



Testing & Engineering Report

Master Plank® laminated veneer lumber (LVL)

TER No. 0812-01exec

Finnforest-USA
Engineered Wood Division

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Division: 06 – WOOD AND PLASTICS
Section: 06170 – Prefabricated Structural Wood

1. Product Line Evaluated:

1.1. Master Plank® laminated veneer lumber (LVL)

1.1.1. Master Plank® Beams and Headers – 2900 Fb- 2.0 E

2. Summary of Performance Evaluation:

- 2.1. Master Plank® LVL provides structural performance to resist the application of gravity, lateral buckling and uplift loading. The product meets these requirements with respect to each of the foregoing building codes in the context of the code referenced *Standard Specification for Evaluation of Structural Composite Lumber Products, ASTM D5456*.
- 2.2. The product may be used as an alternative material to that described in Chapter 23 of the *IBC*, *BNBC*, *SBC*, and the *UBC*, and complies with the requirements noted in [Section 2303.1.9](#) of the *IBC*, [Section 2301.2.1](#) of the *IBC* for allowable stress design, and [Section 2303.4](#) of the *BNBC*.
- 2.3. Master Plank® may be used as an alternative to sawn lumber for floor, roof and wall structural members and materials, and meets the requirements of the above-mentioned codes.
- 2.4. Structural applications include: beams, columns, headers, joists, rafters, rim boards and wall studs.
- 2.5. Master Plank® LVL may also be used for industrial applications such as scaffold plank, staging, bleacher seats, cross arms, ladder rails and other industrial applications.

3. Structural Design:

3.1. Design of Master Plank® LVL is governed by the applicable code and the *ANSI/AF&PA National Design Specification for Wood Construction (NDS®)* and *TER 0812-01*.

3.2. Allowable Stresses for Master Plank® LVL (Allowable Stress Design)

Bending Stress, F _b (psi)		Tensile Stress, F _t (psi)	Compressive Stress, F _c (psi)			Horizontal Shear Stress, F _v (psi)		Modulus of Elasticity E (psi)	
Beam	Plank	Parallel-to-Grain	Parallel-to-Grain	Perpendicular-to-Grain		Beam	Plank	Beam	Plank
				Beam	Plank				
2900	3200	2300	2700	870	435	320	320	2.0x10 ⁶	2.0x10 ⁶

Table 1a: Allowable Stresses for Master Plank® LVL (Allowable Stress Design)

3.3. Specified Strengths for Master Plank® LVL (Limit States Design)

Bending, F _b (MPa)		Tension, F _t (MPa)	Compression, F _c (MPa)			Horizontal Shear, F _v (MPa)		Modulus of Elasticity E (MPa)	
Beam	Plank	Parallel-to-Grain	Parallel-to-Grain	Perpendicular-to-Grain		Beam	Plank	Beam	Plank
				Beam	Plank				
37.25	40.69	25.85	29.50	10.93	5.44	3.40	2.53	13,800	13,800

Table 1b: Specified Strengths for Master Plank® LVL (Limit States Design)



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3.4. Equivalent Specific Gravities and Minimum Fastener Spacing for Design of Mechanical Connections

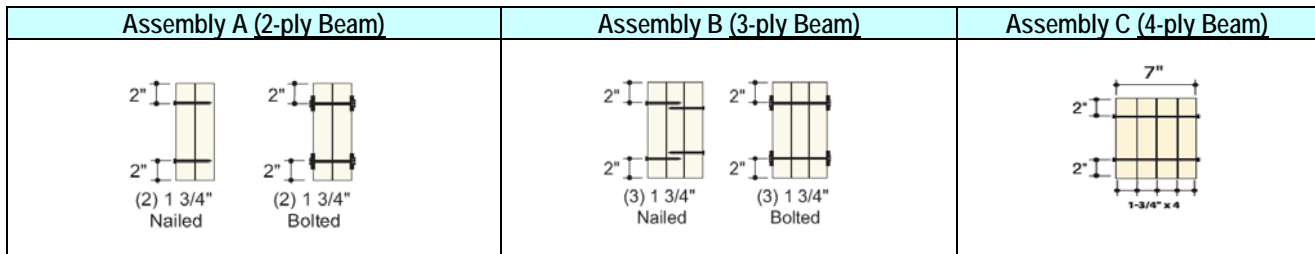
Product	Fastener	Fastener Axis Orientation	Load Direction	Equivalent Specific Gravity for Design Purposes	Minimum Spacing
Master Plank® LVL	Nails & Screws	Y axis	Lateral	0.45	2 inches (51 mm) on-center ⁴
		X axis	Lateral	0.44	
	Nails	X and Y axes	Withdrawal	0.48	
	Bolts	X and Y axes	Lateral	0.50	Per applicable code

