

SPECIAL SPECIFICATION

SECTION 15250S

PIPE AND EQUIPMENT INSULATION AND ACCESSORIES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. This Section includes preformed, rigid and flexible pipe insulation; field-applied jackets; accessories and attachments; and sealing compounds for above ground, interior and exterior mechanical piping systems as listed in Part 3 application schedules. This section also includes mechanical equipment insulation requirements and heat trace system.
- B. Insulation shall be applied in a neat and workmanlike manner. Contractor shall be required to remove and replace all insulation not applied in strict accordance with manufacturer's specifications or not presenting a neat appearance.
- C. Insulation shall be applied to clean dry surfaces. Piping and equipment shall be tested before insulation is applied or joints shall be left uncovered until tests have been performed.
- D. All insulation on indoor work shall have composite (insulation, jacket or facing and adhesive used to adhere jacket or facing to the insulation) fire and smoke Hazard Ratings, as tested by procedure ASTM E-84, NFPA 255 and UL 73 not exceeding Flame Spread of 25, Fuel Contributed of 50 and Smoke Development of 50 Accessories, such as adhesives, mastics, cements tapes and cloths for fittings shall have component rating as listed above.
- E. Insulation shall be continuous through wall and ceiling openings and sleeves.
- F. Specified mastics, adhesives and coatings shall be applied in strict accordance with manufacturer's instructions, including recommended coverages.
- G. All domestic cold water and non-potable water concealed above ceilings or within 24 inches of an outside wall or concealed in partitions, in basement areas, or penthouses shall be insulated.
- H. Materials and operations required for the installation of insulation for domestic cold, non-potable cold water, and hot water, hot water circulating, hot water heating, chilled water, cold condensate, roof drain, dual temperature, and refrigerant piping; converters and hot water storage tanks, underground chilled water and hot water shall be provided.

1.02 REFERENCES

A. American Society of Testing and Materials (ASTM)

- B 209 Aluminum and Aluminum-Alloy Sheet and Plate
- C 533 Calcium Silicate Block and Pipe Thermal Insulation
- C 534 Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tube Form
- C 547 Mineral Fiber Pipe Insulation
- C 553 Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
- C 612 Mineral Fiber Block and Board Thermal Insulation
- C 795 Thermal Insulation for Use in Contact with Austenitic Stainless Steel
- E 84 Standard Test Method for Surface Burning Characteristics of Building Materials

B. American National Standards

- A 117.1 Accessible and Usable Buildings and Facilities

C. Military Specification

- MIL-C-19565C Coating Compounds, Thermal Insulation, Fire- and Water-Resistant, Vapor-Barrier

1.03 SUBMITTALS

- A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), and heat trace for each type of product indicated. Provide manufactures installation requirements for each type of heat trace, insulation, and piping. Show compliance with necessary industry standards and listing agencies. Provide heat trace plan layout, panel control and wiring diagrams, panel electrical loads.

1.04 QUALITY ASSURANCE

- A. All insulating materials required for piping shall be furnished and installed under this contract. The execution of the work shall be in strict accordance with the best practices of the trade, the manufacture's requirements, and the intent of this specification.
- B. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
 2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.
- C. Mockups: Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups according to the following requirements for interior and exterior applications, using materials indicated for the completed Work:
1. Include the following mockups:
 - a. One 10-foot section of 2 inch NPS straight pipe.
 - b. One 90-degree elbow.
 - c. One tee fitting.
 - d. One 2 inch valve.
 - e. Four support hangers, including hanger shields and insert.
 - f. One strainer with removable portion of insulation.
 - g. One reducer.
 - h. Heat trace for above listed.
 2. Build mockups in the location indicated by SDR.
 3. Obtain SDR approval of mockups before starting insulation application.
 4. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 5. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Inspection: Perform the following field quality-control inspections, after installing insulation materials, jackets, and finishes, to determine compliance with requirements:
1. Inspect fittings and valves randomly selected by SDR.
 2. Remove fitting covers from 20 elbows or 1 percent of elbows, whichever is less, for various pipe sizes.

