ICC EVALUATION SERVICE

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Joint Evaluation Report

ESR-4760

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DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
Section: 06 17 19—Cross-laminated Timber
Section: 06 17 13—Laminated Veneer Lumber

REPORT HOLDER:

FRERES LUMBER CO., INC.

EVALUATION SUBJECT:

FRERES MASS PLY PANEL (MPP) AND MASS PLY LAMS (MPL) BEAMS AND COLUMNS

1.0 EVALUATION SCOPE

1.1 Compliance with the following codes:

- 2021, 2018, 2015, 2012, and 2009 *International Building Code*® (IBC)
- 2021, 2018, 2015, 2012, and 2009 *International Residential Code*® (IRC)

For evaluation for compliance with codes adopted by the Los Angeles Department of Building and Safety (LADBS), see ESR-4760 LABC and LARC Supplement.

Property evaluated:

Structural

2.0 USES

Freres Mass Ply Panels (MPP) are used as a component in floors, roofs, and walls in Type III (interior floors only), Types IV and V Construction; and in roofs in Type I and II Construction of the IBC. When panels are installed under the IRC, an engineered design is required in accordance with IRC Section R301.1.3.

Freres Mass Ply Lams (MPL) are intended primarily for use as beams in the joist (edgewise) orientation or columns in the axial orientation, and are permitted for use as beams in the plank (flatwise) orientation.

3.0 DESCRIPTION

3.1 General:

Freres MPP described in this evaluation report complies with requirements noted in Section 2303.1.4 of the 2021, 2018, and 2015 IBC, for allowable stress design (ASD) in accordance with 2021 and 2018 IBC Section 2302.1(1) (2015, 2012, and 2009 IBC Section 2301.2(1)). The panels are manufactured with nominal 1-inch-thick (25.4 mm) Freres 1.6E and 1.0E Douglas-fir LVL described in ICC-ES evaluation report ESR-4759 in accordance with custom layups of ANSI/APA PRG 320. 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 (25.4 mm) LVL pieces within the same MPP layer, when present, are staggered between adjacent layers. Freres MPP is manufactured in a plank billet in nominal thicknesses (t) of $2^{1}/_{16}$ to $12^{1}/_{4}$ inches (52 to 311 mm), nominal widths (w) of 4, 8, 10, and 12 feet (1219, 2438, 3048, and 3658 mm), and lengths up to 48 feet (14.63 m). Figure 2 depicts typical Freres MPP.

Freres MPL is rip-cut vertically from MPP. Note that horizontal rip-cut is not permitted. MPL is available in the grade of F16, F16A, or F10. Freres F16 MPL is available in nominal thicknesses (t) of $2^{1}/_{16}$ to $24^{1}/_{2}$ inches (52 to 622 mm), nominal widths (w) of 1 to 48 inches (25.4 to 1219 mm), and lengths up to 80 feet (24.38 m) (see Figure 1). Freres F16 MPL is ripped from 4-foot (1219 mm) wide MPP with no edge joints between any 1-inch (25.4 mm) 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 (130 mm).

Freres F16A MPL is available in nominal thicknesses (t) of $2^{1}/_{16}$ to $12^{1}/_{4}$ inches (52 to 311 mm), nominal widths (w) of 1 to 72 inches (25.4 to 1829 mm), and lengths up to 80 feet (24 384 mm) (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 (25.4 mm) layers and extreme fiber in tension or compression edge of the MPL is at least 5 inches (127 mm). 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 (130 mm).

Freres F10 MPL is available in nominal thicknesses (t) of $2^{1}/_{16}$ to $3^{1}/_{16}$ inches (52 to 78 mm), nominal widths (w) up to 48 inches (1219 mm), and lengths up to 48 feet (14.63 m) (see Figure 1). Freres F10 MPL is ripped from 4-foot (1219 mm) wide MPP with no edge joints between any 1-inch (25.4 mm) 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 (130 mm).

