PART 1  GENERAL

1.1  RELATED REQUIREMENTS

A. Coordinate Roof Assembly roof insulation work with work before and after. See especially:

1. 07522 - Roof Assembly Modified Bitumen Roofing
2. 07620 - Roof Assembly Steel Blocking and Sheet Metal
3. Other Roof Assembly components such as roofing, sheet metal, hatches, vents, portals, and equipment curbs.

1.2  DEFINITIONS, REFERENCES, AND OVERALL STANDARDS

Follow 07500

1.3  QUALITY ASSURANCE

A. Design Intent: The styrene and lightweight insulating concrete (LWIC) assembly shall achieve an average R-value as prescribed by Code.

1. The styrene board in the subassembly may be omitted within 1 ft of roof drains as long as the LWIC component forms a proper sump for positive drainage.
2. If there is any reason to believe that this insulating value will not be achieved using products and thicknesses specified in the Construction Documents, notify A/E and M-DCPS Maintenance & Operations – Roofing Division representatives in writing, before preparing submittals, with a brief explanation why.

B. Installer’s Qualifications: Each installer of a shown part of the Roof Assembly shall:

1. Have 5 years of successful experience in the installation of that roof component.
2. Be currently listed in the M-DCPS Pre-Qualified Roofing Contractor List.
3. Be currently licensed or certified by the producer of that part of the Roof Assembly.

C. Insurer Certification: Assist M-DCPS in preparing roof insulation acceptance certification as needed for the fire and extended coverage insurance of the Roof Assembly.

D. Pre-Installation Meeting: At least 6 weeks before installation of Roof Assembly, the Contractor shall conduct a meeting at the worksite with installers of each part of the Roof Assembly, affected installers of other work, A/E, AHJs, and M-DCPS – Maintenance & Operations - Roofing Division representatives.
1.4 SUBMITTALS

A. Special Warranties: Before making any other submittals, and at least 10 weeks before pre-installation meeting, submit and obtain approval of draft of (or form for) each specified Special Warranty.

B. Product Data: Description of each product, including standards met, and the following:
   1. Miami-Dade Notice of Acceptance (NOA) or State of Florida Product Approval.
   2. Minimum thickness of concrete at thinnest point over styrene, as stated in NOA.
   3. Thermal resistance values from ASTM C177 or C518 tests.
   4. Producer’s installation instructions.

C. Shop Drawings: Roof plan showing slopes, roof penetrations, thickness of styrene and LWIC, and details for proper installation.
   1. Show openings such as hatches, vents, equipment curbs, portals, as well as crickets.
   2. Show negative pressures on each part of the roof (no less than those shown in the Construction Documents) along with modifications to producer’s roofing design, such as fastener numbers & patterns, as needed to withstand negative pressures, calculated by a Florida registered professional engineer following Test Application Standards TAS 117.
   3. Show details of interface between deck, steel blocking, and LWIC.

D. Samples: Styrene insulation board in thickness to be used, 8 x 8 in.

E. Certification, before installation: Affidavit, from LWIC producer, approving installer.

1.5 SPECIAL WARRANTIES

A. By Membrane Producer: Provide a 20 year Special Warranty from the roof membrane producer covering correction of defects in the roof insulation component of the Roof Assembly.

B. By LWIC Producer and Installer: Provide a 10 year Special Warranty in which the LWIC producer / installer agrees to correct any defective roof insulation work.
   1. See 07500 for the full requirements of this Special Warranty that shall be included in this LWIC Special Warranty (that will accompany the Roof Assembly Special Warranty).
   2. At time of project closeout, submit this signed Special Warranty to the roof membrane producer, for transmittal to Contractor, A/E, and M-DCPS.

PART 2 PRODUCTS

2.1 STYRENE INSULATION BOARD

A. Description: Expanded polystyrene boards, free of chlorinated fluorocarbons, with bonding / venting slots. Mark bundles with FM label and name of producer.
   1. Thickness: As indicated by the project Plans and Specifications
2. Bond slot area in each 2x4 or 4x4 ft board: At least 3% of board area.
3. R-value of unslotted foamed styrene, at 110 °F: At least 3.0 / in. of thickness.
4. Density: 0.9 – 1.1 lb/ft3.
5. Water absorption, by total immersion: 4.0% maximum, by volume.

