

ROOF DECKS

A to Z

Part IX: Oriented Strand Board (OSB)

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

This is the ninth 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 oriented strand board (OSB).

A considerable wealth of information is available from multiple sources on oriented strand board (OSB), so this is not intended as an exhaustive review of all things OSB. There is no lengthy discussion here of the manufacturing process, testing, trade organizations, code ratings, or material cost. Instead, this article is a review of aspects likely to be encountered in the course of a roof consultant's ordinary practice.

Confusion seems to abound regarding this material because the descriptors are often used interchangeably. OSB is a com-

mon term for the broad class of "engineered wood particle boards." Roof consultants are likely to encounter it in both pitched and low-slope assemblies (*Figure 1*). The products are known as Sterling board, Aspenite, and Smart-ply in the United Kingdom. In this country, only some of the common descriptors are appropriate for OSB as we would encounter it. For instance, chip board and particle board (made from

wood chips, sawmill shavings, and even coarse sawdust) should not be considered as appropriate for roof decks. On the other hand, OSB has strands with specific length-to-width ratios generally lying in a panel's long direction; these are on the order of 1



Figure 2 – OSB has strands with specific length-to-width ratios generally lying in the panel's long direction; these are on the order of 1 to 2 in. wide and 6 to 9 in. long, layered and combined with wax and resin adhesive.

Figure 1 – Consultants are likely to encounter OSB in both pitched and low-slope assemblies. Here, a quite large facility used OSB for the roof deck, the inboard face of parapets, penthouse cladding, and elsewhere.

to 2 in. wide and 6 to 9 in. long, layered and combined with wax and resin adhesive (Figure 2). This is in contrast to waferboard, which has randomly oriented flakes that are generally square. With OSB, the strands are sliced from logs in the grain direction so that strength properties of the tree reside in the finished panel product.¹ That is, outer layers are aligned parallel to the strength axis of the panel, and inner layers are aligned perpendicular to the strength axis. For our purposes, only products having mostly rectangular wood strands are addressed (i.e., no waferboard or particle board).

Like plywood, its counterpart and direct competitor, OSB is a commodity product, available to anyone at virtually any builder supply yard. While OSB is generally cheaper than plywood, it is somewhat denser (heavier) and not as stiff. The biggest complaint against OSB is that it doesn't handle moisture very well (a topic explored later). But moisture also affects the strength of plywood, so both work best when moisture content remains low. OSB currently enjoys over 70% market share for structural panels.² Nonetheless, some contractors are stridently dedicated to one or the other, just as some will only hand-nail versus others who



Figure 3 – OSB can be coupled with other materials and marketed as a composite or sandwich product having insulation, such as bead polystyrene; these structural insulated panels are becoming quite popular.

exclusively use pneumatic nail guns.

Some early OSB products were prone to swelling at edges; distortions would telegraph upward through a pitched roof covering and were likely to be seen—particularly under lightweight “builder-grade” shingles. Even though manufacturers now use better

adhesives and resins, board edges are still susceptible to swelling once they are cut in the field. If exposed, board edges can expand by up to 15%, especially if they are cut edges.³

OSB can be coupled with other materials and marketed as a composite or sand-



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Figure 4 – OSB can be integrated with structural cement fiber planks along with isocyanurate foam as the core. Here, fire-safing material was applied at joints.

wich product having insulation such as bead polystyrene (Figure 3). In the modern vernacular, these are termed structural insulated panels (SIP), and they are becoming quite popular. Figure 4 depicts OSB integrated with structural cement fiber planks with isocyanurate foam as the core. OSB may also be the top surface of proprietary nail-board/nail-base products (Figure 5). This product is ideal for cathedral-type ceilings, which are inherently difficult to ventilate and where a deliberate passageway for airflow is crucial. The product

shown is intended to be installed over a continuous pitched roof deck—plywood or OSB—with specialty fasteners.

INSTALLATION PARAMETERS

As stated above, OSB has rectangular flakes that are mostly parallel to the panel's long dimension. Accordingly, the strength/span properties have an orientation, and panels should be arranged with long direction falling across (i.e., perpendicular to) the framing supports.

