

**TO ALL CONTRACTORS**

The following are clarifications and/or changes to the Plans and Specifications, dated October 27, 2021, for the above-named Project, to be Bid on January 11, 2022 @ 2:00 PM

**ENCLOSURE:** Certification Pages.

**Architectural:** Revised Attachment to Document 00 21 13. Revised Drawing Sheets: A1.1, A3.1, A3.2, and A8.1.

**Mechanical:** New Revised Section: 23 07 00. Revised Drawing Sheets: M5.2 and M7.1

**Electrical:** Revised Drawing Sheets: ED.1, E2.1, E4.1 and E8.1

**INTRODUCTORY INFORMATION**

1. Document 00 01 05 of the Project Manual:

- a. Refer to Certification Page, included as an enclosure with this Addendum.

**ARCHITECTURAL SPECIFICATIONS**

2. Document 00 21 13 of the Project Manual:

- a. **Delete** Attachment to Document 00 21 13 (*Questions and Answers, Dated 12/29/2021*) in its entirety and replace with Revised Attachment to Document 00 21 13 (*Questions and Answers, Dated 1/4/2022*), included as an enclosure with this Addendum.

3. Section 10 14 20 of the Specifications:

- a. **Delete** Section 10 14 20 in its entirety. Refer to Drawings for changes in scope of work.

**ARCHITECTURAL DRAWINGS**

4. Sheet A1.1 of the Drawings:

- a. Replace Sheet A1.1 with Revised Sheet A1.1, Revision 2, (clouded revision(s), included as an enclosure with this Addendum.

5. Sheet A3.1 of the Drawings:

- a. Replace Sheet A3.1 with Revised Sheet A31.1, Revision 3, (clouded revision(s), included as an enclosure with this Addendum.

6. Sheet A3.2 of the Drawings:

- a. Replace Sheet A3.2 with Revised Sheet A3.2, Revision 3, (clouded revision(s), included as an enclosure with this Addendum.

7. Sheet A8.1 of the Drawings:

- a. Replace Sheet A8.1 with Revised Sheet A8.1, Revision 3, (clouded revision(s), included as an enclosure with this Addendum.

**MECHANICAL SPECIFICATIONS**

8. Section 23 07 00 of the Specifications:
- a. **Delete** Section 23 07 00 in its entirety and replace with New Revised Section 23 07 00, **(REFER TO ENTIRE SECTION FOR CHANGES)**, included as an enclosure with this Addendum.

**MECHANICAL DRAWING**

9. Sheet M5.2 of the Drawings:
- a. Replace Sheet M5.2 with Revised Sheet M5.2 , Revision 2, (clouded revision(s), included as an enclosure with this Addendum.
10. Sheet M7.1 of the Drawings:
- a. Replace Sheet M7.1 with Revised Sheet M7.1 , Revision 1, (clouded revision(s), included as an enclosure with this Addendum.

**ELECTRICAL DRAWINGS**

11. Sheet ED.1 of the Drawings:
- a. Replace Sheet ED.1, Revision 2, with Revised Sheet ED.1 , Revision 3, (clouded revision(s), included as an enclosure with this Addendum.
12. Sheet E2.1 of the Drawings:
- a. Replace Sheet E2.1, Revision 2, with Revised Sheet E2.1, Revision 3, (clouded revision(s), included as an enclosure with this Addendum.
13. Sheet E4.1 of the Drawings:
- a. Replace Sheet E4.1, Revision 2, with Revised Sheet E4.1, Revision 3, (clouded revision(s), included as an enclosure with this Addendum.
14. Sheet E8.1 of the Drawings:
- a. Replace Sheet E8.1, Revision 1, with Revised Sheet E8.1, Revision 2, (clouded revision(s), included as an enclosure with this Addendum.