3. Remove fitting covers from 20 valves or 1 percent of valves, whichever is less, for various pipe sizes.
- E. Insulation applications will be considered defective if sample inspection reveals noncompliance with requirements. Remove defective Work and replace with new materials according to these Specifications.
- F. Reinstall insulation and covers on fittings and valves uncovered for inspection according to these Specifications.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Insulation materials shall be new and undamaged with the manufacture's name and brand marking clearly displayed on all containers.
- B. Insulation materials shall be kept dry and protected from the weather at all times until installation is complete. Insulation material found to be wet or damaged shall be replaced by the contractor at no cost to the owner.

1.06 COORDINATION

- A. Coordinate with other trades so as to cause no delays in applying insulation; be aware of testing, painting, hanger installation and heat tracing requirements. Coordinate clearance requirements with piping Installer for insulation application.
- B. Protect work of other Contractors and SNL from dirt and debris caused by the insulation work. Remove rubbish daily and at the conclusion of work.
- C. Do not insulate over nameplates or sight /light glasses.
- D. Coordinate with pump layout to insure pressure switches and gauges are extended outside of pump insulation boxes.

1.07 ACCEPTABLE MANUFACTURERS

- A. Insulation:
 1. Armacell
 2. Certainteed Corporation
 3. Knauf Fiber Glass
 4. Johns Manville Corporation
 5. Owens-Coming Fiberglas Corporation

6. Pittsburgh Corning
 7. Rubatex
- B. Jackets:
1. Childres.
 2. Johns Manville Corporation
 3. RPR Metals
 4. Polyguard Products
 5. Proto PVC Corporation

PART 2 – PRODUCTS

2.01 INSULATION MATERIALS

- A. Mineral-Fiber Insulation: Glass fibers bonded with a thermosetting resin complying with the following:
1. Preformed Pipe Insulation: Comply with ASTM C 547, Type I-Molded, for use to -60 TO 605°F , with factory-applied, all-purpose, vapor-retarder jacket (ASJ), with self-sealing adhesive lap (SSL). Minimum nominal 5 lbs./cu.ft. density, maximum "K" of 0.22 (BTU-in./hr.-sq.ft.-deg. F) at 75 deg. F thermal conductivity compressive strength 125 lb/sq. ft.
 2. Blanket Insulation: Comply with ASTM C 553, Type II, without facing.
 3. Pipe and Tank Insulation: Semi-rigid fiberglass board in a roll form faced with factory applied vapor retarder jacket (ASJ). Comply with ASTM C 795, Type II, for use to 650 deg. F. Conductivity, 0.22 (BTU-in./hr.-sq.ft.-deg. F) at 75 deg. F.
 4. Mineral-Fiber Board Thermal Insulation: Comply with ASTM C 612, Type IB, for use to 450 deg. F, with a factory applied jacket manufactured from foil, reinforcing scrim, and kraft paper (FSK). Minimum density of 5 lb./cu.ft. Conductivity of 0.22 (BTU-in./hr.-sq.ft.-deg. F) at 300 deg. F.
 5. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.
- B. Flexible Elastomeric Thermal Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
1. Adhesive: As recommended by insulation material manufacturer.

2. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.
- C. Calcium Silicate Insulation: Preformed pipe sections of non-combustible, inorganic, hydrous calcium silicate with a non-asbestos fibrous reinforcement. Comply with ASTM C 533, Type I.
- D. Standard PVC Fitting Covers: Factory-fabricated fitting cover system consisting of one-piece, pre-molded, PVC covers with fiberglass inserts manufactured from 20-mils thick, high-impact, ultraviolet-resistant PVC.
 1. Shapes: 45- and 90-degree, short- and long-radius elbows, reducers, end caps, soil-pipe hubs, traps, mechanical joints, roof drains, and P-trap and supply covers for lavatories for the disabled.
 2. Adhesive: As recommended by insulation material manufacturer.