The printed span numbers should al-

ways be honored. APA is the designation for the Engineered Wood Association. Formerly known as the American Plywood Association, it kept the acronym because of its universal recognition. For APA-stamped sheathing, the rating is expressed as two numbers, such as 24/16 (Figure 6). The first number is the center-to-center support spacing when used for roof sheathing, and the second number is the maximum span when used as subflooring. Again, the prod-



Figure 5 – Cathedral ceilings are inherently difficult to ventilate. The proprietary nail-board/nail-base product shown makes use of OSB and is ideal for inducing airflow.

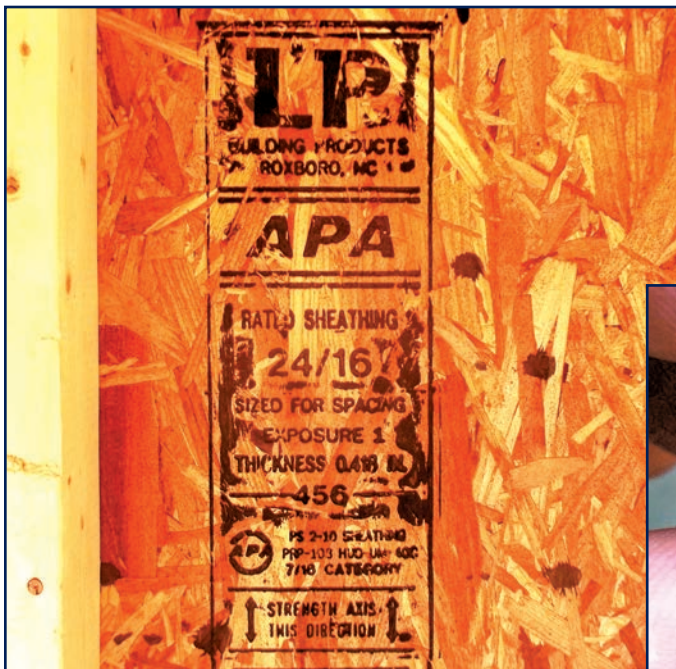


Figure 6 – For APA-stamped sheathing, the rating is expressed as two numbers. The first is the center-to-center support spacing when used for roof sheathing, and the second is the maximum span when used as subflooring.



Figure 7 – Clips are not intended to be the spacing element between panels. They do provide that incidental function, but their purpose is to reduce the effective spacing of framing members.

Figure 8 – As suggested by APA, a 1/8-in. gap should be provided along all sides. Here the deliberate spacing is shown.



uct must be oriented with the strength axis (long dimension) lying across three or more supports (that is, a two-span arrangement). Some of the numerical expressions may seem unusual in a roof framing application. For instance, engineered wood trusses are almost always 24 inches on center, so APA stamps such as 60/32 will seldom be witnessed by our ranks. That, however, could be encountered when material of 7/8-in. thickness is used.

During installation, it is somewhat more difficult to get a nail started in OSB versus plywood; yet, modern pneumatic tools have little difficulty with either. There have been claims that OSB does not hold nails as well as the equivalent thickness of plywood. Most of this appears to center around subfloor applications where hardwood flooring is to be used; much of this argument seems better directed toward proper fastener type and spacing, proper acclimation of the flooring material, and control of crawlspace moisture. Meanwhile in roofs, the claim has little validity, as OSB is perfectly capable of holding roofing nails. In both settings, emphasis should be given to keeping the sheathing dry to the greatest extent possible.

Sheathing panels should not be abutted tightly during installation. Clips afford some measure of spacing, although panels can still be abutted too tightly—even when clips are used. Contrary to widely held belief, these clips are not intended to be the spacing element between panels (Figure 7). They can provide that incidental function, but clips reduce the effective spacing of framing members. That is, they make the panels stiffer by transferring loads to adjacent sheets, much in the same manner as tongue-and-groove edges do for wood planks.⁴

As suggested by APA, a 1/8-in. gap should be provided along all sides (Figure 8). This is easily provided using a 10-d box nail.⁵ (The “d” is a nail size expression associated with a Roman coin called the *denarius*, which was also the name for an English penny; hence, the common expression of a “ten-penny nail.”) Occasional misfitting of abutting sheets may be tolerated, providing that gaps do not exceed a maximum opening of 1/4 in.

