



Solicitation Response

		Response Due Date April 25, 2016	Time 1:00 P.M.	Location 800 Lincoln Way, Ames, IA	
Proposal Number 16394	Description Grimes DOT Maintenance Facility Lab Exhaust System Revisions				
Contract Begin Date May 10, 2016	Contract Completion Date June 13, 2016	Bid Bond N/A	Performance Bond (Y/N) Y	Liquidated Damages N/A	
Purchasing Agent assigned Jody McNaughton		E-mail Address Jody.mcnaughton@dot.iowa.gov	Phone 515-2391298	Fax 515-239-1538	
RESPONDER INFORMATION					
Company Name				Federal Tax ID	
Street Address		City	State	Zip Code	
Contact Name	E-mail Address		Phone	Fax	
Responder agrees to sell goods, services or both at the same prices, terms and conditions to any other Iowa state agency, Regent or Political Subdivision upon request. Please check Yes or No. <input type="checkbox"/> Yes <input type="checkbox"/> No			Responder is an Iowa Targeted Small Business <input type="checkbox"/> Yes <input type="checkbox"/> 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 responses will be accepted.**

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

Method of Award: Award shall be made to the lowest responsible, responsive responder whose response meets the requirements of the solicitation unless otherwise specified. An Iowa responder will be given preference over an out-of-state responder when 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 in the response shall be quoted as the price per unit (e.g., gal., case, each, etc.) as stated in the solicitation. If there is a discrepancy between the unit prices, extended price, or total amount of response, the unit price shall prevail. Unless otherwise indicated, prices shall be firm for the duration of the contract or purchase order. Discounts for early payment are allowed, but not considered in award of the contract.

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

Signed _____ Date _____

Schedule of Prices

Project Description: Replace exhaust system with a new energy recovery unit as indicated in plans and specifications.

Item No.	Description	Quantity	Unit/Price	Lump Sum
1	Contractor to provide and install exhaust system per plans and specifications for Grimes DOT lab	1 Job		\$ _____

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

Authorized
Signature:

Contact Person:

Company:

(Print Name)

Address:

Contractor number: _____

(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 responses 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 solicitation
- Solicitation-
 - 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 Solicitation Response: All responses must address all aspects of the solicitation. Responses must be typed or completed in ink and submitted on the forms supplied by the Iowa DOT.

Responses must be signed and received prior to the bid opening date and time indicated on the Solicitation Response page or other specified areas throughout the solicitation document. The signed, submitted quotation or bidder's proposal shall become the official response to be considered for award.

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

A. Solicitation

1. **Opening:** The opening of responses are made public and conducted at the Iowa DOT, Ames complex unless otherwise specified. Responses received after the time of the opening will be returned to the bidder and considered non-compliant.
2. **Communications:** Questions concerning this solicitation should be directed to the purchasing agent listed on the Solicitation Response page. 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 response shall be quoted as the price per unit (e.g., gal., case, each, etc.) as stated in the solicitation. If there is a discrepancy between the unit bid prices, extended price, or total amount of response, the unit prices shall prevail. Unless otherwise indicated, prices shall be firm for the duration of the contract or purchase order. Discounts for early payment are allowed, but not considered in award of the contract.
4. **Acceptance/Rejection:** The Iowa DOT or provider reserves the right to accept or reject any or all responses 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 response which is deemed to be in the best interests of the state. Any unauthorized changes, additions, or conditional response including any ties to another response or any reservations about accepting an award or entering into a contract, may result in rejection of the response. Responses must remain available for award for thirty (30) days from date of opening.

5. **Bid Results & Disclosure:** Tabulation results will be sent to all responders 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 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.
6. **Quality of Goods:** 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 Solicitation 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 response 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 responder whose response meets the requirements of the solicitation unless otherwise specified. An Iowa company or individual will be given preference over an out-of-state company or individual when 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 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 responder 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 solicitation 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 action of the Iowa DOT Purchasing Section, refer to 761IAC, Chapter 20, Iowa Administrative Code, entitled "Procurement of Equipment, Materials, Supplies and Services".
2. **Affirmative Action:** The Contractor (and also subcontractor, vendor, service provider 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 response, 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:** Responders to the solicitation 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 Solicitation 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 & Solicitation Information

1.1 Purpose

The purpose of this Request for Bid (RFB) is to solicit responses from responsible, responsive bidders to provide the goods and/or services identified and described below as specifically described in Section 2 of this solicitation.

1.2 General

The owner of goods and/or services sought shall be the Iowa Department of Transportation (Iowa DOT).

1.2.1 Project Location

2310 SE 17th St. Grimes, IA 50111

1.2.2 Issuing Agent

The Issuing Agent, identified on the Solicitation Response 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 bidder).

1.2.3 RFB posted on the Internet

Bidders are required to visit the Iowa DOT's website at:

www.iowadot.gov/purchasing/lettingschedule periodically for any and all addendums or other pertinent information regarding this solicitation.

The Iowa DOT must receive responses either **electronically or by standard mail on or before** the deadline on the Solicitation Response page. Any responses received after this deadline may be rejected.

Bidders must furnish all information necessary to be considered for award. Responses that fail to meet the mandatory requirements of the RFB will be disqualified. Verbal information provided by bidders shall not be considered part of the bidders' response.

1.2.4 Clarification

If a Bidder requires additional information to understand specifications found in Section 2 or any other part of the solicitation, all questions must be received in writing no less than 24 hours prior to the bid opening. The Iowa DOT reserves the right to contact Bidders after receiving responses for the purpose of clarification to ensure mutual understanding.

1.2.5 No Minimum Guaranteed Purchase

It is understood that the Iowa DOT considers this a best estimate only of requirements and makes no firm quantity commitment.

1.2.6 Incurring Costs

The costs of preparation and delivery of a response are solely the responsibility of the Bidder. No payments shall be made by the Iowa DOT to cover costs incurred by any Bidder for the preparation of any response.

