APA PRODUCT REPORT®

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IB MAX-CORE® Cross-Laminated Timber — PR-L327
IB X-LAM USA, LLC — Revised March 24, 2023

Products: IB MAX-CORE® Cross-Laminated Timber
IB X-Lam USA, LLC, 1371 Hodgesville Road, Dothan, AL 36301
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www.smartlam.com

1. Basis of the product report:
   - 2021, 2018, and 2015 International Building Code (IBC): Section 2303.1.4 Structural glued cross-laminated timber
   - 2012 IBC: Section 104.11 Alternative materials
   - 2021, 2018, and 2015 International Residential Code (IRC): Sections R502.1.6, R602.1.6, and R802.1.6 Cross-laminated timber
   - 2012 IRC: Section R104.11 Alternative materials
   - ANSI/APA PRG 320-2019, Standard for Performance-Rated Cross-Laminated Timber, recognized in the 2021 IBC and IRC
   - ANSI/APA PRG 320-2017, PRG 320-2012, and PRG 320-2011 recognized in the 2018 IBC and IRC, 2015 IRC, and 2015 IBC, respectively
   - APA Reports T2018P-35, T2018P-39, T2022P-10A, T2022P-16, T2022P-17A, and T2022P-18, Timber Products Inspection (TP) Report A18-085, and other qualification data

2. Product description:
   IB MAX-CORE® cross-laminated timber (CLT) is manufactured in Dothan, Alabama with laminating lumber in accordance with ANSI/APA PRG 320 or proprietary layup combinations approved by APA through product qualification and/or mathematical models using principles of engineering mechanics. Allowable design properties for lumber laminations used in IB MAX-CORE CLT are provided in Table 1. IB MAX-CORE CLT is permitted for use in floor, roof, and wall applications, and is manufactured with nominal widths up to 138 inches, thicknesses of 4-1/8 to 12-3/8 inches, and lengths up to 52-1/2 feet.

3. Design properties:
   IB MAX-CORE CLT shall be designed with the design properties and capacities provided in Tables 2 and 3. **Note that the unbalanced layups listed in Table 3 can be only used in wall and simple span applications and the compression side that consists of lumber laminations in the minor strength direction is stamped with the word "TOP", which shall be installed on the compression (top) side of the simple-span bending member.** The design value adjustment factors shall be based on Table 10.3.1 of the 2018 ANSI/AWC National Design Specification for Wood Construction (NDS). The lateral resistance of IB MAX-CORE CLT, when used as shearwalls or diaphragms, depends on the panel-to-panel connection and anchorage designs, and shall be designed in accordance with Sections 4.4 and 4.5 of the 2021 ANSI/AWC Special Design Provisions for Wind and Seismic (SDPWS), or consulted with the CLT manufacturer and approved by the engineer of record.

   Design values for the Load and Resistance Factor Design (LRFD) used in the U.S. for IB MAX-CORE CLT can be derived from the ASD values published in Table 2 of this report in accordance with Tables 10.3.1, N1, N2, and N3 of the 2018 NDS.

4. Product installation:
   IB MAX-CORE CLT shall be installed in accordance with the recommendations provided by the manufacturer (www.smartlam.com) and the engineering drawing approved by the engineer of record. Permissible details shall be in accordance with the engineering drawing.

5. Fire-rated assemblies:
   Fire-rated assemblies shall be constructed in accordance with the recommendations provided by the manufacturer (see link above). Procedures specified in Chapter 16 of the 2018 NDS shall be permitted for use in designing IB MAX-CORE CLT for a fire exposure up to 2 hours.

6. Limitations:
   a) IB MAX-CORE CLT shall be designed in accordance with principles of mechanics using the design properties specified in this report or provided by the manufacturer.
   b) IB MAX-CORE CLT products shall be limited to dry service conditions where the average equilibrium moisture content of solid-sawn lumber is less than 16%.
   c) Design properties for IB MAX-CORE CLT, when used as beams or lintels with loads applied parallel to the face-bond gluelines, are beyond the scope of this report.
   d) IB MAX-CORE CLT shall be manufactured in compliance with ANSI/APA PRG 320 and documented in the IB X-Lam USA, LLC's in-plant manufacturing standard approved by APA.
   e) IB MAX-CORE CLT is produced at the Dothan, Alabama facility under a quality assurance program audited by APA.
   f) This report is subject to re-examination in one year.

7. Identification:
   IB MAX-CORE CLT described in this report is identified by a label bearing the manufacturer's name (IB X-Lam USA, LLC) and/or trademark, the APA assigned plant number (1136), the product standard (ANSI/APA PRG 320), the APA logo, the CLT grade and thickness (or layup ID), the report number PR-L327, and a means of identifying the date of manufacture.

Table 1. ASD Reference Design Values[(a)] for Lumber Laminations Used in IB MAX-CORE CLT (for Use in the U.S.)