B. Standard: ASTM C578, Type I.

C. Product / Producer.
   1. Holey Board, by Apache.
   2. Insulperm, by Siplast.

2.2 LIGHTWEIGHT INSULATING CONCRETE

A. Approved Manufacturers:
   1. Celcore Inc.
   2. Concrecel Intl.
   3. Elastizell Corp.
   4. Siplast Inc.
   5. Aerix Industries.

B. Product Description: As specified by the Roof System NOA that meets the design wind pressures applicable to the project, and the following:
   1. Formulation: Asbestos-free, and as will produce at least 300 lb/in2 compressive strength.
   2. Bonding Agent: As recommended by LWIC manufacturer.
   3. Fiber Reinforcement: As recommended by LWIC manufacturer.
   4. Do not use perlite unless LWIC installer causes 1 in. expansion material to be applied to all restraining surfaces at perimeter of roof area and at all penetrating items such as hatches, vents, and equipment curbs.
   5. Curing Compound: As recommended by LWIC manufacturer and compatible with first ply of roofing membrane.

2.3 ACCESSORIES

SPECIFIER: Specify reinforcement in LWIC over steel or fiber decks when needed to comply with the UL fire rated assembly that is required in the Construction Documents.

A. Reinforcement in LWIC: Galvanized steel welded wire reinforcement, such as 2x2 – W0.5 x W0.5, or non-welded longitudinally reinforced twisted hexagonal wire type, such as 2160-2-1619 Keydeck, by Keystone.
   1. Where no fire rating is required, alkali-resistant plastic fiber reinforcing may be used in cellular concrete formulations.
PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Check and prepare substrates that are to receive LWIC.

1. Concrete finish: The texture of the roof structure’s concrete finish shall be suitable for properly bonding and preventing LWIC lift-off. Structural roof concrete finish shall be sufficient to interact with LWIC roof fill to meet the minimum wind uplift resistance figures as noted in the Roof Wind Pressure diagrams on the Drawings and shall follow the NOA or State of Florida Product Approval requirements for proper application of the roof membrane.

2. Concrete condition: Dry and free of shrinkage cracks, laitance, bond-breaking substances, and loose material. Surfaces shall be free of pits, honeycomb, ridges and roughness that could interfere with bonding of:

   a. Slurry coat applied to receive styrene boards over normal weight CIP concrete;
   b. The LWIC (without styrene) that is first applied over normal weight CIP concrete before installing roof membrane.

3. Steel deck condition: Dry, clean, and free of oily and bond-breaking substances that could interfere with the bonding of:

   a. LWIC fill in flutes of ribbed steel deck followed by slurry coat to receive styrene boards;
   b. The LWIC (without styrene) that is first applied over flat steel deck before installing roof membrane.
   c. In addition, this LWIC deck component and its diaphragm load capacity shall have been designed and installed to follow FBC, Chapters 19 and 22.

4. Bonding and Composite Action with Structural Decks.

   a. At steel roof decks, ribbed or flat, check the full and proper installation of any shear connectors required by the Construction Documents.
   b. Check ribbed steel roof deck for embossed lugs in the flute walls that are specified to be provided for composite action between deck and LWIC fill.
   c. Report incomplete or improper installation of connectors and lugs.
   d. Provide adhesive to bring wind uplift resistance levels up to the requirements of the LWIC’s NOA or State of Florida Product Approval, where mechanical bonding is inadequate or missing.

5. Expansion Joints: Provide expansion joints in LWIC:

   a. Above expansion joints, changes of direction of steel framing or decking and changes in type of structural deck occur.
   b. Where building wings occur in new construction or are added to existing construction.
   c. Above boundaries between air conditioned and non-conditioned spaces.
   d. Where differential movement between walls and deck may occur.

6. Nailers and blocking: Clean, oil-free galvanized steel only. Use no wood or aluminum.
B. Prepare and bring substrates to the above-specified conditions before Installing slurry coat, styrene insulation, and LWIC.

C. Installation of other work on or passing through roof deck shall be complete and tested. Steel blocking shall be in place, as well as framing for openings, hatches, curbs, supports, roof drains and other penetrations.

3.2 INSTALLATION OF LIGHTWEIGHT INSULATING CONCRETE

A. Delivery and Storage.
   1. Deliver products in producer’s sealed packages or tight bulk containers.
   2. Store products to protect them from weather and physical damage.
   3. Do not use cement that is damaged by moisture, dirt or caking.