1.2.7 Request for Alternatives or Exceptions (BRAE)

Any equipment being offered as an alternative to the specified make/model must be submitted on the enclosed "Bidders Request for Alternatives or Exceptions" form. The form must specifically state the requested alternative and be accompanied by adequate supporting information to evaluate the request.

The "Bidders Request for Alternatives or Exceptions" form must be received in sufficient time *prior* to the opening to evaluate and respond with the appropriate action. It is suggested that any requests for alternatives be submitted either by e-mail or fax immediately upon receipt of the solicitation in order to receive full consideration. Fair treatment to all Bidders shall be the primary concern in evaluation of requests for proposed alternates, particularly those submitted just prior to the opening.

Do not submit "Bidders Request for Alternative or Exceptions" with the response.

1.2.8 It is highly recommended that Contractors visit the site. All interested contractors are to schedule a site visit with Jody McNaughton before April 19, 2016 Pre-bid meeting April 20, 2016 at 10:00 a.m., Location 2310 SE 17th St Grimes, IA 50111

Section 2 Specifications & Contractor Responsibilities

2.1 Purpose

The Iowa DOT is seeking qualified bidders to replace exhaust fans with energy recovery units as specified in the Grimes DOT Lab

2.2 Specifications

Contractor to replace the Grimes lab exhaust system revisions as per plans and specifications.

Contractors are to be licensed certified HVAC installers.

Contractors are to have contractor number at the time of award. Please refer to 2.6 in this proposal for additional information on this requirement.

Additional mandatory specifications are attached after 3.6 of this proposal

2.3 Contractor Responsibilities

2.4.1 Contractors Construction Schedule

The Successful Bidder will, at the pre-construction meeting, submit a detailed construction schedule including dates of commencement and completion on each phase of the proposed construction. Upon acceptance of the schedule, the Bidder will be expected to adhere to these dates as proposed.

2.4.2 Sub-Contractors

The Successful Bidder for the project shall furnish the Iowa DOT with a complete list of subcontractors 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.

2.4.3 Verifying Work of Others

When a Contractor's work depends on proper execution of work by other contractors, such Contractor shall promptly report to the Iowa DOT project manager any defects in such work and/or discrepancies between executed work plans, drawings or specifications.

2.4.4 Safety Data Sheets (SDS)

The vendor shall include with proposal a SDS of materials bid for which these sheets apply. The successful bidder must furnish a SDS with all material delivered.

2.4.5 Guarantee

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.

2.4.6 Workmanship

All workmanship or labor provided upon award shall be warranted for a period of not less than twelve (12) months. The Contractor shall be responsible for any damage to other work resulting from negligence either purposeful or accidental. The Contractor will be allowed a remedy period as mutually agreed upon. The warranty period of twelve (12) months shall begin on the date of final acceptance. Neither the final payment nor any provision of the contract documents shall relieve the Contractor of responsibility for faulty materials or workmanship.

Work shall be performed in best, most workmanlike manner by mechanics, Contractor personnel. Installation shall be made by the manufacturer or their authorized installer where specified. Unsatisfactory work shall be replaced at Contractor's expense. The Iowa DOT project manager shall notify the Contractor and set up a complete walk-through inspection.

2.4.7 Alternates or Exceptions - Alternates or exceptions must be evaluated prior to the letting date listed in this proposal.

2.4.8 Discriminatory Practices

All Contractors or subcontractors working under the terms of these projects are prohibited from engaging in discriminatory employment practices as defined 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.

The successful 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.

2.4.9 Use of Premises

The successful contractors shall confine all apparatus, storage of materials and construction to areas as directed by the Iowa DOT and shall not encumber the premises with materials.

Notwithstanding any approvals or instructions which must be obtained by the Contractors from the Iowa DOT in connection with use of premises, the responsibility for the safe working conditions at the site shall remain that of the Contractors.

2.4.10 Safety and OSHA STDs

The successful bidder 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.

2.4.11 Safety and Health Regulations

The successful contractor, serving in the role of the employer for the project, shall exercise at all times the protection of all persons and property. Successful 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 successful contractor's responsibility to enforce all regulations that apply to these projects.

2.4.12 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.

2.5 Performance and Payment Bond

If the contracted, estimated value is \$25,000 or more, the successful Bidder shall furnish a performance bond 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.

A Resident Commission Agent or attorney-in-fact must file a copy of the power of attorney.

2.6 Power of Attorney

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

2.7 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.

2.8 DOT Responsibilities

Identify Iowa DOT project manager & contact information.

2.8.1 Inspection and Supervision All work shall be according to the approved design and shall be under the direct supervision of the Iowa DOT project manager.

- Periodic site inspections will be carried on by the Iowa DOT project manager with the contractor to ensure coordination of the project.
- The Iowa DOT will provide a list of items requiring inspection prior to or during installation. The Contractor is to give the Iowa DOT project manager notice no less than 24 hours in advance of installation.
- The Iowa DOT project manager will be assigned to work with the successful contractor throughout the project including walk throughs, inspections and final inspection.

Section 3 Supplemental Terms & Conditions

3.1 Contract Award

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

Bid price will include all requirements listed in Section 2 to complete this proposed project. The Contractor shall be responsible for taking all sub-contractor responses and for all coordination between trades.

3.2 Contract Period

The date of completion shall be stated in calendar days on the Responder's Response, and if necessary, adjusted by mutual agreement between the Iowa DOT and successful contractor 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 progression 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.

3.3 Payments and Completion of Contract

3.4.1 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.

3.4.2 Final payment shall be authorized not later than sixty (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.

3.4.3 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.

3.5 Insurance Requirements

Contractor's Insurance

- It shall be the Contractor's responsibility to have liability insurance covering the entire 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 "additionally insured".
- 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.

3.6 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 subcontractors and sureties upon any bond given or filed in connection herewith.

