WFP GL 3000 Glulam and WFP RIM
WFP Engineered Products, LLC

PR-L269
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Products: WFP GL 3000 Glulam and WFP RIM
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1. Basis of the product report:
    - 2021, 2018, 2015, and 2012 International Building Code (IBC): Sections 104.11 Alternative materials and 2303.1.3 Structural glued laminated timber
    - 2021, 2018, and 2015 International Residential Code (IRC): Sections R104.11 Alternative materials, and R502.1.3, R602.1.3, and R802.1.2 Structural glued-laminated timber
    - 2012 IRC: Sections R104.11 Alternative materials, and R502.1.5, R602.1.2, and R802.1.4 Structural glued-laminated timber
    - ANSI 117-2020 and ANSI 117-2015 recognized in the 2021 IBC and IRC, and 2018 IBC and IRC, respectively
    - ANSI A190.1-2017, ANSI A190.1-2012, and ANSI/AITC A190.1-2007 recognized in the 2021 and 2018 IBC and IRC, 2015 IBC and IRC, and 2012 IBC and IRC, respectively
    - 2021 ANSI/AWC Special Design Provisions for Wind and Seismic (SDPWS)
    - ASTM D3737-18e1, D3737-12, and D3737-08 recognized in the 2021 IBC and IRC, 2018 and 2015 IBC and IRC, and 2012 IBC and IRC, respectively
    - ASTM D7672-14e1, D7672-14, and D7672-12 recognized in the 2021 IBC and IRC, 2018 IBC and IRC, and 2015 IBC and IRC, respectively
    - APA Reports T2006P-65A, T2019P-27, T2020P-32, T2022P-15, and T2023P-53, and other qualification data

2. Product description:
    WFP GL 3000 glulam is used primarily as beams, headers, rafters, or purlins, but may be used as axially loaded members. WFP GL 3000 glulam is manufactured with the 30F-E2M3/SP, 30F-E/DF3, and 30F-E/DF4 balanced layup combination using laminated veneer lumber (LVL), as permitted by ANSI A190.1, as the tension and compression laminations, and Southern pine or Douglas fir-Larch laminations in the remainder of the beam. WFP GL 3000 glulam manufactured with the 30F-E/DF3 layup combination is further designated as "GL 3000 DF." WFP GL 3000 glulam manufactured with the 30F-E/DF4 layup combination is further designated as "GL 3000M." The LVL laminations are supplied by manufacturers recognized by APA and identified in WFP's in-plant manufacturing standard approved by APA. The LVL complies with the control values listed in the manufacturing standard and is manufactured in full length and width laminations, and in thicknesses up to 2 inches from wood veneers. All veneer grain is parallel to the length of the billets. The veneers are bonded with exterior-type adhesives complying with ASTM D2559.

    WFP RIM is a glulam rim board manufactured in accordance with ANSI A190.1 (www.apawood.org/resource-library) using Combination 2 (L2/DF) and then resawn to a specific thickness without re-grading. The depth of WFP RIM is limited to 14 inches or less.

3. Design properties:
    Table 1 lists the allowable design properties for WFP GL 3000, GL 3000 DF, and GL 3000M glulams. The allowable loads for WFP GL 3000, GL 3000 DF, and GL 3000M shall be in accordance with the recommendations provided by the manufacturer (www.westernforest.com) and APA Data File: *Glued Laminated Beam Design Tables*, Form

S475 (see link above), as applicable. Table 2 lists the allowable properties for WFP RIM in rim board applications. The allowable bending stress, tensile stress, and compressive stress parallel to grain for Combination 2 glulams may not be applicable to WFP RIM.

4. Product installation:
WFP GL 3000, GL 3000 DF, and GL 3000M glulams shall be installed in accordance with the recommendations provided by the manufacturer and APA Construction Guide: *Glulam Connection Details*, Form T300 (see link above). Permissible field notching and drilling shall be in accordance with the recommendations provided by the manufacturer, and APA Technical Notes: *Field Notching and Drilling of Glued Laminated Timber Beams*, Form S560, and *Effect of Large Diameter Horizontal Holes on the Bending and Shear Properties of Structural Glued Laminated Timber*, Form V700 (see link above).

