APA PRODUCT REPORT®

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FRERES Mass Panel Products — PR-L325
Freres Lumber Co., Inc.

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Products: Freres Mass Panel Products
Freres Lumber Co., Inc., 14114th St., Lyons, Oregon 97358
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1. Basis of the product report:
   - 2018, 2015, and 2012 International Building Code (IBC): Section 104.11 Alternative materials
   - 2018, 2015, and 2012 International Residential Code (IRC): Section R104.11 Alternative materials
   - ANSI/APA PRG 320-2017 Performance Rated Cross-Laminated Timber
   - ASTM D5456-14b, D5456-13, and D5456-09 recognized by the 2018 IBC and IRC, 2015 IBC and IRC, and 2012 IBC and IRC, respectively
   - APA Report T2018P-21 and other qualification data

2. Product description:
   Freres mass panel products (MPP) are manufactured with 1-inch-thick Freres 1.6E Douglas-fir LVL in accordance with custom layups of ANSI/APA PRG 320 through product qualification and mathematical models using principles of engineering mechanics. The LVL layers are parallel laminated, bonded with structural adhesives, and pressed to form a solid panel. Freres MPP can be used in floor, roof, and wall applications, and is manufactured in a plank billet with nominal widths of 2 to 144 inches, thicknesses of 2 to 12 inches, and lengths up to 48 feet.

3. Design properties:
   Freres MPP shall be designed with the design properties and capacities provided in Table 1, or recommendations provided by the manufacturer. The design adjustment factors shall be based on the recommendations provided by the manufacturer and approved by the engineer of record. The lateral resistance of Freres MPP, when used as shearwalls or diaphragms, depends on the panel-to-panel connection and anchorage designs, and shall be consulted with the manufacturer and approved by the engineer of record.

4. Product installation:
   Freres MPP shall be installed in accordance with the recommendations provided by the manufacturer 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 shall be constructed in accordance with the recommendations provided by the manufacturer. Procedures specified in Chapter 16 of the 2015 National Design Specification for Wood Construction (NDS) shall be permitted for use in designing Freres MPP for a fire exposure up to 2 hours.

6. Limitations:
   a) Freres MPP 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 products shall be limited to dry service conditions where the average equilibrium moisture content of solid-sawn lumber is less than 16 percent.
   c) Design properties for Freres MPP, when used as beams or lintels with loads applied parallel to the face-bond gluelines, are beyond the scope of this report.

d) Freres MPP shall be manufactured in accordance with proprietary Freres MPP manufacturing specifications documented in the in-plant manufacturing standard approved by APA.
e) Freres MPP is produced at the Freres facility in Lyons, Oregon under a quality assurance program audited by APA.
f) Properties shown in this report are limited to MPP manufactured with 1-inch-thick Freres 1.6E Douglas-fir LVL.
g) This report is subject to re-examination in one year.

7. Identification:
Freres MPP described in this report is identified by a label bearing the manufacturer's name (Freres) and/or trademark, the APA assigned plant number (1121), the product standard (ANSI/APA PRG 320 or ASTM D5456), the APA logo, the MPP thickness, 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 Layup	Layup ID	Thickness, t_p (in.)	Major Strength Direction				Minor Strength Direction			
			$(F_bS)_{eff,f,0}$ (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)	$(F_bS)_{eff,f,90}$ (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	1,110	16	0.82	2,190	210	2.8	0.17	695
	F16-3	3	1,870	51	1.23	2,190	355	9.0	0.26	695
	F16-4	4	3,325	122	1.64	2,925	630	21	0.34	930
	F16-5	5	5,200	238	2.05	3,650	985	42	0.43	1,160
	F16-6	6	7,500	410	2.46	4,375	1,420	72	0.69	1,390
	F16-7	7	10,200	652	2.66	5,100	1,930	114	0.81	1,630
	F16-8	8	13,325	973	3.04	5,825	2,525	170	0.91	1,860
	F16-9	9	16,850	1,385	3.42	6,575	3,200	242	1.04	2,090
	F16-10	10	20,825	1,900	3.80	7,300	3,950	333	1.15	2,320
	F16-11	11	25,175	2,529	4.18	8,025	4,775	443	1.27	2,550
	F16-12	12	29,975	3,283	4.56	8,750	5,675	575	1.38	2,775

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

(a) Tabulated values are allowable design values.

(b) Tabulated values are limited to MPP manufactured with 1-inch-thick Freres 1.6E Douglas-fir LVL.

(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:

$$\delta = \frac{22.5wL^4}{(EI)_{eff}} + \frac{3wL^2\kappa}{2(GA)_{eff}}$$

where: δ = Estimated deflection, inches
w = uniform load, plf
L = span, feet
$(EI)_{eff}$ = tabulated effective bending stiffness, 10^6 lbf-in.^{2}/ft
κ = 1.2 for rectangular cross-sections
$(GA)_{eff}$ = tabulated effective in-plane (planar) shear rigidity, 10^6 lbf/ft

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

$$\delta = \frac{36PL^3}{(EI)_{eff}} + \frac{3PL\kappa}{(GA)_{eff}}$$

where: δ = Estimated deflection, inches
P = concentrated line load, lbf
L = span, feet
$(EI)_{eff}$ = tabulated effective bending stiffness, 10^6 lbf-in.^{2}/ft
κ = 1.2 for rectangular cross-sections
$(GA)_{eff}$ = tabulated effective in-plane (planar) shear rigidity, 10^6 lbf/ft

APA – The Engineered Wood Association is an approved national standards developer accredited by American National Standards Institute (ANSI). APA publishes ANSI standards and Voluntary Product Standards for wood structural panels and engineered wood products. APA is an accredited certification body under ISO/IEC 17065 by Standards Council of Canada (SCC), an accredited inspection agency under ISO/IEC 17020 by International Code Council (ICC) International Accreditation Service (IAS), and an accredited testing organization under ISO/IEC 17025 by IAS. APA is also an approved Product Certification Agency, Testing Laboratory, Quality Assurance Entity, and Validation Entity by the State of Florida, and an approved testing laboratory by City of Los Angeles.

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