PROJECT MANUAL FOR:

Barnard Hall Room 105
Cleanroom Installation

MONTANA STATE UNIVERSITY
BOZEMAN, MONTANA

January 25, 2017

PPA No. 16-0002

SET NO.:
CONSTRUCTION DOCUMENT SET

SPECIFICATION MANUAL FOR
BARNARD HALL ROOM 105 CLEANROOM INSTALLATION
MSU – BOZEMAN
PPA #16-0002
January 25, 2017

MECHANICAL AND ELECTRICAL ENGINEER:
CONSULTING DESIGN SOLUTIONS, INC

ARCHICECT:
ARCHITECTURE 118
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- Invitation To Bid
- Instructions to Bidders
- Bid Proposal, Form 098

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- MSU Supplemental Conditions
- State of Montana General Conditions
- Montana Prevailing Wage Rates

The following documents are included in electronic versions but not included in the printed project manual.
- Substitution Request, Form 99
- Schedule of Values for Payment, Form 100
- Periodic Estimate for Partial Payment, Form 101
- Acknowledgement of Subcontractors, Form 102
- Consent of Surety to Final Payment, Form 103
- Contract Change Order, Form 104
- Contractor’s Affidavit, Form 106
- Certificate of Substantial Completion, Form 107
- Construction Change Directive, Form 109
- Request for Information, Form 111
- Performance Bond, Form 112
- Labor and Material Payment Bond, Form 113
- Certificate of Final Acceptance, Form 118

Additionally these can be downloaded from our website: [http://www.montana.edu/pdc/contract-documents.html](http://www.montana.edu/pdc/contract-documents.html) – or will be provided upon request.

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The Contractor will be responsible for paying the city of Bozeman Building Inspection Division for building, electrical, mechanical, and plumbing permits.

The Owner will be responsible for paying the city of Bozeman plan review fee and impact fees.

CITY OF BOZEMAN
BUILDING INSPECTION DIVISION
20 EAST OLIVE STREET
SUITE 208
BOZEMAN, MONTANA  59715
(406) 582-2375
INVITATION TO BID

Sealed bids will be received until **2:00 PM on Thursday, February 23, 2017**, and will be publicly opened and read aloud in the offices of MSU Campus Planning, Design and Construction, Plew Building, 6th & Grant, Bozeman, Montana, for: Barnard Hall Room 105 Cleanroom Installation, PPA No. 16-0002.

Bids shall be submitted on the form provided within the Contract Documents. Contract documents may be obtained at the offices of:

- **Montana State University**
- **Campus Planning, Design and Construction**
- **Plew Building, 6th & Grant**
- **PO Box 172760**
- **Bozeman, Montana 59717-2760**

On the web at: [http://www.montana.edu/pdc/bids.html](http://www.montana.edu/pdc/bids.html)

A PRE-BID WALK-THROUGH IS SCHEDULED FOR Tuesday, February 7, 2017, AT 10:00 AM. PARTICIPANTS SHOULD MEET AT: Plew Building, Facilities Conference Room 6th & Grant Street, MSU Bozeman Campus. ATTENDANCE IS STRONGLY RECOMMENDED. Bidders should thoroughly review the contract documents before the pre-bid conference.

Bids must be accompanied by a bid security meeting the requirements of the State of Montana in the amount of 10% of the total bid. After award, the successful bidder must furnish an approved Performance Security and a Labor & Material Payment Security each in the amount of 100% of the contract for contracts equal to or greater than $25,000.

No bidder may withdraw his bid for at least thirty (30) calendar days after the scheduled time for receipt of bids except as noted in the Instructions to Bidders.

The Owner reserves the right to reject any or all bids and to waive any and all irregularities or informalities and the right to determine what constitutes any and all irregularities or informalities.

Time of Completion

Bidder agrees to commence work immediately upon receipt of the Notice to Proceed and to substantially complete the project **within (180) consecutive days**.

The State of Montana makes reasonable accommodations for any known disability that may interfere with an applicant’s ability to compete in the bidding and/or selection process. In order for the state to make such accommodations, applicants must make known any needed accommodation to the individual project managers or agency contacts listed in the contract documents.

State of Montana - Montana State University

Facilities Services

Campus Planning, Design and Construction

Approved by: ____________________

University Engineer

Approved by: ____________________

University Architect
1. **Table of Contents**

*Provided in the Printed Project Manual:*

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- Instruction to Bidders
- Bid Proposal, Form 098
- Sample Standard Form of Contract
- State of Montana General Conditions
- MSU Supplementary Conditions
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*These additional forms can be found on our website or will be provided upon request:*

- Substitution Request, Form 99
- Schedule of Values, Form 100
- Periodic Estimate for Partial Payment, Form 101
- Acknowledgement of Subcontractors, Form 102
- Consent of Surety to Final Payment, Form 103
- Contract Change Order, Form 104
- Contractor’s Affidavit, Form 106
- Certificate of Substantial Completion, Form 107
- Construction Change Directive, Form 109
- Request for Information, Form 111
- Performance Bond, Form 112
- Labor and Material Payment Bond, Form 113
- Certificate of Final Acceptance, Form 118

2. **Viewing of Contract Documents**

2.1. The Contract Documents may be viewed at the following locations:

- Builders Exchange of Billings
  - 2050 Broadwater STE A
  - Billings MT 59102
  - 406/652-1311
  - bbx@billingsplanroom.com

- Bozeman Builders Exchange
  - 1105 Reeves RD W STE 800
  - Bozeman MT 59718
  - 406/586-7653
  - exchange@bozmanplanroom.com

- Great Falls Builders Exchange
  - 202 2ND Avenue S
  - Great Falls MT 59401
  - 406/453-2513
  - gfbe@greatfallsplans.com

- Butte Builders Exchange
  - 4801 Hope Road
  - Butte MT 59701
  - 406/782-5433
  - butteplans@gmail.com

3. **Borrowing of Documents:** Up to two hard copy sets may be obtained for General Contractors. Additionally, Contract Documents will be available electronically. If shipping of hard copies is required, it will be at the contractor’s expense.

3.1. Contract Documents may be obtained at the office of:

MONTANA STATE UNIVERSITY
CAMPUS PLANNING, DESIGN & CONSTRUCTION
PLEW BUILDING 1st FLOOR
6TH AND GRANT
BOZEMAN, MONTANA 59717-2760
406/994-5413

3.2. All borrowed Contract Documents shall be returned to Campus Planning, Design & Construction within ten (10) calendar days after the bid opening for the deposit refund (if deposit was required). However, if the Contract Documents are not in a condition where they can be reused by the Owner to construct the project, the Owner may at its sole discretion may retain the deposit or levy costs to contractor in order to
4. Visits to Site

4.1. Prospective bidders are requested to contact the following for inspection of the site:

Loras O’Toole, Project Manager  
Montana State University  
Campus Planning, Design & Construction  
6th and Grant, PO Box 172760  
Bozeman, Montana 59717-2760  
Ph: 406/994-7092; Fax: 406/994-5665

4.2. Failure to visit site will not relieve the Contractor of the conditions of the contract.

5. Requests for Substitution

5.1. Any requests for product substitutions must be submitted on the “Substitution Request” Form 099, to the Architect/Engineer at least ten (10) days prior to the date of the bid opening for consideration by the Architect/Engineer. Any request for substitution made after this time restriction, including those made after award during project construction may be rejected without consideration by either the Architect/Engineer or the Owner.

6. Bids/Proposals

6.1. The bidder shall submit his bid on the Bid Proposal Form furnished with the Contract Documents.

6.2. DO NOT send the Contract Documents with the Proposal. The Contract Documents shall be returned as noted in Article 3.2 of the Instructions to Bidders.

6.3. If the project is funded by any portion of federal funds, the following may apply: on Federally-funded projects, a “Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion” form must be submitted with the bid proposal. If the debarment form is not included within the Construction Documents, federal funds (if included) do not require the form or are not included in the project and the debarment form is not required.

6.4. Proposals shall be in a sealed envelope and addressed to:

STATE OF MONTANA, MONTANA STATE UNIVERSITY  
CAMPUS PLANNING, DESIGN & CONSTRUCTION  
PLEW BUILDING 1ST FLOOR  
6TH AND GRANT  
PO BOX 172760, BOZEMAN, MONTANA 59717-2760

6.5. The envelope shall state that it contains a “BID PROPOSAL” and indicate the following information:

Name of Project: Barnard Hall Room 105 Cleanroom Installation  
Location: Montana State University Bozeman Campus  
MSU PPA Project Number: 16-0002  
Name of Bidder: 
Acknowledge Addendum Number: __, __, __, __

6.6. It is the bidder’s responsibility to deliver or ensure delivery of the bid proposal to Montana State University, Campus Planning, Design, and Construction. Proposals received after the scheduled closing time for bids by either the bidder, a delivery service (e.g. Federal Express, U.S. Postal Service, United Parcel Service, etc.), or the state’s own mail delivery system, will be rejected. Proposals entitled for consideration must be time-stamped in the Owner’s office prior to the closing time for receipt of bids. The official time clock for receipt of bids and fax modifications is the Owner’s time and date stamp clock located in the reception area of the Owner’s office. No other clocks, calendars or timepieces are recognized. All bidders are responsible to ensure all bids and fax modifications are received in the Owner’s office prior to the scheduled closing time.

6.7. If requested on the Bid Proposal, any person making a bid to perform the Work shall, as a requirement of a responsible bid, set forth the name of each subcontractor specified in the “List of Subcontractors” which is part of the bid proposal. The bidder shall list only one subcontractor for each such portion or work
listed. The bidder whose bid is accepted shall not:

6.7.1. Substitute any other subcontractor in place of the subcontractor listed in the original bid, except by specific consent of the Owner. The Owner, at its sole discretion, may grant substitution with consent of the originally listed subcontractor, or in consideration of other factor(s) involved if deemed relevant to the successful performance of the Contract.

6.7.2. Permit any such subcontract to be voluntarily assigned, transferred or allow it to be performed by any party other than the subcontractor listed in the original bid without the consent of the Owner.

6.8. Bid Proposals entitled to consideration shall be made in accordance with the following instructions:

6.8.1. Made upon form provided;
6.8.2. All blank spaces properly filled;
6.8.3. All numbers stated in both writing and in figures;
6.8.4. Shall contain no additions, conditional or alternate bids, erasures or other irregularities;
6.8.5. Shall acknowledge receipt of all addenda issued.

6.9. Bid Proposals entitled to consideration shall be signed by the proper representative of the firm submitting the proposal as follows:

6.9.1. The principal of a single owner firm;
6.9.2. A principal of a partnership firm;
6.9.3. An officer of an incorporated firm, or an agent whose signature is accompanied by a certified copy of the resolution of the Board of Directors authorizing that agent to sign; or,
6.9.4. Other persons signing for a single-owner firm or a partnership shall attach a power-of-attorney evidencing his authority to sign for that firm.

6.10. Unit Prices: When a Bid Proposal Form contains unit prices, any errors discovered in the extension of those unit prices will be corrected by the Owner using the unit price figures. The adjusted extended amount will then be used to determine the correct total bid. Only after the amounts have been checked and adjusted, if necessary, will the valid low bid be determined.

6.11. Estimated Quantities: All estimated quantities stipulated in the Bid Proposal and other Contract Documents are approximate and are to be used only as a basis for estimating the probable cost of the work and for the purpose of comparing proposals submitted for the work. It is understood and agreed that the actual amounts of work done and materials furnished under unit price items may vary from such estimated quantities. The actual quantities will depend on the conditions encountered at the time the work is performed.

6.12. Any bidder may modify his bid by fax communication only.
6.12.1 It is the bidder’s responsibility to ensure that the entire modification is received at the bid opening location prior to the scheduled closing time for receipt of bids. The modification shall not reveal the bid price, but shall only provide the ADDITION or SUBTRACTION from the original proposal.
6.12.2 The Owner is not responsible for the performance of the facsimile/printer machine, maintaining adequate paper levels, toner levels, the telephone connection, quality of the facsimile, or any other factors affecting receipt of the fax. Unreadable or difficult-to-read facsimiles may be rejected at the sole discretion of the Owner.
6.12.3 Changes in the listed subcontractors, if any, shall also be provided.
6.12.4 Bid modifications must be verified by hard copy provided to the Owner within two (2) business days after the bid opening.
6.12.5 Bid modifications shall be directed to fax phone (406) 994-5665.
6.12.6 All facsimiles shall be date and time stamped on the same time-stamp clock in the Owner’s office that is used for receipt of bids in order to be considered valid. The Owner may also use the date and time on the automatically-generated email notification of facsimile receipt as generated by the State’s system. Any date and time indicated at the top of the facsimile on either the bidder’s or the Owner’s facsimile/printer machine will not be used in determining time of arrival of the modification.

6.13. The Owner reserves the sole right to reject any or all bids and to waive any irregularities or informalities. The Owner also reserves the sole right to determine what constitutes irregularities or informalities and/or
7. **Bid Security**

7.1. **IF THE PROJECT COST IS LESS THAN $25,000, AT ITS SOLE DISCRETION THE STATE OF MONTANA MAY OR MAY NOT REQUIRE BID SECURITY (18-2-302 MCA).**

7.2. All proposals shall be accompanied by a bid security in the amount of 10% of the bid price, as evidence of good faith (18-2-302 MCA). *(MSU does not waive bid security.)*

7.3. Bid security shall be in the form of lawful moneys of the United States, cashier's check, certified check, bank money order or bank draft, bid bond or bonds payable to the State of Montana (18-2-302 MCA).

7.4. If the bidder, to whom a contract is awarded, fails to enter into and execute the proposed contract within fifteen (15) calendar days of award, the bidder shall forfeit the bid security (18-1-204 MCA).

7.5. The bid security of unsuccessful bidders will be returned when the contract has been awarded to the successful bidder or when all bids have been rejected (18-1-205 MCA).

7.6. Execution of and entering into a contract includes providing all necessary insurance certificates, bonds, signed contract and current copy of the construction contractor registration certificate.

7.7. **NOTE: PER STATE POLICY, IF CASH, CHECK, MONEY ORDER, OR BANK DRAFT ARE PROVIDED AS BID SECURITY, IT WILL BE DEPOSITED IN THE TREASURY. UNSUCCESSFUL BIDDERS WILL HAVE THEIR SECURITY RETURNED UPON CONTRACT AWARD. THE SUCCESSFUL BIDDER’S SECURITY MAY BE RETURNED UPON ISSUANCE OF NOTICE TO PROCEED.**

8. **Withdrawal of Bids**

8.1. Any bidder may withdraw his bid proposal at any time prior to the scheduled closing time for the receipt of bids.

8.2. Once the closing time for the receipt of bids is reached, a bid may not be withdrawn for a period of thirty (30) calendar days.

9. **Interpretation of Contract Documents**

9.1. Bidders shall promptly notify the Architect/Engineer of any ambiguity, inconsistency, or error which they may discover upon examination of the Contract Documents or of the site and local conditions.

9.2. Bidders requiring clarification or interpretation of the Contract Documents shall request, in writing, clarification from the Architect/Engineer at least ten (10) calendar days prior to the date set for receipt of bids.

9.3. Any interpretations, corrections, or change in the Contract Documents prior to the bid opening will be made by written addendum issued by the Architect/Engineer. The Architect/Engineer will endeavor to notify all plan holders of any addenda issued but it shall be the responsibility of the individual bidders to insure they have received all addenda prior to the submission of their bid.

9.4. All written addenda issued by the Architect/Engineer will become part of the Contract Documents and all bidders shall be bound by such addenda whether or not received and/or acknowledged by the bidder. No oral or telephone modifications of the Contract Documents will be considered or allowed.

10. **Award of Bids**

10.1. All bids received by the stated hour will be opened and publicly read aloud.

10.2. The Owner reserves the right to reject any and all bids and to waive any informality or irregularity in any bid received. Owner reserves the right to determine what constitutes material and/or immaterial informalities and/or irregularities.

10.3. The low bid shall be determined on the basis of the lowest Base Bid or the lowest combination of Base Bid and Alternate Bids, accepted in consecutive order.
10.4. The Owner shall award such contract to the lowest responsible bidder (18-1-102 MCA).

10.4.1. The Owner may make such investigations as it deems necessary to determine whether or not any or all bidders are responsible.

10.4.2. The term “responsible” does not refer to pecuniary ability only, nor the ability to tender sufficient performance and payment bonds.

10.4.3. The term “responsible” includes, but is not limited to:
   10.4.3.1. Having adequate financial resources to perform the contract or the ability to obtain them;
   10.4.3.2. Being able to comply with the required delivery, duration, and performance schedule;
   10.4.3.3. Having a satisfactory record of integrity and business ethics;
   10.4.3.4. Having the necessary organization, experience, accounting, and operational controls;
   10.4.3.5. Having the necessary production, construction, technical equipment, and facilities; and,
   10.4.3.6. Having the technical skill, ability, capacity, integrity, performance, experience, lack of claims and disputes, lack of actions on bonds, lack of mediations, arbitrations and/or lawsuits related to construction work or performance, and such like.

10.4.4. Bidders shall furnish to the Owner all information and data for this purpose as the Owner may request.

10.4.5. The Owner reserves the right to reject any bid if the investigation or evidence of any Bidder fails to satisfy the Owner that such Bidder is properly and adequately qualified to suitably perform and satisfactorily execute the obligations of the Contract and Work defined in the Contract Documents.

10.5. The Owner shall award such contract to the lowest responsible bidder without regard to residency except on a reciprocal basis: a resident bidder will be allowed a preference on a contract against the bid of any non-resident bidder from any state or country that enforces a preference for resident bidders. The preference given to resident bidders of the State of Montana must be equal to the preference given in the other state or country (18-1-102, MCA). This does not apply when prohibited by Federal requirements.

10.6. The State of Montana may negotiate deductive changes, not to exceed 7% of the total cost of the project, with the lowest responsible bidder when the lowest responsible bids causes the project cost to exceed the appropriation; or with the lowest responsible bidders if multiple contracts will be awarded on the projects when the total of the lowest responsible bids causes the project cost to exceed the appropriation. A bidder is not required to negotiate his bid but is required to honor his bid for the time specified in the bidding documents. The Owner may terminate negotiations at any time (18-2-105(7) MCA).

11. Contract

11.1. The sample Standard Form of Contract between Contractor and Owner, as issued by the Owner, will be used as the contracting instrument and is bound within the Contract Documents.

11.2. The form shall be signed by a proper representative of the bidder as defined above in these instructions.

11.3. The contractor shall also complete and return a federal form W-9 with the Contract.

12. Performance, Labor and Material Payment Security

12.1. IF THE PROJECT COST IS LESS THAN $25,000, AT ITS SOLE DISCRETION THE STATE OF MONTANA MAY OR MAY NOT REQUIRE A PERFORMANCE OR LABOR AND MATERIAL PAYMENT SECURITY (18-2-201 MCA). (MSU REQUIRES BONDS ON ALL PROJECTS ABOVE $25,000.)

12.2. THE CONTRACTOR SHALL PROVIDE BOTH SECURITIES FOR THIS PROJECT AS SPECIFIED BELOW, UNLESS SPECIFICALLY DIRECTED THAT THIS REQUIREMENT HAS BEEN WAIVED ELSEWHERE IN THESE DOCUMENTS.

12.3. The Owner shall require the successful bidder to 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).
12.4. The Owner shall require the successful bidder to 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).

12.5. The bonds shall be executed on forms furnished by the Owner. No other forms will be acceptable.

12.6. The bonds shall be signed in compliance with State statutes (33-17-111 MCA).

12.7. Bonds shall be secured from a State licensed bonding company.

12.8. Power of Attorney

12.8.1. Attorneys-in-fact who sign contract bonds must file with each bond a certified and effectively dated copy of their power of attorney;
12.8.2. One original copy shall be furnished with each set of bonds.
12.8.3. Others furnished with a set of bonds may be copies of that original.

13. Notice To Proceed

13.1. The successful bidder who is awarded the contract for construction will not be issued a Notice to Proceed until there is a signed Contract, the specified insurance certificates and a copy of the bidder’s current Construction Contractor Registration Certificate in the Owner’s possession. All items are required within fifteen (15) calendar days of contract award made by the Owner.

14. Laws and Regulations

14.1. The bidders’ attention is directed to the fact that all applicable federal and state laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over the project shall apply to the contract throughout and will be deemed to be included in this contract as if bound herein in full.

15. Payments

15.1. 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.

16. Time of Completion

16.1. Bidder agrees to commence work immediately upon receipt of the Notice to Proceed and to substantially complete the project within (180) consecutive days).

16.2. If liquidated damages are assessed for exceeding the completion date, they shall accrue at the rate of ONE HUNDRED 00/100 DOLLARS ($100.00) per calendar day. Liquidated damages charges will be deducted from the amount due the Contractor.

~END OF INSTRUCTIONS~
TO:
State of Montana, Montana State University
Campus Planning, Design, and Construction
Attn: Rebecca Barney, Contract Administrator
Plew Building, 6th & Grant, PO Box 172760
Bozeman, Montana 59717-2760

Prospective Bidders:

The undersigned, having familiarized themselves with the Contract Documents, site, location, and conditions of the Work as prepared by Consulting Design Solutions, Inc., 7540 Churchill Road, Manhattan, Montana 59741, 406/282-7082, by submission of this Bid Proposal, hereby agrees to provide all materials, systems, equipment and labor necessary to complete the Work for the total sum as follows:

BASE BID:

 and ___ /100 DOLLARS.

(ALPHA notation) $ (NUMERIC notation)

ALTERNATE NO. 1: DEDUCTIVE provide the alternate self-contained air handling unit in lieu of the base bid unit and remote water source heat pump. See base bid and alternative plans, schedules, specifications and details for required components.

THE BIDDER AGREES TO DEDUCT THE SPECIFIED SCOPE OF WORK FOR THE TOTAL SUM OF:

 and _____ /100 DOLLARS

(ALPHA notation) $ (NUMERIC notation)

This bidder acknowledges receipt of the following addenda:

ADDENDUM No.: _____ Dated: _____
ADDENDUM No.: _____ Dated: _____
ADDENDUM No.: _____ Dated: _____
By signing below, the bidder agrees to all terms specified and AGREES TO fulfill the requirements of the CONTRACT in strict accordance with the bidding documents.

Company Name: __________________________________________
Signature: ________________________________________________
Print Name: ______________________________________________
Title: ____________________________________________________
Business Address: _________________________________________
Construction Contractor Registration No.: _____________________
Phone No.: ________________________________________________
Fax No.: _________________________________________________
Email: ____________________________________________________
Date: ____________________________________________________
STANDARD FORM OF CONTRACT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION

THIS CONTRACT IS SUBJECT TO ARBITRATION PURSUANT TO THE UNIFORM ARBITRATION ACT, MCA TITLE 27, CHAPTER 5

This CONTRACT is made as of: (date)

BETWEEN:

[FIRM NAME]
[ADDRESS]
[CITY, STATE, ZIP]
[PHONE, FAX]

Herein after identified as the “CONTRACTOR” and the State of Montana, acting through its Director, Campus Planning, Design, and Construction, hereinafter identified as the “OWNER”:

State of Montana
Montana State University
Facilities Services
Plew Building 6th & Grant, PO Box 172760
Bozeman, Montana 59717-2760

WITNESSETH that the Contractor and the Owner, for the consideration hereinafter named, agree as follows:

ARTICLE 1 – SCOPE OF WORK
The Contractor shall perform all Work as shown in the Contract Documents entitled:

[PROJECT NAME]
PPA NO.: [PPA NO.]
Bid Documents Dated: (alpha date)

As prepared by:

[FIRM NAME]
[ADDRESS]
[CITY, STATE, ZIP]
[PHONE, FAX]

Hereinafter identified as the “ARCHITECT/ENGINEER.”

ARTICLE 2 – TIME OF COMPLETION
As time is of the essence in performance, coordination, and completion of the Work contemplated under this Contract, the Work to be performed shall commence on a date set forth by the Owner in a written “Notice To Proceed” and shall be completed Within or by:

CONSECUTIVE CALENDAR DAYS.

If the Work is not completed within the time specified, the Owner may assess liquidated damages in the amount of:

[DOLLARS IN ALPHA] DOLLARS ($numeric) PER CALENDAR DAY.

ARTICLE 3 – CONTRACT SUM
The Owner shall pay the Contractor for performance of the Work, subject to additions and/or deductions by Change Order or damages as provided in the Contract Documents, the Contract Sum of:

[DOLLARS IN ALPHA] DOLLARS ($dollars in numeric).

ARTICLE 4 – PROGRESS PAYMENTS
The Owner shall make payments on account in accordance with the Contract Documents as follows: Ninety-Five (95%) of the portion of the Contract Sum for labor, materials, and equipment incorporated in the Work and for materials suitable stored. The Contractor shall be aware that the Owner has thirty-five (35) calendar days upon receipt in which to make approval and payment without being in
violation of statute or being subject to the accrual of interest shall, or the need to make written notice or justification to deny payment in whole or in part. The Contractor shall, within seven (7) calendar days following receipt of payment from the Owner, make payment to subcontractor(s).

ARTICLE 5 – FINAL PAYMENT
Final Payment, constituting the entire unpaid balance of the Contract Sum, shall be paid by the Owner to the Contractor when: 1) the Work is completed in accordance with the Contract Documents; 2) the Contract fully performed; 3) a final Form 101, Periodic Estimate for Partial Payment showing the final correct amounts is approved by the Architect/Engineer; 4) a Form 106, “Contractor’s Affidavit of Completion, Payment of Debts and Claims, and Release of Liens” is completed and submitted; and 5) a Form 103, “Consent of Surety Company To Final Payment” if required, is completed and submitted.

ARTICLE 6 – CONTRACT DOCUMENTS
The Contract Documents, together with this Contract, form the entire Contract and Agreement between the Contractor and Owner. The Contract Documents, which are totally and completely a part of this Contract as if attached hereto or repeated herein, are enumerated in the General Conditions of the Contract for Construction inclusive of Wage Rates, Reports, and all other items bound with the Specifications and/or Project Manual(s).

ARTICLE 7 – PREVAILING WAGE SCHEDULE
The Contractor and all subcontractors at any tier or level shall, as a minimum, pay the standard prevailing rate of wages schedule (including per diem, fringe benefits for health, welfare, and pension contributions and travel allowance) in effect and as applicable to the district in which the Work is being performed.

ARTICLE 8 – VENUE
In the event of any mediation, arbitration, or litigation concerning any matter or dispute arising out of or related to the Contract, venue shall be the Eighteenth Judicial District in and for the County of Gallatin, Montana. The Contract shall be interpreted and subject to the laws of the State of Montana.

ARTICLE 9 – MISCELLANEOUS PROVISIONS
Other documents if any forming part of these contract documents are as follows:
Addendum #1 dated: _____ Addendum #2 dated: _____ Addendum #3 dated: _____
Contractor’s Bid Proposal dated: _____
Contractor’s Revised Proposal dated: _____

EXECUTION OF THIS CONTRACT
This Contract is entered into as of the day and year first written above:

CONTRACTOR: (COMPANY)-owner
(ADDRESS)
(CITY, STATE, ZIP)
(PHONE, FAX)

SAMPLE

 ih

 OWNER: STATE OF MONTANA
MONTANA STATE UNIVERSITY
FACILITIES SERVICES
6TH & GRANT AVENUE, P.O. Box 172760
BOZEMAN, MONTANA 59717-2760

Jeff Butler, Director

Please refer to PPA No. in all correspondence.
### FRONT PAGE HIGHLIGHTS

Note: This list of items is not an exhaustive or all-inclusive list of the contractor’s responsibilities for the Project but is provided solely for convenience and reference.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>REFERENCE</th>
<th>GENERAL CONDITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevailing Wage Rates</td>
<td>Article 3.4.4</td>
<td>The Commissioner of The Montana Department of Labor and Industry (DOL) has established the standard prevailing rate of wages in accordance with 18-2-401 and 18-2-402, MCA.</td>
</tr>
<tr>
<td>Warranty</td>
<td>Article 3.5.2</td>
<td>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.</td>
</tr>
<tr>
<td>Schedule</td>
<td>Article 3.10.1</td>
<td>The Contractor's schedule shall be in the &quot;Critical Path Method&quot; and shall be in a form that is acceptable to the Owner and meet all the conditions of 3.10.</td>
</tr>
<tr>
<td>Time Limit on Claims</td>
<td>Article 4.5.1.</td>
<td>Claims by either party must be initiated within 21 calendar days after occurrence of the event giving rise to such claim.</td>
</tr>
<tr>
<td>Weather Delays</td>
<td>Article 4.3.5.2</td>
<td>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 current critical-path scheduled construction activities.</td>
</tr>
<tr>
<td>Waiver of Consequential Damages</td>
<td>Article 4.3.6</td>
<td>The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract.</td>
</tr>
<tr>
<td>Mediation &amp; Arbitration</td>
<td>Article 4.5 &amp; 4.6</td>
<td>The parties shall endeavor to resolve their Claims by mediation unless the parties mutually agree otherwise. Claims not resolved by mediation shall be decided by arbitration.</td>
</tr>
<tr>
<td>Changes</td>
<td>Article 7</td>
<td>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.</td>
</tr>
<tr>
<td>Change Order Allowable Costs</td>
<td>Article 7.2.2.1</td>
<td>As described with a 5% allowance for overhead and a 10% allowance for profit.</td>
</tr>
<tr>
<td>Time</td>
<td>Article 8</td>
<td>Time is of the essence in performance, coordination, and completion of the Work contemplated herein.</td>
</tr>
<tr>
<td>Liquidated Damages</td>
<td>Article 8.1.6</td>
<td>The Contractor and his surety shall be liable for and shall pay to the Owner the sums stipulated as liquidated damages for each calendar day of delay until the Work is substantially complete.</td>
</tr>
<tr>
<td>Contract Duration/Milestones/Phases</td>
<td>Article 8.1.8</td>
<td>All Work shall reach Substantial Completion by the date(s) listed or within the consecutive calendar days indication after the start date on the written Notice To Proceed.</td>
</tr>
<tr>
<td>Applications for Payment</td>
<td>Article 9.3.2</td>
<td>The Owner has thirty-five (35) calendar days after receipt for approval of the Contractor's Pay Request without being subject to the accrual of interest.</td>
</tr>
<tr>
<td>Retainage</td>
<td>Article 9.3.7</td>
<td>Until the Work is complete, the Owner will pay 95% of the amount due the Contractor on account of progress payments. 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.</td>
</tr>
<tr>
<td>Safety &amp; Protection</td>
<td>Article 10</td>
<td>The Contractor shall be solely responsible for initiating, maintaining and supervising all safety, safety precautions, and safety programs in connection with the performance of the Contract.</td>
</tr>
<tr>
<td>Indemnification and Insurance Requirements</td>
<td>Article 11</td>
<td>The Contractor shall indemnify the Owner against the Contractor's negligence. The Contractor shall least carry Workers' Comp, General Liability, Automobile/Equipment, and Property (all-risk) Insurance Coverages as identified. State of Montana shall be listed as an additional insured with copy of ENDORSEMENT provided along with certificates of insurance. No waivers of subrogation shall be accepted.</td>
</tr>
<tr>
<td>Performance &amp; Payment Bonds</td>
<td>Article 11.7</td>
<td>The Contractor shall furnish a Performance Bond in the amount of 100% of the contract price as security for the faithful performance of his contract. 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.</td>
</tr>
<tr>
<td>Payroll &amp; Basic Records</td>
<td>Article 13.8</td>
<td>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.</td>
</tr>
</tbody>
</table>
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) Contract; 2) Addenda; 3) Supplementary General Conditions; 4) General Conditions; 5) Specifications; 6) Drawings; 7) Instructions To Bidders; 8) Invitation To Bid; 9) Sample Forms.

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

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

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

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

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

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.

1.1.2. **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.

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

1.1.4. **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.

1.1.5. **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.

1.1.6. **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.

1.1.7. **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.

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

1.2.1. 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.

1.2.2. Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade. It is the Contractor’s responsibility to control the Work under the Contract.

1.2.3. 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.

1.3. **CAPITALIZATION**

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.

1.4. **INTERPRETATION**

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

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

1.5.1. 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.

1.5.2. 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.
1.5.3. 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.

1.5.4. 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.

1.5.4.1. 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.

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

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

1.6.1. 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.

1.6.2. 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**

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**

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.

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 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)

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 for the building permit and other permits and governmental fees, licenses and inspections necessary 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, and any required impact fees and which are legally required when bids are received or negotiations concluded.

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:

- 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 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.

3.9.3. 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.

3.9.4. 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.

3.9.5. 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.

3.9.6. 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 provide written reports of all logic and resource loading data with the Schedule and with all
updates to the Schedule.

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 duration, 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
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 within sixty (60) calendar days of 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 Architect/Engineer, 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 bare all costs and delays (including and costs of delay) for any damage, endangerment, compromise, or destruction of any part of the Project or site.

3.14. 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, material and equipment suppliers, their agents 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 construction means, methods, techniques, sequences or procedures. The Architect/Engineer's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

4.2.8. The Architect/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:

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

______________________________
(Name)
Of ________________________________
(Company)

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)"

4.3.2. Continuing Contract Performance.

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.

4.3.3. Claims for Cost or Time for Concealed or Unknown Conditions.

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.

4.3.3.1. 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.

4.3.3.2. 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.

4.3.3.3. 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.

4.3.4. Claims for Additional Cost.

4.3.4.1. 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.

4.3.4.2. 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.

4.3.5. Claims for Additional Time

4.3.5.1. 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.

4.3.5.2. Weather Delays:

4.3.5.2.1. 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.

4.3.5.2.2. 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. 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.

4.3.5.2.3. 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 there from, 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.

4.3.5.2.4. 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.

4.3.5.2.5. 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.
4.3.5.2.6. 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.

4.3.5.3. 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.

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

4.3.5.5. 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.

4.3.6. Claims for Consequential Damages

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

4.3.6.1.1. 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,

4.3.6.1.2. 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.

4.3.6.2. 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.

4.4. RESOLUTION OF CLAIMS, DISPUTES, AND CONTROVERSIES

4.4.1. 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.

4.4.2. 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.

4.4.3. 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.

4.4.4. 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.

4.4.5. 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.

4.4.6. 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.

4.4.7. 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.

4.4.8. 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.

4.5. MEDIATION

4.5.1. 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.

4.5.2. 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.
4.5.3. 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.

4.6. ARBITRATION

4.6.1. 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).

4.6.2. 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.

4.6.3. 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 & Clark 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.

4.6.4. 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.

4.6.5. 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.

4.6.6. 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.

4.6.7. 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.

4.6.8. 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.

4.6.9. 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.

4.6.10. 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 responsive 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 accordance with 39-51-1104 MCA, any Contractor who is or becomes an employer under the provisions of Title 39, Chapter 51 of Montana Code Annotated, who contracts with any Subcontractor who also is or becomes an employer under the provisions of Title 39, Chapter 51 of Montana Code Annotated, shall withhold sufficient money on the contract to guarantee that all taxes, penalties, and interest are paid upon completion of the contract.

5.3.5.1. It is the duty of any Subcontractor who is or becomes an employer under the provisions of Title 39, Chapter 51 of Montana Code Annotated, to furnish the Contractor with a certification issued by the Montana Department of Labor and Industry, prior to final payment stating that said Subcontractor is current and in full compliance with the provisions of Montana Department of Labor and Industry.

5.3.5.2. Failure to comply shall render the Contractor directly liable for all taxes, penalties, and interest due from the Subcontractor, and the Montana Department of Labor and Industry has all of the remedies of collection against the Contractor under the provisions of Title 39, Chapter 51 of Montana Code Annotated, as though the services in question were performed directly for the Contractor.

5.3.6. 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.

5.3.7. 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.

5.4. CONTINGENT ASSIGNMENT OF SUBCONTRACTS

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

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 12.2.

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:

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 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.

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. Direct costs (only those listed in Subparagraph 7.3.9.1 through 7.3.9.5 are allowable);

7.2.3.2. Indirect costs (limited as a percentage on each Change Order per Supplementary General Conditions, Paragraph 7.2.2); and

7.2.3.3. Consequential items (e.g. time extensions, credits, logic, reasonableness, impacts, disruptions, dilution).

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: SEE INSTRUCTIONS TO BIDDERS.

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 by or within: SEE INSTRUCTIONS TO BIDDERS.

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.

8.3. 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 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. The use of electronic method shall be in the Owner’s format.

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.

9.3.7.5. 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. For the purposes of this paragraph regarding certification of payment, electronic mail and/or notes provided through the use of an electronic approval system shall constitute written notice.

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.

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 Contractors Affidavit of Completion Payment of Debts and Claims, and Release of Liens (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 (Form 103) to make final payment; 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. The Contractor shall not and is strictly prohibited from purchasing and/or installing any asbestos-containing materials or products as part of the Work. Should the Contractor do so, the Contractor shall be solely responsible for the immediate remediation and all costs, damages, loss, and/or expenses per Paragraphs 10.1.6, 10.2.2, 10.2.3, and 10.2.4.

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.

10.3.4. The Contractor's responsibility shall include repair or replacement of damaged utilities. 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 the Owner and the Architect/Engineer. If, after exposing an unlocated buried utility, the Contractor continues digging without notifying Owner and Architect/Engineer and further damages the utility, the Contractor will be fully and solely 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 Owner 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 the Owner. 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. claims under workers’ compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed;

11.1.2. claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor’s employees;

11.1.3. claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor’s employees;

11.1.4. claims for damages insured by usual personal injury liability coverage;

11.1.5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;

11.1.6. 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;

11.1.7. claims for bodily injury or property damage arising out of completed operations; and,

11.1.8. 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): 1) arising in favor of or asserted by third parties on account of damage to property, personal injury, or death which injury, death, or damage; or, 2) arising out of or resulting from performance or failure to perform, 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. $1,000,000 per occurrence; aggregate limit of $2,000,000;

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. AN ADDITIONAL INSURED ENDORSEMENT DOCUMENT SHALL BE SUBMITTED WITH THE CERTIFICATES OF INSURANCE. 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 ENDORESEMENTS 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://rmt.d.mt.gov/content/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://rmt.d.mt.gov/content/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.

11.5.2.2.2. 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

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 (18-2-201MCA). 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. Except as noted below, the Contractor is required to notify Surety of any increase in the contract amount resulting from a Change Order within 48 hours of signing and submitting a Change Order and shall submit a copy of Surety's written acknowledgment and consent to Owner before a Change Order can be approved. The Surety’s written acknowledgment and consent on the Change Order form shall also satisfy this consent requirement.

11.7.5.1. Surety consent shall not be required on Change Order(s) which, in the aggregate total amount of all Changes Orders, increase the original contract amount by less than 10%. However, the Contractor is still required to notify Surety of any increase in contract amount resulting from a Change Order(s) within 48 hours of signing and submitting every Change Order.

11.7.5.2. Surety is fully obligated to the Owner for the full contract amount, inclusive of all Change Orders, regardless of whether or not written acknowledgement and consent is received and regardless of whether or not the aggregate total of all Change Orders is more or less than 10% of the original contract amount.

11.7.5.3. A fax with hard copy to follow of Surety's written acknowledgment and consent 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.

12.2.2.2. 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.

12.2.2.3. 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.

15. **EQUAL OPPORTUNITY**

15.1. The Contractor and all Sub-contractors shall not discriminate against any employee or applicant for employment because of race, color, sex, pregnancy, childbirth or medical conditions related to pregnancy or childbirth, political or religious affiliation or ideas, culture, creed, social origin or condition, genetic information, sexual orientation, gender identity or expression, national origin, ancestry, age, disability, military service or veteran status, or marital status, or physical or mental disability and shall comply with all Federal and State laws concerning fair labor standards and hiring practices. The Contractor shall ensure that applicants are employed, and that employees are treated during employment, without regard to race, color, sex, pregnancy, childbirth or medical conditions related to pregnancy or childbirth, political or religious affiliation or ideas, culture, creed, social origin or condition, genetic information, sexual orientation, gender identity or expression, national origin, ancestry, age, disability, military service or veteran status, or marital status, or physical or mental disability.

15.2. 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.

15.3. 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, color, sex, pregnancy, childbirth or medical conditions related to pregnancy or childbirth, political or religious affiliation or ideas, culture, creed, social origin or condition, genetic information, sexual orientation, gender identity or expression, national origin, ancestry, age, disability, military service or veteran status, or marital status, or physical or mental disability.

[END OF GENERAL CONDITIONS]
SUPPLEMENTAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION
(REVISED MARCH 1, 2016)

ARTICLE 1 – GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.3 SPECIFICATIONS

1.1.3.1 ADD: “Approved”: When used to convey Architect’s/Engineer’s action on Contractor’s submittals, applications, and requests, “approved” is limited to Architect’s/Engineer’s duties and responsibilities as stated in the Conditions of the Contract.

1.1.3.2 ADD: “Directed”: A command or instruction by Architect/Engineer. Other terms including “requested,” “authorized,” “selected,” “required,” and “permitted” have the same meaning as “directed.”

1.1.3.3 ADD: “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.”

1.1.3.4 ADD: “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.

1.1.3.5 ADD: “Furnish”: Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

1.1.3.6 ADD: “Install”: Operations at Project site including unloading, temporarily shoring, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

1.1.3.7 ADD: “Provide”: Furnish and install, complete and ready for the intended use.

1.1.3.8 ADD: “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 or portion of the building on which the Project is to be built.

1.6.1 Insert in the sixth line: “All documents which constitute the instruments of service are the property of the Owner.”

In lieu of the phrase “Unless otherwise indicated, the Architect/Engineer and the Architect/Engineer’s consultants shall be deemed the authors of them… except as defined in the Owner’s Contract with the Architect/Engineer.”

ARTICLE 2 – THE OWNER

2.1 THE STATE OF MONTANA

2.1.1 ADD: The State of Montana includes its officers, elected and approved officials, employees and volunteers, and political subdivisions thereof. The State of Montana and Montana State University are synonymous throughout the contract documents.

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.

3.10 CONSTRUCTION SCHEDULES

3.10.1.1 ADD: A pre-construction meeting will be held at a time mutually agreed upon by the Owner, Architect/Engineer and Contractor at Campus Planning, Design and Construction, Montana State University, Bozeman, Montana. The contractor shall confirm the Contractor’s Construction Schedule for the Work. Coordination of operating requirements of the affected buildings, and surrounds, schedule of activities and Owner requirements will be discussed, as well as the order in which the Contractor intends to pursue the work. This schedule will be reviewed and must be mutually agreed upon by the Architect, Contractor and Owner.

3.11 DOCUMENTATION AND AS-BUILT CONDITIONS AT THE SITE

3.11.4 ADD: The contractor shall maintain at the site two (2) construction reference sets of all specifications, drawings, approved shop drawings, change orders and other modifications, addenda, schedules and instructions, in good order.

3.11.4.1 ADD: The record drawings shall be two (2) sets of black (or blue) and white prints of the drawings on which the contractor must record all “red line” changes during the course of construction and will include references to change order numbers, field directives, etc., and their dates. This record set shall be maintained separate and apart from documents used for construction reference. This set will be available for review by the project consultant, architect, engineer and MSU project manager at all times.

3.11.4.2 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.

3.11.4.3 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.

3.11.4.4 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.

3.11.4.5 ADD: The contractor shall prepare and maintain a binder with all project warranty information. This will be provided to the project consultant, architect or engineer at final acceptance.

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

3.13.3 ADD: MSU BOZEMAN Vehicle Regulations state:

“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."

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.

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.

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 MSU Facilities Services. In no case will vehicles be used on the Centennial Mall paving. Access routes are for delivery of equipment, tools, and not for parking.
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 ADD:** 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.

**3.13.5 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 breath 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.

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/)

**3.13.7 ADD:** The Contractor may use the University’s toilet facilities only as directed by the Owner.

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

**4.6. ARBITRATION**

**4.6.3 Insert** in the second line “the Eighteenth Judicial District, Gallatin County” in lieu of “First Judicial District, Lewis & Clark County.”

**4.6.11 ADD:** In responding to a claim brought by a Contractor, the Owner shall have a minimum of forty-five (45) days in which to respond to a revised claim prior to the arbitration hearing.

**ARTICLE 7 – CHANGES IN WORK**

**7.2 CHANGE ORDERS**

7.2.2.1 *Insert* the word “maximum” before “5%” and insert the word “maximum” before “10%”.

7.2.2.4 *ADD:* Total Change Order markup shall not exceed (cost of the work) x 1.15.

7.2.3.1 *Insert* at the beginning of the first sentence the word “Itemized”.

7.2.3.2 *Insert* at the beginning of the first sentence the word “Itemized”.

7.2.3.3 *Insert* at the beginning of the first sentence the word “Itemized”.

7.2.3.4 *ADD:* The Contractor shall provide a complete description summarizing all work involved.

**ARTICLE 8 - TIME**

**8.1. DEFINITIONS**

8.1.8.1 *ADD:* The Owner will issue a written Notice to Proceed on satisfactory receipt of the signed Contract and all required bonds, insurance and other required submittals. Work commenced before receipt of the Notice to Proceed will be entirely at the Contractor’s risk.
8.2. PROGRESS AND COMPLETION

8.2.5 ADD: 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

8.3.4 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.

ARTICLE 9 – PAYMENTS AND COMPLETION

9.3. APPLICATIONS FOR PAYMENT

9.3.7.2.1 Insert in the first line “Schedule of Values” in lieu of “Schedule of Amounts for Contract Payment”.

9.3.7.2.3 ADD: Subcontractor’s List: The Contractor shall list all subcontractors doing work in excess of $5,000.

9.8. SUBSTANTIAL COMPLETION

9.8.4.1 ADD: 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:

9.8.4.1.1 Removal of all debris and waste. All construction debris and waste shall be removed from the campus grounds. Use of the University trash containers will not be permitted.

9.8.4.1.2 Removal of all stains, smears, marks of any kind from surfaces including existing surfaces if said damage is the result of the work.

9.8.4.1.3 Removal of all temporary structures and barricades.

9.10. FINAL COMPLETION AND FINAL PAYMENT

9.10.2.4 Insert in the first line after the word “(Form 103)”: “for contracts greater than or equal to $25,000”

ARTICLE 10 – PROTECTIONS OF PERSONS AND PROPERTY

10.1. SAFETY

10.1.2 Insert in the second line before the word “safeguards”: “and as approved by Owner,”

10.1.2.1 ADD: The Contractor recognizes that the Work will be conducted in and around buildings and areas that are occupied and will continue to function for the purposes of the University. The Contractor shall conduct a project safety meeting prior to the start of the Work, with the Owner’s representative and all others that the Owner’s representative deems necessary. The purpose of the meeting shall be to produce project specific rules and guidelines pertaining to but not restricted to: safety of persons in and around the area of the Work including type and location of fencing, guards, signage, etc.; closing of existing campus circulation routes and designation of alternate routes, including creation of temporary routes of access as required; creation and location of temporary signage as required to
maintain accessible routes for handicapped access to and around the site of the Work. The Contractor shall be solely responsible for implementing all required means and methods for site safety and security that may be agreed upon in this meeting.

10.1.2.2 ADD: Contractor shall notify Owner any time his operations will disrupt use of and access to existing accessible routes. Contractor is solely responsible for maintaining existing accessible routes in the area of the project with the exception of temporary interruptions lasting one day or less. Contractor is responsible for erecting signage identifying temporary re-routing of accessible routes. Such re-routing shall be coordinated with Owner in advance.

10.3. UTILITIES

10.3.1 ADD: 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 ADD: "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 ADD: 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 ADD: 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 ADD: 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 ADD: 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 ADD: 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.

10.3.8 ADD: The Owner allows the contractor to use the Owner’s utilities (water, heat, electricity) services without charge for procedures necessary for the completion of the work.

ARTICLE 11 - INSURANCE AND BONDS

11.4. COMMERCIAL GENERAL LIABILITY INSURANCE

11.4.1.3. Insert in the first line after “State of Montana”: “, Montana State University”.

11.7. PERFORMANCE BOND AND LABOR & MATERIAL PAYMENT BOND (BOTH ARE REQUIRED ON THIS PROJECT)

11.7.1. Insert in the first line at the beginning of the sentence “For contracts equal to or greater than $25,000”.

11.8. CANCELLATION
11.8 **ADD** All Certificates shall contain a provision that coverage provided by the policies will not be cancelled without at least thirty (30) days prior notice to the Owner.

**ARTICLE 13 – MISCELLANEOUS PROVISIONS**

13.1. **GOVERNING LAW**

13.1.1. **Insert** in the second line “The Eighteenth Judicial District, Gallatin County” in lieu of “First Judicial District, Lewis and Clark County”.

**END OF SUPPLEMENTARY GENERAL CONDITIONS**
## Cost Estimate to Re-key Buildings

<table>
<thead>
<tr>
<th>Building</th>
<th>Core #</th>
<th>Cut keys</th>
<th>Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>AJM Johnson</td>
<td>112</td>
<td>448</td>
<td>$13,000.00</td>
</tr>
<tr>
<td>Animal BioScience</td>
<td>109</td>
<td>436</td>
<td>$13,000.00</td>
</tr>
<tr>
<td>ARC</td>
<td>122</td>
<td>488</td>
<td>$14,000.00</td>
</tr>
<tr>
<td>Athletics (Fieldhouse etc.)</td>
<td>500</td>
<td>2,000</td>
<td>$52,000.00</td>
</tr>
<tr>
<td>Cheever Hall</td>
<td>136</td>
<td>544</td>
<td>$18,000.00</td>
</tr>
<tr>
<td>Chem Building</td>
<td>229</td>
<td>916</td>
<td>$30,000.00</td>
</tr>
<tr>
<td>Chem Modular</td>
<td>16</td>
<td>64</td>
<td>$3,000.00</td>
</tr>
<tr>
<td>Cobleigh Hall</td>
<td>380</td>
<td>1,520</td>
<td>$41,000.00</td>
</tr>
<tr>
<td>Cooley Lab</td>
<td>99</td>
<td>396</td>
<td>$12,000.00</td>
</tr>
<tr>
<td>Creative Arts Complex</td>
<td>368</td>
<td>1,472</td>
<td>$50,000.00</td>
</tr>
<tr>
<td>Culbertson Hall</td>
<td>171</td>
<td>684</td>
<td>$23,000.00</td>
</tr>
<tr>
<td>Haynes Hall</td>
<td>113</td>
<td>452</td>
<td>$16,000.00</td>
</tr>
<tr>
<td>Howard Hall</td>
<td>119</td>
<td>476</td>
<td>$16,000.00</td>
</tr>
<tr>
<td>Huffman</td>
<td>39</td>
<td>156</td>
<td>$6,000.00</td>
</tr>
<tr>
<td>EPS</td>
<td>408</td>
<td>1,632</td>
<td>$45,000.00</td>
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<tr>
<td>EPS Complex</td>
<td>928</td>
<td>3,712</td>
<td>$106,000.00</td>
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<tr>
<td>Gaines Hall</td>
<td>175</td>
<td>700</td>
<td>$23,000.00</td>
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<tr>
<td>Grad Art</td>
<td>6</td>
<td>24</td>
<td>$2,000.00</td>
</tr>
<tr>
<td>Hamilton Hall</td>
<td>99</td>
<td>396</td>
<td>$16,000.00</td>
</tr>
<tr>
<td>Heat Plant</td>
<td>17</td>
<td>68</td>
<td>$3,000.00</td>
</tr>
<tr>
<td>Herrick Hall</td>
<td>118</td>
<td>472</td>
<td>$16,000.00</td>
</tr>
<tr>
<td>Kellog Center</td>
<td>35</td>
<td>140</td>
<td>$5,000.00</td>
</tr>
<tr>
<td>Leon Johnson Hall</td>
<td>313</td>
<td>1,252</td>
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</tr>
<tr>
<td>Lewis Hall</td>
<td>163</td>
<td>652</td>
<td>$21,000.00</td>
</tr>
<tr>
<td>Linfield Hall</td>
<td>295</td>
<td>1,180</td>
<td>$34,000.00</td>
</tr>
<tr>
<td>Margarete Hosaeus</td>
<td>134</td>
<td>536</td>
<td>$18,000.00</td>
</tr>
<tr>
<td>Marsh Lab</td>
<td>187</td>
<td>748</td>
<td>$24,000.00</td>
</tr>
<tr>
<td>McCall Hall</td>
<td>52</td>
<td>208</td>
<td>$9,000.00</td>
</tr>
<tr>
<td>Molecular Bean</td>
<td>5</td>
<td>20</td>
<td>$2,000.00</td>
</tr>
<tr>
<td>Montana Hall</td>
<td>156</td>
<td>624</td>
<td>$22,000.00</td>
</tr>
<tr>
<td>Museum of the Rockies</td>
<td>166</td>
<td>664</td>
<td>$25,000.00</td>
</tr>
<tr>
<td>OutDoor Rec</td>
<td>16</td>
<td>64</td>
<td>$3,000.00</td>
</tr>
<tr>
<td>Plant BioScience</td>
<td>112</td>
<td>448</td>
<td>$16,000.00</td>
</tr>
<tr>
<td>Plant Growth</td>
<td>152</td>
<td>608</td>
<td>$20,000.00</td>
</tr>
<tr>
<td>Reid Hall</td>
<td>302</td>
<td>1,208</td>
<td>$36,000.00</td>
</tr>
<tr>
<td>Renne Library</td>
<td>255</td>
<td>1,020</td>
<td>$32,000.00</td>
</tr>
<tr>
<td>Roberts Hall</td>
<td>140</td>
<td>560</td>
<td>$20,000.00</td>
</tr>
<tr>
<td>Romney</td>
<td>98</td>
<td>392</td>
<td>$15,000.00</td>
</tr>
<tr>
<td>Swingle Health Center</td>
<td>137</td>
<td>548</td>
<td>$18,000.00</td>
</tr>
<tr>
<td>Taylor Hall</td>
<td>56</td>
<td>224</td>
<td>$10,000.00</td>
</tr>
<tr>
<td>Traphagen Hall</td>
<td>148</td>
<td>592</td>
<td>$21,000.00</td>
</tr>
<tr>
<td>Univ. Record Storage</td>
<td>9</td>
<td>36</td>
<td>$2,000.00</td>
</tr>
<tr>
<td>VisComm (Black Box)</td>
<td>144</td>
<td>576</td>
<td>$21,000.00</td>
</tr>
<tr>
<td>Wilson Hall</td>
<td>325</td>
<td>1,300</td>
<td>$38,000.00</td>
</tr>
<tr>
<td>Mech Room</td>
<td>501</td>
<td>2,004</td>
<td>$30,000.00</td>
</tr>
</tbody>
</table>
# PROJECT CLOSEOUT CHECKLIST

**PROJECT TITLE:**

**CONTRACTOR:**

**CONSULTANT**

**Date:**

---

**To be submitted with Application of Final Payment**

<table>
<thead>
<tr>
<th>Contract Requirements</th>
<th>Date PM Verified</th>
<th>Date Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Required Documentation:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contractors Affidavit of Completion, MSU Form106 (all contracts)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final application for payment (all contracts)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certificate of Substantial Completion - MSU Form 107 (over $25K)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certificate of Final Acceptance - MSU Form118 (over $25K)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consent of Surety to final payment MSU Form103 (if over $25K)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**MSU PM**

Verification of All Change Orders & Final Amounts with Contract amounts

**Contractor to submit all deliverables to the Consultant**

**To be submitted with Application of Final Payment**

<table>
<thead>
<tr>
<th>Contractor Requirements</th>
<th>Date PM Verified</th>
<th>Date Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building keys returned to Owner</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final walk through and instructions to Owner</td>
<td></td>
<td></td>
</tr>
<tr>
<td>As-built “red lined” drawings (PDF Color Scan of Redlined Construction Set)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete set of project shop drawings/Product Data (3Sets)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demonstration &amp; Training</td>
<td></td>
<td></td>
</tr>
<tr>
<td>City of Bozeman Building Permits:</td>
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<td></td>
</tr>
<tr>
<td>☐ Fire Suppression test &amp; Certificate</td>
<td>☐ Electrical Inspection</td>
<td></td>
</tr>
<tr>
<td>☐ Fire Alarm test &amp; Certificate</td>
<td>☐ Temporary certificate of occupancy</td>
<td></td>
</tr>
<tr>
<td>☐ Elevator Inspection</td>
<td>☐ Final certificate of occupancy</td>
<td></td>
</tr>
<tr>
<td>☐ Plumbing &amp; HVAC test &amp; Inspection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final project inspection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notification of completion of punch list</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copy of warranty Binder</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Contractor Signature _______________________  Consultant Signature _______________________  Project Manager _______________________  

---

*Submit at Record Document Stage/Consultant shall submit Contractor Deliverables to Owner*

<table>
<thead>
<tr>
<th>Consultant Requirements</th>
<th>Date PM Verified</th>
<th>Date Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete set of record drawings (PDF &amp; AutoCAD files to CADD Mgr) 2 Paper sets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation &amp; Maintenance Manuals: including warrantees or guarantees for all equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2 copies – project, trades, building file, support manager: PDF &amp; Paper)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>☐ HVAC</td>
<td>☐ Fire Alarm</td>
<td></td>
</tr>
<tr>
<td>☐ Plumbing</td>
<td>☐ Roof</td>
<td></td>
</tr>
<tr>
<td>☐ Electrical</td>
<td>☐ Project Manual (Divisions 1-13)</td>
<td></td>
</tr>
<tr>
<td>☐ Elevator</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Consultant Signature _______________________  Project Manager _______________________
MONTANA
PREVAILING WAGE RATES FOR BUILDING CONSTRUCTION SERVICES 2017

Effective: January 7, 2017

Steve Bullock, Governor
State of Montana

Pam Bucy, Commissioner
Department of Labor and Industry

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

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

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

MONTANA PREVAILING WAGE REQUIREMENTS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

P. Projects of a Mixed Nature
Section 18-2-408, MCA states:

“(1) The contracting agency shall determine, based on the preponderance of labor hours to be worked, whether the public works construction services project is classified as a highway construction project, a heavy construction project, or a building construction project.