WFP RIM shall be installed in accordance with the recommendations provided by the manufacturer. Permissible field notching and drilling shall be in accordance with the recommendations provided by the manufacturer.

5. Fire-rated assemblies:
Design of fire-resistant exposed wood members in accordance with Chapter 16 of the National Design Specification for Wood Construction (NDS), Section 722.1 of the 2021, 2018, and 2015 IBC, or Section 722.6.3 of the 2012 IBC shall be applicable to WFP GL3000, GL 3000 DF, and GL 3000M glulams. Fire-rated assemblies shall be constructed in accordance with the recommendations provided by the manufacturer, and APA Design/Construction Guide: *Fire-Rated Systems*, Form W305 (see link above).

The provisions of 2021, 2018, and 2015 IBC Section 722 Calculated fire resistance and 2012 IBC Section 722.6.3 Design of fire-resistant exposed wood members shall be applicable to WFP RIM. Fire-rated rim board assemblies shall be constructed in accordance with the recommendations provided by APA Data File: *APA Rim Board in Fire-Rated Assemblies*, Form D350 (see link above) or the manufacturer.

6. Limitations:
a) WFP GL 3000, GL 3000 DF, and GL 3000M glulams and WFP RIM shall be designed in accordance with the code using the design properties specified in this report.
b) WFP GL 3000 glulam shall have a minimum depth of 7-1/4 inches and a maximum depth of 24 inches except that GL 3000 DF and GL 3000M glulam are limited to a maximum depth of 20 inches. WFP GL3000, GL 3000 DF, and GL 3000M glulams shall have a minimum width of 3-1/8 inches and a maximum width of 7-1/2 inches.
c) WFP RIM shall be limited to 1-1/2 or 1-3/4 inches in thickness and a maximum of 14 inches in depth.
d) WFP RIM shall be limited to applications where the rim board is continuously supported for the full length and thickness of the product.
e) WFP RIM is limited to dry service conditions where the average equilibrium moisture content of solid-sawn lumber is less than 16%.
f) WFP GL 3000, GL 3000 DF, and GL 3000M glulams and WFP RIM are produced at WFP Company's facilities in Vancouver and Washougal, Washington, under a quality assurance program audited by APA.
g) This report is subject to re-examination in one year.

7. Identification:
WFP GL 3000, GL 3000 DF, and GL 3000M glulams and WFP RIM described in this report are identified by a label bearing the manufacturer's name (WFP) and/or trademark, the APA assigned plant number (1148 for the Vancouver, Washington plant or 1149 for the Washougal, Washington plant), the product standard (ANSI A190.1), the product grade, the APA logo, the report number PR-L269, and a means of identifying the date of manufacture.

Table 1.   Allowable Design Values for WFP GL 3000, GL 3000 DF, and GL 3000M Glulams for Normal Duration of Load[1,2]