3.2 Material:

3.2.1 Wood Lamination: The nominal 1-inch-thick (25.4 mm) LVL laminations used in fabricating Freres MPP and MPL must be in accordance with the approved in-plant manufacturing standard and described in ICC-ES evaluation report ESR-4759.

3.2.2 Adhesives: Adhesives used to face-bond layers of Freres MPP and MPL, and adhesives used for scarf-joints of LVL laminations are exterior-type structural adhesives conforming to ANSI/APA PRG 320-2019 and the product specifications in the approved quality documentation.

4.0 DESIGN AND INSTALLATION

4.1 General:

Design and installation of Freres MPP and MPL described in this evaluation report must be in accordance with this

evaluation report, the applicable code provisions, and the manufacturer's published design and/or installation instructions. The manufacturer's design and/or installation instructions must be available at the jobsite at all times during installation. The requirements specified for ASD and LRFD, respectively, in accordance with 2021 and 2018 IBC Sections 2302.1(1) and 2302.1(2) (2015, 2012, and 2009 IBC Sections 2301.2(1) and 2301.2(2)); Chapter 10 of the 2018 and 2015 *National Design Specification® for Wood Construction* (NDS); and Sections 4.5 and 4.6 of the 2021 *Special Design Provisions for Wind and Seismic* (SDPWS) are applicable to Freres MPP. The requirements specified for ASD and LRFD, respectively, in accordance with 2021 and 2018 IBC Sections 2302.1(1) and 2302.1(2) (2015, 2012 and 2009 IBC Sections 2301.2(1) and 2301.2(2)) and Chapter 8 of the 2018 and 2015 NDS are applicable to Freres MPL.

4.2 Reference Design Values:

Table 1 provides reference design values for bending and shear capacities of Freres MPP. Table 2 provides reference design values for Freres MPL. The reference design values are intended for allowable stress design and must be adjusted in accordance with Section 4.3 of this evaluation report. The design values used for the LRFD shall be obtained by multiplying the ASD design values by the factors specified in Table 10.3.1 of the 2018 NDS. Table 3 provides the equivalent specific gravities for fastener design and Table 4 provides the minimum nail spacing for Freres MPP and MPL.

4.3 Adjustment Factors:

The reference design values in Table 1 must be adjusted using the adjustment factors specified in Table 10.3.1 of the 2018 or 2015 NDS. The time dependent deformation (creep) factor, K_{er}, of 2.0, as specified in Section 3.5.2 of the NDS must be used to calculate the total deflection due to long-term loading for Freres MPP used as components in floor and roof decks under dry service condition where the moisture content in lumber in service is less than 16 percent, as in most covered structures as specified in Section 10.1.5 of the 2018 or 2015 NDS. The reference design values in Table 2 must be adjusted using the adjustment factors specified in Table 8.3.1 of the 2018 or 2015 NDS.

4.4 Fire Resistance:

When fire resistance is required, the fire resistance rating (FRR) of the exposed Freres MPP and MPL may be determined by calculation in accordance with Chapter 16 of the 2018 or 2015 NDS. As an alternative to the NDS calculation, the Freres MPP and MPL must be tested in accordance with ASTM E119 and must be rated for fire resistance in accordance with the test results and conditions of such tests, and such tests must be submitted to the code official for approval and are outside the scope of this evaluation report.

5.0 CONDITIONS OF USE

The Freres MPP and MPL described in this report complies with, or is a suitable alternative to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 Fabrication, design, and installation must comply with this evaluation report and the manufacturer's published design/installation instructions. In the event of a conflict between the manufacturer's published design and installation instructions and this evaluation report, the most restrictive one governs.

5.2 Use of Freres MPP and MPL products must be limited to dry service conditions where the equilibrium moisture content in lumber in service is less than 16 percent, as in most covered structures.

5.3 Freres MPP may be used as components in walls, floor and roof decks under the IRC when engineered design is submitted in accordance with Section R301.1.3.

