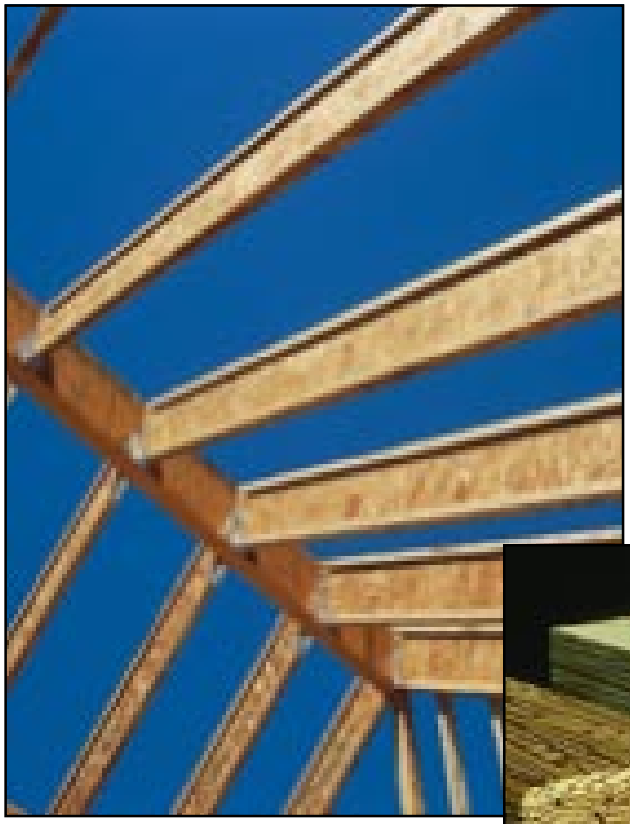
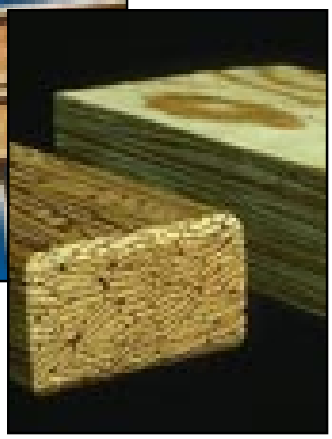
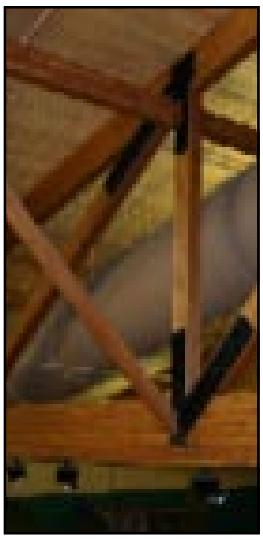
STRUCTURAL COMPOSITE LUMBER & GLUED LAMINATED TIMBER AWARENESS GUIDE







American Wood Council

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STRUCTURAL COMPOSITE LUMBER & GLUED LAMINATED TIMBER 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 Structural Composite Lumber and Glued Laminated Timber 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.

Structural Composite Lumber & Glued Laminated Timber

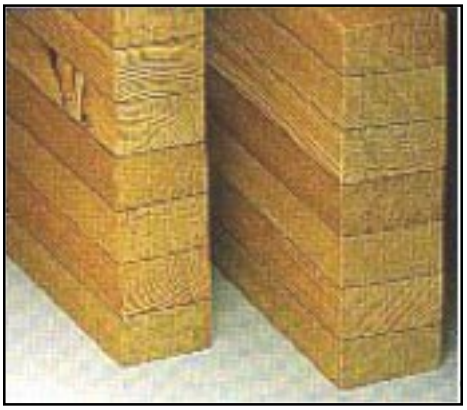
PURPOSE OF THIS GUIDE

The purpose of this Awareness Guide is to provide the fire service with information on the types and properties of Structural Composite Lumber (SCL) and Glued Laminated Timber (glulam), how the products are manufactured, and how they are used in residential construction (Figures 1 and 2).

Figure 1 Parallel Strand Lumber & Laminated Veneer Lumber

Parallel Strand Lumber (PSL) and Laminated Veneer Lumber (LVL) are two types of Structural Composite Lumber (SCL).

Figure 2 Glued Laminated Timber (Glulam)



WHAT ARE SCL AND GLULAM?

Structural composite lumber (SCL) and glulam timbers are recognized as rectangular shaped products that have strength, stiffness, and consistency resulting from wood fiber orientation and strict manufacturing process control. Advancements in technology have given SCL manufacturers the ability to take apart a smaller log, sort the pieces, apply adhesive, and reassemble them back together into an engineered product. SCL products have grown in popularity because of the ability to manufacture long lengths and large cross-sectional dimensions with consistency.

