

**SECTION 07 21 13
THERMAL INSULATION**

SPEC WRITER NOTE: Delete text between
// _____ // not applicable to project.
Edit remaining text to suit project.

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermal insulation.
 - a. Board or block insulation at foundation perimeter.
 - b. Batt or blanket insulation at exterior // framed // and furred // walls.
 - c. Board or block insulation at floor assemblies above unconditioned spaces.
 - d. Board or block insulation at masonry cavity walls.
 - e. Loose fill insulation at exterior hollow masonry walls.
2. Acoustical insulation.
 - a. Semi-rigid insulation at interior framed partitions.
 - b. Batt and blanket insulation at interior framed partitions // and ceilings //.
 - c. Board insulation at interior concrete and masonry partitions.

1.2 RELATED REQUIREMENTS

SPEC WRITER NOTE: Update and retain
references only when specified elsewhere
in this section.

- A. Adhesives VOC Limits: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Insulating Precast Concrete: Section 03 45 00, PRECAST ARCHITECTURAL CONCRETE.
- C. Insulating Concrete Systems: // Section 03 52 00, LIGHTWEIGHT CONCRETE ROOF INSULATION //.
- D. Insulation for Cavity Face of Masonry: Section 04 20 00, UNIT MASONRY.
- E. Loose Fill Insulation for Attic Floors: Section 07 21 23, LOOSE-FILL INSULATION.
- F. Insulation for Insulated Wall Panels: Section 07 40 00, ROOFING AND SIDING PANELS.
- G. Safing Insulation: Section 07 84 00, FIRESTOPPING.

- H. Insulation for Sound Absorptive Pad: Section 09 54 23. LINEAR METAL CEILINGS.
- I. Insulation for Refrigerators and Freezers: Section 11 41 21, WALK-IN COOLERS AND FREEZERS // Section 11 53 23, LABORATORY REFRIGERATORS // Section 11 78 13, MORTUARY REFRIGERATORS //.
- J. Insulation for Prefabricated Metal Buildings: Section 13 34 19, METAL BUILDING SYSTEMS.
- K. Insulation for Piping and Storage Tanks: Section 23 56 00, SOLAR ENERGY HEATING SYSTEM.

1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. ASTM International (ASTM):
 1. C516-08(2013)e1 - Vermiculite Loose Fill Thermal Insulation.
 2. C549-06(2012) - Perlite Loose Fill Insulation.
 3. C552-15 - Cellular Glass Thermal Insulation.
 4. C553-13 - Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 5. C578-15 - Rigid, Cellular Polystyrene Thermal Insulation.
 6. C591-15 - Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
 7. C612-14 - Mineral Fiber Block and Board Thermal Insulation.
 8. C665-12 - Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 9. C728-15 - Perlite Thermal Insulation Board.
 10. C954-15 - Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Base to Steel Studs From 0.033 (0.84 mm) inch to 0.112 inch (2.84 mm) in thickness.
 11. C1002-14 - Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 12. D312/D312M-15 - Asphalt Used in Roofing.
 13. E84-15a - Surface Burning Characteristics of Building Materials.
 14. F1667-15 - Driven Fasteners: Nails, Spikes, and Staples.

1.4 SUBMITTALS

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:

1. Show insulation type, thickness, and R-value for each location.
- C. Manufacturer's Literature and Data:
 1. Description of each product.
 2. Adhesive indicating manufacturer recommendation for each application.
- D. Sustainable Construction Submittals:
 1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
 2. Low Pollutant-Emitting Materials:
 - a. Show volatile organic compound types and quantities.

1.5 DELIVERY

- A. Deliver products in manufacturer's original sealed packaging.
- B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, production run number, and manufacture date.
- C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.6 STORAGE AND HANDLING

- A. Store products indoors in dry, weathertight facility.
- B. Protect products from damage during handling and construction operations.

SPEC WRITER NOTE: Retain UV exposure protection for polystyrene, polyurethane, and polyisocyanurate insulations.

- C. Protect foam plastic insulation from UV exposure.

1.7 WARRANTY

SPEC WRITER NOTE: Always retain construction warranty. FAR includes Contractor's one year labor and material warranty.

- A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

SPEC WRITER NOTE:

1. Determine R-value required, based on U-value used for design by HVAC.
2. Verify R-values, not thicknesses, are shown on drawings. Specify insulations capable of providing R-value within allotted space. Include insulation options when possible.
3. Do not use foam plastic insulation exposed to building interior. Separate insulation from interior with minimum 15 minute thermal barrier. Specify cellular glass block insulation when thermal barrier is not possible.

2.1 INSULATION - GENERAL

A. Insulation Thickness:

1. Provide thickness required by R-value shown on drawings.
2. Provide thickness indicated when R-value is not shown on drawings.

B. Insulation Types:

1. Provide one insulation type for each application.

C. Sustainable Construction Requirements:

SPEC WRITER NOTE: Specify products containing greatest recycled content practicable to maximize material recovery. See EPA Comprehensive Procurement Guidelines (CPG) for guidance about individual products and available recycled content. Section 01 81 13 sets overall project recycled content requirements.

