

**SECTION 07 22 00  
ROOF AND DECK INSULATION**

**SPEC WRITER NOTES:**

1. Delete text between // \_\_\_\_\_ // not applicable to project. Edit remaining text to suit project.
2. Follow recommendations of National Roofing Contractors Association Roofing Manual for design criteria.
3. Comply with ASHRAE Standard 90.1.
4. Ensure positive slope to drains occurs; minimum of 1/48 (1/4 inch per foot) without any "gutters" (no slopes) between drains.
5. Do not use on slopes over 1/12 (1 inch per foot) unless text is edited for this.
6. Ensure drains are located at points of maximum deflection; such as at mid-spans and bottom of slopes.
7. This section is intended for use where insulation is under the roofing or waterproofing membrane.
8. Do not use polystyrene insulation under bituminous roofing or waterproofing membrane.
9. Anchor insulation to deck. Do not specify loosely laid insulation.
10. Coordinate with work of Division 26 ELECTRICAL. Do not install electrical conduit in roof insulation.

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
- B. Roof and deck insulation, // substrate board, // vapor retarder, // and // cover board // on new // concrete // metal deck // substrates ready to receive roofing or waterproofing membrane.
- C. Repairs and alteration work to existing roof insulation.

**1.2 RELATED REQUIREMENTS**

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

- A. Non-Flooring Adhesives and Sealants VOC Limits: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Wood Cants, Blocking, and Edge Strips: Section 06 10 00, ROUGH CARPENTRY.

### 1.3 APPLICABLE PUBLICATIONS

- A. Comply with references to extent specified in this section.
- B. American Society of Heating, Refrigeration and Air Conditioning (ASHRAE):
  - 1. Standard 90.1-13 - Energy Standard for Buildings Except Low-Rise Residential Buildings.
- C. ASTM International (ASTM):
  - 1. C208-12 - Cellulosic Fiber Insulating Board.
  - 2. C552-15 - Cellular Glass Thermal Insulation.
  - 3. C726-05 - Mineral Fiber Roof Insulation Board.
  - 4. C728-15 - Perlite Thermal Insulation Board.
  - 5. C1177/C1177M-13 - Glass Mat Gypsum Substrate for Use as Sheathing.
  - 6. C1278/C1278M-07a(2015) - Fiber-Reinforced Gypsum Panel.
  - 7. C1289-15 - Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
  - 8. C1396/C1396M-14a - Gypsum Board.
  - 9. D41/D41M-11 - Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
  - 10. D312-06 - Asphalt Used in Roofing.
  - 11. D1970/D1970M-15 - Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
  - 12. D2178/D2178M-15 - Asphalt Glass Felt Used in Roofing and Waterproofing.
  - 13. D2822/D2822M-11 - Asphalt Roof Cement, Asbestos Containing.
  - 14. D4586/D4586M-07(2012)e1 - Asphalt Roof Cement, Asbestos-Free.
  - 15. E84-15a - Surface Burning Characteristics of Building Materials.
  - 16. F1667-15 - Driven Fasteners: Nails, Spikes, and Staples.
- D. National Roofing Contractors Association (NRCA):
  - 1. Manual-15 - The NRCA Roofing Manual: Membrane Roof Systems.
- E. U.S. Department of Agriculture (USDA):
  - 1. USDA BioPreferred Program Catalog.
- F. UL LLC (UL):
  - 1. Listed - Online Certifications Directory.
- G. U.S. Department of Commerce National Institute of Standards and Technology (NIST):
  - 1. DOC PS 1-09 - Structural Plywood.
  - 2. DOC PS 2-04 - Performance Standard for Wood-Based Structural-Use Panels.

**1.4 SUBMITTALS**

- A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Submittal Drawings:
  - 1. Show size, configuration, and installation details.
    - a. Nailers, cants, and terminations.
    - b. Layout of insulation showing slopes, tapers, penetrations, and edge conditions.
- C. Manufacturer's Literature and Data:
  - 1. Description of each product.
- D. Samples:
  - 1. Roof insulation, each type.
  - 2. Fasteners, each type.
- E. Sustainable Construction Submittals:

SPEC WRITER NOTE: Retain sustainable construction submittals appropriate to product.