Glulam is produced in laminating plants by gluing together layers of sawn lumber to form large cross-section timbers that retain the traditional look of wood along with engineered strength.

TYPES OF STRUCTURAL COMPOSITE LUMBER

Proprietary brand names are frequently used in the marketplace to identify SCL, such as Microlam®, Ganglam®, and Parallam®. However, the products can be identified by generic names, based on the size and shape of the wood pieces that are glued together:

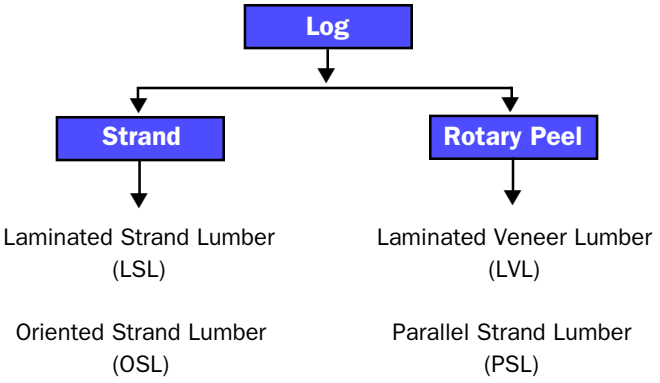
- Laminated Veneer Lumber (LVL)
- Laminated Strand Lumber (LSL)
- Oriented Strand Lumber (OSL)
- Parallel Strand Lumber (PSL)

Manufacture of Structural Composite Lumber

Structural composite lumber products are produced through two primary log-processing methods—stranding and rotary peeling—as depicted in Figure 3.

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

Figure 3 SCL Log Processing Methods

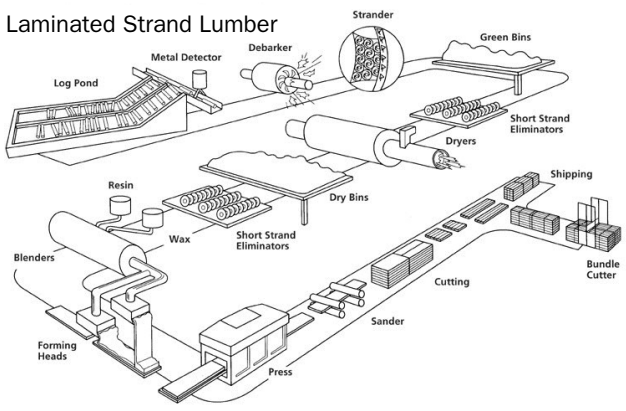


The manufacturing process for all SCL typically includes sorting and aligning the strands or veneer, applying adhesive, and pressing the material together under heat and pressure (Figures 4, 5, and 6). By redistributing natural defects, sorting for stiffness or density, and through quality control procedures, the resulting product is uniform.

Stranding slices the entire log into 3-inch to 12-inch strands, similar to grating a block of cheese. The strands are dried in a large rotary drum, where an adhesive is applied. The strands are then dropped into a forming bin and pressed together to form the individual products. These products can be thin and flat sheets, like plywood, or long and wide, like sawn lumber.

There are two types of SCL strand products—LSL and OSL—which are used primarily as lumber substitutes and as flanges in I-Joists. LSL uses longer length strands than OSL.

Figure 4 Laminated Strand Lumber Manufacturing Process



Rotary peeling uses a knife placed parallel to the outside edge of a spinning log on a lathe. The wood is peeled off the log starting on the outside and working towards the center, similar to removing paper towels from a roll. The wood slices are then cut into individual sheets called veneer, dried, glued, and pressed together to form the product.

There are two types of SCL made from rotary-peeled veneer—LVL and PSL—which are used primarily as lumber or heavy timber substitutes, and as flanges in I-joists. LVL uses full-size veneer sheets, which can range from one-tenth to one-sixth of an inch thick. PSL uses veneer which is too narrow for LVL or plywood.

