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Armaflex®

Master Insulation Guide Specification for Mechanical Systems

- AP Armaflex® Pipe Insulation
- AP Armaflex W Pipe Insulation
- AP Armaflex SS Pipe Insulation
- AP Armaflex Sheet and Roll Insulation
- AP Armaflex SA Sheet and Roll Insulation
- ArmaTuff Laminated Sheets and Rolls
- HT Armaflex Pipe Insulation
- HT Armaflex Roll Insulation
- NH Armaflex Pipe Insulation
- NH Armaflex Sheet and Roll Insulation
- Armafix (IPH and NPH) Insulation Pipe Hangers

Master Insulation Guide Specification For Mechanical Systems

Part 1 – General

1.01 Scope of Work:

A. Provide piping, ductwork and equipment insulation as specified below.

1.02 Definitions:

A. Cold Piping/Surfaces: Pipes or surfaces where the normal operating temperature is 60°F or lower.

B. Third Party Supervision Testing: Verification testing by a nationally recognized independent testing organization that will conduct sampling of the product through to simulated end use testing.

C. Thermal Conductivity: The amount of heat in Btus transferred in one hour through one square foot of homogeneous material one inch in thickness when there is a temperature difference of 1°F.

D. Compression Fit Method: To allow for expansion and contraction of sheet and roll insulation, leave a 1/2″ -wide uncoated border at the butt-edge seams on the surface to be insulated and the insulation surface. Overlap the insulation 1/4″ at the butt-edge and compress the edges into place. Apply adhesive to the butt-edges of the insulation.

1.03 Quality Assurance:

A. Material shall be delivered in nonbroken, factory furnished packaging and stored in a clean, dry indoor space that provides protection against the weather.

B. Insulation shall be applied by qualified personnel skilled in this trade.

C. Progressive testing of the systems to be insulated shall have been completed, inspected and approved by the owners' representative before the insulation is applied.

D. Insulation shall not be applied until all surfaces are clean; dry, and free of dirt, dust, grease, frost, moisture, and other extraneous elements.

E. Work shall be performed at the temperatures recommended by the product manufacturer.

Part 2 – Products

2.01 Elastomeric Insulation:

2.01.1 Acceptable Manufacturers – These specifications are based on products and data of Armacell and designate the type and quality of work intended under this section. Products of other manufacturers proposed as equivalent must be submitted for written approval by the specifying engineer ten days prior to the bid date. Supporting technical data, samples, published specifications and the like must be submitted for comparison. The contractor should warrant that proposed substitutions, if accepted, will provide performance equal to the materials specified herein.

A. Insulation material shall be a flexible, closed-cell elastomeric insulation in tubular or sheet form: AP Armaflex, AP Armaflex W, AP Armaflex SS, or AP Armaflex SA. This product meets the requirements as defined in ASTM C 534, “Specification for preformed elastomeric cellular thermal insulation in sheet and tubular form.”

B. Insulation materials shall have a closed-cell structure to prevent moisture from wicking which makes it an efficient insulation.

C. Insulation material shall be manufactured without the use of CFC’s, HFC’s or HCFC’s. It is also formaldehyde free, low VOC’s, fiber free, dust free and resists mold and mildew.

D. Materials shall have a flame spread index of less than 25 and a smoke-developed index of less than 50 when tested in accordance with ASTM E 84, latest revision. In addition, the product, when tested, shall not melt or drip flaming particles, the flame shall not be progressive and all materials shall pass simulated end-use fire tests.

E. Materials shall have a maximum thermal conductivity of 0.27 Btu-in./h-ft2- °F at a 75°F mean temperature when tested in accordance with ASTM C 177 or ASTM C 518, latest revisions.

F. Materials shall have a maximum water vapor transmission of 0.08 perm-inches when tested in accordance with ASTM E 96, Procedure A, latest revision.

G. The material shall be manufactured under an independent third party supervision testing program covering the properties of fire performance, thermal conductivity and water vapor transmission.

2.02 Special Elastomeric Insulations – High Temperature and Nonhalogen

2.02.1 Acceptable Manufacturers – These specifications are based on products and data of Armacell and designate the type and quality of work intended under this section. Products of other manufacturers proposed as equivalent must be submitted for written approval by the specifying engineer ten days prior to the bid date. Supporting technical data, samples, published specifications, and related documentation must be submitted for comparison. The contractor should warrant that proposed substitutions, if accepted, will provide performance equal to the materials specified herein.

A. Insulation material shall be a flexible, closed-cell elastomeric insulation in tubular or sheet form: HT Armaflex or NH Armaflex.

