## PART 1 GENERAL

1.1 DESCRIPTION

A. The requirements of this section apply to the insulation of mechanical equipment specified elsewhere in these specifications.

B. Related Work: The requirements of Section 23 0500, Common HVAC Materials and Methods, also apply to this section.

1.2 QUALITY ASSURANCE

A. Minimum Insulation Thickness and Thermal Performance: Comply with the provisions of the State of Oregon Energy Efficiency Specialty Code (OSEEC) which references ASHRAE 90.1-2019..

B. Composite (Insulation, Jacket or Facing and Adhesives) Fire and Smoke Hazard Ratings: Not to exceed a flame spread of 25 or smoke development of 50 and containing less than 0.1% by weight deca-PDE fire retardant.

C. Component Ratings of Accessories (Adhesives, Mastics, Cements, Tapes, Finishing Cloth for Fittings): Same as "B" requirements above and permanently treated. No water soluble treatments.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

A. General: In addition to the requirements specified in Section 23 0500, the following apply:

1. Deliver insulation, coverings, cements, adhesives and coatings to the site in factory-fabricated containers with the manufacturer's stamp or label affixed showing fire hazard ratings of the products. Store insulation in original wrappings and protect from weather and construction traffic.

2. Protect insulation against dirt, water, chemical and mechanical damage. Do not install damaged insulation. Remove such insulation from project site.

1.4 SUBMITTALS

A. Submit catalog data and performance characteristics for each product specified.

## PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Insulating Manufacturers: Johns Manville, Knauf, Armstrong, Owens-Corning, Pittsburgh Corning, Pabco, Imcoa, Nomaco, or Certain Teed. Johns Manville products are listed unless indicated otherwise.

B. Adhesive Manufacturers: Foster, 3M, Insul-Coustic, Borden, Kingco or Armstrong.

2.2 PIPING INSULATION

A. Interior and Exterior Piping Systems 50 to 850 Deg. F, ASTM C 547: Glass fiber preformed pipe insulation with a minimum K-value of 0.23 at 75 Deg. F, a minimum density of 3.5 pounds per cubic foot within all-service vapor barrier jacket containing less than 0.1% by weight deca-PDE fire retardant, vinyl or pre-sized finish and pressure sensitive seal.

B. Exterior Installations: Same as for interior installations except 0.016" aluminum finish jacket **[or, in coastal environments, 0.01" stainless steel]**.

C. Interior Piping Systems 32 to 50 Deg. F: Glass fiber preformed pipe insulation with a minimum K-value of 0.23 at 75 deg. F, a minimum density of 3.5 pounds per cubic foot. Polymer vapor barrier jacket containing less than 0.1% by weight deca-PDE fire retardant and with pressure sensitive seal and wicking system to remove condensation from pipe surface. Owens Corning “VaporWick.”

D. Pipe Temperatures Minus 30 to 180 Deg. F: Flexible, preformed, pre-slit, self-sealing elastomeric pipe insulation, thermal conductivity of 0.27 BTU/hr. sq. ft./in. at 75 deg. F and vapor transmission rating of 0.2 perms/inch. Armstrong "Armaflex 2000" or, in concealed locations, Imcoa or Nomaco also approved.

E. Pipe Temperatures up to 1200 Deg. F: High temperature molded calcium silicate insulation with aluminum metal jacket. Furnish with aluminum snap straps. Apply in thickness required for a maximum surface temperature of 120 deg. F at 80 deg. F ambient and for the flow media temperatures. Johns Manville Thermo-12/Gold.

2.3 DUCT INSULATION

A. Interior Above Grade Ductwork: Glass fiber formaldehyde-free blanket with "FSK" facing containing less than 0.1% by weight deca-PDE fire retardant, k value = 0.31 at 75 deg. F, 0.2 perms, and UL 25/50 surface burning rating. Johns Manville "Microlite."

2.4 INSULATION ACCESSORIES

A. Insulation Compounds and Materials: Provide rivets, staples, bands, adhesives, cements, coatings, sealers, welded studs, etc., as recommended by the manufacturers for the insulation and conditions specified except staples not permitted on chilled water lines.

## PART 3 EXECUTION

3.1 PIPING INSULATION

A. Refrigerant Piping Insulation: Insulate suction piping with minimum 1" thick foamed plastic or of thickness necessary to prevent condensation at 85 deg. F and 70% RH. Where possible, slip insulation over the piping as it is installed. Seal all joints and seams.

B. Condensate drains: Insulate drains exposed to outdoor temperatures with 1/2” thick elastomeric pipe insulation. Insulate over heat tape.

3.2 DUCTWORK INSULATION

A. Ductwork: Insulate the following:

1. All supply ductwork.

2. All supply and return ductwork in systems routed in unconditioned spaces or exposed to the outside conditions.

3. All outside air intake ducts.

4. All exhaust ductwork downstream of last backdraft damper.

5. All ductwork required to be insulated by code.

B. Insulation Thickness: Select board and blanket insulation of thickness required to provide the following installed R-value.

1. All heating or cooling system supply and return ducts located on the exterior of the insulated building envelope and all outside air intake ducts, R-8.

2. All heating and cooling system supply and return ducts located in unconditioned spaces, R-5.

3. All heating and cooling system supply ducts located in conditioned spaces where exposed in unfinished spaces or concealed from view in finished spaces, R-3.3. Exposed ductwork in finished spaces shall not be externally insulated.

C. Fittings: Install with wire, straps, and duct adhesive as required. To prevent sagging on all rectangular or square ducts over 24" wide, install Gramweld or equal welding pins on the bottom. Maximum spacing 18" on center in both directions.

D. Installation: Applied with butt joints, all seams sealed with vapor seal mastic or taped with 2" wide vapor-proof, pressure-sensitive tape. Seal all penetrations with vapor barrier adhesive.

E. Internally Lined Ductwork: Where internally lined ductwork is indicated on the Drawings and/or specified, no exterior insulation is required. Select duct lining to provide the required R-value. Carefully lap the ends of the exterior insulation a minimum of 6" past the interior insulation unless otherwise shown. Seal the end of vapor barrier jacket to the duct with mastic where the vapor barrier is required. Duct lining is specified in Section 23 3000.

End of Section