TABLE OF CONTENTS
CONSULTANT REPRESENTATIVES

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

GC/CM PROCUREMENT REQUIREMENTS

| 00 11 16 | INVITATION TO BID | ADDENDUM #1 |
| 00 11 20 | INSTRUCTIONS TO BIDDERS | ADDENDUM #1 |
| 00 11 30 | BID PACKAGE DESCRIPTIONS & SCHEDULE | ADDENDUM #1 |
| 00 11 50 | BID FORM | ADDENDUM #1 |

GC/CM SAMPLE DOCUMENTS

| AIA A312 | PERFORMANCE AND PAYMENT BOND – BY REFERENCE ONLY |
| AIA A401 | STANDARD FORM OF AGREEMENT BETWEEN CONTRACTOR & SUBCONTRACTOR |

GC/CM REQUIREMENTS FOR TRADE CONTRACTORS

| 01006 | SUBTRADE CONTRACTOR BONDS & CERTIFICATES OF INSURANCE |
| 01250 | SUBTRADE CONTRACT MODIFICATION PROCEDURES |
| 01291 | SUBTRADE CONTRACTOR APPLICATIONS FOR PAYMENT |
| 01310 | SUBTRADE PROJECT MANAGEMENT AND COORDINATION |
| 017419 | CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL |

STATE OF MONTANA DOCUMENTS

| ST OF MT | GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION – GC/CM – LATEST ED. |
| ST OF MT | MONTANA PREVAILING WAGE RATES FOR BUILDING CONST. SERVICES – LATEST ED. |
| MSU | SUPPLEMENTAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION – LATEST ED. |

DIVISION 1 - GENERAL REQUIREMENTS

| 01 10 00 | SUMMARY |
| 01 25 00 | SUBSTITUTION PROCEDURES |
| 01 32 00 | CONSTRUCTION PROGRESS DOCUMENTATION |
| 01 32 33 | PHOTOGRAPHIC DOCUMENTATION |
| 01 33 00 | SUBMITTAL PROCEDURES |
| 01 40 00 | QUALITY REQUIREMENTS |
| 01 42 00 | REFERENCES |
| 01 60 00 | PRODUCT REQUIREMENTS |
| 01 70 00 | EXECUTION |
| 01 77 00 | CLOSEOUT PROCEDURES INCLUDING MSU CLOSEOUT REQUIREMENTS |
| 01 78 23 | OPERATION AND MAINTENANCE DATA |
| 01 78 39 | PROJECT RECORD DOCUMENTS |

TABLE OF CONTENTS
<table>
<thead>
<tr>
<th>Section Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01 79 00</td>
<td>DEMONSTRATION AND TRAINING</td>
</tr>
<tr>
<td>01 81 13.13</td>
<td>SUSTAINABLE DESIGN REQUIREMENTS – LEED 2009 FOR NEW CONSTRUCTION</td>
</tr>
<tr>
<td>01 91 13</td>
<td>GENERAL COMMISSIONING REQUIREMENTS</td>
</tr>
<tr>
<td>01 91 15</td>
<td>BUILDING ENCLOSURE COMMISSIONING</td>
</tr>
</tbody>
</table>

**GENERAL REQUIREMENTS FORMS**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSI 13.1A</td>
<td>CSI SUBSTITUTION REQUEST</td>
</tr>
<tr>
<td>AIA C106</td>
<td>DIGITAL DATA LICENSING AGREEMENT</td>
</tr>
<tr>
<td>CSI 12.1A</td>
<td>SUBMITTAL TRANSMITTAL</td>
</tr>
<tr>
<td>CSI 14.1A</td>
<td>PUNCH LIST FORM</td>
</tr>
</tbody>
</table>

**DIVISION 2 – EXISTING CONDITIONS**

<table>
<thead>
<tr>
<th>Section Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>02 32 00</td>
<td>GEOTECHNICAL DATA</td>
</tr>
<tr>
<td>02 41 00</td>
<td>SITE DEMOLITION</td>
</tr>
</tbody>
</table>

**DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING**

<table>
<thead>
<tr>
<th>Section Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>23 72 00</td>
<td>AIR-TO-AIR ENERGY RECOVERY EQUIPMENT</td>
</tr>
<tr>
<td>23 73 13</td>
<td>MODULAR INDOR CENTRAL-STATION AIR-HANDLING UNITS</td>
</tr>
<tr>
<td>23 81 46.13</td>
<td>WATER-TO-AIR HEAT PUMPS</td>
</tr>
</tbody>
</table>

**DIVISION 26 – ELECTRICAL**

<table>
<thead>
<tr>
<th>Section Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>26 01 13.16</td>
<td>MEDIUM VOLTAGE, SINGLE- AND MULTI-CONDUCTOR CABLES</td>
</tr>
<tr>
<td>26 05 43</td>
<td>UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS</td>
</tr>
<tr>
<td>26 05 43.13</td>
<td>EXCAVATION AND BACKFILL</td>
</tr>
<tr>
<td>26 05 43.19</td>
<td>MANHOLES AND HARDWARE</td>
</tr>
<tr>
<td>26 06 50</td>
<td>LUMINAIRE SCHEDULE (INCLUDING Bldg / site &amp; Fixture COUNTS)</td>
</tr>
<tr>
<td></td>
<td>(See Attached – Also available in digital format upon request)</td>
</tr>
<tr>
<td>26 08 12</td>
<td>POWER DISTRIBUTION ACCEPTANCE TESTS</td>
</tr>
<tr>
<td>26 08 13</td>
<td>POWER DISTRIBUTION ACCEPTANCE TEST TABLES</td>
</tr>
<tr>
<td>26 12 19</td>
<td>PAD-MOUNTED, LIQUID-FILLED, MEDIUM-VOLTAGE TRANSFORMERS</td>
</tr>
<tr>
<td>26 13 23</td>
<td>MEDIUM-VOLTAGE PAD-MOUNTED SWITCHGEAR</td>
</tr>
</tbody>
</table>

**DIVISION 31 – EARTHWORK**

<table>
<thead>
<tr>
<th>Section Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>31 10 00</td>
<td>SITE CLEARING</td>
</tr>
<tr>
<td>31 11 00</td>
<td>TREE PROTECTION</td>
</tr>
<tr>
<td>31 20 00</td>
<td>EARTH MOVING</td>
</tr>
<tr>
<td>31 25 00</td>
<td>EROSION AND SEDIMENT CONTROL</td>
</tr>
<tr>
<td>31 63 10</td>
<td>VERTICALLY RAMMED ENGINEERED AGGREGATE PIERS</td>
</tr>
</tbody>
</table>

**DIVISION 33 – UTILITIES**

<table>
<thead>
<tr>
<th>Section Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>33 10 00</td>
<td>WATER DISTRIBUTION PIPING</td>
</tr>
<tr>
<td>33 30 00</td>
<td>SANITARY SEWERS</td>
</tr>
<tr>
<td>Role</td>
<td>Name</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Architect: A&amp;E / ZGF</td>
<td>Dusty Eaton Project Principal</td>
</tr>
<tr>
<td></td>
<td>Bill DuBeau Project Manager</td>
</tr>
<tr>
<td></td>
<td>Paul Siderius Project Manager</td>
</tr>
<tr>
<td></td>
<td>Kris Koessl Construction Administrator</td>
</tr>
<tr>
<td></td>
<td>Allyn Stellmacher Project Designer</td>
</tr>
<tr>
<td></td>
<td>Todd Stine Project Principal</td>
</tr>
<tr>
<td></td>
<td>Dana Forfylow Project Manager</td>
</tr>
<tr>
<td>LEED Consultant: Kath Williams + Associates</td>
<td>Kath Williams LEED Consultant</td>
</tr>
<tr>
<td>M-E-P Engineers: ACE / AEI</td>
<td>Todd Meling ACE Project Manager</td>
</tr>
<tr>
<td></td>
<td>Jeffrey Kraft ACE Electrical Engineer</td>
</tr>
<tr>
<td></td>
<td>Paul Erickson AEI Building Performance</td>
</tr>
<tr>
<td>Lab Consultant: RFD</td>
<td>Terry Brown Laboratory Consultant</td>
</tr>
<tr>
<td>Civil, Geotech, Transportation, and Survey Engineers: DOWL HKM</td>
<td>Clint Little Civil Engineer</td>
</tr>
<tr>
<td></td>
<td>Greg Underhill Geotechnical Engineer</td>
</tr>
<tr>
<td>Structural Engineer: Morrison-Maierle</td>
<td>Kurt Keith Structural Engineer</td>
</tr>
<tr>
<td></td>
<td>Jay Fischer Structural Engineer</td>
</tr>
<tr>
<td>Landscape Architect: Land Design</td>
<td>Stacey Robinson Landscape Architect</td>
</tr>
<tr>
<td></td>
<td>Michael Vereman Project Manager</td>
</tr>
<tr>
<td>Acoustic Consultant: Big Sky Acoustics</td>
<td>Sean Connolly Acoustic Designer</td>
</tr>
<tr>
<td>Technology Consultant: Access Consulting</td>
<td>Paul DeWolf Data/Technology Design</td>
</tr>
<tr>
<td></td>
<td>Pete Weber Data/Technology Design</td>
</tr>
<tr>
<td>Audio Visual Design: Onpoint Designs</td>
<td>Jeff Sanderson Audio Visual Consultant</td>
</tr>
</tbody>
</table>
Payment Bond

CONTRACTOR:
(Name, legal status and address)
« »
« »

SURETY:
(Name, legal status and principal place of business)
« »
« »

OWNER:
(Name, legal status and address)
«Department of Administration, State of Montana»
«P.O. Box 200103
1520 East Sixth Avenue
Helena, MT 59620-0103»

CONSTRUCTION CONTRACT
Date: «»
Amount: $ « »
Description:
(Name and location)
Norm Asbjornson Hall
«Corner of S. 7th Ave. and W. Grant.»

BOND
Date:
(Not earlier than Construction Contract Date)
« »
Amount: $ « »
Modifications to this Bond: « » None « » See Section 18

CONTRACTOR AS PRINCIPAL
Company: (Corporate Seal)
Signature: Name and Title:
« » « »
AGENT or BROKER:
« »
« »

SURETY
Company: (Corporate Seal)
Signature: Name and Title:
« » « »

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party):
«Russ Katherman, P.E.»
«P.O. Box 200103
1520 East Sixth Avenue
Helena, MT 59620-0103»

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 to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety’s obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner’s property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety’s expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety’s obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,
   .1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
   .2 have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant’s obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety’s expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety’s failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney’s fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety’s total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney’s fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner’s priority to use the funds for the completion of the work.
§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 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.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. 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.

§ 13 Notice and Claims 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. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 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.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

1. the name of the Claimant;
2. the name of the person for whom the labor was done, or materials or equipment furnished;
3. a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
4. a brief description of the labor, materials or equipment furnished;
5. the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
6. the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
7. the total amount of previous payments received by the Claimant; and
8. the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic’s lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms “labor, materials or equipment” that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor’s subcontractors, and all other items for which a mechanic’s lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.
§ 16.4 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.

§ 16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 17 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.

§ 18 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: «  »
Standard Form of Agreement Between Contractor and Subcontractor

AGREEMENT made as of the TBD day of TBD in the year TBD
(In words, indicate day, month and year)

BETWEEN the Contractor:
Martel Construction, Inc.
1203 South Church
Bozeman, MT 59715
(406) 586-8585

and the Subcontractor:
Company
Address -
City, State, Zip -

The Contractor has made a contract for construction dated: TBD
With the Owner:
Montana State University
PO Box 172760
Bozeman, MT 59717-2760

For the following Project:
Norm Asbjornson Hall
(Include detailed description of Project, location and address)

which Contract is hereinafter referred to as the Prime Contract and which provides for the furnishing of labor, materials, equipment and services in connection with the construction of the Project. A copy of the Prime Contract, consisting of the Agreement Between Owner and Contractor (from which compensation amounts may be deleted) and the other Contract Documents enumerated therein has been made available to the Subcontractor.

The Architect for the Project is:
A&E Architects
608 N 29th St.
Billings, MT 59101
(406) 248-2633

The Contractor and the Subcontractor agree as follows
ARTICLE 1 THE SUBCONTRACT DOCUMENTS

1.1 The Subcontract Documents consist of (1) this Agreement; (2) the Prime Contract, consisting of the Agreement between the Owner and Contractor and the other Contract Documents enumerated therein; (3) Modifications issued subsequent to the execution of the Agreement between the Owner and Contractor; whether before or after the execution of this Agreement; (4) other documents listed in Article 16 of this Agreement; and (5) Modifications to this Subcontract issued after execution of this Agreement. These form the Subcontract, and are as fully a part of the Subcontract as if attached to this Agreement or repeated herein. The Subcontract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. An enumeration of the Subcontract Documents, other than Modifications issued subsequent to the execution of this Agreement, appears in Article 16.

1.2 Except to the extent of a conflict with a specific term or condition contained in the Subcontract Documents, the General Conditions governing this Subcontract shall be the edition of AIA Document A201, General Conditions of the Contract for Construction, current as of the date of this Agreement.

1.3 The Subcontract may be amended or modified only by a Modification. The Subcontract Documents shall not be construed to create a contractual relationship of any kind (1) between the Architect and the Subcontractor, (2) between the Owner and the Subcontractor, or (3) between any persons or entities other than the Contractor and Subcontractor.

1.4 The Subcontractor shall be furnished copies of the Subcontract Documents upon request, but the Contractor may charge the Subcontractor for the reasonable cost of reproduction.

ARTICLE 2 MUTUAL RIGHTS AND RESPONSIBILITIES

2.1 The Contractor and Subcontractor shall be mutually bound by the terms of this Agreement and, to the extent that the provisions of the edition of AIA Document A201 current as of the date of this Agreement apply to this Agreement pursuant to Paragraph 1.2 and provisions of the Prime Contract apply to the Work of the Subcontractor, the Contractor shall assume toward the Subcontractor all obligations and responsibilities that the Owner, under such documents, assumes toward the Contractor, and the Subcontractor shall assume toward the Contractor all obligations and responsibilities which the Contractor, under such documents, assumes toward the Owner and the Architect. The Contractor shall have the benefit of all rights, remedies and redress against the Subcontractor which the Owner, under such documents, has against the Contractor, and the Subcontractor shall have the benefit of all rights, remedies and redress against the Contractor which the Subcontractor, under such documents, has against the Owner, insofar as applicable to this Subcontract. Where a provision of such documents in inconsistent with a provision of this Agreement, this Agreement shall govern.

2.2 The Contractor may require the Subcontractor to enter into agreements with Sub-subcontractors performing portions of the Work of this Subcontract by which the Subcontractor and the Sub-subcontractor are mutually bound, to the extent of the Work to be performed by the Sub-subcontractor, assuming toward each other all obligations and responsibilities which the Contractor and Subcontractor assume toward each other and having the benefit of all rights, remedies and redress each against the other which the Contractor and Subcontractor have by virtue of the provisions of this Agreement.
ARTICLE 3 CONTRACTOR

3.1 SERVICES PROVIDED BY THE CONTRACTOR

3.1.1 The Contractor shall cooperate with the Subcontractor in scheduling and performing the Contractor's Work to avoid conflicts or interference in the Subcontractor's Work and shall expedite written responses to submittals made by the Subcontractor in accordance with Paragraph 4.1 and Article 5. As soon as practicable after execution of this Agreement, the Contractor shall provide the Subcontractor copies of the Contractor's construction schedule and schedule of submittals, together with such additional scheduling details as will enable the Subcontractor to plan and perform the Subcontractor's Work properly. The Subcontractor shall be notified promptly of subsequent changes in the construction and submittal schedules and additional scheduling details.

3.1.2 The Contractor shall provide suitable areas for storage of the Subcontractor's materials and equipment during the course of the Work. Additional costs to the Subcontractor resulting from relocation of such facilities at the direction of the Contractor, except as previously agreed upon, shall be reimbursed by the Contractor.

3.1.3 Except as provided in Article 14, the Contractor's equipment will be available to the Subcontractor only at the Contractor's discretion and on mutually satisfactory terms.

3.2 COMMUNICATIONS

3.2.1 The Contractor shall promptly make available to the Subcontractor information, including information received from the Owner, which affects this Subcontract and which becomes available to the Contractor subsequent to execution of this Subcontract.

3.2.2 The Contractor shall not give instructions or orders directly to the Subcontractor's employees or to the Subcontractor's Sub-subcontractors or material suppliers unless such persons are designated as authorized representatives of the Subcontractor.

3.2.3 The Contractor shall permit the Subcontractor to request directly from the Architect information regarding the percentages of completion and the amount certified on account of Work done by the Subcontractor.

3.2.4 If hazardous substances of a type of which an employer is required by law to notify its employees are being used on the site by the Contractor, a subcontractor or anyone directly or indirectly employed by them (other than the Subcontractor), the Contractor shall, prior to harmful exposure of the Subcontractor's employees to such substance, give written notice of the chemical composition thereof to the Subcontractor in sufficient detail and time to permit the Subcontractor's compliance with such laws.

3.2.5 The Contractor shall furnish to the Subcontractor within 30 days after receipt of a written request, or earlier if so required by law, information necessary and relevant for the Subcontractor 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, usually referred to as the site, on which the Project is located and the Owner's interest therein.

3.2.6 If the Contractor asserts or defends a claim against the Owner which relates to the Work of the Subcontractor, the Contractor shall make available to the Subcontractor information relating to that portion of the claim which relates to the Work of the Subcontractor.

3.3 CLAIMS BY THE CONTRACTOR

3.3.1 Liquidated damages for delay, if provided for in Paragraph 9.3 of this Agreement, shall be assessed against the Subcontractor only to the extent caused by the Subcontractor or any person or entity for whose acts the Subcontractor may be liable, and in no case for delays or causes arising outside the scope of this Subcontract.
3.3.2 The Contractor's claims for services or materials provided the Subcontractor shall require:
.1 seven day's prior written notice except in an emergency;
.2 written compilations to the Subcontractor of services and materials provided and
charges for such services and materials no later than the fifteenth day of the following
month.

3.4 CONTRACTOR'S REMEDIES
3.4.1 If the Subcontractor defaults or neglects to carry out the Work in accordance with this
Agreement and fails within three working days after receipt of written notice from the Contractor
to commence and continue correction of such default or neglect with diligence and promptness,
the Contractor may, after three days following receipt by the Subcontractor of an additional
written notice, and without prejudice to any other remedy the Contractor may have, make good
such deficiencies and may deduct the reasonable cost thereof from the payments then or
thereafter due the Subcontractor.

ARTICLE 4 SUBCONTRACTOR
4.1 EXECUTION AND PROGRESS OF THE WORK
4.1.1 The Subcontractor shall supervise and direct the Subcontractor's Work, and shall
cooperate with the Contractor in scheduling and performing the Subcontractor's Work to avoid
conflict, delay in or interference with the Work of the Contractor, other subcontractors or Owner's
own forces.

4.1.2 The Subcontractor shall promptly submit Shop Drawings, Product Data, Samples
and similar submittals required by the Subcontract Documents with reasonable promptness
and in such sequence as to cause no delay in the Work or in the activities of the Contractor or
other subcontractors.

4.1.3 The Subcontractor shall submit to the Contractor a schedule of values allocated to the
various parts of the Work of this Subcontract, aggregating the Subcontract Sum, made out in such
detail as the Contractor and Subcontractor may agree upon or as required by the Owner, and
supported by such evidence as the Contractor may require. In applying for payment, the
Subcontractor shall submit statements based upon this schedule.

4.1.4 The Subcontractor shall furnish to the Contractor periodic progress reports on the Work
of this Subcontract as mutually agreed, including information on the status of materials and
equipment which may be in the course of preparation, manufacture or transit.

4.1.5 The Subcontractor agrees that the Contractor and the architect will each have the
authority to reject Work of the Subcontractor which does not conform to the Prime Contract. The
Architect's decisions on matters relating to aesthetic effect shall be final and binding on the
Subcontractor if consistent with the intent expressed in the Prime Contract.

4.1.6 The Subcontractor shall pay for all materials, equipment and labor used in connection
with the performance of this Subcontract through the period covered by previous payments
received from the Contractor, and shall furnish satisfactory evidence, when requested by the
Contractor, to verify compliance with the above requirements.

4.1.7 The Subcontractor shall take necessary precautions to protect properly the Work of other
subcontractors from damage caused by operations under this Subcontract.

4.1.8 The Subcontractor shall cooperate with the Contractor, other subcontractors and
the Owner's own forces whose Work might interfere with the Subcontractor's Work. The
Subcontractor shall participate in the preparation of coordinated drawings in areas of congestion, if required by the Prime Contract, specifically noting and advising the contractor of potential conflicts between the Work of the Subcontractor and that of the Contractor, other subcontractors or the Owner's own forces.

4.2 LAWS, PERMITS, FEES AND NOTICES
4.2.1 The Subcontractor shall give notices and comply with laws, ordinances, rules, regulations and orders of public authorities bearing on performance of the Work of this Subcontract. The Subcontractor shall secure and pay for permits and governmental fees, licenses and inspections necessary for proper execution and completion of the Subcontractor's Work, the furnishing of which is required of the contractor by the Prime Contract.

4.2.2 The Subcontractor shall comply with Federal, state and local tax laws, social security acts, unemployment compensation acts and workers' compensation acts insofar as applicable to the performance of this Subcontract.

4.3 SAFETY PRECAUTIONS AND PROCEDURES
4.3.1 The Subcontractor shall take reasonable safety precautions with respect to performance of this Subcontract, shall comply with safety measures initiated by the Contractor and with applicable laws, ordinances, rules, regulations and orders of public authorities for the safety of persons and property in accordance with the requirements of the Prime Contract. The Subcontractor shall report to the contractor within three days an injury to an employee or agent of the Subcontractor which occurred at the site.

4.3.2 If hazardous substances of a type of which an employer is required by law to notify its employees are being used on the site by the Subcontractor, the Subcontractor's Sub-subcontractors or anyone directly or indirectly employed by them, the Subcontractor shall, prior to harmful exposure of any employees on the site to such substance, give written notice of the chemical composition thereof to the Contractor in sufficient detail and time to permit compliance with such laws by the Contractor, other subcontractors and other employers on the site.

4.3.3 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 Subcontractor, the Subcontractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Contractor in writing. When the material or substance has been rendered harmless, the Subcontractor's Work in the affected area shall resume upon written agreement of the contractor and Subcontractor. The Subcontract Time shall be extended appropriately and the Subcontract Sum shall be increased in the amount of the Subcontractor's reasonable additional costs of demobilization, delay and remobilization, which adjustments shall be accomplished as provided in Article 5 of this Agreement.

4.3.4 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Subcontractor, the Subcontractor's Sub-subcontractors, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorney's 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 Subparagraph 4.3.3 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) including loss of use resulting therefrom and provided that such damage, loss or expense is not due to the sole negligence of a party seeking indemnity.
4.4 CLEANING UP
4.4.1 The Subcontractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations performed under this Subcontract. The Subcontractor shall not be held responsible for unclean conditions caused by other contractors or subcontractors.

4.4.2 As provided under Subparagraph 3.3.2, if the subcontractor fails to clean up as provided in the Subcontract Documents, the Contractor may charge the Subcontractor for the Subcontractor's appropriate share of cleanup costs.

4.5 WARRANTY
4.5.1 The Subcontractor warrants to the Owner, Architect and Contractor that materials and equipment furnished under this Subcontract will be of good quality and new unless otherwise required or permitted by the Subcontract Documents, that the Work of this Subcontract will be free from defects not inherent in the quality required or permitted, and that the Work will conform to the requirements of the Subcontract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Subcontractor's warranty excludes remedy for damage or defect caused by abuse, modifications not executed by the Subcontractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage. This warranty shall be in addition to and not in limitation of any other warranty or remedy required by law or by the Subcontract Documents.

4.6 INDEMNIFICATION
4.6.1 To the fullest extent permitted by law, the Subcontractor shall indemnify and hold harmless the Owner, Contractor, 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 attorney's fees, arising out of or resulting from performance of the Subcontractor's Work under this Subcontract, provided that any 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 then the Work itself), but only to the extent caused by the negligent acts or omissions of the Subcontractor, the Subcontractor's Sub-subcontractors, 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 otherwise reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Paragraph 4.6.

4.6.2 In claims against any person or entity indemnified under this Paragraph 4.6 by an employee of the Subcontractor, the Subcontractor's Sub-subcontractors, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Subparagraph 4.6.1 shall not be limited by a limitation on the amount or type of damages, compensation or benefits payable by of for the Subcontractor or the Subcontractor's Sub-subcontractors under workers' compensation acts, disability benefit acts or other employee benefit acts.

4.7 REMEDIES FOR NONPAYMENT
4.7.1 If the Contractor does not pay the Subcontractor through no fault of the Subcontractor, within seven days from the time payment should be made as provided in this Agreement, the Subcontractor may, without prejudice to any other available remedies, upon seven additional days' written notice to the Contractor, stop the Work of this Subcontract until payment of the amount owing has been received. The Subcontract Sum shall, by appropriate adjustment, be increased by the amount of the Subcontractor's reasonable costs of demobilization, delay and remobilization.

WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution.
ARTICLE 5 CHANGES IN THE WORK

5.1 The Owner may make changes in the Work by issuing Modifications to the Prime Contract. Upon receipt of such a Modification issues subsequent to the execution of the Subcontract Agreement, the Contractor shall promptly notify the Subcontractor of the Modification. Unless otherwise directed by the Contractor, the Subcontractor shall not thereafter order materials or perform Work which would be inconsistent with the changes made by the Modifications to the Prime Contract.

5.2 The Subcontractor may be ordered in writing by the Contractor, without invalidating this Subcontract, to make changes in the Work within the general scope of this Subcontract consisting of additions, deletions or other revisions, including those required by Modifications to the Prime Contract issued subsequent to the execution of this Agreement, the Subcontract Sum and the Subcontract Time being adjusted accordingly. The Subcontractor, prior to the commencement of such changed or revised Work, shall submit promptly to the Contractor written copies of a claim for adjustment to the Subcontract Sum and Subcontract Time for such revised Work in a manner consistent with requirements of the Subcontract Documents.

5.3 The Subcontractor shall make all claims promptly to the Contractor for additional cost, extensions of time and damages for delays or other causes in accordance with the Subcontract Documents. A claim which will affect or become part of a claim which the contractor is required to make under the Prime Contract within a specified time period or in a specified manner shall be made in sufficient time to permit the Contractor to satisfy the requirements of the Prime Contract. Such claims shall be received by the Contractor no less than two working days preceding the time by which the Contractor's claim must be made. Failure of the Subcontractor to make such a timely claim shall bind the Subcontractor to the same consequences as those to which the Contractor is bound.

ARTICLE 6 MEDIATION AND ARBITRATION

6.1 MEDIATION

6.1.1 Any claim arising out of or related to this Subcontract, except claims as otherwise provided in Subparagraph 4.1.5 and except those waived in this Subcontract, shall be subject to mediation as a condition precedent to arbitration or the institution of legal or equitable proceedings by either party.

6.1.2 The parties shall endeavor to resolve their claims by mediation which, unless the parties mutually agree otherwise, shall be in accordance with the Construction Industry Mediation Rules of the American Arbitration Association currently in effect. Request for mediation shall be filed in writing with the other party to this Subcontract and the American Arbitration Association. The request may be made concurrently with the filing of a demand for arbitration but, in such event, mediation shall proceed in advance of arbitration or legal or equitable 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.

6.1.3 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.

6.2 ARBITRATION

6.2.1 Any claim arising out of or related to this Subcontract, except claims as otherwise provided in Subparagraph 4.1.5 and except those waived in this Subcontract, shall be subject to arbitration. Prior to arbitration, the parties shall endeavor to resolve disputes by mediation in accordance with the provisions of Paragraph 6.1.
6.2.2 Claims not resolved by mediation shall be decided by arbitration which, unless the parties mutually agree otherwise, shall be in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association currently in effect. Demand for arbitration shall be filed in writing with the other party to this Subcontract and with the American Arbitration Association, and a copy shall be filed with the Architect.

6.2.3 A demand for arbitration shall be made within the time limits specified in the conditions of the Prime Contract as applicable, and in other cases within a reasonable time after the claim has arisen, and in no event shall it be made after the date when institution of legal or equitable proceedings based on such claim would be barred by the applicable statute of limitations.

6.2.4 Limitation on Consolidation or Joinder. Except by written consent of the person or entity sought to be joined, no arbitration arising out of or relating to the Subcontract shall include, by consolidation or joinder or in any other manner, any person or entity not a party to the Subcontract under which such arbitration arises, unless it is shown at the time the demand for arbitration is filed that (1) such person or entity is substantially involved in a common question of fact or law, (2) the presence of such person or entity is required if complete relief is to be accorded in the arbitration, (3) the interest or responsibility of such person or entity in the matter is not insubstantial, and (4) such person or entity is not the Architect, the Architect's employee, the Architect's consultant, or an employee or agent of any of them. This agreement to arbitrate and any other written agreement to arbitrate with an additional person or persons referred to herein shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

6.2.5 Claims and Timely Assertion of Claims. 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.

6.2.6 Judgment on Final Award. 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.

ARTICLE 7 TERMINATION, SUSPENSION OR ASSIGNMENT OF THE SUBCONTRACT

7.1 TERMINATION BY THE SUBCONTRACTOR

7.1.1 The Subcontractor may terminate the Subcontract for the same reasons and under the same circumstances and procedures with respect to the Contractor as the Contractor may terminate with respect to the Owner under the Prime Contract, or for nonpayment of amounts due under this Subcontract for 60 days or longer. In the event of such termination by the Subcontractor for any reason which is not the fault of the Subcontractor, Sub-subcontractors or their agents or employees or other persons performing portions of the Work under contract with the Subcontractor, the Subcontractor shall be entitled to recover from the Contractor payment for Work executed and for proven loss with respect to materials, equipment, tools, and construction equipment and machinery, including reasonable overhead, profit and damages.

7.2 TERMINATION BY THE CONTRACTOR

7.2.1 If the Subcontractor persistently or repeatedly fails or neglects to carry out the Work in accordance with the Subcontract Documents or otherwise to perform in accordance with this Subcontract and fails within three days after receipt of written notice to commence and continue correction of such default or neglect with diligence and promptness, the Contractor may, after seven days following receipt by the Subcontractor of an additional written notice and without prejudice to any other remedy the Contractor may have, terminate the Subcontract and finish the Subcontractor's Work by whatever method the Contractor may deem expedient.
unpaid balance of the Subcontract Sum exceeds the expense of finishing the Subcontractor's Work and other damages incurred by the Contractor and not expressly waived, such excess shall be paid to the Subcontractor. If such expense and damages exceed such unpaid balance, the Subcontractor shall pay the difference to the Contractor.

7.2.2 If the Owner terminates the Contract for the Owner's convenience, the Contractor shall deliver written notice to the Subcontractor.

7.2.3 Upon receipt of written notice of termination, the Subcontractor shall:
   .1 cease operations as directed by the Contractor in the notice;
   .2 take actions necessary, or that the Contractor 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 Sub-subcontracts and purchase orders and enter into no further Sub-subcontracts and purchase orders.

7.2.4 In case of such termination for the Owner's convenience, the Subcontractor 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.

7.3 SUSPENSION BY THE CONTRACTOR FOR CONVENIENCE

7.3.1 The Contractor may, without cause, order the Subcontractor in writing to suspend, delay or interrupt the Work of this Subcontract in whole or in part for such period of time as the Contractor may determine. In the event of suspension ordered by the Contractor, the Subcontractor shall be entitled to an equitable adjustment of the Subcontract Time and Subcontract Sum.

7.3.2 An adjustment shall be made for increases in the Subcontract Time and Subcontract Sum, including profit on the increased cost of performance, caused by suspension, delay or interruption. 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 Subcontractor is responsible;
   .2 that an equitable adjustment is made or denied under another provision of this Subcontract.

7.4 ASSIGNMENT OF THE SUBCONTRACT

7.4.1 In the event of termination of the Prime Contract by the Owner, the Contractor may assign this Subcontract to the Owner, with the Owner's agreement, subject to the provisions of the Prime Contract and to the prior rights of the surety, if any, obligated under bonds relating to the Prime Contract. In such event, the Owner shall assume the Contractor's rights and obligations under the Subcontract Documents. If the Work of the Prime Contract has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted.

7.4.2 The Subcontractor shall not assign the Work of this Subcontract without the written consent of the Contractor, nor subcontract the whole of this Subcontract without the written consent of the Contractor, nor further subcontract portions of this Subcontract without written notification to the Contractor when such notification is requested by the Contractor.
ARTICLE 8 THE WORK OF THIS SUBCONTRACT

8.1 The Subcontractor shall execute the following portion of the Work described in the Subcontract Documents, including all labor, materials, equipment, services and other items required to complete such portion of the Work, except to the extent specifically indicated in the Subcontract Documents to be the responsibility of others.

(Insert a precise description of the Work of this Subcontract, referring where appropriate to numbers of Drawings, sections of Specifications and pages of Addenda, Modifications and accepted Alternates.)

ARTICLE 9 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

9.1 The Subcontractor's date of commencement is the date from which the Contract Time of Paragraph 9.3 is measured; it shall be the date of this Agreement, as first written above, unless a different date is stated below or provision is made for the date to be fixed in a notice to proceed issued by the Contractor. Subcontractor agrees to commence and to complete its work required by this Subcontract as required by job progress or within the following time limits:

As directed by Martel Construction, Inc., from time to time.

(Insert the date of commencement, if it differs from the date of this Agreement or, if applicable, state that the date will be fixed in a notice to proceed.)

9.2 Unless the date of commencement is established by a notice to proceed issued by the Contractor, or the contractor has commenced visible Work at the site under the Prime Contract, the Subcontractor shall notify the contractor in writing not less than five days before commenc-ing the Subcontractor's Work to permit the timely filing of mortgages, mechanic's liens and other security interests.

9.3 The Work of this Subcontract shall be substantially completed not later than

(Insert the calendar date or number of calendar days after the Subcontractor's date of commencement. Also insert any requirements for earlier Substantial Completion of certain portions of the Subcontractor's Work, if not stated elsewhere in the Subcontract documents.)

, subject to adjustments of this Subcontract Time as provided in the Subcontract Documents.

(Insert provisions, if any, for liquidated damages relating to failure to complete on time.)

None

9.4 With respect to the obligations of both the Contractor and the Subcontractor, time is of the essence of this Subcontract.

9.5 No extension of time will be valid without the contractor's written consent after claim made by the Subcontractor in accordance with Paragraph 5.3.
ARTICLE 10 SUBCONTRACT SUM

10.1 The Contractor shall pay the Subcontractor in current funds for performance of the Subcontract the Subcontract Sum of:

words

( numbers ), subject to additions and deductions as provided in the Subcontract Documents.

10.2 The Subcontract Sum is based upon the following alternates, if any, which are described in the Subcontract Documents and have been accepted by the Owner and the Contractor:

(Insert the numbers or other identification of accepted alternates.)

There are no alternates

10.3 Unit prices, if any, are as follows:

There are no unit costs

ARTICLE 11 PROGRESS PAYMENTS

11.1 Based upon applications for payment submitted to the Contractor by the Subcontractor, corresponding to applications for payment submitted by the Contractor to the Architect, and certificates for payment issued by the Architect, the Contractor shall make progress payments on account of the Subcontract Sum to the Subcontractor as provided below and elsewhere in the Subcontract Documents. Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor and Subcontractor for Work properly performed by their contractors and suppliers shall be held by the Contractor and Subcontractor for those contractors or suppliers who performed Work of furnished materials, or both, under contract with the Contractor or Subcontractor for which payment was made to the Contractor by the Owner or to the Subcontractor by the Contractor, as applicable. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the contractor or Subcontractor, shall create any fiduciary liability or tort liability on the part of the Contractor of Subcontractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the contractor or Subcontractor for breach of the requirements of this provision.

11.2 The period covered by each application for payment shall be one calendar month ending on the last day of the month, or as follows: Retainage will be withheld from each monthly application in the amount of 5% of the work in place. The first progress application will not be processed until Attachments E & H are completed. Progress payments will be made within seven (7) days of receipt of payment from the Owner. It is specifically understood & agreed that the payment to the Subcontract is dependent, as a condition precedent, upon the Contractor receiving contract payments, including retainage payments from the Owner.

11.3 Provided an application for payment is received by the Contractor not later than the 25th day of a month, the Contractor shall include the Subcontractor's Work covered by that application in the next application for payment which the Contractor is entitled to submit to the Architect. The Contractor shall pay the Subcontractor each progress payment within 7 working days after the Contractor receives payment from the Owner. If the Architect does not issue a certificate for payment or the contractor does not receive payment for any cause which is not the fault of the Subcontractor, the Contractor shall pay the Subcontractor, on demand, a progress payment computed as provided in Paragraphs 11.7, 11.8 & 11.9.

© 1997 AIA

AIA DOCUMENT A401-1997
CONTRACTOR-
SUBCONTRACTOR
AGREEMENT

The American Institute
of Architects
1735 New York Avenue, N.W
Washington, D.C. 20006-5292

WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution.
11.4 If an application for payment is received by the Contractor after the application date fixed above, the Subcontractor's Work covered by it shall be included by the contractor in the next application for payment submitted to the Architect.

11.5 Each application for payment shall be based upon the most recent schedule of values submitted by the Subcontractor in accordance with the Subcontract Documents. The schedule of values shall allocate the entire Subcontract Sum among the various portions of the Subcontractor's Work and be prepared in such form and supported by such data to substantiate its accuracy as the Contractor may require. This schedule, unless objected to by the Contractor, shall be used as a basis for reviewing the Subcontractor's applications for payment.

11.6 Applications for payment submitted by the Subcontractor shall indicate the percentage of completion of each portion of the Subcontractor's Work as of the end of the period covered by the application for payment.

11.7 Subject to the provisions of the Subcontract Documents, the amount of each progress payment shall be computed as follows:

11.7.1 Take that portion of the subcontract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Subcontractor's Work by the share of the total Subcontract Sum allocated to that portion of the Subcontractor's Work in the schedule of values, less that percentage actually retained, if any, from payments to the Contractor on account of the Work of the Subcontractor. Pending final determination of cost to the Contractor of changes in the Work which have been properly authorized by the Contractor, amounts not in dispute shall be included to the same extent provided in the Prime Contract, even though the Subcontract Sum has not yet been adjusted.

11.7.2 Add that portion of the Subcontract Sum properly allocable to materials and equipment delivered and suitable stored at the site by the Subcontractor for subsequent incorporation in the Subcontractor's Work or, if approved by the Contractor, suitably stored off the site at a location agreed upon in writing, less the same percentage retainage required by the Prime Contract to be applied to such materials and equipment in the Contractor's application for payment;

11.7.3 Subtract the aggregate of previous payments made by the Contractor; and

11.7.4 Subtract amounts, if any, calculated under Subparagraph 11.7.1 or 11.7.2 which are related to Work of the Subcontractor for which the Architect has withheld or nullified, in whole or in part, a certificate of payment for a cause which is the fault of the Subcontractor.

11.8 Upon the partial or entire disapproval by the Contractor of the Subcontractor's application for payment, the Contractor shall provide written notice to the Subcontractor. When the basis for the disapproval has been remedied, the Subcontractor shall be paid the amounts withheld.

11.9 SUBSTANTIAL COMPLETION

11.9.1 When the Subcontractor's Work or a designated portion thereof is substantially complete and in accordance with the requirements of the Prime contract, the contractor shall, upon application by the Subcontractor, make prompt application for payment for such Work. Within 30 days following issuance by the Architect of the certificate for payment covering such substantially completed Work, the Contractor shall, to the full extent allowed in the Prime Contract, make payment to the Subcontractor, deducting any portion of the funds for the Subcontractor's Work withheld in accordance with the certificate to cover costs of items to be completed or corrected by the Subcontractor. Such payment to the Subcontractor shall be the entire unpaid balance of the Subcontract Sum if a full release of retainage is allowed under the Prime Contract; and
Prime Contract for the Subcontractor's Work prior to the completion of the entire Project. If the Prime Contract does not allow for a full release of retainage, then such payment shall be an amount which, when added to previous payments to the Subcontractor, will reduce the retainage on the Subcontractor's substantially completed Work to the same percentage of retainage as that on the Contractor's Work covered by the certificate.

**ARTICLE 12 FINAL PAYMENT**

12.1 Final payment, constituting the entire unpaid balance of the Subcontract Sum, shall be made by the Contractor to the Subcontractor when the Subcontractor's Work is fully performed in accordance with the requirements of the Subcontract Documents, the Architect has issued a certificate for payment covering the Subcontractor's completed Work and the Contractor has received payment from the Owner. If, for any cause which is not the fault of the Subcontractor, a certificate for payment is not issued or the Contractor does not receive timely payment or does not pay the Subcontractor within three working days after receipt of payment from the Owner, final payment to the Subcontractor shall be made upon demand. *(Insert provisions for earlier final payment to the Subcontractor, if applicable)*

No final payments will be made until all closeout items, warranties, as-builts, instructions, etc. are accepted by the Owner and Architect.

It is specifically understood and agreed that the payment to the Subcontract is dependent, as a condition precedent, upon the Contractor receiving contract payments, including retainage payments from the Owner.

12.2 Before issuance of the final payment, the Subcontractor, if required, shall submit evidence satisfactory to the Contractor that all payrolls, bills for materials and equipment, and all known indebtedness connected with the Subcontractor's Work have been satisfied.

**ARTICLE 13 INSURANCE AND BONDS**

13.1 The Subcontractor shall purchase and maintain insurance of the following types of coverage and limits of liability:

Furnish Certificates of:

.1 General Liability Insurance including coverage for all vehicles that will be on site as a part of your scope of work. - *See Attachment H*

.2 State of Montana Workers Compensation Certificate of Insurance

.3 Contractors Certificate of Registration - *See Attachment B*

13.2 Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from date of commencement of the Subcontractor's Work until date of final payment and termination of any coverage required to be maintained after final payment to the Subcontractor.

13.3 Certificates of insurance acceptable to the Contractor shall be filed with the Contractor prior to commencement of the Subcontractor's Work. These certificates and the insurance policies required by this Article 13 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 Contractor. If any of the foregoing insurance coverages are required to remain in force after final payment and are reasonably available, an additional certificate evidencing continuation of such coverage shall be submitted with the final application for payment as required in Article 12. If any information concerning reduction of coverage is not furnished by the insurer, it shall be furnished by the Subcontractor with reasonable promptness according to the Subcontractor's information and belief.
13.4 The Contractor shall furnish to the Subcontractor satisfactory evidence of insurance required of the Contractor under the Prime Contract.

13.5 The Contractor shall promptly, upon request of the Subcontractor, furnish a copy or permit a copy to be made of any bond covering payment of obligations arising under the Subcontract.

13.6 Performance Bond and Payment Bond:  
No Bond Required

If a bond is required - the cost of the bond will be reimbursed as an increase to the Subcontract Sum at the cost of the bond.

13.7 PROPERTY INSURANCE
13.7.1 When requested in writing, the contractor shall provide the Subcontractor with copies of the property and equipment policies in effect for the Project. The Contractor shall notify the Subcontractor if the required property insurance policies are not in effect.

13.7.2 If the required property insurance is not in effect for the full value of the Subcontractor's Work, then the Subcontractor shall purchase insurance for the value of the Subcontractor's Work, and the Subcontractor shall be reimbursed for the cost of the insurance by an adjustment in the Subcontract Sum.

13.7.3 Property insurance for the Subcontractor's materials and equipment required for the Subcontractor's Work, stored off site or in transit and not covered by the Project property insurance, shall be paid for through the application for payment process.

13.8 WAIVERS OF SUBROGATION
13.8.1 The Contractor and Subcontractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Owner, the Architect, the Architect's consultants, separate contractors, 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 provided under the Prime Contract of other property insurance applicable to the Work, except such rights as they may have to proceeds of such insurance held by the Owner as a fiduciary. The Subcontractor shall require of the Subcontractor's Sub-subcontractors, agents and employees by appropriate agreements, written where legally required for validity, similar waivers in favor of the parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement of 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 no the person or entity had an insurable interest in the property damaged.

ARTICLE 14 TEMPORARY FACILITIES AND WORKING CONDITIONS
14.1 The Contractor shall furnish and make available to the Subcontractor the following temporary facilities, equipment and services; these shall be furnished at no cost to the Subcontractor unless otherwise indicated below:

Refer to Attachment A and the specification.

Storage of material and equipment shall be as directed and approved by the Project Superintendent of the General Contractor.
14.2 Specific working conditions:
(Insert any applicable arrangements concerning working conditions and labor matters for the Project.)
To insure continuous progress of the work and project harmony among all parties, the following measures will be employed:
In case of pickets, strikes or walk-outs by labor unions, a designated neutral gate will be provided for the use of other crafts.
Any Subcontractor who fails to perform or staff his work after three days written notice, shall be deemed in default of this contract and subject to replacement and any damages from such action. This is supplemental to paragraph 3.4.1 of the general conditions.
All work shall be performed subject to the Occupational Safety and Health act (OSHA)
All Subcontractors are responsible for their own cleanup. Any subcontractor who fails to keep his work area satisfactorily cleaned up will be notified by the Project Superintendent. If no improvement is made, the General Contractor will assume responsibility for cleanup at the expense to the Subcontractor.

ARTICLE 15 MISCELLANEOUS PROVISIONS
15.1 Where reference is made in this Subcontract to a provision of another Subcontract Document, the reference refers to that provision as amended or supplemented by other provisions of the Subcontract Documents.

15.2 Payments due and unpaid under his Subcontract 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.
(Insert rate of interest agreed upon, if any)
Interest under this paragraph resulting from any delay in the contractors' receipt of payment from the owner will be paid only to the extent that such interest is paid by the owner to the contractor.

15.3 Retainage and any reduction thereto is as follows:
Retainage will be 5% of the work in place

15.4 The Contractor and Subcontractor waive claims against each other for consequential damages arising out of or relating to this Subcontract, including without limitation, any consequential damages due to either party's termination in accordance with Article 7.

ARTICLE 16 ENUMERATION OF SUBCONTRACT DOCUMENTS
16.1 The Subcontract Documents, except for Modifications issued after execution of this Subcontract, are enumerated as follows:

16.1.1 This executed 1997 edition of the Standard Form of Agreement Between Contractor and Subcontractor, AIA Document A401-1997;

16.1.2 The Prime Contract, consisting of the Agreement between the Owner and Contractor dated as first entered above and the other Contract Documents enumerated in the Owner-Contractor Agreement;
16.1.3 The following Modifications to the Prime Contract, if any, issued subsequent to the
execution of the Owner-Contractor Agreement but prior to the execution of this Agreement:

<table>
<thead>
<tr>
<th>Modification</th>
<th>Date</th>
</tr>
</thead>
</table>

16.1.4 Other Documents, is any, forming part of the Subcontract Documents are as follows:
(List any additional documents that are intended to form part of the Subcontract Documents. Requests for
proposal and the Subcontractor's bid or proposal should be listed here only if intended to be part of the
Subcontract Documents.)

Subcontractor acknowledges the following Attachments:
- Attachment A - Scope of Work
- Attachment B - Contract Certificate of Registration
- Attachment C - Shop Drawings & Submittals
- Attachment D - Construction Schedule
- Attachment F - Safety Requirements
- Attachment F.1 - Clean Up Clause
- Attachment G - Subcontractors Proposal
- Attachment H - Liability Insurance Certificate Requirements
- Attachment I - Immigration Reform and Control Act of 1986
- Attachment L - Lien Releases
- Attachment M - Certified Payroll Requirements
- Attachment N - Contract Forms

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

CONTRACTOR (Signature)  
Date: ___________________
(Printed name and title)

SUBCONTRACTOR (Signature)
Date: ___________________
(Printed name and title)

CAUTION: You should sign an original AIA document or a licensed reproduction. Originals contain the AIA logo
printed in red; licensed reproductions are those produced in accordance with the Instructions to this document.
ATTACHMENT A

MSU Norm Ashjornson Hall

Specific Contract Inclusions and Exclusions to the Subcontract Agreement between Martel Construction, Inc. and Company

INCLUSIONS

Furnish all material and equipment necessary, and perform all labor required for your work as identified below or as additionally shown on/in the contract documents prepared by contract documents include:

- The Drawings - complete, as prepared by XXXX
- The Specifications - Volume 1, Complete as prepared by XXXX
- Addenda - None
- Alternates - None

NOTE: All portions of the General Conditions, Supplementary Conditions, Contract Clauses, Special Provisions, General Requirements, etc., included in the contract documents are incorporated into this Subcontract Agreement. Compliance with incorporation into any lower tier subcontracts is the responsibility of the Subcontractor.

Specific reference is made to the following Specifications under Subcontractor's scope of work:

Reference/Title

- Division 9
- Specification Sections….
- 

GENERAL SCOPE OF WORK INCLUSIONS:

- Includes applicable costs of permits, licenses and fees and sales tax for scope of work. (Building Permit by Owner)

- Sleeves, firestopping, flashing and caulking/sealant as applicable to complete work installed under this Subcontract Agreement.

- Provide all seismic protection and/or devices required of subcontractor’s scope of work.

- Includes layout for scope of work (grid lines, corners and benchmarks by Martel).

- Submittals shall be made in accordance with the Contract Documents, General Requirements and applicable Technical Specifications/Contract Drawings. Submittals shall be provided such that approvals are received allowing materials to be delivered to the project site thirty (30) days prior to the commencement of affected work. However, it is prudent to complete the submittal requirements as early as possible to avoid delays in the work resulting from re-submittals, fabrication errors, late material deliveries, etc. Subcontractor must complete submittals in respect of the project's aggressive schedule.
ATTACHMENT A

MSU Norm Asbjornson Hall

• Submit all required submittals and required shop drawings as required by this Attachment under part "Submittals". Any deviations to contract requirements must be coordinated with all affected parties and costs resulting from the deviation shall be borne by the Subcontractor.

• Subcontractor will submit to Martel, if requested, copies of all relevant publications referenced in the applicable contract specifications as deemed necessary by Martel for proper evaluation of submittals, supplied materials, workmanship, etc.

• Operation and Maintenance data, spare parts lists, spare parts, special tools, inventories of installed properties and training of operation and service personnel must be submitted in accordance with the contract documents and on or before dates determined by Martel. All Owners Training will be pre-scheduled a minimum of thirty (30) days prior, in writing, for formal approval prior to being conducted.

• Provide guarantees (warranties) as required by the contract documents. Guarantees/Warranties shall not commence until the Owner’s final acceptance of the project.

• Construction shall be completed in accordance with schedules generated by Martel Construction, Inc. (with Subcontractor participation provided as required by Martel) including updates as directed by Martel. Subcontractor recognizes and agrees to aggressive schedule requirements and shall staff/supply the project as required by project schedules, work progress, and activity milestones. An overall completed project (including administrative items, final punch list and Owner acceptance) date has been established and is scheduled for  September 28, 2012.

• Project Management for the duration of the project to administrate subcontractors scope of work timely.

• Site Supervisor for the duration of subcontractor’s work.

• Provide onsite supervision including individual(s) responsible for Quality Management, acceptable to Martel and the Architect/Owner.

• Subcontractor shall designate a knowledgeable, trained safety representative tasked with ensuring compliance and enforcement of safe working practices by its employees.

• Provide capabilities for processing layout drawings, shop drawings, as-builts, submittals, change orders, proposals and other items of an administrative nature.

• Provide off loading, handling, hoisting and suitable storage facilities for all equipment and materials required to complete work performed by subcontractor.

• Furnish and install all new incidental material/equipment, including but not limited to carriers, fasteners and appurtenances necessary to complete work under this Subcontract Agreement.

• Provide layout, including coordinated layout drawings as required, to complete interior and exterior work under this Agreement.
ATTACHMENT A

MSU Norm Ashjornson Hall

• Construction debris and rubbish generated by work under this Subcontract Agreement shall be removed from the project work area to the jobsite disposal site.

• Protection of subcontractors existing work and restoration of any damages done by work activities under this contract agreement to other trades work.

• Provide all necessary engineering, testing and factory representatives required of the specifications to complete work under this Subcontract Agreement.

• Includes sealing of all penetrations caused by work under this Subcontract Agreement.

• Cutting and core drilling required to complete work of this Subcontract Agreement.

SPECIFIC SCOPE OF WORK INCLUSIONS:

• Per Subcontractors Clarifications – Attachment G

EXCLUSIONS:

• Per Subcontractors Clarifications – Attachment G
ATTACHMENT B

Contractor Certificate of Registration
or
Independent Contractor Exemption

The Department of Labor and Industry Employment Relations Division requires that all Contractors and Subcontractors in the building or construction industry be registered with the State of Montana whether the contractor or subcontractor has employees or not, prior to beginning work on any of our projects.

Licensed plumbers and electricians acting within the scope of their license are exempt.

This requirement will be satisfied by providing Martel Construction, Inc. with a copy of the "Certificate of Contractor Registration" (if you have employees), or a "Certificate of Exemption" (if you have no employees), issued by the Department of Labor.

These requirements also pertain to companies who provide leased employees to Subcontractors. It is the Subcontractors' responsibility to obtain such documentation and present it to Martel Construction, Inc.

For information regarding the Contractor Registration and Certificate of Exemption call Montana Department of Labor and Industry at 406-444-1446 or 406-444-7734 or go to the following web site:

ATTACHMENT C

Shop Drawings & Submittals

All Shop Drawings and Submittals are to be submitted to Martel Construction, Inc. only. Please fill out a separate form for each section submitted. Include section number, manufacturer, model number and color. The subcontractor or material supplier shall note on the Shop Drawings or Submittals any change of materials from the specifications.

Preliminary Schedule of Values Submittal: A preliminary Schedule of Values must be submitted as a formal submittal for approval to the Project Manger at least 10 days prior to submitting your first Pay Application Packet. No applications for payment will be reviewed for payment without an approved Schedule of Values. Email subcontractors@martelconstruction.com to request your electronic version of your Schedule of Values.

Submit per Specifications. Any samples shall be submitted per specifications.

Number of Copies of Submittals
A. 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. Samples: Submit the number specified in individual specification sections; one of which will be retained by the architect.
   1. After review, produce duplicates.
   2. Retained samples will not be returned to Contractor unless specifically so stated.

Be advised that any Submittal that has received a third rejection is subject to subcontract or purchase order cancellation.

Please send Submittals and Shop Drawings to the following address:

Martel Construction, Inc.
1203 South Church Avenue
Bozeman, Montana  59715

Attn: PM's Name Here

cell
email
ATTACHMENT D

Construction Schedule

Dated…
ATTACHMENT F

SAFETY REQUIREMENTS

The policy of Martel Construction Inc. is to provide and maintain safe working conditions and to follow operating practices that will safeguard all employees. In order to implement this policy the subcontractor will be required to:

1. Provide a safe jobsite and be responsible for the work performance and safety of all employees, personnel, equipment and materials within Subcontractor's or its lower - tier subcontractors' care, custody or control.

2. Adhere to all applicable OSHA/MSHA regulations.


4. Furnish all required safety equipment for its work and ensure all of their employees and lower - tier subcontractors' employees have and wear personal protective equipment in compliance with applicable OSHA/MSHA requirements and Contractors safety rules.

5. Maintain a written Accident Prevention Plan and a jobsite specific safety plan in compliance with applicable OSHA/MSHA regulations. The Plan will address the Subcontractor's role and responsibilities pertaining to safety on the jobsite, training and corrective action and be tailored to safety and health requirements for the work involved. Said plan will be provided to Martel Construction when requested. Subcontractor shall have and enforce disciplinary procedures in the event safety violations are discovered.

6. Attend all safety meetings for the project.

7. Notify the Martel Construction Inc. Superintendent of any unsafe acts or conditions, and all injuries and accidents occurring on the job site.

8. Contractor's supervisor may direct Subcontractors supervisor to remove employees not in compliance with the requirements of this agreement. In the event the Subcontractor fails to promptly correct its safety violation, Contractor may order Subcontractor to stop work until the violation is corrected and may correct the violation and charge all costs of compliance to the Subcontractor.

9. Subcontractor agrees to defend, indemnify and hold Martel Construction harmless from all OSHA/MSHA claims, demands, proceedings, violations, penalties, assessments or fines that arise out of or relate to the Subcontractors failure to comply with any safety-related laws, ordinances, rules, regulations, orders or its obligations here-under. Martel Construction may charge against the sums otherwise owing to Subcontractor the amount of the fine and the fees, costs and expenses incurred by Martel Construction in the defense of the claims citation and/or fine arising from or relating to the Subcontractors above referenced failure. The Subcontractor shall participate in the incremental cost of future fines that are a direct increase due to this Subcontractors OSHA/MSHA violations.
ATTACHMENT F.1
SUPPLEMENTARY GENERAL CONDITIONS

4.4 Clean Up

Add the following clause to Paragraph 4.4

**Daily Clean Up.**

If daily clean up of materials is not performed by the sub-contractor, the general contractor will do so at a rate of $55 per hour. The sub-contractor will be charged for work performed by the general contractor. Each sub-contractor is responsible for removal and legal on site disposal of all packing, shipping and miscellaneous waste materials associated with and classified as construction debris.

**Final Clean-Up**

If final clean up of all debris, masking, and over spray is not performed in a timely manner by the sub-contractor, the general contractor will do so at a rate of $55 per hour. The sub-contractor will be charged for work performed by the general contractor.
ATTACHMENT G

Subcontractors Proposal

Per Subcontractors bid proposal dated ...
ATTACHMENT H

Liability Insurance Certificate Requirements

1. “Insurance Requirements”

SUBCONTRACTOR shall purchase and maintain insurance as required to protect MARTEL CONSTRUCTION and the OWNER from claims set forth below which may arise out of or result from operations of the SUBCONTRACTOR under this Agreement, whether such claims arise during performance or subsequent to completion of the operations under the Agreement and whether such operations be by SUBCONTRACTOR or by anyone directly or indirectly employed by SUBCONTRACTOR or by anyone for whose acts the SUBCONTRACTOR may be liable. Insurance shall be purchased from a company licensed to do business in the state (with an "A" rated or better classification) where the Project is located, and shall be written for not less than the limits of liability specified below or as stipulated with the Main Contract, whichever is greater. The types of claims, required coverage and minimum limits of liability are as follows:

a.) Claims under Workers Compensation, disability benefit and other similar employee benefit act; claims for damages because of bodily injury, occupational sickness or disease or death of employees. Minimum insurance coverage shall include:
   i. Workers Compensation Statutory
   ii. Employer's Liability- Each Accident $ 1,000,000
      Disease - Policy Limit $ 1,000,000
      Disease - Each Employee $ 1,000,000

   Workers Compensation coverage must extend to every employee, including all owners and officers of a closely held corporation and/or individuals operating as a sole proprietor or partnership, if they will be working onsite.

b.) COMMERCIAL GENERAL LIABILITY - Claims for damages because of bodily injury or property damage; Insurance shall include:
   i. Premises - Operations
   ii. Products - Completed Operations
   iii. Blanket Contractual - As will cover the provisions of the Agreement
   iv. Broad Form Property Damage
   v. Personal Injury
   vi. No Exclusion for Blanket Explosion, Collapse, and Underground Property Damage
   vii. Operations of Independent Contractors
   viii. No exclusion for injury to subcontractors employees
   ix. No exclusion for residential or multi-family work

Continued on next page
Minimum Policy Limits:

<table>
<thead>
<tr>
<th>Category</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Aggregate</td>
<td>$2,000,000</td>
</tr>
<tr>
<td>Products/Completed Operations</td>
<td>$2,000,000</td>
</tr>
<tr>
<td>Personal Injury</td>
<td>$1,000,000</td>
</tr>
<tr>
<td>Each Occurrence</td>
<td>$1,000,000</td>
</tr>
</tbody>
</table>

SUBCONTRACTOR shall add MARTEL CONSTRUCTION and PROJECT OWNER as Additional Insured(s) for both ongoing and products/completed operations using form CG2010 (11/85) or equivalent. SUBCONTRACTORS' insurance policy shall be considered primary insurance, without recourse to or contribution from any similar insurance carried by MARTEL CONSTRUCTION. The SUBCONTRACTOR shall deliver to MARTEL CONSTRUCTION certificates of insurance evidencing compliance with this insurance provision prior to the commencement of work. SUBCONTRACTOR shall maintain coverage and additional insured status for one year past substantial completion or to the end of the warranty period, whichever is greater.

c.) COMMERCIAL 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.

With all lines of insurance, the SUBCONTRACTOR is required to provide to MARTEL CONSTRUCTION 30 days written notice if the SUBCONTRACTORS' policy is canceled.
The Subcontractor represents and warrants that it is in compliance with and agrees that it will remain in compliance with the provisions of the Immigration Reform and Control Act of 1986, including but not limited to the provisions of the Act prohibiting hiring and continued employment of unauthorized aliens, requiring verification and record keeping with respect to identity and eligibility for employment, and prohibiting discrimination on the basis of national origin, United States citizenship, or intending citizen status.

The Subcontractor agrees to indemnify and hold Martel Construction, Inc. harmless from all liability, including liability for interest and penalties and including attorney's fees and costs, that Martel incurs as a result of the Subcontractor's failing to comply with any provision of the Immigration Reform and Control Act of 1986.
ATTACHMENT L

Lien Releases

Lien Releases are required to be included in your Pay Application Packet.

Instructions for Filling Out and Submitting Lien Releases

Each and every Application for Payment will require Lien Releases to accompany it as follows:

1. One Martel Lien Release listing Martel Construction, Inc. as your "Customer" to become effective upon release of payment corresponding with the attached Pay Application.

2. One Unconditional Lien Release for each of your second-tier subcontractors and suppliers listed on your approved Schedule of Values. Your subs and suppliers will list you as their "Customer". We recommend that you include a blank copy of the Unconditional Lien Release with your payments to your subs and suppliers. Your subs/suppliers can then sign and return these lien releases to you. Once you receive these they become part of your next Pay Application Packet.

You may request an electronic version of the Lien Releases by emailing subcontractors@martelconstruction.com or call our Bozeman office at 406-586-8585.
MARTEL CONSTRUCTION LIEN WAIVER AND RELEASE
UPON PROGRESS PAYMENT

Project Name: MSU Norm Asbjornson Hall

Project Street Address: 0

Project City, State, Zip: 0

Undersigned's Customer: Martel Construction, Inc.

Current Invoices(s) or Payment Application Number: ____________________________

Current Amount of Invoices(s) or Payment Application Due: ____________________________

Amount Paid to Date on Previous Invoice(s) or Payment Application(s):

Upon receipt by the undersigned of a check in the above referenced payment amount payable to the undersigned, and when the check has been properly endorsed and has been paid by the bank on which it is drawn, this document becomes effective to release and the undersigned shall be deemed to waiver any notice of lien, any private bond right, any claims for payment and any rights under any similar ordinance, rule or statute related to payment rights that the undersigned has on the above described project to the following extent:

This release covers a progress payment for the work, materials or equipment furnished by the undersigned to the project or the undersigned's customer which are the subject of the Invoice or Payment Application, but only to the extent of the payment amount or such portion of the payment amount as the undersigned is actually paid, and does not cover any retention withheld, any items, modifications or changes pending approval, disputed items and claims, or items furnished or invoiced after the payment period. Before any recipient of this document relies on it, evidence of payment to the undersigned should be verified. The undersigned warrants that payment has already been paid or that the money received from this progress payment will be used to promptly pay in full all laborers, subcontractors, materialmen, union dues and suppliers for all work, materials or equipment that are the subject of this waiver and release.

I CERTIFY UNDER PENALTY OF PERJURY UNDER LAWS OF THE STATE OF MONTANA THAT THE ABOVE IS A TRUE AND CORRECT STATEMENT.

Dated: ____________________________

Company

(Company Name)

Signature: ____________________________

Print name: ____________________________

Title: ____________________________
MARTEL CONSTRUCTION UNCONDITIONAL LIEN WAIVER AND RELEASE UPON PROGRESS PAYMENT

Project Name: MSU Norm Asbjornson Hall

Project Street Address: 0

Project City, State, Zip: 0

Undersigned's Customer: Company

Total Amount of Invoice(s) or Payment Application(s) Due to Date:

Amount of Invoices(s) or Payment Application Due at 0-30 Days:

Due at 31-60 Days:

Due at 61 Days and Over:

Amount Paid to Date on Previous Invoice(s) or Payment Application(s):

The undersigned has been paid and has received a progress payment in the above referenced payment amount for all work, materials and equipment the undersigned furnished to customer for the above described property and does hereby waive and release any notice of lien, any private bond right, any claim for payment and any rights under any similar ordinance, rule or statute related to payment rights that the undersigned has on the above described project.

This release covers a progress payment for the work, materials or equipment furnished by the undersigned to the project or to the undersigned's customer which are the subject of the invoice or payment application, but only to the extent of the payment amount or such portion of the payment amount as the undersigned is actually paid, and does not cover any retention withheld, any items, modifications or changes pending approval, disputed items and claims, or items furnished or invoiced after the payment period. Before any recipient of the document relies on it, evidence of payment to the undersigned should be verified. The undersigned warrants that payment has been made and that money received from progress payments was used to promptly pay in full all laborers, subcontractors, materialmen, union dues, and suppliers for all work, materials or equipment that are the subject of this waiver and release.

I CERTIFY UNDER PENALTY OF PERJURY UNDER LAWS OF THE STATE OF MONTANA THAT THE ABOVE IS A TRUE AND CORRECT STATEMENT.

Dated: _______________________________

Signature: _________________________________________

Print name: _______________________________________

Title: _____________________________________________

(Company Name)
ATTACHMENT M

Certified Payroll Requirements

Certified Payroll Reports are required on all Government funded projects

Instructions for Certified Payroll Reports

Starting with your FIRST request for payment on the project, **weekly** Certified Payroll Reports are required. Second Tier Subs are also required to process and turn in Certified Payroll Reports. If you are an Owner and performing the labor yourself, with no employees, please state that on the report and send in a report for each week. Please mail, fax or scan (scan to the email address listed below) **each week** a completed form wh347 Certified Payroll Report to the Martel Construction office. If you are only applying for stored materials or will not be working on site at any time after the first application for payment please state "no work performed" on the report for each week you are not on site. When you are finished working on site at the project please state **"FINAL"** on your last payroll report. In the event you need to go back on site, after you have submitted a "FINAL" report, just turn in the report for the week you are on site and another "FINAL" report when you are done with on site work. Please number your Certified Payroll Reports.

You may request an electronic version of the Certified Payroll Report form by e-mailing Sue Van Dyken svandyken@martelconstruction.com
ATTACHMENT N

Contract Forms

1. Pay Application with Schedule of Values
2. Instructions - Pay Application Packet
3. Identification Form
4. IRS W-9
5. Authorization to Release Information
**APPLICATION FOR PAYMENT**

This application for payment must be completed and forwarded to Martel Construction no later than the 25th day of each month in order to receive payment when due.

<table>
<thead>
<tr>
<th>To:</th>
<th>Martel Construction, Inc.</th>
</tr>
</thead>
</table>
| Project Name: | Norm Ashby

<table>
<thead>
<tr>
<th>Application Number:</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>From:</td>
<td>Company</td>
</tr>
<tr>
<td>Address</td>
<td>1203 South Church</td>
</tr>
<tr>
<td>City, State, Zip</td>
<td>Bozeman, MT 59715-5801</td>
</tr>
<tr>
<td>Contract For:</td>
<td>TBD</td>
</tr>
<tr>
<td>Application Date:</td>
<td>1/25/13</td>
</tr>
<tr>
<td>Period From:</td>
<td>1/1/2013</td>
</tr>
<tr>
<td>Period To:</td>
<td>11/30/2012</td>
</tr>
</tbody>
</table>

**CONTRACTOR’S APPLICATION FOR PAYMENT**

1. **ORIGINAL CONTRACT SUM**
   - $2,279,874 (value from column C1 of SOV)

2. **Net Change by Change Orders**
   - $7,000 (value from column C2 of SOV)

3. **CONTRACT SUM TO DATE**
   - $2,286,874 (line 1 plus line 2)

4. **TOTAL COMPLETED & STORED TO DATE**
   - $154,870 (value from column G of SOV)

5. **LESS RETAINAGE (5%)**
   - $7,743 (line 4 multiplied by 5%)

6. **TOTAL EARNED LESS RETAINAGE**
   - $147,126 (line 5 minus line 6)

7. **LESS PREVIOUS CERTIFICATES FOR PAYMENT**
   - $0 (value column D minus 5% ) (also Line 6 of LAST Pay Ap)

8. **BALANCE DUE BEFORE GROSS RECEIPTS TAX**
   - $147,126 (line 8 minus line 7)

9. **LESS 1% CONTRACTOR’S GROSS RECEIPTS TAX**
   - $1,471.26 (line 9 multiplied by 1%)

10. **CURRENT PAYMENT DUE**
    - $145,655 (line 8 minus line 9)

11. **BALANCE TO FINISH INCLUDING RETAINAGE**
    - $2,139,748 (line 3 minus line 4 plus line 5)

Prior to submitting first pay application to Martel Construction...the following documents are required from the subcontractor:

- Signed contract between Martel Construction and subcontractor.
- Approved Schedule of Values.
- Certificate of Worker's Compensation Insurance. (1)
- Plumbers and Electricians - Copy of current trade licenses is required.
- Montana Certificate of Contractor Registration.
- Signed "Authorization to Release Information" form...Attachment N of Contract.
- Certified payroll reports if applicable. (2)

(1) Documents required prior to starting work at job site.
(2) Documents required for every pay period throughout the duration of the project.

NOW THEREFORE, in receipt of the payment of the amount due on this application (Line 10 above) the undersigned does hereby irrevocably release and waive any and all mechanic’s liens or other liens against the above real estate or any part thereof for any of the materials and/or labor heretofore furnished or performed in connection with this project, reserving, however, all lien rights for labor and/or materials furnished after said date.

Subcontractor

Authorized Signature: ____________________________

Title: ____________________________

Date: ____________________________

---

(1) Documents required prior to starting work at job site.
(2) Documents required for every pay period throughout the duration of the project.
### SUBCONTRACTOR SCHEDULE OF VALUES

**Subcontractor:** Company  
**Project Name:** Norm Asbjornson Hall  
**Application No.:** 1  
**Application Date:** 12/5/13  
**Project No.:** TBD  
**Application Period From:** 1/1/13  
**To:** 1/31/13

In tabulations below, amounts are stated to the nearest dollar.

<table>
<thead>
<tr>
<th>A</th>
<th>Description of Work</th>
<th>B</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lien Release Required</strong></td>
<td></td>
<td><strong>Change Orders</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>Work Completed</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>Balance to Finish</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Scheduled Value</strong></td>
<td><strong>Revised Contract Amount</strong></td>
<td><strong>Previous Applications</strong></td>
<td><strong>Completed and Stored To Date</strong></td>
<td><strong>This Application</strong></td>
<td><strong>Work in Place</strong></td>
<td><strong>Completed</strong></td>
<td><strong>% (G/C3)</strong></td>
<td></td>
</tr>
<tr>
<td>General Requirements</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supervision</td>
<td></td>
<td>$96,800</td>
<td>$1,000</td>
<td>$96,800</td>
<td>$9,680</td>
<td>$9,680</td>
<td>10%</td>
<td>$87,120</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobilization</td>
<td></td>
<td>$25,000</td>
<td>$25,000</td>
<td>$2,400</td>
<td>$200</td>
<td>$2,500</td>
<td>10%</td>
<td>$22,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indirect Equipment</td>
<td></td>
<td>$14,000</td>
<td>$14,000</td>
<td>$1,200</td>
<td>$200</td>
<td>$1,400</td>
<td>10%</td>
<td>$12,600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hoisting</td>
<td></td>
<td>$75,000</td>
<td>$75,000</td>
<td>$7,000</td>
<td>$500</td>
<td>$7,500</td>
<td>10%</td>
<td>$67,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Layout</td>
<td></td>
<td>$30,000</td>
<td>$6,000</td>
<td>$41,000</td>
<td>$4,100</td>
<td>$4,100</td>
<td>10%</td>
<td>$36,900</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site Cleanup</td>
<td></td>
<td>$40,899</td>
<td>$40,899</td>
<td>$4,090</td>
<td>$4,090</td>
<td>10%</td>
<td>$36,809</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weather Protection</td>
<td></td>
<td>$105,000</td>
<td>$105,000</td>
<td>$10,500</td>
<td>$10,500</td>
<td>10%</td>
<td>$94,500</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Liability Insurance</td>
<td></td>
<td>$35,000</td>
<td>$35,000</td>
<td>$0</td>
<td>$0</td>
<td>0%</td>
<td>$35,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bond</td>
<td></td>
<td>$23,975</td>
<td>$23,975</td>
<td>$23,975</td>
<td>$23,975</td>
<td>100%</td>
<td>$0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction OH &amp; Profit</td>
<td></td>
<td>$50,000</td>
<td>$50,000</td>
<td>$0</td>
<td>$0</td>
<td>0%</td>
<td>$50,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Closeout</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>As Builts: Drawings</td>
<td></td>
<td>$8,000</td>
<td>$8,000</td>
<td>$0</td>
<td>$0</td>
<td>0%</td>
<td>$8,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O&amp;M Manuals</td>
<td></td>
<td>$8,000</td>
<td>$8,000</td>
<td>$0</td>
<td>$0</td>
<td>0%</td>
<td>$8,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Punchlist</td>
<td></td>
<td>$10,000</td>
<td>$10,000</td>
<td>$0</td>
<td>$0</td>
<td>0%</td>
<td>$10,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demobilization</td>
<td></td>
<td>$135,000</td>
<td>$135,000</td>
<td>$0</td>
<td>$0</td>
<td>0%</td>
<td>$135,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labor &amp; Equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Footings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Footings - Form Continuous</td>
<td></td>
<td>$215,000</td>
<td>$215,000</td>
<td>$53,750</td>
<td>$53,750</td>
<td>25%</td>
<td>$161,250</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Place Continuous Footings</td>
<td></td>
<td>$43,500</td>
<td>$43,500</td>
<td>$10,875</td>
<td>$10,875</td>
<td>25%</td>
<td>$32,625</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Footings - Form Pad</td>
<td></td>
<td>$75,000</td>
<td>$75,000</td>
<td>$18,750</td>
<td>$18,750</td>
<td>25%</td>
<td>$56,250</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Place Pad Footings</td>
<td></td>
<td>$31,000</td>
<td>$31,000</td>
<td>$7,750</td>
<td>$7,750</td>
<td>25%</td>
<td>$23,250</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Form Footing Pad - Elevator Shafts</td>
<td></td>
<td>$85,000</td>
<td>$85,000</td>
<td>$0</td>
<td>$0</td>
<td>0%</td>
<td>$85,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Place: Elevator Shaft Footing Pads</td>
<td></td>
<td>$22,000</td>
<td>$22,000</td>
<td>$0</td>
<td>$0</td>
<td>0%</td>
<td>$22,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walls</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Form Materials &amp; Accessories</td>
<td></td>
<td>$110,000</td>
<td>$110,000</td>
<td>$0</td>
<td>$0</td>
<td>0%</td>
<td>$110,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formwork Walls</td>
<td></td>
<td>$410,000</td>
<td>$410,000</td>
<td>$0</td>
<td>$0</td>
<td>0%</td>
<td>$410,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Place Walls - all</td>
<td></td>
<td>$102,600</td>
<td>$102,600</td>
<td>$0</td>
<td>$0</td>
<td>0%</td>
<td>$102,600</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formwork Elevator Shafts</td>
<td></td>
<td>$195,000</td>
<td>$195,000</td>
<td>$0</td>
<td>$0</td>
<td>0%</td>
<td>$195,000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### SUBCONTRACTOR SCHEDULE OF VALUES

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lien Release Required</strong></td>
<td><strong>Description of Work</strong></td>
<td><strong>Scheduled Value</strong></td>
<td><strong>Change Orders</strong></td>
<td><strong>Revised Contract Amount (C1+C2)</strong></td>
<td><strong>Previous Work Completed This Application</strong></td>
<td><strong>Completed and Stored Work in Place to Date (D + E + F)</strong></td>
<td><strong>% (G/C3)</strong></td>
<td><strong>Balance to Finish (C3-G)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Subcontracts</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>ABC Co.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>123 Main Street</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Anytown, USA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Phone: 000-000-0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Email: <a href="mailto:Joe.Smith@abcco.com">Joe.Smith@abcco.com</a></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Subcontract Amount $105,000</td>
<td>$105,000</td>
<td>$0</td>
<td>$0</td>
<td>0%</td>
<td>$105,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Materials - Purchase Orders</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete Supply -</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>LMN Co.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>456 Main Street</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Anytown, USA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Phone: 000-000-0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Email: <a href="mailto:Jan.Norris@lmnco.com">Jan.Norris@lmnco.com</a></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Purchase Order Amount $31,500</td>
<td>$31,500</td>
<td>$0</td>
<td>$0</td>
<td>0%</td>
<td>$31,500</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rebar Supply -</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>XYZ Co</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>21 Jump Street</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bozeman, MT 59715</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Phone: 000-000-0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Email: <a href="mailto:Phil.Jones@xyzco.com">Phil.Jones@xyzco.com</a></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Purchase Order Amount $193,600</td>
<td>$193,600</td>
<td>$0</td>
<td>$0</td>
<td>0%</td>
<td>$193,600</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL CURRENT CONTRACT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$2,279,874</td>
<td>$7,000</td>
<td>$2,286,874</td>
<td>$0</td>
<td>$154,070</td>
<td>$800</td>
<td>$154,870</td>
<td>7%</td>
<td>$2,132,004</td>
</tr>
</tbody>
</table>
INSTRUCTIONS: APPLICATION FOR PAYMENT PACKET

Request your electronic version of our Application for Payment Packet by emailing...
subcontractors@martelconstruction.com or call the Bozeman office at 406-586-8585.

The Application for Payment and Schedule of Values forms included in your subcontract or PO are not for use. They are Samples/Examples only. **You must complete and submit your Application for Payment Packet by email.**

Instructions for completing your Application for Payment will be included with your electronic version.

**Each and every Pay Application Packet will include:**

1. **Application for Payment** cover page for the period you are requesting payment.

2. **Schedule of Values** fully completed. (You must submit a Preliminary Schedule of Values for review at least 10 days prior to submitting your first Pay Application Packet. No applications for payment will be reviewed for payment without an approved Schedule of Values. See Attachment C - Shop Drawings & Submittals for further clarification.)

3. **Martel Lien Release** for the period you are requesting payment. (See Attachment L for further clarification.)

4. **Unconditional Lien Release(s)** one from each of your second-tier subcontractors and suppliers listed on your Schedule of Values. (See Attachment L for further clarification.)

5. **Certified Payroll** (if required by specifications)
IDENTIFICATION FORM

Project: Norm Asbjornson Hall

Subcontractor:

Company
Address
City, State, Zip

1. If the name and address shown above is incorrect please make appropriate changes.

2. Phone: ______________________ Fax: ______________________

3. E-mail: ______________________________________________________________________

4. Signature: ______________________________________________________________________
   Type/Print Name & Title: ______________________________________________________________________
   Date: ______________________________________________________________________

5. Union Member: Yes __________ No __________
   If Yes:
   Union Name: ______________________________________________________________________
   Union phone: ______________________________________________________________________
   Local Jurisdiction Number: ______________________________________________________________________

PLEASE COMPLETE THE ATTACHED W-9 FORM AND RETURN TO MARTEL CONSTRUCTION

RETURN TO: Martel Construction, Inc.
            1203 South Church
            Bozeman, MT 59715-5801
Form W-9 (Rev. October 2007)
Department of the Treasury
Internal Revenue Service

Request for Taxpayer Identification Number and Certification

Give form to the requester. Do not send to the IRS.

Name (as shown on your income tax return)

Business name, if different from above

Check appropriate box: ☐ Individual/Sole proprietor ☐ Corporation ☐ Partnership
☐ Limited liability company. Enter the tax classification (D=disregarded entity, C=corporation, P=partnership) ☐
☐ Other (see instructions) ☐

Exempt payee ☐

Address (number, street, and apt. or suite no.)

City, state, and ZIP code

Requester’s name and address (optional)

List account number(s) here (optional)

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on Line 1 to avoid backup withholding. For individuals, this is your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the Part I instructions on page 3. For other entities, it is your employer identification number (EIN). If you do not have a number, see How to get a TIN on page 3.

Note. If the account is in more than one name, see the chart on page 4 for guidelines on whose number to enter.

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me), and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding, and
3. I am a U.S. citizen or other U.S. person (defined below).

Certification Instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest or dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the Certification, but you must provide your correct TIN. See the instructions on page 4.

Sign Here

Signature of U.S. person

Date

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Purpose of Form

A person who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) to report, for example, income paid to you, real estate transactions, mortgage interest you paid, acquisition or abandonment of secured property, cancellation of debt, or contributions you made to an IRA.

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN to the person requesting it (the requester) and, when applicable, to:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),
2. Certify that you are not subject to backup withholding, or
3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners’ share of effectively connected income.

Note. If a requester gives you a form other than Form W-9 to request your TIN, you must use the requester’s form if it is substantially similar to this Form W-9.

Definition of a U.S. person. For federal tax purposes, you are considered a U.S. person if you are:

• An individual who is a U.S. citizen or U.S. resident alien,
• A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States,
• An estate (other than a foreign estate), or
• A domestic trust (as defined in Regulations section 301.7701-7).

Special rules for partnerships. Partnerships that conduct a trade or business in the United States are generally required to pay a withholding tax on any foreign partners’ share of income from such business. Further, in certain cases where a Form W-9 has not been received, a partnership is required to presume that a partner is a foreign person, and pay the withholding tax. Therefore, if you are a U.S. person that is a partner in a partnership conducting a trade or business in the United States, provide Form W-9 to the partnership to establish your U.S. status and avoid withholding on your share of partnership income.

The person who gives Form W-9 to the partnership for purposes of establishing its U.S. status and avoiding withholding on its allocable share of net income from the partnership conducting a trade or business in the United States is in the following cases:

• The U.S. owner of a disregarded entity and not the entity.
Authorization to Release Information

The undersigned hereby authorize the Unemployment Insurance Division, Department of Labor and Industry to give the prime Contractor, Martel Construction, Inc., information concerning their compliance with the unemployment insurance Program. This authorization covers the duration of the contract for Norm Asbjornson Hall

Please acknowledge this authorization below.

Business Name and Address

Company
Address
City, State, Zip

Signature                          Date

Printed Name                          Title
SECTION 01006 – BONDS AND CERTIFICATES OF INSURANCE

PART 1 - GENERAL

1.1 PERFORMANCE AND PAYMENT BOND

A. All bonds shall be dual obligee bonds naming the State of Montana and Martel Construction, Inc. as additional obligee.

B. All bonding companies must be listed by the U.S. Treasury.

C. All bonding companies must be rated A- or better by Best.

D. All bonding companies must be licensed to do business in Montana.

E. “Performance Bond and Payment Bond”, AIA Document A312 - 2010, of the American Institute of Architects, are hereby made a part of the Contract Documents, the same as if bound herein. The Performance and Payment Bond shall be a part of the Contract and shall apply to all Contractors and Subcontractors of the Contract Documents.

1.2 CERTIFICATE OF INSURANCE

A. The Trade Contractor shall purchase and maintain all of the insurance coverage as follows:

1. General Liability: coverage is to be provided under an Occurrence commercial general liability form with limits of $1,000,000 each occurrence; $1,000,000 Personal and Advertising Injury; $2,000,000 General Aggregate and $2,000,000 Products-Completed Operations Aggregate; $500,000 Limited Sudden and Accidental Pollution with additional $10,000 minimum for clean up costs. The policy form shall include the following coverages:

   a. Aggregate Limits Per Project/Location (if your limits are not designated on a per project basis, the Umbrella limit requirements will be increased to $2,000,000).
   b. Premises/Operations.
   c. Blanket Additional insured with primary status for additional insureds. If your policy does not contain a blanket additional insured endorsement, a project specific endorsement naming Martel Construction Inc., and any other designated entities as outlined in the Owner’s general contract may be used.
   d. Explosion, Collapse, and Underground.
   e. Broad Form Property Damage including Completed Operations.
   f. Contractual Liability.
   g. Blanket Waiver of Subrogation.
   h. Limited sudden and accidental pollution – this coverage should provide coverage for property damage and personal injury that arise out of pollutants brought onto the job site by you and/or your sub-subcontractors.
   i. Contingent liability for operations performed on your behalf by sub-subcontractors.

