ADDENDUM NO. 4

To:	All Plan Holders of Record and Interested Parties
Project:	Clinton County Administration Building - Addition & Alterations
Project No.:	22072
Issue Date:	March 8th, 2024
Bids Due:	2:00 PM, March 13, 2024

The following additions, revisions, corrections, and clarifications contained herein shall become part of the Construction Contract Documents for the Project and shall be included in the Scope of Work and Bid Proposals to be submitted. References made below to Specifications and Construction Drawings shall be used as a general guide only. Bidders shall determine for themselves the full scope of work affected by the Addendum items.

The following Addendum is part of the Construction Contract Documents dated February 13, 2024.

This Addendum consists of the following:
Addendum No. 4-- 2 Pages
Addendum No. 4 items by Modus Engineering -- 23 Pages

CHANGES TO CONTRACT DOCUMENTS

CHANGES TO TECHNICAL SPECIFICATIONS:

See attached items per Modus Engineering.

CHANGES TO DRAWINGS:

No changes to the drawings are included in this addendum.

VENDOR APPROVALS:

Specification Section – 072726 – FLUID APPLIED MEMBRANE AIR BARRIERS

1. Approved: Barritech VP Vapor Permeable Air Barrier by Carlisle Coating and Waterproofing

ATTACHMENTS:
Addendum No. 4 items by Modus Engineering

DUBUQUE OFFICE
137 Main Street, Ste. 100
Dubuque, Iowa 52001

origindesign.com
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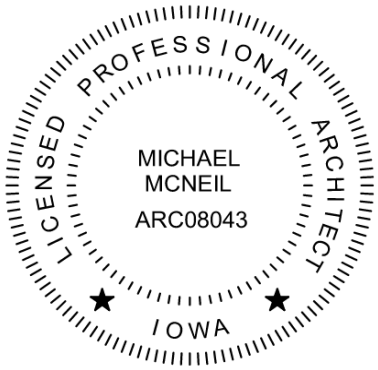
It is required to acknowledge this addendum on the Bid Proposal Form.

	I hereby certify that this portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge. I am a duly licensed Professional Architect under the laws of the State of Iowa. FOR **Origin Design Co.** 3/8/2024 Michael McNeil — Date 6/30/2025 — 3/8/2024 Registration Expires — Date Issued Pages or sheets covered by this seal: Addendum #4

	I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa. FOR Origin Design Co. 3/8/2024 Kevin R. Panczyk, P.E. — Date License Number 24714 My license renewal date is December 31, 2025 Pages or sheets covered by this seal: Addendum 4 - Modus Items Attachment

END OF ADDENDUM NO. 4

Addendum #4

Project:	Clinton County Addition and Alterations	Project Number:	22-086	Date:	March 8, 2024

Note { *This addendum has been issued to modify and/or interpret the bidding documents, including the drawings and specifications. Unless otherwise instructed, the information contained on the addendum shall take precedence over anything contrary on the original bidding documents and shall be hereinafter considered as a party of the bidding documents.*

Specifications

Section 23 07 13 Duct Insulation

1. **ADD** entire specification section.

Section 23 3100 HVAC Ducts and Casing

1. **ADD** entire specification section.

Section 23 33 00 Air Duct Accessories

1. **ADD** entire specification section.

Section 23 36 00 Air Terminal Units

1. **ADD** entire specification section.

Section 23 37 00 Air Outlets and Inlets

1. **ADD** entire specification section.

Plans

No plans are included in this addendum.

Vendor Approvals

No vendor approvals are included in this addendum.

Attachments

Section 23 0713 Duct Insulation... (8.5 x 11)

Section 23 3100 HVAC Ducts and Casing... (8.5 x 11)

Section 23 3300 Air Duct... (8.5 x 11)

Section 233600 Air Terminal Units... (8.5 x 11)

Section 233700-Air Outlets and Inlets... (8.5 x 11)

Total Pages... 22

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SECTION 230713

DUCT INSULATION (ADDENDUM #4)

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass (flexible duct wrap)

B. Fiberglass (duct liner)

1.02 RELATED SECTIONS

A. Specification Section 233100 - HVAC Ducts and Casings

B. Specification Section 233300 - Air Duct Accessories

1.03 REFERENCES

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

B. ASTM C518 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

C. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation

D. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation

E. ASTM C1071 - Standard Specification for Thermal and Acoustical Insulation (Fiberglass, Duct Lining Material)

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials

G. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials

H. ASTM E162 - Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source

I. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

J. ASTM C612: Standard Specification for Mineral Fiber Block and Board Thermal Insulation

K. ASTM C1290: Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts

L. ASTM E2336: Standard Test Methods for Fire Resistive Grease Duct Enclosure Systems

M. ASTM C1338: Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings

N. NAIMA National Insulation Standards

O. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials

P. SMACNA - HVAC Duct Construction Standards - Metal and Flexible

Q. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials

1.04 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, and list of materials and thickness for each service and locations.

