PART 1: GENERAL

1.01 Purpose:

This Design guideline contained herein includes the requirements for mechanical insulation at The University of Texas at Austin

1.02 Scope:

A. Extent of mechanical insulation required by this section is indicated on drawings and schedules, and by requirements of this section.

B. Types of mechanical insulation included in this section include the following:

1. Piping System Insulation:

a. Urethane.
b. Calcium Silicate.
c. Fiberglass.
d. Flexible Unicellular.
e. Aluminum Jackets.

2. Ductwork System Insulation:

a. Fiberglass.
b. Flexible Unicellular.

1.03 Quality Assurance:

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of mechanical insulation products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.

B. Installer's Qualifications: Firm with at least 3 years successful installation experience on projects with mechanical insulations similar to that required for this project.

C. Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame-spread index of 25 or less, and smoke-developed index of 50 or less, as tested by ASTM E 84 (NFPA 255) method.

1.04 Submittals:

A. Product Data: Submit manufacturer's technical product data and installation instructions for each type of mechanical insulation. Submit schedule showing manufacturer's product number, k-value, thickness, and furnished accessories for each mechanical system requiring insulation.

1.05 Deliver, Storage, And Handling:

A. Deliver insulation, coverings, cements, adhesives, and coatings to site in containers with manufacturer's stamp or label, affixed showing fire hazard indexes of products.

B. Protect insulation against dirt, water, and chemical and mechanical damage. Do not install damaged or wet insulation; remove from project site.

PART 2 - PRODUCTS

2.01 Acceptable 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. Armstrong World Industries, Inc.
2. CertainTeed Corp.
3. Knauf Fiber Glass GmbH.
4. Manville Products Corp.
5. Owens-Corning Fiberglas Corp.
6. Pamrod, Inc.
7. Calsitite.

2.02 Piping Insulation Materials:

A. Urethane Piping Insulation:

1. Continuously molded rigid urethane equal to Armalok II shall be used for cold piping. It shall be furnished in 3 or 4-foot sections of a single layer thickness of 1-1/2" for chilled water, 1" for potable cold-water piping and 3/4" for A/C condensate. The insulation sections shall come with a laminated aluminum foil reinforced with fiberglass mesh and bonded to a white kraft paper to form a vapor barrier jacket.

2. The vapor barrier jacket laps and butt joint strips (fabricated of material similar to the jacket) shall be sealed with a contact type adhesive equal to Armstrong 520 Adhesive.

3. Elbows shall be insulated with molded urethane insulation halves and vapor sealed with 4 inch wide fiberglass tape embedded in Foster 30-35 Coating and covered with another layer of Foster 30-35.

4. Valves and tees may be insulated with job fabricated mitre-cut segments of the pipe insulation and vapor sealed similar to the elbows.

B. Calcium Silicate:

1. Calcium Silicate Piping Insulation shall be equal to Johns-Manville's Thermo-12. Use 1-1/2" thick material for the steam piping and 1" thick material for the condensate piping.

2. Wire the insulation firmly in place with no less than 6 loops of No. 16 annealed copper clad wire per three-foot section of insulation.

3. Fittings and valves shall be insulated by successive 1/2" layers of cement, equal to Johns-Manville No. 375 cement. Each layer shall be allowed to dry before the next layer is applied.

4. Cracks and voids in the insulation surfaces and joints shall be carefully filled with the cement so that the resulting surface is smooth and continuous.

5. A layer of 3/4" deadening felt shall be wrapped around the insulation prior to the application of an 8-ounce canvas jacket. The jacket shall be pasted in place with a water-based sealant/coating, equal to Foster Sealfas coating 30-36, as manufactured by the H.B. Fuller Co.

C. Fiberglass Piping Insulation:
ASTM C 547, Class 1 unless otherwise indicated.

D. Jackets for Piping Insulation:
ASTM C 921, Type II for piping with temperatures above ambient.

E. Encase pipe fittings insulation with one-piece premolded PVC fitting covers, fastened as per manufacturer's recommendations.

