Bid Response

	Bid Opening Date	Time of Bid Opening	Bid Opening Location
	2/15/2016	1:00 P.M.	800 Lincoln Way, Ames, IA

Proposal Number	Description			
15843	Ames Materials Lab-Replace 2 VAV Boxes for Analytical Lab			
Contract Begin Date	Contract Completion Date	Bid Bond ($) N/A	Performance Bond (Y/N) N	Liquidated Damages $0.00

Purchasing Agent	E-mail Address	Phone	Fax
Laura Linduski	Laura.linduski@dot.iowa.gov	515-239-1429	515-239-1538

Company Name	Federal Tax ID

Street Address	City	State	Zip Code

Bidder Contact Name	E-mail Address	Phone	Fax

Bidder agrees to sell items/services at the same prices, terms and conditions to any other Iowa state agency. Regent or Political Subdivision upon request. Please check Yes or No. ☐ Yes ☐ No	Bidder is an Iowa Targeted Small Business ☐ Yes ☐ No

GENERAL INFORMATION

The entire contents of this solicitation; Addendums, Schedule of Prices, Specifications, Plans and Drawings, Supplemental Terms and Conditions, Standard Terms and Conditions shall become part of the contract or purchase order. **Faxed or email bids will be accepted.**

Standard Terms and Conditions- Requests for Quotations or Bids

(Please refer to all Standard Terms and Conditions in the solicitation)

Acceptance/Rejection: The Iowa DOT reserves the right to accept or reject any or all bids and to waive irregularities or technicalities, provided such waiver does not substantially change the offer or provide a competitive advantage to any supplier or service provider. The Iowa DOT reserves the right to accept that bid which is deemed to be in the best interests of the state. Any unauthorized changes, additions, or conditional bids including any ties to another bid or proposal or any reservations about accepting an award or entering into a contract, may result in rejection of the bid. Bids must remain available for award for (30) days from the bid opening date.

Method of Award: Award shall be made to the lowest responsible, responsive bidder whose bid meets the requirements of the solicitation unless otherwise specified. An Iowa bidder will be given preference over an out-of-state bidder when bid responses are equal in all aspects and are tied in price. By virtue of statutory authority preference will be given to products and provisions grown and coal produced within the State of Iowa.

Contracts: Successful contractor(s) may be sent either a formal contract or a purchase order. The contractor may not assign the contract to another party without written authorization from the Iowa DOT Purchasing Section.

Pricing and Discount: Unit prices shown on the bid response shall be quoted as the price per unit (e.g., gal., case, each, etc.) as stated in the bid solicitation. If there is a discrepancy between the unit bid prices, extended price, or total amount of bid, the unit price shall prevail. Unless otherwise indicated, prices shall be firm for the duration of the contract or purchase. Discounts for early payment are allowed, but not considered in award of the contract.

We certify that all materials, equipment and/or services bid or proposed meet or exceed the specifications and requirement and will be supplied in accordance with the entire contents of this solicitation including delivery schedules.

Signed _____ Date _____

Schedule of Prices

Project Description: Ames Materials Lab-Replace 2 VAV Boxes for Analytical Lab

Item No.	Description	Quantity	Unit/Price	Total Bid Amount
1	Vendor to provide and install 2 VAV Boxes for Analytical Lab at Ames Materials Lab as per plans and specifications	I Job	Lump/Sum or applicable	$_____

I hereby certify that this Bid Response meets or exceeds the minimum requirements including specifications and addendums.

Authorized Signature: _____

Contact Person:

Company: _____

_____
(Print Name)

Address: _____

Contractor Reg. No:_____

_____
(City) (State) (Zip Code)

Phone No: _____

Email:_____

Fax No.: _____

I acknowledge receipt of addendums.:_____

Iowa Department of Transportation
Standard Terms and Conditions
For

Submission of Quotations or Bids

-INFORMAL-

Informal - means a limited solicitation type of procurement where a sufficient number of quotations or bids from qualified sources are obtained and the aggregate amount of the purchase is less than $50,000.

The entire contents of this bid solicitation shall become a part of a contract or purchase order. In case of a discrepancy between the contents of the solicitation documents, the following items listed by descending order shall prevail:

- Addendums to the bid proposal
- Bid Proposal-
  - Schedule of Prices
  - Specifications
  - Plans and Drawings
- Supplemental Terms and Conditions
- Standard Terms and Conditions

(Example - if there is a statement in the Specifications that contradicts a statement in the Standard Terms and Conditions, the statement in the Specifications shall apply)

Preparation of Bid Response: All bid responses must address all aspects of the proposal including clearly answering all questions within the proposal. Bid responses must be typed or completed in ink and submitted on the forms supplied by the Iowa DOT.

Bid responses must be signed and received prior to the bid opening date and time as indicated on the Bid Response cover page or bid opportunity. The signed, submitted quotation or bidder's proposal shall become the official bid response to be considered for award.

Bid responses may be sent by email, fax, weblink, or delivered by a courier that ensures timely delivery.

A. Solicitation

1. **Bid Opening:** Bid openings are made public and conducted at the Iowa DOT, Ames complex unless otherwise specified. Bid Responses received after the time of the bid opening will be returned to the bidder and considered non-compliant.
2. **Communications:** Questions concerning this proposal should be directed to the purchasing agent listed on the bid proposal. Inquiries can be written, phoned, or faxed. In all cases, written communication will take precedence over verbal communication.
3. **Pricing and Discount:** Unit prices shown on the bid/response shall be quoted as the price per unit (e.g., gal., case, each, etc.) as stated in the bid proposal. If there is a discrepancy between the unit bid prices, extension, or total amount of bid, the unit prices shall prevail. Unless otherwise indicated, prices shall be firm for the duration of the contract or purchase. Discounts for early payment are allowed, but not considered in award of the contract.
4. **Acceptance/Rejection:** The Iowa DOT reserves the right to accept or reject any or all bids and to waive irregularities or technicalities, provided such waiver does not substantially change the offer or provide a competitive advantage to any supplier(s). The Iowa DOT also reserves the right to accept that bid which is deemed to be in the best interests of the state. Any unauthorized changes, additions, or conditional bids including any ties to another bid or proposal or any reservations about accepting an award or entering into a contract, may result in rejection of the bid. Bids must remain available for award for thirty (30) days from date of bid opening.

5. **Bid Results & Disclosure:** A bid tabulation will be sent to all responsive bidders and may be posted on the Iowa DOT website at www.iowadot.gov/purchasing under the *Bid Award link* referencing the proposal number with an award recommendation indicated. At the conclusion of the selection process, the contents of all received bid responses will be placed in the public domain and be open to inspection by interested parties, according to state law. Trade secrets or proprietary information that are recognized as such and are protected by law may be withheld if clearly identified as such in the proposal.
6. **Quality:** All material shall be new and of first quality. Items which are used, demonstrators, refurbished, obsolete, seconds, or which have been discontinued are unacceptable without prior written approval by the Iowa DOT.
7. **Recycled Content:** The Iowa Code encourages purchase of products and materials with recycled content, including but not limited to paper products, oils, plastic products, compost materials, aggregate, solvents, and rubber products. Recycled items or alternatives must be noted in the bid response, if known.
8. **Shipping Terms:** Deliveries shall be F.O.B. Destination unless otherwise specified. All deliveries shall be accompanied by a packing slip indicating the Supplier, quantities shipped, and the purchase order number(s). All delivery charges shall be included in the bid price and paid by the Supplier. No collect C.O.D. deliveries shall be accepted. When entering into a contract, the Supplier shall notify the freight company that all freight and delivery charges are to be prepaid by the Supplier. Goods delivered to the Iowa DOT Distribution Center at 800 Lincoln Way, Ames, IA shall be received between the hours of 7:00 a.m. and 3:00 p.m. on any day except Saturday, Sunday, or a holiday. For deliveries to other Iowa DOT locations, the Supplier may contact the destination location for available times to deliver as not all Iowa DOT locations have the same business hours. The Iowa DOT will not be liable for any freight claims or unpaid freight bills arising from contract or purchase order issues.

B. Award

The binding agreement (award) may be issued in the form a purchase order or contract or both depending on the requirements and complexity of the agreement.

1. **Method of Award:** Award shall be made to the lowest responsible, responsive bidder whose bid meets the requirements of the solicitation unless otherwise specified. An Iowa bidder will be given preference over an out-of-state bidder when bid responses are equal in all aspects and are tied in price. By virtue of statutory authority preference will be given to products and provisions grown and coal produced within the State of Iowa.
2. **Award Protests:** Protests of award recommendations are to be addressed to the Director of Purchasing, and shall be made in accordance with paragraph 761--20.4(6)"e" of the Iowa Administrative Code.
3. **Contracts:** Successful contractor(s) may be sent a formal Contract, Notification of Award or Purchase Order as confirmation of acceptance and award. Any of these binding agreements shall be for the term stated in the bid solicitation or on a purchase order and may be renewed for additional period(s) under the same terms and conditions upon mutual agreement as defined. The successful bidder may not assign a contract to another party without written authorization from the Iowa DOT Purchasing Section. The Iowa DOT may offer a contract extension to the Contractor when a scheduled target date cannot be met.
4. **Consumer Price Index (CPI-U):** A CPI may be allowed as specified in the terms of the Bid Proposal and at the discretion of the Iowa DOT based on currently posted CPI-U, US City Average, All Items – non seasonally adjusted unless otherwise specified. This applies each of any subsequent renewals, extensions, amendments issued under the contract for the duration of the contract.

5. **Payment Terms:** The Iowa DOT typically pays properly submitted vendor invoices within thirty (30) days of receipt, providing goods and/or services have been successfully delivered, installed or inspected (if required), and accepted. Invoices presented for payment must be only for quantities received by the Iowa DOT and must reference the purchase order number or contract to be submitted for processing.
6. **Default (Supplier):** Failure of the Supplier to adhere to specified delivery schedules or to promptly replace rejected materials shall render the Supplier liable for all costs in excess of the bid price when alternate procurement is necessary. This shall not be the exclusive remedy and the Iowa DOT reserves the right to pursue other remedies available to it by law or under the terms of the binding agreement.
7. **Default (Contractor):** Failure of a Contractor other than a Supplier to meet any specified project completion deadline shall render the Contractor liable for all costs incurred by the Iowa DOT that were: a) necessary to meet said deadline; or b) necessary to complete said project after said deadline. This shall not be the exclusive remedy and the Iowa DOT reserves the right to pursue other remedies available to it by law or under the terms of the agreement.

C. General

1. **Administrative Rules:** For Additional details on the rules governing the actions of the Iowa DOT Purchasing Section, refer to 761 IAC, Chapter 20, Iowa Administrative Code, entitled "Procurement of Equipment, Materials, Supplies and Services".
2. **Affirmative Action:** The Contractor (and also subcontractor, vendor or supplier) is prohibited from engaging in discriminatory employment practices forbidden by federal and state law, executive orders and rules of the Iowa Department of Management, pertaining to equal employment opportunity and affirmative action. Contractor may be required to have a copy of their affirmative action program on file, containing goal and time specifications. Contractors doing business with Iowa in excess of $5,000 annually and employing 50 or more full time employees may be required to file with the Iowa Department of Management a copy of their affirmative action plan. Failure to fulfill these non-discrimination requirements may cause the contract to be canceled and the contractor declared ineligible for future state contracts or subject to other sanctions as provided by law or rule.
3. **Applicable Law:** The contract shall be governed under the laws of the State of Iowa. The contractor shall at all times comply with and observe all federal and state laws, local laws, ordinances, and regulations which are in effect during the period of a contract and which in any manner affect the work or its conduct. Any legal action relating to a contract shall only be commenced in the Story County, Iowa, District Court or the United States District Court for the Southern District of Iowa.
4. **Conflict of Interest:** No state or county official or employee, elective or appointive shall be directly or indirectly interested in any contract issued by the Iowa DOT, see Code of Iowa 314.2.
5. **Debarment and Vendor Suspension:** By submitting a proposal, the contractor is certifying that it and its principals and/or subcontractors are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by the State of Iowa or any Federal department or agency.
6. **Equal Opportunity:** Firms submitting bids must be an "Equal Opportunity Employer" as defined in the Civil Rights Act of 1964 and in Iowa Executive Order Number Thirty-four.
7. **Indemnification-Goods:** To the extent the goods are not manufactured in accordance with Iowa DOT's designs, Supplier shall defend, indemnify and hold harmless Iowa DOT, its assignees, and other users of the goods from and against any claim of infringement of any letters patent, trade names, trademarks, copyright or trade secrets by reason of sale or use of any articles purchased. Iowa DOT shall promptly notify Supplier of any such claim.
8. **Infringement:** Goods shall be delivered free of the rightful claim of any third party by way of infringement. Contractor shall indemnify and save harmless the State of Iowa and the Iowa DOT against all claims for infringement of, and/or royalties claimed under, patents or copyrights on materials and equipment furnished under this bid.
9. **Iowa Open Records Law**: All Bid Responses are subject to terms and provisions of Iowa Code Chapter 22 Examination of Public Records (Open Records), specifically 22.7- Confidential Records.

10. **Records Audit:** The contractor agrees that the Auditor of the State of Iowa or any authorized representative of the state, and where federal funds are involved, the Comptroller General of the U.S. Government, shall have access to and the right to examine, audit, excerpt, and transcribe any directly pertinent books, documents, papers, and records of the contractor relating to orders, invoices, or payments of a contract or purchase order.
11. **Targeted Small Businesses:** The Iowa DOT seeks to provide opportunities for women and/or minority small business enterprises. To apply for certification as an Iowa Targeted Small Business, contact the Iowa Department of Inspection and Appeals (515-281-5796). Contractors shall take documented steps to encourage participation from Targeted Small Businesses for the purpose of subcontracting and supplying of goods or services or both.
12. **Taxes:** Prices quoted shall not include state or federal taxes from which the state is exempt. Exemption certificates will be furnished upon request.
13. **Termination:**
    - **Termination Due to Lack of Funds or Change in Law**
      The Iowa DOT shall have the right to terminate this Contract without penalty by giving thirty (30) days written notice to the vendor as a result of any of the following:
      - Adequate funds are not appropriated or granted to allow the Iowa DOT to operate as required and to fulfill its obligations under contract.
      - Funds are de-appropriated or not allocated or if funds needed by the Iowa DOT, at the Iowa DOT's sole discretion, are insufficient for any reason.
      - The Iowa DOT's authorization to operate is withdrawn or there is a material alteration in the programs administered by the Iowa DOT.
      - The Iowa DOT's duties are substantially modified.

Following a 30 day written notice, the Iowa DOT may terminate a binding agreement in whole or in part without the payment of any penalty or incurring any further obligation to the Supplier. Following termination upon notice, the Supplier shall be entitled to compensation upon submission of invoices and proper proof of claim for goods and services under contract up to and including the date of termination.

Section 1 Introduction

1.1 Purpose & Overview of the RFB Process

The purpose of this Request for Bid (RFB) is to solicit Bid Responses from responsible, responsive Bidders to provide the goods and/or services identified and described further in Section 3 of this RFB. The Iowa DOT may renew the contract(s) for up to the number of annual renewals as indicated. Any contract(s) resulting from the RFB shall not be an exclusive contract.

Overview: Cedar Rapids Maintenance Facility is seeking bids for the repair of the Radiant Heat system as per plans and specifications.

1.2 General

1.2.1 The owner of these projects is the Iowa Department of Transportation, 800 Lincoln Way, Ames, IA 50010

Project Location Ames Materials Analytical Lab, 800 Lincoln Way, Ames, IA 50010

Section 2 Administrative Information

2.1 Issuing Agent

The Issuing Agent, identified on the cover page is the sole point of contact regarding the RFB from the date of issuance until the notice of intent to award is issued (selection of the successful contractor).

2.2 Restriction on Communication

From the issue date of this RFB until the notice of intent to award is issued (announcement of the successful bidder), bidders may contact only the Issuing Agent.

The Issuing Agent will respond only to questions regarding the procurement process. Questions related to the interpretation of this RFB must be submitted in writing to the Issuing Officer by the deadline found in the Procurement Timetable listed immediately after the cover sheet**.** Verbal questions related to the interpretation of this RFB will not be accepted. Questions related to the interpretation of this RFB must be submitted as provided in section 2.5. Contractors may be disqualified if they contact any state employee other than the Issuing Agent. *Exception: Contractors may contact the State Targeted Small Business Office on issues related to the preference for Targeted Small Businesses. See Section 2.32.*

In NO CASE shall verbal communication override written communications. Only written communications are binding on the State.

The Iowa DOT assumes no responsibility for representations concerning conditions made by its officers or employees prior to the execution of a contract, unless such representations are specifically incorporated into this RFB. Verbal discussions pertaining to modifications or clarifications of this RFB shall not be considered part of the RFB unless confirmed in writing. All such requests for clarification shall be submitted in writing. Any information provided by the Contractor verbally shall not be considered part of that Contractor's proposal. Only written communications from the Contractor and received by the Department shall be accepted.

With the exception of the written Bid Response which must be submitted by Contractors in accordance with Section 2 herein, communications between the Issuing Agent and Contractors may be conducted by regular prepaid US mail, courier service, e-mail or facsimile transmission.

2.3 Downloading the RFB from the Internet

All correspondence for this Bid Proposal will be posted on the Iowa DOT's website at **www.iowadot.gov/purchasing/lettingschedule.** **Bidders are required** to visit the Iowa DOT's home page periodically for any and all addendums or other pertinent information regarding this bid opportunity.

2.4 Submission of Bid Responses

The Iowa DOT must receive Bid Responses addressed to the Department of Transportation, Purchasing Section, 800 Lincoln Way, Ames, Iowa 50010 before the deadline. **This is a mandatory requirement and will not be waived by the Iowa DOT**. Any Bid Response received after this deadline will be rejected and returned unopened to the contractor.

Contractors mailing Bid Responses must allow ample mail delivery time to ensure receipt by the Iowa DOT on or before the due date. Postmarking by the due date will not substitute for actual receipt of the Bid Response.

Electronic mail and faxed Bid Responses will be accepted.

Contractors must furnish all information necessary to evaluate the Bid Response. Bid Responses that fail to meet the mandatory requirements of the RFB will be disqualified. Verbal information provided by the Contractor shall not be considered part of the Contractor's Bid Response.

