

ICC-ES Evaluation Report

ESR-5697

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DIVISION: 06 00 00— WOOD, PLASTIC AND COMPOSITES Section: 06 17 19— Cross-Laminated Timber	REPORT HOLDER: SCHILLIGER BOIS SAS	EVALUATION SUBJECT: CROSS LAMINATED TIMBER	
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1.0 EVALUATION SCOPE

Compliance with the following codes and standards:

- 2024, 2021 and 2018 [International Building Code® \(IBC\)](#)
- 2024, 2021 and 2018 [International Residential Code® \(IRC\)](#)
- ANSI/APA PRG 320-2019 Performance Standard for Cross-Laminated Timber
- ANSI/APA PRG 320-2025 Performance Standard for Cross-Laminated Timber

Properties evaluated:

- Structural
- Fire resistance

2.0 USES

The cross laminated timber (CLT) panels, described in this evaluation report, are engineered wood products. When installed under the 2024 and 2021 IBC, the CLT panels can be used as floor, roof and wall panels in Types III, IV and V Construction, and in Type I and II Construction where permitted by IBC Section 603 and elsewhere in the Code. When installed under the 2018 IBC, the CLT panels can be used as components in floors and roofs in Type I and II Construction and in roof and floor decks in Type III (interior floor decks only), IV and V construction. When the CLT panels are installed under the IRC, an engineered design is required in accordance with IRC Section R301.1.3.

3.0 DESCRIPTION

3.1 General:

The CLT panels described in this evaluation report comply with requirements noted in IBC Section 2303.1.4 and IBC Section 2302.1(1) for allowable stress design (ASD). The CLT panels are fabricated with at least three planed sawn lumber laminations with adjacent laminations glued together at an angle of 90°. Two adjacent laminations are permitted to be placed in the same strength direction. The CLT panels are fabricated with nominal widths from 7.05 feet to 11.32 feet (2.15 to 3.45 m actual), thicknesses from 2.36 inches to 12.6 inches (60 to 320 mm actual), and lengths from 26.25 feet to 52.50 feet (8 to 16 m actual). The CLT panels are fabricated by face-bonding each layer of laminations using a structural adhesive, complying with Section 3.2.2 of this evaluation report. The lumber laminations in a layer may be edge-bonded using the same adhesive. The layers of laminations are placed in a press to form a dimensionally stable structural element. Refer to [Table 2](#) for CLT panel layouts.

3.2 Material

3.2.1 Wood Laminations: Wood laminations used in fabricating CLT panels are finger-jointed sawn lumber and must be fabricated in accordance with the approved in-plant manufacturing standard for grade and species of the sawn lumber, complying with ANSI/PRG 320-2025 Section 6.1.2 Item c and having a specific gravity of 0.43. The ASD reference design values for the sawn lumber are provided in [Table 1](#) of this evaluation report.

3.2.2 Adhesives: The adhesive used to fabricate CLT panels and finger-jointed wood laminations are non-formaldehyde, one-component polyurethane based, exterior-type structural adhesives, conforming to ANSI/APA PRG 320 and the adhesive specification in the approved quality documentation.

4.0 DESIGN AND INSTALLATION

4.1 General:

Design and installation of CLT panels must be in accordance with this evaluation report, the applicable code provisions and the manufacturer's published design and installation instructions. The manufacturer's design and installation instructions must be available at the jobsite at all times during installation. The design requirements specified for ASD in accordance with 2024, 2021 and 2018 IBC Section 2302.1(1), Chapter 10 of the 2024, 2018 or 2015 *National Design Specification[®] for Wood Construction* (NDS), and Sections 4.5 and 4.6, and Appendix B of the 2024 or 2021 Special Design Provisions for Wind and Seismic (SDPWS) with Commentary, are applicable to the CLT panels.

4.2 Reference Design Values:

[Table 3](#) provides the ASD reference design values for bending and shear capacities of CLT panels. For the Load and Resistance Factor Design (LRFD), the reference design values must be adjusted using the adjustment factors specified in Table 10.3.1 of the 2024, 2018 or 2015 NDS. The reference design values must be adjusted in accordance with Section 4.3 of this evaluation report.

4.3 Adjustment Factors:

The reference design values in [Table 3](#) must be adjusted using the adjustment factors specified in Table 10.3.1 of the 2024, 2018 or 2015 NDS and must not be increased for the lumber size adjustment factor in accordance with the NDS. The time dependent deformation (creep) factor, K_{cr} , of 2.0, as specified in Section 3.5.2 of the NDS must be used to calculate the total deflection due to long-term loading for CLT panels used as components in floor and roof decks under dry service condition such as in most covered structures, where the moisture content in lumber in service is less than 16 percent, as specified in Section 10.1.5 of the 2024, 2018 or 2015 NDS.

