

ROOF DECKS

A to Z

Part VI: Structural Cement Fiber

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ABSTRACT

This is the sixth 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 (both new and old), it is incumbent upon roofing experts to be the authority on these matters. This article will explore features of structural cement fiber roof decks.

INTRODUCTION

A number of systems have been offered by vendors, including Tectum, by Tectum, Inc.; Permadeck, by Concrete Products; Fibro-Plank, by Martin Fireproofing; Insulrock, by Flintkote; and PetriCal, by Fireproof Products Company (now Cornell Corporation). Tectum is the only product currently manufactured. Termed “structural cement fiber” in decades past, this family of decking is referred to as cementitious wood fiber (CWF) in the modern vernacular—a designation observed throughout the remainder of this article. At the risk of more confusion, these systems should not be mixed up with fiber-cement products now in wide use. CWF is too often referred to as only “Tectum,” with such classification being overly broad and incorrect. Tectum is a specific proprietary name by a leading vendor, such mistake being analogous to making a “Xerox” copy, using a “Kleenex,” or drinking from a “Styrofoam” cup.

CWF systems are popular for gymnasiums, automobile showrooms, restaurants,

and even natatorium environments (*Figure 1*); there can even be residential applications for the product. Naturally, CWF in high-humidity settings needs to be well insulated and properly configured with a vapor retarder—an aspect shared with countless other decks. Elsewhere, CWF finds use as wall panels and ceiling panels where sound absorption is needed to buffer the clamor of loud machinery, noisy schools, sports facilities, churches, firing ranges, and the

like. The textured “shredded wheat” finish is appealing for the exposed underside of roof decks and, being a cementitious product, it enjoys a Class A-1 fire rating.

Although the products have been called boards, slabs, panels, tiles, and planks, there are really only two types. For uniformity of definition, tile was the descriptor for units that were situated between and among iron bulb-tee rails; and tongue-and-groove planks were those that rested on top



Figure 1 – The system is popular for gymnasiums, automobile showrooms, restaurants, and even natatorium environments.

of the framing system—that is, framing other than bulb-tee rails. For expediency, the term panels will be used throughout this text, as plank always denotes a tongue-and-groove unit in CWF jargon.

This configuration of roof deck held a small corner of the market in decades past (2% by one account).¹ Yet there are millions of square feet of CWF in service today, with

some dating back to the 1950s. In spite of small overall market share, CWF still remains popular in school construction, sporting facilities, community centers, and anywhere noise is a concern for occupants. Panels are made of aspen wood fibers blended with binder/cement, compressed in a heated press, kiln-dried, and then cut into various profiles. The wood fibers are known as “excelsior,” “wood wool,” and “American moss.” Supplied in bales, this component is also used for shipping, packing, and for decorating seasonal baskets (Figure 2).

Portland cement is the usual binder for all CWF panels, with the exception of Tectum panels, which are manufactured using inorganic hydraulic cement composed of magnesium oxide, sodium silicate glass, magnesium sulfate, and calcium carbonate. Sodium silicate glass infused within the Tectum binder provides some measure of water resistance to assist during foul-weather installations; however, this system—as well as products derived from other binders—can certainly be degraded by chronic leaks.

Composite panels are also available (Figure 3). Old panels used urethane insulation, later evolving to isocyanurate; newer iterations have extruded or



Figure 2 – The wood shavings (aspen) are known as “excelsior,” “wood wool,” and “American moss.”

expanded polystyrene. Panels can also serve as the permanent formboard for poured lightweight insulating concrete (LWIC).

INSTALLATION PARAMETERS

The manufactured panels may be anchored onto the framing system by various methods. Tile panels are nested within

iron bulb tees and then grouted in place (Figure 4). These will have rabbetted edges, and custom product is available that conceals the grid of bulb-tee flanges that would otherwise be seen from the underside.



Figure 3 – Older composite planks used urethane insulation but later evolved into isocyanurate and polystyrene, both extruded and expanded bead. (Photo courtesy of Tectum, Inc.)

