ROOF DECKS A to Z

Part 1: LWIC and AWC

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ABSTRACT

This is the first in a series of articles examining various types of roof decking. Among the numerous considerations when selecting a roof system, perhaps the type of decking is most important. Some of these decks are currently in popular vogue, while others are seldom encountered. Some have slope, while others are inherently fire-resistant. Some should not be pierced with drilled holes and fasteners, and others are intolerant of moisture.

Many times, roof system selection in new construction is arbitrary and capricious. Some designers of new construction specify the same type of deck in every instance, regardless of building use or suitability. Familiarity and convenience seem to be the driving parameters. However, reroofing projects may involve any type of deck. Whether new construction or reroofing, it is incumbent on a roofing expert to be the authority on these matters, as improperly configured materials are a certain recipe for disappointment.

This article will explore attributes and limitations of 1) lightweight insulating concrete and 2) thermosetting asphalt fill.

Figures 1 and 2 — What may first appear to be a random mess is instead a quite viable roof deck system. Here, polystyrene boards are situated into wet LWIC. The polystyrene provides the bulk of the R-value, while holes and slots in the boards provide a "keying-in" of these materials.

LIGHTWEIGHT INSULATING CONCRETE (LWIC)

Lightweight insulating concrete is also known as "insulating fill" and "vermiculite concrete," because that is the aggregate used in the mix. Another variation includes lightweight cellular concrete, which is heavily entrained with air and has no aggregate. These decks enjoy good fire rating and sound damping; moreover, their monolithic nature yields excellent performance during high wind.

LWIC alone is not a structural component. The material is insulation and can be cut with a good pocketknife. Consequently, it must be installed over some span-capable

Figure 3 — Often mistaken for a "metal deck," LWIC is most commonly carried on a metal "formboard." Modern iterations have slots at the bottom of the flutes/ribs to liberate construction water and induce continued drying. This image depicts an older version that predates slotted decks. The material emerging at formboard edges dates to the day it was installed and should not be confused with active leakage.

element—most commonly a metal formboard, although it can certainly be placed over structural concrete. The system can be shaped to virtually any incline to achieve contours necessary for drainage, and it is not limited by the necessary symmetry required of tapered board stock insulation for achieving slopes.

Uninformed onlookers may be astonished during installation activities. What may first appear to be random disarray is instead a quite viable roof deck system (*Figures 1* and *2*). To achieve desired R-value, polystyrene boards are situated into wet LWIC; holes and slots in these boards provide a "keying-in" of these materials.

Attachment is a central consideration of LWIC decks. LWIC has marginal bond strength to some surfaces, so there is potential for separation of the cementitious fill from its substrate in high-wind zones (in certain arrangements of fastening). Accordingly, pull testing should be considered for the optimum fastener type.

Often mistaken from below as a "metal deck," LWIC is most commonly carried on a metal "formboard," which is almost always galvanized; however, galvanized iron sheets have a carbon-steel core, and prolonged exposure to active leakage can prompt rusting at formboard edges as well as at puddle welds to the steel framing. Modern iterations have slots at the bottom of the flutes/ribs to liberate construction water and to induce continued drying. (*Figure 3* depicts an older version that predates slotted decks.) The material emerging along formboard edges is seepage dating from the day the LWIC was installed; this should not be confused with active leakage unless, of course, there is such behavior.

A nailed base sheet (using specialty fasteners) is often applied to LWIC decks. With this layer in place, many choices of roof covering are then available, especially conventional built-up roofing and modified bitumen. There is also appropriate time to consider lap-attached membranes directly over LWIC, observing some precaution about smoothness of the surface. Due to the monolithic nature of the pour, there is virtually zero fluttering of such one-ply membranes over LWIC.

Long-term exposure to entrapped water will reduce LWIC to "beach sand," especially in zones of freeze-thaw cycling; this will sharply reduce the holding capacity of fasteners. Failed roofing over such decks should be dealt with expeditiously, as procrastination in addressing leakage can compromise LWIC as well as the metal formboard. This can make an otherwise affordable reroofing project quickly become unattractive, causing yet more delay. Too often, the unappealing cost of properly addressing wet LWIC prompts the use of stainless steel fasteners) in the course of reroofing. This is a mistake; fasteners may remain in fine condition, but if the roof blows off, that won't matter. The fastener holes expose a portion of the carbon-steel formboard to corrosion from the entrapped moisture that was not addressed. Note also that a galvanic cell can be created by certain fastening arrangements with entrapped moisture in the equation.[1]