2. Automobile Liability Insurance: The Automobile Insurance shall be written on a standard Business Automobile policy with a Combined Single Limit of $1,000,000 for bodily injury and property damage. Coverage must be provided for all owner, non-owned, and hired automobiles. The policy form shall include the following coverages:

   a. Broadened Pollution Liability.
3. **Worker’s Compensation:** as a Trade Contractor, you are obligated to provide Workers’ Compensation and Employer’s Liability insurance as required by applicable state law for all employees engaged in work at the project site pursuant to this contract. The minimum limit is $500,000.00. If at any point during the contract any portion of the work is sublet, you will require the sub-subcontractor to certify the same insurance.

4. **Contractors Equipment:** As a Trade Contractor, it is assumed you will have the opportunity to borrow Martel’s owned, leased, or rental equipment. You shall provide insurance which will respond to damage to any of this equipment while it is under your care. The insurance should contain coverage for a minimum of $10,000 of pollution clean-up costs and shall also respond to any additional rental costs. In addition, a waiver of subrogation in favor of Martel Construction, Inc. and any Owner required entities shall be included on all your equipment policies for your owned, leased, or rented equipment.

5. **Umbrella Liability Insurance:** The Umbrella policy shall be written with a limit of liability of $1,000,000 per occurrence and $1,000,000 aggregate. The policy should provide excess coverage on a Drop Down basis over the General Liability, the Automobile Liability and the Employer’s Liability.

**B. General Conditions:**

1. All policies shall be endorsed to provide Martel Construction, Inc. with 30 days notice of cancellation or reductions in coverage.

2. All coverages shall be written with insurance carriers which have an A.M. Best’s Rating of A- or better or with carriers approved by Martel Construction, Inc.

3. The insurance required by Martel Construction, Inc. in no way represents protection from all the exposures to you. You may need to purchase other insurance coverages, at your own expense, to further protect yourself.

4. Failure to secure insurance as required in this contract will not relieve you for responsibility for any claim.

5. No additional payments will be made to you for the purchase of any of the required insurance coverages. It is assumed all costs are included within your subcontract price.

6. You shall require all lower tier subcontractors to certify insurance which meets all outlined insurance requirements in the contract documents.

**C. Certificates of Insurance:**

1. Prior to the start of any work, a Certificate of Insurance, as shown in Exhibit 1, shall be provided by the Subcontractor evidencing all of the required coverages and limits as outlined above. The certificate holder is Martel Construction, Inc. and the State of Montana shall be named as additional insured.

PART 2 - PRODUCTS (not applicable).

PART 3 - EXECUTION (not applicable).

END OF SECTION 01006
SECTION 01250 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

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

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

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

1.4 PROPOSAL REQUESTS
A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
   1. Proposal Requests issued by Architect via the General Contractor are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
   2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
      a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
      b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
      c. Include an updated Construction Manager's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
1.5 CHANGE ORDER PROCEDURES


1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. Construction Change Directives will only be used in situations where the normal procedure of obtaining preliminary Proposal Request pricing is not a possibility due to urgent demands from the construction process.

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

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

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01250
SECTION 01291 - TRADE CONTRACTOR APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements governing the Sub Contractor's and Suppliers Applications for Payment.

1. Coordinate the Schedule of Values and Applications for Payment with the General Contractor’s Construction Billing System and Cycle to the Owner. Prior to the first Application for Payment, submit a schedule of values for approval.

B. The Terms and Conditions for Payment are as follows:

Subcontract / Supplier shall submit application for payment to Martel Construction on or before the 25th of each month. Payment to be made within 7 days of receipt of payment from the Owner.

Trade contractors shall have a retainage of 5% withheld from each progress payment. Retainage will be released within 35 days from Owner’s Final acceptance of the subcontractors work.

1.3 SCHEDULE OF VALUES

A. Coordinate preparation of the Schedule of Values with Martel Construction, Inc.

1. Correlate line items in the Schedule of Values with other required administrative schedules and forms which may include:

   Contractor's construction schedule.
   Application for Payment form.
   List of subcontractors.
   Schedule of allowances.
   Schedule of alternates.
   List of products.
   List of principal suppliers and fabricators.
   Schedule of submittals.

2. Submit the Schedule of Values to Martel Construction at the earliest feasible date, but in no case later than 15 days after the Notice to Proceed

B. Sub-Schedules: Where the Work is separated into phases that require separately phased payments, provide sub-schedules showing values correlated with each phase of payment.

C. Format and Content: Use the CSI format as a guide to establish the format for the Schedule of Values.

1. Identification: Include the following Project identification on the Schedule of Values:
Project name and location.
Name of the Architect.
Martel Construction Project number.
Contractor's name and address.
Date of submittal.

2. Arrange the Schedule of Values in a tabular form. Use the AIA 702 & 703 Format.

3. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Break principal subcontract amounts down into several line items.

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

5. For each part of the Work where an Application for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

D. Margins of Cost: Show line items for indirect costs, and margins on actual costs, only to the extent that such items will be listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete including its total cost and proportionate share of general overhead and profit margin.

1. As an option, temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown as separate line items in the Schedule of Values or distributed as general overhead expense.

E. Schedule Updating: Update the Schedule of Values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Do not revise the Schedule of Values prior to an approved change.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Architect and paid for by the Owner.

1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.

2. Retainage of 5% will be held on all Trade Contractors.

B. Payment Application Times: Each progress payment date is as indicated in the Agreement. The period of construction Work covered by each Application or Payment is the period indicated in the Agreement.

C. Payment Application Forms: Use AIA Document G 702 and Continuation Sheets G 703 for Application for Payment.

D. Application Preparation: Complete every entry on the form, including execution by person authorized to sign legal documents. Incomplete applications will be returned without action.

1. Entries shall match data on the Original Schedule of Values.

2. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.
E. Transmittal: Submit 1 executed copy of each Application for Payment to Martel Construction by means ensuring receipt within 24 hours; one copy shall be complete, including waivers of lien and similar attachments, when required.

   1. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to Martel Construction.

F. Waivers of Mechanics Lien: With each Application for Payment submit waivers of mechanics liens from Trade Contractors or sub-Trade Contractors and suppliers for the construction period covered by the previous application.

   1. Submit partial waivers on each item for the amount requested, prior to deduction for retainage, on each item.
   
   2. When an application shows completion, submit final or full waivers.
   
   3. The Owner reserves the right to designate which entities involved in the Work must submit waivers.
   
   4. Waiver Forms: Submit waivers of lien on forms, and executed in a manner acceptable to Martel Construction.

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

   List of subcontractors.
   List of principal suppliers and fabricators.
   Schedule of Values.
   Submittal Schedule (preliminary if not final).
   List of Contractor's staff assignments.
   List of Contractor's principal consultants.
   Copies of building permits.
   Copies of authorizations and licenses from governing authorities for performance of the Work.
   Certificates of insurance and insurance policies.

   Performance and payment bonds (if required).

H. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment; this application shall reflect any Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

   Administrative actions and submittals that shall proceed or coincide with this application include:

   Occupancy permits and similar approvals.
   Warranties (guarantees) and maintenance agreements.
   Test/adjust/balance records.
   Maintenance instructions.
   Meter readings.
   Start-up performance reports.
   Change-over information related to Owner's occupancy, use, operation and maintenance.
   Final cleaning.
   Application for reduction of retainage, and consent of surety.
   Advice on shifting insurance coverages.
Final progress photographs.
List of incomplete Work, recognized as exceptions to Architect's Certificate of Substantial Completion.

I.

Final Payment Application: Administrative actions and submittals which must precede or coincide with submittal of the final payment Application for Payment include the following:

Completion of Project closeout requirements.
Completion of items specified for completion after Substantial Completion.
Assurance that unsettled claims will be settled.
Assurance that Work not complete and accepted will be completed without undue delay.
Transmittal of required Project construction records to Owner.
Certified property survey.
Proof that taxes, fees and similar obligations have been paid.
Removal of temporary facilities and services.
Removal of surplus materials, rubbish and similar elements.
Change of door locks to Owner's access.

PART 2 - PRODUCTS  (Not Applicable).

PART 3 - EXECUTION  (Not Applicable).

END OF SECTION 01291
PART 1 - GENERAL

1.1 SUMMARY

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

1. Coordination drawings.
2. Requests for Information (RFIs).
3. Project Web site.
4. Project meetings.

B. Related Requirements:

1. Section 011200 "Multiple Contract Summary" for a description of the division of work among separate contracts and responsibility for coordination activities not in this Section.
2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.2 DEFINITIONS

A. RFI: Request from Owner, Construction Manager, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.3 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design.

Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

1.4 GENERAL COORDINATION PROCEDURES

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

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

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

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

1.5 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
   a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
   b. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility.

1.6 REQUESTS FOR INFORMATION (RFIs)

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

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

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

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect and Construction Manager.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.

D. Architect's and Construction Manager's Action: Architect and Construction Manager will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day. Construction Manager will pass along to architect with 2 business days.

1. The following RFIs will be returned without action:
   a. Requests for approval of submittals.
   b. Requests for approval of substitutions.
   c. Requests for coordination information already indicated in the Contract Documents.
   d. Requests for adjustments in the Contract Time or the Contract Sum.
   e. Requests for interpretation of Architect's actions on submittals.
   f. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
3. Architect’s action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 “Contract Modification Procedures.”

   a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within 10 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:

   1. Project name.
   2. RFI number.
   3. RFI description.
   4. Date the RFI was submitted.
   5. Date Architect’s response was received.

F. On receipt of Architect’s action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect and Construction Manager within seven days if Contractor disagrees with response.

   1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
   2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.7 PROJECT WEB SITE

A. Use Construction Manager’s Project Web site for purposes of hosting and managing project communication and documentation until Final Completion. Project Web site shall include the following functions:

   1. Project directory.
   2. Project correspondence.
   3. Meeting minutes.
   5. RFI forms and logs.
   6. Task and issue management.
   7. Submittals forms and logs.
   8. Drawing and specification document hosting, viewing, and updating.
   10. Archiving functions.

B. Provide up to seven Project Web site user licenses for use of Owner, Architect, and Architect’s consultants.

C. On completion of Project, provide one complete archive copy(ies) of Project Web site files to Owner and to Architect in a digital storage format acceptable to Architect.

D. Contractor, subcontractors, and other parties granted access by Contractor to Project Web site shall execute a data licensing agreement acceptable to Owner and Architect.
1.8 PROJECT MEETINGS

A. General: Construction Manager will schedule and conduct meetings and conferences at Project site unless otherwise indicated.

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

B. Preconstruction Conference: Construction Manager will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:
   a. Tentative construction schedule.
   b. Phasing.
   c. Critical work sequencing and long-lead items.
   d. Designation of key personnel and their duties.
   e. Procedures for processing field decisions and Change Orders.
   f. Procedures for RFIs.
   g. Procedures for testing and inspecting.
   h. Procedures for processing Applications for Payment.
   i. Distribution of the Contract Documents.
   j. Submittal procedures.
   k. Sustainable design requirements.
   l. Preparation of record documents.
   m. Use of the premises.
   n. Work restrictions.
   o. Working hours.
   p. Owner's occupancy requirements.
   q. Responsibility for temporary facilities and controls.
   r. Procedures for moisture and mold control.
   s. Procedures for disruptions and shutdowns.
   t. Construction waste management and recycling.
   u. Parking availability.
   v. Office, work, and storage areas.
   w. Equipment deliveries and priorities.
   x. First aid.
   y. Security.
   z. Progress cleaning.
3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
   b. Options.
   c. Related RFIs.
   d. Related Change Orders.
   e. Purchases.
   f. Deliveries.
   g. Submittals.
   h. Sustainable design requirements.
   i. Review of mockups.
   j. Possible conflicts.
   k. Time schedules.
   l. Weather limitations.
   m. Manufacturer's written instructions.
   n. Warranty requirements.
   o. Compatibility of materials.
   p. Acceptability of substrates.
   q. Temporary facilities and controls.
   r. Space and access limitations.
   s. Regulations of authorities having jurisdiction.
   t. Testing and inspecting requirements.
   u. Installation procedures.
   v. Coordination with other work.
   w. Required performance results.
   x. Protection of adjacent work.
   y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.

5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Construction Manager will conduct progress meetings at weekly intervals.

1. Attendees: In addition to representatives of each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
   a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to
Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

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

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

3. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

E. Owner-Architect-Contractor (OAC) Meetings: Conduct progress meetings at biweekly intervals.

1. Attendees: Representatives of Owner, CM, and Architect. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

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

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Status of RFI's
5) Deliveries.
6) Off-site fabrication.
7) Access.
8) Site utilization.
9) Temporary facilities and controls.
10) Work hours.
11) Hazards and risks.
12) Quality and work standards.
13) Change Orders.
14) Documentation of information for payment requests.

3. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
   a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00
SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

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

B. Related Requirements:
   1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.2 USE CHARGES

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

B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations. Coordinate with owner to connect to system to be provided by the owner.

1.3 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

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

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire prevention program.

1.4 QUALITY ASSURANCE

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

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

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

PART 2 - PRODUCTS

2.1 MATERIALS

A. Chain-Link Fencing: galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts and top rail.

B. Portable Chain-Link Fencing: galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts.

2.2 TEMPORARY FACILITIES

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

B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, Construction Manager, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly.

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

2.3 EQUIPMENT

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

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction.
PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

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

1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."

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

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

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

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

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

D. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

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

1. Toilets: Use of Owner's existing toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

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

G. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

H. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
I. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
   1. Install electric power service underground unless otherwise indicated.
   2. Connect temporary service to Owner's existing power source, as directed by Owner.

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

K. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line for each field office.
   1. Provide additional telephone lines for the following:
   2. At each telephone, post a list of important telephone numbers.
   3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:
   1. Provide construction for temporary offices, shops, and sheds located within construction area that is noncombustible according to ASTM E 136. Comply with NFPA 241.
   2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.
   1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Traffic Controls: Comply with requirements of authorities having jurisdiction.
   1. Protect existing site improvements to remain including curbs, pavement, and utilities.
   2. Maintain access for fire-fighting equipment and access to fire hydrants.

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

E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
   1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
   2. Remove snow and ice as required to minimize accumulations.
F. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
   1. Identification Signs: Provide Project identification signs as indicated on Drawings.
   2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
      a. Provide temporary, directional signs for construction personnel and visitors.
   3. Maintain and touchup signs so they are legible at all times.

G. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

H. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."

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


K. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

L. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
   1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.

M. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

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

C. Temporary Erosion and Sedimentation Control: Comply with requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Section 311000 "Site Clearing."
D. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings, or authorities having jurisdiction, whichever is more stringent.

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

F. Tree and Plant Protection: Comply with requirements specified in Section 015639 "Temporary Tree and Plant Protection."

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

H. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
   1. Extent of Fence: As indicated on Drawings.
   2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

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

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

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

L. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
   1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

M. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire prevention program.
   1. Prohibit smoking in construction areas.
   2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
   3. Develop and supervise an overall fire-prevention and protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
3.5 MOISTURE AND MOLD CONTROL


B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect materials from water damage and keep porous and organic materials from coming into prolonged contact with concrete.

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

1. Keep interior spaces reasonably clean and protected from water damage.
2. Discard or replace water-damaged and wet material.
3. Discard, replace, or clean stored or installed material that begins to grow mold.
4. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.6 OPERATION, TERMINATION, AND REMOVAL

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

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

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

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

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

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."
END OF SECTION 01500
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous demolition waste.
2. Recycling nonhazardous demolition and construction waste.
3. Disposing of nonhazardous demolition and construction waste.

B. Related Requirements:

1. Section 024116 "Structure Demolition" for disposition of waste resulting from demolition of buildings, structures, and site improvements.
2. Section 024119 "Selective Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements.
3. Section 042000 "Unit Masonry" for disposal requirements for masonry waste.
4. Section 044313.13 "Anchored Stone Masonry Veneer" for disposal requirements for excess stone and stone waste.
5. Section 044313.16 "Adhered Stone Masonry Veneer" for disposal requirements for excess stone and stone waste.
6. Section 311000 "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.2 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.
1.3 PERFORMANCE REQUIREMENTS

A. General: Achieve end-of-Project rates for salvage/recycling of 75 percent by weight of total non-hazardous solid waste generated by the Work. Facilitate recycling and salvage of materials, including the following:

1.4 ACTION SUBMITTALS

A. Waste Management Plan: Submit plan within 30 days of date established for commencement of the Work.

1.5 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.
4. Quantity of waste salvaged, both estimated and actual in tons.
5. Quantity of waste recycled, both estimated and actual in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

LEED Submittal: Submit documentation to USGBC, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met. Respond to questions and requests from USGBC regarding construction waste management and disposal until the USGBC has made its determination on the Project's LEED certification application. Document correspondence with USGBC as informational submittals.

H. Qualification Data: For waste management coordinator.
1.6 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management coordination of projects with similar requirements.

Firm employs a LEED-Accredited Professional, certified by the USGBC, as waste management coordinator.

2. Waste management coordinator may also serve as LEED coordinator.

B. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination."

1.7 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.

2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.

3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.

4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.

5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.

6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.

1. Distribute waste management plan to everyone concerned within seven days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until installation.
4. Protect items from damage during transport and storage.
5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Sale and Donation: Not permitted on Project site.

C. Salvaged Items for Owner's Use:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area off-site.
5. Protect items from damage during transport and storage.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Owner.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
   a. Inspect containers and bins for contamination and remove contaminated materials if found.
2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

A. Asphalt Paving: Grind asphalt to maximum 4-inch (100-mm) size.
B. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.
C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
   1. Pulverize concrete to maximum 4-inch (100-mm) size.
D. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
   1. Pulverize masonry to maximum 4-inch (100-mm) size.
   2. Clean and stack undamaged, whole masonry units on wood pallets.
E. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
F. Metals: Separate metals by type.
   1. Structural Steel: Stack members according to size, type of member, and length.
   2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
G. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.
H. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
I. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
J. Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.
K. Carpet: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
   1. Store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.
L. Carpet Tile: Remove debris, trash, and adhesive.
1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

M. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

N. Conduit: Reduce conduit to straight lengths and store by type and size.

3.5 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Burning: Burning of waste materials is permitted only at designated areas on Owner's property, provided required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.

D. Disposal: Remove waste materials and dispose of at designated spoil areas on Owner's property.

E. Disposal: Remove waste materials from Owner's property and legally dispose of them.
3.7 SAMPLE FORMS

END OF SECTION 01 74 19
1. **ARTICLE 1 – GENERAL PROVISIONS**

1.1. **BASIC DEFINITIONS**

1.1.1. **CONTRACT DOCUMENTS** The Contract Documents consist of the Contract between Owner and Contractor (hereinafter the "Contract"), Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Contract 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/Engineer. The Contract Documents shall include the bidding documents and any alterations made thereto by addenda. In the event of a conflict, discrepancy, contradiction, or inconsistency within the Contract Documents and for the resolution of same, the following order of hierarchy and control shall apply and prevail:

1.1.1.1. Contract; 2) Addenda; 3) Pre-Construction Services Conditions; 4) Supplementary General Conditions, if any; 5) General Conditions of the Contract for Construction; 6) Specifications; 7) Drawings; 8) GC/CM Request for Proposals; 9) Sample Forms.

1.2. A conflict, discrepancy, contradiction, or inconsistency occurs within or between the Specifications and the Drawings, resolution shall be controlled by the following:

1.2.1.1. As between figures, dimensions, or numbers given on drawings and any scaled measurements, the figures, dimensions, or numbers shall govern;

1.2.1.2. As between large scale drawings and small scale drawings, the larger scale drawings shall govern;

1.2.1.3. As between the technical specifications and drawings; the technical specifications shall govern.

1.2.1.4. Shop Drawings and Submittals: Shop drawings and other submittals from the Contractor, subcontractors, or suppliers do not constitute a part of the Contract Documents.

1.3. The Contractor acknowledges, understands and agrees that the Contract Documents cannot be changed except as provided herein by the terms of the Contract. No act(s), action(s), omission(s), or course of dealing(s) by the Owner or Architect/Engineer with the Contractor shall alter the requirements of the Contract Documents and that alteration can be accomplished only through a written Modification process defined herein.

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

1.3.2. **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.

1.3.3. **THE CONTRACT** The entire Contract for Construction is formed by the Contract Documents. The Contract represents the entire, complete, and integrated agreement between the Owner and Contract 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 between: (1) the Architect/Engineer and Contractor; (2) the Owner and any Subcontractor, Sub-subcontractor, or Supplier; (3) the Owner and Architect/Engineer; or, (4) between any persons or entities other than the Owner and Contractor. However, the Architect/Engineer shall at all times be permitted and entitled to performance and enforcement of its obligations under the Contract intended to facilitate performance of the Architect/Engineer's duties.

1.3.4. **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 completely fulfill the Contract and the Contractor's obligations. The Work may constitute the whole or a part of the Project and does not include any Pre-Construction Services.

1.3.5. **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 or by separate contractors.

1.3.6. **TIME** Time is of the essence in performance, coordination, and completion of the Work contemplated herein. The Owner may suffer damages if the Work is not completed as specified herein. When any duration or time period is referred to in the Contract Documents by days, the first day of a duration or time period shall be determined as the day following the current day of any event or notice starting a specified duration. All durations in the Contract Documents are calendar days unless specifically stated otherwise.

1.4. **CORRELATION, INTER-RELATIONSHIP, AND INTENT OF THE CONTRACT DOCUMENTS**

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

1.4.2. 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. It is the Contractor's responsibility to control the Work under the Contract.

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

1.5. **CAPITALIZATION**

1.5.1. Terms capitalized in these General Conditions include those which are: (1) specifically defined; and, (2) the titles of numbered articles and identified references to Paragraphs, Subparagraphs and Clauses in the document.

1.6. **INTERPRETATION**

1.6.1. 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.

1.7. **EXECUTION OF THE CONTRACT AND CONTRACT DOCUMENTS**

1.7.1. The Contract shall be signed by the Owner and Contractor. Execution of the Contract by the Contractor constitutes the complete and irrevocable binding of the Contractor and his Surety to the Owner for complete performance of the Work and fulfillment of all obligations. By execution of the Contract, the Contractor acknowledges that it has reviewed and familiarized itself with all aspects of the Contract Documents and agrees to be bound by the terms and conditions contained therein.

1.7.2. 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.
1.7.3. The Contractor acknowledges that it has taken all reasonable actions necessary to ascertain the nature and location of the work, and that it has investigated and satisfied itself as to the general and local conditions which can affect the work or its cost, including but not limited to: (1) conditions bearing upon transportation, disposal, handling, and storage of materials; (2) the availability of labor, water, gas, electric power, phone service, and roads; (3) uncertainties of weather, river stages, tides, or similar physical conditions at the site; (4) the conformation, topography, and conditions of the ground; and, (5) the character of equipment and facilities needed for performance of the Work. The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory geotechnical work done by the Owner, as well as from the drawings and specifications made a part of this contract. Any failure of the Contractor to take the action described and acknowledged in this paragraph will not relieve the Contractor from responsibility for properly ascertaining and estimating the difficulty and cost of successfully performing the Work or for proceeding to successfully perform the Work without additional expense to the Owner.

1.7.4. The Owner assumes no responsibility for any conclusions or interpretations made by the Contractor based on the information made available by the Owner, nor does the Owner assume responsibility for any understanding reached or representation made by any of its officers, agents, or employees concerning conditions which can affect the Work unless that understanding or representation is expressly stated in the Contract Documents.

1.7.4.1. Performance of any portion of the Work, beyond that required for complying with the specifications and all other requirements of the Contract, shall be deemed to be for the convenience of the Contractor and shall be at the Contractor's sole expense.

1.7.4.2. There shall be no increase in the contract price or time allowed for performance which is for the convenience of the Contractor.

1.8. OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS, AND OTHER INSTRUMENTS OF SERVICE

1.8.1. The Drawings, Specifications and other documents, including those in electronic form, prepared by the Architect/Engineer and the Architect/Engineer's consultants are Instruments of Service through which the Work to be executed by the Contractor is described. The Contractor may retain one record set. Neither the Contractor nor any Subcontractor, Sub-subcontractor or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications and other documents prepared by the Architect/Engineer or the Architect/Engineer's consultants. Unless otherwise indicated, the Architect/Engineer and the Architect/Engineer's consultants shall be deemed the authors of them and will retain all common law, statutory and other reserved rights, in addition to the copyrights except as defined in the Owner's Contract with the Architect/Engineer. All copies of Instruments of Service, except the Contractor's record set, shall be returned or suitably accounted for to the Architect/Engineer upon completion of the Work. The Drawings, Specifications and other documents prepared by the Architect/Engineer and the Architect/Engineer's consultants, and copies thereof furnished to the Contractor, are for use solely with respect to this Project. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or material or equipment supplier on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect/Engineer, and the Architect/Engineer's consultants. The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect/Engineer and the Architect/Engineer's consultants appropriate to and for use in the execution of their Work under the Contract Documents. All copies made under this authorization shall bear the statutory copyright notice, if any, shown on the Drawings Specifications and other documents prepared by the Architect/Engineer and the Architect/Engineer's consultants. 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/Engineer's or Architect/Engineer's consultants' copyrights or other reserved rights.

1.8.2. Owner's Disclaimer of Warranty: The Owner has requested the Architect/Engineer prepare the Contract Documents for the Project which are adequate for bidding and constructing the Project. However, the Owner makes no representation, guarantee, or warranty of any nature whatsoever to the Contractor concerning such documents. The Contractor hereby acknowledges and represents that it has not, does not, and will not rely upon any such representation, guarantee, or warranty concerning the Contract Documents as no such representation, guarantee, or warranty have been or are hereby made.
2. **ARTICLE 2 – THE OWNER**

2.1. **THE STATE OF MONTANA**

2.1.1. The Owner is the State of Montana and is the sole entity to be identified as Owner in the Contract and as referred to throughout the Contract Documents as if singular in number.

2.1.2. Except as otherwise provided in Subparagraph 4.2.1, the Architect/Engineer does not have authority to bind the Owner. The observations and participations of the Owner or its authorized representative do not alleviate any responsibility on the part of the Contractor. The Owner reserves the right to observe the work and make comment. Any action or lack of action by the Owner shall not be construed as approval of the Contractor's performance.

2.1.3. The Owner reserves the right to require the Contractor, all sub-contractors and material suppliers to provide lien releases at any time. The Owner reserves the right to withhold progress payments until such lien releases are received for all work for which prior progress payments have been made. Upon the Owner's demand for lien releases (either verbally or written), the Contractor, all sub-contractors and material suppliers shall provide such releases with every subsequent application for payment through Final Acceptance of the Project.

2.1.4. Except for permits and fees, including those required under Subparagraph 3.7.1, which are the responsibility of the Contractor under the Contract Documents, 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.

2.1.5. Information or services required of the Owner by the Contract Documents shall be furnished by the Owner with reasonable promptness. Any other information or services relevant to the Contractor's performance of the Work under the Owner's control shall be furnished by the Owner after receipt from the Contractor of a written request for such information or services.

2.1.6. Unless otherwise provided in the Contract Documents, the Contractor will be furnished, free of charge, such copies of Drawings and Specifications as are reasonably necessary for execution of the Work.

2.2. **OWNER’S RIGHT TO STOP WORK**

2.2.1. If the Contractor fails to correct Work which is not in accordance with the requirements of the Contract Documents as required by Paragraph 12.2 or persistently 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 Subparagraph 6.1.3. The issuance of a stop work order by the Owner shall not give rise to a claim by the Contractor or any subcontractor for additional cost, time, or other adjustment.

2.3. **OWNER’S RIGHT TO CARRY OUT THE WORK**

2.3.1. If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven-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 after such seven-day period give the Contractor a second written notice to correct such deficiencies within a three-day period. If the Contractor within such three-day period after receipt of such second notice fails to commence and continue to correct any deficiencies, 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 increased costs, and compensation for the Architect/Engineer's additional services made necessary by such default, neglect, or failure. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

2.4. **OWNER’S RIGHT TO PERSONNEL**
2.4.1. The Owner reserves the right to have the Contractor and/or subcontractors remove person(s) and/or personnel from any and all work on the project with cause but without cost to the Owner. Such requests from the Owner may be made verbally or in writing and may be done directly with the Contractor or indirectly through the Architect/Engineer. Cause may be, but not limited to, any of the following: incompetence, poor workmanship, poor scheduling abilities, poor coordination, disruption to the facility or others, poor management, causes delay or delays, disruption of the Project, will not strictly adhere to facility procedures and Project requirements either knowingly or unknowingly, insubordination, drug/alcohol use, possession of contraband, belligerent acts or actions, etc. The Contractor shall provide replacement person(s) and/or personnel acceptable to the Owner at no cost to the Owner.

2.4.2. Any issue or circumstance relating to or resulting out of this clause shall not be construed or interpreted to be interference with or impacting upon the Contractor’s responsibilities and liabilities under the Contract Documents.

2.4.3. Person(s) and/or personnel who do not perform in accordance with the Contract Documents, shall be deemed to have provided the Owner with cause to have such persons removed from any and all involvement in the Work.

2.4.4. The Contractor agrees to indemnify and hold harmless the Owner from any and all causes of action, demands, claims, damages, awards, attorneys’ fees, and other costs brought against the Owner and/or Architect/Engineer by any and all person(s) or personnel as a result of actions under this clause.

3. **ARTICLE 3 – THE CONTRACTOR**

3.1. **GENERAL**

3.1.1. The Contractor is the person or entity identified as such in the Contract and is referred to throughout the Contract Documents as if singular in number. The term “Contractor” means the Contractor or the Contractor’s authorized representative and GC/CM as identified in the Pre-Construction Services Conditions.

3.1.2. Construction Contractor Registration: The Contractor is required to be registered with the Department of Labor and Industry under 39-9-201 and 39-9-204 MCA prior to the Contract being executed by the Owner. A bidder must demonstrate that it has registered or promises that it will register immediately upon notice of award and prior to the commencement of any work. If the prevailing bidder cannot or does not register in time for the Owner to execute the Contract within fifteen (15) days of the date on the notice of award, the Owner may award, at its sole discretion, to the next lowest responsible bidder who meets this requirement. The Owner will not execute a contract for construction nor issue a Notice to Proceed to a Contractor who is not registered per 39-9-401(a) MCA. It is solely the Contractor’s responsibility to ensure that all Subcontractors are registered in accordance with Title 39, Chapter 9, MCA.

3.1.3. The Owner’s engagement of the Contractor is based upon the Contractor’s representations by submission of a bid to the Owner that it:

3.1.3.1. has the requisite skills, judgment, capacity, expertise, and financial ability to perform the Work;

3.1.3.2. is experienced in the type of labor and services the Owner is engaging the Contractor to perform;

3.1.3.3. is authorized, licensed and registered to perform the type of labor and services for which it is being engaged in the State and locality in which the Project is located;

3.1.3.4. is qualified, willing and able to perform the labor and services for the Project in the manner and scope defined in the Contract Documents; and,

3.1.3.5. has the expertise and ability to provide labor and services that will meet the Owner’s objectives, intent and requirements, and will comply with the requirements of all governmental, public, and quasi-public authorities and agencies having or asserting jurisdiction over the Project.

3.1.4. The Contractor shall perform the Work in accordance with the Contract Documents.
3.1.5. 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/Engineer in the Architect/Engineer's administration of the Contract, or by tests, inspections or approvals required or performed by persons other than the Contractor.

3.1.6. Quality Control (i.e. ensuring compliance with the Contract Documents) and Quality Assurance (i.e. confirming compliance with the Contract Documents) are the responsibility of the Contractor. Testing, observations, and/or inspections performed or provided by the Owner are solely for the Owner's own purposes and are for the benefit of the Owner. The Owner is not liable or responsible in any form or fashion to the Contractor regarding quality assurance or extent of such assurances. The Contractor shall not, under any circumstances, rely upon the Owner's testing or inspections as a substitute or in lieu of its own Quality Control or Assurance programs.

3.2. REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

3.2.1. Since the Contract Documents are complementary and inter-related, before starting each portion of the Work, the Contractor shall carefully study and compare the various Drawings and other Contract Documents relative to that portion of the Work, shall take field measurements of any existing conditions related to that portion of the Work and shall observe any conditions affecting the Work. These obligations are for the purpose of facilitating construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents. However, any errors, inconsistencies or omissions discovered by the Contractor shall be reported promptly to the Architect/Engineer as a request for information in such form as the Architect/Engineer may require.

3.2.2. Any errors or omissions noted by the Contractor during this review shall be reported promptly to the Architect/Engineer, but 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. If the Contractor believes that additional cost or time is involved because of clarifications or instructions issued by the Architect/Engineer in response to the Contractor's notices or requests for information pursuant to Subparagraphs 3.2.1 and 3.2.2, the Contractor shall make Claims as provided in Subparagraphs 4.3.4 and 4.3.5. If the Contractor fails to perform the obligations of Subparagraphs 3.2.1 and 3.2.2, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. The Contractor shall not be liable to the Owner or Architect/Engineer for damages resulting from errors, inconsistencies, or omissions in the Contract Documents or for differences between field measurements or conditions and the Contract Documents unless the Contractor recognized such error, inconsistency, omission or difference and failed to report it to the Architect/Engineer.

3.2.4. Except as otherwise expressly provided in this Contract, the Contractor assumes all risks, liabilities, costs, and consequences of performing any effort or work in accordance with any written or oral order (including but not limited to direction, instruction, interpretation, or determination) of a person not authorized in writing by the Owner to issue such an order.

3.2.5. By entering into this Contract, the Contractor acknowledges that it has informed itself fully regarding the requirements of the Drawings and Specifications, the General Conditions, the Supplementary General Conditions, all other documents comprising a part of the Contract Documents and all applicable laws, building codes, ordinances and regulations. Contractor hereby expressly acknowledges, guarantees, and warrants to the Owner that:

3.2.5.1. the Contract Documents are sufficient in detail and scope to enable Contractor to construct the finished project;

3.2.5.2. no additional or further work should be required by Owner at the time of Owner's acceptance of the Work; and,

3.2.5.3. when the Contractor's work is finished and the Owner accepts, the Work will be complete and fit for the purpose intended by the Contract Documents. This acknowledgment and guarantee does not imply that the Contractor is assuming responsibilities of the Architect/Engineer.

3.2.6. Sufficiency of Contract Documents: Prior to submission of its bid, and in all events prior to and upon signing the Contract, the Contractor certifies, warrants and guarantees that it has received, carefully reviewed, and 2014-02-07 General Conditions of the Contract for Construction - Final 06-17-2015
evaluated all aspects of the Contract Documents and agrees that said Documents are adequate, consistent, coordinated, and sufficient for bidding and constructing the Work requested, intended, conceived, and contemplated therein.

3.2.6.1. The Contractor further acknowledges its continuing duty to review and evaluate the Contract Documents during the performance of its services and shall immediately notify the Architect/Engineer of any problems, conflicts, defects, deficiencies, inconsistencies, errors, or omissions it discovers in the Contract Documents and the Work to be constructed; and, any variances it discovers between the Contract Documents and applicable laws, statutes, building codes, rules or regulations.

3.2.6.2. If the Contractor performs any Work which it knows or should have known due to its experience, ability, qualifications, and expertise in the construction industry, that involves problems, conflicts, defects, deficiencies, inconsistencies, errors, or omissions in the Contract Documents and the Work to be constructed and, any variances between the Contract Documents and applicable laws, statutes, building codes, rules or regulations, without prior written notification to the Architect/Engineer and without prior authorization to proceed from the Architect/Engineer, the Contractor shall be responsible for and bare the costs and delays (including costs of any delay) of performing such Work and all corrective actions as directed by the Architect/Engineer.

3.2.6.3. Any and all claims resulting from the Contractor's failure, including those of any subcontractor or supplier, to carefully review, evaluate, and become familiar with all aspects of the Contract Documents shall be deemed void and waived by the Contractor.

3.2.7. Sufficiency of Site Conditions: Prior to submission of its bid, and in all events prior to and upon signing the Contract, the Contractor certifies, warrants and guarantees that it has visited, carefully reviewed, evaluated, and become familiar with all aspects of the site and local conditions at which the Project is to be constructed. The Contractor agrees that the Contract Documents are an adequate, consistent, coordinated, and sufficient representation of the site and local conditions for the Work.

3.2.7.1. The Contractor has reviewed and become familiar with all aspects with the Site Survey and Geotechnical Report for the Project and has a full understanding of the information provided therein.

3.2.7.2. If the Work involves modifications, renovations, or remodeling of an existing structure(s) or other man-made feature(s), the Contractor certifies, warrants and guarantees that it has reviewed, evaluated, and become familiar with all available as-built and record drawings, plans and specifications, and has thoroughly inspected and become familiar with the structure(s) or man-made feature(s).

3.2.7.3. Any and all claims resulting from the Contractor's failure, including those of any subcontractor or supplier, to visit, carefully review, evaluate, and become familiar with all aspects of the site, available geotechnical information, and local conditions at which the Project is to be constructed shall be deemed void and waived by the Contractor.

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 recognizing that time and quality are of the essence of the Work. 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. It is the responsibility of and incumbent upon the Contractor to ensure, confirm, coordinate, inspect and oversee all Work (which is inclusive of but not limited to all submittals, change orders, schedules, workmanship, and appropriate staffing with enough competent and qualified personnel) so that the Work is not impacted in terms of any delays, costs, damages, or additional time, or effort on the part Architect/Engineer or Owner. 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/Engineer and shall not proceed with that portion of the Work without further written instructions from the Architect/Engineer. 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 Architect/Engineer or Owner as appropriate shall be solely responsible for
any resulting loss or damage. The Contractor will be required to: review any specified construction or installation procedure; advise the Architect/Engineer if the specified procedure deviates from good construction practice; to advise the Architect/Engineer if following the procedure will affect any warranties, including the Contractor's general warranty, or of any objections the Contractor may have to the procedure and shall propose any alternative procedure which the Contractor will warrant and guarantee. The Contractor is required to: review any specified construction or installation procedure; advise the Architect/Engineer if the specified procedure deviates from good construction practice; to advise the Architect/Engineer if following the procedure will affect any warranties, including the Contractor's general warranty, or of any objections the Contractor may have to the procedure and to propose any alternative procedure which the Contractor will warrant.

3.3.2. The Contractor shall furnish management, supervision, coordination, labor and services that: (1) expeditiously, economically, and properly completes the Work; (2) comply with all requirements of the Contract Documents; and, (3) are performed in a quality workmanlike manner and in accordance with the standards currently practiced by persons and entities performing or providing comparable management, supervision, labor and services on projects of similar size, complexity, cost, and nature to this Project. However, the standards currently practiced within the construction industry shall not relieve the Contractor of the responsibility to perform the Work to the level of quality, detail, and excellence defined and intended by the Contract Documents as interpreted by the Architect/Engineer.

3.3.3. All services and labor rendered by the Contractor, including any subcontractors or suppliers, shall be performed under the immediate supervision at the site of persons possessing expertise and the requisite knowledge in the discipline or trade of service being rendered. The Contractor shall maintain such supervision and personnel at all times that the Contractor's personnel, subcontractors, and/or suppliers are at the site. The Contractor shall never be absent from the site during performance of any portion of the Work by any entity under the supervision and direction of the Contractor. Full time attendance by the Contractor from Notice to Proceed through Final Acceptance is an explicit requirement of this Contract.

3.3.4. The Contractor shall be responsible to the Owner for acts, damages, errors, 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.

3.3.5. 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, WAGES, AND MATERIALS

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

3.4.2. The Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect/Engineer and in accordance with a Change Order. This opportunity to request substitutions does not negate or waive any requirement for the Contractor to follow a pre-bidding “prior approval” requirement nor obligate the Owner to approve any substitution request.

3.4.3. The Contractor shall enforce strict discipline, appropriate behavior, and good order among the Contractor's employees, subcontractors at every tier and level, and other persons carrying out the Contract. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

3.4.4. Prevailing Wages and Montana Residents.

3.4.4.1. The Contractor and all subcontractors at any level or tier of the Work shall give preference to the employment of bona fide Montana residents in the performance of the Work and shall pay the standard prevailing rate of wages, including fringe benefits for health and welfare and pension contributions and travel allowance provisions in effect and applicable to the county or locality in which the work is being performed. (18-2-403, MCA)

3.4.4.2. At least 50% of the workers, as defined by the Department of Labor & Industry (DOLI), must be bona fide Montana residents. (18-2-401, 18-2-402, MCA)

2014-02-07 General Conditions of the Contract for Construction - Final 06-17-2015
3.4.4.3. Indian Employment Preference within the Boundaries of an Indian Reservation. All contractors that are awarded a state agency construction contract within the exterior boundaries of an Indian Reservation shall extend a hiring preference to qualified Indians as provided herein:

3.4.4.3.1. “State agency” means a department, office, board, bureau, commission, agency, or other instrumentality of the executive or judicial branches of the government of this State. “Indian” means a person who is enrolled or who is a lineal descendent of a person enrolled in an enrollment listing of the Bureau of Indian Affairs or in the enrollment listing of a recognized Indian tribe domiciled in the United States.

3.4.4.3.2. Qualified Indians – Employment Criteria: An Indian shall be qualified for employment in a permanent, temporary, or seasonal position if he or she has substantially equal qualifications for any position and resides on the reservation where the construction contract is to be performed.

3.4.4.3.3. Non-Applicability: The Indian Employment Preference Policy does not apply to a project partially funded with federal-aid money from the United States Department of Transportation or when residency preference laws are specifically prohibited by federal law. It does not apply to independent contractors and their employees, student interns, elected officials, or appointed positions.

3.4.4.4. The Commissioner of The Montana Department of Labor and Industry (DOLI) has established the standard prevailing rate of wages in accordance with 18-2-401 and 18-2-402, MCA. A copy of the Rates entitled “State of Montana, Prevailing Wage Rates” are bound herein. The Commissioner of the Montana DOLI has established the resident requirements in accordance with 18-2-409, MCA. The Contractor and all subcontractors at any level or tier of the Work shall direct any and all questions concerning prevailing wage and Montana resident issues for all aspects of the Work to DOLI.

3.4.4.5. The Contractor and all subcontractors at any tier or level of the Work, and as determined by the Montana DOLI, shall classify all workers in the project in accordance with the State of Montana, Prevailing Wage Rates. In the event the Contractor is unable to classify a worker in accordance with these rates he shall contact DOLI for a determination of the classification and the prevailing wage rate to be paid.

3.4.4.6. The Contractor and all subcontractors at any tier or level of the Work shall be responsible for obtaining wage rates for all workers prior to their performing any work on the project. The Contractor is required to pay and insure that its subcontractors at any tier or level and others also pay the prevailing wage determined by the DOLI, insofar as required by Title 18 of the MCA and the pertinent rules and standards of DOLI.

3.4.4.7. It is not the responsibility of the Owner to determine who classifies as a subcontractor, sub-subcontractor, material man, supplier, or any other person involved in any aspect of the Work at any tier or level. All such determinations shall be the sole responsibility of the Contractor, subcontractors, sub-subcontractors, material men, suppliers and others involved in the project at any tier or level. The Contractor, subcontractors, sub-subcontractors, material men, suppliers and others involved in the project shall indemnify and hold harmless the Owner from all claims, attorneys’ fees, damages and/or awards involving prevailing wage or Montana resident issues. Any changes to wages or penalties for failure to pay the correct wages will be the sole responsibility of the Contractor and/or his subcontractors and no further charges or claims shall be made to the Owner. If the parties mutually agree or an arbitrator or court determines that any change in wages is due and any part is attributable to the Owner, the Owner's sole liability shall be for the amount of wages ordered only and not for other expenses, charges, penalties, overhead, profit or other mark-ups.

3.4.4.8. In accordance with 18-2-422(1) MCA, each job classification’s standard prevailing wage rate, including fringe benefits, that the contractors and employers shall pay during construction of the project is included herein by both reference to DOLI’s “Building” or “Heavy/Highway” schedules and as part of these Contract Documents.

3.4.4.9. The Contractor and every employer, including all subcontractors at any tier or level, is required by 18-2-422(2) MCA to maintain payroll records in a manner readily capable of being certified for submission under 18-2-423 MCA, for a period of not less than 3 years after the contractor's,
subcontractor’s, or employer's completion of work on the project or the Final Acceptance by the Owner, which ever is later.

3.4.4.10. Each contractor is required by 18-2-422(3) MCA to post in a visible and accessible location a statement of all wages and fringe benefits in compliance with 18-2-423.

3.5. **WARRANTY AND GUARANTEE**

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

3.5.2. The Contractor shall and does hereby warrant and guarantee all work, workmanship, and materials for the full warranty period as specified in the Contract Documents. The warranty period shall be defined as commencing with Substantial Completion (or with each Substantial Completion if there is more than one) of the Project, or any portion thereof, and continuing for one (1) calendar year from the date of Final Acceptance of the entire project by the Owner. The date of Final Acceptance shall be the date of the Architect/Engineer’s signature on the final request for payment unless otherwise agreed upon in writing for the entire project or any portion thereof, by the Owner, Architect/Engineer and Contractor.

3.5.3. In addition to the one (1) calendar year warranty and guarantee specified in this herein above, the Contractor warrants and guarantees all materials and workmanship for the roofing system for a period of two (2) calendar years from the date of Final Acceptance. This warranty shall cover all labor and materials for roof and roofing finish systems (e.g. flashing, terminations, parapet caps, etc.) repairs from moisture penetration and/or defects in workmanship.

3.5.4. Manufacturer and product warranties and guarantees, as provided by the manufacturer or as specified in the Contract Documents, are in addition to the Contractor’s warranty.

3.6. **TAXES**

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

3.6.2. In compliance with 15-50-206 MCA, the Contractor will have 1% of his gross receipts withheld by the Owner from all payments due and sent to the Montana Department of Revenue. Each subcontractor who performs work greater than $5,000 shall have 1% of its gross receipts withheld by the Contractor and sent to the Montana Department of Revenue. The Contractor shall notify the Department of Revenue on the Department’s prescribed form.

3.7. **PERMITS, FEES, AND NOTICES**

3.7.1. Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay, either directly or through the appropriate subcontractor(s), for the building permit and other permits and governmental fees, licenses and inspections by authorities having jurisdiction for proper execution and completion of the Work which are customarily secured after execution of the Contract, including but not limited to, the building permit fee, electrical, plumbing, sewer connection fee and mechanical permit fee.,

3.7.2. The Contractor shall comply with and give notices required by laws, ordinances, rules, 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 laws, statutes, ordinances, building codes, and rules and regulations, and does so without providing notice to the Architect/Engineer and Owner, the Contractor shall assume responsibility for such Work and shall bear the costs attributable to correction. The
Contractor shall be solely responsible to insure that all work it performs is in full compliance with all prevailing and applicable codes and regulations.

3.7.4. Incident Reporting: The Contractor shall immediately notify the Owner and Architect/Engineer, both orally and in writing, of the nature and details of all incidents which may adversely affect the quality or progress of the Work, including, but not limited to, union disputes, accidents, delays, damages to Work, and other significant occurrences. Such notices are in addition to any other notices required regarding claims.

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.

3.8.2. Unless otherwise provided in the Contract Documents and with specific reference to the calculation and approval of Allowance Work defined in Article 4.9 in the Pre-Construction Services Conditions:

3.8.2.1. allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

3.8.2.2. 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 by the Contractor in the Contract Sum but not in the allowances;

3.8.2.3. whenever costs are more than or less than stated 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 Clause 3.8.2.1; and, (2) changes in Contractor's costs under Clause 3.8.2.2.

3.8.3. Materials and equipment under an allowance shall be selected by the Owner.

3.9. CONTRACTOR'S PERSONNEL

3.9.1. The Contractor shall employ competent personnel, supervisors, project managers, project engineers, project superintendent, and all others who shall be assigned to the Work throughout its duration. Contractor's personnel extend to those employed by the Contractor whether at the site or not. The Owner shall have right to review and approve or reject all replacement of Contractor's personnel. All personnel assigned by the Contractor to the Work shall possess the requisite experience, skills, abilities, knowledge, and integrity to perform the Work.

3.9.2. The Contractor agrees that the employees identified in the response to GC/CM Request for Proposal (RFP) shall be fully and completely engaged to the extent stipulated in the Proposal response for the duration of the Project, except for catastrophic events including but not limited to termination of employment, illness, accident, or death. Any changes in the GC/CM Project Team members or roles should be agreed to with the Owner in writing.

3.9.3. The superintendent and others as assigned shall be in attendance at the Project site during the performance of any and all Work. The superintendent shall represent the Contractor. All communications given to the Contractor's personnel such as the project manager or the superintendent, whether verbal, electronic or written, shall be as binding as if given to the Contractor.

3.9.4. It is the Contractor's responsibility to appropriately staff, manage, supervise and direct the Work which is inclusive of the performance, acts, and actions of his personnel and subcontractors. As such, the Contractor further agrees to indemnify and hold harmless the Owner and the Architect/Engineer, and to protect and defend both from and against all claims, attorneys' fees, demands, causes of action of any kind or character, including the cost of defense thereof, arising in favor of or against the Owner, Architect/Engineer, Contractor, their agents, employees, or any third parties on account of the performance, behavior, acts or actions of the Contractor's personnel or subcontractors.

3.9.5. Prior to the commencement of any work, the Contractor shall prepare and submit a personnel listing and organizational chart in a format acceptable to the Owner which lists by name, phone number (including cell phone), job category, and responsibility the Contractor's key/primary personnel who will work on the Project.
The Contractor shall promptly inform the Owner in writing of any proposed replacements, the reasons therefore, and the name and qualifications of any proposed replacements. The Owner shall have the right to reject any proposed replacements without cost or claim being made by the Contractor. The chart shall be provided to the Owner at the time of the pre-construction conference.

3.9.6. The Contractor shall immediately remove for the duration of the Project, any person making an inappropriate racial, sexual, or ethnic comment, statement, joke, or gesture toward any other individual.

3.9.7. The Contractor shall immediately remove for the duration of the Project, any person who is incompetent, careless, disruptive, or not working in harmony with others.

3.10. **CONSTRUCTION SCHEDULES**

3.10.1. The Contractor shall, promptly after being awarded the Contract, prepare and submit for the Owner's and Architect/Engineer'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 per the requirements of the Contract Documents, 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. The Contractor's schedule shall be in the "Critical Path Method" and shall show the Critical Path of the Work in sufficient detail to evaluate the Contractor's progress. A request for time extension by the Contractor will not be allowed unless a change in the Work is approved by the Owner and materially affects the Critical Path. It is the Contractor's responsibility to demonstrate that any time extensions requests materially affect the Critical Path.

3.10.2. The Contractor shall prepare and keep current, for the Architect/Engineer's approval, a schedule of submittals which is coordinated with the Contractor's Construction Schedule and allows the Architect/Engineer reasonable time to review submittals.

3.10.3. The Contractor shall perform the Work in accordance with the most recent schedule submitted to the Owner and Architect/Engineer.

3.10.4. The Contractor's operations (including but not limited to the Contractor's forces employed, sequences of operations, and methods of operation) at all times during the performance of the contract shall be: (a) subject to the review of the Owner or the Architect/Engineer; and, (b) sufficient to insure the completion of the Work within the specified performance period.

3.10.5. The Critical Path Method Construction Schedule prepared by the Contractor must be in a form that is acceptable to both the Architect/Engineer and the Owner.

3.10.5.1. The Schedule shall show the estimated progress of the entire Project through the individual time periods allowed for completion of each discipline, trade, phase, section, and aspect of the Work. The Contractor shall maintain and retain reports of all logic and resource loading data with the Schedule (and any revisions to the Schedule). Reports and resource loading data shall be provided to the Owner upon request.

3.10.5.2. The Schedule shall show percent complete, progress to date, project work, and projected time to complete the work for all activities. The percent complete and minor schedule changes, including additions of activities, change orders, construction change directives, changes to sequences of activities and significant changes in activity demands must be shown by a revised Schedule. A written report providing details about the changes and what actions are anticipated to get the work completed in the contractual time period shall be submitted with the revised schedule.

3.10.5.3. The Construction Schedule shall include coordinate dates for performance of all divisions of the Work, including shipping and delivery, off-site requirements and tasks, so the Work can be completed in a timely and orderly fashion consistent with the required dates of Substantial Completion and Final Acceptance.

3.10.5.4. The Construction Schedule shall include: (i) the required commencement date, the required dates of Substantial Completion(s) and Final Acceptance for the complete Project and all phases (if any); (ii) any guideline and milestone dates required by the Owner or the Contract Documents; (iii) subcontractor and supplier schedules; (iv) a submittal schedule which allows sufficient time for review.
and action by the Architect/Engineer; (v) the complete sequence of all construction activities with start and completion dates; and, (vi) required decision dates.

3.10.5.5. By receiving, reviewing, and/or commenting on the Construction Schedule or any portion thereof (including logic and resource loading), neither the Owner or Architect/Engineer assume any of the Contractor’s responsibility or liability that the Schedule be coordinated or complete, or for timely and orderly completion of the Work.

3.10.5.6. Receiving, reviewing, and/or commenting on the Schedule, any portion thereof, or any revision thereof, does not constitute an approval, acknowledgement, or acceptance of any durations, dates, milestones, or performance indicated therein.

3.10.5.7. A printout of the Schedule’s logic showing all activities and all resource loading is required with the Schedule and with all updates to the Schedule.

3.10.6. The Contractor shall review and compare, at a minimum on a weekly basis, the actual status of the Work against its Construction Schedule.

3.10.7. The Contractor shall routinely, frequently, and periodically (but not less than monthly) update and/or revise its Construction Schedule to show actual progress of the Work through the date of the update or revision, projected level of completion of each remaining activity, activities modified since the previous update or revision, and major changes in scope or logic. The updated/revised Schedule shall be accompanied by a narrative report which: (1) states and explains any modifications of the critical path, if any, including any changes in logic; (2) defines problem areas and lists areas of anticipated delays; (3) explains the anticipated impact the change in the critical path or problems and delays will have on the entire Schedule and the completion of the Work; (4) provides corrective action taken or proposed; and, (5) states how problems or delays will be resolved in order to deliver the Work by the required phasing milestones (if any), Substantial Completion(s), and Final Acceptance dates.

3.10.8. Delay in Performance: If at any time the Contractor anticipates that performance of the Work will be delayed or has been delayed, the Contractor shall: (1) immediately notify the Architect/Engineer by separate and distinct correspondence of the probably cause and effect of the delay, and possible alternatives to minimize the delay; and, (2) take all corrective action reasonably necessary to deliver the Work by the required dates. Nothing in this paragraph or the Contract Documents shall be construed by the Contractor as a granting by the Architect/Engineer or Owner of constructive acceleration. The results of failure to anticipate delays, or to timely notify the Owner and Architect/Engineer of an anticipated or real delay, are entirely the responsibility of the Contractor whether compensable or not.

3.10.9. Early Completion: The Contractor may attempt to achieve Substantial Completion(s) on or before the date(s) required in the Contract. However, such early completion shall be for the Contractor’s sole convenience and shall not create any real or implied additional rights to Contractor or impose any additional obligations on the Owner or Architect/Engineer. The Owner will not be liable for nor pay any additional compensation of any kind to the Contractor for achieving Substantial Completion(s) or Final Acceptance prior to the required dates as set forth in the Contract. The Owner will not be liable for nor pay any additional compensation of any kind should there by any cause whatsoever that the Contractor is not able to achieve Substantial Completion(s) earlier than the contractually required dates of Substantial Completion(s) or Final Acceptance.

3.10.10. Float in Schedule. Any and all float time in the Contractor’s schedule, regardless of the path or activity, shall accrue to the benefit of the Owner and the Work, and not to the Contractor. Float also includes any difference shown between any early completion dates shown on the Contractor’s Schedule for any phasing milestone(s), Substantial Completion(s) or Final Acceptance and the dates or durations as required by the Contract Documents.

3.10.11. Modification of Required Substantial Completion(s) or Final Acceptance Dates: Modification of the required dates shall be accomplished only by duly authorized, accepted, and approved change orders stating the new date(s) with specificity on the change order form. All rights, duties, and obligations, including but not limited to the Contractor’s liability for actual, delay, and/or liquidated damages, shall be determined in relation to the date(s) as modified.

3.11. DOCUMENTATION AND AS-BUILT CONDITIONS AT THE SITE

2014-02-07 General Conditions of the Contract for Construction - Final 06-17-2015
3.11.1. The Contractor shall maintain at the site for the Owner one record copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and accurately marked to record current field changes and selections made during construction, and one record copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect/Engineer or Owner at any time and shall be delivered to the Architect/Engineer for submittal to the Owner upon completion of the Work.

3.11.2. The Owner shall not be required to process final payment until all documentation and data required by the Contract Documents is submitted to and approved by the Architect/Engineer including, but not limited to, the As-Built Drawings. The Owner will not process any final request for payment until the Architect/Engineer has received and verified that the Contractor has performed the requirements pertaining to the as-built drawings.

3.11.3. The as-built drawings shall be neatly and clearly marked during construction to record all deviations, variations, changes, and alterations as they occur during construction along with such supplementary notes and details necessary to clearly and accurately represent the as-built condition. The as-built drawings shall be available at all times to the Owner, Architect/Engineer and Architect/Engineer’s consultants.

3.12. **SHOP DRAWINGS, PRODUCT DATA AND SAMPLES**

3.12.1. Definitions:

3.12.1.1. 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.

3.12.1.2. 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.

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

3.12.2. Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. The purpose of their submittal is to demonstrate for those portions of the Work for which submittals are required by the Contract Documents the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents. Review by the Architect/Engineer is subject to the limitations of Subparagraph 4.2.7. Informational submittals upon which the Architect/Engineer is not expected to take responsive action may be so identified in the Contract Documents. Submittals which are not required by the Contract Documents may be returned by the Architect/Engineer without action.

3.12.3. The Contractor shall review, approve, and submit to the Architect/Engineer, Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents being issued the Notice To Proceed unless noted otherwise and shall do so in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. Any and all items submitted by the Contractor which are not marked as reviewed for compliance with the Contract Documents and approved by the Contractor, or in the opinion of the Architect/Engineer, have not been reviewed for compliance by the Contractor even if marked as such, may be returned by the Architect/Engineer without action and shall not result in any accusation or claim for delay or cost by the Contractor. Any submittal that, in the opinion of the Architect/Engineer, is incomplete in any area or detail may be rejected and returned to the Contractor. It is the responsibility of and incumbent upon the Contractor to ensure and confirm that all submittals are complete, accurate, and in conformance to the Contract Documents prior to submission.

3.12.4. By approving and submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents and guarantees to the Architect/Engineer and Owner that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

3.12.5. 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/Engineer. Should the Contractor, Subcontractors or Sub-subcontractors install, construct, erect or perform any portion of the Work without approval of any requisite submittal, the
Contractor shall bear the costs, responsibility, and delay for removal, replacement, and/or correction of any and all items, material, and /or labor.

3.12.6. 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/Engineer's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect/Engineer in writing of such deviation at the time of submittal and: (1) the Architect/Engineer 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/Engineer's approval thereof.

3.12.7. The Contractor shall direct specific attention, in writing or on re-submitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect/Engineer on previous submittals. In the absence of such written notice the Architect/Engineer's approval of a re-submission shall not apply to such revisions.

3.12.8. The Contractor shall not be required to provide professional services which 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/Engineer 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/Engineer. The Owner and the Architect/Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided the Owner and Architect/Engineer have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this subparagraph, the Architect/Engineer 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 or design criteria required by the Contract Documents but shall be responsible and held liable for review and verification of all performance or design criteria as required by Paragraph 3.2.

3.12.9. Unless noted otherwise in the Contract Documents, the Contractor shall submit to the Architect/Engineer within sixty (60) days from the date of the Notice To Proceed a minimum of six (6) complete copies of all shop/setting drawings, schedules, cut sheets, products, product data, and samples required for the complete Work. Copies shall be reviewed, marked, stamped and approved on each and every copy by the Contractor prior to submission to the Architect/Engineer or they shall be returned without review or action. The Architect/Engineer shall review with reasonable promptness, making corrections, rejections, or other actions as appropriate. The Architect/Engineer's approval or actions on shop/setting drawings, schedules, cut sheets, products, product data, or samples shall not relieve the Contractor from responsibility for, nor deviating from, the requirements of the plans and specifications. Any deviations from the plans and specifications requested or made by the Contractor shall be brought promptly to the attention of the Architect/Engineer.

3.12.10. Cost for Re-Submissions: the Contractor is responsible for ensuring that all shop drawings, product data, samples, and submittals contain all information required by the Contract Documents to allow the Architect/Engineer to take action. The Contractor shall pay the Architect/Engineer's cost for any re-submission of any rejected item. Such costs shall be deducted from the contract sum by Change Order. The Contractor agrees that any action taken by the Architect/Engineer is solely in the Architect/Engineer's discretion and is non-negotiable for the purposes of the Architect/Engineer's cost recovery for multiple (i.e. more than one) review.

3.13. USE OF SITE
3.13.1. The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

3.13.2. The Contractor shall not damage, endanger, compromise or destroy any part of the Project or the site, including but not limited to work performed by others, monuments, stakes, bench marks, survey points, utilities, existing features or structures. The Contractor shall be fully and exclusively responsible for and bear all costs and delays (including and costs of delay) for any damage, endangerment, compromise, or destruction of any part of the Project or site.

3.13.3. The Contractor shall adhere to all MSU-Bozeman Vehicle Regulations as follows:

3.13.3.1. All students, faculty, staff, and visitors must register any motor vehicle they park on the University campus, for any reason. A visitor is anyone not defined as student, staff or faculty.

3.13.3.2. All Contractor and Contractor employees shall comply with Montana State University parking regulations. MSU parking permits can be purchased at the Huffman Building at Seventh Avenue and Kagy Boulevard. Contractor should call University Police at 994-2121 for permit information. Violators of MSU Bozeman Vehicle Regulations may be ticketed and towed.

3.13.3.3. Unless otherwise indicated on the drawings, all Contractor and Contractor employee vehicles on campus shall be parked in designated parking lots. If allowed on the drawings, vehicles to a maximum number stated, may be parked in project site areas designated and shall only be Contractor vehicles with company signs clearly visible. No personal vehicles shall be parked at the project site in any case. If a driver of a vehicle not allowed to be parked at the project site must unload equipment, tools, or materials, the vehicle must be immediately thereafter moved to a designated lot or leave campus. Vehicles parked in the project site, other than those allowed on the drawings, may be ticketed and towed.

3.13.3.4. Access to the project site shall be only by the route designated on the drawings. In cases where a different route must be used for a specific purpose, permission must be obtained from Owner. In no case will vehicles be used on the Centennial Mall paving. Access routes are for delivery of equipment, tools, and not for parking.

3.13.3.5. Site staging areas for materials and equipment if permitted, will be designated on the drawings if permitted. If not designated, staging is intended to be in the construction area boundaries. Staged materials and equipment must be secured on the ground surface or in trailers. Site staging areas shall be fenced.

3.13.4. The Contractor shall coordinate his operations with the Owner in order that the Owner will have maximum use of existing facilities surrounding the area of the Work, as agreed upon, at all times during normal working hours. Contractor further agrees to coordinate his operations so as to avoid interference with the Owner’s normal operations to as great an extent as possible.

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.

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. **CLEAN UP AND SITE CONTROL**

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 during performance of the Work and at the direction of the Owner or Architect/Engineer. At completion of the Work, the Contractor shall remove from and about the
Project waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials.

3.15.2. If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the cost thereof shall be charged to the Contractor.

3.16. **ACCESS TO WORK**

3.16.1. The Contractor shall provide the Owner and Architect/Engineer access to the Work at all times wherever located.

3.17. **ROYALTIES, PATENTS AND COPYRIGHTS**

3.17.1. 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/Engineer 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/Engineer. 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/Engineer.

3.18. **INDEMNIFICATION**

3.18.1. To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect/Engineer, Architect/Engineer'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 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 which would otherwise exist as to a party or person described in this Paragraph. The Contractor agrees that it will defend, protect, indemnify and save harmless the State of Montana and the Owner against and from all claims, liabilities, demands, causes of action, judgments (including costs and reasonable attorneys' fees), and losses from any cause whatever (including patent, trademark and copyright infringement) except the Owner's sole or partial negligence. This includes any suits, claims, actions, losses, costs, damages of any kind, including the State and Owner's legal expenses, arising out of, in connection with, or incidental to the Contract, but does not include any such suits, claims, actions, losses, costs or damages which are the result of the negligent acts, actions, losses, costs, or damages which are acts, omissions or misconduct of the Owner if they do not arise out of, depend upon or relate to a negligent act, omission or misconduct of the Contractor in whole or in part.

3.18.2. In claims against any person or entity indemnified under this Paragraph 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 Subparagraph 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.

4. **ARTICLE 4 – ADMINISTRATION OF THE CONSTRUCTION CONTRACT**

4.1. **THE ARCHITECT/ENGINEER**

4.1.1. The Architect/Engineer is the person lawfully licensed to practice or an entity lawfully practicing identified as such in the Agreement with the Owner and is referred to throughout the Contract Documents as if singular in number. The term “Architect/Engineer” means the Architect/Engineer's duly authorized representative.

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

4.1.3. If the employment of the Architect/Engineer is terminated, the Owner shall employ a new Architect/Engineer at the sole choice and discretion of the Owner, whose status under the Contract Documents shall be that of the former Architect/Engineer.
4.2. ARCHITECT/ENGINEER’S ADMINISTRATION OF THE CONSTRUCTION CONTRACT

4.2.1. The Architect/Engineer will provide administration of the Contract as described in the Contract Documents, and will be an Owner's representative throughout the complete duration of the Project, including the warranty period. The Architect/Engineer will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified in writing in accordance with the Architect/Engineer Contract.

4.2.2. The Architect/Engineer, as a representative of the Owner, will visit the site at intervals appropriate to the stage of the Contractor's operations to: (1) become generally familiar with and to keep the Owner informed about the progress and quality of the portion of the Work completed; (2) endeavor to guard the Owner against defects and deficiencies in the Work; and, (3) to determine in general if the Work is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Owner and Architect/Engineer will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Contractor's Work. The Owner and Architect/Engineer will neither have control over or charge of, nor be responsible for, the construction means, methods, techniques, sequences or procedures, for the safety of any person involved in the work, 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.

4.2.3. The Architect/Engineer will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect/Engineer 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/Engineer about matters arising out of or relating to the Contract. Communications by and with the Architect/Engineer's consultants shall be through the Architect/Engineer. Communications by and with Subcontractors and material suppliers shall be through the Contractor to the Architect/Engineer. Communications by and with separate contractors shall be through the Owner to the Architect/Engineer.

4.2.5. Based on the Architect/Engineer's evaluations of the Contractor's Applications for Payment, the Architect/Engineer will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts. The Contractor is fully aware that the Owner (i.e. the State of Montana) has established a billing cycle for processing payments in Article 9 of these General Conditions. The Contractor and all Subcontractors are subject to all provisions of Title 28, Chapter 2, Part 21 MCA regarding all aspects of the Work.

4.2.6. The Architect/Engineer will have authority to reject Work that does not conform to the Contract Documents. Whenever the Architect/Engineer considers it necessary or advisable, the Architect/Engineer will have authority to require inspection or testing of the Work in accordance with the General Conditions and any applicable technical specification requirements, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect/Engineer 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/Engineer to the Contractor, Subcontractors, or the Owner or employees, or other persons or entities performing portions of the Work.

4.2.7. The Architect/Engineer 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/Engineer's action will be taken with such reasonable promptness as to cause no delay in the Work or in the activities of the Owner, Contractor or separate contractors, while allowing sufficient time in the Architect/Engineer'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/Engineer's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Paragraphs 3.3, 3.5 and 3.12. The Architect/Engineer's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect/Engineer, of any...
4.2.8. The Architect/Engineer will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Paragraph 7.4.

4.2.9. The Architect/Engineer will conduct inspections to determine the date or dates of Substantial Completion(s) and the date of Final Acceptance, will 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, and will issue a final Certificate for Payment upon compliance with the requirements of the Contract Documents.

4.2.10. If the Owner and Architect/Engineer agree, the Architect/Engineer will provide one or more project representatives to assist in carrying out the Architect/Engineer's responsibilities. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in the Owner's Agreement with the Architect/Engineer.

4.2.11. The Architect/Engineer 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/Engineer's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If no agreement is made concerning the time within which interpretations required of the Architect/Engineer shall be furnished in compliance with this Paragraph 4.2, then delay shall not be recognized on account of failure by the Architect/Engineer to furnish such interpretations until 15 days after written request is made for them.

4.2.12. Interpretations and decisions of the Architect/Engineer 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 initial decisions, the Architect/Engineer will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will render such interpretations and decisions in good faith.

4.2.13. The Architect/Engineer'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/Engineer's or Owner's observations or inspections do not alleviate any responsibility on the part of the Contractor. The Architect/Engineer and the Owner reserves the right to observe and inspection the work and make comment. Action or lack of action following observation or inspection is not to be construed as approval of Contractor's performance.

4.3. CLAIMS AND DISPUTES

4.3.1. Definition. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extensions of time or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes, controversies, and matters in question between the Owner and Contractor arising out of or relating to the Contract. Claims must be initiated by written notice. The responsibility to substantiate Claims shall rest solely with the party making the Claim.

4.3.1.1. Time Limits on Claims. Claims by either party must be initiated within 21 calendar days after occurrence of the event giving rise to such claim. The following shall apply to the initiation of a claim:

4.3.1.1.1. A written notice of a claim must be provided to the Architect/Engineer and the other party within 21 calendar days after the occurrence of the event or the claim is waived by the claiming party and void in its entirety.

4.3.1.1.2. Claims must be initiated by separate, clear, and distinct written notice within the 21 calendar day time frame to the Architect/Engineer and the other party and must contain the notarized statement in Sub-Paragraph 4.3.1.5 when the claim is made by the Contractor. Discussions in any form with the Architect/Engineer or Owner, whether at the site or not, do not constitute initiation of a claim. Notes in project meeting minutes, email correspondence, change order proposals, or any other form of documentation does not constitute initiation of a claim. The written notice must be a separate and distinct correspondence provided in hardcopy to both the Architect/Engineer and Owner and must delineate the specific event and outline the causes and
reasons for the claim whether or not cost or time have been fully determined. Written remarks or notes of a generic nature are invalid in their entirety. Comments made at progress meetings, project site visits, inspections, emails, voice mails, and other such communications do not meet the requirement of providing notice of claim.

4.3.1.1.3. Physical Injury or Physical Damage. Should the Owner or Contractor suffer physical injury or physical damage to person or property because of any error, omission, or act of the other party or others for whose acts the other party is legally and contractually liable, claim will be made in writing to the other party within a reasonable time of the first observance of such physical injury or physical damage but in no case beyond 30 calendar days of the first observance. The notice shall provide sufficient detail to enable the other party to investigate the matter. The provisions of this paragraph shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitations or repose. In all such cases, the indemnification provisions of the Contract shall be effectual and the Contractor’s insurance shall be primary and in full effect.

4.3.1.2. All Claims must contain sufficient justification and substantiation with the written notice or they may be rejected without consideration by the Architect/Engineer or other party with no additional impact or consequence to the Contract Sum, Contract Time, or matter(s) in question in the Claim.

4.3.1.3. If additional compensation is claimed, the exact amount claimed and a breakdown of that amount into the following categories shall be provided with each and every claim:

4.3.1.3.1. Direct costs (as listed in Subparagraph 7.3.9.1 through 7.3.9.5);

4.3.1.3.2. Indirect costs (as defined in Paragraph 7.2.5); and,

4.3.1.3.3. Consequential items (i.e. time extensions, credits, logic, reasonableness, impacts, disruptions, dilution) for the change.

4.3.1.4. If additional time is claimed the following shall be provided with each and every claim:

4.3.1.4.1. The specific number of days and specific dates for which the additional time is sought;

4.3.1.4.2. The specific reasons, causes, and/or effects whereby the Contractor believes that additional time should be granted; and,

4.3.1.4.3. The Contractor shall provide analyses, documentation, and justification of its claim for additional time in accordance with the latest Critical Path Method schedule in use at the time of event giving rise to the claim.

4.3.1.5. With each and every claim, the Contractor shall submit to the Architect/Engineer and Owner a notarized statement containing the following language:

4.3.2. "Under penalty of law (including perjury and/or false/fraudulent claims against the State), the undersigned,

(Name)  (Title)
Of ______________________________
(Company)  (Date)

hereby certifies, warrants, and guarantees that this claim made for Work on this Contract is a true statement of the costs, adjustments and/or time sought and is fully documented and supported under the contract between the parties.

(Signature)  (Date)"

4.3.3. Continuing Contract Performance.
4.4. Pending final resolution of a Claim except as otherwise agreed in writing or as provided in Subparagraph 9.7.1 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 on the portion of the Work not involved in a Claim.

4.4.1. **Claims for Cost or Time for Concealed or Unknown Conditions.**

4.5. If conditions are encountered at the site which are: (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents; or, (2) unknown physical conditions of an unusual nature, which 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, then notice by the observing party shall be given to the other party promptly before conditions are disturbed.

4.5.1.1. The Architect/Engineer will promptly investigate such conditions and, if 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/Engineer 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/Engineer shall so notify the Owner and Contractor in writing, stating the reasons. Claims by either party in opposition to such determination must be made within 21 days after the date of the Architect/Engineer’s decision.

4.5.1.2. If the conditions encountered are materially different, the Contract Sum and Contract Time shall be equitably adjusted, but if the Owner and Contractor cannot agree on an adjustment in the Contract Sum or Contract Time, the adjustment shall be referred to the Architect/Engineer for initial determination, subject to further proceedings pursuant to Paragraph 4.4.

4.5.1.3. Nothing in this paragraph shall relieve the Contractor of its obligation to adequately and sufficiently investigate, research, and examine the site, the site survey, topographical information, and the geotechnical information available whether included by reference or fully incorporated in the Contract Documents.

4.5.2. **Claims for Additional Cost.**

4.5.2.1. If the Contractor wishes to make 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 Paragraph 10.6.

4.5.2.2. If the Contractor believes additional cost is involved for reasons including but not limited to: (1) a written interpretation from the Architect/Engineer; (2) an order by the Owner to stop the Work solely for the Owner’s convenience or where the Contractor was not at least partially at fault; (3) a written order for a minor change in the Work issued by the Architect/Engineer; (4) failure of payment by the Owner per the terms of the Contract; (5) termination of the Contract by the Owner; or, (6) other reasonable grounds, Claim must be filed in accordance with this Paragraph 4.3.

4.5.3. **Claims for Additional Time**

4.5.3.1. If the Contractor wishes to make Claim for an increase in the Contract Time, written notice as specified in these General Conditions shall be provided along with the notarized certification. 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 for the same event or cause only one Claim is necessary. However, separate and distinct written notice is required for each separate event.

4.5.3.2. **Weather Delays:**

4.5.3.2.1. 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 activities.

4.5.3.2.2. Inclement or adverse weather shall not be a prima facie reason for the granting of an extension of time, and the Contractor shall make every effort to continue work under prevailing conditions.
conditions. The Owner may grant an extension of time if an unavoidable delay occurs as a result of inclement/severe/adverse weather and such shall then be classified as a “Delay Day”. Any and all delay days granted by the Owner are and shall be non-compensable in any manner or form. The Contractor shall comply with the notice requirements concerning instances of inclement/severe/adverse weather before the Owner will consider a time extension. Each day of inclement/severe/adverse weather shall be considered a separate instance or event and as such, shall be subject to the notice requirements.

4.5.3.2.3. An “inclement”, “severe”, or “adverse” weather delay day is defined as a day on which the Contractor is prevented by weather or conditions caused by weather resulting immediately therefrom, which directly impact the current controlling critical-path operation or operations, and which prevent the Contractor from proceeding with at least 75% of the normal labor and equipment force engaged on such critical path operation or operations for at least 60% of the total daily time being currently spent on the controlling operation or operations.

4.5.3.2.4. The Contractor shall consider normal/typical/seasonal weather days and conditions caused by normal/typical/seasonal weather days for the location of the Work in the planning and scheduling of the Work to ensure completion within the Contract Time. No time extensions will be granted for the Contractor’s failure to consider and account for such weather days and conditions caused by such weather for the Contract Time in which the Work is to be accomplished.

4.5.3.2.5. A “normal”, “typical”, or “seasonal” weather day shall be defined as weather that can be reasonably anticipated to occur at the location of the Work for each particular month involved in the Contract Time. Each month involved shall not be considered individually as it relates to claims for additional time due to inclement/adverse/severe weather but shall consider the entire Contract Time as it compares to normal/typical/seasonal weather that is reasonably anticipated to occur. Normal/typical/seasonal weather days shall be based upon U.S. National Weather Service climatic data for the location of the Work or the nearest location where such data is available.

4.5.3.2.6. The Contractor is solely responsible to document, prepare and present all data and justification for claiming a weather delay day. Any and all claims for weather delay days shall be tied directly to the current critical-path operation or operations on the day of the instance or event which shall be delineated and described on the Critical-Path Schedule and shall be provided with any and all claims. The Contractor is solely responsible to indicate and document why the weather delay day(s) claimed are beyond those weather days which are reasonably anticipated to occur for the Contract Time. Incomplete or inaccurate claims, as determined by the Architect/Engineer or Owner, may be returned without consideration or comment.

4.5.3.3. Where the Contractor is prevented from completing any part of the Work with specified durations or phases due to delay beyond the control of both the Owner and the Contractor, an extension of the contract time or phase duration in an equal amount to the time lost due to such delay shall be the Contractor’s sole and exclusive remedy for such delay.

4.5.3.4. Delays attributable to and/or within the control of subcontractors and suppliers are deemed to be within the control of the Contractor.

4.5.3.5. In no event shall the Owner be liable to the Contractor, any subcontractor, any supplier, Contractor’s surety, or any other person or organization, for damages or costs arising out of or resulting from: (1) delays caused by or within the control of the Contractor which include but are not limited to labor issues or labor strikes on the Project, federal, state, or local jurisdiction enforcement actions related directly to the Contractor’s Work (e.g. safety or code violations, etc.); or, (2) delays beyond the control of both parties including but not limited to fires, floods, earthquakes, abnormal weather conditions, acts of God, nationwide material shortages, actions or inaction by utility owners, emergency declarations by federal, state, or local officials enacted in the immediate vicinity of the project, or other contractors performing work for the Owner.

4.5.4. **Claims for Consequential Damages**

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

2014-02-07 General Conditions of the Contract for Construction - Final 06-17-2015
4.5.4.1.1. damages incurred by the Owner 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,

4.5.4.1.2. damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, income, and for loss of profit.

4.5.4.2. 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 waiver of consequential damages shall be deemed to preclude an award of liquidated or actual damages, when applicable, in accordance with the requirements of the Contract Documents.

4.6. RESOLUTION OF CLAIMS, DISPUTES, AND CONTROVERSIES

4.6.1. Decision of Architect/Engineer. Claims, including those alleging an error or omission by the Architect/Engineer, shall be referred initially to the Architect/Engineer for decision. A decision by the Architect/Engineer shall be required as a condition precedent to mediation, arbitration or litigation of all Claims between the Contractor and Owner arising prior to the date of Final Acceptance, unless 30 days have passed after the Claim has been referred to the Architect/Engineer with no decision having been rendered by the Architect/Engineer. The Architect/Engineer will not decide disputes between the Contractor and persons or entities other than the Owner. Any Claim arising out of or related to the Contract, except those already waived in Subparagraphs 4.3.6, 7.2.6, 7.3.8, 9.10.4 and 9.10.5 shall, pending compliance with Subparagraph 4.4.5, be subject to mediation, arbitration, or the institution of legal or equitable proceedings. Claims waived in Subparagraphs 4.3.6, 7.2.6, 7.3.8, 9.10.4, and 9.10.5 are deemed settled, resolved, and completed.

4.6.2. The Architect/Engineer will review Claims and within ten (10) days of the receipt of the 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 Architect/Engineer is unable to resolve the Claim if the Architect/Engineer lacks sufficient information to evaluate the merits of the Claim or if the Architect/Engineer concludes that, in the Architect/Engineer's sole discretion, it would be inappropriate for the Architect/Engineer to resolve the Claim.

4.6.3. If the Architect/Engineer requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond within ten (10) days after receipt of such request and shall either provide a response on the requested supporting data, advise the Architect/Engineer when the response or supporting data will be furnished, or advise the Architect/Engineer that no supporting data will be furnished. Upon either no response or receipt of the response or supporting data, the Architect/Engineer will either reject or approve the Claim in whole or in part.

4.6.4. The Architect/Engineer will approve or reject Claims by written decision, which shall state the reasons therefore and which shall notify the parties of any change in the Contract Sum or Contract Time or both. The approval or rejection of a Claim by the Architect/Engineer shall be final and binding on the parties but subject to mediation and arbitration.

4.6.5. When 30 days have passed upon submission of a Claim without decision or action by the Architect/Engineer, or the Architect/Engineer has rendered a decision or taken any of the actions identified in Subparagraph 4.4.2, a demand for arbitration of a Claim covered by such decision or action must be made within 30 days after the date of expiration of Subparagraph 4.4.1 or within 30 days of the Architect/Engineer's decision or action. Failure to demand arbitration within said 30 day period shall result in the Architect/Engineer's decision becoming final and binding upon the Owner and Contractor whenever such decision is rendered.

4.6.6. If the Architect/Engineer renders a decision after arbitration proceedings have been initiated, such decision may be entered as evidence but shall not supersede arbitration proceedings unless the decision is acceptable to all parties concerned.

4.6.7. Upon receipt of a Claim against the Contractor or at any time thereafter, the Architect/Engineer or 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 Architect/Engineer or the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

4.6.8. A Claim subject to or related to liens or bonds shall be governed by applicable law regarding notices, filing deadlines, and resolution of such Claim prior to any resolution of such Claim by the Architect/Engineer, by mediation, or by arbitration, except for claims made by the Owner against the Contractor's bonds.

4.7. MEDIATION

4.7.1. Any Claim arising out of or related to the Contract, except Claims relating to aesthetic effect and except those waived as provided for in Subparagraphs 4.3.6, 7.2.6, 7.3.8, 9.10.4 and 9.10.5 shall, after initial decision by the Architect/Engineer or 30 days after submission of the Claim to the Architect/Engineer, be subject to mediation as a condition precedent to arbitration or the institution of legal or equitable proceedings by either party.

4.7.2. The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be in accordance with the Construction Industry Mediation Rules of the American Arbitration Association currently in effect and/or those rules specified in the contract documents or separately agreed upon between the parties. Construction Industry Mediation Rule M-2 (filing with AAA) is void. The parties shall mutually agree upon a mediator who shall then take the place of AAA in the Construction Industry Mediation Rules. The parties must mutually agree to use AAA and no filing of a request for mediation shall be made to AAA by either party until such mutual agreement has been made. Request for mediation shall be filed in writing with the other party to the Contract and with the American Arbitration Association. The request may be made concurrently with the filing of a demand for arbitration but, in such event, mediation shall proceed in advance of arbitration or legal or equitable 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.

4.7.3. 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.

4.8. ARBITRATION

4.8.1. Any controversy or Claim arising out of or related to this Contract or the breach thereof shall be settled by arbitration in accordance with the Montana Uniform Arbitration Act (MUAA). To the extent it does not conflict with the MUAA, the Construction Industry Arbitration Rules of the American Arbitration Association shall apply except as modified herein. The parties to the arbitration shall bear their own costs and expenses for participating in the arbitration. Costs of the Arbitration panel shall be borne equally between the parties except those costs awarded by the Arbitration panel (including costs for the arbitration itself).

4.8.2. Prior to the arbitration hearing all parties to the arbitration may conduct discovery subject to the provisions of Montana Rules of Civil Procedure. The arbitration panel may award actual damages incurred if a party fails to provide full disclosure under any discovery request. If a party claims a right of information privilege protected by law, the party must submit that claim to the arbitration panel for a ruling, before failing to provide information requested under discovery or the arbitration panel may award actual damages.