2.02 FIELD-APPLIED JACKETS

- A. Aluminum Jacket: Aluminum roll stock, ready for shop or field cutting and forming to indicated sizes, or factor cut and rolled. Comply with ASTM B 209, 3003 alloy, H-14 temper.
 1. Finish and Thickness: Stucco-embossed finish, 0.016 inch thick.
 2. Moisture Barrier: 1-mil thick, heat-bonded polyethylene and kraft paper.
 3. Elbows: Preformed, 45- and 90-degree, short- and long-radius elbows; same material, finish, and thickness as jacket.
 4. Piping which is exposed to weather or called to be electric heated/weatherproofed shall be covered – in addition to insulation and finishes specified for freezing – with corrugated aluminum jacket 0.016 inch thick applied with aluminum lock-type bands, 12-inches apart. Fittings, flanges, strainers and valves shall be coated with BF 65-07.
- B. PVC Jacket: White, 25/50 rated per ASTM E 84, UV resistant, minimum thickness 0.020” for insulation O.D. up to 18” and 0.030” for insulation O.D. above 18”
 1. Fittings – See 2.01D “Standard PVC Fitting Covers”

2.03 ACCESSORIES AND ATTACHMENTS

- A. Bands: Aluminum; 0.007 inch thick 3/4 inch wide.
- B. Bands: Stainless Steel, ASTM A666, Type 304, 0.020 inch thick.

- C. **Manufactured Thermal Hanger Shields:** Thermal inserts shall be 360 degree calcium silicate extending 1 inch past the metal shield and with all service jacket. Sized to fit the pipe diameter and match the outside diameter of the adjoining pipe insulation. Metal shield shall be galvanized steel 180 degree for clevises and roller type hangers and 360 degree for clamp type hangers and supports. Shield and insert length and gauge shall be manufactures standard for the intended application.

2.04 PREINSULATED PIPE

A. Underground Chilled Water and Hot Water:

1. The insulation shall be rigid closed cell urethane foam with a “K” factor of less than 0.15 at 75°F mean pipe temperature and shall be self extinguishing as manufactured by Insta-Foam Products, Inc., or by the Triangle Conduit and Cable Company.
 - a. The urethane foam shall be foamed in place in the factory between the pipe and outer jacket causing the foam to bond securely to both surfaces.
2. There shall be no seams or voids throughout.
3. Thickness shall be 1” and shall be uniform within $\pm 1/8$ ” throughout.
4. The waterproof jacket shall be extruded from Hi-impact rigid vinyl (PVC) type II.
5. All joining of fittings to pipe shall be accordance with the manufacturer’s standard underground installation instructions and as indicated on drawings.

2.05 HEAT TRACING: The self-regulating heater shall consist of two (2) 16 AWG nickel coated-copper bus wires embedded in parallel in a self-regulating polymer core that varies its power output to respond to temperature all along its length, allowing the heater to be crossed over itself without overheating to be used directly on plastic pipe, and to be cut to length in the field. The heater shall be covered by a radiation cross-linked modified polyolefin dielectric jacket.

2.06 In order to provide energy conservation and to prevent heat trace overheating, the heater shall have a self-regulating factor of at least 90 percent. The self-regulation factor is defined as the percentage reduction, without thermostatic control, of the heater output going from 40 degrees F pipe temperature operation to 150 degrees F pipe temperature operation.

- A. The heater shall operate on line voltage of 120 volts without the use of transformers.
- B. The heater shall be sized according to this table. The required heater output rating is in watts per foot at 50 degrees F. (Heater selection based on 1” fiberglass insulation on metal piping).

<u>Pipe Size</u>	<u>Watts Per Lin. Ft</u>
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3 inches or less	3 watts
4 inches	5 watts
6 inches	8 watts
8 inches	2 strips @ 5 watts each
10 inches to 14 inches	2 strips @ 8 watts each

- C. Power connection, end seal, splice and tee kit components shall be applied in the field.
- D. The system shall be controlled by a bulb-sensing DPST thermostat(s) set at 40 degrees F either directly or through an appropriate contactor.
- E. Ground fault circuit breakers shall be provided as required by section 427-22 of the NEC.
- F. Each electrical heat tracing circuit shall be independently monitored for:
 - 1. Heater continuity.
 - 2. Heater voltage (85-300VAC).
 - 3. Heater current (50ma-30A).
- G. Each required monitoring panel shall have the capacity for forty-eight (48) heater circuits. Initially, the monitoring panel shall have seven (7) 4-circuit sensing cards installed and additional cards provided for the complete installed system.
- H. The monitoring system shall be microprocessor based and shall continuously scan all circuits. Nelson Heat Tracing Systems CM-1 or equal.
- I. The monitoring system shall be useable with any heater type (series or parallel) and for any manufacturer's heater cable.
- J. The monitoring system shall have the following alarm features:
 - 1. Loss of busswire continuity.
 - 2. Loss of circuit voltage.
 - 3. Low heater current.
 - 4. Alarm Silence.
 - 5. Programmable alarm delay.
 - 6. Programmable scan speed.
 - 7. Programmable circuits to be scanned.