CLT Grade	Laminations Used in Major Strength Direction									Laminations Used in Minor Strength Direction								
	Grade & Species	F_b (psi)	E (10^6 psi)	F_t (psi)	F_c (psi)	F_v (psi)	F_s (psi)	$F_{c\perp}$ (psi)	G	Grade & Species	F_b (psi)	E (10^6 psi)	F_t (psi)	F_c (psi)	F_v (psi)	F_s (psi)	$F_{c\perp}$ (psi)	G
E4M4	2400f-2.0E DF[(b)]	2,400	2.0	1,925	1,975	180	60	670	0.51	2400f-2.0E SP	2,400	2.0	1,925	1,975	190	60	805	0.57
	2400f-2.0E SP[(b)]	2,400	2.0	1,925	1,975	190	60	805	0.57									
E4M5 & E4M5.1	2400f-2.0E DF[(b)]	2,400	2.0	1,925	1,975	180	60	670	0.51	No. 3 SP	450	1.3	250	725	175	55	565	0.55
	2400f-2.0E SP[(b)]	2,400	2.0	1,925	1,975	190	60	805	0.57									
E4M6	2400f-2.0E DF[(b)]	2,400	2.0	1,925	1,975	180	60	670	0.51	No. 2 SP	750	1.4	450	1,250	175	55	565	0.55
	2400f-2.0E SP[(b)]	2,400	2.0	1,925	1,975	190	60	805	0.57									
V3, V3.2, & V3.3	No. 2 SP	750	1.4	450	1,250	175	55	565	0.55	No. 3 SP	450	1.3	250	725	175	55	565	0.55
V3M5 & V3M5.1	No. 2 SP[(c)]	750	1.4	450	1,250	175	55	565	0.55	No. 3 SP	450	1.3	250	725	175	55	565	0.55
	No. 2 DF[(c)]	900	1.6	575	1,350	180	60	625	0.50									
V3M6 & V3M6.1	No. 2 SP[(d)]	750	1.4	450	1,250	175	55	565	0.55	No. 3 SP	450	1.3	250	725	175	55	565	0.55
	No. 1/No. 2 SPF[(d)]	875	1.4	450	1,150	135	45	425	0.42									
V3M7	No. 2 SP	750	1.4	450	1,250	175	55	565	0.55	No. 2 SP	750	1.4	450	1,250	175	55	565	0.55
V22	No. 2 Eastern Hemlock-Tamarack	575	1.1	275	825	170	55	555	0.41	No. 2 Eastern Hemlock-Tamarack	575	1.1	275	825	170	55	555	0.41

For SI: 1 psi = 0.006895 MPa

(a) Tabulated values are allowable design values and not permitted to be increased for the lumber flat use or size factor in accordance with the NDS. The design values shall be used in conjunction with the section properties provided by the CLT manufacturer based on the actual layup used in manufacturing the CLT panel (see Tables 2 and 3).

(b) 2400f-2.0E DF MSR lumber laminations are used in the outermost layers and 2400f-2.0E SP MSR lumber laminations are used in the other layers in the major strength direction. The 2400f-2.0E DF MSR lumber laminations in the outermost layers are permitted to be replaced by 2400f-2.0E SP MSR lumber laminations.

(c) No. 2 DF lumber laminations are used in the outermost layers and No. 2 SP lumber laminations are used in the other layers in the major strength direction.

(d) No. 1/No. 2 SPF lumber laminations are used in the outermost layers and No. 2 SP lumber laminations are used in the other layers in the major strength direction.

Table 2. ASD Reference Design Values[a, b] for IB MAX-CORE **Balanced** CLT Listed in Table 1 (for Use in the U.S.)