4.8.3. The venue for all arbitration proceedings required by this Contract shall be the seat of the county in which the work occurs or the First Judicial District, Lewis & Clack County, as determined solely by the Owner. Arbitration shall be conducted by a panel comprised of three members with one selected by the Contractor, one selected by the Owner, and one selected by mutual agreement of the Owner and the Contractor.

4.8.4. Any Claim arising out of or related to the Contract, except Claims relating to aesthetic effect and except those waived as provided for in Subparagraphs 4.3.6, 7.2.6, 7.3.8, 9.10.4 and 9.10.5, shall, after decision or action by the Architect/Engineer or 30 days after submission of the Claim to the Architect/Engineer, be subject to arbitration provided a demand for arbitration is made within the time frame provided in Subparagraph 4.4.5. If such demand is not made with the specified time frame, the Architect/Engineer's decision or action is final. Prior to arbitration, the parties shall endeavor to resolve disputes by mediation in accordance with the provisions of Paragraph 4.5.

4.8.5. Claims not resolved by mediation shall be decided by arbitration which, unless the parties mutually agree otherwise, shall be in accordance with the Construction Industry Arbitration Rules of the American
Arbitration Association currently in effect and/or those rules specified in the Contract Documents or separately agreed upon between the parties. Construction Industry Arbitration Rule R-3 (filing with AAA) is void. The parties shall mutually agree upon an arbitrator or arbitrators who shall then take the place of AAA in the Construction Industry Arbitration Rules. The parties must mutually agree to use AAA and no filing of a demand for arbitration shall be made to AAA by either party until such mutual agreement has been made. The demand for arbitration shall be filed in writing with the other party to the Contract and a copy shall be filed with the Architect/Engineer.

4.8.6. A demand for arbitration shall be made within the time limits specified in Subparagraphs 4.4.5 and in no event shall it be made after the date when institution of legal or equitable proceedings based on such Claim would be barred by the applicable statute of limitations as determined pursuant to Paragraph 13.7.

4.8.7. Pending final resolution of a Claim including arbitration, unless otherwise mutually agreed in writing, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract on Work or amounts not in dispute.

4.8.8. Limitation on Consolidation or Joinder. Arbitration arising out of or relating to the Contract may include by consolidation or joinder the Architect/Engineer, the Architect/Engineer’s employees or consultants, except by written consent containing specific reference to the Agreement and signed by the Architect/Engineer, Owner, Contractor and any other person or entity sought to be joined. No arbitration shall include, by consolidation or joinder or in any other manner, parties other than the Owner, Architect/Engineer, Contractor, a separate contractor as described in Article 6 and other persons substantially involved in a common question of fact or law whose presence is required if complete relief is to be accorded in arbitration. No person or entity other than the Owner, Architect/Engineer, Contractor or a separate contractor as described in Article 6 shall be included as an original third party or additional third party to an arbitration whose interest or responsibility is insubstantial. 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.

4.8.9. Claims and Timely Assertion of Claims. The party filing a demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

4.8.10. Judgment on Final Award. 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. The parties agree that the costs of the arbitrator(s’) compensation and expenses shall be borne equally. The parties further agree that the arbitrator(s) shall have authority to award to either party some or all of the costs and expenses involved, including attorney’s fees.

5. ARTICLE 5 – SUBCONTRACTORS

5.1. DEFINITIONS

5.1.1. A Subcontractor is a person or entity who has a direct or indirect contract at any tier or level with the Contractor or any Subcontractor to 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.

5.2. 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 and in no instance later than (30) days after award of the Contract, shall furnish in writing to the Owner through the Architect/Engineer 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/Engineer will promptly reply to the Contractor in writing stating whether or not the Owner or the Architect/Engineer, after due investigation, has reasonable objection to any such proposed person or entity.
5.2.2. The Contractor shall not contract with a proposed person or entity to which the Owner or Architect/Engineer 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/Engineer has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect/Engineer 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 responsibly in submitting names as required.

5.2.4. The Contractor shall not change a Subcontractor, person or entity previously selected if the Owner or Architect/Engineer makes reasonable objection to such substitute. The Contractor shall not change or substitute for a Subcontractor who was required to be listed on the bid without first getting the approval of the Owner.

5.3. **SUBCONTRACTUAL RELATIONS**

5.3.1. 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/Engineer. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect/Engineer 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 which 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.

5.3.2. Upon written request by the Owner, the Contractor shall require its subcontractors to provide to it performance and payment securities for their portion of the Work in the types and form defined in statute (18-2-201 and 18-2-203 MCA) for all sub-contractual agreements.

5.3.3. The Contractor shall prepare a Subcontractors’ and Suppliers’ chart in CSI division format acceptable to the Owner which lists by name, all contact information, job category, and responsibility the Contractor's Subcontractors (at all tiers or levels) and Suppliers with a pecuniary interest in the Project of greater than $5,000.00. The Contractor shall not enter into any agreement with any subcontractor or supplier to which the Owner raises a timely objection. The Contractor shall promptly inform the Owner in writing of any proposed replacements, the reasons therefore, and the name and qualifications of any proposed replacements. The Owner shall have the right to reject any proposed replacements without cost or claim being made by the Contractor. The chart shall be provided to the Owner at the time of the pre-construction conference but no less than 30 days after award of the Contract.

5.3.4. All Contractors and Subcontractors to this contract must comply with all Montana Department of Labor and Industry requirements, regulations, rules, and statutes.

5.3.5. In compliance with state statutes, the Contractor will have the 1% Gross Receipts Tax withheld from all payments. Each “Public Contractor” includes all Subcontractors with contracts greater than $5,000 each. The Contractor and all Subcontractors will withhold said 1% from payments made to all Subcontractors with contracts greater than $5,000.00 and make it payable to the Montana Department of Revenue. The Contractor and all Subcontractors shall also submit documentation of all contracts greater than $5,000.00 to the Montana Department of Revenue on the Department’s prescribed form.

5.4. **CONTINGENT ASSIGNMENT OF SUBCONTRACTS**

2014-02-07 General Conditions of the Contract for Construction - Final 06-17-2015
5.4.1. Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner provided that:

5.4.1.1. assignment is effective only after termination of the Contract by the Owner for cause pursuant to Paragraph 14.2 and only for those subcontract agreements which the Owner accepts by notifying the Subcontractor and Contractor in writing; and,

5.4.1.2. assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

5.4.2. Upon such assignment, if the Work has been suspended for more than 30 days as a result of the Contractor’s default, the Subcontractor’s compensation shall be equitably adjusted for increases in cost resulting from the suspension. Such adjustment shall be at the expense of the Contractor.

5.4.3. The Contractor shall engage each of its subcontractors and suppliers with written contracts that preserve and protect the rights of the Owner and include the acknowledgement and agreement of each subcontractor and supplier that the Owner is a third-party beneficiary of their sub-contractual and supplier agreements. The Contractor’s agreements shall require that in the event of default by the Contractor or termination of the Contractor, and upon request of the Owner, the Contractor’s subcontractors and suppliers will perform services for the Owner.

5.4.4. Construction Contractor Registration: All Subcontractors at any tier or level are required to be registered with the Department of Labor and Industry under 39-9-201 and 39-9-204 MCA prior to the Contract being executed by the Owner. Subcontractors shall demonstrate to the Contractor that it has registered or promises that it will register immediately upon notice of award and prior to the commencement of any work.

6. **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 Paragraph 4.3.

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 when directed to do so. 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 which 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/Engineer 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 Owner shall be reimbursed by the Contractor for costs incurred by the Owner which are payable to a separate contractor because of delays, improperly timed activities or defective construction of the Contractor. The Owner shall be responsible to the Contractor for costs incurred by the Contractor because of delays, improperly timed activities, damage to the Work or defective construction of a separate contractor.

6.2.4. The Contractor shall promptly remedy damage wrongfully caused by the Contractor to completed or partially completed construction or to property of the Owner or separate contractors as provided in Subparagraph 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 Subparagraph 3.14.

6.3. OWNER’S RIGHT TO CLEAN UP

6.3.1. 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/Engineer will determine the responsibility of those involved and allocate the cost accordingly.

7. 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. Minor changes as ordered by the Architect/Engineer has the definition provided in Paragraph 7.4

7.1.2. A Change Order shall be based upon agreement among the Owner, Contractor, and Architect/Engineer; a Construction Change Directive requires agreement by the Owner and Architect/Engineer 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/Engineer 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.

7.1.4. No act, omission, or course of dealing, shall alter the requirement that Change Orders or Construction Change Directives shall be in writing and signed by the Owner, and that Change Orders and Construction Change Directives are the exclusive method for effecting any adjustment to the Contract. The Contractor understands and agrees that neither the Contract Sum nor the Contract Time can be changed by implication, oral agreement, verbal directive, or unsigned Change Order.

7.2. CHANGE ORDERS

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

7.2.1.1. change in the Work;
7.2.1.2. the amount of the adjustment, if any, in the Contract Sum; and,
7.2.1.3. the extent of the adjustment, if any, in the Contract Time.

7.2.2. The cost or credit to the Owner resulting from a change in the Work shall be determined as follows:

2014-02-07 General Conditions of the Contract for Construction - Final 06-17-2015
7.2.2.1. Per the limitations of this Subparagraph, plus a 5% allowance for overhead and a 10% allowance for profit. The allowances for overhead and for profit are limited to the percentages as specified herein unless they are determined to be unreasonable by the Architect/Engineer (not the Contractor) per Subparagraph 7.3.9 for each Change Order or Construction Change Directive; or,

7.2.2.2. By one of the methods in Subparagraph 7.3.4, or as determined by the Architect/Engineer per Subparagraph 7.3.9, plus a maximum allowance of \[\text{TO BE ESTABLISHED BY EARLY WORK AMENDMENT(S) AND/OR GMP AMENDMENT}\] overhead and profit for the GC/CM. Subcontractors shall be limited to a maximum allowance of \[\text{TO BE ESTABLISHED BY EARLY WORK AMENDMENT(S) AND/OR GMP AMENDMENT}\] overhead and profit. The allowances for overhead and for profit are limited to the percentages as specified herein unless they are determined to be unreasonable by the Architect/Engineer (not the Contractor) per Subparagraph 7.3.9 for each Change Order or Construction Change Directive.

7.2.2.3. The Contractor’s proposed increase or decrease in cost shall be limited to costs listed in Subparagraph 7.3.9.1 through 7.3.9.5.

7.2.3. The Contractor shall not submit any Change Order, response to requested cost proposals, or requested changes which are incomplete and do not contain full breakdown and supporting documentation in the following three areas:

7.2.3.1. Itemized direct costs (only those listed in Subparagraph 7.3.9.1 through 7.3.9.5 are allowable);

7.2.3.2. Itemized indirect costs (limited as a percentage on each Change Order per Supplementary General Conditions, Paragraph 7.2.2); and

7.2.3.3. Itemized consequential items (e.g. time extensions, credits, logic, reasonableness, impacts, disruptions, dilution).

7.2.3.4. The Contractor shall provide a complete description detailing and summarizing all work involved.

7.2.4. Any Change Order, responses to requested proposals, or requested changes submitted by the Contractor which, in the opinion of the Architect/Engineer, are incomplete, may be rejected and returned to the Contractor without comment. It is the responsibility of and incumbent upon the Contractor to ensure and confirm that all Change Orders, responses to requested proposals, or requested changes are complete prior to submission.

7.2.5. Overhead, applicable to all areas and sections of the Contract Documents, means “Indirect Costs” as referenced in Subparagraph 7.2.3.2. Indirect costs are inclusive of, but not limited to, the following: home office overhead; off-site supervision; home office project management; change order and/or proposal preparation, design, research, negotiation and associated travel; effects of disruption and dilution of management and supervision off-site; time delays; coordination of trades; postage and shipping; and, effective increase in guarantee and warranty durations. Indirect costs applicable to any and all changes in the work, either through Change Order or Construction Change Directive, are limited to the percentage allowance for overhead in Subparagraph 7.2.2.

7.2.6. By signature on any Change Order, the Contractor certifies that the signed Change Order is complete and includes all direct costs, indirect costs and consequential items (including additional time, if any) and is free and clear of all claims or disputes (including, but not limited to, claims for additional costs, additional time, disruptions, and/or impacts) in favor of the Contractor, subcontractors, material suppliers, or other persons or entities concerning the signed change order and on all previously contracted Work and does release the Owner from such claims or demands.

7.2.7. Any and all changes or adjustments to the Contract Time requested or claimed by the Contractor as a result of a Change Order shall require documentation and justification for the adjustment by a Critical Path Method analysis of the Contractor’s most recent Critical Path Schedule in use prior to the change. Changes which affect or concern activities containing float or slack time (i.e. not on the critical path) and which can be accomplished within such float or slack time, shall not result in an increase in the Contract Time.

7.2.8. Supervision means on-site, field supervision and not home office overhead, off-site management or off-site supervision.
7.2.9. Labor means those persons engaged in construction occupations as defined in Montana Prevailing Wage Rates for Building Construction or Heavy/Highway as bound in the Contract Documents and does not include design, engineering, superintendence, management, on-site field supervision, home office or other off-site management, off-site supervision, office or clerical work.

7.3. CONSTRUCTION CHANGE DIRECTIVES

7.3.1. A Construction Change Directive is a written order prepared by the Architect/Engineer 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. Any and all changes or adjustments to the Contract Time requested or claimed by the Contractor as a result of a Construction Change Directive, shall require documentation and justification for the adjustment by a Critical Path Method analysis of the Contractor's most recent Critical Path Schedule in use prior to the change. Changes that affect or concern activities containing float or slack time (i.e. not on the critical path) and which can be accomplished within such float or slack time shall not result in an increase in the Contract Time.

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

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

7.3.4.1. mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

7.3.4.2. unit prices stated in the Contract Documents or subsequently agreed upon;

7.3.4.3. cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee;

7.3.4.4. By actual cost as shown by the Contractor's and Subcontractor's itemized invoices; or

7.3.4.5. as provided in Subparagraph 7.3.9.

7.3.5. Costs shall be limited to the following: cost of materials, including cost of delivery; cost of labor, including social security, old age and unemployment insurance and fringe benefits under collective bargaining agreements; workers' compensation insurance; bond premiums; and rental value of power tools and equipment.

7.3.6. Overhead and profit allowances shall be limited on all Construction Change Directives to those identified in 7.2.2.

7.3.7. Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect/Engineer 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.

7.3.8. A Construction Change Directive signed by the Contractor indicates the agreement of the Contractor 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.

7.3.9. If the Contractor does not respond or disagrees with the method for adjustment in the Contract Sum in writing within seven (7) calendar days, the method and the adjustment made shall be determined by the Architect/Engineer on the basis of reasonable expenditures and/or savings of those performing the Work directly attributable to the change including, in the case of an increase in the Contract Sum, plus an allowance for overhead and profit as listed under Subparagraph 7.2.2. In such case, and also under Clause 7.3.4.3, the Contractor shall keep and present, in such form as the Architect/Engineer may prescribe, an
itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Subparagraph 7.3.9 shall be limited to the following:

7.3.9.1. costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance as determined by the Prevailing Wage Schedules referenced in the Contract Documents;
7.3.9.2. costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;
7.3.9.3. rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
7.3.9.4. costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and
7.3.9.5. additional costs of field supervision and field office personnel directly attributable to the change.

7.3.10. The amount of credit to be allowed by the Contractor to the Owner for a deletion or change which results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect/Engineer. 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.

7.3.11. Pending final determination of the total cost of a Construction Change Directive to the Owner, amounts not in dispute for such changes in the Work shall be included in Applications for Payment accompanied by a Change Order indicating the parties' agreement with part or all of such costs. For any portion of such cost that remains in dispute, the Architect/Engineer will make an interim determination for purposes of monthly certification for payment for those costs. That 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 4.

7.3.12. When the Owner and Contractor agree with the determination made by the Architect/Engineer concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and shall be recorded by preparation and execution of an appropriate Change Order.

7.4. **MINOR CHANGES IN THE WORK**

7.4.1. The Architect/Engineer will have 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 shall be effected by written order and shall be binding on the Owner and Contractor. The Contractor shall carry out such written orders promptly.

8. **ARTICLE 8 – TIME**

8.1. **DEFINITIONS**

8.1.1. Time is of the essence in performance, coordination, and completion of the Work contemplated herein. The Owner may suffer damages if the Work is not completed as specified herein. When any duration or time period is referred to in the Contract Documents by days, the first day shall be determined as the day following the current day of any event or notice starting a specified duration.

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

8.1.3. The date of commencement of the Work is the date established in the NOTICE TO PROCEED AS ISSUED BY THE OWNER.

8.1.4. The date the Contractor reaches Substantial Completion is the date certified by the Architect/Engineer in accordance with Paragraph 9.8.

8.1.5. The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.
8.1.6. Liquidated Damages. The Owner may suffer loss if the project is not substantially complete on the date set forth in the contract documents. The Contractor and his surety shall be liable for and shall pay to the Owner the sums hereinafter stipulated as liquidated damages for each calendar day of delay until the work is substantially complete: [DOLLARS IN ALPHA] AND NO/100 DOLLARS ($0.00).

8.1.7. The Contractor shall not be charged liquidated or actual damages when delay in completion of the Work is due to:

8.1.7.1. Any preference, priority or allocation order issued by the government;

8.1.7.2. Unforeseeable cause beyond the control and without the fault or negligence of the Contractor, such as acts of God or of the public enemy, fires, floods, epidemics, quarantine restrictions, freight embargoes, and unusually severe weather. All such occurrences resulting in delay must be documented and approved by Change Order.

8.1.7.3. Any delays of Subcontractors or suppliers occasioned by any of the causes specified in 8.1.7.1 and 8.1.7.2 of this article.

8.1.7.4. The Contractor is completely obligated and responsible to provide written notice of each day of delay as provided for in Paragraph 4.3.

8.1.8. Contract Time. All work shall reach Substantial Completion (or Final Acceptance) by or within: [DURATION] consecutive calendar days after the start date on the written NOTICE TO PROCEED.

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 Contract 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 date on the Notice to Proceed and in no case prior to the effective date of insurance required by Article 11 to be furnished by the Contractor. 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.

8.2.4. If the Contractor falls behind the latest construction schedule by more than 14 calendar days through its own actions or inaction, neglect, inexperience, lack of oversight and management of the Work including that of any Subcontractors, written notice to the Owner and Architect/Engineer shall be provided within three (3) days with explanation of how the Contractor intends to get back on schedule. Response to getting back on schedule consists of providing a sufficient number of qualified workers and/or proper materials or an acceptably reorganized schedule to regain the lost time in a manner acceptable to the Owner.

8.2.5. Completion of the work within the stated time and/or by the date stated on the Notice to Proceed is of the essence of this Contract and failure to complete, without approved time extension, may be considered default of the Contract. At the time for completion as stated on the Notice to Proceed or as extended by approved change order, if the work is not substantially complete, the Owner may notify the Contractor and the Contractor’s surety company in writing of the recourse the Owner intends to take, within the Contract, to assess liquidated damages and/or cause the work to be completed.

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/Engineer, or of an employee of either, or of a separate contractor employed by the Owner, or by changes ordered in the Work, or by 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 which the Architect/Engineer determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect/Engineer may determine.
8.3.2. Claims relating to time shall be made in accordance with applicable provisions of Paragraph 4.3.

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

9. **PAYMENTS AND COMPLETION**

9.1. **CONTRACT SUM**

9.1.1. The Contract Sum is stated in the Contract 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**

9.2.1. Before the first Application for Payment, the Contractor shall submit to the Architect/Engineer a schedule of values allocated to various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Architect/Engineer may require. This schedule, unless objected to by the Architect/Engineer, shall be used as a basis for reviewing the Contractor's Applications for Payment.

9.3. **APPLICATIONS FOR PAYMENT**

9.3.1. The Contractor shall submit to the Architect/Engineer an itemized Application for Payment for operations completed in accordance with the Schedule of Values. Such application shall be signed and supported by such data substantiating the Contractor's right to payment as the Owner or Architect/Engineer may require, such as copies of requisitions from Subcontractors and material suppliers, and reflecting retainage if provided for in the Contract Documents.

9.3.2. **NOTICE OF APPROVAL OF PAYMENT REQUEST PROVISION.** Per Title 28, Chapter 2, Part 21, this contract allows the Owner to change the number of days to approve a Contractor's payment request. This contract allows the Owner to approve the Contractor's payment request within thirty-five (35) calendar days after it is received by the Owner without being subject to the accrual of interest.

9.3.3. As provided in Subparagraph 7.3.11, such applications may include requests for payment on account of changes in the Work which have been properly authorized by Construction Change Directives, or by interim determinations of the Architect/Engineer, but not yet included in Change Orders.

9.3.4. Applications for payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay to a Subcontractor or material supplier.

9.3.5. 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.

9.3.6. 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.

9.3.7. Until the work is complete, the Owner will pay 95% of the amount due the Contractor on account of progress payments.

9.3.7.1. If the Work and its progress are not in accordance with all or any part, piece, or portion of the Contract Documents, the Owner may, at its sole discretion and without claim by the Contractor,
increase the amount held as retainage to whatever level deemed necessary to effectuate performance and progress of the Work, for anticipated repairs, warranties or completion of the Work by the Contractor or through the letting of other contracts. The Contractor will not be entitled to additional costs, expenses, fees, time, and such like, in the event the Owner increases the amount held as retainage due to non-compliance and/or non-performance with all or any part, piece, or portion of the Contract Documents.

9.3.7.2. Prior to the first application for payment, the Contractor shall submit the following information on the appropriate forms:

9.3.7.2.1. Schedule of Values and Schedule of Amounts for Contract Payment (Form 100): This form shall contain a breakdown of the labor, material and other costs associated with the various portions of the work and shall be the basis for the progress payments to the Contractor.

9.3.7.2.2. Project/Progress Schedule: If no Schedule (or revised Schedule) is provided with each and every Periodic Estimates for Partial Payment, the Architect/Engineer and/or Owner may return the pay request, or hold it, and may choose not pay for any portion of the Work until the appropriate Schedule, indicating all changes, revisions and updates, is provided. No claim for additional costs or interests will be made by the Contractor or any subcontractor on account of holding or non-payment of the Periodic Estimate for Partial Payment request.

9.3.7.3. Progress Payments

9.3.7.3.1. Periodic Estimates for Partial Payment shall be on a form provided by the Owner (Form 101) and submitted to the Architect/Engineer for payment by the Owner. Payment shall be requested for the labor and material incorporated in the work to date and for materials suitably stored, less the aggregate of previous payments, the retainage, and the 1% gross receipts tax.

9.3.7.3.2. The Contractor, by submission of any partial pay request, certifies that every request for partial payment is correct, true and just in all respects and that payment or credit had not previously been received. The Contractor further warrants and certifies, by submission of any partial pay request, that all previous work for which payment has been received is free and clear of all liens, disputes, claims, security interests, encumbrances, or causes of action of any type or kind in favor of the Contractor, subcontractors, material suppliers or other persons or entities and does release the Owner from such.

9.3.7.3.3. Progress payments do not constitute official acceptance of any portion of the work or materials whether stored on or off-site.

9.3.7.3.4. In compliance with 15-50-206 MCA, the Contractor will have 1% of his gross receipts withheld by the Owner from all payments due. Each subcontractor who performs work greater than $5,000 shall have 1% of its gross receipts withheld by the Contractor. The Contractor shall notify the Department of Revenue on the department's prescribed forms.

9.3.7.4. The Contractor may submit obligations/securities in a form specified in 18-1-301 Montana Code Annotated (MCA) to be held by a Financial Institution in lieu of retainage by the Owner. The Owner will establish the amount that would otherwise be held as retainage. Should the Contractor choose to submit obligations/securities in lieu of retainage, the Owner will require the Financial Institution to execute the Owner’s “Account Agreement for Deposit of Obligations Other Than Retainage” (Form 120) prior to submission of any obligations/securities in accordance with 18-1-302 MCA. The Contractor must extend the opportunity to participate in all obligations/securities in lieu of retainage on a pro rata basis to all subcontractors involved in the project and shall be solely responsible for the management and administration of same. The Owner assumes no liability or responsibility from or to the Contractor or Subcontractors regarding the latter’s participation.

9.3.7.5. The Contractor shall maintain a monthly billing cycle.

9.4. CERTIFICATES FOR PAYMENT

9.4.1. The Architect/Engineer 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/Engineer determines is properly due, or notify the Contractor and Owner in writing of the
Architect/Engineer's reasons for withholding certification in whole or in part as provided in Subparagraph 9.5.1.

9.4.2. The issuance of a Certificate for Payment will constitute a representation by the Architect/Engineer to the Owner, based on the Architect/Engineer's evaluation of the Work and the data comprising the Application for Payment, that the Work has progressed to the point indicated and that, to the best of the Architect/Engineer's knowledge, information and belief, 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/Engineer. 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/Engineer 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/Engineer may withhold or reject a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect/Engineer's opinion the representations to the Owner required by Subparagraph 9.4.2 cannot be made. If the Architect/Engineer is unable to certify payment in the amount of the Application, the Architect/Engineer will notify the Contractor and Owner as provided in Subparagraph 9.4.1. If the Contractor and Architect/Engineer cannot agree on a revised amount, the Architect/Engineer will promptly issue a Certificate for Payment for the amount for which the Architect/Engineer is able to make such representations to the Owner. The Architect/Engineer 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/Engineer's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Subparagraph 3.3.4, because of:

9.5.1.1. defective Work not remedied;
9.5.1.2. third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;
9.5.1.3. failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
9.5.1.4. reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
9.5.1.5. damage to the Owner or another contractor;
9.5.1.6. reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or,
9.5.1.7. persistent failure to carry out the Work in accordance with the Contract Documents.

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

9.5.3. Owner’s Right to Refuse Payment: The Architect/Engineer's approval, or partial approval, of the Contractor's request for payment shall not preclude or prevent the Owner from exercising any of its remedies under this Contract. The Owner shall have right to refuse to make payment(s) to the Contractor due to:

9.5.3.1. the Contractor's failure to perform the Work in compliance with the Contract Documents;
9.5.3.2. the Contractor’s failure to correct any defective or damaged Work;

9.5.3.3. the Contractor’s failure to accurately represent the Work performed in the pay request;

9.5.3.4. the Contractor’s performance of its Work at a rate or in a manner that, in the Owner’s opinion, is likely to result in the Work, or any portion thereof, to be delayed;

9.5.3.5. the Contractor’s failure to use funds previously paid to it by the Owner to pay for the Contractor’s Work-related obligations including, but not limited to, subcontractors and suppliers on this Project;

9.5.3.6. claims made, or anticipated by the Owner to be made, against the Owner or its property;

9.5.3.7. inclusion in the pay request of any amounts in dispute or part of a claim;

9.5.3.8. Damage or loss caused by the Contractor, including its subcontractors and suppliers; or,

9.5.3.9. The Contractor’s failure or refusal to perform its obligations to the Owner.

9.6. PROGRESS PAYMENTS

9.6.1. After the Architect/Engineer has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents or the Owner may take any action the Owner deems necessary under Subparagraph 9.5.3.

9.6.2. The Contractor shall promptly pay each Subcontractor in accordance with Title 28, Chapter 2, Part 21, upon receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor’s portion of the Work, the amount to which said Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of such 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 Contractor is prohibited from holding higher amounts in retainage on any Subcontractor than the Owner is holding from the Contractor.

9.6.4. The Architect/Engineer 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/Engineer and Owner on account of portions of the Work done by such Subcontractor.

9.6.5. Neither the Owner nor Architect/Engineer 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.

9.6.6. Payment to material suppliers shall be treated in a manner similar to that provided in Subparagraphs 9.6.2, 9.6.3, 9.6.4, and 9.6.5.

9.6.7. 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.

9.6.8. 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

9.7.1. If the Owner does not approve payment to the Contractor within thirty-five (35) calendar days after the receipt of a certified Application for Payment, then the Contractor may, upon seven additional days’ written notice to the Owner and Architect/Engineer, suspend the Work until payment of the amount owing has been received. Nothing in the Subparagraph shall limit the Owner’s rights and options as provided in
Subparagraph 9.5.3. 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.

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/Engineer 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/Engineer will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect/Engineer’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/Engineer. In such case, the Contractor shall then submit a request for another inspection by the Architect/Engineer to determine Substantial Completion.

9.8.4. The Contractor shall ensure the project is substantially complete prior to requesting any inspection by the Architect/Engineer so that no more than one (1) inspection is necessary to determine Substantial Completion for all or any portion of the Work. If the Contractor does not perform adequate inspections to develop a comprehensive list as required in Subparagraph 9.8.2 and does not complete or correct such items upon discovery or notification, the Contractor shall be responsible and pay for the costs of the Architect/Engineer’s additional inspections to determine Substantial Completion. Prior to the inspection, the Contractor shall complete the final clean-up of the Project site which, unless otherwise stated in the Contract Documents, shall consist of:

- 9.8.4.1. Removal of all debris and waste. All construction debris and waste shall be removed from the campus grounds. Use of the Owner trash containers will not be permitted.
- 9.8.4.2. Removal of all stains, smears, marks of any kind from surfaces including existing surfaces if said damage is the result of the work.
- 9.8.4.3. Removal of all temporary structures and barricades.

9.8.5. When the Work or designated portion thereof is substantially complete, the Architect/Engineer will prepare a Certificate of Substantial Completion which shall establish the date of Substantial Completion and which shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance. After issuance of the Certificate of Substantial Completion, the Contractor shall finish and complete all remaining items within thirty (30) calendar days of the date on the Certificate. The Architect/Engineer shall identify and fix the time for completion of specific items which may be excluded from the thirty (30) calendar day time limit. Failure to complete any items within the specified time frames may be deemed by the Owner as default of the contract on the part of the Contractor.

9.8.6. 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 there are claims or past payment issues, 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 and authorized by public authorities having jurisdiction over the Work. 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/Engineer as provided under Subparagraph 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/Engineer.

9.9.2. Immediately prior to such partial occupancy or use, the Owner, Contractor and Architect/Engineer 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. 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.

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

9.10.2. Neither final payment nor any remaining retainage shall become due until the Contractor submits to the Architect/Engineer:

9.10.2.1. completed Affidavit on Behalf of Contractor (Form 106) that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied;

9.10.2.2. a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days prior written notice has been given to the Owner;

9.10.2.3. a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents

9.10.2.4. Consent of Surety to make final payment (Form 103); and,

9.10.2.5. if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner.

9.10.3. The Contractor and his surety accepts and assumes responsibility, liability, and costs for and agrees to defend and hold harmless the Owner for and against any and all actions as a result of the Owner making final payment.

9.10.4. By submitting any Application for Payment to the Architect/Engineer the Contractor and his surety certify and declare that all bills for materials, supplies, utilities and for all other things furnished or caused to be furnished by the Contractor and all Subcontractors and used in the execution of the Contract will be fully paid upon receipt of Final Payment and that there are no unpaid obligations, liens, claims, security interests,
encumbrances, liabilities and/or demands of State Agencies, subcontractors, suppliers, mechanics, laborers or any others resulting from or arising out of any work done, caused to be done or ordered to be done by the Contractor under the contract.

9.10.5. In consideration of the prior payments and the final payment made and all payments made for authorized changes, the Contractor releases and forever discharges the Owner from any and all obligations, liens, claims, security interests, encumbrances and/or liabilities arising by virtue of the contract and authorized changes between the parties, either verbal or in writing, and any and all claims and demands of every kind and character whatsoever against the Owner, arising out of or in any way relating to the contract and authorized changes.

9.10.6. The date of Final Payment by the Owner shall constitute Final Acceptance of the Work. The determining date for the expiration of the warranty period shall be as specified in Paragraphs 3.5 and 12.2.2.

9.10.7. If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect/Engineer so confirms, the Owner shall, upon application by the Contractor and certification by the Architect/Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect/Engineer prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

9.10.8. The making of final payment shall constitute a waiver of Claims by the Owner except those arising from:

9.10.8.1. liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;

9.10.8.2. failure of the Work to comply with the requirements of the Contract Documents; or,

9.10.8.3. terms of special warranties required by the Contract Documents.

9.10.9. Acceptance of final payment by the Contractor, a Subcontractor, or material supplier, shall constitute a waiver of any and all obligations, liens, claims, security interests, encumbrances and/or liabilities against the Owner except those previously made in writing per the requirements of Paragraph 4.3 and as yet unsettled at the time of submission of the final Application for Payment.

9.10.10. The Owner’s issuance of Final Payment does not constitute a waiver or release of any kind regarding any past, current, or future claim the Owner may have against the Contractor and/or the surety.

10. ARTICLE 10 – PROTECTION OF PERSONS AND PROPERTY

10.1. SAFETY

10.1.1. Importance of Safety. The Contractor and all Subcontractors (at any tier or level) recognize that safety is paramount at all times. The Contractor shall perform the work in a safe manner with the highest regard for safety of its employees and all other individuals and property at the work site. Contractor shall maintain its tools, equipment, and vehicles in a safe operating condition and take all other actions necessary to provide a safe working environment for performance of work required under this Contract. The Contractor is solely responsible for the means, methods, techniques, sequences and procedures for coordinating and constructing the Work, including all site safety, safety precautions, safety programs, and safety compliance with OSHA and all other governing bodies.

10.1.2. Particular Safeguards. (a) The Contractor shall erect and maintain, as required by Paragraphs 10.1.1 and 10.1.3, safeguards for safety and protection, including posting danger signs and other warnings against hazards, installing suitable barriers and lighting, promulgating safety regulations, and providing notification to all parties who may be impacted by the Contractor’s operations. (b) When use or storage of explosives or other Hazardous Materials/Substances (defined below) or equipment are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly
qualified personnel. (c) The Contractor shall not encumber or load or permit any part of the construction site to be encumbered or loaded so as to endanger the safety of any person(s).

10.1.3. **Compliance with Safety Laws.** Contractor represents and warrants to Owner that it knows and understands all federal, state and local safety statutes, rules, and regulations (Laws) related to the work under this Contract. Contractor shall comply with these Laws. Contractor shall keep all material data safety sheets on site and available at all times.

10.1.4. **Remedy property damage.** The Contractor shall promptly remedy damage and loss to property caused in whole or in part by the Contractor, a Subcontractor of any tier or level, or anyone employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Paragraph 3.18.

10.1.5. **Designation of Safety Representative.** Unless the Contractor designates, in writing to the Owner and the Architect/Engineer, another responsible member of the Contractor's organization as the Safety Representative, the Contractor's superintendent is the Safety Representative. The Safety Representative is defined as that member of the Contractor's organization responsible for all safety under this Contract.

10.1.6. **Release/Indemnity of Owner and Architect/Engineer.** The Contractor agrees that the Owner and Architect/Engineer are not responsible for safety at the work site and releases them from all obligations and liability regarding safety at the work site. The Contractor shall indemnify and defend the Owner and the Architect/Engineer against and from all claims, liabilities, fines, penalties, orders, causes of action, judgments, losses, costs and expenses (including but not limited to court costs and reasonable attorney fees), arising from injuries and death to any persons and damage to real and personal property arising from, in connection with, or incidental to Contractor's safety responsibilities under this Contract.

10.2. **HAZARDOUS MATERIALS/SUBSTANCES**

10.2.1. “Hazardous Materials/Substances” means any substance: (a) the presence of which requires investigation, or remediation under any federal, state or local statute, rule, regulation, ordinance, order, policy or common law; (b) that is or becomes defined as “hazardous waste,” “hazardous substance,” pollutant, or contaminant under any federal, state or local statute, rule, regulation, or ordinance or amendments thereto; (c) that is toxic, explosive, corrosive flammable, or otherwise hazardous and is or becomes regulated by any government authority, agency, board, commission or instrumentality of the United States, the state of Montana or any political subdivision thereof; (d) gasoline, diesel fuel or other petroleum hydrocarbons; (e) containing contains polychlorinated biphenyls (PCBs) or asbestos; or (f) the presence of which causes or threatens to cause a nuisance or trespass on the work site or adjacent property.

10.2.2. The Contractor is solely responsible for all compliance with all regulations, requirements, and procedures governing Hazardous Materials/Substances at the Work Site or that Contractor brings on the site. The Contractor is solely responsible for remediation, costs, damages, loss, and/or expenses for all Hazardous Materials/Substances brought to the site.

10.2.3. If the Contractor encounters Hazardous Materials/Substances during the course of the Work, whether or not identified in the Contract Documents, Work, the Contractor agrees that:

10.2.3.1. Encountering any Hazardous Materials/Substances during performance of the Work does not necessarily mean a change in conditions has occurred nor is it evidence that the Contractor is due additional Contract Time or an increase in the Contract Sum. If encountering Hazardous Materials/Substances is determined to be a change in conditions to the Contract Documents, Paragraph 4.3 and Article 7 apply in determining any additional compensation or extension of time claimed by the Contractor.

10.2.3.2. The Contractor is solely responsible for securing the Work in accordance with this Article 10 involving any Hazardous Materials/Substances against unlawful, unregulated, or improper intrusion, disturbance, or removal. The Contractor shall implement protections and take protective actions throughout the performance of the Work to prevent exposure to workers, occupants, and contamination of the site or area.

10.2.3.3. If the Contractor is unable to or fails to properly secure the Work against unlawful, unregulated, or improper intrusion, disturbance, or removal of Hazardous Materials/Substances, the Contractor shall
immediately implement protections and take protective actions, up to and including stopping Work in the area or on the item affected, to prevent exposure to workers, occupants, and contamination of the site or area. The Contractor shall immediately notify the Owner and Architect in writing giving details of the failure and the corrective actions taken. If the condition is an emergency and notice cannot be provided in writing, then Contractor shall orally and immediately notify the Owner and Architect/Engineer of the condition followed by a full written explanation. 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.

10.2.3.4. If the Contractor notifies the Owner and takes precautions in accordance with this Article 10 upon encountering materials/substances suspected of containing asbestos or polychlorinated biphenyls that are unidentified in the Contract Documents, the Owner shall verify if the unidentified material or substance contains asbestos or polychlorinated biphenyls and shall arrange for the removal or other measures as necessary to allow the Contractor to proceed with the Work. The Contract Time may be extended as appropriate if the Work affected is on the critical path and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs as provided in Article 7. Should the Contractor fail to notify the Owner upon encountering asbestos, polychlorinated biphenyls, or materials/substances suspected of containing asbestos or polychlorinated biphenyls, that are unidentified in the Contract Documents, the Contractor is solely responsible for all mitigation in accordance with Paragraphs 10.1.6, 10.2.2, 10.2.3, and 10.2.4.

10.2.4. The Contractor shall indemnify, hold harmless, and defend the Owner from and against all claims, liabilities, fines, penalties, orders, causes of action, judgments, losses, costs and expenses, including but not limited to court costs and reasonable attorneys' fees, arising from, in connection with, or incidental to the Contractor's handling, disposal, encountering, or release of Hazardous Materials/Substances.

10.3. UTILITIES

10.3.1. Underground Utilities: Buried utilities, including, but not limited to, electricity, gas, steam, air, water, telephone, sewer, irrigation, broadband coaxial computer cable, and fiber optic cables are very vulnerable and damage could result in loss of service. The telephone, broadband and fiber optic cables are especially sensitive and the slightest damage to these components will result in disruption of the operations of the campus.

10.3.2. "One Call" must be notified by phone and in writing at least 72 hours (3 business days) prior to digging to arrange and assist in the location of buried utilities in the field. (Dial 811). The Contractor shall mark the boundary of the work area. The boundary area shall be indicated with white paint and white flags. In winter, pink paint and flags will be accepted.

10.3.3. After buried utilities have been located, the Contractor shall be responsible for any utilities damaged while digging. Such responsibility shall include all necessary care including hand digging. Contractor's responsibility shall also include maintaining markings after initial locate. The area for such responsibility, unless otherwise indicated, shall extend 24 inches to either side of the marked center line of a buried utility line. In cases of multiple or overlapping utilities or inconclusive electronic locating signals, MSU Project Manager may specifically indicate a wider area for Contractor's responsibility.

10.3.4. The Contractor's responsibility shall include repair or replacement of damaged utilities. In the event of damage to the 15 KV electrical distribution system, the broadband or fiber optic cables, repair will consist of replacement from termination to termination. Facilities Services and the MSU Information Technology Center will verify repair and recertification. The Contractor will also be responsible for all costs associated with reterminations and recertification.

10.3.5. Any buried utilities exposed by the operations of the Contractor shall be marked on the plans and adequately protected by the Contractor. If any buried utilities not located are exposed, the Contractor shall immediately contact Facilities Services at the numbers above. If, after exposing an unlocated buried utility, the Contractor continues digging without notifying Facilities Services and further damages the utility, the Contractor will be responsible.

10.3.6. Damage to irrigation systems during seasons of no irrigation that are not immediately and adequately repaired and tested will require the Contractor to return when the system is in service to complete the repair.
10.3.7. In the event of a planned interruption of any existing utility service, the Contractor shall make arrangements with Facilities Services at least 72 hours (3 business days) in advance. Shutdowns of the broadband or fiber optic cables will normally require 5 working days notice to Facilities Services and the Information Technology Center. The Contractor shall bear all costs associated with the interruptions and restorations of service.

11. **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 State of Montana with a rating no less than "A-", such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's 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:

11.1.1.1. claims under workers' compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed;

11.1.1.2. claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;

11.1.1.3. claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;

11.1.1.4. claims for damages insured by usual personal injury liability coverage;

11.1.1.5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting there from;

11.1.1.6. 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;

11.1.1.7. claims for bodily injury or property damage arising out of completed operations; and,

11.1.1.8. claims involving contractual liability insurance applicable to the Contractor's obligations under Paragraph 3.18.

11.1.2. The insurance required by Subparagraph 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 date of commencement of the Work until termination of any coverage required to be maintained after final payment.

11.1.3. Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. These certificates and the insurance policies required by this Paragraph 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire at any time prior to Final Acceptance and then not until at least 30 days' prior written notice has been given to the Owner. If any of the foregoing insurance coverages are required to remain in force after final payment, an additional certificate evidencing continuation of such coverage shall be submitted with the final Application for Payment as required by Subparagraph 9.10.2. 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 in accordance with the Contractor's information and belief.

11.1.4. At the request of the Owner, the Contractor shall provide copies of all insurance policies to the Owner.

11.2. **INSURANCE, GENERAL REQUIREMENTS**

11.2.1. The Contractor shall maintain for the duration of the contract, at its cost and expense, insurance against claims for injuries to persons or damages to property, including contractual liability, which may arise from or in connection with the performance of the Work by the Contractor, its agents, employees, representatives,
assigns, or subcontractors. The Contractor is responsible for all deductibles regardless of policy or level of coverage. The Owner reserves the right to demand, and the Contractor agrees to provide, copies of any and all policies at any time.

11.2.2. Hold Harmless and Indemnification: The Contractor shall protect, defend, and save the state, its elected and appointed officials, agents, and employees, while acting within the scope of their duties as such, harmless from and against all claims, liabilities, demands, causes of action, and judgments whatsoever (including the cost of defense and reasonable attorney fees) arising in favor of or asserted by third parties on account of damage to property, personal injury, or death which injury, death, or damage, arises out of services performed or omissions of services or in any way results from the negligent acts or omissions of the Contractor, its agents, agents, or subcontractors.

11.2.3. Contractor's Insurance: insurance required under all sections herein shall be in effect for the duration of the contract that extends through the warranty period. Insurance required herein shall be provided by insurance policies issued only by insurance companies currently authorized to do business in the state of Montana. No Contractor or Sub-contractor shall commence any Work under this contract until all required insurance has been obtained. During the term of this contract, the Contractor shall, not less than thirty days prior to the expiration date of any policy for which a certificate of insurance is required, deliver to the Owner a certificate of insurance with respect to the renewal insurance policy. The Contractor shall furnish one copy of insurance certificates of insurance herein required, which shall specifically set forth evidence of all coverage required by these contract documents and which shall be signed by authorized representatives of the insurance company or companies evidencing that insurance as required herein is in force and will not be canceled, limited or restricted without thirty days' written notice by certified mail to the contractor and the Owner. The Contractor shall furnish to the Owner copies of any endorsements that are subsequently issued amending coverage or limits. Additionally, all certificates shall include the project name and A/E project number.

11.2.4. Certificates of Insurance and Endorsements. All certificates of insurance and the additional insured endorsements are to be received by the state prior to issuance of the Notice to Proceed. The contractor is responsible to ensure that all policies and coverages contain the necessary endorsements for the State being listed as an additional insured. The state reserves the right to require complete copies of all insurance policies at any time to verify coverage. The contractor shall notify the state within 30 days of any material change in coverage.

11.3. WORKERS’ COMPENSATION INSURANCE

11.3.1. The Contractor shall carry Workers’ Compensation Insurance. Such Workers’ Compensation Insurance shall protect the Contractor from claims made by his own employees, the employees of any Sub-contractor, and also claims made by anyone directly or indirectly employed by the Contractor or Sub-contractor. The Contractor shall require each Sub-contractor similarly to provide Workers’ Compensation Insurance.

11.4. COMMERCIAL GENERAL LIABILITY INSURANCE

11.4.1. Each Contractor shall carry per occurrence coverage Commercial General Liability Insurance including coverage for premises; operations; independent contractor’s protective; products and completed operations; products and materials stored off-site; broad form property damage and comprehensive automobile liability insurance with not less than the following limits of liability:

11.4.1.1. $5,000,000 per occurrence; aggregate limit of $10,000,000;

11.4.1.2. The Commercial General and Automobile Liability Insurance shall provide coverage for both bodily injury, including accidental death, sickness, disease, occupational sickness or disease, personal injury liability coverage and property damage which may arise out of the work under this contract, or operations incidental thereto, whether such work and operations be by the Contractor or by any Subcontractor or by anyone directly or indirectly employed by the Contractor or by Sub-contractor, or by anyone for whose acts any of them may be liable. The Contractor shall maintain the liability insurance required herein for a period of not less than one year after final payment or anytime the Contractor goes on to the location of the project.

11.4.1.3. The Contractor’s liability insurance policies shall list the STATE OF MONTANA as an additional insured. The STATE OF MONTANA includes its officers, elected and appointed officials, employees
and volunteers and political subdivisions thereof. Should the Contractor not be able to list the state as an additional insured, the Contractor shall purchase a per occurrence Owner’s/Contractor’s Protective Policy (OCP) with the STATE OF MONTANA as the insured party in the same occurrence and aggregate limits as that indicated above for the Contractor’s Commercial General Liability Policy.

11.4.1.4. Property damage liability insurance shall be written without any exclusion for injury to or destruction of any building, structure, wires, conduits, pipes, or other property above or below the surface of the ground arising out of the blasting, explosion, pile driving, excavation, filling, grading or from the moving, shoring, underpinning, raising, or demolition of any building or structure or structural support thereof.

11.4.1.5. The Contractor’s insurance coverage shall be PRIMARY insurance as respects the State, its officers, elected and appointed officials, employees and volunteers. Any insurance or self-insurance maintained by the state, its officers, elected and appointed officials, employees and volunteers shall be excess of the Contractor’s insurance and shall not contribute to it. No waivers of subrogation or endorsements limiting, transferring, or otherwise indemnifying liable or responsible parties of the Contractor or any subcontractor will be accepted.

11.5. **PROPERTY INSURANCE (ALL RISK)**

11.5.1. New Construction (for projects involving new construction): At its sole cost and expense, the contractor shall keep the building and all other improvements on the premises insured throughout the term of the agreement against the following hazards:

11.5.1.1. Loss or damage by fire and such other risks (including earthquake damage for those areas with a shaking level at 10g or above as indicated on the seismic map, http://rmtd.mt.gov/aboutus/publications/files/NEHRP.pdf) in an amount sufficient to permit such insurance to be written at all times on a replacement cost basis. This may be insured against by attachment of standard form extended coverage endorsement to fire insurance policies. Certificates of Insurance MUST indicate earthquake coverage if coverage is required per the above referenced map.

11.5.1.2. Loss or damage from leakage or sprinkler systems now or hereafter installed in any building on the premises.

11.5.1.3. Loss or damage by explosion of steam boilers, pressure vessels, and oil or gasoline storage tanks, or similar apparatus now or hereafter installed in a building or buildings on the premises.

11.5.2. Building Renovation (for projects involving building renovation or remodeling)

11.5.2.1. The contractor shall purchase and maintain Builder’s Risk/Installation insurance on a “special causes of loss” form (so called “all risk”) for the cost of the work and any subsequent modifications and change orders. The contractor is not responsible for insuring the existing structure for Builder’s Risk/Installation insurance.

11.5.2.2. At its sole cost and expense, the contractor shall insure all property construction on the premises throughout the term of the agreement against the following hazards:

11.5.2.2.1. Loss or damage by fire and such other risks (including earthquake damage for those areas with a shaking level at 10g or above as indicated on the seismic map at http://rmtd.mt.gov/aboutus/publications/files/NEHRP.pdf) in an amount sufficient to permit such insurance to be written at all times on a replacement cost basis. This may be insured against by attachment of standard form extended coverage endorsement to fire policies. Certificates of Insurance MUST indicate earthquake coverage if coverage is required per the above referenced map.

11.5.2.2.2. Loss or damage from leakage or sprinkler systems now or hereafter installed in any building on the premises.

11.5.2.2.3. Loss or damage by explosion of steam boilers, pressure vessels, oil or gasoline storage tanks, or similar apparatus now or hereafter installed in a building or buildings on the premises.

11.6. **ASBESTOS ABATEMENT INSURANCE**

2014-02-07 General Conditions of the Contract for Construction - Final 06-17-2015
11.6.1. If Asbestos Abatement is identified as part of the Work under this contract, the Contractor or any subcontractor involved in asbestos abatement shall purchase and maintain Asbestos Liability Insurance for coverage of bodily injury, sickness, disease, death, damages, claims, errors or omissions regarding the asbestos portion of the work in addition to the CGL Insurance by reason of any negligence in part or in whole, error or omission committed or alleged to have been committed by the Contractor or anyone for whom the Contractor is legally liable.

11.6.2. Such insurance shall be in “per occurrence” form and shall clearly state on the certificate that asbestos work is included in the following limits:

11.6.2.1. $1,000,000 per occurrence; aggregate limit of $2,000,000.

11.6.3. Asbestos Liability Insurance as carried by the asbestos abatement subcontractor in these limits in lieu of the Contractor’s coverage is acceptable provided the Contractor and the State of Montana are named as additional insureds and that the abatement subcontractor’s insurance is PRIMARY as respects both the Owner and the Contractor. If the Contractor or any other subcontractor encounters asbestos, all operations shall be suspended until abatement with the associated air monitoring clearances are accomplished. The certificate of coverage shall be provided by the asbestos abatement subcontractor to both the Contractor and the Owner.

11.7. PERFORMANCE BOND AND LABOR & MATERIAL PAYMENT BOND (BOTH ARE REQUIRED ON THIS PROJECT)

11.7.1. The Contract shall furnish a Performance Bond in the amount of 100% of the contract price as security for the faithful performance of his contract (18-2-201 MCA). The Contractor shall also furnish a Labor and Material Payment Bond in the amount of 100% of the contract price as security for the payment of all persons performing labor and furnishing materials in connection therewith (18-2-201 MCA). The bonds shall be executed on forms furnished by the Owner and no other forms or endorsements will be acceptable. The bonds shall be signed in compliance with state statutes (33-17-1111 MCA). Bonds shall be secured from a state licensed bonding company. Power of Attorney is required with each bond. Attorneys-in-fact who sign contract bonds must file with each bond a certified and effectively dated copy of their power of attorney:

11.7.1.1. one original copy shall be furnished with each set of bonds.

11.7.1.2. Others furnished with a set of bonds may be copies of that original.

11.7.2. The Owner reserves the right at any time during the performance of Work to require bonding of Subcontractors provided by the General Contractor. Should this occur, the Owner will cover the direct cost. This shall not be construed as to in any way affect the relationship between the General Contractor and his Subcontractors.

11.7.3. Surety must have an endorsement stating that their guarantee of Contractor's performance automatically covers the additional contract time added to a Contractor's contract by Change Order.

11.7.4. A change in the Contractor's organization shall not constitute grounds for Surety to claim a discharge of their liability and requires an endorsement from Surety so stating.

11.7.5. The Contractor is required to notify Surety of increase in contract amount resulting from Change Orders within 48 hours of submitting an application for Change Order and submit a copy of Surety's written acknowledgment and consent to Owner before Change Order can be approved. A fax with hard copy to follow is acceptable. If hard copy is not received by Owner before Application for Payment on any portion or all of said Change Order, it will not be accepted by Owner for payment.

11.7.6. The Surety must take action within 30 days of notice of default on the part of the Contractor or of any claim on bonds made by the Owner or any Subcontractor or supplier.

12. 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/Engineer's request or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Architect/Engineer, be uncovered for the Architect/Engineer'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 which the Architect/Engineer has not specifically requested to examine prior to it being covered, the Architect/Engineer 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, 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**

12.2.1.1. The Contractor shall promptly correct Work that fails to conform to the requirements of the Contract Documents or that is rejected by the Architect/Engineer, 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 and compensation for the Architect/Engineer's services and expenses made necessary thereby, shall be at the Contractor's expense. The Contractor is responsible to discover and correct all defective work and shall not rely upon the Architect/Engineer's or Owner's observations.

12.2.1.2. Rejection and Correction of Work in Progress. During the course of the Work, the Contractor shall inspect and promptly reject any Work that:

12.2.1.2.1. does not conform to the Construction Documents; or,

12.2.1.2.2. does not comply with any applicable law, statute, building code, rule or regulation of any governmental, public and quasi-public authorities, and agencies having jurisdiction over the Project.

12.2.1.3. The Contractor shall promptly correct or require the correction of all rejected Work, whether observed before or after Substantial Completion. The Contractor shall bear all costs of correcting such Work, including additional testing, inspections, and compensation for all services and expenses necessitated by such corrective action.

12.2.2. **AFTER SUBSTANTIAL COMPLETION AND AFTER FINAL ACCEPTANCE**

12.2.2.1. In addition to the Contractor's obligations under Paragraph 3.5, if, within one year after the date of Final Acceptance of the Work or designated portion thereof or after the date for commencement of warranties, 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/Engineer, the Owner may correct it in accordance with Paragraph 2.3.

12.2.2.1.1. The Contractor shall remedy any and all deficiencies due to faulty materials or workmanship and pay for any damage to other work resulting there from, which shall appear within the period of Substantial Completion through one (1) year from the date of Final Acceptance in accordance with the terms and conditions of the Contract and with any special guarantees or warranties provided in the Contract Documents. The Owner shall give notice of observed deficiencies with reasonable promptness. All questions, claims or disputes arising under this Article shall be decided by the Architect/Engineer. All manufacturer, product and supplier warranties are in addition to this Contractor warranty.
12.2.2.1.2. The Contractor shall respond within seven (7) days after notice of observed deficiencies has been given and he shall proceed to immediately remedy these deficiencies.

12.2.2.1.3. Should the Contractor fail to respond to the notice or not remedy those deficiencies; the Owner shall have this work corrected at the expense of the Contractor.

12.2.2.1.4. Latent defects shall be in addition to those identified above and shall be the responsibility of the Contractor per the statute of limitations for a written contract (27-2-208 MCA) starting from the date of Final Acceptance.

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 performance 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 Paragraph 12.2.

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

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

12.2.5. Nothing contained in this Paragraph 12.2 shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the one-year period for correction of Work as described in Subparagraph 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**

12.3.1. If the Owner prefers to accept Work which 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.

13. **ARTICLE 13 - MISCELLANEOUS PROVISIONS**

13.1. **GOVERNING LAW**

13.1.1. The Contract shall be governed by the laws of the State of Montana and venue for all legal proceedings shall be the First Judicial District, Lewis & Clark County.

13.2. **SUCCESSORS AND ASSIGNS**

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

13.3. **WRITTEN NOTICE**
13.3.1. Written notice shall be deemed to have been duly served if delivered in person to the individual or 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 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/Engineer or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed in writing.

13.5. **TESTS AND INSPECTIONS**

13.5.1. Tests, inspections and approvals of portions of the Work required by the Contract Documents or by laws, ordinances, rules, regulations or orders of public authorities having jurisdiction shall be made at an appropriate time. 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/Engineer timely notice of when and where tests and inspections are to be made so that the Architect/Engineer may be present for such procedures. The Owner shall bear costs of tests, inspections or approvals which do not become requirements until after bids are received or negotiations concluded.

13.5.2. If the Architect/Engineer, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Subparagraph 13.5.1, the Architect/Engineer 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/Engineer of when and where tests and inspections are to be made so that the Architect/Engineer may be present for such procedures. Such costs, except as provided in Subparagraph 13.5.3 shall be at the Owner's expense.

13.5.3. If such procedures for testing, inspection or approval under Subparagraphs 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/Engineer'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/Engineer.

13.5.5. If the Architect/Engineer is to observe tests, inspections or approvals required by the Contract Documents, the Architect/Engineer 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**

13.6.1. 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. **COMMENCEMENT OF STATUTORY LIMITATION PERIOD**

13.7.1. As between the Owner and Contractor:

13.7.1.1. **Before Substantial Completion.** As to acts or failures to act occurring prior to the relevant date of Substantial Completion, any applicable statute of limitations shall commence to run and any alleged
cause of action shall be deemed to have accrued in any and all events not later than such date of Substantial Completion;

13.7.1.2. **Between Substantial Completion and Final Certificate for Payment.** As to acts or failures to act occurring subsequent to the relevant date of Substantial Completion and prior to issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of issuance of the final Certificate for Payment; and,

13.7.1.3. **After Final Payment.** As to acts or failures to act occurring after the relevant date of issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of any act or failure to act by the Contractor pursuant to any Warranty provided under Paragraph 3.5, the date of any correction of the Work or failure to correct the Work by the Contractor under Paragraph 12.2, or the date of actual commission of any other act or failure to perform any duty or obligation by the Contractor or Owner, whichever occurs last.

13.8. **PAYROLL AND BASIC RECORDS**

13.8.1. Payrolls and basic records pertaining to the project shall be kept on a generally recognized accounting basis and shall be available to the Owner, Legislative Auditor, the Legislative Fiscal Analyst or his authorized representative at mutually convenient times. Accounting records shall be kept by the Contractor for a period of three years after the date of the Owner's Final Acceptance of the Project.

14. **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:

14.1.1.1. issuance of an order of a court or other public authority having jurisdiction which requires all Work to be stopped; or,

14.1.1.2. an act of government, such as a declaration of national emergency which requires all Work to be stopped.

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 Paragraph 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 Subparagraph 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days’ written notice to the Owner and Architect/Engineer, terminate the Contract and recover from the Owner payment for Work executed and for proven loss with respect to materials, equipment, tools, and construction equipment and machinery, including reasonable overhead and profit but not 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 persistently 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/Engineer, terminate the Contract and recover from the Owner as provided in Subparagraph 14.1.3.

14.2. **TERMINATION BY THE OWNER FOR CAUSE**

14.2.1. The Owner may terminate the Contract if the Contractor:
14.2.1.1. persistently or repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

14.2.1.2. fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;

14.2.1.3. persistently disregards laws, ordinances, or rules, regulations or orders of a public authority having jurisdiction; or,

14.2.1.4. otherwise is guilty of any breach of a provision of the Contract Documents.

14.2.2. When any of the above reasons exist, the Owner, upon certification by the Architect/Engineer 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:

14.2.2.1. take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

14.2.2.2. accept assignment of subcontracts pursuant to Paragraph 5.4; and,

14.2.2.3. finish the Work by whatever reasonable method the Owner may deem expedient. Upon 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 Subparagraph 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/Engineer’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 Architect/Engineer, 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 Subparagraph 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent:

14.3.2.1. that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or,

14.3.2.2. 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:

14.4.2.1. cease operations as directed by the Owner in the notice;

14.4.2.2. take actions necessary, or that the Owner may direct, for the protection and preservation of the Work, and;
14.4.2.3. 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. The Contractor shall provide a full and complete itemized accounting of all costs.

14.4.4. In the event of termination or cancellation of any or all pre-construction services and/or decision not pursue a GMP Amendment/Contract, the Contractor shall not be due any costs, or overhead, or profit on any portion of the Work.

15. **EQUAL OPPORTUNITY**

15.1. The Contractor and all Sub-contractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin or age and shall comply with all Federal and State laws concerning fair labor standards and hiring practices. The Contractor shall take affirmative action to insure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, color, sex, national origin or age. Such action shall include, but not be limited to the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places available to employees and applicants for employment, notices setting forth the policies of non-discrimination.

15.2. The Contractor and all Sub-contractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex, national origin or age.

16. [END OF GENERAL CONDITIONS]
MONTANA
PREVAILING WAGE RATES FOR BUILDING CONSTRUCTION SERVICES 2015

Effective: January 2, 2015

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 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
TABLE OF CONTENTS

MONTANA PREVAILING WAGE REQUIREMENTS:

A. Date of Publication .................................................................................................................. 3
B. Definition of Building Construction ........................................................................................ 3
C. Definition of Public Works Contract ....................................................................................... 3
D. Prevailing Wage Schedule ..................................................................................................... 3
E. Rates to Use for Projects ......................................................................................................... 3
F. Wage Rate Adjustments for Multiyear Contracts ................................................................. 3
G. Fringe Benefits ....................................................................................................................... 4
H. Prevailing Wage Districts ....................................................................................................... 4
I. Dispatch City ............................................................................................................................ 5
J. Zone Pay ................................................................................................................................ 5
K. Computing Travel Benefits .................................................................................................... 5
L. Per Diem .................................................................................................................................. 5
M. Apprentices ............................................................................................................................ 5
N. Posting Notice of Prevailing Wages ....................................................................................... 5
O. Employment Preference ......................................................................................................... 5
P. Building Construction Occupations Website ......................................................................... 5
Q. Welder Rates .......................................................................................................................... 5
R. Foreman Rates ....................................................................................................................... 5

WAGE RATES:

BOILERMAKERS .......................................................................................................................... 6
BRICK, BLOCK, AND STONE MASONs ....................................................................................... 6
CARPENTERS ................................................................................................................................ 6
CEMENT MASONs ........................................................................................................................ 6
CONSTRUCTION EQUIPMENT OPERATORS
  OPERATORS GROUP 1 .................................................................................................................. 7
  OPERATORS GROUP 2 .................................................................................................................. 7
  OPERATORS GROUP 3 .................................................................................................................. 8
  OPERATORS GROUP 4 .................................................................................................................. 8
  OPERATORS GROUP 5 .................................................................................................................. 8
  OPERATORS GROUP 6 .................................................................................................................. 9
  OPERATORS GROUP 7 .................................................................................................................. 9
CONSTRUCTION LABORERS
  LABORERS GROUP 1 .................................................................................................................. 9
  LABORERS GROUP 2 .................................................................................................................. 10
  LABORERS GROUP 3 ................................................................................................................ 10
  LABORERS GROUP 4 ................................................................................................................ 11
DRIY WALL APPLICATORS ......................................................................................................... 11
ELECTRICIANS: INCLUDING BUILDING AUTOMATION CONTROL ........................................ 12
ELEVATOR CONSTRUCTORS ...................................................................................................... 12
FLOOR LAYERS ............................................................................................................................ 12
GLAZIERS ..................................................................................................................................... 13
HEATING AND AIR CONDITIONING ......................................................................................... 13
INSULATION WORKERS-MECHANICAL (HEAT AND FROST) ................................................ 13
IRONWORKERS-STRUCTURAL STEEL AND REBAR PLACERS ............................................... 14
MILLWRIGHTS ............................................................................................................................ 14
PAINTERS: INCLUDING PAPERHANGER .................................................................................... 14
PILE BUCKS .................................................................................................................................. 14
PLASTERERS ............................................................................................................................... 15
PLUMBERS, PIPEFITTERS, AND STEAMFITTERS ..................................................................... 15
ROOFERS ..................................................................................................................................... 16
SHEET METAL WORKERS ......................................................................................................... 16
SPRINKLER FITTERS .................................................................................................................. 16
TAPERS ......................................................................................................................................... 16
TEAMSTERS GROUP 2 ................................................................................................................. 17
TELECOMMUNICATIONS EQUIPMENT INSTALLERS .............................................................. 17
TILE AND MARBLE SETTERS .................................................................................................... 17
A. Date of Publication
The rate schedule was published with the Secretary of State on December 24, 2014. It is for use in bid solicitations first made on or after January 2, 2015.

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, semiskilled, 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), Public Works Contracts for Construction Services Subject to Prevailing Wage Rates, 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
Rates to be used on a public works project are those that are in effect at the time the project and 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
Dispatch City is 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.

J. Zone Pay
Zone pay is not travel pay. It is 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 shall be determined by measuring the road miles one direction over the shortest practical maintained route from the dispatch city to the center of the job.

K. Computing Travel Benefits
Travel pay, also referred to as travel allowance, shall 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.

L. Per Diem
Per Diem typically covers the 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 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>
<td>District 1</td>
<td>$30.72</td>
<td>$29.45</td>
</tr>
<tr>
<td>District 2</td>
<td>$30.00</td>
<td>$29.45</td>
</tr>
<tr>
<td>District 3</td>
<td>$30.00</td>
<td>$29.45</td>
</tr>
<tr>
<td>District 4</td>
<td>$30.00</td>
<td>$29.45</td>
</tr>
</tbody>
</table>

**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>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
<td>$25.74</td>
<td>$12.47</td>
</tr>
<tr>
<td>District 2</td>
<td>$25.74</td>
<td>$12.47</td>
</tr>
<tr>
<td>District 3</td>
<td>$25.82</td>
<td>$12.47</td>
</tr>
<tr>
<td>District 4</td>
<td>$25.10</td>
<td>$12.25</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>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
<td>$21.50</td>
<td>$11.57</td>
</tr>
<tr>
<td>District 2</td>
<td>$21.50</td>
<td>$11.86</td>
</tr>
<tr>
<td>District 3</td>
<td>$21.50</td>
<td>$11.57</td>
</tr>
<tr>
<td>District 4</td>
<td>$21.50</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:**

- Install roll and batt insulation.

## CEMENT MASONs

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
<td>$18.92</td>
<td>$9.26</td>
</tr>
<tr>
<td>District 2</td>
<td>$21.43</td>
<td>$9.41</td>
</tr>
<tr>
<td>District 3</td>
<td>$19.52</td>
<td>$9.26</td>
</tr>
<tr>
<td>District 4</td>
<td>$22.12</td>
<td>$9.26</td>
</tr>
</tbody>
</table>

**Zone Pay:**

- **District 1**
  - 0-30 mi. free zone
  - >30-60 mi. base pay + $1.05/hr.
  - >60 mi. base pay + $1.50/hr.

- **Districts 2 - 4**
  - 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>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
<td>$24.07</td>
<td>$11.40</td>
</tr>
<tr>
<td>District 2</td>
<td>$24.07</td>
<td>$11.40</td>
</tr>
<tr>
<td>District 3</td>
<td>$24.07</td>
<td>$11.40</td>
</tr>
<tr>
<td>District 4</td>
<td>$24.07</td>
<td>$11.40</td>
</tr>
</tbody>
</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

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
<td>$25.54</td>
<td>$11.40</td>
</tr>
<tr>
<td>District 2</td>
<td>$25.54</td>
<td>$11.40</td>
</tr>
<tr>
<td>District 3</td>
<td>$25.54</td>
<td>$11.40</td>
</tr>
<tr>
<td>District 4</td>
<td>$25.54</td>
<td>$11.40</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; Pumcrete\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>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
<th>Zone Pay:</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
<td>$25.95</td>
<td>$11.40</td>
<td>All Districts</td>
</tr>
<tr>
<td>District 2</td>
<td>$25.95</td>
<td>$11.40</td>
<td>0-30 mi. free zone</td>
</tr>
<tr>
<td>District 3</td>
<td>$25.95</td>
<td>$11.40</td>
<td>&gt;30-60 mi. base pay + $3.50/hr.</td>
</tr>
<tr>
<td>District 4</td>
<td>$25.95</td>
<td>$11.40</td>
<td>&gt;60 mi. base pay + $5.50/hr.</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.

### CONSTRUCTION EQUIPMENT OPERATORS GROUP 4

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
<th>Zone Pay:</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
<td>$26.95</td>
<td>$11.40</td>
<td>All Districts</td>
</tr>
<tr>
<td>District 2</td>
<td>$26.95</td>
<td>$11.40</td>
<td>0-30 mi. free zone</td>
</tr>
<tr>
<td>District 3</td>
<td>$26.95</td>
<td>$11.40</td>
<td>&gt;30-60 mi. base pay + $3.50/hr.</td>
</tr>
<tr>
<td>District 4</td>
<td>$26.95</td>
<td>$11.40</td>
<td>&gt;60 mi. base pay + $5.50/hr.</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.

### CONSTRUCTION EQUIPMENT OPERATORS GROUP 5

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
<th>Zone Pay:</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
<td>$27.95</td>
<td>$11.40</td>
<td>All Districts</td>
</tr>
<tr>
<td>District 2</td>
<td>$27.95</td>
<td>$11.40</td>
<td>0-30 mi. free zone</td>
</tr>
<tr>
<td>District 3</td>
<td>$27.95</td>
<td>$11.40</td>
<td>&gt;30-60 mi. base pay + $3.50/hr.</td>
</tr>
<tr>
<td>District 4</td>
<td>$27.95</td>
<td>$11.40</td>
<td>&gt;60 mi. base pay + $5.50/hr.</td>
</tr>
</tbody>
</table>

This group includes but is not limited to:
- Cranes, 45 tons up to and incl. 74 tons.
### 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>$28.95</td>
<td>$11.40</td>
</tr>
<tr>
<td>2</td>
<td>$28.95</td>
<td>$11.40</td>
</tr>
<tr>
<td>3</td>
<td>$28.95</td>
<td>$11.40</td>
</tr>
<tr>
<td>4</td>
<td>$28.95</td>
<td>$11.40</td>
</tr>
</tbody>
</table>

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

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>
<td>$29.95</td>
<td>$11.40</td>
</tr>
<tr>
<td>2</td>
<td>$29.95</td>
<td>$11.40</td>
</tr>
<tr>
<td>3</td>
<td>$29.95</td>
<td>$11.40</td>
</tr>
<tr>
<td>4</td>
<td>$29.95</td>
<td>$11.40</td>
</tr>
</tbody>
</table>

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

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>$19.08</td>
<td>$9.10</td>
</tr>
<tr>
<td>2</td>
<td>$16.66</td>
<td>$8.65</td>
</tr>
<tr>
<td>3</td>
<td>$18.00</td>
<td>$7.90</td>
</tr>
<tr>
<td>4</td>
<td>$18.00</td>
<td>$7.17</td>
</tr>
</tbody>
</table>

**Zone Pay:**
- **District 1**
  - 0-30 mi. free zone
  - >30-60 mi. base pay + $1.50/hr.
  - >60 mi. base pay + $2.00/hr.
- **District 2**
  - 0-15 mi. free zone
  - >15-30 mi. base pay + $0.75/hr.
  - >30-50 mi. base pay + $1.50/hr.
  - >50 mi. base pay + $2.25/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 2

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$18.82</td>
<td>$8.38</td>
</tr>
<tr>
<td>2</td>
<td>$18.86</td>
<td>$6.53</td>
</tr>
<tr>
<td>3</td>
<td>$16.78</td>
<td>$4.40</td>
</tr>
<tr>
<td>4</td>
<td>$18.12</td>
<td>$4.65</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 + $2.00/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>1</td>
<td>$19.48</td>
<td>$9.10</td>
</tr>
<tr>
<td>2</td>
<td>$19.58</td>
<td>$8.65</td>
</tr>
<tr>
<td>3</td>
<td>$19.00</td>
<td>$7.90</td>
</tr>
<tr>
<td>4</td>
<td>$19.00</td>
<td>$7.17</td>
</tr>
</tbody>
</table>

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

### Zone Pay:
- **District 1**
  - 0-30 mi. free zone
  - >30-60 mi. base pay + $1.50/hr.
  - >60 mi. base pay + $2.00/hr.
- **District 2**
  - 0-15 mi. free zone
  - >15-30 mi. base pay + $0.75/hr.
  - >30-50 mi. base pay + $1.50/hr.
  - >50 mi. base pay + $2.25/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>$18.74</td>
<td>$9.10</td>
</tr>
<tr>
<td>District 2</td>
<td>$19.81</td>
<td>$7.01</td>
</tr>
<tr>
<td>District 3</td>
<td>$20.55</td>
<td>$6.78</td>
</tr>
<tr>
<td>District 4</td>
<td>$18.55</td>
<td>$6.97</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 + $2.00/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.

District 3
0-30 mi. free zone
>30-60 mi. base pay + $2.95/hr.
>60 mi. base pay + $4.70/hr.

District 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>$23.81</td>
<td>$11.57</td>
</tr>
<tr>
<td>District 2</td>
<td>$21.50</td>
<td>$11.86</td>
</tr>
<tr>
<td>District 3</td>
<td>$21.50</td>
<td>$11.57</td>
</tr>
<tr>
<td>District 4</td>
<td>$21.50</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>
<td>$26.85</td>
<td>$10.69</td>
</tr>
<tr>
<td>District 2</td>
<td>$29.06</td>
<td>$13.13</td>
</tr>
<tr>
<td>District 3</td>
<td>$27.58</td>
<td>$ 9.92</td>
</tr>
<tr>
<td>District 4</td>
<td>$30.73</td>
<td>$12.37</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:
<table>
<thead>
<tr>
<th>District 1</th>
<th>0-10 mi. free zone</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt;10-45 mi. $0.585/mi. in excess of the free zone.</td>
</tr>
<tr>
<td></td>
<td>&gt;45 mi. $65.00/day</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>District 2</th>
<th>0-08 mi. free zone</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt;08-50 mi. federal mileage rate/mi. in effect when travel occurs, in excess of the free zone.</td>
</tr>
<tr>
<td></td>
<td>&gt;50 mi. $62.50/day</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>District 3</th>
<th>0-08 mi. free zone</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt;08-50 mi. federal mileage rate/mi. in effect when travel occurs, in excess of the free zone.</td>
</tr>
<tr>
<td></td>
<td>&gt;50 mi. $62.50/day</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>District 4</th>
<th>0-18 mi. free zone</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt;18-60 mi. federal mileage rate/mi. in effect when travel occurs and employee uses own vehicle.</td>
</tr>
<tr>
<td></td>
<td>&gt;60 mi. $75.00/day in lieu of any other travel allowance.</td>
</tr>
</tbody>
</table>

Per Diem:
| District 3 | $65.00/day |
|            | $75.00/day (In Big Sky) |

ELEVATOR CONSTRUCTORS

<table>
<thead>
<tr>
<th>District 1</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$47.76</td>
<td>$32.38</td>
</tr>
<tr>
<td>District 2</td>
<td>$47.76</td>
<td>$32.38</td>
</tr>
<tr>
<td>District 3</td>
<td>$47.76</td>
<td>$32.38</td>
</tr>
<tr>
<td>District 4</td>
<td>$47.76</td>
<td>$32.38</td>
</tr>
</tbody>
</table>

Travel:
<table>
<thead>
<tr>
<th>All Districts</th>
<th>0-15 mi. free zone</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt;15-25 mi. $38.28/day</td>
</tr>
<tr>
<td></td>
<td>&gt;25-35 mi. $76.56/day</td>
</tr>
<tr>
<td></td>
<td>&gt;35 mi. $72.55/day or cost of receipts for hotel and meals, whichever is greater.</td>
</tr>
</tbody>
</table>

FLOOR LAYERS

<table>
<thead>
<tr>
<th>District 1</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$19.00</td>
<td>No Rate Established</td>
</tr>
<tr>
<td>District 2</td>
<td>$19.00</td>
<td>No Rate Established</td>
</tr>
<tr>
<td>District 3</td>
<td>$19.00</td>
<td>No Rate Established</td>
</tr>
<tr>
<td>District 4</td>
<td>$19.00</td>
<td>No Rate Established</td>
</tr>
</tbody>
</table>

Travel:
<table>
<thead>
<tr>
<th>All Districts</th>
<th>0-120 mi. free zone</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt;120 mi. $45.00/day</td>
</tr>
</tbody>
</table>
GLAZIERS

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
<td>$18.28</td>
<td>$2.30</td>
</tr>
<tr>
<td>District 2</td>
<td>$17.97</td>
<td>$1.00</td>
</tr>
<tr>
<td>District 3</td>
<td>$19.69</td>
<td>$4.52</td>
</tr>
<tr>
<td>District 4</td>
<td>$20.43</td>
<td>$6.31</td>
</tr>
</tbody>
</table>

Per Diem:
- District 1: Motel + $24.00/day
- Districts 2: $35.00/day
- District 3: All meals rooms and gas paid for by employer
- District 4: $100/day

HEATING AND AIR CONDITIONING

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
<td>$25.37</td>
<td>$12.63</td>
</tr>
<tr>
<td>District 2</td>
<td>$24.24</td>
<td>$14.44</td>
</tr>
<tr>
<td>District 3</td>
<td>$24.61</td>
<td>$14.44</td>
</tr>
<tr>
<td>District 4</td>
<td>$27.33</td>
<td>$14.44</td>
</tr>
</tbody>
</table>

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

Travel:
- All Districts:
  - 0-51 mi. free zone
  - >51 mi.: $0.25/mi. in employer vehicle + $0.65/mi. in employee vehicle

Per Diem:
- All Districts: $60.00/day

INSULATION WORKERS-MECHANICAL (HEAT AND FROST)

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
<td>$32.32</td>
<td>$17.57</td>
</tr>
<tr>
<td>District 2</td>
<td>$32.32</td>
<td>$17.57</td>
</tr>
<tr>
<td>District 3</td>
<td>$32.32</td>
<td>$17.57</td>
</tr>
<tr>
<td>District 4</td>
<td>$32.32</td>
<td>$17.57</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 + $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 + $0.56/mi. if transportation is not provided / $0.20/mi. if in company vehicle.
IRONWORKERS-STRUCTURAL STEEL AND REBAR PLACERS

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
<td>$25.90</td>
<td>$20.73</td>
</tr>
<tr>
<td>District 2</td>
<td>$26.50</td>
<td>$19.03</td>
</tr>
<tr>
<td>District 3</td>
<td>$26.50</td>
<td>$18.84</td>
</tr>
<tr>
<td>District 4</td>
<td>$26.50</td>
<td>$19.03</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.

<table>
<thead>
<tr>
<th>Travel: District 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-45 mi. free zone</td>
</tr>
<tr>
<td>&gt;45-60 mi. $30.00/day</td>
</tr>
<tr>
<td>&gt;60-100 mi. $55.00/day</td>
</tr>
<tr>
<td>&gt;100 mi. $75.00/day</td>
</tr>
</tbody>
</table>

Districts 2 - 4

<table>
<thead>
<tr>
<th>Travel: Districts 2 - 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-45 mi. free zone</td>
</tr>
<tr>
<td>&gt;45-85 mi. $45.00/day</td>
</tr>
<tr>
<td>&gt;85 mi. $75.00/day</td>
</tr>
</tbody>
</table>

MILLWRIGHTS

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
<td>$30.00</td>
<td>$11.57</td>
</tr>
<tr>
<td>District 2</td>
<td>$30.00</td>
<td>$11.57</td>
</tr>
<tr>
<td>District 3</td>
<td>$30.00</td>
<td>$11.57</td>
</tr>
<tr>
<td>District 4</td>
<td>$30.00</td>
<td>$11.57</td>
</tr>
</tbody>
</table>

Zone Pay:

<table>
<thead>
<tr>
<th>All Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-30 mi. free zone</td>
</tr>
<tr>
<td>&gt;30-50 mi. base pay + $4.00/hr.</td>
</tr>
<tr>
<td>&gt;50 mi. base pay + $6.00/hr.</td>
</tr>
</tbody>
</table>

PAINTERS: INCLUDING PAPERHANGER

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
<td>$19.63</td>
<td>$6.98</td>
</tr>
<tr>
<td>District 2</td>
<td>$24.00</td>
<td>$4.65</td>
</tr>
<tr>
<td>District 3</td>
<td>$18.73</td>
<td>$5.52</td>
</tr>
<tr>
<td>District 4</td>
<td>$14.43</td>
<td>$7.50</td>
</tr>
</tbody>
</table>

Travel:

<table>
<thead>
<tr>
<th>All Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-120 mi. free zone</td>
</tr>
<tr>
<td>&gt;120 mi. $45.00/day</td>
</tr>
</tbody>
</table>

PILE BUCKS

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
<td>$27.00</td>
<td>$11.57</td>
</tr>
<tr>
<td>District 2</td>
<td>$27.00</td>
<td>$11.57</td>
</tr>
<tr>
<td>District 3</td>
<td>$27.00</td>
<td>$11.57</td>
</tr>
<tr>
<td>District 4</td>
<td>$27.00</td>
<td>$11.57</td>
</tr>
</tbody>
</table>

Zone Pay:

<table>
<thead>
<tr>
<th>All Districts</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-30 mi. free zone</td>
</tr>
<tr>
<td>&gt;30-50 mi. base pay + $4.00/hr.</td>
</tr>
<tr>
<td>&gt;50 mi. base pay + $6.00/hr.</td>
</tr>
</tbody>
</table>

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>
<tr>
<td>1</td>
<td>$18.92</td>
<td>$9.26</td>
</tr>
<tr>
<td>2</td>
<td>$21.43</td>
<td>$9.41</td>
</tr>
<tr>
<td>3</td>
<td>$19.52</td>
<td>$9.26</td>
</tr>
<tr>
<td>4</td>
<td>$22.12</td>
<td>$9.26</td>
</tr>
</tbody>
</table>

Zone Pay:
District 1
- 0-30 mi. free zone
- >30-60 mi. base pay + $1.05/hr.
- >60 mi. base pay + $1.50/hr.

Districts 2 - 4
- 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>
<tr>
<td>1</td>
<td>$26.95</td>
<td>$13.21</td>
</tr>
<tr>
<td>2</td>
<td>$28.17</td>
<td>$12.88</td>
</tr>
<tr>
<td>3</td>
<td>$28.17</td>
<td>$12.88</td>
</tr>
<tr>
<td>4</td>
<td>$29.86</td>
<td>$15.11</td>
</tr>
</tbody>
</table>

Duties Include:
Assemble, install, alter, and repair pipe-lines or pipe systems that carry water, steam, air, other liquids or gases. Testing of piping systems, commissioning and retro-commissioning. Workers in this occupation may also install heating and cooling equipment and mechanical control systems.

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
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. $0.55/mi. if transportation is not provided.

Special Provision:
If employee travels back and forth from home to job site, the employee will receive compensation for no more than two trips.

Per Diem:
District 4
$90.00/day
### ROOFERS

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
<td>$16.99</td>
<td>$9.97</td>
</tr>
<tr>
<td>District 2</td>
<td>$17.65</td>
<td>$4.69</td>
</tr>
<tr>
<td>District 3</td>
<td>$17.27</td>
<td>$3.90</td>
</tr>
<tr>
<td>District 4</td>
<td>$18.02</td>
<td>$4.15</td>
</tr>
</tbody>
</table>

**Travel:**
- **District 1**
  - 0-50 mi. free zone
  - >50 mi. $0.30/mi.

**Special Provision:** Travel is paid only one way.

**Districts 2 - 4**
- 0-30 mi. free zone
- >30 mi. $0.25/mi. when using employees vehicle.

**Per Diem:**
- **Districts 2 - 4**
  - $55.00/day or actual expenses (verified with receipts) for board and room provided.

