SECTION 23 07 00

HVAC INSULATION

PART 1 - GENERAL

1.1 SUMMARY

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

B. Work Included:

1. Piping Insulation
2. Ductwork Insulation
3. Equipment Insulation

C. Related Sections:

1. Section 23 00 10 – HVAC General Requirements
2. Section 23 05 00 – Common Work Results for HVAC
3. Section 23 20 00 – HVAC Piping and Pumps
4. Section 23 30 00 – HVAC Air Distribution
5. Section 23 70 00 – Central HVAC Equipment
6. Section 23 80 00 – Decentralized HVAC Equipment

1.2 SUBMITTALS:

A. Submit shop drawings in accordance with Division 1 and Section 23 00 10.

B. Submit shop drawings and catalog data for each type of material proposed for this project. Indicate thickness of material for individual services, and installation methods.

1.3 REFERENCES:

A. General: The following standards or codes (latest edition) form a part of this specification to the extent indicated by the reference thereto.

B. American Society for Testing and Materials (ASTM):

ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building materials.

ASTM C 411 Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation

C. National Fire Protection Association (NFPA):

Standard 255 Method of Test of Surface Burning Characteristics of Building Materials

D. Underwriters Laboratories, Inc. (UL)

Standard 723 Tests for Surface Burning Characteristics of Building Materials

E. California Department of Health Services

Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers

PART 2 - PRODUCTS:

2.1 GENERAL

A. Acceptable Manufacturers:

1. Manville, Owens Corning, Armstrong, IMCOA, Knauff or Certain-Teed except where specific manufacturer is named.

B. All insulation materials, jackets and fitting covers shall have a composite flame spread rating not exceeding 25, and a smoke developed rating not exceeding 50 as tested under procedure ASTM E-84-75, NFPA 255 and UL 723. Duct coverings and linings shall not flame, glow, smolder or smoke when tested in accordance with ASTM C411.

2.2 MATERIALS

A. Piping:

1. Refrigerant and Interior Condensate Drain Piping: Closed cell flexible elastomeric insulation, 0.28 btu•in./sq.ft./°F/hr. maximum “K” value at 75°F., maximum water vapor transmission rating of 0.1 perms-inch. Insulation located outside the building shall have a selective finish to protect insulation from ultra violet (UV) solar radiation, unless specifically designed to withstand UV radiation. (Insulation on underground and underfloor piping shall be closed cell polyolefin, 1” thick, with water vapor transmission rating of 0 perms-inch.)

B. Ductwork:

1. Exposed Rectangular Ducts: Rigid fibrous glass insulation, 3.0 lb. density, 0.24 btu•in./sq.ft./°F/hr. maximum “K” value at 75°F, with factory applied reinforced aluminum foil vapor barrier. (Insulation to be exposed in public, finished areas shall have factory applied reinforced white Kraft all service jacket for painting.)
2. Round Ducts, Flat Oval Ducts and Concealed Rectangular Ducts: Flexible fibrous glass insulation, 1.0 lb. density, 0.27 btu•in./sq.ft./°F/hr. maximum “K” value at 75°F, with factory applied reinforced aluminum foil vapor barrier.

3. Acoustic Lining (where indicated and/or noted on Drawings): Fiberglass insulation, 0.26 btu•in./sq.ft./°F/hr. maximum "K" value at 75°F, absolute roughness of exposed surface shall not exceed 0.005 ft., coated to prevent erosion at air velocities up to 2000 fpm, 1.5 lbs/cu.ft. minimum density. Noise reduction co-efficient shall average not less than 0.60 when tested by Acoustical Material Association procedure mounting 6. Liner shall be provided with EPA approved biocide in the erosion coating to protect against microbial growth. Liner shall meet or exceed requirements of ASTM G21 (fungi resistance) and ASTM G22 (bacterial resistance). Acoustic lining shall be one inch thick unless specifically noted otherwise.

C. Sealants, Mastics and Adhesives: Products either manufactured by or recommended by the insulation material manufacturer. For field applications within the weatherproofing system, adhesives and sealants shall comply with the requirements of the California Health Services Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers.

PART 3 - EXECUTION:

3.1 PREPARATION

A. Do not install insulation before piping(, medium/high pressure ductwork) and equipment have been tested and approved.

B. Ensure surface is clean and dry prior to installation. Ensure insulation material is undamaged and dry before application. Finish with system at operating conditions and temperature.