**IOWA DEPARTMENT OF TRANSPORTATION
GRIMES LAB EXHAUST SYSTEM REVISIONS
2300 SE 17th Street
Grimes, IA 50111
IA DOT Project No. BG-5G22(001)—80-77**

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PART 2 - PRODUCTS

PART 3 - EXECUTION

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 performed 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	Demolition, Cutting And Patching And Alterations
1.08	Conferences
1.09	Submittal Procedures
1.10	Submittals For Review
1.11	Construction Schedules
1.12	Quality Assurance/Control
1.13	References
1.14	Inspections, Sampling, And Tests
1.15	Manufacturers' Field Services And Reports
1.16	Security
1.17	Temporary Facilities and Controls
1.18	Parking
1.19	Progress Cleaning
1.20	Products
1.21	Transportation, Handling, Storage And Protection
1.22	Product Options
1.23	Anchoring to New and Existing Construction
1.24	Demonstration And Instructions
1.25	Project Record Documents
1.26	Final Cleaning
1.27	Operation And Maintenance Data
1.28	Extended Warranties
1.29	Maintenance Materials
1.30	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 Owner 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 Contractor 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 Owner, 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 Owner, 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 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.

1.08 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.

1.09 SUBMITTAL PROCEDURES

- A. All submittals are to be made electronically in the form of a PDF file sent (electronically) to the Owner. See Section 01 33 05.
- B. Transmit each submittal with a transmittal indicating, Project Name, IA DOT 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.

1.10 SUBMITTALS FOR REVIEW

- A. Submittal 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 Owner 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.

1.11 CONSTRUCTION SCHEDULES

- A. Submit an initial Draft Construction Schedule at least 3 days before the Pre-Construction Conference. Submit copies to the Owner.
- 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.
- 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 informed as to progress.

1.12 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 Owner 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.

1.13 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 Owner 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.

1.14 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 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.

1.15 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.

1.16 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.

1.17 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.

1.18 PARKING

- A. Coordinate parking areas with Owner to accommodate construction personnel.
- B. Coordinate with the Owner for use of the site.

1.19 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.

1.20 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.

1.21 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.

1.22 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.

1.23 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.

1.24 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.

1.25 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 Owner with final Application for Payment.

1.26 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.

1.27 OPERATION AND MAINTENANCE DATA

- A. In addition to electronic copies of all project data, provide one hard copy of Operation and Maintenance Data in "hard copy" form as described in this article. Provide similarly organized Operation and Maintenance Data on the electronic copy.
- 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. Owner 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.

1.28 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.

1.29 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.

1.30 CONTRACT CLOSEOUT PROCEDURES

- A. 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 Owner 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.
- B. 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 Owner 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.
- C. Complete items of work determined by Owner's final inspection to be incomplete or unacceptable and request additional inspections as necessary.
- D. Reinspection Costs: Should the Owner be required to perform additional Final Inspections because of failure of work to comply with Contract Documents, Contractor shall compensate Owner for additional services. Owner may deduct the cost of the inspections from final payment to Contractor.
- E. 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 08 91 00

LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Louvers, frames, and accessories for continuous blade louvers.

1.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide exterior metal louvers capable of withstanding the effects of loads and stresses from wind and normal thermal movement without evidencing permanent deformation of louver components including blades, frames, and supports; noise or metal fatigue caused by louver blade rattle or flutter; or permanent damage to fasteners and anchors.
 - 1. Wind Load: Uniform pressure (velocity pressure) as set forth by local building code and Cladding Pressure Wind Tunnel Tests Report, but not less 25 psf.
- B. Wind-Driven Rain Performance: Not less than 99 percent effectiveness when subjected to a rainfall rate of 3 inches (75 mm) per hour and a wind speed of 29 mph (13 m/s).

1.3 SUBMITTALS

- A. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes for each product indicated.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.
- B. Single Source Responsibility: Obtain louvers and vents from a single source where alike in one or more respects with regard to type, design, and factory-applied color finish.
- C. SMACNA Standard: Comply with SMACNA "Architectural Sheet Metal Manual" recommendations for fabrication, construction details, and installation procedures.

1.5 WARRANTY

- A. Provide twenty year manufacturer warranty against distortion, metal degradation, and failure of connections.
 - 1. Finish: Include coverage against degradation of exterior finish.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to, the following:
 - 1. Airline Products Co. Div., Danzer Metal Works Co.

2. Aiolite Co.
3. American Warming and Ventilating, Inc.
4. Construction Specialties, Inc.
5. Industrial Louvers, Inc.
6. Reliable Metal Products.
7. Ruskin Mfg. Div., Phillips Industries, Inc.

2.2 MATERIALS

- A. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer to produce required finish.
- B. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5 or T-52.
- C. Fasteners: Of same basic metal and alloy as fastened metal, unless otherwise indicated. Do not use metals which are corrosive or incompatible with materials joined.
 1. Use types, gages, and lengths to suit unit installation conditions.
 2. Use Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.
- D. Anchors and Inserts: Of type, size, and material required for type of loading and installation indicated. Use nonferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or expansion bolt devices for drilled-in-place anchors.
- E. Bituminous Paint: SSPC-Paint 12 (cold-applied asphalt mastic).

2.3 FABRICATION, GENERAL

- A. General: Fabricate louvers to comply with requirements indicated for design, dimensions, materials, joinery, and performance.
- B. Preassemble louvers in shop to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.
- D. Fabricate frames, including integral sills, to fit in openings of size indicated with allowances made for fabrication and installation tolerances of louvers, adjoining construction, and perimeter sealant joints.
- E. Include supports, anchorages, and accessories required for complete assembly.
- F. Provide sill extensions and loose sills made of same material as louvers, where indicated, or required for drainage to exterior and to prevent water penetrating to interior.
- G. Join frame members to one another and to fixed louver blades by welding unless otherwise indicated, or size of louver assembly makes bolted connections between frame members necessary.
- H. Closures: Provide metal closures at end of frame at head, jamb and sills.

