

SECTION: 03 52 16
CELLULAR LIGHTWEIGHT CELLULAR INSULATING CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including all General and Supplementary Conditions apply to this section.

1.2 SUMMARY

- A. This section includes cast-in-place cellular lightweight insulating concrete for roof decks.
- B. Related Sections include:
 - 1. Metal Decking, Division [05000]
 - 2. Rough Carpentry, Wood blocking and curbs, Division [06000]
 - 3. Roof Membrane, Division [07000]

1.3 DEFINITIONS

- A. Cellular Lightweight Insulating Concrete: Low-density concrete produced using preformed foam.

1.4 REFERENCES

- A. ASTM C 150, Standard Specification for Portland Cement.
- B. ASTM C 138, Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
- C. ASTM C 172, Standard Practice for Sampling Freshly Mixed Concrete.
- D. ASTM E 329, Standard Specification for Agencies Engaged in Construction Inspection, Testing or Special Inspection.
- E. ASTM C 495, Standard Test Method for Compressive Strength of Lightweight Insulating Concrete.
- F. ASTM C 796, Standard Test Method for Foaming Agents for use in Producing Cellular Concrete Using Preformed Foam.
- G. ASTM C 869, Standard Specification for Foaming Agents Used in Making Preformed Foam for Cellular Concrete.
- H. ASTM C 578, Standard Specification for Rigid Cellular Polystyrene Thermal Insulation.
- I. ASTM C 177, Standard Test Method for Steady State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus.

- J. ASTM C 518, Standard Test Method for Steady State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- K. ASTM C 513, Standard Test Method for Obtaining and Testing Specimens of Hardened Lightweight Insulating Concrete for Compressive Strength.
- L. ASTM C 1077, Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation.

1.5 SUBMITTALS

- A. Product data for the cellular lightweight insulating concrete and the polystyrene insulating board indicating compliance with all applicable Approvals, Standards and required physical property values.
- B. Florida Product Approval Number, 2014 Code Version, including HVHZ Approval.
- C. Miami Dade County, Notice of Product Acceptance - NOA
- D. Shop drawings indicating polystyrene insulation layout and thicknesses, slope and drain locations, high and low point thickness from atop the structural deck.
- E. Applicator shall be a firm Approved in writing by the foam concentrate Manufacturer. The Manufacturer provided Approval letter shall mention the project by name.
- F. Certificates from manufacturers certifying that each of the following materials comply with referenced standards:
 - 1. Portland Cement
 - 2. Foaming Agent
 - 3. Admixtures
 - 4. Polystyrene (EPS) Holey Board Insulation

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualification: An independent testing agency shall be qualified in accordance with ASTM C 1077 and ASTM E 329 for testing indicated.
- B. FM Global Approval: provide cellular lightweight insulating concrete that has been evaluated by FM Approvals as part of a roof assembly and is listed in the FM RoofNav data base for Class 1 and non-combustible construction.
- C. UL Fire Resistance Ratings: where indicated, provide cellular lightweight insulating concrete identical to those assemblies tested for fire resistance per ASTM E 119 and listed in UL's Fire Resistance Directory. The cellular lightweight insulating concrete shall be UL Classified and listed in the current UL Fire Resistant Design Directory under Category COXX, Floor and Roof Topping Mixtures.

1.7 DELIVERY AND STORAGE

- A. Deliver materials unopened in the manufacturers original packaging or by acceptable bulk delivery.
- B. Materials shall be identifiable by manufacturers labeling.
- C. Where applicable materials shall bear the following Approval Marks:
 - 1. Underwriters Laboratories - UL
 - 2. Factory Mutual - FM
 - 3. Miami-Dade County - NOA

1.8 PROJECT CONDITIONS

- A. When air temperatures 40°F or above are predicted to occur within the first 24 hours after placement, normal application shall apply.
- B. When air temperatures are 40°F and are predicted to fall to freezing within 24 hours of placement, the placement shall be postponed.
- C. Do not place when air temperatures are 32°F or below.
- D. Do not place during precipitation, or when there is a likely expectation that precipitation will occur. Do not place upon surfaces covered with water, frost, ice or snow.

1.9 WARRANTY / GUARANTEE

- A. Upon successful completion of the project, after all post installations have been completed, furnish the Owner a roof deck system manufacturer's warranty. The warranty shall be a term type and shall be issued to the Owner at no additional cost. Specific items covered under the warranty shall include:
 - 1. The actual resistance to heat flow through the roof insulation will be at least 80% of the designed thermal resistance, provided the insulation is dry and the roof membrane is free of leaks.
 - 2. The roof insulation will remain in a re-roof able condition should the roof membrane require replacement during the original term of the warranty (excluding damage caused by fastener withdrawal during the removal of the roof cover).
 - 3. The roof insulation will not cause structural damage to the building as a result of expansion from thermal or chemical reaction.
 - 4. The roof insulation will not cause the roof membrane to leak as a result of vapor pressure build-up from batching (mixing) water used to produce the insulating concrete.
 - 5. The roof insulation warranty period shall be [value] years from the date of substantial completion.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

- A. Manufacturers whose products are listed and meet or exceed the requirements of this specification are approved for use.
- B. Basis of Design: Celcore Incorporated, www.celcoreinc.com.
- C. Manufacturer's listed below may be considered, subject to compliance with the specification:
 - 1. [manufacturer], [website]