**END OF ADDENDUM**

19039.2

DOCUMENT 00 01 05

CERTIFICATION PAGE

PROJECT:

CROOKED LAKE ELEMENTARY SCHOOL  
HVAC REPLACEMENT/DEFERRED MAINTENANCE - PHASE 3  
2939 Bunker Lake Boulevard Northwest  
Andover, Minnesota 55304

ARCHITECT'S CERTIFICATION:

I hereby certify that this Plan, Specification, or Report was prepared by me or under my direct supervision and that I am a duly Licensed Architect under the laws of the State of Minnesota.

Name David M. Maroney, AIA

Signature 

Date October 27, 2021 License No. 20992

STRUCTURAL ENGINEER'S CERTIFICATION:

I hereby certify that this Plan, Specification, or Report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Name Timothy G. LaBissoniere, PE

Signature 

Date October 27, 2021 License No. 21387

MECHANICAL ENGINEER'S CERTIFICATION:

I hereby certify that this Plan, Specification, or Report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Name Blayne J. Parkos, PE

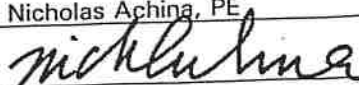
Signature 

Date October 27, 2021 License No. 46630

ELECTRICAL ENGINEER'S CERTIFICATION:

I hereby certify that this Plan, Specification, or Report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Name Nicholas Achina, PE

Signature 

Date October 27, 2021 License No. 40408

END OF DOCUMENT

**ATTACHMENT TO DOCUMENT 00 21 13**

**QUESTIONS AND ANSWERS**

Questions received from bidders through [purchquotes@ahschools.us](mailto:purchquotes@ahschools.us) and associated responses are provided for clarification to the bids, as of 1/4/2022.

**Question 1:** Product Substitution Request from MLAZGAR Associates.

Response: Fixture Substitution Request approved. Refer to Schedule on Sheet E8.1.

**Question 2:** Product Substitution Request from W.R. Meadows, Inc., "INDUROSHINE".

Response: Substitution Request Not Approved. No performance criteria provided which indicates that it meets the requirements of 03 35 37, Article 2.01, Paragraph B.

**Question 3:** "After reviewing the structural drawings, it has come to our attention that you are specifying aluminum grating with a galvanized steel structure. Galvanized steel is known to deteriorate aluminum after an extended period of time. We suggest switching the grating to galvanized steel to eliminate this concern."

Response: Per Section 05 50 00, Article 1.01, Paragraph A, 7, Contractor shall provide isolation materials where dissimilar materials are joined together.

**Question 4:** "The only detail that gives me the size for the aluminum grating is 3A/A7.1. Just call our 2". Can you find out how thick the bar is they want and the spacing between the bars? Also does it need to be banded?"

Response: Grating product info is specified under Section 05 50 00, Article 2.01, Paragraph B and associated Subparagraphs.

**Question 5:** "Will the concealed return air be externally insulated? The specifications state to insulate it if in a non-return air plenum but would not be insulated in a return plenum. (This is hard to tell as this ductwork goes through various rooms/walls). If some areas would require it to be insulated but other areas would not, please specify where it would be required."

Response: The return air ductwork running in the corridor which is non plenum ceiling shall be insulated to the wall (not through the wall). Classroom ceilings are plenums and return duct would be bare. Refer to revised Section 23 07 00, included as an enclosure in Addendum No. 4.

**END OF ATTACHMENT**

**SECTION 23 07 00**

**HVAC INSULATION**

**PART 1 - GENERAL**

**1.01 SUMMARY**

A. **Section Includes:** Include labor, materials, equipment and accessories for the installation of thermal and acoustical insulation for heating, and air conditioning piping and ductwork in strict accordance with insulation Section of the Specification and applicable Drawings.

1. Insulate piping and fittings, including heating and cooling control valve bodies and union fittings up to unit coil connection.
2. Insulate ventilation, heating, air conditioning and exhaust ductwork and fittings, as specified or indicated on Drawings.