8. Auto fault reset.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Surface Preparation: Clean and dry pipe and fitting surfaces. Remove materials that will adversely affect insulation application.

3.02 GENERAL APPLICATION REQUIREMENTS

- A. Apply insulation to piping systems using materials, thickness and jackets listed in the schedule at the end of this section.
- B. Piping exposed to the weather: Heat trace any piping subject to freezing. Any piping with heat tracing shall have the insulation thickness increased by an additional 2-inches mineral insulation of the same finish as specified for the particular service when not subject to freezing.
 1. Polymer piping exposed to weather shall be insulated with 1" molded fiberglass and aluminum jacket and heat traced. The heater shall be sized to maintain 50°F for the pipe. The thermocouple sensing shall cut off the power supply to heaters at 70°F. For chemical piping to scrubbers heater shall be sized to maintain 65°F. The power supply for heat tracing of chemical shall be cut off at 85°F.
- C. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
 1. In steam, hot water, domestic and non-potable service only: Flexible connectors, unions, pressure reducing valves, balancing valves, flow control valves, steam traps, and in sizes less than 1-1/2", valves and strainers.
 2. Fire-suppression piping.
- D. Handicap Lavatories: Cover all exposed lavatory supply and waste fittings with insulation and removable PVC covers to comply with ANSI Std. A117.1 requirements.
- E. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties. Apply insulation with the least number of joints practical.
- F. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.

- G. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and floors unless not allowed by fire stop system. Firestopping and fire-restive joint sealers are specified in Division 7 Section “Firestopping and Smoke Systems”
- H. Hangers and Anchors: Provide factory or field fabricated rigid insulation inserts with metal shields at all hangers of horizontal piping and anchors of vertical piping. Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic.

3.03 MINERAL-FIBER INSULATION APPLICATION

- A. Apply insulation to straight pipes and tubes as follows: Use preformed pipe insulation when able. Use pipe and tank insulation for larger diameter piping where preformed insulation is not available. To meet required thickness, apply multiple layers of insulation with longitudinal and end seams staggered.
 - 1. Keep SSL adhesive and contact surfaces clean and free of dirt and moisture. Seal immediately once adhesive is exposed. Seal circumferential joints with a minimum 3 inch wide tape and secure with two outward clinching staples at the overlap. Rub the longitudinal joints firmly with a squeegee and secure with 2 outward clinching staples evenly spaced in each 3 foot section of insulation.
 - 2. Where vapor retarders are indicated; Seal staples and any penetrations in the insulation with vapor-retarder mastic. Ends of pipe insulation shall be sealed off at valves, fittings and flanges, and at 21 feet intervals on continuous runs, with Benjamin Foster 30-35 adhesive. No staples.
 - 3. Taper the ends of insulation at terminations. Seal all raw edges of insulation with mastic.
- B. Fittings, Valves and Flanges:
 - 1. Where manufactured, by Speedline or Hamfab, factory molded fittings (of the same material and thickness as the pipe insulation) shall be used for all fittings, flanges and valves.
 - 2. Where pre-molded insulation fittings are not manufactured, all fittings, flanges and valves (for service below 603°F) shall be insulated with mitered segments of nominal 6 lb. density fiberglass pipe covering. Hot service finish - concealed and exposed - embed a 20 x 20 weave white glass reinforcing cloth between two 1/16 inch coats of Benjamin Foster 30-36. The glass cloth and second coat shall overlap adjacent covering by at least two inches. Cold Service Finish - concealed and exposed same as above except use Benjamin Foster 30-35.
 - 3. Insulation for removable flanges of pipe strainers on cold services shall be fabricated with built-up sections of fiberglass pipe covering, so arranged as to

facilitate servicing of the strainer. Applications shall be complete with vaporseals. It is the intent of these Specifications that all vapor barriers be sealed and continue to hangers, walls, sleeves, etc. All adhesives and coatings shall be as noted herein.