B. Manufacturer's Installation Instructions: Indicate procedures that ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

B. Applicator Qualifications: Company specializing in performing the work of this section approved by manufacturer.

1.06 REGULATORY REQUIREMENTS

A. Materials: Flame spread/smoke developed rating of 25/50 in accordance with ASTM E84.

B. Identification: External duct insulation and factory insulated flexible duct shall be legibly printed or identified at intervals not greater than 36 inch with name of manufacturer, the thermal resistance R-value at the specified thickness; and the flame spread and smoke developed indexes of the composite material.

1.07 DELIVERY, STORAGE AND PROTECTION

A. Deliver, store, protect and handle products to site.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

C. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 FIBERGLASS (FLEXIBLE DUCT WRAP)

A. Manufacturers:
   1. Owens Corning
   2. Knauff
   3. Johns Manville
   4. CertainTeed
   5. Engineer approved equal.

B. Insulation: ASTM C1290; flexible, noncombustible blanket.
   1. "K" Value: ASTM C518, 0.27 at 75 deg F.
   2. Installed R-value (compressed to 25%) for 1-1/2": 4.5
   3. Maximum Service Temperature: ASTM C411; 250 deg F.
   4. Maximum Moisture Absorption: ASTM C1104; 5% by weight
   5. Density: 1.0 lb./cu. ft. (0.75 lb/cu ft for attic insulation)
   6. Microbial Growth: ASTM C1338; does not support the growth of mold, fungi and bacteria.
   7. Maximum Flame Spread/Smoke Developed Index: ASTM E84; 25/50

C. Vapor Barrier Jacket:
   1. Kraft paper reinforced with fiberglass yarn and bonded to aluminized film.
   2. Maximum Moisture Vapor Transmission: ASTM E96; 0.02 perm.

D. Vapor Barrier Tape Pressure sensitive tape approved by the manufacturer.

2.02 FIBERGLASS (DUCT LINER)

A. Manufacturers:
   1. Johns Manville Permacote Linacoustic
   2. Owens Corning
   3. CertainTeed Ultralite
   4. Knauff
   5. Engineer approved equal.

B. Insulation:
   1. ASTM C1071, flexible noncombustible blanket air surface coated with acrylic coating treated with ASTM G21 and G22 anti-microbial agent to resist growth.
   2. "K" Value: ASTM C518, 0.25 at 75 deg F.
   3. Maximum Service Temperature: 250 deg F.

4. Maximum Velocity on Coated Air Side: 5,000 FPM
5. Noise Reduction Coefficient: 0.50 or higher in accordance with ASTM C423. (1/2" thickness)
   a. Noise reduction coefficient will drive density for each manufacturer may vary by manufacturer to achieve.
6. Maximum Flame Spread/Smoke Developed Index: ASTM E84; 25/50

C. Adhesive: Adhesive: ASTM C916 adhesive as recommended by manufacturer.

D. Liner Fasteners: Galvanized steel welded with integral head.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that ductwork has been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed and dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Insulated Ductwork Conveying Air Below Ambient Temperature:
1. Provide insulation with vapor barrier jackets.
2. Finish with tape and vapor barrier jacket.
3. Continue insulation through walls, sleeves, hangers and other duct penetrations.
4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, expansion joints, reheat coils, and any other item exposed to ductwork air temperature.

C. Insulated Ductwork Conveying Air Above Ambient Temperature:
1. Provide with standard vapor barrier jacket.
2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

3.03 SCHEDULES

FIBERGLASS FLEXIBLE DUCT WRAP

DUCTWORK	THICKNESS
Supply Ducts	1-1/2"
Return Ducts	1-1/2"
Ductwork Exposed to Attic Space	3"
Exhaust	1-1/2"
Relief	1-1/2"
Outside Air Intake Duct	2"
Combustion Air	2"
Fire, Smoke, and Fire/Smoke Damper Sleeves	1-1/2"
VAV Box Reheat Coil Section	1-1/2"

FIBERGLASS DUCT LINER

DUCTWORK	THICKNESS
Transfer Air Duct	1/2"

A. Do not wrap or insulate any exposed supply, return or exhaust duct located in normally occupied areas.

END OF SECTION 230713

SECTION 233100

HVAC DUCTS AND CASING (ADDENDUM #4)

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Materials
B. Ductwork fabrication
C. Manufactured ductwork and fittings
D. Casing
E. Exposed spiral ductwork

1.02 RELATED SECTIONS

A. Specification Section 23 0593 - Testing, Adjusting, and Balancing for HVAC
B. Specification Section 23 0713 - Duct Insulation.
C. Specification Section 23 3300 - Air Duct Accessories.
D. Specification Section 23 3600 - Air Terminal Units.
E. Specification Section 23 3700 - Air Outlets and Inlets.

