

**Vaagen Structural Glued Laminated Timber**  
**Vaagen Timbers, LLC**

**PR-L344**

Revised November 7, 2023

Products: Vaagen Structural Glued Laminated Timber  
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1. Basis of the product report:
  - 2021, 2018, 2015, and 2012 International Building Code (IBC): Section 2303.1.3 Structural glued laminated timber
  - 2021, 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
  - 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
  - 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
  - Qualification test data
2. Product description:

Vaagen glulam products are manufactured with Douglas fir-Larch lumber in accordance with ANSI A190.1. These layup combinations are recognized in ANSI 117. Vaagen glulam products are used as beams, headers, rafters, purlins, and columns, and are manufactured in nominal widths up to 12 inches, depths up to 48 inches, and lengths up to 60 feet. In addition, Vaagen glulam products are used as vertically glued laminated decking with nominal depths up to 12 inches, widths up to 48 inches, and lengths up to 60 feet.
3. Design properties:

Allowable design properties for Vaagen glulam beams and columns are listed in Tables 1 and 2. The allowable spans for Vaagen glulam beams shall be in accordance with the recommendations provided by the manufacturer and APA Data File: *Glued Laminated Beam Design Tables*, Form S475 ([www.apawood.org/resource-library](http://www.apawood.org/resource-library)), as applicable, or shall be determined based on the design properties listed in Table 1, as appropriate. The allowable loads for Vaagen glulam columns shall be in accordance with the recommendations provided by the manufacturer and APA Data File: *Design of Structural Glued Laminated Timber Columns*, Form Y240 (see link above), as applicable, or shall be determined based on the design properties listed in Table 2, as appropriate.
4. Product installation:

Vaagen glulam beams and columns 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).

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 Vaagen glulam products. 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).
6. Limitations:
  - a) Vaagen glulam beams and columns listed in this report shall be designed in accordance with the code using the design properties specified in this report.
  - b) Vaagen glulam beams shall meet the dimensions specified in ANSI 117 and ANSI A190.1.
  - c) Vaagen glulam beams and columns listed in this report are produced at the Vaagen Timbers, Colville, Washington facility under a quality assurance program audited by APA.
  - d) This report is subject to re-examination in one year.
7. Identification:  
Vaagen glulam beams and columns listed in this report are identified by a label bearing the manufacturer's name (Vaagen Timbers) and/or trademark, the APA assigned plant number (1130), the product standard (ANSI A190.1), the APA logo, the combination symbol, the report number PR-L344, and a means of identifying the date of manufacture.

Table 1. Allowable Design Values for Vaagen Timbers Glulam Beams for Normal Duration of Load<sup>(1,2)</sup>

Symbol	Species Outer/ Core <sup>(3)</sup> (Bal or Unbal <sup>(4)</sup> )	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 <sup>(5)</sup>		Compression Perpendicular to Grain		Shear Parallel to Grain <sup>(6)</sup>	Modulus of Elasticity <sup>(7)</sup>			Extreme Fiber in Bending <sup>(8)</sup>	Comp. Perpen- dicular to Grain	Shear Parallel to Grain <sup>(6)</sup>	Modulus of Elasticity <sup>(7)</sup>			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)	$F_{cLx}$ (psi)		$F_{vx}$ (psi)	$E_{x\ true}$ (10 <sup>6</sup> psi)	$E_{x\ app}$ (10 <sup>6</sup> psi)	$E_{x\ min}$ (10 <sup>6</sup> psi)	$F_{by}$ (psi)	$F_{cLy}$ (psi)	$F_{vy}$ (psi)	$E_{y\ true}$ (10 <sup>6</sup> psi)	$E_{y\ app}$ (10 <sup>6</sup> psi)	$E_{y\ min}$ (10 <sup>6</sup> psi)	$F_t$ (psi)	$F_c$ (psi)	SG	
24F-V4	DF/DF (U)	2,400	1,850	650	650	265	1.9	1.8	0.95	1,450	560	230	1.7	1.6	0.85	1,100	1,650	0.50	0.50
24F-V8	DF/DF (B)	2,400	2,400	650	650	265	1.9	1.8	0.95	1,550	560	230	1.7	1.6	0.85	1,100	1,650	0.50	0.50
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	

- <sup>(1)</sup> The combinations in this table are applicable to members consisting of 4 or more laminations and 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.
- <sup>(2)</sup> 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.
- <sup>(3)</sup> DF = Douglas fir-Larch.
- <sup>(4)</sup> The unbalanced (U) layout is intended primarily for simple-span applications and the balanced (B) layout is intended primarily for continuous or cantilevered applications.
- <sup>(5)</sup> 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).
- <sup>(6)</sup> 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.
- <sup>(7)</sup> 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.
- <sup>(8)</sup> 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.