### SHEET METAL WORKERS

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
<td>$25.37</td>
<td>$12.63</td>
</tr>
<tr>
<td>District 2</td>
<td>$24.24</td>
<td>$14.44</td>
</tr>
<tr>
<td>District 3</td>
<td>$24.61</td>
<td>$14.44</td>
</tr>
<tr>
<td>District 4</td>
<td>$27.33</td>
<td>$14.44</td>
</tr>
</tbody>
</table>

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

**Travel:**
- **All Districts**
  - 0-51 mi. free zone
  - >51 mi. $0.25/mi. in employer vehicle
  - $0.65/mi. in employee vehicle

**Per Diem:**
- **All Districts**
  - $60.00/day

### SPRINKLER FITTERS

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
<td>$30.74</td>
<td>$18.22</td>
</tr>
<tr>
<td>District 2</td>
<td>$30.74</td>
<td>$18.22</td>
</tr>
<tr>
<td>District 3</td>
<td>$30.74</td>
<td>$18.22</td>
</tr>
<tr>
<td>District 4</td>
<td>$28.87</td>
<td>$10.52</td>
</tr>
</tbody>
</table>

**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

### TAPERS

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
<td>$20.07</td>
<td>$7.50</td>
</tr>
<tr>
<td>District 2</td>
<td>$23.14</td>
<td>$7.50</td>
</tr>
<tr>
<td>District 3</td>
<td>$23.14</td>
<td>$7.50</td>
</tr>
<tr>
<td>District 4</td>
<td>$23.14</td>
<td>$7.50</td>
</tr>
</tbody>
</table>

**Travel:**
- **All Districts**
  - 0-120 mi. free zone
  - >120 mi. $45.00/day
TEAMSTERS GROUP 2

<table>
<thead>
<tr>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$26.06</td>
<td>$9.16</td>
</tr>
</tbody>
</table>

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.

Zone Pay:
0-25 mi. free zone
>25-50 mi. base pay + $2.50/hr.
>50 mi. base pay + $3.00/hr.

TELECOMMUNICATIONS EQUIPMENT INSTALLERS

<table>
<thead>
<tr>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
<td>$20.30</td>
</tr>
<tr>
<td>District 2</td>
<td>$23.06</td>
</tr>
<tr>
<td>District 3</td>
<td>$22.05</td>
</tr>
<tr>
<td>District 4</td>
<td>$24.11</td>
</tr>
</tbody>
</table>

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.

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.

TILE AND MARBLE SETTERS

No Rate Established

Duties Include:
Apply hard tile, marble, and wood tile to floors, ceilings, and roof decks
SUPPLEMENTAL CONDTIONS OF THE CONTRACT
FOR CONSTRUCTION
(REVISED APRIL 8, 2014)
FOR STATE OF MONTANA GENERAL CONDITIONS

ARTICLE 3 – THE CONTRACTOR

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

3.3.6 ADD: PRODUCT DELIVERY, STORAGE AND HANDLING

3.3.6.1 ADD: Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer’s written instructions.

3.3.6.2 ADD: DELIVERY AND HANDLING:

3.3.6.2.1 ADD: Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.

3.3.6.2.2 ADD: 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.

3.3.6.2.3 ADD: Deliver products to Project site in an undamaged condition in manufacturer’s original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

3.3.6.2.4 ADD: Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and property protected.

3.3.6.3 ADD: STORAGE

3.3.6.3.1 ADD: Store products to allow for inspection and measurement of quantity or counting of units

3.3.6.3.2 ADD: Store materials in a manner that will not endanger Project structure.

3.3.6.3.3 ADD: Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.

3.3.6.3.4 ADD: Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.

3.3.6.3.5 ADD: Comply with product manufacturer’s written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

3.3.6.3.6 ADD: Protect stored products from damage and liquids from freezing.

3.11 DOCUMENTATION AND AS-BUILT CONDITIONS AT THE SITE

3.11.4 ADD: All as-built conditions shall be kept current and the contractor shall not permanently conceal or cover any work until all required information has been recorded.

3.11.5 ADD: All survey and exterior underground utilities shall be recorded using the spatial reference, Montana State Plane, NAD 83, CORS 96, Lambert Conformal Conic. The National Geodetic Survey publishes NAD 83 coordinates in the metric system (i.e., meters). The conversion factor that should be used to convert between English and metric systems is the international conversion factor of 1 ft. = 0.3048 m. coordinate system.
3.11.6 ADD: In marking any as-built conditions, the contractor shall ensure that such drawings indicate by measured
dimension to building corners or other permanent monuments the exact locations of all piping, conduit or utilities
concealed in concrete slabs, behind walls or ceilings or underground. Record drawings shall be made to scale and shall
also include exact locations of valves, pull boxes and similar items as required for maintenance or repair service.

3.12.1 DEFINITIONS:

3.12.1.4 ADD: Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from
previously purchased stock. The term “product” includes the terms “material,” “equipment,” “system,” and terms of
similar intent.

3.12.1.5 ADD: Named Products: Items identified by manufacturer’s product name, including make or model number
or other designation shown or listed in manufacturer’s published product literature that is current as of date of the
Contract Documents.

3.12.1.6 ADD: New Products: Items that have not previously been incorporated into another project or facility.
Products salvaged or recycled from other projects are not considered new products.

3.12.1.7 ADD: Comparable Products: Product that is demonstrated and approved through submittal process to have
the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance,
and other characteristics that equal or exceed those of specified product.

3.12.1.8 ADD: Basis-of-Design Product Specification: A specification in which a specific manufacturer’s product is
named and accompanied by the words “basis-of-design product,” including make or model number or other
designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical
properties, appearance, and other characteristics for purposes of evaluating comparable products of additional
manufacturers named in the specifications.

3.13. USE OF SITE

3.13.5 ADD: By acceptance of MSU Building Keys the Contractor agrees with the following: University keys are the
property of Montana State University. Fabricating, duplicating or modifying University keys is prohibited. Doors must
remain locked at all times. The use of these keys to allow unauthorized persons to enter the above areas is prohibited. Loss
of any key must be reported immediately to the Director, Office of Facilities Services and University Police, if the loss of
keys results in re-keying costs, these costs will be charged to the Contractor. See attached Estimated Re-Keying Costs
per Building.

3.13.6 ADD: The Montana Legislature decreed that the “right to breathe smoke-free air has priority over the desire to
smoke” (MCA 20-40-102). It is the policy of MSU to promote the health, wellness and safety of all employees, students,
guests, visitors, and contractors while on campus. Therefore, the campus will be free of tobacco-use effective August 1,
2012. The use of tobacco (including cigarettes, cigars, pipes, smokeless tobacco and all other tobacco products) by
students, faculty, staff, guests, visitors, and contractors is prohibited on all properties owned or leased by MSU.

3.13.7 ADD: Littering any university property, whether owned or leased, with the remains of tobacco products is
prohibited. All university employees, students, visitors, guests, and contractors are required to comply with this policy,
which shall remain in effect at all times. Refusal to comply with this policy may be cause for disciplinary action in
accordance with employee and student conduct policies. Refusal to comply with the policy by visitors, guests and
contractors may be grounds for removal from campus. (http://www2.montana.edu/policy/smoking_facilities/)

3.13.8 ADD: The Contractor may use the University’s toilet facilities only as directed by the Owner.

ARTICLE 8 - TIME

8.3. DELAYS AND EXTENSIONS OF TIME

8.3.4 ADD: By the act of signing the Contract, the Contractor signifies that he/she and all subcontractors can perform the
work within the stated schedule and that subcontractors, manufacturers, suppliers, and deliverers are known to be able to
support the schedule. Time extension may be granted for unforeseen conditions or events out of the Contractor’s control
causing delay in delivery of materials or causing delay in the Contractor’s ability to perform the work within the Contract
Documents. The Contractor is expected to take all possible measures and bear all reasonable costs in order to anticipate, control, counteract, and expedite such delay-causing conditions, including finding alternative sources of materials, equipment, shipping, and labor. Notification of any claim for schedule delay must be made in writing to the Owner within one week of the causing event or of first knowledge of a known delay causing condition with supporting documentation as required by the Owner. The Owner will respond in writing within one week to claims of delay. No claims of delay will be entertained after the date of completion as stated on the Notice to Proceed or as extended by previously approved delay claims.

END OF SUPPLEMENTARY GENERAL CONDITIONS
## PROJECT CLOSEOUT CHECKLIST

<table>
<thead>
<tr>
<th>Required Documentation:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Contractors Affidavit of Completion, MSU Form106 (all contracts)</td>
<td></td>
</tr>
<tr>
<td>Final application for payment (all contracts)</td>
<td></td>
</tr>
<tr>
<td>Certificate of Substantial Completion - MSU Form 107 (over $25K)</td>
<td></td>
</tr>
<tr>
<td>Certificate of Final Acceptance - MSU Form118 (over $25K)</td>
<td></td>
</tr>
<tr>
<td>Consent of Surety to final payment MSU Form103 (if over $25K)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MSU PM</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Verification of All Change Orders &amp; Final Amounts with Contract amounts</td>
<td></td>
</tr>
</tbody>
</table>

**To be submitted with Application of Final Payment**

<table>
<thead>
<tr>
<th>Contractor</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Building keys returned to Owner</td>
<td></td>
</tr>
<tr>
<td>Final walk through and instructions to Owner</td>
<td></td>
</tr>
<tr>
<td>As-built “red lined” drawings (PDF Color Scan of Redlined Construction Set)</td>
<td></td>
</tr>
<tr>
<td>Complete set of project shop drawings/Product Data (3Sets)</td>
<td></td>
</tr>
<tr>
<td>Demonstration &amp; Training</td>
<td></td>
</tr>
<tr>
<td>City of Bozeman Building Permits:</td>
<td></td>
</tr>
<tr>
<td>□ Fire Suppression test &amp; Certificate</td>
<td>□ Electrical Inspection</td>
</tr>
<tr>
<td>□ Fire Alarm test &amp; Certificate</td>
<td>□ Temporary certificate of occupancy</td>
</tr>
<tr>
<td>□ Elevator Inspection</td>
<td>□ Final certificate of occupancy</td>
</tr>
<tr>
<td>□ Plumbing &amp; HVAC test &amp; Inspection</td>
<td></td>
</tr>
<tr>
<td>Final project inspection</td>
<td></td>
</tr>
<tr>
<td>Notification of completion of punch list</td>
<td></td>
</tr>
<tr>
<td>Copy of warranty Binder</td>
<td></td>
</tr>
</tbody>
</table>

Contractor Signature ____________________________  Consultant Signature ____________________________

Submit at Record Document Stage/Consultant shall submit Contractor Deliverables to Owner

<table>
<thead>
<tr>
<th>Consultant</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete set of record drawings (PDF &amp; AutoCAD files to CADD Mgr) 2 Paper sets</td>
<td></td>
</tr>
<tr>
<td>Operation &amp; Maintenance Manuals: including warrantees or guarantees for all equipment</td>
<td></td>
</tr>
<tr>
<td>(3 copies – project, trades, building file, support manager: PDF &amp; Paper)</td>
<td></td>
</tr>
<tr>
<td>□ HVAC</td>
<td>□ Fire Alarm</td>
</tr>
<tr>
<td>□ Plumbing</td>
<td>□ Roof</td>
</tr>
<tr>
<td>□ Electrical</td>
<td>□ Project Manual (Divisions 1-13)</td>
</tr>
</tbody>
</table>

Consultant Signature ____________________________  Project Manager ____________________________
SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Work under separate contracts.
5. Access to site.
6. Coordination with occupants.
7. Work restrictions.
8. Specification and drawing conventions.

B. Related Requirements:

1. Section 01 50 00 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.2 PROJECT INFORMATION

A. Project Identification: MSU Norm Asbjornson Hall (Previously referred to as Norm Asbjornson Innovation Center (NAIC) - a large campus facility consisting of a parking structure (Phase I), a multi-purpose classroom, office, research, and presentation building, and associated site and utility work (Phase II). These documents outline the work in Phase II.

1. Project Location: SW corner of Grant and S 7th Avenue, Montana State University, Bozeman, MT.


1. Owner's Representative: Sam J. DesJardins, Project Manager.

C. Owner: A/E Division, Department of Administration, State of Montana

1. Owner's Representative: Russ Katherman, PE.

D. Architect: A&E Architects, PC, Billings, MT.

E. General Contractor/Construction Manager (GC/CM) for Phase I and II: Martel Construction, Bozeman, MT.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Phase II is defined by the Contract Documents and consists of the following:
Construction of a three-story classroom, office, and research building with a partial basement and a mechanical penthouse, constructed of a concrete foundation and slab-on-grade supported by rammed earth aggregate piers, and a steel structural frame with steel stud exterior walls and steel deck roof construction. Exterior cladding consists of a combination of masonry veneer, glass curtain wall, and aluminum and glass storefront. Roof membrane is a single-ply membrane over rigid insulation. The interior is finished to a variety of functional uses. Gross building areas as follows:

a. Basement: 5,221  
b. Main: 40,983  
c. Second: 34,190  
d. Third: 34,363  
e. Penthouse: 1,589  
f. Total: 116,709 SF

B. Type of Contract.

1. Project is being constructed under a single prime contract, with Phase I as the Parking Structure and Phase II as MSU Norm Asbjornson Hall.

1.4 PHASED CONSTRUCTION

A. The NAIC building and related site work will be completed as a single phase of construction.

B. The GC/CM will solicit Early Work Packages as follows to assist in developing final pricing:

1. Bid Package 1a: Civil Site Work and Site Utilities, Engineered Aggregate Piers, and bulk Building Excavation and Backfill.
2. Bid Package 1b: Supply Only pricing on Light Fixtures on a quantity and unit cost basis.
3. Bid Package 1c: Supply Only pricing on AAON specified mechanical equipment and appurtenances on a quantity and unit cost basis.

C. Before commencing Work, submit an updated copy of Contractor's construction schedule showing the sequence, commencement and completion dates and occupancy schedule the project.

1.5 WORK UNDER SEPARATE CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.

B. Subsequent Work: Owner may award separate contract(s) for the additional work to be performed at the site. Completion of that work will depend on successful completion of the Parking Structure and Norm Asbjornson Hall under this Contract.

1.6 ACCESS TO SITE

A. General: Contractor shall have full use of Project site as defined in the drawings for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine construction operations to areas defined in the drawings.
2. Driveways, Walkways and Entrances: Keep driveways, loading areas, and entrances serving adjacent facilities clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
   a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
   b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.7 COORDINATION WITH OCCUPANTS

A. Full Owner Occupancy: Owner will occupy the adjacent site and adjacent building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.

B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.8 WORK RESTRICTIONS

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

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

B. On-Site Work Hours: See GC/CM Requirements for Trade Contractors.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
1. Notify Owner not less than two days in advance of proposed utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

1. Notify Owner not less than two days in advance of proposed disruptive operations.

Nonsmoking Building: Smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor-air intakes.

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

1.9 SPECIFICATION AND DRAWING CONVENTIONS

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

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.

2. Abbreviations: Materials and products are identified by abbreviations and scheduled on Drawings.

3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

1.10 MISCELLANEOUS PROVISIONS

A. See GC/CM Requirements for Trade Contractors.

B. See State of Montana General Conditions of the Contractor for Construction – GC/CM.

C. See Montana State University’s Supplemental Conditions of the Contract for Construction.
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00
SECTION 01 25 00 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:
   1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1.3 ACTION SUBMITTALS

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

k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.

m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

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


b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

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

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

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

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied:

   a. Requested substitution is consistent with the Contract Documents and will produce indicated results.

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

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

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

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

   f. Requested substitution provides specified warranty.

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

B. Substitutions for Convenience: Not allowed unless otherwise indicated.

C. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied:

   a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect
for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

b. Requested substitution does not require extensive revisions to the Contract Documents.

c. Requested substitution is consistent with the Contract Documents and will produce indicated results.

d. Requested substitution will not adversely affect Contractor’s construction schedule.

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

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

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

h. Requested substitution provides specified warranty.

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

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 25 00
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's construction schedule.
2. Construction schedule updating reports.
3. Daily construction reports.
4. Site condition reports.

1.2 DEFINITIONS

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

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

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

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

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

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.

1.3 INFORMATIONAL SUBMITTALS

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

1. Working electronic copy of schedule file, where indicated.
2. PDF electronic file.

B. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
   1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

D. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
   1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
   2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
   3. Total Float Report: List of all activities sorted in ascending order of total float.

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

F. Daily Construction Reports: Submit at weekly intervals.

G. Site Condition Reports: Submit at time of discovery of differing conditions.

1.4 COORDINATION

A. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
   1. Secure time commitments for performing critical elements of the Work from entities involved.
   2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
   1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
   2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. **Submittal Review Time:** Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.

4. **Startup and Testing Time:** Include no fewer than 15 days for startup and testing.

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

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

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

1. **Phasing:** Arrange list of activities on schedule by phase.
2. **Work under More Than One Contract:** Include a separate activity for each contract.
3. **Work by Owner:** Include a separate activity for each portion of the Work performed by Owner.
4. **Work Restrictions:** Show the effect of the following items on the schedule:
   a. Coordination with existing construction.
   b. Limitations of continued occupancies.
   c. Uninterruptible services.
   d. Partial occupancy before Substantial Completion.
   e. Use of premises restrictions.
   g. Seasonal variations.
   h. Environmental control.

5. **Work Stages:** Indicate important stages of construction for each major portion of the Work.

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

E. **Upcoming Work Summary:** Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.

F. **Recovery Schedule:** When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule.

G. **Computer Scheduling Software:** Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.2 **CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)**

A. **Gantt-Chart Schedule:** Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 30 days of date established for the Notice to Proceed.
B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Startup Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's construction schedule using a cost- and resource-loaded, time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.

   a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.

2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.

3. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

   a. Preparation and processing of submittals.
   b. Mobilization and demobilization.
   c. Purchase of materials.
   d. Delivery.
   e. Fabrication.
   f. Utility interruptions.
   g. Installation.
   h. Work by Owner that may affect or be affected by Contractor's activities.
   i. Testing.
   j. Punch list and final completion.
   k. Activities occurring following final completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.

3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.

F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight “early start-total float.” Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
10. Dollar value of activity (coordinated with the schedule of values).

G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
5. Changes in the critical path.
6. Changes in total float or slack time.

2.4 REPORTS

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

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

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

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

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

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

END OF SECTION 01 32 00
SECTION 01 32 33 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Periodic construction photographs.

B. Related Requirements:

1. Section 017700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.

1.2 INFORMATIONAL SUBMITTALS

A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

B. Digital Photographs: Submit unaltered, original, full-size image files within three days of taking photographs.

1. Digital Camera: Minimum sensor resolution of 8 megapixels.
2. Identification: Provide the following information with each image description in file metadata tag:
   a. Name of Project.
   b. Name and contact information for photographer.
   c. Date photograph was taken.
   d. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in JPG format, with minimum size of 8 megapixels.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. Photographer: Engage a qualified photographer to take construction photographs.
B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in file name for each image.
2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect.

D. Preconstruction Photographs: Before commencement of demolition and excavation, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.

1. Flag construction limits before taking construction photographs.
2. Take a minimum of 20 photographs to show existing conditions adjacent to property before starting the Work.
3. Take a minimum of 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.

E. Periodic Construction Photographs: Take a minimum of 20 photographs weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

F. Final Completion Construction Photographs: Take a minimum of 80 color photographs after date of Substantial Completion for submission as Project Record Documents. Architect will inform photographer of desired vantage points.

G. Additional Photographs: Architect may request photographs in addition to periodic photographs specified.

1. Three days' notice will be given, where feasible.
2. In emergency situations, take additional photographs within 24 hours of request.
3. Circumstances that could require additional photographs include, but are not limited to, the following:
   a. Special events planned at Project site.
   b. Immediate follow-up when on-site events result in construction damage or losses.
   c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
   d. Substantial Completion of a major phase or component of the Work.
   e. Extra record photographs at time of final acceptance.
   f. Owner's request for special publicity photographs.

END OF SECTION 01 32 33
SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
B. Related Requirements:
   1. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
   2. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
   3. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
   4. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.2 DEFINITIONS
A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action.
B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.3 ACTION SUBMITTALS
A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS
A. Architect's Digital Data Files: Electronic copies of digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.
      a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
      b. Contractor shall execute a data licensing agreement in the form of AIA Document C106, Digital Data Licensing Agreement.
B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
   a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

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

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.

D. Paper Submittals: Place a permanent label or title block on each submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches (150 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information for processing and recording action taken:
   a. Project name.
   b. Date.
   c. Name of Architect.
   d. Name of Construction Manager.
   e. Name of Contractor.
   f. Name of subcontractor.
   g. Name of supplier.
   h. Name of manufacturer.
   i. Submittal number or other unique identifier, including revision identifier.
   1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
   j. Number and title of appropriate Specification Section.
   k. Drawing number and detail references, as appropriate.
   l. Location(s) where product is to be installed, as appropriate.
   m. Other necessary identification.
4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
   a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return without review submittals received from sources other than Contractor.

a. Transmittal Form for Paper Submittals: Use CSI Form 12.1A included in Project Manual.
b. Transmittal Form for Paper Submittals: Provide locations on form for the following information:

1) Project name.
2) Date.
3) Destination (To:).
4) Source (From:).
5) Name and address of Architect.
6) Name of Construction Manager.
7) Name of Contractor.
8) Name of firm or entity that prepared submittal.
9) Names of subcontractor, manufacturer, and supplier.
10) Category and type of submittal.
11) Submittal purpose and description.
12) Specification Section number and title.
13) Specification paragraph number or drawing designation and generic name for each of multiple items.
14) Drawing number and detail references, as appropriate.
15) Indication of full or partial submittal.
16) Transmittal number, numbered consecutively.
17) Submittal and transmittal distribution record.
18) Remarks.
19) Signature of transmitter.

E. Electronic Submittal Procedures

1. Summary:
   a. Shop drawing and product data submittals shall be transmitted to Architect in electronic (PDF) format using Submittal Exchange, a website service designed specifically for transmitting submittals between construction team members.
   b. The intent of electronic submittals is to expedite the construction process by reducing paperwork, improving information flow, and decreasing turnaround time.
   c. The electronic submittal process is not intended for color samples, color charts, or physical material samples.

2. Procedures:
   a. Submittal Preparation - Contractor may use any or all of the following options:
      i. Subcontractors and Suppliers provide electronic (PDF) submittals to Contractor via the Submittal Exchange website.
      ii. Subcontractors and Suppliers provide paper submittals to General Contractor who electronically scans and converts to PDF format.
      iii. Subcontractors and Suppliers provide paper submittals to Scanning Service which electronically scans and converts to PDF format.
   b. Contractor shall review and apply electronic stamp certifying that the submittal complies with the requirements of the Contract Documents including verification of manufacturer / product, dimensions and coordination of information with other parts of the work.
   d. Architect / Engineer review comments will be made available on the Submittal Exchange website for downloading. Contractor will receive email notice of completed review.
e. Distribution of reviewed submittals to subcontractors and suppliers is the responsibility of the Contractor.

f. Submit paper copies of reviewed submittals at project closeout for record purposes in accordance with Section 017800 – Closeout Submittals

3. Miscellaneous:
   a. At Contractor’s option, training is available from Submittal Exchange regarding use of website and PDF submittals. Contact Submittal Exchange at 1-800-714-0024.

   b. Internet Service and Equipment Requirements:
      i. Email address and Internet access at Contractor’s main office.
      ii. Adobe Acrobat (www.adobe.com), Bluebeam PDF Revu (www.bluebeam.com), or other similar PDF review software for applying electronic stamps and comments.

F. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.

2. Name file with submittal number or other unique identifier, including revision identifier.
   a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.

4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software acceptable to Owner, containing the following information:
   a. Project name.
   b. Date.
   c. Name and address of Architect.
   d. Name of Construction Manager.
   e. Name of Contractor.
   f. Name of firm or entity that prepared submittal.
   g. Names of subcontractor, manufacturer, and supplier.
   h. Category and type of submittal.
   i. Submittal purpose and description.
   j. Specification Section number and title.
   k. Specification paragraph number or drawing designation and generic name for each of multiple items.
   l. Drawing number and detail references, as appropriate.
   m. Location(s) where product is to be installed, as appropriate.
   n. Related physical samples submitted directly.
   o. Indication of full or partial submittal.
   p. Transmittal number, numbered consecutively.
   q. Submittal and transmittal distribution record.
   r. Other necessary identification.
   s. Remarks.

5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
   a. Project name.
   b. Number and title of appropriate Specification Section.
   c. Manufacturer name.
d. Product name.

G. Options: Identify options requiring selection by Architect.

H. Deviations: Identify deviations from the Contract Documents on submittals.

I. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

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

K. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements:

1. Post electronic submittals as PDF electronic files directly to Project Web site specifically established for Project.


2. Submit electronic submittals via email as PDF electronic files.


3. Action Submittals: Submit three paper copies of each submittal unless otherwise indicated. Architect will return two copies.

4. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Architect will not return copies.

5. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

   a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.
   b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
   a. Manufacturer's catalog cuts.
   b. Manufacturer's product specifications.
   c. Standard color charts.
   d. Statement of compliance with specified referenced standards.
   e. Testing by recognized testing agency.
   f. Application of testing agency labels and seals.
   g. Notation of coordination requirements.
   h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:
   a. Wiring diagrams showing factory-installed wiring.
   b. Printed performance curves.
   c. Operational range diagrams.
   d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:
   a. PDF electronic file.
   b. Three paper copies of Product Data unless otherwise indicated. Architect will return two copies.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
   a. Identification of products.
   b. Schedules.
   c. Compliance with specified standards.
   d. Notation of coordination requirements.
   e. Notation of dimensions established by field measurement.
   f. Relationship and attachment to adjoining construction clearly indicated.
   g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1067 mm).
3. Submit Shop Drawings in the following format:
   a. PDF electronic file.
   b. Three opaque copies of each submittal. Architect will retain two copies; remainder will be returned.
D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. Number and title of applicable Specification Section.
3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
   a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
   a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned.
      1) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least [three] <Insert number> sets of paired units that show approximate limits of variations.
E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Submit product schedule in the following format:
   a. PDF electronic file.
b. Three paper copies of product schedule or list unless otherwise indicated. Architect will return two copies.

F. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."

G. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."

H. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."

I. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."

J. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

K. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

L. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

M. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

N. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

O. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

P. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

Q. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

R. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

S. Schedule of Tests and Inspections: Comply with requirements specified in Section 014000 "Quality Requirements."
T. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

U. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

V. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

W. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."

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

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

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

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

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

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

END OF SECTION 01 33 00
SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.

2. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

3. Specific test and inspection requirements are not specified in this Section.

1.2 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Laboratory Mockups: Full-size physical assemblies constructed at testing facility to verify performance characteristics.

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 INFORMATIONAL SUBMITTALS

A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.


B. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

1.5 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Field Reports: Prepare written information documenting tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
5. Other required items indicated in individual Specification Sections.

C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:
   a. Provide test specimens representative of proposed products and construction.
   b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
   c. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
   d. When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
   a. Allow seven days for initial review and each re-review of each mockup.

5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed unless otherwise indicated.

K. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Specification Sections.
1.7 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner’s responsibility, Owner will engage a qualified testing agency to perform these services.
   1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
   2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor’s responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
   1. Where services are indicated as Contractor’s responsibility, engage a qualified testing agency to perform these quality-control services.
      a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
   2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
   3. Where quality-control services are indicated as Contractor’s responsibility, submit a certified written report, in duplicate, of each quality-control service.
   4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor’s responsibility.
   5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer’s Field Services: Where indicated, engage a manufacturer’s representative to observe and inspect the Work. Manufacturer’s representative’s services include examination of substrates and conditions, verification of materials, inspection of completed portions of the Work, and submittal of written reports.

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor’s responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

   1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
   3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
   4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
   5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
   6. Do not perform any duties of Contractor.
F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.8 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.
B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00
SECTION 01 42 00 - REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books "National Trade & Professional Associations of the United States."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

1. AABC - Associated Air Balance Council; www.aabc.com
2. AAMA - American Architectural Manufacturers Association; www.aamanet.org
3. AAPFCO - Association of American Plant Food Control Officials; www.aapfc.org
4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org
7. ABMA - American Boiler Manufacturers Association; www.abma.com
8. ACI - American Concrete Institute; (Formerly: ACI International); www.aci.org
9. ACIP - American Concrete Pipe Association; www.concrete-pipe.org
10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aein.org
11. AF&PA - American Forest & Paper Association; www.afandp.org
12. AGA - American Gas Association; www.ag.org
13. AHAM - Association of Home Appliance Manufacturers; www.aham.org
15. AI - Asphalt Institute; www.asphaltinstitute.org
16. AIA - American Institute of Architects (The); www.aia.org
17. AISC - American Institute of Steel Construction; www.aisc.org
18. AIST - American Iron and Steel Institute; www.steel.org
19. AITC - American Institute of Timber Construction; www.aitc-glulam.org
21. ANSI - American National Standards Institute; wwwansi.org
23. APA - APA - The Engineered Wood Association; www.apawood.org
24. APA - Architectural Precast Association; www.archprecast.org
25. API - American Petroleum Institute; www.api.org
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org
29. ASCE - American Society of Civil Engineers; www.asce.org
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org
33. ASS - American Society of Safety Engineers (The); www.asse.org
34. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org
35. ASTM - ASTM International; www.astm.org
36. ATIS - Alliance for Telecommunications Industry Solutions; wwwatis.org
37. AWEA - American Wind Energy Association; www.awea.org
38. AWI - Architectural Woodwork Institute; www.awi.org
39. AWWA - American Water Works Association; www.awwa.org

REFERENCES
42. AWWA - American Water Works Association; www.awwa.org.
43. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
44. BIA - Brick Industry Association (The); www.gobrick.com.
46. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
47. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bwsc.org.
49. CDA - Copper Development Association; www.copper.org.
50. CEA - Canadian Electricity Association; www.electricity.ca.
51. CEA - Consumer Electronics Association; www.cea.org.
52. CFSEI - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
53. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
55. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
58. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
60. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
62. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
63. CSA - Canadian Standards Association; www.csa.ca.
64. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
65. CSI - Construction Specifications Institute (The); www.csinet.org.
67. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
68. CWCA - Composite Wood Council; (See CPA).
70. DHI - Door and Hardware Institute; www.dhi.org.
71. ECA - Electronic Components Association; (See ECIA).
72. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
74. EIA - Electronic Industries Alliance; (See TIA).
77. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
78. ESTA - Entertainment Services and Technology Association; (See PLASA).
80. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
81. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
82. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
84. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.

REFERENCES
REFERENCES

90. GS - Green Seal; www.greenseal.org.
92. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
93. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
97. IAS - International Accreditation Service; www.jasonline.org.
98. IAS - International Approval Services; (See CSA).
99. ICBO - International Conference of Building Officials; (See ICC).
101. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
102. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
103. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
105. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
106. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
107. IESNA - Illuminating Engineering Society of North America; (See IES).
108. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
112. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
113. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
114. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
115. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
117. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
118. ITU - International Telecommunication Union; www.itu.int/home.
120. LMA - Laminating Materials Association; (See CPA).
123. MCA - Metal Construction Association; www.metalconstruction.org.
132. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
137. NCAAA - National Collegiate Athletic Association (The); www.ncaa.org.
140. NECA - National Electrical Contractors Association; www.necanet.org.
143. NETA - InterNational Electrical Testing Association; www.netaworld.org.
144. NFHS - National Federation of State High School Associations; www.nfhs.org.
146. NFPA - NFPA International; (See NFPA).
149. NLGA - National Lumber Grades Authority; www.nlga.org.
150. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
152. NRCA - National Roofing Contractors Association; www.nrca.net.
156. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
159. PCI - Precast/Prestressed Concrete Institute; www pci.org.
161. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
166. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
168. SDI - Steel Door Institute; www.steeldoors.org.
169. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
170. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
172. SJI - Steel Joist Institute; www.steeljoist.org.
175. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
176. SPFPA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
185. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
188. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
189. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

1. DIN - Deutsches Institut fur Normung e.V.; [www.din.de]
2. IAPMO - International Association of Plumbing and Mechanical Officials; [www.iapmo.org]
3. ICC - International Code Council; [www.iccsafe.org]

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

1. COE - Army Corps of Engineers; [www.usace.army.mil]
2. CPSC - Consumer Product Safety Commission; [www.cpsc.gov]
3. DOC - Department of Commerce; National Institute of Standards and Technology; [www.nist.gov]
4. DOD - Department of Defense; [www.quicksearch.dla.mil]
5. DOE - Department of Energy; [www.energy.gov]
6. EPA - Environmental Protection Agency; [www.epa.gov]
7. FAA - Federal Aviation Administration; [www.faa.gov]
8. FG - Federal Government Publications; [www.gpo.gov/fdsys]
9. GSA - General Services Administration; [www.gsa.gov]
10. HUD - Department of Housing and Urban Development; [www.hud.gov]
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; [www.eetd.lbl.gov]
12. OSHA - Occupational Safety & Health Administration; [www.osha.gov]
13. SD - Department of State; [www.state.gov]
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; [www.trb.org]
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; [www.ars.usda.gov]
16. USDA - Department of Agriculture; Rural Utilities Service; [www.usda.gov]
17. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; [www.ojp.usdoj.gov]
18. USP - U.S. Pharmacopeial Convention; [www.usp.org]
19. USPS - United States Postal Service; [www.usps.com]

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list.

REFERENCES
REFERENCES

2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; www.bearfti.ca.gov.
2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
3. CDHS; California Department of Health Services; (See CDPH).
4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; www.txforestservice.tamu.edu.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00
SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Section 012500 "Substitution Procedures" for requests for substitutions.

1.2 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.

2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.

3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.3 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Form of Approval: As specified in Section 013300 "Submittal Procedures."
b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.


1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:
   1. Schedule delivery to minimize long-term storage at Project 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 Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
   4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:
   1. Store products to allow for inspection and measurement of quantity or counting of units.
   2. Store materials in a manner that will not endanger Project structure.
   3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
   4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
   5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
   6. Protect stored products from damage and liquids from freezing.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

   1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
   2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
   1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
   2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
   3. Refer to other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
   1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
   2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
   3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
   4. Where products are accompanied by the term "as selected," Architect will make selection.

B. Product Selection Procedures:
   1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
   2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
   3. Products:
      a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience may be considered.
      b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
   4. Manufacturers:
a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience may be considered.

b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

3. Evidence that proposed product provides specified warranty.

4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.

5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00
SECTION 01 70 00 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.

B. Related Requirements:

1. Section 011000 "Summary" for limits on use of Project site.
2. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
3. Section 078413 "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.2 INFORMATIONAL SUBMITTALS

A. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

B. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.3 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility or Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work.
Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
   1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
   1. Make vertical work plumb and make horizontal work level.
   2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
   3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.

5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.


2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.

2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements"

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 01 70 00
SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

B. Related Requirements:

1. Section 013233 "Photographic Documentation" for submitting final completion construction photographic documentation.
2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
4. Section 017900 "Demonstration and Training" for requirements for instructing Owner's personnel.

1.2 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.3 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest control inspection.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.
1.5 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
   a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.
5. Submit test/adjust/balance records.
6. Submit sustainable design submittals not previously submitted.
7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
6. Advise Owner of changeover in heat and other utilities.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements, including touchup painting.
10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements.
Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.6 FINAL COMPLETION PROCEDURES

A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to GC/CM Requirements for Trade Contractors.
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection to determine acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Submit list of incomplete items in the following format:
   a. MS Excel electronic file. Architect will return annotated copy.

1.8 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
CLOSEOUT PROCEDURES

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

   a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
   b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
   c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
   d. Remove tools, construction equipment, machinery, and surplus material from Project site.
   e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

h. Sweep concrete floors broom clean in unoccupied spaces.

i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.

j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.

k. Remove labels that are not permanent.

l. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.

p. Leave Project clean and ready for occupancy.

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.

2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

   a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 01 77 00
SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

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

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Product maintenance manuals.
5. Systems and equipment maintenance manuals.

1.2 CLOSEOUT SUBMITTALS
A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:

   a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
   b. Enable inserted reviewer comments on draft submittals.

2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return two copies.

C. Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.
PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information.

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

1. Title page.
2. Table of contents.

C. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.
8. Name and contact information for Commissioning Authority.
9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

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

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

F. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

G. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic
sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

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

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

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

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

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

2.2 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
5. Power failure.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.3 OPERATION MANUALS

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

2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

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

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

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

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.
2.4 PRODUCT MAINTENANCE MANUALS

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

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

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

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

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

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

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

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

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

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
   1. Test and inspection instructions.
   2. Troubleshooting guide.
   3. Precautions against improper maintenance.
   4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   5. Aligning, adjusting, and checking instructions.
   6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers’ maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

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

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

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

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

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

E. Drawings: Prepare drawings supplementing manufacturers’ printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
1. Do not use original project record documents as part of operation and maintenance manuals. 

F. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Requirements:

1. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit copies of record Drawings as follows:

   a. Initial Submittal:

      1) Submit PDF electronic files of scanned record prints.
      2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

   b. Final Submittal:

      1) Submit PDF electronic files of scanned record prints.
      2) Print each drawing, whether or not changes and additional information were recorded.

   c. Final Submittal:

      1) Submit record digital data files.
      2) Plot each drawing file, whether or not changes and additional information were recorded.

B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised Drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
   a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
   b. Record data as soon as possible after obtaining it.
   c. Record and check the markup before enclosing concealed installations.

2. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.

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

4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

2. Format: Annotated PDF electronic file with comment function enabled.

3. Identification: As follows:
   a. Project name.
   b. Date.
   c. Designation "PROJECT RECORD DRAWINGS."
   d. Name of Architect.
   e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

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

2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

4. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as annotated PDF electronic file.
2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
   3. Note related Change Orders, record Specifications, and record Drawings where applicable.

B. Format: Submit record Product Data as annotated PDF electronic file.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as PDF electronic file.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 01 78 39
SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.

1.2 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

1.3 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training.

1.4 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.
PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
   a. System, subsystem, and equipment descriptions.
   b. Performance and design criteria if Contractor is delegated design responsibility.
   c. Operating standards.
   d. Regulatory requirements.
   e. Equipment function.
   f. Operating characteristics.
   g. Limiting conditions.
   h. Performance curves.

2. Documentation: Review the following items in detail:
   a. Emergency manuals.
   b. Operations manuals.
   c. Maintenance manuals.
   d. Project record documents.
   e. Identification systems.
   f. Warranties and bonds.
   g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:
   a. Instructions on meaning of warnings, trouble indications, and error messages.
   b. Instructions on stopping.
   c. Shutdown instructions for each type of emergency.
   d. Operating instructions for conditions outside of normal operating limits.
   e. Sequences for electric or electronic systems.
   f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:
   a. Startup procedures.
   b. Equipment or system break-in procedures.
   c. Routine and normal operating instructions.
   d. Regulation and control procedures.
   e. Control sequences.
   f. Safety procedures.
   g. Instructions on stopping.
   h. Normal shutdown instructions.
   i. Operating procedures for emergencies.
   j. Operating procedures for system, subsystem, or equipment failure.
PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2. Owner will furnish an instructor to describe Owner's operational philosophy.
3. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner, through Architect, with at least seven days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a written performance-based test.

END OF SECTION 01 79 00
SECTION 01 81 13.13 - SUSTAINABLE DESIGN REQUIREMENTS - LEED 2009 FOR NEW CONSTRUCTION AND MAJOR RENOVATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements and procedures for compliance with certain USGBC LEED prerequisites and credits needed for Project to obtain LEED-Gold or higher certification based on USGBC's "LEED for New Construction & Major Renovations version 3 (2009 with addenda)."

1. Other LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.

2. A copy of LEED Project checklist is attached at the end of this Section for information only.

a. Some LEED prerequisites and credits needed to obtain the indicated LEED certification depend on Architect's design and other aspects of Project that are not part of the Work of the Contract.

1.2 DEFINITIONS

A. LEED: USGBC's "LEED for New Construction & Major Renovations, version 3."

1. Definitions that are a part of what was formerly known as "LEED 2009 for New Construction & Major Renovations" apply to this Section.

1.3 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site. LEED requirements and submittal process included in agenda.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Respond to questions and requests from Architect and USGBC about LEED prerequisites and credits that are the responsibility of the Contractor, that depend on product selection or product qualities, or that depend on Contractor's procedures until USGBC has made its determination on Project's LEED certification application. Document responses as informational submittals.

B. Submit documentation to Project LEED consultants and respond to questions and requests from GBCI about LEED prerequisites and credits that are the responsibility of the Contractor, that depend on product selection or product qualities, or that depend on Contractor's procedures until GBCI has made its determination on Project's LEED certification application.

1. Document correspondence with LEED consultant as informational submittals.
1.5 ACTION SUBMITTALS

A. Sustainable Design Documentation Submittals:

1. Credit EA 5: Product Data and wiring diagrams for sensors and data collection system used to provide continuous metering of building energy-consumption performance over time.
2. Credit MR 4: Product Data for recycled content indicating postconsumer and preconsumer recycled content and cost.
3. Credit MR 5: Product Data for regional materials indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each regional material.
4. Credit IEQ 3.1:
   a. Construction indoor-air-quality management plan.
   b. Product Data for temporary filtration media.
   c. Product Data for filtration media used during occupancy.
   d. Construction Documentation: Six photographs at each of three different times during the construction period, along with a brief description of the SMACNA approach employed, documenting implementation of the indoor-air-quality management measures, such as protection of ducts and on-site stored or installed absorptive materials.

5. Credit IEQ 3.2:
   a. Signed statement describing the building air flush-out procedures including the dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.
   b. Product Data for filtration media used during flush-out and during occupancy.
   c. Report from testing and inspecting agency indicating results of indoor-air-quality testing and documentation showing compliance with indoor-air-quality testing procedures and requirements.

6. Credit IEQ 4.1: Product Data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used.
7. Credit IEQ 4.2: Product Data for paints and coatings used inside the weatherproofing system indicating VOC content of each product used.
8. Credit IEQ 4.4: Product Data for products containing composite wood or agrifiber products or wood glues indicating that they do not contain urea-formaldehyde resin.

1.6 INFORMATIONAL SUBMITTALS

A. Project Materials Cost Data: Provide statement indicating total cost for materials used for Project in CSI Master Format 2004 Divisions 3 through 10, 31.60.00, 32.10.00, 32.30.00 and 32.90.00 only. Costs exclude labor, overhead, and profit. The following categories of items are not included in the total cost of materials:

1. Furniture.
2. Plumbing.
3. Mechanical.
4. Electrical.
5. Specialty items such as elevators and equipment.
B. Sustainable Design Action Plans: Provide preliminary submittals within **30 days** of date established for commencement of the Work indicating how the following requirements will be met:

1. Credit MR 4: List of proposed materials with recycled content. Indicate cost, postconsumer recycled content, and preconsumer recycled content for each product having recycled content.
2. Credit MR 5: List of proposed regional materials. Identify each regional material, including its source, cost, and the fraction by weight that is considered regional. WHY?
3. Credit IEQ 3.1: Construction indoor-air-quality management plan.
4. Prerequisite SS 1: Stormwater Pollution Prevention Plan (SWPPP) as approved

C. Sustainable Design Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with sustainable design action plans.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Provide products and procedures necessary to obtain LEED credits required in this Section. Although other Sections may specify some requirements that contribute to these LEED credits, Contractor shall provide additional materials and procedures necessary to obtain LEED credits indicated.

2.2 RECYCLED CONTENT OF MATERIALS

A. Credit MR 4: Building materials shall have recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content for Project constitutes a minimum of **20** percent of cost of materials used for Project.

1. Cost of postconsumer recycled content plus one-half of preconsumer recycled content of an item shall be determined by dividing weight of postconsumer recycled content plus one-half of preconsumer recycled content in the item by total weight of the item and multiplying by cost of the item.
2. Do not include [furniture, plumbing, mechanical and electrical components, and specialty items such as elevators and equipment] in the calculation.

2.3 REGIONAL MATERIALS

A. Credit MR 5: Not less than **20** percent of building materials (by cost) shall be regional materials.

2.4 LOW-EMITTING MATERIALS

A. Credit IEQ 4.1: For field applications that are inside the weatherproofing system, adhesives and sealants shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Wood Glues: 30 g/L.
2. Metal-to-Metal Adhesives: 30 g/L.
3. Adhesives for Porous Materials (except Wood): 50 g/L.
4. Subfloor Adhesives: 50 g/L.
5. Plastic Foam Adhesives: 50 g/L.
6. Carpet Adhesives: 50 g/L.
7. Carpet Pad Adhesives: 50 g/L.
8. VCT and Asphalt Tile Adhesives: 50 g/L.
9. Cove Base Adhesives: 50 g/L.
10. Gypsum Board and Panel Adhesives: 50 g/L.
11. Rubber Floor Adhesives: 60 g/L.
12. Ceramic Tile Adhesives: 65 g/L.
13. Multipurpose Construction Adhesives: 70 g/L.
14. Fiberglass Adhesives: 80 g/L.
15. Contact Adhesive: 80 g/L.
16. Structural Glazing Adhesives: 100 g/L.
17. Wood Flooring Adhesive: 100 g/L.
18. Structural Wood Member Adhesive: 140 g/L.
19. Single-Ply Roof Membrane Adhesive: 250 g/L.
20. Special-Purpose Contact Adhesive (Contact Adhesive That Is Used to Bond Melamine-Covered Board, Metal, Unsupported Vinyl, Rubber, or Wood Veneer 1/16 Inch or Less in Thickness to Any Surface): 250 g/L.
21. Top and Trim Adhesive: 250 g/L.
22. Plastic Cement Welding Compounds: 250 g/L.
23. ABS Welding Compounds: 325 g/L.
24. CPVC Welding Compounds: 490 g/L.
25. PVC Welding Compounds: 510 g/L.
26. Adhesive Primer for Plastic: 550 g/L.
27. Sheet-Applied Rubber Lining Adhesive: 850 g/L.
30. Special-Purpose Aerosol Adhesive (All Types): 70 percent by weight.
31. Other Adhesives: 250 g/L.
32. Architectural Sealants: 250 g/L.
33. Nonmembrane Roof Sealants: 300 g/L.
34. Single-Ply Roof Membrane Sealants: 450 g/L.
35. Other Sealants: 420 g/L.
36. Sealant Primers for Nonporous Substrates: 250 g/L.
37. Sealant Primers for Porous Substrates: 775 g/L.
38. Modified Bituminous Sealant Primers: 500 g/L.
39. Other Sealant Primers: 750 g/L.

B. Credit IEQ 4.2: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: VOC not more than 50 g/L.
2. Nonflat Paints and Coatings: VOC not more than 150 g/L.
3. Dry-Fog Coatings: VOC not more than 400 g/L.
4. Primers, Sealers, and Undercoaters: VOC not more than 200 g/L.
5. Anticorrosive and Antitrust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
6. Zinc-Rich Industrial Maintenance Primers: VOC not more than 340 g/L.
7. Pretreatment Wash Primers: VOC not more than 420 g/L.
8. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
9. Clear Wood Finishes, Lacquers: VOC not more than 550 g/L.
10. Floor Coatings: VOC not more than 100 g/L.
11. Shellacs, Clear: VOC not more than 730 g/L.
12. Shellacs, Pigmented: VOC not more than 550 g/L.
13. Stains: VOC not more than 250 g/L.
C. Credit IEQ 4.4: Composite wood, agrifiber products, and adhesives shall not contain urea-formaldehyde resin. All laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies shall not contain urea-formaldehyde and are compliant with VOC content limits listed above in IEQ 4.1.

PART 3 - EXECUTION

3.1 NONSMOKING BUILDING

A. Smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor-air intakes.

3.2 MEASUREMENT AND VERIFICATION

A. Credit EA 5: Implement measurement and verification plan consistent with Option B: Energy Conservation Measure Isolation in the EVO's International Performance Measurement and Verification Protocol (IPMVP), "Volume III: Concepts and Options for Determining Energy Savings in New Construction," and as further defined by the following:

1. <Insert measurement and verification plan design team submitted for credit>.

3.3 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

A. Credit IEQ 3.1: Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."

1. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Section 015000 "Temporary Facilities and Controls," install filter media having a MERV 8 according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.

2. Replace air filters immediately prior to occupancy.

3.4 INDOOR-AIR-QUALITY ASSESSMENT (PROJECT MAY NOT ATTEMPT THIS CREDIT.)

A. Flush-Out:

1. After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total volume of 14,000 cu. ft. of outdoor air per sq. ft. of floor area while maintaining an internal temperature of at least 60 deg F and a relative humidity no higher than 60 percent.

   a. <Insert operating requirements>.

2. If occupancy is desired prior to flush-out completion, the space may be occupied following delivery of a minimum of 3500 cu. ft. of outdoor air per sq. ft. of floor area to the space. Once a space is occupied, it shall be ventilated at a minimum rate of 0.30 cfm per sq. ft. of outside air or the design minimum outside air rate determined in Prerequisite IEQ 1, whichever is greater. During each day of the flush-out period, ventilation shall begin a minimum of three hours prior to
occupancy and continue during occupancy. These conditions shall be maintained until a total of 14,000 cu. ft./sq. ft. of outside air has been delivered to the space.

a. <Insert operating requirements>.

B. Air-Quality Testing: [Engage] [Owner will engage] testing agency to perform the following:


2. Demonstrate that the contaminant maximum concentrations listed below are not exceeded:

   a. Formaldehyde: 27 ppb.
   b. Particulates (PM10): 50 mcg/cu. m.
   c. Total Volatile Organic Compounds (TVOC): 500 mcg/cu. m.
   d. 4-Phenylcyclohexene (4-PH): 6.5 mcg/cu. m.
   e. Carbon Monoxide: 9 ppm and no greater than 2 ppm above outdoor levels.

3. For each sampling point where the maximum concentration limits are exceeded, conduct additional flush-out with outside air and retest the specific parameter(s) exceeded to indicate the requirements are achieved. Repeat procedure until all requirements have been met. When retesting noncomplying building areas, take samples from same locations as in the first test.

4. Air-sample testing shall be conducted as follows:

   a. All measurements shall be conducted prior to occupancy but during normal occupied hours, and with building ventilation system starting at the normal daily start time and operated at the minimum outside airflow rate for the occupied mode throughout the duration of the air testing.
   b. Building shall have all interior finishes installed including, but not limited to, millwork, doors, paint, carpet, and acoustic tiles. Nonfixed furnishings such as workstations and partitions are encouraged, but not required, to be in place for the testing.
   c. Number of sampling locations varies depending on the size of building and number of ventilation systems. For each portion of building served by a separate ventilation system, the number of sampling points shall not be less than one per 25,000 sq. ft. or for each contiguous floor area, whichever is larger, and shall include areas with the least ventilation and greatest presumed source strength.
   d. Air samples shall be collected between 3 and 6 feet from the floor to represent the breathing zone of occupants, and over a minimum four-hour period.
A/E # 14080
PPA # 13-0200
A/E # 2014-02-07

NORM ASBJORNSON HALL
MONTANA STATE UNIVERSITY
JULY 22, 2016

SECTION 01 91 13 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. OPR and BoD documentation are included by reference for information only.

1.2 SUMMARY

A. Section includes general requirements that apply to implementation of commissioning without regard to specific systems, assemblies, or components.

B. Commissioning is systematic processes to provide documented confirmation that building systems perform according to the criteria set forth in the design intent and satisfy the owner’s operational needs. This is achieved by beginning in the design phase and documenting design intent and continuing through construction, acceptance and the warranty period with actual verification of performance. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training.

C. Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:

1. Verify that applicable equipment and systems are installed according to the manufacturer’s recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
2. Verify and document proper performance of equipment and systems.
3. Verify that O&M documentation left on site is complete.
4. Verify that the Owner’s operating personnel are adequately trained.

D. The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.

E. Abbreviations. The following are common abbreviations used in the Specifications and in the Commissioning Plan. Definitions are found in Section 1.3.

A/E - Architect and design engineers
CxA - Commissioning authority
CC - Controls contractor
CM - Construction Manager
Cx - Commissioning
Cx Plan - Commissioning Plan document
EC - Electrical contractor
FT - Functional performance test

GC - General contractor (prime)
MC - Mechanical contractor
OR - Owner’s Representative
PC - Prefunctional checklist
PM - Project manager (of the Owner)
Subs - Subcontractors to General
TAB - Test and balance contractor
F. Related Sections:

1. Division 01 Section 019115 "Facilities Exterior Enclosure Commissioning" for commissioning process activities for building exterior enclosure, roof, and foundation systems, assemblies, equipment, and components.

2. Division 22 Section 220800 "Commissioning of Plumbing" for commissioning process activities for plumbing systems, assemblies, equipment, and components.

3. Division 23 Section 230800 "Commissioning of HVAC" for commissioning process activities for HVAC&R systems, assemblies, equipment, and components.

4. Division 26 Section 260800 "Commissioning of Electrical Systems" for commissioning process activities for electrical systems, assemblies, equipment, and components.

1.3 DEFINITIONS

A. Acceptance Phase: Phase of construction after startup and initial checkout when functional performance tests, O&M documentation review and training occurs.

B. Approval: Acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the Contract Documents.

C. Architect/Engineer (A/E): The prime consultant (architect) and sub-consultants who comprise the design team, generally the HVAC mechanical designer/engineer and the electrical designer/engineer.

D. BoD: Basis of Design. A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

E. CxA: Commissioning Authority. An independent agent, not otherwise associated with the A/E team members or the Contractor, hired by the Owner. The CxA directs and coordinates the day-to-day commissioning activities. The CxA does not take an oversight role like the CM. The CxA is part of the Construction Manager (CM) team or shall report directly to the CM.

F. Cx Plan: Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

G. Datalogging: Monitoring flows, currents, status, pressures, etc. of equipment using stand-alone dataloggers separate from the control system.

H. Deferred Functional Tests: FTs that are performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions that disallow the test from being performed.

I. Deficiency: A condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not complying with the design intent).

J. Design Intent: A dynamic document that provides the explanation of the ideas, concepts and criteria that are considered to be very important to the owner. It is initially the outcome of the programming and conceptual design phases.
K. **Design Narrative or Design Documentation:** Sections of either the Design Intent or Basis of Design.

L. **Factory Testing:** Testing of equipment on-site or at the factory by factory personnel with an Owner’s representative present.

M. **Functional Performance Test (FT):** Test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system’s sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not functional testing, in the commissioning sense of the word. TAB’s primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The commissioning authority develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is usually performed by the installing contractor or vendor. FTs are performed after prefunctional checklists and startup are complete.

N. **General Contractor (GC):** The prime contractor for this project. Generally refers to all the GC’s subcontractors as well. Also referred to as the Contractor, in some contexts.

O. **Indirect Indicators:** Indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100% closed.

P. **Manual Test:** Using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the “observation”).

Q. **Monitoring:** The recording of parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of control systems.

R. **Non-Compliance:** See Deficiency.

S. **Non-Conformance:** See Deficiency.

T. **Over-written Value:** Writing over a sensor value in the control system to see the response of a system (e.g., changing the outside air temperature value from 50F to 75F to verify economizer operation). See also “Simulated Signal.”

U. **OPR:** Owner’s Project Requirements. A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

V. **Prefunctional Checklist (PC):** A list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the CxA to the Sub. Prefunctional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). However, some prefunctional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three phase pump motor of a chiller system). The word prefunctional refers to before functional testing. Prefunctional checklists augment and are combined with the manufacturer’s start-up checklist. Even without a commissioning process, contractors typically perform some, if not many, of the prefunctional checklist items a commissioning authority will recommend. However, few contractors document in writing the execution of these checklist items. Therefore, for most equipment, the contractors execute the checklists on their own.
The commissioning authority only requires that the procedures be documented in writing, and does not witness much of the prefunctional checklisting, except for larger or more critical pieces of equipment.

W. **Sampling:** Functionally testing only a fraction of the total number of identical or near identical pieces of equipment.

X. **Seasonal Performance Tests:** FT that are deferred until the system(s) will experience conditions closer to their design conditions.

Y. **Simulated Condition:** Condition that is created for the purpose of testing the response of a system (e.g., applying a hair blower to a space sensor to see the response in a VAV box).

Z. **Simulated Signal:** Disconnecting a sensor and using a signal generator to send an amperage, resistance or pressure to the transducer and DDC system to simulate a sensor value.

AA. **Systems, Subsystems, Equipment, and Components:** Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

BB. **Startup:** The initial starting or activating of dynamic equipment, including executing prefunctional checklists.

CC. **Subs:** The subcontractors to the GC who provide and install building components and systems.

DD. **Test Procedures:** The step-by-step process which must be executed to fulfill the test requirements. The test procedures are developed by the CxA.

EE. **Test Requirements:** Requirements specifying what modes and functions, etc. shall be tested. The test requirements are not the detailed test procedures. The test requirements are specified in the Contract Documents.

FF. **Trending:** Monitoring using the building control system.

GG. **Vendor:** Supplier of equipment.

HH. **Warranty Period:** Warranty period for entire project, including equipment components. Warranty begins at Substantial Completion and extends for at least one year, unless specifically noted otherwise in the Contract Documents and accepted submittals.

1.4 **COORDINATION**

A. **Commissioning Team:** The members of the commissioning team consist of the Commissioning authority (CxA), the Owner's Representative (OR), the designated representative of the owner's Construction Management firm (CM), the General Contractor (GC or Contractor), the architect and design engineers (particularly the mechanical engineer), the Mechanical Contractor (MC), the Electrical Contractor (EC), the TAB representative, the Controls Contractor (CC), any other installing subcontractors or suppliers of equipment. If known, the Owner's building or plant operator/engineer is also a member of the commissioning team.

B. **Management:** The CxA is hired by the Owner directly. The CxA directs and coordinates the commissioning activities and the reports to the OR. All members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents.

C. **Scheduling:** The CxA will work with the CM and GC according to established protocols to schedule the commissioning activities. The CxA will provide sufficient notice to the CM and GC for scheduling.
commissioning activities. The GC will integrate all commissioning activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

D. The CxA will provide the initial schedule of primary commissioning events at the commissioning scoping meeting. The Commissioning Plan—Construction Phase provides a format for this schedule. As construction progresses more detailed schedules are developed by the CxA. The Commissioning Plan also provides a format for detailed schedules.

1.5 COMMISSIONING PROCESS

A. Commissioning Plan. The Commissioning Plan, provided as part of the bid documents, is binding on the Contractor. The commissioning plan provides guidance in the execution of the commissioning process. Just after the initial commissioning scoping meeting the CxA will update the plan which is then considered the “final” plan, though it will continue to evolve and expand as the project progresses. The Specifications will take precedence over the Commissioning Plan.

B. Commissioning Process. The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.

1. Commissioning during construction begins with a scoping meeting conducted by the CxA where the commissioning process is reviewed with the commissioning team members.

2. Additional meetings will be required throughout construction, scheduled by the CxA with necessary parties attending, to plan, scope, coordinate, schedule future activities and resolve problems.

3. Equipment documentation is submitted to the CxA during normal submittals, including detailed start-up procedures.

4. The CxA works with the Subs in developing startup plans and startup documentation formats, including providing the Subs with prefuctional checklists to be completed, during the startup process.

5. In general, the checkout and performance verification proceeds from simple to complex; from component level to equipment to systems and intersystem levels with prefuctional checklists being completed before functional testing.

6. The Subs, under their own direction, execute and document the prefuctional checklists and perform startup and initial checkout. The CxA documents that the checklists and startup were completed according to the approved plans. This may include the CxA witnessing start-up of selected equipment.

7. The CxA develops specific equipment and system functional performance test procedures. The Subs review the procedures.

8. The procedures are executed by the Subs, under the direction of, and documented by the CxA.

9. Items of non-compliance in material, installation or setup are corrected at the Sub’s expense and the system retested.

10. The CxA reviews the O&M documentation for completeness.

11. Commissioning is completed before Substantial Completion.

12. The CxA reviews, pre-approves and coordinates the training provided by the Subs and verifies that it was completed.

13. Deferred testing is conducted, as specified or required.
1.6 COMMISSIONING TEAM

A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, the Construction Manager (CM) and representatives of the Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

B. Members Appointed by Owner:

1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.

2. Representatives of the facility user and operation and maintenance personnel.

3. The Owners Representatives.

4. Architect and engineering design professionals.

1.7 OWNER'S RESPONSIBILITIES

A. Provide the OPR documentation to the CxA and Contractor for information and use.

B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.

C. Provide the BoD documentation, prepared by Architect and approved by Owner, to the CxA and Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

D. Follow the Commissioning Plan.

E. Attend commissioning scoping meetings and additional meetings as necessary.

1.8 OWNERS REPRESENTATIVE'S RESPONSIBILITIES

A. The Owner's Representative OR shall represent the Owner during the commissioning process as follows:

1. Manage the contract of the A/E, CxA, CM and Contractor.

2. Arrange for facility operating and maintenance personnel to attend various field commissioning activities and field training sessions according to the Commissioning Plan – Construction Phase.

3. Provide final approval for the completion of the commissioning work.

4. Ensure that any seasonal or deferred testing and any deficiency issues are addressed.

5. Follow the Commissioning Plan.

6. Attend commissioning scoping meetings and additional meetings as necessary.

1.9 ARCHITECT/ENGINEERS (AE) RESPONSIBILITIES

A. The AE shall participate in and perform commissioning process activities including, but not limited to, the following:

1. Attend the commissioning scoping meeting and selected commissioning team meetings.
2. Perform normal submittal review, construction observation, as-built drawing preparation, O&M manual preparation, etc., as contracted.
3. Provide any design narrative and sequence documentation requested by the CxA. The designers shall assist (along with the contractors) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
4. Coordinate resolution of system deficiencies identified during commissioning, according to the contract documents.
5. Prepare and submit final as-built design intent documentation for inclusion in the O&M manuals. Review and approve the O&M manuals.
6. Coordinate resolution of design non-conformance and design deficiencies identified during warranty-period commissioning.
7. Participate in the resolution of non-compliance, non-conformance and design deficiencies identified during commissioning during warranty-period commissioning.

1.10 CONSTRUCTION MANAGER’S (CM) RESPONSIBILITIES

A. The construction manager shall participate in and perform commissioning process activities including, but not limited to the following:

1. Facilitate the coordination of the commissioning work by the CxA, and, with the GC and CxA, ensure that commissioning activities are being scheduled into the master schedule.
2. Review and approve the final Commissioning Plan—Construction Phase.
3. Attend a commissioning scoping meeting and other commissioning team meetings.
4. Perform the normal review of Contractor submittals.
5. Furnish a copy of all construction documents, addenda, requests for information, change orders and approved submittals and shop drawings related to commissioned equipment to the CxA.
6. Review and approve the functional performance test procedures submitted by the CxA, prior to testing.
7. Review commissioning progress and deficiency reports.
8. Coordinate the resolution of non-compliance and design deficiencies identified in all phases of commissioning.
10. Attend commissioning scoping meetings and additional meetings as necessary.

1.11 CONTRACTOR’S RESPONSIBILITIES

A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
2. Cooperate with the CxA for resolution of issues recorded in the Issues Log.
3. Attend commissioning team meetings held on a monthly basis.
4. Integrate and coordinate commissioning process activities with construction schedule.
5. Review commissioning progress and deficiency reports.
6. Review and accept construction checklists provided by the CxA.
7. Complete paper or electronic construction checklists as Work is completed and provide to the CxA on a weekly basis.
8. Review and accept commissioning process test procedures provided by the Commissioning Authority.
10. Include the cost of commissioning in the total contract price.
11. Coordinate the training of Owner personnel and provide the times and dates of training to the CxA.
12. Execute seasonal or deferred functional performance testing witnessed by the CxA to facilitate the Cx process.
13. Provide a list of final settings, setpoints, ranges, schedules, and / or trend logs required by the CxA.
14. Follow the Commissioning Plan.
15. Attend commissioning scoping meetings and additional meetings as necessary.
16. From the red-line drawings, edit and update one-line diagrams developed as part of the design narrative documentation and those provided by the vendor as shop drawings for the chilled and hot water, condenser water, domestic water, steam and condensate systems; supply, return and exhaust air systems and emergency power system.

1.12 SUB CONTRACTOR’S RESPONSIBILITIES

A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
2. Assist in equipment testing per agreements with Prime.
3. Include all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these Contract Documents in the base bid price to the Contractor, except for stand-alone data logging equipment that may be used by the CxA.
4. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.
5. Review test procedures for equipment installed by factory representatives.
6. Follow the Commissioning Plan.
7. Attend commissioning scoping meetings and additional meetings as necessary.

1.13 EQUIPMENT SUPPLIERS RESPONSIBILITIES

A. The equipment suppliers shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
2. Assist in equipment testing per agreements with Subs.
3. Include all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these Contract Documents in the base bid price to the Contractor, except for stand-alone datalogging equipment that may be used by the CxA.
4. Through the contractors they supply products to, analyze specified products and verify that the designer has specified the newest most updated equipment reasonable for this project’s scope and budget.
5. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.
6. Review test procedures for equipment installed by factory representatives.
7. Follow the Commissioning Plan.
8. Attend commissioning scoping meetings and additional meetings as necessary.
CxA’S RESPONSIBILITIES

A. The CxA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CxA may assist with problem-solving non-conformance or deficiencies, but ultimately that responsibility resides with the general contractor and the A/E. The primary role of the CxA is to develop and coordinate the execution of a testing plan, observe and document performance—that systems are functioning in accordance with the documented design intent and in accordance with the Contract Documents. The Contractors will provide all tools or the use of tools to start, check-out and functionally test equipment and systems, except for specified testing with portable data-loggers, which shall be supplied and installed by the CxA.

1. Coordinates and directs the commissioning activities using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
2. Coordinate the commissioning work and, with the GC and CM, ensure that commissioning activities are being scheduled into the master schedule.
3. Revise, as necessary, the Commissioning Plan—Construction Phase.
4. Plan and conduct a commissioning scoping meeting and other commissioning meetings.
5. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor start-up and checkout procedures.
6. Before startup, gather and review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
7. Review and comment on normal Contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the A/E reviews.
8. Develop an enhanced start-up and initial systems checkout plan with Subs.
9. Perform site visits, as necessary, to observe component and system installations. Attends selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.
10. Witness all or part of the HVAC piping test and flushing procedure, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owner’s representative of any deficiencies in results or procedures.
11. Witness all or part of any ductwork testing and cleaning procedures, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owner’s representative of any deficiencies in results or procedures.
12. Approve prefunctional tests and checklist completion by reviewing prefunctional checklist reports and by selected site observation and spot checking.
13. Approve systems startup by reviewing start-up reports and by selected site observation.
15. Oversee sufficient functional testing of the control system and approve it to be used for TAB, before TAB is executed.
16. Approve air and water systems balancing by spot testing, by reviewing completed reports and by selected site observation.
17. With necessary assistance and review from installing contractors, write the functional performance test procedures for equipment and systems. This may include energy management control system trending, stand-alone datalogger monitoring or manual functional testing. Submit to CM for review, and for approval if required.
19. Coordinate, witness and approve manual functional performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved.
20. Maintain a master deficiency and resolution log and a separate testing record. Provide the CM with written progress reports and test results with recommended actions.
21. Witness performance testing of smoke control systems by others and all other owner contracted tests or tests by manufacturer’s personnel over which the CxA may not have direct control.
Document these tests and include this documentation in Commissioning Record in O&M manuals.

22. Review equipment warranties to ensure that the Owner’s responsibilities are clearly defined.
23. Oversee and approve the training of the Owner’s operating personnel.
24. Compile and maintain a commissioning record and building systems book(s).
25. Review and approve the preparation of the O&M manuals.
26. Provide a final commissioning report.
27. Coordinate and supervise required seasonal or deferred testing and deficiency corrections.
28. Return to the site at 10 months into the 12 month warranty period and review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal commissioning. Also interview facility staff and identify problems or concerns they have operating the building as originally intended. Make suggestions for improvements and for recording these changes in the O&M manuals. Identify areas that may come under warranty or under the original construction contract. Assist facility staff in developing reports, documents and requests for services to remedy outstanding problems.

1.15 SYSTEMS TO BE COMMISSIONED

A. The systems to be commissioned in this project are listed in sections 019115, 220800, 230800, and 260800.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the Division contractor for the equipment being tested. For example, the mechanical contractor of Division 23 shall ultimately be responsible for all standard testing equipment for the HVAC system and controls system in Division 23, except for equipment specific to and used by TAB in their commissioning responsibilities. Two-way radios shall be provided by the Division Contractor.

B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price to the Contractor and left on site, except for stand-alone datalogging equipment that may be used by the CxA.

C. Datalogging equipment and software required to test equipment will be provided by the CxA, but shall not become the property of the Owner.

D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer’s recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

E. Refer to Section 019113, Part 3.6 E for details regarding equipment that may be required to simulate required test conditions.
3.1 MEETINGS

A. Scoping Meeting. Within 90 days of commencement of construction, the CxA will schedule, plan and conduct a commissioning scoping meeting with the entire commissioning team in attendance. Meeting minutes will be distributed to all parties by the CxA. Information gathered from this meeting will allow the CxA to revise the Commissioning Plan to its “final” version, which will also be distributed to all parties.

B. Miscellaneous Meetings. Other meetings will be planned and conducted by the CxA as construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with particular Subs. The CxA will plan these meetings and will minimize unnecessary time being spent by Subs. These meetings may be held monthly, until the final 3 months of construction when they may be held as frequently as one per week.

3.2 REPORTING

A. The CxA will provide regular reports to the CM and the OR, with increasing frequency as construction and commissioning progresses. Standard forms are provided and referenced in the Commissioning Plan.

B. The CxA will regularly communicate with all members of the commissioning team, keeping them apprised of commissioning progress and scheduling changes through memos, progress reports, etc.

C. Testing or review approvals and non-conformance and deficiency reports are made regularly with the review and testing as described in later sections.

D. A final summary report (about four to six pages, not including backup documentation) by the CxA will be provided to the CM and OR, focusing on evaluating commissioning process issues and identifying areas where the process could be improved. All acquired documentation, logs, minutes, reports, deficiency lists, communications, findings, unresolved issues, etc., will be compiled in appendices and provided with the summary report. Prefunctional checklists, functional tests and monitoring reports will not be part of the final report, but will be stored in the Commissioning Record in the O&M manuals.

E. The sample reports included in Appendix-B are to provide contractors with an example of a format and an indication of the rigor of the required documentation for various report types. They were not developed for this project.

3.3 SUBMITTALS

A. The CxA will be included in any submittal exchange protocol, and will be expected to review the below submittals in coordination with the design team. The CxA will provide appropriate contractors with a specific request for any additional submittal documentation the CxA requires to facilitate the commissioning work. These requests will be integrated into the normal submittal process and protocol of the construction team. At minimum, the request will include the manufacturer and model number, the manufacturer’s printed installation and detailed start-up procedures, full sequences of operation, O&M data, performance data, any performance test procedures, control drawings and details of owner contracted tests. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning authority. All documentation requested by the CxA will be included by the Subs in their O&M manual contributions.

1. Requested Submittals:
GENERAL COMMISSIONING REQUIREMENTS

A. Air Handling Units
B. Heat pumps
C. Automatic Transfer Switch
D. Building Automation/Temperature Controls
E. Pumps
F. Heat Exchangers
G. Dry Cooler
H. Domestic Water Heaters
I. Emergency Generator
J. Exhaust Fans
K. Lighting Controls
L. VAV Terminal Unit Boxes
M. Variable Frequency / Variable Speed Drives

2. Requested Shop Drawings:
   A. Building Distribution Piping
   B. Ductwork
   C. Lighting Control System
   D. Temperature Control System

B. The Commissioning authority will review and provide comment on submittals related to the commissioned equipment for conformance to the Contract Documents as it relates to the commissioning process, to the functional performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of functional testing procedures and only secondarily to verify compliance with equipment specifications. The Commissioning authority will notify the CM, Owner Representative, or A/E as requested, of items missing or areas that are not in conformance with Contract Documents and which require resubmission.

C. The CxA may request additional design narrative from the A/E and Controls Contractor, depending on the completeness of the design intent documentation and sequences provided with the Specifications.

D. These submittals to the CxA do not constitute compliance for O&M manual documentation. The O&M manuals are the responsibility of the Contractor, though the CxA will review and approve them.

E. Contractor’s responsibility for deviations in submittals from requirements of the Contract Documents is not relieved by the Commissioning Authority’s review.

3.4 START-UP, PREFUNCTIONAL CHECKLISTS AND INITIAL CHECKOUT

A. The following procedures apply to all equipment to be commissioned, according to Section 1.13, Systems to be Commissioned. Some systems that are not comprised so much of actual dynamic machinery, e.g., electrical system power quality, may have very simplified PCs and startup.

B. General. Prefunctional checklists are important to ensure that the equipment and systems are hooked up and operational. It ensures that functional performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full prefunctional checkout. No sampling strategies are used. The prefunctional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.

C. Start-up and Initial Checkout Plan. The CxA shall assist the commissioning team members responsible for startup of any equipment in developing detailed start-up plans for all equipment. The primary role of the CxA in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures have been completed. Parties responsible for prefunctional checklists and startup are identified in the commissioning scoping meeting and in the checklist forms.
1. The CxA adapts, if necessary, the representative prefunctional checklists and procedures from Section 230800 and 260800. These checklists indicate required procedures to be executed as part of startup and initial checkout of the systems and the party responsible for their execution.

2. These checklists and tests are provided by the CxA to the Contractor. The Contractor determines which trade is responsible for executing and documenting each of the line item tasks and notes that trade on the form. Each form will have more than one trade responsible for its execution.

3. The subcontractor responsible for the purchase of the equipment develops the full start-up plan by combining (or adding to) the CxA’s checklists with the manufacturer’s detailed start-up and checkout procedures from the O&M manual and the normally used field checkout sheets. The plan will include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan. The full start-up plan could consist of something as simple as:

   a. The CxA’s prefunctional checklists.
   b. The manufacturer’s standard written start-up procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.
   c. The manufacturer’s normally used field checkout sheets.

4. The subcontractor submits the full startup plan to the CxA for review and approval.

5. The CxA reviews and approves the procedures and the format for documenting them, noting any procedures that need to be added.

6. The full start-up procedures and the approval form may be provided to the CM for review and approval, depending on management protocol.

D. Sensor and Actuator Calibration.

1. All field-installed temperature, relative humidity, CO, CO₂ and pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated using the methods described below. Alternate methods may be used, if approved by the Owner before-hand. All test instruments shall have had a certified calibration within the last 12 months. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.

2. All procedures used shall be fully documented on the prefunctional checklists or other suitable forms, clearly referencing the procedures followed and written documentation of initial, intermediate and final results.


   a. All Sensors. Verify that all sensor locations are appropriate and away from causes of erratic operation. Verify that sensors with shielded cable, are grounded only at one end. For sensor pairs that are used to determine a temperature or pressure difference, make sure they are reading within 0.2°F of each other for temperature and within a tolerance equal to 2% of the reading, of each other, for pressure. Tolerances for critical applications may be tighter.

   b. Sensors Without Transmitters---Standard Application. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, install offset in BAS, calibrate or replace sensor.

   c. Sensors With Transmitters---Standard Application. Disconnect sensor. Connect a signal generator in place of sensor. Connect ammeter in series between transmitter and BAS control panel. Using manufacturer's resistance-temperature data, simulate minimum desired temperature. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the BAS. Record all values and recalibrate controller as...
necessary to conform with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction. Reconnect sensor. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, replace sensor and repeat. For pressure sensors, perform a similar process with a suitable signal generator.

d. Critical Applications. For critical applications (process, manufacturing, etc.) more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.

Tolerances, Standard Applications

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Required Tolerance (+/-)</th>
<th>Sensor</th>
<th>Required Tolerance (+/-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling coil, chilled and condenser water temps</td>
<td>0.4F</td>
<td>Flow rates, water</td>
<td>4% of design</td>
</tr>
<tr>
<td>AHU wet bulb or dew point</td>
<td>2.0F</td>
<td>Relative humidity</td>
<td>4% of design</td>
</tr>
<tr>
<td>Hot water coil and boiler water temp</td>
<td>1.5F</td>
<td>Combustion flue temps</td>
<td>5.0F</td>
</tr>
<tr>
<td>Outside air, space air, duct air temps</td>
<td>0.4F</td>
<td>Oxygen or CO₂ monitor</td>
<td>0.1 % pts</td>
</tr>
<tr>
<td>Watthour, voltage &amp; amperage</td>
<td>1% of design</td>
<td>CO monitor</td>
<td>0.01 % pts</td>
</tr>
<tr>
<td>Pressures, air, water and gas</td>
<td>3% of design</td>
<td>Natural gas and oil flow rate</td>
<td>1% of design</td>
</tr>
<tr>
<td>Flow rates, air</td>
<td>10% of design</td>
<td>Steam flow rate</td>
<td>3% of design</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Barometric pressure</td>
<td>0.1 in. of Hg</td>
</tr>
</tbody>
</table>

4. Valve and Damper Stroke Setup and Check.

a. EMS Readout. For all valve and damper actuator positions checked, verify the actual position against the BAS readout.

b. Set pumps or fans to normal operating mode. Command valve or damper closed, visually verify that valve or damper is closed and adjust output zero signal as required. Command valve or damper open, verify position is full open and adjust output signal as required. Command valve or damper to a few intermediate positions. If actual valve or damper position doesn’t reasonably correspond, replace actuator or add pilot positioner (for pneumatics).

5. Closure for heating coil valves (NO): Set heating setpoint 20°F above room temperature. Observe valve open. Remove control air or power from the valve and verify that the valve stem and actuator position do not change. Restore to normal. Set heating setpoint to 20°F below room temperature. Observe the valve close. For pneumatics, by override in the EMS, increase pressure to valve by 3 psi (do not exceed actuator pressure rating) and verify valve stem and actuator position does not change. Restore to normal.

6. Closure for cooling coil valves (NC): Set cooling setpoint 20°F above room temperature. Observe the valve close. Remove control air or power from the valve and verify that the valve stem and actuator position do not change. Restore to normal. Set cooling setpoint to 20°F below room temperature. Observe valve open. For pneumatics, by override in the EMS, increase pressure to valve by 3 psi (do not exceed actuator pressure rating) and verify valve stem and actuator position does not change. Restore to normal.

E. Execution of Prefunctional Checklists and Startup.

1. Four weeks prior to startup, the Subs and vendors schedule startup and checkout with the CM, GC and CxA. The performance of the prefuctional checklists, startup and checkout are directed
and executed by the Sub or vendor. When checking off prefunctional checklists, signatures may be required of other Subs for verification of completion of their work.

2. The CxA shall observe, at minimum, the procedures for each piece of primary equipment, unless there are multiple units, (in which case a sampling strategy may be used as approved by the CM). In no case will the number of units witnessed be less than four on any one building, nor less than 20% of the total number of identical or very similar units.

3. For lower-level components of equipment, (e.g., VAV boxes, sensors, controllers), the CxA shall observe a sampling of the prefunctional and start-up procedures. The sampling procedures are identified in the commissioning plan.

4. The Subs and vendors shall execute startup and provide the CxA with a signed and dated copy of the completed start-up and prefunctional tests and checklists.

5. Only individuals that have direct knowledge and witnessed that a line item task on the prefunctional checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.

F. Deficiencies, Non-Conformance and Approval in Checklists and Startup.

1. The Subs shall clearly list any outstanding items of the initial start-up and prefunctional procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies are provided to the CxA within two days of test completion.

2. The CxA reviews the report and submits either a non-compliance report or an approval form to the Sub or CM. The CxA shall work with the Subs and vendors to correct and retest deficiencies or uncompleted items. The CxA will involve the CM and others as necessary. The installing Subs or vendors shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, and shall notify the CxA as soon as outstanding items have been corrected and resubmit an updated start-up report and a Statement of Correction on the original non-compliance report. When satisfactorily completed, the CxA recommends approval of the execution of the checklists and startup of each system to the CM using a standard form.

3. Items left incomplete, which later cause deficiencies or delays during functional testing may result in back charges to the responsible party. Refer to Part 3.7 herein for details.

3.5 PHASED COMMISSIONING

A. The project requires TAB, startup and performance testing to be executed in phases. Phasing shall be coordinated with the owner/CM, CxA, and A/E and be reflected in the overall project schedule and commissioning schedule by the contractor. Final performance testing of all systems will be as required by the phasing plan. The performance testing of the “systems as a whole” will be performed before final turnover of the entire project.

3.6 FUNCTIONAL PERFORMANCE TESTING

A. This sub-section applies to all commissioning functional testing for all divisions.

B. The general list of equipment to be commissioned is found in Section 019113, Part 1.13. The specific equipment and modes to be tested are found in Sections 230993, and 260800.

C. Objectives and Scope. The objective of functional performance testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.
1. In general, each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested.

2. Development of Test Procedures. Before test procedures are written, the CxA shall obtain all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. The CxA shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Each Sub or vendor responsible to execute a test, shall provide limited assistance to the CxA in developing the procedures review (answering questions about equipment, operation, sequences, etc.). Prior to execution, the CxA shall provide a copy of the test procedures to the Sub(s) who shall review the tests for feasibility, safety, equipment and warranty protection. The CxA may submit the tests to the A/E for review, if requested.

3. The CxA shall review owner-contracted, factory testing or required owner acceptance tests which the CxA is not responsible to oversee, including documentation format, and shall determine what further testing or format changes may be required to comply with the Specifications. Redundancy of testing shall be minimized.

4. The purpose of any given specific test is to verify and document compliance with the stated criteria of acceptance given on the test form.

5. Representative test formats and examples (not designed for this facility) are found in the appendices to Divisions 22, 23, and 26. The test procedure forms developed by the CxA shall include (but not be limited to) the following information:
   a. System and equipment or component name(s)
   b. Equipment location and ID number
   c. Unique test ID number, and reference to unique prefunctional checklist and start-up documentation ID numbers for the piece of equipment
   d. Date
   e. Project name
   f. Participating parties
   g. A copy of the specification section describing the test requirements
   h. A copy of the specific sequence of operations or other specified parameters being verified
   i. Formulas used in any calculations
   j. Required pre-test field measurements
   k. Instructions for setting up the test.
   l. Special cautions, alarm limits, etc.
   m. Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format
   n. Acceptance criteria of proper performance with a Yes / No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.
   o. A section for comments
   p. Signatures and date block for the CxA

D. Test Methods.

1. Functional performance testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system’s trend log capabilities or by stand-alone dataloggers. The CxA may substitute specified methods or require an additional method to be executed, other than what was specified, with the approval of the CM. This may require a change
order and adjustment in charge to the Owner. The CxA will determine which method is most appropriate for tests that do not have a method specified.

2. Simulated Conditions. Simulating conditions (not by an overwritten value) shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.

3. Overwritten Values. Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be erroneous or not applicable. Simulating a condition is preferable, e.g., for the above case, by heating the outside air sensor with a hair blower rather than overwriting the value or by altering the appropriate setpoint to see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.

4. Simulated Signals. Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or over-written values.

5. Altering Setpoints. Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the AC compressor lockout work at an outside air temperature below 55F, when the outside air temperature is above 55F, temporarily change the lockout setpoint to be 2F above the current outside air temperature.

6. Indirect Indicators. Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses. Much of this verification is completed during prefunctional testing.

7. Setup. Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible. The Sub executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Sub shall return all affected building equipment and systems, due to these temporary modifications, to their pre-test condition.

8. Sampling. Multiple identical pieces of non-life-safety or otherwise non-critical equipment may be functionally tested using a sampling strategy. Significant application differences and significant sequence of operation differences in otherwise identical equipment invalidates their common identity. A small size or capacity difference, alone, does not constitute a difference. It is noted that no sampling by Subs is allowed in prefunctional checklist execution.

a. A common sampling strategy referenced in the Specifications as the “xx% Sampling—yy% Failure Rule” is defined by the following example.

\[ xx = \text{the percent of the group of identical equipment to be included in each sample.} \]

\[ yy = \text{the percent of the sample that if failing, will require another sample to be tested.} \]

b. The example below describes a 20% Sampling—10% Failure Rule.

1) Randomly test at least 20% (xx) of each group of identical equipment. In no case test less than three units in each group. This 20%, or three, constitute the “first sample.”

2) If 10% (yy) of the units in the first sample fail the functional performance tests, test another 20% of the group (the second sample).

3) If 10% of the units in the second sample fail, test all remaining units in the whole group.

4) If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the CxA may stop the testing and require the responsible Sub to perform and document a checkout of the remaining units, prior to continuing with functionally testing the remaining units.
E. Coordination and Scheduling. The Subs shall provide sufficient notice to the CxA regarding their completion schedule for the prefunctional checklists and startup of all equipment and systems. The CxA will schedule functional tests through the CM, GC and affected Subs. The CxA shall direct, witness and document the functional testing of all equipment and systems. The Subs shall execute the tests.