2.2 MATERIALS

- A. Cement: portland type I, I/II meeting ASTM C150
- B. Water: shall be clean, potable, free from injurious quantities of acid, alkali, salt, oil, organic matter and other impurities. The maximum permissible chloride level is 250 ppm.
- C. Foaming Agent: meeting ASTM C 869 when tested in accordance with ASTM C 796. Foam concentrate shall be labeled bearing FM, UL and Miami-Dade Approval Marks.
- D. Admixtures: admixtures shall not be used unless approved in writing by the Foam Manufacturer.
- E. Insulating Board: shall be a product of expanded polystyrene meeting ASTM C 578, Type I, 1 lb/ft³ nominal density with keying holes comprising approximately 3% of the gross surface area. Approved manufacturers include:
 - 1. Carpenter Company www.carpenter.com
 - 2. Cellofoam North America www.cellofoam.com
 - 3. Dyplast Products, LLC www.dyplastproducts.com
 - 4. Insulfoam www.insulfoam.com
 - 5. StarRFoam www.starrfoam.com
 - 6. ThermaFoam, LLC www.thermafoam.com
- F. Curing Compound: as required by the insulating concrete manufacturer and applied in accordance with the manufacturers instructions.

2.3 CELLULAR INSULATING CONCRETE

- A. Mix materials in strict accordance with recommendations of the foam manufacturer to yield the proper physical properties. Use the minimum amount of mix water required to produce concrete having good placement and working properties.
- B. Mix and pump the cellular lightweight insulating concrete into place using a batch plant approved by the foam manufacturer. Thoroughly blend all materials before discharging the mixer.

- C. Wet cast density: [38 - 42] lbs/ft³ (+/- 3 lbs/ft³) at the point of placement when sampled in accordance ASTM C 172 except as modified by the applicable sections of ASTM C 495. End of hose wet density shall be determined in accordance ASTM C 138. Do not rod or vibrate sample.
- D. Oven dry density: 26 - 36 lbs/ft³ when tested at 28 days in accordance with the applicable sections of ASTM C 495.
- E. The cellular insulating concrete shall have a minimum 28 day compressive strength of [200 - 350+] psi when tested in accordance with ASTM C 495.
- F. The insulating concrete deck shall be designed to provide an [minimum or average] R-value of: R = [value]

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Structural Concrete Deck: verify that the surface of the structural concrete deck to receive the cellular insulating concrete is free from any materials, debris, standing water, other coverings and/or substances that may prevent bond.
- B. Steel Deck: examine the decking for inadequate anchorage, foreign materials, debris, unevenness, moisture or any applied substances that would prevent proper application or adequate bond. Report inadequacies for correction.

3.2 PREPARATION

- A. Cover and protect all equipment, stands, curbs, drains, etc., prior to beginning placement of the cellular insulating concrete.
- B. Protect all elements that interface with or are beneath the insulating concrete placement from application damage or disfigurement.

3.3 INSTALLATION

- A. Place a slurry layer of cellular concrete to a minimum thickness of 1/8 inch over top of the steel deck corrugations or structural concrete deck. Slurry layer shall be full and without voids.
- B. Immediately place the EPS holey board insulation into the fresh cellular concrete layer in an manner which causes the boards underside to make full contact with the concrete. Cellular concrete shall be caused to enter into the keying holes of the board. The insulation board shall be placed in a brick like pattern of staggered joints butted together.
- C. When required, install the EPS holey board in a stepped configuration with maximum steps of 1 inch.
- D. The installed EPS holey board layer shall be allowed to set overnight, undisturbed, prior to receiving topping.

- F. Place a minimum 2 inch thick topping layer of cellular insulating concrete above the insulation board. Screed and hand finish the placement to a smooth surface.
- G. Apply curing compound to the surface of the deck after topping placement, once the layer has hardened sufficiently to receive foot traffic without causing damage. Curing shall be applied at a rate and in a manner recommended by the foam manufacturer.

3.4 FIELD QUALITY CONTROL

- A. End-of-hose wet density checks shall be taken every thirty minutes during placement. Density information shall be recorded by the placement foreman and kept as a written project record. Sampling shall be done in accordance ASTM C 172 except as modified by the applicable sections of ASTM C 495.
- B. Cylindrical test specimen shall be cast during each days placement or at every 5000 sq/ft of placement. Specimens shall be cast in accordance with the applicable sections of ASTM C 495. Do not rod. A set of test specimens shall be considered (6) 3 x 6 cylinders. (4) specimens of each set shall be tested for compressive strength and (2) shall be for oven-dry density determination. Testing shall be conducted at age 28 days in accordance with ASTM C 495.
- C. Retesting for compressive strength and oven dry density, if required, shall be done in accordance with ASTM C 513.

3.5 PROTECTION

- A. The installed cellular insulating concrete roof deck shall be protected from work traffic for a minimum of 48 hours after topping placement. The roof deck shall be protected from concentrated loads of construction materials. Load distribution materials, such as ply wood, shall be used by other trades when stocking materials.
- B. Coordinate installation of the roof cover such that the installed insulating concrete deck is not exposed for unnecessary extended periods of time. Membrane installation is recommended to begin within 3 to 7 days following roof deck topping placement.

3.6 REPAIRS

- A. Where required to provide a surface condition acceptable to receive the roof cover, repairs to smooth the deck surface, correct depressions or fill divots shall be done in accordance with written guidance provided by the foam concentrate manufacturer.

3.7 DEFECTIVE WORK

- A. Remove and replace any area of the roof deck placement that fails to comply with the requirements of the foam manufacturer, this specification or applicable product Approvals.

END OF SECTION 03 52 16