

This specification is offered as a guide to specifiers and should be employed at the discretion of the user. The ultimate design and installation are the responsibility of the engineer or architect.

## PART 1.00 - GENERAL

### 1.01 SCOPE

- A. The work covered by this specification consists of furnishing all labor, equipment, materials and accessories, and performing all operations required, for the correct fabrication and installation of thermal insulation applied to the following commercial piping systems, in accordance with applicable project specifications and drawings, subject to the terms and conditions of the contract:
1. Chilled water systems from 32F (0C) to 65F (18C)
  2. Heating systems (steam, steam condensate, hot water), ambient up to 450F (232C)
  3. Domestic and service hot water systems, ambient up to 180F (82C)

**Note to Specifiers:** The above temperature ranges are typical for these systems. However, if contract specifications call for service temperatures outside the above ranges, consult the manufacturer's published data to determine operating temperature limitations of the insulation product or products under consideration.

### 1.02 REFERENCES

- A. Thermal insulation materials shall meet the property requirements of one or more of the following specifications as applicable to the specific product or end use:
1. American Society for Testing of Materials Specifications:
    - a. ASTM C 547, "Standard Specification for Mineral Fiber Pipe Insulation"
    - b. ASTM C 585, "Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System)"
    - c. ASTM C 1136, "Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation"

### 1.03 DEFINITIONS

- A. The term "mineral fiber" as defined by the above specifications includes fibers manufactured of glass, rock, or slag processed from a molten state, with or without binder.

### 1.04 SYSTEM PERFORMANCE

- A. Insulation materials furnished should meet the minimum thickness requirements of National Voluntary Consensus Standard 90.1 "Energy Efficient Design of New Buildings," of the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE). However, if other factors such as condensation control or personnel protection are to be considered, the selection of the thickness of insulation should satisfy the controlling factor.
- B. Insulation materials furnished and installed hereunder shall meet the fire hazard requirements of applicable building codes when tested in composite form per one of the following nominally equivalent test methods:

- |  |                          |
|--|--------------------------|
| 1. American Society for Testing of Materials | ASTM E 84                |
| 2. Underwriters' Laboratories, Inc.          | UL 723, CAN/ULC-S102-M88 |
| 3. National Fire Protection Association      | NFPA 255                 |

#### 1.05 QUALITY ASSURANCE

- A. Insulation materials and accessories furnished and installed hereunder shall, where required, be accompanied by manufacturers' current submittal or data sheets showing compliance with applicable specifications listed in Section 1.02 above.
- B. Insulation materials, including all weather and vapor barrier materials, closures, hangers, supports, fitting covers, and other accessories, shall be furnished and installed in strict accordance with project drawings, plans, and specifications.
- C. Insulation materials and accessories shall be installed in a workmanlike manner by skilled and experienced workers who are regularly engaged in commercial insulation work.

#### 1.06 DELIVERY AND STORAGE OF MATERIALS

- A. All of the insulation materials and accessories covered by this specification shall be delivered to the job site and stored in a safe, dry place with appropriate labels and/or other product identification.
- B. The contractor shall use whatever means are necessary to protect the insulation materials and accessories before, during, and after installation. No insulation material shall be installed that has become damaged in any way. The contractor shall also use all means necessary to protect work and materials installed by other trades.
- C. If any insulation material has become wet because of transit or job site exposure to moisture or water, the contractor shall not install such material, and shall remove it from the job site. An exception may be allowed in cases where the contractor is able to demonstrate that wet insulation when fully dried out (either before installation or afterward following exposure to system operating temperatures) will provide installed performance that is equivalent in all respects to new, completely dry insulation. In such cases, consult the insulation manufacturer for technical assistance.

### PART 2.00 - PRODUCTS

#### 2.01 PIPE INSULATION

- A. Molded pipe insulation shall be manufactured to meet ASTM C 585 for sizes required in the particular system. It shall be of a type suitable for installation on piping systems as defined in section 1.01 SCOPE above.

