

20F, 24F, 26F, 28F, and 30F Glulam Beams
Arizona Structural Laminators, LLC

PR-L271

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Products: 20F, 24F, 26F, 28F, and 30F Glulam Beams
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1. Basis of the product report:
 - 2018, 2015, and 2012 International Building Code (IBC): Section 2303.1.3 Structural glued-laminated timber
 - 2018 and 2015 International Residential Code (IRC): Sections R502.1.3, R602.1.3, and R802.1.2 Structural glued-laminated timber
 - 2012 IRC: Sections R502.1.5, R602.1.2, and R802.1.4 Structural glued-laminated timber
 - ASTM D3737-12 and D3737-08 recognized by the 2018 and 2015 IBC and IRC, and 2012 IBC and IRC, respectively
 - ANSI A190.1-2017, ANSI A190.1-2012, and ANSI/AITC A190.1-2007 recognized by the 2018 IBC and IRC, 2015 IBC and IRC, and 2012 IBC and IRC, respectively
 - Full-scale glulam beam test data and model analysis
2. Product description:

Arizona Structural Laminators 20F, 24F, 26F, 28F, and 30F glulam beams are used as beams, headers, rafters, or purlins, and are manufactured in accordance with manufacturing specifications approved by APA. The glulam beams are manufactured in accordance with Arizona Structural Laminators' in-plant manufacturing standard approved by APA. The adhesives used to manufacture the glulam beams are exterior-type adhesives meeting the requirements of ASTM D2559.
3. Design properties:

Table 1 lists the design properties for Arizona Structural Laminators 20F, 24F, 26F, 28F, and 30F glulam beams. The allowable loads for Arizona Structural Laminators 20F, 24F, 26F, 28F, and 30F glulam beams shall be determined based on the design properties listed in Table 1.
4. Product installation:

Arizona Structural Laminators 20F, 24F, 26F, 28F, and 30F glulam beams shall be installed in accordance with the recommendations provided by the manufacturer and APA Technical Note: *Glulam Connection Details*, Form T300 (www.apawood.org/resource-library). Permissible field notching and drilling shall be in accordance with the recommendations provided by the manufacturer and APA Technical Note: *Field Notching and Drilling of Glued Laminated Timber Beams*, Form S560 (see link above).
5. Fire-rated assemblies:

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). For one- or two-hour rated glulam beams, Arizona Structural Laminators 20F, 24F, 26F, 28F, and 30F glulam beams shall be constructed in accordance with ANSI A190.1 and designed in accordance with the recommendations provided by the manufacturer and APA Technical Note: *Calculating Fire Resistance of Glulam Beams and Columns*, Form Y245 (see link above) or Chapter 16 of the 2018 National Design Specification for Wood Construction (NDS).

6. Limitations:
 - a) Arizona Structural Laminators 20F, 24F, 26F, 28F, and 30F glulam beams recognized in this report shall be designed in accordance with the code using the design properties specified in this report.
 - b) Arizona Structural Laminators 20F, 24F, 26F, 28F, and 30F glulam beams shall have a minimum depth of four laminations with the exception of 20F-E/SP1, which shall have a minimum depth of three laminations.
 - c) Arizona Structural Laminators 20F, 24F, 26F, 28F, and 30F glulam beams are produced at Arizona Structural Laminators' facility in Eagar, Arizona, under a quality assurance program audited by APA.
 - d) This report is subject to re-examination in one year.

7. Identification:

Arizona Structural Laminators 20F, 24F, 26F, 28F, and 30F glulam beams described in this report are identified by a label bearing the manufacturer's name (Arizona Structural Laminators) and/or trademark, the APA assigned plant number (1084), the product standard (ANSI A190.1), the APA logo, the layup combination symbol, the report number PR-L271, and a means of identifying the date of manufacture.

Table 1. Allowable Design Values for Arizona Structural Laminators 20F, 24F, 26F, 28F, and 30F Glulam Beams 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. Perpendicular 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	Apparent	Beam Stability				True	Apparent	Beam Stability			Top or Bottom Face	Side Face
		F _{bx} [*] (psi)	F _{bx} ⁻ (psi)	F _{cLx} (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 _{cLy} (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	
20F-E/SP1	SP/PP (U)	2000	1450	805	375	210	1.7	1.6	0.84	950	375	190	1.4	1.3	0.69	900	1000	0.43 ⁽⁹⁾	0.43
24F-E/SP2	SP/PP (B)	2400	2400	805	805	210	1.9	1.8	0.95	1400	375	210	1.4	1.3	0.69	1050	950	0.55	0.43
24F-V4	DF/DF (U)	2400	1850	650	650	265	1.9	1.8	0.95	1450	560	230	1.7	1.6	0.85	1100	1650	0.50	0.50
24F-V8	DF/DF (B)	2400	2400	650	650	265	1.9	1.8	0.95	1550	560	230	1.7	1.6	0.85	1100	1650	0.50	0.50
26F-V5	SP/SP (B)	2600	2600	740	740	300	2.0	1.9	1.00	1950	650	260	1.9	1.8	0.95	1300	1850	0.55	0.55
28F-E2	SP/SP (B)	2800	2800	805	805	300	2.2 ⁽¹⁰⁾	2.1 ⁽¹⁰⁾	1.09 ⁽¹⁰⁾	2000	650	260	1.8	1.7	0.90	1300	1850	0.55	0.55
30F-E2	SP/SP (B)	3000	3000	805	805	300	2.2 ⁽¹⁰⁾	2.1 ⁽¹⁰⁾	1.09 ⁽¹⁰⁾	1750	650	260	1.8	1.7	0.90	1350	1750	0.55	0.55
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, PP = Ponderosa pine, and DF = Douglas fir-larch.

⁽⁴⁾ The balance (B) layout is intended primarily for multiple-span or cantilevered beam applications, but may be used in simple-span applications. The unbalanced (U) layout is intended primarily for simple-span applications, but may be used in multiple-span or cantilevered beam 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 a larger beam volume, F_{bx} shall be multiplied by a volume factor, C_v = (5.125/b)^{1/20} (12/d)^{1/20} (21/L)^{1/20} for 20F-E/SP1, 24F-E/SP2, 26F-V5/SP, 28F-E2/SP, and 30F-E2/SP layout combinations or C_v = (5.125/b)^{1/10} (12/d)^{1/10} (21/L)^{1/10} for 24F-V4/DF and 24F-V8/DF layout combinations, 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). The beam depths are limited to 4 or more laminations except for 20F-E/SP1, which shall have 3 or more laminations.

⁽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 bottom face is a Southern pine lamination and shall be permitted to be designed with a specific gravity of 0.55.

⁽¹⁰⁾ For 28F-E2/SP and 30F-E2/SP members with more than 15 laminations, E_{x true} = 2.1 x 10⁶ psi, E_{x app} = 2.0 x 10⁶ psi, and E_{x min} = 1.06 x 10⁶ psi.

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