(2) Once the project has been classified, employees in each trade classification who are working on that project must be paid at the rate for that project classification”
Q. Occupations Definitions
You can find definitions for these occupations on the following Bureau of Labor Statistics website:
http://www.bls.gov/oes/current/oes_stru.htm

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

S. 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>$30.25</td>
<td>$30.30</td>
</tr>
<tr>
<td>District 2</td>
<td>$30.25</td>
<td>$30.30</td>
</tr>
<tr>
<td>District 3</td>
<td>$30.25</td>
<td>$30.30</td>
</tr>
<tr>
<td>District 4</td>
<td>$30.25</td>
<td>$30.30</td>
</tr>
</tbody>
</table>

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

**Travel:**
- **All Districts**
  - 0-120 mi. free zone
  - >120 mi. federal mileage rate/mi.

**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

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## 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>$26.58</td>
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</tr>
<tr>
<td>District 4</td>
<td>$26.22</td>
<td>$13.19</td>
</tr>
</tbody>
</table>

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

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## CARPENTERS

<table>
<thead>
<tr>
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<tbody>
<tr>
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</tr>
<tr>
<td>District 4</td>
<td>$22.50</td>
<td>$11.82</td>
</tr>
</tbody>
</table>

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

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

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CEMENT MASON AND CONCRETE FINISHERS

<table>
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<tr>
<td>District 4</td>
<td>$19.22</td>
<td>$10.36</td>
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</table>

Duties Include:
Smooth and finish surfaces of poured concrete, such as floors, walks, sidewalks, or curbs. Align forms for sidewalks, curbs, or gutters.

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

CONSTRUCTION EQUIPMENT OPERATORS GROUP 1

<table>
<thead>
<tr>
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<th>Benefit</th>
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<tr>
<td>District 4</td>
<td>$25.41</td>
<td>$12.05</td>
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</table>

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

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

<table>
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</tr>
<tr>
<td>District 4</td>
<td>$26.20</td>
<td>$12.05</td>
</tr>
</tbody>
</table>

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

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

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## CONSTRUCTION EQUIPMENT OPERATORS GROUP 3

<table>
<thead>
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<tr>
<td>District 4</td>
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<td>$12.05</td>
</tr>
</tbody>
</table>

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

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

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### CONSTRUCTION EQUIPMENT OPERATORS GROUP 4

<table>
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<tr>
<td>District 4</td>
<td>$28.95</td>
<td>$12.05</td>
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</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:**
- Asphalt/Hot Plant Operator; Cranes, 25 tons up to and incl. 44 tons; Crusher Operator; Finish Motor Patrol; Finish Scraper.

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### CONSTRUCTION EQUIPMENT OPERATORS GROUP 5

<table>
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<tr>
<td>District 4</td>
<td>$29.95</td>
<td>$12.05</td>
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</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, 45 tons up to and incl. 74 tons.

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### CONSTRUCTION EQUIPMENT OPERATORS GROUP 6

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<tr>
<td>District 4</td>
<td>$30.95</td>
<td>$12.05</td>
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</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).

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CONSTRUCTION EQUIPMENT OPERATORS GROUP 7

<table>
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</tr>
<tr>
<td>District 4</td>
<td>$31.95</td>
<td>$12.05</td>
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</tbody>
</table>

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

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

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CONSTRUCTION LABORERS GROUP 1 / FLAG PERSON FOR TRAFFIC CONTROL

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</tr>
<tr>
<td>District 4</td>
<td>$18.75</td>
<td>$7.92</td>
</tr>
</tbody>
</table>

Zone Pay:
All Districts
- 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.

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CONSTRUCTION LABORERS GROUP 2

<table>
<thead>
<tr>
<th>District</th>
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<th>Benefit</th>
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<tr>
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<tr>
<td>District 4</td>
<td>$17.31</td>
<td>$4.44</td>
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</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:
All Districts
- 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.

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## CONSTRUCTION LABORERS GROUP 3

<table>
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<th>District</th>
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<tr>
<td>District 4</td>
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<td>$7.92</td>
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</table>

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

Zone Pay:
- **All Districts**
  - 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.

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## CONSTRUCTION LABORERS GROUP 4

<table>
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</tr>
<tr>
<td>District 4</td>
<td>$20.15</td>
<td>$7.92</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:
- **All Districts**
  - 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.

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## DRYWALL APPLICATORS

<table>
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</tr>
<tr>
<td>District 4</td>
<td>$22.50</td>
<td>$11.82</td>
</tr>
</tbody>
</table>

Duties Include:
- Drywall and ceiling tile installation.

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

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ELECTRICIANS: INCLUDING BUILDING AUTOMATION CONTROL

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.

<table>
<thead>
<tr>
<th>District</th>
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Travel:
District 1
No mileage due when traveling in employer’s vehicle.
The following travel allowance is applicable when traveling in employee’s vehicle:
- 0-10 mi. free zone
- >10-45 mi. $0.585/mi. in excess of the free zone.
- >45 mi. $75.00/day

Districts 2 & 3
No mileage due when traveling in employer’s vehicle.
The following travel allowance is applicable when traveling in employee’s vehicle:
- 0-08 mi. free zone
- >08-50 mi. federal mileage rate/mi. in excess of the free zone.
- >50 mi. $66.00/day

District 4
No mileage due when traveling in employer’s vehicle.
The following travel allowance is applicable when traveling in employee’s vehicle:
- 0-18 mi. free zone
- >18-60 mi. federal mileage rate/mi.
- >60 mi. $75.00/day

ELEVATOR CONSTRUCTORS

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</tr>
<tr>
<td>District 4</td>
<td>$49.66</td>
<td>$35.61</td>
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</tbody>
</table>

Travel:
All Districts
0-15 mi. free zone
>15-25 mi. $39.63/day
>25-35 mi. $79.26/day
>35 mi. $84.90/day or cost of receipts for hotel and meals, whichever is greater.
FLOOR LAYERS

No Rate Established

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

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GLAZIERS

<table>
<thead>
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<th>District</th>
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</tr>
<tr>
<td>District 4</td>
<td>$20.82</td>
<td>$2.61</td>
</tr>
</tbody>
</table>

Travel:
All Districts
No travel established.

Per Diem:
Districts 1, 2 & 3
$25/day

District 4
No per diem established.

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HEATING AND AIR CONDITIONING

<table>
<thead>
<tr>
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<td>$28.04</td>
<td>$17.38</td>
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</tbody>
</table>

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

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

Per Diem:
All Districts
$65/day

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## INSULATION WORKERS - MECHANICAL (HEAT AND FROST)

<table>
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</tr>
<tr>
<td>District 4</td>
<td>$34.17</td>
<td>$19.47</td>
</tr>
</tbody>
</table>

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

**Travel:**
- **All Districts**
  - 0-30 mi. free zone
  - >30-40 mi. $20.00/day
  - >40-50 mi. $30.00/day
  - >50-60 mi. $40.00/day
  - >60 mi. $45.00/day plus
    - $0.56/mi. if transportation is not provided.
    - $0.20/mi. if in company vehicle.
  - >60 mi. $80.00/day on jobs requiring an overnight stay plus
    - $0.56/mi. if transportation is not provided.
    - $0.20/mi. if in company vehicle.

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## IRONWORKERS - STRUCTURAL STEEL AND REBAR PLACERS

<table>
<thead>
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<th>Benefit</th>
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</thead>
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<td>District 4</td>
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<td>$20.83</td>
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</table>

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

**Travel:**
- **District 1**
  - 0-45 mi. free zone
  - >45-60 mi. $35.00/day
  - >60-100 mi. $60.00/day
  - >100 mi. $80.00/day

**Special Provision:**
When the employer provides transportation, travel will not be paid. However, when an employee is required to travel over 70 miles one way, the employee may elect to receive the travel pay in lieu of the transportation.

- **Districts 2, 3 & 4**
  - 0-45 mi. free zone
  - >45-85 mi. $55.00/day
  - >85 mi. $85.00/day

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## MILLWRIGHTS

<table>
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<tr>
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</tr>
<tr>
<td>District 4</td>
<td>$32.00</td>
<td>$11.82</td>
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</table>

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

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PAINTERS: INCLUDING PAPERHANGERS

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<thead>
<tr>
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<td>District 4</td>
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Travel:
- All Districts
  - 0-120 mi. free zone
  - >120 mi. $45.00/day

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PILE BUCKS

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</tr>
<tr>
<td>District 4</td>
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<td>$11.82</td>
</tr>
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</table>

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

Duties Include:
- 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.

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PLASTERERS

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<td>District 4</td>
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</table>

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

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PLUMBERS, PIPEFITTERS, AND STEAMFITTERS

<table>
<thead>
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<tr>
<td>District 4</td>
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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. $25.00/day
- >50-75 mi. $40.00/day
- >75 mi. $75.00/day

**Special Provision**
If transportation is not provided, mileage at $0.35/mi. with a separate free zone of 20 miles is added to the amounts above. However, if the employee is traveling more than 75 miles/day, only subsistence will be required.

**Districts 2 & 3**
- 0-40 mi. free zone
- >40-80 mi. $35.00/day
- >80 mi. $85.00/day

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

**District 4**
- 0-70 free zone
- >70 mi.
  - On jobs when employees do not work consecutive days: $0.55/mi. if employer doesn’t provide transportation. Not to exceed two trips.
  - On jobs when employees work any number of consecutive days: $100.00/day if employer doesn’t provide transportation.

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ROOFERS

<table>
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<td>$4.15</td>
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Travel:

District 1
0-50 mi. free zone
>50 mi. $0.35/mi.

District 2
0-25 mi. free zone
>50 mi. $0.35/mi.

District 3
0-30 mi. free zone
>50 mi. $0.25/mi.

District 4
0-30 mi. free zone
>50 mi. $0.25/mi.

Per Diem:

District 1
$56.00/day

District 2
Employer pays for room + $25.00/day.

District 3
Employer pays for room + $25.00/day.

District 4
$50.00/day.

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SHEET METAL WORKERS

<table>
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</tr>
<tr>
<td>District 4</td>
<td>$28.04</td>
<td>$17.38</td>
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</table>

Travel:

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

Per Diem:

All Districts
$65.00/day

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SPRINKLER FITTERS

<table>
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<tr>
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<th>Benefit</th>
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<td>District 4</td>
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Duties Include:
Duties Include but not limited to any and all fire protection systems: Installation, dismantling, inspection, testing, maintenance, repairs, adjustments, and corrections of all fire protection and fire control systems, including both overhead and underground water mains, all piping, fire hydrants, standpipes, air lines, tanks, and pumps used in connection with sprinkler and alarm systems.

Travel:
- All Districts
  - 0-60 mi. free zone
  - >60-80 mi. $17.50/day
  - >80-100 mi. $27.50/day
  - >100 mi. $80.00/day

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TAPERS

<table>
<thead>
<tr>
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</tr>
<tr>
<td>District 4</td>
<td>$23.73</td>
<td>$8.76</td>
</tr>
</tbody>
</table>

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

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TEAMSTERS GROUP 2 (TRUCK DRIVERS)

No Rate Established

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.

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### TELECOMMUNICATIONS EQUIPMENT INSTALLERS

<table>
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<tr>
<th>District</th>
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<tr>
<td>4</td>
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**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.

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### TILELAYERS, TERRAZZO AND MARBLE FINISHERS

<table>
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</tr>
<tr>
<td>4</td>
<td>$18.82</td>
<td>$13.38</td>
</tr>
</tbody>
</table>

**Duties Include:**
Finish work on hard tile, marble, and wood tile to floors, ceilings, and roof decks

**Travel:**
**All Districts**
0-60 mi. free zone
>60-75 mi. $30.00/day
>75-215 mi. $65.00/day
>215 mi. $80.00/day

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### TILELAYERS, TERRAZZO AND MARBLE SETTERS

<table>
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<tr>
<td>4</td>
<td>$26.04</td>
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</table>

**Duties Include:**
Apply hard tile, marble, and wood tile to floors, ceilings, and roof decks

**Travel:**
**All Districts**
0-60 mi. free zone
>60-75 mi. $30.00/day
>75-215 mi. $65.00/day
>215 mi. $80.00/day

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1.1  PART 1 - GENERAL

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

B.  Project Description
   1. MSU Barnard Hall Room 105 Cleanroom Installation, PPA#16-0002.
   2. Provide scope of work associated with installing a clean room into the host room Barnard Hall Room 105.
   3. The following items will be provided to the project by the owner, refer to section 016000 for detailed information on each item and to the drawings for contractor project requirements:
      a. Clean room shell including installation. The contractor is to provide cleanroom ceiling supports, seismic bracing, electrical wiring to the cleanroom lights and fan filter units.
      b. Fume hood, requires installation under this contract.
      c. Laminar Flow Clean Benches, require installation under this contract.
      d. Drydown Box, requires installation under this contract.
      e. Cabinets and countertops, requires installation under this contract.
   4. Provide all work in the clean room designed, rated and installed for an acid resistant installation. Upon completion exposed materials are to be PVC, polypropylene, metals coated with appropriate resistant coatings or other approved methods. Materials outside of the cleanroom do not need to meet these requirements. Provide all interior materials resistant to:
      a. Nitric acid (Concentrated).
      b. Hydrochloride acid (Concentrated).
      c. Hydrofluoric acid (Concentrated).
      d. Oxalic Acid (Concentrated).
      e. Hydrogen Bromide acid.

C.  Site Information
   1. Project is located on the first floor of the Barnard Hall (EPS) building. Work is required on subsequent floors to provide required utilities.

D.  Contracts
   1. Contracts shall be under one General Contract and shall include, but not be limited to, all labor, materials, and supervision necessary to furnish and install the Work.

E.  Work Sequence
   1. The work will be conducted in 1 phase to provide the least possible interference to the activities of the Owner's personnel and activities. See drawings for specific requirements phase. Sub phases include:
      a. Host room demolition and cleaning. Includes removing and relocating the south wall of the host room. Refer to Architectural drawings and 017300-3.6 for description of cleaning required.
1) Prior to installation of the clean room and operation of the fan filter units, the space is required to be cleaned to a project closeout level. This requires the cleaning of all Barnard room 105, equipment, piping, electrical and all other services in the space. If the room is not cleaned and the filters are dirty upon completion of the project, the room will be required to be re-cleaned and new filters will be required to be installed by the contractor. Architect and owner to determine if level of cleaning is acceptable for work to proceed.

2) Contractor shall prepare, paint, and clean Host Room (Contractor shall review cleanliness of Host Room with Engineer or Architect) prior to delivery and assembly of cleanroom components.

3) Complete the following cleaning operations (similar to industry standard Final Cleaning requirements) before delivery and assembly of cleanroom components and final air-handling equipment and filters.
   i. Clean Project area disturbed by construction activities. Remove stains, spills, and foreign deposits.
   ii. Remove labels that are not permanent.
   iii. Clean transparent materials, including mirrors.
   iv. Clean exposed finishes to a dust-free condition, free of stains, films, and foreign substances. Sweep and vacuum concrete floors.
   vi. Clean exposed surfaces of diffusers, registers, and grills.

b. Installation of the clean room and setting the fume hood.

c. Completion of the project including installing all services – mechanical, electrical, plumbing, and general work.

2. The Contractor will have access to the site and building from the date of receipt of notice to proceed.

F. Contractor Use of Premises

1. Work on this contract is expected to be done during regular working hours Monday through Friday. Any variation from this will require prior approval of the Consultant and Owner.

2. All work must be coordinated with the Owner and MSU at all times and MSU must be informed about any work impacting campus operations 72 hours or 3 working days in advance of work being conducted and shall require MSU approval.

3. General: Limit use of the premises to construction activities in areas indicated; allow for Owner/MSU occupancy and use by the public. Confine operations to areas within contract limits indicated. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.

4. Contractor shall conduct all his work in such a manner as to minimize the inconvenience and disruption of MSU’s daily schedule.

5. Confine operations at the site to the areas permitted under the Contract. Portions of the site beyond areas on which work is indicated are not to be disturbed. Conform to site rules and regulations affecting the work while engaged in project construction.

6. Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials to the areas designated on the drawings. If additional storage is necessary, obtain and pay for such storage off-site.
7. Contractor shall establish a staging area for storage of materials and equipment.
8. The Contractor is to coordinate with MSU for the location of the job site trailer office.
9. Keep driveways and entrances serving the premises clear and available to MSU and MSU’s employees, staff and visitors at all times, unless otherwise agreed by MSU. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.

G. Parking and Site Access
(See also Supplemental Conditions of the Contract for Construction.)

1. MSU Bozeman Vehicle Regulations state: "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."
2. All Contractor and Contractor employees shall comply with Montana State University parking regulations. MSU parking permits can be purchased at the University Police Office located in the Huffman Building at Seventh Avenue and Kagy Boulevard. Violators of MSU Bozeman Vehicle Regulations may be ticketed and towed.
3. A maximum of three (3) Contractor Permits (or as agreed with MSU) will be made available to the Contractor for parking of essential vehicles within the designated parking lot (as designated on the Cover Sheet of the Contract Documents). Essential vehicles are vehicles used for delivery of equipment and tools required to be parked in close proximity to the construction area. All allowed vehicles only to be parked on hard surfaced areas within the Staging Area. All other Contractor and Contractor employee vehicles on campus shall be parked in designated parking lots to be agreed with MSU. No personal vehicles shall be parked at the project site in any event. 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 move to a designated lot or leave campus.
4. Access and egress to and from the project site shall be north on South 11th and College to South 19th Avenue only. In cases where a different route must be used for a specific purpose, permission must be obtained from MSU. Access routes are for delivery of equipment, tools, and materials and not for parking.
5. The site Staging Areas for materials and equipment are designated on the Cover Sheet of the Contract Documents. Staged materials and equipment must be secured on the ground surface or in trailers. Site staging areas shall be fenced in accordance with the Contract Documents. Vehicles in addition to those allowed to be parked may not be used for staging of equipment, tools, or materials.

H. Owner Occupancy

1. Full Owner/MSU Occupancy: The Owner/MSU will occupy the site during the entire construction period. Cooperate with MSU during construction operations to minimize conflicts and facilitate MSU usage. Perform the work so as not to interfere with MSU’s operations.

I. Safety Requirements

1. General: The safety measures required by the Contract Documents are not meant to be inclusive. The Contractor shall be solely responsible for safety on a 24-
hours-per-day, 7 days-per-week basis and shall take whatever additional measures are necessary to insure the health and safety of the buildings’ occupants, or pedestrians at or near the construction site and access routes and of all other persons in all areas affected by the Contractor's activities. Prior to the start of construction, the Contractor is to submit to the Consultant, a detailed written plan specifying the safety procedures that will be followed. Include (but not by way of limitation) the following: Verbiage, size and locations of warning signs; construction sequence as related to safety; use of barricades (type and location); employee policies as related to safety; and delivery of materials as related to safety. Revise the safety plan as required during construction and resubmit to the Owner.

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

3. Comply with Federal, State, local, and the Owner’s fire, health and safety requirements.

4. Advise MSU whenever work is expected to be hazardous or inconvenient (including objectionable odors) to MSU’s employees, students, visitors or the building occupants.

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

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

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

J. Existing Premises Condition

1. The Contractor is responsible for adequately documenting in photos the existing condition of the premises, to include external road surfaces, curbing and landscaped areas, specifically the cleanliness of areas. Any damage to the premises which is found after construction and is not so documented will be the responsibility of the Contractor to repair or replace.

K. Discrepancies in the Documents

1. The Contractor shall bring any discrepancies between any portions of the drawings and specifications to the attention of the Owner and the Consultant in writing. The Owner and Consultant shall review the discrepancy and clarify the intent desired in the Contract Documents. Unless specifically directed otherwise, the Contractor shall be obligated to provide the greater quantity or quality without any change in contract sum or time.

END OF SECTION 011000
SECTION 012000
PRICE AND PAYMENT PROCEDURES

1.1 GENERAL

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

B. Summary
   1. This Section specified administrative and procedural requirements governing the Contractor's Applications for Payment.
   2. The Contractor's Construction Schedule and Submittal Schedule are included in Section "Submittals".

C. Schedule of Values
   1. Coordinate preparation of the Schedule of Values, Form 100, with preparation of the Contractor's Construction Schedule.
   2. Each prime Contractor shall coordinate preparation of its Schedule of Values for its part of the work with preparation of the Contractor's Construction Schedule.
   3. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:
      a. Contractor's construction schedule
      b. Application for Payment form
      c. List of subcontractors
      d. Schedule of allowances
      e. Schedule of alternates
      f. List of products
      g. List of principal suppliers and fabricators
      h. Schedule of submittals
      i. Submit the Schedule of Values to the Architect at the earliest feasible date, but in no case later than seven (7) days before the date scheduled for submittal of the initial Application for Payment.
      j. 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.

4. Format and Content: Use the Project Manual Table of Contents as a guide to establish the format for the Schedule of Values.

   a. Identification: Include the following project identification on the Schedule of Values:
      1) Project name
      2) Name of the Architect
      3) Project number (PPA No.)
      4) Contractor's name and address
      5) Date of submittal
b. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed:

1) Generic name
2) Related specification section
3) Name of subcontractor
4) Name of manufacturer or fabricator
5) Name of supplier
6) Change Orders (numbers) that have affected value
7) Dollar value

a) Percentage of Contract Sum in the nearest one-hundredth percent, adjusted to total 100%

b. 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.

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

e. 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 art of the work.

5. 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.

a. At the Contractor's 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.

6. Schedule Updating: Update and resubmit the Schedule of Values when Change Orders or Construction Change Directives result in a change in the Contract Sum.

D. Applications for Payment

1. Each Application for Payment shall be consistent with previous applications and payments as certified by the Architect and paid for by the Owner. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.

2. Payment Application Times: Each progress payment date is as indicated in the Agreement. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

3. Payment Application Forms: Use Montana Form 101 as the form for Application for Payment.

4. Application Preparation: Complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the Owner. Incomplete applications will be returned without action.
a. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.
b. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.

5. Transmittal: Submit one (1) executed copy of each Application for Payment to the Architect by means ensuring receipt within 24 hours, including waivers of lien and similar attachments, when required.
   a. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Architect.

6. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include the following:
   a. List of subcontractors
   b. Schedule of Values
      1) Contractor's Construction Schedule (preliminary if not final)
   c. Copies of building permits
      1) Copies of authorizations and licenses from governing authorities for performance of the work
   d. Certificates of insurance and insurance policies (submitted with Contract)
   e. Performance and payment bonds (submitted with Contract if required)

7. 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.

8. Administrative actions and submittals that shall proceed or coincide with this application include:
   a. Occupancy permits and similar approvals
   b. Warranties (guarantees) and maintenance agreements
   c. Test/adjust/balance records
   d. Maintenance instructions
   e. Meter readings
   f. Start-up performance reports
      1) Change-over information related to Owner's occupancy, use, operation and maintenance.
   g. Final cleaning
      1) Application for reduction of retainage, and consent of surety
9. Final Payment Application: Administrative actions and submittals which must precede or coincide with submittal of the final Application for Payment include the following:

a. Completion of project closeout requirements
   1) Completion of items specified for completion after Substantial Completion

b. Assurance that unsettled claims will be settled
   1) Assurance that work not complete and accepted will be completed without undue delay
   2) Transmittal of required project construction records to Owner

END OF SECTION 01200
SECTION 012300
ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General Conditions, Supplemental Conditions and other Division 1 Specification Sections, apply to this section. See also Instructions to Bidders 10.3 Award of Bids.

1.2 SUMMARY
   A. This Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS
   A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

   1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES
   A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

   1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

   B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

   C. Execute accepted alternates under the same conditions as other work of the Contract.

   D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Description of Alternates

Deduct Alternate 1 – Provide alternate air handling unit AHU1-1.

1. Under alternate 1 provide the alternate self-contained air handling unit in lieu of the base bid unit and remote water source heat pump. See base bid and alternative plans, schedules, specifications and details for required components.

2. Under alternate 1 the base bid air handling unit and water source heat pump are not required. The refrigerant piping from the water source heat pump to the air handling unit are not required.

3. Under alternate 1, provide the alternate self-contained water source unit and extend condenser water piping as shown in the plans.

4. Under alternate 1, revise the electrical power requirements to provide power to one self-contained unit.

END OF SECTION
PART 1 - GENERAL

A. Related Documents
   1. Drawings and general provisions of Contract, including General Conditions, Supplemental Conditions and Instructions to Bidders.

B. Substitution Procedures
   1. Substitutions include changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by the Contractor.
   2. Substitution Requests: Submit three copies of each request on MSU Substitution Request Form 099 for each consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
      a. Submit requests in accordance with Instructions to Bidders.
      b. Identify product to be replaced and show compliance with requirements for substitutions. Include a detailed comparison of significant qualities of proposed substitution with those of the Work specified, a list of changes needed to other parts of the Work required to accommodate proposed substitution, and any proposed changes in the Contract Sum or the Contract Time should the substitution be accepted.

C. Architect will review proposed substitutions and notify Contractor of their acceptance or rejection. If necessary, Architect will request additional information or documentation of evaluation.
   1. Architect will notify Contractor of acceptance or rejection of proposed substitution within 10 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

D. Do not submit unapproved substitutions on Shop Drawings or other submittals.

END OF SECTION 012500
SECTION 013000

SUBMITTALS

1.1 GENERAL

A. Related Documents

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

B. Summary

1. This Section specifies administrative and procedural requirements for submittals required for performance of the work, including:
   a. Contractor's construction schedule
   b. Submittal schedule
   c. Daily construction reports
   d. Shop Drawings
   e. Product data
   f. Samples

   Note: All Submittals are to be both print and electronic.

2. Administrative Submittals: Refer to other Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:
   a. Permits
   b. Applications for Payment
   c. Performance and payment bonds
   d. Insurance certificates
   e. List of Subcontractors

3. The Schedule of Values submitted is included in Section "Applications for Payment".

4. Inspection and test reports are included in Section "Quality Requirements".

5. Unless otherwise instructed by the Owner all submittals shall be directed to Architect/Engineer Consultant of Record. The Contractor’s construction schedule, submittal schedule and daily construction reports shall be directed to the Consultant’s representative, the State of Montana’s representative and MSU’s representative. Shop drawings, product data and samples shall be directed to the Consultant’s representative.

C. Submittal Procedures

1. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
   a. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.
b. Coordinate transmittal of different types of submittals for related elements of the work so processing will not be delayed by the need to review submittals concurrently for coordination.

1) The Consultant reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

c. Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for resubmittals.

1) Allow two (2) weeks for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Consultant will promptly advise the Contractor when a submittal being processed must be delayed for coordination.

2) If an intermediate submittal is necessary, process the same as the initial submittal.

3) Allow two (2) weeks for reprocessing each submittal.

4) No extension of contract time will be authorized because of failure to transmit submittals to the Consultant sufficiently in advance of the work to permit processing.

2. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.

a. Provide a space approximately 4” x 5” on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken.

b. Include the following information on the label for processing and recording action taken.

1) Project name and PPA Number
2) Date
3) Name and address of Consultant
4) Name and address of Contractor
5) Name and address of Subcontractor
6) Name and address of supplier
7) Name of manufacturer

   a) Number and title of appropriate Specification Section
   b) Drawing number and detail references, as appropriate

3. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Consultant using a transmittal form. Submittals received from sources other than the Contractor will be returned without action.

a. On the transmittal record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations. Include
Contractor's certification that information complies with Contract Documents requirements.

b. Transmittal Form: Contractor’s standard form.

D. Contractor's Construction Schedule

1. Bar-Chart Schedule: Prepare a fully developed, horizontal bar-chart type Contractor's construction schedule. Submit both in print and electronically within thirty (30) days of the date established for "Commencement of the Work".

a. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the work as indicated in the "Schedule of Values".

b. Within each time bar indicate estimated completion percentage in 10 percent increments. As work progresses, place a contrasting mark in each bar to indicate actual completion.

c. Prepare the schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.

d. Secure time commitments for performing critical elements of the work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the work. Show each activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the work.

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

f. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Consultant's procedures necessary for certification of Substantial Completion.

2. Work Stages: Indicate important stages of construction for each major portion of the Work, including testing and installation.

3. Area Separations: Provide a separate time bar to identify each major construction area for each major portion of the work. Indicate where each element in an area must be sequenced or integrated with other activities.

4. Cost Correlation: At the head of the schedule, provide a two (2) item cost correlation line, indicating "pre-calculated" and "actual" costs. On the line show dollar-volume of work performed as of the dates used for preparation of payment requests.

a. Refer to Section "Price and Payment Procedures" for cost reporting and payment procedures.

5. Distribution: Following response to the initial submittal, print and distribute copies to the Consultant, Owner, subcontractors, and other parties required to comply with scheduled dates. Transmit electronically and post copies in the project meeting room and temporary field office.

a. When revisions are made, distribute 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 construction activities.

6. **Schedule Updating**: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule electronically and in print concurrently with report of each meeting.

E. **Submittal Schedule**

1. After development and acceptance of the Contractor's construction schedule, prepare a complete schedule of submittals. Submit the schedule within ten (10) days of the date required for establishment of the Contractor's construction schedule.

   a. Coordinate submittal schedule with the list of subcontracts, schedule of values and the list of products, as well as the Contractor's construction schedule.

   b. Prepare the schedule in chronological order; include submittals required during the first thirty (30) or sixty (60) days of construction. Provide the following information:

      1) Scheduled date for the first submittal
      2) Related section number
      3) Submittal category
      4) Name of subcontractor
      5) Description of the part of the work covered
      6) Scheduled date for resubmittal
         a) Scheduled date the Consultant's final release or approval

2. **Distribution**: Following response to initial submittal, print and distribute copies to the Consultant, Owner, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the project meeting room and field office.

   a. When revisions are made, distribute 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 construction activities.

3. **Schedule Updating**: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

F. **Daily Construction Reports**

1. Prepare a daily construction report, recording the following information concerning events at the site; and submit duplicate copies to the Consultant at weekly intervals:

   a. List of subcontractors at the site
   b. Approximate count of personnel at the site
   c. High and low temperatures, general weather conditions
   d. Accidents and unusual events
   e. Meetings and significant decisions
f. Stoppages, delays, shortages, losses  
g. Meter readings and similar recordings  
h. Emergency procedures  
i. Orders and requests of governing authorities  
j. Change Orders received, implemented  
k. Services connected, disconnected  
l. Equipment or system tests and start-ups  
m. Partial completions, occupancies  
n. Substantial Completions authorized

G. Shop Drawings

1. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the project is not considered Shop Drawings.

2. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings. Include the following information:

   a. Dimensions  
   b. Identification of products and materials included  
   c. Compliance with specified standards  
   d. Notation of coordination requirements  
   e. Notation of dimensions established by field measurement  
   f. Sheet Size: Except for templates, patterns and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2" x 11", but no larger than 36" x 48".  
   g. Submittal: Submit electronically and in print for the Consultant's review; Consultant’s comments will be returned electronically.

      1) One (1) of the prints returned shall be marked-up and maintained as a "Record Document".

   k. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.

3. Coordination drawings are a special type of Shop Drawing that show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or function as intended.

   a. Preparation of coordination drawings is specified in section "Project Coordination" and may include components previously shown in detail on Shop Drawings or Product Data.  
   b. Submit coordination drawings for integration of different construction elements. Show sequences and relationships of separate components to avoid conflicts in use of space.

H. Product Data

1. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's
installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings".

a. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:

1) Manufacturer's printed recommendations
   a) Compliance with recognized trade association standards
   b) Compliance with recognized testing agency standards

2) Application of testing agency labels and seals
   a) Notation of dimensions verified by field measurement

3) Notation of coordination requirements

b. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

c. Preliminary Submittal: Submit a preliminary single-copy of Product Data where selection of options is required.

d. Submittals: Submit two (2) copies of each required submittal; submit four (4) copies where required for maintenance manuals. The Consultant will retain one (1), and will return the other marked with action taken and corrections or modifications required.

1) Unless non-compliance with Contract Document provisions is observed, the submittal may serve as the final submittal.

e. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.

1) Do not proceed with installation until an applicable copy of Product Data applicable is in the installer's possession.

2) Do not permit use of unmarked copies of Product Data in connection with construction.

I. Samples

1. Submit full-size, fully fabricated samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.

a. Mount, display, or package samples in the manner specified to facilitate review of qualities indicated. Prepare samples to match the Consultant's sample. Include the following:

1) Generic description of the sample

2) Sample source

3) Product name or name of manufacturer
4) Compliance with recognized standards
5) Availability and delivery time

2. Submit samples for review of kind, color, pattern, and texture, for a final check of these characteristics with other elements, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

   a. Where variation in color, pattern, texture, or other characteristics are inherent in the material or product represented, submit multiple units (not less than three (3), that show approximate limits of the variations.
   b. Refer to other specification sections for requirements for samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation and similar construction characteristics.
   c. Refer to other sections for samples to be returned to the Contractor for incorporation in the work. Such samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of sample submittals.

3. Preliminary Submittals: Where samples are for selection of color, pattern, texture, or similar characteristics from a range of standard choices, submit a full set of choices for the material or product.

   a. Preliminary submittals will be reviewed and returned with the Consultant's mark indicating selection and other action.

4. Submittals: Except for samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, submit three (3) sets; one (1) will be returned marked with the action taken.

   a. Maintain sets of samples, as returned, at the project site, for quality comparisons throughout the course of construction.

      1) Unless non-compliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
      2) Sample sets may be used to obtain final acceptance of the construction associated with each set.

5. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the work. Show distribution on transmittal forms.

   a. Field samples specified in individual sections are special types of samples. Field samples are full-size examples erected on site to illustrate finishes, coatings, or finish materials and to establish the standard by which the work will be judged.

      1) Comply with submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

J. Consultant's Action
1. Except for submittals for record, information, or similar purposes, where action and return is required or requested, the Consultant will review each submittal, mark to indicate action taken, and return promptly. Compliance with specified characteristics is the Contractor's responsibility.

2. Action Stamp: The Consultant will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken:

   a. Final-But-Restricted Release: When submittals are marked "Make Corrections Noted", that part of the work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.

   b. Returned for Resubmittal: When submittal is marked "Revise and Resubmit", do not proceed with that part of the work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.

      1) Do not permit submittals marked "Revise and Resubmit" to be used at the project site, or elsewhere where work is in progress.

   c. Other Action: Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned, marked "Action not Required".

END OF SECTION 013000
1.1 GENERAL

A. Related Documents
   1. Drawings and general provisions of Contract, including General Conditions and Supplemental Conditions and other Division1 Specification Sections, apply to this Section.

B. Summary
   1. This section specifies administrative and supervisor requirements necessary for project coordination including, but not necessarily limited to:
      a. Coordination
      b. Administrative and supervisory personnel
      c. General installation provisions
      d. Cleaning and protection
   2. Field Engineering is included in Section "Field Engineering".
   3. Progress meetings, coordination meetings and pre-installation conferences are included in Section "Project Meetings".
   4. Requirements for Contractor's Construction Schedule are included in Section "Submittals".

C. Coordination
   1. Coordination: Coordinate construction activities included under various sections of these specifications to assure efficient and orderly installation of each part of the work. Coordinate construction operations included under different sections of the specifications that are dependent upon each other for proper installation, connection, and operation.
      a. Provide access to work at all times for inspections by Owner and authorized representatives.
      b. Provide safe working conditions and protection of completed work.
      c. Provide barricades and signs.
      d. Where installation of one part of the work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.
      e. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.
      f. Make adequate provisions to accommodate items scheduled for later installation.
      g. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
         1) Prepare similar memoranda for the Owner and separate Contractors where coordination of their work is required.
   2. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the work. Such administrative activities include, but are not limited to, the following:
a. Notify Facilities Services or Campus Planning, Design and Construction of any expected disruptions in service or changes in construction schedule at least 72 hours (3 working days) in advance.
b. Preparation of schedules.
c. Installation and removal of temporary facilities.
d. Delivery and processing of submittals.
e. Progress meetings.
f. Project close-out activities.

3. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
   a. Salvage materials and equipment involved in performance of, but not actually incorporated in, the work. Refer to other sections for disposition of salvaged materials that are designated as Owner's property.

D. Submittals
1. Coordinated Drawings: Prepare and submit coordination drawings where close and careful coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space availability necessitates maximum utilization of space for efficient installation of different components.
   a. Show the interrelationship of components shown on separate shop drawings.
   b. Indicate required installation sequences.
   c. Comply with requirements contained in Section "Submittals".
   d. Section "Basic Electrical Requirements" for specific coordination drawing requirements for mechanical and electrical installations.
2. Staff Names: Within 15 days of Notice to Proceed, submit a list of the Contractor's principal staff assignments, including the Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities; list their addresses and telephone numbers. Post copies of the list in the project meeting room, the temporary field office, and each temporary telephone.

1.2 PROJECT MEETINGS

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

B. Summary
1. This section specifies administrative and procedural requirements for project meetings including but not limited to:
   a. Pre-construction conference
   b. Pre-installment conferences
   c. Coordination meetings
   d. Progress meetings

C. Pre-construction Conference
1. Schedule a pre-construction conference and organizational meeting.
   a. Hold meeting at the project site or other convenient location and prior to commencement of construction activities, including the moving of
equipment on to the site. Conduct the meeting to review responsibilities and personnel assignments.

2. **Attendees:** The Owner, Consultant and their consultants, the Contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the work. Both the Contractor and the Contractor's job foremen shall attend the meeting, along with all subcontractors.

3. **Agenda:** Discuss items of significance that could affect progress including such topics as:
   a. Tentative construction schedule
   b. Critical work sequencing
   c. Designation of responsible personnel
   d. Procedures for processing field decisions and Change Orders
   e. Procedures for processing Applications for Payment
   f. Distribution of Contract Documents
   g. Submittal of Shop Drawings, Product Data and Samples
   h. Preparation of record documents
   i. Use of the premises
   j. Office, work and storage areas
   k. Equipment deliveries and priorities
   l. Safety procedures
   m. First aid
   n. Security
   o. Housekeeping
   p. Working hours

**D. Pre-Installation Conferences**

1. Conduct a pre-installation conference at the site before each construction activity that requires coordination with other construction. The 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 the Consultant of scheduled meeting dates.

2. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for:
   a. Contract Documents
   b. Options
   c. Related Change Orders
   d. Purchases
   e. Deliveries
   f. Shop Drawings, Product Data and quality control samples
   g. Possible conflicts
   h. Compatibility problems
   i. Time schedules
   j. Weather limitations
   k. Manufacturer's recommendations
   l. Compatibility of materials
   m. Acceptability of substrates
   n. Temporary facilities
   o. Space and access limitations
   p. Governing regulations
q. Safety
r. Inspection and testing requirements
s. Required performance results
t. Recording requirements
u. Protection

3. The Consultant will record significant discussions and agreements and
disagreements of each conference, along with the approved schedule. Distribute
the record of the meeting to everyone concerned, promptly, including the Owner
and Consultant.

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

E. Coordination Meeting
1. Conduct project coordination meetings at regularly scheduled times convenient
for all parties involved. Project coordination meetings are in addition to specific
meetings held for other purposes, such as regular progress meetings and special
pre-installation meetings.
2. Request representation at each meeting by every party currently involved in
coordination or planning for the construction activities involved.
3. The Consultant will record meeting results and distribute copies to everyone in
attendance and to others affected by decisions or actions resulting from each
meeting.

F. Progress Meetings
1. Conduct progress meetings at the project site at regularly scheduled intervals.
Coordinate with the Owner and Consultant of scheduled meeting dates.
Coordinate dates of meetings with preparation of the payment request.
2. Attendees: In addition to representatives of the Owner and Consultant, each
subcontractor, supplier, or other entity concerned with current progress or
involved in planning, coordination or performance of future activities shall be
represented at these meetings by persons familiar with the project and authorized
to conclude matters relating to progress.
3. Agenda: Visit job site to raise specific pending issues prior to meeting. Review
and correct or approve minutes of the previous progress meeting. Review other
items of significance that could affect progress. Include topics for discussion as
appropriate to the current status of the project.
   a. Contractor's Construction Schedule: Review progress since the last
meeting. Determine where each activity is in relation to the Contractor's
Construction Schedule, whether on time or ahead or behind 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.
   b. Review the present and future needs of each entity present, including such
items as:
      1) Interface requirements
      2) Time
      3) Sequences
      4) Deliveries
      5) Off-site fabrication problems
      6) Access
      7) Site utilization
8) Temporary facilities and services
9) Hours of work
10) Hazards and risks
11) Housekeeping
12) Quality and work standards
13) Change Orders
14) Documentation of information for payment requests

4. Reporting: The Consultant shall distribute printed and electronic copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
   a. Schedule Updating: Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

1.3 PRODUCTS (NOT APPLICABLE)

1.4 EXECUTION

A. General Installation Provisions
   1. Inspection of Conditions: Require the installer of each major component to inspect both the substrate and conditions under which work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
   2. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.
   3. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.
   4. Provide attachment and connection devices and methods necessary for securing work. Secure work true to line and level. Allow for expansion and building movement.
   5. Visual Effects: Provide uniform joint widths in exposed work. Arrange joints in exposed work to obtain the best visual effect. Refer questionable choices to the Consultant for final decision.
   6. Recheck measurements, quantities and dimensions, before starting each installation.
   7. Install each component during weather conditions and project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.
   8. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.
   9. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated and in compliance with accessibility requirements. Refer questionable mounting height decisions to the Consultant for final decision.

B. Cleaning and Protection
   1. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
2. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

3. Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:
   a. Excessive static or dynamic loading
   b. Excessive internal or external pressures
   c. Excessively high or low temperatures
   d. Thermal shock
   e. Excessively high or low humidity
   f. Air contamination or pollution
   g. Water or ice
   h. Solvents
   i. Chemicals
   j. Light
   k. Radiation
   l. Puncture
   m. Abrasion
   n. Heavy traffic
   o. Soiling, staining and corrosion
   p. Bacteria
   q. Rodent and insect infestation
   r. Combustion
   s. Electrical current
   t. High speed operation
   u. Improper lubrication
   v. Unusual wear or other misuse
   w. Contact between incompatible materials
   x. Destructive testing
   y. Misalignment
   z. Excessive weathering
      aa. Unprotected storage
      ab. Improper shipping or handling
      ac. Theft
      ad. Vandalism

END OF SECTION 013100
SECTION 014000
QUALITY REQUIREMENTS

1.1 GENERAL

A. RELATED DOCUMENTS

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

B. SUMMARY

1. This Section specifies administrative and procedural requirements for quality control services.
2. Quality control services include inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor. They do not include Contract enforcement activities performed by the Architect.
3. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.
4. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.

   a. Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities. Those requirements, including inspections and tests, cover production of standard products as well as customized fabrication and installation procedures.
   b. Inspections, test and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.
   c. Requirements for the Contractor to provide quality control services required by the Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. RESPONSIBILITIES

1. Contractor Responsibilities: The Contractor shall provide inspections, tests and similar quality control services, specified in individual Specification Sections and required by governing authorities, except where they are specifically indicated to be the Owner's responsibility, or are provided by another identified entity; these services include those

   a. Services specified to be performed by an independent agency and not by the Contractor. Costs for these services shall be included in the Contract Sum.
   b. The Contractor shall employ and pay an independent agency, to perform specified quality control services.
   c. The Owner will engage and pay for the services of an independent agency
to perform inspections and tests specified as the Owner's responsibility. Payment for these services will be made by the Owner.

d. Where the Owner has engaged a testing agency or other entity for testing and inspection of a part of the Work, and the Contractor is also required to engage an entity for the same or related element, the Contractor shall not employ the entity engaged by the Owner, unless otherwise agreed in writing with the Owner.

2. Retesting: The Contractor is responsible for retesting where results of required inspections, tests or similar services provide unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.

a. Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original construction.

3. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Associated services required include but are not limited to:

a. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.
b. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.
c. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.
d. Providing the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
e. Security and protection of samples and test equipment at the Project site.

4. Owner Responsibilities: The Owner will provide inspections, tests and similar quality control services specified to be performed by independent agencies and not by the Contractor, except where they are specifically indicated as the Contractor's responsibility or are provided by another identified entity. Costs for these services are not included in the Contract Sum.

a. The Owner will employ and pay for the services of an independent agency, testing laboratory or other qualified firm to perform services which are the Owner's responsibility.

5. Duties of the Testing Agency: The independent testing agency engaged to perform inspections, sampling and testing of materials and construction specified in individual Specification Sections shall cooperate with the Architect and Contractor in performance of its duties, and shall provide qualified personnel to perform required inspections and tests.

a. The agency shall notify the Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
b. The agency is not authorized to release, revoke, alter or enlarge requirements of the Contract Documents, or approve or accept any portion of the Work.

c. The agency shall not perform any duties of the Contractor.

6. Coordination: The Contractor and each agency engaged to perform inspections, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests. The Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

D. SUBMITTALS

1. The independent testing agency shall submit a certified written report and electronic copy of each inspection, test or similar service, to the Architect, in duplicate, unless the Contractor is responsible for the service. If the Contractor is responsible for the service, submit a certified written report of each inspection, test or similar service through the Contractor, in duplicate.

   a. Submit additional copies of each written report directly to the governing authority, when the authority so directs.

   b. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to:

      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 the inspection or test
      6) Designation of the Work and test method
      7) Identification of product and Specification Section
      8) Complete inspection or test data
      9) Test results and in interpretations of test results
     10) Ambient conditions at the time of sample-taking and testing
     11) Comments or professional opinion as to whether inspected or tested Work complies with Contract Document requirements
     12) Name and signature of laboratory inspector
     13) Recommendations on retesting

E. QUALITY ASSURANCE

1. Qualification for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, which are prequalified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.

2. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the State of Montana.
1.3 EXECUTION

A. GENERAL

1. Upon completion of inspection, testing, sample-taking and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes.

2. Protect construction exposed by or for quality control service activities, and protect repaired construction.

3. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION 014000
SECTION 015000
TEMPORARY FACILITIES AND UTILITIES

1.1 GENERAL

A. RELATED DOCUMENTS

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

B. SUMMARY

1. This Section specifies requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection.

2. Temporary utilities required may include but are not limited to:

   a. Telephone service
   b. Electric Service
   c. Water
   d. Natural gas
   e. Sewer

3. Temporary construction and support facilities required may include but are not limited to:

   a. Field offices and storage sheds.
   b. Sanitary facilities, including drinking water
   c. Temporary Project identification signs and bulletin boards
   d. Waste Disposal services
   e. Construction aids and miscellaneous services and facilities

4. Security and protection facilities required include but are not limited to:

   a. Temporary fire protection
   b. Barricades, warning signs, lights
   c. Environmental protection

C. QUALITY ASSURANCE

1. Regulations: Comply with industry standards and applicable laws and regulations if authorities having jurisdiction, including but not limited to:

   a. Building Code requirements
   b. Health and safety regulations
   c. Utility company regulations
   d. Police, Fire Department and Rescue Squad rules
   e. Environmental protection regulations

Requirements for Construction and Demolition”.

D. PROJECT CONDITIONS

1. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.

1.2 PRODUCTS

A. MATERIALS

1. General: Provide new materials; if acceptable to the Architect, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended.

2. Water: Provide potable water approved by local health authorities.

3. Open-Mesh Fencing: Provide 11-gage, galvanized 2-inch, chain link fabric fencing 6-feet high with galvanized barbed wire top strand and galvanized steel pipe posts, 1 1/2” I.D. for line posts and 2-1/2” I.D. for corner posts.

B. EQUIPMENT

1. General: Provide new equipment; if acceptable to the Architect, undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.

2. Water Hoses: Provide 3/4” heavy-duty, abrasion-resistant, flexible rubber hoses 100 ft. long, with pressure rating greater than the maximum pressure of the water distribution system; provide adjustable shut-off nozzles at hose discharge.

3. Electrical Outlets: Provide properly configured NEA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment.

4. Electrical Power Cords: Provide grounded extension cords; use “hard-service” cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.

5. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.

6. Temporary Offices: Provide prefabricated or mobile units or similar job-built construction with lockable entrances, operable windows and serviceable finishes. Provide heated and air-conditioned units on foundations adequate for normal loading.

7. Temporary Toilet Units: Provide self-contained single-occupant toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material.
9. First Aid Supplies: Comply with governing regulations.
10. Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand carried, portable, UL-rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.

   a. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

1.3 EXECUTION

A. INSTALLATION

1. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work and Owner’s operations. Relocate and modify facilities as required.

2. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed, or are replaced by authorized use of completed permanent facilities.

B. TEMPORARY UTILITIES

1. Temporary Telephones: Provide temporary telephone service for all personnel engaged in construction activities, throughout the construction period. Provide cellular telephone, operational and on site at all times.

C. TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

1. Locate field offices, storage sheds, sanitary facilities and other temporary construction and support facilities for easy access and minimal interruption to Owner’s operations.

   a. Maintain temporary construction and support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.

2. Field Offices: The Contractor, at his option, shall provide insulated, weather tight temporary offices of sufficient size to accommodate required office personnel at the Project site. Keep the office clean and orderly for use for small progress meetings. Furnish and equip offices as follows:

   a. Furnish with a desk and chairs, a 4-drawer file cabinet, plan table and plan rack and a 6-shelf bookcase.
   b. Equip with a water cooler and private toilet complete with water closet, lavatory and mirror-medicine cabinet unit.

3. Storage and Fabrication Sheds: Install storage and fabrication sheds, sized, furnished and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds may be open shelters or fully enclosed.
spaces within the building or elsewhere on the site.

4. Sanitary facilities include temporary toilets, wash facilities and drinking water fixtures. Comply with regulations and health codes for the type, number, location, operation and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.

   a. Provide toilet tissue, paper towels, paper cups and similar disposable materials for each facility. Provide covered waste containers for used material.

5. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.

6. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel involved in handling materials that require wash-up for a healthy and sanitary condition. Dispose of drainage properly. Supply cleaning compounds appropriate for each condition.

   a. Provide safety showers, eye-wash fountains and similar facilities for convenience, safety and sanitation of personnel.

7. Drinking Water Facilities: Provide containerized tap-dispenser bottled-water type drinking water units, including paper supply.

   a. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F (7 to 13 deg C).

8. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner. Do not use University trash containers for any reason.

D. SECURITY AND PROTECTION FACILITIES INSTALLATION

1. Do not remove temporary security and protection facilities until Substantial Completion, or longer as requested by the Architect.


   a. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than on extinguisher on each floor at or near each usable stairwell.
   b. Store combustible materials in containers in fire-safe locations.
   c. Maintain unobstructed access to fire extinguishers, fire hydrants,
temporary fire protection facilities, stairways and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.

d. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.

1. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

E. OPERATION, TERMINATION AND REMOVAL


2. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.

3. Termination and Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended, or when 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 the temporary facility. Repair damaged Work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.

a. Materials and facilities that constitute temporary facilities are property of the Contractor. The Owner reserves the right to take possession of Project identification signs.

END OF SECTION 015000
SECTION 016000
PROJECT REQUIREMENTS - OWNER FURNISHED ITEMS

1.1 PART 1 - GENERAL

A. Related Documents
   A. The following items will be provided to the project by the owner, refer to section
      the following specifications for detailed information on each item:
      a. Clean room shell including installation.
      b. Fume hood, requires installation under this contract.
      c. Laminar Flow Clean Benches, require installation under this contract.
      d. Drydown Box, requires installation under this contract.
      e. Cabinets and countertops.

B. MSU Facilities services will deliver owner furnished items to the project site. At contractor
   option, the contractor can make arrangements to move the owner furnished items to aid in project
   completion.

C. The clean room shell including the walls, vestibule, doors, windows, ceiling/roof, lights, fan filter
   units, return grilles and accessories as detailed in the drawings and specifications will be installed
   by the clean room supplier. Connection of the electrical systems for the lighting and fan filter
   units, installation of the fire sprinkler system in the ceiling is to be provided by the contractor
   under this contract. Contractor to install ceiling support (if required) and seismic bracing as
   specified by the clean room supplier.

D. The fume hood and base cabinet will be provided by the owner. Full installation in the new clean
   room is required under this contract. This includes physical installation, exhaust ductwork and
   electrical services.

E. The dry down box will be provided by the owner. Full installation in the new clean room is
   required under this contract. This includes physical installation and exhaust ductwork.

F. Two laminar flow clean benches will be provided by the owner. Full installation in the new clean
   room is required under this contract. This includes physical installation and plug-in to electrical
   services.

G. Cabinets and countertops are shown in the architectural drawings and will be provided by the
   owner. Full installation in the new clean room is required under this contract. This includes
   physical installation of the cabinets and countertops.

2.1 PRODUCTS (Not Used)

3.1 EXECUTION
   A. Refer to the equipment pre-purchase specifications and the project drawings and specifications
      for all installation requirements.

END OF SECTION 016000
PART 1 GENERAL

1.1 WORK INCLUDED

A. Basis of design:
   1. Class 10,000 cleanroom. Free-standing and self-supporting walls. Ceiling/roof is to be entirely self-supported from the walls, except that 4-5 intermediate threaded rod supports to the building structure are allowed to limit center deflection. Coordinate support for ceiling/roof (if required) with the general contractor. The general contractor will install required threaded rod supports and seismic anchors to the existing structure where required.
   2. Provide limited metal construction. For this project limited metal is defined as structural panels of wood or metal construction completely covered with a vinyl/uPVC laminate. “H” structural members with infil panels are acceptable as long as the panels are vinyl coated as specified and structural members are acid resistant powder coated as specified.
   3. No exposed metal in the cleanroom at the completion of installation. Field coating of scratches is allowed only with acid-resistant materials.
   4. Provide all interior materials resistant to:
      a. Nitric acid (Concentrated)
      b. Hydrochloride acid (Concentrated)
      c. Hydroflouric acid (Concentrated)
      d. Oxalic Acid (Concentrated)
      e. Hydrogen Bromide acid.

