

## **SECTION 072100 THERMAL INSULATION**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Board insulation at cavity wall construction, perimeter foundation wall, underside of floor slabs, over roof deck, and exterior wall behind masonry wall finish.
- B. Batt insulation in exterior wall construction.

#### **1.02 DEFINITIONS**

- A. Mineral Fiber Material Composition: Insulation referred to as mineral fiber block, board, and blanket insulation is composed of fibers from mineral based substances such as rock, slag, or glass and processed from the molten state into fibrous form.
  - 1. Based on type of insulation substance, the material will be referred to as a mineral fiber when having a rock or slag base, and glass fiber with a glass or silica sand base, also considered a mineral.
  - 2. Insulation blankets are flexible units consisting of felted, bonded, or unbonded fibers formed into rolls or flat cut pieces referred to as batts; rolls are simply longer versions of batts.
  - 3. For additional information about mineral fiber and the various classification types, refer to the following reference standards; ASTM C553, ASTM C612, ASTM C665, and ASTM C726.

#### **1.03 REFERENCE STANDARDS**

- A. ASTM C165 - Standard Test Method for Measuring Compressive Properties of Thermal Insulations; 2023.
- B. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.
- C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2024.
- D. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.
- E. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).
- F. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2024.
- G. ASTM C726 - Standard Specification for Mineral Wool Roof Insulation Board; 2024.
- H. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2025.
- I. ASTM C1667 - Standard Test Method for Using Heat Flow Meter Apparatus to Measure the Center-of-Panel Thermal Transmission Properties of Vacuum Insulation Panels; 2015.
- J. ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics; 2016 (Reapproved 2023).
- K. ASTM D2126 - Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging; 2025.
- L. ASTM D4491/D4491M - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 2022.
- M. ASTM D4833/D4833M - Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products; 2007 (Reapproved 2020).
- N. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

- O. ICC-ES AC239 - Acceptance Criteria for Termite-Resistant Foam Plastic; 2008, with Editorial Revision (2022).
- P. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

#### **1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- C. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.
- F. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.
- G. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of contractor accreditation and installer certification on project site during and after installation. Present on-site documentation upon request.

#### **1.05 QUALITY ASSURANCE**

- A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); [www.airbarrier.org/#sle](http://www.airbarrier.org/#sle):
  - 1. Installer Qualification: Use accredited contractors, certified installers, evaluated materials, and third-party field quality control audit.
  - 2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

#### **1.06 FIELD CONDITIONS**

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

### **PART 2 PRODUCTS**

#### **2.01 APPLICATIONS**

- A. Insulation Under Concrete Slabs: Extruded polystyrene (XPS) board.
- B. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.
- C. Insulation Inside Masonry Cavity Walls: Expanded polystyrene (EPS) board.
- D. Insulation over Roof Deck: Vacuum insulated panel (VIP) board.

#### **2.02 FOAM BOARD INSULATION MATERIALS**

- A. Expanded Polystyrene (EPS) Board Insulation: Comply with ASTM C578.
  - 1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
  - 2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
  - 3. Board Size: 48 inch by 96 inch (1220 mm by 2440 mm).
  - 4. Board Edges: Square.
  - 5. Water-Resistive Barrier: Integrated film facer on insulation.
  - 6. Type and Compressive Resistance: Type XI, 5 psi (35 kPa), minimum.
  - 7. Type and Water Absorption: Type XI, 4.0 percent by volume, maximum, by total immersion.
  - 8. Type and Thermal Resistance, R-value (RSI-value 30): Type XI, 3.1 (0.55), minimum, per 1 inch (25.4 mm) thickness at 75 degrees F (24 degrees C) mean temperature.