2.5 Nonmaterial and Material Variances

The Iowa DOT reserves the right to waive or permit cure of nonmaterial variances in the Bidder's Bid Response if, in the judgment of the Iowa DOT, it is in the Iowa DOT best interest to do so. Nonmaterial variances include minor informalities that do not affect responsiveness; that are merely a matter of form or format; that do not change the relative standing or otherwise prejudice other Contractors; that do not change the meaning or scope of the RFB; or that do not reflect a material change in the services. In the event the Iowa DOT waives or permits cure of nonmaterial variances, such waiver or cure will not modify the RFB requirements or excuse the Contractor from full compliance with RFB specifications or other contract requirements if the Contractor is awarded the contract. The determination of materiality is in the sole discretion of the Iowa DOT.

2.6 Reference Checks

The Iowa DOT reserves the right to contact any reference to assist in the evaluation of the Bid Response, to verify information contained in the Bid Response and to discuss the Contractor's qualifications and the qualifications of any subcontractor identified in the bidders Bid Response.

2.7 Information From Other Sources

The Iowa DOT reserves the right to obtain and consider information from other sources concerning a Contractor, such as the Contractor's capability and performance under other contracts, the qualifications of any subcontractor identified in the Contractor's Bid Response, specifically, the Contractor's financial stability, past or pending litigation, and publicly available information.

2.8 Verification of Bid Response Contents

The content of a Bid Response submitted by a Contractor is subject to verification. Misleading or inaccurate responses shall result in disqualification and rejection of the Bid Response.

2.9 Criminal History and Background Investigation

The Contractor hereby explicitly authorizes the Iowa DOT to conduct criminal history and/or other background investigation(s) of the Contractor, its officers, directors, shareholders, partners and managerial and supervisory personnel retained by the Contractor for the performance of the contract.

2.10 Bid Response Clarification Process

The Iowa DOT reserves the right to contact a Contractor after the submission of Bid Response for the purpose of clarification to ensure mutual understanding.

This contact may include written questions, interviews, site visits, a review of past performance if the Contractor has provided goods or services to the Iowa DOT or any other political subdivision wherever located, or requests for corrective pages in the Contractor's Bid Response. The Iowa DOT will not consider information received if the information materially alters the content of this Bid Proposal or alters the type of goods and services the Contractor is offering to the Iowa DOT. An individual authorized to legally bind the Contractor shall sign responses to any request for clarification. Responses shall be submitted to the Iowa DOT within the time specified in the Iowa DOT request. Failure to comply with requests for additional information may result in rejection of the Bid Response as non-compliant.

2.11 No Contract Rights until Execution

The full execution of a written contract shall constitute the making of a contract for services and no Contractor shall acquire any legal or equitable rights relative to the contract services until the contract has been fully executed by the successful Contractor and the Iowa DOT.

2.12 Restrictions on Gifts and Activities

Iowa Code Chapter 68B restricts gifts which may be given or received by state employees and requires certain individuals to disclose information concerning their activities with state government. Contractors are responsible to determine the applicability of this Chapter to their activities and to comply with the requirements. In addition, pursuant to Iowa Code section 722.1, it is a felony offense to bribe or attempt to bribe a public official.

The laws of Iowa provide that it is a felony to offer, promise, or give anything of value or benefit to a state employee with the intent to influence that employee's acts, opinion, judgment or exercise of discretion with respect to that employee's duties. Evidence of violations of this statute will be submitted to the proper prosecuting attorney.

2.13 No Minimum Guaranteed

The Iowa DOT anticipates that the selected Contractor will provide services as requested by the Iowa DOT. The Iowa DOT will not guarantee any minimum compensation will be paid to the Contractor or any minimum usage of the Contractor's services.

2.14 Conflicts Between Terms

The Iowa DOT reserves the right to accept or reject any exception taken by the Contractor to the terms and conditions contained in this RFB. Should the Contractor take exception to the terms and conditions required by the Iowa DOT, the Contractor's exceptions may be rejected and the entire proposal declared nonresponsive. The Iowa DOT may elect to negotiate with the Contractor regarding contract terms that do not materially alter the substantive requirements of the request for proposals or the contents of the Contractor's Bid Response.

2.15 Contractors Responsibilities

2.15.1 Codes, Laws and Regulations

The laws of the State of Iowa in relation to and pertaining to public improvements shall apply to these projects. All construction, materials and methods shall comply with the State and Local Building Codes and with Local Ordinances, except where plans and specifications establish a higher standard.

2.15.2 Licenses, Permits and Inspections

The Bidders shall comply with all codes, laws, ordinances, rules and regulations of any public authority having jurisdiction that bears on the performance of its work. Bidders shall pay for all licenses, permits and inspection fees required for its work. Bidders must furnish copies of all approved inspection certificates and approvals from authorities having jurisdiction in a timely fashion upon completion of the work.

2.16 Consideration of Bids

2.16.1 Rejection of Bids

- The Iowa DOT reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the Iowa DOT that such bidder is properly qualified to carry out the obligations of the Contract and to complete the work contemplated therein.
- Conditional bids will not be accepted.

2.16.2 Qualification of Bidder

The Iowa DOT may make such investigations as they deem necessary to determine the ability of the Bidder to perform the required work, and the bidder shall furnish to the Iowa DOT all such information and data for this purpose as the Iowa DOT may request.

2.17 Performance and Payment Bonds

2.17.1 Bonds

If the contracted estimated value is $25,000 or more, the Bidder shall furnish bonds covering the faithful performance of 100% of the Contract and the payment of all obligations arising thereunder. One copy of the bond shall be submitted on Iowa Department of Transportation Form 131070. All items must be properly filled in, including Bidder's signature. Resident commission agent or attorney-in-fact must file a copy of the power of attorney.

2.17.2 Power of Attorney

Attorney-in-fact who signs the Bid Bond, Performance Bond, and Labor and Material Payment Bond must file with each bond a certified and effectively dated copy of the Power of Attorney.

2.18 Labor Regulations

All Bidders, before entering into a contract with the Department, must be registered with the Division of Labor in the Iowa Department of Workforce Development (515-281-3606) according to chapter 91C, Code of Iowa 2015. This pertains to contractor's who engage in the business of construction.

Section 3 General Requirements

3.1 Scope of Work

Successful Bidder shall be required to provide all materials, labor, and equipment necessary to replace 2 VAV boxes for Analytical Lab at the Ames Materials Lab as per the plans and specifications.

- Warranty period of one (1) year for parts and labor
- Start date: February 22, 2016 Completion date: March 31, 2016
- See Attached specifications and plans.
- All work to be coordinated with Brett Hambly, 515-239-1275.

3.2 Adoption of General Conditions

3.2.1 The General Requirements of this Contract shall include the "General Conditions", "Plans and Specifications" and any and all requirements of this RFB, as herein stated.

3.2.2 **3.2.3** All bidder information and conditions, bid check lists and similar documents included in the specifications issued by the Iowa DOT, Ames, Iowa are hereby made a part of the General Conditions.

3.2 Contractor Response

3.3.1 Guidelines

- Contractors shall comply with Iowa Occupational Safety and Health Standards as found in 29 CFR Parts 1910 and 1926. Of particular importance are those standards referring to the use of personal protective equipment (PPE), fall protection and ventilation.

- Contractor may be required to make available to the Iowa DOT all Material Safety Data Sheets (MSDS) for all products provided at time the apparent low bidder has been determined. MSDS shall be sent to the Issuing Agent (when applicable) prior to issuance of the contract.

3.3.2 Guarantee

The Contractor shall guarantee all work executed under this contract, both as the workmanship and materials, for a period of twelve (12) months after the substantial completion date. Neither the final payment nor any provision of the contract documents shall relieve the Contractor of responsibility for faulty materials or workmanship. The Contractor shall remedy any defect thereto and pay for any damage to other work resulting therefrom, which shall appear within a period of one (1) year from the date of the final acceptance. With one month remaining in the guarantee period, the Contractor shall notify the Iowa DOT and set up a complete walk-through inspection.

- All materials, items of equipment, and workmanship furnished under this division of the specifications shall carry the standard warranty against all defects in material and workmanship. Any fault due to defective or improper material, equipment, or workmanship which may develop, shall be made good, forthwith.

- The Guarantee shall include, but not be limited to the following elements and services:
    a. Repair or replace defective materials, equipment, workmanship and installation that develops within the guarantee period, promptly and to Iowa DOT's satisfaction and correct damage caused in making necessary repairs and replacements, including all other damage done to areas, materials, and other systems resulting from the failure or defect, under guarantee by and at the expense of the Contractor.
    b. Replace material or equipment that requires excessive service during guarantee period, as defined and as directed by the Iowa DOT.
    c. Make all service calls, replacements, repairs and adjustments during the guarantee period without cost to the Iowa DOT.

3.4 Sub-Contractors

- The Successful Bidder for the project shall furnish the Iowa DOT with a complete list of subcontractors, schedule of values, and major material suppliers at the pre-construction meeting.
- The Iowa DOT shall approve and maintain the list of subcontractors and major suppliers and issue a general approval of same after official award of the contract, subject to the specific requirements of the Plans, Specifications and the "General Conditions of the Contract, and of these supplementary Conditions," " Special Provisions," and elsewhere with contract documents, as applicable. Deviations from the list of subcontractors and material suppliers shall be made only with the specific approval of, or at the request of the Iowa DOT.

3.5 Protection of Persons and Property

3.5.1 Safety and Health Regulations

The Contractor, serving in the role of the employer for the project, shall exercise at all times the protection of all persons and property. Contractor shall comply with all requirements of the Occupational Safety and Health Act of 1970, Iowa Bureau of Labor and all applicable state and municipal laws, as well as building and construction codes. It is the Contractor's responsibility to enforce all regulations that apply to these projects.

3.5.2 Protection of Site

The Contractor shall furnish all permanent and temporary guards, signs, fencing, shoring, and underpinning and other protection necessary in the performance of the contract and for the necessary protection of all public and private property and shall be responsible for any damage caused by failure to comply with this requirement.

- After building operations are completed, the Contractor shall replace or satisfactorily repair all damaged walks or pavements which shall have become damaged due to operations of these projects.
- The Contractor shall take care of all underground pipes, conduits, etc., encountered in the excavations, and protect same from damage until such time as they can be permanently disposed of.

- The Contractor shall continuously maintain adequate protection of all work from damage and shall protect the Owner's property and adjacent property from damage arising in connection with this contract.

3.6 Miscellaneous Provisions

3.6.1 State of Iowa Building Code

- All construction under this section shall conform to the requirements of the Iowa State Building Code. The provisions of the Iowa State Building Code will be strictly adhered to, and will take precedence over any local Governmental Body Regulations. Work not regulated by the Iowa State Building Code shall be performed in accordance with local Governmental Body Regulations.
- All construction shall conform to the Standard Specifications for Highway and Bridge Construction, Series 2012 where applicable.

3.6.2 Discriminatory Practices

- All Contractors or subcontractors working under the terms of these projects are prohibited from engaging in discriminatory employment practices as forbidden by the Iowa Civil Rights Act of 1965. These provisions shall be fully enforced, as directed through Executive Order Number 34 dated July 22, 1988. Any breach of the provisions contained in the Iowa Civil Rights Acts of 1965 shall be regarded as a material breach of contract.

- Bidder agrees that if awarded a contract to construct and/or remodel any portion of the project described in these Specifications, neither the Contractor nor any subcontractors will engage in any discriminatory employment practices based on race, color, creed, religion of natural origin and that they will in all contracts comply with all statutes of the State of Iowa against discrimination. Failure to do so could be deemed a material breach of contract.

3.7 Contractors Responsibilities

3.7.1 Pre- bid / Site Visit

[X] Non- Required Pre- bid meeting with site visit. This is not a mandatory meeting but is highly recommended that prospective bidders attend the following scheduled meeting where DOT staff will be available. To address any questions or concerns regarding the project.

Pre-bid Date: February 9, 2016 Time: 1:30 P.M. Location: Iowa Department of Transportation Administration Building, Front Security Desk, 800 Lincoln Way, Ames, IA
Please contact Laura Linduski to acknowledge attendance by email; laura.linduski@dot.iowa.gov or by phone; 515-239-1429.

- No considerations or revision in the contract price or scope of the project will be considered by the Iowa DOT for any item which could have been revealed by a thorough on-site inspection and examination or pre- bid meeting.

- In an effort to seek competitive bids the DOT reserves the right to schedule a second pre-bid meeting in the event only one or no vendors are in attendance at the scheduled mandatory pre-bid. The Potential Bidder in attendance at the scheduled pre-bid will not be required, but is welcome to attend the second pre-bid if they choose.

3.7.2 Conditions of Work

Bidders must inform themselves fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve successful bidders of their obligation to furnish all material and labor necessary to carry out the provisions of this contract. Insofar as possible, the Contractor, in carrying out the work, must employ such methods or means as will not cause any interruption of, or interference with the work of any other Contractor.

3.7.3 Obligation

- At the time of the bid opening, each bidder will be presumed to have read and become thoroughly familiar with the drawings, specifications, and other contract documents, including all addenda.
- Bidders are responsible for the proper submission of bids. Omissions by a bidder to examine a form, instrument, or document shall in no way relieve that bidder from any obligations in respect to their bid.

3.8 Bid Proposal Documents

3.8.1 Plans and Specifications

Electronic Plans and specifications are available on the Iowa DOT's website, www.iowadot.gov/purchasing. The Bidder is responsible for all copies of plans and specifications necessary for the execution of the work.

In the event of a conflict between the specifications and the drawings, the specifications shall take precedence.

3.8.2 Materials

Manufacturers and products, in addition to those specifically listed, may be acceptable when it is proven to the satisfaction of the Iowa DOT that:

a. The level of quality proposed is equal to or better than that of the referenced manufacturer/Bidder's quality.
b. The technical characteristics of the proposed product meet or exceed the requirements of the drawings and specifications.
c. The use of the materials or equipment does not require major revisions of the drawings and specifications to permit their use.

- Any additional cost in other work incurred as a result of these approvals shall be borne by the Contractor, including all costs for modifying other related materials/systems and the cost of any additional engineering or design fees required to accommodate the substitution/approval.
- Contractors must be confident that a proposed product or material meets or exceeds the requirements shown on the drawings and specifications. It will be the responsibility of the Contractor to verify and demonstrate that a proposed product meets or exceed the drawings and specifications at time of shop drawing reviews. If a proposed product or material is determined to be technically unacceptable as judged by the Iowa DOT, the Contractor shall be required to supply products or materials that meet the

requirements required to supply products or materials that meet the requirements stated in the drawings and specifications at no cost increase to the Iowa DOT. Under no circumstances will the Iowa DOT be required to prove that proposed substitutions is not equal to the project requirements. The decision of the Iowa DOT on all requested proposals/substitutions is final.

Section 4 Contract Terms & Conditions

4.1 Contract Award

Award will be based on the total lump sum amount of bid price shown on the Schedule of Prices. The DOT will award to the lowest, most responsive, responsible bidder. The Iowa DOT reserves the right to accept the bid(s) which best serves the interest of the State.

Bid price will include all requirements listed in Section 3 to complete this proposed project. The Prime Contractor shall be responsible for taking all sub-bids and for all coordination between trades.

A "Prime" contract shall be awarded for each project for all work shown on the Drawings and described in the Specifications including Site work, General construction, Demolition, Plumbing, Mechanical, Energy management and control and Electrical work. The Prime Contractor shall be responsible for taking all sub-bids and for all coordination between trades.

Protests of award recommendations shall be made in accordance with Paragraph 761--20.4(6)"e", Iowa Administrative Code.

4.2 Contract Period

See Bid Proposal timeline for dates. The date of completion shall be stated in calendar days on the Bidder's Bid Response, and if necessary, adjusted by mutual agreement between the Iowa DOT and successful bidder prior to executing the contract documents.

The Iowa DOT realizes that deliveries and site conditions have a definite bearing on the completion date. The Iowa DOT will demand diligence in the prosecution of the work, but with good cause and satisfactory past performance by the Contractor, the Iowa DOT may revise the completion date to another mutually-acceptable date, when requested in writing and in good faith by the Contractor.

4.3 Immunity of Iowa Department of Transportation

The Contractor shall defend, indemnify and hold harmless the Iowa DOT and its officials and employees from liability arising out of or resulting from the Contractor's activities at the designated work site, its performance or attempted performance of the contract, as well as the Contractor's activities with Sub-Contractors and all other third parties.

4.4 Payments and Completion of Contract

4.4.1 At the Pre-Construction Conference, the contractor shall submit a schedule of values of the various parts of the work, aggregating the total sum of the contract, made out in such form as the Iowa DOT may direct and, if required, supported by evidence as to its correctness. This schedule, when approved by the Iowa DOT, shall be used as a basis for requests for payment.

4.5.2 Final payment shall be authorized not later than thirty (60) days following the completion and final acceptance of the contract, provided that the provisions herein and all other contract requirements have been fulfilled, accepted and approved, where no claims have been filed or following adjudication or release of claims as provided in Chapter 573 of the Code of Iowa.

4.5.3 No notification of payment being processed, no payment made to the Contractor, no partial payment, nor the entire use or occupancy of the work by the Iowa DOT shall be held to constitute an acceptance, in whole or in part, by the Iowa DOT prior to making the final payment and acceptance in full completion of the contract.

4.6 Insurance Requirements

Contractor's Insurance

- It shall be the Contractor's responsibility to have liability insurance covering all of the project operations incident to contract completion and the Contractor(s) must have on file with the Contracting Authority a current "Certificate of Insurance" prior to award of contract. The certificate shall identify the insurance company firm name and address, contractor firm name, policy period, type of policy, limits of coverage, and scope of work covered (single contract or statewide). This requirement shall apply with equal force, whether the work is performed by persons employed directly by the Contractor(s) including a subcontractor, persons employed by a subcontractor(s), or by an independent contractor(s).

- In addition to the above, the Iowa DOT shall be included as an insured party, or a separate owner's protective policy shall be filed showing the Iowa DOT as an insured party.