2.4 FIXED EXTRUDED ALUMINUM LOUVERS

- A. Continuous Horizontal Fixed Blade Louvers: Extruded aluminum frames and louver blades with supporting framework concealed from view from outside face of louver except where shown otherwise on drawings, by placing braces, mullions, and brackets on inside face; with close fitting, field-made splice joints in blades designed to permit expansion and contraction without deforming blades or framework; and complying with the following requirements:
 - 1. Louver Depth: 6", unless otherwise indicated.
 - 2. Frame Type: Exterior Flange, unless otherwise indicated.
 - 3. Frame Thickness: 0.125 inch, unless otherwise indicated.
 - 4. Louver Blade Thickness: 0.125 inch, unless otherwise indicated.
 - 5. Louver Blade Profile: Stormproof design, complying with the Performance Requirements specified.
 - a. 1 inch horizontal blade face profile.
 - b. 3 inch space between blade faces.
 - 6. Free Area: 50 percent.

2.5 ACCESSORIES

- A. Louver Screening for Aluminum Louvers: Fit aluminum louver screen frames with screening covering louver openings and complying with the following requirements:
 - 1. Bird Screening: 1/2 inch square mesh formed with 0.063 inch diameter aluminum wire.
- B. Secure screens to louver frames with stainless steel machine screws, spaced at each corner and at 12 inch o.c. between.
- C. Louver Screen Frames: Fabricate screen frames with mitered corners to louver sizes indicated and to comply with the following requirements:
 - 1. Metal: Same kind and form of metal as indicated for louver frames to which screens are attached.
 - a. Reinforce extruded aluminum screen frames at corners with clips.
 - 2. Finish: Same finish as louver frames to which louver screens are attached.
 - 3. Type: Rewireable frames with a driven spline or insert for securing screen mesh.
- D. Provide all flashing to match louver finish.

2.6 FINISHES

- A. Fluoropolymer Coating (Aluminum Surfaces): Manufacturer's special pigmented 3-coat baked system, for exterior application, consisting of thermo-cured primer, and thermocured fluorocarbon coating color coat and clear coat containing not less than 70% (Kynar 500) resin, 1.5 mil minimum dry film thickness; medium gloss at 60 degrees ASTM D 523.
- B. Color: White.
- C. Touch-Up Materials: As recommended by coating manufacturer for field application.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that prepared openings and flashings are ready to receive work and opening dimensions are as indicated on shop drawings.

3.2 INSTALLATION

- A. Install louver assembly in accordance with manufacturer's instructions.
- B. Install louvers level and plumb and in alignment with adjacent work.
- C. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.
- D. Form closely fitted joints with exposed connections accurately located and secured.
- E. Secure louver frames in openings with concealed fasteners.
- F. Repair finishes damaged by cutting, welding, soldering, and grinding operations require for fitting and jointing. Restore finishes so there is no evidence of corrective work. Return items which cannot be refinished in field to the shop, make required alterations and refinish entire unit, or provide new units.
- G. Protect galvanized and nonferrous metal surfaces from corrosion or galvanic action by application of a heavy coating of bituminous paint on surfaces which will be in contact with concrete, masonry, or dissimilar metals.
- H. Install concealed gaskets, flashings, joint fillers, and insulation, as louver installation progresses where required to make louver joints weathertight. Comply with Division 7 Section "Joint Sealants" for sealants applied during installation of louver.

3.3 ADJUSTING AND PROTECTION

- A. Protect louvers and vents from damage of any kind during construction period including use of temporary protective coverings where needed and approved by louver manufacturer. Remove protective covering at time of Substantial Completion.
- B. Restore louvers and vents damaged during installation and construction period, so that no evidence remains of correction work. If results of restoration are unsuccessful, as judged by the Architect-Engineer, remove damaged units and replace with new units.
 - 1. Clean and touch-up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

3.4 CLEANING

- A. Periodically clean exposed surfaces of louvers and vents, which are not protected by temporary covering, to remove fingerprints and soil during construction period; do not let soil accumulate until final cleaning.
- B. Before final inspection, clean exposed surfaces with water and with a mild soap or detergent not harmful to finishes. Rinse thoroughly and dry surface.

END OF SECTION

SECTION 09 21 16

GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.

PART 2 - PRODUCTS

2.1 INTERIOR GYPSUM BOARD

- A. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 - 1. Thickness: 5/8 inch (15.9 mm).
 - 2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
 - 3. Use: Walls and ceilings, unless noted otherwise.

2.2 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.

2.3 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper or coated glass fiber tape for joints and corners; 2 inches (50 mm) wide unless noted otherwise.
- C. Joint Compound for Interior Gypsum Board:
 - 1. Tape to be set and holes over 1/4 inch (6 mm) in smallest dimension to be filled with chemical setting type compound.
 - 2. Successive coats may be with ready-mixed or powder-mixed vinyl-based joint compound, as recommended by the gypsum board manufacturer.

2.4 AUXILIARY MATERIALS

- A. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.

PART 3 - EXECUTION

3.1 FRAMING INSTALLATION

- A. Studs: Space studs as permitted by standard.

1. Extend partition framing to structure above, unless noted otherwise.

3.2 BOARD INSTALLATION

- A. Comply with ASTM C 840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors.
- D. Install trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
 1. Corner Beads: Install at external corners, using longest practical lengths.
 2. Edge Trim: Install at locations where exposed edge of gypsum board abuts dissimilar materials and as indicated.
- E. Prefill open joints and damaged surface areas.
- F. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes, except for trim products specifically indicated as not intended to receive tape.
 1. Tape to be set and holes over 1/4 inch (6 mm) in smallest dimension to be filled with chemical setting type compound.
 2. Successive coats may be with ready-mixed or powder-mixed vinyl-based joint compound, as recommended by the gypsum board manufacturer.
 3. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).
- G. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 1. Level 4: All surfaces except as noted otherwise.
 - a. Primer and its application to surfaces are specified in Section 09 90 00 "Painting and Coating."
- H. Protect adjacent surfaces from drywall compound and texture finishes and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- I. Remove and replace panels that are wet, moisture damaged, and mold damaged.