1. In general, functional testing is conducted after prefunctional testing and startup has been satisfactorily completed. The control system is sufficiently tested and approved by the CxA before it is used for TAB or to verify performance of other components or systems. The air balancing and water balancing is completed and debugged before functional testing of air-related or water-related equipment or systems. Testing proceeds from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems is checked.

F. Test Equipment. Refer to Section 019113, Part 2 for test equipment requirements.

G. Problem Solving. The CxA will recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the GC, Subs and A/E.

3.7 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

A. Documentation. The CxA shall witness and document the results of all functional performance tests using the specific procedural forms developed for that purpose. Prior to testing, these forms are provided to the CM for review and approval and to the Subs for review. The CxA will include the filled out forms in the O&M manuals.

B. Non-Conformance.

1. The CxA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted and reported to the CM on a standard non-compliance form.

2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA. In such cases the deficiency and resolution will be documented on the procedure form.

3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CxA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the CM.

4. As tests progress and a deficiency is identified, the CxA discusses the issue with the executing contractor.

a. When there is no dispute on the deficiency and the Sub accepts responsibility to correct it:

1) The CxA documents the deficiency and the Sub’s response and intentions and they go on to another test or sequence. After the day’s work, the CxA submits the non-compliance reports to the CM for signature, if required. A copy is provided to the Sub and CxA. The Sub corrects the deficiency, signs the statement of correction at the bottom of the non-compliance form certifying that the equipment is ready to be retested and sends it back to the CxA.

2) The CxA reschedules the test and the test is repeated.

b. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:

1) The deficiency shall be documented on the non-compliance form with the Sub’s response and a copy given to the CM and to the Sub representative assumed to be responsible.
2) Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E. Final acceptance authority is with the Project Manager.

3) The CxA documents the resolution process.

4) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, signs the statement of correction on the non-compliance form and provides it to the CxA. The CxA reschedules the test and the test is repeated until satisfactory performance is achieved.

5. Cost of Retesting.

   a. The cost for the Sub to retest a prefunctional or functional test, if they are responsible for the deficiency, shall be theirs. If they are not responsible, any cost recovery for retesting costs shall be negotiated with the GC.

   b. For a deficiency identified, not related to any prefunctional checklist or start-up fault, the following shall apply: The CxA and CM will direct the retesting of the equipment once at no “charge” to the GC for their time. However, the CxA’s and CM’s time for a second retest will be charged to the GC, who may choose to recover costs from the responsible Sub.

   c. The time for the CxA and CM to direct any retesting required because a specific prefunctional checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, will be backcharged to the GC, who may choose to recover costs from the party responsible for executing the faulty prefunctional test.

   d. Refer to the sampling section of Section 019113, Part 3.6 for requirements for testing and retesting identical equipment.

6. The Contractor shall respond in writing to the CxA and CM at least as often as commissioning meetings are being scheduled concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.

7. The CxA retains the original non-conformance forms until the end of the project.

8. Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for a time extension by the prime contractor.

C. Failure Due to Manufacturer Defect. If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the CM or OR. In such case, the Contractor shall provide the Owner with the following:

1. Within one week of notification from the CM or OR, the Contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the CM or OR within two weeks of the original notice.

2. Within two weeks of the original notification, the Contractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.

3. The CM or OR will determine whether a replacement of all identical units or a repair is acceptable.

4. Two examples of the proposed solution will be installed by the Contractor and the CM will be allowed to test the installations for up to one week, upon which the CM or OR will decide whether to accept the solution.

5. Upon acceptance, the Contractor and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.
D. Approval. The CxA notes each satisfactorily demonstrated function on the test form. Formal approval of the functional test is made later after review by the CxA and by the CM, if necessary. The CxA recommends acceptance of each test to the CM using a standard form. The CM gives final approval on each test using the same form, providing a signed copy to the CxA and the Contractor.

3.8 DEFERRED TESTING

A. Unforeseen Deferred Tests. If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and functional testing may be delayed upon approval of the OR. These tests will be conducted in the same manner as the seasonal tests as soon as possible. Services of necessary parties will be negotiated.

B. Seasonal Testing. During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system’s design) shall be completed as part of this contract. The CxA shall coordinate this activity. Tests will be executed, documented and deficiencies corrected by the appropriate Subs, with facilities staff and the CxA witnessing. Any final adjustments to the O&M manuals and as-builds due to the testing will be made.

3.9 TRAINING OF OWNER PERSONNEL

A. The CM shall be responsible for training coordination and scheduling and ultimately for ensuring that training is completed.

B. The CxA shall be responsible for overseeing and approving the content and adequacy of the training of Owner personnel for commissioned equipment.

1. The CxA shall interview the facility manager and lead engineer to determine the special needs and areas where training will be most valuable. The Owner and CxA shall decide how rigorous the training should be for each piece of commissioned equipment. The CxA shall communicate the results to the Subs and vendors who have training responsibilities. In addition to these general requirements, the specific training requirements of Owner personnel by Subs and vendors is specified in Division 22, 23, and 26.

2. Each Sub and vendor responsible for training will submit a written training plan to the CxA for review and approval prior to training. The plan will cover the following elements:
   a. Equipment (included in training)
   b. Intended audience
   c. Location of training
   d. Objectives
   e. Subjects covered (description, duration of discussion, special methods, etc.)
   f. Duration of training on each subject
   g. Instructor for each subject
   h. Methods (classroom lecture, video, site walk-through, actual operational demonstrations, written handouts, etc.)
   i. Instructor and qualifications
   j. For the primary HVAC equipment, the Controls Contractor shall provide a short discussion of the control of the equipment during the mechanical or electrical training conducted by others.

3. The CxA develops an overall training plan and coordinates and schedules, with the CM and GC, the overall training for the commissioned systems. The CxA develops criteria for determining that the training was satisfactorily completed, including attending some of the training, etc. The CxA recommends approval of the training to the CM using a standard form. The CM also signs the
approval form at one of the training sessions, the CxA presents a one hour presentation discussing the use of the blank functional test forms for re-commissioning equipment. Video recording of the training sessions will be provided by the Trade Contractor with media cataloged by the CxA and added to the O&M manuals.

4. The mechanical design engineer shall at the first training session for each trade group present the overall system design concept and the design concept of each equipment section. This presentation shall be one to two hours in length and include a review of all systems using the simplified system schematics (one-line drawings) including chilled water systems, condenser water or heat rejection systems, heating systems, fuel oil and gas supply systems, supply air systems, exhaust system and outside air strategies.

3.10 OPERATION AND MAINTENANCE MANUALS

A. Standard O&M Manuals.

1. The specific content and format requirements for the standard O&M manuals are detailed in Section 017823.

2. Contractor shall submit two draft copies of the complete operating and maintenance manual to the CM for review by the architect/engineer and CxA within 60 calendar days after review of equipment shop drawings. One copy will be returned to the contractor within 30 days after receipt by the A/E.

3. Contractor shall submit corrected final approved manuals prior to substantial completion. Prior to final submittal, the CxA shall review the O&M manuals (in addition to the initial draft O&M manual), and documentation, with redline as-builds, for systems that were commissioned to verify compliance with the specifications. The CxA will communicate, through the CM, deficiencies in the manuals to the contractor or A/E, as requested. Upon a successful review of the corrections, the CxA will recommend approval and acceptance of these sections of the O&M manuals to the CM. The CxA will also review each equipment warranty and verify that all requirements to keep the warranty valid are clearly stated. This work does not supersede the A/E’s review of the O&M manuals according to the A/E’s contract.

4. A/E Contribution. The A/E will include in the beginning of the O&M manuals a separate section describing the systems including:

a. The design intent narrative prepared by the A/E and provided as part of the bid documents, updated to as-built status by the A/E.

b. Simplified professionally drawn single line system diagrams on 8 ½” x 11” or 11” x 17” sheets. These shall include chillers, water system, condenser water system, heating system, supply air systems, exhaust systems and electrical distribution system. These shall show major pieces of equipment such as pumps, chillers, boilers, control valves, expansion tanks, coils, service valves, switchboards, motor control centers, panel boards, etc.

5. CxA Review and Approval. Prior to substantial completion, the CxA shall review the O&M manuals, documentation and redline as-builds for systems that were commissioned to verify compliance with the Specifications. The CxA will communicate deficiencies in the manuals to the CM, OR or A/E, as requested. Upon a successful review of the corrections, the CxA recommends approval and acceptance of these sections of the O&M manuals to the CM, OR or A/E. The CxA also reviews each equipment warranty and verifies that all requirements to keep the warranty valid are clearly stated. This work does not supersede the A/E’s review of the O&M manuals according to the A/E’s contract.

B. Final Report
1. Final Report Details. The final commissioning report shall include an executive summary, list of participants and roles, brief building description, overview of commissioning and testing scope and a general description of testing and verification methods. For each piece of commissioned equipment, the report should contain the disposition of the commissioning authority regarding the adequacy of the equipment, documentation and training meeting the contract documents in the following areas: 1) Equipment meeting the equipment specifications, 2) Equipment installation, 3) Functional performance and efficiency, 4) Equipment documentation and design intent, and 5) Operator training. All outstanding non-compliance items shall be specifically listed. Recommendations for improvement to equipment or operations, future actions, commissioning process changes, etc. shall also be listed. Each non-compliance issue shall be referenced to the specific functional test, inspection, trend log, etc. where the deficiency is documented. The functional performance and efficiency section for each piece of equipment shall include a brief description of the verification method used (manual testing, BAS trend logs, data loggers, etc.) and include observations and conclusions from the testing.

2. Other documentation will be retained by the CxA

3.11 WRITTEN WORK PRODUCTS

A. The commissioning process generates a number of written work products described in various parts of the Specifications. The Commissioning Plan—Construction Phase, lists all the formal written work products, describes briefly their contents, who is responsible to create them, their due dates, who receives and approves them and the location of the specification to create them. In summary, the written products are:

<table>
<thead>
<tr>
<th>Product</th>
<th>Developed By</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Final commissioning plan</td>
<td>CxA</td>
</tr>
<tr>
<td>2. Cx meeting minutes</td>
<td>CxA</td>
</tr>
<tr>
<td>3. Commissioning schedules</td>
<td>CxA with GC and CM</td>
</tr>
<tr>
<td>4. Equipment documentation submittals</td>
<td>Subs</td>
</tr>
<tr>
<td>5. Sequence clarifications</td>
<td>Subs and A/E as needed</td>
</tr>
<tr>
<td>5. Prefunctional checklists</td>
<td>Subs and CxA</td>
</tr>
<tr>
<td>6. Startup and initial checkout plan</td>
<td>Subs and CxA (compilation of existing documents)</td>
</tr>
<tr>
<td>7. Startup and initial checkout forms filled out</td>
<td>Subs</td>
</tr>
<tr>
<td>8. Final TAB report</td>
<td>TAB</td>
</tr>
<tr>
<td>9. Issues log (deficiencies)</td>
<td>CxA</td>
</tr>
<tr>
<td>10. Commissioning Progress Record</td>
<td>CxA</td>
</tr>
<tr>
<td>11. Deficiency reports</td>
<td>CxA</td>
</tr>
<tr>
<td>12. Functional test forms</td>
<td>CxA</td>
</tr>
<tr>
<td>13. Filled out functional tests</td>
<td>CxA</td>
</tr>
<tr>
<td>14. O&amp;M manuals</td>
<td>Subs</td>
</tr>
<tr>
<td>15. Systems Manual</td>
<td>CxA and Subs</td>
</tr>
<tr>
<td>16. Commissioning record book</td>
<td>CxA</td>
</tr>
<tr>
<td>17. Overall training plan</td>
<td>CxA and CM</td>
</tr>
<tr>
<td>18. Specific training agendas</td>
<td>Subs</td>
</tr>
<tr>
<td>19. Final commissioning report</td>
<td>CxA</td>
</tr>
<tr>
<td>20. Misc. approvals</td>
<td>CxA</td>
</tr>
</tbody>
</table>
1.1 SUMMARY

A. This Section includes general commissioning requirements for the building exterior enclosure, including, but not limited to the following:

1. Statement of energy code compliance requirements and project approach to demonstrating compliance to said code
2. Roles and responsibilities regarding compliance to the energy code
3. References to related documents and specifications sections

B. The materials, components, systems, and assemblies that comprise the above and below-grade building exterior enclosure will be evaluated and tested as outlined in this Section, as well as in accordance with each of the technical Sections associated with the design and construction of the building exterior enclosure. These sections within the specifications, along with any additional testing plan provided as part of the construction documents will constitute the Building Enclosure Commissioning Plan (BECP). The purpose of the BECP will be to provide a process for independent, third-party verification that the performance of the installed building exterior enclosure meets or exceeds the minimum performance requirements set forth by the contract documents for this project.

C. The minimum performance requirements for the building exterior enclosure for this project are defined by the International Energy Conservation Code (IECC) 2012, and all other applicable codes as defined in the construction documents.

D. Unless otherwise agreed to in writing between the Owner and Contractor, the BECP will be managed by a registered architect, professional engineer, or other qualified Commissioning Authority (CA) retained by the Owner.

E. The owner may elect to make the Building Enclosure Commissioning (BECx) a part of the scope of the CA responsible for other building commissioning scopes (e.g. MEP), or may contract directly with a Building Enclosure Commissioning Provider or other qualified professional that is a separate entity from the general building CA. If BECx is included in the scope of the general building CA, the CA may employ the work of qualified BECx sub-consultants as needed so long as the Owner is aware of and approves such arrangements.

F. The qualified professional responsible for managing the BECP will herein be referred to as the “Building Enclosure Commissioning Provider”, but it is understood that this entity may be referred to by other terms in other sections of the Project Specifications. For example, the Building Enclosure Commissioning Provider may be the same entity as or a sub consultant of the general building Commissioning Authority referred to as such elsewhere in this document.

G. The BECP will include, by reference, all requirements set forth by the Architect-of-Record for pre-construction laboratory and field performance testing of the materials, components, systems and assemblies that comprise the building exterior enclosure. In that context, it should be understood by all parties to this project that:
1. Full and complete compliance with the building exterior enclosure performance requirements set forth by the Architect-of-Record in the Basis-of-Design (BOD) or elsewhere in the construction documents for this project will be required to achieve successful “commissioning” of the building exterior enclosure.

2. The requirements of this Section shall in no way relieve the Owner, Contractor, Architect-of-Record and other parties to this project of their respective contractual obligations to the Owner for meeting the specified performance levels in the design and construction of this project.

3. The commissioning requirements of the general contractor and sub-contractor or trade responsible for the final detailing and construction of the building exterior enclosure are included in this Section as well as in each of the technical specification Sections included in this Project Specification as they relate to the design and construction of the building exterior enclosure for this project (Divisions 2 through 26).

H. The Building Enclosure Commissioning Provider will provide regular written summaries (Reports) of the work in progress during the construction of the building exterior enclosure. These reports will include, but may not be limited to, photographs, sketches and diagrams as required illustrating conditions observed in the field, especially deficiencies noted, together with proposed solutions for those conditions where appropriate for further review and acceptance by the Architect-of-Record for the project. Any changes to the contract documents arising out of the Building Enclosure Commissioning Program must be submitted, reviewed, and accepted in writing, by the Architect-of-Record and Owner and submitted with a series of details/schematics and material specifications to the Contractor for pricing prior to implementation on the project. The Contractor shall be responsible for coordinating and managing the commissioning responsibilities of each of the subcontractors responsible for the building exterior enclosure.

1.2 RELATED SECTIONS:

1. Division 1 Section 019113 "General Commissioning Requirements" for general requirements for commissioning processes.

2. Technical specification sections in Division 2 through Division 26 wherever specifications describe requirements regarding materials, components, systems, assemblies and construction methods (including means of sealing penetrations through the enclosure) that comprise the building exterior enclosure.
PART 2 - RELATED WORK

2.1 GENERAL CONTRACTOR’S (and/or CONSTRUCTION MANAGEMENT COMPANY) RESPONSIBILITIES

A. Cooperate with the Building Enclosure Commissioning Provider (may be the same entity as the general building Commissioning Authority), provide access to work, and provide adequate schedule for the work for commissioning tasks.

B. Furnish copies of all shop drawings, manufacturer’s literature, installation instructions, maintenance information, schedules, warranties or other information as requested.

C. Provide qualified personnel for assistance to complete the commissioning tests, including seasonal testing and all required air and water leakage testing for elements of the building exterior enclosure as defined within the BECP.

D. Submit a copy of the General Contractor’s project and site specific Quality Assurance program to be implemented for construction for review by the Architect of Record, the Owner and Owner representatives, the Building Enclosure Commissioning Provider prior to beginning construction and prior to the kick-off meeting of the Building Enclosure Commissioning Process.

E. Participate and ensure all subcontractors utilized for work on this contract participate in a BEC specific meeting prior to beginning construction with the various members of the design and construction teams, including, but not limited to, the Owner, Owner's representatives, Architect of Record, Building Enclosure Commissioning Provider, Mechanical Engineer, suppliers, and manufacturer technical representatives. The subcontractors that must attend this meeting include all subcontractors that will be involved in the construction of the building exterior enclosure, including, but not limited to, the roofing, wall system (including installers for the façade system, including, but not limited to, the masonry, stone, metal panel, siding, EIFS, etc. and installers for the air barrier system and drainage plane and flashing and water management system), flashing, sealant, fenestration, concrete, steel, HVAC, electrical, interior framing and drywall contractors. This meeting will be to discuss construction sequencing and the coordination of trades and the General Contractor’s project and site-specific Quality Assurance program to be implemented that will be completed during construction of the building exterior enclosure.

F. Chair regular Building Enclosure Quality Assurance Meetings with the appropriate subcontractors in attendance, to review and discuss issues and concerns related to the building exterior enclosure noted by the Architect of Record, the Building Enclosure Commissioning Provider, and the Owner or Owner’s representative, during the previous week and what action will be taken to address the noted non-conformances. Maintain a summary of non-conformances and current status.

G. On-site Mock-ups: The Contractor is to complete and participate in the construction of on-site mock-ups as defined within the BECP to check constructability, including elements of the building exterior enclosure, including but not limited to a wall-to-window interfaces and roof-to-wall interfaces. The Contractor shall provide personnel to be present and have a representative present from each trade and/or subcontractor associated with installing the system during building exterior enclosure air and water leakage performance testing on the mock-up, as indicated within the BECP. Personnel from each trade that will be completing the work in the field are to be utilized to construct each required mock-up. Provide a written protocol, timeline for repair of any deficiencies noted during the performance testing and/or a written report from the third party agency performing the tests indicating what repairs were required. If a systemic problem is identified during testing, provide
repair and remediation protocol for any systemic failures identified by the Building Enclosure Commissioning Provider. Include a timeline for repair of all affected elements. Repaired elements shall not be covered up without review by the Building Enclosure Commissioning Provider.

H. Testing of the building during construction: Provide a representative to be present, and have a representative present from each trade and/or subcontractor associated with installing the system during building exterior enclosure air and water leakage performance testing, as indicated within the BECP. Provide a written protocol and a timeline for repair of any deficiencies noted during the performance testing and/or a written report from the third party agency performing the tests indicating what repairs were required. If a systemic problem is identified during testing, please see the following requirement.

I. Provide a repair and remediation protocol for any systemic failures identified by the Commissioning Authority and/or Building Enclosure Commissioning Provider, including a timeline for repair of all affected elements. Repaired elements shall not be covered up without review and documentation by the Building Enclosure Commissioning Provider.

J. Provide copies of all test and inspection reports for inclusion in the Operations and Maintenance (O&M) Manual or Systems Manual to be submitted as part of the project closeout documentation.

K. Provide an O&M Manual and/or Systems Manual as part of the project record closeout documentation that includes, but is not limited to, closeout requirements listed in these specifications and more specifically:

1. As-built drawings, including a copy of all details and drawings that were installed as part of any addendums or change order directives. All deviations shall be clearly marked in red pen.
2. Specifications for the project, including all accepted product substitutions and any additional specifications as part of any addendums or change order directives. All accepted product substitutions and all deviations shall be clearly marked in red pen.
3. A copy of all accepted change orders
4. A copy of all final shop drawings for each product requiring shop drawings, with the A/E markups and comments, showing final as-built conditions
5. A copy of all warranties, organized by product, and any and all product manufacturer letters indicating the product as appropriate to use for the application intended on the project as well as any installation guidance
6. A master product list summarizing all products used on the project for construction of the building exterior enclosure, and sections to include information on each product organized by tabs in a binder, including the following information:

a. Product name
b. Product manufacturer
c. Catalog or other applicable number for ordering
d. Manufacturer's contact information, including the contact information for the technical representatives, including one national contact and one regional technical representative contact
e. Product color
f. Supplier contact information
g. Product performance testing results or metrics (for example, the published air permeability metric for any material/assembly that is being utilized as an air barrier component, the published R-value or U-value for component materials/assemblies of the thermal barrier, etc.).
h. Products installation instructions, including installation instructions supplied with any of the shop drawings that indicated field installed items.

i. Manufacturer’s product maintenance guide

j. Manufacturer’s checklist for periodic review of the product indicating how often the product should be checked and the process for implementing a repair.

L. An O&M Manual and/or Systems Manual, or dedicated section therein, is to be developed for each major building exterior enclosure system; including, but not limited to:

1. Roof/Garden Roof (penetrations, curbs, etc.)
2. Skylights/Sloped glazing
3. Exterior walls (masonry, stone, EIFS, concrete, precast, metal, insulation, framing, vapor retarder, air barrier, sheathing, etc.)
4. Windows
5. Doors
6. Sealants and expansion joints
7. Control joints
8. Flashings (end dams, drip edges, flexible flashing and metal flashings)
9. Shading devices
10. Curtain walls or window walls, storefronts
11. Plaza decks
12. Planters and planted areas
13. Below-grade construction, waterproofing, drainage
14. Floors, slab-on-grade
15. Fire separation/stopping and smoke control
16. Other special building exterior enclosure systems, equipment and controls.

M. Participate in maintenance orientation and inspection and in one maintenance and training session with the building operations and maintenance staff and other participants identified by the Owner and Architect-of-Record, with the assistance of the Building Enclosure Commissioning Provider.

N. Provide labor, materials and facilities:

1. To provide access to work to be tested
2. To provide materials and labor only as specifically indicated as required of the Contractor within the BECP.

2.2 PERFORMANCE REQUIREMENTS

A. Performance requirements include, but are not necessarily limited to, the requirements of the applicable energy code that has been adopted by the AHJ and incorporated into these specifications and construction documents.

B. Preconstruction Testing of Mockups: See also requirements in the individual specification sections in Divisions 2 through 26.

C. Testing of the building enclosure during construction: See also requirements in the individual specification sections in Divisions 2 through 26.

2.3 SUBMITTALS

A. The Contractor is to provide the following submittals to the Building Enclosure Commissioning Provider.
Provider, in addition to submitting them to the Architect-of-Record. These submittals are in addition to those specified in Division 1 Section 019113 "General Commissioning Requirements."

1. Coordination Drawings: Provide cross references on any and all shop drawings indicating that drawings have been checked and cross-referenced by the Contractor to ensure that adjacent elements (i.e., wall elements and fenestration elements) and the dimensions and construction tolerances indicated will allow all work at interfaces to be constructible.

2. Qualifications Data: For fabricators, installers, and testing agencies, submit to the Building Enclosure Commissioning Provider, for review all qualifications required in Divisions 2 through 26 for review.

3. On all submittals for materials and assemblies that comprise portions of the building enclosure, as well as for equipment that penetrates the enclosure and that has specific code requirements related to enclosure performance (e.g., HVAC dampers that separate outside air from HVAC ducts), the performance criteria published by the manufacturer that relates to all code requirements (e.g., allowable air leakage/permeability rates) shall be present and clearly identified in the submittal.

B. The Contractor is to provide the following within closeout documents:

1. Source Quality Control Reports: retain a copy for field review by the Building Enclosure Commissioning Provider and include in the closeout submittal a copy of all manufacturer QA/QC reports submitted for products supplied for the project.

2. Field Quality Control Reports: provide a copy of the test reports for all field water and air penetration and other appropriate building exterior enclosure tests completed.

3. Special Inspections Reports for all special inspections indicated by the Architect/Engineer-of-Record in the specifications.

PART 3 - EXECUTION

3.1 BUILDING ENCLOSURE COMMISSIONING PROVIDER'S DUTIES

A. Cooperate with the Architect and Contractor and provide qualified personnel when scheduled.

B. Promptly notify Architect and Contractor of irregularities or deficiencies in work that are observed during performance of services.

C. Be present to observe all testing of all building exterior enclosure systems as defined in the Contract Documents.

D. Building Enclosure Commissioning Provider is not authorized to:

1. Release, revoke, alter or expand requirements of Contract Documents.

2. Approve or accept any portion of the work.

3. Perform any duties of the Contractor.

3.2 VERIFICATION INSPECTIONS AND TESTING

A. Inspections and testing for this project are described in the Building Enclosure Commissioning Plan (BECP) which includes this and other Sections of the Project Specifications as previously defined.

B. Demonstration of code compliance to IECC 2012 C402.4.1 Air Barriers is intended to be by options.
C402.4.1.2.1 Materials and C402.4.1.2.2 Assemblies, and it is the goal that no testing per option C402.4.1.2.3 Building Test (e.g. blower-door testing) will be required. A full building test utilizing mechanical equipment may be performed if it is determined that to provide value to the BECP process.

C. Test locations:
   1. To be determined by BECP prior to testing, and based on construction schedule. Testing will be performed as the building envelope is completed, focusing on areas in which transitions between assemblies occur, such as window/wall, wall/floor, wall/parapet, as well as inside and outside corners.

D. Test Procedure: Test will be performed with a minimum 20 deg. F differential between test area and ambient outside temperature. Test location is to be sealed on interior framing, and depressurized using a blower door. A thermal imaging camera will be used to identify air leakage. Water will then be sprayed on the exterior of the building at the test location, weather allowing, and visual and thermal imaging inspections will be completed for water intrusion. Results will be documented, and correction plan developed by general contractor.

E. Additional Requirements for construction and evaluation of mockups prior to general construction may be found in the individual technical specifications sections in Divisions 2 through 26.

F. The General Contractor is to:
   1. Certify that building exterior enclosure systems, subsystems, and construction have been completed according to the Contract Documents, including all addenda and change order requirements.
   2. Certify that Field Quality Control procedures have been completed, and that field quality control reports have been submitted, discrepancies corrected, and corrective work approved. Provide a copy of the list of nonconformance maintained by the General Contractor indicating all rework and corrections completed.

G. The Building Enclosure Commissioning Provider is to:
   1. If possible, interior framing will be used for enclosure of test area. CxA to be responsible for installing temporary plastic to enclose these areas for testing.
   2. Verify that Field Quality Control procedures have been completed, and that field quality control reports have been submitted, discrepancies corrected, and corrective work approved.
   3. Provide or witness (per consultant’s contracts) and document field quality-control tests and inspections.
   4. Annotate checklist or data sheets when a deficiency is observed.
   5. Verify that field quality-control testing of building exterior enclosure has been completed and approved.

3.3 FOLLOW-UP INSPECTIONS / DEFERRED TESTING:

A. If field tests cannot be completed because of a deficiency outside the scope of the Building Enclosure, the deficiency shall be documented and reported to the Owner and the Architect-of-Record. Deficiencies shall be resolved and corrected by appropriate parties and a follow-up inspection shall be scheduled, or any planned test shall be rescheduled.

3.4 INSPECTION / TESTING REPORTS:
A. Inspection or Testing reports shall include measured data, data sheets, and a comprehensive summary describing the specific building exterior enclosure systems at the time of testing.

B. When deficiencies are recognized, prepare a preliminary report. Deficiencies will be evaluated by the Architect and the Building Enclosure Commissioning Provider to determine corrective action. Deficiencies shall be corrected and test or inspection repeated. All repairs are to be documented by the Building Enclosure Commissioning Provider.

C. If it is determined that the system is constructed according to the Contract Documents, and yet a performance deficiency is recognized, the Owner will decide whether modifications are required to bring the performance of the system to a level where the failure or deficiency is eliminated and shall be implemented or if the inspection/test results will be accepted as submitted. If corrective Work is performed, the Owner will decide if inspections/tests shall be repeated and a revised report is to be submitted.

3.5 SYSTEMS TO BE COMMISSIONED

A. Refer to Divisions 2 through 26 of the Specification Sections for specific requirements for commissioning each building exterior enclosure element and system. The systems and elements to be commissioned include, but are not limited to:

1. Roofs, including garden roof systems, all penetrations, transitions, etc.
2. Skylights and other sloped glazing
3. Exterior walls, including the air barrier system, and water management systems
4. Windows
5. Doors, louvers
6. Flashings, including all transitions, end-dams, etc.
7. Interface conditions between each of the above listed elements
8. Other special building exterior enclosure systems, equipment and controls.

END OF SECTION 01 91 15
## Substitution Request

(After the Bidding Phase)

<table>
<thead>
<tr>
<th>Project:</th>
<th>Substitution Request Number:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>To:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>From:</th>
<th>A/E Project Number:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Re:</th>
<th>Contract For:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specification Title:</th>
<th>Description:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Section:</th>
<th>Page:</th>
<th>Article/Paragraph:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Proposed Substitution:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Manufacturer:</th>
<th>Address:</th>
<th>Phone:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Trade Name:</th>
<th>Model No.:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Installer:</th>
<th>Address:</th>
<th>Phone:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

History:  
- [ ] New product  
- [ ] 2-5 years old  
- [ ] 5-10 yrs old  
- [ ] More than 10 years old

Differences between proposed substitution and specified product:

```

```

<table>
<thead>
<tr>
<th>Point-by-point comparative data attached - REQUIRED BY A/E</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

Reason for not providing specified item:

```

```

## Similar Installation:

<table>
<thead>
<tr>
<th>Project:</th>
<th>Architect:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Address:</th>
<th>Owner:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date Installed:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

Proposed substitution affects other parts of Work:  
- [ ] No  
- [ ] Yes; explain

```

```

Savings to Owner for accepting substitution: ($ ).

Proposed substitution changes Contract Time:  
- [ ] No  
- [ ] Yes [Add] [Deduct] days.

Supporting Data Attached:  
- [ ] Drawings  
- [ ] Product Data  
- [ ] Samples  
- [ ] Tests  
- [ ] Reports  
- [ ]    

---

Copyright 1996, Construction Specification Institute, 601 Madison Street, Alexandria, VA 22314-1791

September 1996  
CSI Form 13.1A
The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: ____________________________
Signed by: ____________________________
Firm: ____________________________
Address: ____________________________
Telephone: ____________________________
Attachments: ____________________________

A/E's REVIEW AND ACTION

☐ Substitution approved - Make submittals in accordance with Specification Section 01330.
☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01330.
☐ Substitution rejected - Use specified materials.
☐ Substitution Request received too late - Use specified materials.

Signed by: ____________________________ Date: ____________________________

Additional Comments:  ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ A/E ☐
AGREEMENT made as of the «» day of «» in the year «»
(In words, indicate day, month and year.)

BETWEEN the Party transmitting Digital Data (“Transmitting Party”):
(Name, address and contact information, including electronic addresses)

«»
«»
«»
«»
«»
«»

and the Party receiving the Digital Data (“Receiving Party”):
(Name, address and contact information, including electronic addresses)

«»
«»
«»
«»
«»
«»

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

Norm Asbjornson Hall
Montana State University
Bozeman, MT 58717

In consideration of the following promises exchanged, the Parties agree as follows:
TABLE OF ARTICLES

1 GENERAL PROVISIONS
2 TRANSMISSION OF DIGITAL DATA
3 LICENSE CONDITIONS
4 LICENSING FEE OR OTHER COMPENSATION

ARTICLE 1 GENERAL PROVISIONS
§ 1.1 The purpose of this Agreement is to grant a license from the Transmitting Party to the Receiving Party for the Receiving Party’s use of Digital Data on the Project, and to set forth the license terms.

§ 1.2 This Agreement is the entire and integrated agreement between the parties. Except as specifically set forth herein, this agreement does not create any other contractual relationship between the parties.

§ 1.3 Digital Data is defined as information, communications, drawings, or designs created or stored for the Project in digital form.

§ 1.3.1 Confidential Information is defined as Digital Data that the Transmitting Party has designated as confidential and clearly marked with an indication such as “Confidential” or “Business Proprietary.”

ARTICLE 2 TRANSMISSION OF DIGITAL DATA
§ 2.1 The Transmitting Party grants the Receiving Party a nonexclusive limited license to use the Digital Data solely and exclusively to perform services or construction for the Project in accordance with the conditions set forth in Article 3.

§ 2.2 The transmission of Digital Data constitutes a warranty by the Transmitting Party to the Receiving Party that the Transmitting Party (1) is the copyright owner of the Digital Data, (2) has permission from the copyright owner to transmit the Digital Data and grant a license for its use on the Project, or (3) is authorized to transmit Confidential Information.

§ 2.3 The Transmitting Party retains its rights in the Digital Data. By transmitting the Digital Data, the Transmitting Party does not grant to the Receiving Party an assignment of those rights; nor does the Transmitting Party convey to the Receiving Party any right in the software used to generate the Digital Data.

§ 2.4 To the fullest extent permitted by law, the Receiving Party shall indemnify and defend the Transmitting Party from and against all claims arising from or related to the Receiving Party's modification to, or unlicensed use of, the Digital Data.

§ 2.5 The Receiving Party agrees to keep Confidential Information strictly confidential and not to disclose it to any other person except to (1) its employees, (2) those who need to know the content of the Confidential Information in order to perform services or construction solely and exclusively for the Project, or (3) its consultants and contractors whose contracts include similar restrictions on the use of Confidential Information.

ARTICLE 3 LICENSE CONDITIONS
§ 3.1 The parties agree to the following conditions on the limited license granted in Section 2.1:
(State below rights or restrictions applicable to the Receiving Party’s use of the Digital Data, requirements for data format, transmission method or other conditions on data to be transmitted.)

ARTICLE 4 LICENSING FEE OR OTHER COMPENSATION
§ 4.1 The Receiving Party agrees to pay the Transmitting Party the following fee or other compensation for the Receiving Party’s use of the Digital Data:
(State the fee, in dollars, or other method by which the Receiving Party will compensate the Transmitting Party for the Receiving Party’s use of the Digital Data.)
This Agreement is entered into as of the day and year first written above and will terminate upon Substantial Completion of the Project, as that term is defined in AIA Document A201™–2007, General Conditions of the Contract for Construction, unless otherwise agreed by the parties and set forth below.

(Indicate when this Agreement will terminate, if other than the date of Substantial Completion.)

<table>
<thead>
<tr>
<th>TRANSMITTING PARTY</th>
<th>RECEIVING PARTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Signature)</td>
<td>(Signature)</td>
</tr>
<tr>
<td>(Printed name and title)</td>
<td>(Printed name and title)</td>
</tr>
<tr>
<td>Qty.</td>
<td>Reference / Number</td>
</tr>
<tr>
<td>------</td>
<td>--------------------</td>
</tr>
</tbody>
</table>

- Submitted for review and approval
- Resubmitted for review and approval
- Complies with contract requirements
- Will be available to meet construction schedule
- A/E review time included in construction schedule
- Substitution involved - Substitution request attached
- If substitution involved, submission includes point-by-point comparative data or preliminary details
- Items included in submission will be ordered immediately upon receipt of approval

Other remarks on above submission:

- One copy retained by sender

---

<table>
<thead>
<tr>
<th>TRANSMITTAL</th>
<th>To (A/E): ___________</th>
<th>Attn: ___________</th>
<th>Date Rec'd by A/E: ___________</th>
</tr>
</thead>
<tbody>
<tr>
<td>From (Contractor): ___________</td>
<td>By: ___________</td>
<td>Date Tnsmt'd by A/E: ___________</td>
<td></td>
</tr>
</tbody>
</table>

- Approved
- Approved as noted
- Revise / Resubmit
- Rejected / Resubmit

Other remarks on above submission:

- One copy retained by sender

---

<table>
<thead>
<tr>
<th>TRANSMITTAL</th>
<th>To (Contractor): ___________</th>
<th>Attn: ___________</th>
<th>Date Rec'd by Contractor: ___________</th>
</tr>
</thead>
<tbody>
<tr>
<td>From (Subcontractor): ___________</td>
<td>By: ___________</td>
<td>Date Tnsmt'd by Contractor: ___________</td>
<td></td>
</tr>
</tbody>
</table>

- Approved
- Approved as noted
- Not subject to review
- No action required
- Revise / Resubmit
- Rejected / Resubmit
- Approved as noted / Resubmit

Other remarks on above submission:

- One copy retained by sender

---

Copy of

- Owner
- Consultants
- ___________ 
- ___________ 
- ___________ 
- ___________ 
- One copy retained by sender
The following items require the attention of the Contractor for completion or correction. This list may not be all-inclusive, and the failure to include any items on this list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Room Location</th>
<th>Description</th>
<th>Correction/Completion Date</th>
<th>Verification A/E Check</th>
</tr>
</thead>
</table>

☐ Attachments

Signed by: ___________________________ Date: ___________________________

Copies:  
- [ ] Owner  
- [ ] Consultants  
- [ ] __________  
- [ ] __________  
- [ ] __________  
- [ ] __________  
- [ ] __________  
- [ ] __________  
- [ ] __________  
- [ ] File
PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes geotechnical data.

1.2 GEOTECHNICAL DATA

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner’s information for Bidders’ convenience and are intended to supplement rather than serve in lieu of Bidders’ own investigations. They are made available for Bidders’ convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.

B. A geotechnical investigation report for the Proposed Norm Asbjornson Innovation Center, Montana State University, Bozeman, Montana, prepared by DOWL, dated March 8, 2016, is available for viewing as appended to this Document.

END OF SECTION 02 32 00

Attachment to follow: Geotechnical Report (77 pages)
SECTION 02 41 00 – SITE DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

A. This section includes demolition, salvage and removal of selected site structures, utilities and surfacing.

1.2 RELATED REQUIREMENTS

A. Section 31 10 00 - Site Clearing.
B. Section 31 20 00 - Earth Moving.

1.1 RELATED DOCUMENTS

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

Standard Specifications:

2. Except as specifically noted otherwise in the contract documents, all 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.

1.3 COORDINATION

A. Conduct pre-demolition conference to cover the following:
   4. Identify items to be protected and preserved before proceeding with work.
   5. Conduct a walking inspection to identify materials and equipment to be salvaged for re-installation and Owner use.
   6. During the walking inspection, photograph or otherwise determine and record existing physical conditions of boundary areas. Surfaces, equipment, or other items damaged during demolition work are to be restored to original condition as recorded during the walking inspection.
   7. Agree upon location where items salvaged for Owner are to be delivered and stored.

B. Prior to closing or obstructing streets, walks, or other adjacent occupied facilities, obtain written permission from the authorities having jurisdiction. Provide alternate vehicular and pedestrian routes in accordance with the requirements of the Owner and governing authorities. Provide, erect, and maintain temporary barriers and security devices.
C. Traffic and Passageways:

1. Conduct demolition operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.
2. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction.
3. Provide temporary alternate vehicular and pedestrian traffic routes as required to complete the work and in accordance with the requirements of the Owner and governing authorities. Provide, erect, and maintain temporary barriers and security devices.
4. Maintain free and safe passage to and from Owner occupied areas.

D. Coordinate shut-off, capping, and continuation of utility services with Owner prior to any planned mechanical, electrical, and plumbing shutdowns. Schedule site demolition and removal work to ensure uninterrupted service of all utilities, or to obtain prior approval from the Owner for type, start date and duration of planned service outages.

E. Coordinate with the Owner to schedule irrigation shutdowns, demolition and replacement, and to provide temporary irrigation as required.

1.4 OBSTRUCTIONS

A. Some obstructions may not appear on the Drawings. Bidders are advised to carefully inspect the existing site before preparing their proposals. The protection or removal and replacement of minor obstructions such as fences, pipe, and similar items shall be anticipated and accomplished even though not shown or specifically mentioned.

B. Major obstructions encountered that are not shown on the Drawings, or could not have been foreseen by visual inspection of the site prior to bidding, should immediately be brought to the attention of the Architect. The Architect will make a determination for proceeding with the work. If the Architect finds that the obstruction adversely affects the Contractor's costs or schedule of completion, a proper adjustment to the Contract will be made in accordance with the General Conditions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PREPARATION

A. Mark and identify location of utilities to be disconnected.

B. The Contractor is advised that there is a One-Call utility locate number in use for utility location requests within the state of Montana for buried utilities. The one call number is 1-800424-5555. MCA 69-4-501 through 69-4-506 requires the use of the One Call system prior to any excavation work in Montana.

C. The Contractor shall be responsible for having the appropriate utility or Owner turn off all services before demolition is started. Notify affected utility company in advance of date and time when service needs to be disconnected.
3.2 PROTECTION

A. Protect existing utilities, structures and other facilities to remain, including supporting soils, from damage at all times during performance of the work.

B. Protect improvements on adjoining properties as well as those on Owner's property.

C. Prevent movement or settlement of adjacent structures. Provide bracing and shoring as necessary for safety and to support the structure and protect it from movement, settlement or damage.

D. Provide barricades, coverings or other types of protection necessary to prevent damage to existing improvements indicated to remain in place.

E. Protect trees, shrubs and other vegetation unless specifically identified for demolition. Cut and remove tree branches only where, in the opinion of the Owner and Architect, such cutting is necessary to perform the specified work.

F. Restore improvements damaged by the Work to their original condition as acceptable to Owners or other parties or authorities having jurisdiction.

G. Protect salvageable items from damage.

H. Monuments and Markers: Preserve and protect survey monuments, benchmarks and markers from damage or displacement throughout construction. If damage occurs or removal becomes necessary, immediately notify Architect and restore monument or marker to original condition.

3.3 SALVAGEABLE IMPROVEMENTS

A. Carefully remove, store and protect materials and equipment indicated to be salvaged, and deliver to locations on the Owner's premises as directed by the Owner.

B. Carefully remove, store, and protect items noted on Drawings for salvage and re-installation. Store these items at locations as directed by the Owner.

C. Materials Retained by Contractor:
   1. Items of salvageable value not specified to be salvaged or re-installed, once removed, become the property of the Contractor and shall be removed as work progresses.
   2. On-site storage of salvaged items for sale on site will not be permitted.

3.4 STRUCTURE DEMOLITION

A. Perform demolition in accordance with governing authorities. Cease demolition operations immediately if adjacent structures appear to be in danger.

B. Remove existing curbs, gutters and concrete surfacing to existing joints or to neatly cut lines where no joints exist.

C. Pavement Removal: Asphalt and concrete pavement to be removed is shown on the Drawings or is above locations where new piping is to be installed. Remove existing pavement and material below the pavement to a depth sufficient to allow replacement of pavement, sub-base aggregate and base
course aggregate materials to the specified depths below the finished grade elevations indicated on the Drawings. Pavement to be removed shall be separated from pavement to remain by neat, vertically cut edges using a pavement breaker, cutting wheel or other Engineer-approved means.

D. Utilities:

1. Where electrical, natural gas, telephone, or any other utility lines are exposed by demolition excavation, the Contractor shall immediately notify the owner(s) of these utilities that their facilities have been exposed, and shall allow sufficient time for the utility to either re-locate their facilities or to determine that they have been abandoned. Rearrange demolition schedule as necessary to continue overall project progress without delay.

2. The Contractor shall be responsible for having the appropriate utility or Owner turn off all services before demolition is started. Notify affected utility company in advance of date and time when service needs to be disconnected.

3. Remove all buried overhead and underground utilities within the work area (grading limits) that have been abandoned previously or will be abandoned by this project.

4. Disconnect and cap utility services; comply with requirements of governing authorities. Do not commence demolition operations until associated disconnections have been completed.

5. If not in the construction area for the new facilities, all abandoned piping, fittings, and similar items may be left in place or removed at the Contractor’s option.

6. All sanitary sewer lines, water lines, storm drain lines, culverts, utility conduits, and gas lines over 2 inches in diameter to be abandoned in place shall be plugged at the cut ends with concrete to form a tight closure with a length of at least 5 pipe diameters.

7. Submit record documents identifying actual locations of capped or abandoned existing utilities encountered during performance of the specified work.

A. Fencing and/or hand railing indicated on the drawings to remain may be removed by the Contractor at his option as an aid for construction access. Where such fencing is removed, all fence materials must be replaced in their original condition and location after construction is complete. Any fencing materials damaged by the Contractor’s removal or other construction activities must be replaced with new materials matching the existing materials at no extra cost to the Owner.

B. Repair or replace, at Owner’s option, demolition performed in excess of that required. Replacement will be at the sole expense of the Contractor.

3.5 HAZARDOUS MATERIALS

C. Inform Architect and Owner immediately upon discovery of asbestos products, radioactive materials, radon gas, toxic wastes, or other similar hazardous materials. Do not remove hazardous materials without Owner authorization.

D. Explosives are not permitted.

3.6 DEBRIS AND WASTE REMOVAL

A. All material and items not specified to be salvaged shall be removed and legally disposed of offsite by the Contractor. The Contractor shall make all necessary arrangements for this disposal, and shall bear any costs or retain any profit incidental to this disposal.

B. Recycle materials to the greatest extent possible.
C. No burning of debris is allowed on site.

3.7 CLEANING

A. Broom clean demolition areas of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of work.

B. Remove temporary work and protection when no longer needed.

END OF SECTION 02 41 00
SECTION 237200 - AIR-TO-AIR ENERGY RECOVERY EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Heat wheels.
2. Packaged energy recovery units.

1.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Air-to-air energy recovery equipment shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. LEED Submittals:

1. Product Data for Credit EA 4: Documentation indicating that equipment and refrigerants comply.
2. Product Data for Prerequisite IEQ 1: Documentation indicating that units comply with ASHRAE 62.1, Section 5 - "Systems and Equipment."

C. Shop Drawings: For air-to-air energy recovery equipment. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For air-to-air energy recovery equipment, accessories, and components, from manufacturer.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air-to-air energy recovery equipment to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set(s) of each type of filter specified.
2. Fan Belts: One set(s) of belts for each belt-driven fan in energy recovery units.
3. Wheel Belts: One set(s) of belts for each heat wheel.

1.8 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ARI Compliance:


C. ASHRAE Compliance:

1. Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
2. Capacity ratings for air-to-air energy recovery equipment shall comply with ASHRAE 84, "Method of Testing Air-to-Air Heat Exchangers."

D. NRCA Compliance: Roof curbs for roof-mounted equipment shall be constructed according to recommendations of NRCA.

1.9 COORDINATION

A. Coordinate layout and installation of air-to-air energy recovery equipment and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.
B. Coordinate sizes and locations of concrete bases with actual equipment provided.

C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of air-to-air energy recovery equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Packaged Energy Recovery Units: Five years.

PART 2 - PRODUCTS

2.1 HEAT WHEELS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Aaon.

B. Casing:

1. Steel with standard factory-painted finish.
2. Integral purge section limiting carryover of exhaust air to between 0.05 percent at 1.6-inch wg and 0.20 percent at 4-inch wg differential pressure.
3. Casing seals on periphery of rotor and on duct divider and purge section.
4. Support vertical rotors on grease-lubricated ball bearings having extended grease fittings or permanently lubricated bearings. Support horizontal rotors on tapered roller bearing.

C. Rotor: Aluminum segmented wheel strengthened with radial spokes, with nontoxic, noncorrosive, silica-gel desiccant coating.

1. Maximum Solid Size for Media to Pass: 500 micrometer.

D. Rotor: Glass-fiber segmented wheel strengthened with radial spokes impregnated with nonmigrating, water-selective, molecular-sieve desiccant coating.

1. Maximum Solid Size for Media to Pass: 800 micrometer.

E. Drive: Fractional horsepower motor and gear reducer, with speed changed by variable frequency controller and self-adjusting multilink belt around outside of rotor.

1. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
2. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

F. Controls:
1. Variable frequency controller, factory mounted and wired, with exhaust-air sensor to vary rotor speed and maintain exhaust temperature above freezing.

2. Variable frequency controller, factory mounted and wired, with exhaust- and outdoor-air sensors, automatic changeover thermostat and set-point adjuster, to vary rotor speed and maintain exhaust temperature above freezing and air differential temperature above set point. Rotor speed shall increase to maximum when exhaust-air temperature is less than outdoor-air temperature.


4. Speed Settings: Adjustable settings for maximum and minimum rotor speed limits.

G. Disposable Panel Filters:

1. Comply with NFPA 90A.
2. Filter Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lift out from access plenum.
3. Factory-fabricated, viscous-coated, flat-panel type.
4. Thickness: [1 inch] [2 inches] [4 inches].
8. Minimum Arrestance: [80] <Insert inches wg>, according to ASHRAE 52.1.
9. MERV: [5] <Insert value>, according to ASHRAE 52.2.
11. Frame: Galvanized steel with metal grid on outlet side, steel rod grid on inlet side, hinged, and with pull and retaining handles.

H. Extended-Surface, Disposable Panel Filters:

1. Comply with NFPA 90A.
2. Filter Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lift out from access plenum.
3. Factory-fabricated, dry, extended-surface type.
4. Thickness: [1 inch] [2 inches] [4 inches].
8. Minimum Arrestance: [90] <Insert inches wg>, according to ASHRAE 52.1.
9. MERV: [7] <Insert value>, according to ASHRAE 52.2.
11. Media-Grid Frame: [Nonflammable cardboard] [Galvanized steel] [Fire-retardant, 3/4-inch particleboard with gaskets].
12. Mounting Frames: Welded, galvanized steel with gaskets and fasteners, suitable for bolting together into built-up filter banks.

I. Extended-Surface, Nonsupported-Media Filters:

1. Comply with NFPA 90A.
2. Filter Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lift out from access plenum.
5. Initial Resistance: <Insert inches wg>.
7. Minimum Arrestance: [95] <Insert value>, according to ASHRAE 52.1.
8. MERV: [13] <Insert value>, according to ASHRAE 52.2.
9. Media: Fibrous material constructed so individual pleats are maintained in tapered form by flexible internal supports under rated-airflow conditions and antimicrobial agent.
10. Filter-Media Frame: [Galvanized steel] [Hard polyurethane foam].
11. Mounting Frames: Welded, galvanized steel with gaskets and fasteners, suitable for bolting together into built-up filter banks with space for prefilter.

2.2 PACKAGED ENERGY RECOVERY UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Aaon.

B. Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

C. Housing: Manufacturer’s standard construction with corrosion-protection coating and exterior finish, gasketed and called weathertight, hinged access doors with neoprene gaskets for inspection and access to internal parts, minimum 1-inch thick thermal insulation, knockouts for electrical and piping connections, exterior drain connection, and lifting lugs.
   1. Inlet: with damper for exhaust and supply.
   2. Roof Curb: Refer to Section 077200 "Roof Accessories" for roof curbs and equipment supports.


E. Supply and Exhaust Fans: Backward-inclined, plenum centrifugal fan with restrained, spring isolators flexible duct connections.
   1. Motor and Drive: Direct driven.
   2. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
   3. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
   4. Spring isolators on each fan having 1-inch static deflection.

F. Final Filter: Extended-Surface, Nonsupported-Media Filters:
   1. Comply with NFPA 90A.
   2. Filter Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lift out from access plenum.
   4. MERV: 13, according to ASHRAE 52.2.
   5. Media: Fibrous material constructed so individual pleats are maintained in tapered form by flexible internal supports under rated-airflow conditions.
   7. Mounting Frames: Welded, galvanized steel with gaskets and fasteners, suitable for bolting together into built-up filter banks with space for MERV 8 prefilter.
G. Cooling Coils: Rated according to ARI 410 and ASHRAE 33, and bearing the ARI label.
   1. Access: Fabricate coil section to allow removal and replacement of coil and to allow in-place access for service and maintenance of coil(s).
   2. Casing: Manufacturer's standard material.
   3. Tubes: Copper.
   4. Tube Headers: Copper.
   5. Fins: Aluminum.
   6. Fin and Tube Joint: Mechanical bond.
   7. Leak Test: Coils shall be leak tested with air under water.
   8. Refrigerant Coils:
      a. Capacity Reduction: Circuit coils for interleaved control.
      b. Suction and Distributor: Seamless copper tube with brazed joints.

H. Cooling-Coil Condensate Drain Pans:
   1. Fabricated from stainless-steel sheet and sloped in multiple planes to collect and drain condensate from cooling coils, coil piping connections, coil headers, and return bends.
   2. Complying with requirements in ASHRAE 62.1.
   3. Drain Connections: At low point of pan with threaded nipple.
   4. Units with stacked coils shall have an intermediate drain pan to collect and drain condensate from top coil.

I. Hot-Water Coils: Rated according to ARI 410 and ASHRAE 33, and bearing the ARI label.
   1. Access: Fabricate coil section to allow removal and replacement of coil and to allow in-place access for service and maintenance of coil(s).
   2. Casing: Manufacturer's standard material.
   3. Tubes: Copper.
   4. Tube Headers: Copper.
   5. Fins: Aluminum.
   6. Fin and Tube Joint: Mechanical bond.
   7. Leak Test: Coils shall be leak tested with air under water.

J. Heat Pump Heating and Cooling
   1. Provide factory geothermal heat pump to provide cooling.

K. Piping and Wiring: Fabricate units with space within housing for piping and electrical conduits. Wire motors and controls so only external connections are required during installation.
   1. Indoor Enclosure: NEMA 250, Type 12 enclosure contains relays, starters, and terminal strip.
   2. Include nonfused disconnect switches.
   3. Variable-speed controller to vary fan capacity from 100 to approximately 25 percent.

L. Accessories:
   1. Low-Leakage, Isolation Dampers: Double-skin, airfoil-blade, aluminum dampers with compressible jamb seals and extruded-vinyl blade edge seals, in opposed-blade arrangement with cadmium-plated steel operating rods rotating in stainless-steel sleeve sintered bronze or nylon bearings mounted in a single aluminum frame, with operating rods connected with a
common linkage, and electric damper operator factory wired. Leakage rate shall not exceed 5
cfm/sq. ft. at 1-inch wg and 9 cfm/sq. ft. at 4-inch wg.
2. Duct flanges.
3. Hinged access doors with quarter-turn latches.

2.3 CONTROLS

A. Full factory Bacnet Native Aaon DDC Controls.

2.4 CAPACITIES AND CHARACTERISTICS

A. See Schedule on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation
tolerances and other conditions affecting performance of the Work.

B. Examine casing insulation materials and filter media before air-to-air energy recovery equipment
installation. Reject insulation materials and filter media that are wet, moisture damaged, or mold
damaged.

C. Examine roughing-in for electrical services to verify actual locations of connections before installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install heat wheels so supply and exhaust airstreams flow in opposite directions and rotation is away
from exhaust side to purge section to supply side.

1. Install access doors in both supply and exhaust ducts, both upstream and downstream, for
access to wheel surfaces, drive motor, and seals.
2. Install removable panels or access doors between supply and exhaust ducts on building side for
bypass during startup.
3. Access doors and panels are specified in Section 233300 "Air Duct Accessories."

B. Install floor-mounted units on 4-inch-high concrete base designed to withstand, without damage to
equipment, seismic force required by code.

C. Equipment Mounting:

1. Install air-to-air energy recovery equipment on cast-in-place concrete equipment bases. Comply
with requirements for equipment bases and foundations specified in Section 033053
"Miscellaneous Cast-in-Place Concrete."
3.3 CONNECTIONS

A. Comply with requirements for piping specified in Section 232113 "Hydronic Piping" and Section 232116 Hydronic Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to unit to allow service and maintenance.

C. Connect piping to units mounted on vibration isolators with flexible connectors.

D. Connect cooling condensate drain pans with air seal trap at connection to drain pan and install cleanouts at changes in pipe direction.

E. Hot Water Piping: Comply with applicable requirements in Section 232113 "Hydronic Piping" and Section 232116 Hydronic Piping Specialties." Install shutoff valve and union or flange at each coil supply connection. Install balancing valve and union or flange at each coil return connection.

F. Refrigerant Piping: Comply with applicable requirements in Section 232300 "Refrigerant Piping."

G. Comply with requirements for ductwork specified in Section 233113 "Metal Ducts."

H. Install electrical devices furnished with units but not factory mounted.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

2. Adjust seals and purge.

3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

4. Set initial temperature and humidity set points.

5. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

D. Air-to-air energy recovery equipment will be considered defective if it does not pass tests and inspections.
E. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air-to-air energy recovery units.

END OF SECTION 237200
SECTION 237313 - MODULAR INDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Variable-air-volume, single-zone air-handling units.

1.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Air-handling units shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.3 ACTION SUBMITTALS

A. Product Data: For each air-handling unit indicated.
   1. Unit dimensions and weight.
   2. Cabinet material, metal thickness, finishes, insulation, and accessories.
   3. Fans:
      a. Certified fan-performance curves with system operating conditions indicated.
      b. Certified fan-sound power ratings.
      c. Fan construction and accessories.
      d. Motor ratings, electrical characteristics, and motor accessories.

   4. Certified coil-performance ratings with system operating conditions indicated.

   5. Dampers, including housings, linkages, and operators.
   6. Filters with performance characteristics.

B. LEED Submittals:

   1. Product Data for Prerequisite IEQ 1: Documentation indicating that units comply with ASHRAE 62.1, Section 5 - "Systems and Equipment."

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For air-handling units, accessories, and components, from manufacturer.

   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Source quality-control reports.

1.5 CLOSEOUT SUBMITTALS
A. Operation and maintenance data.

1.6 QUALITY ASSURANCE
A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
B. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of air-handling units and components.
C. ARI Certification: Air-handling units and their components shall be factory tested according to ARI 430, "Central-Station Air-Handling Units," and shall be listed and labeled by ARI.
D. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
E. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
F. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Aaon...
   2. No Alternates accepted

2.2 UNIT CASINGS
A. General Fabrication Requirements for Casings:
   1. Forming: Form walls, roofs, and floors with at least two breaks at each joint.
   2. Casing Joints: Sheet metal screws or pop rivets.
   3. Sealing: Seal all joints with water-resistant sealant.
   4. Factory Finish for Steel and Galvanized-Steel Casings: Apply manufacturer's standard primer immediately after cleaning and pretreating.
5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

B. Casing Insulation and Adhesive:

1. Materials: ASTM C 1071, Type I.

2. Location and Application: Factory applied with adhesive and mechanical fasteners to the internal surface of section panels downstream from, and including, the cooling-coil section.

   a. Liner Adhesive: Comply with ASTM C 916, Type I.
   b. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
   c. Liner materials applied in this location shall have air-stream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service-air velocity.

3. Location and Application: Encased between outside and inside casing.

C. Inspection and Access Panels and Access Doors:

1. Panel and Door Fabrication: Formed and reinforced, double-wall and insulated panels of same materials and thicknesses as casing.

2. Inspection and Access Panels:

   a. Fasteners: Two or more camlock type for panel lift-out operation. Arrangement shall allow panels to be opened against air-pressure differential.
   b. Gasket: Neoprene, applied around entire perimeters of panel frames.
   c. Size: Large enough to allow inspection and maintenance of air-handling unit’s internal components.

3. Access Doors:

   a. Hinges: A minimum of two ball-bearing hinges or stainless-steel piano hinge and two wedge-lever-type latches, operable from inside and outside. Arrange doors to be opened against air-pressure differential.
   b. Gasket: Neoprene, applied around entire perimeters of panel frames.
   c. Fabricate windows indoors of double-glazed, wire-reinforced safety glass with an air space between panes and sealed with interior and exterior rubber seals.
   d. Size: At least 18 inches wide by full height of unit casing up to a maximum height of 60 inches.

4. Locations and Applications:

   a. Fan Section: Doors.
   b. Access Section: Doors.
   c. Coil Section: Inspection and access panel.
   d. Damper Section: Doors.
   e. Filter Section: Doors large enough to allow periodic removal and installation of filters.
   f. Mixing Section: Doors.

5. Service Light: 100-W equivalent vaporproof LED fixture with switched junction box located outside adjacent to door.
a. Locations: Fan section.

D. Condensate Drain Pans:
   1. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and from humidifiers and to direct water toward drain connection.
      a. Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
      b. Depth: A minimum of 2 inches deep.
   2. Stainless-steel - Double sloped.
   3. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.
   4. Units with stacked coils shall have an intermediate drain pan to collect condensate from top coil.

E. Air-Handling-Unit Mounting Frame: Formed galvanized-steel channel or structural channel supports, designed for low deflection, welded with integral lifting lugs.
   1. Seismic Fabrication Requirements: Fabricate mounting base and attachment to air-handling unit sections, accessories, and components with reinforcement strong enough to withstand seismic forces defined in Section 230548 "Vibration and Seismic Controls for HVAC" when air-handling unit frame is anchored to building structure.

2.3 FAN, DRIVE, AND MOTOR SECTION

A. Fan and Drive Assemblies: Statically and dynamically balanced and designed for continuous operation at maximum-rated fan speed and motor horsepower.
   1. Shafts: Designed for continuous operation at maximum-rated fan speed and motor horsepower, and with field-adjustable alignment.
      a. Turned, ground, and polished hot-rolled steel with keyway. Ship with a protective coating of lubricating oil.
      b. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

B. Plenum Fan Housings: Steel frame and panel; fabricated without fan scroll and volute housing.

C. Backward-Inclined, Centrifugal Fan Wheels: Single-width-single-inlet and double-width-double-inlet construction with curved inlet flange, backplate, backward-inclined blades welded or riveted to flange and backplate; cast-iron or cast-steel hub riveted to backplate and fastened to shaft with set screws.

D. Fan Shaft Bearings:
   1. Prelubricated and Sealed, Ball Bearings: Self-aligning, pillow-block type with a rated life of 120,000 hours according to ABMA 9.

E. Belt Drives: Factory mounted, with adjustable alignment and belt tensioning, and with 1.5 service factor based on fan motor.
1. Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.
2. Motor Pulleys: Adjustable pitch for use with 5-hp motors and smaller; fixed pitch for use with motors larger than 5 hp. Select pulley size so pitch adjustment is at the middle of adjustment range at fan design conditions.
3. Belts: Oil resistant, nonsparking, and nonstatic; in matched sets for multiple-belt drives.
4. Belt Guards: Comply with requirements specified by OSHA and fabricate according to SMACNA’s "HVAC Duct Construction Standards"; 0.1046-inch-thick, 3/4-inch diamond-mesh wire screen, welded to steel angle frame; prime coated.

F. Internal Vibration Isolation and Seismic Control: Fans shall be factory mounted with manufacturer's standard restrained vibration isolation mounting devices having a minimum static deflection of 1 inch.

1. Seismic Fabrication Requirements: Fabricate fan section, internal mounting frame and attachment to fans, fan housings, motors, casings, accessories, and other fan section components with reinforcement strong enough to withstand seismic forces defined in Section 230548 "Vibration and Seismic Controls for HVAC" when fan-mounting frame and air-handling-unit mounting frame are anchored to building structure.

G. Motor: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

1. Electrically Commutated Motors (ECM).
2. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
4. Mount unit-mounted disconnect switches on exterior of unit.

2.4 COIL SECTION

A. General Requirements for Coil Section:

1. Comply with ARI 410.
2. Fabricate coil section to allow removal and replacement of coil for maintenance and to allow in-place access for service and maintenance of coil(s).
3. For multizone units, provide air deflectors and air baffles to balance airflow across coils.
4. Coils shall not act as structural component of unit.
5. Seismic Fabrication Requirements: Fabricate coil section, internal mounting frame and attachment to coils, and other coil section components with reinforcement strong enough to withstand seismic forces defined in Section 230548 "Vibration and Seismic Controls for HVAC" when coil-mounting frame and air-handling-unit mounting frame are anchored to building structure.
   a. Airflow proving switch.

2.5 INTEGRATED GEOTHERMAL HEAT PUMP

A. Provide geothermal heat pump factory system to provide heating and cooling utilizing R410A refrigerant.

B. Compressors to be inverter duty scroll compressors.
C. Factory accessories to include filter drier, sight glass, and compressor isolation valves.

2.6 HEAT WHEEL

A. Provide factory installed heat wheel.

B. See Section 237200 for requirements of heat wheel.

2.7 AIR FILTRATION SECTION

A. General Requirements for Air Filtration Section:
   1. Comply with NFPA 90A.
   2. Provide minimum air resistance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
   3. Provide filter holding frames arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.

B. Extended-Surface, Disposable Panel Filters:
   1. Factory-fabricated, dry, extended-surface type.
   2. Thickness: 4 inches.
   4. Media: Fibrous material formed into deep-V-shaped pleats and held by self-supporting wire grid.
   7. Provide room for MERV 8 pre-filter

C. Filter Gage:
   1. 3-1/2-inch- diameter, diaphragm-actuated dial in metal case.
   2. Vent valves.
   3. Black figures on white background.
   4. Front recalibration adjustment.
   5. 3 percent of full-scale accuracy.
   6. Range: 0- to 2.0-inch wg.
   7. Accessories: Static-pressure tips with integral compression fittings, 1/4-inch plastic tubing, and 2- or 3-way vent valves.

2.8 DAMPERS

A. General Requirements for Dampers: Leakage rate, according to AMCA 500, "Laboratory Methods for Testing Dampers for Rating," shall not exceed 2 percent of air quantity at 2000-fpm face velocity through damper and 4-inch wg pressure differential.

B. Damper Operators: Comply with requirements in Section 230923.12 "Control Dampers."

C. Electronic Damper Operators:
   1. Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.
2. Electronic damper position indicator shall have visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.

3. Operator Motors:
   a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
   b. Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.
   c. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.

4. Nonspring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.

5. Spring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running and breakaway torque of 150 in. x lbf.

6. Size dampers for running torque calculated as follows:
   b. Opposed-Blade Damper with Edge Seals: 5 inch-lb/sq. ft. of damper.
   c. Parallel-Blade Damper without Edge Seals: 4 inch-lb/sq. ft. of damper.
   d. Opposed-Blade Damper without Edge Seals: 3 inch-lb/sq. ft. of damper.
   e. Dampers with 2- to 3-Inch wg of Pressure Drop or Face Velocities of 1000 to 2500 fpm: Increase running torque by 1.5.
   f. Dampers with 3- to 4-Inch wg of Pressure Drop or Face Velocities of 2500 to 3000 fpm: Increase running torque by 2.0.


8. Overload Protection: Electronic overload or digital rotation-sensing circuitry.


10. Temperature Rating: Minus 22 to plus 122 deg F.

11. Run Time: 12 seconds open, 5 seconds closed.

D. Outdoor- and Return-Air Mixing Dampers: Parallel-blade, aluminum dampers mechanically fastened to cadmium-plated steel operating rod in reinforced cabinet. Connect operating rods with common linkage and interconnect linkages so dampers operate simultaneously.

E. Mixing Section: Multiple-blade, air-mixer assembly located immediately downstream of mixing section.

F. Combination Filter and Mixing Section:
   1. Cabinet support members shall hold 2-inch- thick, pleated, flat, permanent or throwaway filters.
   2. Multiple-blade, air-mixer assembly shall mix air to prevent stratification, located immediately downstream of mixing box.

2.9 CONTROLS

A. Provide terminal strips and connections for field.
2.10 CAPACITIES AND CHARACTERISTICS

A. See Schedule on Drawings.

2.11 SOURCE QUALITY CONTROL

A. Fan Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Fans shall bear AMCA-certified sound ratings seal.

B. Fan Performance Rating: Factory test fan performance for airflow, pressure, power, air density, rotation speed, and efficiency. Rate performance according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating."

C. Water Coils: Factory tested to 300 psig according to ARI 410 and ASHRAE 33.

D. Refrigerant Coils: Factory tested to 450 psig according to ARI 410 and ASHRAE 33.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment Mounting:

1. Install air-handling units on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033053 "Miscellaneous Cast-in-Place Concrete."

2. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

3. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

B. Arrange installation of units to provide access space around air-handling units for service and maintenance.

C. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with new, clean filters.

D. Install filter-gage, static-pressure taps upstream and downstream of filters. Mount filter gages on outside of filter housing or filter plenum in accessible position. Provide filter gages on filter banks, installed with separate static-pressure taps upstream and downstream of filters.

E. Comply with requirements for piping specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

F. Install piping adjacent to air-handling unit to allow service and maintenance.

G. Connect piping to air-handling units mounted on vibration isolators with flexible connectors.
H. Connect condensate drain pans using NPS 1-1/4, ASTM B 88, Type M copper tubing. Extend to nearest equipment or floor drain. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.

I. Hot- and Heat Pump Piping: Comply with applicable requirements in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties." Install shutoff valve and union or flange at each coil supply connection. Install balancing valve and union or flange at each coil return connection.

J. Refrigerant Piping: Comply with applicable requirements in Section 232300 "Refrigerant Piping." Install shutoff valve and union or flange at each supply and return connection.

K. Connect duct to air-handling units with flexible connections. Comply with requirements in Section 233300 "Air Duct Accessories."

END OF SECTION 237313
SECTION 238146.13 - WATER-TO-AIR HEAT PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Concealed horizontal or vertical units, 6 tons and smaller.
   2. Exposed, floor-mounted console units.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:
   1. Product Data for Credit EA 4: Documentation indicating that equipment and refrigerants comply.
   2. Product Data for Prerequisite IEQ 1: Documentation indicating that units comply with ASHRAE 62.1, Section 5 - "Systems and Equipment."

C. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   1. Include diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data

1.5 QUALITY ASSURANCE

A. ASHRAE Compliance:
   1. ASHRAE 15.
   2. Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
C. Comply with NFPA 70.

D. Comply with safety requirements in UL 484 for assembly of free-delivery, water-source heat pumps.

E. Comply with safety requirements in UL 1995 for duct-system connections.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of water-source heat pumps that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, refrigeration components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CONCEALED WATER-SOURCE HEAT PUMPS, 6 TONS AND SMALLER

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Aaon.

2. No alternates accepted

B. Description: Packaged water-source heat pump with temperature controls; factory assembled, tested, and rated according to ASHRAE/ARI/ISO-13256-1.

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

C. General Description

1. Water-Source Heat Pump unit shall include compressor, DX air coil, coaxial refrigerant-to-water heat exchanger, filters, supply fan, and unit controls.

2. Unit shall be factory assembled and tested including leak testing of the coil, pressure testing of the refrigeration circuit, and run testing of the completed unit. Run test report shall be available in an electronic format.

3. Unit shall have decals and tags to indicate caution areas for safety as required by codes.

4. User's manual shall be supplied within the unit.

5. Color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment’s access panel.

6. Unit nameplate shall be affixed to the exterior of the unit.

D. Construction

1. Horizontal units shall have right or left intake, draw-through supply fan, and left or right or end discharge. Unit shall have the ability to be field convertible between side and end discharge.

2. All cabinet walls shall be fabricated of aluminum with 1 inch foil faced cotton insulation. Unit insulation shall have a minimum thermal resistance R-value of 4.

3. Access to air filters, compressor, air coil, refrigerant-to-water heat exchanger, supply fan and electrical and controls components shall be through removable toolless side access panels.
4. Horizontal units shall have access to air filters, expansion valve, filter drier, reversing valve, supply fan and motor through removable bottom access panels.

5. Unit shall be designed with wrench-less flush mounted water connections.

6. Horizontal units shall have integrated hanging brackets with rubber vibration isolation.

7. Unit shall include a 304 stainless steel sloped drain pan. Drain pan connection shall be available on the right (left) side of the air handling section of the unit.

8. Unit shall have ½ inch supply duct flange.

9. Low sound package shall include compressor sound blanket and 1 inch foil faced cotton insulation on the blower housing.

E. Electrical

1. Unit shall be provided with an integrated control panel and compressor contactor for connecting power to the unit.

2. Control circuit transformer and wiring shall provide 24 VAC control voltage from the line voltage to the unit.

3. Units shall be provided with factory installed and factory wired non-fused disconnect. Switch shall be accessible from the exterior of the unit.

4. Unit shall be provided with phase and brownout protection module that shuts down all motors in the unit if the electrical phases are more than 8% out of balance on voltage, the voltage is more that 8% under design voltage, or on phase reversal.

F. Supply Fans

1. Unit shall include direct drive forward curved centrifugal blower.

2. Unit shall include Electronically Commutated Motor (ECM) driven supply fan with thermal overload protection. Supply fan shall include isolator between the fan and cabinet to reduce unit vibration.

G. DX Air Coil

1. DX Air Coil
   a. Coil shall be designed for use with R-410A refrigerant and shall be fabricated from aluminum microchannel tubes.
   b. Coil shall be designed for a minimum of 6°F of refrigerant sub-cooling.
   c. Coil shall be leak tested.
   d. Coil shall be furnished with a thermostatic expansion valve.
   e. Drain pan shall be provided with overflow switch which shuts down the compressor when overflow of the unit drain pan is detected.

H. Refrigeration System

1. Unit shall be factory charged with R-410A refrigerant.

2. Compressors of 2 ton (24 MBH) and larger units shall be R-410A scroll type with thermal overload protection and independently circuited.

3. Compressors of ½ - 1 ½ ton (6 - 18 MBH) units shall be R-410A rotary type with thermal overload protection and independently circuited.

4. Compressor shall carry a 5 year non-prorated warranty, from the date of equipment manufacture.

5. Compressors shall be isolated from compressor mounting plate with the compressor manufacturer’s recommended rubber vibration isolators and compressor mounting plate shall be isolated from the cabinet with rubber vibration isolator, to reduce any transmission of noise from the compressor into the building area.

6. Unit shall be equipped with thermostatic expansion valve type refrigerant flow control.
7. Unit shall be configured as a geothermal water-source heat pump. Unit shall be equipped with an automatic reset low pressure and high pressure refrigerant safety controls, Schrader type service fittings on both the high pressure and low pressure sides, factory installed liquid line heat pump filter drier, reversing valve, and thermostatic expansion valve. Reversing valve shall energize during the cooling mode of operation.

I. Coaxial Heat Exchanger

1. Coaxial Heat Exchanger
   a. All field installed piping shall be hydrostatically tested before being put into service. Test pressure shall be 125 psi for a two hour duration. Leaks and loss in test pressure constitute defects. If test fails, corrections shall be made to the system and the test shall then be repeated to make certain all defects were corrected. All testing shall be performed to ASTM Standards.
   b. Unit shall contain coaxial tube-in-tube heat exchangers. Heat exchanger shall be circuited in a counter flow heating arrangement to the refrigerant system. Field piping connections shall be labeled wrench-less flush mounted water connections. Maximum operating pressure on the water side of the heat exchanger shall be 400 psi.
   c. Unit shall be supplied with Ground/Ground Water Loop extended water temperature range insulation that includes insulation on all water piping and refrigerant suction line.

J. Filters

1. Unit shall include 4 inch thick, pleated panel filters with a MERV rating of 13, upstream of the air coil. Filter rack service access shall be from the side of the unit. Horizontal units shall include side and bottom filter rack service access.

K. Controls

1. Provide Aaon’s factory installed native Bacnet control system. Provide full single zone VAV control.

L. Electrical Connection: Single electrical connection with non-fused disconnect.

M. Capacities and Characteristics:

1. See Schedule on Drawings.

2.2 EXPOSED, CONSOLE WATER-SOURCE HEAT PUMPS (VERTICAL “SB” UNITS)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Aaon.
2. No alternates accepted

B. Description: Packaged water-source heat pump with temperature controls; factory assembled, tested, and rated according to ASHRAE/ARI/ISO-13256-1.

1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
C. General Description

1. Self contained unit shall include compressors, evaporator coils, filters, supply fans, water-cooled condensers, reheat coils, electric heaters, hot water coils, steam coils, and unit controls.
2. Unit shall be factory assembled and tested including leak testing of the coils, pressure testing of the refrigeration circuit, and run testing of the completed unit. Run test report shall be supplied with the unit in the controls compartment's literature pocket.
3. Unit shall have decals and tags to indicate lifting and rigging, service areas, and caution areas for safety and to assist service personnel.
4. Unit components shall be labeled, including (pipe stub outs,) refrigeration system components, and electrical and controls components.
5. Installation, Operation and Maintenance manual shall be supplied within the unit.
6. Laminated color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment's access door.
7. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment's access door.

D. Construction

1. Unit shall be provided with a horizontal intake, have a draw-through supply fan configuration and discharge air vertically.
2. All cabinet walls and access doors shall be fabricated of double wall, impact resistant, rigid polyurethane foam panels.
3. Unit insulation shall have a minimum thermal resistance R-value of 6.5. Foam insulation shall have a density of 2 pounds/cubic foot and shall be tested in accordance with ASTM D1929 for a minimum flash ignition temperature of 610°F.
4. Unit construction shall be double wall with G90 galvanized steel on both sides and a thermal break. Double wall construction with a thermal break prevents moisture accumulation on the insulation, provides a cleanable interior, prevents heat transfer through the panel, and prevents exterior condensation on the panel.
5. Unit shall be designed to reduce air leakage and infiltration through the cabinet. Sealing shall be included between panels and between access doors and openings to reduce air leakage. Refrigerant piping and electrical wiring through cabinet panels shall include sealing to reduce air leakage.
6. Access to filters, compressors, cooling coil, reheat coil, condensers, heaters, supply fans and electrical and controls components shall be through hinged access doors.
7. Access doors shall be flush mounted to cabinetry, with stainless steel removable pin hinges and zinc cast lockable handles.
8. Unit shall include a 304 stainless steel sloped drain pan. Drain pan connection shall be available on the right (left) side of the air handling section of the unit.
9. Cooling coils shall be mechanically supported above the drain pan by multiple supports that allow drain pan cleaning and coil removal.

E. Electrical

1. Unit shall be provided with an integrated control panel.
2. Unit shall be provided with standard power block for connecting power to the unit.
3. Control circuit transformer and wiring shall provide 24 VAC control voltage from the line voltage to the unit.
4. Unit shall be provided with phase and brownout protection which shuts down all motors in the unit if the electrical phases are more than 10% out of balance on voltage, the voltage is more that 10% under design voltage, or on phase reversal.
5. Unit shall be provided with blower auxiliary contacts on the low voltage terminal block which close when the supply fans are energized.
6. Unit shall be provided with manual reset low temperature limit controls which shut off the unit when the discharge temperature reaches a field adjustable setpoint.

F. Supply Fans

1. Unit shall include direct drive, unhoused, backward curved, plenum supply fans.
2. Fan and motor assembly shall be dynamically balanced.
3. Motors shall be high efficiency electronically commutated motors ECM.
4. Supply air shall discharge vertically from the unit.
   a. ECM driven supply fan speed shall be controlled by the manufacturer’s provided DDC Controller.

G. Cooling Coil

1. Evaporator Coil
   a. Coil shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and aluminum (304 stainless steel) end casings. Fin design shall be sine wave rippled.
   b. Coil shall be standard (6 row high) capacity.
   c. Coil shall be hydrogen or helium leak tested.
   d. Coil shall be furnished with a factory installed thermostatic expansion valves.
   e. Drain pan shall be provided with overflow switch which shuts down the cooling circuits when overflow of the unit drain pan is detected.

H. Refrigeration System

1. Unit shall be factory charged with R-410A refrigerant.
2. Compressors shall be R-410A scroll type with thermal overload protection and independently circuited.
3. Unit shall include a variable capacity scroll compressor which shall be capable of modulation from 10-100% of its rated capacity.
4. Compressor shall carry a 5 year non-prorated warranty, from the date of original equipment shipment from the factory.
5. Compressors shall be mounted in an isolated service compartment which can be accessed without affecting unit operation. Lockable hinged compressor access doors shall be fabricated of double wall, rigid polyurethane foam insulated panels to prevent the transmission of noise outside the cabinet.
6. Compressors shall be isolated from unit with the compressor manufacturer’s recommended rubber vibration isolators, to reduce any transmission of noise from the compressor into the building area.
7. Unit shall be equipped with thermostatic expansion valve type refrigerant flow control.
8. Unit shall be configured as a water-source heat pump. Unit shall be equipped with an automatic reset low pressure and manual reset high pressure refrigerant safety controls. Schrader type service fittings on both the high pressure and low pressure sides, factory installed liquid line heat pump filter drier, reversing valve, and thermostatic expansion valves on the indoor coil and refrigerant-to-water heat exchangers. Reversing valve shall energize during the cooling mode of operation.
9. Modulating hot gas reheat shall be provided on the lead refrigeration circuit. Refrigeration circuit shall be provided with hot gas reheat coil, modulating valves, receiver tank, electronic controller, supply air temperature sensor and a dehumidification control signal terminal which allow the unit to have a dehumidification mode of operation, which includes supply air temperature control to prevent supply air temperature swings and overcooling of the space.
10. Each refrigeration circuit shall be equipped with a liquid line sight glass.
11. Each refrigeration circuit shall be equipped with suction and discharge compressor isolation valves.

12. Each refrigeration circuit shall be provided with an adjustable temperature sensor freeze stat which shuts down the cooling circuits when the evaporator coil tubing falls below the setpoint.

I. Condensers

1. Water-Cooled Condenser
   a. All field installed piping shall be hydrostatically tested before being put into service. Test pressure shall be 300 psi for a two hour duration. Leaks and loss in test pressure constitute defects. If test fails, corrections shall be made to the system and the test shall then be repeated to make certain all defects were corrected. All testing shall be performed to ASTM Standards.
   b. Water-cooled condensing section shall contain coaxial tube-in-tube heat exchangers. Heat exchanger shall be circuited in a counter flow arrangement to the refrigerant system. Tubes shall be copper. Field piping connections shall be external to the self contained unit. Connections shall be labeled, extend beyond the unit casing and be factory sealed to prevent condensation in the panel assembly. Maximum operating pressure on the water side of the condenser shall be 300 psi.
   c. Each heat exchanger circuit shall have a flow switch that shuts down the compressors if water flow to the condenser is interrupted.
   d. Water-cooled condensing section shall contain coaxial tube-in-tube heat exchangers. Heat exchanger shall be circuited in a counter flow arrangement to the refrigerant system. Tubes shall be cupronickel. Field piping connections shall be external to the self contained unit. Connections shall be labeled, extend beyond the unit casing and be factory sealed to prevent condensation in the panel assembly. Maximum operating pressure on the water side of the condenser shall be 300 psi.
   e. Each heat exchanger circuit shall have a factory installed motorized shutoff valve.
   f. Unit shall include factory installed head pressure control module and each heat exchanger shall include factory installed head pressure control valve which modulates the condenser water flow based on head pressure and allows cooling operation below 65°F condenser water temperature.

J. Heating Coil

1. Hot Water Heating Coil (where indicated on drawing schedule)
   a. Coil shall be certified in accordance with AHRI Standard 410 and be hydrogen or helium leak tested.
   b. Coil shall be constructed of copper tubes with aluminum fins mechanically bonded to the tubes and aluminum end casings. Fin design shall be sine wave rippled.
   c. Coil shall have single serpentine circuitry.
   d. Coil shall have external piping connections. Supply and return connections shall be sweat connection. Coil connections shall be labeled, extend beyond the unit casing and be factory sealed to minimize air leakage and condensation inside the panel assembly.
   e. Coil shall be located in the preheat position upstream of the cooling coil.
   f. Control valves shall be field supplied and field installed.

K. Filters

1. Unit shall include 4 inch thick, pleated panel filters with a MERV rating of 13, upstream of the heating and cooling coils. Unit shall also include 2 inch thick, pleated panel pre filters with MERV rating of 8, upstream of the 4 inch standard filters.
2. Unit shall include a clogged filter switch.
3. Unit shall include factory installed Magnehelic gauge measuring the pressure drop across the filter rack.