F. Staples, Bands, Wires, and Cement: As recommended by insulation manufacturer for applications indicated.

G. Adhesives, Sealers, and Protective Finishes: As recommended by insulation manufacturer for applications indicated.

H. Flexible Unicellular: Type 1, tubular for temperature ranges - 40^{o}F to 200^{o}F.

I. Aluminum Jacket: 0.020 inch thick.

J. Insulation on 165 psi steam piping is to be aluminum-jacketed calcium silicate.

K. Utilize a particular green color for canvas jacketing of newly-insulated steam pipes upstream of the high-pressure steam regulator, and newly-insulated condensate pipes downstream of the condensate pump(s), to indicate that the insulation underneath is asbestos-free. This color must only be applied to insulation known to be asbestos-free. The recipe is: For each gallon of Foster 30/36 sealer, add 3-1/2 oz of Cal Tint II paint coloring (Thalo Green, part number 830-5515), 1 oz of Cal Tint II paint coloring (Exterior Medium Yellow, part number 830-2024), and water as required to obtain desired consistency.

2.03 Ductwork Insulation Materials:

A. Flexible Fiberglass Ductwork Insulation:

1. A 2" thick fiberglass blanket insulation with a density of 1 pound per cubic foot and thermal conductivity (k value) of 0.29 @ 75^{O}F mean temperature. The blanket shall have a vapor barrier facing of an aluminum foil and kraft paper lamination sandwiching a fiberglass scrim for reinforcing.

B. Flexible Unicellular: A 1" thick flexible unicellular insulation blanket, protected by Armoflex finish protective coating.

C. Ductwork Insulation Accessories: Provide staples, bands, wires, tape, anchors, corner angels and similar accessories as recommended by insulation manufacturer for applications indicated.

D. Ductwork Insulation Compounds: Provide cements, adhesives, coatings, sealers, protective finishes and similar compounds as recommended by insulation manufacturer for applications indicated.

E. Ductwork Insulation Sealing: Blanket insulation with a thermal conductivity of 0.27 or less similar in construction to Owens-Corning Fiberglass Series on pound per cubic foot minimum density with foil reinforced Kraft (FRK) vapor barrier facing. Insulation shall be wrapped tightly on the ductwork with all circumferential joints butted and longitudinal joints overlapped a minimum of 2". Adhere insulation to metal with 4" strips of insulation bonding adhesive at 8" on center. On circumferential and longitudinal joints, the 2" flange of the facing shall be secured using 9/16" flare door staples applied 6" on center and taped with 4" wide fiberglass tape embedded in Childers CP-10 white vapor barrier emulation and covered with Childers CP-10 until the tape is completely covered. All pin penetrations or punctures in facing shall also be taped. Vapor sealing of joints is not required on hot duct application where concealed.

PART 3: EXECUTION

3.01 Plumbing Piping System Insulation:

A. Insulation Omitted: Omit insulation on chrome-plated exposed piping (except for handicapped fixtures), air chambers, unions, strainers, check valves, balance cocks, flow regulators, drain lines from water coolers, drainage piping located in crawl spaces or tunnels, buried piping, fire protection piping, and pre-insulated equipment.

B. Cold Piping:

1. Application Requirements: Insulate the following cold plumbing piping systems:

a. Potable cold water piping.
b. Potable chilled water piping.
c. Clean room chilled water piping.

2. Insulate each piping system specified above with one of the following types and thickness of insulation:

a. Urethane: 1" thickness.
b. Flexible Unicellular: 1/2" wall thickness for pipe sizes up to 1-1/2”, 3/4” for pipe sizes 2” or over.

C. Hot Piping:

1. Application Requirements: Insulate the following hot plumbing piping systems:

a. Potable hot water piping.
b. Potable hot water recirculating piping.

2. Insulate each piping system specified above with one of the following types and thickness of insulation:

a. Calcium Silicate: 1" thick for pipe sizes up to and including 2", 1-1/2" for pipe sizes over 2".

3.02 Hvac Piping System Insulation:

A. Insulation Omitted: Omit insulation on hot piping within radiation enclosures or unit cabinets; on cold piping within unit cabinets provided piping is located over drain pan; on heating piping beyond control valve, located within heated space; on condensate piping between steam trap and union; and on unions, flanges, strainers, flexible connections, and expansion joints.

B. Cold Water Piping (Below Ambient Temperature):

1. Application Requirements: Insulate the following HVAC piping systems:

   a. HVAC chilled water supply and return piping.
   b. Fin water (air conditioner condensate drain) piping.