B. **Related Sections:**

1. Section 23 00 00: Heating, Ventilating, and Air-Conditioning (HVAC) - General Requirements
2. Section 23 05 23: General-Duty Valves for HVAC Piping
3. Section 23 05 30: Hydronic Specialties
4. Section 23 21 13.23: Aboveground Hydronic Piping
5. Section 23 23 00: Refrigerant Piping
6. Section 23 31 13: Metal Ducts

**1.02 REFERENCES**

A. **American Society for Testing and Materials (ASTM):**

1. ASTM E84-82: Test Method for Surface Burning Characteristics of Building Materials.

B. **National Fire Protection Agency (NFPA):**

1. NFPA 255: Tests for Surface Burning Characteristics of Building Materials.

C. **Underwriters' Laboratories (UL):**

1. UL 723

**1.03 SUBMITTALS**

A. **Shop Drawings:** Contractor shall submit a list of insulation to be used prior to beginning any application work.

**1.04 ENVIRONMENTAL REQUIREMENTS**

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

**1.05 QUALITY ASSURANCE**

**A. Regulatory Requirements:**

1. State Building Code
2. Local Codes and Ordinances
3. Local Authority having jurisdiction

**PART 2 - PRODUCTS**

**2.01 MANUFACTURERS**

**A. Acceptable Manufacturers:** Subject to compliance with requirements of the Contract Documents, acceptable manufacturers are as follows or approved equal:

1. Johns Manville
2. Armaflex/Armacell
3. Imcoa
4. Knauf
5. Owens-Corning
6. CertainTeed

**B. Insulation Materials:** Insulation materials manufacturing facilities must be certified and registered with an approved Registrar for conformance with ISO 9000 Quality Standard.

**C. Fire and Smoke Hazard Ratings:**

1. Insulation shall have composite (insulation, jacket or facing, and adhesive used to adhere the facing or jacket to the insulation) fire and smoke hazard ratings as tested by procedure ASTM E84, NFPA 255 and UL 723 not exceeding:
  - a. Flame Spread 25
  - b. Smoke Developed 50
2. Accessories, including adhesives, mastics, cement tapes, glass fabric, and fire resistant cloth for fittings, shall have the same component ratings as listed above.
3. Products or their shipping cartons or packages shall bear a label indicating that flame and smoke ratings do not exceed above requirements. Stencil duct liners with "MEETS 90A REQUIREMENTS".
4. All insulation used for mechanical systems shall have the name of the manufacturer, the thermal resistance R-value at the specified installation thickness, and the flame spread and smoke-developed ratings of the composite materials.

**SECTION 23 07 00**

**2.02 MATERIALS**

**A. Jackets and Facing Descriptions:** Poly-encapsulated paper jacket bonded to aluminum foil, reinforced with fiberglass yarn. Poly-encapsulated paper jacket to be permanently treated for fire and smoke safety, and to prevent corrosion of foil. Beach puncture 50 ox. in./in./year, tensile strength 35 pounds per inch width, Mullen Burst 70 psi, perm rating 0.02 perm. AP-T shall be a factory applied self-seal system and may be used at the Contractor's option.

1. FSK reinforced foil and paper (Foil Scrim Kraft). Aluminum foil, minimum 0.75 mil thick, reinforced with fiber glass yarn mesh and laminated to 40 pound chemically treated fire resistant Poly-encapsulated paper jacket, Underwriters' Laboratories rated.
2. Dura Mesh glass fabric shall be white resin coated 10 by 10 mesh.
3. PVC pipe jacketing and fitting covers, high-impact, white, 20 mil, UV resistant PVC jacketing and preformed fitting covers applied with waterproof adhesive, all components meeting the 25/50 fire and smoke hazard ratings. Johns Manville Zeston 2000 with Perma-Weld adhesive.