- The liability insurance shall be written by an insurance company (or companies) qualified to do business in Iowa. For independent contractors engaged solely in the transportation of materials, the minimum coverage provided by such insurance shall be not less than that required by Chapter 325A, Code of Iowa, for such truck operators or contract carriers as defined therein. For all other contractors, subcontractors, independent contractors, and the Contracting Authority, the minimum coverage by such insurance shall be as follows:

- *Commercial General Liability* including Contractual Liability;
- Contingent Liability; Explosion, Collapse and Underground Drainage
- Damage; Occurrence Basis Bodily Injury: Broad Form Personal Injury; Broad Form Property Damage.

Bodily Injury

The contractor will purchase and maintain throughout the term of this contract the follow minimum limits and coverage:

- Each person $750,000
- Each accident/occurrence $750,000
- Workers Compensation $750,000
- Statutory Limits $750,000
- Employer's liability $750,000
- Pollution Liability $750,000
- Occupation Disease $750,000

Operations

- Property Damage $250,000 each occurrence

Builders Risk Insurance

- Each Contractor holding a valid contract with the Iowa DOT shall furnish and pay for builder's risk insurance, providing coverage for at least the following losses: fire, extended coverage, vandalism and malicious damage to materials incorporated in the project, and materials purchased to be incorporated in the project, either stored on or off the permanent job site. If this insurance coverage is not provided, the Contractor shall assume all responsibility for the perils outlined above which may occur prior to project completion and acceptance.
- Failure on the part of the Contractor(s) to comply with the requirements of this Article will be considered sufficient cause to suspend the work, withhold estimates, and to deny the Contractor(s) any further contract awards, as provided in Article 1103.01.
- The Contractor(s) shall require all subcontractor(s) meet the above insurance requirements.

The Certificate of Insurance must include the following

- Iowa Department of Transportation must be listed as an additional insured
- Proposal Number
- Proposal Description
- Letting Date
- Contract Period

4.7 Public Contract Termination

The provisions of Iowa law as contained in Chapter 573A of the Code of Iowa, an Act to provide for termination of contracts for the construction of public improvements when construction or work thereon is stopped because of national emergency, shall apply to and be a part of this Contract, and shall be binding upon all parties hereto, including sub-contractors and sureties upon any bond given or filed in connection herewith.

PROJECT MANUAL

IOWA DOT
Analytics Lab VAV Replacement

800 Lincoln Way
Ames, IA 50010

IA DOT Project No. BG-XXX(XXX)—XX-XX

IOWA DEPARTMENT OF TRANSPORTATION
800 Lincoln Way
Ames, Iowa 50010

BROOKS BORG SKILES
ARCHITECTURE ENGINEERING LLP
317 - 6th Avenue, Suite 400
Des Moines, Iowa 50309-4108
phone: (515) 244-7167 fax:(515) 244-3813
Project 15044

IOWA Department of Transportation

Analytics Lab VAV Replacement

800 Lincoln Way
Ames, IA 50010

	I hereby certify that this engineering document was prepared by me or under my direct supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa. _____, 20_____ Susan R. Oltrogge, P.E. License number:_____ My license renewal date is December 31, 2017 Discipline ____Mechanical Engineering_____ Specification Divisions covered: _____Divisions 26_____ Date issued ___January 15, 2016_____

IOWA DEPARTMENT OF TRANSPORTATION
ANALYTICS LAB VAV REPLACEMENT
800 Lincoln Way
Ames, IA 50010
IA DOT Project No. BG-3A22(036)—80-85

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CONTRACTOR SAFETY AND SECURITY REQUIREMENTS

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PART 1 - GENERAL

1.1 PURPOSE, SCOPE AND PHILOSOPHY

A. This section defines safety requirements, which Contractor shall comply with and enforce on all State of Iowa worksites. This section also addresses conditions of work and the manner in which owner expects work on their premises to proceed.

B. Failure of this section to reference specific laws, ordinances, codes, rules, regulations or orders does NOT excuse Contractor or Contractor employees from following those regulations that may be applicable to the scope of work being performed by Contractor. Contractors may employ more restrictive or stringent safety measures in order to comply with specific laws, ordinances, codes, rules, regulations, orders or requirements of Contractor's own safety program or employee safety training.

C. The safety requirements may be exceeded by the specific safety rules and procedures of individual operating entities. Contractor and Owner safety representatives shall coordinate to resolve conflicting statements.

D. Contractor shall be aware that the spaces used for construction during this Contract will be occupied by Owner personnel during the entire construction period. All measures necessary will be taken to ensure a safe working environment for Contractor and Owner personnel.

E. Contractor shall not permit any person to enter upon the premises of Owner at the worksite or non-public building entrances, except in accordance with the safety and security requirements

of Owner, or such governmental authority having an interest in the work. Should any unforeseen considerations or problems arise, they shall be resolved by mutual agreement, recognizing that personnel safety is of paramount importance.

1.2 REFERENCES

A. The publications listed below and its supplements, including but not limited to, form a part of these requirements:
   1. U.S. Department of Labor - Occupational Safety and Health Administration (OSHA).
   2. National Crime Information Center (NCIC).
   3. National Fire Protection Association (NFPA).
   4. National Electrical Code (NEC) - Refer to NFPA 70.
   5. Standard for Electrical Safety in the Workplace – Refer to NFPA 70E.
   6. American National Standards Institute, Inc. (ANSI).
   7. The Material Handling Institute, Inc. (MHI) - Refer to Crane Operators Manual.
   8. Environmental Protection Agency (EPA).
   9. Uniform Fire Code or applicable fire code.
   10. Uniform Building Code or applicable building code.

B. Where a standard is referenced in this document, the subject referenced (equipment, material or work) shall be in compliance with the most recent edition of that standard.

C. The referenced standards are minimum requirements. Where the requirements of this document are in excess of, but not contrary to, the referenced standards, Contractor shall comply with the more stringent requirements.

1.3 OWNER'S FACILITY SECURITY REQUIREMENTS AND SAFETY INDOCTRINATION

A. At Owner's option, Contractor employees (or select employees) may be required to possess and display an Owner issued ID or Photo ID.

B. Contractor shall obtain from Owner any safety rules and regulations in effect at Owner's specific worksite. Contractor will be responsible for requiring all of Contractor's employees (including Sub-Contractor employees) to receive and ensure comprehension of this information prior to beginning work.

1.4 PERMITS

A. Safety permits may be required for certain work activities on Owner worksites. Examples include, but are not limited to the following:
   1. Any work such as drilling, soldering, welding, or other work which may burn or produce a flame, including the use of an open flame or any other heat-generating or spark-producing device shall require an "Open-Flame, Cutting, and Spark Hazard Permit" by Contractor to be completed before work begins. Refer to Article 1.6 for welding, cutting and spark production requirements.
      a. As required, the Contractor shall submit a copy of the "Open Flame, Cutting, and Spark Hazard Permit" for review and approval prior to commencement of work if such conditions may be encountered during work.
   2. To perform electrical work on transformers, panels or other equipment shall require a "Lock-Out/Tag-Out Permit" by Contractor to be completed before work begins. Refer to Article 1.7 for electrical work and lock-out/tag-out procedures.
      a. As required, the Contractor shall submit a copy of the "Lock-Out/Tag-Out Permit" for review and approval prior to commencement of work if such conditions may be encountered during work.

B. It is imperative that the conditions noted on the permit(s) are identical to the actual job conditions. When the nature or conditions of a job change in any way, or when new tools are required or different methods are employed to do the job, other than those originally covered in the initial permit, WORK SHALL STOP IMMEDIATELY because the permit is invalid. The permit is only good for what it describes - no more. Work cannot progress until the situation can be carefully analyzed and a new permit issued for the new conditions.

C. Communication is the key to enhancing the effectiveness of the work permits system. Contractor's employees, agents, delegates, invitees and subcontractors and Owner's Designated Representative, including operators and facility supervisors, must all be aware of the permit process and the specific requirements of each permit. This then allows each to review the ongoing work and look for possible changing conditions or deviations during their daily work routine. Permits may only be requested and obtained by Contractor's Designated Representative. After the permit has been issued, but before any work has been performed, the Contractor's copy of the permit shall be read and initialed by Owner's Designated Representative. This assures both Contractor and Owner Designated Representative's knowledge and involvement. After the Owner's Designated Representative has initialed the permits the Contractor's Designated Representative shall distribute the permit to Contractor employees performing that work. Contractor's Designated Representative shall make sure Contractor employees read the permit requirements. These permits must be posted in the work area. If the permit cannot be posted, it must be carried by one of Contractor supervisors in that area. Owner's Designated Representative will, as a routine, periodically question Contractor employees as to the location of the permit and its requirements. Permits are valid for only one day. Permits shall not remain in Contractor's trailer (if a job trailer is required). Permits shall be returned to the Owner's Designated Representative at the end of the day. A historical record shall be maintained by the Owner.

1.5 FIRE PROTECTION AND PREVENTION

A. Contractor's personnel shall observe owner's fire safety rules and regulations and evacuation procedures.

B. Contractor shall provide the number of fire extinguishers and fire protection devices required by law and any additional protection devices required by Owner. Contractor shall also maintain the equipment in good operating condition (i.e., fully charged). All fires and types of extinguishing equipment used shall be promptly reported to Owner's Designated Representative.
   1. A fire extinguisher, rated not less than 2A, must be provided for each 1,500 square feet of the protected building area with travel distance from any point to the nearest extinguisher not to exceed 75 feet.

C. Contractor shall be responsible for the development of a fire protection program to be followed throughout all phases of the construction work and shall provide for the fire-fighting equipment in accordance with OSHA regulations, these guidelines, and the requirements appropriate to the type of construction being performed. This shall include, but not be limited to:
   1. All fire-fighting equipment provided by Contractor shall be conspicuously located, free for access, periodically inspected, and maintained in good operating condition. Defective equipment shall be replaced immediately. Contractor shall give particular attention to training Contractor's personnel in the use of fire extinguishers and their limitations.
   2. Installation of an automatic sprinkler protection system(s) must follow the construction work sequence as soon as possible and be placed in service as soon as applicable laws permit.
   3. The telephone number(s) of the nearest appropriate fire department(s) and Owner's security/emergency number(s) shall be conspicuously posted.

4. All smoking areas shall be designated by Owner's Designated Representative. Smoking shall be prohibited elsewhere, including on all roofs and in areas where flammable or combustible liquids and materials are used and stored. No smoking on state property.

D. Fire prevention program shall also include analysis of potentially hazardous materials, identifying hazardous area classifications, developing guidelines for storage and handling and using items such as fuel oils, flammable gases, solvents, plastics and paints.

E. Notify Owner of areas where work will take place that will produce dust or smoke that may affect cleanliness or function of fire alarm system smoke detectors. Owner may elect to disable devices to prevent false alarms. Contractor shall protect devices and ensure protection (such as covers or bags) are removed upon completion of work in this immediate area. Inform Owner when work is complete so that proper fire alarm system protection can be restored to the area.

1.6 WELDING, CUTTING AND SPARK PRODUCTION

A. Contractor's personnel shall observe Owner's safety regulations regarding welding, cutting and spark production.

B. Provide Owner's Designated Representative a minimum of 48 hours notice for all welding and cutting operations to take place within mechanical spaces with air moving equipment. Timing of such work will be coordinated to take place after normal business hours for the building to allow shutdown of air moving equipment to preclude propagation of fumes throughout building spaces.

C. Proper precautions (isolating welding and cutting, removing fire hazards from the vicinity, providing a fire watch, etc.) for fire prevention shall be taken in areas where welding or other "hot work" is being done. The "Open-Flame, Cutting, and Spark Hazard Permit" must be issued by the facility designated person at the request of the Owner's Designated Representative prior to any welding, cutting or other "hot work" being performed. No welding, cutting or heating shall be done where the application of flammable paints or the presence of other flammable compounds or ignitable dust concentration creates a fire hazard.

D. Contractor shall exercise extreme care in the use of all open flame equipment. Owner's Designated Representative shall be informed daily of all such activities. The following items are of particular importance and shall be strictly enforced by Contractor:
   1. Contractor shall enforce strict compliance with the above "Open-Flame, Cutting, and Spark Hazard Permit".
   2. Contractor's welding, cutting or spark production shall be permitted in flammable liquid areas only if vapor checks are made and automatic sprinklers are in service.
   3. Contractor shall use fire-resistant tarpaulins to contain sparks and hot metals.
   4. Contractor shall confine flammable liquids in approved safety containers.

E. Contractor shall perform welding and cutting in accordance with OSHA regulations. These shall include, but not be limited to:
   1. All exposed combustible materials located below the welding and cutting area shall be removed to a safe location, covered with a fire-resistant material or protected by an approved spark catcher to contain all sparks and slag.
   2. A fire extinguisher suitable for the hazards must be within the immediate area of any welding, cutting, or open flame work. A welder's helper or fire watcher shall be required whenever cutting or welding is performed in locations where a fire might develop.
   3. The user shall inspect all leads, grounds, clamps, welding machines, hoses, gages, torches and cylinders before they are put into operation. Leads must not be placed in traffic areas.
   4. All fittings, couplings and connections are to be "leak-free".

5. Provide adequate ventilation while cutting, welding, soldering or working on galvanized material and while working within enclosed shelters.
6. All work shall have a separate and adequate ground, pulled from the welding machine to the item being welded.
7. At the end of each shift (or when not in use for extended periods or unattended), the welding machine shall be turned off.
8. An approved welding helmet shall be worn.
9. Electric welding is prohibited from any metal ladder. (Metal ladders are not permitted on site.)
10. Compressed gas cylinders shall be secured vertically to an adequate support while in storage or transit. The protective cap must be on during storage and transit. All oxygen cylinders shall be separated while in storage from any flammable gas such as LP or acetylene cylinders by a 5 foot high fire barrier having a 1/2 hour fire rating or separated by a minimum distance of 20 feet. Under no circumstances shall acetylene cylinders be laid down.
11. Keep oil and grease away from oxygen regulators, hoses and fittings. Do not store wrenches, dies, cutters or other grease covered tools in the same compartment with oxygen equipment.
12. Approved cutting goggles shall be worn.
13. Gloves shall be worn to protect hands and wrists. Flying chips and weld slag travel a considerable distance and may be dangerous to other personnel in the area and, therefore, shall require screening or shielding. Heavy leather work gloves, long sleeve shirts or jackets and goggles or a full face shield shall be worn when welding, cleaning, grinding, and brushing surfaces. The same precautions shall be taken for wire brushing and power brushing. Flame-resistant aprons of leather or other suitable material shall be worn as protection against radiating heat and sparks. Clothing should be free of oil and grease.
14. Torches shall never be left in a vessel due to potential leaks.
15. Oxygen shall not be used to operate pneumatic tools, pressurize a container, blow out lines or as a substitute for compressed air or other gases.
16. Cylinders and hoses shall be placed where they are not exposed to sparks and slag from a welding or cutting operation.
17. Cylinders shall be raised to upper levels with approved rigging gear. Do not lift them with slings or by the protective cap.
18. Do not strike an arc on cylinders or use them as rollers.
19. Cutting/burning units must have hoses bled and gages zeroed when not in use.

1.7 ELECTRICAL WORK AND LOCK-OUT/TAG-OUT PROCEDURES

A. General Requirements:
1. All electrical work shall be performed by qualified personnel. Work shall be performed on locked out de-energized circuits whenever possible. Exceptions include: testing of circuits, working on a portion of a continuous industrial process where shutdown of the entire process is not feasible, etc. Work on energized parts shall follow requirements of OSHA.
2. All electrical work, installation, and wire capacities shall be in accordance with the pertinent provisions of NFPA 70 (latest revision) and area classifications.
3. The construction and installation of permanent and temporary electrical power shall comply with OSHA standards.
4. Contractor shall be in compliance with Lock-out/Tag-out procedures prior to starting electrical work, which involves cutting, splicing or tapping existing cables. Contractor shall tag and identify all cables present in the area. Contractor shall check to make sure that the circuit to be worked on has been de-energized and the source locked out. Contractor shall use its own padlock on the disconnect device. Review one line diagram to be sure there are no alternate power sources.

a. Contractor will check for energized cable with a device intended for the purpose before cutting into the cable or opening a splice or termination. Solidly ground the cable to a KNOWN low resistance ground point while working on the cable.

b. Electrical lines shall be de-energized while work is performed with the energy control source locked out. When it is necessary to work with energized lines, only qualified personnel and effective means of personal protection shall be utilized in accordance with NFPA 70E, such as, but not limited to, rubber gloves and blankets which have been tested regularly in accordance with ANSI.

5. At least two people shall be assigned to work on any energized lines or in substations.

B. Grounding Requirements:

1. All electrical circuits shall be grounded in accordance with the NEC, unless otherwise noted in this specification.
2. A ground shall be provided for non-current-carrying metallic parts of equipment such as: generators (if not exempted by NEC 250-6), electrically powered welders, switches, motor-controller cases, fuse boxes, distribution cabinets, frames, non-current-carrying rails used for travel, motors of electrically operated cranes, electric elevators, metal frames of non-electric elevators to which electric conductors are attached, other electric equipment and metal enclosures around electric equipment.
3. Portable and semi-portable electrical tools and equipment shall be grounded by a multi-conductor cord having an identified grounding conductor and a multi-contact polarized plug-in receptacle.
4. Semi-portable equipment, floodlights and work lights shall be grounded. The protective ground of such equipment shall be maintained during moving unless supply circuits are de-energized.
5. Tools protected by a system of double insulation, or its equivalent, need not be grounded. Double-insulated tools shall be distinctly marked and listed by UL or FM.
6. Grounding circuits shall be checked to ensure that the circuit between the ground and a grounded power conductor has a resistance, which is low enough to permit current flow sufficient to cause the fuse or circuit breaker to interrupt the current.
7. Conductors used for bonding and grounding stationary and movable equipment shall be of ample size to carry the anticipated current. When attaching bonding and grounding clamps or clips, a secure and positive metal-to-metal contact shall be made. The ground end shall be attached first and the other end shall be attached and removed by insulated tools or other suitable devices. When removing grounds, the grounding device shall first be removed from the line or equipment using insulated tools or other suitable devices. Such bonding and grounding attachments shall be made before closures are opened and material movements are started and should not be broken until after material movements are stopped and closures are made.
8. All 120-volt single-phase 15 and 20 ampere receptacle outlets which are not a part of the permanent wiring of the building or structure shall have ground-fault circuit interrupters (GFCI) for personnel protection or an assured equipment-grounding conductor program. Permanent wiring of electrical circuits shall be grounded in accordance with NEC. GFCI's may be sensitive to some equipment such as concrete vibrators. In these instances, other precautions shall be taken to protect the equipment.