C. Apply insulation to fittings and elbows and mechanical grooved couplings as follows:

1. Apply mitered sections of pipe insulation, or glass-fiber blanket insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.
2. Cover fittings with standard PVC fitting covers. Secure the fitting covers by wrapping the ends with minimum 1-1/2" wide PVC tape. Overlap a minimum of 2" and do not stretch the last 2" of tape. Secure the throat with a stainless steel tack.
3. On systems requiring a vapor barrier, seal the throat with vapor barrier mastic (the PVC fitting cover is to act as the vapor barrier).

D. Protection of Insulation:

1. Insulation on cold and hot pipes shall be protected by saddles from hangers, guides and rollers.

Installing 360° rigid insulation inserts and 360° sheet metal sleeve as manufactured by Pipe Shields, model CSCW for cold pipes and model CSHW for hot pipes.

Alternate installing 16 gauge galvanized metal shields (at least 3 times the insulation diameter in length and 1/3 the insulation circumference in width), on the outside of the insulation. Where fiberglass insulation is used on piping 360° section of Kaylo pipe insulation of equal thickness shall be used.

2. Exposed piping at an elevation 8 feet or less above the floor, shall be protected with corrugated aluminum jacket 0.016 inch thick applied with aluminum lock-type bands, 12 inches apart.

3.04 FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION

A. Follow manufacturer's written instructions for applying insulation to straight pipes, tubes, and fittings.

1. Seal longitudinal seams and end joints with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

3.05

CALCIUM SILICATE INSULATION APPLICATION

- A. Apply insulation to straight pipes and tubes as follows:
1. Secure each layer of insulation to pipe with stainless-steel bands at 12-inch intervals and tighten without deforming insulation materials.
 2. Apply two-layer insulation with joints tightly butted and staggered at least 3 inches. Secure inner layer with 0.062-inch soft-annealed, stainless-steel wire spaced at 12-inch intervals. Secure outer layer with stainless-steel bands at 12-inch intervals.
 3. Apply an aluminum jacket to cover all insulation. See section on jacketing.
 4. Fittings, flanges, valves, etc., for services where Kaylo insulation is specified as a pipe insulation, shall be insulated with insulating cement of equal thickness to the pipe insulation and finished with open weave glass mesh sealed with BF 30-36 on pipes below 4" IPS. Pipes 4" IPS and above, use Kaylo mitered segments wired in place with copper clad wire. Finish with 1/8" coat of insulating cements, 10 x 10 glass weave reinforcing fabric embedded between two 1/4" coats of BF 30-36.

3.06 3.06 FIELD-APPLIED JACKET APPLICATION

- A. Interior: Apply either aluminum or PVC jacketing to exposed insulated pipe, valves, fittings, and specialties, at an elevation of 8 feet or less above finished floor in mechanical/electrical rooms, penthouses, and services aisles/pipe chases. Fittings of aluminum jacketed piping may be either aluminum or standard PVC fitting covers. Jacketing for piping in existing areas shall match existing jacketing.
- B. Exterior: Apply aluminum jacketing to all external piping that is insulated. Cover all fittings, valves, and specialties with aluminum jacketing.
- C. Apply metal jacket where indicated, with 2-inch overlap at longitudinal seams and end joints. Secure jacket with aluminum bands or sheet metal screws on 12 inches centers and at end joints. On piping exposed to the weather, overlap longitudinal seams arranged to shed water and seal end joints with weatherproof mastic.
- D. Apply PVC jacketing where indicated, with 2-inch overlap at longitudinal seams and at fitting covers, the maximum the cover allows. Seal longitudinal seams by joining with PVC welding solvent. Seal circumferential ends with 1/1/2" PVC tape.

3.07 INSTALLATION HEAT TRACE

- A. Install thermostat sensing bulb on opposite side of pipe from electric heating cable to ensure pipe heat sensing control.

- B. Install tape patterns per the manufacturer's recommendations.
- C. Set thermostatic controls for 40 degrees F operation.