CLT Grade[c]	Layup ID[d]	CLT Thick-ness, t_p (in.)	Lamination Thickness (in.) in CLT Layup									Major Strength Direction				Minor Strength Direction			
			=	⊥	=	⊥	=	⊥	=	⊥	=	$(F_bS)_{eff,f,0}$ (lbf-ft/ft)	$(EI)_{eff,f,0}$ (10^6 lbf-in.^{2}/ft)	$(GA)_{eff,f,0}$ (10^6 lbf/ft)	$V_{s,0}$ (lbf/ft)	$(F_bS)_{eff,f,90}$ (lbf-ft/ft)	$(EI)_{eff,f,90}$ (10^6 lbf-in.^{2}/ft)	$(GA)_{eff,f,90}$ (10^6 lbf/ft)	$V_{s,90}$ (lbf/ft)
E4M4	3-alt	4 1/8	1 3/8	1 3/8	1 3/8							5,575	135	0.75	1,980	755	5.2	0.75	660
	4-maxx	5 1/2	1 3/8	1 3/8 x 2	1 3/8							9,050	293	0.88	2,650	3,025	42	1.5	1,320
	5-alt	6 7/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8					12,850	519	1.5	3,300	6,575	135	1.5	1,980
	5-maxx	6 7/8	1 3/8 x 2	1 3/8	1 3/8 x 2							15,950	645	1.5	3,300	755	5.2	0.88	660
	6-maxx	8 1/4	1 3/8 x 2	1 3/8 x 2	1 3/8 x 2							22,325	1,083	1.5	3,950	3,025	42	1.5	1,320
	7-alt	9 5/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8			22,700	1,286	2.2	4,625	15,100	519	2.3	3,300
	7-maxx	9 5/8	1 3/8 x 2	1 3/8	1 3/8	1 3/8	1 3/8 x 2					29,200	1,653	2.2	4,625	6,575	135	1.6	1,980
	8-maxx	11	1 3/8 x 2	1 3/8	1 3/8 x 2	1 3/8	1 3/8 x 2					36,800	2,381	3.1	5,275	10,650	293	1.8	2,650
	9-alt	12 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	35,225	2,564	3.0	5,950	26,725	1,286	3.0	4,625
	9-maxx	12 3/8	1 3/8 x 2	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8 x 2			45,225	3,293	3.0	5,950	15,100	519	2.4	3,300
E4M5	3-alt	4 1/8	1 3/8	1 3/8	1 3/8							5,575	135	0.50	1,820	140	3.4	0.72	660
	4-maxx	5 1/2	1 3/8	1 3/8 x 2	1 3/8							9,025	292	0.58	2,420	565	27	1.4	1,320
	5-alt	6 7/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8					12,800	518	1.0	3,025	1,230	88	1.4	1,980
	5-maxx	6 7/8	1 3/8 x 2	1 3/8	1 3/8 x 2							15,950	645	1.1	3,025	140	3.4	0.86	660
	6-maxx	8 1/4	1 3/8 x 2	1 3/8 x 2	1 3/8 x 2							22,300	1,082	1.0	3,625	565	27	1.4	1,320
	7-alt	9 5/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8			22,600	1,280	1.5	4,225	2,850	339	2.1	3,300
	7-maxx	9 5/8	1 3/8 x 2	1 3/8	1 3/8	1 3/8	1 3/8 x 2					29,150	1,651	1.5	4,225	1,230	88	1.6	1,980
	8-maxx	11	1 3/8 x 2	1 3/8	1 3/8 x 2	1 3/8	1 3/8 x 2					36,750	2,377	2.1	4,850	2,000	191	1.7	2,650
	9-alt	12 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	35,025	2,549	2.0	5,450	5,050	842	2.9	4,625
	9-maxx	12 3/8	1 3/8 x 2	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8 x 2			45,150	3,287	2.0	5,450	2,850	339	2.3	3,300

Table 2. ASD Reference Design Values[a, b] for IB MAX-CORE **Balanced** CLT Listed in Table 1 (for Use in the U.S.) (Continued)

