

## Fire Resistance of Structural Composite Lumber

### 1. INTRODUCTION

Structural composite lumber (SCL) is a family of engineered wood products, including laminated veneer lumber (LVL), parallel strand lumber (PSL), laminated strand lumber (LSL), and oriented strand lumber (OSL). SCL is created by layering dried and graded wood veneers, strands, or flakes with moisture-resistant adhesives into blocks of material known as billets with wood fibers primarily oriented along the longitudinal axis of the structural member. Billets are subsequently re-sawn into specific sizes for structural uses, such as headers and beams.

Since SCL is made of wood with a very small percentage of thermal-set structural adhesives, the fire performance of SCL is comparable with solid-sawn lumber products of equivalent dimensions. This document provides a summary of SCL fire performance based on the model building codes and research literature.

### 2. FIRE PERFORMANCE OF SCL

#### 2.1 CHAR RATE

The char rate of SCL has been evaluated through ASTM E119 [1] fire tests by the USDA Forest Products Laboratory in Madison, WI [2], and the engineered wood products industry [3]. Those studies concluded that the SCL char rate is comparable with solid-sawn lumber and therefore, Chapter 16 of the 2015 National Design Specification for Wood Construction (NDS) has the following provisions for the SCL char rate [4]:

A nominal char rate,  $\beta_n$ , of 1.5 in./hr. is commonly assumed for solid sawn, structural glued laminated softwood members, laminated veneer lumber, parallel strand lumber, and laminated strand lumber, and cross-laminated timber.

*Note: The definition of SCL in the 2015 NDS does not cover OSL.*

#### 2.2 FIRE DESIGN FOR SCL STRUCTURAL MEMBERS

SCL can be designed for fire performance in accordance with Chapter 16 of the 2015 NDS, which is recognized in Section 722 of the 2015 International Building Code (IBC) [5] as follows:

##### **Section 722** **Calculated Fire Resistance**

**722.1 General.** The provisions of this section contain procedures by which the *fire resistance* of specific materials or combinations of materials is established by calculations... The calculated fire resistance of exposed wood members and wood decking shall be permitted in accordance with Chapter 16 of ANSI/AF&PA *National Design Specification for Wood Construction* (NDS).

## 2.3 SCL FOR USE IN TYPE IV HEAVY TIMBER CONSTRUCTION

SCL can be used in Type IV Heavy Timber Construction provided that the minimum cross-sectional dimension of the SCL meets the requirements specified in Section 602.4 of the 2015 IBC as follows:


**602.4 Type IV.** Type IV construction (Heavy Timber, HT) is that type of construction in which the exterior walls are of noncombustible materials and the interior building elements are of solid or laminated wood without concealed spaces. . . Minimum solid sawn nominal dimensions are required for structures built using Type IV construction (HT). For glued laminated members and structural composite lumber (SCL) members, the equivalent net finished width and depths corresponding to the minimum nominal width and depths of solid sawn lumber are required as specified in Table 602.4. Cross laminated timber (CLT) dimensions used in this section are actual dimensions.

**Table 602.4**  
**Wood Member Size Equivalencies**

Minimum Nominal Solid Sawn Size		Minimum Glued-Laminated Net Size		Minimum Structural Composite Lumber Net Size	
Width, in.	Depth, in.	Width, in.	Depth, in.	Width, in.	Depth, in.
8	8	6-3/4	8-1/4	7	7-1/2
6	10	5	10-1/2	5-1/4	9-1/2
6	8	5	8-1/4	5-1/4	7-1/2
6	6	5	6	5-1/4	5-1/2
4	6	3	6-7/8	3-1/2	5-1/2

## 3. REFERENCES

- 1) ASTM International. 2012. *Standard Test Methods for Fire Tests of Building Construction and Materials*. ASTM E119. West Conshohocken, PA.
- 2) White, R.H. 2006. *Fire Resistance of Structural Composite Lumber Products*. USDA Forest Products Laboratory, Madison, WI.
- 3) American Wood Council. 2014. *Fire Resistance Testing of Structural Composite Lumber Single Beams*. WFCi Report #14035. Leesburg, VA.
- 4) American Wood Council. 2015. *National Design Specification for Wood Construction*. Leesburg, VA.
- 5) International Code Council. 2015. *International Building Code*. Country Club Hills, IL.

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