ROOF DECKS A to Z

Part VIII: Precast Lightweight Cementitious Planks

By L.D. Hogan, RRC, FRCI, PE

This is the eighth in a series of articles examining various deck types. Among the numerous considerations when selecting a roof system, the type of decking is among the most important. With the variety of decks to be encountered (both new and old), it is incumbent upon roofing experts to be the authority on these matters. This article will explore features of precast lightweight cementitious planks.

Steel-edge crete plank is an appellation often used for what is actually a proprietary brand name for the product formerly marketed by Martin Fireproofing. The product/system is more appropriately termed in generic fashion "precast lightweight cementitious plank." The Martin Fireproofing product was lightweight structural concrete (LWSC), but its production ceased some years back. It was a 15- or 18-inch wide plank (*Figure 1*) and was usually more expensive than gypsum. Meanwhile, U.S. Gypsum manufactured a 2-inch-thick, 10-foot-long plank that contained welded wire mesh (*Figure 2*); this product was discontinued in the 1970s. Presently, only Mid-Con manufactures these planks, cast in both 15- and 18-inch widths, the latter being marketed by U.S. Gypsum. It enjoys a good flame-spread rating and, aside from roofs, the product may also be encountered as a floor deck system.

This form of deck should not be confused with other precast concrete planks such as "channel-crete," featured in Part II of this series; those are made of "normal-weight" structural concrete (NWSC). Instead, products described here are made from gypsum, lightweight structural concrete (LWSC), aerated lightweight concrete (*Figure 3*), or even lightweight insulating concrete (LWIC). LWSC differs from NWSC by being roughly two-thirds the weight of

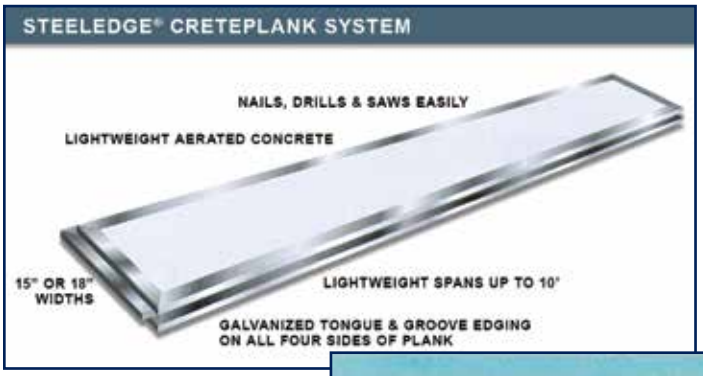

Figure 1 – Martin Fireproofing literature depicting lightweight structural aerated concrete product. It was a 15- or 18-inch-wide plank marketed under the proprietary name "steeledge creteplank."

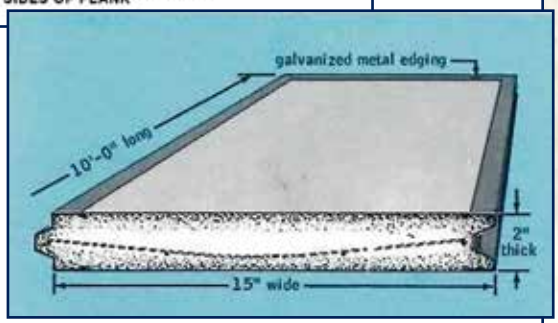

Figure 2 – Graphic from vintage U.S. Gypsum literature showing the 2-inch-thick, 10-foot-long plank; it also shows the arrangement of internal wire reinforcing.

Figure 3 – Aerated lightweight concrete (image courtesy of Martin Fireproofing).

Figure 4 – A precast cementitious plank project in Washington, DC, serving as the substrate for clay tile.

Figure 5 – This type of roof deck is obscure enough that some supply houses may not be aware of it. Accordingly, the particular roof-covering vendor should be consulted regarding its requirements for fastening to these planks. It would also be beneficial to work closely with a fastener vendor. (Image courtesy of Scott Hinesley.)

the latter. This is because lightweight aggregates, complying with ASTM C330, are made from naturally occurring products such as shale, clay, and slate.[1] It should be noted that, being a formed and cast product, the plank's final properties are directly dependent on the ingredients used. NWSC planks can be formulated to have 3,000 to 5,000 psi compressive strength.[2] However, mix proportions that yield such strength values are no longer considered "lightweight" products.

When the plank is gypsum (merely plaster of Paris), it is usually s brighter white than comparable products derived from Portland cement (although white Portland cement is available). Also with the gypsum variety, particles of wood can usually be observed along cuts and breaks—there being no other aggregate or filler in the gypsum product. Steel reinforcement (usually galvanized wire, if present) is embedded within the core of the product.[3] *Figure 4* depicts a project in Washington, DC, where clay tile is being installed on precast lightweight cementitious planks.