For low-slope roof assemblies, direct application of hot (or cold) bitumen to OSB should be avoided. Coated base sheets or venting base sheets should be fastened, and a red rosin sheet should also be used if any bitumen seepage is anticipated. Modern low-rise foam can be directly applied under the guidance of the respective adhesive manufacturer. For pitched roofs, bituminous ice-and-water membranes can be adhered directly, although well-established parameters of moisture vapor control should be



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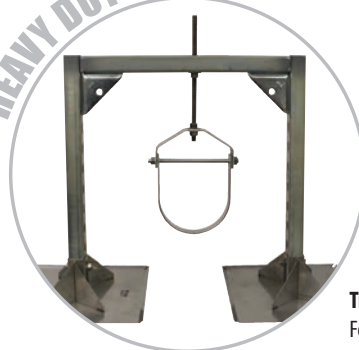


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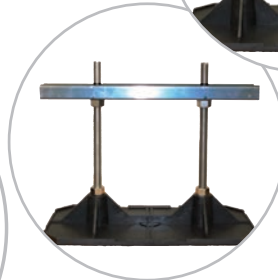
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Figure 9 – OSB is rather intolerant of moisture exposure, so ongoing leakage is sure to cause problems. Remember that board edges can expand by up to 15%, especially if they are cut edges.

Figure 10 – Deck buckling usually stems from substandard ventilation, improper attachment along panel edges, failure to provide space between sheathing panels, or some combination of these. With sufficient attic ventilation, proper spacing of sheathing, correct attachment, and correct span/thickness relationships, virtually all surface undulations can be avoided.




observed (i.e., a continuous impermeable membrane is not appropriate in all parts of the country, having to do with the prevailing direction of moisture vapor drive).

OTHER SITUATIONS THAT MAY BE ENCOUNTERED

As stated earlier, OSB is rather intolerant of moisture exposure, so ongoing leakage is sure to cause problems (Figure 9). Thermal and moisture-related distress is certainly not unique to OSB, but many pitched roof assemblies do have at least some zones of ineffective under-deck air flow. Being the majority of pitched roof market share, OSB decks are too often found with surface undulations related to flawed attic ventilation.⁶

Attic ventilation practices are very well established but not always implemented. Deck buckling of the variety shown in Figure 10 usually stems from substandard ventilation, improper attachment along panel edges, failure to provide space between panel edges, or some combination of these; moreover, ineffective under-deck air flow has occasioned the development of mold/mildew. With sufficient attic ventilation, proper spacing of sheathing, correct attachment, and correct span/thickness relationships, virtually all undulations of this kind can be avoided.

SUMMARY REMARKS

Finally, like several other deck types, OSB is not intended to be exposed for prolonged periods after installation. In the case of pitched roofs, ordinary felt underlayment or more modern building wraps should be applied as soon as practical. Even then, the permanent covering should follow shortly. 

REFERENCES

1. "Oriented Strand Board and Waferboard." *Technical Bulletin TB103*. Structural Board Association: Toronto, ON.
2. http://www.diffen.com/difference/OSB_vs_Plywood.
3. Nigel F. Maynard. "Product Pros and Cons: Oriented Strand Board vs. Plywood; Which Panel Is Right for Your Homes?" *builderonline.com*. Accessed November 24, 2009.
4. L.D. Hogan, D. Kilpatrick, and R. Koziol, "Roof Decks, A to Z; Part 3: Structural Clay Tile and Plywood." *Interface*. November 2011, p. 9.
5. "Prevent Buckling With Proper Spacing." *Builder Tips*. APA – The

6. R.L. Corbin. "Attic Ventilation: Why It's Necessary." *Interface*. August 2000. p. 21.



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