C. Temporary Wiring:

1. Temporary wiring shall be guarded or isolated by elevation to prevent accidental contact by workers or equipment.
2. Flexible/extension cord sets shall be of a type listed by the UL. Flexible/extension cord sets used on construction worksites shall contain the number of conductors required for the service, plus an equipment ground wire. The cords shall be hard usage or extra-hard usage as specified in the NEC. Approved cords may be identified by the word "outdoor" or letters "WA" on the jacket. All portable receptacle boxes must be approved for outside use (free of knock out plugs).

3. Exposed empty light sockets and broken bulbs shall not be permitted. Replace missing or broken lamps as soon as possible.
4. Temporary lights shall be equipped with heavy-duty electric cords with connections and insulation maintained in safe condition. Temporary lights shall not be suspended by their electric cords unless cords and lights are designed for this suspension. Splices shall have insulation equal to that of the cable.
5. Temporary lights shall be equipped with guards to prevent accidental contact with the bulb.
6. Attachment plugs for use in work areas shall be constructed so that they will endure rough use. They shall be equipped with a cord grip to prevent strain on the terminal screws.

1.8 CONTRACTOR'S SAFETY TRAINING AND EDUCATION

A. Contractor shall instruct each employee in the recognition and correction of unsafe acts, behavior and conditions and the regulations applicable to contractor's work environment. The employee shall use these instructions to control or eliminate any hazards or other exposure to illness or injury.

B. Contractor shall acquaint each Contractor employee with the safety and emergency equipment available and the procedures to be followed in each type of emergency.

C. At a minimum, each Contractor shall be required to conduct weekly safety meetings with Contractor personnel and Subcontractors. Minutes must be kept and submitted to the Owner's Designated Representative, if requested.

D. Contractor shall provide a qualified employee who is responsible for maintaining worksite safety during all phases on worksite. The qualified employee shall conduct safety meetings with all personnel weekly, monitor site safety continuously, and thoroughly investigate all accidents and near misses. The qualified employee may have other worksite responsibilities.

E. All Contractor personnel shall receive an initial indoctrination by Contractor's safety supervisor into Contractor's safety procedures and the requirements of this section.

F. Before work begins, Contractor shall provide to Owner a hazardous chemical inventory for contractor-supplied hazardous materials and corresponding MSDS information. Contractors are required to inform Owner's Designated Representative of hazardous substances brought on worksite and to update the hazardous chemical inventory.
   1. The hazardous chemical inventory, along with all update information shall be made available to Owner's Designated Representative on a regular scheduled basis with copies of MSDS information as requested by Owner.

G. Contractors are required to strictly enforce container labeling. Labels are to include the identity of the substance and the appropriate hazard warning on all containers of hazardous substances.
   1. In the event that containers suspected of containing hazardous substances are received without the manufacturer's label, the shipment shall be rejected. All containers of hazardous substances shall be appropriately labeled and identified.
   2. If a shipment of properly labeled containers is received by Contractor without a MSDS, Contractor shall immediately request the MSDS from the manufacturer; a copy of the written request shall be submitted to Owner's Designated Representative. The MSDS is not required for subsequent deliveries of the same product.

H. Contractors are responsible for educating their personnel on the requirements of the Federal Hazard Communication Standard regarding hazardous chemical inventories, MSDS information, container labeling and evacuation procedures.

I. Documentation of employee training is of paramount importance to ensure Federal Hazard Communication Standard compliance. Contractor shall keep complete and accurate records of Contractor personnel training and attendance. This documentation, as well as the hazardous chemical inventory and MSDS file, shall be ready for audit at any time by either Owner's Designated Representative or an OSHA inspector.

1.9 RECORDING AND REPORTING OF INJURIES

A. Every Contractor and Subcontractor shall keep occupational injury and illness records for employees which shall include the following forms:
   1. Supplementary Record of Occupational Injuries and Illnesses or a "First Report of Injury/Illness" as required by the state.
   2. Log and Summary of Occupational Injuries and Illnesses.
   3. Any state safety and health records required.

B. Contractor shall notify Owner of the name of Contractor's employee who will be knowledgeable in the prevention of accidents at the worksite, and whose duty will be to report immediately to Owner's Designated Representative, all accidents and injuries occurring at the worksite. A written report shall be filed with the Owner as soon as practical. If Contractor is required to file an accident report with a public authority, Contractor shall provide a copy of the report to Owner.

C. Contractor shall investigate each OSHA recordable accident to determine the cause and implement future corrective measures. Contractor shall present a written copy of its investigation report and corrective action measures to Owner's Designated Representative.

D. Every Contractor and Subcontractor shall provide the total employee hours worked each day on the worksite to the Owner's Designated Representative or according to the local facility procedures.

1.10 FIRST AID AND MEDICAL ATTENTION

A. All first aid and medical attention for Contractor's workers shall be handled by Contractor in accordance with OSHA regulations.

B. Contractor shall set up a first aid station in compliance with OSHA and state regulations.

1.11 PERSONAL PROTECTIVE EQUIPMENT

A. Contractor is responsible for providing and requiring employees to wear appropriate personal protective equipment for all operations where there is an exposure to hazardous conditions, where there is the need for using such equipment to reduce the hazards to employees, where required by the specifications or where required by plant operating procedures. The most stringent requirements shall take precedence and shall include, but not be limited to:
   1. Hard hats (metal hard hats shall not be worn), safety glasses and full-length trousers are required personal protective equipment and must be worn at all times when tasks preformed at the worksite make such items required. Flexible slip-on side shields are acceptable alternatives to safety glasses. Additional personal protective equipment such as ear plugs, goggles, conductive shoes, grounding straps, safety harness and energy-absorbing lanyard, gloves, safety nets, respirators and similar safety items may be

required depending on the nature of the work area and the work involved. Safety belts are not to be used on any worksite.

2. When the possibility of loose particles or flying projectiles exists, the proper safety wearing apparel and safety protection devices shall be worn. Safety shoes are recommended.
3. Contact lenses may not be worn in operating areas.
4. Flame Retardant clothing and other appropriate and insulating clothing, tools and equipment for use with work on energized electrical equipment in accordance with NFPA 70E.

B. Contractor shall have extra safety glasses and hard hats available on the worksite. Safety glass cleaner shall also be made readily available to all contractor employees on the worksite.

1.12 PERSONAL CONDUCT

A. Horseplay, fighting, gambling, explosives, possession of firearms, drinking alcoholic beverages, use of regulated drugs, being under the influence of drugs or alcohol, theft, vandalism, sabotage and distribution of unauthorized literature shall be cause to bar those involved from the worksite.

1.13 SAFETY INSPECTION AND HOUSEKEEPING

A. At a minimum, Contractor shall check the work area daily at the beginning and at the end of each work shift to ensure safe working conditions are maintained and all safety procedures are followed.

B. During the course of the work, Contractor shall be responsible for properly organizing all activities on the worksite to the extent that good housekeeping shall be practiced at all times. This shall include, but not be limited to:

1. As the job progresses, work areas shall be kept clean at all times.
2. All materials, tools and equipment shall be stored in a stable position to prevent rolling or falling. Materials and supplies shall be kept away from edges of floors, hoistways, stairways and floor openings.
3. A safe access way to all work areas and storage areas shall be maintained. All stairways, corridors, ramps, passageways and work platforms shall be kept clear of loose material and trash.
4. All debris shall be cleared from work areas, passageways, stairs, and in and around buildings or other structures.
5. Combustible scrap and debris shall be removed at regular intervals. Safe means shall be provided to facilitate such removal.
6. Contractor shall supply an adequate number of dumpsters to insure a clean working area at all times. Contractor shall load and transport all refuse and debris to a suitable disposal area away from the worksite and make disposition in a lawful manner.
   a. Contractor's parking and staging areas shall also be maintained clean and free of all debris at all times.
7. Contractor break and eating areas shall be maintained in a clean and orderly condition. Garbage containers shall be placed in these areas and frequently emptied. Eating and drinking shall not be permitted in the construction work areas.
8. Contractor shall restrict the use of flammable liquids and gases to a minimum. Store all flammables not actually needed for immediate use outside building, in a secure shelter. Store flammables outside building during non-work hours. Store rags or wiping waste with oily or flammable residue away from flammable liquids in approved metal containers.
   a. Contractor shall collect and dispose of flammable debris and dust as it is accumulated.
   b. Storage locations for gasoline or other flammable materials used for vehicles or equipment shall be in areas agreed to by Owner's Designated Representative.

These areas shall be diked to retain spilled material and have an appropriately placed fire extinguisher.

c. All items must be properly labeled.

9. Cords and hoses shall be kept a minimum of 7 feet overhead or laid flat outside of walkways.
10. Tools and equipment shall not be strewn about where they might cause tripping or falling hazards and shall, at the end of each workday, be collected and stored in the tool room or craft gang boxes.
11. Each employee shall be instructed to practice required housekeeping as part of assigned duties.

C. Housekeeping and care of the worksite shall be in accordance with the Contract.

1.14 MATERIAL HANDLING AND STORAGE

A. General:
1. Contractor shall be responsible for using safe methods of handling, storage and disposal of materials on the worksite.
2. Contractor's personnel shall observe Owner's safety rules and regulations for receiving, handling, storage and disposal of all materials. See Article 1.18 for proper environmental disposal procedures.

B. Material Storage:
1. All materials stored shall be stacked, braced, racked, blocked, interlocked or otherwise secured to prevent sliding, rolling, falling or collapse.
2. Flammable material storage shall be as previously described under Article 1.13 of this section.
3. Materials stored inside buildings under construction shall not be placed within 6 feet of any hoistway or inside floor opening, or within 10 feet of an exterior wall, which does not extend above the top of the material stored.
4. Materials stored on existing structurally supported floors and roofs shall not exceed the uniform design load capacity of floor or roof.
5. Materials shall be stored in a manner to provide unobstructed access to all exits.
6. Storage location shall be approved by Owner's Designated Representative.

1.15 VERTICAL AND HORIZONTAL WORK SAFETY ACCESS CONTROL

A. Ladders:
1. The use and erection of ladders shall comply with OSHA regulations and shall include, but not be limited to:
   a. Each user must visually inspect each ladder for defects before using.
   b. While ascending or descending a ladder, carry nothing that will prevent holding onto the ladder with both hands. Use a handline if necessary to raise or lower materials.
   c. Metal ladders shall not be used.
   d. Ladders shall be securely tied off.
   e. When working from ladders, work facing the ladder with both feet on the rungs.
   f. All ladders shall have appropriate shoes or footings.
   g. Workers shall not stand on the top or second step of stepladders.

B. Scaffolds:
1. The use and erection of scaffolds shall comply with OSHA regulations and shall include, but not be limited to:
   a. All scaffolds shall be erected on a firm base.
   b. Never exceed safe working loads on scaffolds.

c. Never rig from scaffold handrails or braces.
d. Scaffold handrails, midrails or brace members shall not be climbed. Use ladders for access.
e. Appropriate hand and toe rails and cleats are required.

2. Since federal standards are quite detailed in their specifications for the dozens of types of scaffolds, OSHA 29 CFR Part 1926.451 must be referred to for each particular job's scaffolding requirements.

C. Openings in Floors:

1. The protection of unguarded openings in floors, including access floors shall be barricaded immediately in compliance with OSHA regulations.

1.16 MISCELLANEOUS PROVISIONS

A. General:

1. Contractor is solely responsible for Contractor equipment and goods. Owner is not responsible for any losses by theft (or by whatever nature) of Contractor's property.
2. Loose clothing, rings and other jewelry shall not be worn around operating tools or machines. Keep sleeves buttoned.

B. Illumination:

1. Contractor shall ensure that construction areas, aisles, stairs, ramps, corridors, offices, and storage areas where work is in progress shall be adequately lighted with either natural or artificial illumination. Refer to OSHA Standards for illuminated light levels in all work areas.

C. Hand and Power Tools:

1. All hand and power tools and similar equipment, whether furnished by Contractor or Contractor employees, shall be maintained in a safe operating condition. Damaged tools shall be immediately repaired or replaced. Tools shall be used only for the purpose for which they were designed.
2. Any tools that are designed to have guards must have those guards in place at all times. Any worker removing a guard or using an unguarded tool shall be subject to dismissal from the worksite.
3. Grinders are particularly hazardous. Workers shall be trained in their use. While the grinders are rotating, the operator shall assure that he/she is in a balanced position and that the momentum of the disc will carry the tool away from the operator if it becomes stuck.

D. Sanitation:

1. Contractor shall be allowed to use water fountains, toilets and handwashing facilities in Owner's building. Contractor personnel shall leave these areas mess-free or Owner may prohibit their use by Contractor personnel.

1.17 SIGNS, SIGNALS AND BARRICADES

A. The fabrication and use of barricades and handrails shall be in compliance with Owner's safety rules and with OSHA and ANSI regulations. Special attention shall be given by contractor to the following items:

1. To protect workers from injury, Contractor shall construct removable replaceable handrails, temporary barricades or secured covers for all openings in floors, including access floors, in accordance with all applicable safety regulations. Such handrails, barricades and covers may be removed only when removal is necessary for the performance of work near the opening. They shall be replaced when any of the following occur:

a. The workers take a break and leave the area; or
b. The work is not completed by the end of the working day; or
c. As soon as their absence is no longer necessary for the performance of the work.

2. When such handrails, barricades or covers are removed by Contractor or any Subcontractor, they shall be replaced or rebuilt as necessary by Contractor or Subcontractor who removed them.
3. Contractor shall post areas where it is necessary to do overhead work.

B. Contractor shall be responsible for posting, installing and maintaining signs, signals and barricades to detour the passage of persons at all locations where potential hazards exist.

C. Contractor's employees shall obey all signs, signals and barricades, which are posted to warn of potential or existing hazards.

D. Barricades shall be 42 inches high, installed square and level.

E. The selection and use of signs and tags shall be in conformance with the appropriate ANSI standard.

F. Contractor shall be responsible for attaching danger tags to a piece of equipment (or part of a structure) to warn of potential or immediate hazards.

1.18 ENVIRONMENTAL REQUIREMENTS

A. Contractor Supplied Materials:
1. Contractor shall provide the Owner's Designated Representative with a MSDS for all hazardous and/or toxic material before they are brought on site. All hazardous and/or toxic material brought on site must be approved by Owner's facility management or an appointed alternate.
2. All containers must be properly labeled and kept sealed when not in use.
3. Chemicals that are environmentally safe and compatible are to be used whenever possible.
4. Portable tanks (if capacity exceeds 110 gallons each) brought on site must have secondary containment.

B. Ozone Depleting Chemicals:
1. The following ozone depleting chemicals shall not be used at State of Iowa facilities, including use in cleaning equipment parts:

CFC-11
(CAS #75-69-4)
Fluorocarbon 11
Fluorotrichloromethane
Trichlorofluoromethane
Freon 11
Trichloromonfluoromethane
CFC-12
(CAS #75-71-8)
Dichlorodifluoromethane
F-12
FC-12
Fluorocarbon 12
Freon 12
CFC-113
(CAS #76-13-1)

FC-113
Freon 113
1, 1, 2-Trichloro-1, 2, 2-tetrafluoroethane
1, 2, 2-Trichlorotrifluoroethane

CFC-114
(CAS #76-14-2)
1, 2-Dichloro-1, 1,2-tetrafluoroethane
FC-114
Freon 114
Sym-Dichlorotetrafluoroethane

CFC-115
(CAS #76-15-3)
Chloropentafluoroethane
Fluorocarbon 115
Freon 115

Carbon tetrachloride
(CAS #56-23-5)
Tetrachloromethane
Perchloromethane

Methyl Chloroform
(CAS #71-55-6)
1, 1, 1-Trichloroethane
Chloroethene

2. Refrigeration and air conditioning equipment containing CFCs may continue to be used until feasible substitutes exist. However, when such equipment is disposed of or replaced, the CFCs should be collected for reclamation or proper disposal.
3. Contractor shall notify Owner's Designated Representative for packaging and disposal requirements.
4. Contractor is responsible for ensuring employees handling CFCs are trained and certified.

C. Permits and Notifications:
1. All required environmental permits and notifications must be in hand before installation, modification, or operation of equipment or process begins.

D. Polychlorinated Biphenyls (PCBs):
1. Polychlorinated Biphenyls (PCBs) and PCB-containing equipment shall not be used at or installed in State of Iowa facilities and equipment.
2. All PCB light ballasts and capacitors removed from equipment at a State facility remain the property of the State.

E. Spills:
1. Contractor shall notify the Owner's Designated Representative for instructions on all waste management issues, including packaging and disposal.
2. Contractor shall take steps necessary to minimize the risk of releases of any fuel, oils, solvents, paints and other liquids. This includes releases to the ground, surface waters, sewers and/or atmosphere.
3. Contractor must report spills immediately to the Owner's Designated Representative or site security.

F. Waste Management:
1. Contractor is responsible for ensuring their employees are trained and certified.
2. Contractor shall maintain good housekeeping procedures.

3. Contractor shall notify Owner's Designated Representative for instructions on all waste management issues including packaging and disposal. Contractor shall comply with applicable federal, state and local regulatory requirements, laws and ordinances.
4. Waste may not be discharged to the sewer without prior approval from Owner.
5. No materials used on site may be left on site without prior approval from Owner.

G. Asbestos:
1. Asbestos-containing material (ACM) will not be installed in any State of Iowa facility or equipment.
2. Only Contractors trained and licensed in asbestos removal techniques may remove or otherwise disturb ACM.
3. Contractor must contact the Owner's Designated Representative prior to beginning work in an area to identify the presence or absence of ACM. No work may be conducted that may potentially disturb ACM. If work in an area has already begun, the Contractor is to stop work and contact the Owner's Designated Representative to verify any question as to the presence of asbestos in any material to be disturbed.

