

SECTION 072100 – THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Extruded polystyrene (XPS) foam-plastic board insulation.
2. Molded (expanded) polystyrene foam-plastic board insulation.
3. Glass-fiber blanket insulation.
4. Glass-fiber board insulation.
5. Blown-in / Spray-applied insulation (glass fibers and mineral wool).
6. Mineral-wool blanket insulation.
7. Mineral-wool board insulation.
8. Sound-attenuation batts and blankets.
9. Vapor retarders.

B. Related Sections:

1. Section 054000 – Cold-Formed Metal Framing.
2. Section 061000 – Rough Carpentry.
3. Section 078100 – Applied Fireproofing (to structural members).
4. Section 092116.23 – Gypsum Board Shaft Wall Assemblies.

C. Reference and Industry Standards

1. The following reference standards shall be applicable to this Section:
 - a. New York City Energy Conservation Code **current** edition, as amended.
 - b. The current Enterprise Green Communities (EGC) Criteria, and the current New York City Overlay.
2. Industry Standards
 - ASTM (American Society for Testing and Materials)

D. The current NYC Overlay of the current Enterprise Green Communities Criteria:

1. Mandatory Requirements: See the NYC Overlay of the EGC reference standard for full specifications.
 - a. All projects must achieve compliance with the mandatory criteria measures that are applicable:
 - Criterion 6.4: Healthier Materials Selection
 - Criterion 6.9: Managing Moisture: Roofing and Wall Systems
 - Criterion 6.10: Construction Waste Management

2. Optional Project Requirements for Certification Points

- a. Additionally, rehab projects are required to achieve **55** optional points. Criteria with optional points related to this Specification Section include, but may not be limited to:
- Criterion 6.1: Ingredient Transparency for Material Health
 - Criterion 6.2: Recycled Content and Ingredient Transparency
 - Criterion 6.3: Chemical Hazard Optimization
 - Criterion 6.5: Environmentally Responsible Material Selection
 - Criterion 6.7: Regional Materials
 - Criterion 6.10: Construction Waste Management

1.2 ACTION SUBMITTALS

- A. Material Safety Data Sheets (MSDS).
- B. Environmental Product Declaration (EPD) for each type of product indicated.
- C. Installers of thermal envelope insulation shall provide a certification listing the type, manufacturer, and R-value of insulation installed in each element of the building thermal envelope.
1. For blown or sprayed insulation (fiberglass or cellulose), the initial installed thickness, settled thickness, settled R-value, installed density, coverage area and number of bags installed shall be listed on the certification. The installation installer shall sign, date and post the certification in a conspicuous location of the job site.

1.3 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Documentation for compliance with Enterprise Green Communities Criteria.
- C. Product selection criteria (required R-value, flame spread, carbon and global warming potential (GWP)).

PART 2 - PRODUCTS

2.1 MOLDED (EXPANDED) POLYSTYRENE (EPS) FOAM-PLASTIC BOARD INSULATION, FREE OF HALOGENATED FLAME RETARDANTS

- A. Molded (Expanded) Polystyrene (EPS) Board Insulation: ASTM C578, Type VIII, 13-psi minimum compressive strength.
1. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.2 GRAPHITE POLYSTYRENE (GPS) FOAM-PLASTIC BOARD INSULATION, FREE OF HALOGENATED FLAME RETARDANTS

- A. Graphite-enhanced Expandable Polystyrene (GPS) Board Insulation ASTM C578, Type VIII, 13-psi minimum compressive strength.
 - 1. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.3 GLASS-FIBER BLANKET INSULATION; **FORMALDEHYDE-FREE**

- A. Glass-Fiber Blanket Insulation, Unfaced: ASTM C665, Type I; passing ASTM E136 for combustion characteristics.
 - 1. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
 - 2. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
 - 3. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.
- B. Glass-Fiber Blanket Insulation, Polypropylene-Scrim-Kraft Faced: ASTM C665, Type II (nonreflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier).
 - 1. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.
- C. Glass-Fiber Blanket Insulation, Kraft Faced : ASTM C665, Type II (nonreflective faced), Class C (faced surface not rated for flame propagation); Category 1 (membrane is a vapor barrier).
 - 1. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.
- D. Glass-Fiber Blanket Insulation, Reinforced-Foil Faced: ASTM C665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.
 - 1. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.
- E. Glass-Fiber Blanket Insulation, Foil Faced: ASTM C665, Type III (reflective faced), Class B (faced surface with a flame-propagation resistance of 0.12 W/sq. cm); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.
 - 1. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.4 GLASS-FIBER BOARD INSULATION, FREE OF HALOGENATED FLAME RETARDANTS

- A. Glass-Fiber Board Insulation, Unfaced: ASTM C612, Type IA; unfaced, passing ASTM E136 for combustion characteristics.

1. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
2. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
3. Nominal Density: [2.25 lb/cu. ft.] [3 lb/cu. ft.] [4.25 lb/cu. ft.] [6 lb/cu. ft.].
4. Thermal Resistivity: 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F.
5. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

- B. Glass-Fiber Board Insulation, Faced: ASTM C612, Type IA; faced on one side with foil-scrim-kraft or foil-scrim-polyethylene vapor retarder.

1. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
2. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
3. Nominal Density: [2.25 lb/cu. ft.] [3 lb/cu. ft.] [4.25 lb/cu. ft.] [6 lb/cu. ft.].
4. Thermal Resistivity: 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F.
5. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.5 BLOWN-IN / SPRAY-APPLIED INSULATION; **FORMALDEHYDE-FREE**

- A. Glass Fiber Insulation: Inorganic, non-toxic, odorless, formaldehyde-free non-combustible product conforming to ASTM E136. The polymer adhesive used to apply fiber is water based and non-hazardous.

1. Thermal Conductivity: ASTM C-518-76: R-4.00/inch.
2. Fire Hazard Classification ASTM E84-79:
 - a. Smoke Develop: 0
 - b. Flame Spread: 0
 - c. Fuel Contribution: 0

- B. Mineral Wool Insulation: Inorganic, formaldehyde-free loose fill product specifically designed for blown applications in existing structures, rated non-combustible per NFPA Standard 220.

1. Thermal Conductivity: ASTM C-518-76: R-4.20/inch.
2. Fire Hazard Classification ASTM E84.
 - a. Smoke Develop: 5.
 - b. Flame Spread: 0.

2.6 MINERAL-WOOL BLANKET INSULATION; **FORMALDEHYDE-FREE**

- A. Mineral-Wool Blanket Insulation, Unfaced: Formaldehyde-free, ASTM C665, Type I (blankets without membrane facing); consisting of fibers; passing ASTM E136 for combustion characteristics.

1. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
2. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
3. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

- B. Mineral-Wool Blanket Insulation, Reinforced-Foil Faced: Formaldehyde-free, ASTM C665, Type III (reflective faced); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.
 - 1. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
 - 2. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
 - 3. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.7 MINERAL-WOOL BOARD INSULATION, FREE OF HALOGENATED FLAME RETARDANTS

- A. Mineral-Wool Board Insulation, Types IA and IB, Unfaced: ASTM C612, Types IA and IB; passing ASTM E136 for combustion characteristics.
 - 1. Nominal Density: 4 lb/cu. ft..
 - 2. Flame-Spread Index: Not more than 15 when tested in accordance with ASTM E84.
 - 3. Smoke-Developed Index: Not more than zero when tested in accordance with ASTM E84.
 - 4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.
- B. Mineral-Wool Board Insulation, Types IA and IB, Faced: ASTM C612, Types IA and IB; faced on one side with foil-scrim or foil-scrim-polyethylene vapor retarder.
 - 1. Nominal Density: 4 lb/cu. ft..
 - 2. Flame-Spread Index: Not more than 15 when tested in accordance with ASTM E84.
 - 3. Smoke-Developed Index: Not more than zero when tested in accordance with ASTM E84.
 - 4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.
- C. Mineral-Wool Board Insulation, Type II, Unfaced: ASTM C612, Type II; passing ASTM E136 for combustion characteristics.
 - 1. Nominal Density: 6 lb/cu. ft..
 - 2. Flame-Spread Index: Not more than 15 when tested in accordance with ASTM E84.
 - 3. Smoke-Developed Index: Not more than zero when tested in accordance with ASTM E84.
 - 4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.
- D. Mineral-Wool Board Insulation, Type II, Faced: ASTM C612, Type II; faced on one side with foil-scrim or foil-scrim-polyethylene vapor retarder.
 - 1. Nominal Density: 6 lb/cu. ft..
 - 2. Flame-Spread Index: Not more than 15 when tested in accordance with ASTM E84.
 - 3. Smoke-Developed Index: Not more than zero when tested in accordance with ASTM E84.
 - 4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.
- E. Mineral-Wool Board Insulation, Type III, Unfaced: ASTM C612, Type III; passing ASTM E136 for combustion characteristics.

