



Freres Mass Ply Panels (MPP) and
Mass Ply Lam (MPL) Beams and Columns

PR-L325

Revised February 14, 2025

Freres Lumber Co. Inc. dba Freres Engineered Wood

Products: Freres Mass Ply Panels (MPP) and Mass Ply Lam (MPL) Beams and Columns
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1. Basis of the product report:

- 2024, 2021, 2018, and 2015 International Building Code (IBC): Section 2303.1.4 Cross-laminated timber (Structural glued cross-laminated timber in 2021, 2018, and 2015 IBC)
- 2024, 2021, 2018, and 2015 International Residential Code (IRC): Sections R502.1.6, R602.1.6, and R802.1.5 (R802.1.6 in 2021, 2018, and 2015 IRC) Cross-laminated timber
- ANSI/APA PRG 320-2019 Standard for Performance-Rated Cross-Laminated Timber recognized in the 2024 and 2021 IBC and IRC
- ANSI/APA PRG 320-2017, PRG 320-2012, and PRG 320-2011 recognized in the 2018 IBC and IRC, 2015 IRC, and 2015 IBC, respectively
- 2024, 2018, and 2015 ANSI/AWC NDS, National Design Specification for Wood Construction recognized in the 2024 IBC and IRC, 2021 and 2018 IBC and IRC, and 2015 IBC and IRC, respectively
- APA Reports T2018P-21, T2019P-39, T2019P-69, T2020P-23, T2021P-18, T2021P-25, T2021P-38, and T2023P-44, and other qualification data

2. Product description:

Freres Mass Ply Panels (MPP) are manufactured with nominal 1-inch-thick Freres 1.6E and 1.0E Douglas-fir LVL recognized in APA Product Report PR-L324 in accordance with custom layouts of ANSI/APA PRG 320 through product qualification and mathematical models using principles of engineering mechanics. The LVL layers are parallel-laminated, bonded with approved structural adhesives, and pressed to form a solid panel. The unglued edge joints between the 1-inch-thick LVL pieces within the same MPP layer, when present, are staggered between adjacent layers.

Freres MPP is available in the grade of F10 or F16, and can be used in floor, roof, and wall applications. Freres MPP is manufactured in a plank billet (see Figure 1) in nominal thicknesses (t) of 2-1/16 to 12-1/4 inches, nominal widths (w) of 4, 8, 10, and 12 feet, and lengths up to 48 feet.

Freres Mass Ply Lams (MPL) are rip-cut vertically from MPP and intended primarily for use as beams in the joist (edgewise) orientation or columns in the axial orientation. MPL is not permitted to be rip-cut horizontally from MPP. MPL is available in the grade of F21, F19, F16, F16A, or F10. Freres F21, F19, and F16 MPL are available in nominal thicknesses (t) of 2-1/16 to 24-1/2 inches, nominal widths (w) of 1 to 48 inches, and lengths up to 80 feet. Freres F21, F19, and F16 MPL are ripped from 4-foot wide MPP with no edge joints between any 1-inch layers. Freres F16 MPL is permitted for use in the plank (flatwise) orientation provided that the minimum width (w) is no less than 5-1/8 inches.

Freres F16A MPL is available in nominal thicknesses (t) of 2-1/16 to 12-1/4 inches, nominal widths (w) of 1 to 72 inches, and lengths up to 80 feet (see Figure 1). Freres F16A MPL shall be permitted to be ripped from an MPP billet as long as the distance between the edge joint in any 1-inch layers and extreme fiber in tension or compression edge of the MPL is at

least 5 inches. Freres F16A MPL is permitted for use in the plank (flatwise) orientation provided that the minimum width (w) is no less than 5-1/8 inches.

Freres F10 MPL is available in nominal thicknesses (t) of 2-1/16 to 3-1/16 inches, nominal widths (w) up to 48 inches, and lengths up to 48 feet. Freres F10 MPL is ripped from 4-foot wide MPP with no edge joints between any 1-inch layers. Freres F10 MPL is permitted for use in the plank (flatwise) orientation provided that the minimum width (w) is no less than 5-1/8 inches.

3. Design properties:

Table 1 lists the allowable design properties for Freres MPP. Table 2 lists the allowable stress design properties for Freres MPL beams and columns. Allowable spans for Freres MPP and MPL shall be in accordance with manufacturer's recommendations (www.frereswood.com/products-and-services/mass-ply-products/mass-ply-panel/). Table 3 lists the equivalent specific gravities for fastener design and Table 4 lists the minimum nail spacing for Freres MPP and MPL.