1.03 REFERENCES

A. ASTM A 36 - Structural Steel
B. ASTM A 90 - Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles
C. ASTM A 167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
D. ASTM A 366 - Steel, Sheet, Carbon, Cold Rolled, Commercial Quality
E. ASTM A 480 - General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip
F. ASTM A 525 - General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
G. ASTM A 527 - Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process, Lock Forming Quality
H. ASTM A 568 - Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled
I. ASTM A 569 - Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality
J. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate
K. NFPA 90A - Installation of Air Conditioning and Ventilating Systems
L. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems
M. SMACNA - HVAC Air Duct Leakage Test Manual
N. SMACNA - HVAC Duct Construction Standards - Metal and Flexible
O. UL 181 - Factory-Made Air Ducts and Connectors

1.04 PERFORMANCE REQUIREMENTS

A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.05 SUBMITTALS

A. All submitted documents shall be:
   1. Digital (scanned documents are not acceptable)
   2. Current, within last 5 years

3. Complete and in sufficient detail to allow ready determination of compliance with contract documents
4. Have options clearly indicated as applicable to each submittal

B. Construction submittal
1. Provide (1) submittal including all products listed in this specification section. Provide the following for each product.
a. Product Data
b. Shop Drawings: Indicate duct fittings, particulars such as gauges, sizes, welds, and configuration for four inch (4") pressure class and higher and kitchen hood exhaust systems.

C. Project Record Documents
1. Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

B. Maintain one copy of document on site.

1.07 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three-years experience.

B. Installer: Company specializing in performing the work of this section with minimum three-years experience.

1.08 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A Standards.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures during and after installation of duct sealants.

1.10 WARRANTY

A. Pre-insulated weatherproof exterior ductwork shall have a 10 year warranty.

PART 2 PRODUCTS

2.01 MATERIALS

A. Galvanized Steel Ducts: ASTM A924 and ASTM A653 galvanized steel sheet, lock-forming quality, having G60 zinc coating of in conformance with ASTM A90.

B. Insulated Flexible Duct
1. Manufacturers:
a. Thermaflex G-KM
b. Flexmaster
c. Atco
d. Engineer approved equal.
2. UL 181, Class 1, NFPA 90A and 90B compliant, interlocking spiral of steal wire, fiberglass insulation with R value of 4.2 or greater; core shall be chlorinated polyethylene vapor barrier film. (Polyester is not acceptable). Outer shell/vapor barrier shall be metalized polyester or polyethylene film.
3. Pressure Rating: Six inch (6") positive and one inch (1") negative.
4. Maximum Velocity: 5000 fpm.
5. Temperature Range: -20 to 180 deg F.
6. Vapor Transmission: 0.1 perms or less (ASTM E96)

7. Flex Elbows: Flex duct 90 degree elbow splines for connections to diffusers. Flex elbows shall prevent kinks in flex duct. Elbow spline shall be UL-2043 listed for use in plenums.

C. Fasteners: Rivets, bolts or sheet metal screws.

D. Duct Sealant
1. Manufacturers:
   a. Design Polymerics (DP1010)
   b. Ductmate
   c. Durodyne
   d. Engineer approved equal.
2. Description: Water based, non hardening, high velocity/high pressure duct sealant intended for indoor and outdoor HVAC ducts.
3. Pressure Rating: 10" water column minimum.
4. Service Temperature: -20 to 200F
5. Listings
   a. ASTM E-84/UL723 Flame/Smoke Spread: 25/50 or less.
   b. UL-181B listed for use on Flex Duct connections.
   c. Conforms to NFPA 90A & 90B requirements.
   d. Approved for use on interior of ducts.
6. VOC Content
   a. 0 g/L
   b. CDPH Standard Method v1.1 (14 days): Less than 5.0 mg/m3.

E. Hanger Rod: ASTM A36; steel, galvanized; threaded both ends, threaded one end.

2.02 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gauges, reinforcing and sealing for operating pressures indicated.