5.4 Calculations and drawings demonstrating compliance with this evaluation report must be submitted to the code official. The calculations and drawings must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

5.5 Connections of Freres MPP used as components in floor and roof decks must be designed by a registered design professional in accordance with the NDS or proprietary connectors and fasteners described in an ICC-ES evaluation report. Connectors and fasteners must be completely specified, including size, length, dimension, fastener bearing length and location.

5.6 Freres MPP used to resist out-of-plane transverse forces in walls must be accompanied by complete detailing and wall design that are acceptable to the code official.

5.7 Cutting, drilling, and notching of Freres MPP when used as components in walls, floor and roof decks have not been evaluated and are out of the scope of this evaluation report.

5.8 To be considered as part of a floor and roof diaphragm, Freres MPP used to resist in-plane shear forces in floor and roof diaphragms shall be accompanied by complete detailing and diaphragm design to the satisfaction of the code official.

5.9 Freres MPP roof decks shall be covered with approved roof coverings secured to the building or structure in accordance with applicable provisions of IBC Chapter 15.

5.10 The special inspection for Freres MPP used in walls, roof and floor decks must be conducted in accordance with the applicable requirements of IBC Sections 1704 and 1705.

5.11 Properties shown in Table 2 are limited to F16 and F16A MPL with nominal thicknesses of $2^1/_{16}$ to $24^1/_2$ inches (52 to 622 mm), and F10 MPL with nominal thicknesses of $2^1/_{16}$ to $3^1/_{16}$ inches (52 to 78 mm).

5.12 The distance between the edge joint in any 1-inch-thick (25.4 mm) LVL layers and extreme fiber in tension or compression edge of the MPL must be at least 5 inches (127 mm) when installed in the joist (edgewise) orientation.

5.13 Freres MPP and MPL are fabricated at the Freres Lumber Co., Inc.'s facility in Lyons, Oregon, under a quality control program with inspections by ICC-ES and APA – The Engineered Wood Association.

6.0 EVIDENCE SUBMITTED

6.1 Data in accordance with the ICC-ES Acceptance Criteria for Cross-laminated Timber Panels for Use as Components in Walls, Floors and Roofs (AC455), dated February 2021.

6.2 Data in accordance with ASTM D5456.

7.0 IDENTIFICATION

7.1 Freres MPP and MPL are identified with stamps or sticker noting the Freres Lumber Co., Inc. name or logo (Figure 3), plant number, product layup and designation, production date and shift, and ICC-ES evaluation report number (ESR-4760).

7.2 The report holder's contact information is the following:

FRERES LUMBER CO., INC.
141 N. 14th STREET
PO BOX 276
LYONS, OREGON 97358
(503) 859-2121
www.frereslumber.com

TABLE 1—ASD REFERENCE DESIGN VALUES FOR FRERES MPP[1]

MPP GRADE	LAYUP[2] ID	THICKNESS t_p (in.)	MAJOR STRENGTH DIRECTION				MINOR STRENGTH DIRECTION			
			$(F_bS)_{eff,f,0}$ (lb_f-ft/ft)	$(EI)_{eff,f,0}$ ($x10^6$ lb_f-in.^{2}/ft)	$(GA)_{eff,f,0}$ ($x10^6$ lb_f/ft)	$V_{s,0}$ (lb_f/ft)	$(F_bS)_{eff,f,90}$ (lb_f-ft/ft)	$(EI)_{eff,f,90}$ ($x10^6$ lb_f-in.^{2}/ft)	$(GA)_{eff,f,90}$ ($x10^6$ lb_f/ft)	$V_{s,90}$ (lb_f/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 lb_f = 4.448 N

[1]The tabulated values are reference design values intended for Allowable Stress Design (ASD) and must be adjusted in accordance with Section 4.3.

[2]The MPP layups are developed based on the ANSI/APA PRG 320, using 1-inch-thick Freres 1.6E and 1.0E Douglas-fir LVL, respectively, as described in ICC-ES evaluation report ESR-4759.

