Quality Technical Bulletin

Concerns with Concrete and the Roof

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An article published by Concrete International dated January 2012 by *Peter Craig and Bill Wolfe called "***Another Look at the Drying of Light-weight Concrete***"*
A comparison of drying times for normal weight and light-weight floors identified that non-conditioned, non-wetting environment will produce internal RH above 83% after almost a year for structural light weight and above 80% for normal weight concrete.

Moisture has appeared to have created wrinkles and bubbles on this fully adhered vapor barrier installation.

The finish of your concrete roof is important and depends on your roofing and or vapor barrier system…

Peel and Stick V.B.
will require a
smooth hard trowel finish

Adhered or Epoxy system
will require a
smooth trowel finish

NRCA has tested structural light weight roof systems 4-7 years old with results in the 89%-99% range

Placing holes in your roof vapor barrier is typically not an issue, as the fasteners are metal, which is a vapor barrier and the holes that they produce (under compression) are typically filled with the fastener, which provides a very good overall vapor barrier installation.

Concrete on roofs are fairly typical, especially in hospital construction. The concrete used could either be normal-weight or structural light-weight concrete. Both pose challenges with the roofing installation, however, light-weight concrete is found to be more challenging due to the elevated moisture with-in the slab from the aggregate.

More attention has been given to this topic and the NRCA letter regarding this topic which I have summarized the letter below along with action items that we should to take as responsible Contractors.

As Contractors, we need to be concerned with this type of construction as we have no control over the drying process which negatively affects the roofing. When possible, during design, identify this concern with the design team early. This of course is not always possible when we are not part of the design process, however, we should still discuss the concern and try and work out a plan to alleviate the challenge. *Also, note that this concern should also be reviewed for existing construction and re-roofing projects.*

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The Concern / Challenge:

- ❑ Concrete on the roof needs to be reviewed carefully and roof systems must be evaluated for these concerns:
  - ❑ Normal & structural light weight concrete -Typically an issue with moisture leaving the slab in an uncontrolled environment, such as a roof condition due to exterior RH (*relative humidity*) and frequently re-wetting of the slab.
  - ❑ Structural lightweight concrete inherently contains much more water than normal-weight concrete.
- ❑ If concrete is needed on the roof, ***normal weight concrete is recommended by the NRCA*** due to the increased moisture content in structural light-weight concrete.

Industry Reported Problems Associated with Structural Light-Weight Concrete per the NRCA:

- ❑ **Moisture accumulation** - Excessive moisture from concrete deck can be pressure-differential driven into and condensed within a roof system.
- ❑ **Adhesion loss**. Presence of moisture can result in deterioration of moisture-sensitive roofing materials and adhesive bond loss between adhered material layers.
- ❑ **Adhesive issues** *with water-based and low-volatile organic compounds.* Excessive moisture can affect adhesive curing and drying rates. Also, moisture can result in adhesive "rewetting," resulting in bond strength loss.
- ❑ **Metal and fastener corrosion**. Excessive moisture can contribute to and accelerate metal components' corrosion, including fastener corrosion.
- ❑ **Insulation R-value loss**. The accumulation and presence of moisture in most insulation products will result in reduced thermal performance (lower effective R-value).
- ❑ **Microbial growth**. The presence of prolonged high-moisture contents in contact with organic-based materials, such as wood fiberboard, perlite board and some insulation facer sheets, can support microbial growth.

Current & Future Industry Moisture Testing:

- ❑ The roofing industry historically has used a rudimentary method for determining concrete roof decks' dryness and suitability for roof system application:
  - ❑ Apply roofing materials to concrete roof decks only after a minimum of 28 days after concrete is placed.
    - ➔ ***The 28 day requirement was only to achieve a specific concrete compressive strength and has no relation to the moisture in the concrete.***
  - ❑ Mop or pour hot bitumen on a concrete's surface and monitor it for splattering or bubbling caused by excessive moisture in the concrete.
    - ➔ ***Experience has shown this method to be unreliable, because the test only evaluates topical moisture levels and not moisture levels throughout the concrete's thickness.***
  - ❑ ASTM D4263, "*Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method*." sealing the perimeter of a small, transparent sheet to the concrete surface & monitoring it for developing condensation.
    - ➔ ***Experience has shown this method to be unreliable. An airtight seal at the test panel's edges is difficult to achieve, and unless temperatures on the top & bottom sides of the concrete deck are nearly identical, the resulting pressure difference can result in false "dry" indications.***
  - ❑ NRCA has stated that the flooring in-situ ASTM F2170 probe test is appropriate for roofing & recommends that the RH be 75% at this point, until further testing has been completed by the NRCA.
    - ➔ ***This test is no longer thought as valid fo exterior conditions.***

Construction Tips and Specification Suggestions:

- ❑ **A vapor barrier system is recommended for ALL new and re-roof concrete roofs.**
- ❑ ***NRCA recommends:***
  - ❑ Installing an above-deck venting system, such as a mechanically attached venting base sheet…**OR**
  - ❑ sealing the concrete deck with a high-quality, two-part epoxy moisture mitigation membrane as used in the flooring industry – **(This type of membrane is systemically not very flexible and might be an issue if the roof develops cracks)**
- ❑ **A peel and stick vapor barrier with a fastened insulation system is typically best to get covered the quickest without future damage to the roofing system.**

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