CLT Grade[c]	Layup ID[d]	CLT Thick-ness, t_p (in.)	Lamination Thickness (in.) in CLT Layup									Major Strength Direction				Minor Strength Direction			
			=	⊥	=	⊥	=	⊥	=	⊥	=	$(F_bS)_{eff,f,0}$ (lbf-ft/ft)	$(EI)_{eff,f,0}$ (10^6 lbf-in.^{2}/ft)	$(GA)_{eff,f,0}$ (10^6 lbf/ft)	$V_{s,0}$ (lbf/ft)	$(F_bS)_{eff,f,90}$ (lbf-ft/ft)	$(EI)_{eff,f,90}$ (10^6 lbf-in.^{2}/ft)	$(GA)_{eff,f,90}$ (10^6 lbf/ft)	$V_{s,90}$ (lbf/ft)
E4M5.1	3-alt	3 5/8	1 3/8	7/8	1 3/8							4,400	94	0.51	1,600	55	0.87	0.50	420
	4-maxx	4 1/2	1 3/8	7/8 x 2	1 3/8							6,500	172	0.52	1,980	230	7.0	0.89	840
	5-alt	5 7/8	1 3/8	7/8	1 3/8	7/8	1 3/8					10,150	351	1.0	2,575	675	36	1.0	1,500
	6-maxx	7 1/4	1 3/8 x 2	7/8 x 2	1 3/8 x 2							17,625	752	1.0	3,200	230	7.0	1.0	840
	7-alt	8 1/8	1 3/8	7/8	1 3/8	7/8	1 3/8	7/8	1 3/8			18,000	861	1.5	3,575	1,550	144	1.5	2,575
	7-maxx	8 5/8	1 3/8 x 2	7/8	1 3/8	7/8	1 3/8 x 2					24,225	1,229	1.7	3,800	675	36	1.2	1,500
	8-maxx	10	1 3/8 x 2	7/8	1 3/8 x 2	7/8	1 3/8 x 2					31,650	1,862	2.4	4,400	1,190	93	1.4	2,160
	9-alt	10 3/8	1 3/8	7/8	1 3/8	7/8	1 3/8	7/8	1 3/8	7/8	1 3/8	28,000	1,708	2.0	4,575	2,725	361	2.0	3,650
	9-maxx	10 7/8	1 3/8 x 2	7/8	1 3/8	7/8	1 3/8	7/8	1 3/8 x 2			36,900	2,360	2.2	4,775	1,550	144	1.7	2,575
E4M6	3-alt	4 1/8	1 3/8	1 3/8	1 3/8							5,575	135	0.54	1,820	235	3.6	0.72	660
	4-maxx	5 1/2	1 3/8	1 3/8 X 2	1 3/8							9,025	292	0.63	2,420	945	29	1.4	1,320
	5-alt	6 7/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8					12,800	518	1.1	3,025	2,050	95	1.4	1,980
	5-maxx	6 7/8	1 3/8 x 2	1 3/8	1 3/8 x 2							15,950	645	1.1	3,025	235	3.6	0.87	660
	6-maxx	8 1/4	1 3/8 x 2	1 3/8 x 2	1 3/8 x 2							22,300	1,082	1.1	3,625	945	29	1.4	1,320
	7-alt	9 5/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8			22,625	1,281	1.6	4,225	4,750	365	2.2	3,300
	7-maxx	9 5/8	1 3/8 x 2	1 3/8	1 3/8	1 3/8	1 3/8 x 2					29,175	1,651	1.6	4,225	2,050	95	1.6	1,980
	8-maxx	11	1 3/8 x 2	1 3/8	1 3/8 x 2	1 3/8	1 3/8 x 2					36,750	2,378	2.3	4,850	3,325	205	1.7	2,650
	9-alt	12 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	35,050	2,551	2.2	5,450	8,400	905	2.9	4,625
	9-maxx	12 3/8	1 3/8 x 2	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8 x 2			45,150	3,288	2.2	5,450	4,750	365	2.3	3,300

Table 2. ASD Reference Design Values[a, b] for IB MAX-CORE **Balanced** CLT Listed in Table 1 (for Use in the U.S.) (Continued)

CLT Grade[c]	Layup ID[d]	CLT Thick-ness, t_p (in.)	Lamination Thickness (in.) in CLT Layup									Major Strength Direction				Minor Strength Direction			
			=	⊥	=	⊥	=	⊥	=	⊥	=	$(F_bS)_{eff,f,0}$ (lbf-ft/ft)	$(EI)_{eff,f,0}$ (10^6 lbf-in.^{2}/ft)	$(GA)_{eff,f,0}$ (10^6 lbf/ft)	$V_{s,0}$ (lbf/ft)	$(F_bS)_{eff,f,90}$ (lbf-ft/ft)	$(EI)_{eff,f,90}$ (10^6 lbf-in.^{2}/ft)	$(GA)_{eff,f,90}$ (10^6 lbf/ft)	$V_{s,90}$ (lbf/ft)
V3	3-alt	4 1/8	1 3/8	1 3/8	1 3/8							1,740	95	0.49	1,820	140	3.4	0.52	605
	4-maxx	5 1/2	1 3/8	1 3/8 x 2	1 3/8							2,825	205	0.58	2,420	565	27	1.1	1,210
	5-alt	6 7/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8					4,000	363	0.98	3,025	1,230	88	1.0	1,820
	5-maxx	6 7/8	1 3/8 x 2	1 3/8	1 3/8 x 2							4,975	451	1.0	3,025	140	3.4	0.62	605
	6-maxx	8 1/4	1 3/8 x 2	1 3/8 x 2	1 3/8 x 2							6,975	758	0.98	3,625	565	27	1.0	1,210
	7-alt	9 5/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8			7,100	899	1.5	4,225	2,825	338	1.6	3,025
	7-maxx	9 5/8	1 3/8 x 2	1 3/8	1 3/8	1 3/8	1 3/8 x 2					9,125	1,157	1.5	4,225	1,230	88	1.1	1,820
	9-alt	12 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	11,000	1,793	2.0	5,450	5,025	837	2.1	4,225
V3.2	3-alt	3 5/8	1 3/8	7/8	1 3/8							1,380	66	0.49	1,600	55	0.87	0.36	385
	4-maxx	4 1/2	1 3/8	7/8 x 2	1 3/8							2,030	120	0.51	1,980	230	7.0	0.66	770
	5-alt	5 7/8	1 3/8	7/8	1 3/8	7/8	1 3/8					3,175	246	0.98	2,575	670	36	0.72	1,380
	6-maxx	7 1/4	1 3/8 x 2	7/8 x 2	1 3/8 x 2							5,500	526	0.98	3,200	230	7.0	0.72	770
	7-alt	8 1/8	1 3/8	7/8	1 3/8	7/8	1 3/8	7/8	1 3/8			5,650	604	1.5	3,575	1,530	143	1.1	2,370
	7-maxx	8 5/8	1 3/8 x 2	7/8	1 3/8	7/8	1 3/8 x 2					7,575	860	1.6	3,800	670	36	0.84	1,380
	8-maxx	10	1 3/8 x 2	7/8	1 3/8 x 2	7/8	1 3/8 x 2					9,900	1,305	2.3	4,400	1,180	92	0.97	1,980
	9-alt	10 3/8	1 3/8	7/8	1 3/8	7/8	1 3/8	7/8	1 3/8	7/8	1 3/8	8,775	1,199	2.0	4,575	2,700	357	1.4	3,350
	9-maxx	10 7/8	1 3/8 x 2	7/8	1 3/8	7/8	1 3/8	7/8	1 3/8 x 2			11,550	1,654	2.1	4,775	1,530	143	1.2	2,370