**B. Inserts:** Install insulation inserts at outside hangers and supports for piping 1-1/2 inches and larger. Inserts between the pipe and pipe hangers shall be of equal thickness to the adjoining insulation and insulation saddles, and shall be provided with a vapor barrier. Insulation inserts shall be as manufactured by Pipe Shields Incorporated, Insul-Shield Uni-Grip or Johns Manville Thermo 12/Gold. Shield shall be installed between hanger and insulation on all piping.

PIPE SIZE	"INSULATION" INSERTS NOT LESS THAN THE FOLLOWING LENGTHS	SHIELD LENGTH	MINIMUM GAUGE
Less Than 1-1/2 Inches	—	10 Inches	26
1-1/2 Inch to 2-1/2 Inches	10 inches Long	12 Inches	24
3 Inches to 6 Inches	12 inches Long	14 Inches	20
8 Inches to 10 Inches	16 inches Long	18 Inches	16
12 Inches and Over	22 inches Long	24 Inches	16

1. At hanger and support points for insulated piping, install an insert around the lower 1/3 circumference. Shields shall overlap inserts 1 inch on each side.
2. Insulation shields shall be installed between insulation and pipe hangers for all pipe sizes.

**C. Glass Fiber Insulation:** Johns Manville "Micro-Lok" AP-T, meeting ASTM C547 or approved equal, having average thermal conductivity not exceeding 0.23 Btu per inch per square foot per degrees F per hour at mean temperature of 75 degrees F.

**D. Elastomeric Foam Insulation:** Rubatex R-180-FS tubing insulation been compounded to meet the indicated flame spread and smoke density rating.

1. Insulation thicknesses of 3/8, 1/2, and 3/4 inch, tested independently, shall have a maximum fire/smoke rating of 25/50. Other thicknesses are rated at 25/100.

**SECTION 23 07 00**

**E. Calcium Silicate Insulation:** Johns Manville Thermo-12/Gold, asbestos free color coded hydrous calcium silicate, meeting ASTM C533 or approved equal.

1. Insulate fittings and valves 3 inches and smaller with Ryder's Thermokote V cement to same thickness as adjacent pipe insulation. Insulate over 3 inches with mitered segments of pipe insulation wired in place and finished with Thermokote V Cement. Fittings for temperatures 600 degrees F and over shall be made up in double layer construction.
2. Seal canvas on pipe insulation and fittings with mildew resistant adhesive, Benjamin Foster 81-42W.

**F. Flexible Cellular Polyolefin Foam (IMCOA) ASTM C534:**

1. Insulation: Imcoa, Imcolock with pre-slit longitudinal seam with each mating surface adhesive coated and protected with a mylar release liner.
  - a. No external vapor barrier jacket shall be required if the water vapor permeability is 0.01 perm inch or less. Insulation which is U.V. stabilized can be exposed to sunlight and weathering without any special paint coating. The insulation can be directly buried underground without any protective jacket if the manufacturer warrants its underground use.
2. Description: Imcolock shall comply with ASTM C-534, UL94HBF, UBC42-1 Class I, ASTM E-84 25/50, NFPA 255, UL723.

a.	K Factor: ASTM C177	.24 at 75 degrees F	
		.26 at 90 degrees F	
b.	Moisture Vapor Transmission: ASTM E96	(0.0) Zero perm inch	
c.	Minimum Service Temperature:	-110 degrees F	
d.	Maximum Service Temperature:	210 degrees F	
e.	Maximum Flame Spread: ASTM E84	25	
f.	Maximum Smoke Developed: ASTM E84	50	
g.	Shall contain no potential corrosive constituents associated with stress corrosion failure of copper tubing.		
h.	<u>Connection Method</u>	<u>Piping System Temperature Range</u>	
	1) Fuse-Seal Hot Melt Method	-110 degrees	+ 210 degrees
	2) Contact Adhesive (Mfg. Approval)	-110 degrees	+ 210 degrees
	3) Lap seal end joint tape recommended by insulation manufacturer	32 degrees	+ 210 degrees

**PART 3 - EXECUTION**

**3.01 PIPING SPECIALTIES REQUIREMENTS**

**A. General Requirements:** Insulation shall be applied on clean, dry surfaces. Contractor shall clean and prepare all surfaces to be insulated prior to application.