Molded fibrous glass pipe insulation shall comply with the requirements of ASTM C 547. One of the following types shall be used:

- 1. For indoor systems operating at temperatures from 0°F (-18°C) to +850°F (454°C):
  - a. **Fiberglas™ Evolution™ Paper-Free ASJ Pipe Insulation**, Owens Corning Fiberglas Pipe Insulation with factory applied paper free all service jacket and SSL II adhesive closure

system, rated for a maximum service temperature of 850F (454C). Circumferential joints shall be sealed with paper free butt strips that are compatible with Evolution™ facing. Stapling is not required to complete the closure. Sufficient thickness of insulation shall be used to maintain the outer surface temperature of the operating system below +150F (65C). Manufacturer's data regarding thickness constraints in relation to operating temperature shall be followed.

When multiple layers are required, all inner layer(s) shall be No Wrap.

On cold systems, vapor barrier performance is extremely important. All penetrations of the Evolution™ and exposed ends of insulation shall be sealed with a mold resistant vapor barrier mastic. Evolution™ jacket is a suitable vapor retarding outer jacket for high humidity applications (>90%). Mastic pipe section ends at every fourth pipe section joint and at each fitting to provide isolation of water incursion.

NOTE: Alternate paper free insulation systems may include but not be limited to unfaced fiber glass pipe insulation with a field applied paper free jacket material such as PVC (polyvinyl chloride) or PVDC (polyvinylidene chloride).

- b. **Fiberglas™ SSL II® Pipe Insulation**, Owens Corning Fiberglas Pipe Insulation with factory applied all-service jacket (ASJ) and two-component adhesive closure system, rated for a maximum service temperature of 850F (454C). For large pipe sizes where SSL-II is not available, the single adhesive SSL closure may be substituted. Circumferential joints shall be sealed with butt strips that are compatible with ASJ facing. Stapling is not required to complete the closure. Sufficient thickness of insulation shall be used to maintain the outer surface temperature of the operating system below +150F (65C). Manufacturer's data regarding thickness constraints in relation to operating temperature shall be followed.

When multiple layers are required, all inner layer(s) shall be No Wrap.

On cold systems, vapor barrier performance is extremely important. All penetrations of the ASJ and exposed ends of insulation shall be sealed with vapor barrier mastic. If humidities in excess of 90% are expected, the ASJ shall be protected with either a mastic coating or a suitable vapor retarding outer jacket. Mastic pipe section ends at every fourth pipe section joint and at each fitting to provide isolation of water incursion.

2. For systems operating at temperatures to +850F (232C) and always above the ambient temperature:
  - a. **No-Wrap Pipe Insulation** rated for maximum operating temperature of 850F (454C) may be installed using appropriate banding materials and then covered with either metal or PVC jacketing or otherwise jacketed and/or finished in accordance with details shown.
3. For piping equal to or larger than 10" (250 mm) diameter operating at temperatures up to +650F (343C) and where moderate abuse resistance is required, the following may be installed:
  - a. **Owens Corning Fiberglas™ Pipe and Tank Insulation**, fiber glass insulation, maximum operating temperature of 650F (343C), end-grain factory-adhered to an ASJ all-service jacket. All joints shall be stapled then (1) sealed with mastic or (2) closed with 3" (75 mm) pressure-sensitive tape matching the ASJ jacket.
4. For piping equal to or larger than 10" (250 mm) diameter operating at temperatures up to +850F (454C) and where moderate abuse resistance is required, the following may be installed:
  - a. **Owens Corning Fiberglas™ Flexwrap® Insulation**, fiber glass insulation, maximum operating temperature of 850F (343C), factory-adhered to either a PSK (Poly-Scrim-Kraft)

or FRK (Foil-Reinforced Kraft) facing. All joints and facing penetrations shall be sealed with appropriate pressure sensitive tape or vapor retarder mastic when the application requires a vapor seal.

- B. Fittings and valves shall be insulated with pre-formed fiberglass fittings, fabricated sections of Owens Corning Fiberglas Pipe Insulation, Owens Corning Pipe and Tank Insulation, Owens Corning Fiberglas Flexwrap™ Insulation, Owens Corning TIW blanket insulation, or insulating cement. Thickness shall be equal to adjacent pipe insulation. Finish shall be with pre-formed PVC fitting covers or as otherwise specified on contract drawings.