Figure 5 Parallel Strand Lumber Manufacturing Process

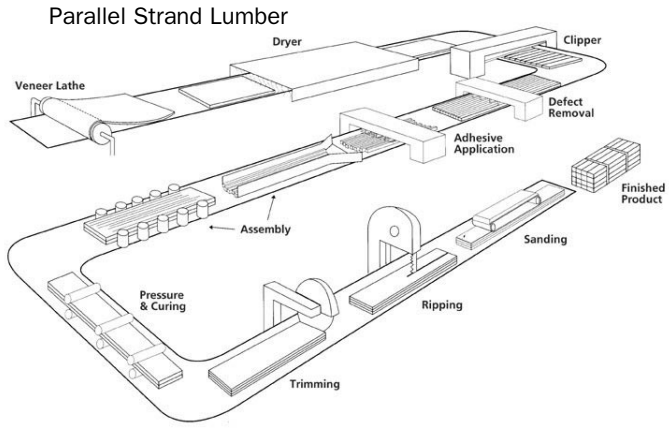
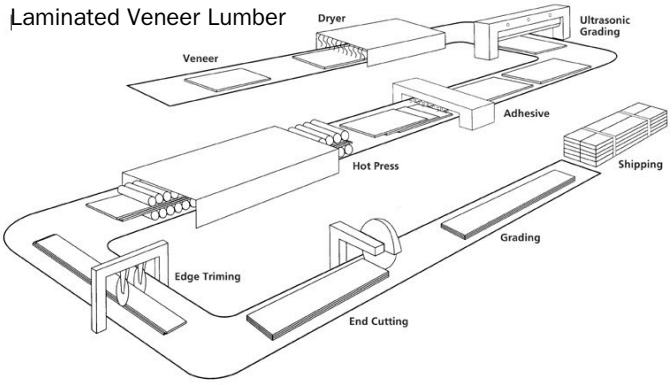


Figure 6 Laminated Veneer Lumber Manufacturing Process



Structural composite lumber is available in a range of sizes and grades. The material typically undergoes final processing in a continuous or fixed press to form what is called a "billet" (for example: 4' wide x 60' long), which is then resawn into final product dimensions. SCL ranges in depths from $3\frac{1}{2}$" to 18" and thicknesses up to 7".

Manufacture of Glued Laminated Lumber (Glulam)

Glulam is fabricated using individual pieces of nominally 1- to 2-inch thick, kiln-dried lumber, laminated together under controlled conditions of temperature and pressure, to form large timber sections (Figure7). It is typically manufactured using Douglas fir, Hem-Fir, Southern pine, Spruce-Pine-Fir, Alaskan Yellow cedar, and Ponderosa pine lumber.

Glulam can be fabricated in almost any straight or arched configuration for long spans. Glulam is manufactured with laminate layers (called lams), glued together. The required strength and position of each lamination is predetermined through engineering analysis. The tension and compression (outside) lams are made of higher-grade lumber and carry much of the bending load. However, the core lams are equally important as they resist the horizontal shear stresses. Individual lams are formed by cutting kiln-dried lumber into pre-determined thicknesses. For glulam, the lams are then joined together using thermosetting adhesives. These adhesives undergo irreversible chemical change when first heated under pressure. (The Adhesive Awareness Guide in this series contains specific information on engineered wood product (EWP) adhesive performance.)

Figure 7 Glue-Laminated Timbers Used in Roof Truss

Glulam timbers are desirable for their strength characteristics and appearance. Glulam is available in a variety of widths, depths, and lengths.

Performance Requirements: Strength and Durability

Strength–Engineered wood products, such as SCL, must meet certain physical (dimension) and mechanical property (strength) tests.

Glulam quality control programs ensure that the product meets required performance criteria.

Durability–It is important that an engineered wood product such as SCL retain its strength and structural integrity after it has been in service, and, in some cases, exposed to exterior conditions under normal conditions of use.

How SCL or Glulam is Used

During construction is the best time to see how an SCL or glulam framing system is configured and carries loads. These large cross-section dimension members can be used almost anywhere, and typically are installed as floor or roof beams, headers over doors and windows, rimboard around the edge of a foundation, or as studs in wall framing (Figures 8 and 9).

Site Visits

Although residential construction is built from the ground up, framing is best inspected from the roof down. The most important structural characteristic common to all buildings and all types of construction is referred to as "load path continuity." Load path is the prescribed route that gravity loads—such as live, snow, and water ponding—and lateral loads—from wind and earthquakes—follow to the footings. For simple single-family dwellings, the roof, ceiling and floor loads are collected through rafters or joists, which rest on exterior walls, and interior beams or bearing walls.

Figure 8 SCL Used as Ridge Beam in Roof

The layout drawings will show the minimum grade and species required of each SCL or glulam member, the on-center spacing, points of bearing, and connector information. It is also important to assure that large cross-section dimension members are properly attached to adjacent framing members and tied together with straps, hangers or other types of approved connectors.

FOR MORE INFORMATION

Barnes, Derek, 2000. "An Integrated Model of the Effect of Processing Parameters on the Strength Properties of Oriented Strand Wood Products," *Forest Products Journal* 50 (11/12): 33-42.

http://www.forestprod.org

Figure 9 SCL Used as Header and Blocking

SCL is used here as a header above a window and as blocking between I-joists. Note the V-notches for roof ventilation.

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