Symbol	Species Outer/ Core[3] (Bal or Unbal[4])	Bending About X-X Axis (Loaded Perpendicular to Wide Faces of Laminations)										Bending About Y-Y Axis (Loaded Parallel to Wide Faces of Laminations)							Axially Loaded		Fasteners
		Extreme Fiber in Bending[5]		Compression Perpendicular to Grain		Shear Parallel to Grain[6]	Modulus of Elasticity[7]						Extreme Fiber in Bending[8]	Comp. Perpen-dicular to Grain	Shear Parallel to Grain[6]	Modulus of Elasticity[7]			Tension Parallel to Grain	Comp. Parallel to Grain	Specific Gravity for Dowel-Type Fastener Design
		Bottom of Beam Stressed in Tension (Positive Bending)	Top of Beam Stressed in Tension (Negative Bending)	Ten. Face	Comp. Face		True	App-arent	Beam Stabi-lity							True	App-arent	Beam Stabi-lity			Top or Bottom Face	Side Face
		F_{bx}^{+} (psi)	F_{bx}^{-} (psi)	$F_{c\perp x}$ (psi)		F_{vx} (psi)	$E_{x\,true}$ (10^6 psi)	$E_{x\,app}$ (10^6 psi)	$E_{x\,min}$ (10^6 psi)			F_{by} (psi)	$F_{c\perp y}$ (psi)	F_{vy} (psi)	$E_{y\,true}$ (10^6 psi)	$E_{y\,app}$ (10^6 psi)	$E_{y\,min}$ (10^6 psi)	F_t (psi)	F_c (psi)	SG	
WFP GL 3000[9] (30F-E2M3/SP)	LVL/SP (B)	3000	3000	650[10]	650[10]	300	2.2	2.1	1.11		1750	650	265	1.8	1.7	0.90	1350	1750	0.50	0.50
WFP GL 3000 DF[9] (30F-E/DF3)	LVL/DF (B)	3000	3000	650	650	265[11]	2.2	2.1	1.11		1550	560	230	1.8	1.7	0.90	1100	1650	0.50	0.50
WFP GL 3000M[9] (30F-E/DF4)	LVL/DF (B)	3000	3000	550	550	265[11]	2.2	2.1	1.11		1550	560	230	1.8	1.7	0.90	1100	1650	0.50	0.50[12]
Wet-use factor		0.8		0.53		0.875	0.833					0.8	0.53	0.875	0.833			0.8	0.73	see NDS	

[1] The combinations in this table are intended primarily for members stressed in bending due to loads applied perpendicular to the wide faces of the laminations. Allowable design values are tabulated, however, for loading both perpendicular and parallel to the wide faces of the laminations.

[2] The tabulated allowable design values are for normal duration of loading. For other durations of loading, see the applicable building code. The tabulated allowable design values are for dry conditions of use. For wet conditions of use, multiply the tabulated values by the wet-use factors shown at the bottom of the table.

[3] SP = Southern pine, DF = Douglas fir-Larch, and LVL = laminated veneer lumber per the manufacturing standard.

[4] The balanced (B) layup is intended primarily for multiple-span or cantilevered beam applications, but may be used in simple-span applications.

[5] The values of F_{bx} are based on members 5-1/8 inches in width by 12 inches in depth by 21 feet in length. For members with a larger volume, F_{bx} shall be multiplied by a volume factor, $C_v = (5.125/b)^{1/10}\,(12/d)^{1/10}\,(21/L)^{1/10}$, where b is the beam width (in.), d is the beam depth (in.), and L is the beam length between the points of zero moment (ft).

[6] For non-prismatic members, members subject to impact or cyclic loading, or shear design of bending members at connections (NDS 3.4.3.3), the F_{vx} and F_{vy} values shall be multiplied by a factor of 0.72. The tabulated F_{vy} values are for timbers with laminations made from a single piece of lumber across the width or multiple pieces that have been edge bonded. For timber manufactured from multiple piece laminations (across width) that are not edge bonded, value shall be multiplied by 0.4 for members with 5, 7, or 9 laminations or by 0.5 for all other members.

[7] The tabulated E values include true E (also known as "shear-free E"), apparent E, and E for beam stability calculation (NDS 3.3.3.8). For calculating beam deflections, the tabulated E_{app} values shall be used unless the shear deflection is determined in addition to bending deflection based on the tabulated E_{true}. The axial modulus of elasticity, E_{axial} and $E_{axial\,min}$, shall be equal to the tabulated $E_{y\,true}$ and $E_{y\,min}$ values.

[8] The values of F_{by} are based on members 12 inches in depth. For depths less than 12 inches, F_{by} shall be permitted to be increased by multiplying by the flat use factor, $(12/d)^{1/9}$, where d is the beam depth in inches. When d is less than 3 inches, use the size adjustment factor for 3 inches.