Flanges, couplings and valve bonnets shall be covered with an oversized pipe insulation section sized to provide the same insulation thickness as on the main pipe section. An oversized insulation section shall be used to form a collar between the two insulation sections with low-density blanket insulation being used to fill gaps. Jacketing shall match that used on straight pipe sections. Rough cut ends shall be coated with suitable weather or vapor resistant mastic as dictated by the system location and service. On hot systems where fittings are to be left exposed, insulation ends should be beveled away from bolts for easy access.

On cold systems, particular care must be given to vapor sealing the fitting cover or finish to the pipe insulation vapor barrier. All valve stems shall be sealed with caulking to allow free movement of the stem but provide a seal against moisture incursion. Valve handle extensions are recommended.

- C. Piping located outdoors and exposed to the weather shall be insulated as indicated above except the thickness shall be determined according to the worst weather extremes expected. The insulation shall then be protected with one of the following weatherproof finishes as indicated on contract drawings:
1. Metal jacketing shall be 0.016" (0.4 mm) minimum aluminum or stainless steel with moisture barrier, secured in accordance with the jacket manufacturer's recommendations. Joints shall be applied so they will shed water and shall be sealed completely.
  2. UV resistant PVC jacketing may be applied in lieu of metal jacketing provided jacketing manufacturer's limitations with regard to pipe size, surface temperature, and thermal expansion and contraction are followed.
  3. Fittings shall be insulated as prescribed above, jacketed with preformed fitting covers matching outer jacketing used on straight pipe sections, with all joints weather sealed.
  4. On outdoor chilled water and refrigerant lines, the insulation system shall be completely vapor sealed before the weather-resistant jacket is applied. The outer jacket shall not compromise the vapor barrier by penetration of fasteners, etc. Vapor stops at butt joints shall be applied at every fourth pipe section joint and at each fitting to provide isolation of water incursion.
- D. All piping shall be supported in such a manner that neither the insulation nor the vapor/weather barrier is compromised by the hanger or the effects of the hanger. In all cases, hanger spacing shall be such that the circumferential joint may be made outside the hanger. On cold systems, vapor barrier shall be continuous, including material covered by the hanger saddle.
1. Piping systems 3" (75 mm) in diameter or less, insulated with Owens Corning insulation, may be supported by placing saddles of the proper length and spacing under the insulation as designated in Owens Corning Pub. 1-IN-14210.
  2. For hot or cold piping systems larger than 3" (75 mm) in diameter, operating at temperatures less than +200F (93C) and insulated with fiber glass, high density inserts such as fiberglass or foam with sufficient compressive strength shall be used to support the weight of the piping

system. At temperatures exceeding +200F (93C), high temperature pipe insulation shall be used for high density inserts.

3. Where pipe shoes and roller supports are required, insulation shall be inserted in the pipe shoe to minimize pipe heat loss. Where possible, the pipe shoe shall be sized to be flush with the outer pipe insulation diameter.
4. Thermal expansion and contraction of the piping and insulation system can generally be taken care of by utilizing double layers of insulation and staggering both longitudinal and circumferential joints. Where long runs are encountered, expansion joints may be required where single layers of insulation are being used and should be so noted on the contract drawings.
5. On vertical runs, insulation support rings shall be used as indicated on contract drawings.

## 2.02 ACCESSORY MATERIALS

- A. Accessory materials installed as part of insulation work under this section shall include (but not be limited to):
  1. Closure Materials - Butt strips, bands, wires, staples, mastics, adhesives; pressure-sensitive tapes. Mold resistant mastics are recommended for chilled water applications.
  2. Field-applied jacketing materials - Sheet metal, plastic, canvas, fiber glass cloth, insulating cement, PVC fitting covers
  3. Support Materials - Hanger straps, hanger rods, saddles, support rings, high density inserts.
- B. All accessory materials shall be installed in accordance with project drawings and specifications, manufacturer's instructions, and/or in conformance with the current edition of the Midwest Insulation Contractors Association (MICA) "Commercial & Industrial Insulation Standards."

