



Plywood or OSB?

Moisture-related concerns exist with wood structural panels

by Mark S. Graham

NRCA's technical services staff continues to hear from roofing contractors experiencing moisture-related dimensional stability problems with plywood and oriented strand board structural panel sheathing used with steep-slope roof systems. Following is a brief discussion of moisture mechanics, linear expansion and thickness swell testing, and NRCA's recommendations for plywood and OSB structural panel sheathing roof decks.

Moisture mechanics

Plywood and OSB sheathing, similar to all wood products, are hygroscopic, meaning they tend to absorb and release moisture from their surroundings.

When not exposed to direct wetting, structural panel sheathing's moisture content is a function of its environment's relative humidity and temperature. During construction and its service life, panels may be exposed to direct moisture. When exposed to direct wetting, structural panel sheathing's moisture content is influenced by wetting time and panel variables that affect capillarity, such as veneer species of plywood and wax additives in OSB.



APA—The Engineered Wood Association reports the approximate moisture content for wood structural panels after manufacturing is 5% to 8% for plywood and 2% to 4% for OSB. Some acclimation to ambient humidity conditions likely will occur during transit and storage.

Research conducted by APA shows the equilibrium moisture content for plywood and OSB is lower than that of solid wood. For example, at 70 F and 50% relative humidity, solid wood has an equilibrium moisture content of 9.2% whereas plywood has an equilibrium

moisture content of 7% and OSB has an equilibrium moisture content of 5.2%. In comparison, solid wood has a higher capacity to hold moisture than plywood, which has a higher capacity to hold moisture than OSB.

APA research

APA recently completed and published research about moisture-related dimensional stability of wood structural panel sheathing.

Linear expansion of plywood and OSB specimens was tested from oven dry to vacuum soak. Average tested results for 1/2-inch-thick plywood compared with 7/16-inch-thick OSB showed similar linear expansion—about 0.23%—in the “along direction” (a panel’s strength direction). However, in the “across direction” (a panel’s perpendicular-to-strength direction), the average tested linear

expansion was 0.3% for plywood compared to 0.38% for OSB. It is worth noting linear expansion in the across direction is about 30% greater than that in the along direction and OSB’s linear expansion in the across direction is about 28% greater than that of plywood.

APA indicates the effect of linear expansion of wood structural panels may lead to buckling after panels are nailed to framing.

Thickness swell was similarly evaluated. APA indicates thickness swell primarily is related to the radial expansion of the wood fibers

with some increase expected from the release of compression that occurs during sheathing’s manufacturing process. The thickness swell of OSB generally is greater than solid wood (and plywood) because of the release of compaction stress created during sheathing’s manufacturing process.

The average tested thickness swell from oven dry to vacuum soak for 1/2-inch-thick plywood was 9.4% compared with 32.9% for 7/16-inch-thick OSB; the average tested thickness swell for OSB is 3.5 times greater than that of plywood.

APA notes thickness swell is especially sensitive to one-sided wetting, such as that occurring during construction.

APA also notes thickness swell from total water immersion after 24 hours is about the same as three days of one-sided wetting.

Additional information about APA’s research is provided in APA Technical Topics Form No. TT-028D, “Moisture-related Dimensional Stability,” which is accessible at apawood.org.

NRCA’s guidelines

NRCA recommends structural panel roof sheathing for steep-slope roof assemblies comply with PS 1, “Structural Plywood”; PS 2, “Performance Standard for Wood-based Structural-Use Panels”; or APA PRP-108,

“Performance Standards and Qualification Policy for Wood Structural Panels.”

NRCA has concerns about the long-term performance of OSB panels, including those addressed by PS 2 and PRP-108. Although NRCA acknowledges the widespread use of OSB panels for constructing roof deck substrates, experience has shown OSB panels are subject to dimensional changes, ridging and fastener backout resulting from changing

moisture conditions. If given a choice between an OSB panel roof deck substrate or a plywood roof deck substrate, NRCA prefers roof deck substrates constructed of

plywood panels complying with PS 1.

Additional information about structural panel sheathing roof decks for steep-slope roof assemblies is provided in *The NRCA Roofing Manual: Steep-slope Roof Systems—2021*. 🌱🌿

MARK S. GRAHAM is NRCA’s vice president of technical services.

 [@MarkGrahamNRCA](https://twitter.com/MarkGrahamNRCA)