B. Materials shall have a flame spread index of less than 30 and a smoke developed index of less than 200 when tested in accordance with ASTM E 84, latest revision. In addition, the product, when tested, shall not melt or drip flaming particles, and the flame shall not be progressive.

C. HT Armaflex shall have a maximum thermal conductivity of 0.30 Btu-in./h-ft2-°F at a 75°F mean temperature when tested in accordance with ASTM C 177 or ASTM C 518, latest revisions. NH Armaflex shall have a maximum thermal conductivity of 0.275 Btu-in./h-ft2-°F at a 75°F mean temperature when tested in accordance with ASTM C 177 or ASTM C 518, latest revisions.

D. HT Armaflex and NH Armaflex shall have a maximum water vapor transmission of 0.05 perm-inches when tested in accordance with ASTM E 96, Procedure A, latest revision.

2.03 Adhesives and Finishes

A. Adhesive shall be the insulation manufacturer's recommended contact adhesive: Armaflex 520, Armaflex 520 BLV or Armaflex HT 625 Adhesive.

B. Insulation finish shall be the insulation manufacturer's recommended finish: Armaflex WB Finish.

C. Accessories such as adhesives, mastics and cements shall have the same properties as listed above and shall not detract from any of the system ratings as specified above.

Part 3 – Installation

3.01 Piping:

A. Install pipe insulation by slitting tubular sections and applying onto piping or tubing. Alternately, whenever possible, slide unslit sections over the open ends of piping or tubing. All seams and butt joints shall be adhered and sealed using Armaflex 520 or 520 BLV Adhesive. When using AP Armaflex SS, only the butt joints shall be adhered using Armaflex 520 or 520 BLV Adhesive. Armaflex HT 625 Adhesive shall be used with HT Armaflex.

B. Insulation shall be pushed onto the pipe, never pulled. Stretching of insulation may result in open seams and joints.

C. Tape the ends of the copper tubing before slipping the Armaflex insulation over the new pipes to prevent dust from entering the pipe.

D. All edges shall be clean cut. Rough or jagged edges of the insulation shall not be permitted. Proper tools such as sharp
non-serrated knives must be used.

E. On cold piping, insulation shall be adhered directly to the piping at the high end of the run using a two-inch strip of Armaflex 520 or 520 BLV Adhesive on the ID of the insulation and on the pipe. All exposed end cuts of the insulation shall be coated with Armaflex 520 or 520 BLV Adhesive. All penetrations through the insulation and termination points must be adhered to the substrate to prevent condensation migration.

F. Sheet insulation shall be used on all pipes larger than 6″ IPS. Insulation shall not be stretched around the pipe. On pipes larger than 12″ IPS, adhere insulation directly to the pipe on the lower 1/3 of the pipe. On pipes greater than 24″ IPS, complete adhesion is recommended.

G. Seams shall be staggered when applying multiple layers of insulation.

3.02 Valves, Flanges and Fittings:

A. All fittings shall be insulated with the same insulation thickness as the adjacent piping. All seams and mitered joints shall be adhered with Armaflex 520 or 520 BLV Adhesive. Screwed fittings shall be sleeved and adhered with a minimum 1″ overlap onto the adjacent insulation. Armaflex HT 625 Adhesive shall be used with HT Armaflex.

B. Valves, flanges, strainers, and Victaulic couplings shall be insulated using Armaflex donuts that shall then be covered with sheet or oversized tubular insulation.

3.03 Hangers:

A. Support piping system using high density inserts with sufficient compressive strength. The pipe support insulation shall be elastomeric foam with the same or greater thickness than the pipe insulation. All joints shall be sealed with Armaflex 520 or 520 BLV adhesive.

B. Standard and split hangers -- Piping supported by ring hangers shall have hangers insulated with the same insulation thickness as the adjacent pipe. All seams and butt joints shall be sealed with Armaflex 520 or 520 BLV Adhesive. Armaflex HT 625 Adhesive shall be used with HT Armaflex. Ring hangers may be sleeved using oversized tubular insulation. On cold piping, insulation shall extend up the hanger rod a distance equal to four times the insulation thickness. Insulation tape may be used to a thickness equal to the adjacent insulation thickness.

C. Clevis hangers or other pipe support systems -- Saddles shall be installed under all insulated lines at unistrut clamps, clevis hangers, or locations where the insulation may be compressed due to the weight of the pipe. All piping shall have wooden dowels or blocks of a thickness equal to the insulation inserted and adhered to the insulation between the pipe and the saddle.