3.3 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

END OF SECTION

SECTION 09 90 00
PAINTING AND COATING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint and coating systems on interior and exterior substrates.

1.2 DEFINITIONS

- A. Conform to ASTM D 16 for interpretation of terms used in this section.
- B. Gloss Level: As defined by "MPI Architectural Painting Specification Manual".

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum five years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years of experience.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.5 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Benjamin Moore & Co.
 2. Diamond Vogel Paints.
 3. Glidden Professional.
 4. PPG Architectural Finishes, Inc.
 5. Pratt & Lambert.
 6. Sherwin-Williams Company (The).
 7. Tnemec Company, Inc.

2.2 PAINT, GENERAL

- A. Material Compatibility:
1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 2. Supply each coating material in quantity required to complete entire project's work from a single production run.
 3. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
- C. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

2.3 PAINT SYSTEMS, GENERAL

- A. General Paint System Notes:
1. Specific products listed (if any) are for reference only. Other similar products are also acceptable. Similar shall be understood to be paints of similar or greater solids content, similar depth of application (DFT) and similar in-service performance record.
 2. All paints are to be applied at the manufacturer's suggested depth (DFT) level for the substrate and type of application.

2.4 PAINT SYSTEMS

- A. Paint GI-OP-3LA - Gypsum Board/Plaster, Acrylic, 3 Coat:
1. One coat of finish paint manufacturer's recommended latex primer / sealer.
 2. Eggshell: Two coats of acrylic; Solo, Eg-Shel, A75 Series, by Sherwin Williams.
 3. Flat: Two coats of acrylic; Solo, A74 Series, by Sherwin Williams.

2.5 ACCESSORY MATERIALS

- A. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified; commercial quality. Comply with manufacturer's product data for product to be thinned or tinted.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Gypsum Board: 12 percent, measured in accordance with ASTM D4442.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Existing painted surfaces:
 - 1. Inspect entire surface.
 - 2. Remove all materials or coating that will interfere with the paint bond.
 - 3. Remove all loose paint.
 - 4. Fill / patch areas where loose paint is removed or other depressions as necessary to produce a continuous, even surface.
 - 5. Prime fill / patch areas before applying bond coat to the entire wall surface.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied and cured.
- D. Additional Coats: Regardless of number of coats specified, apply as many coats as necessary to complete hide imperfections and produce a uniform finish coat.
- E. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
 - 1. Mechanical and Electrical:
 - a. In finished areas, paint all insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
 - b. Paint interior surfaces of air ducts and convectors and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
 - c. Paint dampers exposed behind louvers, grilles, and convectors and baseboard cabinets to match face panels.
- F. Do Not Paint or Finish the Following Items:
 - 1. Required labels including: fire rating labels, equipment serial number and capacity labels.
 - 2. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
 - 3. Items indicated to receive other finishes.
 - 4. Items indicated to remain unfinished.
 - 5. Finished metals including: Stainless steel, anodized aluminum, terne metal, chromium plated metals, copper, bronze, brass and similar items.
 - 6. Floors, unless specifically so indicated.
 - 7. Ceramic and other tiles.
 - 8. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
 - 9. Glass.
 - 10. Surfaces in concealed areas and inaccessible areas such as furred spaces, utility tunnels, pipe spaces, and duct shafts except where visible through grilles, registers or the like. Do not paint pipes, ducts or conduit located in such spaces.
 - 11. Ductwork, piping, conduits, hangers, equipment supports, and equipment in rooms devoted primarily to mechanical and electrical equipment.

3.4 CLEANING AND PROTECTION

- A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

- C. As work progresses, promptly remove paint where spilled, splashed or spattered.
- D. During progress of work, maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris. Do not allow accumulation of empty containers or other excess items except in areas designated for that purpose.
- E. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.5 PROTECTION AND CORRECTION

- A. Protect finished coatings until completion of project.
- B. Touch-up damaged coatings after Substantial Completion.
- C. Following completion of painting in each area, reinstall items which were removed for painting by the Contractor.
- D. Upon completion of this portion of work, visually inspect surfaces and remove paint from surfaces not scheduled to be painted.
- E. In event that system does not cover and achieve finish in accordance with manufacturer's claims, apply corrective material to achieve required finish.
- F. Spot painting to correct soiled or damaged paint surfaces will be allowed only when touch-up spot is blended into surrounding finish and is not visible to normal viewing. If not possible, re-coat entire surface to corners or visible stopping point.

3.6 PAINTING SCHEDULE

- A. Gypsum Board Ceilings:
 - 1. System: GI-OP-3LA (Acrylic).
 - 2. Gloss/Sheen: Flat (<5).

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. Energy Recovery Units.
 - 2. 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 SUBMITTALS

- A. 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.
- B. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.
- C. 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. Proper thermal overload protection is in place for electrical equipment.
 - 3. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 4. Duct systems are clean of debris.
 - 5. Fans are rotating correctly.
 - 6. Volume dampers are in place and open.
 - 7. Access doors are closed and duct end caps are in place.
 - 8. Air outlets are installed and connected.
 - 9. Duct system leakage is minimized.
- I. Examine operating safety interlocks and controls on HVAC equipment.
- J. 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. 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, 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.