B. Increase duct sizes gradually, not exceeding 15 degree divergence wherever possible; maximum 30 degree divergence upstream of equipment and 45 degree convergence downstream.

C. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows are used, provide airfoil turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with fiberglass insulation.

D. Fabricate continuously welded round and oval duct fittings two gauges heavier than duct gauges indicated in SMACNA Standard. Joints shall be minimum four inch (4") cemented slip joint, brazed or electric welded. Prime coat welded joints.

E. Provide standard 45 degree lateral wye takeoffs or 90 degree conical tee takeoffs.

F. Fabricate all exposed ductwork using paint grip galvanized sheet metal.

G. All outside air intake or relief ductwork above finished areas shall be caulked to be watertight. An auxiliary continuous drain pan shall be provided beneath these ducts to prevent damage in case of a waterproofing failure. Line this drain pan with 1/2 inch duct liner and turn up all edges.

H. All joints in rectangular, round or oval ductwork that exceed 100 inches in perimeter length shall be made with Ductmate, TDC, or TDF connections.

2.03 MANUFACTURED DUCTWORK AND FITTINGS

A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible and as indicated. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.

B. [Round] [Flat Oval] Ducts: Machine made from round spiral lock seam duct with light reinforcing corrugations, fittings manufactured at least two gauges heavier metal than duct.

2.04 CASINGS

A. Fabricate casings in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible and construct for operating pressures indicated.

B. Mount floor mounted casings on four inch (4") high concrete curbs. At floor, rivet panels on eight inch (8") centers to angles. Provide liner of 18 gauge galvanized expanded metal mesh supported at 12 inch centers, turned up 12 inches at sides with sheet metal shields where floors are acoustically insulated.

2.05 EXPOSED SPIRAL DUCTWORK

A. Galvanized spiral duct construction and gauge shall be in accordance with SMACNA HVAC Duct Construction Standards.

B. Fittings: All fittings shall be self-sealing, double lipped, gasket type fittings with EPDM rubber gasket. No external sealant or tape is allowed. Fittings shall be galvanized steel constructed in accordance with ASTM A653 and A924.

C. Elbows: Elbows shall be gored elbows. 45° elbows shall be 3-piece elbows and 90° elbows shall be 5-piece elbows.

D. Hangers: Exposed spiral duct hangers shall be steel aircraft quality zinc coated wire hangers or 1/8" thick, 1" wide galvanized steel strap with threaded rod.

E. Taps: System shall utilize high efficiency shoe type saddle taps.

F. Reducers: All spiral reducers in exposed areas shall be concentric to keep centerline of duct at consistent elevation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

C. All ductwork shall be sealed to provide a SMACNA Seal Class A installation for all longitudinal seams, all transverse seams and all duct penetrations. Flame spread rating shall not exceed 25 and smoke developed shall not exceed 50 when tested in compliance with ASTM-E-84-87.

D. Sealant shall be non-hardening and water resistant. Sealant shall be capable of being applied with a brush and shall be applied in accordance with manufacturer's instructions. Each seam or penetration shall be dressed after application of sealant for neat appearance.

E. Ductwork shall be installed following essentially lines indicated on the drawings. Install offsets, and angles. Transitions may be required to avoid interference with other work and existing conditions. Maintain full capacity of ductwork.

F. Flex Duct Installation:
   1. Maximum length of flex duct: 5ft
   2. Provide 90 deg elbow splines to prevent flex duct kinking, especially when connecting to ceiling diffusers
   3. Connections to rigid ducts and fittings: Peal back insulation and place flexible inner core over fitting and seal with two layers of duct tape (minimum 2" overlap on fitting and flex duct core). Install clamps over the top of the duct tape. Stretch insulation back over fitting and wrap with two layers of duct tape. Duct Sealant/Mastic may be substituted for the tape that seals the inner core to the fitting. Refer to manufacturer's instructions. Duct tape, mastic/sealant and clamps shall be UL181 listed.

G. Duct sizes are net outside dimensions. Maintain outside sizes for lined ducts. Do not increase duct dimensions.

H. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

I. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

J. Use crimp joints with or without bead for joining round duct sizes eight inch (8") and smaller with crimp in direction of airflow.

K. Use double nuts and lock washers on threaded rod supports.

L. Connect terminal units to supply ducts directly with rigid duct. Do not use flexible duct.

M. Connect diffusers to low pressure ducts directly or with five foot (5') maximum length of flexible duct held in place with strap or clamp.

N. Connect flexible ducts to metal ducts with draw bands.

O. For units with filtered return air grilles (fan coils, blower coils, heat pumps, etc.), remove the unit filter and connect the return air ductwork tight to the unit. The return duct shall match the size of the unit return air opening.