1. Insulation shall be continuous through wall and ceiling openings and sleeves.
  - a. Where insulated pipe passes through a fire rated wall, ceiling or floor, insulation shall stop at fire barrier face and start at opposite side. On chilled water piping, the insulation shall carry through the sleeve with no unsealed joints.



**SECTION 23 07 00**

2. Insulation on cold surfaces where vapor barrier jackets are used shall be applied with a continuous, unbroken vapor seal. Hangers, supports and anchors that are secured directly to cold surfaces shall be adequately insulated and vapor-sealed by cementing pieces of vapor barrier over and around same.

**B. Fittings, Expansion Joints, Valve Bodies, Strainers, and Flanges:** Insulate elbows, tees, and valves with Johns Manville Zeston 2000 system of premolded PVC fittings and fiberglass inserts installed in accordance with manufacturer's instructions. Fittings may be insulated with 3/4 pound Microlite blanket compressed to 1/2 the thickness of adjoining pipe covering and secured with 3-ply jute twine or mitered pipe insulation segments secured with 3-ply jute twine and finished with Ryder's Thermokote No. 1 cement. After cement is dry, finish fittings with two coats Benjamin Foster 30-36 reinforced with Dura-Mesh or 6 ounce canvas overlapping adjacent jacket.

**3.02 INSULATING PIPING**

- A. General Requirements:** Insulate piping with Johns Manville Micro-Lok HP Ultra jacketed fiberglass, IMCOA insulation or approved equal as indicated.
1. Seal jacket laps and end laps with Insul-Coustic 215 or approved equal mastic applied to two surfaces.
  2. Piping run in walls shall be fully insulated.
  3. Piping shall be insulated up to coil headers of all equipment unless noted otherwise.
  4. Heating and Tertiary Piping connections to Chilled Beams and Displacement Units may be insulated with 1 inch thick Rubatex pipe insulation.
- B. Air Conditioning Drain Lines Insulation:** Insulate drain lines not in mechanical equipment rooms with fiberglass or IMCOA insulation in accordance with the following schedule:

PIPE SIZE	THICKNESS
Through 1 Inch	1/2 Inch Thick
1-1/4 Inches Through 6 Inches	1 Inch Thick
8 Inches & above	1.5 Inch Thick

**C. Glycol & Non-Glycol Hot Water Heating Supply and Return Piping Insulation:** Insulation pipe and fittings shall be complete up to coil headers of mechanical units unless noted otherwise. End of Strainers with plug shall not be covered. Pipe insulation shall be fiberglass in accordance with the following schedule:

FLUID TEMP 105 THROUGH 200 DEGREES	
PIPE SIZE	THICKNESS
Less than 1 Inch	1-1/2 Inch Thick
1 Inch Through 1-1/4 Inches	1-1/2 Inch Thick
1-1/2 Inches Through 6 Inches	2 Inch Thick
8 Inches and Over	2 Inch Thick

1. Hot water supply and return piping in radiator covers shall not be insulated unless noted otherwise on Drawings.

**SECTION 23 07 00**

**3.03 INSULATING STEAM AND CONDENSATE PIPING**

A. **General Requirements:** Insulate piping under 500 degrees F with Johns Manville Micro-Lok AP-T jacketed fiberglass pipe insulation, or approved equal.

1. Insulation of steam and condensate pipe and fittings shall be complete up to unit casing of air handling units, cabinet unit heaters, unit heaters, convectors, unit ventilators, and other mechanical units. End of strainers with plug shall not be covered.