1. Insulation Recycled Content:

- a. Polyisocyanurate/polyurethane rigid foam: 9 percent recovered material.
- b. Polyisocyanurate/polyurethane foam-in-place: 5 percent recovered material.
- c. Glass fiber reinforced: 6 percent recovered material.
- d. Phenolic rigid foam: 5 percent recovered material.
- e. Rock wool material: 75 percent recovered material.

SPEC WRITER NOTE:

1. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS includes

comprehensive product list setting VOC limits for low-emitting materials.
 2. Retain subparagraphs applicable to products specified in this section.

2. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
 - a. Non-Flooring Adhesives and Sealants.

2.2 THERMAL INSULATION

A. Perimeter Insulation In Contact with Soil:

1. Polystyrene Board: ASTM C578, Type IV, V, VI, VII, or IX.
2. Cellular Glass Block: ASTM C552, Type I or IV.

B. Exterior Framing or Furring Insulation:

SPEC WRITER NOTE: Both insulation types are furnished with vapor retarding facing. When vapor retarder is not required, specify Type I, unfaced.

1. Mineral Fiber: ASTM C665, Type II, Class C, Category I where concealed by thermal barrier.
2. Mineral Fiber: ASTM C665, Type III, Class A at other locations.

C. Inside Face of Exterior Wall Insulation:

1. Mineral Fiber Board: ASTM C612, Type IB or II.
2. Perlite Board: ASTM C728.
3. Cellular Glass Block: ASTM C552, Type I.

D. Floor Assemblies Above Unconditioned Spaces:

1. Mineral Fiber Board: ASTM C612, Type IB or Type II.
2. Perlite Board: ASTM C728.
3. Cellular Glass Block: ASTM C552, Type I.

E. Masonry Cavity Wall Insulation:

1. Mineral Fiber Board: ASTM C612, Type II, with vapor retarder facing; maximum permeance 29 ng/Pa/s/sq. m (0.5 perms).
2. Polyurethane or Polyisocyanurate Board: ASTM C591, Type I, with vapor retarder facing; maximum permeance 29 ng/Pa/s/sq. m (0.5 perms).
3. Polystyrene Board: ASTM C578, Type X.
4. Perlite Board: ASTM C728.
5. Cellular Glass Block: ASTM C552, Type I or IV.

F. Masonry Fill Insulation:

1. Vermiculite Insulation: ASTM C516, Type II.
2. Perlite Insulation: ASTM C549, Type IV.

2.3 ACOUSTICAL INSULATION

A. Semi Rigid, Batts and Blankets:

1. Widths and lengths to fit tight against framing.
2. Mineral Fiber boards: ASTM C553, Type II, flexible, or Type III, semi rigid // FSK faced // unfaced //.
 - a. Density: nominal 4.5 pound.
3. Mineral Fiber Batt or Blankets: ASTM C665 // FSK faced // unfaced //.
4. Maximum Surface Burning Characteristics: ASTM E84.
 - a. Flame Spread Rating: 25.
 - b. Smoke Developed Rating: 450.

B. Sound Deadening Board:

1. Mineral Fiber Board: ASTM C612, Type IB.
 - a. Thickness: 13 mm (1/2 inch).
2. Perlite Board: ASTM C728.
 - a. Thickness: 13 mm (1/2 inch).

2.4 ACCESSORIES

A. Fasteners:

1. Staples or Nails: ASTM F1667, zinc-coated, size and type to suit application.
2. Screws: ASTM C954 or ASTM C1002, size and length to suit application with washer minimum 50 mm (2 inches) diameter.
3. Impaling Pins: Steel pins with head minimum 50 mm (2 inches) diameter.
 - a. Length: As required to extend beyond insulation and retain cap washer when washer is placed on pin.
 - b. Adhesive: Type recommended by manufacturer to suit application.

B. Insulation Adhesive:

1. Nonflammable type recommended by insulation manufacturer to suit application.

C. Tape:

1. Pressure sensitive adhesive on one face.

PART 3 - EXECUTION**3.1 PREPARATION**

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.
- C. Clean substrates. Remove contaminants capable of affecting subsequently installed product's performance.

3.2 INSTALLATION - GENERAL

- A. Install products according to manufacturer's instructions and approved submittal drawings.
 - 1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
- B. Install insulation with vapor barrier facing the heated side, unless indicated otherwise.
- C. Install // board // and block // insulation with joints close and flush, in regular courses, and with end joints staggered.

SPEC WRITER NOTE: Include options when
insulation facing act as a vapor
retarder.

- D. Install batt and blanket insulation with joints tight. Fill framing voids completely. Seal // penetrations, terminations, facing joints, // facing cuts, tears, and unlapped joints with tape.
- E. Fit insulation tight against adjoining construction and penetrations, unless indicated otherwise.

3.3 THERMAL INSULATION

- A. Perimeter Insulation In Contact with Soil:
 - 1. Vertical insulation:
 - a. Fill joints of insulation with same material used for bonding.
 - b. Bond polystyrene board to surfaces with adhesive.
 - c. Bond cellular glass insulation to surfaces with hot asphalt or adhesive cement.
 - 2. Horizontal insulation under concrete floor slab:
 - a. Lay insulation boards and blocks horizontally on level, compacted and drained fill.
 - b. Extend insulation from foundation walls towards center of building minimum 600 mm (24 inches).