3.02 CLEANING

A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that may be harmed by excessive dirt with temporary filters or bypass during cleaning.

B. Clean duct systems with high power vacuum machines. Protect equipment that may be harmed by excessive dirt with filters or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

3.03 SCHEDULES

DUCTWORK MATERIAL

AIR SYSTEM	MATERIAL
Low Pressure Supply	Galvanized Steel
Return and Relief	Galvanized Steel
General Exhaust	Galvanized Steel
Outside Air Intake	Galvanized Steel

DUCTWORK PRESSURE CLASS

AIR SYSTEM	PRESSURE CLASS
Supply (Upstream of VAV units)	3"
Supply (Downstream of VAV units)	1"
Return and Relief	1"
General Exhaust	1"
Outside Air Intake	1/2"

DUCT PRESSURE CLASS (IN.)	SYSTEM FAN EXTERNAL STATIC PRESSURE
1/2" w.g.	Up to1/2” w.g.
1” w.g.	Over 1/2” up to 1 w.g.
2” w.g.	Over 1” up to 2” w.g.
3” w.g.	Over 2” up to 3” w.g.
4” w.g.	Over 3” up to 4” w.g.
6” w.g.	Over 4” up to 6” w.g.
10” w.g.	Over 6” up to 10” w.g.

END OF SECTION 233100

SECTION 233300

AIR DUCT ACCESSORIES (ADDENDUM #4)

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct access doors
B. Duct test holes
C. Fire dampers
D. Rectangular Manual Balance Dampers
E. Round Manual Balance Dampers

1.02 RELATED SECTIONS

A. Specification Section 23 3100 - HVAC Ducts and Casings.
B. Specification Section 23 3600 - Air Terminal Units.

1.03 REFERENCES

A. AMCA 500-D – Laboratory Methods of Testing Dampers
B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
C. NFPA 90A - Installation of Air Conditioning and Ventilating Systems
D. NFPA 70 - National Electrical Code
E. SMACNA - HVAC Duct Construction Standards - Metal and Flexible
F. UL 33 - Heat Responsive Links for Fire-Protection Service
G. UL 555 - Fire Dampers and Ceiling Dampers

1.04 SUBMITTALS

A. All submitted documents shall be:
    1. Digital (scanned documents are not acceptable)
    2. Current, within last 5 years
    3. Complete and in sufficient detail to allow ready determination of compliance with contract documents
    4. Have options clearly indicated as applicable to each submittal
B. Construction submittal
    1. Provide (1) submittal including all products listed in this specification section. Provide the following for each product.
        a. Product Data, including electrical characteristics if applicable
        b. Shop Drawings
        c. Installation Instructions
C. Project Record Documents
    1. Indicate final installed locations of all components on a PDF floor plan, including remote test switches for life safety dampers

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years experience.

1.06 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories Inc., as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Architectural Specification Sections.

B. Protect dampers from damage to operating linkages and blades.

1.08 EXTRA MATERIALS

A. Provide two of each size and type of fusible link for each style or type of fire damper or combination fire/smoke damper furnished for this project.

PART 2 PRODUCTS

2.01 DUCT ACCESS DOORS

A. Manufacturers:
   1. Ruskin
   2. Nailor
   3. Ductmate
   4. Acudor
   5. Engineer approved equal.

B. Frame: 22 gauge galvanized steel

C. Door: 22 gauge double skin galvanized

D. Seal: Neoprene

E. Insulation: 1” Fiberglass (on insulated duct only)

F. Configuration:
   1. Less Than 12 Inch Square: Secure with two (2) Cam locks.
   2. Up to 24 inch Square: Continuous plated steel hinge and two Cam locks.
   3. Walk Through Access Doors (Plenum Door): Continuous plated steel hinge with two
      a. dual acting handles.
   4. Spiral Duct Doors: Dual plate covers with large hand tightening knobs.

G. Access doors with sheet metal screw fasteners are not acceptable.

H. Windows: Provide where noted on plans

2.02 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches or neoprene plugs.

B. Permanent Test Holes: Factory fabricated, airtight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.03 FIRE DAMPERS

A. Manufacturers:
   1. Ruskin
   2. Greenheck
   3. United Enertech
   4. Nailor
   5. Air Balance
   6. NCA
   7. Pottorff
   8. Engineer approved equal.

