



# ICC-ES Evaluation Report

## ESR-4081

Reissued June 2022

Revised December 2022

*This report is subject to renewal June 2024.*

**DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES**

**Section: 06 17 19—Cross-laminated Timber**

**REPORT HOLDER:**

**BINDERHOLZ BAUSYSTEME GmbH**

**EVALUATION SUBJECT:**

**BINDERHOLZ CLT BBS**

### 1.0 EVALUATION SCOPE

**Compliance with the following codes:**

- 2018, 2015, 2012 and 2009 *International Building Code*® (IBC)
- 2018, 2015, 2012 and 2009 *International Residential Code*® (IRC)

For compliance with codes adopted by Los Angeles Department of Building and Safety (LADBS), see [ESR-4081 LABC and LARC Supplement](#).

**Compliance with the following standards:**

- ANSI/APA PRG-320-2019 Standard for Performance-Rated Cross-Laminated Timber

**Property evaluated:**

Structural

### 2.0 USES

Binderholz CLT BBS is a cross-laminated timber (CLT) panel for use as components in floors and roofs in Type I and II Construction (IBC) and in roof and floor decks in Type III (interior floor decks only), IV and V construction (IBC). The Binderholz CLT BBS panels are available in two formats, BBS System Format (BBS SYS) and BBS XL. When 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 Binderholz CLT BBS panels described in this evaluation report comply with requirements noted in Section 2303.1.4 of the 2018 and 2015 IBC, for allowable stress design (ASD) in accordance with 2018 IBC Section 2302.1(1) (2015, 2012 and 2009 IBC Section 2301.2(1)). Binderholz CLT BBS panels are plane timber building components which are made of at least three laminations of sawn and planed

softwood lumber boards. Adjacent laminations are glued at an angle of 90°. The elements can be produced with a width up to 137.8 inches (3.5 meters) and a length of up to 72.2 feet (22 meters) in the BBS XL format, and with a width of up to 49.2 inches (1.25 meters) and a length of up to 65.6 feet (20 meters) in BBS System Format. The BBS System Format is for use in the major strength direction only, and fabricated with large finger joints. The Binderholz CLT BBS panels are manufactured by face-bonding each layer using a formaldehyde-free, polyurethane-based structural adhesive. The laminations for CLT BBS may be edge-bonded by a mixture of melamine urea formaldehyde-based glue and hot melt glue. The layers are placed in a press to form a dimensionally stable structural element. Refer to Tables 2 and 3 for the grade and layup designations of Binderholz CLT BBS panels. Figures 1 and 2 depict the Binderholz CLT BBS System Format and BBS XL panel and section structure. Figures 4 and 5 depict example applications of the Binderholz CLT BBS System Format and BBS XL panels.

#### 3.2 Material:

**3.2.1 Wood Laminations:** Wood laminations used in manufacturing Binderholz CLT BBS panels must be sawn lumber complying with the report holder's approved quality documentation. ASD reference design properties for the wood laminations are equivalent to SPF Structural Select lumber grade referenced in the NDS. See Table 1. The minimum specific gravity is 0.42.

**3.2.2 Adhesives:** Adhesive used to face-bond layers of Binderholz CLT BBS panels and adhesive used for finger-joints of wood laminations are one-component polyurethane based, exterior-type structural adhesives, conforming to ANSI/APA PRG-320-2019 and the product specifications in the approved quality documentation

### 4.0 DESIGN AND INSTALLATION

#### 4.1 General:

Design and installation of Binderholz CLT BBS 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 requirements specified for allowable stress design in accordance with 2018 IBC Section 2302.1(1) (2015, 2012 and 2009 IBC Section 2301.2(1)), and Chapter 10 of the 2018 or 2015 NDS, are applicable to Binderholz CLT BBS panels.

## 4.2 Reference Design Values:

Tables 4 through 7 provide, respectively, reference design values for bending capacities and in-plane shear capacities of Binderholz CLT BBS panels. The reference design values in Tables 4 and 7 are intended for allowable stress design (ASD) and must be adjusted in accordance with Section 4.3 of this evaluation report.