B. Installing Insulation Board.
   1. Cover steel deck or CIP normal weight concrete substrate with a 1/8 to 1/4 in. slurry coat of LWIC.
   2. Install insulation board within 20 minutes of placing the slurry coat so that slurry and board are in full contact. Never lay boards without full bed of slurry beneath.
   3. Lay insulation board in brick pattern (lateral joints staggered) with joints butted snugly. Remove loose boards and immediately re-grout.

C. Installing Lightweight Insulating Concrete over Insulation Board.
   1. Install LWIC the same day that the styrene insulation has been set in place.
   2. Placing: Place LWIC over insulation board while fill in the insulation board cores is still plastic. Screed to an even surface to receive the roofing membrane.
   3. Cover: Provide minimum 2 in. of LWIC over styrene insulation board, measuring the depth from topmost edges of styrene.
   4. Drainage: Increase thickness of LWIC as needed to obtain roof drainage slope of at least 1/4in./ft, or greater slope as shown or implied by Construction Documents.
   5. Crickets: In sumps between roof drains, between roof drains and parapets, and at high side of curbs, construct crickets uniformly sloped to drain 1/2 in./ft. or more.
   6. Curing: Apply curing agent to retain moisture for proper cure. Observe other proper curing instructions of the LWIC provider.

D. Installing Lightweight Insulating Concrete over Impervious Decks or Substrates.
   1. No roof membrane shall be placed directly over impervious decks or substrates unless a venting mechanism is provided that meets Code, the appropriate NOA or Florida Products Approval, and MS section 07522.
E. Installing Fill Over Deflecting Substrate.
   1. A deflecting substrate is one that allows more than 1/8 in. deflection in 4 ft under normal traffic: In this condition, install LWIC within 4 hours of setting insulation.
   2. Plan early installation of insulation each day to ensure both a 4 hour slurry cure and sufficient time to place LWIC in one uninterrupted operation.
   3. If installation is interrupted due to wet weather or other situations beyond human control, inspect installed insulation board to confirm adhesion to the substrate.

F. Curing: Apply curing compound by roller or spray to partly seal surface of the LWIC against rapid moisture loss while curing.

3.3 FIELD QUALITY CONTROL

A. Check density each hour at point of placement, following ASTM C138.
   1. Keep a log for submittal to A/E. Record measured density each 60 minutes or less.
   2. Measure cast densities with a scale ranging from 1 to 75 lb in increments of 1/4 lb. Calibrate scale to 1/16 lb accuracy. Use a 0.2 ft3 (1.3 gal) or larger measuring bucket.

B. Testing Oven Dry Density and Compressive Strength: Make a set of 4 standard cylinders for each 75yd3 or fraction thereof. Test cylinders following ASTM C495.

C. Walkability Inspection and Withdrawal Testing by Contractor:
   1. Jointly walk the roof with A/E and M-DCPS Maintenance & Operations – Roofing Division representatives to determine if the LWIC is sufficiently cured, indentation-free, sloped, smooth and dry for application of roof membrane.
   2. Test at least 5 fastener withdrawals, following FBC TAS 105, to empirically establish average uplift resistance.
   3. In any areas where fasteners, upon testing, will not hold at least 40 pounds after 5 days of cure, remove LWIC and recast.
   4. If resistances are not achieved, a Florida registered professional engineer retained by Contractor shall recalculate the number of needed fasteners following FBC TAS 117.

D. Perform additional testing and calculations as needed to determine how uplift resistance can be achieved by improving quality of LWIC, type, number, pattern and spacing of fasteners, using galvanized steel fastening plates with expansion bolts into structure, or other remedies.
   1. If a deficiency in uplift resistance continues and the LWIC roof deck and/or its fastening scheme cannot be corrected after further testing and calculations, remove the defective LWIC and fasteners, then recast and refasten.
3.4 PROTECTION

A. Do not expose LWIC to weather more than 7 days. Cover with weighted opaque plastic film if exposure will be longer.

B. Prevent traffic on LWIC until it is dry and does not indent from footwear traffic.

C. Do not use LWIC as a temporary working surface without installing a sturdy protection course.

END OF SECTION