B. Fabricate in accordance with NFPA 90A and UL 555 (latest edition) and as indicated.

C. Ratings (refer to code review plans for wall classifications):
   1. 1-1/2 hours in accordance with UL-555
   2. 3 hours in accordance with UL-555
   3. Air Velocity: 3000 fpm
   4. Differential Pressure: 4” WC

D. Multiple Blade Dampers (Vertical & Horizontal):
   1. Minimum 16 gauge galvanized steel frame and 6 inch (6”) maximum width 3-V shape roll formed galvanized steel blades.

2. Oil-impregnated bronze or stainless steel sleeve bearings and plated steel axels.
3. 1/8" x 1/2" plated steel concealed linkage.
4. Stainless steel closure spring, blade stops and lock.
5. Locate damper operator on exterior of duct and link to damper operating shaft. Operator shall have open/close labeling to indicate damper position. Provide factory identification to determine damper position.
6. Factory installed sleeve. Provide extended length sleeves where required
7. Provide with round duct transitions where required.
8. Fusible Link: UL 33, separate at 212 deg F with adjustable link straps for combination fire/balancing dampers.

2.04 RECTANGULAR MANUAL BALANCE DAMPERS

A. Size and Application:
   1. 18” wide x 12” tall and smaller: Field/Shop Fabricated or Factory Provided.
   2. Larger than 18” wide x 12” tall: Factory Provided.

B. Field/Shop Fabricated Rectangular Balance Dampers
   1. Fabricate in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible, current addition and per the below:
      a. Blade: 24 Gage minimum, but not thinner than two gages thinner than duct gage. Blade must have hemmed edges and be 1/8” smaller than the duct on all sides.
      b. Rod: 3/8” minimum. Rod shall be continuous on 2” pressure class and above.
      c. Bearings: Provide closed end bearings for rod penetrations
      d. Locking Device: Provide quadrant locking device to keep damper in fixed position.
   2. Stand-off plate: On insulated ducts, provide a 2” stand-off plate to allow for damper operation after insulation installation.
   3. Sealing: Damper component penetration of ducts must be sealed to maintain a Class A Seal rating.

C. Factory Fabricated Manual Balance Dampers
   1. Manufacturers
      a. Greenheck MBD
      b. Ruskin
      c. Pottorff
      d. United Enertech
      e. Engineer approved equal
   2. Description: Rectangular damper intended for balancing purposes (not for positive shut-off or control)
   3. Construction:
      a. Frame: Galvanized, 16 gauge
      b. Blades: Galvanized, 16 gauge, Opposed blade orientation, 20 gauge blade stops
      c. Control Shaft: Steel, 3/8” diameter (minimum)
      d. Bearings: Synthetic Nylon
      e. Linkage: Concealed in frame
      f. Stand-off Plate: 2” stand-off plate to allow for damper operation after insulation installation.
      g. Operator: Locking Hand Quadrant
   4. Remote Cable Operator (when indicated on the plans):
      a. Cable Operator: Worm gear operator in lieu of lock hand quadrant.
      b. Cable: Steel, with coupling and clips to secure to operator.
      c. Ceiling Cup/Wall Plate: Galvanized steel and fire rated bracket. See plans for type and location.
   5. Performance:
      a. Max Velocity: 1500 fpm
      b. Max Pressure: 2.5” W.C.
      c. Temperature range: -40 to 180 degrees f

2.05 ROUND MANUAL BALANCE DAMPER

A. Field/Shop Fabricated Round Balance Dampers
   1. Fabricate in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible, current addition and per the below:
      a. Blade: 24 Gage minimum, but not thinner than two gages more thin than duct gage
      b. Rod: 3/8” minimum. Rod shall be continuous on 2” pressure class and above. Rod shall also be continuous on all ducts 12” and larger.
      c. Bearings: Provide closed end cast alloy bearings for rod penetrations
      d. Locking Device: Provide quadrant locking device to keep damper in fixed position.
      e. Stand-off plate: Provide a 2” stand-off plate to allow for damper operation after insulation installation.
   2. Sealing: Damper component penetration of ducts must be closed and sealed to maintain a Class A system rating.

B. Factory Fabricated Manual Balance Dampers
   1. Manufacturers
      a. Greenheck MBDR
      b. Ruskin
      c. Pottorff
      d. United Enertech
      e. Engineer approved equal
   2. Description: Circular damper intended for balancing purposes (not for positive shut-off or control)
   3. Construction:
      a. Frame: Galvanized, 20 gauge
      b. Blade: Galvanized, 20 gauge
      c. Shaft: Steel, 3/8” diameter (minimum)
      d. Bearings: Synthetic Nylon
      e. Stand-off Plate: 2” stand-off plate to allow for damper operation after insulation installation.
      f. Operator: Locking Hand Quadrant
   4. Remote Cable Operator (when indicated on the plans):
      a. Cable Operator: Worm gear operator in lieu of lock hand quadrant
      b. Cable: Steel, with coupling and clips to secure to operator.
      c. Ceiling Cup/Wall Plate: Galvanized steel and fire rated bracket. See plans for type and location.
   5. Performance:
      a. Max Velocity: 1500 fpm
      b. Max Pressure: 1” W.C.
      c. Temperature range: -25 to 180 degrees

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers at fire dampers, combination fire and smoke dampers and elsewhere as indicated. Review locations prior to fabrication.

