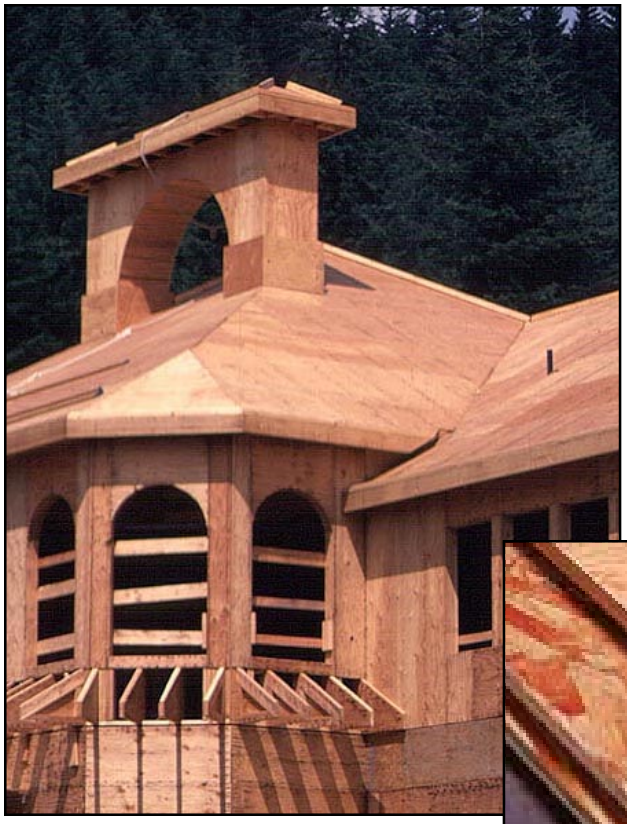
WOOD STRUCTURAL PANEL AWARENESS GUIDE



American Wood Council

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WOOD STRUCTURAL PANEL AWARENESS GUIDE

The American Wood Council (AWC) is the voice of North American traditional and engineered wood products, representing over 75% of the industry. From a renewable resource that absorbs and sequesters carbon, the wood products industry makes products that are essential to everyday life and employs over one-third of a million men and women in well-paying jobs. AWC's engineers, technologists, scientists, and building code experts develop state-of-the-art engineering data, technology, and standards on structural wood products for use by design professionals, building officials, and wood products manufacturers to assure the safe and efficient design and use of wood structural components. For more wood awareness information, see www.woodaware.info.

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The purpose of this informational guide is to provide awareness to the fire service on the types of wood structural panels and how they are used in the construction of residential buildings. This publication is one in a series of eight Awareness Guides developed under a cooperative agreement between the Department of Homeland Security's United States Fire Administration, and the American Wood Council.

Wood Structural Panels

PURPOSE OF THIS GUIDE

The purpose of this Awareness Guide is to provide the fire service with information on the types and properties of wood structural panels and how they are used in residential construction (Figure 1).

Figure 1 Plywood & OSB Panels

WOOD STRUCTURAL USE PANELS —Sheathing for Roofs, Floors, and Walls

Plywood and oriented strand board (OSB) are two types of wood structural panels commonly used in residential construction. Less frequently seen is particleboard and it is seldom used in structural applications, but is often used as underlayment over floor sheathing, in cabinets, and in furniture. All are available as 4' x 8' panels but are sometimes available in larger sizes.

Wood structural panels are available in three bond classifications – *Exterior, Exposure 1*, and *Interior*.

This classification provides a measure of moisture resistance of the glue bond but does not relate to fungal decay resistance of the panel. Wood panels with an *Exterior* bond classification are suitable for repeated wetting and redrying or long-term exposure to weather or other conditions of similar severity (Figure 2).

Figure 2 Wood-Framed Apartments under Construction

Wood panels with an *Exposure 1* bond classification are suitable for uses not permanently exposed to weather. *Exposure 1* panels are intended to resist the effects of moisture on structural performance due to construction delays, or other conditions of similar severity. Exposure 1 panels may also be used when exposure to the outdoors is on the under-side only, such as at roof overhangs.

Wood panels with *Interior* bond classification are intended for interior applications only.