1. Nominal Density: 8 lb/cu. ft..
2. Flame-Spread Index: Not more than 15 when tested in accordance with ASTM E84.
3. Smoke-Developed Index: Not more than zero when tested in accordance with ASTM E84.
4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

- F. Mineral-Wool Board Insulation, Type III, Faced: ASTM C612, Type III; faced on one side with foil-scrim or foil-scrim-polyethylene vapor retarder.

1. Nominal Density: 8 lb/cu. ft..
2. Flame-Spread Index: Not more than 15 when tested in accordance with ASTM E84.
3. Smoke-Developed Index: Not more than zero when tested in accordance with ASTM E84.
4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.8 SOUND-ATTENUATION (ACOUSTIC) BATTS, NON-FIRE-RATED; FORMALDEHYDE-FREE

- A. Type: Kraft-faced glass fiber acoustical insulation, complying with ASTM C665, Type II, Class C.
- B. Surface Burning Characteristics: ASTM E84.
- C. Fire Resistance Ratings: Part of ASTM E119 fire tested wall assemblies.
- D. Sound Transmission Class: ASTM C423, STC as required by local authorities for application.

2.9 SOUND-ATTENUATION (ACOUSTIC) BLANKETS, FIRE-RATED; FORMALDEHYDE-FREE

- A. Type: Unfaced glass fiber acoustical insulation, complying with ASTM C665, Type I.
- B. Surface Burning Characteristics: ASTM E84.
- C. Combustion Characteristics: Passes ASTM E136.
- D. Fire Resistance Ratings: Part of ASTM E119 fire tested wall assemblies.
- E. Sound Transmission Class: ASTM C423, STC as required by local authorities for application.
- F. Dimensional Stability: Linear shrinkage less than 0.1%.

2.10 VAPOR RETARDERS

- A. Polyethylene Vapor Retarders: ASTM D4397 [6 mils] [10 mils] thick, with a maximum permeance rating of 0.13 perm.
- B. Vapor Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

2.11 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
 - 1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.
- B. Insulation Anchors, Spindles, and Standoffs: As recommended by manufacturer.
- C. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.
- D. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide ventilation between insulated attic spaces and vented eaves.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Install insulation with manufacturer's R-value label exposed after insulation is installed.
- D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.2 INSTALLATION OF SLAB INSULATION

- A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
 - 1. If not otherwise indicated, extend insulation a minimum of **[24 inches] [36 inches] <Insert dimension>** below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
 - 1. If not otherwise indicated, extend insulation a minimum of **[24 inches] [36 inches] <Insert dimension>** in from exterior walls.

3.3 INSTALLATION OF FOUNDATION WALL INSULATION

- A. Butt panels together for tight fit.
- B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors.
- C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or damp-proofing according to manufacturer's written instructions.

3.4 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. Attics: Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
 - 5. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
 - 6. For wood-framed construction, install blankets according to ASTM C1320 and as follows:
 - a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
 - 7. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
 - a. Exterior Walls: Set units with facing placed toward **[exterior of construction]** **[interior of construction]** **[as indicated on Drawings]**.
 - b. Interior Walls: Set units with facing placed **[as indicated on Drawings]** **[toward areas of high humidity]** **<Insert location>**.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 - 1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..

3.5 INSTALLATION OF VAPOR RETARDERS

- A. Place vapor retarders on **[interior]** **[and]** **[exterior]** side of construction **[indicated on Drawings]**. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.
 - 1. Fasten vapor retarders to wood framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches o.c.
 - 2. Before installing vapor retarders, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
 - 3. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.
- C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.
- D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

END OF SECTION 072100