L. Controls

1. Factory Installed and Factory Provided Controller
   a. Unit controller shall be capable of controlling all features and options of the unit. Controller shall be factory installed in the unit controls compartment and factory tested.
   b. Controller shall be capable of standalone operation with unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling available without dependence on a building management system.
   c. Controller shall have an onboard clock and calendar functions that allow for occupancy scheduling.
   d. Controller shall include non-volatile memory to retain all programmed values, without the use of an external battery, in the event of a power failure.
   e. Variable Air Volume Controller (multi-zone)
      1) Unit shall utilize a variable capacity compressor system and a variable speed supply fan system to modulate cooling and airflow as required to meet space temperature cooling loads and to save operating energy. Supply fan speed shall modulate based on supply air duct static pressure. Cooling capacity shall modulate based on supply air temperature.
      2) With modulating hot gas reheat, unit shall modulate cooling and hot gas reheat as efficiently as possible, to meet space humidity loads and prevent supply air temperature swings and overcooling of the space.
      3) Unit shall modulate heating with constant airflow to meet space temperature heating loads. With staged heating, capacity shall modulate based on space temperature. With modulating heating, capacity shall modulate based on supply air temperature.
      4) Return air temperature sensor, supply air temperature sensor, and supply air duct static pressure sensor shall be furnished with the unit for field installation.
      5) Control of supply airflow, for duct static pressure control, shall be with unit controller, factory installed electronically commutated motor, and supply air duct static pressure sensor.
   f. Single Zone Variable Air Volume Controller
      1) Unit shall utilize a variable capacity compressor system and a variable speed fan system to modulate cooling and airflow as required in meeting the space temperature needs and to save unit operating energy. Unit fan speed shall modulate based on space temperature, not supply air pressure.
      2) Units with modulating heat shall be capable of modulating fan speed in both the heating and cooling mode variable capacity heat pump, hydronic coils.
      3) With modulating hot gas reheat, unit shall modulate cooling and hot gas reheat as efficiently as possible, to meet space humidity loads and prevent supply air temperature swings and overcooling of the space.
      4) Unit shall be provided with a supply air sensor for supply air temperature control. Mixing boxes and bypass ducts shall not be required for operation as a single zone VAV system.
      5) Where specified for instruction/demonstration purposes: Unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling shall be accomplished with connection to interface module with LCD screen and input keypad, interface module with touch screen, or with connection to PC with free configuration software. Controller shall be capable of connection with other factory installed and factory provided unit controllers with individual unit configuration,
setpoint adjustment, sensor status viewing, and occupancy scheduling available from a single unit. Connection between unit controllers shall be with a modular cable. Controller shall be capable of communicating and integrating with a LonWorks or BACnet network. [WattMaster Orion Controls System]

6) Unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling shall be accomplished with connection to PC with free configuration software. Controller shall be IP addressable and be able to reside on a TCP/IP network. Controller shall be capable of communicating and integrating with a LonWorks, BACnet, or Modbus network. [JENEsys Controls System]

7) Unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, push button override, and occupancy scheduling shall be accomplished with an interface module with LCD screen and input keypad. Controller shall be capable of communicating and integrating with a BACnet MS/TP network. [AAON Mini Controller]

M. Accessories

1. Unit shall be provided with a low voltage safety shutdown terminal block for field installation of a smoke detector which shuts off the unit’s control circuit.

N. Electrical Connection: Single electrical connection with non-fused disconnect.

O. Capacities and Characteristics:

1. See Schedule:

2.3 HOSE KITS

A. General: Hose kits shall be designed for minimum 400-psig working pressure and operating temperatures from 33 to 211 deg F. Tag hose kits to equipment designations.

B. Hose: Length 24 inches braided stainless steel, complete with adapters,. Minimum diameter, equal to water-source, heat-pump connection size.

C. Isolation Valves: Two-piece, bronze-body ball valves with stainless-steel, standard-port ball and stem with normal pipe thread (NPT) connections, and galvanized-steel lever handle. Provide valve for supply and return. If balancing device is combination shutoff type with memory stop, the isolation valve may be omitted on the return.

D. Strainer: Y-type with blowdown valve in supply connection.

E. Balancing Device: Mount in return connection. Include meter ports to allow flow measurement with differential pressure gage.

1. Automatic balancing valve, factory set to operate within 10 percent of design flow rate over a 40:1 differential pressure range of 2 to 80 psig.
PART 3 - EXECUTION

3.1 INSTALLATION

A. Floor Mounting: Install water-source heat pumps using elastomeric mounts. Comply with requirements for vibration isolation devices specified in Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment."


B. Suspended Units: Install water-source heat pumps with continuous-thread hanger rods and spring hangers with vertical-limit stop of size required to support weight of water-source heat pump unit.

1. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment."
2. Comply with requirements for hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

C. Install wall-mounting thermostats, humidistats, and switch controls in electrical outlet boxes at heights to match lighting controls or as required in Section 230923.27 "Temperature Instruments," and Section 230923 "Direct Digital Control (DDC) System for HVAC."

D. Connect supply and return hydronic piping to heat pump.

E. Connect heat-pump condensate drain pan to indirect waste connection with condensate trap of adequate depth to seal against fan pressure. Install cleanouts in piping at changes of direction.

F. Connect supply and return ducts to water-source heat pumps with flexible duct connectors specified in Section 233300 "Air Duct Accessories."

G. Install electrical devices furnished by manufacturer but not specified to be factory mounted.

H. Install piping adjacent to machine to allow service and maintenance.

I. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

J. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections:

1. After installing water-source heat pumps and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Heat pumps will be considered defective if they do not pass tests and inspections.
C. Prepare test and inspection reports.

END OF SECTION 238146.13
SECTION 26 05 13.16 - MEDIUM-VOLTAGE, SINGLE- AND MULTI-CONDUCTOR CABLES

PART 1 - GENERAL

1.1 RELATED WORK
   A. Section 26 0543 – Underground Ducts and Raceways for Electrical Systems
   B. Section 26 0812 – Power Distribution Acceptance Tests
   C. Section 26 0813 – Power Distribution Acceptance Test Tables

1.2 DESCRIPTION
   A. Section includes cables and related splices, terminations, and accessories for medium-voltage electrical distribution systems.
   B. Cables are for use in underground duct applications.
   C. Conductors shall be rated to operate at conductor temperature of 90°C for continuous normal operation, 130°C for emergency overload conditions, and 250°C for short circuit conditions, based on 40°C maximum ambient temperature.
   D. Conductor sizes in Section are based on copper wire and only copper wire shall be used.

1.3 REFERENCE STANDARDS
   A. AEIC CS6 – Specification for Ethylene Propylene Rubber Insulated Shielded Power Cables Rated 5 through 69kV
   B. ASTM B-8 – Standard Specification for Concentric-Lay Stranded Copper Conductors, Hard, Medium-Hard or Soft
   C. ICEA S-94-649 – 5-46kV Concentric Neutral Cables Rated 5000 to 46000 Volts
   D. IEEE 48 – Standard Test Procedures and Requirements for Alternating-Current Cable Terminations 2.5kV through 765kV
   E. IEEE 386 – Standard for Separable Insulated Connector Systems for Power Distribution Systems above 600 V (ANSI)
   F. IEEE 404 – Standard for Extruded and Laminated Dielectric Shielded Cable Joints Rated 2500 – 500000 V (ANSI)
   G. IEEE 576 – Recommended Practice for Installation, Termination, and Testing of Insulated Power Cable as Used in Industrial and Commercial Applications (ANSI)
   H. NFPA 70 – National Electrical Code
   I. UL 1072 – Medium-Voltage Power Cable

1.4 SUBMITTALS
   A. Product Data: For each type of cable indicated. Include splices and terminations for cable and cable accessories.
1. Include cable drawings with the following data:
   a. Longitudinal cutback and cross-sectional view of cable.
   b. Identification and structure of cable components.
   c. Dimensions of cable components in English and SI units.

B. Material Certificates: For each cable and accessory type, signed by manufacturer.

C. Manufacturer Testing Certificate: For each type and voltage class of cable indicated.

D. Certified Field Quality Control Test Reports per requirements in Section 26 0812 – Power Distribution Acceptance Tests and Section 26 0813 – Power Distribution Acceptance Test Tables for each type and voltage class of cable indicated. Indicate applicable standards compliance. Interpret test results and corrective action taken for compliance with specification requirements.

E. Qualification Data: For testing agency.

F. Manufacturer’s Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation.

G. Installation Guide: Include the following:
   1. Maximum allowable pulling tension (in pounds and newtons)
   2. Minimum allowable bending radius
   3. Recommended pulling compounds
   4. Splicing and termination instructions with diagrams, dimensions, and material lists
   5. Weight per 1,000 ft
   6. Standard “packaging” of reels (i.e., lengths, lagging, banding, etc.)
   7. Reactance and AC resistance (ohms to neutral) of each size and voltage class of cable, both in magnetic and non-magnetic duct, based on 3-1/C cables or 1-3/C cable in one duct.

H. Closeout Submittals:
   1. Project Record Documents:
      a. Record actual locations of cables, splices, and terminations.
   2. Operation and Maintenance Data:
      a. Include manufacturer’s recommended operating instructions, maintenance procedures and intervals, and preventive maintenance instructions.

1.5 QUALITY ASSURANCE

A. Installer: Engage cable splicer, trained and certified by splice material manufacturer, to install, splice, and terminate medium-voltage cable, having not less than 3 yrs experience as licensed electrician.

B. Regulatory Requirements:
   1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.
   2. Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and indicated.

C. Source Limitations: Obtain cables and accessories through one source from single manufacturer.
D. All cables shall be of a single type and configuration. Date of manufacture shall not precede contract date by more than one year.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Coordinate with manufacturer to provide protective covering over cable and reel to prevent damage during shipping, storage, or handling.

B. Store in clean, dry space. Protect from dirt, fumes, water, corrosive substances, and construction debris.

1.7 WARRANTY

A. Refer to Division 01 and Section 26 0000 – General Electrical Requirements for general warranty requirements.

B. Manufacturer shall provide standard 1 yr warranty against defects in materials and workmanship for products specified in this Section. Warranty period shall begin on date of substantial completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Cables:
   1. General Cable (Cablec)
   2. Kerite
   3. Okonite
   4. Prysmian (Pirelli)

B. Cable Splicing and Terminating Products and Accessories:
   1. Raychem Corporation
   2. RTE Components; Cooper Power Systems, Inc.
   3. Thomas & Betts Corporation/Elastimold
   4. 3M; Electrical Products Division

2.2 CABLES

A. Cable Type: MV90

B. Comply with UL 1072, AEIC CS6, ICEA S-93-639, and ICEA S-94-649

C. Conductor: Copper

D. Conductor Insulation: Ethylene-propylene-rubber

E. Voltage Rating: 15 kV

F. Insulation Thickness: 133 percent (220 mil) insulation level

G. Concentric Neutral: Solid copper wires shall be spirally applied to provide neutral rating equal to 1/3 of the cable conductor current rating.
H. Cable Jacket: 80 mil extruded, chlorinated, polyethylene jacket. Color: black, unless otherwise designated.

I. Cables utilizing combination insulation shield and jacket are acceptable.

J. Cable lengths shall be supplied with factory-installed, moisture-proof end seals on conductors on each end. Cable seals shall be rubber or plastic caps, and shall prevent moisture from seeping into cable ends.

K. Each cable reel shall be tagged with the following:

1. Manufacturer
2. Cable Size
3. Cable Type
4. Voltage Class
5. Manufacture Date
6. Cable Length
7. Tolerances
8. Reel Number
10. Customer Name

L. Surface Marking:

1. Cables shall be permanently printed (or imprinted) on jacket surface at regular intervals over entire length of cable with the following:
   a. Manufacturer’s name
   b. Cable type
   c. Insulation type and thickness
   d. Conductor size and type
   e. Voltage class
   f. Sequential footage number
   g. Year of manufacture
   h. UL designation

M. Cables shall be constructed and rated for continuous and intermittent submersion in water and shall be suitable for installation in conduit and underground duct.

N. Cable shield shall be capable of withstanding fault current indicated on drawings for 1/10 second.

2.3 SPlice kits

A. Connectors and Splice Kits: Comply with IEEE 404; type as recommended by cable or splicing kit manufacturer for application.

B. Splicing Products: As recommended, in writing, by splicing kit manufacturer for specific sizes, ratings, and configurations of cable conductors. Include components required for complete splice, with detailed instructions.
   1. Combination tape and cold-shrink-rubber sleeve kit with rejacketing by cast-epoxy-resin encasement or other waterproof, abrasion-resistant material.
2.4 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 200A and 600A, 15 kV class, 95 KV BIL load make/break and continuous-current rating; coordinated with insulation diameter, conductor size, and material of cable being terminated, with steel-reinforced hook-stick eye, grounding eye, and arc-quenching material. Include capacitance coupled test point on terminator body. Include cold shrinkable metallic shield adapter kit to ground metallic shielded cable. Include connection bus with parking stand for wall mounting.

C. Test-Pont Fault Indicators: Sealed and self-contained applicable current-trip ratings and arranged for installation in test points of load-break separable connectors, and complete with self-resetting indicators capable of being installed with shotgun hot stick and tested with test tool.

D. Tool Set: Shotgun hot stick with energized terminal indicator, fault-indicator test tool, and carrying case.

2.5 ARC-PROOFING MATERIALS

A. Arc-Proofing Tape: Fireproof tape, flexible, conformable, intumescent to 0.3" thick, compatible with cable jacket.

2.6 FAULT INDICATORS

A. Indicators: Automatic current reset fault indicator, arranged to clamp to cable sheath and provide a display after fault has occurred in cable. Instrument shall not be affected by heat, moisture, and corrosive conditions and shall be recommended by manufacturer for installation conditions.

2.7 CONDUCTOR IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend.

B. Manufacturers: Brady USA, Ideal, Marking Services, Inc. (MRI), Seton, or approved equal.

C. Color-Coding Conductor Tape: Orange, self-adhesive vinyl tape not less than 3 mils thick by 1" to 2" wide.

D. Metal Tags: Brass or aluminum, 2" x 2" x 0.05", with stamped legend, punched for use with self-locking nylon tie fastener.

E. Identification shall include:
   1. Circuit (CKT11A“)
   2. Phase (“PhA, PhB, PhC“)
   3. Destination Station Number (“ToSTA11A-1“)

F. Tags shall not start with the word “FROM”.

2.8 SOURCE QUALITY CONTROL

A. Test and inspect cables according to Section 26 0812 – Power Distribution Acceptance Tests and Section 26 0813 – Power Distribution Acceptance Test Tables.
PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cables according to IEEE 576.

B. Pull Conductors: Do not exceed manufacturer’s recommended minimum installation temperature, maximum pulling tensions, and sidewall pressure values.
   1. Where necessary, use manufacturer-approved pulling compound or lubricant that will not deteriorate conductor or insulation.
   2. Use pulling means, including fish tape, cable, rope, and basket-weave cable grips that will not damage cables and raceways. Do not use rope hitches for pulling attachment to cable.
   3. Cut off cable damaged by cable grips or pulling make-ups so as to provide clean, undamaged cable for termination. Continuously record pulling tension during installation.
   4. Make attachment to cable by compression or epoxy filled pulling eye and provide break away (clutch) tension device.

C. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.

D. Support cables in handholes and manholes from walls on heavy-duty, non-metallic cable rack arms, at least 3” above the floor. Support cables with reinforced nylon cradles. Anchor to wall with stainless steel anchor bolts. Refer to drawings for details.

E. In manholes and cable vaults, train cables around walls by longest route from entry to exit and support cables at intervals adequate to prevent sag. Fill lowest ducts first, avoid covering or blocking duct entrances and allow space for future cable installation.

F. Provide loop around each manhole as designated on plans.

G. Cut cable in clean, dry environment. Seal cut ends with waterproof seal immediately after cutting. Maintain a seal during and after pulling.

H. Install cable splices at pull points (accessible locations) and elsewhere as indicated.

I. Install terminations at ends of conductors. Do not install exterior terminations during inclement weather or damp atmospheric conditions.

J. Install stress cones at cable splices and terminations, grounded per cable and connector manufacturer recommendations.

K. Check phase rotation before connections are made to existing circuits. Clearly letter cable terminations. Identify phases with phase designations lettered on terminal boxes and other terminations throughout the system.

L. Arc Proofing: Unless otherwise indicated, arc proof medium-voltage cable at locations not protected by conduit, cable tray, direct burial, or termination materials. In addition to arc-proofing tape and/or manufacturer’s written instructions, apply arc proofing as follows:
   1. Clean cable sheath.
   2. Wrap metallic cable components with 10 mil pipe-wrapping tape.
   3. Smooth surface contours with electrical insulation putty.
   4. Apply arc-proofing tape in one half-lapped layer with coated side toward cable.
   5. Band arc-proofing tape with 1”-wide bands of half-lapped, adhesive, glass-cloth tape 2” o.c.
M. Seal around cables passing through fire-rated elements according to Section 26 0593 – Electrical Systems Firestopping.

N. Install fault indicators on each phase where indicated.

O. Ground shields of shielded cable at terminations, splices, and separable insulated connectors. Ground metal bodies of terminators, splices, cable and separable insulated-connector fittings, and hardware.

P. Power-Circuit Conductor Identification: For primary conductors in vaults and manholes use color-coding conductor tape for 15kV system identification. Use metal tags to identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above. Phase identification shall be consistent throughout the system.

3.2 FIELD QUALITY CONTROL

A. Perform cable acceptance tests on cable circuits after installing cables and before electrical circuitry has been energized. Splices and terminations required as part of this project are to be completed and acceptance tested as part of cable tests. For cables not spliced or terminated as part of project, ends should be clean, dry and long enough to eliminate leakage from conductor to ground along outer surface of cable.

B. Perform acceptance tests and damage investigations under constant supervision of Owner’s representative. Contractor shall coordinate and provide labor, material, equipment, and services necessary to test each completed cable circuit.

C. Remove and replace defective cables and retest as required.

D. Refer to Section 26 0812 – Power Distribution Acceptance Tests and Section 26 0813 – Power Distribution Acceptance Test Tables for visual and mechanical inspection and electrical tests. Certify compliance with test parameters.

END OF SECTION 26 0513.16
SECTION 26 05 43 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED WORK

A. Section 03 3000 - Cast-In-Place Concrete
B. Section 26 0543.13 - Excavation and Backfill
C. Section 26 0543.19 - Manholes and Hardware

1.2 DESCRIPTION

A. Section includes conduits, ducts, and duct accessories for concrete encased for underground primary power distribution.

B. The terms duct and duct bank, as used in this Section, are defined as follows:
   2. Duct Bank: Two or more ducts run together.

1.3 REFERENCE STANDARDS

B. ANSI C80.1 – Rigid Steel Conduit-Zinc Coated (GRC)
D. NEMA RN 1 – Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
E. NEMA TC2 – Electrical Polyvinylchloride (PVC) Conduit
F. NEMA TC3 – PVC Fittings for Use with Rigid PVC Conduit and Tubing
G. NEMA TC6&8 – PVC Plastic Utilities Duct for Underground Installation
H. NEMA TC9 – Fittings for PVC Plastic Utility Duct for Underground Installation
I. NFPA 70 – National Electrical Code
J. UL 651 – Schedule 40 and 80 Rigid PVC Conduit
K. UL 651A – Type EB and A Rigid PVC Conduit and HDPE Conduit
L. ULG – Electrical Rigid Metallic Conduit-Steel
1.4 SUBMITTALS

A. Product data for the following:
   1. Duct bank materials, including spacers and miscellaneous components
   2. Ducts and conduits and their accessories, including elbows, end bells, bushings, seals, bends, fittings, plugs, pull tape, and solvent cement
   3. Warning tape

B. Manufacturer’s Installation Instructions:
   1. Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

C. Closeout Submittals:
   1. Project Record Documents:
      a. Record actual routing of conduits and duct banks.
   2. Operation and Maintenance Data:
      a. Include manufacturer’s recommended operating instructions, maintenance procedures and intervals, and preventive maintenance instructions.
      b. Include spare parts data listing, source, and current prices of replacement parts and supplies.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Comply with NFPA 70
   2. Comply with ANSI C2
   3. Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store in clean, dry space. Maintain factory wrapping or provide additional canvas or plastic cover to protect from dirt, water, construction debris, and traffic.

B. Deliver ducts to project site with end capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming.

1.7 WARRANTY

A. Manufacturer shall provide standard 1 yr written warranty against defects in materials and workmanship for products specified in this Section. Warranty period shall begin on date of substantial completion.
PART 2 - PRODUCTS

2.1 CONDUITS

A. Rigid Nonmetallic Conduit (RNC): NEMA TC 2 Type EPC-40-PVC, UL 651, with matching fittings by same manufacturer, complying with NEMA TC 3 and UL 651, listed for underground use, concrete encased.

B. Size:
   1. 4” nominal for voltages above 600 V

2.2 DUCT ACCESSORIES

A. Duct Spacers:
   1. Rigid PVC interlocking spacers.
   2. Factory-fabricated, 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. Horizontal and vertical locking separation between ducts as shown on drawings.

B. Elbows: Material to match conduit; minimum bend radius of 48”.

C. Bell Ends: Manufactured bell ends of appropriate sizes at each end of conduit; pre-manufactured system for PVC with conduit seals, provisions for roughing into the concrete pour and waste stops, when entering a new building or a new manhole.

D. Plugs: Closure plugs or caps of same material as conduit at ends of unused sections.

E. Pull Tape: Nylon pull tape with measurement markings in uniform lengths in each empty duct.

F. Warning tape: Permanent, bright-colored, continuous-printed, polyethylene tape with embedded continuous metallic strip or core. Not less than 6” wide by 4 mils thick.
   1. Manufacturers: Brady USA, Ideal, Marking Services, Inc. (MRI), Seton, or approved equal.

G. Concrete Dye

H. Solvent Cement: Recommended by conduit manufacturer.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate layout and installation of ducts with final arrangement of other utilities, site grading, and surface features as determined in the field.

B. Coordinate elevations of ducts and duct bank entrances into manholes, pad-mounted switchgear vaults and pad-mounted transformer vaults with final locations and profiles of ducts and duct banks as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations from those indicated as required to suit field conditions and to ensure that duct
runs drain to manholes, and as approved by Architect. For manholes construction, refer to Section 26 0543.19 – Manholes and Hardware.

C. Adjust the depth of electrical utilities to avoid existing utilities with no change to contract price.

D. Utility Coordination: When duct lines are being constructed for use by a utility serving the project, consult with them for duct size and quantity, minimum bending radii, maximum distance between pulling points, grounding details, termination arrangement, and other criteria.

3.2 EXISTING UTILITIES

A. The existing utilities shown on contract drawings have been plotted from available records. No guarantee is made as to accuracy of locations indicated, and is shown for the benefit of Contractor.

B. Contact all serving utility companies and have them locate their lines prior to commencing work. Coordinate with Owner all existing utility lines prior to commencing work.

C. Protect shown, visible and located utilities from damage. Promptly repair all active shown, visible and located utilities damaged by construction. This repair shall be made solely at the expense of the Contractor.

D. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with Owner to shut off services if lines are active.

3.3 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Owner no fewer than 10 business days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Owner’s written permission.

3.4 DUCT INSTALLATION

A. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and away from 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, 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. Do not use conduit that requires the use of couplings for straight runs.

D. Sealing: Provide temporary closure at termination of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand minimum of 15 psig hydrostatic pressure. Provide watertight entrance sealing device where an underground conduit enters a structure through a concrete roof or membrane waterproofed wall or floor.

E. Pulling Cord: Install 100 lbf test nylon cord in ducts, including spares. Identify with tags at each end and at any intermediate pull point the origin and destination of each spare duct. Provide a removable permanent cap over each end of each spare duct.
F. Concrete Encased Ducts: Support ducts on duct spacers.

1. Spacer Installation:
   a. Provide spacers close enough to prevent sagging and deforming of ducts, with not less than 4 spacers per 20 ft of duct. Secure spacers to earth and to ducts to prevent floating during concreting. Stagger spacers approximately 6” between tiers. Tie entire assembly together using tie wires and reinforcing steel. Install base and intermediate spacers at every coupling point of each duct line for a separation horizontally and vertically per NEC.

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. Terminate each pour in a vertical plane if more than one pour is necessary, and install 3/4” reinforcing rod dowels extending 18” into concrete on both sides of joint near corners of envelope. Obtain Architect’s approval for the number and location of dowels.

3. Pouring Concrete: Space 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 bars and ties without forming conductive or magnetic loops around ducts or duct groups. Size reinforcing bars and wire ties as indicated on drawings. Provide rebars with minimum of 3” of concrete on sides, top and bottom. Reinforcing bars shown in sections are required throughout.

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 of materials and in a manner acceptable to Architect.

6. Maintain a grade of at least 4” per 100 ft, either from one manhole or pull box to the next, or from a high point between them, depending on surface contour.

7. Warning Tape: Bury warning tape approximately 12” above all concrete-encased ducts and duct banks. Align tape parallel to and within 3” of the centerline of duct bank. Provide an additional warning tape for each 12” increment of duct bank width over a nominal 18”. Space additional tapes 12” apart, horizontally.

8. Place duct banks on an undisturbed soil base if possible. Where concrete encased duct bank is installed over an extensive area of disturbed earth such that within the periphery of a building, provide a separate concrete base under the duct bank to ensure stability of raceways during installation. Allow this base to set before duct bank is installed.

G. Arrangement and Routing:

1. Arrange multiple duct runs in accordance with details shown on drawings. Locate underground ducts where indicated on drawings and grade to the elevations shown on civil drawings.

2. Make minor changes in location or cross-section as necessary to avoid obstructions or conflicts. Where duct runs cannot be installed substantially as shown because of conditions not discoverable prior to digging of trenches, refer the condition to the Architect for written instructions before further work is done.

3. Maintain a 12” minimum vertical separation between ducts and other systems at crossings where other utility piping systems are encountered or being installed along a raceway route. Maintain a 12” minimum separation between ducts and other systems in parallel runs. Do not place ducts
over valves or couplings in other piping systems. Refer conflicts with these requirements to the Architect for written instructions before further work is done.

4. Provide markers at grade to indicate direction of underground conduits provided under this contract. Provide markers consisting of double-ended arrows, straight for straight runs and bent at locations where runs change direction. Provide markers at all bends and at intervals not exceeding 100 ft in straight runs. Use markers made of sheet bronze not less than 1/4” thick embedded in and secured to the top of concrete posts. User markers not less than 10” long and 3/4” wide and marked ELECTRIC CABLES in letters 1/4” high incised into the bronze to a depth of 3/32”.

5. Enter manholes and structures with ducts at right angles.

3.5 UNDERGROUND DUCT APPLICATION

A. Ducts for Electrical Cables Over 600V: RNC, NEMA Type Schedule 40-PVC, in concrete encased duct bank, unless otherwise indicated.

B. Underground Ducts Crossing Paved Driveways and Roadways: RNC, NEMA Type EPC-40-PVC, encased in reinforced concrete.

3.6 EARTHWORK

A. Excavation and Backfill: Comply with Section 26 0543.13 - Excavation and Backfill, do not use heavy-duty, hydraulic-operated compaction equipment.

3.7 CONCRETE

A. Concrete: 3000 psi, 28-day strength, complying with Division 03 – Concrete, where concrete encased.

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts.

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% fill of duct. If obstructions are indicated, remove obstructions and retest.

B. Preparation for pulling in conductors:

1. Do not install crushed or deformed raceways. Avoid traps in raceways where possible. Take care to prevent the lodging of plaster, concrete, dirt, or trash in raceways, boxes, fittings, and equipment during the course of construction. Make raceways entirely free of obstructions or replace them. Ream all raceways, remove burrs, and clean raceway interior before introducing conductors or pull wires.

2. Immediately after installation, plug or cap all raceway ends with watertight and dust-tight seals until the time for pulling in conductors.

C. Do not backfill underground direct buried and concrete encased ducts until the Architect has inspected them. Notify Architect 24 h in advance of duct concrete pour, or backfill of direct buried ducts.
3.9 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.

END OF SECTION 26 0543
SECTION 26 05 43.13 – EXCAVATION AND BACKFILL

PART 1 - GENERAL

1.1 RELATED WORK
A. Section 31 2000 - Earth Moving
B. Section 26 0543 - Underground Ducts and Raceways for Electrical Systems

1.2 DESCRIPTION
A. Section lists methods and materials for trench excavation and backfill for electrical and communications conduits in duct banks. Refer to Section 26 0543 – Underground Ducts and Raceways for Electrical Systems.

1.3 DEFINITIONS
A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
B. Excavation: Removal of material encountered above sub-grade elevations and to lines and dimensions indicated.
C. Duct: A single underground conduit encased in concrete or direct buried.
D. Duct Bank: Two or more ducts run together.
E. Fill: Soil materials used to raise existing grades.
F. Sub-grade: Surface or elevation remaining after completing excavation, or top surface of fill or backfill immediately below subbase, drainage fill, or topsoil materials.
G. Utilities: On-site underground ducts and duct banks as well as underground services within buildings.

1.4 SUBMITTALS
A. Submit list of materials to be used for backfill.

1.5 QUALITY ASSURANCE
A. Pre-excavation Conference: Conduct conference at project site to comply with requirements in Division 01 Section “Project Coordination.”

PART 2 - PRODUCTS

2.1 FILL MATERIAL
A. Type 1 Fill:
   1. Material from excavation separated from materials, which do not compact by tamping and rolling. No stones larger than 3” and no building, organic, or corrosive or frozen materials and no lumps larger than 6”.

EXCAVATION AND BACKFILL

26 05 43.13 - 1
B. Type 2 Fill:
   1. Sand or gravel materials with none larger than 2” and of that portion passing the #4 sieve less the 5% to pass #200 sieve.

C. Type 3 Fill:
   1. Gravel of rounded to sub-angular shape, screened, which will pass 3/4” sieve and retained on #4 sieve.

D. Type 4 Fill:
   1. Pit run rock or gravel with maximum stone size of 1”.

E. Type 5 Fill:
   1. Pea gravel, screened, which will pass 3/8” sieve and retained on #4 sieve.

2.2 CRUSHED ROCK
   A. Crushed Rock: 1-1/4” minus, unless smaller is required for bedding material.

2.3 SAND
   A. Sand: Clean and washed building sand.

2.4 TOPSOIL
   A. Topsoil: Equal in quality to that removed.

2.5 SOD
   A. New Sod: Mature, densely rooted grass free of weeds and objectionable grasses.

2.6 PLANTS
   A. Plants: Obtained from a commercial nursery and be similar to those replaced.

PART 3 - EXECUTION

3.1 PREPARATION
   A. Establish grade lines and locations of roadways and sidewalks, grade beams, and pill caps. Provide necessary stakes and batter boards.

   B. Verify elevations of existing utilities prior to excavation for new ducts.

   C. Verify locations of vaults and manholes with civil drawings.

   D. Coordinate excavation and backfill with Section 31 2000 – Earth Moving.

3.2 EXCAVATION
   A. Provide excavation for underground work, including ducts, vaults, manholes, unless otherwise shown or specified.

   B. Excavate trench to 24” wider than duct or duct bank dimensions and minimum of 3” below bottom of duct.
C. Include clearing, tree removal, grubbing, pavement removal, substructure removal such as walls, footings, and piers, and all incidental work such as tunneling, sheet piling, shoring, underpinning, pumping, bailing, and transportation. Coordinate excavation extending beyond construction limits with Construction Manager and Owner.

D. Do not provide blasting on this project without written permission of Architect and Owner.

E. Dispose of excess excavation material on site in location designated by Construction Manager.

F. Over excavate 3” and fill with 3” of sand, where trench bottom is rock, or rocky, or contains debris larger than 1”, or material with sharp edges.

G. Perform all crossings of concrete or asphalt after surface material has been saw cut to required width and removed.

H. Conform to utility company requirements for excavation and vault installation in addition to contract document requirements where excavations are for installing utility company’s ducts and vaults.

3.3 ROCK EXCAVATION

A. Use mechanical methods to remove rock in trenches for underground ducts.

B. Refer to Geotechnical Report available from Architect/Engineer for data on rock.

C. Include rock excavation in the Bid, unless otherwise indicated.

3.4 INSTALLATION

A. Keep underground ducts to proper line and grade and sealed to prevent entrance of animals or foreign matter.

B. Provide bracing and sheet piling as necessary to support trenches. Comply with Local Regulations, applicable provisions of OSHA Regulations on trenching, or with provisions of "Manual of Accident Prevention in Construction" published by Associated General Contractors of America.

C. Do not lay duct in water.

D. Keep trench free from water until duct joint material has hardened and concrete encasement is in place.

E. Do not increase the contract cost due to presence of ground water in soil or necessity of sheet piling or bracing trenches. Adjust contract cost when sheet piling is left in place, on written order of Owner.

F. Do not remove sheet piling until trench is substantially backfilled. Cut off sheet piling left in place not less than 2 ft below new, finished grade.

G. Place underground ducts on 3” compacted bedding of sand. Shape bedding for clearance for joints and fittings, tamped in place and graded evenly to ensure uniform bearing for the full length of duct. Do not support duct by blocking, planking or mounding of bedding material.
H. Install lines passing under foundations with minimum of 3” clearance to concrete and ensure there is no disturbance of bearing soil.

3.5 BACKFILL

A. Backfill around ducts by hand to depth of 12” above top of duct with specified fill in 6” layers. Compact backfill thoroughly with compactor of suitable weight or with approved mechanical tamper. Do not use flooding or jetting with water.

B. Place backfill from 12” above duct to elevation of subgrade in layers not exceeding 8” in depth with specified fill.

C. Backfill from 12” above duct to sub-grade with specified fill, when excavating through areas which are to become walks, roads, driveways or parking areas of concrete, bituminous or exposed gravel surfacing or such areas are existing to remain. Backfill in 12” layers and compact with mechanical means to density 95% modified proctor.

D. Conform excavation, duct laying, backfilling, grading and surfacing, as herein specified, when excavation occurs on public property or areas beyond the property line. Comply with additional requirements for public utility or other authorities. Check with each utility and incorporate cost of any additional requirements in base bid.

E. Backfill around vaults to be free of debris larger than 1-3/4” in all directions to 1 ft from vault.

F. Provide 6” of pea gravel or sand bedding for vaults.

G. Other backfill shall be free of debris larger than 6” in diameter.

H. Place backfill material so as to obtain a minimum degree of compaction of 95% of maximum density at optimum moisture content. Moisten backfill material as required to obtain proper compaction.

I. Broken pavement, concrete, sod, roots, and debris shall not be used for backfill.

3.6 DEWATERING

A. Provide, operate, and maintain all pumps or other dewatering equipment required for control of water in trenches and excavations for electrical and communications site work during the entire construction period.

3.7 SHORING

A. Provide as required by trenching and excavating to secure site work. Comply with applicable safety regulations.

3.8 FINISHING

A. On completion of trenching and backfilling operations, restore grades to original elevation or to new sub-grade elevation.

B. Replace surfaces to existing conditions when trenching is through existing areas or beyond construction limits.

C. Use 6” of topsoil and sod to match existing elevations in landscaped areas or as otherwise approved by Landscape Architect.
3.9 SURFACE FINISHING

A. Refinish every disturbed surface to its original condition.

B. Replace planted materials not surviving 90 days after contract acceptance at Contractor’s own expense.

C. Return after 1 year and re-fill, compact and refinish settled areas to grade.

3.10 CARE OF PLANTS AND TREES

A. Remove and safely store plants and trees with trunks smaller than 6” diameter prior to commencing site work. Avoid trees larger than 6” diameter when so indicated on drawings. Replace plants and trees upon completion of site work.

END OF SECTION 26 05 43.13
SECTION 26 05 43.19 – MANHOLES AND HARDWARE

PART 1 - GENERAL

1.1 RELATED WORK

A. Section 26 0543 – Underground Ducts and Raceways for Electrical Systems

B. Section 26 0543.13 – Excavation and Backfill

1.2 DESCRIPTION

A. Section includes underground utility structures: vaults, manholes and accessories for power cable systems.

1.3 REFERENCED STANDARDS

A. AASHTO HB 17 – Standard Specifications for Highway Bridges

B. ANSI C2 – National Electrical Safety Code

C. ASTM A 48/A 48M – Specification for Gray Iron Castings

D. ASTM C 270 – Specification for Mortar for Unit Masonry

E. ASTM C 387 – Specification for Packaged, Dry, Combined Materials for Mortar and Concrete

F. ASTM C 858 – Specification for Underground Precast Concrete Utility Structures

G. ASTM C 891 – Standard Practice for Installation of Underground Precast Concrete Utility Structures

H. ASTM C 1037 – Practice for Inspection of Underground Precast Concrete Utility Structures


J. ISO 9000 – Quality Management

K. ISO 10012 – Measurement Management Systems

L. NFPA 70 – National Electrical Code

M. SCTE 77 – Specification for Underground Enclosure Integrity

1.4 SUBMITTALS

A. Product Data:
   1. Accessories for underground utility structures.
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
4. Ladder details
5. Grounding details
6. Dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps
7. Joint details

C. Product Certificates: For concrete and steel used in precast concrete vaults and manholes, as required by ASTM C 858.

D. Field quality-control test reports.

1. Indicate field test and inspection procedures and interpret test results and corrective action taken for compliance with specification requirements.

E. Manufacturer’s Installation Instructions:

1. Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Closeout Submittals:

1. Project Record Documents:
   a. Record actual location of underground utility structures.

2. Operation and Maintenance Data:
   a. Include manufacturer’s recommended operating instructions, maintenance procedures and intervals, and preventive maintenance instructions.
   b. Include spare parts data listing, source, and current prices of replacement parts and supplies.

1.5 QUALITY ASSURANCE

A. Comply with ANSI C2

B. Comply with NFPA 70

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store precast concrete and other factory-fabricated underground utility structures at project site as recommended by manufacturer to prevent physical damage. Arrange so identification markings are visible.

B. Life and support precast concrete units only at designated lifting or supporting points.
1.7 WARRANTY

A. Refer to Division 01 and Section 26 0000 – General Electrical Requirements for general warranty requirements.

B. Manufacturer shall provide standard 1 yr written warranty against defects in materials and workmanship for products specified in this Section. Warranty period shall begin on date of substantial completion.

PART 2 - PRODUCTS

2.1 PRECAST CONCRETE VAULTS AND MANHOLES

A. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom. Frame and cover shall form top of enclosure and shall have load rating consistent with that of vault and manhole.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carder Concrete Products
2. Christy Concrete Products
3. Elmhurst-Chicago Stone Co.
4. Oldcastle Precast Group
5. Riverton Concrete Products; a division of Cretex Companies, Inc.
6. Utility Concrete Products, LLC.
8. Wausau Tile, Inc.
9. Jensen Precast

C. Comply with ASTM C 858, with structural design loading as specified in Part 3 “Underground Enclosure Application” Article and with interlocking mating sections, complete with accessories, hardware, and features.

1. Duct Entrances in Vault and Manhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.

   a. Type and size: Fittings matched to duct or conduit to be terminated.
   b. Fittings: Aligned with elevations of approaching ducts and located near interior corners of vaults and manholes to facilitate racking of cable.

D. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the groundwater level at grade.

2.2 UTILITY STRUCTURE ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Bilco Company (The)
2. Campbell Foundry Company
3. Carder Concrete Products
4. Christy Concrete Products  
5. East Jordan Iron Works, Inc.  
7. Jensen Precast  
8. McKinley Iron Works, Inc.  
9. Neenah Foundry Company  
10. NewBasis  
11. Oldcastle Precast Group  
13. Pennsylvania Insert Corporation  
14. Riverton Concrete Products; a division of Cretex Companies, Inc.  
15. Strongwell Corporation; Lenoir City Division  
17. Utility Concrete Products, LLC.  
18. Utility Vault Co.  
19. Wausau Tile, Inc.

B. Manhole Frames, Covers, and Chimney Components: Comply with structural design loading specified for manhole.

1. Frame and Cover: Weatherproof, gray cast iron complying with ASTM A 48/A 48M, Class 30B with milled cover-to-frame bearing surface; diameter as indicated on drawings.
   a. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
2. Cover Legend: Cast in. Selected to suit system.
   a. Legend: “ELECTRIC” for duct systems with medium-voltage cables.
3. Manhole Chimney Components: Precast concrete rings with dimensions matched to those of roof opening.
   a. Mortar for Chimney Ring and Frame and Cover Joints: Comply with ASTM C 270, Type M, except for quantities less than 2.0 ft\(^3\) where packaged mix complying with ASTM C 387, Type M, may be used.

C. Pulling Eyes in Concrete Walls: Eyebolt with reinforcing-bar fastening insert, 2” diameter eye, and 1” x 4” bolt.

D. Bolting Inserts for Concrete Utility Structure Cable Racks and Other Attachments: Flared, threaded inserts for noncorrosive, chemical-resistant, nonconductive thermoplastic material; 1/2” ID by 2-3/4” deep, flared to 1-1/4” minimum at base.

1. Tested Ultimate Pullout Strength: 12,000 lbf minimum.

E. Cable Rack Assembly: Steel, hot-dip galvanized, except insulators.

1. Stanchions: T-section or channel; 2-1/4” nominal size; punched with 14 holes on 1-1/2” centers for cable-arm attachment.
2. Arms: 1-1/2” wide, lengths ranging from 3” with 450 lb minimum capacity to 18” 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.

F. Duct-Sealing Compound: Non-hardening, 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.
G. Fixed Manhole Ladders: Arranged for attachment to roof or wall and floor of manhole. Ladder, mounting brackets and braces: Fabricated from hot-dip galvanized steel.

H. Cover Hooks: Heavy duty, designed for lifts 60 lbf and greater. Minimum two required.

2.3 SOURCE QUALITY CONTROL

A. Test and inspect precast concrete utility structures according to ASTM C 1037.

PART 3 - EXECUTION

3.1 UNDERGROUND ENCLOSURE APPLICATION

A. Manholes: Precast concrete:
   1. Manholes Not Located in Deliberate Traffic Paths by Heavy or Medium Vehicles: H-10 load rating according to AASHTO HB 17.

3.2 INSTALLATION OF CONCRETE VAULTS AND MANHOLES

A. Precast Concrete Vault and Manhole Installation
   1. Comply with ASTM C 891, unless otherwise indicated.
   2. Install units level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances.
   3. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1” sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
   4. Concrete: 5000 psi 28-day strength, complying with Division 03 – Concrete.

B. Elevations:
   1. Vault and Manhole Roof: Install with rooftop as indicated on drawings.
   2. Manhole Frame: In paved areas and traffic-ways, set frames flush with finished grade. Set other manhole frames 1” above finished grade.

C. Manhole Access: Circular opening in manhole roof; sized to match cover size.
   1. Manhole with Fixed Ladders: Offset access opening from manhole centerlines to align with ladder.
   2. Install chimney, constructed of precast concrete collars and rings, to support frame and cover and to connect cover with manhole roof opening. Provide moisture-tight masonry joints and waterproof grouting for cast-iron frame to chimney.

D. Fixed Manhole Ladders: Arrange to provide for safe entry with maximum clearance from cables and other items in manholes.

E. Pack and smooth non-shrink grout at all rough edges around duct entrances at each vault and manhole.
3.3 GROUNDING

A. Comply with IEEE C2 grounding requirements.

B. Grounding Manholes: Install a driven ground rod through manhole floor, close to wall, and set rod depth so 4” will extend above finished floor. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2” above to 6” below concrete. Seal floor opening with waterproof, nonshrink grout.

C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, catch basins, metallic cover frame and cable shields within each manhole, to ground rod or grounding conductor. Make connections with #4 AWG minimum, stranded, copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. Demonstrate capability and compliance with requirements on completion of installation of underground utility structures.

2. Test vault and manhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Correct deficiencies and retest as specified above to demonstrate compliance.

C. Interpret test results in writing and submit to Engineer.

3.5 CLEANING

A. Clean internal surfaces of vaults and manholes, including sump and remove foreign material, after completing the installation of all devices, equipment, cables and terminations.

B. Remove water from vaults and manholes. If vaults and manholes continue to fill up with water, Contractor shall pump them regularly until the source of water has been detected and corrected.

END OF SECTION 26 0543.19
SECTION 26 08 12 – POWER DISTRIBUTION ACCEPTANCE TESTS

PART 1 - GENERAL

1.1 RELATED WORK

   A. Section 26 0513.16 – Medium-Voltage, Single- and Multi-Conductor Cables
   B. Section 26 0813 – Power Distribution Acceptance Test Tables
   C. Section 26 1219 – Pad-Mounted, Liquid-Filled, Medium-Voltage Transformers
   D. Section 26 1323 - Medium-Voltage Pad-Mounted Switchgear

1.2 DESCRIPTION

   A. Section includes acceptance testing requirements for assessing the suitability for service and reliability of the power distribution system.
   B. Contractor to ensure all tested electrical equipment, both contractor and Owner supplied, is operational and within industry and manufacturer’s tolerances and is installed in accordance with design specifications.
   C. Tests and inspections shall be performed after installation.
   D. Tests and inspections shall determine suitability for energization.
   E. Electrical systems shall pass tests prior to substantial completion or Owner occupancy.
   F. This specification requires contractor to engage services of testing agency.
   G. All tests tables referenced in this specification provided in Section 26 0813 – Power Distribution Acceptance Test Tables.
   H. Items to be tested and inspected as follows:
      1. 15kV primary cable and terminations
      2. Liquid filled transformers – (1) 2000 kVA, 12.47kV – 480Y/277 V pad mounted transformer
      3. Medium-voltage oil switches
      4. Thermographic survey

1.3 REFERENCE STANDARDS

   B. ANSI/IEEE C57 – Distribution, Power, and Regulating Transformers
   C. ANSI/IEEE C57.104 – Guide for the Interpretation of Gases Generated in Oil-immersed Transformers
D. ANSI/IEEE Std. 48 – Standard Test Procedure and Requirements for High-Voltage Alternating-Current Cable Terminations
E. ANSI/IEEE Std. 81 – Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
F. ANSI/IEEE Std. 141 – IEEE Recommended Practice for Electrical/Power Distribution for Industrial Plants (IEEE Red Book)
I. ANSI/IEEE Std. 242 – IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems (IEEE Buff Book)
K. ANSI/IEEE Std. 400 – Guide for Making High-Direct-Voltage Tests on Power Cable Systems in the Field
N. ANSI/IEEE Std. 1100 – IEEE Recommended Practice for Powering and Grounding Sensitive Electronic Equipment (IEEE Emerald Book)
P. ASTM D3612 – Standard Test Method for Analysis of Gases Dissolved in Electrical Insulating Oil by Gas Chromatography
Q. ASTM D3613 – Standard Practice for Sampling Insulating Liquids for Gas Analysis and Determination of Water Content
R. NETA – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems
S. NEMA MG1 – Motors and Generators
T. NFPA 70 – National Electrical Code
U. NFPA 70B – Recommended Practice for Electrical Equipment Maintenance
V. NFPA 70E – Electrical Safety Requirements for Employee Workplaces
W. NIST – National Institute of Standards and Technology
1.4 SUBMITTALS

A. Test Reports: Include the following:

1. Summary of project
2. Description of equipment tested
3. Equipment used to conduct the test
4. Description of test
5. Test results, as compared to manufacturers’ or industry accepted standards and tolerances
6. Conclusions and recommendations
7. Signature of responsible test organization authority

B. List of equipment used to perform tests. Identify the following:

1. Type
2. Manufacturer
3. Model number
4. Serial number
5. Date of last calibration
6. Documentation of calibration leading to NIST standards

1.5 QUALITY ASSURANCE

A. Qualifications of Testing Agency:

1. Testing firm shall be a corporately and financially independent testing organization that can function as an unbiased testing authority, professionally independent of the manufacturer, supplier, and installers of equipment or system evaluated by the testing firm.
2. Testing firm shall be regularly engaged in testing of electrical equipment, devices, installations and systems.
3. Testing firm shall meet Federal Occupational Safety and Health Administration (OSHA) requirements for accreditation of independent testing laboratories.
4. On-site technical person shall be currently certified by the International Electrical Testing Association in electrical power distribution system testing.
5. Testing firm shall use technicians who are regularly employed by the firm for testing services.
6. Testing firm shall submit proof of above qualifications with bid documents when requested.

PART 2 - PRODUCTS

2.1 NOT APPLICABLE TO THIS SECTION.

PART 3 - EXECUTION

3.1 PREPARATION

A. Documentation: Deliver the following to testing firm, minimum two weeks prior to commencement of testing:
1. Complete set of electrical plans and specifications, with available short circuit indicated on power riser diagrams.
2. Approved submittals and shop drawings of equipment being tested.
3. Pertinent change orders.

B. Schedule: Notify Owner and Engineer 15 working days prior to performance of any tests.

C. Coordination: Coordinate with Construction Manager/Owner/Engineer the testing schedule and availability of equipment ready for testing.

D. Test Power: Provide test power (including specialized) for equipment testing before and after service energizing.

3.2 FIELD QUALITY CONTROL

A. Inspection and Test Procedures: Comply with NETA.

1. Medium-Voltage Cables:
   a. Visual and Mechanical Inspection:
      1) Compare cable date with drawings and specifications.
      2) Inspect exposed sections of cables for physical damage.
      3) Verify tightness of accessible bolted connections by calibrated torque wrench in accordance with manufacturer's published data or Table 12.
      4) Perform thermographic survey of all terminations and splices in accordance with paragraph “Thermographic Survey.”
      5) Inspect compression-applied connectors for correct cable match and indentation.
      6) Inspection for grounding, cable support, and termination.
      7) Verify visible cable bends meet or exceed ICEA and manufacturer’s minimum allowable bending radius.
      8) Inspect for adequate arc proofing in common cable areas, if specified.
      9) Inspect jacket and insulation condition.
     10) Inspect for correct identification and arrangements.
   b. Electrical Tests:
      1) Perform concentric neutral-continuity test on each power cable by ohmmeter method and record value.
      2) Perform insulation-resistance test using megohm meter with voltage output of at least 2500 V. Individually test each conductor with other conductors and concentric neutral grounded. Test duration shall be 1 minute.
      3) Perform DC high-potential test on cables, including terminations and joints after cable system installation and before placing cable in service. Adhere to precautions and limits as specified in applicable NEMA/ICEA Standards for the specific cable. Perform tests in accordance with ANSI/IEEE Standard 400. Test voltages shall not exceed 80% of cable manufacturer’s factory test value or maximum test voltage in Table 6.
      a) Insure input voltage to test set is regulated.
b) Current-sensing circuits in test equipment shall measure only leakage current associated with cable under test and shall not include internal leakage of test equipment.

c) Record wet- and dry-bulb temperatures or relative humidity and temperature.

d) Test each section of cable individually.

e) Individually test each conductor with other conductors grounded. Ground concentric neutrals.

f) Terminations shall be adequately corona-suppressed by guard ring, field reduction sphere, or other suitable method as necessary.

g) Insure maximum test voltage does not exceed limits for terminators specified in ANSI/IEEE Standard 48 or manufacturer’s specifications.

h) Apply DC high-potential test in at least 5 equal increments until maximum test voltage is reached. No increment shall exceed voltage rating of the cable. Record DC leakage current at each step after constant stabilization time consistent with system charging current.

i) Raise conductor to specified maximum test voltage and hold for 15 minutes. Record readings of leakage current at 30 seconds and one minute and at one-minute intervals thereafter.

j) Reduce conductor test potential to zero and measure residual voltage at discrete intervals.

k) Apply grounds for time period adequate to drain insulation stored charge.

4) Perform high voltage phase test after successful completion of continuity and high potential tests. Testing agent shall conduct a high voltage phase test at normal line voltage to verify that segments of the system can be paralleled together.

c. Test Values:

1) Concentric neutral must exhibit continuity. Investigate resistance values in excess of 10 ohms per 1000 ft of cable.

2) Graphic plots may be made of leakage current versus step voltage at each increment and leakage current versus time at final test voltages.

   a) Step voltage slope should be reasonably linear.
   b) Capacitive and absorption current should decrease continually until steady state leakage is approached.

2. Liquid Filled Transformers:

a. Visual and Mechanical Inspection:

1) Compare equipment nameplate data with drawings and specifications.

2) Inspect physical and mechanical condition for physical damage, cracked insulators, and tightness of connection.

3) Verify removal of shipping bracing after final placement.

4) Inspect impact recorder prior to unloading, if applicable.

5) Verify alarm, control, and trip settings on temperature and level indicators are as specified.

6) Verify operation of alarm, control, and trip circuits from temperature and level indicators, pressure relief device, and fault pressure relay.

7) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer’s published data or Table 12.

8) Perform thermographic survey in accordance with paragraph “Thermographic Survey.”

9) Verify correct liquid level in tanks and bushings.
10) Perform specific inspections and mechanical tests as recommended by manufacturer.

11) Verify correct equipment grounding.

b. Electrical Tests:

1) Perform insulation-resistance tests, winding-to-winding and each winding-to-grounding with test voltage in accordance with Table 5. Test duration shall be for 10 minutes with resistance tabulated at 30 seconds, 1 minute, and 10 minutes.

2) Calculate polarization index.

3) Perform a turns-ratio test on no-load tap-changer positions and load tap-changer positions. Verify tap setting is as specified. Verify winding polarities are in accordance with nameplate.

4) Perform insulation power-factor/dissipation-factor tests on windings and correct to 68°F in accordance with test equipment manufacturer's instructions.

5) Perform power-factor/dissipation-factor tests (or hot collar watts-loss tests) on bushings and correct to 68°F in accordance with test equipment manufacturer's instructions.

6) Remove sample of insulating liquid in accordance with ASTM D923. Sample shall be tested for the following:
   a) Dielectric breakdown voltage: ASTM D877 and/or ASTM D1816.
   b) Acid neutralization number: ASTM D974.
   c) Specific gravity: ASTM D1298.
   d) Interfacial tension: ASTM D971 or ASTM D2285.
   e) Color: ASTM D1500.
   g) Measure dissipation factor or power factor in accordance with ASTM D924.

7) Remove sample of insulating liquid in accordance with ASTM D3613 and perform dissolved gas analysis (DGA) in accordance with ANSI/IEEE C57.104 or ATSM D3612.

c. Test Values:

1) Bolt-torque levels shall be in accordance with Table 12, unless otherwise specified by manufacturer.

2) Insulation-resistance test values at one minute should not be less than values recommended in Table 5. Resistance values to be temperature corrected in accordance with Table 14.

3) Polarization index should be compared to manufacturer's factory test results. If manufacturer's data is not available, acceptance test results will serve as baseline data.

4) Turns-ratio test results shall not deviate more than 0.5% from either the adjacent coils or the calculated ratio.

5) Maximum power factor of liquid-filled transformers corrected to 68°F shall be in accordance with transformer manufacturer's published data. Representative values are shown in Table 3. Compare with test equipment manufacturer's published data.

6) Investigate bushing power factors and capacitances that vary from nameplate values by more than 10%. Investigate any bushing hot collar watts-loss results that exceed test equipment manufacturer's published data.

7) Typical excitation-current test data pattern for three-legged core transformer is two similar current readings and one lower current reading.

8) Consult manufacturer if winding-resistance measurements vary more than 1% from adjacent windings.

9) Consult manufacturer if core insulation is less than one megohm at 500 VDC.

10) Insulating liquid shall comply with Table 4.
11) Evaluate results of dissolved-gas analysis in accordance with IEEE Standard C57.104. Use results as baseline for future tests.

3. Medium-Voltage Oil Switches:
   a. Visual and Mechanical Inspection:
      1) Compare equipment nameplate data with drawings and specifications.
      2) Inspect physical and mechanical condition.
      3) Inspect anchorage, alignment, grounding and required clearances.
      4) Perform mechanical operation and contact alignment tests on both the switch and its operating mechanism.
      5) Check each fuse holder for adequate support and contact.
      6) Verify fuse sizes and types correspond to drawings.
      7) Test electrical and mechanical interlock systems for correct operation and sequencing.
      8) Verify tightness of accessible bolted electrical connections and/or cable connections by calibrated torque-wrench method in accordance with manufacturer’s published data or Table 12.
      9) Perform thermographic survey of accessible bolted electrical connections in accordance with paragraph "Thermographic Survey."
      10) Verify insulating oil level is correct.
      11) Confirm correct application of manufacturer’s recommended lubricants.
      12) Record as-found and as-left operation-counter readings.
   b. Electrical Tests:
      1) Measure contact resistance.
      2) Remove a sample of insulating liquid in accordance with ASTM D923. Sample shall be tested for the following:
         a) Dielectric breakdown voltage: ASTM D877.
         b) Color: ASTM D1500.
         c) Visual condition: ASTM D1524.
      3) Perform insulation-resistance tests pole-to-pole, pole-to-ground, and across open poles. Test duration shall be one minute. Use a test voltage in accordance with Table 1 or manufacturer’s published data.
      4) Perform insulation-resistance test on control wiring at 1000 VDC. Test duration shall be one minute. Do not perform this test on wiring connected to solid-state relays. Follow manufacturer’s recommendation.
      5) Perform and over-potential test on each pole with switch closed. Test each pole-to-ground with other poles grounded. Test voltage shall be in accordance with manufacturer’s published data or Table 11.
   c. Test Values:
      1) Bolt-torque levels shall be in accordance with Table 12, unless otherwise specified by manufacturer.
      2) Contact resistance values shall not exceed high limit of normal range as indicated in manufacturer’s published data. If manufacturer’s data is not available, investigate values that deviate from adjacent poles or similar switches by more than 50% of lowest value.
      3) Insulating liquid shall comply with Table 4.
      4) Control wiring insulation resistance shall comply with manufacturer’s published data. In the absence of manufacturer’s published data, use Table 1. Values of insulation resistance less than this table or manufacturer’s minimum shall be investigated.
4. Thermographic Survey:
   a. Visual and Mechanical Inspection:
      1) Inspect physical, electrical, and mechanical conditions.
      2) Remove all necessary covers prior to thermographic inspection.
      3) Equipment to be inspected shall include all current-carrying devices. Provide report including the following:
         a) Discrepancies.
         b) Temperature difference between area of concern and reference area.
         c) Cause of temperature difference.
         d) Areas inspected. Identify inaccessible and unobservable areas and equipment.
         e) Identify load conditions at time of inspection.
         f) Provide photographs and thermogram of deficient area.
   b. Test Parameters:
      1) Inspect distribution systems with imaging equipment capable of detecting minimum temperature difference of 2°F at 86°F.
      2) Equipment shall detect emitted radiation and convert detected radiation to visual signal.
      3) Thermographic surveys should be performed during periods of maximum possible loading but not less than 40% of rated load of the electrical equipment being inspected. Refer to NFPA 70B, Section 20.17 (Infrared Inspection).
   c. Test Results:
      1) Temperature differences of 2°F to 5°F indicate possible deficiency and warrant investigation.
      2) Temperature differences of 7°F to 27°F indicate deficiency; repair as time permits.
      3) Temperature differences of 29°F and above indicate major deficiency; repair immediately.
      4) Suggested actions based on temperature rise can be found in Table 18.

B. Test Reports:
1. Testing firm shall do the following:
   a. Prepare test report, including description of equipment tested, description of test, test results, conclusions and recommendations, retesting results, list of test equipment used and calibration date.
   b. Show test results in comparison to industry and manufacturer’s values and tolerances.
   c. Interpret test results in writing and give recommendations for acceptance or rejection upon consultation with Engineer and prior to energizing equipment.
   d. Assure electrical equipment is operational and within industry and manufacturer’s tolerances, and is installed in accordance with contract documents.
   e. Assure suitability of energization.
   f. Report to the Owner and Engineer any system, material, or workmanship that is found defective on the basis of acceptance tests.
   g. Retest equipment when required.
   h. Maintain written record of tests.
   i. Utilize safety practices during the tests in accordance with:
      1) Acceptable state and local safety operating procedures
      2) Owner’s safety practices
      3) OSHA
      4) NFPA 70E
   j. Perform tests with apparatus de-energized and grounded, except where otherwise specifically required ungrounded by test procedures.
   k. Assemble and certify final test report.
   l. Provide 4 copies of complete test report.
m. Attach label to all tested equipment with indication of date tested and testing firm name.

2. Contractor shall do the following:
   a. Investigate, replace, or repair any fault in material or in any part of the installation revealed by the tests.
   b. Deliver one copy of each test report directly to Engineer within 30 days after completion of testing, unless directed otherwise. Insert a copy of each test report in the equipment operation and maintenance manuals.

C. Test Equipment:
   1. Test Instrument Calibration:
      a. Testing firm shall have calibration program that assures test instruments are maintained with rated accuracy.
      b. Instruments shall be calibrated in accordance with the following frequency schedule:
         1) Field instruments: Analog, 6 months maximum; Digital, 12 months maximum
         2) Laboratory instruments: 12 months
         3) Leased specialty equipment: 12 months where accuracy is guaranteed by lessor
      c. Dated calibration labels shall be visible on test equipment.
      d. Records, which show date and results of instruments calibrated or tested, must be kept up-to-date.
      e. Up-to-date instrument calibration instructions and procedures shall be maintained for test instrument.
      f. Equipment used for field testing shall be more accurate than instrument being tested.
      g. Calibrating standard applied to testing equipment shall be of higher accuracy than instrument tested.

END OF SECTION 26 08 12
<table>
<thead>
<tr>
<th></th>
<th>Oil, Silicone, and Less-Flammable Hydrocarbon Maximum Value (Percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Power Transformers and Reactors</td>
<td>0.5%</td>
</tr>
<tr>
<td>New Distribution Transformers and Regulators</td>
<td>1.0%</td>
</tr>
<tr>
<td>Remanufactured Power Transformers and Reactors</td>
<td>1.0%</td>
</tr>
<tr>
<td>Remanufactured Distribution Transformers and Regulators</td>
<td>1.5%</td>
</tr>
</tbody>
</table>
## TABLE 4

### Insulating Fluid Limits

#### Table 4.1

<table>
<thead>
<tr>
<th>Test</th>
<th>ASTM Method</th>
<th># 69 kV and Below</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dielectric breakdown, kV minimum</td>
<td>D877</td>
<td>30</td>
</tr>
<tr>
<td>Dielectric breakdown, kV minimum @ 1 mm (0.04&quot;) gap</td>
<td>D1816</td>
<td>25</td>
</tr>
<tr>
<td>Dielectric breakdown, kV minimum @ 2 mm (0.08&quot;) gap</td>
<td>D1816</td>
<td>45</td>
</tr>
<tr>
<td>Interfacial tension mN/m minimum</td>
<td>D971 or D2285</td>
<td>38</td>
</tr>
<tr>
<td>Neutralization number, mg KOH/g maximum</td>
<td>D974</td>
<td>0.015</td>
</tr>
<tr>
<td>Water content, (ppm) maximum</td>
<td>D1533</td>
<td>20</td>
</tr>
<tr>
<td>Power factor at 25°C, %</td>
<td>D924</td>
<td>0.05</td>
</tr>
<tr>
<td>Power factor at 100°C, %</td>
<td>D924</td>
<td>0.40</td>
</tr>
<tr>
<td>Color</td>
<td>D1500</td>
<td>1.0</td>
</tr>
<tr>
<td>Visual condition</td>
<td>D1524</td>
<td>Bright and clear</td>
</tr>
</tbody>
</table>


#### Table 4.2

<table>
<thead>
<tr>
<th>Test</th>
<th>ASTM Method</th>
<th>Acceptable Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dielectric breakdown, kV minimum</td>
<td>D877</td>
<td>30</td>
</tr>
<tr>
<td>Visual</td>
<td>D2129</td>
<td>clear, free of particles</td>
</tr>
<tr>
<td>Water content, (ppm) maximum</td>
<td>D1533</td>
<td>50</td>
</tr>
<tr>
<td>Dissipation/power factor, 60 Hz, % max. @ 25°C</td>
<td>D924</td>
<td>0.1</td>
</tr>
<tr>
<td>Viscosity, cSt @ 25°C</td>
<td>D445</td>
<td>47.5 – 52.5</td>
</tr>
<tr>
<td>Fire point, °C, minimum</td>
<td>D92</td>
<td>340</td>
</tr>
<tr>
<td>Neutralization number, mg KOH/g max.</td>
<td>D974</td>
<td>0.01</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ASTM Method</th>
<th>Test</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1816</td>
<td>Dielectric breakdown voltage for 2 mm (0.08&quot;) gap, kV</td>
<td>Minimum: 40; Maximum: 34.5 kV class and below; Desirable: 60</td>
</tr>
<tr>
<td>D1816</td>
<td>Dielectric breakdown voltage for 1 mm (0.04&quot;) gap, kV</td>
<td>Minimum: 20; Maximum: 34.5 kV class and below; Desirable: 30</td>
</tr>
<tr>
<td>D974</td>
<td>Neutralization number, mg KOH/g</td>
<td>Minimum: ---; Maximum: 0.03</td>
</tr>
<tr>
<td>D877</td>
<td>Dielectric breakdown voltage kV</td>
<td>Minimum: 30; Maximum: ---</td>
</tr>
<tr>
<td>D924</td>
<td>AC loss characteristic (dissipation factor), %</td>
<td>Minimum: 25°C; Maximum: 100°C</td>
</tr>
<tr>
<td></td>
<td>25°C</td>
<td>Minimum: ---; Maximum: 0.1</td>
</tr>
<tr>
<td></td>
<td>100°C</td>
<td>Minimum: ---; Maximum: 1</td>
</tr>
<tr>
<td>D1533B</td>
<td>Water content, (ppm)</td>
<td>Minimum: ---; Maximum: 25</td>
</tr>
<tr>
<td>D1524</td>
<td>Condition-visual</td>
<td>Minimum: Clear; Maximum: 25</td>
</tr>
<tr>
<td>D92</td>
<td>Flash point (°C)</td>
<td>Minimum: 275; Maximum: ---</td>
</tr>
<tr>
<td>D92</td>
<td>Fire point (°C)</td>
<td>Minimum: 300°; Maximum: ---</td>
</tr>
<tr>
<td>D971</td>
<td>Interfacial tension, mN/m, 25°C</td>
<td>Minimum: 38; Maximum: ---</td>
</tr>
<tr>
<td>D445</td>
<td>Kinematic viscosity, mm²/s. (cSt), 40°C</td>
<td>Minimum: 1.0 X 10²(100); Maximum: 1.3 X 10²(130)</td>
</tr>
<tr>
<td>D1500</td>
<td>Color</td>
<td>Minimum: L2.5; Maximum: --</td>
</tr>
</tbody>
</table>


The test limits shown in this table apply to less-flammable hydrocarbon fluids as a class. Specific typical values for each brand of fluid should be obtained from each fluid manufacturer.

a. If the purpose of the HMWH installation is to comply with the NFPA 70 *National Electrical Code*, this value is the minimum for compliance with NEC Article 450.23.
### TABLE 5

**Transformer Insulation-Resistance Acceptance Test Voltage and Minimum Results**

<table>
<thead>
<tr>
<th>Transformer Coil Rating Type in Volts</th>
<th>Minimum DC Test Voltage</th>
<th>Recommended Minimum Insulation Resistance in Megohms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Liquid Filled</td>
</tr>
<tr>
<td>0 - 600</td>
<td>1000</td>
<td>100</td>
</tr>
<tr>
<td>601 - 5000</td>
<td>2500</td>
<td>1000</td>
</tr>
<tr>
<td>5001 - 15000</td>
<td>5000</td>
<td>5000</td>
</tr>
</tbody>
</table>

See Table 14 for Temperature Correction Factors.

**NOTE:** Since insulation resistance depends on insulation rating (kV) and winding capacity (kVA), values obtained should be compared to manufacturer's test data.
<table>
<thead>
<tr>
<th>Rated Voltage Phase-to-Phase kV</th>
<th>Conductor Sizes AWG or kcmil (mm)</th>
<th>Nominal Insulation Thickness mils (mm)</th>
<th>100% Insulation Level</th>
<th>133% Insulation Level</th>
<th>Maximum DC Field Test Voltages, kV During/After Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>8-1000 (8.4-507)</td>
<td>90 (2.29)</td>
<td>140 (3.56)</td>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Above 1000 (507)</td>
<td></td>
<td></td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>8</td>
<td>6-1000 (13.3-507)</td>
<td>115 (2.92)</td>
<td>140 (3.56)</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>Above 1000 (507)</td>
<td>175 (4.45)</td>
<td>175 (4.45)</td>
<td>36</td>
<td>44</td>
</tr>
<tr>
<td>15</td>
<td>2-1000 (33.6-507)</td>
<td>175 (4.45)</td>
<td>220 (5.59)</td>
<td>56</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>Above 1000 (507)</td>
<td>220 (5.59)</td>
<td>220 (5.59)</td>
<td>56</td>
<td>64</td>
</tr>
<tr>
<td>25</td>
<td>1-2000 (42.4-1013)</td>
<td>260 (6.60)</td>
<td>320 (8.13)</td>
<td>80</td>
<td>96</td>
</tr>
<tr>
<td>28</td>
<td>1-2000 (42.4-1013)</td>
<td>280 (7.11)</td>
<td>345 (8.76)</td>
<td>84</td>
<td>100</td>
</tr>
<tr>
<td>35</td>
<td>1/0-2000 (53.5-1013)</td>
<td>345 (8.76)</td>
<td>420 (10.7)</td>
<td>100</td>
<td>124</td>
</tr>
</tbody>
</table>


The DC field test voltages listed above are intended for cable designed in accordance with ICEA specifications. When older cables or other types/classes of cables or accessories are connected to the system, voltages lower than those shown may be necessary. Consult the manufacturers of the cables and/or accessories before applying the test voltage.
### TABLE 6 (CONT.)
Medium-Voltage Cables
Acceptance Test Values

<table>
<thead>
<tr>
<th>Rated Voltage Phase-to-Phase kV</th>
<th>Conductor Sizes AWG or kcmil (mm)</th>
<th>Nominal Insulation Thickness mils (mm)</th>
<th>AC Test Voltage, kV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>100% Insulation Level</td>
<td>133% Insulation Level</td>
</tr>
<tr>
<td>5 kV</td>
<td>8-1000</td>
<td>90 (2.29)</td>
<td>115 (2.92)</td>
</tr>
<tr>
<td></td>
<td>1001-3000</td>
<td>140 (3.56)</td>
<td>140 (3.56)</td>
</tr>
<tr>
<td>8 kV</td>
<td>6-1000</td>
<td>115 (2.92)</td>
<td>140 (3.56)</td>
</tr>
<tr>
<td></td>
<td>1001-3000</td>
<td>175 (4.45)</td>
<td>175 (4.45)</td>
</tr>
<tr>
<td>15 kV</td>
<td>2-1000</td>
<td>175 (4.45)</td>
<td>220 (5.59)</td>
</tr>
<tr>
<td></td>
<td>1001-3000</td>
<td>220 (5.59)</td>
<td>220 (5.59)</td>
</tr>
<tr>
<td>25 kV</td>
<td>1-3000</td>
<td>260 (6.60)</td>
<td>320 (8.13)</td>
</tr>
<tr>
<td>28 kV</td>
<td>1-3000</td>
<td>280 (7.11)</td>
<td>345 (8.76)</td>
</tr>
<tr>
<td>35 kV</td>
<td>1/0-3000</td>
<td>345 (8.76)</td>
<td>420 (10.7)</td>
</tr>
</tbody>
</table>


All AC voltages are RMS values.
### TABLE 6 (CONT.)
Medium-Voltage Cables
Acceptance Test Values

#### Table 6.3
Partial Discharge Requirements
for Semiconducting Coating and Tape Designs Only

<table>
<thead>
<tr>
<th>Rated Circuit Voltage</th>
<th>Minimum Partial Discharge Extinction Level, kV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100% Insulation Level</td>
</tr>
<tr>
<td>2001-5000</td>
<td>4</td>
</tr>
<tr>
<td>5001-8000</td>
<td>6</td>
</tr>
<tr>
<td>8001-15000</td>
<td>11</td>
</tr>
</tbody>
</table>


#### Table 6.4
Very Low Frequency Testing Levels
0.1 Hz Test Voltage (RMS)

<table>
<thead>
<tr>
<th>System Voltage</th>
<th>Phase-to-Phase (kV) (RMS)</th>
<th>Proof Phase-to-Ground (kV) (RMS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>47</td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 12

**U.S. Standard**

**Bolt Torques for Bus Connections**

*Heat-Treated Steel – Cadmium or Zinc Plated*

<table>
<thead>
<tr>
<th>Grade</th>
<th>SAE 1 &amp; 2</th>
<th>SAE 5</th>
<th>SAE 7</th>
<th>SAE 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Tensile (psi)</td>
<td>64K</td>
<td>105K</td>
<td>133K</td>
<td>150K</td>
</tr>
<tr>
<td>Bolt Diameter in Inches</td>
<td>Torque (Foot Pounds)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/4</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>5/16</td>
<td>7</td>
<td>11</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>3/8</td>
<td>12</td>
<td>20</td>
<td>27</td>
<td>30</td>
</tr>
<tr>
<td>7/16</td>
<td>19</td>
<td>32</td>
<td>44</td>
<td>48</td>
</tr>
<tr>
<td>1/2</td>
<td>30</td>
<td>48</td>
<td>68</td>
<td>74</td>
</tr>
<tr>
<td>9/16</td>
<td>42</td>
<td>70</td>
<td>96</td>
<td>105</td>
</tr>
<tr>
<td>5/8</td>
<td>59</td>
<td>96</td>
<td>135</td>
<td>145</td>
</tr>
<tr>
<td>3/4</td>
<td>96</td>
<td>160</td>
<td>225</td>
<td>235</td>
</tr>
<tr>
<td>7/8</td>
<td>150</td>
<td>240</td>
<td>350</td>
<td>380</td>
</tr>
<tr>
<td>1.0</td>
<td>225</td>
<td>370</td>
<td>530</td>
<td>570</td>
</tr>
</tbody>
</table>

**Bolt Torques for Bus Connections**

*Silicon Bronze Fasteners*¹

*Torque (Foot Pounds)*

<table>
<thead>
<tr>
<th>Bolt Diameter in (Inches)</th>
<th>Nonlubricated</th>
<th>Lubricated</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/16</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>3/8</td>
<td>20</td>
<td>14</td>
</tr>
<tr>
<td>1/2</td>
<td>40</td>
<td>25</td>
</tr>
<tr>
<td>5/8</td>
<td>55</td>
<td>40</td>
</tr>
<tr>
<td>3/4</td>
<td>70</td>
<td>60</td>
</tr>
</tbody>
</table>

¹ Bronze alloy bolts shall have a minimum tensile strength of 70,000 psi
TABLE 12 (CONT.)

Bolt Torques for Bus Connections
Aluminum Alloy Fasteners²
Torque (Foot Pounds)

<table>
<thead>
<tr>
<th>Bolt Diameter in Inches</th>
<th>Lubricated</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/16</td>
<td>8.0</td>
</tr>
<tr>
<td>3/8</td>
<td>11.2</td>
</tr>
<tr>
<td>1/2</td>
<td>20.0</td>
</tr>
<tr>
<td>5/8</td>
<td>32.0</td>
</tr>
<tr>
<td>3/4</td>
<td>48.0</td>
</tr>
</tbody>
</table>

² Aluminum alloy bolts shall have a minimum tensile strength of 55,000 psi.

Bolt Torques for Bus Connections
Stainless Steel Fasteners³
Torque (Foot Pounds)

<table>
<thead>
<tr>
<th>Bolt Diameter in Inches</th>
<th>Uncoated</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/16</td>
<td>14</td>
</tr>
<tr>
<td>3/8</td>
<td>25</td>
</tr>
<tr>
<td>1/2</td>
<td>45</td>
</tr>
<tr>
<td>5/8</td>
<td>60</td>
</tr>
<tr>
<td>3/4</td>
<td>90</td>
</tr>
</tbody>
</table>

³ Bolts, cap screws, nuts, flat washers, locknuts: 18-8 alloy.
Belleville washers: 302 alloy.
## TABLE 14
Insulation Resistance Conversion Factors For Conversion of Test Temperature to 20°C

<table>
<thead>
<tr>
<th>°C</th>
<th>°F</th>
<th>Apparatus Containing Immersed Oil Insulations</th>
<th>Apparatus Containing Solid Insulations</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>32</td>
<td>0.25</td>
<td>0.40</td>
</tr>
<tr>
<td>5</td>
<td>41</td>
<td>0.36</td>
<td>0.45</td>
</tr>
<tr>
<td>10</td>
<td>50</td>
<td>0.50</td>
<td>0.50</td>
</tr>
<tr>
<td>15</td>
<td>59</td>
<td>0.75</td>
<td>0.75</td>
</tr>
<tr>
<td>20</td>
<td>68</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>25</td>
<td>77</td>
<td>1.40</td>
<td>1.25</td>
</tr>
<tr>
<td>30</td>
<td>86</td>
<td>1.98</td>
<td>1.58</td>
</tr>
<tr>
<td>35</td>
<td>95</td>
<td>2.80</td>
<td>2.00</td>
</tr>
<tr>
<td>40</td>
<td>104</td>
<td>3.95</td>
<td>2.50</td>
</tr>
<tr>
<td>45</td>
<td>113</td>
<td>5.60</td>
<td>3.15</td>
</tr>
<tr>
<td>50</td>
<td>122</td>
<td>7.85</td>
<td>3.98</td>
</tr>
<tr>
<td>55</td>
<td>131</td>
<td>11.20</td>
<td>5.00</td>
</tr>
<tr>
<td>60</td>
<td>140</td>
<td>15.85</td>
<td>6.30</td>
</tr>
<tr>
<td>65</td>
<td>149</td>
<td>22.40</td>
<td>7.90</td>
</tr>
<tr>
<td>70</td>
<td>158</td>
<td>31.75</td>
<td>10.00</td>
</tr>
<tr>
<td>75</td>
<td>167</td>
<td>44.70</td>
<td>12.60</td>
</tr>
<tr>
<td>80</td>
<td>176</td>
<td>63.50</td>
<td>15.80</td>
</tr>
</tbody>
</table>
**TABLE 18**
Thermographic Survey
Suggested Actions Based on Temperature Rise

<table>
<thead>
<tr>
<th>Temperature difference (TD) based on comparisons between similar components under similar loading</th>
<th>Temperature difference (TD) based upon comparisons between component and ambient air temperatures</th>
<th>Recommended action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1°C to 3°C</td>
<td>1°C to 10°C</td>
<td>Possible deficiency; warrants investigation</td>
</tr>
<tr>
<td>4°C to 15°C</td>
<td>11°C to 20°C</td>
<td>Indicates probably deficiency; repair as time permits</td>
</tr>
<tr>
<td>-- -- --</td>
<td>21°C to 40°C</td>
<td>Monitor until corrective measures can be accomplished</td>
</tr>
<tr>
<td>&gt;15°C</td>
<td>&gt;40°C</td>
<td>Major discrepancy; repair immediately</td>
</tr>
</tbody>
</table>

Temperature specifications vary depending on the exact type of equipment. Even in the same class of equipment (i.e., cables) there are various temperature ratings. Heating is generally related to the square of the current; therefore, the load current will have a major impact on \( T \). In the absence of consensus standards for TD, the values in this table will provide reasonable guidelines.


It is a necessary and valid requirement that the person performing the electrical inspection be thoroughly trained and experienced concerning the apparatus and systems being evaluated as well as knowledgeable of thermographic methodology.

END OF SECTION 26 08 13
SECTION 26 12 19 – PAD-MOUNTED, LIQUID-FILLED, MEDIUM-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 RELATED WORK
A. Section 26 0812 - Power Distribution Acceptance Tests
B. Section 26 0813 - Power Distribution Acceptance Test Tables

1.2 DESCRIPTION OF SYSTEM
A. Specification covers 3-phase, liquid-filled, compartmental type, loop feed, pad-mounted transformers, including tap changers, fuses, and terminations.

1.3 REFERENCE STANDARDS
A. ANSI C57.12.26 Standard for Transformers - Pad-Mounted, Compartmental-Type, Self-Cooled, 3-Phase Distribution Transformers for Use with Separable Insulated High-Voltage Connectors, H-V, 34,500 Grd/19,920 V and below; 2500 kVA and Smaller.
B. ANSI C57.12.28 Pad-Mounted Equipment - Enclosure Integrity.
C. IEEE C57.12.00 Standard General; Requirements for Liquid - Immersed Distribution, Power, and Regulating Transformers.
D. UL 340 Tests for Comparative Flammability of Liquids.

1.4 SUBMITTALS
A. Submit shop drawings for equipment provided under this Section.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Acceptable Manufacturers: ABB, Cooper, General Electric, RTE, Square D
B. Rating of transformer(s) shall be as shown on drawings:
   1. kVA as shown on plans
   2. Primary Voltage 12470Y/7200 Wye
   3. BIL 95 kV
   4. Secondary Voltage 480Y/277 Wye
   5. Impedance 5.75
   6. Temperature Rise 65°C (over 30°C average ambient temperature)
2.2 CONSTRUCTION

A. Transformer(s) shall:
   1. Be compartmental type, self-cooled, tamper-resistant and weatherproof.
   2. Include sealed tank construction to withstand pressure of 15 psi.
   3. Include welded cover.

B. Transformer tank and high and low voltage compartments shall be assembled as integral unit.

C. High and low voltage compartments shall be located side by side, separated by a steel barrier.

D. Cooling panels will be provided on back of tank.

E. High voltage compartment shall not be accessible until low voltage door has been opened.

F. Low voltage door shall have 3-point latching mechanism with vault type handle having provisions for single padlock and pentahead locking device.

G. Access doors shall have provisions for securing doors in open position.

H. Provide lifting eyes and jacking pads.

I. Include tank grounding provisions in each compartment.

J. Provide a minimum of (2) welded, ground lug attachment points for concentric neutral termination on lower front of transformer tank. Ground lugs shall accommodate 1/0 stranded copper ground conductor.

2.3 FINISH

A. In accordance with ANSI C57.12.28 – Standard for Pad-mounted Enclosure Integrity.

B. Dark green per ANSI standards.

2.4 INSULATING FLUID

A. Coolant and insulating fluid shall be less flammable, dielectric, with fire point of not less than 300°C Liquid shall be biodegradable and nontoxic, Envirotemp FR3 or Biotemp.

2.5 CORE AND COIL CONSTRUCTION

A. Coils shall be wound with copper windings.

B. Core shall be high grade, grain oriented silicon steel laminations.

C. Core and coil assemblies shall be wound core type, 5-legged construction.

D. Internal leads shall be insulated.

E. Manual Tap Changer:
   1. Provide tap changer, externally operated.
   2. Tap changer handle shall have provisions for padlocking.
3. Tap changer shall be 4-position with four 2-1/2% full capacity taps, 2 above and 2 below rated voltage.

2.6 HIGH VOLTAGE COMPARTMENT

A. Terminations:
1. Terminations shall be dead front construction.
2. Provide universal 200 amp load break type bushing wells and parking stands as indicated on drawings, for loop feed and mounting accessory equipment.
3. Bushing wells shall be externally clamped and externally removable.
4. Provide 1 set of load break bushings and 1 load break feed-thru insert for each phase.
5. Mount lightning arrestors to one side and phase conductor elbows to other side.

B. High Voltage Switch:
1. Provide integral, oil immersed, 4-position, rotary, gang operated, rated for load break operation, T-Blade design with make before break option.
2. Switches shall rotate full 360 degrees without a physical stop. Moveable index plate shall be provided that will limit accidental switch rotation.
3. Switch operating handles shall be permanently attached, hook stick operable, and clearly marked for switch operation and circuit identification.
4. 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.
5. Primary switches shall be rated 200 amp (min.) continuous current.
6. The switch positions and required sequences are defined below. Position 1 at 12:00 and rotation listed is clockwise.

C. Position Description
1. Source A and B connected to transformer winding
2. Source B connected to transformer winding
3. Source A connected to B, transformer winding disconnected
4. Source A connected to transformer winding

Note: Load break bayonet fuse devices shall not be considered as providing a switching function.

D. Primary Fusing:
1. Provide Bay-O-Net type fuse combined with current limiting backup fuses.
2. Fuses shall have continuous current ratings sized per manufacturer's recommendations for indicated kVA, impedance, and primary voltage.
3. Primary fuse assembly shall have minimum rating of 6000 amps.
4. Bayonet fuse units shall be oil immersed, hot stick operable, and rated for load break operation.
5. Provide Load sensing fuse elements.
6. Provide (1) spare fuse element for each bayonet fuse.
7. Provide oil drip tray for each bayonet fuse.

E. Surge Arrestors:
1. Provide 3 distribution class metal oxide varistor type surge arrestors, installed in high voltage compartment and grounded to structure. Connect to incoming load break bushings.

2.7 LOW VOLTAGE TERMINATIONS AND EQUIPMENT

A. Bushings shall be molded epoxy.
B. Externally clamped, blade type spade terminals with NEMA spacing.

C. High voltage neutral on Wye-Wye units shall be connected internally to low voltage neutral with provisions for opening this connection for testing.

D. Low voltage neutral bushing shall be fully insulated.
   1. Connect to adjacent ground pad on tank with detachable strap.