## 4.3 Adjustment Factors:

The reference design values in Tables 4 through 7 must be adjusted using the adjustment factors specified in Table 10.3.1 of the 2018 or 2015 NDS. The reference design values in Tables 6 and 7 must not be increased for the lumber size adjustment factor in accordance with 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 Binderholz CLT BBS panels used as components in floor and roof decks under dry service condition where the moisture content in lumber in service is less than 16 percent, as in most covered structures.

## 4.4 Fire Resistance:

When fire resistance is required, the fire resistance for the exposed Binderholz CLT BBS panels must be determined by calculation in accordance with Chapter 16 of the 2018 or 2015 NDS. As an alternative to the NDS calculation, the Binderholz CLT BBS panels must be tested in accordance with ASTM E119 and must be rated for fire resistance in accordance with the test results and conditions of such tests.

## 5.0 CONDITIONS OF USE

The Binderholz CLT BBS 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 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 Use of Binderholz CLT BBS panels must be limited to dry service conditions where the moisture content in lumber in service is less than 16 percent, as in most covered structures.
- 5.3 Calculations and drawings demonstrating compliance with this evaluation report must be submitted to the code official. The calculations and drawings must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.
- 5.4 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 NDS or

proprietary connectors and fasteners recognized in a current ICC-ES evaluation report.

- 5.5 Cutting, drilling, and notching of Binderholz CLT BBS panels when used as components in floor and roof decks have not been evaluated and are outside the scope of this evaluation report.
- 5.6 The in-plane shear values for Binderholz CLT BBS panels listed in Tables 6 and 7 are applicable for in-plane shear design of the CLT panels used in roof diaphragms, and floor diaphragms. The complete diaphragm designs have not been evaluated and are outside the scope of this evaluation report.
- 5.7 Binderholz CLT BBS panels used to resist in-plane shear forces in floor and roof diaphragms must be accompanied by complete detailing and diaphragm design that are acceptable to the code official.
- 5.8 Binderholz CLT BBS panels used to resist out-of-plane transverse forces in walls must be accompanied by complete detailing and wall design that are acceptable to the code official.
- 5.9 Binderholz CLT BBS panel roof decks must be covered with approved roof coverings secured to the building or structure in accordance with applicable provisions of IBC Chapter 15.
- 5.10 Special inspection must be conducted in accordance with the applicable requirements of Sections 1704 and 1705 of the IBC.
- 5.11 Binderholz CLT BBS 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. Binderholz CLT BBS panels are fabricated in Burgbernheim, Germany and Unternberg, Austria, under a 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 February 2019 (editorially revised June 2020).

## 7.0 IDENTIFICATION

- 7.1 The ICC-ES mark of conformity, electronic labeling or the evaluation report number (ESR-4081) along with the name, registered trademark, or registered logo of the report holder must be included in the product label.
- 7.2 In addition, Binderholz CLT BBS panels are identified with stamps noting the Binderholz Bausysteme GmbH name or logo (Figure 3), product layout and designation, production date and shift, and ICC-ES evaluation report number (ESR-4081).
- 7.3 The report holder's contact information is the following:

**BINDERHOLZ BAUSYSTEME GMBH**  
**ZILLERTALSTRASSE 39**  
**FÜGEN, TIROL 6263**  
**AUSTRIA**  
**+43 6245 70500**  
[www.binderholz.com](http://www.binderholz.com)