B. Exterior Framing or Furring Insulation:

1. General:
 - a. Open voids are not acceptable.
 - b. Pack insulation around door frames and windows, in building expansion joints, door soffits, and other voids.
 - c. Pack behind outlets, around pipes, ducts, and services encased in walls.
 - d. Hold insulation in place with pressure sensitive tape.
 - e. Lap facing flanges together over framing for continuous surface. Seal penetrations through insulation and facings.
2. Metal Studs:
 - a. Fasten insulation between metal studs, framing, and furring with pressure sensitive tape continuous along flanged edges.
3. Wood Studs:
 - a. Fasten insulation between wood studs or framing with nails or staples through flanged edges on face of stud.
 - b. Space fastenings maximum 150 mm (six inches) apart.
4. Roof Rafters and Floor Joists:
 - a. Friction fit insulation between framing to provide minimum 50 mm (2 inch) air space between insulation and roof sheathing and subfloor.
5. Ceilings and Soffits:
 - a. Wood Framing:
 - 1) Fasten blanket insulation between wood framing and joists with nails or staples through flanged edges of insulation.
 - 2) Space fastenings maximum 150 mm (6 inches) on center.
 - b. Metal Framing:
 - 1) Fasten insulation between metal framing with pressure sensitive tape continuous along flanged edges.
 - 2) At metal framing and ceilings suspension systems, install insulation above suspended ceilings and metal framing at right angles to main runners and framing.
 - 3) Tape insulation tightly together without gaps. Cover metal framing members with insulation.
 - c. Ceiling Transitions:
 - 1) In areas where suspended ceilings transition to structural ceiling, install blanket or batt insulation.

- 2) Extend insulation from suspended ceiling to underside of structure above.
- 3) Secure blanket and batt with continuous cleats to structure above.

C. Inside Face of Exterior Wall Insulation:

1. Location: On interior face of solid masonry and concrete walls, beams, beam soffits, underside of floors, and to face of studs to support interior wall finish where indicated.
2. Bond insulation to solid vertical surfaces with adhesive. Fill joints with adhesive cement.
3. Fasten board insulation to face of studs with screws, nails or staples. Space fastenings maximum 300 mm (12 inches) on center. Stagger fasteners at board joints. Install fasteners at each corner.

D. Floor Assemblies Above Unconditioned Spaces:

1. Use impaling pins for attach insulation to underside of horizontal surfaces. Space fastenings as required to hold insulation in place and prevent sagging.
 - a. Bond insulation with adhesive when separate vapor retarder is used.

E. Masonry Cavity Wall Insulation:

1. Install insulation on exterior faces of concrete and masonry inner wythes of cavity walls.
2. Bond polystyrene board to surfaces with adhesive.
3. Bond mineral polyurethane or polyisocyanurate board, and perlite board to surfaces with adhesive.
4. Bond cellular glass insulation to surfaces with hot asphalt or adhesive cement.
5. Fill insulation joints with same material used for bonding.

F. Masonry Fill Insulation:

1. Pour fill insulation in masonry unit hollow cores from tops of walls, or from sill where windows or other openings occur.
2. Pour in lifts of maximum 6 m (20 feet).

3.4 ACOUSTICAL INSULATION

A. General:

1. Install insulation without voids.
2. Pack insulation around door frames and windows, in building expansion joints, door soffits, and other voids.

3. Pack behind outlets, around pipes, ducts, and services encased in walls.
4. Hold insulation in place with pressure sensitive tape.
5. Lap facer flanges together over framing for continuous surface. Seal all penetrations through the insulation and facers.
6. Do not compress insulation below required thickness except where embedded items prevent required thickness.

B. Semi Rigid, Batts and Blankets:

1. Semi Rigid Batts and Blankets:

- a. When insulation is not full thickness of cavity, adhere insulation to one side of cavity, maintaining continuity of insulation and covering penetrations or embedments.
- b. Wood Framing:
 - 1) Fasten blanket insulation between wood framing and joists with nails or staples through flanged edges of insulation.
 - 2) Space fastenings maximum 150 mm (6 inches) on center.
- c. Metal Framing:
 - 1) Fasten insulation between metal framing with pressure sensitive tape continuous along flanged edges.
 - 2) At metal framing or ceilings suspension systems, install blanket insulation above suspended ceilings or metal framing at right angles to the main runners or framing.
 - 3) Tape insulation tightly together so no gaps occur and metal framing members are covered by insulation.

C. Sound Deadening Board:

1. Secure // with adhesive to masonry and concrete walls // and // with screws to metal and wood framing //. Secure sufficiently in place until subsequent cover is installed. Seal all cracks with caulking.

3.5 CLEANING

- A. Remove excess adhesive before adhesive sets.

3.6 PROTECTION

- A. Protect insulation from construction operations.
- B. Repair damage.

- - E N D - -