C. Provide duct test holes where indicated and required for testing and balancing purposes.

D. Provide fire dampers, combination fire and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components and where required by authorities having

jurisdiction. Install with required perimeter mounting angles, sleeves, and breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

E. Demonstrate re-setting of fire dampers to owner's representative.

F. Provide volume balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum two duct widths from duct take-off. Drawings may not indicate all volume damper locations.

G. Provide volume balancing dampers on duct take-off to diffusers, grilles and registers, regardless of whether dampers are specified as part of the diffuser, grille or register assembly. Locate as close as possible yet accessible to the main trunk duct. Drawings may not indicate all volume damper locations.

H. Provide turning vanes in all supply, return and exhaust ductwork unless noted otherwise. Turning vanes shall not be installed in kitchen hood exhaust, dishwasher hood exhaust and kiln hood exhaust.

I. Provide original installation inspection during construction and 11-month re-inspection after substantial completion of all existing and new fire/smoke/fire smoke dampers in all HVAC systems serving project's construction area. Mechanical Contractor shall adjust, fix or replace any damper found not to meet installation requirements. Provide an electronic log of all dampers with size, location, pre-inspection condition and post-inspection condition to Owner and Design Team after original inspection and after re-inspection of fire/smoke/fire smoke dampers.

END OF SECTION 233300

SECTION 233600

AIR TERMINAL UNITS (ADDENDUM #4)

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single duct variable volume air terminal units

1.02 RELATED SECTIONS

A. Specification Section 230923 - Direct Digital Control Systems for HVAC

B. Specification Section 23 0993 - Sequence of Operation

C. Specification Section 232113 - Hydronic Piping.

D. Specification Section 233100 - HVAC Ducts and Casings.

E. Specification Section 233300 - Air Duct Accessories.

F. Specification Section 233700 - Air Outlets and Inlets

1.03 REFERENCES

A. AHRI 880 - Performance Rating of Air Terminals

B. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials

C. NFPA 70 - National Electrical Code

D. NFPA 90A - Installation of Air Conditioning and Ventilation Systems

E. UL 181 - Factory-Made Air Ducts and Connectors

1.04 PERFORMANCE TOLERANCES

A. Base performance on tests conducted in accordance with AHRI 880.

1.05 SUBMITTALS

A. Shop Drawings: Indicate configuration, general assembly, and materials used in fabrication, and electrical characteristics and connection requirements.

B. Product Data: Provide data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings that indicate airflow, static pressure, and NC designation. Include electrical characteristics and connection requirements.

C. Include schedules listing discharge and radiated sound power level for each of second through sixth octave bands at inlet static pressures of 0.5 to 2.0 in W.C.

D. Manufacturer's Installation Instructions: Indicate support and hanging details, and service clearances required.

1.06 PROJECT RECORD DOCUMENTS

A. Record actual locations of units and controls components.

1.07 OPERATION AND MAINTENANCE DATA

A. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists. Include directions for resetting constant volume regulators.

1.08 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years experience.

1.09 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by UL or ETL as suitable for the purpose specified and indicated.

1.10 WARRANTY

A. Provide parts and labor warranty for one year after system acceptance or 18 months after shipment from factory, whichever is sooner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The Trane Co.

B. Titus

C. Price Industries

D. Carnes

E. Nailor Industries

F. Krueger

G. Tuttle & Bailey

H. Engineer approved equal.

2.02 MANUFACTURED UNITS

A. Constant and variable air volume air terminal units for connection to single or dual duct, central air systems.

B. Identify each terminal unit with clearly marked identification label and airflow indicator. Include unit nominal airflow, maximum factory set airflow, minimum factory set airflow, and coils type.