E. Accessories:
   1. Each transformer shall be equipped with the following:
      a. Dial type thermometer for indicating top liquid temperature.
      b. Globe valve to serve as drain valve, bottom filler plug connection, and liquid sampling valve.
      c. Globe valve for top filter plug connection and vacuum pump connection.
      d. Pressure vacuum gauge.
      e. Magnetic liquid-level indicator.
      f. Spare fuse pocket with 1 complete set of fuses.
   2. Pressure relief device.
   3. Stainless steel nameplate mounted in low-voltage compartment with the following information:
      a. Serial number and style number.
      b. Graphic representation of high-voltage and low-voltage connections.
      c. kVA ratings at all cooling class ratings and temperature rises.
      d. Transformer impedance at 55°C base kVA rating.
      e. Tap changer positions, voltages and full load currents at each tap setting.
      f. Low voltage rating and full load current.
      g. Gallons of liquid in tank and radiators.
      h. Maximum allowable pressure on tank.
      i. Transformer weight with and without oil.
      j. Listing as non-PCB transformer.

F. Labeling:
   1. Provide 7” x10” warning label on outside high voltage compartment door and danger label on inside low voltage compartment door.

2.8 HARDWARE

A. Provide hardware, including bolts, fasteners, caps, plugs, etc. of corrosion resistant materials or plated with corrosion resistant materials.

2.9 TESTING

A. Report of transformer tests shall be submitted for each transformer:
   1. Standard ANSI tests.
   2. Resistance measurements of windings on rated voltage tap of each transformer and at tap extremes of 1 transformer only of given rating on order.
   3. Ratio tests on rated voltage connections and on tap connections.
   4. Phase-relation and polarity tests on rated voltage connections.
   5. No load losses and excitation current at rated voltage on rated voltage connections.
   6. Impedance and load losses at rated current on rated voltage connections of each transformer and on extremes of 1 unit only of given rating on order.
   7. Applied and induced potential tests.
   8. Regulation and efficiency at rated load and voltage.
9. Insulation resistance tests (high voltage to ground, low voltage to ground, high voltage to low voltage).

B. Temperature test or tests shall be made on 1 unit only of transformers covered by these specifications of given rating, provided that test data is not available from records of temperature tests on duplicate or essentially duplicate transformer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install components as indicated and in accordance with manufacturer's instructions and recommendations.

B. Install transformer level and plumb.

C. Provide means for lifting complete transformer.

D. Bearing surfaces of lifting means shall be free from sharp edges.

E. Provide facilities for guying transformer.

F. Provide lifting means for untanking transformer.

G. Base shall permit rolling (or sliding) in directions of both center lines of transformer and provision shall be made for pulling transformer in these directions.

H. Locate jacking facilities near extreme ends of junction of base segments.

I. Jack ports or lugs shall be so designed that lifting members of jack can be inserted.

J. If liquid filling of any part of transformer is required at job site, supplier shall furnish liquid and job site supervision, and shall furnish or make available suitable filter press and vacuum pump.

3.2 ACCEPTANCE TESTING

A. Testing by Testing Agency

B. Acceptance testing to be performed in accordance with Section 26 0812 – Power Distribution Acceptance Tests and Section 26 0813 – Power Distribution Acceptance Test Tables.
SECTION 26 13 23 - MEDIUM-VOLTAGE PAD-MOUNTED SWITCHGEAR

PART 1 - GENERAL

1.1 RELATED WORK

A. Section 26 0812 – Power Distribution Acceptance Tests

B. Section 26 0813 – Power Distribution Acceptance Test Tables

1.2 REFERENCE

A. Work under this Section is subject to requirements of Contract Documents including General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements.

1.3 DESCRIPTION

A. Provide freestanding, self-supporting, pad mounted switchgear, complete with switches, bushings and bus terminals.

1.4 REFERENCE STANDARDS

A. IEEE C37.74 - Requirements for Subsurface, Vault and Pad-mounted Load-interrupter Switchgear and Fused Load-interrupter Switchgear for Alternating Current Systems Up to 38 Kv

1.5 SUBMITTALS

A. Submit shop drawings for equipment provided under this Section.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Manufacturers: Cooper RVAC Model 10 (Basis of Design), S & C Electric Model PME

B. Provide gear in accordance with the one-line diagram.

C. Pad-mounted gear:
   1. UL Listed.
   2. Dead front, non-fused, 4-way, double sided, vacuum switchgear, E200 fluid insulation.
   4. Enclose interrupter switches within inner grounded steel compartment.
   5. Equip switch terminals with bushings continuous ratings as shown on drawings.
6. Provide termination compartments, one for each 3-phase switch.

D. Ratings:
   1. Ratings for integrated pad-mounted gear as shown below:
      a. kV, Nominal           15
      b. kV, BIL               95
      c. Main Bus Continuous, Amperes  600
      d. Interrupting Rating, Amperes 50,000
      e. Three-Pole Interrupter Switches
         1) Continuous, Amperes  600
         2) Load Switching, Amperes 600
         3) Amperes Rms Asymmetrical  20,000

E. Enclosure:
   1. Sheet steel.
   2. Weld structural joints and butt joints and grind external seams flush and smooth.
   3. Provide base of continuous 90-degree flanges, turned inward and welded at corners for bolting to concrete pad.

F. Doors:
   2. Door-edge flanges shall overlap with door-opening flanges.
   3. Stainless steel hinges with stainless-steel hinge pins.
   4. Door (or set of double doors) equipped with automatic 3-point latching mechanism.
   5. Spring-loaded latching mechanism shall latch automatically when door is closed.
   6. Pentahead socket wrench or tool required to actuate mechanism to unlatch door and, in same motion, recharge spring for next closing operation.
      a. Provision latching mechanism for padlocking.

G. Finish:

H. Bus:
   1. Bus supports, bus, and interconnections shall withstand stresses associated with short circuits up through maximum rating of switchgear.
   2. Provide ground bus of short circuit rating equal to integrated assembly. In each bay, bolt ground bus to copper-clad steel bracket welded to steel enclosure.

I. Termination Compartments:
   1. Provide busing wells to permit connection of elbows.
   2. Provide adequate depth for bushings rated 600 A.
   3. Provide 1 parking stand for each bushing or bushing well. Locate parking stand immediately adjacent to associated bushing or bushing well and accommodate standard feedthru and standoff insulators.
   4. Three welded ground lug attachment points for concentric neutral termination. Ground lugs shall accommodate #1/0 copper conductor.

J. Interrupter Switches:
   1. Use ganged, 3-phase, quick-make quick-break vacuum interrupter mechanism.
   2. Enclose in inner steel compartment.
   3. Operator switch with hook stick operable handle within termination compartment.
4. Circuit interruption shall take place completely within interrupter, with no external arc or flame.

K. Provide "Caution – High Voltage – Keep Out" signs on external doors and hinged bolted panels providing access to high voltage.

L. Provide nameplate on Integrated switchgear assembly:
   1. Indicating manufacturer's drawing number
   2. Voltage ratings (kV nominal; kV maximum design; kV BIL)
   3. Main bus continuous rating (amperes)
   4. Short-circuit ratings (amperes, rms symmetrical and MVA 3-phase symmetrical at rated nominal voltage)
   5. Momentary and fault-closing ratings (amperes, rms asymmetrical)

M. Provide nameplate in each bay indicating:
   1. Ratings of interrupter switch (amperes continuous and interrupting)
   2. Maximum rating of power fuse in amperes
   3. Catalog number of fuse units or refill units

N. Provide label for switch handle with position and circuit identification.

O. Submit identification to Owner/Engineer for approval.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install equipment per manufacturer's recommendations and as indicated.

B. Coordinate final locations with General Contractor and review final locations with Engineer prior to setting equipment.

C. Protect equipment during installation to prevent twisting or deformations, exposure to damaging environments, and work of other trades. Maintain protection until completion of construction.

D. Prior to energizing, factory representative shall visually inspect switchgear installation to verify switches are operable and bus connections are complete.

E. Test switch operators at least once after energizing.

3.2 ADJUSTMENTS AND CLEANING

A. Immediately prior to final inspection, make final adjustments and thoroughly clean equipment.

B. Refinish damaged enclosures to original quality.

3.3 CONNECTIONS

A. Provide cable terminations at switchgear - Section 26 0513.16 – Medium-Voltage Cables.
B. Tighten bus joints, electrical connectors, and terminals according to manufacturer's published torque-tightening values.

3.4 ACCEPTANCE TESTING

A. Testing by Testing Agency

B. Perform acceptance testing - Section 26 0812 – Power Distribution Acceptance Tests and Section 26 0813 – Power Distribution Acceptance Test Tables.

C. Adjust or replace equipment as needed to comply with manufacturer's specifications and submit new test reports.

END OF SECTION 26 13 23
SECTION 31 10 00 – SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing, and removing site utilities.

1.2 RELATED REQUIREMENTS:

1. Section 31 20 00 - Earth Moving.
2. Section 02 32 00 "Geotechnical Data" for geotechnical report and recommendations for the site.
3. Section 02 41 00 "Site Demolition" for demolition of existing site improvements.

1.3 RELATED DOCUMENTS

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

B. Standard Specifications:

2. Except as specifically noted otherwise in the contract documents, all 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.

C. Related Sections:

1. Section 02 32 00 "Geotechnical Data" for geotechnical report and recommendations for the site.
2. Section 02 41 00 "Site Demolition" for demolition of existing site improvements.

1.4 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
B. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow.

C. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.

D. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and as defined by landscape architect.

E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.5 MATERIAL OWNERSHIP

A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.6 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
   1. Use sufficiently detailed photographs or videotape.
   2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.7 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Contractor before performing work.
   1. Do not proceed with work on adjoining property until approved by landowner.

C. Utility Locator Service: Notify One Call for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.
PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 023200 "Geotechnical Data" within geotechnical report.

   1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Protect existing site improvements to remain from damage during construction.

   1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

A. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

3.4 EXISTING UTILITIES

A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.

   1. Arrange with utility companies to shut off indicated utilities.

B. Locate, identify, and disconnect utilities indicated to be abandoned in place.
C. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Coordinate utility interruption with City of Bozeman personnel.

D. Excavate for and remove underground utilities indicated to be removed.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Grind down stumps and remove roots, obstructions, and debris to a depth of 18 inches below exposed subgrade.
3. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and non-soil materials from topsoil, including clay lumps, gravel, and other objects more than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles to 72 inches.
2. Stockpile surplus topsoil to allow for re-spreading deeper topsoil.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 10 00
SECTION 31 11 00 – 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. All proprietary products listed within this specification shall be considered as a BASIS-OF-DESIGN PRODUCT.

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 32 84 00 - Irrigation System

B. Section 32 93 00 - Landscaping

C. Section 32 92 00 – 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 an 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.

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.
END OF SECTION 31 11 00
SECTION 31 20 00 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for concrete slabs-on-grade.
4. Subbase course for concrete walks and pavements.
5. Subbase course and base course for asphalt paving.
6. Subsurface drainage backfill for walls and trenches.
7. Excavating and backfilling trenches for utilities and pits for buried utility structures.

1.2 RELATED REQUIREMENTS:

A. Section 23 20 00 Geotechnical Investigation
B. Section 31 10 00 - Site Clearing.
C. Section 31 63 10 – Vertically Rammed Engineered Aggregate Piers
D. Section 33 10 00 Water Distribution Piping
F. Section 33 30 00 Sanitary Sewer
G. Section 33 41 00 Strom Utility Drainage Piping
H. Section 32 12 16 Asphalt Paving
I. Section 32 13 13 Concrete Paving

1.3 RELATED DOCUMENTS

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

B. Standard Specifications:

2. Except as specifically noted otherwise in the contract documents, all 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.

1.4 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
   1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt and or concrete paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. 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.

F. Fill: Soil materials used to raise existing grades.

G. Rock: Rock material in beds, ledges, un-stratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. or more in volume that exceed a standard penetration resistance of 100 blows/2 inches when tested by a geotechnical testing agency, according to ASTM D 1586.

H. 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.

I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:
   1. Geotextiles.
   2. Controlled low-strength material, including design mixture.
   3. Warning tapes.
B. Samples for Verification: For the following products, in sizes indicated below:

2. Warning Tape: 12 inches long; of each color.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to ASTM D 698.

C. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

1.7 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

1.8 PROJECT CONDITIONS

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

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

B. Utility Locator Service: Notify "Call Before You Dig" and the Campus Locates for area where Project is located before beginning earth moving operations.

C. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, specified in Section 312500 "Erosion and Sediment Control," are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
B. Satisfactory Soils: Obtain approval from the Architect for all fill before placing soil. Satisfactory fill material shall be free of rock or gravel larger than [3 inches (75 mm)] in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; 3" minus in compliance with the Montana Public Works Standard Specifications, sixth edition (MPWSS), as amended by City of Bozeman Modifications to MPWSS, latest edition.

D. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; 1.5" minus in compliance with the Montana Public Works Standard Specifications, sixth edition (MPWSS), as amended by City of Bozeman Modifications to MPWSS, latest edition.

E. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; Type 1 Pipe Bedding in compliance with the Montana Public Works Standard Specifications, sixth edition (MPWSS), as amended by City of Bozeman Modifications to MPWSS, latest edition.

F. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

G. Topsoil: Topsoil shall be free of existing sod and lawn. Imported – Friable, dark loamy soil, fertile, free from rubble, stones, clay lumps, extraneous material, and plant roots and reasonably free of weeds. Physical properties as follows:

- Clay between 7-27%
- Silt between 28-50%
- Sand less than 52%

H. Sod: Sod shall be from a commercial sod farm located in Gallatin Valley. Sod shall be well-established lawn turf grasses similar to the seed mix described below:

<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>

2.2 GEOTEXTILES

A. Separation Geotextile: Propex 350ST woven geotextile fabric, manufactured for separation applications, or approved equal.
2.3 CONTROLLED LOW-STRENGTH MATERIAL

A. Controlled Low-Strength Material: Self-compacting, flowable concrete material produced from the following:

1. Portland Cement: ASTM C 150, Type II or Type III.
2. Fly Ash: ASTM C 618, Class C or F.

2.4 ACCESSORIES

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

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

PART 3 - EXECUTION

3.1 PREPARATION

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

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

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

3.2 DEWATERING

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

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

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

A. Explosives: Do not use explosives.

3.4 EXCAVATION, 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.

1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). 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. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

2. Engineered Aggregate Pier (EAP) Foundations: Stop excavations 6 to 12 inches (150 to 300 mm) above bottom of footing before EAPs are placed. After EAPs have been installed, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete foundations. See the EAP specification section for additional footing subgrade preparation.

3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch (25 mm). Do not disturb bottom of excavations intended as bearing surfaces.

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.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 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. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate 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. 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 Section 015639 “Temporary Tree and Plant Protection.”

3.8 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes) to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

3.9 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent erosion and windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.10 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.11 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.


3.12 SOIL FILL

A. Fill to be in compliance with the Montana Public Works Standard Specifications, sixth edition (MPWSS), as amended by City of Bozeman Modifications to MPWSS, latest edition.

3.13 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 place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
   2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.14 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Compaction to be in compliance with the Montana Public Works Standard Specifications, sixth edition (MPWSS), as amended by City of Bozeman Modifications to MPWSS, latest edition.

B. All existing fill and deleterious material should be removed in their entirety from the proposed building footprint. All exposed subgrade surfaces should be free of mounds and depressions which could prevent uniform compaction. If unexpected fill or obstructions are encountered during site clearing or excavation, such features should be removed and the excavation should extend to the natural soils and thoroughly cleaned prior to fill placement and construction.

C. All fill and backfill should be approved by the geotechnical engineer, moisture conditioned and placed in 8-inch loose lifts. The fill and backfill should then be compacted with an appropriately sized compactor to the following minimum dry densities as determined by ASTM D698.

   1. Below Foundations = 98 percent
   2. Around Foundations = 95 percent
   3. All Other Fill = 95 percent

D. No fill should be placed over frozen ground or in a frozen condition. All loose disturbed soil and/or fills in the base of the over-excavation should be removed from the foundation excavation prior to placement of structural fill. Footings should not be placed on either uncompacted disturbed native soils, or uncontrolled fill. Qualified personnel should observe all footing and slab subgrades to confirm subsoil conditions.
E. Imported gravel meeting the below specifications or the site soils may be used as foundation wall backfill provided proper moisture conditioning to near optimum moisture (± 2 percent) and compacted in accordance with the details presented above. If backfill is needed below foundations, only imported gravel meeting the specifications below should be used. Other imported gravel options may be used by approval of the geotechnical engineer.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-inch</td>
<td>100</td>
</tr>
<tr>
<td>No. 4</td>
<td>25-60</td>
</tr>
<tr>
<td>No. 200</td>
<td>0 - 12</td>
</tr>
</tbody>
</table>

Liquid limits less than 25 and PI less than 6

F. Surface water should not be allowed to accumulate and infiltrate soils near the proposed foundations. It must be controlled and directed away from the structures. A simple means of reducing moisture changes is to prevent surface water infiltration by sloping the ground away from the foundation. The recommended minimum slope within 10 feet of the building is 1 inch vertical for 1 foot horizontal. The sloped ground should be initially constructed at a greater slope to account for settlement/consolidation of exterior backfill. Within 10 feet of the foundation, the upper 12 to 18 inches of backfill should consist of less permeable, compacted clay soils. The area around the foundation should be inspected regularly, particularly after a rain event to determine if proper drainage away from the structure has been maintained.

3.15 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.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Turf or Unpaved Areas: Plus or minus [1 inch (25 mm)].
2. Walks: Plus or minus [1 inch (25 mm)].
3. Pavements: Plus or minus [1/2 inch (13 mm)].

C. Grading inside Building Lines: Finish subgrade to a tolerance of [1/2 inch (13 mm)] when tested with a 10-foot (3-m) straightedge.
3.16 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.


3.17 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.


3.18 FIELD QUALITY CONTROL

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

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material and maximum lift thickness comply with requirements.
3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.

B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. 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.

D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

E. 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:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 4000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length, but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length, but no fewer than two tests.
F. 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.

3.19 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish 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.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.20 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.

3.21 PLACING OF TOPSOIL AND SOD

A. All areas disturbed by construction, except surfaces occupied by paving and areas indicated to be undisturbed shall be restored with topsoil and sod.

B. Cut sod in uniformly wide strips, uniformly 1-1/2 inches thick with clean cut edges.

C. 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.

D. Sod shall be installed in place on the site not more than 24 hours after cutting.

E. Obtain ENGINEER’s approval of rough grading before placing topsoil.

F. Relieve subgrade compaction using a fracturing, deep-tine aerifier, a high-pressure water injection aerifier, or other method approved by OWNER.

G. Scarify and place 9-10 inches minimum of topsoil. Uniformly spread layer of topsoil over areas that have been distributed. If quantity of on-site topsoil is insufficient, import off-site topsoil.

H. Level topsoil to eliminate water pockets and irregularities. Compact to 85 % Standard Proctor Density in planted areas.
I. Slope graded surfaces to drain surface water away from buildings; minimum slope 1/4 inch in 12 inches (2%).

J. Grade uniformly with rounded surfaces at tops and bottoms of abrupt changes in plane. Hand-grade steep slopes and areas that are inaccessible for machine work and areas around existing trees.

K. Protect graded areas from undue erosion. Repair and regrade if required. Refill and compact where settlement or erosion occurs. Provide hay bales and burlap as required to prevent erosion throughout project.

L. Grade areas to elevations and slopes indicated without depressions causing pocketing of surface water or humps, producing localized runoff and gullying. Ponding of water on-site is not allowed. Finish surfaces to be not more than 0.10 foot above or below established grade elevation.

M. Remove all lumps and clods prior to placing sod.

END OF SECTION 31 20 00
SECTION 31 25 00 – EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Contractor shall be fully responsible for the Storm Water Discharge Permit and fully comply with the Montana Department of Environmental Quality (DEQ) regulations in regards to Storm Water Discharges associated with Construction Activity including, but not limited to, any and all submittals, inspections, fees, reporting, training, and installation of Best Management Practices (BMP’s). CONTRACTOR shall sign all permits and forms and assumes all responsibility of management of the Storm Water Erosion Control Plan and any associated records or fines.

B. The CONTRACTOR is required to develop a Storm Water Pollution Prevention Plan (SWPPP) per DEQ standards. The SWPPP must clearly address the effluent limitations and the selected BMP’s to be used to manage pollutant sources and ensure appropriate protection of state surface waters as outlined in DEQ’s General Permit for Storm Water Discharges Associated with Construction Activity (called “General Permit”). In case of conflict between this specification and the General Permit, the General permit shall prevail.

C. The site is required to reach “final stabilization” before permit coverage may be terminated. In Montana’s semi-arid climate, the time necessary to achieve this “final stabilization” often requires maintenance and permit coverage well beyond the Substantial Completion phase to ensure vegetation or other site stabilization measures are in-place.

1.2 RELATED REQUIREMENTS:

A. Section 31 10 00 - Site Clearing.

B. Section 31 20 00 - Earth Moving.
1.3 RELATED DOCUMENTS

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

B. Standard Specifications:


2. Except as specifically noted otherwise in the contract documents, all 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.

1.4 DEFINITIONS

A. Best Management Practices (BMPs)

1. Schedule of activities, prohibition of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of state surface waters. BMP’s also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

B. Final stabilization

1. The time at which all soil-disturbing activities at the site have been completed, and a vegetative cover has been established with a density of at least 70% of the pre-disturbance levels, or equivalent permanent, physical erosion reduction methods have been employed. Final stabilization using vegetation must be accomplished using seeding mixtures or forbs, grasses, and shrubs that are adapted to the conditions of the site. Establishment of a vegetative cover capable of providing erosion control equivalent to pre-existing conditions at the site will be considered final stabilization.

1.5 SUBMITTALS

A. Prior to receiving a Notice to Proceed, contractor shall submit to the ENGINEER the following documentation:
1. a copy of the completed and signed NOI form;

2. a copy of the signed SWPPP as submitted to the DEQ; and

3. a copy of the Department's Confirmation Letter for receipt of the complete NOI Package.

B. In addition, the ENGINEER shall be copied on all documentation submitted to or received from the MT DEQ including but not limited to notices of noncompliance, if necessary and the Notice of Termination, when submitted.

1.6 APPLICABLE LAWS AND REGULATIONS

1.7 Per ARM 17.30.1105, CONTRACTOR shall obtain permit coverage under the General Permit for Storm Water Discharges Associated with Construction Activity (General Permit). A copy of this permit is included at the end of this section.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 GENERAL

A. Permit coverage can be obtained by the DEQ's Water Protection Bureau after receiving the following Notice of Intent (NOI) Package items by the proposed construction start date:

B. NOI form with all requested items completed. A draft copy of this form is included in the Appendix and intended as a starting point for development of the NOI. Technical data available to the ENGINEER has been included in this draft permit for the CONTRACTOR’s convenience.

C. Storm Water Pollution Prevention Plan (SWPPP) addressing all requested items in the General Permit. A draft copy of the form created by the DEQ to satisfy this requirement is included in the Appendix and intended as a starting point for development of the SWPPP. Additional guidance to completing a SWPPP can be found in the General Permit and on the MT DEQ website. Technical data available to the ENGINEER has been included in this draft permit for the CONTRACTOR’s convenience.

D. Application fee based on the total acres of disturbed land.

E. CONTRACTOR must read and be familiar with the General Permit to assist in the completion of the forms and submittal of the NOI Package. Note that formal signatory requirements allow only certain qualified people to sign NOI forms and other forms or reports.
F. The CONTRACTOR will be responsible for annual renewals of the permit until “final stabilization” has occurred and the Notice of Termination (NOT) can be submitted. The CONTRACTOR must submit a NOT form when the construction activity is complete and the site has achieved “final stabilization.” ENGINEER shall be notified of any inspection made for the purpose of determining if the site has achieved final stabilization.

G. SWPPP Administrator

1. Per DEQ regulations, the CONTRACTOR must specify a Primary SWPPP Administrator(s), a Secondary SWPPP Administrator (as applicable), and any other designated SWPPP Administrator(s) in the SWPPP. A SWPPP Administrator(s) is an individual or position title who is responsible for developing, implementing, maintaining, revising, and updating the SWPPP. The SWPPP Administrator(s) must address all aspects of the SWPPP, initiating with the start of construction activities, and lasting until final stabilization is achieved and the permit authorization is terminated. There can be multiple individuals and/or position titles which serve as a SWPPP Administrator; but a Primary SWPPP Administrator and Secondary SWPPP Administrator (as applicable) must be identified on the NOI Form and in the SWPPP.

2. The SWPPP Administrator(s) must have knowledge of the principles and practices of erosion and sediment controls and pollution prevention practices and possess the skills necessary to assess site conditions and determine the effectiveness of selected BMPs.

3. The SWPPP Administrator(s) must meet the authorized representative requirements as defined in Part 4.15 of the General Permit to sign inspection reports and other reports. The primary and secondary SWPPP Administrators identified in Section F of the Form NOI must meet this requirement. The SWPPP Administrator(s) must be trained as required in the General Permit.

3.2 Inspections

A. Inspections must be performed by a SWPPP Administrator. Site inspections are to be conducted according to section 2.3.4 of the General Permit. Site inspections are to be conducted during the construction project's normal working hours and the inspection schedule must be documented in the SWPPP. Site inspections must be performed in accordance with one of the two schedules listed Parts 2.3.1. or 2.3.2. of the General Permit unless subject to the schedule in Part 2.3.3. The initial SWPPP submitted with the NOI Package must specify which inspection schedule will be utilized (either Part 2.3.1. or 2.3.2.), and this inspection schedule must be used until final stabilization is achieved for all areas of the construction activity, except for any temporary reduced inspection schedule as allowed in Part 2.3.3. The CONTRACTOR cannot switch between the inspection schedule options in Parts 2.3.1. and 2.3.2. during the life of the permit authorization.

3.3 Maintenance

A. All BMPs identified in the SWPPP must be maintained in effective operating condition. If site inspections identify BMPs which are not in effective operating condition, maintenance must be performed before the next storm event. If existing BMPs need to be modified, or if additional BMPs are necessary for any
reason, implementation of these additional measures must be completed before the next storm event. All changes in the design, implementation, or installation of erosion and sediment control or other BMPs must be documented where applicable in the SWPPP. SWPPP changes must also be summarized in a SWPPP Revision/Update Log as required in Part 3.12.2. of the General Permit. Prior to submitting a Notice of Termination, all temporary BMP’s should be removed.

3.4 Recordkeeping

A. At the identified site, the primary SWPPP Administrator must retain all documentation required in the General permit including but not limited to:

1. a copy of the General Permit;

2. a copy of the completed and signed NOI form;

3. a copy of the Department’s Confirmation Letter for receipt of the complete NOI Package

4. a copy of the latest up-to-date and signed SWPPP;

5. BMP installation and design standards for all BMPs installed and detailed in the SWPPP;

6. SWPPP Administrator(s) documentation under Part 3.2. of the General Permit;

7. SWPPP Administrator Delegation Form (if applicable);

8. SWPPP Revision/Update Log as required under Part 3.12.2. of the General Permit;

9. all inspection records required under Part 2.3. of the General Permit; and

10. all reports of noncompliance under Part 4 of this permit.

11. These documents are to be made available at the site immediately upon request from the ENGINEER, OWNER, a Department representative, EPA official, or local official.

END OF SECTION 31 25 00
SECTION 31 63 10 – VERTICALLY RAMMED ENGINEERED AGGREGATE PIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes all equipment, material, labor, and supervision for the design, installation, and testing of the drilled/replacement, vertically rammed engineered aggregate pier (EAP) ground improvement system. The EAP system must meet the performance requirements specified in this specification and the construction documents and shall rely on subsurface information presented in the project geotechnical report. The EAP lengths shall be designed to terminate within the dense poorly graded gravel bearing layer encountered at depths ranging from approximately 17.0 to 21 feet below existing ground surface as indicated on the boring logs of the geotechnical report. It is noted that the depth to gravel layer increases to 21 feet towards the east half and northeast corner area of the building footprint.

B. Work in other Sections related to Engineered Aggregate Piers:
   1. Division 31 Section “Site Clearing.”
   2. Division 31 Section “Earth Moving.”

1.2 DESCRIPTION OF EAP SYSTEM

A. The EAP system shall be constructed by vertically ramming (compacting, with no vibration) aggregate in an excavated or drilled shaft using special high-energy impact ramming equipment. The aggregate pier elements shall be in a columnar configuration and shall be used to reinforce soils for the support of slabs and high bearing pressure footings.

B. Special high-energy impact ramming apparatus shall be used to produce the EAP ground improvement system. The ramming assembly shall include a 2,500 lb. class hydraulic break hammer, equivalent or greater, with a patented beveled rammer.

1.3 REFERENCE STANDARDS

A. Design:

B. Modulus and Uplift Testing
C. Materials and Inspection
   2. ASTM STP 399 (1966)- Dynamic Cone Penetrometer Testing
   4. ASTM D 698 - Standard Proctor Test/Aggregate Densification

D. Conflicts between Specifications and References
   1. Where specifications and reference documents conflict, the Project Structural Engineer of Record/Project Geotechnical Engineer shall make the final determination of the applicable document.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. EAP Designer Submittals:
   1. Submit detailed design calculations, subgrade/ground improvement construction drawings, material specifications and shop drawings, (the Design Submittal), to the Structural Engineer of Record and Project Geotechnical Engineer for review and approval at least 3 weeks prior to the beginning of construction. All EAP system design calculations and plans shall be prepared and sealed by a Professional Engineer licensed in the state of Montana. The design submittal shall consider the following:

   a. Design Considerations:
      1) The design submitted by the EAP Designer shall consider the actual service load bearing pressure and settlement of all foundations in the building, including spread footings, shearwall and retaining wall footings, and strip wall footings, and shall be in accordance with acceptable engineering practice and these specifications.
      2) The design life of the installed EAP system shall be no less than 75 years.
      3) The EAP system shall be designed to preclude significant plastic bulging deformations at the top-of–pier design stress and in the absence of tip termination upon a bearing stratum (stiff or medium dense soil) to preclude significant tip stresses as determined from end-bearing capacity analysis or the shape of the telltale test curve from telltales installed in modulus test piers. The results of the modulus test shall be used to verify the design assumptions.
      4) EAP system shall be designed in accordance with the reference design standards in Section 1.3. EAP system design shall meet the following performance criteria:
         a) Allowable service level dead load plus live load bearing pressure for footings supported by EAP reinforced subgrade shall be 5,500 psf.
         b) Estimated total long-term settlement for footings: shall be less than or equal to 1.0-inch.
         c) Estimated long-term differential settlement of adjacent footings shall be less than or equal to ½-inch.
         d) Coefficient of sliding friction applied as a uniform value across the footing bottom in contact with the EAP improved subgrade shall be a minimum of 0.45.
         e) Minimum EAP bearing stiffness (verified by modulus test) shall be 200 psi/in (pci).
         f) One-third (1/3) increase to ASD pressure permissible for short-term loading wind and/or seismic loading.
5) EAPs shall be designed and constructed to meet the combined, service level loadings and allowable settlement limits indicated in the Drawings, as provided by the project Structural Engineer of-Record.

6) The size and spacing of the EAPs shall be described on the subgrade/ground improvement construction drawings. The Installer shall be responsible for delivering a system that will support the loading conditions and control settlement in accordance with these specifications. The Owner’s Representative shall approve any modifications in size and spacing of the pier elements.

C. EAP Installer Submittals:
1. Modulus Test Requirements – A load test schedule shall be prepared by the Installer for each modulus test (based on the project requirements and in accordance with Section 3.4 of these specifications. Each proposed load test location shall be shown on the shop drawings, and must be approved by the Project Geotechnical Engineer and Project Structural Engineer of Record. The intent is to locate the load tests at locations where the most settlement and/or design load is anticipated. A report of load testing results shall be submitted to the Owner and Project Geotechnical Engineer after completion of the load tests. The report shall include a description of the installation equipment, installation records and complete test data; analysis of the test data and verification of the design parameter values based on the modulus test results. The report shall be prepared by or under the direct supervision of a registered professional engineer experienced in modulus testing, performance and analysis of the aggregate pier system.

2. Aggregate – Material delivery tickets from the aggregate supplier shall be obtained by the EAP installer to verify that it has the appropriate rating and gradation. Approval of alternate materials shall be obtained from the Pier Designer.

3. Minutes of EAP pre-installation conference.

4. Daily EAP Installation Reports – Aggregate Pier Progress Report shall be completed by the installer during each day of installation, and shall consist of the following: Date of installation and summary of installation equipment and installation procedures; Pier location, length, and diameter; Final elevations of the pier top and bottom; Documentation of any unusual subsurface conditions encountered; Soil and groundwater observations, if any; The results of any field Quality Control testing or deflection monitoring done. The Installer shall immediately report any unusual conditions encountered during installation to the EAP Designer, to the Owner’s Testing Agency, and the Project Geotechnical Engineer.

5. EAP System Record Drawings - The Installer shall furnish Record Drawings specifying the location of the installed EAPs to the Project Structural Engineer of Record, and Project Geotechnical Engineer. The record shall indicate the constructed pier location, length, average lift depth, final elevations of the base and top of piers, and the type and size of the densification equipment used. The record shall also include select graphs of the rammer deflection data and or calibrated dynamic penetration test (ASTM STP 399) data for the piers constructed.

D. Project Geotechnical Engineer Observation Report
1. EAP Installation: A signed and sealed written observation report shall be provided by the Project Geotechnical Engineer to the General contractor, to the EAP System Designer, to the Owner’s Testing Agency, and the Project Structural Engineer of Record.

2. Spread Foundation Construction: The Project Geotechnical Engineer shall prepare a report documenting the spread foundation construction, including verification of EAP elements required for each foundation and preparation of the foundation bottom as specified in these specifications and construction documents.


1.5 QUALITY ASSURANCE

A. EAP System Installer Qualifications: An experienced installer who has completed 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. They shall have a minimum of 5 years of experience with the installation of EAP and shall have completed at least 25 projects of similar or larger size and scope. The Installer shall adhere to all requirements described in this Specification.

B. EAP System Designer Qualifications: EAP System Designer (Designer) shall have demonstrated experience in the design of similar size and types of projects and shall have a minimum of 5 years of experience EAP System design and shall have completed at least 25 projects of similar or larger size and scope. The Designer shall be a professional engineer who is legally qualified to practice in Montana.

C. The EAP Designer, Installer, shall have a pre-installation meeting at the site to include the General Contractor, Geotechnical Engineer and Testing Agency personnel and prepare and distribute meeting minutes in accordance with Division 1 Specification - “Administrative Requirements”.

D. The Installer shall have a full-time Quality Control (QC) representative to verify and report all QC installation procedures. The Installer shall immediately report any unusual conditions encountered during installation, to the EAP System Designer, to the Owner’s Testing Agency, and the Project Geotechnical Engineer.

E. The Owner is responsible for retaining an independent engineering testing firm to provide Quality Assurance (QA) services. The Testing Agency shall observe the modulus and uplift test(s) when modulus or uplift test(s) are to be performed. The Installer shall set up and conduct the test(s) and provide and install all dial indicators and other measuring devices. The Testing Agency shall observe the installation of EAP test elements.

F. The EAP System Designer or a qualified representative shall perform sufficient site visits as to observe excavation and installation of the EAPs. A qualified Designer representative consists of an individual with at least 2 years of construction/design experience.

PART 2 - PRODUCTS

2.1 AGGREGATE

A. Material used to form the EAP elements shall be hard and chemically inert so as to remain stable during column construction and building service life in the anticipated soil and ground water conditions. The aggregate shall consist of solid, durable, and non-friable rock; free of thin, slab-type rock fragments and conform to standards used by the EAP industry.

B. Material shall be used with a grading appropriate for compaction to form a dense column.

C. The material used to build the EAP elements shall be as specified by the EAP System Designer. The EAP System Designer shall be notified for approval, prior to use, when changes in specification or supply of the material is encountered.

PART 3 - EXECUTION
3.1 GENERAL

A. EAP system installation shall be performed following rough grading of the project site or building pad.

B. General Contractor to locate and protect underground and aboveground utilities and other structures from damage during installation of the EAP elements.

C. A working surface shall be established as needed by the General Contractor to provide wet weather protection of the subgrade and to provide access for efficient operation of the EAP system installation.

D. Ponding of water in the area of footing excavation shall not be permitted. General Contractor and EAP installer to coordinate to maintain a level, well drained surface.

E. If cave-ins occur during excavation such that the sidewalls of the shaft are deemed to be unstable, a temporary steel casing shall be used to stabilize the excavation.

F. If cave-ins occur on top of a lift of aggregate such that the volume of the caved soils is greater than 15 percent of the volume of the aggregate in the lift, then the aggregate shall be considered contaminated and shall be removed and replaced with uncontaminated aggregate.

G. After drilling of the shaft, to form the bottom bulb the rammer energy shall be applied on the first lift of aggregate in wet conditions or to the in-situ soil in dry conditions. After construction of the bottom bulb, aggregate shall be rammed in thin lifts in the shaft to the planned top elevation as shown in the drawings and/or quality control records. Aggregate shall be placed in the augered cavity in compacted lift thicknesses no greater than 24 inches or as determined by the EAP System Designer.

H. A specially-designed beveled tamper and high-energy impact densification apparatus shall be employed to densify lifts of aggregate during installation. The tamper diameter shall be at least 80% of the pre-augered hole diameter. The apparatus shall apply direct downward impact energy to each lift of aggregate.

3.2 LOCATING EAP ELEMENTS

A. The center of each pier element shall be within six inches of the plan locations indicated or specifically approved by the pier installer. The final measurement of the top of piers shall be the lowest point on the aggregate in the last rammed lift.

B. Ground elevations at each staked EAP location shall be provided in sufficient detail to estimate drilling depth elevations to within 2 inches. These shall be provided on stakes at each pier location and by data export a minimum of 1 day prior to pier installation in a given area.

C. EAP elements installed outside of the above tolerances and deemed not acceptable, except as caused by obstructions or Changed Conditions, shall be rebuilt at no additional expense to the General Contractor or Owner.

3.3 OBSTRUCTIONS

A. Should any obstruction be encountered during drilling or excavation for EAPs, the General Contractor shall be responsible for removing such obstruction, or the pier shall be relocated or abandoned as approved by the Owner’s Representative. Obstructions include, but are not limited to, boulders, timbers, concrete, bricks, debris, utility lines, etc., that prevent installing the EAPs to the required depth, or cause the aggregate pier to drift from the required locations.
B. EAP elements may be terminated short of design depths on top of partially weathered rock, or very dense gravel layers as approved by the Project Geotechnical Engineer of Record.

3.4 FIELD TESTING AND INSPECTIONS

A. The Installer shall have a full-time Quality Control representative (QCR) to report installation procedures. The QCR may be a member of the installation crew. The QCR shall immediately report any unusual conditions encountered during installation to the EAP System Design Engineer, the General Contractor, and to the Testing Agency. The quality control procedures shall include the preparation of EAP Progress Reports completed during each day of installation and containing the following:

1. EAP location;
2. EAP length and drilled diameter;
3. Planned and actual pier elevations at the top and bottom of EAP element;
4. Average lift thickness for each EAP element;
5. Depth of groundwater, if encountered;
6. Documentation of any unusual conditions encountered; and
7. Type and size of ramming equipment used.

B. The Owner shall retain an independent engineering testing firm to provide Quality Assurance (QA) services. This Testing Agency shall observe the modulus and uplift test(s) when modulus or uplift test(s) are to be performed. The Installer shall set up and conduct the test(s) and provide and install all dial indicators and other measuring devices. The Testing Agency shall observe the installation of EAP elements.

C. Prior to installing production piers, the aggregate pier designer shall establish the required energy output for the rammer and terminal rammer-blow deflection criterion for the ramming of each lift. Rammer energy output shall be confirmed by the installer prior to construction of production piers. Instrumentation used to confirm rammer-blow deflections shall be capable of recording to a precision of at least 0.001 inch per rammer stroke, and shall be capable of recording deflection accompanying each rammer blow. During pier lift construction, rammer-blow deflections shall be monitored in at least 5% of the piers for the project to confirm that the design deflection per rammer-blow is achieved. Rammer-blow deflection monitoring shall be performed randomly on installed piers to confirm that terminal rammer-blow deflections meet the established acceptance criterion.

D. EAP Modulus Load Testing

1. A minimum of one modulus test shall be performed to verify the parameter values selected for design. The test(s) shall be performed by the EAP installer at locations agreed upon by the EAP System Designer, Project Structural Engineer of Record, Project Geotechnical Engineer and the Owner’s Testing Agency. EAP modulus testing shall be performed in accordance with the requirements outlined in the EAP Design Submittal. At a minimum, the modulus testing shall include the following:
   a. EAP elements shall be tested to 150% of the maximum design stress as shown in the EAP System design submittal. Modulus Test Procedures shall utilize appropriate portions of ASTM D 1143, ASTM D 1194 and ASTM D 3689, as outlined below. The modulus tests shall be of the type and installed in a manner specified herein.
   b. The Modulus test shall be performed in and on the neat drilled diameter only, no exceptions, i.e. a footing area is not acceptable.
   c. Unless terminating upon a bearing layer as verified by testing agency, a telltale shall be installed at the bottom of the test pier so that bottom-of-pier deflections may be determined. Acceptable performance is indicated when the bottom of the pier deflection is no more than 20% of the top of pier deflection at the design stress level.
   d. ASTM D-1143 general test procedures shall be used as a guide to establishing load increments, load increment duration, and load decrements.
e. With the exception of the load increment representing approximately 115% of the design maximum EAP stress, all load increments shall be held for a minimum of 15 minutes, a maximum of 2 hours, and until the rate of deflection reduces to 0.01 inch per hour, or less.

f. The load increment that represents approximately 115% of the design maximum stress on the EAP shall be held for a minimum of 15 minutes. Loads are then maintained until the rate of deflection reduces to 0.01 inch per hour or for the maximum of 4 hours, whichever is occurs first.

g. A seating load equal to 5 percent of the total load shall be applied to the loaded steel plate prior to application of load increments and prior to measurement of deflections to compensate for surficial disturbance.

2. The results of the modulus load test shall be reported on a deflection versus stress graph. The EAP modulus shall be calculated as the design stress divided by the deflection of the top plate minus the deflection of the bottom plate at the design stress. The deflection of the top and bottom plates shall not exceed the upper zone settlement as shown in the design calculations.

3. Based on the load tests, if performance criteria specified in this specification and on construction drawings is not met, the installer shall either modify the design and/or installation to meet the performance criteria or retest to prove compliance with performance criteria at no additional charge unless the unacceptable performance is due to a change-of-condition from those revealed in the geotechnical site characterization.

3.5 FOOTING AND UTILITY EXCAVATIONS

A. Coordinate all excavations made subsequent to EAP installations so that the integrity of the EAPs are not compromised. Confirm safe excavation distances/depths with the Installer and EAP System Designer. Protect completed EAP elements during foundation preparation per Details provided in the EAP Design Drawings.

B. Footing excavation must be performed with a smooth-edged bucket (no teeth) to limit disturbance of the tops of piers at bearing elevation. Over-excavation below the bottom of the footing may be allowed, with replacement per Details provided in the EAP Design Drawings.

C. Typical installation sequencing will consist of installing the EAP from the rough graded or native ground surface above the footing subgrade elevations. The pier tops will be extended to elevations approximately 12 inches above footing subgrade. The remainder of the pier excavation will be backfilled with overburden to protect the top of piers until the footing excavation is completed. The overburden will then be excavated down to the footing subgrade using a smoothed edged excavator bucket to limit disturbance to the tops of the piers and footing subgrade. If excavation is conducted properly in a good workmanship manner the final footing subgrade with top of piers exposed should consist of a smooth level unyielding surface.

D. Before footing construction, the tops of all the EAP elements exposed in each footing excavation shall be inspected by the Geotechnical Engineer and Testing Agency. The tops of any pier elements that may have been disturbed by footing excavation and related activity shall be recompacted to a dry density equivalent to at least 97% of the maximum dry density obtainable by the ASTM compaction procedure (ASTM D 698). Mechanical tamping type compactors (not vibratory) shall be used to re-compact the pier tops as necessary to meet the requirements of the EAP design, and the requirements of the construction documents.

E. Inspect all foundations and remove all loose soil or mud and properly prepare foundation subgrade as directed by the Owner’s testing agency prior to concrete placement.

F. Foundation excavations to expose the tops of EAP elements shall be made in a workmanlike manner, and shall be protected until concrete placement, with procedures and equipment best suited to:
1. Prevent softening of the matrix soil between and around the EAP elements before pouring structural concrete, i.e. water shall not be allowed to pond in footing excavations or around tops of piers.

2. Achieve direct and firm contact between the dense, undisturbed EAP elements (or properly placed structural fill per EAP Design Details) and the concrete foundations.

G. If same day placement of foundation concrete is not possible, the Contractor shall consider the placement of a minimum 3-inch thick lean concrete seal ("mud mat") immediately after the foundation bottom is excavated and approved.

H. EAP elements designed for each footing shall be exposed at the completion of footing excavation.

I. For the purpose of this specification, the zone of influence is an envelope defined by a horizontal distance of 5 feet from the EAP edge then extending down 5 feet to a point that intersects an imaginary 1:1 sloping plane from the top of the EAP element. The zone of influence continues along the 1:1 slope to a point that corresponds to the bottom of the EAP element elevation.

J. In the event that utility excavations are required within the zone of influence, the General Contractor shall contact the EAP Designer to develop construction solutions to minimize impacts on the installed EAP.

END OF SECTION 31 63 10
SECTION 33 10 00 - WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY
A. This Section includes water-distribution piping and related components outside the building for combined water service and fire-service mains.

1.2 RELATED REQUIREMENTS:
A. Section 31 10 00 - Site Clearing.
B. Section 31 20 00 - Earth Moving.

1.3 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. Standard Specifications:
   2. Except as specifically noted otherwise in the contract documents, all 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.

1.4 DEFINITIONS
A. DI: Ductile Iron
B. PE: Polyethylene plastic.
C. PP: Polypropylene plastic.
D. PVC: Polyvinyl chloride plastic.

1.5 ACTION SUBMITTALS
A. Product Data: For each type of product, pipe, fitting and miscellaneous fitting indicated.
1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For water valves and specialties to include in emergency, operation, and maintenance manuals.

1.8 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.


D. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:

1. Ensure that valves are dry and internally protected against rust and corrosion.
2. Protect valves against damage to threaded ends and flange faces.
3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves, including fire hydrants, according to the following:

1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use hand-wheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.10 PROJECT CONDITIONS

A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:

1. Notify Architect no fewer than two 2 days in advance of proposed interruption of service.
2. Do not proceed with interruption of water-distribution service without Architect's written permission.

1.11 COORDINATION

A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.1 WATER MAINS, SERVICES, VALVES AND FITTINGS


2.2 CORROSION-PROTECTION PIPING ENCASEMENT


2.3 FIRE HYDRANTS


PART 3 - EXECUTION

3.1 GENERAL

A. Refer to Section 31 20 00 "Earth Moving" for excavating, trenching, and backfilling.

END OF SECTION 33 10 00
SECTION 33 30 00 - SANITARY SEWERS

PART 1 - GENERAL

1.1 SUMMARY
   A. This Section includes waste water-collection piping and related components outside the building.

1.2 RELATED REQUIREMENTS:
   A. Section 31 10 00 - Site Clearing.
   B. Section 31 20 00 - Earth Moving.

1.3 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
   B. Standard Specifications:
      2. Except as specifically noted otherwise in the contract documents, all 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.

1.4 DEFINITIONS
   A. PVC: Polyvinyl chloride plastic.

1.5 ACTION SUBMITTALS
   A. Product Data: For each type of product, pipe, fitting and miscellaneous fitting indicated.
   B. Shop Drawings: For manholes. Include plans, elevations, sections, details, and frames and covers.

1.6 INFORMATIONAL SUBMITTALS
   A. Field quality-control reports.
1.7 QUALITY ASSURANCE

A. Regulatory Requirements:
   2. Comply with standards of authorities having jurisdiction for waste water-service piping, including materials, installation, and testing.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

PART 2 - PRODUCTS

2.1 MAINS, MANHOLES, CLEANOUTS, FRAMES, COVERS AND FITTINGS


PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION


3.3 MANHOLE AND CLEANOUT INSTALLATION


3.4 FIELD QUALITY CONTROL

3.5 CLEANING

A. Clean dirt and superfluous material from interior of piping.

END OF SECTION 33 30 00
SECTION 33 41 00 - STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe and fittings.
2. Manholes.
3. Catch basins.
4. Stormwater inlets.
5. Stormwater detention structures.
6. Pipe outlets.
7. Oils sand separators

1.2 RELATED REQUIREMENTS:

A. Section 31 10 00 - Site Clearing.
B. Section 31 20 00 - Earth Moving.

1.3 RELATED DOCUMENTS

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

B. Standard Specifications:

2. Except as specifically noted otherwise in the contract documents, all 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.

1.4 DEFINITIONS

A. PVC: Polyvinyl chloride plastic.
B. RCP: Reinforced concrete pipe.
C. CMP: corrugated metal pipe
1.5 ACTION SUBMITTALS

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

B. Shop Drawings:

1. Manholes: Include plans, elevations, sections, details, frames, and covers.
2. Catch basins and stormwater inlets: Include plans, elevations, sections, details, frames, covers, and grates.
3. Stormwater Detention Structures: Include plans, elevations, sections, details, frames, covers, design calculations, and concrete design-mix reports.

1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

D. Handle manholes, catch basins and stormwater inlets according to manufacturer's written rigging instructions.

PART 2 - PRODUCTS

2.1 PIPE, MANHOLES, CATCHBASINS, INLETS, OIL SAND SEPARATORS AND MISCELLANEOUS FITTINGS


PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

3.3 FIELD QUALITY CONTROL


3.4 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with water.

END OF SECTION 33 41 00
March 8, 2016
Q:\22\11447-0140\Study\Geotechnical\Engineering Lab Building\MSU NAIC Fnl GI RPT.docx

Mr. Dusty Eaton, AIA, LEED AP, Principal
608 N. 29th St.
Billings, MT 59701

RE: Final Geotechnical Report
Norm Asbjornson Innovation Center
Montana State University – Bozeman, MT

Dear Mr. Eaton:

We are pleased to present this final geotechnical report for the proposed Norm Asbjornson Innovation Center located at Montana State University in Bozeman, Montana. The enclosed report describes site conditions and presents geotechnical related conclusions and recommendations for final design and planning of the facility. We are available to answer any questions that may come up as the design progresses.

Please contact DOWL if you have any questions in regard to this report.

Respectfully submitted,

DOWL

[Signature]

Gregory Underhill, P.E.
Senior Geotechnical Engineer
GEOTECHNICAL REPORT

PROPOSED NORM ASBJORNSON INNOVATION CENTER
MONTANA STATE UNIVERSITY
BOZEMAN, MONTANA

Prepared for:

A&E ARCHITECTS

Mr. Dusty Eaton, AIA, LEED AP, Principal
608 N. 29th St.
Billings, MT 59701

Prepared by:

DOWL

2090 Stadium Drive
Bozeman, Montana 59715

Author: Greg Underhill, P.E.
Review: David Barrick, P.E.

March 8, 2015
TABLE OF CONTENTS

1.0 SUMMARY .................................................................................................................. 1
2.0 PLANNED CONSTRUCTION ....................................................................................... 4
3.0 INVESTIGATION PROCEDURE .................................................................................. 4
   3.1 INVESTIGATIONS .................................................................................................... 4
   3.2 FIELD INVESTIGATION .......................................................................................... 4
   3.3 LABORATORY TESTING ......................................................................................... 5
4.0 SITE CONDITIONS ....................................................................................................... 8
   4.1 LOCAL GEOLOGIC CONDITIONS ......................................................................... 8
   4.2 SITE DESCRIPTION ............................................................................................... 8
   4.3 SOILS .................................................................................................................... 9
       4.3.1 Asphalt Surfacing .......................................................................................... 9
       4.3.2 Topsoil .......................................................................................................... 9
       4.3.3 Clay .............................................................................................................. 9
       4.3.4 Gravel .......................................................................................................... 9
       4.3.5 Silty Sand / Sandy Silt .................................................................................. 10
       4.3.6 Poorly graded sand ...................................................................................... 10
       4.3.7 Sandstone and Siltstone Bedrock ................................................................. 10
   4.4 GROUNDWATER .................................................................................................... 10
   4.5 EARTHQUAKES AND SEISMICITY ..................................................................... 11
5.0 ENGINEERING ANALYSIS AND RECOMMENDATIONS ........................................... 11
   5.1 GENERAL ............................................................................................................ 12
   5.2 FOUNDATIONS .................................................................................................... 12
       5.2.1 Foundation Options/Recommendations ....................................................... 12
       5.2.2 Lateral Pressures ......................................................................................... 21
       5.2.3 Interior Slab on Grade Floor ....................................................................... 21
       5.2.4 Basement Considerations ......................................................................... 22
       5.2.5 Corrosion Considerations ......................................................................... 23
   5.3 EARTHWORK ....................................................................................................... 23
       5.3.1 Site Grading and Drainage ........................................................................ 23
       5.3.2 Construction on Moisture Sensitive Subgrade Soils ................................ 25
       5.3.3 Excavation ................................................................................................. 25
6.0 LIMITATIONS ............................................................................................................ 26

LIST OF FIGURES

Figure 1: Vicinity Map .................................................................................................... 3
Figure 2: Boring Location Map ..................................................................................... 7

LIST OF TABLES

Table 3-1 Laboratory Testing Summary ................................................................. 6
Table 4-1 Approximate Depth to Ground Water (Nov 3, 2014 and Dec 18, 2015) .... 11
Table 5-1 Approximate Depth to Gravel Layer ...................................................... 13
Table 5-2 Approximate Depth to Weak Bedrock ..................................................... 13
Table 5-3 Allowable Capacities for Drilled Piers .................................................... 16
Table 5-4 Allowable Pile Capacities ....................................................................... 19
Table 5-5 Screw Pile Allowable Axial Capacities ................................................. 20

- 1 -

Q:\22\11447-01\40Study\Geotechnical\Engineering Lab Building\Final Submittal\MSU NAIC Fnl GI RPT.docx
Table 5-6 Lateral Loads Clay and Silt Backfill .......................................................... 21
Table 5-7 Lateral Loads Imported Gravel Backfill ......................................................... 21
Table 5-8 Imported Gravel Specification ................................................................. 24

APPENDICES

Appendix A  Boring Logs
Appendix B  Laboratory Test Results
Appendix C  Photographs
Appendix D  Screw Pile Information
1.0 SUMMARY

DOWL has completed a final geotechnical evaluation for the proposed new Norm Asbjornson Innovation Center (NAIC) at the Montana State University Bozeman, Montana. A preliminary investigation report was submitted on January 13, 2014. This final investigation consisted of advancement of four additional borings within the proposed engineering building footprint. This final report incorporates findings from the preliminary investigation as well as information obtained from the additional borings. This investigation report provides final geotechnical related recommendations pertinent for project final design and planning.

The proposed site is located on the northeast corner of West Grant and South 7th avenue within the current pay parking lot and band practice field east of the Health and PE complex (see Figure 1). The preliminary investigation included advancing four borings (Borings B-1 through B-4) at locations that also encompassed the proposed adjacent parking garage. Additional borings were advanced during May 2015 within the proposed parking garage site (Borings B-5 through B-8). Borings B-9 through B-12 were then advanced within the proposed NAIC engineering building footprint during December 2015. This final investigation report includes information from borings advanced directly within the engineering building footprint as well as adjacent boring information, additional laboratory testing and final analysis recommendations.

The soil profiles encountered in the additional borings B-9 through B-12 are relatively consistent with the soil profiles indicated in borings B-1 through B-4. The soil profiles consist of topsoil or pavement surfacing overlaying native lean clay deposits that overlay layers of medium to very dense gravel deposits. Medium dense to very dense silty sand and or sandy silt deposits underlay the gravel and transition to siltstone or sandstone bedrock at depth. The siltstone and sandstone deposits are poorly indurated and are considered to be relatively soft or weak in consistency. The siltstone and sandstone deposits extend to the greatest depth drilled.

Groundwater was encountered in all of the borings at depths ranging from approximately 19.7 to 20.0 feet during the time of the investigations.

Based on the investigation boring and laboratory testing information the surficial native clay soils typically exhibit moderate to low bearing strength and high compressibility. Settlements in excess of two (2) inches could occur from heavily loaded footings placed on the native clay soils and the potential for excessive differential settlements is significant. It is therefore recommended to utilize deep foundations to support the new facilities. Options for engineered aggregate piers, drilled piers, driven piling or screw piles are provided.

It is our opinion that the native clay soils are suitable to support interior slab on-grade floors provided the clay subgrade soils are partially over-excavated from beneath the floor areas and subgrade preparation and structural fill placement is performed as specified under Section 5.2.3.
Recommendations in this report are contingent upon DOWL’s involvement during the planning, design and construction stages of the project. If any unexpected soils or conditions are revealed during construction, this office should be notified immediately to survey the conditions and make necessary modifications.
NORM ASBJORNSON INNOVATION CENTER
MONTANA STATE UNIVERSITY
PRELIM GEOTECHNICAL INVESTIGATION
VICINITY MAP

PROJECT 4522.11447.01
DATE 12/30/2014

FIGURE #1
2.0 PLANNED CONSTRUCTION

The new Norm Asbjornson Innovation Center (NAIC) project includes an engineering building and parking garage. The project area is located on the corner of West Grant and South 7th avenue within the current pay parking lot and band practice field immediately east of the Health and PE complex. The proposed facility locations are presented in Figure 2. The parking garage structure is currently under construction and is located within the southwest corner area of the site primarily within the southern end of the current band practice field. The proposed Norm Asbjornson Innovation Center will be located within the northern portion of the site which is currently utilized as a pay parking lot and band practice field. The NAIC building will consist of a three story structure with slab-on-grade floor with perimeter frost wall and partial basement. The structural system will include a steel frame with columns and an exterior, non-bearing wall “skin” and associated wall/strip footing. It is our understanding that laboratory facilities will be located on the first floor which will require concrete pavements designed to accommodate truck loadings. The partial basement will be connected to the existing steam tunnel alignment that is located along Grant Street.

3.0 INVESTIGATION PROCEDURE

3.1 INVESTIGATIONS

A preliminary geotechnical evaluation and report was completed at the general site of Norm Asbjornson Innovation Center during November, 2014. The preliminary investigation consisted of advancement of four geotechnical borings (B-1 through B-4), laboratory testing, preliminary engineering analysis and a Preliminary Geotechnical Report which was submitted on January 13, 2015. The preliminary investigation included advancing four borings (Borings B-1 through B-4) at locations that also encompassed the proposed adjacent parking garage. Additional borings were advanced during May 2015 within the proposed parking garage site (Borings B-5 through B-8). Borings B-9 through B-12 were then advanced within the proposed NAIC engineering building footprint during December 2015.

3.2 FIELD INVESTIGATION

The final field investigation for the NAIC building was performed on December 18, 2015. The field investigation consisted of a geologic review, site observations and advancement of an additional four (4) soil borings (Borings B-9 through B-12). The borings were advanced utilizing a truck-mounted Mobile B-61 drilling rig equipped with 8 ¼ inch O.D. hollow stem augers. The drilling was performed under the direction of a DOWL Geotechnical Engineer. The locations of the borings as well as all previous borings are presented in the Geotechnical Investigation Boring Location Site Map (Figure 2). Borings B-9 through B-12 were advanced to depths ranging from approximately 20.3 to 26.5 feet.
Horizontal locations of the borings were determined by measuring from existing building and sidewalk corners. Vertical elevations of the exploration borings were determined by interpolation from topographic map contours.

At each boring location, Standard Penetration Test (SPT) sampling was performed using a 2-inch outside diameter split-spoon sampler in accordance with ASTM D 1586. The tests were performed utilizing an “Automatic Hammer” which simulates driving the sampler into the soil utilizing a series of drops of a 140 lb. weight falling 30 inches for a total penetration of 18 inches into the soil. The number of blows required for each 6 inches of penetration was recorded. The Standard Penetration Resistance ("N-value") of the soil was then calculated as the number of blows required for the final 12 inches of penetration. If 50 blows were recorded within a single 6-inch interval, the test was terminated and the blow count was recorded as 50 blows for the number of inches of penetration. This resistance, or N-value, provides a measure of the relative density of granular soils and the relative consistency of cohesive soils.

During the drilling, pertinent information including soil sample depths, stratigraphy, soil engineering characteristics and groundwater occurrence were noted. Soil samples were collected while advancing the soil borings using split-spoon sampler. Disturbed bulk samples were obtained from drill cuttings at intervals selected by the field engineer. Relatively undisturbed samples were obtained by hydraulically pushing Shelby tube sample collectors into the subgrade soils. These samples were then transported to the DOWL soils laboratory where engineering property and strength tests were conducted. This information was recorded and is presented on the logs of exploration borings in Appendix A.

The soil descriptions shown on the boring logs are based on field and laboratory testing in accordance with ASTM Standards D 2487 or D 2488. The boring logs contain both factual and interpretive information. On the logs, horizontal lines, designating the interface between differing materials encountered, represent approximate boundaries. The actual transitions may be more gradual or abrupt. The soil and groundwater conditions depicted are only for the specific dates and locations reported, and therefore, are not necessarily representative of other locations and times.

**3.3 LABORATORY TESTING**

Disturbed split-spoon and bulk samples along with relatively undisturbed Shelby tube samples were collected during the field investigation and submitted for testing. Laboratory testing was completed on select soil samples to assist in soil classification and to characterize soil engineering properties. Laboratory testing included the following:
<table>
<thead>
<tr>
<th>Test</th>
<th>Purpose of Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content (ASTM D 2216)</td>
<td>Provides a measure of natural (in-situ) water content.</td>
</tr>
<tr>
<td>Atterberg Limits (ASTM D 4318)</td>
<td>Provides an indicator of the consistency and swell potential of fine grained soils.</td>
</tr>
<tr>
<td>Particle-Size Distribution (ASTM D 422)</td>
<td>Provides a measure of grain sizes of the soils for classification and identification of physical characteristics.</td>
</tr>
<tr>
<td>Moisture-Density Relationship (ASTM D 698)</td>
<td>Provides a measure of the relationship of water content to the density of soil during compaction.</td>
</tr>
<tr>
<td>One dimensional Consolidation (ASTM D 2435)</td>
<td>To determine the amount and rate at which a soil will compress when loaded.</td>
</tr>
<tr>
<td>Unconfined Compression (ASTM 2166)</td>
<td>To determine general soil or rock shear strength properties.</td>
</tr>
<tr>
<td>Direct Shear (ASTM D 3080)</td>
<td>To determine general soil or rock shear strength properties.</td>
</tr>
<tr>
<td>Corrosion Tests (pH, Resistivity, and Sulfates)</td>
<td>To determine the potential for corrosive interaction of soils with concrete and metal</td>
</tr>
</tbody>
</table>
4.0 SITE CONDITIONS

4.1 LOCAL GEOLOGIC CONDITIONS

The Gallatin valley is an intermountain basin in the Rocky Mountains bounded by the Bridger and Gallatin Ranges to the East and South. The Gallatin Mountain Range has provided material for vast coalescing alluvial fans deposited upon the valley floor from the South and East valley limits, sloping rather steeply to the North. These alluvial/fluviatile deposits range from Tertiary to Quaternary in age. The project site is located on the MSU campus south of downtown Bozeman which is situated in the southeast extremity of the Gallatin Valley on Quaternary alluvial fan deposits known as the Bozeman Fan. The alluvial fan deposits typically consist of varying thickness depositional clays, sands and gravels. Tertiary age fluviatile and soft bedrock strata underlay the alluvial fan deposits at varying depths and locations.

4.2 SITE DESCRIPTION

A site map is presented in Figure 2. The proposed site is located on the northeast corner of West Grant and South 7th avenue within the current pay parking lot and band practice field. The new NAIC building will be situated primarily on the paved parking area with the western portion of the building extending onto the grassed band practice field. Various buried utilities exist within the site. The topography of the site area is essentially flat sloping gently at an approximate one percent grade to the north. Photographs of the site are presented in Appendix C.

4.3 SOILS

In summary, the soil profiles encountered in borings B-9, through B-12 are relatively consistent and very similar to the conditions reveled in the preliminary exploration borings B-1 through B-4 and borings B-5 through B-8 which advanced for the parking garage. The following borings were advanced within or close to the perimeter of the proposed NAIC building: B-2, B-4, B-9, B-10, B-11, and B-12. The soil profiles consist of topsoil or pavement surfacing overlying native lean clay deposits that overlay layers of medium to very dense gravel deposits. Medium dense to very dense silty sand and or sandy silt deposits underlay the gravel and transition to siltstone or sandstone bedrock at depth. The siltstone and sandstone deposits are poorly indurated and are considered to be relatively soft or weak in consistency. The siltstone and sandstone deposits extend to the greatest depth drilled.

The soil profiles are presented in detail in the exploration boring logs in Appendix A. At the NAIC building location the lean clay deposits extend from the surface to depths ranging from 16.3 (B-2) to 20.5 feet (B-4) feet in depth at which depths gravel was encountered. The gravel layer extends to depths ranging from approximately 23.0 feet (B-2) to 27.0 feet (B-4) at which depths medium dense to dense silty sand/sandy silt and poorly graded sand deposits are encountered. These deposits transition to siltstone or sandstone at depth. The following sections summarize the soils encountered at the NAIC
building site:

4.3.1 **Asphalt Surfacing**

The asphalt surfacing section at the student parking lot ranged from consisted of approximately three and one half (3.5) to five (5) inches of asphalt and five (5) to nine (9) inches of road base.

4.3.2 **Topsoil**

Topsoil was encountered in Borings B-2 and B-12. The topsoil was approximately 8 inches in thickness. It is noted that topsoil thickness can vary across the site and may be thicker at other locations.

4.3.3 **Clay**

Native lean and or sandy lean clay was encountered near surface in all borings. In general, the clay ranged from soft to stiff and as an average is medium stiff in consistency and standard penetration (N) values generally ranged from 5 to 19 blows per foot. Moisture content of the clay ranged from 19.3 to 29 percent from depths ranging between 2.5 to 19 feet. Liquid limits and plasticity indices ranged from 30 to 43 percent and 11 to 20 respectively. Results from unconfined compression tests from samples indicate that the clay exhibits unconfined compressive strengths ranging from 1.0 to 3.3 kips per square foot with corresponding undrained shear strengths of .500 to 1.65 kips per square foot; in place unit dry unit weights of the clay ranged from 86.6 to 96.6 pounds per cubic foot (pcf). Results from unconfined compression tests from samples of clay taken at depths of 3, 6 and 16 feet in Borings B-1, B-3 and B-4 respectively indicated that the clay exhibited unconfined compressive strengths ranging from 2.9 to 2.0 kips per square foot with corresponding undrained shear strengths of 1.45 to 1.0 kips per square foot; in place unit dry unit weights of the clay ranged from 98 to 103 pounds per cubic foot (pcf). Standard penetration tests taken in Borings B-9 through B-12 were similar to those in Borings B-1 through B-4.

In general, the clay deposits exhibit moderate to low bearing strength, moderate to high compressibility and are generally high in natural moisture.

4.3.4 **Gravel**

Gravel was encountered in all borings at depths ranging from 16.3 feet (B-2) to 20.5 feet (B-4). The gravel can be generally classified as poorly graded gravel with sand and cobbles. The gravel ranged from dense to very dense in consistency. Standard penetration (N) values ranged from 33 to greater than 84 blows per foot. The gravel was at or below the water table and saturated. The gravel layer thickness ranges from approximately 7 to 9.5 feet and averages approximately 8.6 feet in thickness across the parking garage site based on the borings advanced.

The gravel deposits exhibit high bearing strength and low compressibility.
4.3.5 **Silty Sand / Sandy Silt**

Silty sand/sandy silt underlays the gravel deposits at all boring locations. These deposits transition between sand and silt at random depth intervals but are predominantly silty sand. The deposits ranged from coarse to fine grained. The deposits extended to depths ranging from 35 feet (B-2) to 45 feet (B-5) at which depths the soils transitioned to sandstone and siltstone. The silty sand and sandy silt ranged from medium dense to dense in consistency. Standard penetration (N) values generally ranged from 18 to 43 blows per foot and averaged 27 blows per foot in the medium dense intervals. Isolated layers of poorly graded sand and fine gravel were encountered within the sand and silt deposits. The sand and silt was below the water table and saturated.

The sand deposits exhibit moderate to high bearing strength and moderate to low compressibility.

4.3.6 **Poorly graded sand**

Poorly graded sand with widely scattered fine gravel was encountered between the depths of 38.0 to 45.0 feet in boring-7. These deposits transitioned to very weak slightly indurated sandstone at approximately 45 feet in B-7. The deposits ranged from coarse to fine grained. The sand ranged was dense to very dense in consistency. Standard penetration (N) values generally ranged from 54 to 66 blows per foot. This deposit did exhibit sensitivity to differential hydrostatic pressure indicated buy heaving sand in the augers during drilling.

The sand deposits exhibit high bearing strength and low compressibility.

4.3.7 **Sandstone and Siltstone Bedrock**

Sandstone and siltstone bedrock was encountered underlying the sand and silt deposits at depths ranging from 35 to 49.5 feet. In general the bedrock formations are considered moderately indurated or soft rock. It was possible to auger into the formations with some difficulty. Auger refusal was encountered in the sandstone in boring B-3 at a depth of 42 feet. Standard penetration tests ranged from 39 within a “soft layer” to greater than 80 blows per foot. Based on our experience, bedrock undelaying the campus area can be variable in consistency and may contain soft zones.

The bedrock formations generally exhibit high bearing strength and low compressibility.

4.4 **GROUNDWATER**

Groundwater was encountered in all of the borings at depths ranging from 19.7 to 20.0 feet during the time of the investigations. Table 4-1 presents the approximate depths to the ground water table observed at the time of the investigations. Note B-2 and B-4 were advanced during November of 2014. The groundwater generally flows within the gravel layer.
### Table 4-1

Approximate Depth to Ground Water (Nov 3, 2014 and Dec 18, 2015)

<table>
<thead>
<tr>
<th>Boring</th>
<th>Surface Elevation</th>
<th>Depth to Ground Water (ft)</th>
<th>Ground Water Elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-2</td>
<td>4921.1</td>
<td>*20.2</td>
<td>*4900.9</td>
</tr>
<tr>
<td>B-4</td>
<td>4920.2</td>
<td>*20.0</td>
<td>*4900.2</td>
</tr>
<tr>
<td>B-9</td>
<td>4922.4</td>
<td>**20.8</td>
<td>**4901.6</td>
</tr>
<tr>
<td>B-10</td>
<td>4921.9</td>
<td>**20.3</td>
<td>**4901.6</td>
</tr>
<tr>
<td>B-11</td>
<td>4921.3</td>
<td>**19.8</td>
<td>**4901.5</td>
</tr>
<tr>
<td>B-12</td>
<td>4920.9</td>
<td>**19.7</td>
<td>**4901.6</td>
</tr>
</tbody>
</table>

*Measured 11/3/2014  
**Measured 12/18/2015

Fluctuations of groundwater occur due to seasonal moisture conditions, irrigation practices, changes in land use, and many other factors. Form our experience groundwater elevations can fluctuate significantly within the MSU campus dependent upon location. Groundwater conditions may vary from those encountered at the time of the field investigation depending upon the influence of these factors. Perched water tables have been encountered at various locations within the MSU campus.

### 4.5 EARTHQUAKES AND SEISMICITY

The project site is generally within an area of high seismicity. The USGS database presents spectral response acceleration data in bedrock for short (0.2 sec) periods (Ss) and for long (1 sec) periods (S1) for similar probability and 50-year return periods. According to USGS design procedures, this data is then adjusted depending on the soil classification to reflect magnification effects as the earthquake wave energies pass from bedrock into soil. The values are then reduced by a factor that accounts for partial damping of the wave energy by the structure. The final values obtained (known as SDS and SD1) become the basis for the structural design and in this case at the proposed site are estimated at 0.533 g (SDS) and 0.223 g (SD1).

The methods of ASCE/SEI 7-05 require that the properties of the soil at the proposed building site be classified as one of several site classes. The seismic design parameters for this site include a seismic zone soil profile type of (D), in accordance with the above referenced standard. Site Class D corresponds to a stiff soil profile. We have based this classification on the laboratory test data and exploration information.

### 5.0 ENGINEERING ANALYSIS AND RECOMMENDATIONS

Based on the planned construction and soils encountered at the site, the following recommendations are provided at this time.
5.1 GENERAL

The Center will consist of a three story building with slab-on-grade floor with perimeter frost wall and partial basement. The structural system will include a steel frame with columns and an exterior, non-bearing wall “skin” and associated wall/strip footing. It is our understanding that laboratory facilities will be located on the first floor which will require concrete pavements designed to accommodate truck loadings. The partial basement will be connected to the existing steam tunnel alignment that is located along Grant Street. Morrison and Maierle has provided the following range of preliminary service level combined loading reactions for the MSU NAIC building foundations, split up by the various differing areas throughout the footprint:

1. 3 story with basement or mechanical penthouse column foundation reactions:
   - Combined gravity loads (dead, live, snow): 200-400 kips vertical load
   - Seismic loads at moment frames: 200-300 kip-ft overturning moment load, 10-30 kip overturning vertical load, 15-35 kip horizontal load

2. 3-story column foundation reactions:
   - Combined Gravity loads (dead, live, snow): 100-300 kips vertical load
   - Seismic loads at moment frames: 200-300 kip-ft overturning moment load, 10-30 kip overturning vertical load, 10-30 kip horizontal load

3. Single story column foundation reactions (i.e. north classroom extension, southeast heavy lab/maker spaces, bridge to parking garage):
   - Combined gravity loads (dead, live, snow): 20-50 kips vertical load
   - Seismic loads at moment frames: 50-100 kip-ft overturning moment load, 5-10 kip overturning vertical load, 5-10 kip horizontal load

4. Exterior non-bearing foundation wall reactions:
   - Combined gravity loads (dead, live, snow): 5-7 klf vertical loads

Engineering considerations associated with design and construction of the proposed facilities will include foundation options to support column and wall loads, basement considerations, interior concrete floor slabs, surface drainage and site earthwork. Recommendations for these topics are presented in detail in the following sections.

5.2 FOUNDATIONS

5.2.1 Foundation Options/Recommendations

As discussed previously, the near surface soils at the site consist of native lean clay deposits. Based on the investigation, boring and laboratory testing information, the surficial native clay soils typically exhibit moderate to low bearing strength and high compressibility. Settlements in excess of two (2) inches could occur from heavily loaded footings placed on the native clay soils and the potential for excessive
differential settlements is significant. It is therefore recommended to utilize deep foundations or soil improvement methods to support the new facilities. Options for engineered aggregate piers (EAPs), drilled piers, driven piling or screw piles are provided.

It is our opinion that the native clay soils are suitable to support interior slab on-grade floors provided the clay subgrade soils are partially over-excavated from beneath the floor areas and subgrade preparation and structural fill placement is performed as specified under Section 5.2.3.

As discussed previously an approximate eight (8) foot thick dense gravel layer is encountered at depths of 16 to approximately 20 feet. The depth to the gravel layer increases in the northeasterly direction across the site with the greatest depth recorded in boring B-4. The gravel layer overlays medium dense to dense silty sand and/or sandy silt. Weak bedrock is encountered at depths ranging from 35 to 45 feet.

Groundwater was encountered during the time of investigations at depths ranging from approximately 19.7 to 20.0 feet between the approximate elevation ranges from 4900.2 to 4901.6.

Given the potentially heavy column and footing loads, it is recommended that the deep foundations bear within the bedrock deposits below the gravel layer or soil improvement methods (engineered aggregate piers (EAPs)) are utilized for the upper clay layer. Table 5-1 presents the approximate depth to the gravel layer at borings advanced within the garage footprint area. It is noted that the elevation of the gravel layer varies across the NAIC site. Table 5-2 presents the approximate depth to the bedrock bearing layer. It is noted the elevation of the weak bedrock contact varies by approximately 8 feet.

<table>
<thead>
<tr>
<th>Table 5-1</th>
<th>Approximate Depth to Gravel Layer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boring</td>
<td>Surface Elevation</td>
</tr>
<tr>
<td>B-2</td>
<td>4921.1</td>
</tr>
<tr>
<td>B-4</td>
<td>4920.2</td>
</tr>
<tr>
<td>B-9</td>
<td>4922.4</td>
</tr>
<tr>
<td>B-10</td>
<td>4921.9</td>
</tr>
<tr>
<td>B-11</td>
<td>4921.3</td>
</tr>
<tr>
<td>B-12</td>
<td>4920.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 5-2</th>
<th>Approximate Depth to Weak Bedrock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boring</td>
<td>Surface Elevation</td>
</tr>
<tr>
<td>B-2</td>
<td>4921.1</td>
</tr>
<tr>
<td>B-4</td>
<td>4920.2</td>
</tr>
<tr>
<td>B-3</td>
<td>4922.9</td>
</tr>
<tr>
<td>B-5</td>
<td>4921.2</td>
</tr>
<tr>
<td>B-6</td>
<td>4922.3</td>
</tr>
</tbody>
</table>
All exterior foundation walls should be placed at a minimum depth of 4.0 feet below final exterior grade for frost protection.

**Preparation of construction working surface:** After the topsoil and pavement fills are excavated to the first floor slab elevation, lean clay subgrade soil will be exposed during construction of the foundation elements. The lean clay is moisture sensitive and will become soft and unstable during wet weather periods. Excessive disturbance of the clay subgrade during wet weather will compromise the subgrade in areas where concrete slabs are to be installed and subsequently require additional over-excavation and replacement of unstable soils. The Contractor should be made aware of this potential and schedule his operations accordingly or construct a suitable wet weather platform (placement of gravel and or stabilization fabric) so as not to compromise the clay subgrade during construction.

### 5.2.1.1 Engineered Aggregate Piers

The structure could be supported by engineered aggregate piers (EAP). The piers are constructed by augering 24- to 36-inch diameter holes to typical depths of ranging from 8 to 25 feet below the base of the footings and backfilling the excavations with thin lifts of compacted (engineered) aggregate. Compaction densifies the aggregate and increases lateral stress in the soil matrix. The system serves to reduce settlement and increase bearing capacity by replacing compressible soils (clay) soils in the upper 16 to 20 feet (depth to the dense gravel layer) below the footing with a “stiffer” composite soil matrix. The piers are constructed in a grid pattern either under footings and or fill areas. Engineered aggregate pier elements typically cover approximately 30 percent of the footing footprint area. Gravel is typically not placed between the piers and individual footings. The piers are typically constructed a minimum distance of 12 inches above the bottom of footing elevation. The top of the pier is then “scraped off” to footing subgrade using a smooth lipped excavator bucket. The top of the pier is then inspected to ensure it is well compacted and undisturbed at footing subgrade elevation. The building foundation is then designed utilizing conventional spread footings.

During the adjacent parking garage investigation/planning phase DOWL discussed the project with Mr. John Martin of Geotech Foundation Company-West (GTFC-WEST), who designs and installs engineered aggregate piers, in regard to the applicability of using engineered aggregate piers for the parking garage. Engineered aggregate piers were evaluated for feasibility and cost and were ultimately utilized for the parking garage project. Based on structural loads provided to date for the NAIC building, and subgrade conditions, engineered aggregate piers are a viable foundation alternative for this project. For the parking garage GTFC-WEST recommended that footings placed on EAP improved foundation soils could be designed for an allowable bearing capacity of 5,500 pounds per square foot. Estimated settlement for footings designed accordingly would be total settlements of less than 1 inch and ½ inch or less differential settlement. As foundation conditions are similar at the NAIC building it is anticipated that similar bearing pressures may be utilized; however, GTFC-WEST must be contacted in regard to their
recommendations specific to the NAIC project. It is recommended that the piers be designed to bear on the gravel deposits which are encountered at depths ranging from 16 to 20 feet.

**Seismic Design Methodology for Engineered Aggregate Piers:** Unlike drilled piers or driven piling engineered aggregate piers are not considered part of the foundation system for seismic design. Lateral load resistance is required for drilled piers and driven piling foundations because they are structurally connected to the foundation elements. Engineered aggregate piers are used to improve (reinforce) the foundation soils in order to increase bearing capacity, minimize settlements and mitigate liquefaction potential if needed. Engineered aggregate piers have been utilized in Seattle for many building projects to mitigate liquefaction potential conditions. Seismic foundation design for foundation soils improved by engineered aggregate piers treat the foundation as a spread footing condition where seismic resistance is provided by sliding resistance between the top of the engineered aggregate pier and concrete footing and passive pressure resistance provided by the backfill material or floor slabs.

**Design /Build Process:** Engineered aggregate pier design/installation is a proven technology and has been used extensively for many projects in the United States. Engineered aggregate piers are incorporated into a specific project under a design/build contractual process. That is, the current industry consists of established engineered aggregate pier companies that provide design, installation and warranty service. Geotechnical and structural information is provided to the engineered aggregate pier companies. They then utilize the information to develop an appropriate engineered aggregate pier design for the project. The company then installs the piers complying with an extensive quality assurance program which monitors compaction and placement of the engineered aggregate pier. Test piers are installed to confirm the stiffness moduli used for design. A representative of the project geotechnical engineer is also onsite to observe and confirm that the engineered aggregate pier company complies with the submitted quality assurance program.

**Engineered Aggregate Pier Considerations:**

1. The piers should extend to the dense gravel layer which is encountered at the approximate depths ranging from 16 to 20 feet.

2. Allowable bearing pressure for the EAP design must be confirmed by the EAP design firm. Based on EAP design utilized for the parking garage project an allowable bearing pressure of 5,500 pounds per square foot was utilized. Estimated settlement for footings designed accordingly were total settlements of less than 1 inch and ½ inch or less differential settlement.

3. Footings placed on the piers may be designed to resist sliding using a coefficient of friction of 0.45.

4. The EAP designer installer should submit a quality control /assurance plan prior to mobilizing to the site.
5. A representative of the project geotechnical engineer must be onsite to observe and confirm that the engineered aggregate pier company complies with the submitted quality assurance program.

6. The tops of all aggregate piers must be inspected for compactness (density) prior to placement of footings.

7. A minimum of one demonstration pier should be installed with the EAP Contractor standard procedures and load tested to confirm the stiffness modulus. The EAP contractor is responsible for setting up and recording test results. The test will also be observed and recorded by the project geotechnical engineer.

5.2.1.2 Drilled Piers

The proposed structures may be supported on drilled piers end bearing in the siltstone and sandstone bedrock which are encountered at depths ranging from approximately 35 to 45 feet below existing ground. Because of the relatively thin dense gravel layer with underlying medium dense sand and silty layers it is recommended to extend the drilled piers through these layers into the bedrock. The allowable bearing capacities have been determined by assuming contribution of end bearing and skin friction and using the “Beta” Analysis Method. A safety factor of 3 has been used to determine allowable end bearing and contributing skin friction. Anticipated total settlement for this type of foundation is estimated to be 1/4-inch. The drilled piers should extend a minimum distance of 4 feet into the siltstone and sandstone bedrock. Therefore, based on the information from four borings, the pier lengths will vary from approximately 39 to 49 feet below existing ground.

Table 5-3
Allowable Capacities for Drilled Piers

<table>
<thead>
<tr>
<th>Pier Diameter (Feet)</th>
<th>Downward Capacity (Tons)</th>
<th>*Uplift Capacity (Tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>85</td>
<td>40</td>
</tr>
<tr>
<td>3</td>
<td>155</td>
<td>63</td>
</tr>
<tr>
<td>4</td>
<td>233</td>
<td>80</td>
</tr>
</tbody>
</table>

*Plus the weight of the pier. Uplift capacities shown assume reinforcement within the entire pier length and a factor of safety of 3 for allowable side resistance.

A minimum diameter of 24 inches is recommended to facilitate proper cleaning and inspection of the pier excavations.