These are "nailable" planks, meaning they are capable of engaging and holding appropriate fasteners. Consequently, precast lightweight cementitious planks are often found as the substrate for pitched roof coverings such as tile or slate, although they can certainly receive shingles or wood shakes. However, underlayments, tiles, and coverings should be hand-nailed; pneumatic nail guns are discouraged, and staples

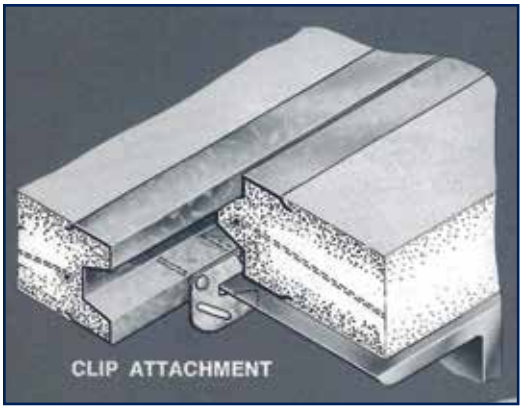

Figure 6 – Attachment of panels to the support framing may be by purlin clips. (Image courtesy of U.S. Gypsum.)

Figure 7 – Just as with openings in other deck types, these panels need support bracing where the continuity of tongue-and-groove edges is violated. This can be as simple as anchoring a lumber ledge band or adding red-iron framing members. The issue is to determine how panels are terminated and how any unbraced fractions are addressed. (Image courtesy of Scott Hinesley.)

should not be considered. Low-slope forms of roofing should have a base ply fastened first, followed by whatever insulation and membrane are specified. This type of roof deck is obscure enough that some supply houses may not be aware of it (*Figure 5*). Accordingly, the particular roof-covering vendor should be consulted regarding its requirements for fastening to these planks. It would be beneficial to work closely with a fastener vendor, as well.

Attachment of planks to the support framing may be by purlin clips (*Figure 6*); alternatively, planks may be welded or screwed down to framing supports. Replacement of individual planks may be arduous because of possible scarce availability of matching units and the need for tongue-and-groove integrity to be maintained. Small individual regions of patching and repairs can be carried out using an "all-grooved" product manufactured specifically for this purpose. In such a case, adjacent plank edges can be drawn together by toe-nail fastening. This plank system is capable of serving as a horizontal shear diaphragm if plank edges are welded in a prescribed pattern; if that was not carried as the original manner of attachment, diaphragm capacity would instead have needed to be incorporated into the structure.

Consideration also must be given to cut ends and rows of fractional planks. Just as with openings in some other deck types, these panels require support bracing where the continuity of tongue-and-groove edges is breached. This is especially crucial at unions with building walls or anywhere drifting snow surcharge loading may be expected. Internal wire reinforcement is not carried over the edge (or integrated into the wall), so compensation must be made with

Figure 8 – Example of damage needlessly inflicted on precast lightweight cementitious planks. Contractors working on such a deck should diligently research the proper type and size of fasteners.

Figure 9 – Without embedded wire reinforcing, this compromised deck would surely have fallen. Note the "white" core, indicating that this is a gypsum product.

underside bracing. Such a provision can be as simple as anchoring a new lumber ledge band or adding red-iron framing members (*Figure 7*). The need for this measure may be encountered at large equipment curbs, penthouse projections, and along some entire outlying edges. The issue to explore during inspection is how panels are terminated and how any unbraced fractions are addressed.

Without caution, considerable damage can be inflicted on this type of deck by careless practices. Reroofing activities can sometimes create disturbance to structures even when there is no particular framing discrepancy. Rooftop trafficking, dropped tools, and incorrectly stockpiled materials have been known to cause textured ceilings to flake off, light bulbs to break, plaster ceilings to crack, mirrors and frames to fall from walls, wood rafters and truss chords ti sokubter, and sometimes even more dramatic results. *Figure 8* depicts a project where planks were heavily damaged by a contractor installing shingles following tear-off; there is no justification for this irresponsible work. Without the embedded wire reinforcing, this compromised deck would surely have fallen inward (*Figure 9*).

SUMMARY REMARKS

Projects involving precast lightweight cementitious planks should not be approached casually. This deck type constitutes a small part of modern construction but can be found in older structures, so encountering it in a reroofing scenario is far more probable. Neglected decks that have been exposed to unchecked leakage may be compromised to the extent that replacement with another substrate may be necessary. On the other hand, older decks that are sound and dry may continue to serve satisfactorily; rejecting a deck of this type merely because it is old is unsubstantiated. Finally, as outlined earlier, contractors working on such a deck should establish and communicate the anticipated tear-off practices and diligently research the proper type and size of fasteners to be used; naturally, pull-out testing should be the basis of fastener selection.

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