SECTION 15082

PLUMBING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Insulation materials
   a. Mineral fiber
2. Field-applied jackets

B. Refer to Part 3 - PIPING INSULATION SCHEDULE-GENERAL for location of required Work, or as otherwise shown on the Drawings

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency

1. Insulation installed indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less
2. Insulation installed outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less

1.4 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature

1.5 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Section 15070

B. Coordinate clearance requirements with piping Installer for piping insulation application and equipment Installer for equipment insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance

1.6 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied

B. Products shall not contain asbestos, lead, mercury, or mercury compounds

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C871

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C795

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process

F. Mineral-Fiber, Preformed Pipe Insulation

1. Products: Subject to compliance with requirements, provide one of the following
   a. Johns Manville; Micro-Lok
   b. Knauf Insulation; 1000 Pipe Insulation
   c. Owens Corning; Fiberglas Pipe Insulation
2. Type I, 850 deg F materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" article

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated

2.3 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C921, Type I, unless otherwise indicated

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application

1. Verify that systems and equipment to be insulated have been tested and are free of defects
2. Verify that surfaces to be insulated are clean and dry
3. Proceed with installation only after unsatisfactory conditions have been corrected

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and pipe system as specified in insulation system schedules

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state

D. Install insulation with longitudinal seams at top and bottom of horizontal runs

E. Install multiple layers of insulation with longitudinal and end seams staggered

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties

G. Keep insulation materials dry during application and finishing

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer

I. Install insulation with least number of joints practical

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic

1. Install insulation continuously through hangers and around anchor attachments
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth
2. Cover circumferential joints with 3-inch wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches O.C.
3. Overlap jacket longitudinal seams at least 1½ inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches O.C.
   a. For below ambient services, apply vapor-barrier mastic over staples
4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints

3.4 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation
3. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier
4. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker
5. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour
6. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape
7. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant

D. Install removable insulation covers at locations indicated. Installation shall conform to the following

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation

2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket
3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket

3.5 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches O.C.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant

B. Insulation Installation on Pipe Flanges

1. Install preformed pipe insulation to outer diameter of pipe flange
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant

C. Insulation Installation on Pipe Fittings and Elbows

1. Install preformed sections of same material as straight segments of pipe insulation when available
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation
4. Install insulation to flanges as specified for flange insulation application

3.6 FIELD-APPLIED JACKET INSTALLATION

A. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches O.C. and at end joints

3.7 FINISHES

A. Equipment and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 9 painting Sections

1. Flat acrylic finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof
   a. Finish coat material: Interior, flat, latex-emulsion size

B. Color: Final color as selected by Architect/Engineer. Vary first and second coats to allow visual inspection of the completed Work

C. Do not field paint aluminum or stainless-steel jackets

3.8 EQUIPMENT INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option

B. Domestic hot-water storage tank insulation shall be the following, of thickness to provide an R-value of 12.5

1. Mineral-fiber pipe and tank

3.9 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following

1. Air piping
2. Underground piping
3. Exposed sewer piping
4. Exposed sludge piping
5. Chrome-plated pipes and fittings unless there is a potential for personnel injury

3.10 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water, Deionized Water

1. Insulation shall be the following
   a. Mineral-fiber, preformed pipe insulation, Type I: ½-inch thick

B. Domestic Hot Water

1. 1½" and smaller: Insulation shall be the following
   a. Mineral-fiber, preformed pipe insulation, Type I: 1-inch thick
2. 2" and larger: Insulation shall be the following
   a. Mineral-fiber, preformed pipe insulation, Type I: 3-inches thick

END OF SECTION