Plywood

Plywood is a wood structural panel made with plies (sheets) of wood veneer that are glued together under heat and pressure. Plywood is stronger and stiffer when the grain of the face veneers are oriented perpendicular to supports, which is the typical orientation for most floor and roof applications. On floors and roofs, it should seldom be oriented with the long axis parallel to supports. Plywood can be rated as Exterior or Exposure 1.

Photos and graphics courtesy of
APA – The Engineered Wood Association.
For more information, visit www.apawood.org

Figure 3 Plywood Production Line

Plywood panels are assembled in the factory by laying-up thin sheets of wood veneer. The veneers are sorted and dried prior to being coated with adhesive (Figure 3).

Oriented Strand Board (OSB)

In response to greater demand for housing and commercial buildings, a decreasing supply of older trees, and increasing environmental restrictions on logging, waferboard was developed in the United States in the mid-fifties, followed by OSB in the late 1970s. OSB is a second-generation mat-formed product resulting from process improvements made to the earlier waferboard products.

OSB is made with layers of thin, rectangular strands or flakes of wood that are produced by feeding freshly cut hardwood or softwood logs through a cutting machine called a strander. Strands are then dried and blended with adhesives. Strands in the face layers are generally formed at right angles to those in the core layers, thus providing directional strength and stiffness properties. The trees needed to make OSB are usually smaller, less merchantable, and faster growing than the ones used for plywood. OSB is *not* made from recycled wood or wood waste from other manufacturing operations.

The wood strands are blended with adhesives, then glued under heat and pressure to the desired panel thickness (Figure 4).

Figure 4 OSB Production Line

Particleboard

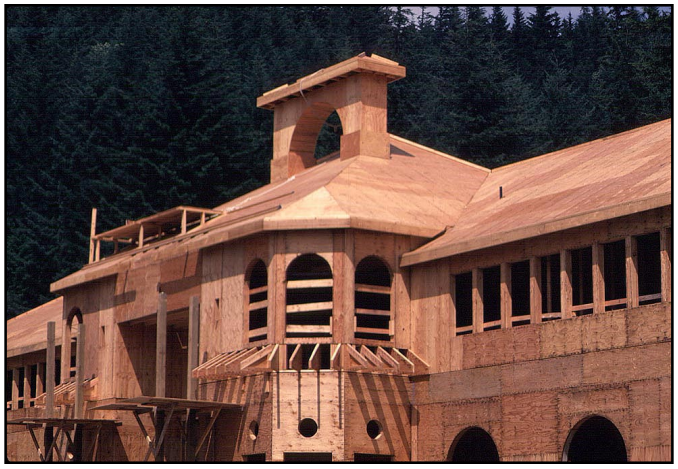
Particleboard is composed of very small particles of wood glued together under heat and pressure. It is not classified in the building codes as a wood structural panel and is therefore not generally used in normal construction for structural purposes such as floor, roof, or wall sheathing. It is, however, sometimes used in floors in manufactured housing. Its glue bond is classified as "Interior," which means that it is not to be used in high-humidity locations.

Grades of Wood Structural Panels

Wood structural panels are available in many thicknesses, ranging from $^1/_2$" – $1^1/_2$". These panels are primarily used in residential construction as roof sheathing, wall sheathing, subflooring, as single layer floors under carpet and pad, in structural insulated panels, I-joist webstock, and rim boards.

"Sheathing" is an unsanded panel intended for use as a structural covering and nail-base material for roofs, subfloors, and walls (Figure 5).

Figure 5 Sheathing

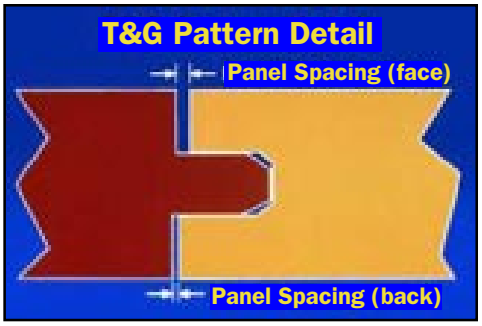


Sheathing that will be covered with shingles, brick veneer, etc.