2.03 SINGLE DUCT VARIABLE VOLUME AIR TERMINAL UNITS

A. Basic Assembly:
   1. Casings: Minimum 22 gauge galvanized steel.
   2. Lining: Minimum one inch (1") thick elastomeric or vinyl coated fibrous glass insulation, 1.5 lb./cu ft or heavier density, meeting NFPA 90A requirements and UL 181 erosion requirements and bacteriological standard ASTM C665 and ASTM E 84 25/50. Fibers must be isolated from air stream using a fiber free lining or a vinyl or metal facing over the lining.
   3. Plenum Air Inlets: Round stub connections for duct attachment.
   4. Plenum Air Outlets: "S" slip and drive connections.

B. Basic Unit:
   1. Configuration: Air volume damper assembly inside unit casing.
   2. Volume Damper: Construct of galvanized steel with peripheral gasket and self-lubricating bearings; maximum damper leakage: 2% of design air flow at three inch inlet static pressure.

C. Hot Water Heating Coil:
   1. Construction: 1/2 inch copper tube mechanically expanded into aluminum plate fins, leak tested under water to 200 psig pressure, factory installed.
   2. Capacity: See schedule on drawings.

D. Sound:
   1. The air terminal unit NC must not be higher than 35 at the scheduled maximum CFM at 1.0 in W.C. inlet pressure.
   2. Select an air terminal unit larger than scheduled as needed to meet the maximum NC requirement.

E. Air Flow Sensing:
   1. Provide a multiple point averaging velocity pressure measuring sensor in the air valve inlet. The sensor must be a velocity pressure amplifying design.
   2. Provide taps on the total and static pressure lines for TAB to use to measure the pressures.

F. Controls: See Specification Section 23 0993 Sequence of Operation.

G. Provided and Installed by the Building Automation Contractor. See the Sequence of Operation (23 0993), Control Devices (23 0913) and the Control Drawings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide ceiling access doors or locate units above easily removable ceiling components.

C. Support units individually from structure. Do not support from adjacent ductwork.

D. Connect to ductwork.

E. Provide minimum of five feet (5') of one inch (1") thick lined ductwork downstream of units. A discharge attenuator meets these requirements.

F. Install heating coils if required.

G. Verify that electric power is available and of the correct characteristics for air valves requiring electrical power.

3.02 SCHEDULES

A. See drawings.

END OF SECTION 233600

SECTION 233700

AIR OUTLETS AND INLETS (ADDENDUM #4)

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Diffusers/registers/grilles

B. Louvers

1.02 REFERENCES

A. ADC 1062 - Certification, Rating and Test Manual

B. AMCA 500 - Test Method for Louvers, Dampers and Shutters

C. ARI 650 - Air Outlets and Inlets

D. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets

E. SMACNA - HVAC Duct Construction Standard - Metal and Flexible

F. NFPA 70 - National Electrical Code

G. NFPA 90A - Installation of Air Conditioning and Ventilating Systems

1.03 SUBMITTALS

A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Review ceiling type and style before submitting. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.04 PROJECT RECORD DOCUMENTS

A. Record actual locations of air outlets and inlets.

1.05 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.

B. Test and rate louver performance in accordance with AMCA 500.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years experience.

PART 2 PRODUCTS

2.01 DIFFUSERS/REGISTERS/GRILLES

A. Manufacturers:
   1. Titus
   2. Carnes
   3. Tuttle & Bailey
   4. Price Ind.
   5. Krueger
   6. Nailor
   7. Engineer approved equal.

B. Refer to schedule on drawings for style, size, and finish.

2.02 LOUVERS

A. Manufacturers:
   1. Ruskin
   2. American Warming
   3. Louvers and Dampers, Inc.
   4. Pottorff
   5. Greenheck

6. United Enertech
7. Air Balance
8. Engineer approved equal.

B. Type: Drainable blades on 37-1/2 degree slope, heavy channel frame bird screen with 1/2 inch square mesh for exhaust and 3/4 inch for intake. (See drawings).

C. Fabrication: Extruded aluminum, 0.080 inch thick welded assembly with factory anodized finish. Color to be selected by architect. Architect has authority to select multiple colors.

D. Mounting: Furnish with exterior flat flange for installation. Verify with architect prior to ordering.

E. Interior louvers shall be constructed of 0.125 inch thickness with welded construction.

F. Refer to drawings for louver dimensions.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position and type to conform to architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with airtight connection.

D. Provide balancing dampers on duct take-off to diffusers, grilles and registers, despite whether dampers are specified as part of the diffuser or grille and register assembly.

E. Paint ductwork visible behind air outlets and inlets matte black.

F. Provide a cable operated damper or access panel where a balancing damper is located above gypsum ceilings or in an inaccessable location. Externally cable operated damper shall be similar to Ruskin ZCDR25.

3.02 SCHEDULES

A. See drawings.

END OF SECTION 233700