It is highly recommended for continuous insulation protection to use hanger sizes equal to the outer diameter of the pipe plus insulation thickness.

D. Armafix IPH or Armafix NPH can be used to prevent compression of insulation at standard split, clevis hangers or other pipe support systems. To minimize the movement of Armafix, it is recommended that a pair of non-skid pads be adhered to the clamps. In addition, to prevent loosening of the clamps, use of an antivibratory fastener, such as a nylon-locking nut, is also recommended.

3.04 Outdoors Exposed Piping:

A. All outdoor exposed piping shall be painted with two coats of Armaflex WB Finish. Prior to applying the Finish, the insulation shall be wiped clean with denatured alcohol. The Finish shall not be tinted.

B. All outdoor exposed piping shall have the seams located on the lower half of the pipe.

C. Contact Armacell for alternate products.

3.05 Piping Insulation Thickness Schedule:

NOTE – This Armaflex insulation wall thickness schedule is based upon Armacell NORMAL Design Conditions of 85°F and 70% RH. Deviations from these design conditions may change the Armaflex Insulation thickness requirements. Consult local energy code requirements for minimum insulation thickness.

3.05.1 AP Armaflex and NH Armaflex Insulations

Piping System	Up to 2″	Over 2″ to 4″	Over 4″ to 6″	Over 6″
Plumbing:				
Cold Water	1/2″	1/2″	1/2″	3/4″
Hot Water	1/2″	1/2″	3/4″	3/4″
Heating Hot Water	3/4″	3/4″	1″	1″
Drains:				
Roof Drains	1/2″	1/2″	1/2″	3/4″
Storm Drains	1/2″	1/2″	3/4″	3/4″
Chilled Water:				
Chilled Water	1/2″	3/4″	1″	1″
Condensate Drain	1/2″	3/4″	–	–
Refrigeration:				
Above 25°F	3/4″	3/4″	1″	1″
11°F to 25°F	1″	1″	1″	1-1/4″
-10°F to 10°F	1″	1-1/4″	1-1/4″	1-1/2″
Below -10°F	1-1/4″	1-1/4″	1-1/2″	1-1/2″

3.05.2 HT Armaflex Insulation

Piping System	Up to 2″	Over 2″ to 4″	Over 4″ to 6″	Over 6″
Plumbing:				
Cold Water	1/2″	1/2″	1/2″	3/4″
Hot Water	1/2″	1/2″	3/4″	3/4″
Heating Hot Water	3/4″	3/4″	1″	1″
Drains:				
Roof Drains	1/2″	1/2″	1/2″	3/4″
Storm Drains	1/2″	1/2″	3/4″	3/4″
Chilled Water:				
Chilled Water	3/4″	1″	1″	1″
Condensate Drain	1/2″	3/4″	–	–
Refrigeration:				
Above 25°F	3/4″	1″	1″	1″
11°F to 25°F	1″	1″	1-1/4″	1-1/4″
-10°F to 10°F	1″	1-1/4″	1-1/2″	1-1/2″
Below -10°F	1-1/4″	1-1/2″	1-3/4″	1-3/4″

3.06 Square and Rectangular Ductwork:

A. The ductwork must be sloped to prevent “ponding” of water. The recommendation is at least a 2° angle to the outer side.

B. Armaflex Sheet Insulation shall be adhered directly to clean, oil-free surfaces with a full coverage of Armaflex 520 and 520 BLV Adhesive, or Armaflex Low VOC Spray Adhesive. Armaflex HT 625 Adhesive shall be used with HT Armaflex. AP Armaflex SA shall be adhered directly to clean, oil-free surfaces.

C. The duct insulation shall be constructed from the bottom up, with the top insulation sized to extend over the side insulation. This will form a watershed.

D. Butt-edge seams shall be adhered using Armaflex 520, 520 BLV, or HT 625 Adhesive by the compression fit method to allow for expansion/contraction. Leave a 1/2″-wide uncoated border at the butt-edge seams on the duct surface and the insulation surface. Overlap the insulation 1/4″ at the butt-edges and compress the edges into place. Apply Armaflex 520, 520 BLV, or HT 625 Adhesive to the butt-edges of the insulation.

E. Standing metal duct seams shall be insulated with the same insulation thickness as installed on the duct surface. Seams may be covered using strips of Armaflex Sheet Insulation or half sections of tubular pipe insulation with miter-cut ends. Standing seams shall be adhered using Armaflex 520, 520 BLV, or HT 625 Adhesive.