B. Provide the cleanroom as a completely self-supporting wall structure with walls, roof, ceiling, structure, partitions, windows, doors, return grilles and all other components of construction. Provide self-supporting, walkable lid/roof (4-5 threaded rod supports are allowed to limit center of ceiling deflection), coordinate rod supports with existing and new host room services.

C. Provide light fixtures.

D. Provide fan filter units with boron free filters.

E. Provide complete installation of all components including all shipping and handling costs.

F. See attached drawing for shell dimensions.

1.2 SHOP DRAWINGS

A. Submit shop drawings for all cleanroom constructions, equipment and components.

B. Provide shop drawings that include all construction information, ratings, components, warranty information and dimensional data with quote that indicates unit meets all specifications.
C. Any manufacturer desiring to bid shall meet or exceed all requirements of the following specification. Any deviation from these specifications or lack of providing all supporting information with the bid will be subject to rejection of the bid. A bidder must state if they are unable or unwilling to meet any requirements of this specification. Inability or unwillingness to meet any requirement in part or total may be cause for rejection of bid. Any exception taken by the bidder must be clearly identified on the bid forms.

D. Substitution Requests: to be received a minimum 10 days prior to the bid date.

E. Addenda: Bidder shall acknowledge all addenda. Any changes or questions for clarifications must be received a minimum 7 days prior to the bid date.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. All equipment shall fit through a standard 42 inch wide by 84 inch high door.

B. Provide with 1-year warranty from assembly date for all components, equipment and accessories.

C. Provide all shipping and freight costs in the bid. Include the delivery time in days required to ship the equipment from the factory to the project site listed below. It is the responsibility of the manufacturer to store the equipment at the factory until called for by the project General Contractor. Based on the delivery time required, the General Contractor will call for the equipment to be shipped in time for project installation. Equipment is to be shipped to Montana State University, Campus Stores, Bozeman, MT 59717. Facilities Services personnel will move the materials from storage to the project site.

D. State in the bid the delivery time from the time of order to on site delivery. Delivery time required for this project is 8 weeks maximum from the time the order is placed to delivery on site. Apply any quick ship costs to meet this delivery requirement.

E. State in the bid, the construction and assembly time from the time of on site delivery (or host room availability) to final construction. Construction time allocated for this clean room is 4 weeks maximum from time of delivery or from the time of host room availability.

2.2 CLEANROOM CONSTRUCTION

A. The nominal size of the clean room is 20’x16’ with an integrated walkable ceiling/lid at 9’-0” inside clearance. Provide a vestibule gowning area of 8’ wide and 4’ long. (See drawing for exact layout).

B. Provide the entire space rated as a Class 10,000 cleanroom. The airflow design is single pass with air exiting the cleanroom at the floor level and back to the host room, with the host room serving as the return air plenum. Air is taken from the plenum space and routed down through the room with Fan Filter Units.

C. Provide rigid, non-insulated, 4” maximum thickness modular wall panels with 0.12mm thick (minimum) white vinyl (uPVC) laminate on the interior surfaces. Provide structural reinforcement at regular intervals (e.g. 16” or 24” on center) at the north and east walls.
of the cleanroom to allow for upper cabinet installation. Panels can be self-supporting or frame supported.

D. Frame (if needed): Factory-applied powder-coated aluminum “H” shape frame shall have three-coat fluoropolymer finish system with color coat and clear coat containing not less than 70 percent PVDF resin by weight (AAMA 2605) OR epoxy primer and two-coat silicone-modified, polyester-enamel finish (MPI INT 5.4B). Provide coating that is resistant to all acids listed in the “Basis of Design” section above.

E. Leveling base / curb: Provide 3” high (minimum) integrated, adjustable base to ensure true and plumb final cleanroom assembly on the existing concrete floor which may have irregularities. Curb shall provide adequate dimension to allow integral coved base for floor covering material as shown on drawings.

F. Provide rigid “walkable” self-supporting ceiling using the same materials as the wall construction except provide the outside top (outer surface) with a walkable material. If needed, provide intermediate ceiling/lid threaded rod support to limit deflection. 4-5 threaded rods are permitted to be attached to the host structure (beam and deck construction). Roof/ceiling shall be capable of supporting 25 psf with 300 pound single concentrated load. Coordinate supports with host room mechanical and existing systems. If a pattern of roof supports does not match the attached drawing, make provisions for an alternate ceiling pattern that allows for the installation of the lights and fan filter units. Complete suspension or attachment to the host room structure for clear room support is not allowed for this project. Coordinate support for ceiling/roof (if required) with the general contractor. The general contractor will install required threaded rod supports and seismic anchors to the existing structure where required.

G. Provide (2) 3’x7’ man doors with half-lite windows. Provide doors with white polyester-enamel powder coat finish, designed for acid resistance to Hydroflouric acid.

1. Hinges: compatible with cleanroom and door assemblies.

2. Closers: basis of design: LCN 4041

3. Latchsets: ADA compliant lever handle, core to be Best 93K series or compatible with Best 7-pin core system. Provide one Entrance latchset (door 1) and one Passage latchset (door 2).

H. Windows: Provide integral, compatible glazing panels of impact-resistant, polycarbonate (plexi-glass) or acrylic sheet

I. Provide (4) 2’x4’ and (2) 2’x2’ Boron Free Fan Filter Units (FFU) for mounting in the hard lid ceiling. See attached FFU schedule as required to meet class 10,000 requirements, 277v / 1phase power.

J. Provide (5) 2’x4’ and (3) 2’x2’ recessed, clean room rated LED light fixtures. See plans for layout.

1. Provide Class 10,000 rated clean room light fixtures with gasketing between the lens and door frame, door frame and housing, and housing to grid. Housing to be made of heavy gauge steel and powder coated after fabrication. All exposed metal is required to be powder coated for acid resistance to Hydroflouric acid. Lens screws may be painted/touched up after installation.
2. 2x4 Light fixtures shall be rated for a minimum of 5250 delivered lumens, using less than 65 input watts, 277v/1ph.

3. 2x2 light fixtures shall be rated for a minimum of 2625 delivered lumens, using less than 33 input watts, 277v/1ph.

4. Light fixtures shall be rated for a minimum of 50,000 hours at 70% lumen maintenance.

5. LED’s used shall be provide 4000K with 85 CRI.

6. Lens shall be Pattern 12 acrylic, 0.125” thick, inverted. Smooth side down for cleanability.

K. Provide (6) return air grille mounted in the lower wall panels for return air back to host space. Provide return grilles with volume dampers to all for space balancing and pressurization. Size grilles for 500 cfm each, 18”x12” nominal size. Coordinate height and location of return grilles to allow for flooring installation and cabinet installation.

L. Provide seismic and/or sway bracing as required to meet the seismic requirements of the site (Bozeman, MT). Provide seismic bracing drawing and certification with the submittal package. Provide certification documentation by a licensed structural engineer, with the submittal package.

M. Provide a complete set of installation drawings in both AutoCAD format and PDF format.

N. Provide all material crated for common carrier transportation and delivered to the site as noted above.

O. Provide full installation of all components by the manufacturer’s trained installation crews.

P. Provide cleanroom air quality certification. Certification to include filter scan, particle counts at work height, room pressure differentials and test documentation. Provide certification at the final completion of the project, after all general construction is completed.

Q. Install the cleanroom in coordination with the installation of the fume hood. Fume hood is required be set in the room prior to enclosing at least one wall due to height constraints of the fume hood.

R. Include coordination with project contractor to provide a complete installation. This includes coordination of cleanroom installation schedule, verification of host room availability (demolition and cleaning of host room is required to be complete prior to installation of cleanroom).

S. All touch-up and construction damage repair shall be reviewed with the Architect or Engineer and shall be replaced or repaired to their satisfaction, at the sole descervation of the Architect or Engineer. All touch-up materials shall be match surface/material being repaired.

END OF CLEANROOM SPECIFICATION
NOTES:
1. ALL DIMENSIONS AND SIZES ARE NOMINAL, UNLESS NOTED OTHERWISE

CLEANROOM FLOOR PLAN
1/4" = 1'-0"

EPS 105 CLEANROOM
REMODEL

PPA #16-0002
EX A
1/3/17
<table>
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<th>TAG</th>
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<th>MODEL</th>
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<th>ARRANGEMENT</th>
<th>ALTITUDE (W.C.)</th>
<th>AIRFLOW (CFM)</th>
<th>SP (IN W.C.)</th>
<th>DRIVE</th>
<th>CONTROL</th>
<th>MAX DBA</th>
<th>FILTER TYPE</th>
<th>VOLT.</th>
<th>PHASE</th>
<th>HZ</th>
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<th>REMARKS</th>
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<td>VESTIBULE</td>
<td>VESTIBULE</td>
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<td>4500'</td>
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<td>277</td>
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**REMARKS:**
1. PROVIDE ACID RESISTANT POWDER COATED PAINT FINISH, SNAP IN PRE-FILTER (MERV 7), PREWIRED DISCONNECT AND PTFE BORON-FREE ULPA FILTERS. PROVIDE SOLID STATE OR THREE SPEED FAN SPEED CONTROLLER.
PART 1  GENERAL

1.1  WORK INCLUDED

A. Basis of design:
   1. Polypropylene construction.
   2. Nominal 5’ (60”) hood.
   3. Vertical laminar flow with boron free HEPA supply air filtration.
   4. Needs to meet or exceed Class 1000 air quality standards.
   5. Suitable for high acid and trace metal analysis use.
   6. Model Nu-aire NU-156-530 or equal.
   7. UL Listed unit.

B. Provide the complete hood, acid storage support base cabinet, rear top duct connection and all accessories.

C. Provide internal light fixtures,

D. Provide internal circulation fan. External exhaust fan to be provide by others.

E. Include all shipping and handling costs.

F. Maximum installed dimensions including support base are: 61” wide, 107-1/2” tall (including duct connection), 38” deep.

1.2  SHOP DRAWINGS

A. Submit shop drawings for the fume hood and components.

B. Provide shop drawings that include all construction information, ratings, components, warranty information and dimensional data.  Submit shop drawings with the quote indicating if unit meets all specifications.

C. Any alternate manufacturer desiring to bid shall meet or exceed all requirements of the following specification. Any deviation from these specifications or lack of providing all supporting information with the bid will be subject to rejection of the bid. A bidder must state if they are unable or unwilling to meet any requirements of this specification. Inability or unwillingness to meet any requirement in part or total may be cause for rejection of bid. Any exception taken by the bidder must be clearly identified on the bid forms.

D. Substitution Requests: to be received a minimum 10 days prior to the bid date.

E. Addenda: Bidder shall acknowledge all addenda. Any changes or questions for clarifications must be received a minimum 7 days prior to the bid date.
PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. All equipment shall fit through a standard 42 inch wide by 84 inch high door.

B. Provide with 1-year warranty for all components, equipment and accessories.

C. Provide all shipping and freight costs in the bid. Include the delivery time in days required to ship the equipment from the factory to the project site listed below. It is the responsibility of the manufacturer to store the equipment at the factory until called for by the project General Contractor. Based on the delivery time required, the General Contractor will call for the equipment to be shipped in time for project installation. Equipment is to be shipped to Montana State University, Campus Stores, Bozeman, MT 59717. Facilities Services personnel will move the materials from storage to the project site.

D. State in the bid the delivery time from the time of order to on site delivery. Delivery time required for this project is 8 weeks maximum from the time the order is placed to delivery on site. Apply any quick ship costs to meet this delivery requirement.


F. Provide UL listed fume hood.

2.2 FUME HOOD CONSTRUCTION

A. Maximum dimensions including rear exhaust duct are 60-1/2” wide, 37-1/2” deep, 77-3/8” tall (64” tall without the exhaust duct).

B. Provide ½” stress relieved, seam welded, white polypropylene construction for the outer cabinet shell, inner workspace walls and spill trough plenum under work space. Provide fully non-metallic interior with front filter maintenance. Provide flush interior access panels. Provide ¼” thick access panels and work surface. Provide exhaust duct and rear duct plenum constructed of ¼” thick polypropylene. Provide double wall construction. Provide polypropylene sliding window components, handles, hinges and screws. Provide pvc coated metallic counter weights for the window counter balance system. Provide clear Lexan polycarbonate view screen. Provide a return air plenum and spill trough below the work surface. Provide removable solid work surface with perforated front and rear grilles. Provide shash opening from 19-1/2” fully open to fully closed, with a work opening of 8”-12”.

C. Provide the internal space rated to Class 1,000 cleanroom level. Provide with polypropylene internal blower supply fan with plastic impeller and HEPA filter module with Boron Free HEPA filters. Provide separatorless HEPA filters rated for 99.99% efficiency at 0.3 micron particle size. Provide access opening with 100fpm air barrier. Provide supply air from the clean room through a pre-filter at the top of the hood, through the supply fan, through the HEPA filters and into the hood through a PVC diffuser. Direct supply air in a laminar flow across the entire interior of the hood at a downflow velocity of 60 fpm. Provide exhaust air removed from the hood at the back, bottom of the hood to ensure air is drawn away from the front opening, through the return air plenum under
the work surface. Provide exhaust transition from exhaust plenum to 10” diameter duct connection at top of hood.

D. Provide with Nu-Aire NU-55-530 (or approved equal) polypropylene fume hood base cabinet. Provide base cabinet constructed of ½” thick polypropylene (1/4” thick back panel). Provide with adjustable leg levelers. Provide with 3 vented doors with polypropylene hinges and pulls.

E. Provide with Nu-Aire NU-S948-06 (or approved equal) exhaust monitor alarm with supply blower interlock. Provide a digital manometer with integrated digital transducer to monitor the exhaust system negative pressure. Provide with LED to indicate acceptable pressure, caution, near alarm and alarm condition. Provide with interlock to the supply blower to shut down supply fan upon loss of exhaust pressure.

F. Provide with polypropylene enclosed fluorescent lighting with Lexan polycarbonate cover, 100 foot-candles (1076 LUX with low heat fluorescent ballast.

G. Provide modular electrical component construction sealed in polypropylene case with access panel. Provide solid state motor voltage regulator. Provide single point electrical connection, 120v/1phase power, 6 amps.

H. Provide magnehelic gauge to monitor supply plenum static pressure, encased with polypropylene housing with Lexan polycarbonate window.

I. Electrical outlets are not required in the hood.

J. Provide hood completely factory assembled, shipped to job site. Provide base completely factory assembled and shipped to the job site. Final installation of the base and the hood including exhaust and single point electrical connections will be completed by others. However, any assembly of the hood or base not included from the factory is the responsibility of the hood supplier. Any field assembly other than described, is required to be completed by factory trained personnel at the job site.

END OF FUME HOOD SPECIFICATION
Setting the Standard
in the most demanding environments

NuAire offers a wide variety of polypropylene laboratory furniture and equipment. Products include the FumeGard vertical laminar airflow fume hoods, FumeGard conventional and by-pass fume hoods, FumeGard base cabinets, FumeGard acid storage cabinets and a full line of polypropylene casework. All FumeGard hoods are available in nominal 4, 5, 6, and 8 foot lengths; and 24” (610 mm) or 30” (762 mm) work surface depths.

NuAire Polypropylene products are the ideal solution to meet your requirements. They have a proven performance record in a wide range of markets.

Applications:
• Chemical Engineering
• Electrical Engineering
• Material Science
• Environmental Toxic Analysis
• Analytical Chemistry
• Metallurgy
• Water Treatment Facilities
• Toxicology
• Trace Metal Analysis
• Marine Science
• Waste Management
• Soil Science
• Semiconductor
Durable Polypropylene Construction

NuAire Polypropylene products are constructed from primarily stress-relieved, fully seam-welded, and reinforced white polypropylene. The outer cabinet shell, inner workspace walls, spill trough plenum under workspace, and shelves are constructed from 1⁄2 inch (13 mm) polypropylene. The exhaust duct, access panels, and work surface are constructed from 1⁄4 inch (6 mm) polypropylene.

Polypropylene is a highly corrosive-resistant material that has high temperature and tensile strength. It possesses excellent chemical resistance to organic solvents and degreasing agents as well as electrolytic attack. The properties of polypropylene are enhanced with anti-oxidizing agents and UV stabilizers to increase strength and improve thermal characteristics. Polypropylene is lightweight, stain resistant, and has a low moisture absorption rate. All this makes NuAire polypropylene products an excellent choice for long-lasting, highly corrosive-resistant, metal-free applications.

Our product’s basic construction is polypropylene. However, depending upon customer requirements, other thermoplastics may be used. Polyvinyl Chloride (PVC), Chlorinated Polyvinyl Chloride (CPVC), Flame Retardant Polypropylene, Polyvinylidene Fluoride (PVDF), High Density Polyethylene (HDPE), and TFE-Tetrafluoroethylene (Teflon®) are available.

Virtually Metal Free

All FumeGard cabinets are virtually metal free and do not use nylon components. “Double wall” construction forms the plumbing chase for the routing and connection of all services required [A, B], including the electrical outlets. The sloped bottom polypropylene sink basin and strainer are fabricated from 1⁄4 inch (6 mm) polypropylene [C]. Access panels are provided for front maintenance of HEPA filters, services, electronic systems, and counterweight balance system. The window counterbalance contains metallic weights, but is encased in PVC [D]. Metallic components, such as the fluorescent lighting, are fully encased in non-metallic materials [E]. Drawers, drawer guides, sliding window components, drawer pulls, handles, hinges, and screws are also manufactured using polypropylene [F, G, H].
FumeGard NU-156
vertical laminar airflow fume hood for high acid and trace metal analysis use

Constructed almost entirely of polypropylene, this fume hood contains the HEPEX™ Zero Leak Airflow System, available only from NuAire. The HEPEX™ system prevents uneven particulate loading by eliminating direct blasts to the HEPA filter, dispensing air over 100% of the surface. The system surrounds positive pressure airflow chambers and ducts with negative air pressure relative to the laboratory. This limits the possibility of leaks and guards against filter failure.

The FumeGard NU-156 is designed and tested to meet product and personnel containment performance as established by National Sanitation Foundation Standard No. 49 for Biological Safety Cabinets. These cabinets meet or exceed Federal Standard 209e, Class 10 air quality conditions, and have been independently tested for containment properties in accordance to ASHRAE Standard 110-1995 for Fume Hoods.
Standard Features

- HEPEX™ Zero Leak Air Flow System
- Large Separator-Less (Aluminum Free) HEPA Filters, 99.999% Efficient on 0.3 Micron Particles
- PVC Diffuser over Supply HEPA
- ½” (13 mm) Stress Relieved All Seam Welded Polypropylene Work Zone
- Vented and Plumbed Spill Trough Plenum under Work Surface
- ⅛” (6 mm) Lexan® with Margard® View Screen with 10” (254 mm) Access Opening at 105 LFPM
- View Screen Slides 19 ½” (495 mm) Maximum Opening to Fully Closing
- Removable Work Surface/Inlet Grill
- Front Filter Removal without Removing View Screen
- Polypropylene Blower/HEPA Filter Module
- Polypropylene Enclosed Fluorescent Lighting with Lexan Cover: 100 Foot-Candles (1076 LUX) with Low-Heat Fluorescent Ballast
- Modular Electrical Component Construction Sealed in Polypropylene Case with Access Panel
- Solid State Motor Voltage Regulator

Optional Features

- ULPA Filters: 99.999% Efficient on 0.12 Micron Particles
- Remote Controlled Service Valves for Air, Vacuum, and/or NZ Available in PVC, PVDF, Teflon® or Polypropylene
- Magnehelic Gauge to Monitor Supply Plenum Encased in Polypropylene Housing with Lexan® Window
- Additional Duplex Outlet(s) with PVC Covers
- Cascade Rinse Tanks with Nitrogen Purge
- Digital Manometer/Alarm
- Exhaust Interlocks for Building Controls
- D.I. or N2 Teflon® Spray Guns
- Teflon®, PVDF, or Polypropylene Dip Tanks with or without Drains
- Polypropylene or PVDF sinks with Hot/Cold or D.I. Water Faucets
- Teflon® Liquid/Air Aspirators to Syphon Chemicals
- Fully Perforated Work Surface (10% Open)
- Polypropylene Rectangle-to-Round Exhaust Transitions
- Custom Polypropylene Sinks with Chemically Resistant “P”-Trap
- Ground Fault Circuit Interrupter for Duplex Outlet
- Vented Base Support Cabinet

NU-156 Specifications

<table>
<thead>
<tr>
<th>Overall Dimensions</th>
<th>4 ft Models</th>
<th>5 ft Models</th>
<th>6 ft Models</th>
<th>8 ft Models</th>
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<tbody>
<tr>
<td>Width 24” Work Surface</td>
<td>48 ½” (1232 mm)</td>
<td>60 ½” (1537 mm)</td>
<td>72 ½” (1842 mm)</td>
<td>96 ½” (2451 mm)</td>
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<td>Height (includes pre-filter grill)</td>
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<td>67 ½” (1718 mm)</td>
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<td>Width 24” Work Surface</td>
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<td>30” Work Surface</td>
<td>756 lbs (344 kg)</td>
<td>839 lbs (381 kg)</td>
<td>900 lbs (409 kg)</td>
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<td>1925 m/hr</td>
<td>2382 m/hr</td>
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<td>30” Work Surface</td>
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<td>1753 m/hr</td>
<td>2168 m/hr</td>
<td>3000 m/hr</td>
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| Exhaust Static | 0.8” (20 mm) w.g. | 0.8” (20 mm) w.g. | 0.8” (20 mm) w.g. | 1.5” (38 mm) w.g. |

| Exhaust Duct Opening | 4” x 24” (102 x 610 mm) | 4” x 30” (102 x 762 mm) | 4” x 30” (102 x 762 mm) | 4” x 36” (102 x 914 mm) |

| Airflow Characteristics | Down Flow Velocity: 60 LFPM (0.30 m/s) | Inflow Velocity: 105 LFPM (0.53 m/s) | 10” Access Opening |

| Electrical Requirements**** | 115 Volts AC, 60 Hz – or – 230 50 Hz Blower/Lights (Amps): 6 (8 for 8 ft Model) – or – (3 @ 230 VAC) Outlet 115 V (Amps): 15” – or – (10 @ 230 VAC) |

* Metallic pipe, required for natural gas, or any other metallic surface, is coated with a 20-mil thickness of thermoplastic powder PolyArmor®
** Includes fume hood base cabinet. Leg levelers, handles, hinges and screws are made of polypropylene. Solid doors have adjustable air vents and are secured with a concealed magnetic latch.
*** Concurrent Balance Value shall be used for design and balance exhaust/supply HVAC requirements.
**** If more amperage is required, separate circuits can be provided at additional cost.
**NU-55 Fume Hood Base**

*polypropylene fume hood bases*

The NU-55 Fume Hood Base is available as an option for NuAire polypropylene fume hoods. The NU-55 is constructed from long-lasting, corrosive-resistant, white polypropylene. The outer cabinet shell, kick panel, and shelves are constructed using 1/2 inch (13 mm) polypropylene. The rear access panels use 1/4 inch (6 mm) polypropylene.

The entire cabinet is totally seam welded and reinforced with polypropylene supports to ensure the cabinets’ ability to withstand the weight of the FumeGard Fume Hood. All bases come with adjustable leg levelers with 1 1/4 inch (32 mm) maximum adjustment.
FumeGard NU-55 Polypropylene Fume Hood Bases

**NU-55 4 ft Fume Hood Base**

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<th>Height (B)</th>
<th>Depth (C)</th>
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<td>NU-55-430</td>
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**NU-55 5 ft Fume Hood Base**

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<th>Height (B)</th>
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<td>NU-55-524</td>
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<td>NU-55-530</td>
<td>60 1/2&quot; (1537 mm)</td>
<td>28 1/4&quot; (718 mm)</td>
<td>32&quot; (813 mm)</td>
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**NU-55 6 ft Fume Hood Base**

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<td>NU-55-624</td>
<td>72 1/2&quot; (1842 mm)</td>
<td>28 1/4&quot; (718 mm)</td>
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<td>NU-55-630</td>
<td>72 1/2&quot; (1842 mm)</td>
<td>28 1/4&quot; (718 mm)</td>
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**NU-55 8 ft Fume Hood Base**

<table>
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</tbody>
</table>
PART 1  GENERAL

1.1  WORK INCLUDED

A.  Basis of design:
   1.  Polypropylene Class 100 Horizontal Laminar Flow table top work station.
   3.  Unit designed for trace metal operation with no metal in the work chamber.
   4.  Provide quantity of 2.
   5.  Provide all interior materials resistant to:
       a.  Nitric acid (Concentrated)
       b.  Hydrochloride acid (Concentrated)
       c.  Hydroflouric acid (Concentrated)
       d.  Oxalic Acid (Concentrated)
       e.  Hydrogen Bromide acid.

B.  Provide the complete laminar clean bench and all accessories.

C.  Provide internal light fixtures,

D.  Provide internal fan.

E.  Include all shipping and handling costs.

1.2  SHOP DRAWINGS

A.  Submit shop drawings for the Laminar Clean Bench and components.

B.  Provide shop drawings that include all construction information, ratings, components, warranty information and dimensional data.  Submit shop drawings with the quote indicating if unit meets all specifications.

C. Any alternate manufacturer desiring to bid shall meet or exceed all requirements of the following specification. Any deviation from these specifications or lack of providing all supporting information with the bid will be subject to rejection of the bid. A bidder must state if they are unable or unwilling to meet any requirements of this specification. Inability or unwillingness to meet any requirement in part or total may be cause for rejection of bid. Any exception taken by the bidder must be clearly identified on the bid forms.

D. Substitution Requests: to be received a minimum 10 days prior to the bid date.

E. Addenda: Bidder shall acknowledge all addenda. Any changes or questions for clarifications must be received a minimum 7 days prior to the bid date.

PART 2  PRODUCTS

2.1  GENERAL REQUIREMENTS
A. Provide with 1-year warranty for all components, equipment and accessories.

B. Provide all shipping and freight costs in the bid. Include the delivery time in days required to ship the equipment from the factory to the project site listed below. It is the responsibility of the manufacturer to store the equipment at the factory until called for by the project General Contractor. Based on the delivery time required, the General Contractor will call for the equipment to be shipped in time for project installation. Equipment is to be shipped to Montana State University, Campus Stores, Bozeman, MT 59717. Facilities Services personnel will move the materials from storage to the project site.

C. State in the bid the delivery time from the time of order to on site delivery. Delivery time required for this project is 8 weeks from the time the order is placed to delivery on site. Apply any quick ship costs to meet this delivery requirement.

D. Provide clean bench conforming to the latest NEC standards. Provide unit to meet or exceed specifications for Class 100 Unidirectional Flow Clean-Air Devices per the Institute of Environmental Sciences Technology, TEST-RP-CC002.2.

2.2 LAMINAR CLEAN BENCH CONSTRUCTION

A. Maximum dimensions including rear exhaust duct are 50" wide, 34" deep, 46" tall with a 23" (minimum) high work chamber and 22" (minimum) deep work surface. Unit needs to fit through a 42" wide door.


C. Provide the internal space rated to Class 100 level, metal free. Provide with coated internal blower supply fan with coated impeller and HEPA filter module with Boron Free HEPA filters. Provide separatorless HEPA filters rated for 99.99% efficiency at 0.3 micron particle size. Provide supply air from the clean room through a pre-filter grille at the top of the hood. Provide air into the hood through the supply fan, through the HEPA filters and into the hood through a grille. Direct supply air in a laminar flow across the entire interior of the hood at a downflow with the fan rated for 800 cfm at 1.2" of static pressure, 1/3hp. Provide fan with a solid state speed controller to adjust airflow rate.

D. Provide with (2) enclosed fluorescent lights, 100 foot-candles in the work chamber.

E. Provide with fan and light switches mounted on the module. Provide with (2) 115v, 15 amp GFI duplex receptacles.

F. Provide magnehelic gauge to monitor HEPA filter pressure drop.

G. Provide laminar clean bench completely factory assembled, shipped to job site. Final installation of the clean bench including single point electrical connections will be completed by others. However, any assembly of the clean bench not included from the factory is the responsibility of of the hood supplier. Any field assembly other than described, is required to be completed by factory trained personnel at the job site.

END OF LAMINAR CLEAN BENCH SPECIFICATION
1. Clean acrylic side and top panels.

2. From front of unit.

3. Exposed to view, determine the help function.

4. Dual or multiple. Clear, easy to clean, and easy to remove.

5. Side view.

6. Solid polycarbonate top.

7. Split 1/2" away from power cord.

8. Direct drive motor.

9. fluorescent tubes (2) x 250W.

10. 15A, 120V, 60Hz. Double pin.

11. Wood frame, heavy filter, 54" x 48" x 3'

12. Use with or without the help function.

NOTES:

4. Electrical wiring to conform to latest NEC standards.

3. Make grille, motor, and other electrical components are metal, but outside of the unit.

2. Unit designed to track metal operation with no metal parts in work chamber.

1. Unit constructed of white, specified relieved polycarbonate.
PART 1 GENERAL

1.1 WORK INCLUDED

A. Basis of design:
   1. Polypropylene dry down cabinet.
   2. Model TFI Inline Design Corporation or approved equal.
   3. 4 chamber design with exhaust duct.

B. Provide the dry down cabinet and all accessories.

C. Include all shipping and handling costs.

1.2 SHOP DRAWINGS

A. Submit shop drawings for the Dry Down Cabinet and components.

B. Provide shop drawings that include all construction information, ratings, components, warranty information and dimensional data. Submit shop drawings with the quote to indicating the unit meets all specifications.

C. Any alternate manufacturer desiring to bid shall meet or exceed all requirements of the following specification. Any deviation from these specifications or lack of providing all supporting information with the bid will be subject to rejection of the bid. A bidder must state if they are unable or unwilling to meet any requirements of this specification. Inability or unwillingness to meet any requirement in part or total may be cause for rejection of bid. Any exception taken by the bidder must be clearly identified on the bid forms.

D. Substitution Requests: to be received a minimum 10 days prior to the bid date.

E. Addenda: Bidder shall acknowledge all addenda. Any changes or questions for clarifications must be received a minimum 7 days prior to the bid date.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Provide with 1-year warranty for all components, equipment and accessories.

B. Provide all shipping and freight costs in the bid. Include the delivery time in days required to ship the equipment from the factory to the project site listed below. It is the responsibility of the manufacturer to store the equipment at the factory until called for by the project General Contractor. Based on the delivery time required, the General Contractor will call for the equipment to be shipped in time for project installation. Equipment is to be shipped to Montana State University, Campus Stores, Bozeman, MT 59717. Facilities Services personnel will move the materials from storage to the project site.
C. State in the bid the delivery time from the time of order to on site delivery. Delivery time required for this project is 8 weeks maximum from the time the order is placed to delivery on site. Apply any quick ship costs to meet this delivery requirement.

2.2 DRY DOWN CABINET CONSTRUCTION

A. Maximum dimensions including side exhaust duct are 43” wide, 25” deep, 65” tall, minimum internal volume of the cabinet chambers is 16 cubic feet. Provide with 4 chambers matching the attached cut sheet.

B. Provide stress relieved, seam welded, white polypropylene construction for the cabinet. Provide fully non-metallic interior with front filter maintenance. Provide with clear polycarbonate access doors with polypropylene hinges and pulls.

C. Provide the unit with side inlet Boron Free ULPA filters. Provide separatorless ULPA filters rated for 99.99% efficiency at 0.3 micron particle size. Provide exhaust air duct on the side of the cabinet with a nominal 8” diameter duct connection. Provide exhaust rated for 350 cfm and 0.6” sp maximum. Provide exhaust plenum with an exhaust damper for balancing.

END OF DRY DOWN CABINET SPECIFICATION
DRY DOWN BOXES

QNT: (1)
MAT: WHITE POLYPROPYLENE & CLEAR POLYCARBONATE

NOTE: THIS IS A PROPRIETARY DESIGN AND IS NOT TO BE DUPLICATED.
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DRAWN BY
DATE

APPD

RCX

5655 E. 59h.COMMERCE CITY, COLORADO

NOTES:

DESIGN CORP.

INLINE DESIGN

WRITTEN CONSENT OF TFI / OR DIVULGED WITHOUT THE

TOLERANCES

LC-834-01

DRY DOWN BOXES

NEW WIDTH AND HEIGHT CHANGED

30002.0000

65.0000

27.0000

20.0000

10.0000

ULPA

27.0000

6.0000

8.8459

6.0000

25.000

22.0000

25.0000

16.0000

22.0000

68.000

0.500

25.5000

3.0000

55.0000

12.0000

23.000

10.1875

38.0000

59.6900

7.875 OD

DAMPER

2016.0000

24.0000

215.0000

24.0000

ULPA FILTERS

EXHAUST OUTLET

EXHAUST OUTLET

FRONT VIEW

SIDE VIEW

PLAN VIEW

QNT: (1)
PART 1 GENERAL

1.1 WORK INCLUDED

A. Basis of design:
1. Cabinet Construction: Polypropylene, acid resistant.
2. Countertop Construction: Modified Epoxy Resin
3. Exposed metal components are not approved for this project.
4. Provide all materials resistant to:
   a. Nitric acid (Concentrated)
   b. Hydrochloride acid (Concentrated)
   c. Hydrofluoric acid (Concentrated)
   d. Oxalic Acid (Concentrated)
   e. Hydrogen Bromide acid.

B. Refer to attached exhibits for cabinet layouts, quantities and countertop sizes.

1.2 SHOP DRAWINGS

A. Submit shop drawings for the cabinets and countertops.

B. Provide shop drawings that include all construction information, ratings, components, warranty information and dimensional data. **Submit shop drawings with the quote indicating if unit meets all specifications.**

C. Any alternate manufacturer desiring to bid shall meet or exceed all requirements of the following specification. Any deviation from these specifications or lack of providing all supporting information with the bid will be subject to rejection of the bid. A bidder must state if they are unable or unwilling to meet any requirements of this specification. Inability or unwillingness to meet any requirement in part or total may be cause for rejection of bid. Any exception taken by the bidder must be clearly identified on the bid forms.

D. Substitution Requests: to be received a minimum 10 days prior to the bid date.

E. Addenda: Bidder shall acknowledge all addenda. Any changes or questions for clarifications must be received a minimum 7 days prior to the bid date.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. All equipment shall fit through a standard 42 inch wide by 84 inch high door.

B. Provide with 1-year warranty for all components, equipment and accessories.

C. Provide all shipping and freight costs in the bid. Include the delivery time in days required to ship the equipment from the factory to the project site listed below. **It is the**
D. State in the bid the delivery time from the time of order to on site delivery. Delivery time required for this project is 8 weeks maximum from the time the order is placed to delivery on site. Apply any quick ship costs to meet this delivery requirement.

2.2 CASEWORK CONSTRUCTION

A. Provide polypropylene cabinets. Provide cabinets constructed of ½" thick polypropylene (1/4" thick back panel).
   1. Face Style: Flush Overlay.
   2. Cabinet Style: Face Frame.
   5. Door and Drawer Pulls: Polypropylene.
   7. Countertop Supports: Polypropylene
      a. Provide support for countertop as needed where no base cabinets are provided below countertop areas.

B. Provide polypropylene wall-mounted shelf units.
   1. Material: 1" thick, 12" deep, polypropylene with eased edges and perimeter rails.
   2. Coordinate proper and adequate support with Cleanroom Manufacturer.
      a. Language from Cleanroom Specification: “Provide structural reinforcement at regular intervals (e.g. 16” or 24” on center) at the north and east walls of the cleanroom to allow for upper cabinet installation.”

2.3 COUNTER TOP CONSTRUCTION

A. Provide Modified Epoxy Resin Countertop
   1. Top Thickness: 1 inch
   2. Edge Treatment: Uniformly rounded on exposed edges and corners.
   3. Material: Epoxy Resin, chemical and abrasion resistant, non-glare black matte finish.
   4. Backsplash Curb: same material as top, 4 inches high. Provide where tops abut wall surfaces. Include end curb where top abuts end wall.

B. Provide Integral Sink
   1. Single-basin, epoxy sink bonded to countertop with invisible joint line.
   2. Size: 20” wide, 17” front to back, 12” deep, interior dimensions.
   3. Provide with drain fitting, provide with rear right drain, (offset).

C. Grommets
   1. General Contractor shall provide (4) compatible grommets through countertop in locations to be determined by Owner.
   2. Provide to General Contractor written instructions and all specialty tools needed.

END OF CASEWORK & COUNTER TOP SPECIFICATION
1. NORTH- CLEANROOM - EXHIBIT
   1/4" = 1'-0"

2. NORTH- PENINSULA - EXHIBIT
   1/4" = 1'-0"
1. SOUTH - CLEANROOM - EXHIBIT

2. SOUTH - PENINSULA - EXHIBIT
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

2. Installation of the Work.
3. Cutting and patching.
4. Coordination of Owner-installed products.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

B. Related Requirements:

1. Section 011000 "Summary" for limits on use of Project site.

1.3 QUALITY ASSURANCE

A. 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 Consultant of locations and details of cutting and await directions from Consultant 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 those 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 Consultant'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. 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. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Consultant for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. 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.

B. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. 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.

B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

C. 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 written and email request for information to Consultant.
3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings. If discrepancies are discovered, promptly notify Consultant by email and in writing.

1. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
2. Inform installers of lines and levels to which they must comply.
3. Check the location, level and plumb, of every major element as the Work progresses.
4. Notify Consultant when deviations from required lines and levels exceed allowable tolerances.

B. 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 Consultant.

3.4 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 Consultant, and in compliance with accessibility requirements.
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.

3.5 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. 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: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Proceed with patching after construction operations requiring cutting are complete.

F. 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. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

G. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.6 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.

3. Containerize hazardous and unsanitary waste materials separately from other waste.

4. 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.

1. 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.

H. 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.

I. 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.

3.7 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.

3.8 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 017300
PART 1 - GENERAL

1.1 WASTE MANAGEMENT REQUIREMENTS

Owner requires that this project generate the least amount of trash and waste possible. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration and shall be recycled:

- Aluminum and plastic beverage containers.
- Corrugated cardboard.
- Wood pallets.
- Clean dimensional wood: May be used as blocking or furring.
- Land clearing debris, including brush, branches, logs, and stumps.
- Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.

Methods of trash/waste disposal that are not acceptable are:
- Burning on the project site.
- Burying on the project site.
- Dumping or burying on other property, public or private.
- Other illegal dumping or burying.

Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, State and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.2 DEFINITIONS

Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
Non-hazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
Return: To give back reusable items or unused products to vendors for credit.
Reuse: To reuse a construction waste material in some manner on the project site.
Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
Toxic: Poisonous to humans either immediately or after a long period of exposure.
Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

1.3 WASTE MANAGEMENT PLAN IMPLEMENTATION

Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and the Architect.
Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
Meetings: Discuss trash/waste management goals and issues at project meetings, including the Pre-bid meeting, Pre-construction meeting and regular job-site meetings.
Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.

As a minimum, provide:
Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking.
Separate dumpsters for each category of recyclable.
Recycling bins at worker lunch area.

Provide containers as required.

Provide adequate space for pick-up and delivery and convenience to subcontractors.

Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION 017320
SECTION 01740
WARRANTIES AND BONDS

1.1 GENERAL

A. RELATED DOCUMENTS

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

B. SUMMARY

1. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers standard warranties on products and special warranties.
   a. Refer to the General Conditions for terms of the Contractor's special warranty of workmanship and materials.
   b. General closeout requirements are included in Section "Project Closeout."
   c. Specific requirements for warranties for the Work and products and installations that are specified to be warranted, are included in the individual Sections of Divisions-2 through -16.
   d. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

2. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

C. DEFINITIONS

1. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

2. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

D. WARRANTY REQUIREMENTS

1. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.

2. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

3. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with
requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefitted from use of the Work through a portion of its anticipated useful service life.

4. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

   a. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

5. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

E. SUBMITTALS

1. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect’s Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.

   a. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within fifteen days of completion of that designated portion of the Work.

2. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate items and identification, ready for execution by the required parties. Submit a draft to the Owner through the Architect for approval prior to final execution.

   a. Refer to individual Sections of Divisions-2 through -16 for specific content requirements, and particular requirements for submittal of special warranties.

3. Forms of Submittal: At Final Completion compile two copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

   1. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2” by 11” paper.

      a. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a
WARRANTIES AND BONDS

1. Provide a typed description of the product or installation, including the name or the product, and the name, address and telephone number of the installer.
   b. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS", the Project title or name, and the name of the Contractor.

2. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

1.2 PRODUCTS (NOT APPLICABLE)

1.3 EXECUTION

A. SCHEDULE OF WARRANTIES

1. Schedule: Provide warranties and bonds on products and installations as specified in the appropriate Sections.

END OF SECTION 017400
1.1 GENERAL

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

B. SUMMARY
   1. This Section specifies administrative and procedural requirements for project
      closeout, including but not limited to:
      a. Inspection procedures
      b. Project record document submittal
      c. Operating and maintenance manual submittal
      d. Submittal of warranties
      e. Final cleaning
      f. Closeout requirements for specific construction activities are included in
         the appropriate Sections in Divisions - 2 through - 33.

C. SUBSTANTIAL COMPLETION
   1. Preliminary Procedures: Before requesting inspection for certification of
      Substantial Completion, complete the following. List exceptions in the request.
      a. In the Application for Payment that coincides with, or first follows, the
         date Substantial Completion is claimed, show 100 percent completion for
         the portion of the Work claimed as substantially complete. Include
         supporting documentation for completion as indicated in these Contract
         Documents and a statement showing an accounting of changes to the
         Contract Sum.
         1) If 100 percent completion cannot be shown, include a list of
            incomplete items, the value of incomplete construction, and
            reasons the Work is not complete.
      b. Advise Owner of pending insurance change-over requirements.
      c. Submit specific warranties, workmanship bonds, maintenance
         agreements, final certifications and similar documents.
      d. Obtain and submit releases enabling the Owner unrestricted use of the
         Work and access to services and utilities; include occupancy permits,
         operating certificates and similar releases.
      e. See the Supplemental Conditions of the Contract for Construction 3.11
         for Documentation and As-Built Conditions, and the Project Closeout
         Checklist: Contractor Requirements. Submit maintenance manuals, final
         project photographs, damage or settlement survey, property survey, and
         similar final record information.
      f. Deliver tools, spare parts, extra stock, and similar items.
      h. Complete start-up testing of systems, and instruction of the Owner's
         operating and maintenance personnel. Discontinue or change over and
         remove temporary facilities from the site, along with construction tools,
         mock-ups, and similar elements.
      i. Complete final clean up requirements, including touch-up painting.
         Touch-up and otherwise repair and restore marred exposed finishes.
2. Inspection Procedures: On receipt of a request for inspection, the Consultant will either proceed with inspection or advise the Contractor of unfilled requirements. The Consultant will prepare the Certificate of Substantial Completion following inspection, or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.
   a. The Consultant will repeat inspection when requested and assured that the Work has been substantially completed.
   b. Results of the completed inspection will form the basis of requirements for final inspection.

D. FINAL ACCEPTANCE
1. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.
   a. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
   b. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
   c. Submit a certified copy of the Consultant's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Consultant.
   e. Submit consent of surety to final payment.
   f. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
2. Re-inspection Procedure: The Consultant will re-inspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Consultant.
   a. Upon completion of re-inspection, the Consultant will prepare a certificate of final acceptance, or advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
   b. If necessary, re-inspection will be repeated.

E. RECORD DOCUMENT SUBMITTALS
1. See also the Supplemental Conditions of the Contract for Construction 3.11 for Documentation and As-Built Conditions, and the Project Closeout Checklist: Contractor Requirements.
2. General: Do not use record documents (red-line markups) for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Consultant’s reference during normal working hours.
3. Record Drawings (Red-lined): Maintain two clean, undamaged sets of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the sets to show the red-line changes during the course of construction with actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the
corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

a. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.

b. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.

c. Note related Change Order numbers where applicable.

d. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.

4. Record Specifications: Maintain one complete copy of the Project Manual, including addenda, and one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction.

Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data.

a. Upon completion of the Work, submit record Specifications to the Consultant for the Owner's records.

5. Record Product Data: Maintain one copy of each Product Data submittal. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site, and from the manufacturer's installation instructions and recommendations. Give particular attention to concealed products and portions of the Work which cannot otherwise be readily discerned later by direct observation. Note related Change Orders and mark up of record drawings and Specifications.

a. Upon completion of mark-up, submit (3) complete sets of record Product Data to the Consultant for the Owner's records.

6. Record Sample Submitted: Immediately prior to the date or dates of Substantial Completion, the Contractor will meet at the site with the Consultant and the Owner's personnel to determine which of the submitted Samples that have been maintained during progress of the Work are to be transmitted to the Owner for record purposes. Comply with delivery to the Owner's Sample storage area.

7. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Consultant for the Owner's records.

8. Maintenance Manuals: Provide one (1) draft copy for review. Provide two (2) final paper copies and one electronic pdf file prior to final completion. Organize operating and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual heavy-duty 3-inch, 3 ring vinyl-covered binders. MSU will supply specific binders. Contact CPDC at 406/994-5413.

Mark appropriate identification on front and spine of each binder. Include the following types of information; and others as specified in other Divisions:

a. Emergency instructions

b. Spare parts list

c. Copies of warranties

d. Wiring diagrams
F. Warranties and Bonds

1. Summary
   a. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturer’s standard warranties on products and special warranties.

   1) Refer to the General Conditions and Supplemental Conditions for terms of the Contractor's special warranty of workmanship and materials.
   2) General closeout requirements are included in Section "Project Closeout."
   3) Specific requirements for warranties for the Work and products and installations that are specified to be warranted, are included in the individual Sections of Divisions -2 through -16.
   4) Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

C. Separate Prime Contracts: Each prime Contractor is responsible for warranties related to its own Contract.

2. Definitions
   a. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
   b. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

3. Warranty Requirements
   a. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
   b. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
   c. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is
responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefitted from use of the Work through a portion of its anticipated useful service life.

d. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1) Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

e. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

4. SUBMITTALS

a. Submit written warranties to the Consultant prior to the date certified for Substantial Completion. If the Consultant's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Consultant.

1) When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Consultant within fifteen days of completion of that designated portion of the Work.

b. Forms of Submittal: At Final Completion compile two copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

c. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2” by 11” paper.

1) Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name or the product, and the name, address and telephone number of the installer.

2) Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS, the Project title or name, and the name of the Contractor.

e. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.
1.2 EXECUTION

A. CLOSEOUT PROCEDURES

1. Functional Demonstration: Demonstrate proper operation of all systems to Consultants and Owners representative prior to request for substantial completion. Coordinate schedule with Consultant.

2. Operating and Maintenance Instructions: Provide two (2) duplicate training sessions for each MSU trade group responsible for systems installed under this project. Coordinate schedule with Owner. Arrange for each installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the following items:
   a. Maintenance manuals
   b. Record documents
   c. Spare parts and materials
   d. Tools
   e. Lubricants
   f. Fuels
   g. Identification systems
   h. Control sequences
   i. Hazards
   j. Cleaning
   k. Warranties and bonds
      1) Maintenance agreements and similar continuing commitments

END OF SECTION 017700
PART 1 - GENERAL

1.1 A. RELATED DOCUMENTS

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

1.2 SUMMARY

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

1. Operation and maintenance documentation directory.
2. Operation manuals for systems, subsystems, and equipment.
3. Product maintenance manuals.
4. Systems and equipment maintenance manuals.

1.3 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. Two paper copies and one electronic pdf. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will deliver two copies to the Owner. For Final manuals MSU will supply specific binders. Contact CPDC at 406/994-5413.

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 and Commissioning Authority will return copy with comments.
1. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR 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. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
   9. 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

G. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: **MSU will supply specific binders. Contact CPDC at 406/994-5413.** These binders are sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and oversize sheets will need to be folded to 8x11.5.
   
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 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. Precautions against improper use.

9. 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.

2.3 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.
2.4 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. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
B. 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.

C. 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.

D. 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.

E. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

PART 4 - MATERIAL AND FINISHES MAINTENANCE MANUAL

General: Incorporate as part of the O & M Manuals. Material and finishes to the Architect/Engineer for approval and distribution. Provide one section for architectural products, including applied materials and finishes, and a second section for products designed for moisture protection and products exposed to the water.

SCHEDULE 0 - Refer to individual specification sections for additional requirements on the care and maintenance of materials and finishes

PART 5 - Architectural Products, Applied Materials and Finishes: Provide complete manufacturers data and instructions on the care and maintenance of architectural products, including applied materials and finishes.

PART 6 - Manufacturers Data: Provide complete information on architectural products, including but not limited to the following items, as applicable:

SCHEDULE 0 - Manufacturer’s catalog number
SCHEDULE 1 - Size
SCHEDULE 2 - Material composition
SCHEDULE 3 - Color texture reordering information for specially manufactured products
SCHEDULE 4 - 5. Manufacturer and supplier/installers contact information
SCHEDULE 5 - Warranty terms

PART 7 - Care and Maintenance Instruction: Provide complete information on the care and maintenance of architectural products, including the manufacturer’s recommendations for the types of cleaning agents to be used and the methods of cleaning. In addition, provide information regarding cleaning agents and methods which could prove detrimental to the product. Include the manufacturer’s recommended schedule for cleaning and maintenance.

PART 8 - Manufacturer’s Data: Provide complete manufacturer’s data giving detailed information including, but not limited to the following, as applicable:

SCHEDULE 0 - Applicable standards
SCHEDULE 1 - Chemical composition
PART 9 - Schedule: Provide complete information in the materials and finishes manual on products specified in the following sections:
Division 1, sections 016000 through 016005
Division 6
Division 7
Division 8
Division 9
Division 10
Division 12
Division 13
Division 21
Division 22
Division 23
Division 26

9.1 Color Schedule: Provide complete information on MSU CPDC provided electronic spreadsheet form, to include manufacturer’s name and number, location, item and surface of all pai

END OF SECTION 017823
PART 1 - GENERAL

1.1 SUMMARY

A. See also General Conditions and Supplemental Conditions of the Contract for Construction.

B. See the Supplemental Conditions of the Contract for Construction 3.11 for Documentation and As-Built Conditions, and the Project Closeout Checklist: Contractor Requirements

C. Section includes administrative and procedural requirements for project record documents, including the following:
   1. Record Drawings.
   2. Record Specifications.
   3. Record Product Data.

D. Related Requirements:
   1. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
   2. Divisions 02 through 33 Sections for specific requirements for project record documents of the Work in those Sections.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings (Redline Markups): Comply with the following:
   1. Number of Copies: Submit one set(s) of marked-up record prints.
   2. Number of Copies: Submit copies of record Drawings as follows:
      a. Submittal:
         1) Submit two for review paper-copy set(s) of marked-up record prints.
         2) Submit PDF electronic files of scanned record prints and one set(s) of file prints.
         3) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
      b. Final Submittal:
         1) Submit one paper-copy set(s) of marked-up record prints.
         2) Submit PDF electronic files of scanned record prints and one set(s) of prints.
         3) Print each drawing, whether or not changes and additional information were recorded.

B. Record Specifications: Submit one paper copy or annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one paper copy or 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. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.

4. Identification: As follows:
   a. Project name and PPA Number.
   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, paper copy or scanned PDF electronic file(s) of marked-up paper copy of Specifications.

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, paper copy or scanned PDF electronic file(s) of marked-up paper copy of Product Data.

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, paper copy, or scanned PDF electronic file(s) of marked-up miscellaneous record submittals.

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 017839
PART 1 - GENERAL

1.1 SUMMARY

1. System Demonstration:
   a. General:
      i. The system demonstration is a functional test of systems to determine whether
         they are substantially complete and operating as specified. Systems are to be
         tested and confirmed to be operating properly by the contractor prior to the
         Demonstration.
      ii. Where initial Demonstration Session uncovers substantial deficiencies that
         require more than one Demonstration Session, Contractor shall reimburse Owner
         for personnel costs associated with performing subsequent Sessions.
   b. Systems to be Tested:
      i. All systems installed and/or provided under the project to have functional testing.
   c. Attendance:
      i. The system demonstration is to be provided by trained representatives that are
         familiar with the systems, and can operate systems as required to test and verify
         proper function. The Engineer and Owner’s representatives will be present to
         document performance and/or deficiencies. The General Contractor or others
         may attend if desired.
      ii. Individual testing sessions (modules) shall be provided for each type or group of
         systems, separated roughly by trade group that will be performing maintenance
         on the system. MSU trades groups and systems typically involved in testing are:
         (1) Electricians
         (2) Heating Plant (Hydronic and steam heating systems, controls)
         (3) Plumbers (Plumbing, gas-fired heating, process piping systems)
         (4) Refrigeration (Refrigeration, chilled water, packaged cooling systems)
   d. Schedule:
      i. Contractor to coordinate time requirements and dates with Owner and Engineer.
      Begin scheduling with sufficient time prior to desired Substantial Completion
      date to allow all parties to work into schedule, and for deficiencies to be
      completed prior to desired Substantial Completion date. Demonstration is to be
      provided prior to, and separate from, training.

2. Training:
   a. General:
      i. The system training is intended to familiarize the Owner’s operating and
         maintenance staff with all systems requiring maintenance. Training is to be
         provided after the systems are in place and operational, after issues noted during
         the Demonstration have been resolved, and before final acceptance.
   b. Systems Requiring Training:
      i. All systems installed and/or provided under the project are to have training.
   c. Attendance:
      i. Training is to be provided by trained representatives that are familiar with the
         system’s operation and maintenance requirements. Individual training sessions
         (modules) shall be provided for each type or group of systems, separated roughly
         by trade group that will be performing maintenance on the system. MSU trades
         groups and systems typically requiring training are:
         (1) Electricians
d. Schedule:
   i. Duplicate training sessions are to be provided for each training module, so that Owner’s operating personnel can be split into two groups during training. Duplicate training sessions to be scheduled during different weeks. Length of training sessions will be determined by scope of training, and as coordinated with Owner after draft copy of training documents have been reviewed.

2.1 PRODUCTS
1. Not applicable

3.1 EXECUTION
1. Demonstration:
   a. Demonstration Program:
      i. Engineer to develop a demonstration program to verify the proper operation of all required systems. Submit program to Owner and Contractor at least two weeks prior to Demonstration.
      ii. Engineer to work with Contractor to generate methods to be used to verify sequences and modes of operation that cannot be verified directly.
      iii. Engineer to provide at least one copy of all submittals, contract drawings, specifications, and changes related to systems to be demonstrated. Documents to be made available during Demonstration.
      iv. Contractor to provide at least one copy of Operating and Maintenance Manuals to be used during demonstration, including specified sequences of operation for field-constructed systems, and operating sequences for all manufactured equipment.
   b. Demonstration Session:
      i. Verify that all systems are functional and ready to operate in all modes prior to demonstration.
      ii. Assemble all program materials required for demonstration.
      iii. Contractor to provide all equipment necessary for access to, and operation of, systems including tools, ladder, lighting, and diagnostic equipment.
      iv. Verify operation of individual components within systems.
      v. Verify controls of related components are coordinated.
      vi. Verify all operating sequences, operating modes, and safety controls.
      vii. Record all pressures, temperatures, and other relevant data available from installed devices.
      viii. Where digital control systems are available, set-up trend reports of relevant parameters which will confirm proper operation of systems installed, modified, or affected by changes made during this project. Provide copies of reports to Engineer and Owner for review. Review, analyze, and discuss results, and provide follow-up reports as required to confirm proper operation.

2. Training:
   a. Training Documentation:
      i. Contractor to submit draft copy of agenda and training documents to Owner for review at least two weeks prior to training date.
      ii. Provide a copy of the following items for each person that will be attending the
Demonstration and Training

(1) Training agenda.
(2) Summary of new systems and existing systems affected by this project.
(3) Summary of work performed under this project.
(4) Control system drawings and sequences of operation.
(5) List of important maintenance and trouble-shooting operations for all systems.

iii. Provide minimum of 2 copies of following items:
(1) Contract documents including all drawings, specifications, addendums, and change orders.

b. Training Sessions:
   i. Assemble at location to be determined by the Owner.
   ii. Distribute training documentation as indicated above.
   iii. Provide classroom style training if required for orientation, discussion of new systems and existing systems affected by this project, and other issues appropriate for a classroom format.
   iv. Visit site and review locations, and perform detailed review of operation and maintenance requirements for current systems.

