

SECTION 03 52 00 LIGHTWEIGHT CONCRETE ROOF INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION

Section specifies insulating concrete placed on a prepared structural deck.

1.2 RELATED WORK

B. Roof decks: Section 03 51 16, GYPSUM CONCRETE ROOF DECKS.

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

B. Manufacturer's Literature and Data:

1. Description of material.
2. Specifications for mixing, placing, curing and protection of insulating concrete.
3. Interstitial deck: Test specimens reports.

C. Certificates: Aggregate or foam manufacturer's written certification that applicator has equipment and training to provide a satisfactory installation.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact.

B. Store in dry and watertight facilities. Do not store materials on ground.

1.5 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to extent referenced.

Publications are referenced in text by basic designation only.

B. American Concrete Institute (ACI):

- 305R-10 Hot Weather Concreting
306R-10 Cold Weather Concreting
308R-01(R2008)..... Curing Concrete
523.1R-06 Guide for Cast-in-Place Low-Density Concrete

C. American Society for Testing and Materials (ASTM):

- A82-07..... Steel Wire, Plain, for Concrete Reinforcement
A185-07..... Steel Welded Wire Fabric, Plain, for Concrete
Reinforcement

C150-09	Portland Cement
C260-10	Air-Entraining Admixtures for Concrete
C309-07	Liquid Membrane Forming Compounds for Curing Concrete
C332-09	Lightweight Aggregates for Insulating Concrete
C495-07	Compressive Strength of Lightweight Insulating Concrete
C578-10	Rigid Cellular Polystyrene Thermal Insulation
C665-06	Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
C796-04	Foaming Agents For Use in Producing Cellular Concrete Using Preformed Foam
C869-91(R2006).....	Foaming Agents Used in Making Preformed Foam for Cellular Concrete

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Portland cement: ASTM C150, Type I or Type III.
- B. Lightweight Aggregate: Vermiculite or Perlite conforming to ASTM C332, Group I.
- C. Foaming Agent: ASTM C869.
- D. Air-Entrainment Agent:
 - 1. ASTM C260 type recommended by the aggregate manufacturer.
 - 2. Admixtures with chloride salts or regenerated foam types not acceptable.
- E. Water: Clean and potable, free from impurities detrimental to the concrete.
- F. Insulation and Control Joint Filler:
 - 1. Control Joint Filler: Glass fiber or similar vapor permeable highly compressible material which will compress to one-half its thickness under a load of 172 kPa (25 psi) or less.
 - 2. Insulation: ASTM C665, unfaced for relief vents.
 - 3. Insulation Board:
 - a. Polystyrene: ASTM C578, Type I.
 - b. Board with evenly distributed holes or slots for bonding; approximately 3 percent open area.
- G. Wire Mesh Reinforcing

1. Hexagonal Mesh: Fabricated of ASTM A82, galvanized steel wire 0.9 mm (0.0359-inch) diameter twisted to form 50 mm (2-inch) hexagons with W0.5 galvanized steel wire woven into mesh spaced 200 mm (18-inches) apart.
2. Welded wire fabric: ASTM A185, 102 x 204 mm (4 by 8-inches) - W1.2/W05 - or 50 x 50 mm (2 by 2-inches) - W05/W0.5.

H. Admixtures:

1. Air Entraining: ASTM C260, Type recommended by the aggregate manufacturer. Admixtures with chloride salts or pregenerated foam types are not acceptable for vermiculite or perlite concrete.
2. Accelerating, Retarding, and Water Reducing: ASTM C494, Type as recommended by insulating concrete manufacturer.

- I. Concrete Sealer: ASTM C309, Type 2, white, pigmented, curing, sealing, hardening and dustproofing concrete, and compatible with latex paint or acrylic paint, not acting as a bond breaker for the paint.