- B. Termite-Resistant Expanded Polystyrene (EPS) Board Insulation: Comply with ASTM C578.
  - 1. Termite Resistance: Comply with ICC-ES AC239.
  - 2. Flame Spread Index (FSI): 25 or less, when tested in accordance with ASTM E84.
  - 3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
  - 4. Board Size: 48 inch by 96 inch (1220 mm by 2440 mm).
  - 5. Type and Thermal Resistance, R-value (RSI-value): Type XI, 3.1 (0.55), minimum, per 1 inch (25.4 mm) thickness at 75 degrees F (24 degrees C) mean temperature.
  - 6. Board Edges: Square.
- C. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.
  - 1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
  - 2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
  - 3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
  - 4. Type and Thermal Resistance, R-value (RSI-value): Type IV, 5.0 (0.88), minimum, per 1 inch (25.4 mm) thickness at 75 degrees F (24 degrees C) mean temperature.
  - 5. Complies with fire resistance requirements indicated on drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
  - 6. Board Edges: Square.
- D. Fire-Resistant Extruded Polystyrene (XPS) Insulation Board: Two rows of high-strength, low-conductive, epoxy-concrete columns in between insulation boards. Columns are fixed to top and bottom surfaces of structural thermal break block, providing load transfer and high-compressive strength to support masonry-framed walls.
  - 1. Compressive Strength: 1500 psi (10342 kPa), when tested in accordance with ASTM D1621.
  - 2. Physical Properties Including Thermal Resistance and Density: R-value (RSI-value): 5.5 (0.97); Type: TBLK-1; 23-5/8 inches by 4 inches by 2-1/2 inches (600 mm by 102 mm by 63.5 mm).
- E. Extruded Polystyrene (XPS) Continuous Insulation (CI) Board: Comply with ASTM C578, and manufactured using carbon black technology.
  - 1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
  - 2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
  - 3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
  - 4. Type and Thermal Resistance, R-value (RSI-value): Type IV, 5.6 (0.98), minimum, per 1 inch (25.4 mm) thickness at 75 degrees F (24 degrees C) mean temperature.
  - 5. Board Size: 48 inch by 96 inch (1220 mm by 2440 mm).
  - 6. Board Thickness: 1-3/4 inch (44.5 mm).
  - 7. Board Edges: Shiplap, at long edges.
  - 8. Type and Water Absorption: Type IV, 0.3 percent by volume, maximum, by total immersion.
- F. Extruded Polystyrene (XPS) Cavity Wall Insulation Board: Comply with ASTM C578, and manufactured using carbon black technology.
  - 1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
  - 2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
  - 3. Type and Thermal Resistance, R-value (RSI-value): Type IV, 5.6 (0.98), minimum, per 1 inch (25.4 mm) thickness at 75 degrees F (24 degrees C) mean temperature.
  - 4. Board Size: 15-3/4 inch by 96 inch (400 mm by 2440 mm).
  - 5. Board Thickness: 1-3/4 inch (44.5 mm).
  - 6. Board Edges: Square.
- G. Expanded Graphite Polystyrene (GPS) Board Insulation: Comply with ASTM C578, Type I.
  - 1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
  - 2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
  - 3. Board Edges: Square.

- H. Rigid Thermoset Board Insulation: Fiber-free phenolic insulation with zero Ozone Depletion Potential (ODP) blowing agent and faced on both sides with low emissivity composite foil.
  - 1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
  - 2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
  - 3. Board Width, Nominal: 47-1/4 inch (1200 mm).
  - 4. Board Length, Nominal: 16 inch (406 mm).
  - 5. Board Thickness, Nominal: 1-3/16 inch (30 mm).
  - 6. Board Edges: Square.
  - 7. Water Absorption: 1.2 percent by volume, maximum.
  - 8. Compressive Strength: 15 psi (104 kPa), minimum.
  - 9. Thermal Resistance: R-value (RSI-value) of 8.05 (1.42), minimum, per inch at 75 degrees F (24 C), minimum, when tested according to ASTM C518.
- I. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, comply with ASTM C1289.
  - 1. Classifications:
    - a. Type I: Faced with aluminum foil on both major surfaces of the core foam.
      - 1) Class 1 - Non-reinforced core foam.
      - 2) Compressive Strength: 16 psi (110 kPa), minimum.
      - 3) Thermal Resistance, R-value (RSI-value): At 1-1/2 inch (38.1 mm) thick; 9.0 (1.59), minimum, at 75 degrees F (24 degrees C).
  - 2. Board Size: 48 inch by 96 inch (1220 mm by 2440 mm).
  - 3. Board Thickness: 1.5 inch (37.5 mm).
  - 4. Board Edges: Square.
- J. Polyisocyanurate (ISO) Cover Board Insulation: Rigid high-density polyisocyanurate cover board; comply with ASTM C1289.
  - 1. Type II ISO Cover Layer, Compressive Strength: 80 psi (551 kPa).
  - 2. Glass facers on both major surfaces.
  - 3. Board Thickness: 1/2 inch (12.7 mm).
  - 4. Board Edges: Square.
- K. Rigid Vacuum Insulated Panels (VIP): Microporous core, evacuated, encased, and sealed in thin, gas-tight envelope. Accompany panels with infill panels around skylights and other roof penetrations.
  - 1. Panel Width: 11.8 to 23.6 inches (300 to 600 mm).
  - 2. Panel Length: 11.8 to 47.2 inches (300 to 1200 mm).
  - 3. Panel Thickness: 0.79 inch (20 mm).
  - 4. Compressive Strength: ASTM C165, 23 psi (159 kPa) at 10 percent deformation.
  - 5. Service temperature: Minus 40 to 176 degrees F (minus 40 to 80 degrees C).
  - 6. Thermal resistance in accordance with ASTM C1667. Center panel values as follows:
    - a. Insulation Thickness: 0.79 inch (20 mm), R-value (RSI-value) of 26 (4.58).
  - 7. Calculated edge effect thermal resistance properties in accordance ASTM C1667.
    - a. Insulation Thickness: 0.79 inch (20 mm), R-value (RSI-value) of 22 (3.87).
  - 8. Dimensional Stability: ASTM D2126, 336 hours at 70 degrees F (21 degrees C) and 97 percent relative humidity.
  - 9. Nominal Panel Mass:

## **2.03 MINERAL FIBER BOARD INSULATION MATERIALS**

- A. Mineral Wool Roof Insulation Boards: Comply with ASTM C726, with high-density top layer. Mold and microbial growth resistant.
  - 1. Face Coating: None, unfaced.
  - 2. Board Size: 48 by 48 inches (1220 by 1220 mm).
  - 3. Board Thickness: 2 inches (51 mm).
  - 4. Board Edges: Square.

## **2.04 ACCESSORIES**

- A. Foundation Insulation and Drainage Board: Flexible board comprised of majority post-industrial recycled content, providing both subgrade insulation and drainage.
  - 1. Application: Install vertically directly against acceptable substrates.
  - 2. Board Thickness: 3/4 inch (19.1 mm).
  - 3. Water Permeability of Geotextiles by Permittivity: 47.2 gpm/sq ft, 3/4 inch (19.1 mm), measured in accordance with ASTM D4491/D4491M.
  - 4. Index Puncture Resistance of Geomembranes and Related Products: 54 lb, 3/4 inch (25.5 kg, 19.1 mm), in accordance with ASTM D4833/D4833M.
- B. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
  - 1. Application: Sealing of interior circular penetrations, such as pipes or cables.
  - 2. Width: Are required for application.
- C. Sill Plate Sealer: Closed-cell foam tape with rubberized adhesive membrane; bridges gap between foundation structure and sill plate or skirt board.
  - 1. Width: 3-1/2 inches (89 mm).
  - 2. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 30 days of weather exposure.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

### **3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER**

- A. Install boards horizontally on foundation perimeter.
- B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

### **3.03 BOARD INSTALLATION AT EXTERIOR WALLS**

- A. Install boards horizontally on walls.
- B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

### **3.04 BOARD INSTALLATION AT CAVITY WALLS**

- A. Secure insulation fasteners to substrate at following frequency:
  - 1. Six (6) per insulation board.
- B. Install boards to fit snugly between wall ties.
  - 1. Place membrane surface facing out, and tape seal board joints.
- C. Install boards horizontally on walls.
  - 1. Install in running bond pattern.
  - 2. Butt edges and ends tightly to adjacent boards and protrusions.
- D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

### **3.05 BOARD INSTALLATION UNDER CONCRETE SLABS**

- A. Place insulation under slabs on grade after base for slab has been compacted.
- B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
- C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

### **3.06 BOARD INSTALLATION OVER LOW SLOPE ROOF DECK**

- A. Board Installation Over Roof Deck, General:
  - 1. See applicable roofing specification section for specific board installation requirements.

2. Fasten insulation to deck in accordance with roofing manufacturer's written instructions and applicable Factory Mutual requirements.
  3. Do not apply more insulation than can be covered with roofing on the same day.
- B. Vacuum Insulated Panel Installation:
1. Use infill strips to make up spacing differences where runs of panels do not accurately fit roof dimensions. Ensure infill strips are same thickness as panels and accurately trimmed to active close-butting joints and continuity.
  2. Secure infill panels to roof substrate using suitable adhesive or tape.
  3. Install infill strips at roof perimeter, abutting penetrations.

### **3.07 BATT INSTALLATION**

- A. Install insulation and vapor retarder in accordance with manufacturer's instructions.
- B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

### **3.08 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Coordination of Air Barrier Association of America (ABAA) Tests and Inspections:
  1. Provide testing and inspection required by ABAA Quality Assurance Program (QAP).
  2. Notify ABAA in writing of schedule for air barrier work, and allow adequate time for testing and inspection.
  3. Cooperate with ABAA testing agency.
  4. Allow access to air barrier work areas and staging.
  5. Do not cover air barrier work until tested, inspected, and accepted.

### **3.09 PROTECTION**

- A. Do not permit installed insulation to be damaged prior to its concealment.

**END OF SECTION**