"Underlayment" is used as the top layer in a two-layer floor-panel system. It is usually plywood and it may be sanded on the top face.

"Single-floor" is used as a combination subfloor and underlayment in single-layer floor applications. It is often used under carpet and pads. It is commonly available with tongue-and-groove edges (T&G) along the 8-foot sides (Figures 6 and 7).

Figure 6 Tongue and Groove (T&G) Profile



The T&G edges ensure that adjacent panel surfaces move up and down together when walked on to ensure even wear of finish flooring such as vinyl or carpet.

Figure 7 Single-Layer Floor Panel Installation

"Siding" panels are generally available as plywood, but some siding-grade panels and lap siding are available in OSB (Figures 8a and 8b). Lap siding is manufactured by cutting wood structural panels covered with a moisture resistant surface finish and edge treatment.

Figure 8a Siding Installation

Figure 8b Siding Installation

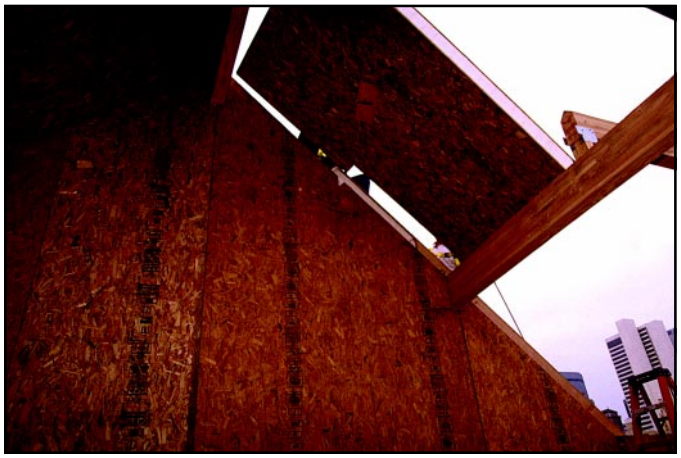
Structural Insulated Panels (SIPs)

Structural insulated panels (SIPs) are composites of foam plastic [usually expanded polystyrene (EPS)] sandwiched between wood structural panels. The SIPs are used to make floors, walls, and roofs (Figure 9).

SIPs are used because they are energy efficient. They are generally made with $^{7}/_{16}$" OSB skins over EPS. The EPS can be up to a foot thick, making SIPs ideal for cold climates.

SIPs are made in a factory with all the openings and shapes precut and the electrical and plumbing chases in place. Once the foundations are in place, the building can be enclosed within two or three days. The interior surface of SIPs is then covered with gypsum wallboard, just as with a field-built structure.

Figure 9 Wood Structural Insulated Panel (SIP) Installations



WHERE ARE PANELS USED?

Applications of Structural Panels in Construction

Floors

The most common wood structural panel installed in typical floor applications is $^{23}/_{32}$–inch thick, installed at 24 inches on center, and used as a combination subfloor-underlayment (Figures 10a and 10b). With supports at 24 inches on-center or less, these panels provide a strong, stiff, and solid surface on which different types of finish flooring (such as carpet and pad) can be directly applied. A two-layer floor system, comprised of a layer of structural subflooring and an underlayment layer, is also used in many applications.

Figure 10a Floor Construction

Figure 10b Floor Construction

Walls

Wood structural panels keep walls standing upright by resisting forces along the walls ("racking") that come from wind and earthquakes (Figures 11 and 12). In some cases, wall sheathing of cardboard, foam plastic, or other materials replaces the wood structural panel bracing system.

Roofs

Wood structural panels are routinely used as roof sheathing in pitched and flat roofs under various waterproofing systems. In addition to carrying gravity loads from snow, rain, finish roofing, mechanical units, and people, they also serve to resist lateral forces applied to buildings from high winds or earthquakes.

The most common panel thicknesses used in roofs are $^{7}/_{16}$" and $^{15}/_{32}$". They are generally supported by trusses spaced 24" oc. In areas with minimal or no snow loads, building codes typically permit wood structural panels as thin as $^{3}/_{8}$" thick in roofs with supports up to 24" oc.

Figure 11 Wall Construction

Figure 12 Seismic Test of Walls

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