Table 2: Equivalent Specific Gravities and Minimum Fastener Spacing for Design of Mechanical Connections

3.5. Connection Requirements for Multiple Member Side-Loaded Beams

Maximum Uniformly Distributed Load (PLF) That Can Be Applied to Either Side Of the Beam					
Assembly Detail (See Figures 1-3)	2 Rows of 16d (0.162x3-½") Nails at 12" o.c.	3 Rows of 16d (0.162x3-½") Nails at 12" o.c.	2 Rows of 16d (0.131x3-½") Nails at 12" o.c. or	3 Rows of 16d (0.131x3-½") Nails at 12" o.c. or	2 Rows of ½" Bolts at 12" o.c.
A	510	760	350	530	1,015
B	380	570	265	395	760
C					675

Table 3: Connection Requirements for Multiple Member Side-Loaded Beams



Figures 1-3: Connection Requirements for Multiple Member Side-Loaded Beams

4. Fire-Resistance:

- 4.1. The provisions of *IBC Section 721.6.3*, dealing with the design of fire-resistant exposed wood members, apply to Master Plank® LVL.
- 4.2. The nominal char rate for Master Plank® LVL is 1.65 in/hr (0.70 mm/min).

5. Conditions of Use:

- 5.1. Master Plank® LVL shall be installed in accordance with the applicable code, the approved construction documents, this TER and the manufacturer’s installation instructions. If this TER and the manufacturer’s instructions are not in agreement, this TER supersedes and should be followed.

6. Material Safety Data Sheet for Master Plank® LVL:

- 6.1. Master Plank® complies with all Federal, State and Local MSDS requirements.

7. Identification:

- 7.1. Master Plank® LVL is identified with a stamp noting the product manufacturer (Finnforest Oy), product distributor (Finnforest-USA, Engineered Wood Division), product name, product grade, the quality control agency VTT Building Technology (AA-607), other information to confirm code compliance and the number of this TER for field identification.

8. Report Date:

- 8.1. This TER shall be re-evaluated one year from the issue date.



Responsibility Statement

The information contained herein is based on a product evaluation performed in accordance with the referenced testing and/or analysis using generally accepted engineering practices. Product quality control is the responsibility of the manufacturer. Consult your local jurisdiction or design professional to assure compliance with the local building code and the proper detailing and application for the intended purpose. [Qualtim, Inc.](#) and [SBC Research Institute](#) do not make any warranty, express or implied, or assume any legal liability or responsibility for the use, application of, and/or reference to opinions, findings, conclusions, or recommendations included in this report.

Appendix A

2009 IBC

2301.2 General design requirements. The design of structural elements or systems, constructed partially or wholly of wood or wood-based products, shall be in accordance with one of the following methods:

1. *Allowable stress design* in accordance with Sections 2304, 2305 and 2306.
2. *Load and resistance factor design* in accordance with Sections 2304, 2305 and 2307.
3. *Conventional light-frame construction* in accordance with Sections 2304 and 2308.

Exception: Buildings designed in accordance with the provisions of the AF&PA WFCM shall be deemed to meet the requirements of the provisions of Section 2308.

4. The design and construction of log structures shall be in accordance with the provisions of ICC 400.

2303.1.9 Structural composite lumber. Structural capacities for structural composite lumber shall be established and monitored in accordance with ASTM D 5456.