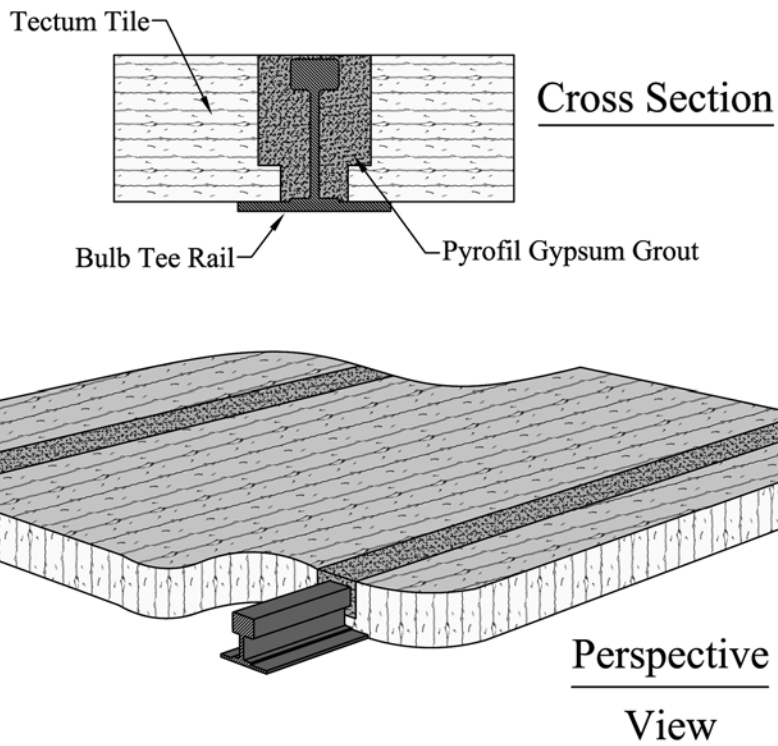


Figure 4 – Planks nested within iron bulb tees are grouted in place and will have rabbetted edges. Note that “Pyrofil” is now marketed as SecureRock gypsum-concrete patch by USG Corporation. (Photo courtesy of Tectum, Inc.)

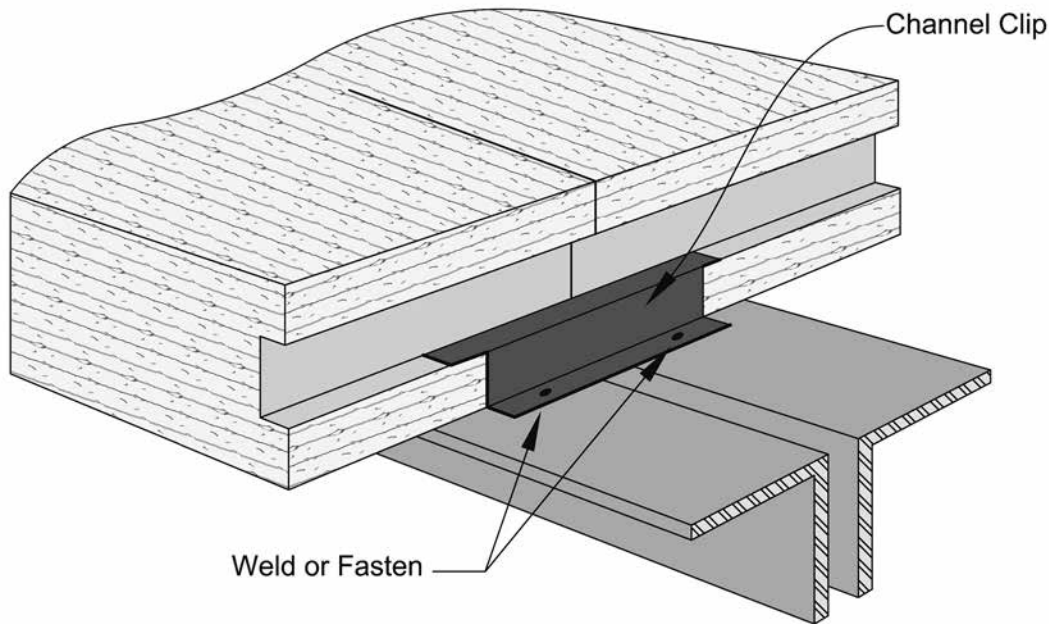


Figure 5 – Panels that span the top of joists and beams may be secured with a hold-down cleat at each support with tongue-and-groove edges advancing.

Alternatively, panels may span the top of joists and beams and be secured with a hold-down cleat at each support with tongue-and-groove edges advancing (Figure 5). Early attachment of the clip was by welding, but screw attachment has been the only means of attaching planks since the mid-1980s, as clips do not provide acceptable diaphragm design. The panels are

field-cut at ridges, hips, valleys, parapets, curbs, and walls; a good circular saw with carbide-tipped blade is usually adequate for this work (Figure 6).