3.3 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. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- C. 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.
- D. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- E. Verify that motor starters are equipped with properly sized thermal protection.
- F. Check dampers for proper position to achieve desired airflow path.
- G. Check for airflow blockages.
- H. Check for proper sealing of air-handling-unit components.
- I. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.4 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.
- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.5 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. Manufacturers' test data.
 - 2. Field test reports prepared by system and equipment installers.
 - 3. 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. Owner's name and address.
 - 6. Contractor's name and address.
 - 7. Report date.
 - 8. Signature of TAB supervisor who certifies the report.
 - 9. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 - 10. 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.
 - 11. Nomenclature sheets for each item of equipment.
 - 12. Data for terminal units, including manufacturer's name, type, size, and fittings.
 - 13. Notes to explain why certain final data in the body of reports vary from indicated values.
 - 14. 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. Energy Recovery 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).

E. Instrument Calibration Reports:

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

3.6 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.

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 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.

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.

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 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Outdoor and Supply Air Ducts from an energy recovery unit shall be the following:
 1. Mineral-Fiber Blanket: 2 inches (50 mm) thick.
- B. Exhaust Air Ducts from an energy recovery to louver unit shall be the following:
 1. Mineral-Fiber Blanket: 2 inches (50 mm) thick.

END OF SECTION

SECTION 23 31 13

METAL DUCTS

PART 1 - GENERAL

1.1 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.

1.2 PERFORMANCE REQUIREMENTS

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

1.3 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 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.

2.5 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.

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 Energy Recovery Unit:
 - 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. Duct-mounted access doors.
 - 3. Flexible ducts.
 - 4. Duct accessory hardware.

1.3 SUBMITTALS

- A. Product Data: For each type of product.

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 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.

2.5 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

2.6 DUCT ACCESSORY HARDWARE

- A. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

2.7 CONTROL DAMPERS

- A. Basis of Design: Ruskin type CD36.
- B. Construction:
 - 1. Galvanized steel.
 - 2. Frame: Minimum 16 gauge; reinforced corners.
 - 3. Blades: Minimum 16 gauge, opposed blade; non-metallic bearings.
 - 4. Blade Seals: UL94, 5903 vinyl coated polyester.
 - 5. Leakage Rate: Maximum 5.4 cfm/sq ft at 1.0 inch wg.
 - 6. Jamb seals: Stainless steel compression type.
- C. Actuators:
 - 1. Basis of Design: Belimo EFB120.
 - 2. Voltage: 120.
 - 3. Energize Open, Spring Return.

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.
- F. Install access doors with swing against duct static pressure.
- G. 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.
- H. Connect diffusers to ducts with maximum 60-inch (1500-mm) lengths of flexible duct clamped or strapped in place.
- I. Connect flexible ducts to metal ducts with draw bands .

- J. 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.

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 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

SECTION 23 43 38

PORTABLE SOURCE CAPTURE FILTRATION UNITS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Portable Filtration Units.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service location and telephone number.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum of three years of documented experience.

1.4 WARRANTY

- A. Manufacturer's Limited Warranty: Manufacturer agrees to repair or replace components of portable source capture that fail(s) in materials or workmanship within specified warranty period.
 - 1. Warranty Period: One year from ship date.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Monoxivent PCFS-10.
- B. Alternate Manufacturers: Air Systems International, Air Quality Engineering.

2.2 DESCRIPTION

- A. Cabinet: 18-gauge steel with epoxy powder coating.
- B. Blower Motor: 1.5 HP at 3450 RPM
- C. Voltage: 120/1 with 25'-0" long, 12-gauge, 3-wire cord. 13 amp start-up.
- D. Airflow: 750 CFM.

- E. Weight: 360lbs without arm.
- F. Wheels: (4) Casters, 5" diameter with swivel and locking capability.
- G. Filter Type: Cartridge, 12"x24" polyester/cellulose media.
- H. Control Panel with the following indicators:
 - 1. On/Off rocker switch.
 - 2. On/Off indicator light.
 - 3. Filter Indicator Light
 - 4. Operation hours counter.
- I. Features
 - 1. 10'-0" arm.
 - 2. Clean-out tray,
 - 3. Manual air pulse cleaning system.
 - 4. Access door for filter change and duct bin access.
 - 5. Internal baffle.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 23 72 00

AIR-TO-AIR ENERGY RECOVERY EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fixed-plate total heat exchangers.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air-to-air energy recovery equipment to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Filters: One set(s) of each type of filter specified.

1.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Manufacturer shall be able to provide evidence of independent testing of the core by Underwriters Laboratory (UL), verifying a maximum flame spread index (FSI) of 25 and a maximum smoke developed index (SDI) of 50 thereby meeting NFPA 90A and NFPA 90B requirements for materials in a compartment handling air intended for circulation through a duct system. The method of test shall be UL Standard 723.
- C. Unit shall be Listed under UL 1812 Standard for Ducted Air to Air Heat Exchangers. The unit must pass commercial flammability requirements and shall not be labeled "For Residential Use Only".

- D. The energy recovery ventilator shall be Certified by the Home Ventilating Institute (HVI) under CSA 439.

1.7 COORDINATION

- A. Coordinate layout and installation of air-to-air energy recovery equipment and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, and partition assemblies.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of air-to-air energy recovery equipment that fail in materials or workmanship within specified warranty period.
 - 1. Ten year limited warranty on energy exchange core.
 - 2. Two year limited warranty against defects in material and workmanship on all other components.