4. Product installation:

Freres MPP and MPL shall be installed in accordance with the recommendations provided by the manufacturer (see link above) and the engineering drawing approved by the engineer of record. Permissible details shall be in accordance with the engineering drawing.

5. Fire-rated assemblies:

Fire-rated assemblies using Freres MPP shall be constructed in accordance with the recommendations provided by the manufacturer. Procedures specified in Chapter 16 of the NDS shall be permitted for use in designing Freres MPP for a fire exposure up to 2 hours.

The provisions specified in the 2024, 2021, 2018, and 2015 IBC Section 722 Calculated fire resistance shall be applicable to Freres MPL. Fire-rated assemblies using Freres MPL shall be constructed in accordance with the recommendations provided by APA Design/Construction Guide: *Fire-Rated Systems, Form 305* (www.apawood.org/resource-library), and the manufacturer.

6. Limitations:

- a) Freres MPP and MPL shall be designed in accordance with principles of mechanics using the design properties specified in this report or provided by the manufacturer.
- b) Freres MPP and MPL products shall be limited to dry service conditions where the average equilibrium moisture content of solid-sawn lumber is less than 16%.
- c) Freres MPP and MPL shall be manufactured in accordance with the proprietary Freres MPP and MPL manufacturing specifications documented in the in-plant manufacturing standard approved by APA.
- d) Freres MPP and MPL are produced at the Freres facility in Lyons, Oregon under a quality assurance program audited by APA.
- e) Properties shown in Table 2 are limited to F21, F19, F16, and F16A MPL with nominal thicknesses of 2-1/16 to 24-1/2 inches, and F10 MPL with nominal thicknesses of 2-1/16 to 3-1/16 inches.
- f) The distance between the edge joint in any 1-inch layers and extreme fiber in tension or compression edge of the MPL must be at least 5 inches when installed in the joist (edgewise) orientation.
- g) This report is subject to re-examination in one year.

7. Identification:

Freres MPP and MPL described in this report are identified by a label (stamp or sticker) bearing the manufacturer's name (Freres) and/or trademark, the APA assigned plant number (1121), the product standard (ANSI/APA PRG 320 and/or ASTM D5456), the APA

logo, the MPP or MPL grade and thickness (or layup ID), the report number PR-L325, and a means of identifying the date of manufacture.

Table 1. ASD Reference Design Values^(a,b,c) for Freres MPP (for Use in the U.S.)

MPP Grade	Layup ID	Thickness, t_p (in.)	Major Strength Direction				Minor Strength Direction			
			$(F_b S)_{eff,f,0}$ (lbf-ft/ft)	$(EI)_{eff,f,0}$ (10^6 lbf-in. ² /ft)	$(GA)_{eff,f,0}$ (10^6 lbf/ft)	$V_{s,0}$ (lbf/ft)	$(F_b S)_{eff,f,90}$ (lbf-ft/ft)	$(EI)_{eff,f,90}$ (10^6 lbf-in. ² /ft)	$(GA)_{eff,f,90}$ (10^6 lbf/ft)	$V_{s,90}$ (lbf/ft)
F16	F16-2	2-1/16	1,110	16	0.82	2,190	75	0.47	0.03	695
	F16-3	3-1/16	1,870	51	1.2	2,190	225	4.6	0.28	695
	F16-4	4-1/16	3,325	122	1.6	2,925	510	16	0.41	930
	F16-5	5-1/8	5,200	238	2.1	3,650	910	37	0.55	1,160
	F16-6	6-1/8	7,500	410	2.5	4,375	1,420	72	0.69	1,390
	F16-7	7-1/8	10,200	652	2.7	5,100	1,690	93	0.75	1,630
	F16-8	8-3/16	13,325	973	3.0	5,825	2,300	148	0.88	1,860
	F16-9	9-3/16	16,850	1,385	3.4	6,575	3,000	221	1.0	2,090
	F16-10	10-3/16	20,825	1,900	3.8	7,300	3,800	315	1.1	2,320
	F16-11	11-1/4	25,175	2,529	4.2	8,025	4,700	432	1.3	2,550
	F16-12	12-1/4	29,975	3,283	4.6	8,750	5,675	575	1.4	2,775
F10	F10-2	2-1/16	670	7.3	0.38	1,280	170	2.2	0.11	650
	F10-3	3-1/16	1,510	25	0.58	1,530	585	12	0.40	980
	F10-4	4-1/16	2,675	58	0.77	2,030	1,320	39	0.60	1,310
	F10-5	5-1/8	4,200	114	0.96	2,550	1,580	74	0.61	1,640
	F10-6	6-1/8	6,050	197	1.2	3,050	2,470	144	0.76	1,960
	F10-7	7-1/8	8,225	312	1.3	3,550	3,550	249	0.91	2,290
	F10-8	8-3/16	10,750	466	1.5	4,075	4,475	291	1.1	2,625
	F10-9	9-3/16	13,600	664	1.7	4,575	5,825	434	1.2	2,950
	F10-10	10-3/16	16,775	910	1.9	5,075	7,375	618	1.4	3,275
	F10-11	11-1/4	20,300	1,212	2.1	5,600	9,100	848	1.5	3,600
	F10-12	12-1/4	24,175	1,573	2.3	6,100	11,025	1,129	1.7	3,925