4.4 Fire Resistance:

4.4.1 Under the 2024 and 2021 IBC: When fire performance is required, the fire resistance rating of the exposed CLT panels may be determined by calculation in accordance with Chapter 16 of the NDS. Additionally, the heavy timber construction provisions of IBC Section 602.4 are applicable to CLT panels. As an alternative to these provisions, CLT panels must be tested in accordance with ASTM E119 with a fire resistance rating in accordance with the test results and the conditions of such tests. Such test must be submitted to the code official for approval and are outside the scope of this evaluation report.

4.4.2 Under the 2018 IBC: Procedures specified in Chapter 16 of the 2018 or 2015 NDS shall be permitted for use in designing CLT panels for a fire exposure up to 2 hours. The CLT panels can be in 2-hour fire-resistance-rated construction, when tested in accordance with ASTM E119 with a fire resistance rating in accordance with the test results and the conditions of such tests, and such tests must be submitted to the code official for approval and are outside the scope of this evaluation report.

5.0 CONDITIONS OF USE:

The CLT panels 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** Fabrication, design, and installation of CLT panels must comply with this evaluation report and the manufacturer's published design and installation instructions. In the event of a conflict between the manufacturer's published design and installation instructions and this evaluation report, the more restrictive requirements govern.
- 5.2** The construction documents prepared or reviewed by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed specifying the CLT panels, must indicate compliance with this evaluation report and applicable codes and must be submitted to the code official for approval.

- 5.3** The complete diaphragm designs have not been evaluated and are outside the scope of this report. To be considered as part of a floor and roof diaphragm, CLT panels used to resist in-plane shear forces must be accompanied by complete detailing and diaphragm design in accordance with 2024 or 2021 SDPWS Section 4.5.
- 5.4** Use of CLT panels to resist in-plane-shear forces in shear walls must be accompanied by complete detailing and design of shear walls in accordance with 2024 or 2021 SDPWS Appendix B.
- 5.5** Use of CLT panels to resist gravity or out-of-plane transverse forces in walls must be accompanied by complete detailing and wall design that are acceptable to the code official.
- 5.6** Connections between wall panels and roof/floor panels, and other support members shall be accompanied by complete detailing and design that are satisfactory to the code official. Fasteners and connectors must be properly specified, including size, length, dimension, fastener bearing length and location. Connections must be designed in accordance with the mechanical connection provisions in the NDS or proprietary connectors and fasteners recognized in a current ICC-ES evaluation report.
- 5.7** Roofs constructed with CLT panels must be covered with approved roof coverings secured to the building or structure in accordance with applicable provisions of IBC Chapter 15.
- 5.8** Cutting, drilling, and notching of CLT panels when used as components in floor and roof decks have not been evaluated and are outside the scope of this evaluation report.
- 5.9** Use of CLT panels must be limited to dry service conditions where the equilibrium moisture content in lumber in service is less than 16 percent, as in most covered structures.
- 5.10** Special inspection must be conducted in accordance with the applicable requirements of Sections 1704 and 1705 of the IBC.
- 5.11** The CLT panels may be used as components in floor and roof decks under the IRC when an engineered design is submitted in accordance with Section R301.1.3.
- 5.12** The CLT panels are fabricated under an approved quality control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

Data in accordance with the [ICC-ES Acceptance Criteria for Cross-laminated Timber Panels for Use as Components in Walls, Floors, and Roofs \(AC455\)](#), dated October 2022 (Editorially revised June 2024).

7.0 IDENTIFICATION

- 7.1** The ICC-ES mark of conformity, electronic labeling, or the evaluation report number (ICC-ES ESR-5697) along with the name, registered trademark, or registered logo of the report holder must be included in the product label.
- 7.2** In addition, each CLT panel is identified with a product label bearing the panel grade and layup, the production lot number, and the ICC-ES evaluation report number (ESR-5697).
- 7.3** The report holder's contact information is the following:

SCHILLIGER BOIS SAS
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TABLE 1—ASD REFERENCE DESIGN VALUES FOR LUMBER LAMINATIONS USED IN CLT PANELS^{1,2}

CLT GRADE	MAJOR STRENGTH DIRECTION							MINOR STRENGTH DIRECTION						
	$f_{b,0}$ (psi)	E (10^6 psi)	$f_{t,0}$ (psi)	$f_{c,0}$ (psi)	$f_{v,0}$ (psi)	$f_{s,0}$ (psi)	$f_{c\perp}$ (psi)	$f_{b,90}$ (psi)	E (10^6 psi)	$f_{t,90}$ (psi)	$f_{c,90}$ (psi)	$f_{v,90}$ (psi)	$f_{s,90}$ (psi)	$f_{c\perp}$ (psi)
CLT	1,650	1.8	850	1,800	150	50	490	1,650	1.8	850	1,800	150	50	490

For SI: 1 psi = 6,895 Pa

¹Tabulated design values are allowable design values and not permitted to be increased for the lumber flat use or size factor in accordance with the NDS.