END OF SECTION 179000
SECTION 024119
SELECTIVE DEMOLITION

PART 1 - GENERAL

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

1.2 SUMMARY
A. Section Includes:
   1. Demolition and removal of selected portions of building or structure.
   2. Salvage of existing items to be reused or recycled.

1.3 DEFINITIONS
A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner.
C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 QUALITY ASSURANCE
A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
B. Standards: Comply with ANSI A10.6 and NFPA 241.

1.5 PRE-INSTALLATION MEETINGS
A. Pre-demolition Conference: Conduct conference at Project site.

1.6 CLOSEOUT SUBMITTALS
A. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.7 FIELD CONDITIONS
A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
   1. Before selective demolition, Owner will remove the following items:
      a. Text books and other loose classroom resources.
      b. Loose shelving units and storage cabinets.
      c. Loose furniture (tables and chairs).
      d. Loose equipment.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
D. Hazardous Materials: Hazardous materials are present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is included in the Contract Documents. Examine report to become aware of locations where hazardous materials are present. Do not proceed with selective demolition until all hazardous materials have been removed. Do not proceed with selective demo until all hazardous materials have been removed.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities and the protection facilities indicated to remain in service and protect them against damage during selective demolition operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit and email a written report to Architect and MSU Project Manager.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Comply with requirements for existing services/systems interruptions specified in Section 011000 "Summary."

C. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. If services/systems are required to be removed, relocated, or abandoned, provide temporary
services/ systems that bypass area of selective demolition and that maintain continuity of services/ systems to other parts of building.

2. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.

3. Piping to be removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.

4. Piping to be abandoned in place: Drain piping and cap or plug piping with same or compatible piping material.

5. Equipment to be removed: Disconnect and cap services and remove equipment.

6. Equipment to be removed and reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.

7. Equipment to be removed and salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

8. Ducts to be removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

9. Ducts to be abandoned in place: Cap or plug ducts with same or compatible ductwork material.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Section 015000 "Temporary Facilities and Controls".

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

B. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.

C. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

D. Do not use cutting torches for selective demolition operations.

E. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

F. Dispose of demolished items and materials promptly.

G. Removed and Salvaged Items:
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 on campus as directed by Owner.
5. Protect items from damage during transport and storage.

H. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

I. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal".

B. Burning: Do not burn demolished materials.

3.6 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119
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SECTION 104416 – FIRE EXTINGUISHERS

PART 1  GENERAL

1.1  SUMMARY
   A. Comply with applicable state and local codes. Meet the requirements of NFPA 10.
   B. Provide products bearing approved labels.

1.2  SUBMITTALS
   A. Submit Shop Drawings and details of the fire extinguishers.

PART 2  PRODUCTS

2.1  GENERAL
   A. Provide fire extinguishers as manufactured by Potter Roemer or approved equal.

2.2  MATERIALS
   A. Provide extinguishers FE-1 that are 10 lb., 4A80BC rating, UL approved.
   B. Provide Wall Mounted Extinguisher FE-1 with wall hook.

PART 3  EXECUTION

3.1  INSTALLATION
   A. Mount with center approximately 48 inches above the floor.
   B. Install with a maximum 75’ travel distance between fire extinguishers. Provide additional fire extinguishers as required to meet code or as directed by the local fire marshall.

END OF SECTION 104416
PART 1  GENERAL

1.1  SUMMARY

A. Scope of Work
1. The Automatic Sprinkler Control Contractor is responsible for the design and installation of an automatic sprinkler system in the remodel area and clean room.

2. Provide listed corrosion resistant fire sprinkler heads in the clean room. Provide all work in the clean room designed, rated and installed for an acid resistant installation. Provide all interior materials resistant to:
   a. Nitric acid (Concentrated).
   b. Hydrochloride acid (Concentrated).
   c. Hydrofluoric acid (Concentrated).
   d. Oxalic Acid (Concentrated).
   e. Hydrogen Bromide acid.

3. Piping is exposed in the host room Barnard Hall Room 105.

4. Install sprinkler heads in the center of ceiling panels in the clean room.

B. Section Includes:
1. Automatic Sprinkler systems.
2. Requirements of NFPA 13 and local governing authorities.
3. Fire protection sprinkler piping work with feed and cross main piping, branch line piping and sprinklers.

C. Related Sections:
1. Applicable Division 22 and 23 Sections. Refer to other Divisions for coordination of work.

1.2  GOVERNING AUTHORITIES

A. Comply with applicable state and local codes. Meet the requirements of NFPA 13 and NFPA 45 (Laboratory Requirements). Meet requirements of the Bozeman Fire department. Conform to classifications of occupancy, area coverage, rating of heads, and maximum number of heads served by each branch line and riser.

B. Provide sprinkler products bearing approved labels.

1.3  SUBMITTALS

A. Shop drawings:
   1. Submit Shop Drawings and details of the fire protection system to and receive approval from the governing authorities before six copies are forwarded to Consulting Design Solutions, Inc.
2. Submit a certificate upon completion of each fire protection sprinkler piping system stating that the work has been completed and tested in accordance with NFPA 13, that there are no defects in the system, and that it is operational. Sprinkler test procedures and certificate format will be as indicated in NFPA 13, unless otherwise directed by the governing authorities.

1.4 HYDRAULIC CRITERIA
A. Design a wet-pipe sprinkler system to protect remodel area. Provide design that is per NFPA 13.

B. Hazard Classifications:
1. Barnard Hall Room 105 and Clean room: Ordinary Hazard Group 1 as required by NFPA 45.

1.5 CONTRACTOR QUALIFICATIONS
A. The contractor for the automatic sprinkler installation is required to be a qualified fire protection contractor regularly engaged in the installation of automatic fire sprinkler systems and other fire equipment.

PART 2 PRODUCTS

2.1 MATERIALS
A. Provide materials complying with NFPA 13, "Standard for the Installation of Sprinkler Systems:. Size drain piping as shown, or if not shown, as required to drain the sprinkler system piping properly.

2.2 FIRE SPRINKLER PIPING
A. All interior piping is required to be in accordance with NFPA 13. Provide piping that matches existing piping.

B. Pipe Sizes 2 Inches and Smaller
   1. Pipe: Schedule 40 ASTM A-120 black steel
   2. Fittings: Class 150 malleable iron or Class 125 cast iron, or forged steel, threaded, ANSI B16.3 or B16.4
   3. Or match existing.

C. Pipe Sizes 2 1/2 Inches and Larger.
   1. Pipe: Schedule 40, ASTM A-120 black steel
   2. Fittings: Class 150 malleable iron, Class 125 cast iron, or forged steel, threaded, ANSI B16.3 or B16.4.
   3. Or match existing.

D. Fittings: UL and Factory Mutual approved; electric-resistance welded steel pipe, ASTM A135, or match existing.

E. Option: Schedule 10 pipe may be used on overhead sprinkler piping. Join pipe by UL Listed mechanical grooved couplings. Cut grooves are not permitted. Fit-fast installation technique couplings/fittings are not permitted on this project.
F. Option: Allied XL piping may be used on overhead sprinkler piping provided the following conditions are met:

1. Minimum Pipe Size 1 inch; maximum pipe size 3 inches.
2. Threads: Shop cut according to applicable ANSI standards.
3. Pipe Fittings: Provide pipe fittings that are listed for use with this type of pipe.

2.3 PIPING PRODUCTS
A. Provide factory-fabricated fire protection sprinkler piping products of the sizes and types indicated. Where not indicated, provide products to comply with installation requirements and with NFPA 13. Provide sizes and types to match piping and equipment connections.

2.4 AUTOMATIC SPRINKLERS
A. Provide standard, soldered-link, automatic sprinklers with 165°F operating temperature; except provide sprinklers with operating temperatures as required by NFPA 13 for installation near heating equipment or lights, or as indicated in other Sections of Specifications. Heads will be as follows:

1. In exposed areas, heads will be brass upright or equal.
2. In the cleanroom, utilize corrosion resistant white recessed heads with white escutcheon. Size orifice according to hydraulic calculations.

B. Maintenance Stock: For each style and temperature range required, furnish additional fire sprinklers of each type installed. Comply with NFPA 13.

C. Hangers and Supports: Provide hangers and supports as required by NFPA 13 and by governing authorities. Hangers will be listed by UL.

PART 3 EXECUTION

3.1 AUTOMATIC SPRINKLER DESIGN CRITERIA
A. System Design: Design entire existing space per NFPA 13. This standard will be used for water supply and demand and sprinkler design density. Comply with all local codes.

B. Maintain a 10 pound cushion between the supply curve and the demand point, including the hose stream allowance. Include underground piping in the hydraulic calculation for sprinkler piping.

3.2 INSTALLATION
A. During installation, comply with the requirements of NFPA 13. Install sprinkler piping products in accordance with recognized industry practices to ensure that fire protection sprinklers piping complies with governing requirements and services the intended purposes.

B. Examine other work shown on the Drawings and conditions at the jobsite. Coordinate the routing of work with other construction trades to avoid interference with other installations.
C. Locate pipe routing and sprinkler head locations as required to avoid equipment, plumbing piping, heating, and air conditioning piping, ductwork, lighting fixtures, electrical conduits and bus ducts and similar work.

D. Provide pipe offsets as required to complete the installation. Modify shop prefabricated piping, pipe hangers, and other components as required to fit the jobsite conditions.

E. Shop drill and weld weld-o-lets piping.

F. Contractor is responsible for a neat and clean installation. Confirm proposed location of all exposed piping with engineer prior to bid. Conceal all piping in finished areas. Install all heads level. Fully recess all recessed heads.

3.3 IDENTIFICATION

A. Apply signs to controls, and drain, test and alarm valves to identify their purposes and functions. Provide lettering sizes and styles from NFPA'S suggested styles.

3.4 CLEANING AND FLUSHING

A. After fire sprinkler piping installation has been completed, and before piping is placed in service, flush new sprinkler piping under pressure, as required to remove foreign substances as required by NFPA 13. Continue flushing until water is clear, and check to ensure that debris has not clogged sprinklers.

3.5 TESTING

A. Repair or replace piping system as required to eliminate leakage in accordance with NFPA Standards for "little or no leakage", and retest as specified to demonstrate compliance.

END OF SECTION 211300
SECTION 220000 – BUILDING MECHANICAL PLUMBING REQUIREMENTS

PART 1 GENERAL

1.1 GENERAL SUPPLEMENTARY AND OTHER CONDITIONS OF THE CONTRACT

A. The general, supplementary and other Conditions of the Contract and the General Requirements (Division 1) are hereby made a part of this section.

1.2 INTENT OF PLANS AND SPECIFICATIONS

A. The plans and specifications contemplate the complete installation of the system described so that at the conclusion of the construction, the systems will be turned over to the owner complete and ready for safe, efficient operation. The plans and specifications cannot deal individually with the many minute items which may be required by the nature of the systems. Furnish and install all such items normally included on systems of this type, which while not mentioned directly herein, are obviously essential to the installation and operation of the system and which are normally furnished on quality installations of this type.

B. In receiving bids, it will be assumed that each bidder has made a thorough inspection of the conditions and is familiar with all conditions affecting the extent or cost of this work. Claims for extra payments as a result of failure to examine the conditions prior to submitting the bid will not be allowed.

C. The drawings are partly diagramtic and do not necessarily show the exact locations of plumbing and piping runs unless specifically dimensioned. Install piping to avoid other trades and install in a compact and neat manner to maximize the available space.

1.3 CODES, ORDINANCES AND PERMITS

A. Comply with all state and local codes and ordinances applying to the work specified herein. Attention is directed in particular to the UNIFORM PLUMBING CODE, INTERNATIONAL BUILDING CODE, INTERNATIONAL MECHANICAL CODE, INTERNATIONAL FUEL GAS CODE, INTERNATIONAL ENERGY CONSERVATION CODE AND/OR ANY AUTHORITY HAVING JURISDICTION, and local regulations concerning the specified plumbing, heating and cooling equipment.

B. Make application for, obtain and pay for all required permits and certificates of inspection for the work.

C. In the event of conflict between this specification and a governing code or ordinance, provide work to meet the higher standard. Provide all work to meet any local codes that affect work on the project. Extra payment will not be allowed for changes required by local regulations.

1.4 INSPECTION

A. Request regular inspections of duly authorized inspectors as required by codes and ordinances.
1.5 SUBSTITUTING

A. Submit proposals to contractor for substitution of material and equipment listed on the drawings and/or these specifications after the architect/engineer's approval has been obtained. For such proposals, provide materials and equipment that conform in type, function, quality of material and assembly and meet the requirements indicated in drawings and specifications. **SUBMIT REQUESTS FOR APPROVAL TO THE ARCHITECT/ENGINEER AT LEAST 10 DAYS PRIOR TO THE BID DATE.** Include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitute including drawings, cuts, performance and test data and any other information needed for an evaluation. Include a statement setting forth any changes in any other equipment or other work that incorporation of the substitute would require. The burden of proof of the merit of the proposed substitute is upon the proposer. If these proposed substitutions are considered as acceptable equals for quotations and use, approval will be issued in an addendum.

1.6 SHOP DRAWINGS

A. Prior to the placing of orders for any equipment, submit to the engineer for approval a complete schedule of mechanical equipment and fixtures to be installed. Include in the schedule at least six (6) sets each of catalogs, cuts, diagrams, shop drawings, performance curves or any other descriptive material necessary to fully describe the equipment proposed and its operating characteristics. In the schedules, list the operating conditions of the equipment at the conditions listed on the schedules.

B. Submit all shop drawings and sign, "approve" and initial prior to submittal to the engineer. The engineer will check the shop drawings to aid in interpreting the plans and specifications, and in so doing will assume that the shop drawings conform to all specified requirements set forth in this specification. The approval of the shop drawings by the engineer does not relieve the contractor of the responsibility of complying with all elements of the specification.

C. Make the determination of quantities of material and equipment required based on the drawings. Schedules on the drawings and in the specification are completed as an aid to the contractor, but where discrepancies arise, provide the proper number to complete this work.

1.7 ASBESTOS CONTAINING MATERIALS

A. Coordinate all work with the asbestos abatement contractor for this project. Prior to the start of work review all asbestos reports or sample analysis, that the Owner has had completed. Do not cut into or in any other way disturb existing materials which contain asbestos. Asbestos abatement is not within the scope of Division 22 work. If a material that has not been tested for asbestos must be disturbed, make a request in writing to the Owner that the material be tested for asbestos prior to the start of work.

B. Provide materials and equipment which do not contain asbestos. At the completion of the project, certify in writing that the materials and equipment installed do not contain asbestos.
1.8 LEAD FREE DOMESTIC WATER SYSTEMS

A. Provide a lead-free domestic water system including all equipment, piping, valves, fittings, joint materials and all other components in contact with domestic water. Lead-free is determined by the current codes and standards.

PART 2 PRODUCTS

2.1 MATERIALS.

A. Provide 3M CP25 caulk for fire barrier caulking system or Hilti or approved equal. Provide fire barrier caulk that is UL classified and Factory Mutual System approved.

PART 3 EXECUTION

3.1 INSTALLATION OF THE WORK

A. Examine all the drawings before proceeding with the layout and installation of his work. General and electrical wiring contract drawings will be made available to this Contractor. SHOULD DISCREPANCIES AFFECTING THE WORK BE FOUND, IMMEDIATELY REPORT SAME TO THE ENGINEER FOR INSTRUCTIONS. Provide for and cover the expense of subsequent changes made necessary by neglecting to discover and report such discrepancies, under the direction of the Engineer.

B. “Furnish”, “Provide”, and/or “Install” are all considered as a requirement to both furnish the equipment and install it unless specific reference is made to the furnishing or installing of the equipment by others.

C. Confer and cooperate with other Contractors on the job in the installation of the work so all work will be installed in proper relationship to the surrounding location and shape of any part to avoid conflicts. Provide for the correct size and location of any changes, slots, and openings required and do any cutting or patching made necessary by failure to make proper arrangements in this respect with no cost to the owner.

D. Locate pipes essentially as shown on the drawings, but in exact locations as laid out on the job to suit actual conditions. Arrange exposed pipes as closely as practical to wall or ceiling surfaces. Indicated connections to equipment are necessarily based on equipment of a given manufacturer. If the use of “approved equal” equipment is proposed, then assume the responsibility for proper location in a manner approved by the Engineer. Make changes that are necessary for this reason without additional cost to the Owner.

E. Follow the equipment manufacturer's instructions and recommendations in the installation and connection of all equipment and materials furnished under this contract. In the event of conflict or discrepancy between manufacturer’s instructions and the contract documents, notify the Engineer before proceeding. Do not make any equipment installation in a manner that voids the manufacturer’s warranty of the equipment.

3.2 CLEANING

A. Refer to section 232116 for cleaning of the heating and chilled water piping systems.

B. Remove labels, stickers, etc., and leave the entire installation in a clean, usable condition.
C. Thoroughly clean heating and cooling equipment, tanks, heat exchangers, pumps, traps, ducts, etc., and install new filters or filter media.

3.3 PAINTING

A. Protect the finishes of all mechanical equipment during storage, installation and until final acceptance. “Touch up” any damage or imperfections or if extensive, repaint the entire unit as directed by the Engineer.

3.4 FIRE BARRIER PENETRATIONS

A. Seal all cracks, voids, or holes for the passing of mechanical and electrical items through floors and fire rated walls, or ceilings with fire rating of 1 hour or more with a fire barrier caulk.

B. Provide 3M CP 25 caulk for fire barrier caulking system.

C. Install fire barrier caulking system in accordance with the manufacturer's recommendations to maintain a fire rating of 3 hours minimum.

3.5 SLEEVES

A. The Mechanical Contractor will set and maintain all sleeves. Provide sleevers for any pipe passing through building construction including walls, floors, roofs or masonry partitions in accordance with the following.

B. Provide all pipe sleeves through slabs, floors, masonry walls and partitions that are 1/2 inch greater in inside diameter than the external diameter of pipe passing through. Provide sleeves for insulated piping that are large enough to accommodate the insulation without harming the insulation or vapor barrier. Provide all sleeves that are fabricated from new material cut square and reamed.

C. Provide sleeves in all masonry partition walls and floors. Provide sleeves that are Schedule 40 steel pipe. Ensure that wall sleeves are flush with the wall surface. Extend the top of floor sleeves 1” above the floor, and ensure the bottom of the sleeve is flush with the floor.

D. Protect the space between the pipe and the sleeves, through fire rated walls and floors as designated below.

E. Furnish and install chrome-plated wall, floor and ceiling plates on all exposed pipes where they pass through walls, floors, or ceilings in finished areas. Provide the wall plates with set screws or spring locks for clamping to the pipe.

F. Provide watertight seal at all sleeves through floors.

3.6 OPENINGS

A. Provide all openings required for the passage of ductwork and mechanical equipment in the construction. Determine the correct location for all openings.

B. Provide the inside dimensions of all openings that are 1/2 inch greater than the size of the ductwork or equipment passing through the opening. Provide openings for insulated
ductwork are large enough to accommodate the insulation without harming the insulation or vapor barrier.

C. Protect all openings through fire rated walls and floors as described above.

D. Patch and seal all openings through all non-fire rated construction around piping or ductwork. Seal openings to match construction material or provide fire rated caulking as described in “Fire Barrier Penetrations” above.

E. Seal all openings around piping and ductwork in return air plenums to prevent non-plenum rated materials from being exposed in the plenums.

3.7 EXISTING SERVICES

A. Verify the exact location of all existing building services extended and/or relocated for this project. Also verify the exact location and take proper precautions to protect all services which may be encountered during construction.

B. Protect, brace, and support all active services which are encountered where required for proper execution of the work and without interruption of service if possible.

C. Protect all inactive services which are encountered or remove as directed by the Owner, Utility Company, or Municipal Agency having jurisdiction.

D. When active services must be temporarily interrupted, make arrangements to work continuously including overtime if required, to assure that services will be interrupted only as long as actually required to complete necessary work.

3.8 ACCESS TO EQUIPMENT

A. Provide access to all motors, valves, dampers, controls, specialties, etc., for maintenance purposes. Provide all access doors, access panels, removable sections, etc., required for access. The General Contractor will provide access panels and doors required in the building construction where shown on the plans. Coordinate the location of the access openings relative to the mechanical equipment to assure proper access to the equipment.

B. Provide all access openings required for manual motorized, fire and smoke dampers and other devices requiring access in the ductwork, plenums, housings, tanks, etc., under this portion of the contract.

3.9 PROTECTIVE DEVICES

A. Protect all sheaves, belts, drives, couplings, and moving parts by approved permanent guards, shields, or railings, which will be in place whenever the equipment is in operation and will be in accordance with applicable safety standards.

3.10 TESTS

A. Perform tests on the systems Specified herein.

B. Conduct all tests in the presence of the engineer and/or owner. Prior to conducting any tests or balancing of the systems, obtain and file a letter with the engineer's office if the tests are to be witnessed by the owner. Where required, perform such tests in the
presence of local or state building inspection officials. Maintain reports of all tests as they are performed. Include the following information in the reports:

1. Project
2. Contractor
3. Date
4. Test performed and portion of system tested.
5. Test results
6. Name and signature of person performing test.
7. Name and signature of witness of the test.

C. Upon completion of the project, submit the test reports with the operation and maintenance manuals for review by the Engineer.

D. Test soil, waste, and vent and storm drainage piping in accordance with applicable state and local codes. The minimum test will be as follows: Apply the water test to the drainage and vent systems either in its entirety or in sections. If applied to the entire system, tightly close all openings in the piping, except the highest opening, and fill the system with water to point of overflow. If the system is tested in sections, tightly plug each opening except the highest opening of the section under test, and fill each section with water, but do not test any section with less than ten (10) foot head of water. In testing successive sections, test at least the upper ten (10) feet of the next preceding section, so that no joint or pipe in the building (except the uppermost ten (10) feet of the system) is submitted to a test of less than a ten (10) foot head of water. Keep the water in the system, or in the portion under test, for at least fifteen (15) minutes before inspection starts. The system is then tight at all points.

E. Test domestic water piping and prove it watertight under a hydrostatic pressure of 150 psig. Ensure the piping system maintains the test pressure without loss for 2 hours. Determine loss by a drop in gauge pressure or visual leakage. Read the test pressure from a gauge location at the low elevation of the system or portion being tested.

3.11 STERILIZATION OF THE WATER SUPPLY

A. Chlorinate all domestic hot and cold water lines to comply with local and State health regulations.

B. Ensure this work is witnessed by the Architect/Engineer.

C. Apply the chlorinating agent at the start of a new line and inject it through a corporation cock or similar device, to ensure complete chlorination of all pipe.

D. Use calcium hypochlorite where applicable and use commercial products such as H.T.H., Perchloron, or Mexochloron. First mix the calcium hypochlorite mix to a homogeneous paste. The paste must contain approximately five (5) percent available chlorine by weight. Then, thin the paste to a slurry and mix with water to obtain a resultant consistency of 100 parts per million. Feed this mixture into the pipeline and retain for a one-hour contact period. Then open all valves in groups of three and run water of 100 parts per million calcium chlorite concentration through for a ten minute interval for each group of valves.

E. After chlorination, open all valves and run water through to waste for a ten minute period or until the waste water indicates a residual of not over 0.5 parts per million.
F. Provide potable water system testing by an approved independent testing agency and certify that the potable water system meets the requirements of local health authorities before using for domestic service upon completion of the system. The testing agency will obtain a representative sample at random outlets on the Project. If test sample does not prove to be potable, sterilize the entire Project's potable water system at no additional cost to the Owner. Furnish a copy of the test to the engineer and the local utility.

3.12 ALL EQUIPMENT FURNISHED UNDER DIVISION 220000:

A. At a time set by the contractor and agreed to by the owner, arrange to place equipment in operation and have available at that time, if required, representatives of the manufacturer of equipment to assist in starting equipment, to make necessary adjustments to equipment, and to prove satisfactory operation prior to turning facility over to the owner.

B. Repair or replace any irregularities, faulty equipment, etc., as required prior to acceptance.

C. Run operating test for 30 hour periods and submit data for approval.

D. Charge all equipment with clean media and completely finish installation prior to acceptance.

E. Properly balance all pumped water systems.

F. Properly balance all air systems. Balance the CFM of all diffusers to within 10% of the CFM listed on the schedule.

3.13 OPERATION AND MAINTENANCE MANUALS

A. Refer to Division 1 Requirements.

B. Include the following close-out documents in the manuals:
   1. Final Test and Balance reports.
   2. Valve tag chart.
   3. Asbestos letter.
   5. Equipment start-up and functional test reports.

3.14 PROJECT CLOSE OUT

A. Refer to Division 1 Requirements.

B. Final Payment will not be made until the contractor has satisfactorily completed all final inspection items.

C. Guarantee: Fully guarantee all equipment and work, parts and labor for one year from the date of substantial completion, unless noted otherwise. Guarantee all equipment and work and assume full responsibility to repair any equipment with no additional expense to the Owner which the manufacturer refuses to guarantee. The Owner has the right to order repairs to any equipment or work provided hereon and to charge the contractor for the same if repairs are not made during a reasonable period of time not to exceed 24 hours during an emergency or 72 hours on a non-critical item.

END OF SECTION 220000

BUILDING MECHANICAL PLUMBING REQUIREMENTS 220000 - 7
SECTION 220010 - DEMOLITION

PART 1 GENERAL
1.1 The extent of demolition is shown on the drawings.
1.2 Owner has first right of salvage for plumbing fixtures and mechanical equipment.
1.3 Remove all items which the owner does not wish to retain and dispose of off site.
1.4 SUBMIT PROPOSED SCHEDULE OF WORK TO ARCHITECT AND OWNER FOR REVIEW PRIOR TO START WORK. INCLUDE IN SCHEDULE COORDINATION FOR SHUT-OFF CAPPING AND CONTINUATION OF UTILITIES.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION
3.1 Demolish in an orderly and careful manner as required to accommodate new work. Protect existing supporting structural members.
3.2 Field verify exact locations of existing services and construction prior to demolition work. Take all necessary precautions to avoid damage to existing utilities or structure.
3.3 Repair all demolition performed in excess of that required at no cost to the owner.
3.4 Cap all pipes below floor or above ceiling. Remove all excess pipes and ducts.
3.5 Carefully remove all items to be retained by owner and store as directed by the owner.
3.6 Remove from site all debris, rubbish, and all other items which the owner does not retain and dispose of off site.

END OF SECTION 220010
PART 1 GENERAL

1.1 WORK INCLUDED

A. Provide factory-fabricated valves recommended by manufacturer for use in service indicated. Provide valves of types and pressure ratings indicated; provide proper selection as determined by Installer to comply with Installation requirements. Provide end connections which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.

B. SIZES: Unless otherwise indicated, provide valves of same size as upstream pipe size.

C. OPERATORS: Provide handwheels, fastened to valve stem, for valves other than quarter-turn. Provide lever handle for quarter-turn valves, 6” and smaller.

D. Refer to section 220553 for valve tag and valve chart requirements.

1.2 SHOP DRAWINGS

A. Submit shop drawings in accordance with section 220000.

B. Indicate pressure and temperature classifications and joining methods for all types of valves used in the project.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. The following valve manufacturers are approved: Nibco, Apollo, Red White, Watts or approved equal. Approved flow control valves are Autoflow, Nexus, Griswold or approved equal.

2.2 GATE VALVES

A. Provide NIBCO No. T-111 threaded, S-111 solder, 125 PSI steam, 200 PSI WOG for Bronze Gate Valves. Provide valves conforming to MSS SP-80.

B. Provide NIBCO No. F-617-0 flanged, 125 PSI steam, 200 PSI WOG for iron body gate valves. Provide valves conforming to MSS SP-70.

2.3 BALL VALVES

A. Provide NIBCO No. T-580 threaded, S-580 solder, 125 PSI steam, 400 PSI WOG for Bronze Ball Valves. Provide valves conforming to federal specification WW-V-35 CLASS A, Type II. Furnish with extended lever handle.

2.4 MANUAL BALANCING VALVES

A. Provide Armstrong, Victaulic TA, Bell and Gossett or Taco circuit setter valves.

1. Provide all valves constructed of bronze body-brass ball type with glass and carbon filled TFE seat rings.
3. Provide with memory stop feature to allow valve to be closed for service and then reopened to set point without disturbing balance position.
4. Provide with calibrated name plates to assure specific valve settings.
5. Provide valves designed for positive shut-off.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.

B. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward from horizontal plane unless unavoidable. Install valve drains with hose-end adapter for each valve that must be installed with stem below horizontal plane.

C. Install extended-stem valves, where insulation is indicated, arranged in proper manner to receive insulation.

3.2 SELECTION

B. Select and install valves with the following ends or types of pipe-tube connections:

1. Tube Size 2” and Smaller: Soldered joint valves.
2. Pipe Size 2” and Smaller: Threaded valves.
3. Pipe Size 2-1/2” and Larger: Flanged.

C. Install back flow preventers between 12” and 60” above finished floor. Pipe back flow preventer drains full size to floor drain utilizing an air gap fitting.

END OF SECTION 220523
PART 1 GENERAL

1.1 WORK INCLUDED

A. Provide pipe hangers that adequately support the piping system. Install near or at changes in piping direction and at concentrated loads. Install to provide vertical adjustment to maintain pitch required for proper drainage. Install to allow for expansion and contraction of the piping.

B. Construct and install duct hangers in accordance with the SMACNA HVAC Duct Construction Standards. Do not attach duct hangers to the floor or roof decks. Attach hangers to the structural steel construction with joist or beam clamps.

1.2 SESMIC REQUIREMENTS

A. Provide and install duct, piping and equipment supports to meet all seismic requirements as required in the International Building Code and American Society of Civil Engineer (ASCE), ASCE-7, latest editions.

B. Each manufacturer of seismic system components will submit a certificate of compliance for review and acceptance by the engineer and/or the authority having jurisdiction.

1.3 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 220000.

B. Indicate pipe hangers to be used for each size and type of pipe.

C. Indicate seismic supports to be used for each type of pipe, duct or equipment on the project.

PART 2 PRODUCTS

2.1 SESIMIC SUPPORTS

A. Provide seismic supports for piping, ductwork and equipment as manufactured by Amber Booth, Mason Industries, or approved equal.

2.2 PIPE HANGERS

A. Provide hangers that are constructed of malleable or wrought iron, and hangers supporting copper pipe that are copper plated. Hangers for pipe 3 inches and smaller must be adjustable split ring, ELCEN FIG. 89, Galv. and ELCEN FIG. 389 copper plated. For piping above 3 inches, hangers must be adjustable, Clevis type, ELCEN FIG. 12.

B. Support rod loading: Provide total hanger rod load (including piping, insulation, and medium) that does not exceed following limits:
### C. Nominal Rod Diameter vs. Max. Load

<table>
<thead>
<tr>
<th>Nominal Diameter</th>
<th>Max. Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8 IN</td>
<td>600 LB</td>
</tr>
<tr>
<td>1/2 IN</td>
<td>1100 LB</td>
</tr>
<tr>
<td>5/8 IN</td>
<td>1800 LB</td>
</tr>
<tr>
<td>3/4 IN</td>
<td>2700 LB</td>
</tr>
<tr>
<td>7/8 IN</td>
<td>3700 LB</td>
</tr>
<tr>
<td>1 IN</td>
<td>4900 LB</td>
</tr>
</tbody>
</table>

### 2.3 SUSPENDED EQUIPMENT

A. Provide threaded rod supports at each corner and additional support points. Provide vibration isolation as specified for each piece of equipment. Provide seismic support cables at each corner hanger and attach to the structure. Provide rod stiffeners for rods longer than 12”.

### 2.4 CONCRETE ANCHORS

A. Provide Hilti (or approved equal) concrete inserts installed per the manufacturers recommendations. Coordinate locations of pipe support anchors.

### PART 3 EXECUTION

#### 3.1 PIPE SUPPORT INSTALLATION

A. Where groups of three or more pipes occur, they may be supported with trapeze hangers using two hangers as specified with a capped pipe cross member.

B. Do not attach pipe hangers to the roof deck. Attach hangers to the steel construction with beam clamps, beam attachment and brackets bolted to joists and beams. Hang near joist panel joints wherever possible.

C. Provide pipe hangers for insulated piping that are large enough to encompass the insulation, using a metal shield so the vapor barrier jacket will not be broken. See Section 220719, Mechanical Insulation.

D. Hanging from one pipe to another is prohibited.

E. Install pipe hangers with the following spacing:

1. **HORIZONTAL STEEL PIPE:**
   
<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Maximum Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 1-1/4”</td>
<td>8 feet</td>
</tr>
<tr>
<td>1-1/2” to 3”</td>
<td>10 feet</td>
</tr>
<tr>
<td>4” to 6”</td>
<td>12 feet</td>
</tr>
</tbody>
</table>

2. **HORIZONTAL COPPER PIPE/TUBE:**

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Maximum Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2” to 3/4”</td>
<td>5 feet</td>
</tr>
<tr>
<td>1”</td>
<td>6 feet</td>
</tr>
</tbody>
</table>
3. Support horizontal cast iron soil pipe at five foot intervals except where 10 ft. lengths of pipe are used, 10 ft. intervals may be used.

4. Support horizontal and vertical plastic pipe 4'-0" on center.

5. Support vertical piping except plastic at each floor.

END OF SECTION 220529
SECTION 220553 – IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 WORK INCLUDED

A. Provide identification for all piping and mechanical equipment as specified in this section.

1.2 SHOP DRAWINGS

A. Submit shop drawings as indicated in Section 220000. Provide shop drawings indicating the materials used, colors and lettering for all piping and equipment labels. Furnish a complete list of equipment labels to be furnished for the project.

1.3 STANDARDS

A. Comply with ANSI A13.1 for lettering size, length of color field and viewing angles of identification devices.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Approved manufacturers are Allen Systems, W. H. Bradley, Industrial Safety Supply or Seaton Name Plate.

2.2 PIPE MARKERS

A. PLASTIC PIPE MARKERS; Snap-On Type: Provide manufacturer's standard pre-printed, semi-rigid, snap-on, color coded pipe markers complying with ANSI A13.1.

B. PLASTIC PIPE MARKERS; Pressure-Sensitive Type: Provide manufacturer's standard pre-printed, permanent adhesive, color coded pressure sensitive vinyl pipe markers complying with ANSI A13.1.

C. Small Pipes: For external diameters less than 6"(including insulation), provide full band pipe markers, extending 360 degrees around pipe at each location fastened by one of the following methods.

1. Snap on application of pre-tensioned semi-rigid plastic pipe marker.
2. Adhesive lap joint in pipe marker overlap.
3. Laminated or bonded application of pipe marker to pipe or insulation.
4. Taped to pipe or insulation with color coded plastic adhesive tape at least 2" wide with a full circle at both ends of pipe marker, tape lapped 4".

D. Large Pipes: For pipe diameters 6" and larger (including insulation), provide either full-band or strip type pipe markers, no narrower than 3 times letter height, and of required length fastened by one of the following methods:

1. Laminated or bonded application of pipe marker to pipe or insulation.
2. Taped to pipe or insulation with color-coded plastic adhesive tape, not less than 2" wide with a full circle at both ends of pipe marker. The tape must be lapped 4" at both ends.
3. Strapped-to-pipe or insulation application of semi-rigid type with manufacturer's standard stainless steel bands.

E. Provide lettering of the manufacturer's standard pre-printed nomenclature which best describes the piping system in each instance, or as selected by the engineer in cases of variance with names as shown or specified.

F. Provide with arrows on each pipe marker indicating direction of flow, either integrally with the piping system service lettering or as a separate unit of plastic.

G. Provide plastic tape of the manufacturer's standard color coded pressure sensitive vinyl tape not less than 3 mils thick. Provide tape for pipe with outside diameters (including insulation) less than 6", 1-1/2" wide. Provide tape for larger pipes, 2-1/2" wide.

2.3 VALVE TAGS

A. Provide brass valve tags that are 18 gauge with stamp engraved piping system abbreviation in 1/4" high letters and sequenced valve numbers 1/2" high. Tags will be 1-1/2" high. Fill the tag engraving with black enamel. Provide valve tag fasteners that are solid brass chain or solid brass S-hooks manufactured specifically for the connection of tags. Furnish flow control valves with brass tags listing equipment tag and rating.

2.4 EQUIPMENT LABELS

A. Provide engraved plastic laminate signs that are constructed of engraving stock melamine plastic laminate, complying with Fed. Spec. L-P-3387 in the sizes and thicknesses indicated, engraved with the engraver's standard letter style of the sizes and wording indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate. Provide engraving that exposes a contrasting inner layer. The thickness will be 1/16" for units up to 8" max. dimension 1/8" for larger units. Fasteners will be self tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

B. Provide plastic equipment markers that are manufacturer's standard laminated plastic, color coded equipment markers. Conform to the following color code.

1. Green: Cooling equipment and components.
2. Yellow: Heating equipment and components.
3. Yellow/Green: Common heating and cooling equipment components.
4. Blue: Equipment which does not meet any of the above criteria.
5. For hazardous equipment use colors and designs recommended by ANSI 13.1.

C. Provide nomenclature matching the terminology on the schedules as closely as possible and includes the following:

1. Name and plan number.
2. Equipment service.
3. Design capacity.
4. Other design parameters such as pressure drop, entering and leaving conditions, rpm etc.

D. Provide markers that are approximately 2-1/2" x 4" for control devices, dampers and valves; and 4-1/2" by 6" for equipment.
E. Provide Lettering and Graphics that coordinates names, abbreviations and other
designations used in mechanical identification work, with corresponding designations
shown specified or scheduled. Provide numbers, lettering and wording as indicated or,
if not otherwise indicated, as recommended by manufacturers or as required for proper
identification and operation/maintenance of mechanical systems and equipment. Where
multiple systems of the same generic name are shown and specified, provide individual
system number as well as service.

PART 3 EXECUTION

3.1 COORDINATION

A. Where identification is to be applied to surfaces requiring insulation, painting or other
covering, install the identification after completion of the painting and insulating.

3.2 INSTALLATION

A. Install pipe markers on each system including arrows to indicate the direction of flow.
Locate pipe markers and color bands as follows wherever piping is exposed to view in
occupied spaces, machine rooms, accessible maintenance spaces, plenums and
exterior locations.

1. Near each valve and control device.
2. Near each branch, excluding short take-offs for fixtures and terminal units.
3. Where pipes pass through walls floors or ceilings.
4. Near major items and other points of origination and termination.
5. Spaced intermediately along pipe runs at a maximum distance of 50’, reduce
   spacing to 25’ in congested areas of piping and equipment.

B. Provide valve tags on all valves, cocks and control devices in each piping system;
exclude plumbing fixture valves and shut off valves at plumbing equipment.

C. Valve Chart: Provide a valve chart in the operation and maintenance manual indicating
   the following:

1. Valve tag number.
2. Valve type: ball valve, butterfly valve, gate valve, etc.
3. System service: plumbing hot water, heating supply, chilled water supply, etc.
4. Use: isolation, balancing, shut-off, drain, etc.
5. Manufacturer.

D. Provide mechanical equipment identification on or near each major item of mechanical
equipment as herein specified. Provide signs that are engraved plastic laminate.
Provide signs for the following general categories:

1. Main control and operating valves including safety devices and gas outlets.
2. Meters, gauges and thermometers.

END OF SECTION 220553
SECTION 220719 – PLUMBING PIPING INSULATION

PART 1  GENERAL

1.1 WORK INCLUDED
A. Insulate all piping on the project as specified in this section.

1.2 SHOP DRAWINGS
A. Submit shop drawings as indicated in Section 220000. Include shop drawings for each type of insulation to be used on the project.

1.3 QUALITY ASSURANCE
A. Provide all covering and insulation materials used on this project that have the manufacturer’s name on the container. All materials must be dry and in good condition.

B. Provide all materials with composite fire and smoke hazard ratings as tested by procedures ASTM 84, NFPA 255 and U.L. 723 not to exceed 25 flame spread and 50 smoke developed.

PART 2  PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS
A. Accepted insulation materials are Certainteed or equal.

2.2 MATERIALS
A. Provide fiberglass pipe insulation that is Certainteed 500° fiberglass pipe insulation with factory applied all-service jacket. Provide insulation rated for use between -20°F and 500°F. Furnish the all service jacket with self sealing lap. Provide thermal conductivity at or below 0.22 BTU-in/hr,SF,°F at 100°F mean temperature. Seal all end joints with 3” wide butt strips of materials identical to pipe covering jackets.

B. Insulate ADA lavatory and sink P-trap drain and exposed supply pipes with fully molded, Truebro, Handi, Lav-Guard Insulation kit, light gray color. Provide insulation that is self extinguishing. Furnish nylon type fasteners with kit.

PART 3  EXECUTION

3.1 PIPE INSULATION
A. Insulation Thickness:

1. Insulate the following systems with the following thickness of fiberglass insulation:

   1/2” to 1”  1-1/2 to 3”  4” and Larger

   a. Domestic Hot Water      1”      1”      1”
      (including tempered hot water and recirculated hot water)

   b. Domestic Cold Water     1/2”     1/2”     1”
A. Installation

1. Install all pipe insulation in accordance with the manufacturer’s instructions. Seal all longitudinal joints with factory applied self-sealing laps. Seal all end joints with 3” wide butt strips of materials identical to pipe covering jackets, using adhesive such as Benjamin Foster 30-35 or self-sealing jacket. No stapling are permitted on any vapor barrier jackets. Do not perform any vapor barrier work or self-sealing laps or lap work when temperatures are below 40°F.

2. Insulate all fittings, valves, flanges and strainers with mitered segments of pipe insulation wired in place. Coat each fitting with two 1/8” coats of an approved vapor barrier mastic such as Benjamin Foster 30-35. Reinforce each fitting by wrapping with glass fabric cloth extending 2” onto adjacent pipes and finish with an additional coating of mastic worked into mesh of cloth to provide a smooth finish. Cover with 6 ounce canvas cover in all exposed areas. At the contractors option, premolded plastic fitting covers may be used if taped and sealed. A continuous vapor barrier must be maintained on all cold piping systems. Use corner beads on all square corners.

3. Maintain a continuous vapor barrier on all domestic cold water, chilled water and rain water piping systems. Install all pipe hangers on these systems outside the insulation with insulation shields installed to protect the insulation. Repair any damage to the vapor barrier with an approved vapor barrier mastic.

4. Install insulation shields between insulation and pipe hangers. Ensure shields are of sufficient size to prevent damage to the insulation.

5. Insulate the exposed water pipes and exposed drain on all lavatories.

END OF SECTION 220719
SECTION 221010 – PLUMBING PIPING AND SPECIALTIES

PART 1 GENERAL

1.1 WORK INCLUDED

A. Furnish and install where shown on the drawings and required to connect fixtures and equipment, pipe and fittings of type and material for the various services as noted below.

1.2 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 220000.

B. Indicate ASTM or ANSI ratings, pipe and fitting weights, pressure and temperature classifications and joining methods for all types of piping used in the project.

1.3 QUALITY ASSURANCE

A. Submit certification that each welder has passed A.W.S. qualification tests for the welding process involved and that certification is current. Ensure all welding is in compliance with the ASME “Boiler and Pressure Vessel Code”, Section IX, “Welding and Brazing Qualifications”. Comply with provisions of ASME B31 Series “Code for Pressure Piping”.

B. Provide a lead-free domestic water system including all equipment, piping, valves, fittings, joint materials and all other components in contact with domestic water. Lead-free is determined by the current codes and standards.

PART 2 PRODUCTS

2.1 DOMESTIC WATER PIPING AND REVERSE OSMISIS PIPING

A. In the clean room, metallic piping, fittings, valves and accessories are not allowed due to the harsh environment. In the clean room, provide Aquatherm polypropylene piping with fusion fittings, PEX tubing rated for domestic use with compression fittings (coat any exposed metal with 2 coats of epoxy paint) or schedule 80 pvc with solvent fittings rated for domestic use.

B. Outside the clean room, provide Type L, ASTM B88, hard drawn copper tubing for domestic cold and hot water in building above grade. Provide wrought copper solder type fittings, ANSI B16.22. Provide joints for pipe and fittings that are made with non-corrosive flux and 95-5 solder. Provide the maximum lead content of the flux and solder of 0.2% by volume.

C. Provide Type K, ASTM B88, soft drawn copper tubing for domestic cold water and hot water in building below grade. Provide McDonald copper flare fittings or equal.

D. At contractor option, outside the clean room, Pro-press mechanical fittings are acceptable in place of solder fittings.

E. Reverse Osmosis piping in the building shall be schedule 80 pvc with solvent fittings.
2.2 SANITARY SEWER, STORM SEWER AND VENT PIPE

A. Provide schedule 40 PVC plastic Type DWV pipe and fittings. Polyvinyl chloride (PVC) Schedule 40 will conform to ASTM D 1785 & 2665. Provide joints that are primer & solvent hub type.

B. Provide GSR FUSEAL DWV flame retardant polypropylene fittings and schedule 40 flame retardant polypropylene pipe meeting ASTM D2146 for ACID DRAIN, WASTE AND VENT PIPING. ENFIELD AND ORION is an acceptable equal. Base requirements on ASTM D 635. Make all connections in concealed locations with the GSR FUSEAL process. Provide joints in exposed or easily accessible locations are GSR Mechanical Joints. Provide circumferential grooves in piping that do not exceed 0.030" when mechanical joints are used. At the contractor's option GSR FUSEAL joints may be used in exposed locations. Match existing piping, fittings and connection types at connections to existing systems.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide all pipes are round and straight, of required size. Do cutting with proper tools and ream pipes to full size after cutting.

B. Properly enclose, support, guide, anchor, sway brace, connect, test, clean and flush out piping and properly insulate and protect where required.

C. Pipe sizes shown on the drawings are nominal pipe internal sizes and not outside diameters unless noted otherwise.

D. Run pipes substantially as indicated on the drawings. However, the architect/engineer reserves the right to require this Contractor to make minor changes in pipe locations where conflicts occur with other trades. Provide for such changes without extra cost to the Owner.

E. Install piping with ample provisions for expansion and contraction to prevent injury to the same and to the building construction. Make such provision by means of piping offsets, changes in direction, expansion loops and/or suitable expansion joints. Provide suitable anchors and guides to permit proper deflection and compression of offset loops and expansion joints. Do not use expansion joints in lieu of offsets, changes in direction or loops, except where specified and/or indicated on the drawings or where otherwise obviously necessary.

F. Run all pipes with proper grade to provide for easy draining and in group runs where applicable and in a neat and orderly manner, to the satisfaction of architect/engineer. Install lines required to be enclosed in ceiling, chaseways or spaces to permit such enclosure as intended. Carefully lay out all pipe runs and schedule to avoid unnecessary interferences with other work.

G. Provide minimum grade for horizontal drainage piping is 1/4 inch per foot for 3 inch diameter piping or less, 1/8 inch per foot for 4 inch and larger piping. Install all roof drain piping at 1/8 inch per foot.

H. Install dielectric unions at each piping joint between ferrous and non-ferrous piping and joints between dissimilar metals. Comply with manufacturer's installation instructions.
Provide standard products recommended by manufacturer for use in service indicated, which effectively isolate piping (electric conductance), prevent galvanic action and stop corrosion.

I. At all fixture connections where nipples are necessary between copper tubing and fixtures, ensure such nipples are standard weight full iron size chrome plated brass pipe nipples with suitable brass or copper adapters. Steel or iron nipples will not be permitted in any location in copper lines where connections are made to brass fixtures valves or trim.

3.2 JOINTS

A. Threaded Joints: Cut piping straight and square, ream, thread and work into place without springing. Use prepared pipe thread lubricant on outside threads only.

B. Flanged Joints: When bolting flanged joints, take care to insure that there is no restraint on opposite end of pipe or fittings which would prevent uniform gasket compression or cause unnecessary stress in flanges. Keep one flange free to move in any direction while flange bolts are being tightened. Tighten bolts gradually and at a uniform rate, so that gasket compression is uniform over entire area of gasket.

C. Welded Joints: Make welds by electric arc welding process in accord with ANSI B31.1. Mill or machine bevel pipe, except that in field limited amount of pipe may be flame beveled. Pipe with a wall thickness of 3/16 IN or less need not be beveled but may be welded by melting down into, and building up over abutting ends. Separate abutting ends of joints before welding to permit complete fusion to bottom without overlapping. Tack in two or more points to maintain alignment, and fusion weld. Weld continuously around pipe. Make all welds of sound weld metal, thoroughly fused into ends of pipe, and to bottom of “V”. Build in excess of pipe wall to give reinforcement of one fourth pipe wall thickness. Weld metal will present a gradual increase in thickness from surface of pipe to center of weld. Provide minimum weld width of two and one half times thickness of pipe wall. Use welding elbows at all turns in welded lines except where pipe bends are indicated or are required for flexibility. Mitered ells will not be permitted. Make all welded fittings of same material with same pressure and temperature rating as pipe with which they are used. Make flanged connections to control valves, pump suction, and specialties with ANSI standard welding neck flanges. All other flange connections may be made with slip-on flanges provided they are seal welded on inside. Fuse all fillet welds for flanges or fittings into pipe and plate for minimum distance of 1-1/2 times pipe wall thickness and depth of weld of 1-1/4 times pipe wall thickness. Provide eccentric reducers with flat side on top of pipe to prevent entrapment of air in the piping system.

D. Weld-o-lets and thread-o-lets: Scribe and cut openings in main pipes for welded branches accurately taking care to remove all of plug and cuttings from main pipe. Full weld fillet welds for full depth of fillet, with additional beads to form well rounded connection as recommended by weld-o-let manufacturer. Partially filled fillets not acceptable. Cut all openings into pipe for welded connections accurately to give carefully matched intersections.

E. High temperature soldered joints: Take care to avoid annealing of pipe material. Copper potable water piping will have soldered or brazed joints. Clean jointing surfaces thoroughly by hand. Apply flux immediately after cleaning. Do not rely on flux for actual cleaning. Fill all voids with solder as flux leaves to insure a strong joint. Select flux compatible with type joint being made. Ensure all joints comply with local codes and

PLUMBING PIPING AND SPECIALTIES 221010 - 3
ordinances and are installed per the Copper Development Association recommendations.

F. PVC Pipe: Provide solvent welded joints in all plastic piping according to instructions furnished by the pipe manufacturer. Do not install plastic pipe if it is not completely dry, if the ambient temperature is below 40°F or under direct exposure to the sun in temperatures above 90°F. Do not test plastic pipe with air or other compressible gases which could rupture the pipe and cause an injury. Cut pipe evenly, completely deburr and bevel. Clean pipe joint area, prime, cure, cement, and allow 48 hours of drying time before applying any appreciable internal or external pressure.

3.3 TESTS

A. Test piping as outlined in Section 220000.

END OF SECTION 221010
SECTION 224200 - PLUMBING FIXTURES

PART 1  GENERAL

1.1  RELATED DOCUMENTS

A.  The General, Supplementary and other Conditions of the Contract and the General Requirements (Division 1) are hereby made a part of this Section.

B.  Section 220000, General Requirements in its entirety, including references to the General Construction Specifications, are hereby adopted and made part of these Specifications.

1.2  SUMMARY

A.  The work involved in this specification and the accompanying drawings consists of performing all labor and furnishing of all materials, fixtures and equipment necessary to install complete sanitary sewer systems and potable hot and cold water systems, as described herein and/or shown on the drawings. This includes all piping, wiring and materials obviously necessary for complete systems though not specifically mentioned or shown.

1.3  MANUFACTURERS AND SELECTION

A.  Provide models, sizes and capacities as listed on the plumbing schedule on the plans. Pre-approved manufacturers are listed below. Provide all other plumbing fixtures as listed in the schedule or approved equal via the prior approval process.

<table>
<thead>
<tr>
<th>FIXTURE</th>
<th>APPROVED MANUFACTURER</th>
</tr>
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<tbody>
<tr>
<td>Water Closets, Urinals, Lavatories:</td>
<td>Kohler</td>
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<tr>
<td></td>
<td>American Standard</td>
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<tr>
<td></td>
<td>Eljer</td>
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<tr>
<td>Stainless Steel Sinks:</td>
<td>Just</td>
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<td>Kohler</td>
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<td>Faucets:</td>
<td>Delta</td>
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<td>Chicago Faucet</td>
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<tr>
<td></td>
<td>T&amp;S Brass</td>
</tr>
<tr>
<td>Drainage Specialties:</td>
<td>GSR Fuseal</td>
</tr>
</tbody>
</table>

1.4  SHOP DRAWINGS

A.  Submit shop drawings on all plumbing fixtures and equipment. Clearly label each item as designated on the plans. Include unit dimensions and construction specifications on the drawings. Clearly designate all features specified on the shop drawings.
1.5 STANDARDS

A. Provide all fixtures and faucets designated "ADA" in compliance with ANSI standard 117.1 and the Americans with Disabilities Act (ADA), buildings and facilities providing accessibility and usability for physically handicapped people.

B. Provide all fixtures and accessories to meet the latest requirements of the latest adopted edition of the Uniform Plumbing Code.

C. Provide lavatory and shower valves with temperature limit stops.

1.6 LEAD FREE DOMESTIC WATER SYSTEMS

A. Provide a lead-free domestic water system including all equipment, piping, valves, fittings, joint materials and all other components in contact with domestic water. Lead-free is determined by the current codes and standards.

PART 2 PRODUCTS

2.1 MATERIAL

A. CLEANOUTS (CO)

1. Furnish and install full size brass screw cleanout plugs at the bottom of all soil, waste and storm sewer stacks and at all points where shown on drawings, and where necessary to permit the entire drainage system to be rodded out easily. Provide cleanouts adjacent to the drains for floor drains located in branch lines on grade.

2. Provide JR SMITH 4020 series cast iron universal floor cleanout with inside caulk ferrule, brass plug, adjustable housing and round nickel brass secured frame and scoriated tractor cover. Provide the cover to accept the floor covering in the location being installed, i.e., synthetic covering, composition tile, terrazzo, etc. Provide carpet markers where needed. Provide all cleanouts installed in floors with waterproof membranes with clamping devices. Install cleanouts installed above finished grade with a seepage pan of 4 lb. sheet lead at least 3 feet square.

3. Provide JR SMITH 4420 wall cleanouts with brass plug and round stainless steel secured access cover.

B. FLOOR DRAINS (FD)

1. Furnish and install floor drains where shown on the drawings and as specified.

2. Provide acid resistant floor drains, GSR Fuseal or approved equal. Provide fixed height, moderate traffic floor drain for light traffic areas with 8" diameter grate, sediment strainer with removable flashing collar, manufactured from flame retardant (FR) polypropylene material conforming to ASTM D4101. Provide a boss on the body of the drain which can be drilled and tapped to accept a primer line up to ½” NPT.
C. EMERGENCY EYE WASH AND SHOWER

1. Furnish and install corrosion resistant combination shower and eye/face wash with Schedule 80 PVC construction, ABS plastic bowl, laminar flow eye/face wash, ABS plastic shower head with flow control, stayopen ball valve, floor flange, green corrosion resistant epoxy coating, yellow safety stripes and 1-1/4" supply connection.

2. See plans for more information including model number and mixing valve.

PART 3 EXECUTION

3.1 SYSTEM OF PLUMBING

A. Install the continuous waste and vent method of plumbing. Install hot, tempered and cold water lines where shown. Conceal all water piping in finished areas in joist spaces, above ceilings, and in walls.

B. Place pipes run overhead as close to the ceiling as possible, to maintain proper headroom and to present a neat appearance, all consistent with the pitching of pipes for drainage of the systems.

C. Install the plumbing work in strict accordance with the best plumbing practice, and in accordance with all applicable local, state and national plumbing regulations.