Table 2. ASD Reference Design Values[a, b] for IB MAX-CORE **Balanced** CLT Listed in Table 1 (for Use in the U.S.) (Continued)

CLT Grade[c]	Layup ID[d]	CLT Thick-ness, t_p (in.)	Lamination Thickness (in.) in CLT Layup									Major Strength Direction				Minor Strength Direction			
			=	⊥	=	⊥	=	⊥	=	⊥	=	$(F_bS)_{eff,f,0}$ (lbf-ft/ft)	$(EI)_{eff,f,0}$ (10^6 lbf-in.^{2}/ft)	$(GA)_{eff,f,0}$ (10^6 lbf/ft)	$V_{s,0}$ (lbf/ft)	$(F_bS)_{eff,f,90}$ (lbf-ft/ft)	$(EI)_{eff,f,90}$ (10^6 lbf-in.^{2}/ft)	$(GA)_{eff,f,90}$ (10^6 lbf/ft)	$V_{s,90}$ (lbf/ft)
V3.3	3-alt	2 5/8	7/8	7/8	7/8							705	24	0.31	1,160	55	0.87	0.33	385
	4-maxx	3 1/2	7/8	7/8 x 2	7/8							1,140	53	0.37	1,540	230	7.0	0.68	770
	5-alt	4 3/8	7/8	7/8	7/8	7/8	7/8					1,620	94	0.62	1,930	500	23	0.66	1,160
	6-maxx	5 1/4	7/8 x 2	7/8 x 2	7/8 x 2							2,825	195	0.62	2,310	230	7.0	0.66	770
	7-alt	6 1/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8			2,875	232	0.94	2,700	1,150	87	1.0	1,930
	7-maxx	6 1/8	7/8 x 2	7/8	7/8	7/8	7/8 x 2					3,700	298	0.94	2,700	500	23	0.71	1,160
	8-maxx	7	7/8 x 2	7/8	7/8 x 2	7/8	7/8 x 2					4,650	429	1.3	3,075	810	49	0.78	1,540
	9-alt	7 7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	4,450	462	1.2	3,475	2,030	216	1.3	2,700
	9-maxx	7 7/8	7/8 x 2	7/8	7/8	7/8	7/8	7/8	7/8 x 2			5,725	594	1.2	3,475	1,150	87	1.0	1,930
V3M5	3-alt	4 1/8	1 3/8	1 3/8	1 3/8							2,090	108	0.50	1,820	140	3.4	0.59	660
	4-maxx	5 1/2	1 3/8	1 3/8 x 2	1 3/8							3,400	234	0.58	2,420	565	27	1.2	1,320
	5-alt	6 7/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8					4,800	414	0.99	3,025	1,230	88	1.1	1,820
	5-maxx	6 7/8	1 3/8 x 2	1 3/8	1 3/8 x 2							5,825	502	1.0	3,025	140	3.4	0.66	605
	6-maxx	8 1/4	1 3/8 x 2	1 3/8 x 2	1 3/8 x 2							8,075	837	0.99	3,625	565	27	1.1	1,210
	7-alt	9 5/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8			8,375	1,013	1.5	4,225	2,825	338	1.6	3,025
	7-maxx	9 5/8	1 3/8 x 2	1 3/8	1 3/8	1 3/8	1 3/8 x 2					10,525	1,270	1.5	4,225	1,230	88	1.2	1,820
	8-maxx	11	1 3/8 x 2	1 3/8	1 3/8 x 2	1 3/8	1 3/8 x 2					13,175	1,820	2.0	4,850	2,000	190	1.3	2,420
	9-alt	12 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	12,825	1,993	2.0	5,450	5,025	837	2.1	4,225
	9-maxx	12 3/8	1 3/8 x 2	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8 x 2			16,125	2,505	2.0	5,450	2,825	338	1.7	3,025