²The tabulated design values are used in conjunction with the section properties analytically derived using the equations outlined in the ANSI/APA PRG 320 to derive the reference design values in Table 3, based on the actual layup used in manufacturing the CLT panel (see Table 2).

TABLE 2—THE CLT PANEL LAYUPS

LAYUP ¹		THICKNESS t_p ²		LAMINATION ACTUAL THICKNESS ³					
					⊥		⊥		⊥
CLT-3L	60 3L	[mm]	60	20	20	20			
		[in.]	2.36	0.79	0.79	0.79			
	70 3L	[mm]	70	20	30	20			
		[in.]	2.76	0.79	1.18	0.79			
	80 3L	[mm]	80	30	20	30			
		[in.]	3.15	1.18	0.79	1.18			
	90 3L	[mm]	90	30	30	30			
		[in.]	3.54	1.18	1.18	1.18			
	100 3L	[mm]	100	30	40	30			
		[in.]	3.94	1.18	1.57	1.18			
	110 3L	[mm]	110	40	30	40			
		[in.]	4.33	1.57	1.18	1.57			
	120 3L	[mm]	120	40	40	40			
		[in.]	4.72	1.57	1.57	1.57			
CLT-5L	100 5L	[mm]	100	20	20	20	20	20	
		[in.]	3.94	0.79	0.79	0.79	0.79	0.79	
	110 5L	[mm]	110	20	20	30	20	20	
		[in.]	4.33	0.79	0.79	1.18	0.79	0.79	
	120 5L	[mm]	120	20	30	20	30	20	
		[in.]	4.72	0.79	1.18	0.79	1.18	0.79	
	130 5L	[mm]	130	30	20	30	20	30	
		[in.]	5.12	1.18	0.79	1.18	0.79	1.18	
	140 5L	[mm]	140	40	20	20	20	40	
		[in.]	5.51	1.57	0.79	0.79	0.79	1.57	
	150 5L	[mm]	150	30	30	30	30	30	
		[in.]	5.91	1.18	1.18	1.18	1.18	1.18	
	160 5L	[mm]	160	40	20	40	20	40	
		[in.]	6.30	1.57	0.79	1.57	0.79	1.57	
	170 5L	[mm]	170	30	40	30	40	30	
		[in.]	6.69	1.18	1.57	1.18	1.57	1.18	
	180 5L	[mm]	180	40	30	40	30	40	
		[in.]	7.09	1.57	1.18	1.57	1.18	1.57	
	200 5L	[mm]	200	40	40	40	40	40	
		[in.]	7.87	1.57	1.57	1.57	1.57	1.57	
CLT-5DL	160 5DL	[mm]	160	30+30	40	30+30			
		[in.]	6.30	1.18+1.18	1.57	1.18+1.18			
	170 5DL	[mm]	170	40+30	30	30+40			
		[in.]	6.69	1.57+1.18	1.18	1.18+1.57			
	180 5DL	[mm]	180	40+40	20	40+40			
		[in.]	7.09	1.57+1.57	0.79	1.57+1.57			
CLT-7L	200 7L	[mm]	200	20	40	20	40	20	40
		[in.]	7.87	0.79	1.57	0.79	1.57	0.79	1.57
	220 7L	[mm]	220	40	20	40	20	40	20
		[in.]	8.66	1.57	0.79	1.57	0.79	1.57	0.79
	240 7L	[mm]	240	30	40	30	40	30	40
		[in.]	9.45	1.18	1.57	1.18	1.57	1.18	1.18
CLT-7DL	220 7DL	[mm]	220	40+40	20	20	20	40+40	
		[in.]	8.66	1.57+1.57	0.79	0.79	0.79	1.57+1.57	
	240 7DL	[mm]	240	40+40	20	40	20	40+40	
		[in.]	9.45	1.57+1.57	0.79	1.57	0.79	1.57+1.57	
	260 7DL	[mm]	260	40+40	30	40	30	40+40	
		[in.]	10.24	1.57+1.57	1.18	1.57	1.18	1.57+1.57	
CLT-8DL	300 8DL	[mm]	300	40+40	30	40+40	30	40+40	
		[in.]	11.81	1.57+1.57	1.18	1.57+1.57	1.18	1.57+1.57	
	320 8DL	[mm]	320	40+40	40	40+40	40	40+40	
		[in.]	12.60	1.57+1.57	1.57	1.57+1.57	1.57	1.57+1.57	

For SI: 1 in. = 25.4 mm

¹The panel layouts are developed based on the ANSI/APA PRG 320, using sawn lumber complying with Section 3.2.1 of the evaluation report. The CLT layout designation refers to the number of layers and the layout series.