## PART 3.00 - EXECUTION

### 3.01 SITE INSPECTION

- A. Before starting work under this section, carefully inspect the site and installed work of other trades and verify that such work is complete to the point where installation of materials and accessories under this section can begin.
- B. Verify that all materials and accessories can be installed in accordance with project drawings and specifications and material manufacturers' recommendations.
- C. Verify, by inspecting product labeling, submittal data, and/or certifications which may accompany the shipments, that all materials and accessories to be installed on the project comply with applicable specifications and standards and meet specified thermal and physical properties.

### 3.02 PREPARATION

- A. Ensure that all pipe and fitting surfaces over which insulation is to be installed are clean and dry.
- B. Ensure that insulation is clean, dry, and in good mechanical condition with all factory-applied vapor or weather barriers intact and undamaged. Wet, dirty, or damaged insulation shall not be acceptable for installation.

- C. Ensure that pressure testing of piping and fittings has been completed prior to installing insulation.

### 3.03 INSTALLATION

#### A. General

1. Install all insulation materials and accessories in accordance with manufacturer's published instructions and recognized industry practices to ensure that it will serve its intended purpose.
2. Install insulation on piping subsequent to installation of heat tracing, painting, and acceptance tests.
3. 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. Butt insulation joints firmly to ensure complete, tight fit over all piping surfaces.
4. Maintain the integrity of factory-applied vapor barrier jacketing on all pipe insulation, protecting it against puncture, tears or other damage. All staples used on cold pipe insulation shall be coated with suitable sealant to maintain vapor barrier integrity.

#### B. Fittings

1. Cover valves, fittings, and similar items in each piping system using one of the following:
  - a. Mitered sections of insulation equivalent in thickness and composition to that installed on straight pipe runs.
  - b. Insulation cement equal in thickness to the adjoining insulation.
  - c. PVC Fitting Covers insulated with material equal in thickness and composition to adjoining insulation.

#### C. Penetrations

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

#### D. Joints

1. Butt pipe insulation against hanger inserts. For hot pipes, it is recommended all joints be staggered when operating temperature is over 400F (204C) double layer. Seal jacketing according to type being used. Seal self-sealing laps by firmly rubbing down surface of tape and flap.
2. All pipe insulation ends shall be tapered and sealed, regardless of service.

#### E. Vertical Piping

1. If specified on contract drawings, vertical piping shall be protected to a height of 8'-0" (2.4 m) above the floor. All insulated, exposed vertical piping within the building and all insulated piping exposed to the outdoors shall be additionally jacketed with 0.016" thick (0.4 mm) (minimum) aluminum.

### 3.04 FIELD QUALITY ASSURANCE

- A. Upon completion of all insulation work covered by this specification, visually inspect the work and verify that it has been correctly installed. This may be done while work is in progress, to assure compliance with requirements herein to cover and protect insulation materials during installation.

3.05 PROTECTION

- A. Replace damaged insulation, which cannot be satisfactorily repaired, including insulation with vapor barrier damage and moisture-saturated insulation.
- B. The insulation contractor shall advise the general and/or the mechanical contractor as to requirements for protection of the insulation work during the remainder of the construction period, to avoid damage and deterioration of the finished insulation work.

3.06 SAFETY PRECAUTIONS

- A. Insulation contractor's employees shall be properly protected during installation of all insulation. Protection shall include proper attire when handling and applying insulation materials, and shall include (but not be limited to) disposable dust respirators, gloves, hard hats, and eye protection.
- B. The insulation contractor shall conduct all job site operations in compliance with applicable provisions of the Occupational Safety and Health Act, as well as with all state and/or local safety and health codes and regulations that may apply to the work.

APPENDIX

Refer to the publications listed below for product information, including uses, descriptions, physical properties, performance, specification compliance and application recommendations:

DATA SHEETS

Owens Corning Vaporwick® Pipe Insulation	44542
Owens Corning Fiberglas® Pipe Insulation	20547
Owens Corning Pipe and Tank Insulation	14728
Owens Corning Fiberglas® Flexwrap™ Insulation	57629

CATALOGS

Catalog, Owens Corning Mechanical Insulation Systems	14210
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