H. Lead:
1. Contractor must contact the Owner's Designated Representative prior to beginning work in an area to identify the presence or absence of lead in painted, coated or other suspected materials that may be disturbed during the course of work.
2. Contractor must comply with the federal, state and local regulations related to construction activities involving lead-containing materials.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION

SECTION 01 14 00

GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

1.02 Schedule Of Values
1.03 Applications For Payment
1.04 Change Procedures
1.05 Owner Use Of Site
1.06 Coordination
1.07 Unanticipated Utility Lines
1.08 Demolition, Cutting And Patching And Alterations
1.09 Conferences
1.10 Progress Meetings
1.11 Submittal Procedures
1.12 Submittals For Review
1.13 Construction Schedules
1.14 Quality Assurance/Control
1.15 References
1.16 Inspections, Sampling, And Tests
1.17 Manufacturers' Field Services And Reports
1.18 Security
1.19 Temporary Facilities and Controls
1.20 Parking
1.21 Progress Cleaning
1.22 Products
1.23 Transportation, Handling, Storage And Protection
1.24 Product Options
1.25 Anchoring to New and Existing Construction
1.26 Demonstration And Instructions
1.27 Project Record Documents
1.28 Final Cleaning
1.29 Operation And Maintenance Data
1.30 Extended Warranties
1.31 Maintenance Materials
1.32 Contract Closeout Procedures

1.02 SCHEDULE OF VALUES

A. Submit schedule on AIA Form G703 or in a computer generated printout which follows the format used in the AIA Form G703. Form must be typed.

B. Submit two copies of the Schedule of Values for review within 15 days after date of Owner-Contractor Agreement established in Notice to Proceed but in no case later than one week before the first request for payment.

C. Schedule of Values must be approved before first request for payment can be reviewed.

D. Update Schedule of Values at each submission of request for payment by indicating modifications in individual items and additions or subtractions made through Change Orders (COs) or Construction Change Directives (CCDs). Place COs and CCDs at the end of the Schedule of Values.

1.03 APPLICATIONS FOR PAYMENT

A. Submit three copies of each application on AIA Form G702.

B. Content and Format:
   1. Utilize Schedule of Values to organize items listed in Application for Payment.
   2. If approved by the Owner, CCDs may be included in the request for payment once they have been signed by all parties.
   3. COs may be included in the request for payment once they have been signed by all parties. When a CO is added which contains previously authorized CCDs, the CCDs included in the CO must be removed from the Schedule of Values or listed as a sub-item to the CO.

C. Payment Period: As specified in Contract.

1.04 CHANGE PROCEDURES

A. The Architect/Engineer may initiate Instructions to Contractor (ITC) describing clarifications or modifications to the Contract Documents. If the Contractor believes a modification requires additional fee or time, Contractor shall prepare and submit a price quotation. Proposals by the Contractor shall include all related items including modifications to other Work resulting from the proposed change. If Contactor does not indicate that a change in cost or time is required within 14 calendars after receiving an ITC, it shall indicate that the Contractor accepts that change as no cost / no time change.

B. The Contractor may propose a change by submitting a request for change to the Architect/Engineer, describing the proposed change and its full effect on the Work, with a statement of the reason for the change, and the effect on the Contract Sum Price and Contract Time with full documentation, and a statement of the effect on the rest of the Work.

C. Contractor's proposals (in response to a request for proposal or when initiated by him/her) shall be accompanied by a draft AIA Form G701 with all information filled out by the Contractor.

D. Construction Change Directive (CCD) may be issued by the Architect/Engineer, based on agreement of all parties, when it is important that work proceed on an item of work before a Change Order can be fully processed.

E. Final Change Order package will be prepared by the Owner as indicated in Contract.

1.05 OWNER USE OF SITE

A. Owner will occupy site for the duration of the project.
   1. Coordinate work around Owner use of the facility.
   2. Normal Owner work hours at the facility are from 7:00 am to 6:00 pm Monday thru Friday. Special road, weather or other conditions may cause Owner to work outside those hours.

1.06 COORDINATION

A. Coordinate scheduling, submittals, and Work of the various Sections of the Project Manual and as described on the Drawings to ensure efficient and orderly sequence of installation of interdependent construction elements.

B. Coordinate work of all subcontractors and sub-subcontractors.

C. Coordinate delivery scheduling, equipment requirements, installation details and rough-in requirements with Equipment Vendor selected by Owner by separate bid.

D. Coordinate space requirements and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable.

E. In finished areas, conceal pipes, ducts, and wiring within the construction.

1.07 UNANTICIPATED UTILITY LINES

A. Should utility lines be encountered that are not indicated, advise Owner immediately.

B. Rectify damage to or repair accidentally damaged or broken utility lines immediately under direction of Owner.

1.08 DEMOLITION, CUTTING AND PATCHING AND ALTERATIONS

A. See Sections 01 73 29 - Cutting and Patching and 02 41 00 - Selective Demolition.

1.09 CONFERENCES

A. Preconstruction Conference: Owner will schedule a preconstruction site mobilization conference after Notice of Award for all affected parties.

B. Preinstallation Conference: If required to verify or resolve issues arising during the construction, convene a conference at project site of all parties involved. Record minutes and distribute to all parties including the Owner and A/E.

1.10 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at maximum two-week intervals.

B. Preside at meetings, record minutes, and distribute copies within two days to those affected by decisions made.

1.11 SUBMITTAL PROCEDURES

A. All submittals are to be made electronically in the form of a PDF file sent (electronically) to Architect with copy to the Owner. See Section 01 33 05.

B. Transmit each submittal with a transmittal indicating, Project Name, IA DOT Project Number, BBSAE Project Number, Product Name, Submittal Number (as noted below).
   1. Provide separate transmittal for each product or group of related products that are to be reviewed as a group.

C. Number the submittal forms with CSI MasterFormat04 Section Number followed by a Submittals Number (e.g. 08 71 00.1, 08 71 00.2, 08 21 00.1.) For resubmittals, use the original number with an additional Revision number (e.g. 08 71 00.1-Rev 1, 08 71 00.1-Rev 2.) If it is not clear what number should be used for given item, request direction from the Architect.

D. Identify Project, Contractor, subcontractor or supplier. Identify pertinent Drawing sheet and detail number(s), and Specification Section number, as appropriate.

E. Schedule submittals to expedite the Project. Coordinate submission of related items.

F. Clearly mark which parts of the submitted documents are to be reviewed. If submitted product data contains multiple products and there is no indication of which are to be used on the Project, the Architect reserves the right to return the submittal without review.

G. Identify variations from Contract Documents and product or system limitations that may impact the completed Work.

H. Schedule of Submittals including all proposed products shall be prepared by the Contractor and submitted in duplicate within 15 days after date of Owner-Contractor Agreement Notice to Proceed. Submit complete list of major Products proposed for use, with name of manufacturer, trade name, and model number of each Product and include date when submittal will be made to the Architect/Engineer and date when response is needed on each item. Allow minimum 2 weeks for responses.

I. Maintain Schedule of Submittals showing status of each item. Make available at each Progress Meeting.

J. Submittals for Information:
   1. Architect/Engineer reserves right to not respond to informational submittals.
   2. Architect/Engineer will forward informational submittals, unstamped and unmarked, to Owner, without comment.

1.12 SUBMITTALS FOR REVIEW

A. Architect/Engineer review is for general conformance with design concept and Contract Documents. Markings or comments shall not be construed as releasing Contractor from compliance with Contract Documents. Contractor is responsible for details and accuracy, for confirming and correlating quantities and dimensions, for selection of fabrication processes, for technique of assembly, and for performing work in a safe manner.

B. Procedure:
   1. After Architect/Engineer review of submittal, at least one returned copy will have required corrections marked and/or will be accompanied by a comment sheet.
   2. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with comments and indications.
   3. Revise and resubmit as required, identifying changes made since previous submittal. Clearly identify any unrequested changes on all submittals and resubmittals.
   4. The Architect will use the following marking system for indicating disposition of reviews. See review stamp on the sample Submittal Review/ Comment Form at the end of this section.
      a. Submittals marked “APPROVED” or “FURNISH AS CORRECTED” shall be considered reviewed and approved by the Owner as noted in accordance with the requirements of Contract Documents. Resubmittal is not necessary.
      b. Submittals marked with “REVISE AND RESUBMIT” have been reviewed and are considered not approved and subject to notes and markings indicating required revisions. The extent of information to be resubmitted will be specified in the attached notes. The Contractor shall process returned reviewed submittals marked “REVISE AND RESUBMIT” and shall resubmit with requested information or corrections until an approval rating is achieved as indicated in Subparagraph 1 above.
      c. Submittals marked with “REJECTED” are not considered to meet Project Requirements.

d. Submittals marked with "NOT REVIEWED" are considered for information only. The Architect neither approves nor disapproves the submittal.

1.13 CONSTRUCTION SCHEDULES

A. Submit an initial Draft Construction Schedule at least 3 days before the Pre-Construction Conference. Submit copies to the Owner and to the Architect/Engineer.

B. At the Pre-Construction Conference the Owner and Contractor will discuss scheduling differences and develop a revised Initial Construction Schedule.

C. Within 5 days after the Pre-Construction Conference, the Contractor shall submit a revised Construction Schedule. All major subcontractors shall sign the revised Construction Schedule indicating agreement therewith. Submit copies to the Owner and to the Architect/Engineer.

D. Construction Schedule shall be in the form of a bar graph (Gantt Chart) and shall be computer generated. Each task shall include start date, end date and number of days. Required relationships to other tasks shall be shown. Tasks greater than 2 weeks shall be subdivided into smaller tasks.

E. Maintain construction schedule and provide revised schedules at Progress Meetings as needed to maintained Owner and Architect informed as to progress.

1.14 QUALITY ASSURANCE/CONTROL

A. Monitor material suppliers', fabricators', and subcontractors' quality control and workmanship to ensure work of specified quality.

B. Comply fully with manufacturer's instructions and Contract Documents. Should instructions conflict with Contract Documents or deviate from good construction practice, request clarification from Architect/Engineer before proceeding.

C. Comply with specified standards as a minimum quality for the Work. When more than one specified requirement applies or when additional codes apply, the Contractor shall comply with higher standard of those that are applicable.

D. Secure products in place with positive anchorage devices designed and sized to withstand foreseeable stresses and vibration without physical distortion or disfigurement.

1.15 REFERENCED STANDARDS

A. Conform to referenced standard by date of issue current as of date of Contract Documents, except when a specific date is specified or established by applicable code or stated in these Contract Documents.

B. Should specified referenced standard conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

C. The Contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.16 INSPECTIONS, SAMPLING, AND TESTS

A. Contractor shall engage a testing agency to perform all tests required by code or by this specification.

B. Test agency shall be approved by the Owner. Submit name and credential of the proposed agency to the Owner for approval before engaging the agency in a contract.

C. Provide all data required by the testing agency (including mixes to be used) in a timely manner.

D. Notify Architect/Engineer, Owner and the Owner's testing agency at least 24 hours before the need for testing.

E. Cooperate with testing agency as necessary for performance of their work including providing access and manpower for obtaining of samples and inspection of the Work.

1.17 MANUFACTURERS' FIELD SERVICES AND REPORTS

A. When specified in individual Specification Sections or on the Drawings, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions and to initiate instructions when necessary.

B. Report observations and site decisions or instructions that are supplementary or contrary to manufacturers' published recommendations.

1.18 SECURITY

A. Take measures to protect Work and existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

B. Conform to Owner's safety and security requirements.

1.19 TEMPORARY FACILITIES AND CONTROLS

A. Contractor may use existing electrical service to each building.

B. Coordinate with the Owner to provide water from the nearest existing source.

C. Provide additional temporary ventilation, lighting and heating if required to execute Work.

D. Contractor personnel may use existing toilet facilities in the building. If toilet rooms become dirtied beyond normal use, Contractor shall clean the toilet room.

E. Provide for storage and security of tools and materials delivered to the site but not yet installed.
   1. Coordinate with the Owner for use of portions of the site outside those areas directly affected by the Work.
   2. Coordinate all usage of the site with the Owner's representative, including scheduling all deliveries.

F. Barriers
   1. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
   2. Provide protection barriers as required to protect building occupants and users from construction operations.
   3. Provide barricades and covered walkways if required by governing authorities for public rights-of-way.
   4. Provide protection for plants designated to remain. Replace damaged plants.
   5. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.
   6. Coordinate location, installation and removal of barriers with Owner.

1.20 PARKING

A. Coordinate parking areas with Owner to accommodate construction personnel.

B. Coordinate with the Owner for use of the site.

1.21 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Locate collection container in area designated by Owner.

C. Entire work areas shall be cleaned daily.

D. Areas outside primary construction area, which become dirtied by construction operations, shall be cleaned immediately.

1.22 PRODUCTS

A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work, but does not include machinery and equipment used for preparation, fabrication, conveying, and erection of the Work. Products may also include existing materials or components authorized for reuse.

B. Do not use materials and equipment removed from existing premises, except as specifically identified or allowed by the Contract Documents.

C. Use interchangeable components of the same manufacturer for similar components.

D. Definition of Terms
   1. Furnish: To supply and deliver, unload, inspect for damage (same as supply).
   2. Install: To unpack, assemble, erect, apply, place, connect, finish, cure, protect, clean, and ready for use.
   3. Provide: To furnish or supply, plus install.
   4. Supply: To supply and deliver, unload, inspect for damage (same as furnish).

E. Substitutions: See article "Substitutions" in this section.

1.23 TRANSPORTATION, HANDLING, STORAGE AND PROTECTION

A. Transport, handle, store and protect products in accordance with manufacturer's instructions and generally accepted construction practice.

B. Contractor is responsible for protection of stored and installed materials from moisture and mold resulting from failure to control moisture, including humidity levels.

C. Materials or products which arrive at the site wet or with a moisture content above that designated in the Specification and which have no indication of mold shall be dried out or dried to recommended moisture content level by quickest possible means which will not damage the product or material.

D. Materials or products which arrive at the site with mold present shall be removed from the site immediately.

1.24 PRODUCT OPTIONS

A. Products Specified by Referenced Standards or by Description Only: Any Product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options allowed. No substitutions allowed after Bid period, except under conditions specified herein.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a pre-bid request for substitution within time limits established in Instructions to Bidders for any manufacturer not named. Lists of manufacturers beginning with "Acceptable manufacturers include:" shall be considered to permit substitutions.

D. "Similar To" or "Equal To" indicate an example product that meets specifications. "Basis of Design" indicates applicable characteristics of named product were used to design systems. In either case Contractor may propose any product that has the same or similar characteristics. A formal substitution is not required, but submittals must include sufficient data to show that the product has the same or similar characteristics to the products so indicated. The Architect/Engineer may reject any product, which, in his/her opinion, is not sufficiently similar to the indicated product.

1.25 ANCHORING TO NEW AND EXISTING CONSTRUCTION:

A. Do not anchor items to new or existing construction in a way that will place an excessive load on the construction.

B. Plaster and Gypsum Board: Do not anchor anything directly to gypsum board or plaster, always anchor to the framing system or to wood blocking or to substrate to which the gypsum board or plaster is anchored

C. Hollow Masonry
   1. Do not anchor anything weighing more than 1 pound or capable of resulting in pressure being applied of more than 3 pounds in any direction to the face of hollow masonry.
   2. Where loads heavier than those listed above must be anchored to hollow concrete block, provide one of the following:
      a. Set anchor into core that has been grouted solid at the core where the anchor is set, at least one core above and two cores below.
      b. Provide a system that engages both walls of the concrete block and provides a rigid spacer/brace in the core between the walls similar to Hilti HIT HY 70 for Masonry Construction.
   3. Under no circumstances use impact driven fasteners on hollow masonry unless the cores are grouted solid.

1.26 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed-upon times, at equipment location. Owner shall be allowed to videotape all training.

1.27 PROJECT RECORD DOCUMENTS

A. Maintain in the Field Office one reference set of the following documents:
   1. Drawings.
   2. Specifications.

3. Addenda.
4. Architect’s Supplemental Instructions (ASI's) and Instructions to Contractor (ITC's).
5. Requests for Information and Responses (RFI's).
6. Requests for Changes (RFC's)
7. Change Orders and other modifications to the Contract.
8. Reviewed Shop Drawings, Product Data, and Samples.
9. Manufacturer's instruction for assembly, installation, and adjusting.

B. Record Documents: Legibly mark and record actual revisions to the Work on one “Record” set of the Drawings and Specifications, including the following:
1. Changes made by Addenda.
2. Product substitutions or alternates utilized and approved.
3. Manufacturer's name and product model of actual products installed.
4. Changes made by the following:
   a. Change Orders.
   b. Architectural Supplemental Instructions (ASI's) and Instructions to Contractor (ITC's).
   c. Responses to Requests for Information (RFI's).
   d. Requests for Changes (RFC's)
   e. Changes documented by Meeting Notes or Field Reports discussed and agreed to during Progress Meetings or Site Observations.
5. Record the following:
   a. Measured location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   b. Measured depths of foundations in relation to finish first main floor datum.
   c. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   d. Actual equipment locations.
   e. Field changes of dimensions and details.
   f. Details not on the original Contract Drawings.

C. All recorded changes shall be “clouded” and identified; make reference to the document that originated the change.

D. Ensure entries are complete and accurate, enabling future reference by Owner.

E. Store record documents separate from documents used for construction.

F. Record information concurrent with construction progress, not less than weekly. Provide status update as agenda item at regular progress meetings. Provide record documents for review during progress meeting when requested.

G. Submit Record Documents to Architect/Engineer with final Application for Payment.

1.28 FINAL CLEANING

A. Execute final cleaning prior to substantial completion inspection for each phase.

B. Dismantle and remove from the site all temporary barriers, closures and other temporary structures or materials.

C. Remove waste and surplus materials, rubbish, and construction facilities from the site.

D. Final cleaning must follow all procedure requirements indicated for Progress Cleaning.

1.29 OPERATION AND MAINTENANCE DATA

A. In addition to electronic copies of all project data indicated in Section 01 33 00, provide one hard copy of Operation and Maintenance Date in "hard copy" form as described in this article. Provide similarly organized Operation and Maintenance Data on the electronic copy required in Section 01 33 05.