CWF decks can be configured for use over virtually any kind of structure. CWF can be installed over ordinary steel bar joists, wood beams, and even on pre-engineered metal buildings with tapered



Figure 6 – Planks may need to be field-cut at ridges, hips, valleys, parapets, curbs, and walls; a good circular saw with carbide-tipped blade is usually adequate for this work.

columns and cold-rolled girts. In the low-slope roofing domain, CWF is classified as a “nailable” roof deck, although this does not suggest that ordinary nails should be used in the assembly. Just as with wood, gypsum, and LWIC, direct-to-deck adhesion with mopping asphalt should not be carried out. Instead, a base sheet or board insulation should be affixed using appropriate fasteners. In decades past, the base sheet was often coupled with a ply of Kraft paper or a red rosin sheet, especially when hot-applied insulation was to be used. Following that arrangement, any number of roof coverings can then be utilized.

Multiple specialized fasteners have been developed for this application. These will commonly

be auger-type or expanding wire devices, or they will be threaded deck screws with liberal shank diameter and deep thread relief. Polymeric fasteners will require predrilling, and planning should be implemented when tapered board insulation is being installed. Properly configured fasteners do not need to emerge from the panel underside, and such a condition may indeed be unacceptable to the owner. In any event, pull tests are recommended to determine the best fastener to be used in a specific deck, and the various component manufacturers anticipated should be consulted when their products are to be part of a CWF assembly. Note also that base ply fasteners may need to be coupled with large-diameter stress plates in high-wind zones. The NRCA has developed a chart showing recommended fasteners for CWF. Sound panels are usually capable of good fastener engagement. For this reason, caution should be exercised during tearing-off over a CWF deck, as considerable damage can be inflicted by careless extraction of the old fasteners. Meanwhile, some of the modern low-rise foam products are compatible with CWF. Some fleece-back membrane vendors also list this as a suitable method.

The National Roof Deck Contractors Association (NRDCA)² correctly advises that special attachment methods may be required for diaphragm construction. Moreover, openings greater than 8 inches in diameter or 8 inches in any dimension must be braced from below and tied into the struc-



Figures 7 and 8 – When under-insulated or not properly configured with a vapor retarder, sagging or bowing of panels can be experienced over time. On occasion, planks have slumped and fallen out of the array.

tural framing. Planks situated across unbraced openings are prone to experience cracking at the cut corners.

CWF roof decks should be made watertight at the completion of each day's work, preferably by application of the roof, although this ideal sequencing is rare. When sidewalls and the roof deck are not erected concurrently, panel edges and ends need to be weatherproofed to avoid damage. Over three decades ago, the author was involved on a new school gymnasium project. The newly installed CWF deck had been left exposed for nearly two weeks while awaiting the new built-



up roof. Naturally, minor warping and distortion of the panels commenced, quickly becoming the topic of argument and contentious jobsite meetings. Advice from the product manufacturer's rep was to hose down the deck in front of the base sheet application, expecting that relieving the pent-up stresses would cause panels to relax back into shape. This advice (also advocated in one technical source³) was not acceptable, and considerable rework of deck planks was instead necessary.

Adjacent panels should align vertically to provide a uniform substrate for the

roof system. Elevation differences among panels in excess of 1/8 in. are considered unacceptable. Uneven joints of 1/8 in. or more should be grouted with the grout feathered to a slope of 1/8 in. per ft.⁴ This limit highlights the importance of proper shipping, storage, and protection of panels, once installed.

Finally, CWF is rather intolerant of ongoing leakage, and neglected roof decks are sure to be encountered. Performance maladies, when encountered, are often traceable to structural overloading, unbraced openings, improper repairs, and deferred

maintenance. When underinsulated or not properly configured with a vapor retarder, sagging or bowing of panels can be expected over time. This has, on occasion, proceeded to the point that panels fell out of the array (Figures 7 and 8). There can also be manufacturing flaws such as improperly blended ingredients (Figure 9).


SUMMARY REMARKS

CWF is listed as an acceptable substrate in most membrane vendors' literature; however, some caution that the respective technical department must first be contacted



Figure 9 – Manufacturing flaws (although infrequent) can include improperly blended ingredients.

when such decks are to be coupled with their products. Because of some practices outlined above, these older decks may well have a cementitious slurry coat over the top surface, which could be misidentified as a concrete deck. Or it could be a composite with vermiculite or cellular concrete placed atop, with the likelihood of confusing the entire assembly as being LWIC. Consequently, the investigating consultant should always check the deck underside to verify that it is indeed a CWF substrate throughout.

Finally, replacement panels may be hard to find, as several manufacturers are no longer in the marketplace. But if a CWF deck 1) is in good condition, 2) is lying flat and true, 3) will support structural loads from today's requirements for added insulation and snow loads, and 4) will accept the correct attachment scheme, then these decks can be reroofed with little difficulty. 

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