SECTION 15700

COVERING AND INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The requirements of Division 1, The General Conditions, the Supplementary General conditions, and the Contract Drawings are hereby made a part of this section as fully as if repeated herein.

1.02 WORK INCLUDED

A. Providing thermal insulation for the HVAC and plumbing systems to include piping, ductwork, fittings, casings, and equipment.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Section 07800 “Roof Penetrations”
B. Section 15100 “Mechanical Materials & Methods”
C. Section 15400 “Medical Equipment Process Piping Systems”
D. Section 15300 “Plumbing, Piping”
E. Section 15600 “Ductwork”

1.04 QUALITY ASSURANCE

A. The following manufacturers are acceptable:
   1. Insulation:
      a) Armstrong Cork Co.
      b) Certainteed Corp.
      c) Manville Products Co.
      d) Owens-Corning Fiberglass Corp.
      e) Knauf

   2. Adhesives
      a) Foster
      b) Minnesota Mining
      c) Chicago Mastic
      d) Armstrong
      e) Manville Products Corp.
      f) Childers Inc.

Insulation installers(s) shall have a minimum of five (5) years of successful installation experience on projects with pipe, duct, and equipment insulation similar to that required under this section.

B. Jackets and Covers

a) Childers and Covers
b) Armstrong

1.05 SUBMITTALS

A. Furnish a schedule and listing of each type of insulation, thickness, density, type of jackets, etc., and the work and service to which each type of insulation is to be applied.

B. Submittals shall conform to the requirements as stated in Section 15100 Mechanical Materials & Methods.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation against dirt, water, chemical, and mechanical damage. No damaged insulation will be accepted.

B. 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.

C. Store insulation in original wrappings and protect from weather and construction traffic.

PART 2 - PRODUCTS

2.01 GENERAL

A. All material and equipment shall be new; and shall conform to the grade, quality, and standards specified here-in. Equipment or materials of the same type shall be the product of the same manufacturer throughout.

2.02 FIRE RESISTANCE

A. Materials used as part of the thermal insulation shall have a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed.

B. Factory assembled materials shall be tested as assemblies. Materials that are field applied may be tested individually. Fugitive or corrosive materials used to impart flame resistance are not acceptable nor are treatments subject to deterioration due to the effect of moisture or high humidity.

C. Determine ratings by the standard method of test for surface burning characteristics of building materials, ASTM E-84, or NFPA #255.

D. Requirements to establish that fire hazard ratings for materials proposed for use do not exceed those specified shall conform to:
1. Label or listing by Underwriter Laboratories, Inc.
2. Certified test report from an approved testing laboratory.

E. Materials exempt from the foregoing Fire Resistant Rating are:
   1. Jackets or canvas, PVC, and nylon.
   2. Polyurethane, polystyrene, cork, and flexible closed cellular insulation.
   3. Nylon anchors for securing insulation to ducts and equipment.
   4. Treated wood inserts used between shields and piping at hangers on low temperature piping.
   5. Factory premolded one-piece PVC fitting and valve covers.

2.03 INSULATION FOR PIPING

A. Piping systems described shall be insulated as follows; including flanges, fittings, valves, and expansion joints. All piping subject to freezing such as in outdoor air, discharge plenums, or outdoors shall be insulated with a minimum of 2 inch insulation.

PIPING SYSTEM	THICKNESS
Cold Water	1/2”
Hot Water supply and return	1”
Drains from A.C. Units, cooling coil pans, and miscellaneous piping subject to condensation.	1”
Horizontal storm water piping and vertical leaders including roof drain bodies	1/2”
Refrigeration Suction Piping	3/4”

B. Type P-1 Glass Fiber for Hot and Cold Pipes

   1. Insulation shall be composed of fiberglass, jacketed with a white kraft paper outer surface bonded to aluminum foil and reinforced with fiberglass yarn. The thermal conductivity (k) is not to exceed 0.24 BTU-in/sq. ft./degree F/hr. at 75 degrees F (O.C. 25 ASJ, J-M Flame-safe AP or approved equal).

   2. Fiberglass density shall be 6 lbs./cu. ft. in equipment rooms and where pipes are exposed and 4 lbs./cu. ft. density where pipes are concealed.

   3. For cold pipes, ends of insulation shall be sealed off with vapor barrier coating (BF 30-35) at flanges, valves, and fittings and at intervals of not more than 21 feet on continuous runs of pipe.

