

CONCRETE & LIGHTWEIGHT STRUCTURAL CONCRETE MOISTURE

Before above-deck roofing is applied to new concrete decks, moisture within the concrete should be examined to ensure conditions are acceptable to apply above-deck roofing materials. Most importantly, the building design and construction should accommodate latent moisture sources that may be present after the above-deck roofing is installed.

CONCRETE DESIGN, NORMAL WEIGHT vs. LIGHTWEIGHT STRUCTURAL CONCRETE:

Roof deck designs include various concrete forms, concrete admixtures, aggregate types and curing compounds.

Normal weight structural concrete (145-155 pcf density) has been successfully used for roof decks for well over a century in the US. Common concrete mixtures used today contain Portland cement and solid aggregates (sand and gravel) that absorb less than 2% moisture by weight.

Lightweight structural concrete (70-120 pcf density) historically was used for flooring; however, more recent trends include using lightweight structural concrete for roof deck construction. Lightweight structural concrete contains porous aggregates (expanded shale, clay and slate) that absorb up to 20% water by weight. This additional water must dry after the curing process which can be problematic when the roof deck is exposed to frequent precipitation.

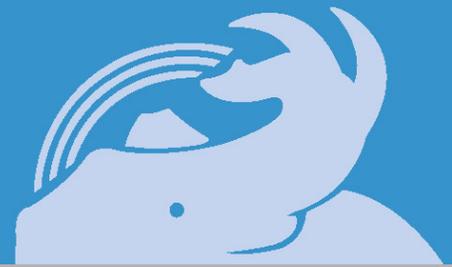
It should be noted that *lightweight structural concrete* (70-120 pcf density) is not the same as *lightweight insulating concrete* (20-40 pcf density).

CONCRETE MOISTURE TEST METHODS:

In the past, two moisture tests were generally accepted by the roofing industry to examine concrete roof decks. These qualitative test methods provided visual evidence of *unacceptable moisture levels*.

1. ASTM D4263, *Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method* involves observing condensation under a sealed plastic sheet.
2. NRCA's *Hot Bitumen Pour and Peel Test* includes pouring hot bitumen onto the concrete deck surface, then observing conditions for unacceptable frothing or bubbles. The bitumen was allowed to cool, then peeled away to examine the quality of adhesion.

NRCA, and SOPREMA®, no longer consider these tests reliable to evaluate concrete roof decks.



RECOMMENDATIONS:

Concrete Design: SOPREMA does not design, evaluate, test nor analyze structural concrete. Concrete roof decks should be designed and evaluated by qualified professionals, with the assurance that the roof deck will dry and cure properly to accommodate all project requirements.

Refer to ACI 301, *Specifications for Structural Concrete*, and also refer to UL Listings, FM Approvals and other jurisdictional requirements applicable to concrete roof decks. Normal weight structural concrete (145 to 155 pcf density) with 2,500 psi minimum compressive strength is recommended for roof deck construction.

Concrete moisture (relative humidity): A relative humidity (RH) of 75% or less is considered acceptable to apply above-deck roofing. Relative humidity of concrete varies when the concrete is exposed to precipitation and other varying project conditions. When necessary to quantify RH, refer to ASTM F2170 *Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes*.

Vapor Retarders: Refer to the SOPREMA *Vapor Retarder Technical Manual* at www.soprema.us. For new concrete roof decks where the relative humidity is high, the following vapor retarder options are recommended:

- Un-primed concrete deck: Apply COLPLY EF Adhesive at 2 to 2-1/2 gallons per square, and install an acceptable SOPREMA SBS modified bitumen ply fully-adhered and sealed watertight.
- Un-primed concrete deck: Apply COLPLY EF Adhesive in 1/2 to 3/4 in wide ribbons spaced 6 in apart (approximately 2 gallons per square), and install an acceptable SOPREMA SBS modified bitumen ply, ribbon-adhered to the deck in the ribbons of adhesive.

For concrete roof decks with low RH values (less than 75%), the concrete should be primed with the applicable SOPREMA primer, then apply the appropriate heat welded, self-adhesive, cold-applied, asphalt-applied, or other vapor retarder option.

Adhesion tests (peel tests) are recommended to examine the bond between the vapor retarder and concrete deck surface. Refer to the SOPREMA *Vapor Retarder Technical Manual* at www.soprema.us.

Refer to ACI, NRCA, SPRI, ARMA, RCI and other related industry standards for current roofing industry positions, development of new standards and other information related to the design, installation and testing of concrete decks for above-deck roofing applications.