Table 2. Allowable Design Values for Vaagen Timbers Glulam Columns for Normal Duration of Load<sup>(1)</sup>

Combination Symbol	Species <sup>(2)</sup>	Grade	All Loading				Axially Loaded			Bending about Y-Y Axis				Bending about X-X Axis		Fasteners Specific Gravity for Dowel-Type Fastener Design
			Modulus of Elasticity <sup>(3)</sup>			Compression Perpendicular to Grain	Tension Parallel to Grain	Compression Parallel to Grain		Loaded Parallel to Wide Faces of Laminations			Loaded Perpendicular to Wide Faces of Laminations			
			$E_{x \text{ true}}, E_{y \text{ true}}$ or $E_{\text{axial}}$ ( $10^6$ psi)	$E_{x \text{ app}}$ or $E_{y \text{ app}}$ ( $10^6$ psi)	$E_{x \text{ min}}, E_{y \text{ min}}$ or $E_{\text{axial min}}$ ( $10^6$ psi)		2 or More Lams	4 or More Lams	2 or 3 Lams	Bending <sup>(4)</sup>			Shear Parallel to Grain <sup>(5,6)</sup>	Bending <sup>(7)</sup>	Shear Parallel to Grain <sup>(5)</sup>	
						$F_{cL}$ (psi)	$F_t$ (psi)	$F_c$ (psi)	$F_c$ (psi)	4 or More Lams	3 Lams	2 Lams		$F_{vy}$ (psi)		
			$F_{cL}$ (psi)	$F_t$ (psi)	$F_c$ (psi)	$F_c$ (psi)	$F_{by}$ (psi)	$F_{by}$ (psi)	$F_{by}$ (psi)	$F_{vy}$ (psi)	$F_{bx}$ (psi)	$F_{vx}$ (psi)	SG			
1	DF	L3	1.6	1.5	0.79	560	950	1,550	1,250	1,450	1,250	1,000	230	1,250	265	0.50
2	DF	L2	1.7	1.6	0.85	560	1,250	1,950	1,600	1,800	1,600	1,300	230	1,700	265	0.50
3	DF	L2D	2.0	1.9	1.00	650	1,450	2,300	1,900	2,100	1,850	1,550	230	2,000	265	0.50
4	DF	L1CL	2.0	1.9	1.00	590	1,400	2,100	1,950	2,200	2,000	1,650	230	2,100	265	0.50
5	DF	L1	2.1	2.0	1.06	650	1,650	2,400	2,100	2,400	2,100	1,800	230	2,200	265	0.50
Wet-use factors			0.833			0.53	0.8	0.73		0.8			0.875	0.8	0.875	see NDS

<sup>(1)</sup> The tabulated allowable design values are for normal duration of loading. For other durations of loading, see 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 factors shown at the bottom of the table.

<sup>(2)</sup> DF = Douglas fir-Larch.

<sup>(3)</sup> The tabulated E values include shear-free (true) modulus of elasticity ( $E_{x \text{ true}}$ ,  $E_{y \text{ true}}$ , and  $E_{\text{axial}}$ ), apparent modulus of elasticity ( $E_{x \text{ app}}$  and  $E_{y \text{ app}}$ ), and 5<sup>th</sup> percentile modulus of elasticity ( $E_{x \text{ min}}$ ,  $E_{y \text{ min}}$ , and  $E_{\text{axial min}}$ ). For column stability calculation (NDS 3.7.1),  $E_{\text{axial min}}$  shall be used. For calculating the total deflection due to bending, the tabulated  $E_{x \text{ app}}$  or  $E_{y \text{ app}}$  values shall be used, or as an alternative, the true (shear-free) bending deflection shall be calculated using the tabulated  $E_{x \text{ true}}$  or  $E_{y \text{ true}}$ , which shall be added to the calculated shear deflection to determine the total deflection due to bending.

<sup>(4)</sup> 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.

<sup>(5)</sup> For non-prismatic members, notched members, members subject to impact or cyclic loading, or shear design of bending members at connections (NDS 3.4.3.3), the tabulated  $F_{vx}$  and  $F_{vy}$  values shall be multiplied by 0.72.

<sup>(6)</sup> The tabulated  $F_{vy}$  values are for members of 4 or more lams. The tabulated  $F_{vy}$  values shall be multiplied by a factor of 0.95 for 3 lams and 0.84 for 2 lams. For members with 5, 7, or 9 lams manufactured from multiple-piece lams with unbonded edge joints, the tabulated  $F_{vy}$  values shall be multiplied by a factor of 0.4. For all other members manufactured from multiple-piece lams with unbonded edge joints, the tabulated  $F_{vy}$  values shall be multiplied by a factor of 0.5. This adjustment shall be cumulative with the adjustment specified in Footnote 5.

<sup>(7)</sup> 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).

<sup>(8)</sup> The tabulated  $F_{bx}$  values are for members without special tension lams up to 15 inches in depth. If the member depth is greater than 15 inches without special tension lams, the tabulated  $F_{bx}$  values must be multiplied by a factor of 0.88. If special tension lams are used, the tabulated  $F_{bx}$  values are permitted to be increased by a factor of 1.18 regardless of the member depth provided that the increased  $F_{bx}$  value does not exceed 2,400 psi. This factor shall be cumulative with the volume factor,  $C_v$ , specified in Footnote 7.

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