# ROOF DECKS, A to Z

## Part 2: Wood Planks and Precast Concrete Planks

By Lyle D. Hogan, RRC, FRCI, PE

*This is the second in a series of articles examining various deck types. Among the numerous considerations when selecting a roof system, the type of decking is one of the most important. With the variety of decks to be encountered, it is incumbent upon roofing experts to be the authorities on these matters. This article will explore features of 1) wood plank decking and 2) precast concrete planks.*

### WOOD PLANK DECKING

Many types of wood have been used as substrates for roof covers, but this article deals specifically with planks 2½ to 3 inches thick and the like. Such materials are common in older warehouses, textile mills, and heavy manufacturing settings. Unless badly neglected, they are very durable (*Figure 1*). They also accept fasteners very well. With a #14 threaded screw, the author has recorded pull values of nearly 1,000 lbs in a 2½-in softwood deck. Naturally, fasteners occurring at joints will not be fully seated, but the alert roofing mechanic will recognize this and reposition the wayward screw. With some planks, tooling of ordinary threaded deck screws is arduous due to torque limitations of even modern drill guns.

Wood plank decks are commonly tongue and groove, but they can also be "splined" in the manner of heavier industrial wood floors (*Figure 2*). But they do not serve as a horizontal shear diaphragm; lumber units merely nested side by side will not impart lateral strength to a framing system, and such provision must be gained elsewhere in the structure. Although mostly found in older facilities, matching lumber planks are still available from some mills (*Figure 3*).

The long-established practice of using a nailed base sheet is still legitimate on these decks. This is handy when a particular environment merits a vapor retarder. A nailed base sheet—using proper fasteners and stress plates to increase base-sheet pullover resistance—will provide a fine substrate for virtually any type of vapor impedance layer. As with other "nailable" decks,


*Figure 1 – Wood plank decks are common in older warehouses, textile mills, and heavy manufacturing settings. Unless badly neglected, they are very durable and accept fasteners remarkably well.*

*Figure 2 – Wood plank decks are commonly tongue and groove, but they can also be "splined" in the manner of heavier industrial wood floors.*

*Figure 3 – Although mostly found in older facilities, matching lumber planks are still available from certain mills.*

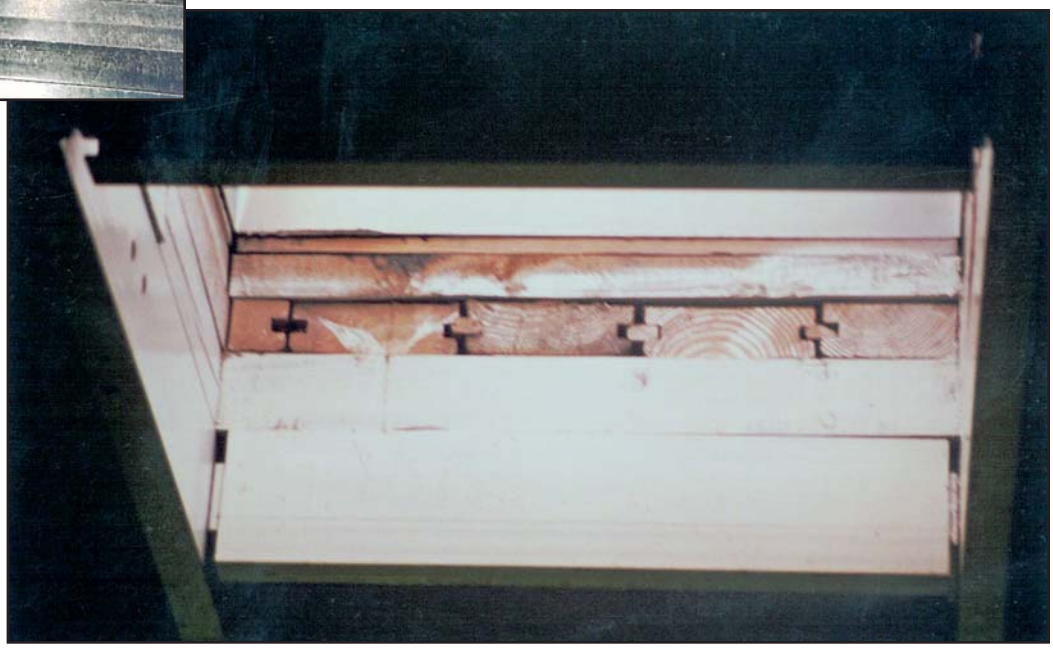
with this layer in place, many choices of insulation and roof covering are available.

Plank decks are not as prone to buckling as some wood sheathing, especially if span relationships are "stretched." Nonetheless, even thick lumber units can warp and twist if not properly seasoned and can splinter when overloaded. Shrinkage of planks may also be observed where decks have been in service for decades (*Figure 4*).

Inexcusable procrastination in addressing leaks can reduce a functional wood deck to a fall-through hazard (*Figure 5*). Failure to mitigate leakage can sharply reduce load-carrying capacity. Paint on the underside can obscure this behavior during interior inspection, so be aware of such potential when preparing contract documents for reroofing.