721.6.3 Design of fire-resistant exposed wood members.

The *fire-resistance rating*, in minutes, of timber beams and columns with a minimum nominal dimension of 6 inches (152 mm) is equal to:

Beams: $2.54Zb [4 - 2(b/d)]$ for beams which may be exposed to fire on four sides.

(Equation 7-18)

$2.54Zb [4 - (b/d)]$ for beams which may be exposed to fire on three sides.

(Equation 7-19)

Columns: $2.54Zd [3 - (d/b)]$ for columns which may be exposed to fire on four sides

(Equation 7-20)

$2.54Zd [3 - (d/2b)]$ for columns which may be exposed to fire on three sides.

(Equation 7-21)

where:

b = The breadth (width) of a beam or larger side of a column before exposure to fire (inches).

d = The depth of a beam or smaller side of a column before exposure to fire (inches).

Z = Load factor, based on Figure 721.6.3(1).

721.6.3.1 Equation 7-21. Equation 7-21 applies only where the unexposed face represents the smaller side of the column. If a column is recessed into a wall, its full dimension shall be used for the purpose of these calculations.

721.6.3.2 Allowable loads. Allowable loads on beams and columns are determined using design values given in AF&PA NDS.

721.6.3.3 Fastener protection. Where minimum 1-hour *fire resistance* is required, connectors and fasteners shall be protected from fire exposure by 1½ inches (38 mm) of wood, or other *approved* covering or coating for a 1-hour rating. Typical details for commonly used fasteners and connectors are shown in AITC Technical Note 7.

721.6.3.4 Minimum size. Wood members are limited to dimensions of 6 inches (152 mm) nominal or greater. Glued-laminated timber beams utilize standard laminating combinations except that a core lamination is removed. The tension zone is moved inward and the equivalent of an extra nominal 2-inch-thick (51 mm) outer tension lamination is added.

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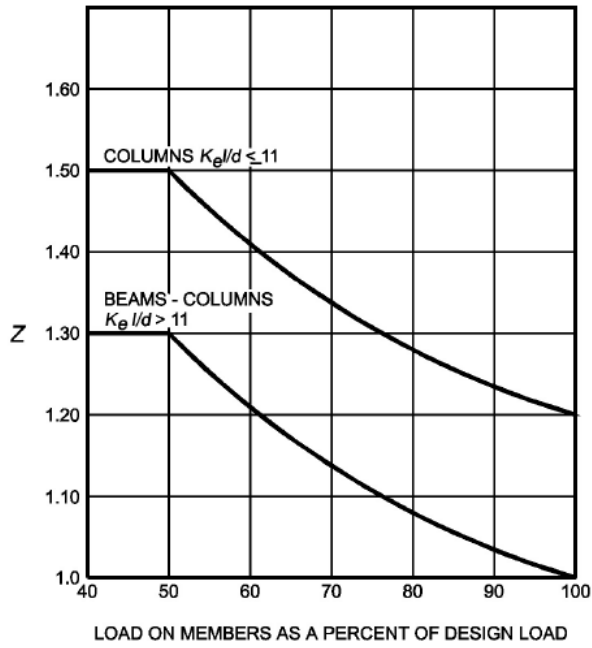


FIGURE 721.6.3(1)
LOAD FIGURE

K_e = The effective length factor as noted in Figure 721.6.3(2).
 l = The unsupported length of columns (inches).

BUCKLING MODES						
THEORETICAL K_e VALUE	0.5	0.7	1.0	1.0	2.0	2.0
RECOMMENDED DESIGN K_e WHEN IDEAL CONDITIONS APPROXIMATED	0.65	0.80	1.2	1.0	2.10	2.4
END CONDITION CODE						

FIGURE 721.6.3(2)
EFFECTIVE LENGTH FACTORS

1996 BNBC (BOCA)

2303.4 Combustibility: Wood used as structural elements or portions thereof shall be limited to combustible structural elements as required by this code.

Exceptions

1. Fireretardant-treated wood as permitted by Table 602, Note d, and which complies with Section 2310.0.
2. As specifically permitted by Section 602.4.1.