3.2 WASTE, VENT AND WATER CONNECTIONS

A. Provide chrome-plated brass pipe for all exposed flush, waste and supply pipes at the fixtures, iron pipe size. No steel nipples will be allowed. Provide heavy cast brass chromium plated components for faucets, stop valves, pop-up wastes, traps, flush valves etc. Water lines to all individual fixtures, where exposed, must be equipped with high grade, loose key chromium plated brass stop valves model B-1315 T&S BRASS or equal. Install all chrome plate over a nickel plated base. Provide backing at wall to support fixtures. Provide all water closets with all bolt caps with retainer clips. Match groups of fixtures. Furnish all fixtures which do not have integral traps with 17 gauge chromium plated brass p-traps with cleanouts.

B. Provide waste, vent and water supply piping to plumbing fixtures which is not shown on the drawings and size in accordance with the plumbing schedule on the plans. Vent all plumbing fixtures, wastes, and drains in accordance with all applicable Local, State and National Plumbing Regulations.

C. SHOCK ABSORBERS: Install piping with proper safeguards to prevent water hammer. This will be done by providing air cushions in the piping at each plumbing fixture. Air cushion must be same size as piping on which installed, 16" long, with removable cap wherever accessible.

D. Provide all floor sinks and floor drains with trap primer taps and JR Smith 2699, Watts A200 or PPP P1-500 trap primer valves. Connect valve to nearest water supply or supply stop. Install valve in an accessible location.

END OF SECTION 224200
SECTION 230000 - BUILDING MECHANICAL HVAC REQUIREMENTS

PART 1 GENERAL

1.1 GENERAL SUPPLEMENTARY AND OTHER CONDITIONS OF THE CONTRACT

A. The general, supplementary and other Conditions of the Contract and the General Requirements (Division 1) are hereby made a part of this section.

B. The Building Mechanical Plumbing Requirements, Division 220000 are hereby made part of this section.

PART 2 PRODUCTS

2.1 MATERIALS.

A. The Building Mechanical Plumbing Requirements, Division 220000 are hereby made part of this section.

PART 3 EXECUTION

3.1 INSTALLATION OF THE WORK

A. The Building Mechanical Plumbing Requirements, Division 220000 are hereby made part of this section.

3.2 TESTS

A. Perform tests on the systems specified herein.

B. Conduct all tests in the presence of the engineer and/or owner. Prior to conducting any tests or balancing of the systems, obtain and file a letter with the engineer’s office if the tests are to be witnessed by the owner. Where required, perform such tests in the presence of local or state building inspection officials. Maintain reports of all tests as they are performed. Include the following information in the reports:

1. Project
2. Contractor
3. Date
4. Test performed and portion of system tested.
5. Test results
6. Name and signature of person performing test.
7. Name and signature of witness of the test.

C. Upon completion of the project, submit the test reports with the operation and maintenance manuals for review by the Engineer.

D. Test hot water heating and chilled water piping and prove it watertight under a hydrostatic pressure of 100 psig. Ensure the piping system maintains the test pressure without loss for 2 hours. Determine loss by a drop in gauge pressure or visual leakage. Read the test pressure from a gauge location at the low elevation of the system or portion being tested.
E. Test natural gas piping with an air pressure of not less than 25 psig. Ensure the system holds this pressure for 24 hours without pressure drop except for pressure change due to temperature differential. For natural gas piping which is welded or carrying gas at pressures over 14 inches water column pressure, test at a pressure of 60 psig. and is continued for a length of time satisfactory to the administrative authority, but in no case less than 30 minutes.

F. Testing and charging refrigeration system:
1. PIPING TESTS: After the refrigeration piping and fittings have been assembled, remove all flux from connections and clean all lines. Blow out the piping system out with dry nitrogen to remove any free water or dirt which might be present. Charge the refrigerant lines with dry nitrogen and prove them tight at minimum gauge pressures of 300 PSI on the high side and 150 PSI on the low side. Ensure the system holds these pressures for a period of 24 hours without pressure drop except for pressure change due to temperature differential.

2. EVACUATION AND DEHYDRATION: After the piping system has been proven tight by the pressure test, accomplish evacuation and dehydration of the system using the double evacuation method described in the following paragraphs.

3. EQUIPMENT AND CONDITIONS: Provide a two-stage, high vacuum pump capable of pumping down to 100 microns or lower while evacuating the system, and of adequate displacement to evacuate the various systems within a reasonable mercury absolute. Also provide a wetbulb vacuum indicator, a supply of 100 percent methyl alcohol for use with this instrument and a temperature-pressure conversion chart for 100 percent methyl alcohol. Do the evacuation only when the ambient air temperature is 50 degrees F or higher. Be careful to go no lower than 5.16 millimeters of mercury absolute on the evacuation procedure to prevent the formation of ice in the piping system.

4. SYSTEM EVACUATION: This procedure begins after the vacuum pump and wetbulb indicator have been properly attached to the piping system. The vacuum is operated continuously until the pressure within the system reaches 5.16 millimeters of mercury absolute at which point the pump is stopped.

5. REFRIGERATION AND OIL CHARGE: Charge the system with the proper amount of refrigerant and oil as recommended by the manufacturer based on the system size and refrigerant piping lengths. After charging the system, check the system sub-cooling and the suction and discharge pressure to ensure the system is properly charged with refrigerant. Verify that the oil level is correct as recommended by the unit manufacturer.

6. OPERATING TESTS: Operate the systems as near as possible to design conditions for 48 hours, not necessarily continuous. During this time sufficient data will be logged to provide proof of satisfactory operation.

END OF SECTION 230000
SECTION 230010 - DEMOLITION

PART 1 GENERAL

1.1 The extent of demolition is shown on the drawings.

1.2 Owner has first right to salvage mechanical equipment.

1.3 Remove all items which the owner does not wish to retain and dispose of off site.

1.4 SUBMIT PROPOSED SCHEDULE OF WORK TO ARCHITECT AND OWNER FOR REVIEW PRIOR TO START WORK. INCLUDE IN SCHEDULE COORDINATION FOR SHUT-OFF CAPPING AND CONTINUATION OF UTILITIES.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 Demolish in an orderly and careful manner as required to accommodate new work. Protect existing supporting structural members.

3.2 Field verify exact locations of existing services and construction prior to demolition work. Take all necessary precautions to avoid damage to existing utilities or structure.

3.3 Repair all demolition performed in excess of that required at no cost to the owner.

3.4 Cap all pipes below floor or above ceiling. Remove all excess pipes and ducts.

3.5 Carefully remove all items to be retained by owner and store as directed by the owner.

3.6 Remove from site all debris, rubbish, and all other items which the owner does not retain and dispose of off site.

END OF SECTION 230010
SECTION 230523 – GENERAL DUTY VALVES FOR HVAC PIPING

PART 1  GENERAL

1.1  WORK INCLUDED

A. Provide factory-fabricated valves recommended by manufacturer for use in service indicated. Provide valves of types and pressure ratings indicated; provide proper selection as determined by Installer to comply with Installation requirements. Provide end connections which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.

B. SIZES: Unless otherwise indicated, provide valves of same size as upstream pipe size.

C. OPERATORS: Provide handwheels, fastened to valve stem, for valves other than quarter-turn. Provide lever handle for quarter-turn valves, 6" and smaller.

D. Refer to section 230553 for valve tag and valve chart requirements.

1.2  SHOP DRAWINGS

A. Submit shop drawings in accordance with section 230000.

B. Indicate pressure and temperature classifications and joining methods for all types of valves used in the project.

PART 2  PRODUCTS

2.1  ACCEPTABLE MANUFACTURERS

A. The following valve manufacturers are approved: Nibco, Apollo, Red White, Watts or approved equal. Approved flow control valves are Autoflow, Nexus, Griswold or approved equal.

2.2  GATE VALVES

A. Provide NIBCO No. T-111 threaded, S-111 solder, 125 PSI steam, 200 PSI WOG for Bronze Gate Valves. Provide valves conforming to MSS SP-80.

B. Provide NIBCO No. F-617-0 flanged, 125 PSI steam, 200 PSI WOG for iron body gate valves. Provide valves conforming to MSS SP-70.

2.3  BALL VALVES

A. Provide NIBCO No. T-580 threaded, S-580 solder, 125 PSI steam, 400 PSI WOG for Bronze Ball Valves. Provide valves conforming to federal specification WW-V-35 CLASS A, Type II. Furnish with extended lever handle.

2.4  FLOW CONTROL VALVES

A. Provide Flow Design Incorporated combination flow control-ball valve with temperature/pressure test port for Flow Control Valves. Butterfly valve may be used with 3" and larger control valves. Control valves will provide rated flow for a pressure differential from 2 PSI to 32 PSI. The control valve will control flow within 5% of the
factory setting. Provide Hanging Metal I.D. Tag with model, flow setting and location. Furnish with extended valve handles and extended pete’s plugs to accommodate up to 2” insulation. Nexus and Griswold are approved equal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.

B. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward from horizontal plane unless unavoidable. Install valve drains with hose-end adapter for each valve that must be installed with stem below horizontal plane.

C. Install extended-stem valves, where insulation is indicated, arranged in proper manner to receive insulation.

3.2 SELECTION

A. Select and install valves with the following ends or types of pipe-tube connections:

1. Tube Size 2” and Smaller: Soldered joint valves.

2. Pipe Size 2” and Smaller: Threaded valves.

3. Pipe Size 2-1/2” and Larger: Flanged.

END OF SECTION 230523
SECTION 230529 – HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1  GENERAL

1.1  WORK INCLUDED

A. Provide pipe hangers that adequately support the piping system. Install near or at changes in piping direction and at concentrated loads. Install to provide vertical adjustment to maintain pitch required for proper drainage. Install to allow for expansion and contraction of the piping.

B. Construct and install duct hangers in accordance with the SMACNA HVAC Duct Construction Standards. Do not attach duct hangers to the floor or roof decks. Attach hangers to the structural steel construction with joist or beam clamps.

1.2  SESMIC REQUIREMENTS

A. Provide and install duct, piping and equipment supports to meet all seismic requirements as required in the International Building Code and American Society of Civil Engineer (ASCE), ASCE-7, latest editions.

B. Each manufacturer of seismic system components will submit a certificate of compliance for review and acceptance by the engineer and/or the authority having jurisdiction.

1.3  SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 230000.

B. Indicate pipe hangers to be used for each size and type of pipe.

C. Indicate seismic supports to be used for each type of pipe, duct or equipment on the project.

1.4  CONCRETE BASES

A. Provide (in coordination with the General Contractor) all concrete bases required for equipment (boilers, air handling units, tanks, pumps, furnaces, water heaters, etc.) inside the building and condensing units outside the building. After the bases are poured, allow them to set at least five (5) days before mounting equipment.

PART 2  PRODUCTS

2.1  SESMIC SUPPORTS

A. Provide seismic supports for piping, ductwork and equipment as manufactured by Amber Booth, Mason Industries, or approved equal.

2.2  PIPE HANGERS

A. Provide hangers that are constructed of malleable or wrought iron, and hangers supporting copper pipe that are copper plated. Hangers for pipe 3 inches and smaller must be adjustable split ring, ELCEN FIG. 89, Galv. and ELCEN FIG. 389 copper plated. For piping above 3 inches, hangers must be adjustable, Clevis type, ELCEN FIG. 12.
B. Support rod loading: Provide total hanger rod load (including piping, insulation, and medium) that does not exceed following limits:

<table>
<thead>
<tr>
<th>Nominal Rod Diameter</th>
<th>Max. Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8 IN</td>
<td>600 LB</td>
</tr>
<tr>
<td>1/2 IN</td>
<td>1100 LB</td>
</tr>
<tr>
<td>5/8 IN</td>
<td>1800 LB</td>
</tr>
<tr>
<td>3/4 IN</td>
<td>2700 LB</td>
</tr>
<tr>
<td>7/8 IN</td>
<td>3700 LB</td>
</tr>
<tr>
<td>1 IN</td>
<td>4900 LB</td>
</tr>
</tbody>
</table>

2.3 ROOF MOUNTED EQUIPMENT

A. Provide roof curbs as specified in the equipment sections for roof top units, roof mounted fans and other similar equipment. Anchor the curbs to the roof and anchor the equipment to the curbs.

2.4 SUSPENDED EQUIPMENT

A. Provide threaded rod supports at each corner and additional support points. Provide vibration isolation as specified for each piece of equipment. Provide seismic support cables at each corner hanger and attach to the structure. Provide rod stiffeners for rods longer that 12”.

2.5 CONCRETE ANCHORS

A. Provide Hilti (or approved equal) concrete inserts installed per the manufacturers recommendations. Coordinate locations of pipe support anchors.

2.6 CONCRETE PAD CONSTRUCTION

A. Provide four inch thick indoor equipment bases with re-bar twelve inches on centers both ways. Provide six inch thick outdoor bases with re-bar twelve inches on centers both ways.

B. Provide wedge anchors to attach the indoor pads to the concrete floors. Provide anchors in the pads to match the equipment support requirements.

PART 3 EXECUTION

3.1 PIPE SUPPORT INSTALLATION

A. Where groups of three or more pipes occur, they may be supported with trapeze hangers using two hangers as specified with a capped pipe cross member.

B. Do not attach pipe hangers to the roof deck. Attach hangers to the steel construction with beam clamps, beam attachment and brackets bolted to joists and beams. Hang near joist panel joints wherever possible.
C. Provide pipe hangers for insulated piping that are large enough to encompass the insulation, using a metal shield so the vapor barrier jacket will not be broken. See Section 230713, Duct Insulation.

D. Hanging from one pipe to another is prohibited.

E. Install pipe hangers with the following spacing:

1. HORIZONTAL STEEL PIPE:

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Maximum Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 1-1/4&quot;</td>
<td>8 feet</td>
</tr>
<tr>
<td>1-1/2&quot; to 3&quot;</td>
<td>10 feet</td>
</tr>
<tr>
<td>4&quot; to 6&quot;</td>
<td>12 feet</td>
</tr>
</tbody>
</table>

2. HORIZONTAL COPPER PIPE/TUBE:

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Maximum Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2&quot; to 3/4&quot;</td>
<td>5 feet</td>
</tr>
<tr>
<td>1&quot;</td>
<td>6 feet</td>
</tr>
<tr>
<td>1-1/4&quot;</td>
<td>7 feet</td>
</tr>
<tr>
<td>1-1/2&quot; to 2&quot;</td>
<td>8 feet</td>
</tr>
</tbody>
</table>

3. Support horizontal cast iron soil pipe at five foot intervals except where 10 ft. lengths of pipe are used, 10 ft. intervals may be used.

4. Support horizontal and vertical plastic pipe 4'-0" on center.

5. Support vertical piping except plastic at each floor.

END OF SECTION 230529
SECTION 230553 – IDENTIFICATION FOR HVAC PIPING, DUCTWORK AND EQUIPMENT

PART 1 GENERAL

1.1 WORK INCLUDED
A. Provide identification for all piping, ductwork and mechanical equipment as specified in this section.

1.2 SHOP DRAWINGS
A. Submit shop drawings as indicated in Section 230000. Provide shop drawings indicating the materials used, colors and lettering for all piping and equipment labels. Furnish a complete list of equipment labels to be furnished for the project.

1.3 STANDARDS
A. Comply with ANSI A13.1 for lettering size, length of color field and viewing angles of identification devices.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS
A. Approved manufacturers are Allen Systems, W. H. Bradley, Industrial Safety Supply or Seaton Name Plate.

2.2 PIPE MARKERS
A. PLASTIC PIPE MARKERS; Snap-On Type: Provide manufacturer's standard pre-printed, semi-rigid, snap-on, color coded pipe markers complying with ANSI A13.1.

B. PLASTIC PIPE MARKERS; Pressure-Sensitive Type: Provide manufacturer's standard pre-printed, permanent adhesive, color coded pressure sensitive vinyl pipe markers complying with ANSI A13.1.

C. Small Pipes: For external diameters less than 6" (including insulation), provide full band pipe markers, extending 360 degrees around pipe at each location fastened by one of the following methods.

1. Snap on application of pre-tensioned semi-rigid plastic pipe marker.
2. Adhesive lap joint in pipe marker overlap.
3. Laminated or bonded application of pipe marker to pipe or insulation.
4. Taped to pipe or insulation with color coded plastic adhesive tape at least 2" wide with a full circle at both ends of pipe marker, tape lapped 4".

D. Large Pipes: For pipe diameters 6" and larger (including insulation), provide either full-band or strip type pipe markers, no narrower than 3 times letter height, and of required length fastened by one of the following methods:

1. Laminated or bonded application of pipe marker to pipe or insulation.
2. Taped to pipe or insulation with color-coded plastic adhesive tape, not less than 2" wide with a full circle at both ends of pipe marker. The tape must be lapped 4" at both ends.
3. Strapped-to-pipe or insulation application of semi-rigid type with manufacturer's standard stainless steel bands.

E. Provide lettering of the manufacturer's standard pre-printed nomenclature which best describes the piping system in each instance, or as selected by the engineer in cases of variance with names as shown or specified.

F. Provide with arrows on each pipe marker indicating direction of flow, either integrally with the piping system service lettering or as a separate unit of plastic.

G. Provide plastic tape of the manufacturer's standard color coded pressure sensitive vinyl tape not less than 3 mils thick. Provide tape for pipe with outside diameters (including insulation) less than 6", 1-1/2" wide. Provide tape for larger pipes, 2-1/2" wide.

2.3 VALVE TAGS

A. Provide brass valve tags that are 18 gauge with stamp engraved piping system abbreviation in 1/4" high letters and sequenced valve numbers 1/2" high. Tags will be 1-1/2" high. Fill the tag engraving with black enamel. Provide valve tag fasteners that are solid brass chain or solid brass S-hooks manufactured specifically for the connection of tags. Furnish flow control valves with brass tags listing equipment tag and rating.

2.4 DUCTWORK LABELS

A. Provide ductwork labels for all ductwork exposed in mechanical rooms. In addition provide labels on trunk ductwork located above accessible ceilings. Provide painted stencils or pressure sensitive vinyl tape, not less that 3 mils thick, 1-1/2" wide. Provide airflow direction labels at each label indicating the direction of airflow at that point in the duct system.

2.5 EQUIPMENT LABELS

A. Provide engraved plastic laminate signs that are constructed of engraving stock melamine plastic laminate, complying with Fed. Spec. L-P-3387 in the sizes and thicknesses indicated, engraved with the engraver's standard letter style of the sizes and wording indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate. Provide engraving that exposes a contrasting inner layer. The thickness will be 1/16" for units up to 8" max. dimension 1/8" for larger units. Fasteners will be self tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

B. Provide plastic equipment markers that are manufacturer's standard laminated plastic, color coded equipment markers. Conform to the following color code.

1. Green: Cooling equipment and components.
2. Yellow: Heating equipment and components.
3. Yellow/Green: Common heating and cooling equipment components.
4. Blue: Equipment which does not meet any of the above criteria.
5. For hazardous equipment use colors and designs recommended by ANSI 13.1.

C. Provide nomenclature matching the terminology on the schedules as closely as possible and includes the following:

1. Name and plan number.
2. Equipment service.
3. Design capacity.
4. Other design parameters such as pressure drop, entering and leaving conditions, rpm etc.

D. Provide markers that are approximately 2-1/2" x 4" for control devices, dampers and valves; and 4-1/2" by 6" for equipment.

E. Lettering and Graphics will coordinate names, abbreviations and other designations used in mechanical identification work, with corresponding designations shown specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of mechanical systems and equipment. Where multiple systems of the same generic name are shown and specified, provide individual system number as well as service.

PART 3 EXECUTION

3.1 COORDINATION

A. Where identification is to be applied to surfaces requiring insulation, painting or other covering, install the identification after completion of the painting and insulating.

3.2 INSTALLATION

A. Install pipe markers on each system including arrows to indicate the direction of flow. Locate pipe markers and color bands as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces, plenums and exterior locations.

1. Near each valve and control device.
2. Near each branch, excluding short take-offs for fixtures and terminal units.
3. Where pipes pass through walls, floors or ceilings.
4. Near major items and other points of origination and termination.
5. Spaced intermediate along pipe runs at a maximum distance of 50', reduce spacing to 25' in congested areas of piping and equipment.

B. Provide valve tags on all valves, cocks and control devices in each piping system; exclude plumbing fixture valves and shut off valves at plumbing equipment.

C. Valve Chart: Provide a valve chart in the operation and maintenance manual indicating the following:

1. Valve tag number.
2. Valve type: ball valve, butterfly valve, gate valve, etc.
3. System service: plumbing hot water, heating supply, chilled water supply, etc.
4. Use: isolation, balancing, shut-off, drain, etc.
5. Manufacturer.

D. Provide ductwork labels at the following locations.

1. At each piece of equipment connected by ductwork.
2. Provide at 10 foot intervals in mechanical rooms.
3. Provide at 50 foot intervals above accessible ceilings and at changes in direction.

E. Provide mechanical equipment identification on or near each major item of mechanical equipment as herein specified. Provide signs that are engraved plastic laminate. Provide signs for the following general categories:

1. Main control and operating valves including safety devices and gas outlets.
2. Meters, gauges and thermometers.
3. Air Handling Units

END OF SECTION 230553
PART 1 GENERAL

1.1 WORK INCLUDED

A. The mechanical contractor will procure the services of an independent air balance and testing agency, approved by the engineer, which specializes in the balancing and testing of heating, ventilation, and air conditioning systems, to balance, adjust, and test air moving equipment and air distribution or exhausting systems as herein specified. All instruments used by this agency must be accurately calibrated and maintained in good working order. If requested, conduct the tests in the presence of the mechanical engineer responsible for the project and/or his representative.

1.2 AGENCY QUALIFICATIONS

A. The testing agency is required to meet the following qualification requirements.

1. Specialize in the balancing and testing of HVAC systems.
2. Certified by NEBB or AABC.
3. An office within 300 miles of the site.
4. Provide proof of having successfully completed at least five projects of similar size and scope.

B. Provide within fifteen days after receipt of contract, the name and qualifications of the test and balance agency for approval by the engineer.

1.3 WORK SEQUENCE

A. Provide balance and testing work only after the HVAC system has been completed and is in full working order. Do not perform any water system or pump tests until the piping system has been cleaned and the correct amount of propylene glycol has been added to the system.

B. The mechanical contractor will put all heating, ventilating, and air conditioning systems and equipment into operation and continue operation of the same during each working day of testing and balancing.

1.4 WARRANTY

A. Provide an extended warranty of 90 days, after completion of the test and balance work, during which time the Engineer at his discretion may request a recheck, or resetting of any outlet, supply air fan, or exhaust fan as listed in test report. The agency will provide technicians to assist the engineer in making any tests he may require during this period of time.

1.5 REPORTS

A. After completing the testing and balancing, compile the test data, and submit four (4) copies of the complete test data to the contractor for forwarding to the owner, architect and engineer for evaluation and approval.

B. Insert all information on a sheet listing all items required herein and be included in complete test and balance report. Neatly type all sheets.
PART 2 PRODUCTS  (NOT APPLICABLE)

PART 3 EXECUTION

3.1 TESTING PROCEDURES

A. Testing Procedure - Phase One

1. Perform the following tests and balance air systems in accordance with the following requirements:

   a. Test and adjust fan RPM to design requirements.

   b. Test and record motor full load amperes.

   c. Make Pitot tube traverse of main supply ducts and obtain design CFM at fans.

   d. Test and record system static pressures, suction and discharge.

   e. Test and adjust system for design CFM outside air.

   f. Test and record entering air temperatures.

   g. Test and record leaving air temperatures.

   h. Adjust all main supply and return air ducts to proper design CFM.

   i. Test and adjust each diffuser, grille, and register to within 10% of design requirements.

   j. Identify each grille, diffuser, and register as to location and area.

   k. Identify and list size, type, and manufacturer of diffusers, grilles, registers and all tested equipment. Use manufacturer's ratings on all equipment to make required calculations.

   l. Include in readings and tests of diffusers, grilles, and registers required FPM velocity and test resultant velocity, required CFM and test resultant CFM after adjustments.

   m. In cooperation with the control manufacturer's representative, set adjustments of automatically operated dampers to operate as specified, indicated, and/or noted. Testing agency will check all controls for proper calibrations and list all controls requiring adjustment by control installers.

   n. Adjust all diffusers, grilles, and registers to minimize drafts in all areas.

   o. Test and adjust each fume hood to within 10% of the design CFM. Record velocity and CFM for each fume hood. Perform tests at four representative sash positions from fully open to fully closed.

   p. As a part of the work of this contract, the mechanical contractor will make any changes in the pulley, belts, and dampers and will install additional dampers.
required for correct balance as recommended by air balance agency, at no additional cost to the owner.

B. Testing Procedure - Phase Two

1. Prepare the water systems for balancing in the following manner:
   a. Open all valves to full open position. Set coil valve to full coil flow.
   b. Have contractor remove and clean all strainers.
   c. Complete air balance must have been accomplished before actual water balance begins.
   d. Proceed to balance each hot water coil.
   e. Upon completion of flow readings and adjustments at coils, mark all settings and record data.

C. Test and Balance Procedure - Phase Three

1. Upon completion of Phase 1 and 2, proceed with Phase 3 as follows:
2. Record and check the following items at each heating and cooling coil:
   a. CFM
   b. Inlet water temperatures.
   c. Leaving water temperatures.
   d. GPM
   e. Inlet air temperature.
   f. Leaving air temperature.

END OF SECTION 230593
SECTION 230713 – HVAC PIPING AND DUCT INSULATION

PART 1 GENERAL

1.1 WORK INCLUDED

A. Insulate all piping on the project as specified in this section. Insulate all supply, return, outside air, make up air and transfer air ductwork with 1-1/2” thick external insulation.

B. Insulate the vertical exhaust ductwork from the mechanical chase, up through the building with (2) layers of 1-1/2” thick fire wrap insulation.

1.2 SHOP DRAWINGS

A. Submit shop drawings as indicated in Section 230000. Include shop drawings for each type of insulation to be used on the project.

1.3 QUALITY ASSURANCE

A. Provide all covering and insulation materials used on this project that have the manufacturer’s name on the container. All materials must be dry and in good condition.

B. Ensure all materials have composite fire and smoke hazard ratings as tested by procedures ASTM 84, NFPA 255 and U.L. 723 not to exceed 25 flame spread and 50 smoke developed.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Accepted insulation materials are Certainteed or equal.

2.2 MATERIALS

A. Provide fiberglass pipe insulation that is Certainteed 500° fiberglass pipe insulation with factory applied all-service jacket. Insulation must be rated for use between -20°F and 500°F. Furnish the all service jacket with self sealing lap. Ensure thermal conductivity is 0.22 BTU-in/hr, SF,°F at 100°F mean temperature. Seal all end joints with 3” wide butt strips of materials identical to pipe covering jackets.

B. Insulate all refrigerant suction lines with one half (1/2) inch wall thickness closed cell insulation. Ensure insulation is Armstrong AP ARMAFLEX or equal, all joints and seams must be sealed with Armstrong 520 adhesive. Cover insulation installed outdoors with Armstrong WB Armaflex finish.

C. Apply exterior duct wrap insulation of the type noted below where described herein.

1. Type 75 fiberglass duct wrap, 1-1/2” thick, with foil reinforced kraft jacket, minimum insulation value, R – 5.

2. Provide for all supply, return, outside air, make up air and transfer air ductwork ductwork. Spiral ductwork exposed in occupied spaces does not require insulation.
D. Provide 3M Fire Barrier Duct Wrap 615+ blanket for PVC fume hood exhaust duct insulation. Apply two layers of 1-1/2” thick insulation to the vertical fume hood exhaust duct through the exhaust fan roof curb. See attached installation information and Engineering Judgement from 3M and plan details for installation information.

PART 3 EXECUTION

3.1 PIPE INSULATION

A. Insulation Thickness:

1. Insulate the following systems with the following thickness of fiberglass insulation:

<table>
<thead>
<tr>
<th>System</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chilled Water</td>
<td>1&quot;</td>
</tr>
<tr>
<td>Heated Hot Water</td>
<td>1&quot;</td>
</tr>
<tr>
<td></td>
<td>1-1/2&quot;</td>
</tr>
</tbody>
</table>

A. Installation

1. Install all pipe insulation in accordance with the manufacturer’s instructions. Seal all longitudinal joints with factory applied self-sealing laps. Seal all end joints with 3" wide butt strips of materials identical to pipe covering jackets, using adhesive such as Benjamin Foster 30-35 or self-sealing jacket. No stapling are permitted on any vapor barrier jackets. Do not perform any vapor barrier work or self-sealing laps or lap work when temperatures are below 40°F.

2. Insulate all fittings, valves, flanges and strainers with mitered segments of pipe insulation wired in place. Coat each fitting with two 1/8” coats of an approved vapor barrier mastic such as Benjamin Foster 30-35. Reinforce each fitting by wrapping with glass fabric cloth extending 2” onto adjacent pipes and finish with an additional coating of mastic worked into mesh of cloth to provide a smooth finish. Cover with 6 ounce canvas cover in all exposed areas. At the contractors option, premolded plastic fitting covers may be used if taped and sealed. A continuous vapor barrier must be maintained on all cold piping systems. Use corner beads on all square corners.

3. Maintain a continuous vapor barrier on all domestic cold water, chilled water and rain water piping systems. Install all pipe hangers on these systems outside the insulation with insulation shields installed to protect the insulation. Repair any damage to the vapor barrier with an approved vapor barrier mastic.

4. Install insulation shields between insulation and pipe hangers. Ensure shields are of sufficient size to prevent damage to the insulation.

3.2 EXTERNAL FLEXIBLE DUCT INSULATION

A. Wrap duct wrap insulation tightly on the ductwork with all lateral joints butted tight and longitudinal joints overlapped a minimum of 3”. Adhere insulation with insulation adhesive. Additionally secure insulation to the bottom of rectangular ducts over 24” wide with suitable mechanical fasteners at not more than 18” O.C. On lateral joints, staple the flange on the facing on 6” centers and tape with foil-reinforced Kraft tape. On longitudinal joints, staple the overlap on 6” centers and tape with foil-reinforced Kraft tape. Also tape all pin penetrations or punctures in facing.
3.3 EXTERNAL FIRE WRAP DUCT INSULATION

A. Install fume exhaust duct insulation per the manufacturer’s UL listing. Provide all overlap, fastening methods and installation methods as required.

END OF SECTION 230713
**Project:** Montana State University, EPS Building 105  
Clean room

**Contractor:** Consulting Design Solutions

**Fire Stopping Category:** Wraps

**Hourly Rating Requested/Type:** 1 Hour / F

**Protected Item:** Shaft Alternative

**Protected Item Size:** 16 in. PVC HVAC Exhaust Duct

**Fire Barrier Material:** Fire Barrier Duct Wrap 615+

**Special Conditions:** Requesting 1 hour shaft alternative for 16 in. diameter exhaust duct.

**Application Details:** To protectively wrap this application, install in accordance with Intertek Design 3MU/FRD 120-18 with the following modifications/clarifications:

1. Install Duct Wrap following parameters of Intertek Design 3MU/FRD 120-18.
   - 2-layers of 3M Fire Barrier Duct Wrap 615+ is required, maintaining minimum 3 in. overlaps and banding every 10-1/2 in. on center and max 1-1/2 in. from each end of the wrap/shaft enclosure.
2. Duct wrap to flare out onto the face of the rated substrate minimum 3 inches in all directions around duct.
   - Wrap to be fastened to the substrate using minimum 2 in. wide by 1/8 in. thick steel bar stock perforated minimum 6 in. on center for steel fasteners. Fasteners to be steel masonry or steel mechanical fasteners having minimum 75 lb. pull out strength in conjunction with 1-1/4 in. diameter steel washers.

**Note:** Shaft alternative must run from rated assembly to rated assembly. Item being protected must be firestopped at the rated assemblies per a listed/tested system.

**3M Fire Barrier Material:** Fire Barrier Duct Wrap 615+

**Based On:** 3MU/FRD 120-18, ESR 1255

This Engineering Judgment (EJ) is based upon the sole and exclusive use of 3M brand Fire Protection Products as described within. Modification of any of the parameters of this EJ, including, without limitation, the use of non-3M brand Fire Protection Products, shall render this EJ null and void. This fire-resistive enclosure design is expected to achieve the hourly rating indicated above. This engineering judgment is based on performance results obtained in testing with independent laboratories which have been tested in accordance to ISO 6944 Type A and / or internal 3M fire tests.

**Engineering Judgment Prepared By:**

Anthony Kilmer  
Technical Service Representative

**Reviewed By:**

CAM  
579821  
cc: Thomas Thoreson  
Email: tthoreson@mmm.com
3M™ Fire Barrier Duct Wrap 615+
Product Data Sheet and Installation Guide
Commercial Kitchen Grease and Ventilation Air Ducts
1. Product Description

3M™ Fire Barrier Duct Wrap 615+ is a flexible fire-resistant wrap consisting of an inorganic fiber blanket encapsulated with a scrim-reinforced foil. The product is 1-1/2" thick, 6 pcf density.\(^1\) It is used to fire rate commercial kitchen grease ducts as well as ventilation ducts. 3M™ Fire Barrier Duct Wrap 615+ is a proven alternative to 1- or 2-hour fire-resistant rated shaft enclosures for grease ducts (ICC-ES ESR-1255). With its excellent insulating capabilities, low weight and thin profile, it is an ideal choice for a duct enclosure system. This non-asbestos\(^2\) wrap installs easily due to its high flexibility and strength.

\(^1\) In accordance with the tolerances in ASTM C 892 Standard Specification for High-Temperature Fiber Blanket Thermal Insulation.

\(^2\) These fibers are not biopersistent and are therefore non-carcinogenic per Note Q of EU Directive 67/548/EEC (guideline 97/69/EG).

Product Features

- Two-layer wrap for grease ducts rated as a shaft alternative per ASTM E 2336
- Zero clearance to combustible throughout the entire enclosure system
- Butted inner layer in 2-layer grease duct applications
- One-layer wrap for fire-resistant ventilation ducts per ISO 6944
- High flexibility for installation ease
- Foil encapsulated for blanket protection, less dust, and high wrap strength
- Wide range of penetration seal systems
- Available in:
  - 24" x 25 ft. (609.6mm x 7.62m)
  - 48" x 25 ft. (1219.2mm x 7.62m)
- Blanket adhered to foil scrim helps prevent wrap from slumping

2. Applications

3M™ Fire Barrier Duct Wrap 615+ is an ideal fire resistive enclosure for commercial kitchen grease ducts and ventilation air ducts. It is a proven alternative to a 1- or 2-hour fire-resistant rated shaft enclosures for grease ducts and provides zero clearance to combustible construction throughout the entire enclosure system (per ICC-ES ESR-1255). 3M™ Fire Barrier Water Tight Sealant 1000 NS, 3M™ Fire Barrier Water Tight Sealant 1003 SL or 3M™ Fire Barrier Silicone Sealant 2000+ is used in combination with 3M™ Fire Barrier Duct Wrap 615+ to firestop the duct when the duct penetrates fire-rated floor or wall assemblies. 3M™ Fire Barrier Duct Wrap 615+ also provides a firestop solution where a T-rating is required for penetrations located outside wall cavities or outside fire-resistance rated shaft enclosures.


T-rating for metallic through-penetrating items: 3M™ Fire Barrier Duct Wrap 615+ is used in conjunction with 3M Fire Barrier sealants to achieve up to 2-hour equal F & T-ratings in ASTM E 814 (UL 1479) tested through-penetrations.

3. Specifications

Installation shall be in strict accordance with manufacturer’s written instructions, as shown on the approved shop drawings. 3M™ Fire Barrier Duct Wrap 615+ shall be a high-temperature fibrous thermal insulation blanket encapsulated in a fiberglass-reinforced aluminized polyester foil. Duct Wrap density shall be nominal 6 pcf (96 kg/m³) and have a nominal 1-1/2" (38.1mm) thickness. The fiber blanket shall have a continuous use limit of 1000°C (1832°F). The blanket thermal resistance (R-value) at ambient temperature shall be minimum 6.3 \(\frac{F\text{-}ft^2}{hr^2\text{-}Btu}\).

Smoke Developed Index and Flame Spread Index of the bare blanket, and of the foil encapsulated blanket shall be 0/0. The foil encapsulation shall be bonded to the core blanket material.

For technical support relating to 3M™ Fire Protection Products and Systems, call: 1-800-328-1687
For more information on 3M™ Fire Protection Products, visit: www.3M.com/firestop
4. Performance & Typical Physical Properties

Scrim Color: Aluminum with Black Text
Blanket Color: White
Blanket Weight: 0.9 lbs/ft.² (4.38 kg/m²)
Surface Burning: Foil Encapsulated Blanket (ASTM E 84)
Flame Spread 0, Smoke Development 0

<table>
<thead>
<tr>
<th>Single layer R-Value of 3M™ Fire Barrier Duct Wrap 615+ at 77°F (25°C):</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.38 $\frac{\text{F} - \text{ft}^2 - \text{hr}}{\text{Btu}}$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Single layer R (SI) Value of 3M™ Fire Barrier Duct Wrap 615+ at 77°F (25°C):</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.89 $\frac{\text{m}^2 - \text{K}}{\text{W}}$</td>
</tr>
</tbody>
</table>

Thermal Conductivity:

<table>
<thead>
<tr>
<th>Temp.</th>
<th>$\text{Btu-in. hr - ft}^2 - \text{°F}$</th>
<th>$\text{W m}^2 - \text{K}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>500°F (260°C)</td>
<td>0.60</td>
<td>0.09</td>
</tr>
<tr>
<td>1000°F (537°C)</td>
<td>1.15</td>
<td>0.17</td>
</tr>
<tr>
<td>1500°F (815°C)</td>
<td>1.93</td>
<td>0.28</td>
</tr>
<tr>
<td>1800°F (982°C)</td>
<td>2.51</td>
<td>0.36</td>
</tr>
<tr>
<td>2000°F (1093°C)</td>
<td>2.94</td>
<td>0.43</td>
</tr>
</tbody>
</table>

Linear Shrinkage (24 hrs at 2012°F (1000°C)): 1.2%

Noise Reduction Coefficient (ASTM C 423): 0.80

5. Design Listings

Grease Duct Listings – ASTM E 2336 / ICC-ES AC101

<table>
<thead>
<tr>
<th>Fire Resistant Rating</th>
<th>Enclosure System</th>
<th>Third-Party Testing Services Design Listing</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- and 2-hour</td>
<td>2 layers of 3M™ Fire Barrier Duct Wrap 615+</td>
<td>ICC-ES ESR-1255 Intertek 3MU/FRD 120-18 Intertek 3MU/FRD 120-19</td>
<td>Rectangular Rectangular Round</td>
</tr>
</tbody>
</table>

Ventilation Duct Listings – ISO 6944-85

<table>
<thead>
<tr>
<th>Fire Resistant Rating</th>
<th>Enclosure System</th>
<th>Third-Party Testing Services Design Listing</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- and 2-hour</td>
<td>1 layer of 3M™ Fire Barrier Duct Wrap 615+</td>
<td>Intertek 3MU/MA 60-01 Underwriters Laboratories HNLJ-V-27 Underwriters Laboratories HNLJ-V-31</td>
<td>Rectangular/Round (1 hour) Rectangular/Round (2 hour) Rectangular (2 hour) 2- &amp; 3-sided Rectangular (2 hour)</td>
</tr>
</tbody>
</table>

This document only contains a partial list of Design Listings. For the latest information go to www.3M.com/firestop or speak to your authorized 3M distributor or sales representative at (800) 328-1687.

6. Codes & Test Standards

3M™ Fire Barrier Duct Wrap 615+ has been tested in accordance with the following:

- ICC-ES AC101: Acceptance Criteria for Grease Duct Enclosure Assemblies
- ASTM E 136: Standard Test Method for Behavior of Material in a Vertical Tube Furnace at 750°C (1382°F)

3M™ Fire Barrier Duct Wrap 615+, when installed per ASTM E 2336 tested Grease Duct Design Listings, addresses the following code requirements:

- New York City OTCR Buildings Bulletin 2010-021
- NFPA 96: 2008/2011

3M™ Fire Barrier Duct Wrap 615+, when installed per ISO 6944 tested Ventilation Duct Design Listings, can help to satisfy the following code requirements:

- New York City OTCR Buildings Bulletin 2012-011
- NFPA 92B: Standard for Smoke Management Systems in Malls, Atria, and Large Spaces, 2009 Edition – Section 7.5.2
- International Mechanical Code: 2006/2009/2012 – Section 513.10.2
- International Building Code: 2006/2009/2012 – Section 909.10.2

7. Packaging, Storage, Shelf Life

3M™ Fire Barrier Duct Wrap 615+ rolls are packaged in corrugated cardboard boxes. Product is stable under normal storage conditions. Normal stock and stock rotation practices are recommended. 3M™ Fire Barrier Duct Wrap 615+ shelf life is indefinite when stored in original unopened packaging in a dry warehouse environment. Pallets should not be stacked. 3M™ Fire Barrier Water Tight Sealant 1000 NS or 1003 SL or 3M™ Fire Barrier Silicone Sealant 2000+ must be also stored in a dry warehouse environment.
8. Grease Duct Installation Techniques

3M™ Fire Barrier Duct Wrap 615+ should be installed per the application design listing in accordance with the following basic installation instructions.

**Material and Equipment**
- 24" or 48" wide* by 1-1/2" (38.1mm) thick** by 25 ft. (762cm) standard length 3M™ Fire Barrier Duct Wrap 615+ blanket (60.96cm by 121.92cm by 762cm)
- 3M™ FSK Facing Tape 3320 (aluminum foil, fiberglass scrim, kraft paper backing with acrylic adhesive or equivalent)
- Minimum 3/4" (19mm) wide filament tape (Scotch® Filament Tape 898 recommended)
- Stainless steel or carbon steel banding material, minimum 1/2" (12.7mm) wide and minimum 0.015" (0.38mm) thick with banding clips of the same material
- Hand banding tensioner, crimping tool and banding cutter
- Minimum 12 gauge copper-coated steel insulation pins used with minimum 2-1/2" (63.5mm) square galvanized steel or stainless steel speed clips or 1-1/2" (38.1mm dia. round or equivalent sized insulated cup-head pins
- Capacitor discharge stud gun
- Access door hardware: four galvanized steel threaded rods, 1/4" diameter by minimum 6" long (6.35mm by 152.4mm) with 1/4" (6.35mm) wing nuts and 1/4" (6.35mm) washers
- 4" (102mm) long steel hollow tubing to fit threaded rods
- Minimum 4pcf (64kg/m3) density mineral wool or scrap pieces of 3M™ Fire Barrier Duct Wrap 615+
- 3M™ Fire Barrier Water Tight Sealant (1000 NS or 1003 SL) or 3M™ Fire Barrier Silicone Sealant 2000+

*Note: 48" (121.92cm) wide blanket helps to maximize coverage since the 3" (76.2mm) longitudinal overlaps occur less frequently.

**In accordance with the tolerances in ASTM C 892 Standard Specification for High-Temperature Fiber Blanket Thermal Insulation.**

**Preparatory Work**
3M™ Fire Barrier Duct Wrap 615+ is installed with common insulation tools, such as knives, banders and capacitor discharge guns for applying insulation pins. In order to install the duct firestop system, the surfaces of all the openings and penetrating items need to be clean, dry, frost free and free of dust.

**2-Layer Grease Duct Method (ASTM E 2336)**
Note: This general instruction for applying 3M™ Fire Barrier Duct Wrap 615+ details a two-layer wrap installation of 3M™ Fire Barrier Duct Wrap 615+ blanket applied directly to a grease duct. To minimize waste, the 3M™ Fire Barrier Duct Wrap 615+ material should be rolled out tautly before measuring. The first layer of 3M™ Fire Barrier Duct Wrap 615+ blanket is wrapped around the perimeter of the duct and is cut to a length to either butt to itself or overlap it not less than 3" (76.2mm). The interface between adjacent blankets forms the “longitudinal” joint. Inner layer longitudinal joints can be tightly butted joints or they should overlap onto adjacent blankets with a min. 3" (76.2mm) overlap. Aluminum foil or FSK tape is used to seal all cut edges of the blanket and any tears in the foil scrim. This first layer is temporarily held in place using filament tape. The first layer does not require steel banding.

The second layer of 3M™ Fire Barrier Duct Wrap 615+ is wrapped around the perimeter of the previously installed first layer of 3M™ Fire Barrier Duct Wrap 615+. The other layer perimeter (lateral) joints should be offset a minimum 3" (76.2mm) from the inner layer perimeter joints. The perimeter joints should be a minimum 3" (76.2mm) overlap. Offset the outer layer longitudinal joints a minimum 10.5" (26.7cm) from the inner layer longitudinal joints. The outer layer longitudinal joints should be a minimum 3" (76.2mm) overlap. The one exception to this rule is the “Butt Joint with Collar Method” where it is permissible for the longitudinal joints to be tightly butted and then covered with a minimum 6" wide collar centered over it. These are available pre-made (3M™ Fire Barrier Duct Wrap 615+ Collar). The second layer of wrap can be temporarily held in place using filament tape. The second layer of wrap requires permanent fastening with stainless (or carbon) steel banding, or with rows of weld pins (impaling or cup-head style).

**3M™ Fire Barrier Duct Wrap 615+ Commercial Kitchen Grease Duct Systems (Figure 1)**

1- or 2-Hour Shaft Alternative Zero Clearance to Combustibles

Telescoping Wrap Technique With Banding For Ducts 24" (60.9cm) or Less

1. First layer 3M™ Fire Barrier Duct Wrap 615+
2. Second layer 3M™ Fire Barrier Duct Wrap 615+
3. 3/4" (19mm) wide filament tape
4. Steel banding 1/2" (12.7mm) wide min. typical for permanent fastening
5. Longitudinal joint butt or min. 3" (76.2mm) overlap on inner layer, min. 3" (76.2mm) overlap on outer layer
6. Perimeter (lateral) joint butt or min. 3" overlap (76.2mm) on inner layer, min. 3" (76.2mm) overlap on outer layer
7. Metallic commercial cooking exhaust duct

Note: System integrity is limited by quality of installation. Ducts ≥ 24" (60.9cm) wide require pinning on the bottom side of horizontal ducts and on a minimum of one of the wider sides of a vertical duct. Vertical ducts require pinning on all sides > 48" (121.8cm).

Consult current independent testing laboratories (e.g. Intertek, UL) for design or system details. See Detail 9 for additional pinning information.
8. Grease Duct Installation Techniques cont.

Four approved grease duct installation techniques: 3M™ Fire Barrier Duct Wrap 615+

2A. Butt Joint Inner Layer with Telescoping Outer Layer

With the Butt-Joint Inner Layer and Telescoping Outer Layer technique, the inner layer of blankets abut the adjacent pieces of blanket. The outer layer blankets each overlap one adjacent blanket, and then the exposed edge is covered by the next blanket as shown in Figure 2A.

1a. First layer of 3M™ Fire Barrier Duct Wrap 615+
1b. Second layer of 3M™ Fire Barrier Duct Wrap 615+
2. Steel banding 1/2" (12.7mm) wide min. typical
3. 3" (76.2mm) min. longitudinal overlap
4. Tightly butted joint

2B. Telescoping 3" (76.2mm) Overlap Wrap

With the Telescoping Overlap Wrap method, each blanket overlaps one adjacent blanket, and each blanket has one edge exposed and one edge covered by the next blanket as shown in Figure 2B.

1a. First layer of 3M™ Fire Barrier Duct Wrap 615+
1b. Second layer of 3M™ Fire Barrier Duct Wrap 615+
2. Steel banding 1/2" (12.7mm) wide min. typical
3. 3" (76.2mm) min. longitudinal overlap

2C. Checkerboard 3" (76.2mm) Overlap Wrap

With the 3" (76.2mm) Checkerboard Overlap Wrap method, blankets with both edges exposed alternate with blankets with covered edges, as shown in Figure 2C.

1a. First layer of 3M™ Fire Barrier Duct Wrap 615+
1b. Second layer of 3M™ Fire Barrier Duct Wrap 615+
2. Steel banding 1/2" (12.7mm) wide min. typical
3. 3" (76.2mm) min. longitudinal overlap

2D. Butt Joint with Collar

With the Butt Joint and Collar method, adjacent blankets are butted tightly together and 6" (152.4mm) wide collar of duct wrap is centered over the joint, overlapping each blanket by 3" (76.2mm) minimum as shown in Figure 2D.

1a. First layer of 3M™ Fire Barrier Duct Wrap 615+
1b. Second layer of 3M™ Fire Barrier Duct Wrap 615+
2. Steel banding 1/2" (12.7mm) wide min. typical
3. 6" (152.4mm) min. wide 3M™ Fire Barrier Duct Wrap 615+ Collar
4. Tightly butted joint
8. Grease Duct Installation Techniques cont.

Access Door Installation

Four galvanized steel threaded rods, 1/4" diameter (6.35mm) by 4-1/2" to 5" long (114.3mm to 127mm) are welded to the duct at the corners of the door opening. Four steel tubes, each 3" (76.2mm) long, are placed over the rods to act as protection for the 3M™ Fire Barrier Duct Wrap 615+, and to transfer the wing nut force to the access door, when fastening the door. Four insulation pins are welded to the door panel for installation of the blanket. One layer of 3M™ Fire Barrier Duct Wrap 615+ is sized approximately 1/2" to 1" larger than the access door on all sides and impaled over the insulation pins on the panel. It is essential that this layer fit tightly against the wrap surrounding the access door opening with no through openings. A second layer of 3M™ Fire Barrier Duct Wrap 615+ is cut to overlap the first layer by a minimum of 1" (25.4mm). Impale the second layer over the pins. A third layer of 3M™ Fire Barrier Duct Wrap 615+ is cut to overlap the second layer by a minimum of 1" (25.4mm). The third layer is impaled over the pins and all three layers are locked in place with galvanized or stainless steel speed clips. Pins that extend beyond the outer layer of 3M™ Fire Barrier Duct Wrap 615+ should be turned down or cut off to avoid sharp points on the door. The insulated door panel is placed over the threaded rods and held in place with washers and wing nuts. The details are shown in Figure 3. The details for installing the 3M™ Fire Barrier Grease Duct Access Door (pre-manufactured) are shown in Figure 3A.

3M™ Fire Barrier Duct Wrap 615+ Commercial Kitchen Grease Duct Systems (Figure 3)

Field-Fabricated 2-Hour Access Door System

1. Access hole
2. 1/4" (6.35mm) dia. by a minimum 6" (152.4mm) all-threaded rods
3. Access door cover – 16 gauge
4. Insulation pins (impaling pins) – welded (optional)
5. First layer 3M™ Fire Barrier Duct Wrap 615+ cut same size as cover
6. Second layer 3M™ Fire Barrier Duct Wrap 615+ with 1" (25.4mm) overlap on all sides
7. Third layer 3M™ Fire Barrier Duct Wrap 615+ with 1" (25.4mm) overlap on all sides
8. Speed clips (optional)
9. Aluminum tape covering all exposed edges
10. 4" (102mm) long steel hollow tubing to fit threaded rods
11. 1/4" (6.35mm) diameter wings nuts and 1/4" (6.35mm) washers

Note: System integrity is limited by quality of installation. Consult current independent testing laboratories (e.g. Intertek, UL) for Design or System Details. In all four overlap techniques the perimeter overlap can occur at any location on the duct.

3M™ Fire Barrier Duct Wrap 615+ Commercial Kitchen Grease Duct Systems (Figure 3A)

Pre-Fabricated 1- or 2-Hour Access Door System

1. Access hole
2. 1/4" (6.35mm) dia. by a minimum 6" (152.4mm) all-threaded rods
3. 3M™ Fire Barrier Grease Duct Access Door or Ductmate ULtimate Door™
4. Insulation pins (impaling pins) – welded
5. First layer 3M™ Fire Barrier Duct Wrap 615+ with 1" (25.4mm) overlap beyond access door on all sides
6. Second layer 3M™ Fire Barrier Duct Wrap 615+ cut to same size as first layer
7. Third Layer 3M™ Fire Barrier Duct Wrap 615+ with 1" (25.4mm) overlap beyond second layer on all sides
8. Speed clips
9. Aluminum tape covering all exposed edges
10. 1/4" (6.35mm) diameter wings nuts and 1/4" (6.35mm) washers
11. Insulation pins (cup-head pins) – welded
12. Access door cover – 16 gauge cut same size as third layer of duct wrap with clearance holes to match pattern of all-threaded rods

Note: System integrity is limited by quality of installation. Consult current independent testing laboratories (e.g. Intertek, UL) for Design or System Details. In all four overlap techniques the perimeter overlap can occur at any location on the duct.
8. Grease Duct Installation Techniques cont.

3M™ Fire Barrier Duct Wrap 615+
Commercial Grease Duct Systems (Figure 4)
1 or 2-Hour Shaft Alternative Zero Clearance to Combustibles
Suggested Roof Vent
1. Duct
2. Roof Assembly
3. Roof Flashing
4. Vent Flashing
5. Two layers 3M™ Fire Barrier Duct Wrap 615+
6. Firestopping System for Rated Roof Assemblies Only
7. Extend wrap a min. distance that meets local code requirements for clearance to combustibles

Note: System integrity is limited by quality of installation. Consult current independent testing laboratories (e.g. Intertek, UL) for Design or System Details.

3M™ Fire Barrier Duct Wrap 615+
Commercial Grease Duct Systems (Figure 5)
Suggested Free-Standing Hood Installation
1. Hood
2. First layer 3M™ Fire Barrier Duct Wrap 615+
3. Second layer 3M™ Fire Barrier Duct Wrap 615+
4. 3” (76.2mm) minimum overlap
5. Banding typical

Note: System integrity is limited by quality of installation. Consult current independent testing laboratories (e.g. Intertek, UL) for Design or System Details.

3M™ Fire Barrier Duct Wrap 615+
Grease Duct Systems (Figure 6)
Suggested Grease Hood Installation
1. Two layers 3M™ Fire Barrier Duct Wrap 615+
2. Scotch® Filament Tape 898 (or similar) for temporary hold
3. Steel banding 1/2” (12.7mm) wide min. typical for permanent fastening
4. 6” (152.4mm) long, 12 Gauge Copper-Coated Insulation Pins with Speed Clips
   — OR —
5. 12 Gauge cupped head pins
6. 3” (76.2mm) min. perimeter overlap
7. 3” (76.2mm) min. seam overlap
8. Cutout Duct Wrap around junction boxes or fan louvres

Note: System integrity is limited by quality of installation. Consult current independent testing laboratories (e.g. Intertek, UL) for Design or System Details.
9. Ventilation Air Duct Installation Techniques

3M™ Fire Barrier Duct Wrap 615+ should be installed per the application design listing in accordance with the following basic installation instructions.

1-Layer Ventilation Duct Method (ISO 6944)

Note: This general instruction for applying 3M™ Fire Barrier Duct Wrap 615+ details a one-layer wrap installation of 3M™ Fire Barrier Duct Wrap 615+ blanket applied directly to a ventilation duct. To minimize waste, the 3M™ Fire Barrier Duct Wrap 615+ material should be rolled out tautly before measuring. The single layer of 3M™ Fire Barrier Duct Wrap 615+ blanket is wrapped around the perimeter of the duct and is cut to a length to overlap itself not less than 3” (76.2mm), this is known as the “circumferential” or “lateral” joint. The interface between adjacent blankets forms the “longitudinal” joint. The minimum overlap required at the longitudinal joints is a minimum 3” (76.2mm) overlap. Aluminum foil tape or FSK tape is used to seal all cut edges of the blanket and any tears in the foil scrim. As an installation aide, the blanket may be temporarily held in place using filament tape. The 3M™ Fire Barrier Duct Wrap 615+ requires permanent fastening with stainless (or carbon) steel banding, or with rows of weld, pins (impaling or cup head style).

Three approved ventilation duct installation techniques:

3M™ Fire Barrier Duct Wrap 615+

7A. Telescoping 3” (76.2mm) Overlap Wrap

With the Telescoping Overlap Wrap method, each blanket overlaps one adjacent blanket. Each blanket has one edge initially exposed which is then covered by the edge of the next blanket as shown in Figure 2A.