PART 2 - PRODUCTS

2.1 FIXED-PLATE TOTAL HEAT EXCHANGERS

- A. Manufacturers:
 - 1. Basis of Design: Renew Air.
- B. Description: Capable of transferring both sensible and latent energy between airstreams. Latent energy transfer shall be accomplished by direct water vapor transfer from one airstream to the other, without exposing transfer media in succeeding cycles directly to the exhaust air and then to the fresh air.
- C. Construction
 - 1. Casing: 24-gauge steel, with lapped corners and zinc plated screw fasteners.
 - 2. Insulation: 1-inch expanded polystyrene foam insulation faced with a cleanable foil face on all exposed surfaces.
 - 3. Access Door: Airtight compression seal using closed cell foam gaskets.
 - 4. Paint: textured, powder coat paint.
- D. Plates: Evenly spaced and sealed and arranged for counter airflow.
 - 1. Plate Material: Chemically treated paper with selective hydroscopicity and moisture permeability, and gas barrier properties.
- E. Disposable Panel Filters:
 - 1. Comply with NFPA 90A.
 - 2. Filter Holding Frames: Arranged for angular orientation, with access doors on one side of unit. Filters shall be removable from one side or lift out from access plenum.
 - 3. Factory-fabricated, viscous-coated, flat-panel type.
 - 4. MERV: 8, according to ASHRAE 62.1, spun polyester.
 - 5. Media: Interlaced glass fibers sprayed with nonflammable adhesive[**and antimicrobial agent**].

6. Frame: Galvanized steel with metal grid on outlet side, steel rod grid on inlet side, hinged, and with pull and retaining handles.
- F. Passive Frost Control: The ERV core shall perform without condensing or frosting under normal operating conditions (defined as outside temperatures above -10°F and inside relative humidity below 40%). Occasional more extreme conditions shall not affect the usual function, performance or durability of the core. No condensate drains will be allowed.
 - G. Positive Airstream Separation: Water vapor transfer shall be through molecular transport by hygroscopic resin and shall not be accomplished by “porous plate” mechanisms. Exhaust and fresh airstreams shall travel at all times in separate passages, and airstreams shall not mix.
 - H. Vibration Isolation:
 1. Manufacturers: Mason 30N, Vibrex HXA, Peabody SRH, Vibration Mountings and Controls.
 2. Description: Spring type element in series with nominal 1 inch thick neoprene element with integral grommet.

2.2 CAPACITIES AND CHARACTERISTICS

- A. Units ERV-1
 1. Basis of Design: Renewaire Model EV200.
 2. Airflow: 149 cubic feet per minutes.
 3. External Static Pressure: 0.6 inches of water.
 4. Temperature Effectiveness Percentage: 79.
 5. Total Effectiveness Percentage Winter/Summer: 73/59.
 6. Electrical
 - a. Voltage: 120V.
 - b. Frequency: 60 Hz.
 - c. Phase: Single.
 - d. Watts: 157.
 - e. Full Load Amps: 1.5.
- B. Units ERV-2, ERV-3
 1. Basis of Design: Renewaire Model EV300.
 2. Airflow: 295 cubic feet per minutes.
 3. External Static Pressure: 0.5 inches of water.
 4. Temperature Effectiveness Percentage: 70.
 5. Total Effectiveness Percentage Winter/Summer: 63/47.
 6. Electrical
 - a. Voltage: 120V.
 - b. Frequency: 60 Hz.
 - c. Phase: Single.
 - d. Watts: 315.
 - e. Full Load Amps: 3.3.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Examine casing insulation materials and filter media before air-to-air energy recovery equipment installation. Reject insulation materials and filter media that are wet, moisture damaged, or mold damaged.
- C. Examine roughing-in for electrical services to verify actual locations of connections before installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install fixed-plate heat exchangers so supply and exhaust airstreams flow in opposite directions.
 - 1. Install duct access doors in both supply and exhaust ducts, both upstream and downstream, for access to heat exchanger. Access doors and panels are specified in Section 233300 "Air Duct Accessories."
- B. Suspended Units: Suspend units from structural support frame using threaded steel rods and spring hangers.
- C. Install units with clearances for service and maintenance.
- D. Install new filters at completion of equipment installation and before testing, adjusting, and balancing.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 DEMONSTRATION

- A. Train Owner's maintenance personnel to operate and maintain air-to-air energy recovery units.

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Single conductor building wire.
- B. Wiring connectors.
- C. Electrical tape.
- D. Wire pulling lubricant.

1.2 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2001 (Reapproved 2007).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011.
- C. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- E. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
 - 3. Notify Architect/Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.4 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

3/25/2016

BBSAE No. 15043

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
BG-5G22(001)--80-77 / Grimes Lab Exhaust System Revisions

260519 - 1

2.1 ALL CONDUCTORS AND CABLES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose indicated.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70/ICEA S-95-658.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Conductor Material:
 - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project unless otherwise indicated. Conductor sizes indicated are based on copper.
 - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
- G. Minimum Conductor Size:
 - 1. Branch Circuits: 12 AWG.
 - a. Exceptions:
 - 1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.
 - 2) 20 A, 120 V circuits longer than 150 feet (46 m): 8 AWG, for voltage drop.
 - 2. Control Circuits: 14 AWG.
- H. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- I. Conductor Color Coding:
 - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 - 2. Color Coding Method: Integrally colored insulation.
 - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
 - 3. Color Code:
 - a. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - b. Equipment Ground, All Systems: Green.
 - c. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.

2.2 SINGLE CONDUCTOR BUILDING WIRE

- A. Description: Single conductor insulated wire.
- B. Conductor Stranding:
 - 1. Feeders and Branch Circuits: Stranded.

- C. Insulation Voltage Rating: 600 V.
- D. Minimum 90 degree C insulation rating.
- E. Insulation: Type THHN/THWN or THHN/THWN-2.

2.3 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable. Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.
- B. Wiring Connectors for Splices and Taps:
 - 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
- C. Wiring Connectors for Terminations:
 - 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
 - 2. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
- D. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- E. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
- F. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

2.4 WIRING ACCESSORIES

- A. Electrical Tape:
 - 1. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
- B. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
 - 1. Manufacturers:
 - a. 3M: www.3m.com.
 - b. American Polywater Corporation: www.polywater.com.
 - c. Ideal Industries, Inc: www.idealindustries.com.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that work likely to damage wire and cable has been completed.