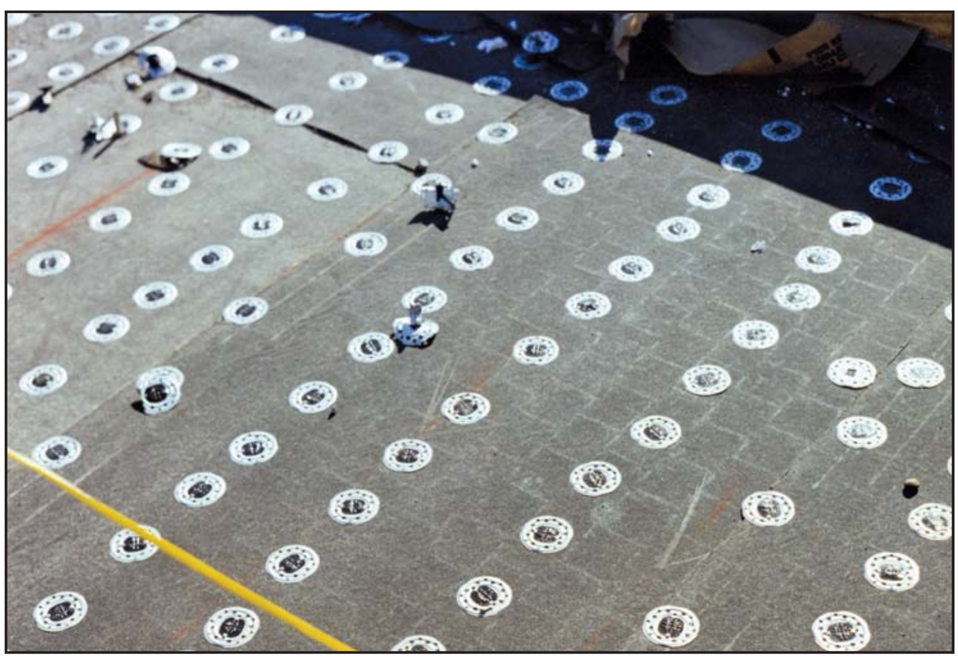

Figure 4 — A nailed base sheet (using specialty fasteners) is often applied to LWIC decks. With this layer in place, many roof-covering choices are available.

Figures 5 and 6 — Ordinarily installed over a structural concrete deck, All-Weather Crete is more appropriately termed a "substrate" for the eventual roof covering. Here, the ball field (occupied below) at Georgetown University receives what resembles a roadway pavement topping.

THERMOSETTING ASPHALT FILL

More commonly known as All-Weather Crete (AWC) and marketed by Silbrico, this system enjoyed some popularity 30 to 40 years ago. Some very large projects were constructed with AWC as the substrate, and many remain in place to be encountered by the roof consultant.

The system is a mix of perlite and asphalt, screeded to incline, and then moderately compacted into whatever contours may have been specified. Casual onlookers would likely confuse this work with a roadway paving operation. But it was an insulating "deck," and it was a plausible substrate for roof coverings.

AWC is not a structural component because, alone, it could not span or support a flexural load (sharing this limitation with LWIC, as described above). Consequently, it must be installed over a structural form of some type—ordinarily cast-in-place concrete. For this reason, AWC is more appropriately termed a "substrate" for the eventual roof covering.

There has always been some ambiguity about the expression "thermosetting." The asphalt binder is certainly not thermoset—neither is it thermoplastic. Instead, asphalt exhibits rheological properties and occupies a somewhat special class of materials known as viscoelastics. Perlite aggregate, however, imparts what characterizes the finished and compacted mix as a thermosetting fill.

AWC can be shaped to complex surfaces without obeying the symmetry rules of tapered board stock (an attribute shared with LWIC). Fittingly, built-up roofs were the system of choice over AWC. And why not?—a bituminous substrate was already present and perfectly compatible with application of primers and more bitumen.

AWC went down dry and hot and was ready for roofing as soon as it cooled.[2] Once marketed as an early form of inverted roofing, this arrangement proved unsatisfactory. However, the system did serve well in many instances of overroofing.

So when core sampling into an older roof and granular asphaltic perlite is encountered, the deck/substrate is AWC.

REFERENCES

1. L.D. Hogan, "Hostile Environments," *Interface*, June 1995, pp.6-8
2. Donald G. McNamara, "Perlite Asphalt Thermal Setting Roof Insulation," *The Roof Deck* (a series of articles as they appeared in *The Roofing Spec*, official publication of NRCA), (no date), pp. 23-24

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TPO Weathering Project Midterm Inspection Report

The Western States Roofing Contractors Association's (WSRCA) TPO Weathering Farm Project is entering the midpoint (eight to nine years) of the expected service life of low-slope membranes, and a report was published on its status in the May/June issue of *Western Roofing.*

This is believed to be the largest cooperative *in-situ* roof research and testing project undertaken publicly by manufacturers and contractors. Since 2001 - 2002, approximately 470 squares of TPO products by three manufacturers (originally four) have been weathering in four variant geographical locations (San Antonio, TX; Seattle, WA; Anchorage, AK; and Las Vegas, NV).

For the full report, visit **http://www.wsrca.com/pdf/WSRCA_TPO0510.pdf**.