[9] The beam depths are limited to 7-1/4 to 24 inches for GL 3000 (30F-E2M3/SP), and 7-1/4 to 20 inches for GL 3000 DF (30F-E/DF3) and GL 3000M (30F-E/DF4) glulams. The beam widths are limited to 3-1/8 to 7-1/2 inches.

[10] The values of $F_{c\perp x}$ shall be permitted to be increased to the published allowable compressive stress perpendicular to grain of the outermost laminated veneer lumber in the plank (flatwise) orientation.

[11] The value of F_{vx} for GL 3000 DF (30F-E/DF3) shall be reduced to 255 psi, 215 psi, and 210 psi, respectively, for 9-1/4-inch, 7-1/2-inch, and 7-1/4-inch deep beams. The value of F_{vx} for GL 3000M (30F-E/DF4) shall be reduced to 250 psi, 245 psi, 210 psi, and 205 psi, respectively, for 9-1/2-inch, 9-1/4-inch, 7-1/2-inch, and 7-1/4-inch deep beams.

[12] The equivalent specific gravity for nail withdrawal from the LVL tension and compression laminations shall be reduced to 0.49.

Table 2. Allowable Design Properties for WFP RIM[1,2]

Product	Thickness (in.)	Horizontal Load Transfer Capacity (lbf/ft)[3,4] Nails Spaced at 6 inches o.c.	Vertical Load[5]				Lateral Resistance for 1/2-inch-dia. Lag Screws (lbf)[7]
			Uniform (lbf/ft)		Concentrated (lbf)[6]		
			Depths ≤ 11-7/8 in.	11-7/8 in. < Depth ≤ 14 in.	Depths ≤ 11-7/8 in.	11-7/8 in. < Depth ≤ 14 in.	
WFP RIM	1-1/2	215	2,900	NA	2,600	NA	425
	1-3/4	225	3,600	3,600	3,200	3,200	425

For SI: 1 inch = 25.4 mm, 1 lbf = 0.454 kg, 1 psi = 6.9 kPa.

[1]   The rim board depth shall not exceed 14 inches. Only permitted in applications where the rim board is continuously supported for the full length and thickness of the product.
[2]   All design values are applicable to the normal load duration (10 years) for wood products, except for the horizontal load transfer capacity, which is based on the short-term load duration (10 minutes). Design values shall be adjusted for other load durations in accordance with the applicable building code except that the uniform vertical load capacity and concentrated vertical load capacity are not permitted to be increased for any load durations shorter than the normal load duration (10 years). The horizontal load transfer capacity is permitted to be increased by a factor of 1.4 when subjected to wind loads. Toe-nailed connections are not limited by the 150 lbf/ft lateral load capacity noted for Seismic Design Categories D, E, and F in Section 4.1.10 of the 2021 SDPWS, and Section 4.1.7 of the 2015 and 2008 SDPWS.
[3]   WFP RIM shall be permitted to be substituted for solid-sawn framing in horizontal wood diaphragms as shown in Table 4.2A of the SDPWS, provided the maximum shear values for the diaphragms are limited to the allowable lateral capacity noted in this table.
[4]   8d common (0.131 x 2-1/2 inches) nails shall be used to connect the floor sheathing to WFP RIM and to connect WFP RIM to the sill plate (toenail). Two 8d box (0.113 x 2-1/2 inches) or common (0.131 x 2-1/2 inches) nails are required to connect each floor joist to the sill plate, and two 8d box (0.113 x 2-1/2 inches) or common (0.131 x 2-1/2 inches) nails are required to connect WFP RIM to the end of each floor joist.
[5]   Compression perpendicular-to-grain capacities of the sill plate and floor sheathing must be checked and must not be exceeded.
[6]   The concentrated vertical load capacity is based on a 4-1/2-inch bearing length.
[7]   Capacity of lag screw connections between rim board and deck ledgers per lag screw of 1/2 inch in diameter when installed into the face of WFP RIM, 2x spruce-pine-fir side member, and 1/2-inch-thick sheathing with a full penetration of the WFP RIM of the lag screw. Minimum end distance of 4 inches is required.

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