B. Bind in a three ring binders with durable covers.

C. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", and title of project.

D. Internally subdivide the binder contents with permanent, tabbed page dividers, logically organized, with title clearly printed on or under reinforced laminated plastic tabs. Organize product data according to MasterFormat04 numbering.

E. O&M binders shall include all final, approved submittals that appear in the electronic version. Do not submit O&M binders until all electronic copies of the required O&M and Warranty submittals transmitted and have achieved final approval.

F. Contents:
   1. Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.
   2. Product and system descriptions data.
   3. Operation and maintenance instructions, arranged by system.
   4. Project documents and certificates.

G. Submit one copy of completed volumes in final form with request for substantial completion site inspection. A/E shall review the O&M binders to verify completion. Contractor shall make any corrections to the O&M binders noted and upon final approval submit the number of final copies requested by the Owner (up to two copies maximum).

H. In addition to one (1) paper copy, Contractor shall submit an electronic copy of final, approved Operation and Maintenance Data at Project Close-Out in the form described in Section 01 33 00. All submittals shall be scanned by the contractor in .pdf format and submitted on a CD.

1.30 EXTENDED WARRANTIES

A. Effective dates of warranties shall be the Date of Substantial Completion (not the date of installation) and must be identified on the warranty or by signed letter modifying the warranty.

B. Provide two copies of all extended warranties.

C. Execute and assemble documents from Subcontractors, suppliers, and manufacturers.

D. Submit with request for final inspection.

E. Include warranties under a separate page divider at the end of the Operation and Maintenance Manual or in a separate binder, labeled as described for the Operations and Maintenance Manual.

1.31 MAINTENANCE MATERIALS

A. Provide Products, spare parts, maintenance and extra materials in quantities specified in individual Specification Sections or on the Drawings.

B. Deliver to Project site and place in location as directed by Owner; deliver prior to final payment; obtain a written receipt.

1.32 CONTRACT CLOSEOUT PROCEDURES

A. After all utilities have been installed but prior to substantial completion, Contractor shall demonstrate, in the presence of the Owner, continuity of all tracer wires from end to end at all underground utilities. Tracer wires which fail a continuity test shall be repaired or replaced and re-tested until a successful continuity test is achieved. Provide Owner 48 hour notice of this activity.

B. Substantial Completion
   1. Submit with request for substantial completion inspection:
      a. List of incomplete work, value of incomplete work, and reasons for being incomplete.
      b. One copy of Operation and Maintenance Manuals completed volumes in final form. This copy will be returned after substantial completion inspection, with Architect/Engineer comments. Revise content of documents as required prior to final submittal.
   2. If Work is found to be acceptable, the Architect/Engineer will provide a certification of substantial completion accompanied by a Punchlist showing items not yet completed or not yet completed satisfactorily. Omission of an item from the Punchlist does not relieve Contractor from the requirement to completely conform to the Contract Documents.

C. Final Inspection
   1. Do not request a Final Inspection until all construction requirements of the Project have been met in conformance with the Contract Documents.
   2. Prior to requesting final inspection and final payment, as required by General Conditions, complete the following:
      a. Submit copy of final punchlist of work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance.
      b. Submit Project Record Documents.
      c. Submit two "hard copies" and one electronic copy of Operation and Maintenance Manuals, final volumes, revised.
      d. Two copies of all written warranties, workmanship/maintenance bonds, agreements, final certifications and similar documents.
         1) For items of Work delayed materially beyond Date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of completion as start of warranty period.
      e. Submit electronic copy of all submittals.
      f. Submit Energy Rebate Forms.
      g. Submit proof, satisfactory to Owner, that fees and similar obligations of Contractor have been paid.
      h. Submit proof to the Owner that all keys borrowed during the course of the project have been returned.
      i. Deliver tools, spare parts, extra stocks of materials (if any), and similar physical items to Owner.
      j. List of Extra Material: See individual sections for specific requirements.
   3. Submit the following to the Architect/Engineer with request for final inspection:

a. Written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect/Engineer's and Owner's Representative's inspection.

b. Written certification from product manufacturers stating that no asbestos containing materials have been installed in the Project. Statements are required from each manufacturer supplying materials installed on this job including those installed by all subcontractors and sub-subcontractors.

4. Coordinate schedule of final inspection so that all parties required to view and approve the Work are present.

D. Complete items of work determined by Architect/Engineer's final inspection to be incomplete or unacceptable and request additional inspections as necessary.

E. Reinspection Costs: Should the Owner or the Architect/Engineer be required to perform additional Final Inspections because of failure of work to comply with Contract Documents, Contractor shall compensate Owner and/or Architect/Engineer for additional services. Owner may deduct the cost of the inspections from final payment to Contractor.

F. Final Acceptance and Payment

1. Submit after final inspection and acceptance:

a. Two copies of all inspections and certifications required by authorities having jurisdiction.

b. Final Application for Payment, identifying total adjusted Contract Sum, previous payments, and amount remaining due.

c. AIA Forms G706 - Contractor's Affidavit of Payment of Debts and Claims, G706A - Contractor's Affidavit of Release of Liens, and G707 - Consent of Surety to Final Payment.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 33 05

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.3 SUBMITTALS

A. Submittal Schedule: Submit a list of anticipated submittal.

1. For each item:
   a. Indicate when submittal will be made to the Architect.
   b. Indicate when the submittal review is needed from the Architect.

2. Submit no later than first Project Meeting after Preconstruction Conference.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Upon written request the Architect may make available limited electronic digital data files of the Contract Drawings for Contractor's use in preparing submittals.

1. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
2. Digital Drawing Software Program: The Contract Drawings are available in electronic format.
3. Before Architect will release files, Contractor shall execute a data use agreement on the form provided by the Architect.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 10 working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 7 working days for review of each resubmittal.

D. Submittal Numbering:

1. Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01, 061000.02, 081000.01). Resubmittals shall include a suffix (e.g., 061000.01 Rev1, 061000.1 Rev2).

E. Transmittal: Each submittal shall be accompanied by a transmittal.

1. Include the following information on the transmittal.
    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Engineer
    e. Name of Contractor.
    f. Name of firm or entity that prepared submittal.
    g. Names of subcontractor, manufacturer, and supplier.
    h. Submittal number as described in this Section.
    i. Number and title of appropriate Specification Section.
    j. Drawing number and detail references, as appropriate.
    k. Location(s) where product is to be installed, as appropriate.
    l. Other necessary identification.

2. For electronic submittals, make transmittal the first page of the PDF file containing the submittal.
3. For hard paper submittals or samples, submit a paper transmittal with the physical submittal and send a PDF copy of the transmittal for record.
4. A single transmittal may accompany multiple products if they are related products submitted as a package. However, all products in the submittal must have unique submittal number and be listed separately on the transmittal.

5. On the transmittal or on a separate sheet following the transmittal, provide a stamp indicating the General Contractor's review and disposition and comments or changes noted as a result of that review. Disposition stamp to be signed by the reviewer.

F. Electronic Submittals:

1. All submittals are to be made electronically unless impossible to do so.
2. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
3. Name file with submittal number or other unique identifier, including revision identifier.
   a. File name shall use Project identifier and submittal number as described in this Section (e.g., #####-061000.01). Resubmittals shall include a suffix (e.g., #####-061000.01.Rev1)

G. Physical Object Submittals:

1. Use paper or physical submittal only where impossible to make submittal electronically including physical samples, physical models, and color charts whose visual reproduction as an electronic submittal is not sufficiently controllable to ensure an accurate reproduction for selection of color, texture and the like.
2. In addition to the transmittal that shall accompany physical object submittals, each individual object or loose page shall have a label affixed to it containing not less than the Project name and the submittal number.

H. Options: Identify options requiring selection by Architect.

I. Deviations and Additional Information: On the transmittal or on an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

J. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

K. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

L. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Submit electronic submittals via email as PDF electronic files.
   a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
2. Only one copy of electronic submittal is required.
3. Where physical object submittals are necessary, submit the following:
   a. Action Submittals: Submit three paper copies of each submittal unless otherwise indicated. Architect will return two copies.
   b. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Architect will not return copies.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. Mark each copy of each submittal to show which products and options are applicable. The Architect/Engineer reserves the right to return without review or comment any product data containing multiple products or options on which products or options specific to the Project are not clearly indicated.
2. Include the following information, as applicable:
   a. Manufacturer's catalog cuts.
   b. Manufacturer's product specifications.
   c. Standard color charts.
   d. Statement of compliance with specified referenced standards.
   e. Testing by recognized testing agency.
   f. Application of testing agency labels and seals.
   g. Notation of coordination requirements.
   h. Availability and delivery time information.
3. For equipment, include the following in addition to the above, as applicable:
   a. Wiring diagrams showing factory-installed wiring.
   b. Printed performance curves.
   c. Operational range diagrams.
   d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
4. Submit Product Data before or concurrent with related Samples.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
   a. Identification of products.
   b. Schedules.
   c. Compliance with specified standards.
   d. Notation of coordination requirements.
   e. Notation of dimensions established by field measurement.
   f. Relationship and attachment to adjoining construction clearly indicated.

g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
   a. If drawings are submitted as PDF files, clear indicate what size is should printed in order to be to scale.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. Number and title of applicable Specification Section.
   e. Specification paragraph number and generic name of each item.
3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
5. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
6. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
   a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
7. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
   a. Number of Samples: Submit two sets of Samples. Architect will retain one Sample sets; remainder will be returned.
      1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least two sets of paired units that show approximate limits of variations.

E. Contractor's Construction Schedule: Comply with requirements specified in Section 01 14 00 "General Requirements."

F. Application for Payment and Schedule of Values: Comply with requirements specified in Section 01 14 00 "General Requirements."

G. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 01 40 00 "Quality Requirements."

H. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 14 00 "General Requirements."

I. Maintenance Data: Comply with requirements specified in Section 01 14 00 "General Requirements."

J. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

K. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

L. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

1. Where submitted product data contains written certification of relevant requirements, Architect may waive the requirement for separate manufacturer’s letter.

M. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

1. Where submitted product data contains written certification of relevant requirements, Architect may waive the requirement for separate manufacturer’s letter.

N. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

1. Where submitted product data contains written certification of relevant requirements, Architect may waive the requirement for separate manufacturer’s letter.

O. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

P. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

Q. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

R. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations.

Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification and Calculations: In addition to Shop Drawings, Product Data, and other required submittals, submit either digital copies of signed documents or digitally signed PDF electronic file and one paper copy of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S RESPONSIBILITIES

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract, site conditions, and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 01 14 00 "General Requirements."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents. Sign with full name, not initials.

D. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

E. Revise and resubmit submittals as required, identify all changes made since previous submittal

3.2 ARCHITECT'S ACTION

A. Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action. See review stamp on the sample Submittal Review/ Comment Form at the end of this section

1. Submittals marked “APPROVED” or “FURNISH AS CORRECTED” shall be considered reviewed and approved by the Owner as noted in accordance with the requirements of Contract Documents. Resubmittal is not necessary.
2. Submittals marked “REVISE AND RESUBMIT” have been reviewed and are considered not approved and subject to notes and markings indicating required revisions. The extent of information to be resubmitted will be specified in the attached notes. The Contractor shall process returned reviewed submittals marked “REVISE AND RESUBMIT” and shall resubmit with requested information or corrections until an approval rating is achieved as indicated in Subparagraph 1 above.
3. Submittals marked “REJECTED” are not considered to meet Project Requirements.
4. Submittals marked "NOT REVIEWED" are considered for information only. The Architect neither approves nor disapproves the submittal.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION

BROOKS BORG SKILES
ARCHITECTURE ENGINEERING LLP

SUBMITTAL REVIEW/COMMENT FORM

PROJECT: **IDOT Analytics Lab VAV Replacement**

BBSAE PROJ. No.: **15044**

SUBMITTAL NUMBER:

SPECIFICATION SECTION:

DESCRIPTION:

REVIEWED BY:

Primary:

Secondary:

DATE ROUTED:

NUMBER OF COPIES ROUTED:

BROOKS BORG SKILES
ARCHITECTURE ENGINEERING LLP

☐ Approved ☐ Revise and Resubmit

☐ Furnish as Corrected ☐ Rejected

☐ Not Reviewed

Date: _____ By: _____

Architect/Engineer review is for general conformance with design concept and Contract Documents. Markings or comments shall not be construed as releasing Contractor from compliance with Contract documents. Contactor is responsible for details and accuracy, for confirming and correlating quantities and dimensions, for selection of fabrication processes, for technique of assembly and for performing work in a safe manner.

COMMENTS:

1.

SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Metal pipe hangers and supports.
   2. Trapeze pipe hangers.
   3. Thermal-hanger shield inserts.
   4. Fastener systems.
   5. Pipe stands.
   6. Equipment supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
   1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
   2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:
   1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
   2. Galvanized Metallic Coatings: Pre-galvanized or hot dipped.
   3. Nonmetallic Coatings: Plastic coating, jacket, or liner.

4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Stainless-Steel Pipe Hangers and Supports:
1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:
1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel .

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Hot or Cold Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) minimum compressive strength and vapor barrier.

B. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

C. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

D. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.6 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
   1. Properties: Nonstaining, noncorrosive, and nongaseous.
   2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
   1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
   2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:
   1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
   2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

G. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

H. Install lateral bracing with pipe hangers and supports to prevent swaying.

I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

L. Insulated Piping:
   1. Attach clamps and spacers to piping.

      a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
      b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
      c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
   2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
   3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
   4. Shield Dimensions for Pipe: Not less than the following:

      a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
   5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm) .

3.5 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports or metal trapeze pipe hangers and attachments for general service applications.

F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
   2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F (566 deg C), pipes NPS 4 to NPS 24 (DN 100 to DN 600), requiring up to 4 inches (100 mm) of insulation.
   3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
   4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 (DN 15 to DN 600) if little or no insulation is required.
   5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
   6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8 (DN 20 to DN 200).
   7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
   8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
   9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
   10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8 (DN 10 to DN 200).
   11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3 (DN 10 to DN 80).
   12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
   13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).
   2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.

K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
   2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
   3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
   4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
   5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.

L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
   2. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
   3. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
   4. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
   5. C-Clamps (MSS Type 23): For structural shapes.
   6. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
   7. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
   8. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
   9. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
   10. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
   11. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

      a. Light (MSS Type 31): 750 lb (340 kg).
      b. Medium (MSS Type 32): 1500 lb (680 kg).
      c. Heavy (MSS Type 33): 3000 lb (1360 kg).
   12. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
   13. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
   14. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
   2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.

3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

N. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

O. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION

SECTION 23 05 53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Pipe labels.

B. .

PART 2 - PRODUCTS

2.1 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction according to ASME A13.1.

B. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

   1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
   2. Lettering Size: Size letters according to ASME A13.1 for piping

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 PIPE LABEL INSTALLATION

A. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Balancing Air Systems:
   a. Variable-air-volume systems.

2. Balancing Hydronic Piping Systems:
   a. Constant-flow hydronic systems.
   b. Variable-flow hydronic systems.
   c. Primary-secondary hydronic systems.

3. Testing, adjusting, and balancing existing systems and equipment.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. BAS: Building automation systems.

C. NEBB: National Environmental Balancing Bureau.

D. TAB: Testing, adjusting, and balancing.

E. TABB: Testing, Adjusting, and Balancing Bureau.

F. TAB Specialist: An independent entity meeting qualifications to perform TAB work.

G. TDH: Total dynamic head.

1.4 INFORMATIONAL SUBMITTALS

A. Tab Plan: Within 90 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

B. Control System Coordination Reports: Communicate in writing to the controls installer and BAS provider all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

C. Final Report: Indicate deficiencies in systems that prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1. Submit to the Commissioning Authority within two weeks after completion of testing, adjusting, and balancing.
   2. Revise TAB plan to reflect actual procedures and submit as part of final report.
   3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
   4. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
   5. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
   6. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
   7. Units of Measure: Report data in I-P (inch-pound) units only.
   8. Include the following on the title page of each report:
      a. Name of Testing, Adjusting, and Balancing Agency.
      b. Address of Testing, Adjusting, and Balancing Agency.
      c. Telephone number of Testing, Adjusting, and Balancing Agency.
      d. Project name.
      e. Project location.
      f. Project Architect.
      g. Project Engineer.
      h. Project Contractor.
      i. Project altitude.
      j. Report date.

D. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

E. Instrument calibration reports, to include the following:

   1. Instrument type and make.
   2. Serial number.
   3. Application.
   4. Dates of use.
   5. Dates of calibration.

1.5 QUALITY ASSURANCE

A. TAB Specialists Qualifications: Certified by AABC NEBB or TABB.

   1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC NEBB or TABB.
   2. TAB Technician: Employee of the TAB specialist and certified by AABC NEBB or TABB as a TAB technician.

B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.6 FIELD CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.

B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

E. Examine equipment performance data including fan and pump curves.

F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

G. Examine test reports specified in individual system and equipment Sections.

H. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
   5. Duct systems are clean of debris.
   6. Fans are rotating correctly.
   7. Fire and volume dampers are in place and open.
   8. Air coil fins are cleaned and combed.

9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.
11. Duct system leakage is minimized.
12. Hydronic systems are flushed, filled, and vented.
13. Pumps are rotating correctly.
14. Proper strainer baskets are clean and in place.
15. Service and balance valves are open.

I. Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.

J. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

K. Examine system pumps to ensure absence of entrained air in the suction piping.

L. Examine operating safety interlocks and controls on HVAC equipment.

M. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
1. Submit to Engineer.
2. Include certification that the plan developer has reviewed the contract documents, the equipment and systems, and the control system with the Architect and other installers to sufficiently understand the design intent for each system.
3. Include at least the following in the plan:
   a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
   b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
   c. Identification and types of measurement instruments to be used and their most recent calibration date.
   d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
   e. Final test report forms to be used.
   f. Detailed step-by-step procedures for TAB work for each system and issue, including:
      1) Terminal flow calibration (for each terminal type).
      2) Diffuser proportioning.
      3) Branch/submain proportioning.
      4) Total flow calculations.
      5) Rechecking.
      6) Diversity issues.
   g. Details of how TOTAL flow will be determined; for example:
      1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
      2) Water: Pump curves, circuit setter, flow station, ultrasonic, etc.

h. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and methods to verify this.
i. Confirmation of understanding of the outside air ventilation criteria under all conditions.
j. Methods for making coil capacity measurements, if specified.
k. Time schedule for TAB work to be done in phases (by floor, etc.).
l. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.
m. Procedures for field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
n. Procedures for formal deficiency reports, including scope, frequency and distribution.