²Gross thickness of CLT panels.

³Actual thickness of lamination after planing. "||": Face laminations are oriented parallel to the major strength direction and "⊥": Face laminations are oriented perpendicular to the major strength direction.

TABLE 3—ASD REFERENCE DESIGN VALUES FOR THE CLT PANELS¹

LAYUP ²		THICKNESS t_p^3 (in.)	MAJOR STRENGTH DIRECTION				MINOR STRENGTH DIRECTION			
			$(F_b S)_{eff,f,0}$ (lb _r -ft/ft)	$(EI)_{eff,f,0}$ (x10 ⁶ lb _r -in. ² /ft)	$(GA)_{eff,f,0}$ (x10 ⁶ lb _r /ft)	$V_{s,0}$ (lb _r /ft)	$(F_b S)_{eff,f,90}$ (lb _r -ft/ft)	$(EI)_{eff,f,90}$ (x10 ⁶ lb _r -in. ² /ft)	$(GA)_{eff,f,90}$ (x10 ⁶ lb _r /ft)	$V_{s,90}$ (lb _r /ft)
CLT-3L	60 3L	2.36	1,258	22.9	0.39	946	170	0.88	0.39	315
	70 3L	2.76	1,640	34.8	0.42	1,103	384	2.97	0.58	473
	80 3L	3.15	2,284	55.4	0.58	1,261	170	0.88	0.42	315
	90 3L	3.54	2,830	77.3	0.58	1,418	384	2.97	0.58	473
	100 3L	3.94	3,399	103.1	0.61	1,576	682	7.04	0.77	630
	110 3L	4.33	4,298	143.4	0.77	1,734	384	2.97	0.61	473
	120 3L	4.72	5,030	183.2	0.77	1,891	682	7.04	0.77	630
CLT-5L	100 5L	3.94	2,895	87.8	0.77	1,576	1,480	22.89	0.77	946
	110 5L	4.33	3,378	112.7	0.96	1,734	1,930	34.84	0.80	1,103
	120 5L	4.72	3,746	136.4	0.83	1,891	2,687	55.43	1.16	1,261
	130 5L	5.12	5,272	207.9	1.16	2,049	1,930	34.84	0.83	1,103
	140 5L	5.51	6,581	279.5	1.16	2,206	1,480	22.89	0.83	946
	150 5L	5.91	6,513	296.4	1.16	2,364	3,329	77.27	1.16	1,418
	160 5L	6.30	8,294	402.7	1.60	2,522	2,398	49.48	0.91	1,261
	170 5L	6.69	7,784	401.5	1.21	2,679	5,056	143.4	1.53	1,734
	180 5L	7.09	9,918	541.6	1.53	2,837	3,999	103.1	1.21	1,576
CLT-5DL	200 5L	7.87	11,578	702.6	1.55	3,152	5,918	183.2	1.55	1,891
	160 5DL	6.30	9,135	443.5	1.16	2,522	682	7.04	0.83	630
	170 5DL	6.69	10,415	537.2	1.44	2,679	384	2.97	0.73	473
	180 5DL	7.09	11,723	640.3	1.90	2,837	170	0.88	0.65	315
	200 5DL	7.87	14,380	872.6	1.60	3,152	682	7.04	0.91	630
CLT-7L	200 7L	7.87	8,104	491.8	1.37	3,152	9,758	402.7	2.39	2,522
	220 7L	8.66	14,747	984.3	2.39	3,467	5,435	196.2	1.37	2,206
	240 7L	9.45	13,724	999.4	1.82	3,782	11,668	541.6	2.30	2,837
CLT-7DL	220 7DL	8.66	17,205	1,148.4	2.09	3,467	1,480	22.89	1.00	946
	240 7DL	9.45	20,215	1,472.1	2.62	3,782	2,398	49.48	1.10	1,261
	260 7DL	10.24	23,231	1,832.6	2.39	4,098	3,999	103.1	1.37	1,576
	280 7DL	11.02	26,324	2,236.3	2.31	4,413	5,918	183.2	1.66	1,891
CLT-8DL	300 8DL	11.81	30,002	2,730.9	3.39	4,728	6,848	247.2	1.55	2,206
	320 8DL	12.60	33,178	3,221.3	3.19	5,043	9,593	395.9	1.82	2,522

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

¹The tabulated values are reference design values intended for Allowable Stress Design (ASD) and must be adjusted in accordance with Section 4.3. For LRFD, the reference design values must be adjusted using the adjustment factors specified in Table 10.3.1 of the 2024, 2018 or 2015 NDS.

²The CLT layups are developed based on the ANSI/APA PRG 320, using sawn lumber complying with Section 3.2.1 of the evaluation report. The layup designation refers to the number of layers of the CLT panels.

³Gross thickness of the CLT panels.



FIGURE 1—COMPANY LOGO