3.08 EQUIPMENT

List of Materials

- A. Expansion Tanks (Chilled Water and Hot Water) Shall be 1-1/2" thick fiberglass industrial board. Type 705 6 lb. density and finished with 0.016 aluminum or Alpha TGH 1000 jacketing.
- B. Hot Water Converters, Condensate Receivers, Flash Tanks, Separators and Blow-Off Tanks:

Shall be 1-1/2" thick fiberglass, 705 6 lb. density. Finish with .016 aluminum or Alpha TGU 1000 jacketing.
- C. Chilled Water Cooler:

Shall be 2" thick fiberglass industrial board, Type 705, faced with foil reinforced kraft (FRK), 6 lb. density finished with 0.016 aluminum or Alpha TGH 1000 jacketing.
- D. Pumps (Chilled Water and Hot Water):

Shall be 2" thick, 6 lb. density fiberglass rigid board, Type 705, applied to sheet metal boxes as described herein below.
- E. Boiler Flue:

Double- or triple-wall metal flue, both horizontal and vertical, from boilers shall be insulated with 1"-thick high-temperature mineral wool. Flues shall be insulated on all indoor portions and to a height of at least 7 feet above roofs, and on any areas where human contact may occur. Provide aluminum jacket on outdoors insulated areas only.
- F. Emergency Electric Generator:

Emergency Electric Generator Engine Exhaust. Engine exhaust piping, fittings, and silencer shall be insulated with 4" thick hydrous calcium silicate pipe insulation and block finish same as for Boiler Flue.
- G. Ducts in Trenches:

Rectangular ducts shall be insulated with 1" thick fiberglass industrial board, Type 705, 6 lb. density, finished with 0.016 aluminum or Alpha TGH 1000 jacketing.

"Pipe Wrap" with ASJ jacketing shall be acceptable for the above A through D sections. The 705 board shall be applied by mechanical fasteners such as stick clips. Joints shall be sealed with an adhesive, as approved and reinforced with a

glass of cloth membrane. All pinheads shall be buttered with an adhesive, as approved.

Removable heads for all equipment (such as coolers and interchangers) and the horizontally split pumps, shall be enclosed in aluminum sheet metal boxes for easy removal with 6 lb. density fiberglass rigid board applied to inside of sheet metal boxes of thickness as described above.

H. Roof Drains:

1. Wrap roof drain sump with 1-1/2" thick fiberglass blanket and cover with a premolded PVC cover.

3.09 FINISHES

- A. Paint insulation finished with all service jacket as specified in Division 9 Section "Painting."
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of the insulation manufacturer's recommended protective coating.

TABLE 1

Insulation Schedule

Piping System <i>(See Note 2)</i>	Operating Temp. ° F	Pipe Size 1" & Below	Pipe Size 1-1/2" to 2"	Pipe Size 2-1/2" to 4"	Pipe Size Above 4"	Material	Vapor Barrier
Heating Water	120 to 200	1" indoors 1-1/2" outdoors	1" indoors 2" outdoors	1-1/2" indoors 2" outdoors	1-1/2" indoors 2" outdoors	M.F.	No
Chilled Water	Up to 58	1" indoors 1-1/2" outdoors	1" indoors 1-1/2" outdoors	1" indoors 2" outdoors	1" indoors 2" outdoors	M.F.	Yes
Process Cooling Water	Up to 65	1"	1"	1"	1"	M.F.	Yes
Process Cooling Water	66 to 110	N.R.	N.R.	N.R.	N.R.	None	Yes
Condensate Drains	35 to 70	1"	1"	1"	1"	M.F.	Yes
Domestic Cold & Non Potable Water <i>(See Note 1)</i>	55 to 65	1"	1"	1"	1"	M.F.	Yes
Domestic Hot & Recir. Water	100 150	1'	1"	1-1/2'	1-1/2'	M.F.	No
Roof Drains	32 to 65	1'	1'	1"	1'	M.F.	Yes
Engine Exhaust	100+	1"	1"	1"	1"	C.S.	No
Boiler stacks (double-wall systems)	300+	--	--	--	1"	Hi-temp M.F.	No

Note 1. Insulation of domestic cold and non-potable water is only required in exterior walls, in ceiling spaces below roofs, and in areas subject to freezing.