B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Refer to section 019113 for checklist forms.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" ASHRAE 111 NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," and Section 230719 "HVAC Piping Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.

B. For variable-air-volume systems, develop a plan to simulate diversity.

C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling-unit components.

K. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Adjust the variable-air-volume systems as follows:

1. Verify that the system static pressure sensor is located two-thirds of the distance down the duct from the fan discharge.
2. Verify that the system is under static pressure control.
3. Select the terminal unit that is most critical to the supply-fan airflow. Measure inlet static pressure, and adjust system static pressure control set point so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
4. Calibrate and balance each terminal unit for maximum and minimum design airflow as follows:
   a. Adjust controls so that terminal is calling for maximum airflow. Some controllers require starting with minimum airflow. Verify calibration procedure for specific project.
   b. Measure airflow and adjust calibration factor as required for design maximum airflow. Record calibration factor.
   c. When maximum airflow is correct, balance the air outlets downstream from terminal units.
   d. Adjust controls so that terminal is calling for minimum airflow.
   e. Measure airflow and adjust calibration factor as required for design minimum airflow. Record calibration factor. If no minimum calibration is available, note any deviation from design airflow.
   f. When in full cooling or full heating, ensure that there is no mixing of hot-deck and cold-deck airstreams unless so designed.
   g. On constant volume terminals, in critical areas where room pressure is to be maintained, verify that the airflow remains constant over the full range of full cooling to full heating. Note any deviation from design airflow or room pressure.

5. After terminals have been calibrated and balanced, test and adjust system for total airflow. Adjust fans to deliver total design airflows within the maximum allowable fan speed listed by fan manufacturer.
   a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.

b. Set terminals for maximum airflow. If system design includes diversity, adjust terminals for maximum and minimum airflow so that connected total matches fan selection and simulates actual load in the building.
c. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
d. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
e. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.

6. Measure fan static pressures as follows:
   a. Measure static pressure directly at the fan outlet or through the flexible connection.
   b. Measure static pressure directly at the fan inlet or through the flexible connection.
   c. Measure static pressure across each component that makes up the air-handling system.
   d. Report any artificial loading of filters at the time static pressures are measured.

7. Set final return and outside airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.
   a. Balance the return-air ducts and inlets the same as described for constant-volume air systems.
   b. Verify that terminal units are meeting design airflow under system maximum flow.

8. Re-measure the inlet static pressure at the most critical terminal unit and adjust the system static pressure set point to the most energy-efficient set point to maintain the optimum system static pressure. Record set point and give to controls contractor.
9. Verify final system conditions as follows:
   a. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to match design if necessary.
   b. Re-measure and confirm that total airflow is within design.
   c. Re-measure final fan operating data, rpms, volts, amps, and static profile.
   d. Mark final settings.
   e. Test system in economizer mode. Verify proper operation and adjust if necessary. Measure and record all operating data.
   f. Verify tracking between supply and return fans.

3.6 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports for coils. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required coil and heat exchanger flow rates with pump design flow rate.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. In addition to requirements in "Preparation" Article, prepare hydronic systems for testing and balancing as follows:

1. Check pressure at expansion tank.
2. Check highest vent for adequate pressure.
3. Check flow-control valves for proper position.
4. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
5. Verify that motor starters are equipped with properly sized thermal protection.
6. Check that air has been purged from the system.

D. Adjust flow-measuring devices installed in mains and branches to design water flows.

a. Measure flow in branch pipes.
b. Adjust branch balance valves for design flow.
c. Re-measure each branch after all have been adjusted.

E. Verify that memory stops have been set.

3.7 TOLERANCES

A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
1. Air Outlets and Inlets: Plus or minus 10 percent.
2. Heating-Water Flow Rate: Plus or minus 10 percent.

B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.8 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.
3. Certify validity and accuracy of field data.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB specialist.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:
    a. Indicated versus final performance.

b. Notable characteristics of systems.
c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:
    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Fan drive settings including settings and percentage of maximum pitch diameter.
    e. Other system operating conditions that affect performance.

D. Apparatus-Coil Test Reports:

1. Coil Data:
    a. System identification.
    b. Location.
    c. Coil type.
    d. Number of rows.
    e. Fin spacing in fins per inch (mm) o.c.
    f. Make and model number.
    g. Face area in sq. ft. (sq. m).
    h. Tube size in NPS (DN).
    i. Tube and fin materials.
    j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):
    a. Airflow rate in cfm (L/s).
    b. Average face velocity in fpm (m/s).
    c. Air pressure drop in inches wg (Pa).
    d. Outdoor-air, wet- and dry-bulb temperatures in deg F (deg C).
    e. Return-air, wet- and dry-bulb temperatures in deg F (deg C).
    f. Entering-air, wet- and dry-bulb temperatures in deg F (deg C).
    g. Leaving-air, wet- and dry-bulb temperatures in deg F (deg C).
    h. Water flow rate in gpm (L/s).
    i. Water pressure differential in feet of head or psig (kPa).
    j. Entering-water temperature in deg F (deg C).
    k. Leaving-water temperature in deg F (deg C).
    l. Refrigerant expansion valve and refrigerant types.
    m. Refrigerant suction pressure in psig (kPa).
    n. Refrigerant suction temperature in deg F (deg C).
    o. Inlet steam pressure in psig (kPa).

E. Air-Terminal-Device Reports:

1. Unit Data:
    a. System and air-handling unit identification.
    b. Location and zone.
    c. Apparatus used for test.
    d. Area served.
    e. Make.
    f. Number from system diagram.
    g. Type and model number.

h. Size.
i. Effective area in sq. ft. (sq. m).

2. Test Data (Indicated and Actual Values):
a. Airflow rate in cfm (L/s).
b. Air velocity in fpm (m/s).
c. Preliminary airflow rate as needed in cfm (L/s).
d. Preliminary velocity as needed in fpm (m/s).
e. Final airflow rate in cfm (L/s).
f. Final velocity in fpm (m/s).
g. Space temperature in deg F (deg C).

F. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:
a. System and air-handling-unit identification.
b. Location and zone.
c. Room or riser served.
d. Coil make and size.
e. Flowmeter type.

2. Test Data (Indicated and Actual Values):
a. Airflow rate in cfm (L/s).
b. Entering-water temperature in deg F (deg C).
c. Leaving-water temperature in deg F (deg C).
d. Water pressure drop in feet of head or psig (kPa).
e. Entering-air temperature in deg F (deg C).
f. Leaving-air temperature in deg F (deg C).

G. Instrument Calibration Reports:

1. Report Data:
a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.9 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

END OF SECTION

SECTION 23 07 13

DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section was issued originally in Package 4 dated September 1, 2015, and is reissued with updated content in Package 5 dated November 16, 2015.

B. Section includes:
   1. Duct Insulation.
   2. Duct Liner.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Products shall not contain asbestos, lead, mercury, or mercury compounds.

B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

D. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin.
   1. Comply with ASTM C 553, Type II and ASTM C 1290.
   2. 'K' ('Ksi') value: 0.27 at 75 degrees F (0.039 at 24 degrees C), when tested in accordance with ASTM C 518.
   3. Density: 1.0 lb/cu.ft.
   4. Maximum Service Temperature – Faced: 250 degrees F.
   5. Maximum Water Vapor Sorption: 5.0 percent by weight.
   6. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

E. Acoustic Duct Liner: Mineral or glass fibers bonded by a thermosetting resin.
   1. Comply with ASTM C 1071, Type I and ASTM D 5116.
   2. Density: 2 lbs/cu. Ft.
   3. Suitable for airstream velocities up to 6,000 fpm.
   4. Maximum service temperature: 250 degrees F.
   5. Maximum Water Vapor Sorption: 3.0 percent.
   6. Surface treated with EPA anti-microbial agent for prevention of fungal or bacterial growth per ASTM G21.
   7. Minimum Noise Reduction Coefficient for 1” thick: 0.70.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber and ASJ Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
   1. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
   1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
   1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
   2. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
   3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
   4. Color: White.

2.4 SEALANTS

A. ASJ Flashing Sealants:
   1. Materials shall be compatible with insulation materials, jackets, and substrates.
   2. Fire- and water-resistant, flexible, elastomeric sealant.
   3. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
   4. Color: White.
   5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.5 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
   1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.

2.6 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
   1. Width: 3 inches (75 mm).
   2. Thickness: 11.5 mils (0.29 mm).
   3. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
   4. Elongation: 2 percent.
   5. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
   6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

2.7 SECUREMENTS

A. Bands:
   1. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, 1/2 inch (13 mm) wide with wing seal or closed seal.
   2. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:
   1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, length to suit depth of insulation indicated.
   2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding length to suit depth of insulation indicated with integral 1-1/2-inch (38-mm) galvanized carbon-steel washer.
   3. Insulation-Retaining Washers: Self-locking washers with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.

D. Wire: 0.080-inch (2.0-mm) nickel-copper alloy .

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
   1. Verify that systems to be insulated have been tested and are free of defects.
   2. Verify that surfaces to be insulated are clean and dry.

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

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
   3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:
   1. Draw jacket tight and smooth.
   2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
   3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches (50 mm) o.c.

      a. For below ambient services, apply vapor-barrier mastic over staples.
   4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
   5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches (50 mm).
   1. Comply with requirements in Section 078413 "Penetration Firestopping" and fire-resistive joint sealers.

3.5 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts: Secure with adhesive and insulation pins.
   1. Apply adhesives according to manufacturer's recommended coverage rates per unit area.
   2. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

      a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
      b. On duct sides with dimensions larger than 18 inches (450 mm), place pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
      c. Pins may be omitted from top surface of horizontal, rectangular ducts.
      d. Do not overcompress insulation during installation.
      e. Impale insulation over pins and attach speed washers.
      f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
   3. For ducts with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

      a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
      b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).
   4. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
   5. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

3.6 ACOUSTIC DUCT LINER APPLICATION:

A. Secure insulation with mechanical liner fasteners. Refer to SMACNA HVAC Duct Construction Standards - Metal and Flexible for spacing.

B. Seal and smooth joints. Seal and coat transverse joints.

C. Seal liner surface penetrations with adhesive.

D. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

3.7 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Supply Ducts from air handling units not otherwise noted to have duct liner shall be the following:
   1. Mineral-Fiber Blanket: 2 inches (50 mm) thick.

B. Supply Ducts on variable volume air handling system from the discharge of each VAV to the end of each branch and to each diffuser shall be the the following:
   1. Acoustic Duct Liner: 1 inch (25 mm) thick.

END OF SECTION

SECTION 23 07 19

HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes insulating the following HVAC piping systems:
   1. Heating hot-water piping.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
   2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber, Preformed Pipe Insulation:
   1. Type I, 850 deg F (454 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
   1. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. ASJ Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
   1. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
   1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
   1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
   2. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
   3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
   4. Color: White.

2.5 SEALANTS

A. Joint Sealants:
   1. Materials shall be compatible with insulation materials, jackets, and substrates.
   2. Permanently flexible, elastomeric sealant.
   3. Service Temperature Range: Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C).
   4. Color: White or gray.
   5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Metal Jacket Flashing Sealants:
   1. Materials shall be compatible with insulation materials, jackets, and substrates.
   2. Fire- and water-resistant, flexible, elastomeric sealant.
   3. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
   4. Color: Aluminum.
   5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. ASJ Flashing Sealants:
   1. Materials shall be compatible with insulation materials, jackets, and substrates.
   2. Fire- and water-resistant, flexible, elastomeric sealant.
   3. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
   4. Color: White.
   5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
   1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.

2.7 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
   1. Width: 3 inches (75 mm).
   2. Thickness: 11.5 mils (0.29 mm).
   3. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
   4. Elongation: 2 percent.
   5. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
   6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

2.8 SECUREMENTS

A. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
   1. Verify that systems to be insulated have been tested and are free of defects.
   2. Verify that surfaces to be insulated are clean and dry.
   3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
   3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
   4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:
   1. Draw jacket tight and smooth.
   2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
   3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches (50 mm) o.c.

      a. For below-ambient services, apply vapor-barrier mastic over staples.
   4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
   5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
   1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
   2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
   3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
   4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
   5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
   6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
   7. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
   8. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated.

3.5 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:
   1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
   2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
   3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches (150 mm) o.c.
   4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:
   1. Install preformed pipe insulation to outer diameter of pipe flange.
   2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
   3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
   4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:
   1. Install preformed sections of same material as straight segments of pipe insulation when available.

D. Insulation Installation on Valves and Pipe Specialties:
   1. Install preformed sections of same material as straight segments of pipe insulation when available.
   2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
   3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
   4. Install insulation to flanges as specified for flange insulation application.

3.6 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

3.7 INDOOR PIPING INSULATION SCHEDULE

A. Heating-Hot-Water Supply and Return,:
   1. 2” and Smaller: Insulation shall be the following:
      a. Mineral-Fiber, Preformed Pipe, Type I: 1 inch (25 mm) thick.

END OF SECTION

SECTION 23 09 23

INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Actuators.

B. Control Valves.

C. Control Air Piping.

1.2 REFERENCES

A. ASHRAE 85 - Automatic Control Terminology for Heating, Ventilating, Air Conditioning

B. ASME MC85.1 - Terminology for Automatic Control

C. NEMA EMC1 - Energy Management Systems Definition

D. NFPA 90A – Standard for the Installation of Air-Conditioning and Ventilating Systems

E. NFPA 101 - Life Safety Code

1.3 SYSTEM DESCRIPTIONS

A. The Iowa Department of Transportation (The Owner) has a campus-wide Johnson Controls Building Automation System. Provide a fully integrated Building Automation System (BAS) incorporating the components herein specified and indicated on the drawings. System shall include pneumatic components to provide a complete functioning Control System.

B. All materials and equipment shall be standard components regularly manufactured for this and/or other systems. All components shall be thoroughly tested and proven in actual use.

C. The BAS system shall provide automatic decision-making and control for building heating, ventilating and air conditioning (HVAC) along with other functions. The Owner has a contract with Johnson Control, controls and instrumentation contractor, for materials and installation of all Johnson Controls equipment. As part of this contract, Johnson Controls has agreed to provide controls and instrumentation systems to Contractors on Iowa Department of Transportation projects. For assistance contact:
   1. Scott Underwood
   2. Johnson Controls, Inc
   3. 11318 Aurora Ave
   4. Des Moines, IA 50322
   5. (515)-202-1635 (cell)

D. Contract Allowance for sale of controls and instrumentation to Contractor: Contractor to include an allowance in the Contract Sum for purchase and installation of controls and instrumentation specified in this Section including delivery to job site, unloading, handling, and all required taxes. Include all costs associated with coordination, preparation, mark-up, overhead, and profit

for Contractor or any Subcontractors other than Johnson Controls in Contractor's base bid sum and not this allowance.

1.4 SCOPE

A. Provide, assemble, mount, and wire all devices and system components.

B. Assist the Balancing Contractor.

C. Facilitate and perform the complete checkout of the entire system, verifying proper operation in accordance with design specifications.

1.5 COMPONENTS PRICING

A. The Controls Contractor, as a subcontractor, shall provide pricing to the next higher-level hierarchy of the subcontractor/contractor relationship as a lump sum price for all components included in this section and as indicated on the project drawings.

1.6 COORDINATION

A. The following incidental work shall be furnished by the designated contractor under supervision of the Controls Contractor. The Controls Contractor shall provide all required information, materials, direction, and training to the designated contractor as required to provide a complete working system.

B. The Mechanical Contractor shall:
   1. Install control valves and sensor wells that are provided by the controls contractor.
   2. Provide necessary valved pressure taps, water, drain and overflow connections and piping.
   3. Install automatic dampers, required interconnection linkages and extend damper shafts as necessary for mounting of actuators
   4. Provide access doors or other approved means of access in ductwork for service of control equipment.

1.7 SUBMITTALS FOR REVIEW

A. Division 01 33 00 Submittal Procedures.

B. Clearly note the proposed deviations from specified sequences and equipment, and substantiate with written explanation.

C. Shop Drawings and Equipment Product Data:
   1. Manufacturer's printed data sheets for all control system components clearly identify data by component.
   2. General catalog sheets, including details of construction, ratings, and dimensions for each component.
   3. Show complete details of interconnections between temperature control systems and controls specified with equipment or systems.
   4. Provide Valve Schedules indicating size, type, design flow, valve capacity, pressure drop and CV value, identification and part number.
   5. Provide Dampers Schedule indicating dimension and descriptions of blank-offs, installation location, damper features, identification and part number.
   6. Shop Drawings and Product Data are not required for BAS panels or specific parts included in the bill of materials in panel drawings.

1.8 SUBMITTALS AT CLOSEOUT

A. Project Record Documents: Maintain documents at site during construction and submit at Contract Closeout.

B. Operation and Maintenance Data Include:
   1. Red-mark "Record" control system drawings and then turn them over to the Owner's Representative.
   2. Provide directions for calibration, adjustment and maintenance instructions for each type of component.
   3. Complete Index of Contents
   4. Shop drawings of control system showing devices, interconnections between devices, and connections to items provided by others.
   5. Specifications data sheets on each device.

1.9 WARRANTY

A. The scope of work included in this section shall be guaranteed to be free from original defects in both material and workmanship for the period as indicated in the contract terms.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Johnson Controls Inc. unless otherwise indicated.