- B. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- C. Verify that field measurements are as shown on the drawings.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.3 INSTALLATION

- A. Circuiting Requirements:
 - 1. Unless dimensioned, circuit routing indicated is diagrammatic.
 - 2. When circuit destination is indicated and routing is not shown, determine exact routing required.
 - 3. Arrange circuiting to minimize splices.
 - 4. Include circuit lengths required to install connected devices within 10 ft (3.0 m) of location shown.
 - 5. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits routed longer than 75 feet (25 m).
- B. Insulation Types:
 - 1. Use THHN/THWN-2 for:
 - a. Feeders concealed in ceilings, walls, partitions and crawlspaces.
 - b. Feeders installed below raised flooring.
 - c. Feeders installed in underfloor duct.
- C. Type MC Cable is not permitted for use.
- D. Install products in accordance with manufacturer's instructions.
- E. Install conductors and cable in a neat and workmanlike manner in accordance with NECA 1.
- F. Installation in Raceway:
 - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 - 2. Pull all conductors and cables together into raceway at same time.
 - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- G. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
- H. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

- I. Make wiring connections using specified wiring connectors.
 - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
 - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
 - 3. Do not remove conductor strands to facilitate insertion into connector.
 - 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
 - 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

- J. Where a circuit passes through an outlet box and is tapped, all leads are to be pigtailed to the wiring device, including the equipment ground, to prevent loss of neutral or ground during maintenance work. Wiring at Outlets: Install conductor at each outlet, with at least 150 mm (6 inches) of slack.

- K. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
 - 1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
 - b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
 - 2. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.

- L. Do not use split bolt connectors or scotch lock type wire connectors.

- M. Insulate ends of spare conductors using vinyl insulating electrical tape.

- N. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

- O. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

END OF SECTION

SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Metal conduits, tubing, and fittings.
 - 2. Boxes, enclosures, and cabinets.

1.2 DEFINITIONS

- A. FMC: Flexible metal conduit.
- B. IMC: Intermediate metal conduit.
- C. LFMC: Liquid-tight flexible metal conduit.

1.3 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduit, wireways and fittings, floor boxes, hinged-cover enclosures, , and cabinets.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. EMT: Comply with ANSI C80.3 and UL 797.
- C. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- D. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
 - 1. Fittings for EMT:
 - a. Material: Steel.
 - b. Type:
 - 1) For sizes 1-1/2" and below: Set screw.
 - 2) For sizes 2" and larger: Compression.

2.2 BOXES, ENCLOSURES, AND CABINETS

- A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.
- D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- E. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- F. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- G. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Indoors: Apply raceway products as specified below unless otherwise indicated:
 - 1. Exposed, Not Subject to Physical Damage, including most locations in mechanical and electrical rooms: EMT.
 - 2. Concealed in Ceilings and Interior Walls and Partitions: EMT .
 - 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 - 4. Boxes and Enclosures: NEMA 250, Type 1 unless otherwise noted.
- B. Minimum Raceway Size: 3/4-inch (21-mm) trade size.
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
 - 2. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- D. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

- B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.
- E. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- F. Metal Clad cable is prohibited unless otherwise indicated. Comply with Section 260519 for allowed power conductors in conduit.
- G. Support conduit within 12 inches (300 mm) of enclosures to which attached.
- H. Stub-ups to Above Recessed Ceilings:
 - 1. Use EMT, IMC, or RMC for raceways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- J. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- K. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- L. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- M. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- N. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground service raceway enters a building or structure.
 - 3. Where otherwise required by NFPA 70.

- O. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- P. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- Q. Locate boxes so that cover or plate will not span different building finishes.
- R. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- S. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- T. Set metal floor boxes level and flush with finished floor surface.

3.3 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.

1.2 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

PART 2 - PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS

- A. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.
- B. Identification for Equipment:
 - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
 - a. Enclosed switches, circuit breakers, motor controllers and variable frequency drives with integral disconnecting means:
 - 1) Identify power source and circuit number. Include location when not within sight of equipment.
 - 2) Identify load(s) served. Include location when not within sight of equipment.
- C. Identification for Conductors and Cables:
 - 1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
 - 2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment.

2.2 IDENTIFICATION NAMEPLATES AND LABELS

- A. Identification Labels:
 - 1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 - 2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

2.3 WIRE AND CABLE MARKERS

- A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- C. Legend: Power source and circuit number or other designation indicated.
- D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
- E. Minimum Text Height: 1/8 inch (3 mm).
- F. Color: Black text on white background unless otherwise indicated.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
 - 1. Flush-Mounted Equipment: Inside of equipment door.
 - 2. Interior Components: Legible from the point of access.
 - 3. Conductors and Cables: Legible from the point of access.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing, or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Mark all handwritten text, where permitted, to be neat and legible.

3.3 FIELD QUALITY CONTROL

- A. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Manual Motor Starters.
 - 2. Enclosures.

1.2 SUBMITTALS

- A. Product Data: For each type of enclosed switch, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NFPA 70.

1.4 COORDINATION

- A. Coordinate layout and installation of switches, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 MANUAL MOTOR STARTER

- A. General-purpose Class A, NEMA 1 manually operated type with full voltage controller for induction motors, rated in horsepower. Units shall include overload protection, red pilot light, and toggle operator.
- B. Accessories:
 - 1. Interchange heater elements to protect motors ranging from 0.4 to 16.0 amps.
 - 2. Trip-free handle mechanism.

2.2 ENCLOSURES

- A. Enclosed Switches:
 - 1. Indoor, Dry and Clean Locations: NEMA 1.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install individual wall-mounted switches with tops at uniform height unless otherwise indicated.

3.3 IDENTIFICATION

- A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

- A. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
 2. Test continuity of each circuit.
- B. Tests and Inspections:
1. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

3.5 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION



Bidders Request for Alternatives or Exceptions (BRAE)

Letting Date: 4/25/16

Proposal No.: 16394

BRAE form due on or before: 4/18/2016

Item: _____

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: Jody McNaughton
Email: jody.mcnaughton@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: _____