1. Single layer of 3M™ Fire Barrier Duct Wrap 615+
2. Steel banding 1/2” (12.7mm) wide min. typical
3. 3” (76.2mm) min. longitudinal overlap

7B. Checkerboard 3” (76.2mm) Overlap Wrap

With the 3” (76.2mm) Checkerboard Overlap Wrap method, blankets with both edges exposed alternate with blankets with covered edges, as shown in Figure 2B.

1. Single layer of 3M™ Fire Barrier Duct Wrap 615+
2. Steel banding 1/2” (12.7mm) wide min. typical
3. 3” (76.2mm) min. longitudinal overlap

7C. Butt Joint with Collar

With the Butt Joint and Collar method, adjacent blankets are butted tightly together and 6” (152.4mm) wide collar of duct wrap is centered over the joint, overlapping each blanket by 3” (76.2mm) minimum as shown in Figure 2C.

1. Single layer of 3M™ Fire Barrier Duct Wrap 615+
2. Steel banding 1/2” (12.7mm) wide min. typical
3. 6” (152.4mm) min. wide 3M™ Fire Barrier Duct Wrap 615+ Collar
4. Tightly butted joint

3M™ Fire Barrier Duct Wrap 615+ Ventilation Duct Systems (Figure 8)

1. 3M™ Fire Barrier Duct Wrap 615+, 1-layer
2. Perimeter (lateral) joint min. 3” (76.2mm) overlap
3. 3/4” (19mm) wide filament tape
4. Steel banding 1/2” (12.7mm) wide min. typical for permanent fastening
5. Longitudinal joint min. 3” (76.2mm) overlap
6. Metallic ventilation duct

Note: System integrity is limited by quality of installation. Ducts ≥ 24” (60.9cm) wide require pinning on the bottom side of horizontal ducts and on a minimum of one of the wider sides of a vertical duct. Vertical ducts require pinning on all sides > 48” (121.8cm).

10. Grease Duct & Ventilation Air Duct Installation Techniques

Duct Support (Grease & Ventilation)

Horizontal duct assemblies with maximum cross-sectional areas of 24” x 24” (610mm x 610mm) must be supported with min. 3/8” diameter (9.5mm), all-thread steel rod and 2” x 2” x 1/8” (51mm x 51mm x 3.2mm) steel angle, spaced a maximum of 60” (1524mm) on center. A min. clearance of 0” (0mm) and a max. clearance of 6” (152mm) is required between the vertical edge of the blanket material surrounding the duct and the steel rod. Horizontal duct assemblies with max. dimensions of 24” x 48” (610mm x 1219mm) must be supported with min. 1/2” diameter (12.7mm), all-thread steel rod and 2” x 2” x 1/4” (51mm x 51mm x 6.4mm) steel angle spaced a max. of 60” (1524mm) on center. A min. clearance of 0” (0mm) and a max. clearance of 6” (152mm) is required between the vertical edge of the blanket material surrounding the duct and the steel rod. Vertical ducts must be supported at every floor line on the top of the slab.

Pinning & Banding Requirements

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<th>Banding with Bottom-Side Pinning</th>
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3M™ Fire Barrier Duct Wrap 615+ Pinning guide (Figure 9)

Additional pinning to prevent sagging of the duct wrap. For all ducts greater than 24” (60cm) in width, pinning is required to support the blanket on the bottom horizontal surface and on the outside face of a vertical duct run. Space pins a max. of 10-1/2” (26.7cm) apart in the direction of the blanket width, and a max. 12” (30cm) apart in the direction of the blanket length.

Materials and Equipment

- Minimum 12 gauge copper-coated steel insulation pins used with minimum 2-1/2” (63.5mm) square galvanized steel or stainless speed clips or 1-1/2” (38.1mm) dia. round or equivalent sized insulated cup-head pins
- Capacitor discharge stud gun

Note: Either apply min. 12 gauge copper-coated impaling pins to the bare duct using a capacitor discharge gun or apply min. 12 gauge cup-head pins after the duct wrap is installed.

Note: System integrity is limited by quality of installation. Consult current independent testing laboratories (e.g. Intertek, UL) for Design or System Details.

**3M™ Fire Barrier Duct Wrap 615+**

**Hanging Support Details for Fire-Rated Ductwork (Figure 10)**

Note: To facilitate the application of 3M Fire Barrier Duct Wrap 615+ so that the rods & trapeze hangers are outside the wrap envelope, the following dimensions are recommended:

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<th></th>
<th>1-layer</th>
<th>2-layer</th>
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<td>1. Rod-to-bare duct clearance (Y)</td>
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<td>6” (152mm)</td>
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<tr>
<td>2. Added rod length (X)</td>
<td>2” (51mm)</td>
<td>4” (102mm)</td>
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Note: System integrity is limited by quality of installation. Consult current independent testing laboratories (e.g. Intertek, UL) for Design or System Details.

**3M™ Fire Barrier Duct Wrap 615+**

**Hanger Penetrations of Wrap Envelope for Grease or Ventilation Duct Systems (Figure 11)**

1. Min. 1/2” (12.7mm) crown of 3M™ Fire Barrier Sealant CP 25WB+ or 3000WT
2. Tape seams – min. 3” (76.2mm) wide aluminum tape, 3M™ FSK Facing Tape 3320 (or equivalent)
3. 1 or 2 layers of 3M™ Fire Barrier Duct Wrap 615+ (application dependent)
4. All Threaded Rod
5. C-channel or angle iron trapeze support
6. Seismic bracing wire

Note: The inclusion of metallic items penetrating out of the wrap envelope may diminish the T-Rating of the enclosure.

Note: System integrity is limited by quality of installation. Consult current independent testing laboratories (e.g. Intertek, UL) for Design or System Details.

**3M™ Fire Barrier Duct Wrap 615+**

**Conduit Penetrations of Wrap Envelope for Grease or Ventilation Duct Systems (Figure 12)**

1. Duct
2. 1 or 2 layers of 3M™ Fire Barrier Duct Wrap 615+ (application dependent)
3. Min. 1/2” (12.7mm) crown of 3M™ Fire Barrier Sealant CP 25WB+ or 3000WT

Note: The inclusion of metallic items penetrating out of the wrap envelope may diminish the T-Rating of the enclosure. Penetrants within the wrap envelope are not protected from the effects of a grease fire.

Note: System integrity is limited by quality of installation. Consult current independent testing laboratories (e.g. Intertek, UL) for Design or System Details.
3M™ Fire Barrier Duct Wrap 615+
Suggested Two-Sided Wrap Installation (Figure 13)

1. Concrete slab
2. 1 or 2 layers of 3M™ Fire Barrier Duct Wrap 615+ (application dependent)
3. Concrete fasteners – min. 1/4" (6.35mm) dia. steel concrete anchors
4. 1/8" (3.18mm) thick x 2" to 3" (50.8mm to 76.2mm) wide bar stock perforated 12" (30.5cm) O.C.
5. Duct
6. Steel banding 1/2" (12.7mm) wide min. typical for permanent fastening
7. Banding clips

Note: System integrity is limited by quality of installation. Consult current independent testing laboratories (e.g. Intertek, UL) for Design or System Details.

3M™ Fire Barrier Duct Wrap 615+
Suggested Three-Sided Wrap Installation (Figure 14)

1. Concrete slab assembly
2. 1 or 2 layers of 3M™ Fire Barrier Duct Wrap 615+ (application dependent)
3. Concrete fasteners – min. 1/4" (6.35mm) dia. steel concrete anchors
4. 1/8" (3.18mm) thick x 2" to 3" (50.8mm to 76.2mm) wide bar stock perforated 12" (30.5cm) O.C.
5. Duct
6. Steel banding 1/2" (12.7mm) wide min. typical for permanent fastening
7. Banding clips

Note: System integrity is limited by quality of installation. Consult current independent testing laboratories (e.g. Intertek, UL) for Design or System Details.

3M™ Fire Barrier Duct Wrap 615+
Elbow and Banding Installations (Figure 15)
Suggested Elbow Pattern Installation (A)
1. Perimeter
2. 3” (76.2mm) min. overlap
3. Hole cut (off-center)
Note: Place overlap on opposite side of horizontal pattern.

Suggested Banding Pattern Installation (B)
1. Grease of ventilation duct
2. 1 or 2 layers of 3M™ Fire Barrier Duct Wrap 615+ (application dependent)
3. Steel or stainless steel banding 1/2” (12.7mm) wide min. typical for permanent fastening with max. 10-1/2” (26.7cm) spacing
4. 3” (76.2mm) overlay (typical throughout application)
5. Min. 3” (76.2mm) perimeter overlap (not shown)
Note: 1-layer application depicted. When 2-layer application is required, replicate these steps with outer joints staggered a min. 3” (76.2mm) from inner joints. Banding is required on outermost layer only.

Note: System integrity is limited by quality of installation. Consult current independent testing laboratories (e.g. Intertek, UL) for Design or System Details.

3M™ Fire Barrier Duct Wrap 615+
Suggested Installation for 90° Turn (Figure 16)
A-F (representative field-cut duct wrap sections)
1. Duct
2. 1 or 2 layers of 3M™ Fire Barrier Duct Wrap 615+ (application dependent)
3. Scotch® Filament Tape 898 (or equivalent)
4. Steel banding 1/2” (12.7mm) wide min. typical for permanent fastening
5. Min. 3” (76.2mm) perimeter overlap
6. Min. 3” (76.2mm) longitudinal overlap
Note: 2-layer application depicted. When 1-layer application is used, install banding (item 4) as a permanent hold.

Note: System integrity is limited by quality of installation. Consult current independent testing laboratories (e.g. Intertek, UL) for Design or System Details.
3M™ Fire Barrier Duct Wrap 615+
Suggested Branching Duct Details (Figure 17)

1. Duct
2. Full width pieces of 1 or 2 layers of 3M™ Fire Barrier Duct Wrap 615+ (application dependent)
3. Steel banding 1/2" (12.7mm) wide min. typical for permanent fastening
4. 3M™ Fire Barrier Duct Wrap 615+ (field cut)

Note: Install first piece onto the inside of the inner duct area and then install the adjacent pieces so they overlap at the edges a minimum of 3" (76.2mm). When an application requires a second layer of duct wrap, install the second piece over the first piece and overlap at the edges a minimum of 3" (76.2mm).

3M™ Fire Barrier Duct Wrap 615+
Suggested Duct Wrap / Shaft Transition Installations (Figure 18)

1. Fire barrier gypsum shaft assembly
2. 5/8" (15.88mm) depth of 3M™ Fire Barrier Sealant 1000NS, 1003SL or 2000+
3. 1 or 2 layers of 3M™ Fire Barrier Duct Wrap 615+ (application dependent)
4. 3M™ Fire Barrier Duct Wrap 615+ (use small scrap piece)
5. Fire barrier concrete floor assembly
6. Air gap as required by local mechanical code (grease ducts)
7. Extend duct wrap into shaft a min. distance that meets local code requirements for clearance to combustibles

Note: System integrity is limited by quality of installation. Consult current independent testing laboratories (e.g. Intertek, UL) for Design or System Details.

Penetrations

When the duct penetrates a fire rated wall, ceiling or floor, an approved firestop system must be employed. Figures 19–21 illustrate typical conditions. To firestop the wrapped duct, follow the installation parameters detailed in a compatible ASTM E 814 tested through-penetration firestop design. Note: Through-penetration designs in which the duct is bare where it passes through combustible or limited-combustible construction (e.g. gypsum walls or wood joist floor-ceiling assemblies) are appropriate for ventilation duct scenarios only. It is not appropriate for bare, uninsulated grease ducts to pass through combustible assemblies. Intertek 3MU/DI design listings contain through penetration details. See system details of UL System HNLJV.27, Section 3.C. for applicable UL through penetration systems.

3M™ Fire Barrier Duct Wrap 615+
Typical Through Penetration Firestop System (Figure 19)

1-Hour Through Penetration Systems Fire-Rated Wood/Gypsum Floor/Ceiling Assembly

1. Floor/ceiling assembly
2. Duct
3. One or two layers 3M™ Fire Barrier Duct Wrap 615+
4. Banding or pinning
5. 3M™ Fire Barrier Packing Material PM 4, 4 pcf mineral wool, or scrap duct wrap (min. 33% compressed)
6. 3M™ Fire Barrier Water Tight Sealant 1000 NS, 3M™ Fire Barrier Water Tight Sealant 1003 SL, or 3M™ Fire Barrier Silicone Sealant 2000+

Note: Sealant to be applied at a minimum 5/8" (15.9mm) depth.

Note: System integrity is limited by quality of installation. Consult current independent testing laboratories (e.g. Intertek, UL) for Design or System Details.

3M™ Fire Barrier Duct Wrap 615+
Typical Through Penetration Firestop System (Figure 20)

1- or 2-Hour Through Penetration Systems — Gypsum Wall or Gypsum Shaftwall

1a. Gypsum wall assembly
1b. Gypsum shaftwall assembly
2. Duct
3. One or two layers 3M™ Fire Barrier Duct Wrap 615+ (layering dependant on application)
4. Banding or pinning
5. 3M™ Fire Barrier Packing Material PM 4, 4 pcf mineral wool, or scrap duct wrap (min. 33% compressed)
6. 3M™ Fire Barrier Sealant 1000NS or 2000+ applied at a min. 5/8" (15.9mm) depth

Note: The assembly can be either a symmetrical gypsum wall or an asymmetrical gypsum shaftwall.

Note: System integrity is limited by quality of installation. Consult current independent testing laboratories (e.g. Intertek, UL) for Design or System Details.

For technical data and properties of 3M™ Fire Barrier Water Tight Sealant 1000 NS, 3M™ Fire Barrier Water Tight Sealant 1003 SL, or 3M™ Fire Barrier Silicone Sealant 2000+, see separate product data sheets available from your 3M representative or go to www.3M.com/firestop.

3M™ Fire Duct Wrap 615+ Typical Through Penetration Firestop System (Figure 21)

1- or 2-Hour Through Penetration Systems
4-1/2" (11.4cm) Concrete Floor or Wall

1. Floor/ceiling or wall assembly
2. Duct
3. One or two layers 3M™ Fire Barrier Duct Wrap 615+ (application dependent)
4. Banding or pinning
5. 3M™ Fire Barrier Packing Material PM 4, 4 pcf mineral wool or scrap duct wrap (min. 33% compressed)
6. 3M™ Fire Barrier Water Tight Sealant 1000 NS, 3M™ Fire Barrier Water Tight Sealant 1003 SL, or 3M™ Fire Barrier Silicone Sealant 2000+

Note: Sealant to be applied at a minimum 5/8" (15.9mm) depth.

For wall assembly apply sealant to both sides of wall.
(3M™ Fire Barrier Water Tight Sealant 1003 SL not suited for wall applications.)

For technical data and properties of 3M™ Fire Barrier Water Tight Sealant 1000 NS, 3M™ Fire Barrier Water Tight Sealant 1003 SL or 3M™ Fire Barrier Silicone Sealant 2000+, see separate product data sheets available from your 3M representative or go to www.3M.com/firestop.

11. Maintenance

No maintenance is expected when installed in accordance with the applicable Intertek, UL or other third-party listed system and in accordance with 3M™ Fire Barrier Duct Wrap 615+ Installation Guidelines. Once installed, if any section of the 3M™ Fire Barrier Duct Wrap 615+ is damaged such that the blanket requires repair, the following procedure will apply:

1. If the blanket has not been damaged but the foil has ripped, seal the rips with aluminum foil tape.
2. If the blanket has been damaged:
   a. The damaged section should be removed by cutting the steel banding or removing the clips holding it in place.
   b. A new section of the same dimension should be cut from a roll of 3M™ Fire Barrier Duct Wrap 615+, either 24" (60.9cm) or 48" (121cm) wide.
   c. The new section should be placed and fitted ensuring the same overlap that existed previously (i.e. the original installation method).
   d. The steel banding should be placed around the material and tensioned so as to sufficiently hold the 3M™ Fire Barrier Duct Wrap 615+ in place.

12. Availability

3M™ Fire Barrier Duct Wrap 615+ is available from 3M Authorized Fire Protection Products Distributors and Dealers. 3M™ Fire Barrier Duct Wrap 615+ is available in 24" x 25 ft, Roll (1 case), 48" x 25 ft, Roll (1 case). 3M™ Fire Barrier Duct Wrap Collars 615+ are available in 1.5" x 6" x 25 ft, Rolls (4 case). For additional technical and purchasing information regarding this and other 3M™ Fire Protection Products, please call: 1-800-328-1687 or visit www.3M.com/firestop.

13. Safe Handling Information

Prior to handling or disposal of 3M™ Fire Protection Products, consult all relevant Material Safety Data Sheets (MSDS).
Important Notice to User:

Technical Information: The technical information, recommendations and other statements contained in this document are based upon tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed.

Product Use: Many factors beyond 3M’s control and uniquely within user’s knowledge and control can affect the use and performance of a 3M product in a particular application. Given the variety of factors that can affect the use and performance of a 3M product, user is solely responsible for evaluating the 3M product and determining whether it is fit for a particular purpose and suitable for user’s method of application.

Warranty and Limited Remedy: 3M warrants that each 3M™ Fire Protection Product will be free from defects in material and manufacture for 90 days from the date of purchase from 3M’s authorized distributor. 3M MAKES NO OTHER EXPRESS OR IMPLIED WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. If a 3M product does not conform to this warranty, the sole and exclusive remedy is, at 3M’s option, replacement of the 3M product or refund of the purchase price.

Limitation of Liability: Except where prohibited by law, 3M will not be liable for any loss or damage arising from the 3M product, whether direct, indirect, special, incidental or consequential, regardless of the legal theory asserted.
Design Number 3MU/FRD 120-18
October 29, 2012
FIRE RESISTANT GREASE DUCT
3M Company
3M Fire Barrier™ Duct Wrap 615+
ASTM E 2336-04 (2009) and
ICC-ES Acceptance Criteria for Grease Duct Enclosure Systems (AC101)
Noncombustibility Test (ASTM E 136) – Pass
Fire Resistance Test (ASTM E 119) – 2 hr
Durability Test (ASTM C 518 modified) – Pass
Internal Fire Test – 4 hr @ 500°F and 30 minutes @ 2000°F – Pass
Fire-Engulfment Test (ASTM E 119 Exposure) – 2 hr

1. GREASE DUCT: Use a continuously-welded, liquid-tight, L-shaped, rectangular duct system with horizontal and vertical shafts constructed of 16 GA sheet steel with a maximum 2304 inch² area and a maximum 48-inch dimension. When required, equip the duct with a pre-fabricated access door (Item 6) or field-fabricated access door (Item 7).
   A. Construct the grease duct using sections affixed to each other with welded joints.
   B. Reinforce the grease duct to IMC or NFPA 96 requirements designed to carry the weight of the grease duct assembly covered with two layers of insulation (Item 4) under a fire load equivalent to the ASTM E 2336 exposure and the ASTM E 119 time-temperature curve.
   C. Rigidly support the grease duct (Item 1) as specified in Item 5 or in accordance with IMC or NFPA 96 requirements when those requirements are greater.
   D. Protect the annular space around the grease duct (Item 1) passing through a fire-rated assembly with an Intertek-certified, compatible, 3M, penetration firestop system, refer to Section 10, having the same fire rating as the assembly.

2. FASTENERS: Refer to Figure 1. Weld minimum 12 GA, 6-1/2-inch long, copper-coated, steel insulation pins or 12 GA, insulated cup head steel pins to the grease duct (Item 1). Match the following fastener method with corresponding insulation (Item 4) method.
   A. Compression Butt Joint: Refer to 4A Section View B-B. Locate pins at all blanket overlaps, on all sides of the grease duct (Item 1), and meet the following requirements.
      i. Space pins maximum 12 inches apart in rows across the width of grease duct (Item 1). Locate pins maximum 6-3/4 inches from the edges of the grease duct (Item 1). Refer to section view A-A.
      ii. Space the rows of pins as follows: use pattern nominal 9 inches apart, then maximum 2 inches apart, then nominal 9 inches apart along the length of the grease duct (Item 1). Refer to Item 4A section view B-B.

1 ACCEPTANCE CRITERIA FOR GREASE DUCT ENCLOSURE ASSEMBLIES, AC101, Approved April 2001 (Editorially revised October 2004) states, “The system may be installed with zero clearance from the insulating materials to combustibles.”
DESIGN NO. 3MU/FRD 120-18 continued

iii. After insulation (Item 4A) is installed, place minimum 2-1/2 x 2-1/2-inch square, galvanized steel, self-locking washer clips onto all insulation pins.

iv. After clips are installed, cut off or bend flush with insulation (Item 4A) the pins that are too long.

B. Butt Joint with Collar: Refer to 4B Section View B-B. Locate pins at all blanket overlaps, on all sides of the grease duct (Item 1), and meet the following requirements.

i. Space pins maximum 12 inches apart in rows across the width of grease duct (Item 1). Locate pins maximum 6-3/4 inches from the edges of the grease duct (Item 1). Refer to section view A-A.

ii. Space the rows of pins as follows: use pattern nominal 9 inches apart, then maximum 3 inches apart, then nominal 9 inches apart along the length of the grease duct (Item 1). Refer to Item 4B section view B-B.

iii. After insulation (Item 4B) is installed, place minimum 2-1/2 x 2-1/2-inch square, galvanized steel, self-locking washer clips onto all insulation pins.

iv. After clips are installed, cut off or bend flush with insulation (Item 4B) the pins that are too long.

C. Single End Overlap (Telescope): Refer to 4C Section View B-B. Locate pins at all blanket overlaps, on all sides of the grease duct (Item 1), and meet the following requirements.

i. Space pins maximum 12 inches apart in rows across the width of grease duct (Item 1). Locate pins maximum 6-3/4 inches from the edges of the grease duct (Item 1). Refer to section view A-A.

ii. Space the rows of pins maximum 10-1/2 inches apart along the length grease duct (Item 1). Where pieces of insulation (Item 4C) are butted together, space pins a maximum 1-1/2 inches from the edge of the insulation. Refer to Item 4C section view B-B.

iii. After insulation (Item 4C) is installed, place minimum 2-1/2 x 2-1/2-inch square, galvanized steel, self-locking washer clips onto all insulation pins.

iv. After clips are installed, cut off or bend flush with insulation (Item 4C) the pins that are too long.

D. Dual End Overlap (Checkerboard): Refer to 4D Section View B-B. Locate pins at all blanket overlaps, on all sides of the grease duct (Item 1), and meet the following requirements.

i. Space pins maximum 12 inches apart in rows across the width of grease duct (Item 1). Locate pins maximum 6-3/4 inches from the edges of the grease duct (Item 1). Refer to section view A-A.

ii. Space the rows of pins maximum 10-1/2 inches apart along the length grease duct (Item 1). Where pieces of insulation (Item 4D) are butted together, space pins a maximum 1-1/2 inches from the edge of the insulation. Refer to Item 4D section view B-B.

iii. After insulation (Item 4D) is installed, place minimum 2-1/2 x 2-1/2-inch square, galvanized steel, self-locking washer clips onto all insulation pins.

iv. After clips are installed, cut off or bend flush with insulation (Item 4D) the pins that are too long.

3. BANDING: Do not use banding for the installation of insulation method (Item 4A), Compression Butt Joint. Banding is an option to fastener methods (Items 2B, 2C and 2D) but not fastener method (Item 2A). After insulation (Item 4) is installed, apply minimum 1/2 inch wide, 0.015-inch thick stainless steel bands or minimum 1/2 inch wide, 0.020-inch thick carbon steel bands and secured with minimum 1-inch long stainless or carbon steel crimp clamps to be used with corresponding banding type. When needed to ease installation, use filament tape as a temporary hold for the insulation (Item 4) prior to banding. Place banding a maximum 1-1/2 inches from all insulation (Item 4) edges and a maximum of 10-1/2 inches on center (O.C.). Tension the banding to hold the insulation (Item 4) in place without cutting or damaging the insulation (Item 4) or grease duct (Item 1).

4. CERTIFIED MANUFACTURER: 3M Company

CERTIFIED PRODUCT: 3M Fire Barrier™ Duct Wrap

MODEL: 615+

INSULATION: Apply the non-combustible (ASTM E136) and durable (ASTM C518) insulation in two layers of nominal 1-1/2-inches thick, 6-pcf density blanket, made of calcium-, silica-, and magnesium-oxide (CSM) fibers, encapsulated with polypropylene-foil or aluminized polyester-foil scrim over the entire surface of the grease duct (Item 1). Apply the inner first layer (Figure 1, 4.1) in accord with one of the four methods (A, B, C, or D) that follow. Offset the second outer layer (Figure 1, 4.2) one half the width of the inner first layer (Figure 1, 4.1) so that the joints of the inner first layer (Figure 1, 4.1) are covered by and approximately in the center of the second outer layer (Figure 1, 4.2). Apply the second outer layer (Figure 1, 4.2) in accord with the same method selected for the first inner layer (Figure 1, 4.1). Use blanket, available in various widths, that is fully encapsulated or single faced with a polypropylene-foil or polyester-foil scrim. Expose a foil-faced side of insulation to view. Wrap one layer of insulation around the grease duct (Item 1) perimeter so that each terminating end of insulation a minimum of 3 inches at all transverse joints. Stagger the transverse overlap location so that no two consecutive adjacent overlaps align. Refer to section view A-A for transverse overlap section view. Cover all visually-exposed ends and edges of insulation with nominal 4-inch wide, pressure-sensitive, aluminum foil tape.

A. Compression Butt Joint: Refer to Item 4A section view B-B. Wrap the grease duct (Item 1) with two layers of insulation installed with compression butt joints at all circumferential joints. Apply the first layer, center pieces of insulation (Item 4A) over 2-inch-wide pin bay, so that each piece nominal 24-inch-wide blanket occupies two (2) full 9-inch-wide bays and three (3) full 2-inch-wide bays. Compress each edge of each piece of insulation together and butt to preceding edge of insulation in 2-inch-wide bays. After installation, each piece of installed insulation width is 2 inches less than insulation nominal width. (Example: each piece of nominal 24-inch-wide insulation when installed is 22 inches wide.) Verify all insulation butt joints are compressed minimum 50% at compression butt joints. Offset the second layer of insulation so that the compression butt joint of the first layer of insulation is centered under the second layer of insulation and install in same manner as first layer of insulation.

B. Butt Joint with Collar: Refer to Item 4B section view B-B. Wrap the grease duct (Item 1) with two layers of insulation installed with butt joints at all circumferential joints. Apply the first layer, center pieces of insulation (Item 4A) over 3 inch wide pin bay, so that each piece nominal 24-inch-wide blanket occupies two (2) full 9-inch-wide bays and one (1) full 3-inch-wide bays and half of two (2) 3-inch-wide bays at each circumferential edge. Butt each end of each piece of insulation together with preceding edge of insulation. Each piece of installed insulation width is its nominal width. (Example: each piece of nominal 24-inch-wide insulation when installed...
DESIGN NO. 3MU/FRD 120-18 continued

is 24 inches wide.) Offset the second layer of insulation so that the butt joint of the first layer of insulation is centered under the second layer of insulation and install in same manner as first layer of insulation. Place and center 6-inch-wide collar of insulation over the butt joint. Overlap 6-inch-wide collar onto each adjacent insulation 3 inches. Verify all insulation butt joints with collars are three layers of insulation in overall thickness.

C. Single End Overlap (Telescope): Refer to Item 4C section view B-B. Wrap the grease duct (Item 1) with two layers of insulation installed with 3-inch minimum overlaps at all longitudinal joints. Overlap each adjacent insulation edge with the edge of the next piece of insulation. Verify all insulation overlaps are three layers of insulation in overall thickness.

i. Starting at one end of the grease duct (Item 1), apply the first piece of insulation around the grease duct (Item 1) to overlap fasteners (Item 2C). Refer section view A-A.

ii. Position and overlap the leading edge of the second piece of insulation nominally 3 inches over the flush edge of the first piece of insulation. Place the opposite edge of the second piece of insulation flush against the surface of the grease duct (Item 1). An “S-shaped” cross section of the insulation is created. Refer to Item 4C section view B-B.

iii. Apply all additional pieces of insulation as “S-shaped” cross section of the insulation in compliance with Item 4Cii.

iv. Position the second layer of insulation so that the joint of the first layer of insulation is centered under the second layer of insulation and install in same manner as first layer of insulation.

D. Dual End Overlap (Checkerboard): Refer to Item 4D section view B-B. Verify all insulation overlaps are a minimum 3 inches in overall thickness. Do not align two consecutive insulation end overlaps. Overlap each full width insulation edge with the edge of the “gull wing” (v) shaped piece of insulation. Install insulation with zero clearance at the overlaps, or in the field between overlaps. Verify all insulation overlaps are four layers of insulation in overall thickness.

i. Wrap the first piece of insulation around the grease duct (Item 1) so that the insulation is flush against the surface of the grease duct (Item 1). Position the starting end of the insulation to overlap pins (Item 2A) a minimum of 1-1/2 inches while the edges of the insulation overlap the rows of pins (Item 2B) a minimum of 1-1/2 inches.

ii. Position the second piece of insulation nominally 18 inches from the edge of the first piece of insulation. Install the second piece in the same manner as the first.

iii. Cover the grease duct (Item 1) that is exposed between the edges of the first two pieces of insulation with another piece of insulation. Position the starting end of the insulation to overlap pins (Item 2A) a minimum of 1-1/2 inches while the edges of the insulation overlap the adjacent edges of the two pieces installed insulation a minimum of 1-1/2 inches.

iv. Position the second layer of insulation so that the first layer of insulation is centered under the second layer of insulation and install in same manner as first layer of insulation.

5. SUPPORTS: If the grease duct is 24-inches x 24-inches or smaller, support the grease duct (Item 1) with insulation (Item 4) using a un-insulated “trapeze” system composed of a minimum 2 x 2 x 1/8-inch steel angle as the trapeze cross-member and two (2), minimum 3/8-inch diameter, all-thread, steel rods connected using nuts and washers. For ducts larger than 24-inches x 24-inches, support the grease duct (Item 1) with insulation (Item 4) using a un-insulated “trapeze” system composed of a minimum 2 x 2 x 1/4-inch steel angle as the trapeze cross-member and two (2), minimum 1/2-inch diameter, all-thread, steel rods connected using nuts and washers. Connect the all-thread steel rods to the bottom of the floor assembly using an attachment method designed to carry the weight of the grease duct (Item 1) with insulation (Item 4) under a fire load equivalent to ASTM E 119 time-temperature curve. Place one (1) all-thread steel rod at each end of trapeze cross-member. Center grease duct (Item 1) with insulation (Item 4) on trapeze cross-member. Space all-thread steel rods a maximum 6 inches from surface of the insulated grease duct or allowing all-thread steel rods to contact with the insulation (Item 4) at the minimum distance. Extend trapeze cross-member at least 2 inches past each all-thread, steel rod. Space trapeze supports a maximum 60 inches on center.

6. CERTIFIED MANUFACTURER: 3M Company

CERTIFIED PRODUCT: 3M Fire Barrier™ Grease Duct Access Door MODELS:
• 000-51115-16584-9 (door for 20x20 opening),
• 000-51115-16583-2 (door for 12x8 opening), and
• 000-51115-16582-5 (door for 10x6 opening)

CERTIFIED MANUFACTURER: Ductmate Industries, Inc.

CERTIFIED PRODUCT: 3M Fire Barrier™ Duct Wrap MODELS: Ductmate ULtimate Door™
• D2020ULWS (door for 20x20 opening),
• D128ULWS (door for 12x8 opening), and
• D106ULWS (door for 10x6 opening)

ACCESS DOOR ASSEMBLY: When required, apply an access door and insulated cover plate as described:

A. OPTIONAL PRE-FABRICATED ACCESS DOOR: Mark a clean-out access opening location on the grease duct (Item 1) with insulation (Item 4) at its mid-height along the horizontal section. Cut an opening (maximum 22 x 22 inches) in the insulation (Item 4) the same size as the outside dimension of the desired pre-fabricated access door model. Remove and discard the cut insulation (Item 4). Cut an opening (maximum 20 x 20 inches) into the side of the grease duct (Item 1) according to the manufacturer’s instructions for the size of the pre-fabricated access door to be installed. Install and tightly secure the pre-fabricated access door in accordance with the manufacturer’s instructions to the grease duct (Item 1). Fit pre-fabricated access door with four (4), 3/8-inch diameter, corner-thumb bolts through the exterior face.

B. CERTIFIED MANUFACTURER: 3M Company

CERTIFIED PRODUCT: 3M Fire Barrier™ Duct Wrap

MODEL: 615+
ACCESS INSULATION: Remove the four (4), 3/8-inch diameter, corner-thumb bolts and replace them with four (4), 3/8-inch diameter, all-thread, steel rods extending from pre-fabricated access door (Item 6A). Apply three (3) layers of access insulation over the pre-fabricated access door (Item 6A) as follows. Cut the first piece of rectangular access insulation a minimum 1/4 inch larger than the clean-out access opening. Position, square, and impale the first piece of the access insulation over the four (4), 3/8-inch diameter, all-thread, steel rods extending from pre-fabricated access door (Item 6A). Press the first piece of access insulation flush over the pre-fabricated access door (Item 6A). Compress and abut the cut edges of the first piece of the access insulation against the cut edges of opening in the insulation (Item 4). Cut a second piece of access insulation the same size as the first piece of access insulation. Press the second piece of access insulation flush over the first piece of access insulation. Compress and abut the cut edges of the first piece of the access insulation against the cut edges of opening in the insulation (Item 4). Cut a third piece of rectangular access insulation a minimum of 2 inches larger than the second piece of access insulation on all sides. Seal cut edges of the third piece of access insulation with nominal 4-inch-wide aluminum foil tape. Position, square, and impale the third piece of the access insulation over the four (4), 3/8-inch diameter, all-thread, steel rods extending from pre-fabricated access door (Item 6A). Press the third piece of access insulation flush over second piece of access insulation.

C. COVER PLATE: Cut a cover plate to the same dimensions as the third piece of access insulation (Item 6B) using a minimum 16 GA steel sheet. Drill holes in the cover plate that match the location of the four (4), 3/8-inch diameter, all-thread, steel rods and locate the holes so that the cover plate is squared to the third piece of access insulation (Item 6B). After all three (3) layers of access insulation (Item 6B) are impaled over the four (4), 3/8-inch diameter, all-thread, steel rods install the cover plate. Pass the four (4), 3/8-inch diameter, all-thread, steel rods through the cover plate. Place washers and wing nuts onto each of the four (4), 3/8-inch diameter, all-thread, steel rods. Secure the cover plate by tightening wing nuts.

Figure 3 – Field Fabricated Access Door Option A

7. OPTIONAL FIELD-FABRICATED ACCESS DOORS: Mark a clean-out access opening location on the grease duct (Item 1) with insulation (Item 4) at its mid-height along the horizontal section. Use either Option A or B.

A. (OPTION A) Cut a 12x12-inch opening in the insulation (Item 4). Remove and discard the cut insulation (Item 4). Cut and center a 10x10-inch opening into the side of the grease duct (Item 1) by maintaining a 1-inch clearance between the perimeter of the opening and the cut insulation (Item 4). Remove and discard the cut steel. Weld four (4), minimum 4-inch long, 1/4-inch diameter, all-thread, steel rods extending from pre-fabricated access door (Item 6A). Position, square, and impale the third piece of access insulation over the four (4), 3/8-inch diameter, all-thread, steel rods extending from pre-fabricated access door (Item 6A). Press the third piece of access insulation flush over second piece of access insulation.
rods to the grease duct (Item 1). Locate one (1) steel rod at each corner of the grease duct (Item 1) opening so that they are 11 inches on center and squared within the insulation (Item 4) opening.

i. ACCESS DOOR: Cut a 12x12-inch, 16 GA, steel plate to be used as an access door. Drill clearance holes in the access door to match the all-thread, steel rod pattern. Place the access door over the all-thread, steel rods. Seal the opening in the grease duct (Item 1) by overlapping the access door over the opening cut in the insulation (Item 4) by 1 inch on all sides. Weld four (4), minimum 6-1/2-inch long, 12 GA, copper-coated, steel insulation pins to the access door corners so that the insulation pins are 9 inches on center.

ii. CERTIFIED MANUFACTURER: 3M Company

CERTIFIED PRODUCT: 3M Fire Barrier™ Duct Wrap
MODEL: 615+

ACCESS INSULATION: Apply three (3) layers of access insulation over the access door. Cut the first piece of access insulation into a 12x12-inch square and install it over the insulation pins and cover the access door (Item 7Aii). Cut the second piece of access insulation into a 14x14-inch square. Square it and install it over the insulation pins. Cover the first piece of access insulation so that a 1-inch overlap exists. Cut the third piece of access insulation into a 16x16-inch square. Square it and install it over the insulation pins. Cover the second piece of access insulation so that a 1-inch overlap exists. Secure access insulation to the insulation pins with 1-1/2-inch long, 1/4-inch diameter, all-thread, steel rods. Apply washers and wing nuts over the all-thread, steel rods. Secure the access door by tightening the wing nuts.

B. (OPTION B) Cut a maximum 16x16-inch opening into the insulation (Item 4) and the grease duct (Item 1). Remove and discard the cut insulation (Item 4) and steel. Weld together four (4) pieces of 1-1/2 x 1-1/4 x 1/8-inch steel angle, with the flange outward, to form a 1-1/2-inch tall, flanged frame. Position, center, and continuously weld the flanged frame around the opening in the grease duct (Item 1). Position one (1), minimum 4-inch long, 1/4-inch diameter, all-thread, steel rod in the center of each of the four (4) corners of the flange and weld them in place.

i. ACCESS DOOR: Cut an 18-1/2 x 18-1/2-inch, 16 GA, steel plate to be used as an access door. Drill clearance holes in the access door to match the all-thread, steel rod pattern on the flange. Place the access door over the all-thread, steel rods.

ii. COVER PLATE: Cut a 20-1/2 x 20-1/2-inch external cover plate out of 16 GA steel sheet and drill clearance holes matching the locations of the all-thread, steel rods on the flange. Weld minimum four (4), 12 GA, copper-coated, steel insulation pins onto the internal surface of the cover plate, spaced minimum 14 inches on center. Limit insulation pin length to one-half total access insulation thickness. Install access insulation (Item 7Bii). Position the cover plate with access insulation over the all-thread, steel rods flush to access door. Apply washers and wing nuts over the all-thread, steel rods. Secure the access door by tightening the wing nuts.

iii. CERTIFIED MANUFACTURER: 3M Company

CERTIFIED PRODUCT: 3M Fire Barrier™ Duct Wrap
MODEL: 615+

ACCESS INSULATION: Apply two layers of access insulation over the interior of the cover plate. Cut the first piece of access insulation into a 20-1/2 x 20-1/2-inch square and install it over the insulation pins on the internal surface of the cover plate. Cut the second piece of access insulation into a 24 x 24-inch square. Square it and install it over the insulation pins. Cover the first piece of access insulation so that a 1-3/4-inch overlap exists. Secure access insulation to insulation pins with 1-1/2-inch long, 1/4-inch diameter, all-thread, steel rods. Apply washers and wing nuts over the all-thread, steel rods. Secure the access door by tightening the wing nuts.

8. NONCOMBUSTIBLE SUPPORTING CONSTRUCTION: Refer to Figures 3 and 4. Use one of the following wall or floor assemblies.

A. GYPSUM WALL ASSEMBLY: Symmetrical two-hour rated gypsum wall assembly constructed of the following:

i. Steel Studs – Minimum 25 GA galvanized steel studs measuring 3-5/8 inch wide with 1-1/4-inch legs spaced maximum 24 inch on center (O.C.). Attach studs with minimum #6 x 3-8/8-inch steel stud framing screws to floor and ceiling tracks.
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Figure 5 – Noncombustible Supporting Constructions

ii. Tracks – Channel U-shaped floor and ceiling runners measuring 1/2-inch deep by 3-5/8-inch wide, which are secured to floor and ceiling with 1-inch long fasteners suitable for the mounting to substrate and spaced maximum 18-inch O.C.

iii. Gypsum Board – Cover studs and runners with two layers of 5/8 inch thick, Type X gypsum board on each face. Fasten base layer of gypsum board to steel studs with #6 1-1/8 inch bugle head phillips drywall screws spaced maximum 12 inch O.C. Fasten face layer of gypsum board with #6, 1-5/8 inch long bugle phillips drywall screws spaced maximum 8 inches O.C. Apply vinyl or casein, dry or premixed joint compound to face layers of gypsum board in two coats to all exposed screw heads and gypsum board joints. Embed minimum 2 inch wide paper, plastic or fiberglass tape in first layer of joint compound over joints in gypsum board. Minimum wall assembly thickness of 6 inches measured from face layer of gypsum board to opposite face layer of gypsum board.

B. SHAFT WALL ASSEMBLY:
Asymmetrical two-hour rated gypsum shaft wall assembly constructed of the following:

i. Visual Gypsum Board – Cover studs and runners with two layers of minimum 1/2 inch thick, Type X gypsum board on each face. Fasten base layer of gypsum board to steel studs with #6 1-1/8 inch bugle head phillips drywall screws spaced maximum 12 inch O.C. Fasten face layer of gypsum board with #6, 1-5/8 inch long bugle phillips drywall screws spaced maximum 8 inches O.C. Apply vinyl or casein, dry or premixed joint compound to face layers of gypsum board in two coats to all exposed screw heads and gypsum board joints. Minimum wall assembly thickness of 4-1/2 inches measured from face layer of gypsum board to opposite face layer of gypsum board.

ii. Interior Gypsum Board – Cut 1-inch thick Type X gypsum board 1-inch less than floor to ceiling height. Insert the longitudinal edges of the 1-inch thick Type X gypsum board into the C-T or C-H studs. Secure the transverse edge of the 1-inch thick Type X gypsum board to the long leg of J-runner using its tabs or minimum 1-5/8-inch long Type S self-tapping bugle head steel screws spaced maximum 12 inches on center.

iii. Steel Studs – Cut minimum 25 GA galvanized steel C-T or C-H studs measuring minimum 2-1/2 inches wide with minimum 1-1/2-inch flanges 3/4-inches less than floor to ceiling height and spaced maximum 24 inch on center (O.C.) in runners with T or H section abutting long leg of runner.

iv. Runners – Use minimum 2-1/2-inch wide J-runner compatible with studs and having unequal vertical legs: minimum 1-inch short leg and minimum 2-inch long leg. Position J-runners with short leg towards visual face of shaft wall. Attach to floor and ceiling using steel fasteners located a maximum of 2-inches from each end and a maximum of 24 inch O.C.

C. CONCRETE WALL ASSEMBLY: Symmetrical, two-hour rated, solid concrete, wall assembly made from reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m$^3$) concrete, which may also be used as a shaft wall assembly. Constructed of solid concrete with a minimum concrete thickness measured from exposed face to exposed face using one of the following:

i. lightweight concrete is 3.6 inches;

ii. sand-lightweight concrete is 3.8 inches;

iii. carbonate aggregate concrete is 4.6 inches; and

iv. siliceous aggregate concrete is 5.0 inches.

D. MASONRY WALL ASSEMBLY: Symmetrical, two-hour rated, nominal 8 x 8 x 16 CMU, wall assembly made from lightweight or normal weight (100-150 pcf or 1600-2400 kg/m$^3$) concrete, which may also be used as a shaft wall assembly.

E. CONCRETE FLOOR ASSEMBLY: Symmetrical two-hour rated solid concrete floor assembly made from reinforced lightweight or normal weight (100-150 pcf or 1600-2400 kg/m$^3$) concrete. Constructed of solid concrete with a minimum concrete thickness measured from exposed face to exposed face using one of the following:

i. lightweight concrete is 3.6 inches;

ii. sand-lightweight concrete is 3.8 inches;

iii. carbonate aggregate concrete is 4.6 inches; and

iv. siliceous aggregate concrete is 5.0 inches

3 Refers to building construction referenced in the building codes.
DESIGN NO. 3MU/FRD 120-18 continued

9. OPENING – Create an opening in the assembly. Position the grease duct (Item 1) concentrically or eccentrically in the opening so that the annular space ranges from minimum 0.5 inch to maximum 4-1/2 inches. Establish an opening designed to house the grease duct (Item 1) covered with insulation (Item 4) and the desired annular space but not exceeding a cross-sectional area of maximum 3136 inch² and a maximum dimension of 59.5 inches.
10. PENETRATION FIRESTOP: Install two-hour, fire-resistant, ASTM E 814, firestop system. Install firestop between the supporting construction (Item 6) and the grease duct (Item 1) or the grease duct (Item 1) protected with the insulation (Item 4). Use a symmetrical wall penetration firestop, an asymmetrical shaft penetration firestop, or an asymmetrical floor penetration firestop constructed of the following components.

A. CERTIFIED MANUFACTURER: 3M Company
CERTIFIED PRODUCT: 3M Fire Barrier™ Duct Wrap
MODEL: 615+
PACKING MATERIAL: Fill the entire annular space’s width with minimum 4-pcf density mineral wool or certified insulation without the encapsulation (foil scrim).
Cut the packing material into strips not less than one and one half (1-1/2) times the width of the annular space to be filled. Compress packing material nominally 33% and insert packing material into the annual space.
For wall assemblies, recess the surface of packing material nominally 5/8 inches from surfaces of both faces of the supporting construction (Item 8).
For floor assemblies, recess the surface of packing material nominally 5/8 inches from the visual surface of the supporting construction (Items 8) and install a minimum depth of 4-inches.

B. CERTIFIED MANUFACTURER: 3M Company
CERTIFIED PRODUCT: 3M™ Fire Barrier™ Sealant
MODEL: Water-Tight 1000-NS Silicone, 1003-SL Silicone (Floor Assembly Only), 2000+ Silicone, or CP 25 WB+
FILL, VOID OR CA VITY MATERIAL:
Install minimum 5/8-inch depth of fill material into the recess over the entire surface of the packing material (Item 7A). Screed the fill material flush with the surface of the supporting construction (Item 8). Overlap a minimum of 1/4 inches, the fill material onto face of supporting construction (Item 8).

This material was extracted and drawn by 3M Fire Protection Products from the 2012 Product Directory, © Intertek
SECTION 230900 - TEMPERATURE CONTROLS (AUTOMATIC)

PART 1 GENERAL

1.1 WORK INCLUDED

A. The work involved in this specification and the accompanying drawings consists of performing all labor and furnishing of all material and equipment necessary to extend the existing Automatic Temperature Control (ATC) System for Heating, Ventilating and Air Conditioning systems as specified herein, including minor items obviously necessary for complete and operating installation. Also included in this section is relocation of any existing control equipment as required by the work.

B. Provide new controls connected to the existing Direct Digital Control (DDC) system consisting of all necessary Stand Alone Controllers, Application Specific Controllers, Room Sensors, Air Stream Sensors, Relays, Valves, Damper Operators and other accessory equipment. Provide a complete system of electrical wiring to fill the intent of the Specifications. Competent mechanics regularly employed by the supplier of the temperature control equipment will install this system.

C. Extend the existing Johnson Controls DDC system for the new work and sequences. Provide new graphics for the new HVAC systems.

D. Section 230000, Mechanical Special Conditions, in its entirety, including reference to applicable provisions of the General Requirements, are hereby adopted and made part of this section of the specification.

1.2 SHOP DRAWINGS

A. Submit shop drawings as indicated in Section 230000.


C. Also include in submittal a trunk cable schematic diagram depicting the personal computer interface, control panel locations and a description of the communication type, media and protocol.

D. Also include in submittal a complete point list of all connected points to the DDC system.

E. Include complete performance data and manufacturer's descriptive literature for all products used on the project.

F. Submit complete approved shop drawings and as-built documentation for inclusion in the mechanical contractors operation and maintenance manuals.

1.3 CONTRACTOR'S QUALIFICATIONS

A. The temperature control contractor is required to be a factory approved representative of an approved temperature control manufacturer. Competent mechanics regularly employed by the temperature control contractor are required to install the system.

B. Pre-approved company is:

1. Johnson Controls, Inc.
C. ATC contractors are required to be independent of the testing and balancing contract for this project.

D. The Installer is not allowed to subcontract out the installation to another entity that is not an authorized representative of the Manufacturer and/or has not completed the Manufacturer's certified training.

E. At the time of bid, the Installer is required to have a fully staffed support office located within a 150-mile radius of the project site and must directly employ service technicians. Installer is required to be able to provide the owner with 24/7 emergency service within a reasonable time frame.

1.4 CODES AND STANDARDS

A. Refer to section 230000 for applicable code requirements.

B. Install wiring per the latest adopted edition of the National Electric Code and per division 260000.

1.5 GUARANTEE

A. Provide a one year warranty for all components, parts and assemblies against defects in material and workmanship after approved system demonstration. Expressed warranties are conditionally based on the requirement that the items covered within the guarantee are used and maintained in accordance with the manufacturer's recommendations. Guarantee commences at time of acceptance and continues for the previously indicated duration. Individual or aggregate beneficial use means the Owner's operators are able to use the system and receive reliable information from inputs and outputs completed by the ATC Contractor.

B. The following procedures will govern the guarantee period. Within thirty days after the Owner is receiving beneficial use or approved operation, ATC Contractor will initiate the guarantee period by formally transmitting to the Owner commencement notification of the period for the system(s), subsystem(s), and devices previously accepted. Guarantee notification will be formally transmitted in like manner for subsequent phases of portions thereof which remain incomplete at the time of initial notification.

C. All products used in this installation must be new, currently under manufacture, and must be applied in standard off the shelf products. Spare parts must be available for at least 5 years after completion of this contract.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide a DDC controls for the new work comprised of a network of interoperable, stand-alone digital controllers, graphical user interface software, portable operator terminals, printers, network devices and other devices as specified herein.

B. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system. Controllers that utilize proprietary or manufacturer specific communication protocols are not acceptable.
C. Provide all components and controllers supplied under this contract with “peer-to-peer” communicating devices.

D. Temperature Control Panels: Furnish temperature control panels of code gauge steel with locking doors for mounting all devices as shown. All electrical devices within a control panel must be factory wired. Connect all external wiring to terminal strips mounted within the panel. Provide engraved phenolic nameplates identifying all devices mounted on the face of control panels.

2.2 COMMUNICATION

A. All control products provided for this project must comprise a BACnet internetwork connected to the existing system. Provide communication to all control components (i.e., all types of controllers and Operator Workstations) conforms to ANSI/ASHRAE Standard 135-2001, BACnet.

B. Operate each BACnet device on the BACnet Data Link/Physical layer protocol specified for that device as defined in this section.

C. Provide all communication media, connectors, repeaters, bridges, hubs, switches, and routers necessary for the internetwork.

D. Provide all controllers with a communication port for connections with the Operator Workstations using the BACnet Data Link/Physical layer protocol.

E. Automatically synchronize the time clocks in all controllers daily. Automatically broadcast an operator change to the time clock in any controller to all controllers on the network.

2.3 CONTROLLER SOFTWARE

A. Add to or upgrade the existing applications software for building and energy management.

B. Scheduling. Provide the capability to schedule each object or group of objects in the system. Each schedule must consist of the following:

   1. Weekly Schedule. Provide separate schedules for each day of the week. Each of these schedules should include the capability for start, stop and optimal start. Each schedule may consist of up to 10 events. When a group of objects are scheduled together, provide the capability to adjust the start and stop times for each member.

   2. Holiday Schedules. Provide the capability for the operator to define up to 99 special or holiday schedules. These schedules may be placed on the scheduling calendar and will be repeated each year. The operator will define the length of each holiday period.

C. Alarm Reporting. The operator will determine the action to be taken in the event of an alarm. Route alarms to the appropriate workstations based on time and other conditions.

D. Remote Communication. Provide the system with the ability to dial out in the event of an alarm using BACnet Point-To-Point at a minimum of 56K baud. Ensure receivers are BACnet workstations.
E. Maintenance Management. The system will monitor equipment status and generate maintenance messages based upon user-designated run-time, starts, and/or calendar date limits.

F. Sequencing. Provide application software to properly sequence the start and stop of chillers, boilers, and pumps to minimize energy usage in the facility.

G. PID Control. Supply a PID (proportional-integral-derivative) algorithm with direct or reverse action and anti-windup. The algorithm will calculate a time-varying analog value that is used to position an output or stage a series of outputs. The controlled variable, setpoint, and PID gains must be user-selectable.

2.4 BUILDING CONTROLLERS

A. General. Add a building controller if needed or connect an existing controller. Each of these panels must meet the following requirements.

1. Provide the Energy Management and Control System comprised of one or more independent, standalone, microprocessor-based Building Controllers to manage the global strategies described in the System Software section.
2. Provide the Building Controller with sufficient memory to support its operating system, database, and programming requirements.
4. The operating system of the Building Controller will manage the input and output communication signals to allow distributed controllers to share real and virtual object information, and allow central monitoring and alarms.
5. Provide controllers that perform scheduling with a real-time clock.

B. Communication

1. Each Building Controller will support direct Ethernet or a communications card. Connect the communications card to the Building Controller by an PC-104 bus connection. Connect the Building Controller to the BACnet network using the ISO 8802-3 (Ethernet) Data Link/Physical layer protocol.
2. Each Building Controller with a communications card will perform BACnet routing if connected to a network of Custom Application and Application Specific Controllers.
3. The controller will provide a service communication port using BACnet Data Link/Physical layer protocol P-T-P for connection to a hand-held workstation/ and/or modem.
4. The Building Controller secondary communication network will support BACnet MS/TP.

C. Controller hardware must be suitable for the anticipated ambient conditions.

1. Mount controllers used outdoors and/or in wet ambient conditions within waterproof enclosures, and ensure they are rated for operation at 0°C to 40°C [32°F to 100°F] and 10 to 90% RH.
2. Mount controllers used in conditioned space in dust-proof enclosures, and ensure they are rated for operation at 0°C to 50°C [32°F to 120°F].

D. Building Controllers will be fully peer to peer.
E. Serviceability. Provide diagnostic LEDs for power, communication, and processor. Make all wiring connections to field-removable, modular terminal strips — or to a termination card connected by a ribbon cable.

F. Memory. Provide the Building Controller with as a minimum standard SRAM of 256 KB, standard DRAM of 1MB and standard non-volatile 1 MB of flash memory in lieu of EPROM. Memory will be user extendible through RAM chip sockets and SIMMs for future memory expansion.

G. Immunity to power and noise. Controller must be able to operate at 90% to 110% of nominal voltage rating and will perform an orderly shutdown below 80% nominal voltage. The Building Controller will maintain all database information including BIOS and programming information in the event of a power loss for at least 72 hours. Protect operation against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m [3 ft].

H. Inputs/Outputs.

1. Inputs. Controller input/output board will support dry contact, 0-5 VDC and 0-10 VDC- voltage, 4-20 mA- current and thermistor-resistive signal types on an individual basis for connecting any status or sensing device. Analog resolution must be 10-bit A to D.

2. Outputs. Controller input/output board will support plug-and-play I/O modules or built in HOA modules configured with manual-auto-off override switch, potentiometer and input channel for feedback status or and unrelated analog or digital input. Output supported must be 0-10 VDC. All HOA’s will be supervised.

3. Diagnostics. Provide controller input/output board with red LEDs providing input status indication.

4. External Power. Provide controller input/output board with one on-board 24 VDC terminal for directly connected active transducers.

2.5 ADVANCED APPLICATION CONTROLLERS

A. General. Provide an adequate number of Advanced Application Controllers to achieve the performance specified in the Part 1 Article on “System Performance.” Each of these panels must meet the following requirements.

1. Provide the Advanced Application Controller with sufficient memory to support its operating system, database, and programming requirements.

2. Advanced Application Controllers must be fully peer to peer.

3. The operating system of the Controller will manage the input and output communication signals to allow distributed controllers to share real and virtual object information, and allow central monitoring and alarms.

