

ICC-ES Evaluation Report

ESR-1104

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This report is subject to re-examination in two years.

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DIVISION: 06 00 00—WOOD, PLASTICS AND COMPONENTS
Section: 06 17 00—Shop-Fabricated Structural Wood

REPORT HOLDER:

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EVALUATION SUBJECT:**ANTHONY POWER BEAM®****1.0 EVALUATION SCOPE****Compliance with the following codes:**

- 2006 *International Building Code*® (IBC)
- 2006 *International Residential Code*® (IRC)

Property evaluated:

Structural

2.0 USES

Anthony Power Beams are used as beams, headers, rafters or purlins in applications where the members are stressed in bending due to loads applied perpendicular to the wide faces of the laminations.

3.0 DESCRIPTION**3.1 General:**

Anthony Power Beams are glue-laminated timber members that comply with the requirements noted in Section 2303.1.3 of the IBC and Sections R502.1.5, R602.1.2, and R802.1.4 of the IRC.

Anthony Power Beams are fabricated to combinations 28F-E 1, 28F-E 2, 30F-E 1 and 30F-E 2. The beams consist of southern pine lumber that is E-rated and visually graded before laminating into rectangular cross sections complying with Section 3 of the supplement to ANSI/AF & PA NDS-2005, for depth, width and appearance. Individual laminations are 2 inches (51 mm) or less in net thickness. Anthony Power Beams are manufactured in nominal widths of 3, 4, 6 and 8 inches (76, 102, 152 and 203 mm), depths ranging from 5¹/₂ to 28⁷/₈ inches (140 to 733 mm) and lengths up to 60 feet (18 288 mm).

Quality control for lumber grading and beam fabrication is monitored by the APA—The Engineered Wood Association (APA-EWA) (AA-649) in accordance with the approved quality documentation. Anthony Power Beams meet the requirements of ANSI/AITC A190.1-02 and the additional requirements of APA-EWA quality control procedures applicable to these layup combinations.

3.2 Materials:

3.2.1 Adhesives: Face and end-joint bonding adhesives comply with ASTM D 2559 for exterior or wet use.

3.2.2 End Joints: End joints comply with ANSI A190.1-2002 and AITC 200-04 Manufacturing Quality Control Systems Manual.

3.2.3 Lumber: Grade requirements are contained in Table 2 of this report for lumber used in various laminations associated with combinations listed in this report. Grade specifications are included in the Standard Specifications for Structural Glued-laminated Timber of Softwood Species (AITC 117-04) and the supplemental requirements of AITC for these layup combinations.

3.3 Layup:

Manufacturing grade and layup requirements for the grade combinations are noted in Table 2 of this report. Manufacturing details are provided by AITC and are included in the plant production procedures manual. Lamination grades and zones are as defined in the AITC Standard Specification for Structural Glued-laminated Timber of Softwood Species (AITC 117-04).

3.4 Design:

Design values are contained in Table 1 of this report. The design of the structural glued-laminated beams and connections shall comply with the applicable code.

4.0 INSTALLATION

Installation of Anthony Power Beams shall comply with the applicable code, this report and the manufacturer's published installation instructions. The manufacturer's published installation instructions shall be available at the jobsite at all times during installation.

5.0 CONDITIONS OF USE

The Anthony Power Beams described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 Installation complies with this report, the manufacturer's published instructions and the applicable code.

- 5.2** Anthony Power Beams shall be fabricated and identified in accordance with this report.
- 5.3** The allowable design values provided in Table 1 of this report are applicable for Power Beams installed in dry conditions of service. Dry conditions of service are those conditions in which the maximum moisture content is less than 16 percent. For Power Beams installed in wet conditions of service, the allowable stresses shall be determined by multiplying the applicable dry allowable stress by the corresponding wet-use factor, as provided in Table 1 of this report.
- 5.4** Power Beams that are not balanced, as defined by Table 2 of this report, shall be marked "TOP" every eight feet, and shall be installed in such a manner that the side marked "TOP" is installed on the top side.
- 5.5** Design calculations and details for specific applications shall be furnished to the code official to verify compliance with this report and the applicable code. The calculations and details shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

- 5.6** Anthony Power Beams shall be manufactured in El Dorado, Arkansas, and Washington, Georgia, under a quality control program with inspections by APA—The Engineered Wood Association (AA-649).

6.0 EVIDENCE SUBMITTED

- 6.1** Calculations and analysis based on ASTM D 3737.
- 6.2** Reports of load tests.
- 6.3** Quality documentation.

7.0 IDENTIFICATION

The Anthony Power Beams described in this report shall be identified by a stamp bearing the manufacturer's name (Anthony Forest Products Co.), lumber combination, the APA manufacturing plant (El Dorado, Arkansas plant – 1079 or Washington, Georgia plant –1080), identification of beams that are not balanced in accordance with Section 5.4 of this report, the name of the inspection agency (APA—The Engineered Wood Association) and the evaluation report number (ESR-1104).