- 1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
- 2. Biobased Content:
  - a. Show type and quantity for each product.
- 3. Low Pollutant-Emitting Materials:
  - a. Show volatile organic compound types and quantities.
  - b. Certify each // composite wood // and agrifiber // product contain no added urea formaldehyde.
- F. Qualifications: Substantiate qualifications meet specifications.
  - 1. Installer.

**1.5 QUALITY ASSURANCE**

- A. Installer Qualifications: Same installer as Division 07 roofing section installer.

**1.6 DELIVERY**

- A. Comply with recommendations of NRCA Manual.
- B. Deliver products in manufacturer's original sealed packaging.
- C. Mark packaging, legibly. Indicate manufacturer's name or brand, type, and manufacture date.
- D. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

**1.7 STORAGE AND HANDLING**

- A. Comply with recommendations of NRCA Manual.
- B. Store products indoors in dry, weathertight facility.
- C. Protect products from damage during handling and construction operations.

**1.8 FIELD CONDITIONS**

- A. Environment:
  - 1. Install products when existing and forecasted weather permit installation according to manufacturer's instructions.

**1.9 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."
- B. Manufacturer's Warranty: Warrant substrate board, vapor retarder, insulation, and cover board against material and manufacturing defects as part of Division 07 roofing system warranty.

**PART 2 - PRODUCTS**

**2.1 SYSTEM PERFORMANCE**

- A. Insulation Thermal Performance:
  - 1. Overall Average R-Value: RSI-57 (R-33), minimum.
  - 2. Any Location R-Value: RSI-17 (R-10), minimum.
- B. Fire and Wind Uplift Resistance: Provide roof insulation complying with requirements specified in Division 07 roofing section.

SPEC WRITER NOTE: Retain surface burning characteristics when insulation is installed over combustible and steel roof decks.

- C. Insulation on // Combustible // Metal // Decking: UL labeled indicating compliance with one of the following:
  - 1. UL Listed.
  - 2. Insulation Surface Burning Characteristics: When tested according to ASTM E84.
    - a. Flame Spread Rating: 75 maximum.

- b. Smoke Developed Rating: 150 maximum.

**2.2 PRODUCTS - GENERAL**

- A. Provide each product from one manufacturer.
- B. 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:

SPEC WRITER NOTE: Retain one or more of insulation types below based on project requirements.

- a. Mineral Fiber: 75 percent total recycled content, minimum.
- b. Fiberglass: 20 percent total recycled content, minimum.
- c. Cellulose: 75 percent post-consumer recycled content, minimum.
- d. Perlite Composite Board: 23 percent post-consumer recycled content, minimum.
- e. Rigid Foam: 9 percent total recycled content, minimum.
- f. Glass Fiber Reinforced Rigid Foam: 6 percent total recycled content, minimum.

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.
  - b. Composite wood and agrifiber.

SPEC WRITER NOTES:  
1. Retain paragraph below when it is appropriate to incorporate Federal

Guiding Principles IV from Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings incorporated in Executive Order 13423 "Strengthening Federal Environmental, Energy, and Transportation Management, dated January 24, 2007, [www.ofee.gov/eo/eo13423\\_main.asp](http://www.ofee.gov/eo/eo13423_main.asp): Enhance Indoor Environmental Quality: Biobased Content Requirement. Requirement differs from related requirements in LEED definitions.

2. Project's General Requirements should indicate goals for percentages of bio-based, rapidly-renewable, and certified sustainable wood products.

3. Bio-Based Materials: Where applicable, provide products designated by USDA and meeting or exceeding USDA recommendations for bio-based content, and products meeting Rapidly Renewable Materials and certified sustainable wood content definitions; refer to [www.biopreferred.gov](http://www.biopreferred.gov).

### **2.3 ADHESIVES**

- A. Primer: ASTM D41/D41M.
- B. Asphalt: ASTM D312, Type III or IV for vapor retarders and insulation.
- C. Modified Asphaltic Insulation Adhesive: Insulation manufacturer's recommended modified asphaltic, asbestos-free, cold-applied adhesive formulated to adhere roof insulation to substrate or to another insulation layer.
- D. Bead-Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended bead-applied, low-rise, one- or multicomponent urethane adhesive formulated to adhere roof insulation to substrate or to another insulation layer.
- E. Full-Spread Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component urethane adhesive formulated to adhere roof insulation to substrate or to another insulation layer.
- F. Roof Cement: Asbestos free, ASTM D2822/D2822M, Type I or Type II; or, ASTM D4586/D4586M, Type I or Type II.