4. All equipment that requires scheduling will be scheduled in that equipments controller.

5. Both firmware and controller database must be loadable over the network.

B. Communication.

1. Each Advanced Application Controller will reside on a BACnet network using the MS/TP or Ethernet Data Link/ Physical layer protocol.
2. The controller will provide a service communication port using BACnet Data Link/Physical layer protocol for connection to portable operator’s workstation and allow access to the entire network.

C. Controller hardware must be suitable for the anticipated ambient conditions.
   1. Mount controllers used outdoors and/or in wet ambient conditions within waterproof enclosures, and ensure they are rated for operation at 0°C to 40°C [32°F to 100°F].
   2. Mount controllers used in conditioned space in dust-proof enclosures, and ensure they are rated for operation at 0°C to 50°C [32°F to 120°F].

D. Serviceability. Provide diagnostic LEDs for power, communication, and processor. Make all wiring connections to field-removable, modular terminal strips — or to a termination card connected by a ribbon cable.

E. Memory. The Advanced Application Controller must be non-volatile FLASH memory.

F. Immunity to power and noise. Controller must be able to operate at 90% to 110% of nominal voltage rating and will perform an orderly shutdown below 80% nominal voltage. Protect operation against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m [3 ft].

2.6 APPLICATION SPECIFIC CONTROLLERS

A. General. Application Specific Controllers (ASCs) are microprocessor-based DDC controllers which through hardware or firmware design are able to control a wide variety of equipment. They are fully user-programmable, and are not restricted to any one type of equipment.
   1. Each ASC must be capable of standalone operation and will continue to provide control functions without being connected to the network.
   2. Each ASC will contain sufficient I/O capacity to control the target system.
   3. Both firmware and controller database must be loadable over the network
   4. Application Specific Controllers must be fully peer to peer
   5. ASC’s will come with an integrated housing to allow for easy mounting and protection of the circuit board. Only wiring terminals may be exposed.

B. Communication
   1. The controller will reside on a BACnet network using the MS/TP Data Link/Physical layer protocol.
   2. Provide each controller with a BACnet Data Link/Physical layer compatible connection for a laptop computer or a portable operator’s tool. Extend this connection to a space temperature sensor port where shown and allow access to the entire network.
   3. Provide each controller with a secondary sub network for communicating sensors or I/O expansion modules

C. The hardware must be suitable for the anticipated ambient conditions.
1. Mount controllers used outdoors and/or in wet ambient conditions within waterproof enclosures, and ensure they are rated for operation at -40°C to 65°C [-40°F to 150°F] and/or suitably installed in a heated or fan cooled enclosure
2. Mount controllers used in conditioned space in dust-proof enclosures, and ensure they are rated for operation at 0°C to 50°C [32°F to 120°F].

D. Serviceability. Provide diagnostic LEDs for power, communication, and processor. Make all wiring connections to field-removable, modular terminal strips.

E. Memory. The Application Specific Controller will use non-volatile memory and maintain all BIOS and programming information in the event of a power loss.

F. Immunity to power and noise. ASC must be able to operate at 90% to 110% of nominal voltage rating and will perform an orderly shutdown below 80%. Protect operation against electrical noise of 5-120 Hz and from keyed radios up to 5 W at 1 m [3 ft].

G. Transformer. Power supply for the ASC must be rated at minimum of 125% of ASC power consumption, and must be fused or current limiting type.

H. Input/Output. ASC must support as a minimum, directly connected, a combination of analog outputs and binary outputs and universal software selectable analog or digital inputs. ASC inputs must support 0-5 VDC-voltage, 4-20mA-current, thermistor-resistance and dry contacts. ASC outputs must support 0-10 VDC-voltage, digital triac rated at 0.5 amps at 24 VAC

I. System Object Capacity. The system size will be expandable to at least twice the number of input/output objects required for this project. Additional controllers (along with associated devices and wiring) will be all that is necessary to achieve this capacity requirement. The Operator Workstations installed for this project will not require any hardware additions or software revisions in order to expand the system.

2.7 NETWORKS

A. The Local Area Network (LAN) must be either a 10 or 100 Megabits/sec Ethernet network supporting BACnet, Java, XML, HTTP, and CORBA IIOP for maximum flexibility for integration of building data with enterprise information systems and providing support for multiple Network Area Controllers (NACs) and user workstations

B. Local area network minimum physical and media access requirements:
   1. Ethernet; IEEE standard 802.3
   2. Cable; 10 Base-T, UTP-8 wire, category 5
   3. Minimum throughput; 10 Mbps, with ability to increase to 100 Mbps

2.8 NETWORK ACCESS

A. Connect to existing building control system.

2.9 GRAPHICAL USER INTERFACE SOFTWARE (GUI)

A. The FMS contractor will create a comprehensive set of user-friendly graphic screens for the new work in the existing system. Provide graphics for all mechanical systems and floor plans of the building. Graphic screens will include individual diagrammatic depictions of each system and sub-system (chilled water system, hot water system,
chiller, boiler, air handler, and all terminal equipment). The user will be able to move between screens using hyperlinks or jump-tags. Point/object information on the graphic displays will dynamically update. Show on each graphic all input and output points/objects for the system. Also show relevant calculated points/objects such as set points. Canned, text-based, graphic screens or summary pages listing all terminal equipment on a single screen are NOT acceptable.

B. Operating System:
   1. The GUI will run on the existing system.

C. The GUI will employ browser-like functionality for ease of navigation. It must include a tree view (similar to Windows Explorer) for quick viewing of, and access to, the hierarchical structure of the database. In addition, menu-pull downs, and toolbars will employ buttons, commands and navigation to permit the operator to perform tasks with a minimum knowledge of the HVAC Control System and basic computing skills. These include, but are not limited to, forward/backward buttons, home button, and a context sensitive locator line (similar to a URL line), that displays the location and the selected object identification.

D. Modifying common application objects, such as schedules, calendars, and set points will be accomplished in a graphical manner.

E. At a minimum, the GUI will permit the operator to perform the following tasks, with proper password access:
   a. Create, delete or modify control strategies.
   b. Add/delete objects to the system.
   c. Tune control loops through the adjustment of control loop parameters.
   d. Enable or disable control strategies.
   e. Generate hard copy records or control strategies on a printer.
   f. Select points to be alarmable and define the alarm state.
   g. Select points to be trended over a period of time and initiate the recording of values automatically.

F. The Graphical User Interface software (GUI) will provide the ability to perform system programming and graphic display engineering as part of a complete software package. Access to the programming functions and features of the GUI will be through password access as assigned by the system administrator.

G. Provide a library of control, application, and graphic objects to enable the creation of all applications and user interface screens.

H. Include a standard library of objects for development and setup of application logic, user interface displays, system services, and communication networks.

I. The objects in this library must be capable of being copied and pasted into the user’s database and must be organized according to their function. In addition, the user will have the capability to group objects created in their application and store the new instances of these objects in a user-defined library.
2.10 MATERIALS

A. ELECTRICAL WIRING

1. Provide all electrical wiring in connection with the temperature control system under this section of the specifications in accordance with Division 16 of the Specifications.

2. Provide all power wiring as required for a complete operational temperature control system. Provide all power wiring not indicated in the electrical plans and documents for all temperature control devices and panels.

3. Provide battery back-up and/or UPS units at all control equipment.

B. CONTROL INSTRUMENTS

1. Dead Band Room Thermostats: Thermostats in spaces where separate heating and cooling actuators are employed must be single combination heating and cooling, modulating type. Provide each thermostat with two separate control outputs. One output will control the cooling and the other control the heating. The cooling set point will be independent of the heating set point in such a manner that the temperature differential established between the heating and cooling set points develops a "NO ENERGY BAND". When the space temperature is within a "NO ENERGY BAND" neither heating nor cooling energy is added to the space. Both the heating and cooling set points must be independently adjustable. The heating and cooling set point scales must be in accordance with ASHRAE Standard 90-75. Provide each set point with an independent adjustable sensitivity. Provide set point dial stops. Provide all thermostats with covers with visible thermometers. Provide thermostats with concealed set points under the covers. Locate thermostats and room sensor 48" above finished floor. Meet all ADA requirements and coordinate with electrical lighting controls.

2. In the clean room, remote room controller. Provide with remote setpoint adjustment. In the clean room return grille nearest the air handing unit, provide a return air duct sensor. This sensor is required to be coated for corrosion resistance to the acids in the room.

3. Low-limit thermostats: Must be vapor pressure type with an element 6 m [20 ft] minimum length. Element must respond to the lowest temperature sensed by any 30 cm [1 ft] section. The low-limit thermostat will be manual reset only and be supplied as DPST.

4. Duct Mounted Temperature Sensors: Use averaging sensors where prone to temperature stratification or where ducts are larger than 10 sq. ft. (1 sq. m). Averaging sensors must incorporate a 2x4 electrical conduit box housing, and utilize a sensing element incorporated in a copper capillary with a minimum length of 20 feet. Install the sensor according to manufacture recommendation and loop and fasten at a minimum of every 36 inches. Use single point sensors where not affected by temperature stratification or where ducts are smaller than 9 sq. ft. (0.84 sq. m). Point sensors must incorporate a 2x4 electrical conduit box housing.
C. SWITCHES AND RELAYS.

1. Pressure Switches: Differential pressure type switches (air or water service) must be UL Listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA 1 enclosure, with scale range and differential suitable for intended application, or as specified.

2. Current Switches: Solid state, split core current switch that operates when the current level (sensed by the internal current transformer) exceeds the adjustable trip point. Current switch to include an integral LED for indication of trip condition and a current level below trip set point.

3. Relays: Furnish all electric relays and coordinate with the supplier of magnetic starters for auxiliary contact requirements. Provide all electric control devices of a type to meet current, voltage, and switching requirement of their particular application. Relays must be provided with 24 VAC coils and contacts must be rated at 10 amps minimum.

D. VALVES:

1. Equip all valves with throttling plugs and removable composition discs. The Control Contractor will size all valves, and they will be guaranteed to be of sufficient size to meet the heating or cooling requirements.

2. All coil valves must be of the molded rubber diaphragm type. Valves 2" and smaller must be screwed and valves 2½" and larger must be flanged.

3. All 3-way control valves must be 3-way modulating valves. Provide these valves with removable composition discs, must be screwed below 2½" sizes and 2½" sizes and larger must be flanged.

4. Select all control valves for a maximum pressure drop of 3 psig.

E. DAMPERS:

1. Equipment manufacturers will provide all dampers.

F. ACTUATORS:

1. Valve and damper actuators must be oil immerse gear train, spring return type with close off ratings for the service in which they are being used.

2. Select damper actuators and springs to compensate for size of damper and the torque required. Minimum torque must be rated for 5 in-lb/ft² plus a 1.8 safety factor (minimum or higher as recommended by actuator manufacturer).

3. Provide end switches on all damper actuators in fan systems. Wire end switches so that the damper is open before the fan operates.
G. RELAY AND MISCELLANEOUS DEVICES:

1. Furnish and install necessary relays of the positive and gradual acting type as required for the successful operation of the system. Install all such devices in local temperature control panels or equipment enclosures.

H. CONTROL LABELS:

1. Provide all temperature control devices, whether or not located on temperature control panels, with plastic nameplates indicating their purpose in the Sequence of Operation. Attach permanent labels to all temperature control devices except room thermostats.

PART 3 EXECUTION

3.1 SEQUENCE OF OPERATION:

A. EMERGENCY POWER TO CONTROLS.

1. Provide required power for new controls (and existing if required) connected to the emergency power systems in the project. New exhaust fan, existing variable air volume boxes and other controls as described below that need to operate during building power failure are required to be powered by the emergency generator system. See electrical drawings for emergency power circuit for the control components. Coordinate and include in the bid any costs for required wiring with the project electrical contractor.

2. Provide latching alarm to indicate normal power failure at the DDC system.

B. NEW AIR HANDLING UNIT AHU1-1, EXISTING VAV-126, EXISTING RETURN VAV VR121, WSHP1-1 (BASE BID SYSTEM), FAN FILTER UNITS (FFU), FUME HOOD EXHAUST (EF1-1)

1. The new air handling unit is a constant volume system, semi-custom air handling unit with split DX cooling system (with water cooled heat pump), inlet mixing section, fan section and HEPA filter section. A remote water cooled heat pump is to be provided and the existing room VAV box is to be used for make-up air ventilation. The unit is to provide cooling, make-up air ventilation, heating (from the VAV Box), space pressurization and filtration to the host room and to the new clean room.

2. Fan filter units (FFU) provided with the clean room will supply air from the host room to the clean room. The fan filter units will operate continuously to maintain a positive pressure in the clean room to a class 10,000 level. The new exhaust hood and dry down boxes will be exhausting continuously from the clean room. The existing VAV box VAV-126 will be the make-up air for the air being exhaust from the cleanroom. VAV-126 damper will be open to the constant airflow listed in the schedules to maintain a positive pressure in the clean room and a slight negative pressure between the clean room and the hallway. The air handling unit fan will operate continuously. See plans for the VAV box duct connection to the return air side of the AHU. A manual return air damper will allow for proper balancing of the return/outside airflows. Reprogram VAV box controller to allow box to supply the constant volume of make up air required.
3. Systems are to operate 24/7.

4. Provide a return air temperature sensor for the air handling unit at one of the return grilles in the clean room.

5. Provide a discharge supply temperature sensor for monitoring and service.

6. Upon a call for cooling, the cooling system will operate to provide cooling through the AHU to the host room and then from the host room to the clean room through the fan filter units. Provide a 2 position control valve for the water source unit. Operate the associated water source heat pump. Water flow is continuous through the unit during operation. Close valve when the unit does not call for cooling.

7. Upon a call for heating, the cooling system will be off, and the VAV box reheat coil will provide heating to the make up air system of the air handling unit to provide heat to the space.

8. Provide a current sensor on both the air handling unit supply fan and the hood exhaust fan to monitor fan operation. Provide an alarm at the DDC system upon AHU or exhaust fan failure.

9. Provide current sensors at the fan filter units (FFU) to indicate loss of power at these units. Alarm the DDC system.

10. Upon a loss of building power, the fan filter units and fume hood exhaust fan are designed to continue to operate on emergency power. A return air VAV box serves the room. Reprogram this VAV box to be normally closed. Upon loss of building power, spring-open the return air VAV box damper and the supply air VAV-126 box to allow transfer air into the host room 105.

11. Provide a differential air pressure sensors across the air handling unit filters. Alarm the DDC system to indicate dirty filter situation in the air handling unit.

12. Provide emergency remote manual shutdown switch for the air handling unit just inside the main exit door to the host room 105. Provide a red mushroom switch in a plastic cover box, mount at 60" aff. Upon activation of the switch, the air handling unit shall be off.

13. Control Indication: Provide the necessary temperature sensors and fan current sensors to indicate the following at the electronic control system:

   a. AHU Fan On-Off Status and alarm
   b. Fume Hood Fan On-Off Status and alarm.
   c. VAV126 damper position (0-100% Open)
   d. VR121 damper position (open or closed)
   e. Outside Air Damper Position (0-100% Open)
   f. Make up air temperature (at (E)VAV126 discharge)
   g. Return Air Temperature.
   h. Mixed Air Temperature.
   i. Supply Air Temperature at AHU Discharge Duct
   j. Low Temperature Alarm
   k. Room Air Temperature and Setpoint at return grille.
   l. AHU dirty filter alarm.
   m. FFU On-Off Status and alarm.
n. Water Source Heat pump status.
o. VAV126 heating valve position, 0-100% open.

C. AHU1-1 A (ALTERNATE BID)

1. Under alternate bid, provide DDC controls for a computer room type unit. Provide interface between the DDC system and the unit controller. Unit will be provided with BACnet interface. Integrate all points described below into the DDC system to allow for monitoring.
   - High Temperature
   - Dirty Filter
   - Low Temperature
   - High Humidity
   - Low Humidity
   - High Head Press
   - Sensor Failure
   - Low Suction Press
   - Comm. Failure
   - Loss of Air Flow

2. Sequences are to match the base bid with the following exceptions.
   a. Install humidity sensor and interlock with system humidifier.
   b. Unit has a self-contained water source cooling system.
   c. Provide electrical phase monitor for the unit.

D. EMERGENCY SHOWER FLOW SWITCH

1. A flow switch is provided with the emergency shower. Connect the flow switch to the DDC system to alarm upon water flow at the emergency shower.

3.2 MSU DDC GUIDELINES

A. Refer to the MSU DDC control guidelines for the MSU Campus DDC Controls standards. A copy can be obtained from MSU Facilities services upon request. Campus standards are adopted as part of this specification.

3.3 OPERATOR INSTRUCTION:

A. See Division 1 for System Demonstration and owner training requirements.

END OF SECTION 230900
SECTION 232113 – HVAC PIPING AND PIPE FITTINGS

PART 1  GENERAL

1.1  WORK INCLUDED

A. Furnish and install where shown on the drawings and required to connect fixtures and equipment, pipe and fittings of type and material for the various services as noted below.

1.2  SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 230000.

B. Indicate ASTM or ANSI ratings, pipe and fitting weights, pressure and temperature classifications and joining methods for all types of piping used in the project.

1.3  QUALITY ASSURANCE

A. Submit certification that each welder has passed A.W.S. qualification tests for the welding process involved and that certification is current. Provide all welding in compliance with the ASME “Boiler and Pressure Vessel Code”, Section IX, “Welding and Brazing Qualifications”. Comply with provisions of ASME B31 Series “Code for Pressure Piping”.

PART 2  PRODUCTS

2.1  REFRIGERANT PIPING

A. Provide Type "L", refrigerant grade, copper tubing, hard drawn with wrought copper solder type fittings ANSI B16.22, suitable for connection with silver solder for all refrigerant piping. While sweating fittings together, sweep dry nitrogen through the tubing to prevent oxidation.

2.2  HVAC PIPING

A. Provide Type L, ASTM B88, hard drawn copper tubing for condenser water in building above grade to match the existing piping. Provide wrought copper solder type fittings, ANSI B16.22. Provide joints for pipe and fittings that are made with non-corrosive flux and 95-5 solder.

B. Provide Sch. 40, ASTM D1785, PVC pipe and fittings for condensate drain piping for the water cooled units.

PART 3  EXECUTION

3.1  INSTALLATION

A. Ensure all pipes are round and straight, of required size. Do cutting with proper tools and ream pipes to full size after cutting.

B. Properly enclose, support, guide, anchor, sway brace, connect, test, clean and flush out piping and properly insulate and protect where required.
C. Pipe sizes shown on the drawings are nominal pipe internal sizes and not outside diameters unless noted otherwise.

D. Run pipes substantially as indicated on the drawings. However, the architect/engineer reserves the right to require this Contractor to make minor changes in pipe locations where conflicts occur with other trades. Provide for such changes without extra cost to the Owner.

E. Install piping with ample provisions for expansion and contraction to prevent injury to the same and to the building construction. Make such provision by means of piping offsets, changes in direction, expansion loops and/or suitable expansion joints. Provide suitable anchors and guides to permit proper deflection and compression of offset loops and expansion joints. Do not use expansion joints in lieu of offsets, changes in direction or loops, except where specified and/or indicated on the drawings or where otherwise obviously necessary.

F. Run all pipes with proper grade to provide for easy draining and in group runs where applicable and in a neat and orderly manner, to the satisfaction of architect/engineer. Install lines required to be enclosed in ceiling, chaseways or spaces to permit such enclosure as intended. Carefully lay out all pipe runs and schedule to avoid unnecessary interferences with other work.

G. Ensure minimum grade for horizontal drainage piping is 1/4 inch per foot for 3 inch diameter piping or less, 1/8 inch per foot for 4 inch and larger piping. Install all roof drain piping at 1/8 inch per foot.

H. Install dielectric unions at each piping joint between ferrous and non-ferrous piping and joints between dissimilar metals. Comply with manufacturer's installation instructions. Provide standard products recommended by manufacturer for use in service indicated, which effectively isolate piping (electric conductance), prevent galvanic action and stop corrosion.

I. At all fixture connections where nipples are necessary between copper tubing and fixtures, ensure such nipples are standard weight full iron size chrome plated brass pipe nipples with suitable brass or copper adapters. Steel or iron nipples will not be permitted in any location in copper lines where connections are made to brass fixtures valves or trim.

3.2 JOINTS

A. Threaded Joints: Cut piping straight and square, ream, thread and work into place without springing. Use prepared pipe thread lubricant on outside threads only.

B. Flanged Joints: When bolting flanged joints, take care to insure that there is no restraint on opposite end of pipe or fittings which would prevent uniform gasket compression or cause unnecessary stress in flanges. Keep one flange free to move in any direction while flange bolts are being tightened. Tighten bolts gradually and at a uniform rate, so that gasket compression is uniform over entire area of gasket.

C. High temperature soldered joints: Take care to avoid annealing of pipe material. Copper potable water piping will have soldered or brazed joints. Clean jointing surfaces thoroughly by hand. Apply flux immediately after cleaning. Do not rely on flux for actual cleaning. Fill all voids with solder as flux leaves to insure a strong joint. Select flux compatible with type joint being made. Ensure all joints comply with local codes and
ordinances and are installed per the Copper Development Association recommendations.

D. PVC Pipe: Provide solvent welded joints in all plastic piping according to instructions furnished by the pipe manufacturer. Do not install plastic pipe if it is not completely dry, if the ambient temperature is below 40°F or under direct exposure to the sun in temperatures above 90°F. Do not test plastic pipe with air or other compressible gases which could rupture the pipe and cause an injury. Cut pipe evenly, completely deburr and bevel. Clean pipe joint area, prime, cure, cement, and allow 48 hours of drying time before applying any appreciable internal or external pressure.

3.3 TESTS

A. Test piping as outlined in Section 230000.

END OF SECTION 232113
SECTION 232116 - HYDRONIC SPECIALTIES

PART 1  GENERAL

1.1  WORK INCLUDED

A. Furnish and install all specialties as shown on the plans and specified in this section.

1.2  SHOP DRAWINGS

A. Submit shop drawings on all hydronic and steam specialties as listed in Section 230000.

PART 2  PRODUCTS

2.1  HYDRONIC SPECIALTIES

A. Manual Air Vents - Install as shown on the plans, on high points in the piping and where required to vent the system. Provide manual air vents that are ¼” ball valve with 12” soft copper tubing at outlet.

B. Provide HOFFMAN Series 400 for strainers. Provide strainer of cast iron construction. Strainers for pipe sizes 2 inch and smaller must have screwed connections. Strainers for pipe sizes 2-1/2 inches and larger must have flanged connections. Provide strainer rated for 250 PSI at 400°F for steam systems and 400 PSI at 100°F for hydronic systems. Select screens for steam or water service, based on Pipe use.

C. Pressure Gauges – Provide WEISS No. UG1N for pressure gauges. Provide gauges with Phosphor Bronze Bourdon tube with brass movement, 0-60 psig pressure with 4-1/2 inch diameter dial. Furnish pressure gauges used in steam service with a No. SY-14S coil syphon, to prevent steam from reaching the bourdon tube. Accuracy must be within 1% over entire scale range. Provide each gauge complete with pressure snubbers, and “T” handle cock. Terice and U.S. Gauge will be accepted as equal.

D. Thermometers – Provide WEISS No. A9VS35 for thermometers. Provide thermometers with 9 inch scale, separable, adjustable socket, red reading mercury with thermometer wells. Scale range must be 30-200 degrees F. Terice and U.S. Gauge will be accepted as equal.

E. Flexible Connectors - Furnish and install as shown on the plans. Provide METRAFLEX style No. 400HT for connectors. Furnish flexible connectors at the inlet and outlet of base mounted pumps and the HWS/HWR to the boilers. Twin City Hose and Vibration Mountings Inc. will be accepted as equal.

F. See 230523 for valves including balancing valves.

PART 3  EXECUTION

3.1  HYDRONIC SYSTEM FILL AND TREATMENT

A. At completion of project, fill new piping with clean water and add cleaning compound, tri-sodium phosphate. Circulate at room temperature for eight hours. Coordinate with control contractor to open all system valves.

B. Make temporary connection to the building water system.
C. Without stopping circulation, introduce water into system and open drain valve. Continue flushing until clear water is visible from drain connection. Clean all strainers after flushing the system.

END OF SECTION 232116
PART 1 GENERAL

1.1 WORK INCLUDED
   A. Rigid and Flexible duct.

1.2 RELATED WORK
   A. Section 230713 Duct Insulation.
   B. Section 233300 Ductwork Accessories.

1.3 SHOP DRAWINGS
   A. Submit shop drawings as indicated in Section 230000.
   B. Submit shop drawings on all manufactured spiral duct and flexible fiberglass duct.
   C. Indicate on drawings duct construction, type and construction of fittings and metal gauges. Indicate velocity ratings, pressure ratings and UL listing for flexible duct.

1.4 QUALITY ASSURANCE
   A. Construct and install all duct in accordance with the HVAC Duct Construction Standards, published by the Sheet Metal and Air Conditioning Contractors National Association, Inc. Provide all duct materials and construction that meet the requirements of the latest edition of NFPA 90A, and the latest edition of the International Mechanical Code.

PART 2 PRODUCTS

2.1 LOW PRESSURE DUCT (Static pressure ≤ 1" WG positive or negative)
   A. Provide low pressure duct for all duct.
   B. Provide low pressure rectangular duct that is galvanized iron fabricated and erected in a workmanlike manner. Fabricate plenums, goosenecks and special fittings, as shown on the drawings, or as required. Where space permits, construct duct elbows with an inside radius equal to or greater than the duct width. Where space does not permit duct turns as described above, use duct turn vanes.
   C. Properly brace and reinforce duct with transverse joints and bracing. Cross break ducts 18" in width and larger.
The minimum metal gauges for above floor low pressure duct are as follows:

<table>
<thead>
<tr>
<th>Max. Dimension of Rect. Ducts or Dia. of Round Ducts</th>
<th>Galvanized Sheet Steel Gauge Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 12&quot;</td>
<td>26</td>
</tr>
<tr>
<td>Over 13&quot; to 30&quot;</td>
<td>24</td>
</tr>
<tr>
<td>Over 31&quot; to 54&quot;</td>
<td>22</td>
</tr>
<tr>
<td>Over 55&quot; to 84&quot;</td>
<td>20</td>
</tr>
<tr>
<td>Over 85&quot;</td>
<td>18</td>
</tr>
</tbody>
</table>

D. Provide spiral round ductwork. Provide spiral duct manufactured by UNITED MCGILL, AIR DISTRIBUTION SYSTEMS CO., NORLOCK, NORPACK, ACCU-DUCT, METCO, LEWIS AND LAMBERT or approved equal. Construct ELBOWS with a center line radius equal to 1.5 times the diameter. 90 degree elbows will be 5 piece, 65 degrees and 45 degree elbows will be 3 piece and 30 degree elbows will be 2 piece. Where space does not permit the use of elbows as described above, use mitered 90 degrees elbows with turning vanes. Provide BRANCH TAKE-OFFS that are 90 degree straight tees, tangential tees or straight 45 degree lateral wyes. Do not use any bullnose tees. Use Y-45-90 tees. Provide duct fittings constructed by the duct manufacturer. Provide the ductwork manufactured from galvanized steel meeting ASTM A-527-57 in gauges specified above.

2.2 FLEXIBLE AIR DUCTS

A. Provide flexible air ducts from the main ducts grilles and diffusers that are Certainteed Certaflex 25 duct with 1" insulation and fiberglass mylar jacket. Provide the duct rated for 8" WG positive, 3/4" WG negative pressure and 4000 fpm at 250°F. Make connections with stainless steel bands. Hart & Cooley, Flexmaster, JP Lamborn are approved as equal.

B. Provide factory fabricated duct, complying with NFPA 90A for connectors up to 8 feet maximum length and not passing through the floors of buildings. Provide approximate lengths as indicated on the drawings.

C. Provide flexible ducts that are listed by Underwriters Laboratories, Inc. complying with UL 181. Ducts must be class 1.

2.3 HIGH EFFICIENCY TAKE-OFF’S

A. Provide high efficiency take-off’s as manufactured by Sheet Metal Connectors, Flexmaster, Columbia HVAC Products, or approved equal. Provide at all round duct runouts. Provide without volume damper. See specification 233300 for separate volume damper.

2.4 PVC EXHAUST DUCTWORK

A. Provide PVC ductwork for all exhaust for this project. All PVC exhaust duct shall be Harrison Machine and Plastics Corporation “Superduct” PVC or approved equal. Material fittings and custom transitions can be obtained from Harrington Industrial Plastic, Spokane, WA, (509)926-4142.
B. PVC material compounds used in the manufacture of HARRISON SUPERDUCT® PVC pipe and the fabrication of HARRISON SUPERDUCT® fittings shall conform to Type 1 Grade 1 PVC, Cell Class 12454B, as described in ASTM D-1784.

C. Provide sizes thru 18" with a 0.187" wall thickness.

D. Fabricated duct shall consist of a singular buttwelded seam, thermally fused.

E. Provide three piece 90° elbows and two piece 45° elbows with a centerline radius of approximately 1 to 1 1/2 times the duct diameter.

F. Provide couplings that are "sleeve" type style with a have a minimum socket depth of 2" or more.

G. Provide Balancing Dampers with a locking quadrant, to permanently position.

PART 3 EXECUTION

3.1 INSTALLATION

A. Verify the exact location of ductwork to avoid interference with the work of other trades. Take special care to avoid interference with piping, conduit, light fixtures etc. Install concealed duct to allow the installation of the ceilings at the height shown on the plans.

B. Duct sizes shown on the plan are net interior dimensions. Increase the overall duct size to accommodate internal insulation.

C. Install flexible connections between suction and discharge openings in fan units where shown on plans, to prevent transmission of vibration noises. Provide material that is watertight and fire retardant glass fabric approved by Underwriter's Laboratory. Furnish the flexible material with all necessary angles, bolts, clips or other fasteners.

D. Construct all medium pressure ductwork in accordance with the HVAC Duct Construction Standards, as published by SMACNA, for 3" WG static pressure positive or negative. Seal medium pressure duct in accordance with Seal Class A as defined in the SMACNA HVAC Duct Construction Standards, latest edition.

E. Construct all low pressure duct in accordance with the HVAC Duct Construction Standards, as published by SMACNA, for 1" W.G. static pressure positive or negative. Seal low pressure duct in accordance with Seal Class C as defined in the SMACNA HVAC Duct Construction Standards, latest edition.

F. Paint all ductwork visible through the face of the register or grille with a flat black paint.

G. Seal water tight the bottom 1" of all exhaust and fresh air duct to prevent the leakage of any condensed water from the duct.

H. During construction, cover all openings in the duct work which would allow debris to enter the duct. Clean the entire ductwork system of all dust and debris at the conclusion of the construction.

I. Construct and install all duct hangers in accordance with the SMACNA HVAC Duct Construction Standards. Do not attach duct hangers to the floor or roof decks. Attach hangers to the structural steel construction with joist or beam clamps.
J. Install PVC ductwork to meet all manufacturers instructions.

1. Solvent cementing should not be attempted at temperatures below 40°F or much above 90°F. Joints should not be made in hot, direct sunlight.

2. Remove all burrs and chips from any duct that has been cut. With a clean, dry, cotton rag wipe away any surface contamination on the surfaces that are to be joined. If the surfaces are wet (i.e. condensation), DO NOT ATTEMPT TO JOIN THEM—they will fail.

3. Using an applicator, approximately half the size of the duct diameter, apply PRIMER. The function of primer, in making quality joints, is to penetrate and soften the hard surfaces of PVC duct. This must be done on BOTH surfaces to be joined.

4. DO NOT ALLOW THE PRIMER TO DRY before applying the solvent. Once the two surfaces to be joined have been fitted together, give the joint a quarter twist (if possible) to thoroughly mix the two solvent reduced surfaces.

5. Provide primer and cement rated for the materials and installation.

END OF SECTION 233100
PART 1 GENERAL

1.1 WORK INCLUDED

A. Manual Dampers
B. Access Panels
C. Control Dampers
D. Filters and Filter Gauges

1.2 SHOP DRAWINGS

A. Submit shop drawings as indicated in Section 230000.
B. Submit shop drawings for manual dampers, access panels, fire dampers, control dampers, filters and filter gauges.
C. Include in shop drawings manufacturer's descriptive literature and performance data at actual design conditions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Approved duct accessories manufacturer’s are Ruskin, Nailor, Air Balance, Greenheck or approved equal.

2.2 MANUAL DAMPERS

A. Furnish and install splitter dampers and balancing dampers in the ductwork where shown and wherever required to accurately balance the system. Provide dampers constructed of a minimum of 18 gauge, rigid to prevent vibration and held securely in place at any setting with a heavy lock quadrant. The engineer must approve damper construction. Provide volume damper construction that meets the SMACNA HVAC DUCT CONSTRUCTION STANDARDS.

2.3 ACCESS PANELS

A. Furnish and install large access panels in the duct work adjacent to all dampers and equipment which may require servicing or cleaning. Furnish access panels adjacent to all control dampers, fire dampers, smoke dampers, louvers and coils. Provide tight fitting panels and locate panels so as to make them easily accessible. Provide all panels installed in insulated ductwork that are double wall, insulated type.

B. Provide access panels installed in low pressure duct manufactured by Ruskin or approved equal. Provide panels that are Model ADH-22 with 1", 1-1/2 pound fiberglass insulation.
2.4 CONTROL DAMPERS

A. Furnish and install where shown on plans RUSKIN CD-50 LOW LEAKAGE CONTROL DAMPER. Ensure frames are 5" x 1" x .125" 6063T5 extruded aluminum hat channel with hat mounting flanged on both sides of the frame. Reinforce each corner with two die formed internal braces and machine staked for maximum rigidity. Provide blades that are airfoil type extruded aluminum with integral structural reinforced tube running full length of each blade. Provide blade edge seals that are extruded vinyl double edge design with inflatable pocket which enables air pressure from either direction to assist in blade to blade seal off. Blade seals must be locked in extruded blade slots without the use of cement. Provide with bearings that are non-corrosive two piece molded synthetic. Provide square or hexagonal axles to provide positive locking connection to blades and linkage. Conceal linkage in frame. Ensure dampers have a maximum leakage of 6 cfm/sq. ft. at 4 in. wg. PREFCO, AIR BALANCE, NAILOR, GREENHECK and AMERICAN WARMING are considered as equal.

2.5 FILTER GAUGES

A. Install filter gauges across air handling unit filters. Mount gauges on units or ducts and connect them to reading points on both sides of filters with 1/4-inch copper tubing and shut-off cocks. Gauges must be Dwyer Instruments, Inc., Magnehelic Series 2000. Provide with air filter kit including mounting panel, static pressure ties, aluminum tubing and vent valves.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install all duct accessories in accordance with the latest edition of the SMACNA HVAC Duct Construction Standard and as recommended by the manufacturer.

B. Install access panels adjacent to all coils, fire dampers, and control dampers. Install access panels in an accessible location.

END OF SECTION 233300
SECTION 233401 - EXHAUST FANS

PART 1 GENERAL

1.1 WORK INCLUDED

A. Furnish and install as shown on the plans and listed in the schedules, exhaust fans.

1.2 SHOP DRAWINGS

A. Submit shop drawings as indicated in Section 230000. Include in shop drawings all performance data as listed on the schedule and complete unit specifications. Clearly designate all accessories to be provided.

1.3 STANDARDS

A. Provide unit that is UL approved and AMCA certified.

PART 2 PRODUCTS

2.1 PLASTIC ROOF MOUNTED UTILITY SET FANS

A. Provide chemical exhaust fans, manufactured by Plastec or approved equal.

B. Provide fan and all components to operate in corrosive and explosive atomospheres.

C. Provide fans resistant to:
   1. Nitric acid (Concentrations up to 16 M)
   2. Hydrochloride acid (Concentrations up to 12 M)
   3. Hydroflouric acid (Concentrated)
   4. Oxalic Acid (Concentrated)
   5. Hydrogen Bromide acid.

D. Provide carbon fiber impregnated polypropylene housing construction. Provide UV treated materials, one piece construction. Provide airstream that is metal free of the same construction as the housing. Provide blower and impeller constructed of spark resistant materials.

E. Provide direct drive motors with heavy duty ball bearings designed for continuous duty.

F. See plans for all required accessories. Provide field fabricated roof curbs for external mounted fans. Provide weather enclosures for exterior fans.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install the exhaust fans as shown on the plans and in accordance with the manufacturer's instructions.

B. Verify that the unit is operating properly after installation.

END OF SECTION 233401
SECTION 233713 – DIFFUSERS, REGISTERS, AND GRILLES

PART 1 GENERAL

1.1 WORK INCLUDED

A. Furnish and install grilles, registers and diffusers as shown on the plan and listed on the schedule.

1.2 SHOP DRAWINGS

A. Submit shop drawings as indicated in Section 230000.

B. Include in shop drawings all performance data listed in schedule. Include a schedule which lists the model, size, CFM, throw, NC and air pressure drop for each register, grille and diffuser.

C. Include manufacturer’s descriptive literature for each grille, register and diffuser. Clearly label each model description with the equipment tag from the plan.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Model numbers listed on the schedule are Krueger. Equivalent models from Titus, Metal-Aire, Price, Nailor and Carnes will be accepted as equal.

2.2 CONSTRUCTION

A. Provide registers, grilles and diffusers with size, capacity, construction, materials and mounting similar to those listed in the schedule. Provide units constructed in a neat and workmanlike manner of heavy gauge metal. Provide finish as listed on the schedule.

B. Furnish special requirements such as frames, dampers, blank-off baffles, etc as listed on the schedule or designated on the plans.

C. Furnish dampers where listed on the schedule. Provide dampers that are opposed or radial blade and of heavy duty construction to prevent vibration. Butterfly dampers are not acceptable.

PART 3 EXECUTION

3.1 INSTALLATION

A. Mount grilles, registers and diffusers as shown on the plan and recommended by the manufacturer.

B. Locate grilles, registers and diffusers as shown on the Reflected Ceiling Plans.

END OF SECTION 233713
SECTION 237313- MODULAR INDOOR CENTRAL-STATION AIR-HANDLING UNITS
(Base Bid)

PART 1  GENERAL

1.1 WORK INCLUDED

A. Provide factory-fabricated custom air handling unit to meet the performance requirements as shown on the equipment schedule. Unless otherwise noted, each unit shall be complete with 2" double wall casing design, 2"-3# fiberglass insulation, with mixing section, 2" MERV 8 pre filter section, DX cooling coil, (1) direct drive supply plenum fan, Variable Speed Drive (VSD), and final HEPA filters as detailed on the plans.

1.2 SHOP DRAWINGS

A. Submit shop drawings as indicated in Section 230000. Include in shop drawings all performance data shown on the schedule and complete unit specifications. List performance data at design operating conditions. Include in shop drawings certified and guaranteed fan performance, coil performance data and sound levels.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide semi custom air handling units as manufactured by Air Zone International or approved equal.

2.2 CONSTRUCTION

A. General: Provide equipment that fits through 42" opening. Air handling unit performance must be as listed in the schedule.

B. Unit Construction: Construct unit of a complete frame with removable panels and access doors. Design unit to withstand 6" positive pressure and 4" negative pressure. Provide double wall, solid interior liner with 3 lb/cu.ft. insulation between walls. Provide insulation meeting NFPA-90A requirements for flame spread and smoke generation. Provide cooling coil section with double sloped, insulated, galvanized drain pan. Provide access doors that are double wall with full gasketed perimeter. Provide access doors with cam lock handles that allow full removal of door.

C. Unit Sections and Arrangement: Refer to schedule and drawings for exact arrangement of the air handling unit. Provide fan section with direct drive plenum fan, cooling coil section with dx cooling coil, no heating section, 2" prefilter section with MERV 8 prefilters, final filter section with 12" deep HEPA filters. Provide inlet section with manual mixing dampers. Provide unit with disconnect.

D. SISW Direct Drive Plenum type (DrawThrough Supply Fan): Fan shall be direct drive plenum fan with an airfoil backward curved steel wheel. The fan and motor shall be assembled on structural tubular frame with open spring isolators having a minimum 1” deflection. Fan and wheel as an assembly shall be AMCA rated.

E. Premium efficiency, inverter duty rated motors for belt driven fans shall be factory mounted directly on the fan support framework, internal to the air unit. Each adjustable motor base shall be mounted to a base rigidly supported to the fan structural framework.
Refer “Electric Motors and Controllers” for additional requirements. The fan and motor assembly shall be constructed with a roll out assembly to allow for easy service.

F. Motors shall be NEMA design B with class F insulation. Motor voltage and horsepower shall match that specified on the drawings. Motors shall have a minimum service factor of 1.15. Motors shall be high efficient type meeting the minimum standards of EPACT with ODP casing and suitable for use with a VF Drive. Brake horsepower of the fan shall not exceed 90% of the horsepower rating of the motor. The motor shall be provided with heavy-duty steel NEMA type adjustable base.

G. Fan bases shall be mounted on spring vibration isolators that remove a minimum of 95% of any fan vibration. Isolators shall consist of unitized adjustable open spring with a welded steel plate and shall allow for the spring to be changed if required.

H. The mounting plate of the isolator shall have a neoprene pad on its base for sound absorption. Nuts and bolts shall be zinc-electroplated to prevent corrosion. Bolting equipment to isolator with bolts smaller than main adjusting bolt will not be allowed. Base plate shall have adequate means for bolting to the structure. In addition each fan assembly shall be isolated from fan pressure wall by flexible connection. Neoprene gasket and/or hard mounting is unsatisfactory.

I. Coil Sections: Provide coil sections complete with coil and coil holding frame. Enclose coil headers and return bends in the coil casing. Provide refrigerant coils that are full face, intertwined type with refrigerant connections exterior to the unit. Coils must be tested to 450 psig. Provide water coils of aluminum plate fins and seamless copper tubing. Bond fins to the tubes by mechanical expansion of the tubes. Coil casing will be galvanized steel. Construct headers of round copper piping.

J. Filter Sections: Provide high efficiency filter section with HEPA filters, (2) 16”x25”. Provide section with access door to allow the full removal of the filters. Filters must be 12” deep. Provide 2” prefilters in the filter mixing box section.

K. Filter Mixing Box: Provide a mixing module with manual outside air and return air dampers factory mounted. Provide dampers that are double skin air foil design with metal compressible jamb seals and extruded vinyl blade edge seals on all blades. Provide stainless steel sleeve bearings. Provide dampers rated for a maximum leakage rate of 3 cfm/sqft/ at 1”w.g. Arrange dampers in opposed blade configuration.

L. Electrical: The air handling unit manufacturer shall factory prewire the fan motor for a complete prewired package. Unit wiring shall terminate in a NEMA 1 enclosure terminal panel with tagged terminal strips. The entire air handling unit as assembled at the factory shall be either UL or ETL labeled.

M. Variable Speed Fan Drive Controllers: The unit shall have a variable speed drive controller (VSD). The variable speed drives (“VSD”) shall be provided by the air unit manufacturer.

1. The 208V AC VSD shall be a pulse width modulated (PWM) design that operates directly from three (3) phase, 208V AC ±10%, 60 hertz utility power. The VSD shall generate a sine coded, adjustable voltage/frequency three (3) phase output for complete speed control of any squirrel cage induction motor. The VSD shall maintain a one hundred and ten (110%) percent current overload capability for sixty (60) seconds with automatic stall prevention and voltage boost to prevent
nuisance tripping during load or line side transient conditions. Provide an input line reactor or tuned line filter, adjusted as required, to minimize any electrical distortion back into the building electrical power supply system to within IEEE Standard 519-1992 limits. The VSD shall maintain a power factor of not less than 0.95 throughout its speed range.

2. The VSD shall have the following basic design:

a. Converter: Converter shall consist of a modularized diode rectifier and capacitor assembly, which will first convert, then filter and maintain a fixed DC voltage source from the fixed voltage and frequency input.

b. Inverter: Inverter uses IGBT semiconductors with a minimum rating of 1100V AC on 208V AC controls to invert the converter generator fixed DC voltage into a sine coded pulse width modulated output.

c. Control Logic: Consists of a single printed circuit board and incorporates an eight (8) bit or larger, microcomputer central processing unit to control all inverter, converter, base drive and external interface functions.

d. Terminal strip for input signals from the Division 17 Building capabilities. Refer to Division 17 for interface and coordination.

e. Enclosure: A single NEMA 12 enclosure to house the drive and all accessories.

f. All internal wiring within the variable speed drive shall be copper.

g. Sine coded, pulse width modulated output.

h. Eight (8) bit or larger, microcomputer control logic.

i. Maximum and minimum speed adjustment capability.

j. Controlled speed range of 20:1 or greater.

k. Overload capability of ten (10%) percent for sixty (60) seconds. Control System for remote start-stop and speed control signal

l. Process follower 4-20mA or 1-10V DC input.

m. Minimum of three (3) selectable output frequency ranges.

n. Minimum fifteen (15) selectable volts/hertz patterns.

o. Touch pad operator controls with at least four (4) segment digital frequency/speedometer or digital readout displaying at a minimum: output frequency, output current and status.

1) Output frequency.

2) Output current.

3) Status.

p. Incoming electrical power disconnect/circuit breaker with through door handle.

q. Torque or current limiting circuit.

r. Coast or ramp to stop.

s. Adjustable acceleration and deceleration.

t. Fault indicators.

u. Proportion Integral (PI) set point controller.

v. Provide Siemens FLN, Johnson N2, or equivalent communication interface card at each VSD. The digital communications interface shall be set up so as to provide, at minimum, the following monitoring and control points:

1) Start and stop.

2) Speed control signal.

3) Speed reference feedback.

4) Motor operating status.

5) Fault diagnostics.
6) Metered points including: Motor power in HP, Motor power in kW, Motor kWh, Motor current, Motor voltage, Hours run, DC link voltage, Thermal load on motor, Thermal load on VFD, Heatsink temperature

w. Provide interfaces with the building control system as follows:

1) Fan start/stop: 24V DC contact.
2) Fan run status: 24V DC contact.
3) Speed signal input: 4 to 20 mA.
4) VSD failure: 24V DC contact.
5) Two (2) auxiliary status contacts.
6) Analog Outputs: Two (2) 0 to 20 mA signals.
7) Programmable Analog Inputs: Two (2) voltage and one (1) current.
8) Programmable Digital Inputs: At least five (5).

x. The VSD shall have, as a minimum, the following protective features:

1) Ground fault protection.
2) Electronic thermal motor overload or current limit control.
3) Current limited stall prevention during acceleration, deceleration and run conditions.
4) Automatic restart after momentary power loss or momentary over voltage. No restart into ground fault.
5) Controls for start into a rotating motor.
6) Antiwindmill protection.
7) Fault indicators shall indicate over current/overload, over voltage, over temperature, control function error.
8) DC bus discharge indicator.
9) Current limiting DC bus fuse.
10) Isolated operator controls.
11) Phase-to-phase short circuit protection.
12) Heat sink over temperature protection.

y. The VSD shall have the following adjustments available:

1) Acceleration - 0.2 to 1800 seconds or 0.1 to 300 seconds.
2) Deceleration - 0.2 to 1800 seconds or 0.1 to 300 seconds.
3) Volts/hertz adjustments.
4) Minimum frequency.
5) Maximum frequency.
6) Carrier frequency.
7) Torque limit.
8) Input line reactors or tuned line filters shall be provided by the inverter manufacturer to limit interference from the line to the drive and to limit any electrical distortion back to the building electrical power supply system in accordance with the recommendations of IEEE Standard 519-1992 to less than three (3%) percent. The filter or reactor assembly shall be mounted integral with the VSD or in a separate enclosure adjacent to the VSD if the manufacturer provides the field wiring. Coordinate installation requirements with Division 16.
9) A signal isolator shall be provided to isolate the control signal to and from the inverter drive.

3. The VSD shall be designed to operate within the following environmental and service conditions:

a. Ambient service temperature - 10°C to 40°C.
b. Ambient storage temperature - 20°C to 60°C.
c. Humidity – non-condensing to ninety (90%) percent.
d. Altitude to 5000’.
e. Service factor - 1.0.
f. Input voltage - three (3) phase, 208V AC ±10%.
g. Input frequency - 50/60 hertz ±2 hertz.

4. The VSD shall be subject to the following parameters and tests:
   a. All integrated circuits (TTL) and all components used for circuit board construction shall be tested to an acceptance criteria of 0.5% AQL (Accepted Quality Level).
   b. In circuit testing of all printed circuit boards shall be conducted to insure proper mounting and correct value of all components.
   c. All printed circuit boards shall be burned in for at least twenty-four (24) hours, at a minimum of 70ºC and temperature cycled.
   d. Final printed circuit board assemblies shall be functionally tested via computerized test equipment where all tests and acceptance criteria are preprogrammed and test results are stored as detailed quality assurance data. The Engineer and Owner may witness the factory tests. The Division 15 Subcontractor shall give the Engineer and Owner at least two (2) weeks written notice prior to start of the factory test.
   e. All fully assembled controls shall be combine tested for performance and functionality at the manufacturer’s factory with fully loaded VAV rated induction motors. The combined test data shall then be analyzed to insure adherence to quality assurance specifications.

5. The VSD shall be designed and built to the following standards:
   a. ETL and/or UL
   b. NEMA - ICS-3-303
   c. IEEE STD 444 (ANSI C34.3)
   d. IEEE STD 519-1992

6. The VSD shall be provided with the following features:
   a. NEMA 1 Housing.
   b. The overload relay package and line reactor or tuned line filter shall be mounted in the inverter cabinet.
   c. Capacitor shall be sized based on the VSD design and the two (2) second ride through as required. The capacitor shall provide assistance to maintain the DC bus voltage for a two (2) second momentary power loss or furnish automatic restart capability, which allows restart into a rotating motor in both forward and reverse rotation.

PART 3 EXECUTION

3.1 INSTALLATION

A. Field verify all access requirements.

B. Install piping to allow filter access, motor access and equipment room access.

C. Anchor unit to the floor/pad.

D. Program and set up the VSD.

END OF SECTION 237313
SECTION 238123 - COMPUTER ROOM AIR CONDITIONER (Alternate Bid)

PART 1  GENERAL

1.1  WORK INCLUDED

A. Furnish and install a vertical computer room air conditioning unit as shown on the plans and listed in the schedules. Provide a Water/Glycol cooled, self-contained unit consisting of an indoor package including a fan section, compressors and controls with a self contained, water cooled compressor system and unit mounted humidifier. Provide unit designed for 24 hour continuous operation.

1.2  SHOP DRAWINGS

A. Submit shop drawings as indicated in Section 230000. Include in shop drawings all performance data listed on the schedule and complete unit specifications. Clearly designate all accessories to be provided.

1.3  STANDARDS

PART 2  PRODUCTS

2.1  ACCEPTABLE MANUFACTURER'S

A. Provide unit manufactured by Stultz, Liebert, Data Aire or approved equal.

2.2  CONSTRUCTION

A. The cabinet and access panels shall be fabricated from 16 gauge galvanized steel and painted with a 2-ply epoxy finish to match and provide corrosion protection. The panels shall be lined with 1/2” (13 mm) coated fiberglass, 2 lb (.90 kg), high-density sound and thermal insulation and sealed with self-extinguishing gasketing conforming to NFPA 90A and 90B. The main unit color shall be Black.

B. Provide with front only access.

C. FAN SECTION: Provide fan that is the centrifugal type, double width, double inlet and is statically and dynamically balanced as a completed assemble to a maximum vibration level of two mils in any plane. Provide heavy duty steel shaft with self-aligning ball bearings with a minimum life span of 100,000 hours. Provide the fan motor rated for 1750 RPM and mounted on an adjustable slide base. Provide the drive package with two-belt, variable speed design, sized for 200% of the fan motor horsepower. Locate the fans to draw air over the A-frame coil to ensure even air distribution and maximum coil performance.

D. HUMIDIFIER: Provide humidifier that is of the electrode steam canister type with adjustable humidity output setting. Provide with automatic flush cycle to control mineral concentration of the water. Provide with a change cylinder light. An infrared type unit is accepted as equal.

E. ELECTRIC SYSTEM: The systems shall incorporate modular motor controllers utilizing motor start protectors and circuit breakers to eliminate the need for fuses. All wiring shall be in accordance with the National Electric Code (NEC) and shall include: Motor branch circuit short circuit protection; Motor load switching controllers (contactors) and Motor...
overload protection. The control circuit shall be a 24 VAC Class II low voltage circuit, including primary and secondary circuit protection. Low voltage, high voltage, and common wires shall be color-coded and shall be individually numbered at each end for ease of service tracing. All wiring shall be in accordance with the National Electric Code (NEC).

1. Provide electrical phase monitoring.

F. The unit mounted main power disconnect switch factory provided, is as standard. The disconnect switch shall be dust-proof, non-fused type with a lockable handle.

G. DIRECT EXPANSION SYSTEM: The system shall be configured for a draw-thru air pattern to provide uniform air distribution over the coil face. The coils shall be designed to provide maximum coil surface area and minimum depth to provide a high sensible cooling capacity. The coils shall be seamless drawn copper tubes, mechanically bonded to tempered aluminum fins with a raised lanced fin design for maximum heat transfer. Coil end plates shall be hot dipped galvanized steel. The evaporator coil shall be mounted in an insulated UL-94-V-O polymeric or stainless steel condensate drain, depending upon COS model size. The evaporator coil shall have a 5.5 face area and be 4 rows deep. It shall be constructed of copper tubes and aluminum fins and has a maximum face velocity of 491 at 2700 CFM. Refrigerant flow shall be controlled by an externally equalized thermostatic expansion valve.

H. Refrigeration System: All refrigerant piping shall be refrigerant grade tubing. Each refrigeration circuit shall include, as a minimum a refrigerant drier/strainer sight glass with moisture detector, a thermal expansion valve with rapid bleed port feature and external equalizer, an evaporator coil, a compressor, a high pressure switch with manual reset, and a low pressure switch with automatic reset. Split/Remote systems shall have a liquid line solenoid for refrigerant isolation to prevent liquid slugging. All high-pressure joints shall be brazed, and the entire system shall be pressure tested at the factory with dry nitrogen, evacuated to at least 50 microns and fully charged with refrigerant.

I. Scroll Compressor: The compressor shall be high efficiency, high reliability and low noise scroll compressor(s). The compressor shall be complete with charging and service shraeder ports, internal vibration isolation, internal thermal overloads, an internal pressure relief valve, an internal discharge gas vibration eliminator, and external vibration mounting isolation. Provide with compressor sound jacket.

J. Backward Inclined, Plenum Style Fan, With an EC Motor: The blower(s) shall be direct driven, single inlet, two-fold backward curved radial fan with an electronically commutated motor for maintenance free operation. The motor shall include: integrated electronic control board and direct microprocessor control signaling for fan speed control, soft-starting capabilities, RS-485 BUS connection, and integrated current limitations. Each fan shall be low noise, low vibration manufactured with an anti-corrosive aluminum impeller. Each fan impeller shall be dynamically and statically balanced in two planes to minimize vibration during operation.

K. MICROPROCESSOR CONTROLLER: The floor mounted A/C shall be provided with microprocessor based Temperature and Humidity controller with Alarms. The controller shall incorporate a "user-friendly", menu driven, operating environment, to allow easy system setup and operation. Provide microprocessor-based control system with a backlit LCD alphanumeric display for visual indication of unit operating conditions.
L. User Interface  Provide a liquid-crystal alpha-numerical display to visually monitor and customize unit functions and settings, operated via a 6-key menu-driven Windows type structure, in five different modes; Information, Alarm Log, Control, Service and Factory.

M. LCD Graphic Display shall indicate current unit functions via symbol identification:
- Cooling
- Heating
- Humidifying
- Dehumidifying
- Heating

N. Alarm Control: Alarm conditions activate an audible and visual indicator. The alarms are acknowledged through a dedicated alarm key located on the user interface. Provide alerts to the following alarm conditions (if applicable):
- High Temperature
- Dirty Filter
- Low Temperature
- Smoke Detection
- High Humidity
- Firestat
- Low Humidity
- Leak Detection
- High Head Press
- Sensor Failure
- Low Suction Press
- Comm. Failure
- Loss of Air Flow

Upon the receipt of any alarm, the alarm condition is displayed along with suggested operator actions to be taken. An audible tone and red LED is presented at time of the alarm occurrence.