B. **Steam and Condensate Piping Insulation Schedule - Low Pressure:**

PIPE SIZE	STEAM PIPE INSULATION	CONDENSATE PIPE INSULATION
1/2 Inch Through 3 Inch	2-1/2 Inches	2 Inch
4 Inches and Over	3 Inches	2 Inches

**3.04 INSULATING DIRECT EXPANSION REFRIGERANT PIPING**

A. **Insulation:** Insulate refrigerant suction and hot gas line piping with flexible cellular polyolefin foam pipe insulation.

B. **Exterior Insulation:** Insulate refrigerant suction, liquid line and hot gas piping, exposed to weather, or below grade, with flexible cellular polyolefin foam insulation. Provide a PVC jacket on the piping that is exposed to weather. In lieu of flexible cellular polyolefin foam insulation, Contractor may use HT/Armaflex insulation.

C. **Fittings:** Insulate sweat type fittings with flexible cellular polyolefin foam of same size as that used on adjacent tubing.

1. Bond slit and butt joints with flexible cellular polyolefin foam adhesive (Fuse-Seal).
2. Insulate screwed type fittings with sleeves of aertube having an inside diameter large enough to overlap the insulation of adjacent tubing or pipe.
3. Sleeves shall be made by cementing 2 miter-cut pieces of larger size flexible cellular polyolefin foam together.

D. **Application:** Bond joints and butt ends with adhesive by applying to both surfaces. Press both surfaces together after adhesive is non-tacky to touch.

E. **Direct Expansion Refrigerant Piping Insulation Schedule:**

PIPE SIZE	THICKNESS
Through 1-1/2 Inch	1 Inch Thick
2 Inch and Over	1-1/2 Inch Thick

**SECTION 23 07 00**

**3.05 INSULATING FOR PIPING OUTSIDE BUILDING EXPOSED TO WEATHER**

- A. **Insulated Pipe Exposed to Weather:** Insulate service water, including domestic hot, cold, and circulating water; chilled water; hot water heating; and steam and condensate piping, when exposed to the elements, with Johns Manville metal jacketed fiberglass pipe insulation, or approved equal. Jacket insulation with a minimum thickness of 0.016 inch aluminum, No. 5005. Provide a moisture barrier between insulation and jacket.
1. Secure insulation and jacket in place by continuous friction type joint providing positive weather-proof seal.
  2. Snap, strap and clip, 0.016 inch aluminum, 2 inches wide with weather-proof sealant, and place at each circumferential joint.
  3. Insulate fittings with mitered sections of Micro-Lock. Seal joints with a sealing compound and preformed aluminum bands and formed fitting covers.
  4. Pipe insulation may be calcium-silicate in lieu of fiberglass.

**3.06 INSULATING COIL HEADERS**

- A. **General Requirements:** Insulate exposed heating and cooling coil headers at air handling units with 1 inch thick, 3 pound density fiberglass board boxed over return bends with all-purpose covering overlapping sheet metal 2 inches and secured with adhesive glass cloth tape.
- B. VAV box coil headers shall be insulated with external duct insulation.

**3.07 INSULATING HOT WATER; AIR SEPARATORS, SIDE STREAM FILTERS, AND CONVERTORS/HEAT EXCHANGERS**

- A. **Thermal Insulation Schedule:** Insulate the above hot equipment with Micro-Flex large-diameter pipe and tank fiberglass wrap insulation with FSK facing in accordance with the following schedule:

TEMPERATURE	THICKNESS
150 Degrees F	2 Inches
200 Degrees F	3 Inches
250 Degrees F	3-1/2 Inches

1. Insulation shall be cut, scored or mitered to fit contour of equipment with edges tightly butted and secured with staples and seal with matching pressure-sensitive tape. Provide banding where application requires additional securement.

**3.08 INSTALLATION APPLICATION - EXTERNAL DUCT INSULATION**

A. **Fiber Glass Blanket Insulation:**

1. Apply insulation with edges tightly butted and secured over mastic adhesive applied in 6 inch wide strips around full perimeter of duct on 18 inch centers. Ductwork larger than 16 inches wide shall have welded pins and clips applied to bottom of duct on 15 inch centers holding insulation to duct.
2. Insulation joints shall have both edges buttered with mastic, lapped not less that 2 inch width, and firmly adhered together.