*Figure 5 – Inexcusable procrastination in addressing leaks can reduce a functional wood deck to a fall-through hazard. Underside paint can obscure this behavior during interior inspection, so be aware of this potential when preparing contract documents.*

*Figure 4 – Shrinkage of planks may be observed where decks have been in service for decades.*



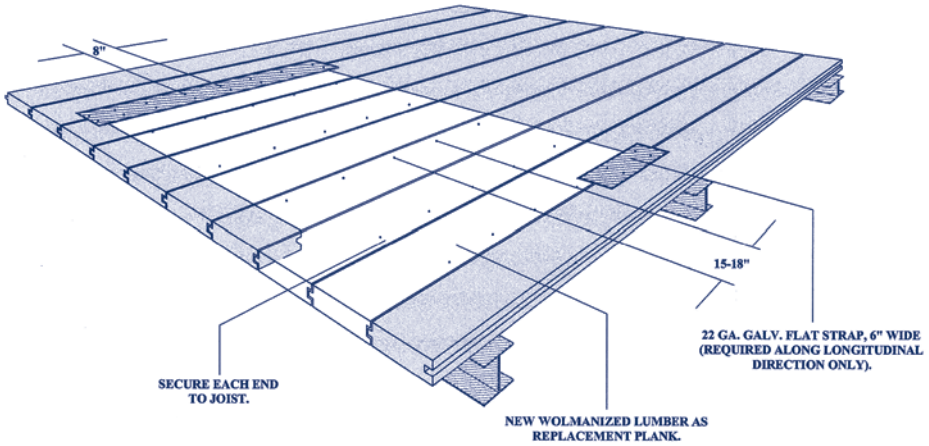



*Figure 6 – Repairs are probably best made by replacement in kind, although tongue-and-groove integrity must be maintained. Any variations of the repair depicted must recognize this aspect.*

*Figure 7 – Channel-crete is a reinforced concrete product, although it is neither prestressed nor posttensioned. Span capability is derived from internal steel tendons embedded in the "legs" of the plank.*

Repairs are usually done as a replacement in kind, but maintaining edge integrity is paramount when such work is carried out. *Figure 6* depicts restoration using sheet metal straps that are stitch-screwed to adjacent members. Consideration must also be given to the hold-down mechanism for securing replacement planks to framing elements. Note that modern loss-prevention measures were in their infancy (or nonexistent) when some vintage plank decks were installed. The hold-down device may be entirely absent on older decks, as the focus was on downward load capacity rather than uplift resistance.

*Figure 8 – Channel-crete may be installed over a steel framing system.*

*Figure 9 – Channel-crete may also be installed over a structure made entirely of concrete. The use of hold-down clips is crucial.*

## PRECAST CONCRETE PLANKS

This is a reinforced concrete product and was commonly marketed as "Channel-crete" (*Figure 7*). "Precast" simply means the product is cast in a factory setting as opposed to being cast in place at the site. It is neither prestressed nor posttensioned.

Span capability is derived from internal steel tendons embedded in the legs while the planks are being cast. Concrete is comparatively weak in tension, so an unreinforced plank of this configuration would have poor span properties. The internal "rebars" have been configured for the "developmental length" necessary to impart tensile strength. There is also welded wire mesh across the remainder of the surface.

Precast planks have a distinct fastening limitation. The thin part of the product (most of the surface) can be as little as 1¼ in thick. While structural grade concrete is used (3,000 psi compressive strength and sometimes beyond), this thickness dimension falls short of the necessary embedment for concrete anchors. The author has witnessed some foolhardy attempts to fasten a roof covering to Channel-crete decks. Most of these attempts resulted in failure to engage, while others caused spalling and significant plank damage. The simple point here is that deck products of this type are better left without fastening. Today's designer has multiple alternatives for securing a roof covering to this deck.

Channel-crete may be installed over steel framing (*Figure 8*) or over a structure made entirely of concrete (*Figure 9*). In contrast with some other precast shapes (to be discussed in future articles), there is no attempt to have long edges nested or engaged. As a consequence, the use of hold-down clips is crucial.

By virtue of having no long contact along ends and edges, Channel-crete also cannot serve as a horizontal shear diaphragm. This is no particular indictment, as some other roof/deck types must also be situated onto a framing system that stands alone as a shear diaphragm, (i.e., standing-seam metal; wood planks; steel-edge "Crete-plank"; or for that matter, an ordinary steel deck when sidelap stitching screws have been omitted).

Precast planks may be comparatively fragile during roof tear-off. Again, recognizing the thin surface, aggressive tooling and trafficking may inflict serious damage unless caution is exercised.

Lyle D. Hogan, RRC, FRCI, PE

Lyle Hogan is owner and principal engineer with Fincastle Engineering, Inc., Summerfield, NC. He is a registered engineer in six states, a Registered Roof Consultant, a Fellow of RCI, and an ICC structural masonry inspector. Lyle has designed and administered roofing projects using a variety of systems across the United States. He is a three-time recipient of RCI's prestigious Richard M. Horowitz Award and chairman of the Association's *Interface* Editorial Board.