TABLE 1—DESIGN VALUES FOR STRUCTURAL GLUED LAMINATED POWER BEAM® FOR NORMAL DURATION OF LOAD AND DRY CONDITIONS OF USE^{1,2,3}

Combination Symbol ⁴	Species Outer Laminations/ Core Laminations ⁵	BENDING ABOUT X-X AXIS						BENDING ABOUT Y-Y AXIS				AXIALLY LOADED				
		Loaded Perpendicular to Wide Faces of Laminations		Compression Perpendicular to Grain ⁸ (F _{c,x})		Shear Parallel to Grain ⁹ (Horizontal) (F _{vx})	Modulus of Elasticity ⁷ (E _x) x 10 ⁶ psi	Loaded Parallel to Wide Faces of Laminations		Extreme Fiber in Bending (F _{bx})	Compression Perpendicular to Grain (F _{c,y})	Shear Parallel to Grain ¹⁰ (Horizontal) (F _{vy})	Modulus of Elasticity (E _y) x 10 ⁶ psi	Tension Parallel to Grain (F _t)	Compression Parallel to Grain (F _c)	Modulus of Elasticity (E) x 10 ⁶ psi
		Tension Zone Stressed in Tension ⁶ (psi)	Compression Zone Stressed in Tension ⁷ (psi)	Tension Face (psi)	Compression Face (psi)			Extreme Fiber in Bending (F _{by}) (psi)	Compression Perpendicular to Grain (F _{c,y}) (psi)							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
The following combination is NOT BALANCED																
28F E-1	SP/SP	2800	2300	805	805	300	2.1	1600	650	260	1.7	1300	1850	1.7		
The following combination is BALANCED																
28F E-2	SP/SP	2800	2800	805	805	300	2.1	1600	650	260	1.7	1300	1850	1.7		
The following combination is NOT BALANCED , is only for nominal widths, 6" or less.																
30F E-1	SP/SP	3000	2400	805	805	300	2.1	1750	650	260	1.7	1250	1750	1.7		
The following combination is BALANCED , is only for nominal widths, 6" or less.																
30F E-2	SP/SP	3000	3000	805	805	300	2.1	1750	650	260	1.7	1350	1750	1.7		
Wet-use factors		0.8	0.8	0.53	0.53	0.875	0.833	0.8	0.53	0.875	0.833	0.8	0.73	0.83		

Note: 1 in. = 25.4 mm, 1psi = 0.00689 MPa.

¹The combinations in this table are applicable to members consisting of 4 or more laminations and are for members stressed principally in bending due to loads applied perpendicular to the wide faces of the laminations. However, design values are provided for loading both perpendicular and parallel to the wide faces of the laminations.

²The tabulated design values are for dry conditions of use. To obtain wet-use design values, multiply the tabulated values by the wet-use factors shown at the bottom of the table.

³The tabulated design values are for normal duration of loading. For other durations of loading, see the National Design Specification for Wood Construction as specified by the applicable code.

⁴The combinations symbols relate to a specific combination of grades and species. The first two numbers in the combination symbol correspond to the design value in bending shown in Column 3. The letter "E" in the combination symbol indicates the combination is made from E-rated (E) lumber in the outer zones.

⁵The symbol used here is SP for Southern Pine.

⁶The tabulated design value in bending, F_{bx}, is based on members 5 1/8 in. x 12 in. x 21 ft. in length. For larger members, F_{bx} shall be modified by a volume factor, C_v, determined by the following equation:

$$C_v = K_L \left[\left(\frac{5.125}{b} \right) \left(\frac{12}{d} \right) \left(\frac{21}{L} \right) \right]^{0.05} \leq \text{or } C_v = K_L \left[\left(\frac{130}{b} \right) \left(\frac{305}{d} \right) \left(\frac{6400}{L} \right) \right]^{0.05} \leq 1.0$$

where:

b = width (in.); d = depth (in.);
L = span (ft.)

b = width (mm); d = depth (mm);
L = span (mm)

Single Span: K_L = 1.0 for uniform loading,
1.09 for single concentrated loads at mid-span
0.96 for 2 equal concentrated loads at 1/3 points of span.
Continuous Beam or Cantilever: K_L = 1.0 for all loading.

⁷Design values in this column are for extreme fiber stress in bending when the member is loaded such that the compression zone laminations are subjected to tensile stresses. For more information, see AITC 117-Design, Section 2.0.

⁸The design value for shear, F_{vx}, shall be decreased by multiplying by a factor of 0.72 for non-prismatic members, notched members, and for all members subject to impact or cyclic loading. The reduced design value shall be used for design of members at connections that transfer shear by mechanical fasteners. The reduced design value shall also be used for determination of design values for radial tension and torsion.

⁹For members with more than 15 laminations, E_x = 2.0 million psi.

¹⁰Design 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 timbers 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.