   4. Fittings and valves shall be insulated with factory-premolded insulation fittings, mitered segments of 6 psf density fiberglass pipe covering, or fiberglass blanket

insulation compressed a minimum of 2 to 1. Fitting insulation thickness shall be the same as the adjoining pipe insulation. The ends of the cover must be vapor sealed on cold piping.

5. Insulation for removable flanges shall be fabricated with sectional pipe insulation extending a minimum of 1 inch beyond the end of the bolts. Finish shall be the same as that specified in paragraph (5).

6. Concealed piping shall be banded in place with three (3) aluminum bands per section, one over each end of the joint sealing strip and one in the middle of the section. Where self-sealing laps are used, bands are not required.

C. Insulation shall be vermin resistant.
   1. Pipe Insulation: Shall be equal to Owens Corning Fiberglass 25 ASJ, Johns-Manville type ASJ, CSG type ASJ, or approved substitute.

2.04 INSULATION FOR SHEETMETAL

A. Insulate sheet metal as follows:
   1. Air conditioning system supply and return air ducts where concealed 1 1/2 inch type D-1.

   2. Air conditioning system supply and return air ducts where exposed 1 inch type D-2.

   3. All ductwork serving “Patient Treatment Area” and “Water Treatment & Storage Areas” to have no duct liner or interior insulation. No exposed fiberglass insulation or liner in total system.

B. Type D-1 Duct Insulation with Vapor Barrier
   1. Flexible duct insulation shall be 1 lb. per cu. ft. density glass fiber with a laminated kraft paper and aluminum foil reinforced with fiberglass yarn. Maximum K factor of 0.27 at 75 degrees F mean temperature.

   2. Insulation shall be strip adhered to the duct on sides and top and completely adhered on the bottom with duct adhesive (B. F. 85-20). Joints shall be butted with facing overlapping all joints at least 2 inches and sealed with vapor barrier adhesive. Seal all breaks and punctures with vapor barrier tape and adhesive. For ducts over 24 inches in width, the insulation shall be additionally secured to the bottom of the ducts with mechanical fasteners spaced on 18 inch centers, maximum. Seal penetrations of facing with vapor barrier tape. Fasten insulation with 16 gauge copper clad wire or fiberglass cord on 12 inch centers.

   3. Insulation shall be Owens Corning Fiberglass type ED-10C or approved equal.

C. Type D-2 Rigid Duct Insulation with Vapor Barrier

   1. Rigid duct insulation shall be 6 lbs. per cu. ft. density glass fiber with maximum K factor of .22 at 75 degrees F. mean temperature. (Owens Corning Fiberglass Type

705 with ASJ facing or approved.)

2. Insulation shall be impaled over welded pins applied to duct surface on 12 inch centers. Use a minimum of two rows of fasteners on each side of duct. Secure insulation with suitable speed washers or clips firmly imbedded into insulation.

3. All joints, edges, speed washers, and breaks in the vapor barrier shall be sealed with 3 inch wide strips of the vapor barrier facing adhered with vapor barrier adhesive.

4. Provide type D-2 for exterior duct with weather-tight, vermin resistant jacket.

2.05 ALUMINUM ACCESS COVERS

A. Sections of equipment requiring periodic servicing such as removable heads, pumps, etc., shall be insulated with aluminum covers lined with the same material and thickness as the adjoining insulation.

2.06 ALUMINUM DIFFUSERS, RETURN AND EXHAUST AIR GRILLES

B. Insulation shall be adhered to completely covering all surface area of diffuser and grill. Fasten insulation, overlapping all joints and seal with vapor barrier adhesive.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. All work shall be performed by workmen skilled in the trade required for the work. All materials and equipment shall be installed in accordance with the approved recommendations of the manufacturer and the best practices of the trade and in conformance with the Contract Document. The Contractor shall promptly notify the Engineer in writing of any conflict between any requirements of the Contract Documents and manufacturer's directions and shall obtain written instructions from the Engineer before proceeding with the work. Should the Contractor perform any work that does not comply with the manufacturer's directions or such written instructions from the Engineer, he shall bear all costs arising in correcting such deficiencies.