For SI: 1 in. = 25.4 mm; 1 ft = 304.8 mm; 1 lbf = 4.448 N

^(a) Tabulated values are allowable design values.

^(b) Tabulated values are limited to F16 and F10 MPP manufactured with 1-inch-thick Freres 1.6E and 1.0E Douglas-fir LVL, respectively, as recognized in APA Product Report PR-L324.

^(c) Deflection under a specified uniformly distributed load, w , acting perpendicular to the face of a single-span panel may be calculated as a sum of the deflections due to moment and shear effects using the effective bending stiffness, $(EI)_{eff}$, and the effective in-plane (planar) shear rigidity, $(GA)_{eff}$, as follows:

$$\delta = \frac{22.5wL^4}{(EI)_{eff}} + \frac{9wL^2}{5(GA)_{eff}} \quad [1]$$

where: δ = estimated deflection, inches;
L = span, feet;

w = uniform load, lbf/ft²;
 $(EI)_{eff}$ = tabulated effective bending stiffness, lbf-in.²/ft; and

$(GA)_{eff}$ = tabulated effective in-plane (planar) shear rigidity, lbf/ft.

For a concentrated load, P, located in the middle of a single span MPP panel acting perpendicular to the panel, the deflection may be calculated as follows:

$$\delta = \frac{36PL^3}{(EI)_{eff}} + \frac{18PL}{5(GA)_{eff}} \quad [2]$$

where: δ = estimated deflection, inches;

L = span, feet;

$(GA)_{eff}$ = tabulated effective in-plane (planar) shear rigidity, lbf/ft.

P = concentrated load, lbf/ft of width;

$(EI)_{eff}$ = tabulated effective bending stiffness, lbf-in.²/ft; and

Table 2. Allowable Stress Design Properties for Freres MPL^(a,b)

Property		Design Stress (psi)			
		F21	F19	F16A and F16	F10
Bending (F_b) ^(c)	Joist ^(d)	2,800	2,150	1,900	950
	Plank	NA	1,925	1,250 ^(g)	965
Modulus of Elasticity (E) ^(e)	Joist	2,100,000	1,900,000	1,600,000	900,000
	Plank	NA	1,600,000	1,400,000	850,000
Horizontal Shear (F_v)	Joist	285	285	285 ^(h)	300
	Plank	NA	55	90 ⁽ⁱ⁾	40
Compression Perpendicular to Grain ($F_{c\perp}$)	Joist	750	750	750	750
	Plank	NA	500	500	500
Tension parallel to grain (F_t) ^(f)		1,750	1,550	1,300	200
Compression Parallel to grain ($F_{c\parallel}$)		2,900	2,425	2,400	1,550

For SI: 1 inch = 25.4 mm; 1 foot = 304.8 mm; 1 lbf = 4.448 N; 1 psi = 6.9 KPa

- (a) The tabulated values are design values for normal duration of load. All values, except for E and $F_{c\perp}$, are permitted to be adjusted for other load durations as permitted by the code. The design stresses are limited to dry-use conditions where the average equilibrium moisture content of solid-sawn lumber is less than 16%.
- (b) Joist = load parallel to glueline, plank = load perpendicular to glueline (see Figure 1 for available thicknesses).
- (c) The tabulated bending stress (F_b) may be increased by 4 percent when the member qualifies as a repetitive member as defined in the NDS.
- (d) The tabulated values are based on a reference depth of 12 inches. For other depths, when loaded edgewise, the allowable bending stress (F_b) shall be modified by $(12/d)^{1/6}$, where d = member depth in inches. For depths less than 3-1/2 inches, the factor for the 3-1/2-inch depth shall be used.
- (e) Apparent modulus of elasticity.
- (f) The tabulated values are based on a reference length of 4 feet. For lengths longer than 4 feet, the allowable tensile stress shall be modified by $(4/L)^{1/7}$, where L = member length in feet. For lengths shorter than 4 feet, use the tabulated value unadjusted.
- (g) The tabulated value can be increased to 1,650 psi for 2-1/16 inches in thickness.
- (h) The tabulated value for F16A shall be multiplied by 0.3 for 3-ply members, 0.4 for all other odd-ply members, and 0.5 for all even-ply members.
- (i) For beams equal to or greater than 6 inches in depth, the tabulated value shall be reduced to 55 psi.