TABLE 2—ASD REFERENCE DESIGN VALUES FOR FRERES MPL[1,2]

Property		Design Stress (psi)	
		F16A and F16	F10
Bending (F_b)[3]	Joist[4]	1,900	950
	Plank	1,250[7]	965
Modulus of Elasticity (E)[5]	Joist	1,600,000	900,000
	Plank	1,400,000	850,000
Horizontal Shear (F_v)	Joist	255[8]	255
	Plank	90[9]	40
Compression Perpendicular to Grain ($F_{c\perp}$)	Joist	750	750
	Plank	500	500
Tension parallel to grain (F_t)[6]		1,300	200
Compression Parallel to grain ($F_{c\|\|}$)		2,400	1,750

For **SI**: 1 in. = 25.4 mm; 1 ft = 304.8 mm; 1 lb_f = 4.448 N; 1 psi = 6.9 KPa

[1]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 percent.
[2]Joist = load parallel to glueline, plank = load perpendicular to glueline (see Figure 1 for available thicknesses).
[3]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.
[4]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.
[5]Apparent modulus of elasticity.
[6]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.
[7]The tabulated value can be increased to 1,650 psi for $2^1/_{16}$ inches in thickness
[8]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.
[9]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

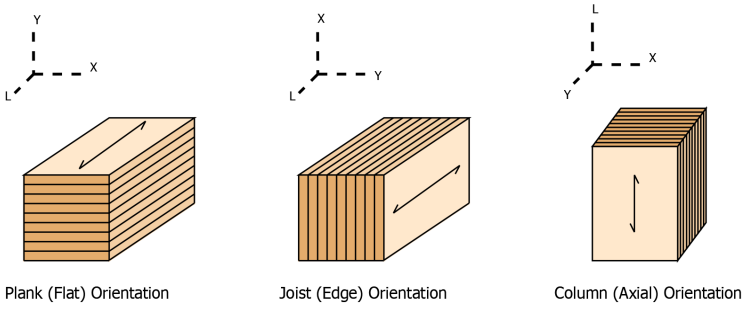
GRADE	EQUIVALENT SPECIFIC GRAVITY (ESG)					
	Nails and Wood Screws				Bolts and Lag Screws	
	Withdrawal Load		Lateral Load		Lateral Load	
	Installed in Edge	Installed in Face	Installed in Edge	Installed in Face	Installed in Face	
					Parallel to Grain	Perpendicular to Grain
F16A and F16	0.42	0.41	0.41	0.60	0.42	0.63
F10	0.42	0.41	0.34	0.58	0.41	0.63

TABLE 4—MINIMUM ALLOWABLE NAIL SPACINGS FOR FRERES MPP AND MPL[1,2]

ORIENTATION	COMMON NAIL SIZE[3,4]	MINIMUM END DISTANCE (in.)	MINIMUM NAIL SPACING (in.)	
			Single Row	Multiple Rows
Edge[5]	12d (0.148 in. x $3^1/_4$ in.) & smaller	$1^1/_2$	3	NR[7]
	16d (0.162 in. x $3^1/_2$ in.)	NR[7]		
Face[6]	16d (0.162 in. x $3^1/_2$ in.) & smaller	1	2	2

For **SI**: 1 in. = 25.4 mm

[1]Edge distance shall be sufficient to prevent splitting.
[2]The tabulated values are limited to MPP and MPL with a thickness of $2^1/_{16}$ inch or thicker.
[3]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.).
[4]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.
[5]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.).
[6]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.
[7]Not recommended.