2.2 MIXES AND MIXING

Roof Deck

- A. Mix insulating concrete in accordance with ACI 523.1R or manufacturer's printed specifications where more demanding.
- B. Place in accordance with chapter 5 of ACI 523.1R, or manufacturer's specifications where more demanding.
1. Cold Weather Concreting: ACI 306R and ACI 523.1R. Remove and replace frozen concrete.
 2. Hot Weather Concreting ACI 305R.
 3. Place insulating concrete to not less than 90 mm (3-1/2 inches) over the top of the steel deck crests.
 4. Smooth the placed material to a uniform finish following the screeding operation.
 5. Free surface of loose material, finish smooth to receive sealer.
- C. Design Mix:
1. Compressive strength: Minimum 862 kPa (125 psi) when tested in accordance with ASTM C495 except do not oven dry cellular concrete samples.
 2. Dry density: Maximum 450 Kg/cubic meter (28 pcf).
- D. Vermiculite or Perlite aggregate mix.

1. Mix proportions as recommended by aggregate manufacturer for specified strength and density.
 2. Approximate proportions:
 - a. Ratio of 0.17 cubic meter (6 cubic feet) of aggregate to 42 Kg (94 pounds) of Portland cement.
 - b. Air entraining agent approximately 8 Kg (0.11 pound) per 95 L (25 gallons) of water.
 - c. Slump approximately 70 mm (2.7 inches).
 - d. Water to assure uniform and consistent mix.
- E. Cellular concrete mix:
1. Mix proportions as recommended by foam manufacture for specified strength and cast density.
 2. Preformed foam concentrate diluted at approximately 40 parts water to one part concentrate.

Interstitial Deck

- A. Compressive Strength:
Minimum 1550 kPa (225 psi). Test in accordance with ASTM C495.
- B. Dry density when tested in accordance with ASTM C495.
600Kg/m³ (36 pcf).
450Kg/m³ (28 pcf).
- C. Vermiculite or Perlite aggregate mix.
1. Mix proportions as recommended by aggregate manufacturer for specified strength and density.
 2. Approximate proportions: Ratio of 0.12 m³ (4 cubic feet) of aggregate to 42 Kg (94 pounds) of Portland cement with air entraining agent.
- D. Cellular concrete mix:
UL design No.P902 for cellular concrete.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Clean deck of debris, oil, and other contaminants that will prevent bond.
- B. Do not start until curbs, sleeves, edge venting, or other penetration forms are completed.

3.2 PLACING INSULATING CONCRETE

- A. Place in accordance with ACI 523.1R or manufacturer's specifications where more demanding.
- B. Cold Weather Concreting: ACI 306R.
Remove and replace frozen concrete.
- C. Hot Weather Concreting: ACI 305R.
- D. Place reinforcement as required for fire rating and for seismic areas.
 - 1. Lap the edges of the reinforcement 150 mm (6-inches) and the ends 150 mm (6-inches).
 - 2. Locate at midheight of insulating concrete.
 - 3. Place reinforcement without attachment approximately 13mm (1/2 inch) above steel deck crests in insulating concrete.
- E. Place for thickness and profiles shown.
- F. Place concrete not less than 50 mm (2-inches), or more than 200 mm (8-inches) in thickness.
- G. Slope insulating concrete uniformly, 1 in 50 (1/4-inch per foot) minimum, to drains or scuppers.
- H. Depressions that create ponding are not acceptable.
- I. Leave surface free of loose material and finish to receive roofing material specified.
- J. Roof relief Vents for Vermiculite or Perlite Concrete:
 - 1. Under roof relief vents, remove insulating concrete to structural deck and fill with ASTM C665 insulating material.
 - 2. Coordinate with roofing and sheet metal work to space vents minimum 152 mm (6-inches) in diameter, a maximum distance of 9 m (30 feet) from adjacent vent and from vented edge.
- K. Control Joints For Perlite Concrete:
 - 1. Install minimum 25 mm (1-inch) wide control joint through thickness of perlite concrete around perimeter of roof deck and at junction of roof penetrations.
 - 2. Fill control joints with control joint filler specified.

3.4 CURING, PROTECTION AND TESTING

- A. Roof Deck: Cure in accordance with ACI 308R, or manufacturer's specification where more demanding.
- B. Interstitial Deck: Cure in accordance with ACI 523.1R or manufacturer's specification where more demanding.

- C. Interstitial Deck: After curing for not less than 30 days, for vermiculite and perlite concrete, apply one coat of sealer at approximate rate of 3m²/litre (125 square feet per gallon to insulating concrete in accordance with sealer manufacturer's specification.
- D. Do not permit traffic on insulating concrete for 72 hours after placing.

END OF SECTION 03 52 00