Table 3. Equivalent Specific Gravity for Fastener Design of Freres MPP and MPL

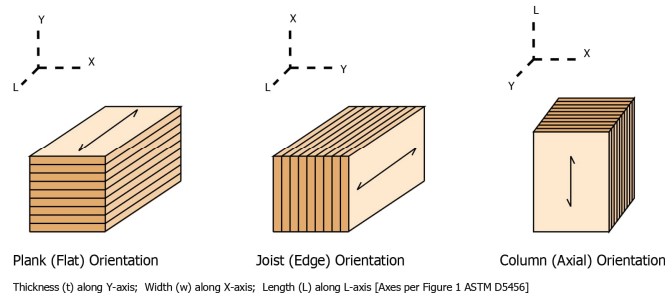
Grade	Equivalent Specific Gravity (ESG)					
	Nails and Wood Screws				Bolts and Lag Screws	
	Withdrawal Load		Lateral Load		Lateral Load	
	Installed in Edge	Installed in Face	Installed in Edge	Installed in Face	Installed in Face	
					Parallel to Grain	Perpendicular to Grain
F21	0.49	0.50	0.49	0.60	0.54	0.59
F19	0.40	0.50	0.49	0.59	0.52	0.63
F16A and F16	0.42	0.50	0.41	0.62	0.42	0.63
F10	0.42	0.50	0.34	0.58	0.41	0.63

Table 4. Minimum Allowable Nail Spacings for Freres MPP and MPL^(a,b)

Orientation	Common Nail Size ^(c,d)	Minimum End Distance (in.)	Minimum Nail Spacing (in.)	
			Single Row	Multiple Rows
Edge ^(e)	12d (0.148 in. x 3-1/4 in.) & smaller	1-1/2	3	NR ^(g)
	16d (0.162 in. x 3-1/2 in.)	NR ^(g)		
Face ^(f)	16d (0.162 in. x 3-1/2 in.) & smaller	1	2	2

For SI: 1 inch = 25.4 mm

- (a) Edge distance shall be sufficient to prevent splitting.
(b) The tabulated values are limited to MPP and MPL with a thickness of 2-1/16 inches or thicker.
(c) 16d sinkers (0.148 in. x 3-1/4 in.) may be spaced the same as a 12d common wire nail (0.148 in. x 3-1/4 in.).
(d) Nails listed are common wire nails. For box nails, the spacing and end distance requirements of the next shorter common nails may be used: e.g., a 16d box (0.135 in. x 3-1/2 in.) nail may be spaced the same as a 12d common (0.148 in. x 3-1/4 in.) nail. Fastener sizes and closest on-center spacing not specifically described above are beyond the scope of this report.
(e) Nail penetration for edge nailing shall not exceed 2-1/2 inches for 12d common nails (0.148 in. x 3-1/4 in.) and 2-1/4 inches for 8d common nails (0.131 in. x 2-1/2 in.).
(f) Tabulated closest on-center spacing for face orientation is applicable to nails that are installed in rows parallel to the grain (length) of the MPP and MPL. For nails installed in rows perpendicular to the direction of grain (width/depth) of the MPP and MPL, the closest on-center spacing for face orientation shall be sufficient to prevent splitting of the MPP and MPL.
(g) Not recommended.



Plies	2	3	4	5	6	7	8	9	10	11	12	
Fractional Nominal (in.)	2 1/16	3 1/16	4 1/16	5 1/8	6 1/8	7 1/8	8 3/16	9 3/16	10 3/16	11 1/4	12 1/4	
Decimal Nominal (in.)	2.04	3.06	4.08	5.10	6.12	7.14	8.16	9.18	10.20	11.22	12.24	
Plies	13	14	15	16	17	18	19	20	21	22	23	24
Fractional Nominal (in.)	13 1/4	14 1/4	15 5/16	16 5/16	17 3/8	18 3/8	19 3/8	20 3/8	21 7/16	22 7/16	23 1/2	24 1/2
Decimal Nominal (in.)	13.26	14.28	15.30	16.32	17.34	18.36	19.38	20.40	21.42	22.44	23.46	24.48

Legends: Thickness available for F10, F16, F16A, F19, and F21 Thickness available for F16, F16A, F19, and F21 Thickness available for F16, F19, and F21

Figure 1. Freres MPP and MPL Orientations and Thicknesses

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