### **2.4 ROOF AND DECK INSULATION**

- A. Roof and Deck Insulation, General: Preformed roof insulation boards approved by roofing manufacturer.

SPEC WRITER NOTE: Retain one or more of insulation types below based on project requirements. If retaining more than one type, indicate locations of different types on drawings.

- B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, faced with glass fiber reinforced cellulosic felt facers on both major surfaces of the core foam.
- C. Cellular Glass Board Insulation: ASTM C552, Type IV, kraft-paper sheet faced.
- D. Perlite Board Insulation: ASTM C728, expanded perlite particles, selected binders, and cellulosic fibers with surface treated to reduce bitumen absorption.
- E. Cellulosic Fiber Board Insulation: ASTM C208, Type II, // Grade 1 for built-up asphalt or modified bitumen roofing // Grade 2 for single-ply roofing //.
- F. Tapered Roof Insulation System:
  - 1. Fabricate of mineral fiberboard, polyisocyanurate, perlite board, or cellular glass. Use only one insulation material for tapered sections. Use only factory-tapered insulation.
  - 2. Cut to provide high and low points with crickets and slopes as shown.
  - 3. Minimum thickness of tapered sections; 38 mm (1-1/2 inch).
  - 4. Minimum slope 1/48 (1/4 inch per 12 inches).

SPEC WRITER NOTE: Specify Composite Nail Base Insulated Roof Sheathing for steep slope roof installations such as shingle, slate, tile, or metal.

- G. Composite Nail Base Insulated Roof Sheathing:
  - 1. Oriented-Strand-Board-Surfaced, Polyisocyanurate-Foam Sheathing: Polyisocyanurate thermal insulation ASTM C1289, Type V, insulation thickness as shown, with oriented strand board laminated to top surface.
  - 2. Oriented Strand Board: NIST DOC PS 1, Exposure 1, // 11 mm (7/16 inch) // 16 mm (5/8 inch) // thick.
  - 3. Bottom surface faced with felt facers.

## 2.5 INSULATION ACCESSORIES

- A. Glass (Felt): ASTM D2178/D2178M, Type VI, heavy duty ply sheet.

## B. Cants and Tapered Edge Strips:

SPEC WRITER NOTE: Retain first paragraph below for roofing systems requiring wood cant strips at roof perimeter and major openings.

1. Wood Cant Strips: Refer to Section 06 10 00, ROUGH CARPENTRY.
2. Insulation Cant Strips: ASTM C208, Type II, Grade 1, cellulosic-fiber insulation board.
3. Tapered Edge Strips: 1/12 (1 inch per 12 inches), from 0 mm (0 inches), 300 mm to 450 mm (12 inches to 18 inches) wide.
  - a. Cellulosic Fiberboard: ASTM C208.
  - b. Mineral Fiberboard: ASTM C726.
  - c. Perlite Board: ASTM C728.

## C. Vapor Retarder:

1. Glass-Fiber Felts: ASTM D2178/D2178M, Type IV, asphalt impregnated.
2. Self-Adhering Sheet Vapor Retarder: ASTM D1970/D1970M, minimum 1.0 mm (40 mils) thick membrane of HDPE film fully coated with asphalt adhesive, or 0.76 to 1.0 mm (30 to 40 mils) thick membrane of butyl rubber based adhesive backed by a layer of high density cross-laminated polyethylene; maximum permeance rating of 6 ng/Pa/s/sq. m (0.1 perms).

## D. Substrate Board:

SPEC WRITER NOTE: Select one or more paragraphs below for roofing systems requiring support for vapor retarder over steel deck, or where specific substrate board is required by specified fire-resistance-rated roof assembly design.

1. Gypsum Board: ASTM C1396/C1396M, 16 mm (5/8 inch) thick, Type X.
2. Glass-Mat, Water-Resistant Gypsum Roof Board: ASTM C1177/C1177M, // 13 mm (1/2 inch) // Type X, 16 mm (5/8 inch) // thick, factory primed.
3. Cellulosic-Fiber-Reinforced, Water-Resistant Gypsum Roof Board: ASTM C1278/C1278M, // 6 mm (1/4 inch) // 10 mm (3/8 inch) // 13 mm (1/2 inch) // 16 mm (5/8 inch) // thick.
4. Perlite Board Insulation: ASTM C728, // 19 mm (3/4 inch) // 25 mm (1 inch) //.