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3. Staples may be used to hold adhesive joints while drying. Vapor barrier shall not have open penetrations.
4. Ductwork 16 inches and smaller may be less welded pins and clips, but shall have 2 inch wide adhesive tape applied on 4 foot centers completely around duct with 4 inch overlap at ends. Vertical ductwork and sides of duct 36 inches and greater shall have welded pins and clips on bottom third of duct on 18 inch centers.
5. Round ducts greater than 16 inch diameter shall have welded pins and clips on bottom third of duct on 18 inch centers, with 4 inch wide glass fiber tape glued over joints and ends stapled. Round ducts 16 inches and smaller may be less pins and clips, but shall have 4 inch overlap at ends.

**B. Fiber Glass Board Insulation:**

1. Apply insulation with edges buttered with mastic and tightly butt and impale over welded pins and secure with clips. Space pins to hold insulation securely in place, but not over 18 inches on center. Seal joints with 4 inch wide glass cloth vapor barrier tape, permanently glued in place, ends stapled.
2. Insulate exposed round and oval ducts similar as concealed ducts, unless otherwise indicated.

**3.09 EXTERNAL DUCT INSULATION SCHEDULE**

A. **Schedule:** Provide insulation on the following ductwork systems as indicated:

<u>Type of Duct System</u>	<u>Type of Insulation</u>	<u>Thickness</u>	<u>Density</u>
<b>HVAC Ductwork:</b> Supply ductwork shall be externally insulated from air handling unit to air outlet.	Fiber glass blanket insulation in <u>concealed areas</u> .	1-1/2"	1 pound
	Fiber glass board insulation in <u>exposed areas</u> .	1-1/2"	3 pound
<b>HVAC Ductwork:</b> Return ductwork in non-return air plenum shall be externally insulated from air handling unit to air outlet. Corridor ductwork is in non-plenum ceiling, therefore it shall be insulated.	Fiber glass blanket insulation in <u>concealed areas</u> .	1-1/2"	1 pound
	Fiber glass board insulation in <u>exposed areas</u> .	1-1/2"	3 pound
<b>Exhaust Ductwork:</b> Vertical ductwork from roof penetrations to drip pans, drip pans, and exhaust/relief louver plenums shall be externally insulated. If horizontal ductwork is not internally lined, provide external insulation for 15 feet from drip pan. (See separate article in this Section for Kitchen exhaust ductwork insulation).	Fiber glass blanket insulation in <u>concealed areas</u> .	1-1/2"	1 pound
	Fiber glass board insulation in <u>exposed areas</u> .	1-1/2"	3 pound
<b>Relief Ductwork:</b> Shall be externally insulated for 15 feet from roof opening or louver.	Fiber glass blanket insulation in <u>concealed areas</u> .	1-1/2"	1 pound
	Fiber glass board insulation in <u>exposed areas</u> .	1-1/2"	3 pound

**SECTION 23 07 00**

**Energy Recovery Unit Supply Ductwork:** Ductwork shall be externally insulated from energy recovery unit supply outlet to air handling unit mixing box. (Note: All ductwork exposed to weather shall be double-wall ductwork. Refer to Section 23 31 13.) Fiber glass board insulation. 2" 3 pound

**Outside Air Ductwork:** Ductwork shall be externally insulated from intake hood/louver to the air handling unit mixing box. Outside air Fiber glass board insulation. 2" 3 pound

**Mixed Air Ductwork:** Mixed air ductwork shall be externally insulated. Fiber glass board insulation. 1-1/2" 3 pound

**B. General Requirements:**

1. External duct insulation shall be omitted where double wall duct construction is used and where internal lining is used. See Section 23 31 13 of the Specifications.

**END OF SECTION**