2.2 SENSORS AND INPUT DEVICES

A. Room Temperature Sensors
   1. Room sensors shall be constructed for either surface or wallbox mounting.
   2. Room sensors shall have the following options when specified:
      a. Sensitivity: Adjustable from 0.75 to 4.0 psig/°F (9 to 50 kPa/°C)
      b. Flow Capacity: 400 SCIM (107 mL/s)
      c. Air Consumption: 20 SCIM (5 mL/s)
      d. Supply Pressure: 13 to 25 psig (91 to 175 kPa)
      e. Dial Range: 55 to 85°F
      f. Air Connections: Two (Supply and Output)
      g. Acceptable manufacturers: Johnson Controls, model T-4002

2.3 ACTUATORS

A. Pneumatic Valve Actuators
   1. Acceptable manufacturers: Johnson Controls or approved equal.
   2. Pneumatic operators, spring return type with non-ferrous metal bellows or diaphragm of neoprene or other elastomer. Bellows or diaphragm shall be of sufficient size so that a change in operating pressure of not more than two (2) percent of the total motor operating pressure range will be required to start the valve or damper moving. Provide positive positioning or sequencing relays with adjustable operating range and starting point for operators sequenced with other operators to permit adjustment of control sequences, except for control valves in confined spaces in terminal units, which may use springs with range selected to provide necessary sequencing. Metal parts shall be aluminum, mill finish galvanized steel, or zinc plated steel or stainless steel.

B. Pneumatic Damper Actuators
   1. Acceptable manufacturers: Johnson Controls D-3031 or approved equal.
   2. Damper Actuator shall have the following options when specified:
      a. Stroke: 1 in. (25 mm); Adjustable with stops to 7/8, 3/4, 5/8, and 1/2 in. (22,
      b. 19, 16 and 13 mm).
      c. Effective Damper Area: 2.8 Sq. in. (18 cm2).
      d. Spring Ranges: 5–10 PSIG (35–70 kPA).
      e. Piston Rod: Threaded, 5/16 in. Diameter.
      f. Ambient: -20–150°F (-29–66°C).
      g. Control Pressure: 15 or 20 PSIG (105 or 140 kPA); 25 PSIG (175 kPA) Maximum.
      h. Air Connection: Barbed fitting for 5/32 or ¼ in. O.D. Polytubing.
      i. Materials:
         1) Actuator and nut: Polycarbonate.
         2) Stops: Nylon.
         3) Swivels and Washers: Oilon.
         4) Diaphragm: Systhetic Elastomer.
         5) Rod and Spring: Steel.

2.4 CONTROL AIR PIPING

A. Instrument Air piping shall be specified copper or polyethylene tubing.

B. Tubing fittings shall be brass or copper solder joint with compression fittings used at connections to equipment. Copper tubing shall be seamless Type M hard or soft temper.

C. Polyethylene tubing shall be Fire Resistant with a density of .92 grams/cc, a melt index of .3 decigrams/min, and stress crack resistance of 2000 hrs. minimum per ASTM-D 1693.

PART 3 - EXECUTION

3.1 GENERAL

A. Completely install automatic temperature control system as specified.

B. Coordinate installation of devices, wiring, and other items with other trades.

C. Locate thermostat/sensors where they will not be affected by heat from other sources, such as direct rays of sun, pipes or ducts in wall, convectors, direct air currents from diffusers, light dimmers and similar items.

D. Coordinate locations of space temperature sensors as indicated or approved by owner representative.

3.2 START-UP SERVICES

A. When installation is complete and automatic control system is placed in operation, adjust and calibrate all instruments and devices in system and ensure that system is operating in accord with specified sequences.

B. Diagnose component and system problems. Communicate irregularities to the appropriate contractor for correction.

3.3 SENSORS AND INPUT DEVICES

A. All Input devices shall be installed per the manufacturer's recommendation.

B. Space Temperature Sensors: Shall be mounted 42-50” above the finished floor.

END OF SECTION

SECTION 23 21 13

HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes pipe and fitting materials and joining methods for the following:
   1. Pipe and fittings.
   2. Dielectric fittings.
   3. Ball valves.
   4. Swing check valves.

1.3 SUBMITTALS

A. Product Data: For each type of the following:

   1. Valves.

   2. Check valves.

1.4 QUALITY ASSURANCE

A. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

   1. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
   2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

PART 2 - PRODUCTS

2.1 HEATING WATER PIPE AND FITTINGS

A. 2" and Under:
   1. Copper Tube: Type L hard temper copper, ASTM B88.

a. Fittings: ASME B16.22, solder wrought copper.
b. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.
c. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings.
1) Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.

2.2 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch (3.2-mm) maximum thickness unless otherwise indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

D. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

E. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

2.3 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:
1. Description:
a. Standard: ASSE 1079.
b. Pressure Rating: 125 psig (860 kPa) minimum at 180 deg F (82 deg C).
c. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:
1. Description:
a. Standard: ASSE 1079.
b. Factory-fabricated, bolted, companion-flange assembly.
c. Pressure Rating: 125 psig (860 kPa) minimum at 180 deg F (82 deg C) .
d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:
a. Description:
b. Nonconducting materials for field assembly of companion flanges.

c. Pressure Rating: 150 psig (1035 kPa) .
d. Gasket: Neoprene or phenolic.
e. Bolt Sleeves: Phenolic or polyethylene.
f. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:
a. Description:
b. Standard: IAPMO PS 66.
c. Electroplated steel nipple, complying with ASTM F 1545.
d. Pressure Rating: 300 psig (2070 kPa) at 225 deg F (107 deg C).
e. End Connections: Male threaded or grooved.
f. Lining: Inert and noncorrosive, propylene.

2.4 BALL VALVES

A. Manufacturers:
1. Conbraco Industries.
2. Nibco, Inc.
3. Milwaukee Valve Company.

B. Up To and Including 2 Inches (50 mm):
1. Bronze one piece body, chrome plated brass ball, teflon seats and stuffing box ring, lever handle with balancing stops, solder ends with union.

2.5 SWING CHECK VALVES

A. Manufacturers:
1. Hammond Valve.
2. Nibco, Inc.
3. Milwaukee Valve Company.

B. Up To and Including 2 Inches (50 mm):
1. Bronze body, bronze trim, bronze rotating swing disc, with composition disc, threaded ends with screw x solder adapter for copper tube.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Blowdown-Drain Piping: Same materials and joining methods as for piping specified for the service in which blowdown drain is installed.

B. Air-Vent Piping: Same materials and joining methods as for piping specified for the service in which blowdown drain is installed.

C. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.

3.2 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

C. Install piping to permit valve servicing.

D. Install piping at indicated slopes.

E. Install piping free of sags and bends.

F. Install fittings for changes in direction and branch connections.

G. Install piping to allow application of insulation.

H. Select system components with pressure rating equal to or greater than system operating pressure.

I. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

J. Install drains, consisting of a tee fitting, NPS 3/4 (DN 20) ball valve, and short NPS 3/4 (DN 20) threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

K. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

L. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

M. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

N. Install unions in piping, NPS 2 (DN 50) and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

O. Install flanges in piping, NPS 2-1/2 (DN 65) and larger, at final connections of equipment and elsewhere as indicated.

P. Install shutoff valve immediately upstream of each dielectric fitting.

Q. Comply with requirements in Section 230516 "Expansion Fittings and Loops for HVAC Piping" for installation of expansion loops, expansion joints, anchors, and pipe alignment guides.

R. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.

S. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

T. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

3.3 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric unions.

3.4 HANGERS AND SUPPORTS

A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hanger, support, and anchor devices. Comply with the following requirements for maximum spacing of supports.

3.5 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

D. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

E. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.

3.6 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

C. Install ports for pressure gages and thermometers at coil inlet and outlet connections. Comply with requirements in Section 230519 "Meters and Gages for HVAC Piping."

3.7 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.

2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

END OF SECTION

SECTION 23 21 16

HYDRONIC PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes special-duty valves and specialties for the following:
   1. Flow controls and balance devices.
   2. Air control devices.
   3. Strainers.

1.3 ACTION SUBMITTALS

A. Product Data: For each product specified herein.

   1. Flow controls and balance devices: Include flow and pressure drop curves based on manufacturer's testing for balancing valves and automatic flow-control valves.
   2. Hydronic specialties.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For air-control devices, hydronic specialties, and special-duty valves.

1.5 QUALITY ASSURANCE

A. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

   1. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

2.1 FLOW CONTROLS AND BALANCE DEVICES

A. Automatic Balancing Valve Manufacturers: Griswold, Flow Design, Inc..

1. Factory assembled, pressure compensating flow control valve, preset to control flow rate within 5 percent of tagged rating over an operating pressure differential of at least 10 times minimum required for full flow conditions; stainless steel internal components.
2. Ball valve: Brass body, stainless steel trim; internal parts replaceable without removing valve body from pipe; full port design; extended neck where used on insulated pipe.
3. Strainer: Brass and stainless steel; 510 micron mesh screen; with back-flush/drain valve.
4. Unions: Ground joint seal or rubber O rings.
5. FC-1, 2" and smaller: Flow control, ball valve, union, dual temperature and pressure test ports.
6. FC-2, 2" and smaller: Strainer, ball valve, union, single temperature and pressure test port.
7. End connections as applicable to piping system.

2.2 AIR-CONTROL DEVICES

A. Manual Air Vents:
1. Body: Bronze.
2. Internal Parts: Nonferrous.
3. Operator: Screwdriver or thumbscrew.
4. Inlet Connection: NPS 1/2 (DN 15).
5. Discharge Connection: NPS 1/8 (DN 6).
6. CWP Rating: 150 psig (1035 kPa).
7. Maximum Operating Temperature: 225 deg F (107 deg C).

2.3 STRAINERS

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
3. Strainer Screen: Stainless-steel, **20**-mesh strainer, or perforated stainless-steel basket.
4. CWP Rating: 125 psig (860 kPa).

PART 3 - EXECUTION

3.1 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains and at supply connection to each piece of equipment.

B. Install indicated flow control valves in the return pipe of each heating or cooling terminal.

3.2 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

END OF SECTION

SECTION 23 31 13

METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section was issued originally in Package 4 dated September 1, 2015, and is reissued with updated content in Package 5 dated November 16, 2015.

B. Section Includes:

1. Single-wall rectangular and round ducts and fittings.
2. Sheet metal materials.
3. Sealants and gaskets.
4. Hangers and supports.

1.3 PERFORMANCE REQUIREMENTS

A. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.4 QUALITY ASSURANCE

A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60 (Z180) G90 (Z275).

2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

D. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.4 DUCT LINER

A. Refer to Section 23 07 13 Duct Insulation.

2.5 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

2.6 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

F. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead.

C. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

D. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
   1. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg (500 Pa) and Lower: Seal Class C.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

   1. Where practical, install concrete inserts before placing concrete.
   2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
   3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
   4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.
   5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet (5 m).

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 DUCT SCHEDULE

A. Supply Ducts:

1. Ducts Connected to Variable-Air-Volume Air-Handling Units :

a. Pressure Class: Positive 3-inch wg (750 Pa).
b. Minimum SMACNA Seal Class: C.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 6 .

B. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.

C. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

D. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: Spin in.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

END OF SECTION

SECTION 23 33 00

AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section was issued originally in Package 4 dated September 1, 2015, and is reissued with updated content in Package 5 dated November 16, 2015.

B. Section Includes:
   1. Manual volume dampers.
   2. Turning vanes.
   3. Duct-mounted access doors.
   4. Flexible ducts.
   5. Duct accessory hardware.

1.3 SUBMITTALS

A. Product Data: For each type of product.

   1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60 (Z180).
2. Exposed-Surface Finish: Mill phosphatized.

B. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

C. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.3 MANUAL VOLUME DAMPERS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

B. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch (150 x 760 mm).

C. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch (200 x 1825 mm). Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

D. End Bearings: Except in round ducts 12 inches (300 mm) and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.

2.4 TURNING VANES

A. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

B. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

C. Vane Construction: Single wall for ducts up to 48 inches (1200 mm) wide and double wall for larger dimensions.

2.5 DUCT-MOUNTED ACCESS DOORS

A. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2 (7-2M), "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."

1. Door:

a. Double wall, rectangular.
b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
c. Hinges and Latches: 1-by-1-inch (25-by-25-mm)butt or piano hinge and cam latches.

d. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:

a. Access Doors Less Than 12 Inches (300 mm) Square: No hinges and two sash locks.
b. Access Doors up to 18 Inches (460 mm) Square: Two hinges and two sash locks.
c. Access Doors up to 24 by 48 Inches (600 by 1200 mm): Three hinges Continuous and two compression latches with outside and inside handles.

2.6 FLEXIBLE DUCTS

A. Insulated, Flexible Duct: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.

1. Pressure Rating: 10-inch wg (2500 Pa) positive and 1.0-inch wg (250 Pa) negative.
2. Maximum Air Velocity: 4000 fpm (20 m/s).
3. Temperature Range: Minus 20 to plus 210 deg F (Minus 29 to plus 99 deg C).
4. Insulation R-value: Comply with ASHRAE/IESNA 90.1

2.7 DUCT ACCESSORY HARDWARE

A. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel ducts.

C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

D. Set dampers to fully open position before testing, adjusting, and balancing.

E. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
1. At outdoor-air intakes and mixed-air plenums.
2. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.

3. Upstream from turning vanes.
4. Elsewhere as indicated.

F. Install access doors with swing against duct static pressure.

G. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).
2. Two-Hand Access: 12 by 6 inches (300 by 150 mm).
3. Head and Hand Access: 18 by 10 inches (460 by 250 mm).
4. Head and Shoulders Access: 21 by 14 inches (530 by 355 mm).
5. Body Access: 25 by 14 inches (635 by 355 mm).

H. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

I. Install flexible connectors to connect ducts to equipment. Connect terminal units to supply ducts with maximum 60 inch lengths of flexible duct. Do not use flexible ducts to change directions.

J. Connect diffusers to ducts with maximum 60-inch (1500-mm) lengths of flexible duct clamped or strapped in place.

K. Connect flexible ducts to metal ducts with draw bands .

L. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
3. Inspect turning vanes for proper and secure installation.

END OF SECTION

SECTION 23 36 00

AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Shutoff, single-duct air terminal units.

1.2 SUBMITTALS

A. Product Data: For each type of air terminal unit.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for air terminal units.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Operation and Maintenance Data: For air terminal units to include maintenance manuals.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 SHUTOFF, SINGLE-DUCT AIR TERMINAL UNITS

A. Manufacturers:

1. Basis of Design: Titus PESV
2. Alternate Manufacturers: Price, Kruger, Tuttle and Bailey.

B. Compliance with AHRI Standard 880.

C. Configuration: Volume-damper assembly inside unit casing with control components inside a protective metal shroud.

D. Casing: 0.034-inch-thick galvanized steel, single wall.

1. Casing Liner: Minimum ½” thick vinyl coeated fibrous glass insulation, 1.5 lb/cu ft (24 g/L) density that complies with UL 181 and NFPA 90A. Coat all exposed edges of insulation with NFPA 90A approved sealant.
2. Air Inlet: Round stub connection for duct attachment.
3. Air Outlet: S-slip and drive connections.
4. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket.

E. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.

1. Maximum Damper Leakage: AHRI 880 rated, 2 percent of nominal airflow at 1-inch wg inlet static pressure.

F. Hydronic Heating Coils: Copper tube with minimum wall thickness of 0.016-inch with male solder header connections and with mechanically bonded aluminum fins spaced no closer than 0.1 inch. Coils leak tested to 300 psi. Coil performance data hall be based on tests run in accordance with AHRI Standard 410. Include manual air vent and drain valve.

G. Control devices: Supplied by Johnson Controls.

2.3 SOURCE QUALITY CONTROL

A. Factory Tests: Test assembled air terminal units according to AHRI 880.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 5, "Hangers and Supports" and with Section 23 05 29 "Hangers and Supports for HVAC Piping and Equipment."

3.2 TERMINAL UNIT INSTALLATION

A. Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

B. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.

3.3 CONNECTIONS

A. Where installing piping adjacent to air terminal unit, allow space for service and maintenance.

B. Hot-Water Piping: Comply with requirements in Section 23 21 13 "Hydronic Piping" and Section 23 21 16 Hydronic Piping Specialties," and connect heating coils to supply with shutoff valve, strainer, control valve, and union or flange; and to return with balancing valve and union or flange.

C. Comply with requirements in Section 23 31 13 "Metal Ducts" for connecting ducts to air terminal units.

D. Make connections to air terminal units with flexible connectors complying with requirements in Section 23 33 00 "Air Duct Accessories."

3.4 IDENTIFICATION

A. Label each air terminal unit with plan number, nominal airflow, and maximum and minimum factory-set airflows. Comply with requirements in Section 23 05 53 "Identification for HVAC Piping and Equipment" for equipment labels.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.
2. Leak Test: After installation, fill water coils and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Air terminal unit will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.6 AIR TERMINAL UNIT CONTROL

A. Cooling: Modulate the volume control damper to maintain zone temperature setpoint (adj.). If damper at minimum position and space temperature more than 2F below setpoint for more than 5 minutes, begin heating sequence.

B. Heating: VAV damper shall go to heating cfm position and heating valve shall modulate to maintain zone temperature setpoint. If valve is closed for 5 minutes, resume cooling mode.

END OF SECTION

SECTION 23 37 13

DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section was issued originally in Package 4 dated September 1, 2015, and is reissued with updated content in Package 5 dated November 16, 2015.

B. Section Includes:
   1. Diffusers

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

   1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
   2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS

2.1 DIFFUSERS

A. Steel or aluminum construction as scheduled, by model number.

B. Dampers: Where indicated and where required for proper air balance; opposed blade types, operable through face.

C. Finish: As scheduled on Drawings.

2.2 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

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

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

Bidders Request for Alternatives or Exceptions (BRAE)

Letting Date: 2/15/2016

Proposal No.:15843 BRAE form due on or before: 2/9/2016

Item: Ames Materials Lab-Replace 2 VAV Boxes for Analytical Lab Spec. No.:_____

Request: _____

_____

Bidder Proposes to furnish in lieu of above: _____

_____

_____

_____

NOTE: The determination of acceptance of this BRAE request is only valid for the bid for which it was submitted. BRAE approvals received for this bid do not determine or set a precedent for what is acceptable in any other bid posted by the State of Iowa.

Email/Fax to:

Iowa Department of Transportation
Purchasing Section
Attention: Laura Linduski
Email: laura.linduski@dot.iowa.gov

Fax No.: 515-239-1538

Submitted By _____

Company _____

Address_____

_____
City State Zip

Phone No. _____

Fax No. _____

==========

DOT USE ONLY

Approved _____ Disapproved _____

Reason _____

_____

_____

Signature: _____ Date: _____