## E. Cover Board:

SPEC WRITER NOTE: Typically retain one paragraph from four below for VA roofing systems. Cover board is required under single-ply membranes installed over plastic foam insulation board based upon NRCA recommendations.

1. Glass-Mat, Water-Resistant Gypsum Roof Board: ASTM C1177/C1177M, // 6 mm (1/4 inch) // 13 mm (1/2 inch) // 16 mm (5/8 inch) // thick, factory primed.
2. Cellulosic-Fiber-Reinforced, Water-Resistant Gypsum Roof Board: ASTM C1278/C1278M, // 6 mm (1/4 inch) // 10 mm (3/8 inch) // 13 mm (1/2 inch) // 16 mm (5/8 inch) // thick.
3. Cellulosic-Fiber Insulation Board: ASTM C208, Type II, Grade 2, 13 mm (1/2 inch) thick.
4. Oriented Strand Board: DOC PS 2, Exposure 1, 11 mm (7/16 inch) thick.

## **2.6 ACCESSORIES**

- A. Fasteners: Corrosion-resistant carbon steel fasteners and galvalume-coated steel or plastic round plates for fastening substrate board and insulation to roof deck.
- B. Nails: ASTM F1667; type to suit application.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Comply with requirements of Division 07 roofing section.

### **3.2 PREPARATION**

- A. Examine and verify substrate suitability for product installation.
- B. Protect existing construction and completed work from damage.

### **3.3 INSTALLATION - GENERAL**

- A. Install products according to manufacturer's instructions.
  1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
- B. Comply with requirements of UL for insulated steel roof deck.
- C. Attach substrate board and other products to meet requirements of Division 07 roofing section.

### 3.4 SUBSTRATE BOARD INSTALLATION

SPEC WRITER NOTES:

1. The National Roofing Contractors Association recommends substrate board be installed over steel deck. Use substrate board over steel deck on all VA new construction.
2. Use substrate board over steel deck to provide continuous support for vapor retarder where required.

- A. Fasten substrate board to top flanges of steel decking to resist uplift pressures according requirements for specified roofing system.
  1. Locate the long dimension edge joints solidly bearing on top of decking ribs.

### 3.5 VAPOR RETARDER INSTALLATION

SPEC WRITER NOTES:

1. Review requirement for vapor retarders for use over decks to receive insulation for heated buildings where the January average means temperature is below 4.5 degrees C (40 degrees F), the relative humidity is 45 percent or greater. Vapor retarders should typically be considered for heated portions of buildings where a high humidity condition is expected such as a kitchen, indoor swimming pool, or laundry.
2. Follow NRCA procedures for determining if vapor retarders are required, including venting, and ASHRAE for calculations; however, under conditions of extreme humidity and cold weather conditions, a vapor retarder is required and water vapor transmission analysis is required. Ensure that the vapor retarder is shown at all locations where required on the Drawings.

- A. Vapor Retarder Installation, General:
  1. Install continuous vapor retarder on roof decks where indicated.
  2. At vertical surfaces, turn up vapor retarder to top of insulation or base flashing.
  3. Seal penetrations through vapor retarder with roof cement to prevent moisture entry from below.
- B. Cast in Place Concrete Decks, Except Insulating Concrete:
  1. Prime deck as specified.

2. Apply two plies of asphalt saturated felt mopped down to deck.

C. Precast Concrete Unit Decks Without Concrete Topping:

1. Prime deck as specified.
2. Apply two plies of asphalt saturated felt.
3. Mop to deck, keeping bitumen 100 mm (4 inches) away from joints of precast units. Bridge joints with felt. Mop between plies as specified.

### 3.6 INSULATION INSTALLATION

SPEC WRITER NOTES:

1. Calculate dew point location to determine amount of insulation required over vapor retarder, if any. Ensure dew point occurs within insulation thickness to prevent condensation occurring on interior surface of vapor retarder.
2. Ensure that the total insulation thickness will span flutes in metal deck.
3. Specify R value for each layer of insulation to avoid ambiguities.
4. Indicate types of insulation required when more than one type is needed due to roofing system designs. Edit Part 2 PRODUCTS to correspond to acceptable insulation types.
5. Use two layers, except on steel decks used for canopies or unheated structures.
6. Mechanical fasteners shall not extend through both layers of insulation over heated spaces.
7. Comply with International Building Code requirements for use of plastic insulation.
8. Use cellular glass or mineral fiber board for tapered edge strips at gravel stop in facilities with raised edges.
9. For tapered insulation systems, use minimum thickness at roof drains of 38 mm (1-1/2 inch).
10. Use crickets to eliminate "gutters" in roof slopes. Do not allow "flat areas" where ponding will occur. Provide dishes at drains, 13 mm (1/2 inch) deep. Coordinate with drawing details.
11. Use cellular glass board for plaza at promenade decks.