O. Sequential Activation: To minimize the total in rush current loads during system startup/restart, provide controller configured for time-delay sequence startup. The user can designate electric heater, EC fans and/or humidifier restart delays. The unit restart delay can be adjusted from 0 to 999 seconds.

P. BMS Interface: Provide controller with a communication interface port that can be field connected through a serial interface to a Building Management System via BACnet. A controller interfaced to a network must be configured for BMS communication.

Q. Supply Air Sensor: Provided by temperature control contractor.

R. AIR PATTERN: Up-Flow, The air conditioner shall be configured for an up-flow air pattern with free evaporator return air through rear ducted filtered flange box and conditioned supply air through the top of the unit.

S. GLYCOL COOLED SYSTEMS:
1. Stainless Steel Brazed–Plated Glycol Cooled Condensers: Each evaporator refrigerant circuit shall be provided with a factory installed single pass, counterflow configured, brazed plate heat exchanger, with integral subcooler, constructed of type 316 stainless steel; designed and tested for a 450 psig. w.w.p.
2. Two-Way Head Pressure Regulating Valve. Each refrigerant circuit's head pressure shall be controlled by a factory installed 2-way glycol regulating valve rated for 600 psig. w.w.p.

T. AIR FILTRATION: Provide with 2", 60% Eff. filters. Filter ratings are based on dust spot efficiency rating per ASHRAE Test Standard 52-76

PART 3 EXECUTION

3.1 INSTALLATION

A. Install unit as shown on the plans and in accordance with manufacturer's instructions.

3.2 MANUFACTURER'S FIELD SERVICES

A. Supply service of factory trained representative to supervise testing, start-up, and instruction on operation and maintenance to owner.

B. Supply initial charge of refrigerant and oil.

C. A factory trained service representative will assist in the system start-up. The service representative will verify that the system is properly installed in accordance with the manufacturer's recommendations. After system start-up, the service representative will test the system to verify that all safety and operating controls are functioning properly and perform initial system setup. File with the engineer a letter from the service representative which states the following:

1. The system has been properly installed.

2. The system is operating correctly.

3. The safety and operating controls have been tested and are functioning properly.

If the service representative finds any problem with the system installation, correct the problem at no additional cost to the owner. The service representative will thoroughly instruct the owner's personnel on the operation and maintenance of the unit.

END OF SECTION 238123
SECTION 238241- WATER TO WATER HEAT PUMPS (Base Bid)

PART 1  GENERAL

1.1  WORK INCLUDED
    A. Furnish and install water source heat pump as listed in the schedule and as specified herein.

1.2  QUALITY ASSURANCE
    A. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL), in accordance with ANSI/UL 1995 – Heating and Cooling Equipment and bear the Listed Mark.
    B. All wiring shall be in accordance with the National Electric Code (NEC).
    C. The system shall be factory tested for safety and function.
    D. The condensing units shall be factory charged with R-410A.

1.3  STANDARD LIMITED WARRANTY
    A. The equipment shall be provided with a 1 year warranty from the date of substantial completion of the project.
    B. In addition, provide an extended 10 year compressor warranty (base bid). 7 year for alternate bid.

1.4  SHOP DRAWINGS
    A. Submit shop drawings as indicated in Section 230000. Shop drawings shall include all performance data shown on the schedule and complete unit specifications. Performance data shall be listed at design operating conditions. Shop drawings shall include certified and guaranteed fan performance, coil performance data and sound levels.

PART 2  PRODUCTS

2.1  ACCEPTABLE MANUFACTURERS
    A. The system shall be LG, Daiken or approved equal.
    B. Refer to the drawing for schedules and specifications listing specific units, types, capacities and special features.
    C. Units shall be furnished complete with all accessories required for proper operation.

2.2  CONDENSING UNITS
    A. General: The condensing unit is designed specifically for use with Multi-V Water IV Heat Pump series components.
1. The condensing unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of scroll compressors, motors, brazed plate heat exchanger, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports and liquid receivers.

2. Each condensing unit shall incorporate contacts for electrical demand shedding from a central BMS, utility control or demand meter.

3. The condensing unit shall be modular in design and should allow for side-by-side installation with minimum spacing.

4. The following safety devices shall be included on the condensing unit; high pressure sensor and switch, low pressure sensor, control circuit fuses, crankcase heater, fusible plug, overload relay, inverter overload protector, thermal protector for compressor motor, over current protection for the inverter and anti-recycling timer.

5. To ensure the liquid refrigerant does not flash when supplying to the various indoor units, the circuit shall be provided with a sub-cooling feature.

6. Oil recovery cycle shall be automatic occurring 2 hours after start of operation and then every 8 hours of operation.

B. Unit Cabinet:

1. The condensing unit shall be corrosion resistant. The unit shall be constructed from rust-proofed, mild steel panels coated with a baked enamel finish.

C. Condenser Heat Exchanger:

1. The condenser heat exchanger shall be a stainless brazed plate type designed for closed loop/dry cooler applications. Coaxial type heat exchangers are approved as equal.

2. The heat exchanger shall have a maximum system water pressure of 285 psi (equivalent to 640ft of head).

D. Compressor:

1. The scroll compressors shall be variable speed (PWM inverter) controlled which is capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure as measured in the condensing unit. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures detected are read every 20 seconds and calculated. With each reading, the compressor capacity shall be controlled to eliminate deviation from target value.

2. Constant speed compressors are accepted as equal for this project.

3. The capacity control range shall be as low as 8% to 100%.

4. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.

5. Oil separators shall be standard with the equipment together with an intelligent oil management system.
6. The compressor shall be spring mounted to avoid the transmission of vibration.

E. Electrical:

F. The power supply to the outdoor unit shall be as listed in the schedule.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install all equipment in accordance with the manufacturers instructions.

B. Install piping and ductwork to allow filter access, motor access and equipment access.

C. Anchor equipment to the structure.

END OF SECTION 238241
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PART 1 GENERAL

1.1 GENERAL SUPPLEMENTARY AND OTHER CONDITIONS OF THE CONTRACT

A. The general, supplementary and other Conditions of the Contract and the General Requirements (Division 1) are hereby made a part of this section.

1.2 INTENT OF PLANS AND SPECIFICATIONS

A. The plans and specifications contemplate the complete installation of the system described so that at the conclusion of the construction, the systems will be turned over to the owner complete and ready for safe, efficient operation. The plans and specifications cannot deal individually with the many minute items which may be required by the nature of the systems. The contractor shall be obliged to furnish and install all such items normally included on systems of this type, which while not mentioned directly herein, are obviously essential to the installation and operation of the system and which are normally furnished on quality installations of this type.

B. The drawings are partly diagrammatic and do not necessarily show exact location of conduit unless specifically dimensioned. Riser and other diagrams are schematic and do not necessarily show the physical arrangement of the equipment. They shall not be used for obtaining quantities or lineal runs of conduit.

C. In receiving bids, it will be assumed that each bidder has made a thorough inspection of the conditions and is familiar with all conditions affecting the extent or cost of this work. Claims for extra payments as a result of failure to examine the conditions prior to submitting the bid will not be allowed.

1.3 ELECTRONIC COPIES OF DOCUMENTS

A. Electronic drawing files are available for construction coordination upon written request to the architect or engineer for a cost of $100 per drawing. A written release waiver will be required to be signed by the entity requesting the drawing(s). Upon receipt of signed waiver and payment of drawing fee, electronic files will be delivered. Regardless of files delivered, it is the responsibility of the recipient to field verify all conditions prior to the fabrication or installation of any work.

1.4 CODES, ORDINANCES, PERMITS, AND FEES

A. Comply with all state and local codes and ordinances applying to the work specified herein. Attention is directed in particular to the NATIONAL ELECTRIC CODE (NEC), NATIONAL FIRE PROTECTION ASSOCIATION (NFPA), AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI), NATIONAL ELECTRICAL MANUFACTURERS INSTITUTE (NEMA), INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS (IEEE), INTERNATIONAL BUILDING CODE (IBC), UNIFORM FEDERAL ACCESSIBILITY STANDARDS (UFAS), INTERNATIONAL ENERGY CONSERVATION CODE (IECC), MANUFACTURERS INSTRUCTIONS AND/OR ANY AUTHORITY HAVING JURISDICTION, and local regulations concerning the specified electrical, lighting and special systems equipment.

B. Make application for, obtain and pay for all required permits and certificates of inspection for the work.
C. In the event of conflict between this specification and a governing code or ordinance, the higher standard shall govern. Bidders shall familiarize themselves with local regulations which affect their work in any way. Extra payment will not be allowed for changes required by local regulations.

1.5 RESPONSIBILITY

A. Be responsible for the installation of a satisfactory and complete system in accordance with the intent of the drawing and specifications. Provide, at no extra cost, all incidental items required for completion of the work even though they are not specifically mentioned or indicated on the drawings or in the specifications.

B. The drawings do not attempt to show complete details of the building construction which affect the electrical installation; and reference is therefore required to the Architectural, Structural, Landscape and Mechanical drawings and specifications and to shop drawings of all trades for additional details which affect the installation of the work covered under this Division of the Contract.

C. Location of electrical system components shall be checked for conflicts with openings, structural members and components of other systems having fixed locations. In the event of any conflicts, the Architect/Engineer shall be consulted and his decision shall govern. Necessary changes shall be made at no additional expense to the Architect/Engineer or Owner.

D. Determine, and be responsible for, the proper location and character of inserts for hangers, chases, sleeves and other openings in the construction required for the work, and obtain this information well in advance of the construction progress so work will not be delayed. Roughing-in fixtures, etc., must be laid out accurately. Connections to equipment of the same class shall be equal heights, plumb, and at right angles to the wall, unless otherwise directed.

E. Final location of inserts, hangers, etc., required for each installation, must be coordinated with facilities required for other installations to prevent interference.

F. Take extreme caution not to install work that connects to equipment until such time as complete Shop Drawings of such equipment have been approved by the Architect/Engineer. Any work installed by the Contractor, prior to approval of Shop Drawings, will be at the Contractor's risk.

G. At all times during the performance of this Contract, properly protect work from damage and protect the Owner's property from injury or loss. Make good any damage, injury or loss, except such as may be directly due to errors in the Bidding Documents or caused by Agents or Employees of the Owner. Adequately protect adjacent property as provided by law and the Bidding Documents. Provide and maintain passageways, guard fences, lights and other facilities for protection required by Public Authority or Local conditions.

H. Circuiting and switching shall be exactly as shown on drawings. Combining of home runs is acceptable. Contractor shall refer to NEC Article 310.8 and adjust accordingly. Combining of wiring of various systems in conduit runs is not acceptable unless otherwise specified herein or noted on drawings.
1.6 **INSPECTION**

A. Regular inspections shall be requested of duly authorized inspectors as required by codes and ordinances.

1.7 **SUBSTITUTING**

A. Proposals to contractor for substitution of material and equipment listed on the drawings and/or these specifications shall be submitted after the architect/engineer's approval has been obtained. For such proposals, materials and equipment will have to conform in type, function, quality of material and assembly and meet the requirements indicated in drawings and specifications. REQUESTS FOR APPROVAL SHALL BE SUBMITTED TO THE ARCHITECT/ENGINEER AT LEAST 10 DAYS PRIOR TO THE BID DATE. Each request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitute including drawings, cuts, photometric IES files, performance and test data and any other information needed for an evaluation. A statement setting forth any changes in any other equipment or other work that incorporation of the substitute would require shall be included. The burden of proof of the merit of the proposed substitute is upon the proposer. If these proposed substitutions are considered as acceptable equals for quotations and use, approval will be issued in an addendum.

1.8 **SHOP DRAWINGS**

A. The contractor shall submit to the engineer for approval, prior to the placing of orders for any equipment, a complete schedule of electrical equipment and light fixtures to be installed. The schedule shall consist of at least six (6) sets each of catalogs, cuts, diagrams, shop drawings, photometric data or any other descriptive material necessary to fully describe the equipment proposed and its operating characteristics. The schedules shall list the operating conditions of the equipment at the conditions listed on the schedules. Provide shop drawings for the following equipment:

1. Disconnect and Safety Switches.
2. Wiring Devices.
3. Lighting Fixtures.
5. Raceway and Fittings.
6. Cables, Wires and Terminations.
7. Grounding Connections.

B. All shop drawings shall be submitted by the contractor and shall have been signed, "approved" and initialed by the contractor prior to submittal to the engineer. The engineer will check the shop drawings to aid in interpreting the plans and specifications, and in so doing will assume that the shop drawings conform to all specified requirements set forth in this specification. The approval of the shop drawings by the engineer does not relieve the contractor of the responsibility of complying with all elements of the specification.

C. The determination of quantities of material and equipment required shall be made by the contractor from the drawings. Schedules on the drawings and in the specification are completed as an aid to the contractor, but where discrepancies arise, it shall not release the contractor from providing the proper number to complete this work.
1.9 ASBESTOS CONTAINING MATERIALS

A. Coordinate all work with the asbestos abatement contractor for this project. Prior to the start of work the Contractor shall review all asbestos reports or sample analysis, that the Owner has completed. The Contractor shall not cut into or in any other way disturb existing materials which contain asbestos. Asbestos abatement is not within the scope of Division 16 work. If the Contractor must disturb a material that has not been tested for asbestos, request in writing shall be made to the Owner that the material be tested for asbestos prior to the start of work.

B. The Contractor shall provide materials and equipment which do not contain asbestos. At the completion of the project, the Contractor shall certify in writing that the materials and equipment installed do not contain asbestos.

PART 2 PRODUCTS

2.1 MATERIALS

A. Fire barrier caulking system shall be 3M CP25 caulk. Fire barrier caulk shall be UL classified and Factory Mutual System approved.

PART 3 EXECUTION

3.1 INSTALLATION OF THE WORK

A. The Contractor shall examine all the drawings before proceeding with the layout and installation of his work. General, mechanical, and plumbing contract drawings will be made available to this Contractor. SHOULD DISCREPANCIES AFFECTING THE WORK BE FOUND, THE CONTRACTOR SHALL IMMEDIATELY REPORT SAME TO THE ENGINEER FOR INSTRUCTIONS. Subsequent changes made necessary by the neglect of any Contractor to discover and report such discrepancies shall be made by and at the expense of the Contractor, under the direction of the Engineer.

B. Furnish, provide, and/or install shall be considered as requiring the Contractor to both furnish the equipment and install it unless specific reference is made to the furnishing or installing of the equipment by others.

C. The Contractor shall confer and cooperate with other Contractors on the job in the installation of his work so all work will be installed in proper relationship to the surrounding location and shape of any part to avoid conflicts. The Contractor shall be responsible for the correct size and location of any changes, slots, and openings required by him and shall be required to do, at his expense, any cutting or patching made necessary by his failure to make proper arrangements in this respect.

D. The Contractor shall follow the equipment manufacturer's instructions and recommendations in the installation and connection of all equipment and materials furnished under this contract. In the event of conflict or discrepancy between manufacturer's instructions and the contract documents, the Contractor shall notify the Engineer before proceeding. No equipment installation shall be made in a manner that voids the manufacturer's warranty of the equipment.

3.2 SUPPLEMENTARY FRAMING AND HOUSEKEEPING PADS
A. Provide the design, fabrication, and erection of supplementary structural framing required for the attachment of hangers or other devices supporting electrical equipment.

B. Provide framing members of standard rolled steel shapes, A-36 steel, designed for their actual loads, with allowable stresses specified by AISC, without excessive deflection and with consideration for rigidity under vibration, in accordance with standard structural practices.

C. When suspending transformers or similar vibrating equipment, provide vibration isolators to isolate vibration from structural members.

### 3.3 CLEANING

A. Labels, stickers, etc., shall be removed and the entire installation left in a clean, usable condition.

### 3.4 PAINTING

A. Finishes of all electrical equipment shall be protected during storage, installation and until final acceptance. Any damage or imperfections shall be "touched up" or if extensive, the entire unit shall be repainted as directed by the Engineer.

### 3.5 FIRE BARRIER PENETRATIONS

A. All cracks, voids, or holes for the passing of mechanical and electrical items through floors and fire rated walls, or ceilings with fire rating of 1 hour or more shall be sealed with a fire barrier caulk.

B. Fire barrier caulking system shall be 3M CP 25 caulk.

C. Fire barrier caulking system shall be installed in accordance with the manufacturer's recommendations to maintain a fire rating of 3 hours minimum.

### 3.6 PLENUM PENETRATIONS

A. Seal all cracks, voids, or holes for the passing of mechanical and electrical items through plenum construction with material to match surrounding construction or with fire barrier caulk.

### 3.7 SLEEVES

A. The Electrical Contractor shall set and maintain all sleeves. Any conduit passing through building construction including walls, floors, roofs or masonry partitions shall be encompassed with sleeves in accordance with the following.

B. All conduit sleeves through slabs, floors, masonry walls and partitions shall be 1/2 inch greater in inside diameter than the external diameter of pipe passing through. All sleeves shall be fabricated from new material cut square and reamed.

C. Sleeves shall be provided in all masonry partition walls and floors. Sleeves shall be Schedule 40 steel pipe. Wall sleeves shall be flush with the wall surface. The top of floor sleeves shall extend 1" above the floor, the bottom of the sleeve shall be flush with the floor.
D. The space between the pipe and the sleeves, through fire rated walls and floors shall be protected as designated below.

E. Furnish and install chrome-plated wall, floor and ceiling plates on all exposed pipes where they pass through walls, floors, or ceilings in finished areas. The wall plates shall have set screws or spring locks for clamping to the pipe.

F. All sleeves through floors shall be sealed watertight.

3.8 OPENINGS

A. All openings required for the passage of multiple conduits and electrical equipment in the construction shall be provided by the Electrical Contractor. The Electrical Contractor shall be responsible for determining the correct location for all openings.

B. The inside dimensions of all openings shall be 1/2 inch greater than the size of the ductwork or equipment passing through the opening. Openings for insulated ductwork shall be large enough to accommodate the insulation without harming the insulation or vapor barrier.

C. All openings through fire rated walls and floors shall be protected as described above.

3.9 EXISTING SERVICES

A. The Contractor shall verify the exact location of all existing building services extended and/or relocated for this project. The Contractor shall also verify the exact location and take proper precautions to protect all services which may be encountered during construction.

B. All active services which are encountered shall be protected, braced and supported where required for proper execution of the work and without interruption of service if possible.

C. All inactive services which are encountered shall be protected, or removed as directed by the Owner, Utility Company, or Municipal Agency having jurisdiction.

D. When active services must be temporarily interrupted, arrangements shall be made to work continuously including overtime if required, to assure that services will be interrupted only as long as actually required to complete necessary work.

3.10 REMODELING WORK

A. Wherever existing electrical wire, conduit, controls, circuits, etc., are cut into, removed, interrupted, as a result of the remodeling, all such items that serve areas or equipment that remain shall be re-routed, extended, relocated, etc., as necessary to maintain operation of equipment and services.

B. Downtime shall be held to a minimum. Outages shall be scheduled at a time acceptable to and approved by the owner. Consult with the owner in sufficient time for him/her to make necessary preparations for the outage. Must give the owner a minimum of 72 hours notice prior to outage.

3.11 TEMPORARY SERVICES
A. Contractor shall provide temporary services which will allow all contractors to continue work throughout the project. Coordinate exact requirements with general contractor.

3.12 ACCESS TO EQUIPMENT
A. Access shall be provided to all motors, junction boxes, relays, controls, specialties, etc., for maintenance purposes. All access doors, access panels, removable sections, etc., required for access shall be provided. The General Contractor will provide access panels and doors required in the building construction where shown on the plans. The location of the access openings relative to the electrical equipment shall be coordinated to assure proper access to the equipment.

3.13 PROTECTIVE DEVICES
A. All sheaves, belts, drives, couplings, and moving parts shall be protected by approved permanent guards, shields, or railings, which shall be in place whenever the equipment is in operation and shall be in accordance with applicable safety standards.

3.14 TESTS
A. Test all wiring and connections for shorts between conductors, shorts to ground, and for continuity prior to installation of fixtures and equipment.
B. Perform insulation resistance test on all feeder conductors installed under this contract, including neutrals, using a megohmmeter. Minimum value shall be 100 megohm at 60 degrees F.
C. Correct and retest any defects and submit data to engineer.
D. Test all low-voltage cabling, installed within the contract, per industry standards and submit test results to engineer.

3.15 ALL EQUIPMENT FURNISHED UNDER DIVISIONs 26000, 27000, and 28000:
A. At a time set by the contractor and agreed to by the owner, arrange to place equipment in operation and have available at that time, if required, representatives of the manufacturer of equipment to assist in starting equipment, to make necessary adjustments to equipment, and to prove satisfactory operation prior to turning facility over to the owner.
B. Any irregularities, faulty equipment, etc., shall be repaired or replaced as required prior to acceptance.

3.16 OPERATION AND MAINTENANCE MANUALS
A. Refer to Division 1 Requirements.
B. Include the following close-out documents in the manuals:
   1. Warranty letter.
   2. Low-voltage cabling test reports.
   3. Fire Alarm test reports.
3.17 PROJECT CLOSE OUT

A. Refer to Division 1 Requirements.

B. Final Payment will not be made until the contractor has satisfactorily completed all final inspection items.

C. Guarantee: All equipment and work shall be fully guaranteed, parts and labor for one year from the date of substantial completion, unless noted otherwise. The contractor has the full responsibility to guarantee all equipment and work and shall assume full responsibility to repair any equipment at his cost which the manufacturer refuses to guarantee. The Owner has the right to order repairs to any equipment or work provided hereon and to charge the contractor for the same if repairs are not made during a reasonable period of time not to exceed 24 hours during an emergency or 72 hours on a non-critical item.

END OF SECTION 260500
SECTION 260513 - MEDIUM, LOW AND CONTROL VOLTAGE CABLES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

B. Related Sections:

1. Section 260526 - Grounding and Bonding for Electrical
2. Section 260533 - Electrical Materials and Methods

PART 2 PRODUCTS

2.1 CABLE AND WIRE (600 VOLTS AND BELOW)

A. Secondary distribution and power cable shall be single conductor stranded copper, No. 12 AWG minimum; with NEC Type THHN insulation rated 90 degrees C, 600 volts. Alan Wire, American Insulated Wire, General, Cerro Wire, Encore, Republic Wire, Rockbestos, Service Wire, Southwire or United Copper Industries.

B. Lighting wire for above ground use shall be single conductor stranded copper, No. 12 AWG minimum, with NEC Type THHN insulation rated 90 degrees C, 600 volts. Alan Wire, American Insulated Wire, General, Cerro Wire, Encore, Republic Wire, Rockbestos, Service Wire, Southwire or United Copper Industries.

C. Lighting wire for underground use in conduit shall be single conductor stranded copper, No. 12 AWG minimum, with NEC Type XHHW insulation rated 90 degrees C in dry locations and 75 degrees C in wet locations, 600 volts. American Insulated Wire, General, Cerro Wire, Encore, Republic Wire, Rockbestos, Service Wire, Southwire or United Copper Industries.

D. Control cable shall be single conductor stranded copper No. 14 AWG minimum; with NEC Type THHN insulation rated 90 degrees C, 600 volts.

E. Instrumentation and special systems wire shall be in accordance with manufacturers’ recommendations, but shall not be less than 20 AWG.

F. Type MC cable shall be made up of individual conductors as noted above, be color coded, include a separate ground conductor, and shall have a corrugated metal armor over its entire length.

PART 3 EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. Install all cables and wires (including telecommunications, low voltage control and power limited circuits) in raceways. Telecommunications raceways shall be continuous from outlet boxes to telecommunications rooms.
B. Use cable lubricant when pulling secondary feeder cables. Avoid exceeding manufacturer’s recommendations on pulling tensions; sidewall pressures and cable bend radii.

C. Segregate wiring of different voltage levels. Except as follows, circuits operating at different voltages shall not share raceways.
   1. Power wiring to rooftop motors and rooftop receptacles may be routed together.
   2. Power and control wiring between variable speed drives and motor disconnect switches may be routed together.

D. Splice power cables with solderless compression butt splices or ring lugs. Terminate power cables including motor leads with solderless compression ring lugs. Splice branch circuit wiring, lighting wiring, and control and instrumentation wiring with wire nut connectors. Terminate control and instrumentation wiring with solderless compression ring or spade lugs. Compression connectors and lugs shall be crimped with tools specifically designed for the terminations being crimped.

E. If no color coding system exists for each indicated system function and voltage, color code circuits as follows:
   1. Three Phase Power 480/277 Volts:
      - Phase X (A): Brown
      - Phase Y (B): Orange
      - Phase Z (C): Yellow
      - Neutral: Gray
      - Ground: Green
   2. Three Phase Power 208/120 Volts:
      - Phase X (A): Black
      - Phase Y (B): Red
      - Phase Z (C): Blue
      - Neutral: White
      - Ground: Green
   3. Less Than 120 Volts: Use Industry Standard Methods

F. Provide home runs of No. 10 AWG wire for 20 amp branch circuits that exceed 150' in length.

G. Ground the shields of shielded instrumentation and control cables at one end only. The shields at the other end shall be insulated from ground.

H. Provide identification tags on all cables and conductors terminated in panels.

3.2 COMMISSIONING

A. Perform commissioning activities in accordance with Related Sections.

END OF SECTION 260513
SECTION 260526 – GROUNDING AND BONDING FOR ELECTRICAL

PART 1  GENERAL

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

B. Related Sections:
1. Section 260513 - Medium, Low & Control Voltage Cables
2. Section 260533 - Electrical Materials and Methods
3. Section 260800 - Electrical Acceptance Tests

1.2  SUMMARY
A. Provide grounding for all systems and equipment.

1.3  GROUNDING SYSTEM REQUIREMENTS
A. The total grounding system with all connections completed shall have a maximum resistance to ground of 25 ohms.

1.4  CONNECTION REQUIREMENTS
A. Provide exothermic weld type, or Burndy Hyground, ground connections for concealed, underground, and concrete encased ground connections, for ground connections to structural steel, connections between sections of the main ground bus and all connections to the substation room ground bus bars.

B. Exposed ground connections (except connections to structural steel and substation room ground bus bars) may be made with copper or bronze compression ground fittings or bolted compression ring lugs.

C. Provide exothermic weld type, or Burndy Hyground ground connections for splices and taps of grounding conductors No. 8 AWG and larger. Exposed splices and taps shall be taped.

PART 2  PRODUCTS

2.1  GROUNDING CONDUCTORS
A. Grounding conductors for general use shall be stranded, copper conductor, sized in accordance with the NEC unless shown otherwise on the drawings, and insulated with green NEC Type THHN insulation rated 90 degrees C, 600 volts.

2.2  GROUND CONNECTIONS
A. Ground connections shall be Burndy Hyground, Cadweld, Thermo-weld or Thomas & Betts Blackburn only.

PART 3 EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. Ground the shields of shielded instrumentation and control cable in accordance with Specification Section 260513.

B. Provide bare copper grounding conductors transformers, switchgear, panelboards, motor control centers and control panels to the building grounding system. Equipment rated above 480 volts or 600 amps shall be grounded by a minimum of two independent grounding conductors.

C. Bond transformer, UPS system, central battery/inverter system, emergency generator, and separately derived electrical system neutrals to the building grounding system.

D. Ground motors rated 460 volts and below by motor feeder equipment grounding conductors. Stranded copper grounding conductors connected to building steel shall also bond motors rated over 460 volts.

E. Provide green insulated equipment grounding conductors in all service, feeder, and branch circuits for connection of load devices to the power source ground. Raceways shall not be used as equipment grounding conductors.
   1. Equipment grounding conductors shall not be daisy-chained.
   2. Bond equipment-grounding conductors in boxes and enclosures where the grounding conductors are terminated or spliced.

F. Bond conduits, wireways, surface raceways, boxes, and enclosures together, and to the building grounding system. Provide bonding bushings and bonding jumpers to bond conduits where they enter a box or enclosure.

G. Protect separately routed grounding conductors subject to damage or physical abuse by Schedule 40 PVC nonmetallic conduits. Grounding conductors shall not be routed in metallic conduits except when routed with phase conductors.

3.2 COMMISSIONING

A. Perform commissioning activities in accordance with Related Sections.

END OF SECTION 260526
SECTION 260533 - ELECTRICAL MATERIALS AND METHODS

PART 1  GENERAL

1.1  RELATED DOCUMENTS

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

B. Related Sections:
   1. Section 260513 - Medium, Low & Control Voltage Cables
   2. Section 260526 - Grounding and Bonding for Electrical

1.2  SUMMARY

A. Provide conduits, surface raceways, boxes, fittings and supports to form a complete, coordinated, and continuously grounded raceway system.

1.3  CONDUIT REQUIREMENTS

A. Conduits indoors in general areas shall be electrical metallic tubing (EMT) with steel set screw fittings.

B. Conduits outdoors shall be galvanized rigid steel or intermediate metal conduit with cast or malleable iron threaded fittings and bushings.

C. Final connections to recessed lighting fixtures shall be 1/2" minimum flexible metallic conduit, manufactured wiring systems, or galvanized steel Type MC cable, all with steel fittings.
   1. Manufactured wiring systems shall
      a. Only be used above accessible ceilings.
      b. Shall not be used in walls or above permanent ceilings.
      c. Shall contain a dedicated, separate, grounding conductor
      d. Be limited to lengths of 6’0” or less.
   2. Type MC cable conductors shall be color coded to match the building color-coding scheme. Type MC cable shall be terminated with steel setscrew connectors that have integral insulating bushings. Self-locking, twist-in type fittings are not acceptable.

D. Final connections to motors, transformers and equipment subject to vibration or removal for maintenance shall be 1/2" minimum liquid tight flexible metallic conduit with steel liquid tight fittings. Transformer connections may be non-liquid tight flexible metallic conduit in electrical rooms only.

E. Connections to recessed devices, (including communication outlet boxes, junction or pull boxes, etc) shall be with standard conduit of the type appropriate for the wall construction.

1.4  BOX REQUIREMENTS
A. Provide sheet steel outlet boxes, extensions, and plaster rings for EMT, flexible metal conduit, and MC cable.

B. Provide cast or malleable iron outlet boxes and covers for galvanized rigid steel conduits, intermediate metal conduits, and liquid tight flexible metal conduits.

C. Boxes shall be sized for all conductors and devices to be contained within. Box extensions shall not be used to correct for undersized boxes. A single extension may be used as follows only if all free conductors extend at least 3 inches outside of the extension opening.

1. On boxes being flush mounted in masonry walls.
2. On existing boxes in walls that are being furred out.
3. On existing boxes for connecting to an existing circuit.
4. On fire alarm, security and clock system boxes where required by the system manufacturer's instructions.

D. Plaster rings shall not be considered box extensions, but their capacities may be included in box fill calculations.

1.5 SUPPORT REQUIREMENTS

A. Surface mounted equipment shall be secured to steel channels. The channels shall be attached with toggle bolts to hollow tile, block or similar surfaces, and attached with screws or bolts and expansion shields to solid masonry or concrete.

PART 2 PRODUCTS

2.1 CONDUITS

A. Electrical metallic tubing shall be thin wall steel tubing, electro-galvanized or hot dipped galvanized inside and outside. Fittings and bushings shall be galvanized steel set screw type with two screws per connection for sizes over 2”.

B. Galvanized rigid steel conduit and intermediate metal conduit shall be hot dipped galvanized inside and outside, in 10’ lengths and threaded on both ends. Fittings and bushings shall be cast or malleable iron, and hot dipped galvanized inside and outside.

C. PVC conduit and fittings shall be Type DB for encasement in concrete, Schedule 40 for direct burial, concealed and exposed work, and schedule 80 in parking structures. Fittings shall be of the same type and from the same manufacturer as the conduit. PVC conduit shall be UL Labeled for 90 degrees C cables. Cantex, Carlon or National Pipe & Plastic.

D. Fiberglass reinforced epoxy conduit shall be standard wall, iron pipe size, sunlight resistant, gray color, with matching push-fit fittings. FRE or Champion.

E. Flexible metallic conduit shall be galvanized steel or aluminum. Fittings shall be of steel with cadmium or galvanized finish. Fittings shall be machine screw clamp type, single or two-piece. Self-locking, twist-in type fittings are not acceptable.
F. Liquid tight flexible metallic conduit shall consist of a flexible, galvanized steel core, a continuous copper ground strip and a polyvinyl chloride jacket. Fittings shall be steel liquid tight grounding type from the same manufacturer as the conduit.

2.2 BOXES

A. Boxes for fixtures, outlets, switches, equipment connections and wire pulling shall be
   1. Cast or formed from carbon steel sheets of commercial grade steel not less than 14-gauge,
   2. One-piece construction, zinc, or cadmium plated,
   3. Tapped for mounting plates and covers as required.

B. Pull and junction boxes shall be
   1. Fabricated from galvanized or painted code gauge cold rolled carbon steel sheets.
   2. Welded construction with flat removable covers fastened to the box with machine screws.
   3. Seams and joints shall be closed and reinforced with flanges formed of the same material from which the box is constructed or by continuous welding which will provide equivalent strength to flange construction.
   4. Preferably not provided with ‘knockouts’.

C. Box covers shall be fastened in place by machine screws or hinges and latches. Self-tapping or sheet metal fasteners are not acceptable.

2.3 SUPPORTS

A. Hangers and brackets shall be made of steel pipe, channel iron, angle iron or prefabricated steel channel. Prefabricated steel channel shall be by B-Line, Hilti, Powerstrut or Unistrut.

B. Anchors shall be lead shield anchors or plastic expansion anchors for small loads, and expansion or epoxy anchors for large loads. Powder-driven anchors shall not be used.

2.4 LABELS AND DIRECTORIES

A. Equipment nameplates shall be engraved .125 inch (1/8") thick laminated plastic, white, with black letters. The engraved letters shall be at least one quarter inch (¼") high. Nameplates shall be mechanically secured in place with sheet metal screws and/or bolts and nuts.

B. Receptacles and lighting switches shall be labeled using clear adhesive backed nylon or Mylar tape with black text permanently laminated to the tape.

C. Panel directories shall be typed on supplied card stock with panel, or card stock similar in thickness and material as those supplied with the panels. Install supplied clear plastic cover, or one of like material.

PART 3  EXECUTION
3.1 RACEWAYS

A. Size conduits in accordance with the NEC, but not less than the sizes shown on the drawings. Minimum power and control conduit size shall be 1/2". Minimum telecommunications conduit size shall be 3/4".

B. Install concealed and exposed conduits parallel to or at right angles to building lines. Conduits shall not be embedded in concrete slabs except where specifically shown. Install surface raceways as close to room corners or trim features as possible to make the surface raceways less obvious. Where conduits are routed over beams and under corrugated decking, conduits shall be offset 3" below the decking to avoid damage from future decking penetrations.

C. Conceal conduits wherever possible and practical. When conduits cannot be concealed in finished areas, use surface raceways with matching boxes from the same manufacturer as the raceways.

D. Metal conduits, fittings, enclosures and raceways shall be mechanically joined together in a firm assembly to form a continuous electrical conductor providing effective electrical grounding continuity.

E. Provide expansion fittings at the intervals specified in the manufacturer's instructions.

F. Conduits entering panels located outdoors, in parking structures, in steam tunnels and on cooling towers shall enter from the sides, back, or bottom. Conduits shall not enter from the top.

G. Separate raceways from uninsulated steam pipes, hot water pipes, and other hot surfaces by a minimum of 4" horizontally or 12" vertically. Separate raceways from ventilation ducts and insulated pipes so that they do not come into contact with each other.

H. Low voltage signal circuits shall be separated or shielded from power circuits to prevent the induction of noise into the signal circuits.

I. EMT entering sheet metal enclosures and outlet boxes shall be secured in place by a connector with a locknut. Rigid conduit shall be secured with locknut inside and outside and a bushing. Sufficient thread on the connector or conduit shall extend into the enclosure so that the bushing will butt tight into the connector or conduit. Bushings shall not be used as jamb nuts or in lieu of locknuts.

J. Flexible metallic conduit to motors and similar equipment shall not exceed 3'-0" in length, and shall have adequate slack to absorb the maximum vibration. Flexible conduit connections to lighting fixtures shall not exceed 6'-0" in length.

3.2 MOUNTING HEIGHTS

A. Except where shown otherwise, install equipment and devices at the following heights:

1. Receptacles (Wall): 18" A.F.F. to center
2. Receptacles (Above Counter): 44" A.F.F. to center
3. Receptacles (Unfinished Area): 44" A.F.F. to center
4. Surface Raceway Receptacle Strips: 42" A.F.F. to bottom
5. Light Switches: 44" A.F.F. to center
6. Telephone Outlets (Wall Phone): 54” A.F.F. to center
7. Telephone/Data Outlets: 18” A.F.F. to center
8. Clock Outlets: 88” A.F.F. to center
10. Fire Alarm Horn/Strobes: 80” A.F.F. to bottom
11. Card Readers: 44” A.F.F. to card slot
12. Security System Controls: 44” A.F.F. to center
13. Thermostats/HVAC Controls: 44” A.F.F. to center
14. Electrical Panels: 72” A.F.F. to top
15. Safety Switches/Motor Starters/Variable Frequency Drives: 72” A.F.F. to top (except top of handle shall not exceed 78” A.F.F.)
16. Motor Control Pushbuttons: 60” A.F.F. to center

3.3 SUPPORTS

A. Provide 4” thick concrete housekeeping pads for floor-mounted equipment.

B. Support all electrical items independently of supports provided by the other trades.

C. Support conduits and boxes using steel conduit straps or 1/4-inch minimum diameter threaded rod hangers. Suspended ceiling hangers or hanger wire shall not be used (except to support flexible metallic conduit and manufactured wiring systems).

D. Hangers shall be of sufficient strength that their deflection at mid span does not exceed 1/240 of the hanger span length after the cables are installed.

E. Route flexible metallic conduit, manufactured wiring systems and Type MC cable parallel to or perpendicular to building lines, and in a neat and workmanlike manner. Coil the excess manufactured wiring systems and Type MC cable, and support independently of the ceiling grid system at intervals not exceeding 3 feet.

3.4 PENETRATIONS, SLEEVES, AND FIRE SEALS

A. Cut floor and wall penetrations neatly and to the minimum size required for installation of the equipment and raceways.

B. Provide galvanized steel pipe sleeves for all conduits penetrating floors, exterior walls and roofs.

1. Extend floor sleeves above the floor a minimum of 2 inches.
2. Embed sleeves in new concrete or step-core concrete and grout sleeves into existing concrete with epoxy grout.
3. Seal floor sleeves using fire-sealing systems approved by a Nationally Recognized Testing Laboratory.
4. Seal exterior wall and roof penetrations water tight.

C. Patch both sides of wall penetrations cut for electrical equipment and raceways to seal against the passage of air, sound and fire.

1. Seal conduit penetrations in fire rated walls using fire-sealing caulk approved by a Nationally Recognized Testing Laboratory.
2. Seal conduit penetrations in non-rated walls using masonry materials that match the wall construction.
3. Fire seal between recessed outlet boxes located on opposite sides of a fire rated wall if the box openings are over 16 square inches and the boxes are less than 24 inches apart.

3.5 EXPANSION FITTINGS

A. Provide expansion fittings at all building expansion joints. Expansion fittings shall be bonded to the raceway on both sides.

B. Provide expansion fittings, in accordance with manufacture recommendations, in all areas subject to swings in temperature of more than 15 degrees C.

C. Install expansion fittings in all locations where expected expansion difference is ¼", or more, between boxes.

3.6 IDENTIFICATION

A. Provide nameplates and labels in accordance with Article 2.6.

1. Laminated plastic labels shall be mechanically secured in place with sheet metal screws and/or bolts and nuts
2. Labels shall be neatly centered. Place labels in like positions on similar equipment.

B. Color code wiring as noted in Section 260513

C. Color code junction boxes and box covers of emergency and fire alarm circuits with red paint. Color code junction boxes and box covers of temperature control circuits with blue paint.

D. Mark junction box covers in indelible ink with the panel and breaker numbers of the circuits contained within.

E. Provide a 3" by 5" yellow "Warning Arc Flash Hazard" label on the outside of panels in 'occupant areas' - Brady Type 99454 or equivalent from another manufacturer. Center the label horizontally and vertically on outside of door.

F. Provide a 4" by 6" "Danger Arc Flash and Shock Hazard" label on the outside of panels in areas open only to 'qualified personnel', and on the inside panel door of panels in 'occupant areas' - Brady Type 99459. Center label on gutter areas of distribution panels, centered above or below the directory of panels, and otherwise centered in other applications. In all cases, label will be no lower than 48" or above 84" AFF

END OF SECTION 260533
SECTION 260800 - ELECTRICAL ACCEPTANCE TESTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

B. Related Sections:
   1. Section 018113 - Sustainable Design Requirements
   2. Section 019100/019110 - Commissioning
   3. Section 017823 - Operation and Maintenance Manual

1.2 TESTS

A. Perform the visual inspections, manual operations and tests on systems and equipment as described in Part 3, "Execution".

B. Tests shall be performed and documented by an independent testing agency.

1.3 TEST REPORTS

A. Provide written test reports, signed and dated, for all tests prior to acceptance of the tested equipment by the Owner. Test reports on Megger, dielectric absorption and high potential tests shall include the ambient temperature and relative humidity existing at the time of the tests.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 VISUAL INSPECTIONS

A. Prior to any testing, perform visual inspections to verify the following:
   1. The equipment is completely and properly installed
   2. The equipment is free from damage and defects
   3. Shipping blocks and restraints have been removed
   4. Electrical terminations have been properly tightened
   5. The equipment has been properly aligned
   6. The equipment has been properly lubricated
   7. The ventilation louvers are open and unobstructed
   8. The equipment is ready to be tested

3.2 MANUAL OPERATION

A. Prior to any testing, mechanical devices shall be exercised or rotated manually to verify that they operate properly and freely.
3.3 POWER CABLE TESTS

A. Perform a continuity check and a 1,000 volt DC Megger test on 600 volt power cables No. 4 AWG and larger.

1. The Megger test shall be performed between each pair of conductors and from each conductor to ground.
2. The Megger test shall be performed for 15 seconds or until the insulation resistance value stabilizes.
3. The insulation resistance between conductors and from each conductor to ground shall be 100 megohms minimum in one minute or less. In addition, the lowest insulation resistance value shall not differ from the highest value by more than 20 percent. If Megger readings for a given circuit or feeder are above 1000 megohms, the 20% balance requirement may be waived.

3.4 CONTROL CABLE TESTS

A. Perform a continuity check on control and instrumentation wiring.

3.5 SECONDARY SWITCHGEAR TESTS

A. Perform a continuity check and 1,000 volt DC Megger test on buses, and on main and feeder breakers.

B. Perform a primary current injection test and a 'Ducter' (contact resistance) test on main breakers.

C. Perform a 1,000-volt DC Megger test and a turns-ratio test on CT's and PT's.

D. Calibrate the metering.

3.6 SERVICE, DISTRIBUTION, AND MOTOR CONTROL EQUIPMENT TESTS

A. Perform a 1,000-volt Megger test on buses, motor starters and disconnect switches. This test may be combined with the feeder cable Megger test by testing the devices and terminated cables together.

B. Perform a continuity check on motor control circuits and control panel internal wiring.

C. Perform an operational test on the controls.

D. Perform a continuity check and a 1,000-volt DC Megger test on 3 phase distribution and isolation transformers.

3.7 MOTOR TESTS

A. Perform a 1,000-volt Megger test on 460 volt, 3 phase motors, and a 500 volt Megger test on 200 volt, 3 phase motors.

B. "Bump" motors to verify proper direction of rotation.

C. Run motors and check for vibration.

3.8 GROUNDING TESTS
A. Measure the resistance to ground of each ground rod before connection to the other ground rods. The resistance shall not exceed 25 ohms.

B. Measure the resistance to ground of the total ground system with all connections completed. The resistance shall not exceed 2 ohms for primary services or 5 ohms for secondary services.

C. Tests of the resistance to ground shall be made using either the three point method or the fall-of-potential method.

D. Perform a continuity check from equipment ground bus bars and ground lugs to the ground system.

3.9 FIRE ALARM SYSTEMS

A. Perform testing in accordance with NFPA 72-1999, Chapter 7.

3.10 COMMISSIONING

A. Perform Commissioning activities per Related Sections above.

END OF SECTION 260800
SECTION 262726 - WIRING DEVICES

PART 1  GENERAL

1.1 RELATED DOCUMENTS

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

B. Related Sections:
   1. Section 260513 - Medium, Low & Control Voltage Cables
   2. Section 260526 - Grounding and Bonding for Electrical
   3. Section 260533 - Electrical Materials and Methods

PART 2  PRODUCTS

2.1 WIRING DEVICES COLOR(S)

A. Face color of wiring device(s) on the project shall be selected during the submittal phase of the project by the owner/architect. Wiring devices submitted need to offer the following standard colors at a minimum: white, ivory, almond, light almond, grey, brown, red and orange.

2.2 TOGGLE SWITCHES

A. Toggle switches shall be rated 120/277 volts, 20-amperes, single-pole, double-pole, 3-way or 4-way as shown, specification grade, extra-heavy duty, back and side wired. Arrow Hart, Bryant, Hubbell, Leviton or Pass & Seymour.

2.3 DUPLEX RECEPTACLES

A. Duplex receptacles shall be rated 125 volts, 20 amps, 2-pole, 3-wire, NEMA Type 5-20R, UL heavy duty, back and side wired, grounding type with nylon or Lexan bodies. Arrow-Hart, Bryant or Hubbell 5362, or Leviton or Pass & Seymour 5362A.

2.4 GFCI DUPLEX RECEPTACLES

A. GFCI duplex receptacles shall be rated 125 volts, 20 amps, 2 pole, 3 wire straight blade type with nylon or Lexan bodies. GFCI receptacles shall trip when ground currents exceed 5 ma, shall trip in 25 milliseconds maximum, and shall have an interrupting rating of 2000 amps. Receptacles shall lock out (off) when the protection system fails. Arrow Hart, Bryant, Hubbell or Leviton.

2.5 SPECIAL PLUGS AND RECEPTACLES

A. Special receptacles shall be of the voltage, amperage, number of poles, number of wires, configuration, and NEMA Type shown, and specification grade, with nylon or Lexan bodies. Arrow-Hart, Bryant, Hubbell, Leviton or Pass & Seymour. Provide the required quantity of mating plugs when shown on the drawings.
2.6 COVER PLATES

A. Cover plates for switches and receptacles shall be a nylon material, unless otherwise indicated. Coverplate screws shall be powder-coated and touched up after install to avoid any exposed metal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Except where necessary to match existing receptacles, install receptacles with their ground slots below, or to the left, of the line and neutral slots.

B. Provide No. 10 AWG wire to NEMA Type 6-20R receptacles serving freezers, window air conditioners or other large appliances.

C. Where shown on the drawings, provide a separate neutral conductor for each single-phase branch circuit. The neutrals of these single-phase circuits shall not be shared or daisy-chained.

D. Receptacles installed in surface raceways being fed by multiple circuits, shall have adjacent receptacles from alternate circuits.

E. Provide ground fault circuit interrupter (GFCI) receptacles for new and existing 120 volt duplex receptacles located outdoors, in toilet rooms and within 6 feet of water sources including sinks, cup sinks, fume hood sinks, faucets, hose bibs and water coolers. Standard receptacles protected by an upstream GFCI receptacle or a GFCI circuit breaker are not acceptable.

F. Provide waterproof enclosures for receptacles located outdoors or when designated "waterproof" in special indoor applications. Enclosures shall remain watertight even while in use. Cantex, Carlon, Leviton or TayMac Corporation.

G. Provide a nametag on the back of each cover plate of new and existing light switches and receptacles identifying the panel and circuit number feeding the device. Trace the existing circuits using an electronic circuit tracer if necessary. Nametags shall consist of black text permanently laminated to adhesive backed clear nylon or Mylar tape. Brother P-Touch. Embossed plastic tape labels are not acceptable.

H. Color code junction boxes and box covers of emergency circuits with red paint.

I. Mark junction box covers in indelible ink with the panel and breaker numbers of the circuits contained within.

3.2 FIELD QUALITY CONTROL

A. The contractor shall perform testing in accordance with Specification Section 260800, and shall submit a test report.

3.3 COMMISSIONING

A. Perform commissioning activities in accordance with Related Sections.

END OF SECTION 262726
PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

B. Related Sections:

1. Section 260513 - Medium, Low & Control Voltage Cables
2. Section 260526 - Grounding and Bonding for Electrical
3. Section 260533 - Electrical Materials and Methods
4. Section 260800 - Electrical Acceptance Tests

1.2 SUMMARY

A. Provide the following equipment as shown.

1. Disconnect switches

1.3 SUBMITTALS

A. Submit shop drawings for each switch including dimensioned plans and elevations and component lists. Show ratings, including short time and short-circuit current ratings, and horizontal and vertical bus ampacities.

PART 2 PRODUCTS

2.1 MANUAL MOTOR STARTERS

A. Manual motor starters shall be of the voltage shown, horsepower rated for the motors shown, single select single, double-pole pole, single throw, toggle operated, with red "run" pilot light, motor overload heater, padlock provision and a NEMA Type 1 enclosure. Allen-Bradley, Eaton, GE, Siemens or Square D.

2.2 DISCONNECT SWITCHES

A. Disconnect switches shall be of the voltage and amperage shown, horsepower rated for motor applications, fusible or non-fusible as shown, 3 pole, NEMA Type HD heavy duty, in a NEMA Type 1 enclosure indoors or NEMA Type 3R enclosure outdoors. Provide fuse rejection kits and Class R dual element fuses in fusible disconnect switches. Provide early break auxiliary contacts in motor disconnect switches used with variable frequency drives. Disconnect switches shall be lockable in the open and closed positions. Allen-Bradley, Eaton, GE, Siemens or Square D.

PART 3 EXECUTION
3.1 **FIELD QUALITY CONTROL**
   A. Perform testing in accordance with Specification Section 260800, and submit a test report.

3.2 **COMMISSIONING**
   A. Perform Commissioning activities per Related Sections above.

3.3 **TRAINING**
   A. Provide a qualified service technician from the Manufacturer's staff to provide training.
   
   B. Train Owner's maintenance personnel on equipment operation, start-up and shutdown, trouble-shooting, servicing and preventative maintenance procedures. Review the data contained in the Operating and Maintenance Manuals with Owner's personnel. Training shall occur separate from startup activities.

   1. Provide 2 hours of training minimum.

END OF SECTION 262900
SECTION 265100 - INTERIOR LIGHTING

PART 1  GENERAL

1.1  RELATED DOCUMENTS

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

B. Related Sections:
   1. Section 260513 - Medium, Low & Control Voltage Cables
   2. Section 260526 - Grounding and Bonding for Electrical
   3. Section 260533 - Electrical Materials and Methods
   4. Section 260800 - Electrical Acceptance Tests

PART 2  PRODUCTS

2.1  LIGHTING FIXTURES

A. Lighting fixtures shall be of specification grade, and shall be listed or labeled by Underwriters Laboratories (UL) or other approved agency. Lighting fixtures shall be provided in accordance with the Fixture Schedule.

B. Light Fixtures listed within the Light Fixture Schedule are scheduled and used as a basis of design. Alternate light fixtures to those listed within the Light Fixture Schedule shall meet or exceed the requirements of those listed in addition to the requirements provided within this specifications.

2.2  EMERGENCY LIGHTING

A. Emergency lighting shall consist of LED or fluorescent emergency lighting fixtures or sealed beam emergency lighting units as shown. Chloride, Dual-Lite or Exide Lightguard.

1. LED or Fluorescent emergency lighting fixtures shall consist of normal light fixtures with their light sources integrally or remotely connected to a maintenance free, nickel cadmium battery pack, and solid-state battery charger. Minimum light output shall be 1100 lumens. The battery pack shall be sized for a minimum of 90 minutes of battery operation. The battery charger shall provide overload, short circuit, brownout and low battery voltage protection. The unit shall include self-diagnostic and self-exercising circuitry to exercise and test itself for 5 minutes every month and for 30 minutes every 6 months. The unit shall include a test/monitor module with status indicating lights mounted on a device plate suitable for mounting remotely from the fixture and battery pack in a single gang outlet box.

2. Sealed beam emergency lighting units shall consist of 6 volt, sealed beam, PAR36 lamps connected to a wall or ceiling mounted maintenance free nickel cadmium battery pack and solid state battery charger. The battery pack shall be
sized for a minimum of 90 minutes of battery operation. The battery charger shall provide overload, short circuit, brownout and low battery voltage protection. The unit shall include self-diagnostic and self-exercising circuitry to exercise and test itself for 5 minutes every month and for 30 minutes every 6 months. The unit shall include a test/monitor module with status indicating lights.

2.3 EXIT SIGNS

A. Exit signs shall be of the LED type. Fluorescent, electro luminescent light panel or self-powered luminous signs shall not be used. Chloride, Dual-Lite, Emergi-Lite, Exide Lightguard, Lightalarms, Lithonia or Sure-Lites.

1. LED’s shall be wired in parallel to prevent multi-lamp failure, and shall be concealed within the sign by a clear panel and red optical diffuser. Power consumption shall not exceed 2 watts per face.

2. Exit signs shall have white die cast aluminum or polycarbonate housings with universal mounting brackets; brushed aluminum stencil faces with red letters and multi-directional knockout arrows.

3. Exit signs shall be provided with emergency battery packs and battery chargers when required. Batteries shall be maintenance free nickel cadmium, and shall be mounted within the signs.

PART 3 EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. Support recessed troffers independently of the ceiling grid system by using two, safety wires minimum on diagonally opposite corners of the fixtures. Support recessed downlights by using safety wires or by rigidly attaching the fixtures to the building structure or ceiling grid system. Removable T-bar clips shall not be used to attach fixtures to the ceiling grid system.

B. Install fixtures level, with no gaps between adjacent fixtures or between fixtures and surrounding surfaces. Lenses, reflectors and trims of fixtures shall be properly and uniformly aligned.

C. Provide an individual feed with ground conductor from a junction box to each lighting fixture. Lighting fixtures shall not be daisy-chained.

D. Drops to recessed fixtures may be flexible metallic conduit, or manufactured wiring systems may be used where accessible. Fixtures shall be provided with sufficient length to permit removal and lowering of the fixtures 12” below the ceiling.

E. Provide green grounding conductors back to the panel ground for lighting circuits. Raceways shall not be used as grounding conductors.

F. Fixtures shall have their exterior labels removed and shall be thoroughly cleaned. Burned out lamps shall be replaced.

G. Mount emergency lighting battery packs in accordance with the manufacturer’s instructions. Locate the remote test/monitor modules identically so that they are visible and they form a straight line when viewed from the end of the corridor or room. Where a suspended ceiling exists, center the modules in adjacent ceiling tiles.
H. Mount sealed beam emergency lighting units where shown and aim their lamps to light the egress path as uniformly as possible.

3.2 FIELD QUALITY CONTROL

A. A visual inspection shall be performed to verify cleanliness and alignment of the fixtures. Misalignment and light leaks shall be corrected, and rattles due to ventilation system vibration shall be eliminated.

B. An operational test shall be performed to verify that all fixtures light properly, and are switched according to the drawings.

3.3 COMMISSIONING

A. Perform Commissioning activities per Related Sections above.

3.4 TRAINING

A. Provide a qualified service technician from the Manufacturer's staff to provide training.

B. Train Owner's maintenance personnel on equipment operation, start-up and shutdown, trouble-shooting, servicing and preventative maintenance procedures. Review the data contained in the Operating and Maintenance Manuals with Owner's personnel. Training shall occur separate from startup activities.

1. Provide 2 hours of training minimum.

END OF SECTION 265100