Plank (Flat) Orientation Joist (Edge) Orientation Column (Axial) Orientation

Thickness (t) along Y-axis; Width (w) along X-axis; Length (L) along L-axis [Axes per Figure 1 ASTM D5456]

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, and F16A Thickness available for F16 and F16A Thickness available for F16

FIGURE 1—FRERES MPP AND MPL ORIENTATIONS AND THICKNESSES

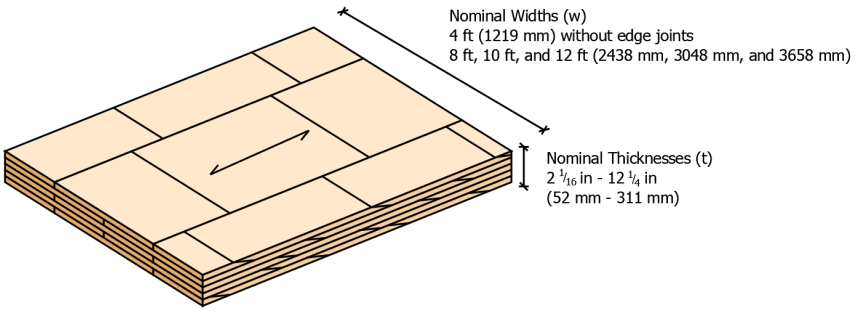


FIGURE 2—TYPICAL FRERES MPP

FIGURE 3—COMPANY LOGO FOR FRERES LUMBER CO., INC.

DISCLAIMER

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DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
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REPORT HOLDER:

FRERES LUMBER CO., INC.

EVALUATION SUBJECT:

FRERES MASS PLY PANEL (MPP) AND MASS PLY LAMS (MPL) BEAMS AND COLUMNS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Freres MPP and MPL beams and columns, described in ICC-ES evaluation report ESR-4760, have also been evaluated for compliance with the codes noted below as adopted by the Los Angeles Department of Building and Safety (LADBS).

Applicable code editions:

- 2020 *City of Los Angeles Building Code* (LABC)
- 2020 *City of Los Angeles Residential Code* (LARC)

2.0 CONCLUSIONS

The Freres MPP and MPL beams and columns, described in Sections 2.0 through 7.0 of the evaluation report ESR-4760, comply with the LABC Chapters 6 and 23, and the LARC, and are subjected to the conditions of use described in this supplement.

3.0 CONDITIONS OF USE

The Freres MPP and MPL beams and columns, described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report ESR-4760.
- The design, installation, conditions of use and identification are in accordance with the 2018 *International Building Code®* (IBC) provisions noted in the evaluation report ESR-4760.
- The design, installation and inspection are in accordance with additional requirements of LABC Chapters 16 and 17, as applicable.
- Under the LARC, an engineered design in accordance with LARC Section R301.1.3 must be submitted.

This evaluation report supplement expires concurrently with the evaluation report ESR-4760, reissued November 2022.

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1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Freres MPP and MPL beams and columns, described in ICC-ES evaluation report ESR-4760, have also been evaluated for compliance with the codes noted below.

Applicable code edition*(s)*:

- 2019 *California Building Code* (CBC)

For evaluation of applicable chapters adopted by the California Office of Statewide Health Planning and Development (OSHPD) AKA: California Department of Health Care Access and Information (HCAI) and the Division of State Architect (DSA), see Sections 2.1.1 and 2.1.2 below.

- 2019 *California Residential Code* (CRC)

2.0 CONCLUSIONS

2.1 CBC:

The Freres MPP and MPL beams and columns, described in Sections 2.0 through 7.0 of the evaluation report ESR-4760, comply with CBC Chapters 6 and 23, provided the design and installation are in accordance with the 2018 *International Building Code*® (IBC) provisions noted in the evaluation report and the additional requirements of the CBC Chapters 6, 16, 17 and 23, as applicable.

2.1.1 OSHPD: The applicable OSHPD Sections of the CBC are beyond the scope of this supplement.

2.1.2 DSA: The applicable DSA Sections of the CBC are beyond the scope of this supplement.

2.2 CRC:

The Freres MPP and MPL beams and columns, described in Sections 2.0 through 7.0 of the evaluation report ESR-4760, comply with CRC Chapters 5, 6 and 8, provided the design and installation are in accordance with the 2018 *International Residential Code*® (IRC) provisions noted in the evaluation report.

This evaluation report supplement expires concurrently with the evaluation report ESR-4760, reissued November 2022.