A. Insulation Installation, General:

SPEC WRITER NOTE: Base sheet is not required for all insulation. Confirm the

requirement to include it according to the roofing system.

1. Base Sheet: Where required by roofing system, install one lapped base sheet specified in Division 07 roofing section by mechanically fastening to roofing substrate before installation of insulation.

SPEC WRITER NOTE: Coordinate cant strip requirement with roof systems referencing this section.

2. Cant Strips: Install // preformed insulation cant strips // wood cant strips specified in Section 06 10 00 ROUGH CARPENTRY // at junctures of roofing system with vertical construction.

SPEC WRITER NOTE: Retain paragraph below for re-roofing projects.

3. Use same insulation as existing for roof repair and alterations unless specified otherwise.

B. Insulation Thickness:

1. Thickness of roof insulation shown on drawings is nominal. Provide thickness required to comply with specified thermal performance.

SPEC WRITER NOTE: Verify sufficient R-Value occurs over vapor retarder to prevent condensation, especially over insulating concrete decks.

2. Insulation on Metal Decks: Provide insulation in minimum thickness recommended by insulation manufacturer to span deck flutes. Support edges of insulation on metal deck ribs.
3. When actual insulation thickness differs from drawings, coordinate alignment and location of roof drains, flashing, gravel stops, fascias and similar items.

SPEC WRITER NOTE: Ensure that roof slopes high and low points are shown on the roof plan, including crickets. Do not have "gutters" or level areas between drains. Ensure that drains are located at low points. Ensure that correct geometry is shown for slope.

4. Where tapered insulation is used, maintain insulation thickness at high points and roof edges shown on drawings.
  - a. Low Point Thickness: Minimum 38 mm (1-1/2 inches).

5. Use minimum two layers of insulation when required thickness is 68 mm (2.7 inch) or greater.
- C. Lay insulating units with close joints, in regular courses and with end joints staggered.
  1. Stagger joints between layers minimum 150 mm (6 inches).
- D. Lay units with long dimension perpendicular to the rolled (longitudinal) direction of the roofing felt.
- E. Seal cut edges at penetrations and at edges against blocking with bitumen or roof cement.

SPEC WRITER NOTE: Insulation is required to be mechanically anchored to steel decks. Delete non applicable text. Refer to Division 07 roofing section requirements for resistance to wind storm uplift. Design for wind conditions of area where building is constructed.

- F. Cut to fit tightly against blocking or penetrations.
- G. Cover all insulation installed on the same day; comply with temporary protection requirements of Division 07 roofing section.
- H. Installation Method:
  1. Adhered Insulation:
    - a. Prime substrate as required.
    - b. Set each layer of insulation firmly in solid mopping of hot asphalt.
    - c. Set each layer of insulation firmly in ribbons of bead-applied insulation adhesive.
    - d. Set each layer of insulation firmly in uniform application of full-spread insulation adhesive.
  2. Mechanically Fastened Insulation:
    - a. Fasten insulation according to requirements in Division 07 roofing section.
    - b. Fasten insulation to resist uplift pressures specified in Division 07 roofing section.
  3. Mechanically Fastened and Adhered Insulation:
    - a. Fasten first layer of insulation according to "Mechanically Fastened Insulation" requirements.
    - b. Fasten each subsequent layer of insulation according to "Adhered Insulation" requirements.

**3.7 COVER BOARD INSTALLATION**

- A. Install cover boards over insulation with long joints in continuous straight lines with staggered end joints.
- B. Offset cover board joints from insulation joints 150 mm (6 inches), minimum.

SPEC WRITER NOTE: Do not mechanically  
fasten cover board under singly ply  
membranes to avoid potential excessive  
wear and puncture of membrane at exposed  
cover board fasteners.

- C. Secure cover boards according to // "Adhered Insulation" //  
"Mechanically Fastened Insulation" // requirements.

- - E N D - -