2. Insulate each piping system specified above with one of the following types and thickness of insulation:

   a. Urethane: 1-1/2" thick for pipe sizes up to and including 4". 2" thick for pipe over 4".

C. Hot Water Piping (To 250^{o} F):

1. Application Requirements: Insulate the following hot HVAC piping systems.

   a. HVAC hot water supply and return piping.
   b. Condensate Piping

2. Insulate each piping system specified above with one of the following types and thickness of insulation:

   a. Fiberglass: 1" thick for pipe sizes up to and including 1", 1-1/2" thick for pipe sizes 1-1/4" through 4", 2" thick for pipe over 5".

   b. Calcium Silicate: 1" thick for pipe sizes up to and including 4", 2" thick for pipe over 4".

D. Low Pressure Steam Piping (to 250^{o} F):

1. Application Requirements: Insulate the following low-pressure steam piping systems (steam piping up to 15 psi).

   a. Low pressure steam piping.

2. Insulate each piping system specified above with the following type and thickness of insulation:

   a. Calcium Silicate: 1-1/2" thick for pipe sizes up to and including 2-1/2". 2" thick for pipe over 2-1/2".

E. Protection of Piping Insulation: Protect outdoor insulation from weather or installation exposed to foot traffic by aluminum jacketing.

3.03 Installation Of Piping Insulation:

A. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.

B. Install insulation on pipe systems subsequent to installation of testing and acceptance of tests.

C. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other.

D. Clean and dry pipe surfaces prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.

E. Maintain integrity of vapor-barrier jackets on pipe insulation, and protect to prevent puncture or other damage.

F. Cover valves, fittings and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run. Install factory molded, precut units.

G. Extend piping insulation without interruption through walls, floors and similar piping penetrations, except where otherwise indicated.

H. Install aluminum jackets on all exterior applications and include metal jacket bands of 3/8" wide; .020" thick aluminum or stainless steel and adhesives compatible with insulation. Locate seams on bottom side of horizontal pipe.

3.04 Duct System Insulation:

A. Cold Ductwork (Below Ambient Temperature and Return Air Ductwork in unconditioned spaces):

1. Application Requirements: Insulate the following cold ductwork:

a. Outdoor air intake ductwork between air entrance and fan inlet or HVAC unit inlet.

b. HVAC supply ductwork between fan discharge, or HVAC unit discharge, and room supply diffuser.

c. Insulate neck and bells of supply diffusers.

2. Insulate each ductwork system specified above with the following type of insulation:

a. Flexible Fiberglass

B. Hot Ductwork (Above Ambient Temperature):

1. Application Requirements: Insulate the following hot ductwork:

a. Hot supply between the fan discharge or heating unit discharge and the room supply diffuser.

b. Ductwork downstream of mixing devices and other supply ductwork.

2. Insulate each ductwork system above with the following type of insulation:

a. Flexible Fiberglass.

C. Outside Supply Ductwork:

1. Application Requirement: Insulate the following supply ductwork:

a. Outside supply ductwork between HVAC unit and building wall.

2. Insulate each ductwork system above with the following type of insulation:

a. Flexible Unicellular.

3.05 Installation Of Ductwork Insulation:

A. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.

B. Install insulation materials with smooth and even surfaces.

C. Clean and dry ductwork prior to insulating. Overlap insulation joints to ensure complete and tight fit over surfaces to be covered.

D. Maintain integrity of vapor-barrier on ductwork insulation, and protect it to prevent puncture and other damage.

E. Extend ductwork insulation without interruption through walls, floors and similar ductwork penetrations, except where otherwise indicated.

F. Seal joints and seams of the cold duct insulation as recommended by manufacturer.

G. Lined Ductwork: Except as otherwise indicated, omit insulation on ductwork where internal insulation or sound absorbing linings have been installed.

3.06 Existing Insulation Repair:

A. Repair damaged sections of existing mechanical insulation, both previously damaged or damaged during this construction period. Use insulation of same thickness as existing insulation, install new jacket lapping and seal over existing.

B. Protection And Replacement:
Replace damaged insulation, which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture-saturated units.

C. Protection: Insulation installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF STANDARD 15250