Pier spacing should be not less than 3.0 pier diameters measured from outside edge to outside edge of the piers. For pier spacing less than 3.0 pier diameters, piers will behave as a group and individual pier
capacities may be reduced. Capacity reduction will depend upon pier spacing and the numbers of piers within the group. If closer spacings are required, DOWL should be notified so that appropriate reduction factors can be provided based on actual pier/pile layout.

**Drilled Pier Considerations:**

1. The drilled piers should be constructed in accordance to ACI 360.1

2. Concrete placed in pier excavations using the wet method of installation should be a fluid mix with a minimum slump of 6 to 8 to prevent voids from forming around the reinforcing steel inches, while at the same time maintaining minimum 28-day-4000 psi strength requirements.

3. The geotechnical engineer must confirm drilled pier embedment depths and end bearing foundation conditions during construction.

4. A minimum of three load tests should be conducted on select piers using the dynamic load testing method to confirm capacities.

5. A project survey benchmark should be established and used to confirm pier end bearing elevations.

6. Groundwater will be encountered at depth of 20 feet and possibly higher. Temporary casing of the drilled pier holes will be required to prevent sloughing of the boring walls or the alternate slurry method of installation may be used.

7. The bearing soils for the drilled piers will consist of bedrock deposits. It is imperative that all loose slough should be removed from the bottom of the pier boring. Loose material in the bottom of the hole will be compressible and may cause excessive settlement of the pier if not removed. The pier installation contractor shall utilize the appropriate cleaning bit to achieve a clean, slough free bottom.

8. It is noted that heaving sand conditions were encountered in some of the exploration borings. Temporary casing of the drilled pier excavations will likely be required.

9. The drilled pier installer should be equipped with appropriate drilling equipment and be prepared for any difficulties resulting from drilling into and through dense to very dense gravels as well as sloughing of granular soil. Pre-submittals by the contractor indicating means and methods and equipment to be used should be required.

10. Pumping directly from the drilled pier excavations for dewatering purposes should not be used. Dewatering in this manner may compromise the integrity of the relatively soft bedrock in the bottom of the excavations from differential hydrostatic pressures and will affect the pier end...
bearing conditions. Water, Polymer additives or the slurry method may be utilized to prevent caving of the pier excavation walls and during advancement.

11. Casing should be withdrawn as the concrete is tremmied while maintaining the casing bottom below the top of the concrete.

12. It is suggested that this project be reviewed with an experienced drilled pier installation contractor to discuss the drilled pier installation considerations.

5.2.1.3 Driven Piling

Steel H-piles fitted with driving points driven to required capacities in the sandstone and siltstone bedrock may be used to support the structural loads. The piles will have to be driven through the dense gravel layer and medium dense to dense sand and silt deposits into the underlying bedrock.

It is noted that that driven H-Piles were used for the MSU Engineering and Physical Science building which was constructed in July of 1994 located on the southeast corner of South 7th Avenue and Grant Street. Subgrade conditions were similar to those encountered at this project site. The pilings used were HP-12x74 and HP 10x57. A static load test was conducted on a HP 12x74 test pile which indicated an ultimate capacity greater than 360 tons could be achieved. The recommended design working load for these piles was 130 tons. Based on review of pile driving records it is noted that the installed pile embedment lengths varied considerably and ranged from 31 feet to greater than 51 feet. This is because the bedrock consistency varies and also the recommended design capacities for the piles are considered quite high given the relatively soft bedrock conditions. The variance in pile embedment lengths could be an issue in regard to contractor bidding and payments. We are therefore recommending somewhat lower pile capacities than those used for the Engineering and Physical Science building.

For estimating purposes, it is assumed that the piles will be driven into the bedrock approximately seven feet. If weathered bedrock zones are encountered, these penetration depths may be greater. The lengths of pile may vary depending on the elevation from where they are driven, weathered bedrock zones or elevation variations of the bedrock. Steel H-piles can be spliced to reduce waste caused by variable lengths.

Also to be considered with driven piling is that considerable vibrations will be induced into the surrounding soils and possibly into the adjacent structures. The vibrations could cause settlements or other damage to the older buildings in the vicinity of the new buildings.

Allowable Capacities: The axial capacities have been determined based on soil boring information, laboratory test results, static analysis using the DRIVEN Software program and review of previous pile installations at MSU. The following table may be used when evaluating steel H-piles for design
considerations. It is assumed the piling would be driven seven feet into the siltstone and sandstone bedrock. Anticipated settlements are less ¼ inch.

<table>
<thead>
<tr>
<th>*Pile Section</th>
<th>Allowable Axial Load (Tons)</th>
<th>Allowable Uplift (Tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP 10x57</td>
<td>80</td>
<td>14</td>
</tr>
<tr>
<td>HP 12x74</td>
<td>100</td>
<td>20</td>
</tr>
</tbody>
</table>

*Piles should consist of 50 ksi steel

2. The contractor should select a driving hammer and cushion combination capable of installing the selected piling without overstressing the pile material. The contractor should submit the pile-driving plan and the pile hammer-cushion combination to the geotechnical engineer for evaluation of the driving stresses well in advance of pile installation.

3. A static load test should be conducted on one test pile to confirm capacity.

4. The pile-driving system should be analyzed using the wave equation to evaluate the potential for overstressing of the pile materials during driving.

5. It is recommended the Pile Driving Analyzer (PDA) testing be conducted on a minimum of ten (10) production piles at various locations within the building foot prints to ensure capacities are being achieved. These piles should be designated as test piles. Test piles are typically driven five (5) feet below the anticipated final pile tip elevations to further confirm capacities. This requirement could be adjusted based on the results of the PDA testing during pile installation.

6. We recommend pile spacing of equal to or greater than three pile diameters. For driven piles with spacing of greater than three pile diameters, the axial load capacity for a group will be the sum of the individual capacities.

7. During driving of the pile sections, Pile Driving Analyzer (PDA) monitoring should be performed to ensure that the existing structures and equipment within the area are not subjected to vibration damage.

8. A representative of the geotechnical engineer should observe pile-driving operations on a full-time basis. Each pile should be observed and checked for buckling, crimping, and alignment; penetration resistance, depth of penetration, and general pile driving operations should be recorded.

9. Driven piles should be designed to resist lateral loads using a modulus of horizontal subgrade reaction of 5 tcf (tons per cubic foot) for the clay soils, subgrade reaction of 40 tons per cubic foot (tcf) for the medium dense to dense natural sand and gravel.
5.2.1.4 Screw Piles

Screw piles consist of 5.5 to 9 inch diameter pipe piles with helixes welded on. The piles consist of 85ksi steel (usually ½ inch thick). All helix welds conform to AWS and ASTM standards. The piles are installed by large tracked excavators with torque converters. Capacities are confirmed by relating installation torque to bearing capacities. Screw piles have been used for many building and parking garage projects and are a proven technology. Screw Piles were utilized for foundation support for the Gallatin County Detention Center which was constructed in 2005. Foundation conditions at the detention center are somewhat similar to conditions at the proposed Innovation Center. A static load test was conducted on a screw pile during the Gallatin County Project to confirm capacities and indicated that ultimate capacity of 325 kips was achieved for a 5.5 inch diameter pile with two helixes. We have discussed the project foundation conditions with Mr. Mike Oliveira of Alpine Site Services Inc. Denver Co., who oversaw installation of the Screw Piles at the Detention Center Project. Based on his review of the foundation conditions at the Innovation center site Mr. Oliveira is confident that Screw Piles are a feasible foundation alternative for the Innovation Project. DOWL also believes that Screw Piles may be a cost effective option. DOWL observed the static load test for the Screw Pile at the Detention Center and installation of several of the piles. Information in regard to Screw Piles is included in Appendix D.

Based on conversations with Mr. Olivia, and the testing that was conducted for the detention center, the following allowable capacity may be used for project planning purposes. Larger capacities may be achieved with larger pipe diameters. The Screw Piles should bear within the siltstone and sandstone bedrock deposits.

<table>
<thead>
<tr>
<th>Table 5-5 Screw Pile Allowable Axial Capacities</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Pile Section</td>
</tr>
<tr>
<td>5.5 inch diameter Screw Pile</td>
</tr>
<tr>
<td>Allowable Axial Load</td>
</tr>
</tbody>
</table>

*Piles to consist of 85 ksi steel

1. Screw Piles should be designed in coordination with Alpine Site Services Inc. or other experienced qualified Screw Pile design /installer.

2. Static load tests should be conducted multiple piles at various locations to confirm capacities.

All exterior foundation walls should be placed at a minimum depth of 4 feet below final exterior grade for frost protection.

A 1/3 increase in the allowable bearing pressure may be assumed for transient loadings.
5.2.2 Lateral Pressures

The following values may be utilized for resistance to soil lateral loads on foundation walls, grade beams and footings,

<table>
<thead>
<tr>
<th>Table 5-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lateral Loads</td>
</tr>
<tr>
<td>Clay and Silt Backfill</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Condition</th>
<th>Coefficient of Earth Pressure</th>
<th>γK (equivalent fluid pressure)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static Condition Level Backfill</td>
<td>Ko = 0.64, Ka = 0.47, Kp = 2.1</td>
<td>*79 pcf, *58 pcf, **260 pcf</td>
</tr>
</tbody>
</table>

*These recommendations are based on the assumption that no hydrostatic pressures exist.  
**neglecting the first foot of backfill depth.

<table>
<thead>
<tr>
<th>Table 5-7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lateral Loads</td>
</tr>
<tr>
<td>Imported Gravel Backfill</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Condition</th>
<th>Coefficient of Earth Pressure</th>
<th>γK (equivalent fluid pressure)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static Condition Level Backfill</td>
<td>Ko = 0.41, Ka = 0.25, Kp = 3.5</td>
<td>*59 pcf, *36 pcf, **400 pcf</td>
</tr>
</tbody>
</table>

*These recommendations are based on the assumption that no hydrostatic pressures exist.  
**neglecting the first foot of backfill depth.

- Coefficient of friction between concrete and clay δ = 0.25
- Coefficient of friction between concrete and gravel δ = 0.45

5.2.3 Interior Slab on Grade Floor

The existing native clay subgrade is suitable for support of standard light load bearing interior concrete floor slabs provided a minimum of 12-inches of ¾-inch minus base gravel is utilized under the slab and proper subgrade compaction and preparation are performed as discussed below. It is our understanding that laboratory facilities will be located on the first floor which will require concrete pavements designed to accommodate truck loadings. A minimum of 20 inches of ¾ inch minus base gravel will be required under the slab for these areas.

Light traffic pavement /slab on-grade thickness placed on 12 inches of road base gravel may be designed assuming a modulus of subgrade reaction (k) equal to 140 pounds per cubic inch. Heavy traffic pavement slab on-grade thickness placed at the laboratory locations placed on the 20 inches of road base gravel may be designed assuming a modulus of subgrade reaction (k) equal to 200 pounds per cubic inch. A geotextile stabilization fabric should be placed between the prepared subgrade under the heavy pavement sections. The geotextile fabric should be Geotex 350ST woven as manufactured by Propex or equal.
Fill areas when encountered should be evaluated for compaction by proof rolling and compacting to required densities. Areas that cannot be compacted should be over-excavated a minimum of 12-inches and replaced with compacted base gravel. A geotextile stabilization fabric should be placed between the prepared subgrade. The geotextile fabric should be Geotex 350ST woven as manufactured by Propex or equal. The clay subgrade soils are also moisture sensitive and will become excessively soft if saturated by rainfall events and excessive tracking from construction equipment.

All concrete slab subgrade soil should be evaluated during construction by proof-rolling with heavy equipment and compacting as specified.

The granular base gravel fill should be compacted to not less than 95% of maximum dry density at plus or minus two percentage points of optimum moisture according to ASTM D 698. The soils should be placed in loose lifts not exceeding 8 inches to ensure uniform compaction is achieved.

After excavation to the required subgrade elevation the clay subgrade soils should be moisture conditioned and compacted to not less than 95% of maximum dry density at plus or minus 2% of optimum moisture as determined by ASTM D 698 prior placement of stabilization fabric imported granular fill placement.

5.2.4 Basement Considerations

It is our understanding that a partial basement is proposed to be located in the northwest corner area of the NAIC building. The basement will connect to the existing steam tunnel alignment that is located along Grant Street. The prosed depth of the basement is approximately 15 feet with an approximate top of slab elevation of 4906.3. The top of basement slab elevation (assuming 4906.3) is approximately 2 feet below the invert elevation (4908.5) of the branch steam tunnel. It is noted that the native dense gravel layer is located at elevations ranging from 4899.7 (B-4) to 4904.8 (B-11) and the basement floor elevation may approximate the gravel elevation at some locations. Additionally a thin layer of clay may remain between the gravel layer and floor excavation elevation. Groundwater elevation approximates the top to the gravel layer (elevation 4900.2) at Boring B-4 location. Groundwater was encountered during the time of the investigation at approximate elevations ranging from 4900.2 (B-4) to 4901.6 (B-10) and could fluctuate to higher elevations. Given this information it is recommended to waterproof the basement. A mat type foundation for the basement may be desirable which would be more resistant to hydrostatic pressures.

Dependent upon groundwater elevations at the time of construction heaving of the clay layer may occur. Dependent upon conditions during construction, the clay layer should be monitored for heave prior to placement of the floor slab.

Review of the branch steam tunnel plans to which the basement will be connected indicates that 12 inches of washed gravel has been placed under the tunnel and a perforated drain pipe placed within the gravel. A
filter fabric was placed between the excavation bottom and drain gravel. A similar drainage system should be utilized for the basement and tied into the drain gravel and pipe at the branch steam tunnel location. Drain gravel should extend partially up the sidewalls of the basement at least above the footing/stem wall contact area and above the branch tunnel base elevation (4908.4). A perimeter drain pipe should be installed around the basement stem wall/footing elevation and tied into the branch tunnel gravel. Drainage pipes should be considered under the basement floor slab to minimize the potential for hydrostatic uplift should groundwater elevations approach the slab elevation.

Clay soils are elevated in natural moisture at the basement floor/drain gravel excavation depth. The clay soils should not be disturbed during excavation. A smooth lipped excavation bucket should be used. A filter fabric should be placed between the clay subgrade and drain gravel. The filter fabric should be a non-woven high survivability fabric.

Dewatering may be required for construction depending upon excavation depths and groundwater conditions at the time. Excavation wall stability will be a concern considering the relatively deep excavation required (See Section 5.3.3).

5.2.5 Corrosion Considerations

The clay surface soils at the site exhibit high corrosion potential to buried metal. A minimum resistivity value of 1650 to 1950 ohm-cm and pH of 7.6 was recorded from test results on a sample of the lean clay.

All buried metal pipes and appurtenances should be protected for severe corrosive conditions.

The clay soils exhibit low corrosivity potential to concrete. A percent soluble sulfate value less than 0.1 percent was recorded from test results on a sample of the lean clay.

Type I-II Portland cement is recommended for all project concrete.

5.3 EARTHWORK

5.3.1 Site Grading and Drainage

The following criteria should be used for site preparation purposes and when preparing construction and project documents.

- All existing fill and deleterious material should be removed in their entirety from the proposed building footprint. All exposed subgrade surfaces should be free of mounds and depressions which could prevent uniform compaction. If unexpected fill or obstructions are encountered
during site clearing or excavation, such features should be removed and the excavation should extend to the natural soils and thoroughly cleaned prior to fill placement and construction.

- All fill and backfill should be approved by the geotechnical engineer, moisture conditioned and placed in 8-inch loose lifts. The fill and backfill should then be compacted with an appropriately sized compactor to the following minimum dry densities as determined by ASTM D698.
  
  - Below Foundations = 98 percent
  - Around Foundations = 95 percent
  - All Other Fill = 95 percent

- No fill should be placed over frozen ground or in a frozen condition. All loose disturbed soil and/or fills in the base of the over-excavation should be removed from the foundation excavation prior to placement of structural fill. Footings should not be placed on either uncompacted disturbed native soils, or uncontrolled fill. Qualified personnel should observe all footing and slab subgrades to confirm subsoil conditions.

- Imported gravel meeting the below specifications or the site soils may be used as foundation wall backfill provided proper moisture conditioning to near optimum moisture (± 2 percent) and compacted in accordance with the details presented above. If backfill is needed below foundations, only imported gravel meeting the specifications below should be used. Other imported gravel options may be used by approval of the geotechnical engineer.

<table>
<thead>
<tr>
<th>Table 5-8</th>
<th>Imported Gravel Specification</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-inch</td>
<td>100</td>
</tr>
<tr>
<td>No. 4</td>
<td>25-60</td>
</tr>
<tr>
<td>No. 200</td>
<td>0 - 12</td>
</tr>
<tr>
<td>Liquid limits less than 25 and PI less than 6</td>
<td></td>
</tr>
</tbody>
</table>

- Surface water should not be allowed to accumulate and infiltrate soils near the proposed foundations. It must be controlled and directed away from the structures. A simple means of reducing moisture changes is to prevent surface water infiltration by sloping the ground away from the foundation. The recommended minimum slope within 10 feet of the building is 1 inch vertical for 1 foot horizontal. The sloped ground should be initially constructed at a greater slope...
to account for settlement/consolidation of exterior backfill. Within 10 feet of the foundation, the upper 12 to 18 inches of backfill should consist of less permeable, compacted clay soils. The area around the foundation should be inspected regularly, particularly after a rain event to determine if proper drainage away from the structure has been maintained.

- Roof downspouts and drains should discharge at least 10 feet beyond the limits of all foundation wall backfill.

5.3.2 **Construction on Moisture Sensitive Subgrade Soils**

After the topsoil and pavement fills are excavated to the first floor slab elevation, lean clay subgrade soil will be exposed during construction of the foundation elements. The lean clay is moisture sensitive and will become soft and unstable during wet weather periods. Excessive disturbance of the clay subgrade during wet weather will compromise the subgrade in areas where concrete slabs are to be installed and subsequently require additional over-excavation and replacement of unstable soils. Additional operation of construction equipment on excessively wet clay soils could be problematic. The Contractor should be made aware of this potential and schedule his operations accordingly or construct a suitable wet weather platform (placement of gravel and or stabilization fabric) so as not to compromise the clay subgrade during construction.

5.3.3 **Excavation**

Based on the soils encountered, conventional earthmoving equipment should be capable of excavating the site soils. All excavations should be approved by a qualified observer prior to backfill placement.

All excavations must conform to OSHA Standards for Excavations, 29 CFR Part 1926.652 Appendix B to Subpart P. Based on field observations and laboratory tests, the majority of the soils at the site are classified as Type C using OSHA classification system. Type C soils require excavation slope angles not to exceed 1.5 H: 1 V (horizontal to vertical). Soil and moisture conditions should be continually evaluated at the time of construction to ensure compliance with OSHA requirements. The contractor should have a designated safety officer familiar with soils to monitor trench wall conditions during construction. Trench wall stability and compliance with OSHA requirements is the Contractor’s responsibility.
6.0 LIMITATIONS

The conclusions and recommendations presented in this report assume that site conditions are not substantially different than those exposed by the explorations. If during construction, subsurface conditions are observed or appear to be present that are different from those encountered in the explorations, DOWL geotechnical staff should be advised promptly so that those conditions can be reviewed and recommendations reevaluated, where necessary.

If there is a substantial lapse of time between submission of this report and the start of work, and if conditions have changed due to natural causes or construction operations, DOWL should review this report to determine the applicability of the conclusions and recommendations considering the changed conditions.

This report was prepared for use by the owner and their representatives. It should be made available to prospective contractors for information on factual data only and not as a warranty of subsurface conditions.

These services have been performed in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing in this area under similar conditions. No warranty is made or implied.
Appendix A

Boring Logs
**Unified Soil Classification System**

<table>
<thead>
<tr>
<th>Criteria for Assigning Group Symbols and Names</th>
<th>Soil Classification Generalized Group Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>COARSE-GRAINED SOILS More than 50% retained on No. 200 sieve</td>
<td><strong>GRAVELS</strong> More than 50% of coarse fraction retained on No. 4 sieve</td>
</tr>
<tr>
<td>SANDS 50% or more of coarse fraction passes No. 4 sieve</td>
<td><strong>CLEAN GRAVELS</strong> Less than 5% fines <strong>GRAVELS w/ FINES</strong> More than 12% fines</td>
</tr>
<tr>
<td>FINE-GRAINED SOILS 50% or more passes the No. 200 sieve</td>
<td><strong>SILTS &amp; CLAYS</strong> Liquid limit less than 50 <strong>SILTS &amp; CLAYS</strong> Liquid limit greater than 50</td>
</tr>
<tr>
<td>HIGHLY ORGANIC SOILS</td>
<td>Primarily organic matter, dark in color and has an organic odor</td>
</tr>
</tbody>
</table>

**Relative Density or Consistency Using Standard Penetration Test Values**

<table>
<thead>
<tr>
<th>Cohesionless Soils(a)</th>
<th>Cohesive Soils(b)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Density</strong>&lt;sup&gt;(c)&lt;/sup&gt;</td>
<td>N blows/ft&lt;sup&gt;(c)&lt;/sup&gt;</td>
</tr>
<tr>
<td>Very loose</td>
<td>0 to 4</td>
</tr>
<tr>
<td>Loose</td>
<td>5 to 10</td>
</tr>
<tr>
<td>Med. Dense</td>
<td>11 to 29</td>
</tr>
<tr>
<td>Dense</td>
<td>30 to 49</td>
</tr>
<tr>
<td>Very Dense</td>
<td>Over 50</td>
</tr>
<tr>
<td>Hard</td>
<td>Over 30</td>
</tr>
</tbody>
</table>

(a) Soils consisting of gravel, sand and silt, either separately or in combination, possessing no characteristics of plasticity and exhibiting drained behavior.
(b) Soils possessing the characteristics of plasticity, and exhibiting undrained behavior.
(c) Undrained shear strength = ½ unconfined compressive strength.
(d) Qp - Denotes pocket penetrometer field measurement (tons per square foot) approximation to unconfined compressive strength.

**Groundwater Elevation**

- Water Elevation Noted During Drilling
- Water Elevation Recorded After Drilling Complete

**Soil Moisture**

- Dry: No sign of water dry to the touch
- Slightly Moist: Dry of optimum moisture content
- Moist: Approximately at optimum moisture
- Very Moist: Moisture content above optimum but below saturated
- Wet: Wet of optimum to saturated

**Component Definitions By Gradation**

<table>
<thead>
<tr>
<th>Component</th>
<th>Size Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boulders</td>
<td>Greater than 12-in.</td>
</tr>
<tr>
<td>Cobbles</td>
<td>3-in. to 12-in.</td>
</tr>
<tr>
<td>Gravel</td>
<td>3-in. to No. 4 (4.75 mm)</td>
</tr>
<tr>
<td>Coarse sand</td>
<td>No. 4 (4.75 mm) to No. 200 (0.075 mm)</td>
</tr>
<tr>
<td>Medium sand</td>
<td>No. 10 (2.0 mm) to No. 40 (0.425 mm)</td>
</tr>
<tr>
<td>Fine sand</td>
<td>No. 40 (0.425 mm) to No. 200 (0.074 mm)</td>
</tr>
<tr>
<td>Silt and Clay</td>
<td>Smaller than No. 200 (0.075 mm)</td>
</tr>
</tbody>
</table>

**Silt and Clay Descriptions**

<table>
<thead>
<tr>
<th>Description</th>
<th>Typical Unified Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silt</td>
<td>ML (non-plastic)</td>
</tr>
<tr>
<td>Clayey Silt</td>
<td>CL</td>
</tr>
<tr>
<td>Silty Clay, Lean Clay</td>
<td>CH</td>
</tr>
<tr>
<td>Clay, Fat Clay</td>
<td>MH</td>
</tr>
<tr>
<td>Plastic Silt</td>
<td>OL</td>
</tr>
<tr>
<td>Organic Soils</td>
<td>OH, Pt</td>
</tr>
</tbody>
</table>

**Descriptive Terminology Denoting Components Proportions**

<table>
<thead>
<tr>
<th>Descriptive Terms</th>
<th>Range of Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trace or Scattered</td>
<td>0 - 5%</td>
</tr>
<tr>
<td>Few</td>
<td>5 - 10%</td>
</tr>
<tr>
<td>Some or Adjective&lt;sup&gt;(a)&lt;/sup&gt;</td>
<td>15 - 30%</td>
</tr>
<tr>
<td>And</td>
<td>30 - 50%</td>
</tr>
</tbody>
</table>

<sup>(a)</sup>Use gravelly, sandy or silty as appropriate.

**Samples**

- **Split Spoon Sampler (2.0” OD)**
- **Ring Sampler (3.0” OD)**<sup>#</sup>
- **Shelby Tube Sampler (3.0” OD)**
- **Bulk Sample (auger cuttings)**
- **Core Barrel**

<sup>#</sup>Indicates increased blow counts due to sampler size.

Unless otherwise noted, drive samples advanced with 140-lb. hammer and 30-in. drop.
## Material Description

<table>
<thead>
<tr>
<th>Depth (ft.)</th>
<th>Elevation (ft.)</th>
<th>Graph Log</th>
<th>Material Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4921.10</td>
<td>4920.4</td>
<td>Surface Elevation: 4921.10</td>
</tr>
<tr>
<td>0.7</td>
<td>4919.8</td>
<td>4916</td>
<td>8&quot; +/- Topsoil, very moist, black, organics</td>
</tr>
<tr>
<td>1.3</td>
<td>4912</td>
<td>4912</td>
<td>Fill, Silty Sand, SM; very moist, medium dense, black, organics, brick fragments</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sandy Lean Clay, CL; very moist to moist, stiff, tan, fine grained sand, silty in part</td>
</tr>
<tr>
<td>12.0</td>
<td>4909.1</td>
<td>4908</td>
<td>Lean Clay, CL; moist, stiff, light brown</td>
</tr>
<tr>
<td>16.3</td>
<td>4904.8</td>
<td>4904</td>
<td>Poorly Graded Gravel with Clay and Sand, GP-GC; moist to very moist, very dense, brown to multi-colored, rounded to sub angular gravel, fine to coarse grained sand</td>
</tr>
<tr>
<td>20.2</td>
<td>4900</td>
<td>4900</td>
<td>Groundwater observed at 20.2 feet</td>
</tr>
<tr>
<td>21.3</td>
<td>4899.8</td>
<td>4899.8</td>
<td>Poorly Graded Gravel with Sand, GP; wet, very dense, dark brown to multi-colored, rounded to sub angular gravel, fine to coarse grained sand</td>
</tr>
<tr>
<td>23.0</td>
<td>4898.1</td>
<td>4898.1</td>
<td>Silty Sand/Sandy Silt, SM/ML; very moist to wet, medium dense to very dense/very stiff to hard, light brown, fine grained sand</td>
</tr>
</tbody>
</table>

## Tests

<table>
<thead>
<tr>
<th>Layer</th>
<th>N Value</th>
<th>BLOWSF/FT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>18/18</td>
<td>100%</td>
</tr>
<tr>
<td>2</td>
<td>17/24</td>
<td>71%</td>
</tr>
<tr>
<td>3</td>
<td>17/18</td>
<td>94%</td>
</tr>
<tr>
<td>4</td>
<td>14/18</td>
<td>78%</td>
</tr>
<tr>
<td>5</td>
<td>18/18</td>
<td>100%</td>
</tr>
<tr>
<td>6</td>
<td>19/18</td>
<td>106%</td>
</tr>
<tr>
<td>7</td>
<td>16/16</td>
<td>100%</td>
</tr>
<tr>
<td>8</td>
<td>17/18</td>
<td>94%</td>
</tr>
<tr>
<td>9</td>
<td>16/18</td>
<td>89%</td>
</tr>
<tr>
<td>10</td>
<td>12/18</td>
<td>67%</td>
</tr>
<tr>
<td>11</td>
<td>18/18</td>
<td>100%</td>
</tr>
</tbody>
</table>

## Additional Data/Remarks

- Slow and rough drilling through gravel
- California sampler pushed
**LOG OF BOREHOLE B-2**

**CLIENT**
A&E Architects

**PROJECT**
MSU Norm Asbjornson Innovation Center

**BORING LOCATION**
Northwest Corner of Parking Garage

**SITE**
Montana State University

---

**MATERIAL DESCRIPTION**

<table>
<thead>
<tr>
<th>Depth (ft.)</th>
<th>Graphic Log</th>
<th>Elevation (ft.)</th>
<th>N Value</th>
<th>Bows/ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>35.0</td>
<td>4886.1</td>
<td>14 76</td>
<td>8/18</td>
<td>44%</td>
</tr>
<tr>
<td>40.0</td>
<td>4881.1</td>
<td>28 80</td>
<td>22/18</td>
<td>122%</td>
</tr>
<tr>
<td>50.1</td>
<td>4871</td>
<td>50/50</td>
<td>3/1.5</td>
<td>200%</td>
</tr>
</tbody>
</table>

**ADDITIONAL DATA/REMARKS**
- Severe sand heave observed at 35.0 feet
- End of drilling for 11/4/2014
- Slow smooth drilling with full weight on bit

---

**Surface Elevation:** 4921.10

**Boring terminated at 50.1 feet**

**Groundwater observed at 20.2 feet**
### MATERIAL DESCRIPTION

#### Surface Elevation: 4922.95

**3.5" Asphalt Pavement, black**

**6" Road Base, Well Graded Gravel with Sand, GW; moist, brown, angular to sub angular gravel, fine to coarse grained sand**

**Sandy Lean Clay, CL; moist to very moist, medium stiff to very stiff, brown, fine grained sand, silty in part**

**Sandy Lean Clay, CL; moist to very moist, stiff, brown to light brown**

**Poorly Graded Gravel with Clay and Sand, GP-GC; wet to very moist, dense, brown to multi-colored, rounded to sub angular gravel, fine to coarse grained sand**

Groundwater observed at 20.8 feet

**Poorly Graded Gravel with Sand, GP; wet, dense, brown to multi-colored, rounded to sub angular gravel, fine to coarse grained sand**

**Sandy Silt, ML; wet to very moist, hard, brown, with fine to coarse grained sand, minor rounded gravel lenses, clayey in part**

#### ADDITIONAL DATA/REMARKS

- Lab #29901
- Liquid Limit=36
- Plasticity Index=13
- Consolidation Cc=0.14
- Unconfined qu=2.01 ksf
- Cohesion (qu/2)=1.01 ksf
- Dry Unit Weight=98.0 pcf
- Nat. Moisture=26.5%

**Slow and rough drilling through gravel**

**Slow and smooth drilling with full weight on bit**

---

**Diagram and Table:**

<table>
<thead>
<tr>
<th>Depth (FT.)</th>
<th>Material Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.3</td>
<td>3.5&quot; Asphalt Pavement, black</td>
</tr>
<tr>
<td>0.8</td>
<td>6&quot; Road Base, Well Graded Gravel with Sand, GW; moist, brown, angular to sub angular gravel, fine to coarse grained sand</td>
</tr>
<tr>
<td>4</td>
<td>Sandy Lean Clay, CL; moist to very moist, medium stiff to very stiff, brown, fine grained sand, silty in part</td>
</tr>
<tr>
<td>12.5</td>
<td>Lean Clay, CL; moist to very moist, stiff, brown to light brown</td>
</tr>
<tr>
<td>19.5</td>
<td>Poorly Graded Gravel with Clay and Sand, GP-GC; wet to very moist, dense, brown to multi-colored, rounded to sub angular gravel, fine to coarse grained sand</td>
</tr>
<tr>
<td></td>
<td>Groundwater observed at 20.8 feet</td>
</tr>
<tr>
<td>22.5</td>
<td>Poorly Graded Gravel with Sand, GP; wet, dense, brown to multi-colored, rounded to sub angular gravel, fine to coarse grained sand</td>
</tr>
<tr>
<td>27.5</td>
<td>Sandy Silt, ML; wet to very moist, hard, brown, with fine to coarse grained sand, minor rounded gravel lenses, clayey in part</td>
</tr>
</tbody>
</table>

**Graph:**

- Depth Elevation: 4922.95
- Material Log with sample locations and N-values

---

**Test Results:**

- M.C.
- PL
- LL

**Additional Information:**

- Surface Elevation: 4922.95
- Project Details
- Client: A&E Architects
- Project: MSU Norm Asbjornson Innovation Center
- Boring Location: South Central Portion of Innovation Center
- Site: Montana State University

**Loggers:**

- D. Barrick
- G. Underhill

**Approvers:**

- G. Underhill

**Dates:**

- Started: 11/5/2014
- Finished: 11/5/2014

---

**Contact:**

- Dowl HKM
- 2090 Stadium Drive
- Bozeman, Montana 59715
- Telephone: (406) 586-8834
- www.dowlhk.com

---

**Drill Rig:**

- Longyear BK-81

**Driller:**

- Paul Bray

**Hammer:**

- Auto
<table>
<thead>
<tr>
<th>Depth (ft.)</th>
<th>Material Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>32.0</td>
<td>Siltstone, Sandy Silt, ML; wet to very moist, hard, brown, with fine to coarse grained sand, clayey in part (very soft rock)</td>
</tr>
<tr>
<td>36.0</td>
<td>Sandstone, Poorly Graded Sand with Silt, SP-SM; wet, very dense, brown</td>
</tr>
<tr>
<td>40.0</td>
<td>Boring terminated due to auger refusal at 42.0 feet</td>
</tr>
<tr>
<td>44.0</td>
<td>Groundwater observed at 20.8 feet</td>
</tr>
</tbody>
</table>

**MATERIAL DESCRIPTION**

<table>
<thead>
<tr>
<th>Depth (ft.)</th>
<th>Elev.</th>
<th>Borehole</th>
<th>N Value</th>
<th>Blow/ft</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>32.0</td>
<td>4892</td>
<td>13 18 43</td>
<td>12</td>
<td>18/18 100%</td>
<td>California sampler pushed</td>
</tr>
<tr>
<td>36.0</td>
<td>4888</td>
<td>13 18 25</td>
<td>12</td>
<td>18/18 100%</td>
<td>Rough and very slow drilling at 41.0 feet</td>
</tr>
<tr>
<td>40.0</td>
<td>4884</td>
<td>13 18 24</td>
<td>13</td>
<td>18/18 100%</td>
<td></td>
</tr>
<tr>
<td>44.0</td>
<td>4880</td>
<td>13 18 24</td>
<td>14</td>
<td>9/9 100%</td>
<td></td>
</tr>
</tbody>
</table>

**ADDITIONAL DATA/REMARKS**

- Surface Elevation: 4922.95
- 40% N Value
- Blow/ft: 18/18 100%
## LOG OF BOREHOLE B-4

### MATERIAL DESCRIPTION

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.3</td>
<td>4&quot; Asphalt Pavement, black</td>
</tr>
<tr>
<td>0.8</td>
<td>5&quot; Road Base, Well Graded Gravel with Sand, GW; moist, brown, sub angular gravel, fine to coarse grained sand</td>
</tr>
<tr>
<td>1.6</td>
<td>Fill, Lean Clay with Sand, CL; moist, medium stiff, black, fine grained sand</td>
</tr>
<tr>
<td>1.8</td>
<td>Sandy Lean Clay, CL; moist, medium stiff, brown, fine grained sand, silty in part</td>
</tr>
<tr>
<td>9</td>
<td>Lean Clay, CL; slightly moist, soft to stiff, tan to cream white</td>
</tr>
<tr>
<td>13.5</td>
<td>Groundwater observed at 20.0 feet</td>
</tr>
<tr>
<td>20.0</td>
<td>Poorly Graded Gravel with Sand, GP; wet, very dense, brown to dark brown, angular to sub rounded gravel, fine to coarse grained sand</td>
</tr>
<tr>
<td>27.5</td>
<td>Silty Sand/Sandy Silt, SM/ML; very moist to wet, medium dense to very dense/very stiff to hard, brown, fine to medium grained sand, clayey in part</td>
</tr>
</tbody>
</table>

### ADDITIONAL DATA/REMARKS

- Lab #29904
  - Consolidation Cc=0.09
  - Unconfined qu=2.27 ksf
  - Cohesion (qu/2)=1.14 ksf
  - Dry Unit Weight=101.3 pcf
  - Nat. Moisture=21.1%
- Lab #7125
  - Liquid Limit=35
  - Plasticity Index=19

- Slow and rough drilling through gravel
- Smooth and slow drilling

---

**DOWL HKM**

2090 Stadium Drive
Bozeman, Montana 59715
Telephone: (406) 586-8834
www.dowlhk.com


**DRILL CO.** HazTech  **DRILL RIG** Longyear BK-81

**DRILLER** Paul Bray  **HAMMER** Auto

**LOGGED BY** D. Barrick  **APPROVED BY** G. Underhill
2" thick fine to coarse grained sand and rounded gravel lenses observed at 36.3 feet

Siltstone, Sandy Silt, ML; wet to very moist, hard, brown

becoming more competent with depth

Sandstone, Silty Sand, SM; wet to very moist, very dense, brown, fine to coarse grained sand

Boring terminated at 60.3 feet

Groundwater observed at 20.0 feet

Rough to smooth drilling at 36.5 feet

Smooth drilling on siltstone at 43.0 feet
**LOG OF BOREHOLE B-5**

**PROJECT**
MSU NAIC Parking Garage

**SITE**
Montana State University

**BORING LOCATION**
Northwest Corner of Parking Garage

---

### MATERIAL DESCRIPTION

**Surface Elevation: 4921.18**

<table>
<thead>
<tr>
<th>DEPTH (FT.)</th>
<th>GRAPHIC LOG</th>
<th>ELEVATION (FT.)</th>
<th>MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td></td>
<td>4920.72</td>
<td>5.5&quot; +/- Topsoil, moist, dark brown, organics</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lean Clay, CL; moist to slightly moist, medium stiff to stiff, light brown, intermittent sand layers</td>
</tr>
</tbody>
</table>

**Groundwater observed at 18.5 feet**

<table>
<thead>
<tr>
<th>DEPTH (FT.)</th>
<th>GRAPHIC LOG</th>
<th>ELEVATION (FT.)</th>
<th>MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.0</td>
<td></td>
<td>4907.18</td>
<td>Poorly Graded Gravel with Cobbles and Clay, GP-GC; slightly moist, medium dense to dense, gray to multi-colored, sub rounded to well rounded</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DEPTH (FT.)</th>
<th>GRAPHIC LOG</th>
<th>ELEVATION (FT.)</th>
<th>MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>21.0</td>
<td></td>
<td>4900.18</td>
<td>Silty Sand, SM; wet, medium dense to dense, light brown, slightly to non-plastic</td>
</tr>
</tbody>
</table>

---

**ADDITIONAL DATA/REMARKS**

**M.C.**

**Tests**

<table>
<thead>
<tr>
<th>NUMBER</th>
<th>IN. RECOVERED</th>
<th>IN. DRIVEN</th>
<th>POCKET PENTETROMETER, TSF</th>
<th>PL</th>
<th>LL</th>
<th>ADDITIONAL DATA/REMARKS</th>
</tr>
</thead>
</table>

**LOGGED BY** J. Potts

**APPROVED BY** G. Underhill
<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>MATERIAL DESCRIPTION</th>
<th>ELEVATION (FT)</th>
<th>GRAPHIC LOG</th>
<th>BULK DENSITY</th>
<th>BLOWS PER 6&quot;</th>
<th>N BLOWS/FT</th>
<th>NUMBER IN. RECOVERED</th>
<th>NUMBER IN. DRIVEN</th>
<th>POCKET PENETROMETER, TSF</th>
<th>M.C.</th>
<th>PL</th>
<th>LL</th>
<th>ADDITIONAL DATA/REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40.0</td>
<td>Silty Sand, SM; wet, dense to very dense, light yellow brown</td>
<td>4881.18</td>
<td>12</td>
<td>23</td>
<td>19</td>
<td>8</td>
<td>18/18</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40.5</td>
<td></td>
<td>4882.5</td>
<td>22</td>
<td>76</td>
<td>34</td>
<td>9</td>
<td>18/18</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45.0</td>
<td>Siltstone (Silty Sand, SM); very moist, very dense, light yellow brown</td>
<td>4876.18</td>
<td>16</td>
<td>48</td>
<td>14</td>
<td>10</td>
<td>17/18</td>
<td>94%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Blow counts unadjusted for large split spoon</td>
</tr>
<tr>
<td>45.5</td>
<td></td>
<td>4873.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51.4</td>
<td>Poorly Graded Gravel with Cobbles and Sand, GP; wet, very dense, gray, minor clay observed</td>
<td>4869.78</td>
<td>28</td>
<td>50</td>
<td>11</td>
<td>11/10</td>
<td>110%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53.4</td>
<td>Siltstone, (Silty Sand, SM); very moist to wet, very dense, light gray, sub rounded, medium grained sand, poorly cemented</td>
<td>4867.78</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56.5</td>
<td>Boring terminated at 56.5 feet</td>
<td>4864.68</td>
<td>50/50</td>
<td></td>
<td>50/50</td>
<td>12</td>
<td>5/4</td>
<td>125%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>58.5</td>
<td>No groundwater observed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>63</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### MATERIAL DESCRIPTION

<table>
<thead>
<tr>
<th>MATERIAL DESCRIPTION</th>
<th>BULK DENSITY</th>
<th>GRAVIACAL DENSITY</th>
<th>GRAVITY</th>
<th>M.C.</th>
<th>PL</th>
<th>LL</th>
</tr>
</thead>
<tbody>
<tr>
<td>3&quot; Asphalt Pavement, black</td>
<td>101</td>
<td>102</td>
<td>62</td>
<td>3.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road Base, Well Graded Gravel with Sand, GW; moist, brown, angular to sub angular, fine to coarse grained sand</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.6 Lean Clay, CL; moist to slightly moist, medium stiff to stiff, light brown, trace sand and silt, medium plasticity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.5 Poorly Graded Gravel with Clay, GP-GC; moist, very dense to dense, multi-colored to light gray, sub angular to rounded</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.2 Groundwater observed at 21.1 feet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25.6 Silty Sand, SM; wet, dense, light brown to multi-colored, medium to fine grained sand, trace clay</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### ADDITIONAL DATA/REMARKS

- USCS = CL
- Liquid Limit = 34
- Plasticity Index = 11
- Consolidation Cc = 0.12
- Unconfined (qu) = 1.507 ksf
- Cohesion (qu/2) = 0.754 ksf
- Dry Unit Weight = 93.3 pcf
- Nat. Moisture = 24.5%
- Lab # 7811
- Nat. Moisture = 22.3%
<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>MATERIAL DESCRIPTION</th>
<th>GRAPHIC LOG</th>
<th>ELEVATION (FT)</th>
<th>BULK SAMPLES</th>
<th>SAMPLES</th>
<th>DRIVEN/PUSH BLOWS PER 6&quot;</th>
<th>ADDITIONAL DATA/REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>36.0</td>
<td>Poorly Graded Sand, SP; wet, medium dense, yellow brown</td>
<td></td>
<td>4878.79</td>
<td></td>
<td>9</td>
<td>18/18 100%</td>
<td>Heavy sand in auger</td>
</tr>
<tr>
<td>38.5</td>
<td></td>
<td></td>
<td>4885.79</td>
<td></td>
<td>8</td>
<td>31/21 78%</td>
<td></td>
</tr>
<tr>
<td>43.5</td>
<td>Siltstone, (Silty Sand, SM); wet to very moist, very dense, brown, fine grained sand</td>
<td></td>
<td>4879.79</td>
<td></td>
<td>8</td>
<td>30/20 78%</td>
<td></td>
</tr>
<tr>
<td>45.2</td>
<td>Boring terminated at 45.2 feet</td>
<td></td>
<td>4877.09</td>
<td></td>
<td>50/50</td>
<td>2/2 100%</td>
<td></td>
</tr>
</tbody>
</table>

Surface Elevation: 4922.29

Groundwater observed at 45.2 feet
**MATERIAL DESCRIPTION**

Surface Elevation: 4922.4

<table>
<thead>
<tr>
<th>DEPTH (FT.)</th>
<th>MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.3</td>
<td>3.5&quot; Asphalt Pavement, black</td>
</tr>
<tr>
<td>5.5</td>
<td>5.5&quot; Road Base, Well Graded Gravel with Sand, GW; moist, dark brown to black, sub rounded gravel, fine to coarse grained sand, 1&quot; minus</td>
</tr>
<tr>
<td>0.8</td>
<td>Lean Clay, CL; moist, medium stiff, light brown, silty in part, trace sand stiff at 5.0 feet</td>
</tr>
<tr>
<td>4.5</td>
<td>very stiff at 15.0 feet</td>
</tr>
<tr>
<td>13</td>
<td>Poorly Graded Gravel with Clay and Sand, GP-GC; moist, very dense, brown to multi-colored, sub rounded to sub angular gravel, fine to coarse grained sand</td>
</tr>
<tr>
<td>16.4</td>
<td>Groundwater observed at 20.8 feet</td>
</tr>
<tr>
<td>18</td>
<td>Silty Sand, SM; wet, medium dense, dark brown to multi-colored, fine to medium grained sand</td>
</tr>
</tbody>
</table>

**Boring Terminated at 26.5 feet**

Groundwater observed at 20.8 feet
### CLIENT
A&E Architects

### PROJECT
MSU Norm Asbjorson Innovation Center

### SITE
Montana State University

### BORING LOCATION
East Central Portion of Innovation Center

---

#### MATERIAL DESCRIPTION

**Surface Elevation:** 4921.9

<table>
<thead>
<tr>
<th>DEPTH (FT.)</th>
<th>MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.4</td>
<td>5&quot; Asphalt Pavement, black</td>
</tr>
<tr>
<td>0.4</td>
<td>9&quot; Road Base, Well Graded Gravel with Sand, moist, brown to black, sub rounded gravel, fine to coarse grained sand, 1&quot; minus</td>
</tr>
<tr>
<td>1.2</td>
<td>Lean Clay, CL; moist, stiff, dark brown to black</td>
</tr>
<tr>
<td></td>
<td>silty in part at 3.6 feet</td>
</tr>
<tr>
<td></td>
<td>medium stiff at 6.0 feet</td>
</tr>
<tr>
<td></td>
<td>stiff at 17.5 feet</td>
</tr>
<tr>
<td></td>
<td>Poorly Graded Gravel with Clay and Sand, GP-GC; very moist, very dense, brown to multi-colored, sub rounded to sub angular gravel, fine to coarse grained sand</td>
</tr>
<tr>
<td></td>
<td>Groundwater observed at 20.3 feet</td>
</tr>
<tr>
<td></td>
<td>Boring terminated at 26.5 feet</td>
</tr>
<tr>
<td></td>
<td>Groundwater observed at 20.3 feet</td>
</tr>
</tbody>
</table>

---

#### LABORATORY DATA

**Lab #31120**
- USCS: CL
- Sand: 96.1%
- Liquid Limit: 30
- Plasticity Index: 12
- Unconfined (q) = 1.01 ksf
- Cohesion (q/2) = 0.51 ksf
- Dry Unit Weight: 96.5pcf
- Nat. Moisture: 21.0%

**Lab #31121**
- USCS: CL
- Sand: 9.3%
- Fines: 90.7%
- Liquid Limit: 38
- Plasticity Index: 20
- Consolidation: 0.29
- Unconfined (q) = 3.359 ksf
- Cohesion (q/2) = 1.680 ksf
- Dry Unit Weight: 100.3pcf
- Nat. Moisture: 22.7%
- Direct Shear: 29.8 degrees

**Lab #8378**
- Nat. Moisture: 28.9%

---

#### LOG OF BOREHOLE B-10

<table>
<thead>
<tr>
<th>DEPTH (FT.)</th>
<th>MATERIAL DESCRIPTION</th>
<th>SAMPLES</th>
<th>TESTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ELEVATION (FT.)</td>
<td>BLOWS PER 6&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>5&quot; Asphalt Pavement, black</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>0.4</td>
<td>9&quot; Road Base, Well Graded Gravel with Sand, moist, brown to black, sub rounded gravel, fine to coarse grained sand, 1&quot; minus</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>1.2</td>
<td>Lean Clay, CL; moist, stiff, dark brown to black</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>silty in part at 3.6 feet</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>medium stiff at 6.0 feet</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>stiff at 17.5 feet</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>19.0</td>
<td>Poorly Graded Gravel with Clay and Sand, GP-GC; very moist, very dense, brown to multi-colored, sub rounded to sub angular gravel, fine to coarse grained sand Groundwater observed at 20.3 feet</td>
<td>15</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>Boring terminated at 26.5 feet</td>
<td>25</td>
<td>69</td>
</tr>
</tbody>
</table>

---

#### ADDITIONAL DATA/REMARKS

- Lab #31120
- Lab #31121
- Lab #8378
**MATERIAL DESCRIPTION**

Surface Elevation: 4921.3

<table>
<thead>
<tr>
<th>DEPTH (FT.)</th>
<th>MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>4&quot; Asphalt Pavement, black</td>
</tr>
<tr>
<td>0.3</td>
<td>6.5&quot; Road Base, Well Graded Gravel with Sand, moist, dark brown to black, sub rounded gravel, fine to coarse grained sand, 1&quot; minus</td>
</tr>
<tr>
<td>0.9</td>
<td>Lean Clay, CL; moist, medium stiff, light brown, silty in part, trace sand</td>
</tr>
<tr>
<td>4.5</td>
<td>Lean Clay with Sand, CL; moist, medium stiff, light brown, fine grained sand, silty in part</td>
</tr>
<tr>
<td>9.0</td>
<td>very stiff at 12.5 feet</td>
</tr>
<tr>
<td>16.5</td>
<td>stiff at 15.0 feet</td>
</tr>
<tr>
<td>18.0</td>
<td>Poorly Graded Gravel with Clay and Sand, GP-GC; moist, very dense, brown to multi-colored, sub rounded gravel, fine to coarse grained sand</td>
</tr>
<tr>
<td>18.5</td>
<td>Groundwater observed at 19.8 feet</td>
</tr>
<tr>
<td>24.0</td>
<td>Boring terminated at 24.0 feet</td>
</tr>
<tr>
<td>27.0</td>
<td>Groundwater observed at 19.8 feet</td>
</tr>
</tbody>
</table>

**TESTS**

<table>
<thead>
<tr>
<th>DRIVEN/PUSH BLOWS/FT</th>
<th>NUMBER IN. RECOVERED IN.</th>
<th>POCKET PENETROMETER, TSF</th>
<th>M.C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>16/18</td>
<td>89%</td>
<td>PL</td>
</tr>
<tr>
<td>20</td>
<td>24/24</td>
<td>100%</td>
<td>LL</td>
</tr>
<tr>
<td>30</td>
<td>16/18</td>
<td>89%</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>18/24</td>
<td>75%</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>17/18</td>
<td>94%</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>18/18</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>19/18</td>
<td>106%</td>
<td></td>
</tr>
</tbody>
</table>

**ADDITIONAL DATA/REMARKS**

- Lab #31122
  - Nat. Moisture=28.4%
- Lab #8379
  - Nat. Moisture=22.9%
### LOG OF BOREHOLE B-12

#### MATERIAL DESCRIPTION

<table>
<thead>
<tr>
<th>DEPTH (FT.)</th>
<th>MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>8&quot; +/- Topsoil, very moist, black, organics</td>
</tr>
<tr>
<td>2.5</td>
<td>FIG. 920.9 0.7 Lean Clay, CL; moist, stiff, light brown, silty in part, trace sand</td>
</tr>
<tr>
<td>4.5</td>
<td>medium stiff at 3.0 feet</td>
</tr>
<tr>
<td>5</td>
<td>stiff at 5.0 feet</td>
</tr>
<tr>
<td>7.5</td>
<td>medium stiff at 9.0 feet</td>
</tr>
<tr>
<td>9</td>
<td>stiff at 10.5 feet</td>
</tr>
<tr>
<td>12.5</td>
<td>FIG. 908.4 12.5 Lean Clay with Sand, CL; moist, stiff, light brown to brownish orange, fine grained sand</td>
</tr>
<tr>
<td>15.5</td>
<td>FIG. 905.6 17.0 Poorly Graded Gravel with Clay and Sand, GP-GC; moist, very dense, brown to multi-colored, sub rounded gravel, fine to coarse grained sand</td>
</tr>
<tr>
<td>18</td>
<td>Groundwater observed at 19.7 feet</td>
</tr>
<tr>
<td>20.3</td>
<td>Groundwater observed at 19.7 feet</td>
</tr>
</tbody>
</table>

#### ADDITIONAL DATA/ REMARKS

- Lab #31123
- Nat. Moisture=26.5%
- Groundwater observed at 19.7 feet
- Boring terminated at 20.3 feet

#### LAB #31123

- M.C.
- Dept.
- Sample Type
- In.
- Driven Pocket Penetrometer, TST
- N Value
- BLOWS/FT
- PL
- LL
- ADDED DATA/ REMARKS
Appendix B

Laboratory Testing
# SUMMARY OF PHYSICAL PROPERTIES TEST RESULTS

| LAB NUMBER | LOCATION | DEPTH RANGE (feet) | CLASSIFICATION SYMBOL | FINES SMALLER THAN 0.075 mm | SAND NO. 200(0.075 mm) TO NO. 414.76 mm | SAND NO. 414.76 mm) TO 3 IN.(76.2 mm) | LIQUID LIMIT - % | PLASTICITY INDEX - % | MAXIMUM DRY UNIT WEIGHT(D698) - PCF | OPTIMUM MOISTURE CONTENT - % | CONSOLIDATION - Pc - KSF | CONSOLIDATION - Cc | CONSOLIDATION - Cs | UNCONFINED, qu - KSF | COHESION, qu/2 - KSF | UNIT WT. (CONSOL.) - DRY PCF | UNIT WT. (UNCONF.) - DRY PCF | DIRECT SHEAR - DEGREES | NATURAL MOISTURE - % |
|------------|----------|-------------------|------------------------|-----------------------------|---------------------------------------|----------------------------------------|-------------------|-------------------|--------------------------|--------------------------|--------------------------|----------------|----------------|----------------|----------------|--------------------------|--------------------------|------------------|----------------|----------------|
| 29901      | B-3      | 5.0'-6.9'         | CL                     | 36                          | 13                                    | 2.77                                   | 0.14              | 0.02              | 2.01                     | 1.01                     | 89.9                     | 98.0           | 26.5           |                |                |                          |                          |                  |                |                |
| 29904      | B-4      | 15.0'-17.0'       | CL                     | 2.99                        | 2.09                                 | 0.02                                   | 2.01              | 2.27              | 1.14                     | 96.6                     | 101.3                    |                |                |                |                |                          |                          |                  |                |                |
| 7125       | B-4      | 17.0'-18.5'       | CL                     | 35                          | 19                                    | 35                                     | 140.5             | 17.6              |                          |                          |                          |                | 21.3           |                |                |                          |                          |                  |                |                |
| 8376       | B-9      | 1.0'-6.0'         | CL                     | 88                          | 9                                     | 3                                      | 35                | 140.9             | 17.6                     |                          |                          |                | 21.3           |                |                |                          |                          |                  |                |                |
| 8377       | B-9      | 12.5'-14.0'       | CL                     | 96                          | 4                                     | 30                                     | 12                | 1.01              | 0.51                     | 96.5                     | 21.0                     |                |                |                | 24.3           |                          |                          |                  |                |                |
| 31120      | B-10     | 4.0-6.0’          | CL                     | 96                          | 4                                     | 30                                     | 12                | 1.01              | 0.51                     | 96.5                     | 21.0                     |                |                |                | 24.3           |                          |                          |                  |                |                |
| 31121      | B-10     | 13.0'-15.0'       | CL                     | 91                          | 9                                     | 38                                     | 20                | 3.70              | 0.29                     | 3.36                     | 1.68                     | 90.0           | 100.3          | 20.8           | 22.7           |                          |                          |                  |                |                |
| 8378       | B-10     | 17.5'-19.0’       | CL                     | 91                          | 9                                     | 38                                     | 20                | 3.70              | 0.29                     | 3.36                     | 1.68                     | 90.0           | 100.3          | 20.8           | 22.7           |                          |                          |                  |                |                |
| 31122      | B-11     | 8.0-10.0’         | CL                     | 96                          | 4                                     | 30                                     | 12                | 1.01              | 0.51                     | 96.5                     | 21.0                     |                |                |                | 24.3           |                          |                          |                  |                |                |
| 8379       | B-11     | 12.5'-14.0'       | CL                     | 96                          | 4                                     | 30                                     | 12                | 1.01              | 0.51                     | 96.5                     | 21.0                     |                |                |                | 24.3           |                          |                          |                  |                |                |
| 31123      | B-12     | 8.0-9.0’          | CL                     | 96                          | 4                                     | 30                                     | 12                | 1.01              | 0.51                     | 96.5                     | 21.0                     |                |                |                | 24.3           |                          |                          |                  |                |                |
### UNCONFINED COMPRESSION TEST

**SAMPLE UNIT LOAD - KSF**

![Graph showing compressive stress vs. vertical strain](image)

**LAB NO.: 29897**
- **RATIO:** 2.00
- **LOCATION:** B-1
- **DEPTH:** 2.5-4.5'
- **DATE TESTED:** 11/225/14

**LAB NO.: 29901**
- **RATIO:** 2.08
- **LOCATION:** B-3
- **DEPTH:** 5.0-6.9'
- **DATE TESTED:** 11/25/14

**LAB NO.: 29904**
- **RATIO:** 1.39
- **LOCATION:** B-4
- **DEPTH:** 15.0-17.0'
- **DATE TESTED:** 11/25/14

<table>
<thead>
<tr>
<th>TYPE OF BREAK</th>
<th>LAB NO.: 29897</th>
<th>LAB NO.: 29901</th>
<th>LAB NO.: 29904</th>
</tr>
</thead>
<tbody>
<tr>
<td>% MOISTURE</td>
<td>19.8 %</td>
<td>21.3 %</td>
<td>21.5 %</td>
</tr>
<tr>
<td>WET UNIT WT.</td>
<td>123.5 PCF</td>
<td>118.9 PCF</td>
<td>123.0 PCF</td>
</tr>
<tr>
<td>DRY UNIT WT.</td>
<td>103.1 PCF</td>
<td>98.0 PCF</td>
<td>101.3 PCF</td>
</tr>
<tr>
<td>U.C. STRENGTH, qu</td>
<td>2.90 KSF</td>
<td>2.01 KSF</td>
<td>2.27 KSF</td>
</tr>
<tr>
<td>COHESION (qu/2)</td>
<td>1.45 KSF</td>
<td>1.01 KSF</td>
<td>1.14 KSF</td>
</tr>
</tbody>
</table>

**PROJECT:** MSU NAIC  
**SAMPLED BY:** DOWL HKM  
**PROJECT NO.:** 4522.11447.01  
**DATE SAMPLED:** 11/3/2014  

**DOWL HKM**
LIQUID AND PLASTIC LIMITS TEST REPORT

Dashed line indicates the approximate upper limit boundary for natural soils.

**PLASTICITY INDEX**

<table>
<thead>
<tr>
<th>LIQUID LIMIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 10 20 30 40 50 60 70 80 90 100 110</td>
</tr>
</tbody>
</table>

**CL-ML**

| CL or OL |
| ML or OL |
| MH or OH |

**LIQUID LIMIT**

- **WATER CONTENT**
  - 35.33
  - 35.34
  - 35.35
  - 35.36
  - 35.37
  - 35.38
  - 35.39
  - 35.4
  - 35.41
  - 35.42
  - 35.43

- **NUMBER OF BLOWS**
  - 5 6 7 8 9 10 20 25 30 40

**MATERIAL DESCRIPTION**

<table>
<thead>
<tr>
<th>LL</th>
<th>PL</th>
<th>PI</th>
<th>%&lt;#40</th>
<th>%&lt;#200</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>16</td>
<td>19</td>
<td>94.4</td>
<td>75.5</td>
</tr>
</tbody>
</table>

- lean clay with sand

**Remarks:**

- **Project No.** 4522.11447  **Client:** A&E ARCHITECTS
- **Project:** MSU NAIC ENGINEERING BUILDING
- **Location:** B-1  **Sample Number:** 7124  **Depth:** 2'-8'

**Figure #** 7124B

**Tested By:** TJM  **Checked By:** CEP
### Material Description

**USCS**

- AASHTO

<table>
<thead>
<tr>
<th>Natural Sat.</th>
<th>Dry Dens. (pcf)</th>
<th>LL</th>
<th>PI</th>
<th>Sp. Gr.</th>
<th>Overburden (ksf)</th>
<th>P&lt;sub&gt;C&lt;/sub&gt; (ksf)</th>
<th>C&lt;sub&gt;C&lt;/sub&gt;</th>
<th>C&lt;sub&gt;S&lt;/sub&gt;</th>
<th>Swell Press. (ksf)</th>
<th>Clpse. %</th>
<th>e&lt;sub&gt;0&lt;/sub&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>82.5 %</td>
<td>26.5 %</td>
<td>89.9</td>
<td>36</td>
<td>13</td>
<td>2.68</td>
<td>0.534</td>
<td>2.77</td>
<td>0.14</td>
<td>0.02</td>
<td>0.0</td>
<td>0.861</td>
</tr>
</tbody>
</table>

### Additional Information

- **Project No.:** 4522.11447.01
- **Client:** A&E Architects
- **Project:** MSU NAIC Engineering Building
- **Location:** B-3 5.0-6.9'
- **Depth:** 5.0-6.9'
- **Sample Number:** 29901
- **Sampled By:** DOWL HKM
- **Remarks:** Sample No.29901

---

**Figure 02**

**Tested By:** _____________________________  **Checked By:** MC ___________________________
MATERIAL DESCRIPTION

<table>
<thead>
<tr>
<th>Natural Sat.</th>
<th>LL</th>
<th>PI</th>
<th>Sp. Gr.</th>
<th>Overburden (ksf)</th>
<th>P_C (ksf)</th>
<th>C_C</th>
<th>C_S</th>
<th>Swell Press. (ksf)</th>
<th>Swell %</th>
<th>e_D</th>
</tr>
</thead>
<tbody>
<tr>
<td>77.5 %</td>
<td>96.6</td>
<td>2.68</td>
<td>1.546</td>
<td>2.99</td>
<td>0.09</td>
<td>0.02</td>
<td>1.60</td>
<td>0.2</td>
<td>0.732</td>
<td></td>
</tr>
</tbody>
</table>

**EXTRACTION:**

- **Percent Strain:** -3.6 -3.2 -2.8 -2.4 -2.0 -1.6 -1.2 -0.8 -0.4 0.0 0.4
- **Applied Pressure - ksf:** 0.1 1 10
- **Water Added:**

---

**CONSOLIDATION TEST REPORT**

**MATERIAL DESCRIPTION**

**USCS AASHTO**

**Project No.:** 4522.11447.01  
**Client:** A&E Architects

**Project:** MSU NAIC Engineering Building

**Location:** B-4 15.0-17.0'  
**Depth:** 15.0-17.0'  
**Sample Number:** 29904

**Remarks:**
- Sample No.29904
- Sampled By:DOWL HKM

**Figure 03**

**Tested By: [Signature] Checked By: MC**
LIQUID AND PLASTIC LIMITS TEST REPORT

Dashed line indicates the approximate upper limit boundary for natural soils.

<table>
<thead>
<tr>
<th>MATERIAL DESCRIPTION</th>
<th>LL</th>
<th>PL</th>
<th>PI</th>
<th>%&lt;#40</th>
<th>%&lt;#200</th>
<th>USCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>STP</td>
<td>35</td>
<td>16</td>
<td>19</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Project No. 4522.11447 Client: A&E ARCHITECTS
Project: MSU NAIC ENGINEERING BUILDING
Location: B-4
Sample Number: 7125 Depth: 17'-18.5'

Remarks:

Figure # 7125B

Tested By: TJM Checked By: CEP

STP 35 16 19

4522.11447 A&E ARCHITECTS
7125B

MSU NAIC ENGINEERING BUILDING

BEGEMAN, MONTANA
LIQUID AND PLASTIC LIMITS TEST REPORT

SOIL DATA

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>SOURCE</th>
<th>SAMPLE NO.</th>
<th>DEPTH</th>
<th>NATURAL WATER CONTENT (%)</th>
<th>PLASTIC LIMIT (%)</th>
<th>LIQUID LIMIT (%)</th>
<th>PLASTICITY INDEX (%)</th>
<th>USCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>●</td>
<td></td>
<td>8376</td>
<td>1'-6'</td>
<td>21.3</td>
<td>21</td>
<td>35</td>
<td>14</td>
<td>CL</td>
</tr>
</tbody>
</table>

Dashed line indicates the approximate upper limit boundary for natural soils.

Client: MT Dept of A & E
Project: NAIC Phase 330
Project No.: 4522.11447
LAB #: 8376B

Tested By: CS
Checked By: CEP
**Particle Size Distribution Report**

**Material Description**

Bulk Sample
lean clay

**Atterberg Limits (ASTM D 4318)**

<table>
<thead>
<tr>
<th>PL</th>
<th>LL</th>
<th>PI</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>35</td>
<td>14</td>
</tr>
</tbody>
</table>

**Classification**

USCS (D 2487)= CL
AASHTO (M 145)= A-6(12)

**Coefficients**

<table>
<thead>
<tr>
<th>D90</th>
<th>D85</th>
<th>D60</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1084</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D50</th>
<th>D30</th>
<th>D15</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

**Remarks**

(no specification provided)

---

**Test Results (ASTM C136 & ASTM C117)**

<table>
<thead>
<tr>
<th>Opening Size</th>
<th>Percent Finer</th>
<th>Spec.*</th>
<th>Pass? (X=Fail)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4&quot;</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/8&quot;</td>
<td>98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#4</td>
<td>97</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#10</td>
<td>95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#20</td>
<td>94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#40</td>
<td>93</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#80</td>
<td>92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#100</td>
<td>92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#200</td>
<td>88</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Remarks**

---

**Date Received:** 12/18/15  
**Date Tested:** 1/5-8/16  
**Tested By:** CS  
**Checked By:** C Paulson  
**Title:** Materials Lab Manager  
**Date Sampled:** 12/18/15
Test specification: ASTM D 698-12 Method A Standard

<table>
<thead>
<tr>
<th>Elev/Depth</th>
<th>Classification</th>
<th>Nat. Moist.</th>
<th>Sp.G.</th>
<th>LL</th>
<th>PI</th>
<th>% &gt; #4</th>
<th>% &lt; No.200</th>
</tr>
</thead>
<tbody>
<tr>
<td>1'-6'</td>
<td>CL</td>
<td>A-6(12)</td>
<td>21.3</td>
<td>2.65</td>
<td>35</td>
<td>14</td>
<td>3</td>
</tr>
</tbody>
</table>

Maximum dry density = 105.9 pcf

Optimum moisture = 17.6 %

Project No. 4522.11447  Client: MT Dept of A & E
Project: NAIC Phase 330
Location: B-9  Sample Number: 8376

Remarks:

Date: 1/8/16

LAB # 8376A

Tested By: CS  Checked By: CEP
Material Description

lean clay

Atterberg Limits (ASTM D 4318)

<table>
<thead>
<tr>
<th>PL</th>
<th>LL</th>
<th>PI</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>30</td>
<td>12</td>
</tr>
</tbody>
</table>

Classification

<table>
<thead>
<tr>
<th>USCS (D 2487)</th>
<th>AASHTO (M 145)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL</td>
<td>A-6(11)</td>
</tr>
</tbody>
</table>

Coefficients

<table>
<thead>
<tr>
<th>D90</th>
<th>D85</th>
<th>D60</th>
<th>D50</th>
<th>D30</th>
<th>D15</th>
<th>C_u</th>
<th>C_c</th>
</tr>
</thead>
</table>

Remarks

Sampled By: DOWL
F.M.=0.01

Date Received: 12/18/15  Date Tested: 
Tested By: JM  Checked By: MC
Title: Lab Manager

Location: B-10  Sample Number: 31120  Depth: 4.0-6.0'

Client: Montana Department of Administration
Project: Norm Asbjornson Innovation Center

Date Sampled: 12/18/15

Tested By:  Checked By: 
**Soil Description**

Lean CLAY

**Atterberg Limits**

\[ PL = 18 \quad LL = 38 \quad PI = 20 \]

**Coefficients**

\[ D_{90} = \quad D_{85} = \quad D_{50} = \quad D_{15} = \]
\[ C_u = \quad C_c = \]

**Classification**

USCS = CL  \quad AASHTO = A-6(18)

**Remarks**

% +3" | % Gravel | % Sand | Silt | Clay
---|---|---|---|---
0.0 | 0.0 | 0.0 | 9.0 | 90.7

| SIEVE SIZE | PERCENT FINER | SPEC.* PERCENT (X=NO) | PASS?
---|---|---|---|
#10 | 100.0 | | |
#20 | 99.8 | | |
#40 | 99.1 | | |
#80 | 97.0 | | |
#200 | 90.7 | | |

---

Source of Sample: B-10  
Sample Number: 31121

Depth: 13.0'-15.0'  
Date: 12-18-15

---

**Tetra Tech**  
**Billings, MT**

**Client:** Montana Department of Administration  
**Project:** Norm Asbjornson Innovation Center

**Project No:** 4522.11447.01-Phase  
**Figure**
UNCONFINED COMPRESSION TEST

SAMPLE UNIT LOAD - KSF

Vertical Strain

Compressive Stress, kips/ft²

Compressive Stress, kips/ft²

Unconfined Compression Test Graph

SIEVE
LIQUID LIMIT
#4
10
20
40
80
100
PLASTIC LIMIT
PLASTIC INDEX
USCS
AASHTO

% MOISTURE
WET UNIT WT.
DRY UNIT WT.
U.C. STRENGTH, qu
COHESION (qu/2)

LEAN CLAY
DESCRIPTION

PROJECT:
Norm Asbjornson Center

LAB NO.:
31120

SAMPLED BY:
DOWL

DATE SAMPLED:
12/18/2015

DATE TESTED:
1/12/2016

LOCATION:
BH-10

DEPTH:
4.0-6.0’

RATIO:
2.09

PLATE NO.:
01

DOWL
## CONSOLIDATION TEST REPORT

### WATER ADDED

### Percent Strain vs. Applied Pressure - ksf

<table>
<thead>
<tr>
<th>Natural Saturation</th>
<th>Natural Moisture</th>
<th>Dry Dens. (pcf)</th>
<th>LL</th>
<th>PI</th>
<th>Sp. Gr.</th>
<th>P_c (ksf)</th>
<th>C_c</th>
<th>Initial Void Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>71.2 %</td>
<td>23.0 %</td>
<td>90.0</td>
<td>38</td>
<td>20</td>
<td>2.70</td>
<td>3.7</td>
<td>0.29</td>
<td>0.872</td>
</tr>
</tbody>
</table>

### MATERIAL DESCRIPTION

- **USCS:** CL
- **AASHTO:** A-6(18)

- **Lean CLAY**

### Project Information

- **Project No.:** 4522.11447.01-4522.11447.01
- **Client:** Montana Department of Administration
- **Project:** Norm Ashjornson Innovation Center
- **Source of Sample:** B-10
- **Depth:** 13.0'-15.0'
- **Sample Number:** 31121
- **Sample Number:** 31121
- **Tetra Tech**
- **Billings, MT**

### Remarks:

Figure
### Sample Type: Undisturbed

**Description:** Lean CLAY

**Specific Gravity:** 2.70

**Remarks:**

![Graph of Shear Stress vs. Normal Stress](image)

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Content, %</td>
<td>22.7</td>
<td>22.7</td>
<td>22.7</td>
</tr>
<tr>
<td>Dry Density, pcf</td>
<td>90.2</td>
<td>90.4</td>
<td>91.2</td>
</tr>
<tr>
<td>Saturation, %</td>
<td>70.6</td>
<td>70.9</td>
<td>72.3</td>
</tr>
<tr>
<td>Void Ratio</td>
<td>0.8691</td>
<td>0.8654</td>
<td>0.8482</td>
</tr>
<tr>
<td>Diameter, in.</td>
<td>2.500</td>
<td>2.500</td>
<td>2.500</td>
</tr>
<tr>
<td>Height, in.</td>
<td>0.750</td>
<td>0.750</td>
<td>0.750</td>
</tr>
<tr>
<td>Water Content, %</td>
<td>31.4</td>
<td>30.4</td>
<td>27.9</td>
</tr>
<tr>
<td>Dry Density, pcf</td>
<td>91.2</td>
<td>91.8</td>
<td>95.0</td>
</tr>
<tr>
<td>Saturation, %</td>
<td>99.9</td>
<td>98.2</td>
<td>97.3</td>
</tr>
<tr>
<td>Void Ratio</td>
<td>0.8481</td>
<td>0.8353</td>
<td>0.7750</td>
</tr>
<tr>
<td>Diameter, in.</td>
<td>2.500</td>
<td>2.500</td>
<td>2.500</td>
</tr>
<tr>
<td>Height, in.</td>
<td>0.742</td>
<td>0.738</td>
<td>0.720</td>
</tr>
<tr>
<td>Normal Stress, ksf</td>
<td>1.000</td>
<td>2.000</td>
<td>4.000</td>
</tr>
<tr>
<td>Fail. Stress, ksf</td>
<td>1.041</td>
<td>1.388</td>
<td>2.174</td>
</tr>
<tr>
<td>Strain, %</td>
<td>3.2</td>
<td>4.8</td>
<td>3.2</td>
</tr>
<tr>
<td>Ult. Stress, ksf</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strain, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strain rate, in./min.</td>
<td>0.005</td>
<td>0.005</td>
<td>0.005</td>
</tr>
</tbody>
</table>

**Client:** Montana Department of Administration

**Project:** Norm Asbjornson Innovation Center

**Source of Sample:** B-10  
**Depth:** 13.0’-15.0’

**Sample Number:** 31121

**Proj. No.:** 4522.11447.01-Phase 330

**Date Sampled:** 12-18-15

**Figure:**
## UNCONFINED COMPRESSION TEST

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unconfined strength, ksf</td>
<td>3.359</td>
</tr>
<tr>
<td>Undrained shear strength, ksf</td>
<td>1.680</td>
</tr>
<tr>
<td>Failure strain, %</td>
<td>2.9</td>
</tr>
<tr>
<td>Strain rate, in./min.</td>
<td>0.060</td>
</tr>
<tr>
<td>Water content, %</td>
<td>22.7</td>
</tr>
<tr>
<td>Wet density, pcf</td>
<td>123.0</td>
</tr>
<tr>
<td>Dry density, pcf</td>
<td>100.3</td>
</tr>
<tr>
<td>Saturation, %</td>
<td>90.1</td>
</tr>
<tr>
<td>Void ratio</td>
<td>0.6811</td>
</tr>
<tr>
<td>Specimen diameter, in.</td>
<td>2.875</td>
</tr>
<tr>
<td>Specimen height, in.</td>
<td>6.000</td>
</tr>
<tr>
<td>Height/diameter ratio</td>
<td>2.09</td>
</tr>
</tbody>
</table>

### Description:
Lean CLAY

### Soil Properties:
- **LL**: 38  
- **PL**: 18  
- **PI**: 20  
- **GS**: 2.70  
- **Type**: Undisturbed

### Details:
- **Project No.**: 4522.11447.01-Phase 330
- **Date Sampled**: 12-18-15
- **Remarks**: Figure ______

### Client:
Montana Department of Administration

### Project:
Norm Asbjornson Innovation Center

### Source of Sample:
B-10  
**Depth**: 13.0'-15.0'  
**Sample Number**: 31121

---

**UNCONFINED COMPRESSION TEST**
Tetra Tech  
Billings, MT
Appendix C

Photographs
Boring B-2 – View Northwest – Northwest Corner of Innovation Center Site

Boring B-2 – View Northeast – Northwest Corner of Innovation Center Site
Boring B-3 – View Northeast – South Central Portion of Innovation Center

Boring B-3 – View Northwest – South Central Portion of Innovation Center
Boring B-4 – View North – Northeast Corner of Innovation Center

Boring B-4 – View South – Northeast Corner of Innovation Center
View Northeast – Drilling Boring B-10

View Southeast – Drilling Boring B-10
View Northwest – Drilling Boring B-11

View West – Drilling Boring B-11
View Northwest – Drilling Boring B-12

View West – Drilling Boring B-12
Appendix D

Screw Pile Information
Greg,

Thanks for contacting Alpine Site Services about using our screw pile foundation system as an alternate for the MSU Innovation Center project in Bozeman, MT. We appreciate your interest and do feel our system will work very well (again) for the project site soils and expected loads. As you remembered, Alpine does provide a thorough package documenting our piles and conducts load testing on all projects to ASTM standards.

I've attached our engineer's letter from the Gallatin Co. Detention Center project in '09 showing that our screw piles achieved 140kip compressive service loads, along with an almost 20kip lateral load (when installed with the concrete cap specified), with a safety factor of 2 and 2.6 respectively. Also, I've attached our Alpine brochure and some other information as you requested. As you said, screw piles would be a viable foundation given the lighter sand layers involved here, with the strong advantages of faster installation and verified loading provided by our load testing.

Alpine has completed several large parking garage structures throughout the Rocky Mountain region, including one in Jackson Hole, WY and one in Glenwood Springs, CO. Our screw pile system has proven capabilities on commercial, educational and industrial projects for over 12 years in all kinds of soils conditions, and with strict loading parameters. In fact, we've completed 5 major buildings for the Mesa State campus in Grand Junction, CO and many other private and public educational buildings in Colorado.

Thanks again for your interest and for thinking of Alpine for this project. Please contact me with any requests for further information, and please let us know about this project moving forward. I'll be sure and keep in touch with Martel Construction, as it was a pleasure working with them on the detention center project.

Mike Oliveira
(303) 994-3131 mobile

Alpine Site Services
10875 Dover Street, Suite 1100
Westminster, CO 80021
(303) 420-0048 office
ADVANTAGES

Save Valuable Time

- Engineered Screwpiles are four times faster than drilled piers, caissons, and driven piles. With multiple machines, reduce your installation time even further.
- Because our machines easily access difficult sites and require far less space during installation than other methods, the rest of the site can be working at the same time.
- Our Screwpiles work in virtually any weather. Your site keeps working while others are having a “snow day.”

Control Cost & Save Money

- All the costs for our Engineered Screwpiles are presented up-front. Prices won’t change after the job is completed. You won’t experience “sticker shock” over post completion charges for extra length, casing or rock.
- Because of their design and installation process, Engineered Screwpiles will always save you money over other deep foundation systems.

Proven Reliability

- Alpine’s Engineered Screwpiles are load tested for verified performance you can rely on.
- Our patent pending torque monitoring system ensures consistency during installation.
- Throughout the process, data and charting output is provided for engineer’s verification and review.

Simple Change-Over

- Pre-engineered details/drawings make change-over a snap with rapid turn around on custom detailing and designs.

WHEN SHOULD YOU USE ENGINEERED SCREWPILES

- If the over-excavation depth is greater than 3’
- If the bearing psf is 2500 or less
- When the expected caisson, drilled pier or driven pile depth is greater than 20’
- For dense material or soil, stone, cobble and boulders
Save time & cost overruns on your next project.

For more information on engineered screwpiling, contact Bernie Gochis at 303.420.0048 • email: bgochis@alpinesites.com

5990 Kipling Parkway • Suite 001 • Arvada, Colorado 80004
Typical Steps to Screwpile Engineering Integration

Structural Engineer of Record responsibilities:
1. Provide all project loading information (axial, tension and lateral loads)
2. Provide background drawings for Screwpile engineer to design pile layout
3. Coordinate pile location placement, with assistance from Screwpile Engineer
4. Review Screwpile shop drawings and Load Test provided by Alpine

Geotechnical Engineer responsibilities:
1. Provide Soils Report (Borings), consult with Alpine on difficult sites
2. Observe Pile characteristics and Load Testing
3. Inspect Installs for Depth & Torque, provide inspection logs

Screwpile Engineer responsibilities:
1. Design Pile & Pile Connection
2. Design Pile Layout
3. Review Load Test & Determine torque requirements
4. Review install logs & write project completion documents
March 6, 2009

Attn: Bernie Gochis
Alpine Site Services
5990 Kipling Parkway, Suite 001
Arvada, CO 80004

Re: Gallatin County Detention Center Lateral Load Test
Bozeman, MT
AEI Project #080251

Test Date: March 4, 2009

Dear Mr. Gochis,

At your request, a representative from our office has observed an in situ lateral load test and reviewed the results to verify that the intended pile and pile cap design is appropriate for the site. The test was performed using a built up assembly anchored with a single vertical pile and a single battered pile tied together with a steel plate and a high capacity hydraulic load cell to apply lateral load to the test pile and pile cap. The test generally followed the requirements of ASTM D1143.

The purpose of our test was to determine if the pile, pile cap, and backfill material will have sufficient lateral capacity to resist a seismic lateral load of 18,000 pounds as specified by the project Engineer of Record. A test pile, comprised of a single five and one-half inch outside diameter screw pile, 0.360 inch wall thickness, and two ¼ inch thick helices, was installed to a depth of 19'-0" from existing grade. The first helix was 12" in diameter and located approximately six inches from the tip of the pile. The second helix was 14" in diameter and located approximately 1'-4" above the first helix. The installation torque achieved at bearing depth was approximately 49,000 lb-ft. A 3'-4"x3'-4"x3'-0" deep concrete cap reinforced as indicated on the project documents was placed with the test pile cap plate embedded 6 inches into the base per the preliminary shop drawings provided by our office and cured to a final tested compression strength of approximately 3,200 psi. Backfill material was placed around the test assembly and compacted in 6 inch lifts as required for the site backfill per the geotechnical recommendations to a height approximately equal to the top of the concrete pile cap.

A lateral design load of 18,000 pounds was applied with a recorded deflection of 0.021 inches after a load rest duration of fifteen minutes. The loading was then increased to a load of 42,000 pounds with an additional load rest duration of ten minutes where a relaxation occurred to a final proof load of 40,800 pounds with an associated final measured deflection of 0.071 inches. In the hope of determining a failure point, the lateral force was increased to a maximum load of 50,000 pounds. Over the course of a 22 minute loading rest, a relaxation of approximately 3,000 pounds occurred to a minimum maintained load of 47,000 pounds with an associated total final deflection of 0.113 inches. Although no failure was observed and the service level deflection limit had still not been reached, the load test was concluded. The pile and pile cap assembly rebounded as the test load was released to a deflection of 0.062 under zero load, indicating that the pile behaved in a linear elastic manner, with an acceptable total lateral movement. It is likely the remaining deflection is due to the friction force between the concrete cap and surrounding soil at this deflection point had become greater than the force exerted by the pile shaft returning to the original un-deflected shape.

This test established that the pile and pile cap foundation system will have sufficient lateral capacity with the controlled structural fill specified in the geotechnical report to resist the seismic lateral loading provided by the Engineer of Record. Although a deflection limit of 3/8 inch was set for the service level load of 18,000 pounds, this deflection was not achieved even at an ultimate proof load of 47,000 pounds. Based on the lateral load test
information detailed above, the pile and concrete pile cap are sufficient to provide 18,000 pounds of lateral resistance with negligible deflection and a minimum safety factor of 2.6. Piles shall be placed such that there is adequate concrete cover provided (2" minimum), and no more than 3" out of dimensioned location. Piles placed singly, or in pairs, such that they support a discrete column load, shall be evaluated on a case-by-case basis considering the actual service load so that an allowable tolerance may be established.

**Pile Material Test Specimens:**

Pile test samples will be taken from the pile fabrication yard at Alpine Site Services, as well as from the project site during installation. The samples are to be collected and delivered to a material testing company for testing. The pile sections will be tested to verify the structural properties of the pipe material. For the 140 kip pile, the minimum fy for the steel must meet or exceed 70 ksi, and the minimum nominal material thickness must be 0.360 inches for the pipe shaft wall thickness. Samples shall be taken for testing from the site at the rate of one sample per 200 sections or portions thereof of piling installed.

**Installation Torque Logs:**

Installation Torque Logs will be reviewed as they become available during production pile installation. Review of the logs will verify that minimum required torques per the compression load test documentation were achieved, and/or that satisfactory steps were taken to correct any piers that did not achieve specified torque. Special Inspection reports provided by the geotechnical engineer will also be reviewed to verify that minimum installation depths are achieved, or that acceptance was provided for any piers that did not meet the minimum depth requirement.

Should questions arise, or if further information is required, please contact our office.

Sincerely,

Anchor Engineering & Inspection, Inc.

Reviewed by,

Richard M. Schauppner, P.E.  
Project Manager

Eric A. Hanson, P.E.  
Principal