F. Insulation seams shall be staggered when applying multiple layers of insulation.

3.07 Round Ductwork:

A. AP Armaflex Sheet and Roll Insulation, HT Armaflex Roll Insulation, or NH Armaflex Sheet and Roll Insulation shall be used on all round ductwork. Insulation shall be wrapped not stretched around the duct. On ductwork larger than 12″ in diameter, the insulation shall be adhered to the duct

surface on the lower one third. On ductwork greater than 24″ in diameter, the insulation shall be completely adhered to the duct surface. Longitudinal seams shall be located on the lower half of any round ductwork.

B. Butt-edge seams shall be adhered using Armaflex 520, 520 BLV, or HT 625 Adhesive by the compression fit method to allow for expansion/contraction. Leave a 1/2″ wide uncoated border at the butt-edge seams on the duct surface and the insulation surface. Overlap the insulation 1/4″ at the butt-edges and compress the edges into place. Apply Armaflex 520, 520 BLV, or HT 625 Adhesive to the butt-edges of the insulation.

C. Insulation seams shall be staggered when applying multiple layers of insulation.

3.08 Exposed Outdoor Duct:

A. All outdoor exposed ductwork shall be finished using one of the following applications: For all the application methods described below it is very important that the exterior horizontal surfaces shall be sloped to prevent ponding on the surface of the coated insulation. If the substrate is not sloped make the necessary adjustments to provide for a slope. DO NOT compromise the Armaflex insulation thickness to achieve the necessary slope.

3.08.1 ArmaTuff – Laminated Armaflex Sheet and Roll Insulations

ArmaTuff laminated Armaflex sheet and roll insulations may be used for insulating exterior applications such as duct, tanks, vessels and large pipes. Refer to section 3.06 for further installation details.

ArmaTuff Plus is a white laminate composite layer of coated foil and polymer on Armaflex insulations, which offers durability and resistance to weathering, ultraviolet, acid rain and chemicals. The composite is 0.010 inches (10 mils) thick. The seams must be installed in compression and sealed with Armaflex 520 or 520 BLV contact adhesive. Cover the seams using ArmaTuff White Seal Tape.

ArmaTuff White is a white laminate composite layer of coated foil and polymer on Armaflex insulations, which offers durability and resistance to weathering, ultraviolet, acid rain and chemicals. The composite is 0.005 inches (5 mils) thick. The seams must be installed in compression and sealed with Armaflex 520 or 520 BLV contact adhesive. Cover the seams using ArmaTuff White Seal Tape.

ArmaTuff Silver is a silver metal foil composite of layers of foil and polymer on Armaflex insulations, which offers durability and resistance to weathering and ultraviolet radiation. The composite is 0.005 inches (5mils) thick. The seams must be installed in compression and sealed with Armaflex 520 or 520 BLV contact adhesive. Cover the seams using ArmaTuff Silver Seal Tape.

3.08.2 Armaflex WB Finish

All outdoor ductwork shall be finished with a minimum requirement of two coats of Armaflex WB Finish.

1. Rectangular ductwork

a. The surface of the insulation must be clean and dry.

b. Apply first coat of Armaflex WB Finish at a rate of 400 square feet per gallon.

c. Allow to dry at least four hours.

d. Apply second coat at a rate of 400 square feet per gallon.

DO NOT TINT FINISH!

3.08.3 Armaflex WB Finish With 10 x 10 Leno Weave Glass Mesh

All outdoor ductwork shall be finished with a minimum requirement of two coats of Armaflex WB Finish. For additional durability, a 10 x 10 Leno weave glass cloth can be applied over the insulation:

1. Rectangular ductwork

    a. The surface of the insulation must be clean and dry.

    b. Allow adhesive seams on the insulation to set for two hours.

    c. Application of 10 x 10 Leno weave glass mesh.

        1. Apply thin uniform coat of Armaflex Low VOC Spray Contact Adhesive. Allow to become tacky, and apply 10 x 10 Leno weave glass mesh. Low VOC Adhesive may take up to 10 minutes to become tacky.)

        2. As an alternate, use pre-adhesived 10 x 10 Leno glass mesh.

    d. Allow adhesive and mesh to dry four hours.

    e. Apply Armaflex WB Finish over the mesh at a rate of less than 400 square feet per gallon. Allow to dry four hours.

    f. Apply the second coat of Armaflex WB Finish at a rate of less than 400 square feet per gallon.

    DO NOT TINT FINISH!

2. Round ductwork

    a. The surface of the insulation must be clean and dry.

    b. Allow adhesive seams on the insulation to set for two hours.

    c. Application of 10 x 10 Leno weave glass mesh.