3.02 GENERAL

A. Install all insulation systems subsequent to testing and acceptance of tests.

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

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

D. Maintain integrity of vapor barrier jackets on insulation and protect to prevent puncture or other damage.

E. Extend insulation without interruption through walls, floors, and similar piping penetrations.

F. Install protective metal shield and insulated inserts wherever needed to prevent compression of insulation.

G. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

H. Protect all insulation requiring protection during the construction period to avoid damage and deterioration.

I. All materials shall be applied per manufacturer's recommendations.

3.03 INSTALLATION FOR PIPING

A. The insulation shall be secured with copper clad wire and covered with a coat of insulating cement. After the cement is dried, a 1/16" coat of vapor barrier mastic (BF30-35) (BF30-36 for hot piping) is to be applied into which is imbedded a 10 x 10 weave white glass reinforcing cloth. the cloth is to overlap itself at least 1" and the adjoining pipe insulation by 2". Apply a final 1/16" coat of vapor barrier mastic and smooth the surface. In lieu of the field applied finish, factory-premolded PVC fitting covers may be used over the insulation.

B. Jackets shall be neatly fitted around supports, anchors, etc., and drawn smooth and tight.

C. All joints and seams shall lap at least 1 1/2" using either a joint tape of the same material as the jacket or an extension of the jacket itself, either of which is secured by a pressure sensitive cement or bonding adhesive.

D. Exposed work shall be banded at least every 18" or an extension of the jacket itself, either of which is secured by a pressure sensitive cement or bonding adhesive.

E. Vapor barrier must be a complete moisture and vapor seal including all joints. The barrier must be free of any breaks or punctures. Where penetrations and openings exist, such as hangers, the barrier must be carried down to the metal around the protrusion or opening in either case, insulation must be completely shielded from the atmosphere by the vapor barrier.

F. Fittings and valves shall be covered with a blanket type glass fiber which shall be enclosed by fabricated fittings and valve jackets which overlap the adjoining pipe covering. All pressure sensitive vinyl tape which shall overlap all joints and breaks in the jacket by at least 1 1/2".

Where the pipes are operating below ambient, this entire portion of the insulation shall receive a vapor barrier coating. Insulation, coatings, and jackets shall be continuous through wall and floor openings.

G. Fittings operating above ambient may in lieu of the preceding paragraph, be covered with a three-hour hydraulic setting combination insulating and finished cement having a "k" factor not greater than 0.87 at a mean temperature of 200^{O} F. The thickness of the cement shall be such that the surface is substantially flush with the pipe covering. Where the insulation terminates at a fitting that is not covered, the end of the insulation shall be beveled off with this same cement. All fittings insulated in this manner shall be covered by a fabric jacket as specified and cemented down with lagging adhesive as specified.

H. Expansion joints which are to be insulated shall be covered with readily removable sections of insulation of the same thickness as provided for adjacent piping. The removable insulation shall be provided with a jacket of .016" thickness galvanized steel which shall be installed in a manner to permit removal and reinstallation of the section without damage and which shall be suitable for the service.

3.04 INSTALLATION FOR DUCTS

A. Insulation sections are to be butted together and the joints wrapped with 3 inch wide butt strips securely sealed in place. The longitudinal joints shall be completely sealed with an approved adhesive. In lieu of field applied adhesives, insulation with self-sealing laps and butt strips way be used.

B. Vapor barrier must be a complete moisture and vapor seal including all joints. The barrier must be free of any breaks or punctures. where penetrations and openings exist, such as at hangers, protruding shafts and access panels, the barriers must be carried down to the metal around the protrusion or openings or extend along the protrusion and sealed thoroughly. In either case, the insulation must be completely shielded from the atmosphere by the vapor barrier.

C. Insulation boards shall be installed by impaling them on metal pins which are either anchored to the duct by a waterproof cement specifically made for attachment to metal and in successful use for at least five years and guaranteed to hold at temperatures up to 200^{O} F or are welded to the metal so as not to distort or burn through the metal. In either case, the pins shall be placed approximately 3" from each corner of the insulation and so spaced that no portion of the insulation, 20" x 20" sq., will be without a pin. Each pin shall be able to support a load of 20 pounds. The insulation shall be held on the pins by metal fasteners and the excess pin clipped off.

D. The edges around access doors and nameplates and the corners of ducts and casings in exposed places must be protected with continuous corner beads and installed flush with the finished surface.

E. Insulation, when applied, shall allow adequate length for wrapping so that stretch out distance is adequate and thickness integrity of insulation is maintained as previously

specified.

F. Outdoor insulation shall be weatherproof type (aluminum jacket), minimum .016" thickness, moisture barrier adhered to inside face, secured to insulation with stainless steel or aluminum bands, and sealed joints.

END OF SECTION