3.2 INSTALLATION

A. General: Ensure insulation is continuous through inside walls and partitions. Insulated piping passing through (smoke barriers,) smoke partitions, fire walls, fire partitions, and fire rated floors shall have insulation of type, thickness and density to match U.L. Through-Penetration Firestop Systems as specified in Section 23 00 10 under Sleeves and Inserts. Insulated piping passing through nonfireresistance rated floors shall be fireblocked as specified in Section 23 00 10 under Sleeves and Inserts. Insulated ducts passing through smoke partitions and fire rated assemblies where a fire damper is not required shall be insulated with calcium silicate for a length equal to twice the thickness of the wall with all voids between the sleeve and duct insulation tightly packed with mineral-wool insulation or U.L. approved packing with sealant. All penetrations through equipment room walls and other areas of noise or heat generation shall be tightly sealed with mineral fiber rope

B. . Finish insulation neatly at hangers, supports and other protrusions.

C. Piping:

1. General:

   a. Fittings and valves shall be insulated and jacketed with the same material as the adjacent piping or it may be finished with a smooth coat of approved insulating cement and jacketed with an approved recovering cloth and vapor sealed. Where PVC fitting covers are used, insulation shall be wrapped tightly using sufficient quantities to prevent deformation of covers.

   OR

   Use mitered segments of insulation on elbows and oversized insulation on valves and tees coated with two coats of vapor barrier mastic, reinforced with glass fabric extending two inches onto adjacent pipes, and same diameter as adjoining covering. No plastic materials on fittings will be allowed.

   b. Mitering of straight pipe insulation to form elbows will not be acceptable or allowed.
   c. All jacket joints and seams shall be lapped not less than 2".
   d. Insulation exposed to weather (and insulation exposed to abuse in finished spaces) shall be covered with minimum 0.016 aluminum jacket with all joints sealed weather-tight.
   e. Insulation at pipe hangers (except for rain conductors and domestic water piping 2" size and smaller) shall be calcium silicate in preformed sections 12" long enclosing pipe around entire circumference. Insulation at pipe hangers for domestic water piping 2" size and smaller shall be as specified for piping. Pipe hangers shall be oversized to enclose pipe and insulation. Provide sheet metal saddle between hanger and insulated pipe. Pipe hanger insulation shall be as manufactured by Pipe Shields, Inc., B
   f. ergen-Power Pipe Supports, Inc., Rilco Mfg. Co., Inc. or Valued Engineered Products, Inc.
   g. Elastomeric and other foam insulations shall be installed without stretching or compressing individual lengths.

2. Refrigerant Piping: Cover all valves and fittings with equivalent thickness of insulating material. All edges shall be tightly butted. Seal all joints vapor tight.

D. Ductwork:

1. External:

   a. Rigid duct insulation shall be secured to rectangular ducts with mechanical fasteners such as metal stick clips or cupped head weld pins located a maximum of 3" from each edge and spaced a maximum of 12" on center each way. All insulation joints shall be tightly butted. All joints, voids and punctures in facing shall be sealed vapor tight with pressure sensitive foil tape and mastic.

b. Flexible duct insulation shall be provided with a minimum 2" facing flap overlapping adjacent and connecting insulation. Seams shall be stapled approximately 6" on center with ½" outward clinching staples. Where rectangular ducts are 24" in width or greater, insulation shall be secured to the bottom of the duct with mechanical fasteners to prevent sagging. All insulation joints shall be tightly butted. All joints, voids and punctures in facing shall be sealed vapor tight with mastic.

2. Internal: The lining shall be applied to cut-to-size pieces fastened to the entire interior of the duct with mastic, stick clips and speed washers. Edges and joints shall be coated with fire resistant mastic. External duct insulation is not required on ducts with internal lining unless noted otherwise.
3. Ductwork exposed to outside conditions shall be insulated as specified herein and covered with minimum .025 inch thick aluminum jacket with seams lapped a minimum 3", sealed with silicon caulk. Covers shall be neatly finished and completely watertight.
4. Where duct mounted heating coils are located downstream from cooling coils and at variable air volume terminal units the coil shall be provided with vapor-sealed external duct insulation on sides, top and bottom.
5. Where ductwork is indicated to have internal acoustic lining, sheet metal drops to diffuser and register necks shall be unlined and shall be externally insulated.
6. The top of all diffusers shall be insulated to cover the entire top surface area, including flex duct transitions, and vapor sealed

3.3 INSULATION THICKNESS SCHEDULE

A. Piping:

Type	Size, Inches	Insulation Thickness, Inches
	*Runouts 1" and Under	1
Refrigerant Suction	All	1
Heat Pump Refrigerant Liquid	All	1
Waste Lines Carrying Condensate from A/C Units, Ice Makers, etc.	All	1/2

B. Ductwork:

Type	Insulation Thickness Inches, External
Outside Air Intake and Untempered Supply	2
Supply (Heating and Cooling)	1-1/2
Return (Equip. Room Only)	1-1/2
Plenums	1-1/2
Exhaust (Between MOD & Louver)	2

Supply & Return Exposed to Outside Air Conditions (& in Attic Space)	2

END OF SECTION 23 07 00