        1. Apply thin uniform coat of Armaflex Low VOC Spray Contact Adhesive. Allow to become tacky, and apply 10 x 10 Leno weave glass mesh. Low VOC Adhesive may take up to 10 minutes to become tacky.)

        2. As an alternate, use pre-adhesived 10 x 10 Leno glass mesh.

    d. Allow adhesive and mesh to dry four hours.

    e. Apply Armaflex WB Finish over the mesh at a rate of less than 400 square feet per gallon. Allow to dry four hours.

    f. Allow a three-inch gap in the glass mesh at the bottom, unexposed portion of the duct to allow for thermal expansion/contraction.

    g. Apply the second coat of Armaflex WB Finish a rate of not more than 400 square feet per gallon.

    DO NOT TINT FINISH!

3.08.4 Mastic System

1. Round or rectangular ductwork

There are a number of acceptable mastic products including the following:

Childers AK-CRYL™ CP-9
Childers AK-CRYL™ CP-10
Childers AK-CRYL™ CP-35

Epolux Manufacturing Corp Epolux 510
Mon-Eco Industries MEI 55-40
Vimasco WC 5
Vimasco WC 7

Please consult the mastic manufacturer for any additional recommendations.

a. The surface of the insulation must be clean and dry.

b. Wipe the surface of the Armaflex Insulation with a clean cloth.

c. Apply a tack coat of mastic with a uniform thickness at a rate of 50 square feet/gallon by trowel, glove, large brush, or spray.

DO NOT THIN MASTIC!

d. Blend 10 x 10 Leno weave glass mesh into the first application of mastic, making sure to overlap the seams of the glass cloth by
2 inches.

e. Apply a finish coat within one hour after the tack coat at a rate of 50 square feet/gallon. The mastic will dry to the touch in two hours, but complete drying takes 24 to 36 hours.

3.09 Ventilation Ductwork Insulation Thickness Schedule:

NOTE - This Armaflex insulation wall thickness schedule is based upon Armacell NORMAL Design Conditions of 85°F and 70% RH. Deviations from these design conditions may change the Armaflex Insulation thickness requirements. Consult local energy code requirements for minimum insulation thickness.

Duct Systems:

Supply and Return, Outside Air or Exhaust Air:

System Temperature	AP Armaflex Thickness	HT Armaflex Thickness	NH Armaflex Thickness
Below 0°F	2″	2″	2″
0°F to 20°F	1-1/2″	1-1/2″	1-1/2″
21°F to 40°F	1″	1″	1″
41°F to 55°F	3/4″	3/4″	3/4″
56°F to 100°F	1/2″	1/2″	1/2″
101°F to 120°F	3/4″	3/4″	3/4″
121°F to 140°F	1″	1″	1″
141°F to 160°F	1-1/2″	1-1/2″	1-1/2″
161°F to 180°F	2″	2″	2″
181°F to 220°F	2″	2-1/2″	2″
221°F to 300°F	–	3″	–

3.10 Ventilation Equipment Insulation:

A. Armaflex Sheet Insulation shall be adhered directly to clean, oil-free surfaces with a full coverage of Armaflex 520, 520 BLV, Low VOC Spray Adhesive, or HT 625 Adhesive. AP Armaflex SA shall be adhered directly to clean, oil-free surfaces.

B. All seams and butt-joints shall be adhered and sealed with Armaflex 520, 520 BLV, or HT 625 Adhesive.

C. On cold surfaces: All exposed end cuts of insulation shall be coated with Armaflex 520, 520 BLV, or HT 625 Adhesive.

D. Seams shall be staggered when applying multiple layers of insulation.

3.11 Ventilation Equipment Insulation Thickness Schedule:

NOTE – This Armaflex insulation wall thickness schedule is based upon Armacell NORMAL Design Conditions of 85°F and 70% RH. Deviations from these design conditions may change the Armaflex Insulation thickness requirements. Consult local energy code requirements for minimum insulation thickness.

System Temperature	AP Armaflex Thickness	HT Armaflex Thickness	NH Armaflex Thickness
Below 0°F	2″	2″	2″
0°F to 20°F	1-1/2″	1-1/2″	1-1/2″
21°F to 40°F	1″	1″	1″
41°F to 55°F	3/4″	3/4″	3/4″
56°F to 100°F	1/2″	1/2″	1/2″
101°F to 120°F	3/4″	3/4″	3/4″
121°F to 140°F	1″	1″	1″
141°F to 160°F	1-1/2″	1-1/2″	1-1/2″
161°F to 180°F	2″	2″	2″
181°F to 220°F	2″	2-1/2″	2″
221°F to 300°F	–	3″	–

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