¹¹For bending members with the load applied parallel to the wide face of the laminations (vertically laminated members), the bending stress shall be adjusted for depths other than 12 inch (0.3 m) by multiplying 12/d^{1/3} where d is the beam depth in inches or (0.3/d)^{1/3} where d is the beam depth in meters.

TABLE 2—GRADE REQUIREMENTS FOR MEMBERS STRESSED PRINCIPALLY IN BENDING AND LOADED PERPENDICULAR TO THE WIDE FACES OF LAMINATIONS^{1, 2, 3}

Combination Symbol	Depth of Member	Tension Lamination ⁴	Minimum Grade of Lamination ⁵									
			Percent/Grade/Species Each Zone					Fraction/Edge Knot/Each Zone ⁶				
			Outer Tension Zone ⁷	Inner Tension Zone ⁸	Core	Inner Comp. Zone ⁸	Outer Comp. Zone	Outer Ten. Zone	Inner Ten. Zone	Core	Inner Comp. Zone	Outer Comp. Zone
1	2	3	4	5	6	7	8	9	10	11	12	13
The following combination is NOT BALANCED and is for either dry or wet use												
28F-E1 SP	4 lams to 13.75 in.	Special Provisions ⁴	10%2.3E 3-12 +10%N1D 2.3E	10%N1D	N2M	10%N1D	10%N1D 2.3E	1/3	—	—	—	—
	> 13.75 in.		5%2.3E 5-16 +5%N1D 2.3E	15%N1D	N2M	15%N1D	10%N1D 2.3E	1/5	—	—	—	—
The following combination is BALANCED and is for either dry or wet use												
28F-E2 SP	4 lams to 13.75 in.	Special Provisions ⁴	10%2.3E 3-12 +10%N1D 2.3E	10%N1D	N2M	10%N1D	10%2.3E +10%N1D 2.3E	1/3	—	—	—	1/3
	> 13.75 in.		5%2.3E 5-16 +5%N1D 2.3E	15%N1D	N2M	15%N1D	5%2.3E 5-16 +5%N1D 2.3E	1/5	—	—	—	1/5
30F member sizes are limited to 4 and 6-inch nominal widths.												
The following combination is NOT BALANCED and is for either dry or wet use												
30F-E1 SP	4 lams to 13.75 in.	Special Provisions ⁴	10%2.3E 3-12 +10%N1D 2.3E	10%N1D	N2M	20%N1D	10%N1D 2.3E	1/3	—	—	—	—
	> 13.75 in.		5%2.3E 5-16 +5%N1D 2.3E	15%N1D	N2M	15%N1D	15%N1D 2.3E	1/5	—	—	—	—
30F member sizes are limited to 4 and 6-inch nominal widths												
The following combination is BALANCED and is for either dry or wet use.												
30F E2 SP	4 lams to 13.75 in.	Special Provisions ⁴	10%2.3E 3-12 +10%N1D 2.3E	10%N1D	N2M	10%N1D	10%2.3E 3-12 +10%N1D 2.3E	1/3	—	—	—	1/3
	>13.75 in.		5%2.3E 5-16 +5%N1D 2.3E	15%N1D	N2M	15%N1D	5%2.3E 5-16 +5%N1D 2.3E	1/5	—	—	—	1/5

Note: 1 in. = 25.4 mm.

¹The combinations in this table are applicable to members stressed principally in bending due to a load applied perpendicular to the wide faces of the laminations.

²All combinations are applicable to members with four or more laminations.

³The combinations in Table 2 have been established based on procedures given in ASTM D3737, as modified by subsequent research.

⁴In addition to the basic requirements for 302-24 tension lamination as provided in AITC 117-404, the grading restrictors as set forth in Anthony Forest Products Power Beam® quality control manual shall apply.

⁵Percent values are based on the total depth of the member. All fractional numbers of lamination shall be rounded upward to the next whole number. For the inner tension and compression zones, the resulting excess of percentage resulting from rounding upward of the outer zone is permitted to be subtracted from the inner zone requirements.

⁶When lamination thickness exceeds 1 3/8 in., divide the depth of the member by the actual thickness of the lamination used and multiply by 1 3/8 in. Obtain the percentage of grades required for the various zones from the table using this calculated depth. For instance, if a member 15 in. deep is laminated with 1-1/2 in. thick lamination, divide 15 in. by 1-1/2 in. and multiply by 1-3/8 in., which equals 13.75 in. Enter the table with a depth of 13.75 in. to determine percentage of grades to use. The actual depth of the member shall be used to determine the tension lamination requirements from Column 3.

⁷Where slope of grain is not tabulated, it shall be the slope of grain required for the grade.

⁸See the applicable portions of AITC 117 requirements for the slope of grain.

⁹The modulus of elasticity of the No. 1 D grade shall be monitored periodically by the Icn0 span E method of testing described in Annex C of AITC 117-04 to ensure that an average modulus of elasticity of 2.0x10⁶ psi is maintained.