Table 2. ASD Reference Design Values[a, b] for IB MAX-CORE **Balanced** CLT Listed in Table 1 (for Use in the U.S.) (Continued)

CLT Grade[c]	Layup ID[d]	CLT Thick-ness, t_p (in.)	Lamination Thickness (in.) in CLT Layup									Major Strength Direction				Minor Strength Direction			
			=	⊥	=	⊥	=	⊥	=	⊥	=	$(F_bS)_{eff,f,0}$ (lbf-ft/ft)	$(EI)_{eff,f,0}$ (10^6 lbf-in.^{2}/ft)	$(GA)_{eff,f,0}$ (10^6 lbf/ft)	$V_{s,0}$ (lbf/ft)	$(F_bS)_{eff,f,90}$ (lbf-ft/ft)	$(EI)_{eff,f,90}$ (10^6 lbf-in.^{2}/ft)	$(GA)_{eff,f,90}$ (10^6 lbf/ft)	$V_{s,90}$ (lbf/ft)
V3M5.1	3-alt	3 5/8	1 3/8	7/8	1 3/8							1,650	75	0.50	1,600	55	0.87	0.41	420
	4-maxx	4 1/2	1 3/8	7/8 x 2	1 3/8							2,430	137	0.51	1,980	230	7.0	0.74	840
	5-alt	5 7/8	1 3/8	7/8	1 3/8	7/8	1 3/8					3,800	280	0.99	2,575	670	36	0.77	1,380
	6-maxx	7 1/4	1 3/8 x 2	7/8 x 2	1 3/8 x 2							6,425	584	0.99	3,200	230	7.0	0.77	770
	7-alt	8 1/8	1 3/8	7/8	1 3/8	7/8	1 3/8	7/8	1 3/8			6,675	680	1.5	3,575	1,530	143	1.1	2,370
	7-maxx	8 5/8	1 3/8 x 2	7/8	1 3/8	7/8	1 3/8 x 2					8,750	948	1.6	3,800	670	36	0.88	1,380
	8-maxx	10	1 3/8 x 2	7/8	1 3/8 x 2	7/8	1 3/8 x 2					11,375	1,428	2.3	4,400	1,180	92	1.0	1,980
	9-alt	10 3/8	1 3/8	7/8	1 3/8	7/8	1 3/8	7/8	1 3/8	7/8	1 3/8	10,250	1,334	2.0	4,575	2,700	357	1.5	3,350
	9-maxx	10 7/8	1 3/8 x 2	7/8	1 3/8	7/8	1 3/8	7/8	1 3/8 x 2			13,225	1,804	2.1	4,775	1,530	143	1.2	2,370
V3M6	3-alt	4 1/8	1 3/8	1 3/8	1 3/8							2,030	95	0.49	1,820	140	3.4	0.52	495
	4-maxx	5 1/2	1 3/8	1 3/8 x 2	1 3/8							3,300	205	0.58	2,420	565	27	1.1	990
	5-alt	6 7/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8					4,675	363	0.98	3,025	1,230	88	1.0	1,820
	5-maxx	6 7/8	1 3/8 x 2	1 3/8	1 3/8 x 2							5,825	451	1.0	3,025	140	3.4	0.62	605
	6-maxx	8 1/4	1 3/8 x 2	1 3/8 x 2	1 3/8 x 2							8,125	758	0.98	3,625	565	27	1.0	1,210
	7-alt	9 5/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8			8,275	899	1.5	4,225	2,825	338	1.6	3,025
	7-maxx	9 5/8	1 3/8 x 2	1 3/8	1 3/8	1 3/8	1 3/8 x 2					10,650	1,157	1.5	4,225	1,230	88	1.1	1,820
	8-maxx	11	1 3/8 x 2	1 3/8	1 3/8 x 2	1 3/8	1 3/8 x 2					13,400	1,666	2.0	4,850	2,000	190	1.2	2,420
	9-alt	12 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	12,825	1,793	2.0	5,450	5,025	837	2.1	4,225
	9-maxx	12 3/8	1 3/8 x 2	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8 x 2			16,475	2,304	1.9	5,450	2,825	338	1.6	3,025

Table 2. ASD Reference Design Values[a, b] for IB MAX-CORE **Balanced** CLT Listed in Table 1 (for Use in the U.S.) (Continued)

CLT Grade[c]	Layup ID[d]	CLT Thick-ness, t_p (in.)	Lamination Thickness (in.) in CLT Layup									Major Strength Direction				Minor Strength Direction			
			=	⊥	=	⊥	=	⊥	=	⊥	=	$(F_bS)_{eff,f,0}$ (lbf-ft/ft)	$(EI)_{eff,f,0}$ (10^6 lbf-in.^{2}/ft)	$(GA)_{eff,f,0}$ (10^6 lbf/ft)	$V_{s,0}$ (lbf/ft)	$(F_bS)_{eff,f,90}$ (lbf-ft/ft)	$(EI)_{eff,f,90}$ (10^6 lbf-in.^{2}/ft)	$(GA)_{eff,f,90}$ (10^6 lbf/ft)	$V_{s,90}$ (lbf/ft)
V3M6.1	3-alt	3 5/8	1 3/8	7/8	1 3/8							1,610	66	0.49	1,600	55	0.87	0.36	315
	4-maxx	4 1/2	1 3/8	7/8 x 2	1 3/8							2,370	120	0.51	1,980	230	7.0	0.66	630
	5-alt	5 7/8	1 3/8	7/8	1 3/8	7/8	1 3/8					3,700	246	0.98	2,575	670	36	0.72	1,380
	6-maxx	7 1/4	1 3/8 x 2	7/8 x 2	1 3/8 x 2							6,425	526	0.98	3,200	230	7.0	0.72	770
	7-alt	8 1/8	1 3/8	7/8	1 3/8	7/8	1 3/8	7/8	1 3/8			6,575	604	1.5	3,575	1,530	143	1.1	2,370
	7-maxx	8 5/8	1 3/8 x 2	7/8	1 3/8	7/8	1 3/8 x 2					8,825	860	1.6	3,800	670	36	0.84	1,380
	8-maxx	10	1 3/8 x 2	7/8	1 3/8 x 2	7/8	1 3/8 x 2					11,550	1,305	2.3	4,400	1,180	92	0.97	1,980
	9-alt	10 3/8	1 3/8	7/8	1 3/8	7/8	1 3/8	7/8	1 3/8	7/8	1 3/8	10,225	1,199	2.0	4,575	2,700	357	1.4	3,350
	9-maxx	10 7/8	1 3/8 x 2	7/8	1 3/8	7/8	1 3/8	7/8	1 3/8 x 2			13,475	1,654	2.1	4,775	1,530	143	1.2	2,370
V3M7	3-alt	4 1/8	1 3/8	1 3/8	1 3/8							1,740	95	0.52	1,820	235	3.6	0.52	605
	4-maxx	5 1/2	1 3/8	1 3/8 x 2	1 3/8							2,825	205	0.62	2,420	945	29	1.1	1,210
	5-alt	6 7/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8					4,000	363	1.1	3,025	2,050	95	1.1	1,820
	5-maxx	6 7/8	1 3/8 x 2	1 3/8	1 3/8 x 2							4,975	451	1.1	3,025	235	3.6	0.62	605
	6-maxx	8 1/4	1 3/8 x 2	1 3/8 x 2	1 3/8 x 2							6,975	758	1.1	3,625	945	29	1.1	1,210
	7-alt	9 5/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8			7,100	900	1.6	4,225	4,725	363	1.6	3,025
	7-maxx	9 5/8	1 3/8 x 2	1 3/8	1 3/8	1 3/8	1 3/8 x 2					9,125	1,157	1.6	4,225	2,050	95	1.1	1,820
	8-maxx	11	1 3/8 x 2	1 3/8	1 3/8 x 2	1 3/8	1 3/8 x 2					11,500	1,666	2.2	4,850	3,325	205	1.2	2,420
	9-alt	12 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	11,000	1,795	2.1	5,450	8,350	900	2.1	4,225
	9-maxx	12 3/8	1 3/8 x 2	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8 x 2			14,125	2,305	2.1	5,450	4,725	363	1.6	3,025

Table 2. ASD Reference Design Values[a, b] for IB MAX-CORE **Balanced** CLT Listed in Table 1 (for Use in the U.S.) (Continued)

CLT Grade[c]	Layup ID[d]	CLT Thick-ness, t_p (in.)	Lamination Thickness (in.) in CLT Layup									Major Strength Direction				Minor Strength Direction			
			=	⊥	=	⊥	=	⊥	=	⊥	=	$(F_bS)_{eff,f,0}$ (lbf-ft/ft)	$(EI)_{eff,f,0}$ (10^6 lbf-in.^{2}/ft)	$(GA)_{eff,f,0}$ (10^6 lbf/ft)	$V_{s,0}$ (lbf/ft)	$(F_bS)_{eff,f,90}$ (lbf-ft/ft)	$(EI)_{eff,f,90}$ (10^6 lbf-in.^{2}/ft)	$(GA)_{eff,f,90}$ (10^6 lbf/ft)	$V_{s,90}$ (lbf/ft)
V22	3-alt	4 1/8	1 3/8	1 3/8	1 3/8							1,340	74	0.41	1,820	180	2.9	0.41	605
	4-maxx	5 1/2	1 3/8	1 3/8 x 2	1 3/8							2,170	161	0.49	2,420	725	23	0.85	1,210
	5-alt	6 7/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8					3,075	286	0.83	3,025	1,570	74	0.83	1,820
	5-maxx	6 7/8	1 3/8 x 2	1 3/8	1 3/8 x 2							3,825	355	0.85	3,025	180	2.9	0.49	605
	6-maxx	8 1/4	1 3/8 x 2	1 3/8 x 2	1 3/8 x 2							5,350	596	0.83	3,625	725	23	0.83	1,210
	7-alt	9 5/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8			5,450	707	1.2	4,225	3,625	286	1.2	3,025
	7-maxx	9 5/8	1 3/8 x 2	1 3/8	1 3/8	1 3/8	1 3/8 x 2					7,000	909	1.2	4,225	1,570	74	0.89	1,820
	9-alt	12 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	8,450	1,410	1.7	5,450	6,400	707	1.7	4,225

For SI: 1 in. = 25.4 mm; 1 ft = 304.8 mm; 1 lbf = 4.448N

(a) Tabulated values are allowable design values and not permitted to be increased for the lumber flat use or size factor in accordance with the NDS.

(b) Deflection under a specified uniformly distributed load, w, acting perpendicular to the face of a single-span CLT panel shall be permitted to be calculated as a sum of the deflections due to moment and shear effects using the effective bending stiffness, $(EI)_{eff}$, and the effective in-plane (planar) shear rigidity, $(GA)_{eff}$, as follows:

$$\delta = \frac{22.5wL^4}{(EI)_{eff}} + \frac{9wL^2}{5(GA)_{eff}} \quad [1]$$

where: δ = estimated deflection, inches;
w = uniform load, lbf/ft^2;
L = span, feet;
$(EI)_{eff}$ = tabulated effective bending stiffness, lbf-in.^{2}/ft; and
$(GA)_{eff}$ = tabulated effective in-plane (planar) shear rigidity, lbf/ft.

For a concentrated load, P, located in the middle of a single span CLT panel acting perpendicular to the panel, the deflection shall be permitted to be calculated as follows:

$$\delta = \frac{36PL^3}{(EI)_{eff}} + \frac{18PL}{5(GA)_{eff}} \quad [2]$$

where: δ = estimated deflection, inches;
P = concentrated load, lbf/ft of width;
L = span, feet;
$(EI)_{eff}$ = tabulated effective bending stiffness, lbf-in.^{2}/ft; and
$(GA)_{eff}$ = tabulated effective in-plane (planar) shear rigidity, lbf/ft.

(c) The CLT grade and layups are developed based on ANSI/APA PRG 320, as permitted by the standard.

(d) The layup designation refers to the number of layers and the layup series (alt or maxx).

Table 3. ASD Reference Design Values[a, b] for IB MAX-CORE **Unbalanced** CLT[c] Listed in Table 1 (for Use in the U.S.)

CLT Grade[d]	Layup ID[e]	CLT Thick-ness, t_p (in.)	Lamination Thickness (in.) in CLT Layup									Major Strength Direction				Minor Strength Direction			
			=	⊥	=	⊥	=	⊥	=	⊥	=	$(F_bS)_{eff,f,0}$ (lbf-ft/ft)	$(EI)_{eff,f,0}$ (10^6 lbf-in.^{2}/ft)	$(GA)_{eff,f,0}$ (10^6 lbf/ft)	$V_{s,0}$ (lbf/ft)	$(F_bS)_{eff,f,90}$ (lbf-ft/ft)	$(EI)_{eff,f,90}$ (10^6 lbf-in.^{2}/ft)	$(GA)_{eff,f,90}$ (10^6 lbf/ft)	$V_{s,90}$ (lbf/ft)
V3	4-alt	5 1/2	1 3/8	1 3/8	1 3/8	1 3/8						1,740	95	0.49	1,820	140	3.4	0.52	605
	6-alt	8 1/4	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8				4,000	363	0.98	3,025	1,230	88	1.0	1,820
	8-alt	11	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8		7,100	899	1.5	4,225	2,825	338	1.6	3,025

For SI: 1 in. = 25.4 mm; 1 ft = 304.8 mm; 1 lbf = 4.448N

[a] Tabulated values are allowable design values and not permitted to be increased for the lumber flat use or size factor in accordance with the NDS. Tabulated values ignore the contribution of the outermost compression layer.

[b] Refer to Footnote (b) of Table 2 for deflection under different loading scenarios.

[c] **Unbalanced CLT layups can be only used in wall and simple span applications. The compression side that consists of lumber laminations in the minor strength direction is stamped with the word "TOP", which shall be installed on the compression (top) side of the simple-span bending member.**

[d] The CLT grade and layups were developed based on ANSI/APA PRG 320, as permitted by the standard.

[e] The layup designation refers to the number of layers and the layup series (alt).

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