TABLE 1—ASD REFERENCE DESIGN VALUES FOR LUMBER LAMINATIONS USED IN BINDERHOLZ CLT BBS<sup>1</sup>

CLT Grade	Laminations Used in Major Strength Direction (psi)						Laminations Used in Minor Strength Direction (psi)					
	F <sub>b</sub>	E <sub>0</sub> (10 <sup>6</sup> )	F <sub>t</sub>	F <sub>c</sub>	F <sub>v</sub>	F <sub>s</sub>	F <sub>b</sub>	E (10 <sup>6</sup> )	F <sub>t</sub>	F <sub>c</sub>	F <sub>v</sub>	F <sub>s</sub>
BBS SYS	1,250	1.5	700	1,400	135	45	1,250	1.5	700	1,400	135	45
BBS XL	1,250	1.5	700	1,400	135	45	1,250	1.5	700	1,400	135	45

For SI: 1 psi = 6,895 Pa

<sup>1</sup>Tabulated values are allowable design values and are not permitted to be increased for the lumber size adjustment factor in accordance with the NDS. The design values must be used in conjunction with the section properties based on the actual layup used in manufacturing the CLT panel. See Tables 4 and 5.

TABLE 2—BINDERHOLZ CLT BBS SYS PANEL LAYUPS

BBS SYS LAYUP <sup>1</sup>	CLT THICKNESS t <sub>p</sub> <sup>2</sup>		LAMINATION ACTUAL THICKNESS <sup>3</sup>						
				⊥		⊥		⊥	
60-3s	[mm]	60	20	20	20				
	[in]	2.36	0.79	0.79	0.79				
80-3s	[mm]	80	20	40	20				
	[in]	3.15	0.79	1.57	0.79				
80-3s-2	[mm]	80	30	20	30				
	[in]	3.15	1.18	0.79	1.18				
90-3s	[mm]	90	30	30	30				
	[in]	3.54	1.18	1.18	1.18				
100-3s	[mm]	100	35	30	35				
	[in]	3.94	1.38	1.18	1.38				
100-3s-2	[mm]	100	30	40	30				
	[in]	3.94	1.18	1.57	1.18				
120-3s	[mm]	120	40	40	40				
	[in]	4.72	1.57	1.57	1.57				
120-3s-2	[mm]	120	20+20	40	40				
	[in]	4.72	0.79+0.79	1.57	1.57				
120-3s-3	[mm]	120	20+20	40	20+20				
	[in]	4.72	0.79+0.79	1.57	0.79+0.79				
160-3s	[mm]	160	20+40	40	40+20				
	[in]	6.30	0.79+1.57	1.57	1.57+0.79				
100-5s	[mm]	100	20	20	20	20	20		
	[in]	3.94	0.79	0.79	0.79	0.79	0.79		
120-5s	[mm]	120	20	30	20	30	20		
	[in]	4.72	0.79	1.18	0.79	1.18	0.79		
120-5s-2	[mm]	120	30	20	20	20	30		
	[in]	4.72	1.18	0.79	0.79	0.79	1.18		
140-5s	[mm]	140	40	20	20	20	40		
	[in]	5.51	1.57	0.79	0.79	0.79	1.57		
140-5s-2	[mm]	140	20+20	20	20	20	40		
	[in]	5.51	0.79+0.79	0.79	0.79	0.79	1.57		
140-5s-3	[mm]	140	20+20	20	20	20	20+20		
	[in]	5.51	0.79+0.79	0.79	0.79	0.79	0.79+0.79		
150-5s	[mm]	150	40	20	30	20	40		
	[in]	5.91	1.57	0.79	1.18	0.79	1.57		
150-5s-2	[mm]	150	20+20	20	30	20	40		
	[in]	5.91	0.79+0.79	0.79	1.18	0.79	1.57		
150-5s-3	[mm]	150	20+20	20	30	20	20+20		
	[in]	5.91	0.79+0.79	0.79	1.18	0.79	0.79+0.79		
160-5s	[mm]	160	40	20	40	20	40		
	[in]	6.30	1.57	0.79	1.57	0.79	1.57		
160-5s-2	[mm]	160	20+20	20	40	20	40		
	[in]	6.30	0.79+0.79	0.79	1.57	0.79	1.57		
160-5s-3	[mm]	160	20+20	20	40	20	20+20		
	[in]	6.30	0.79+0.79	0.79	1.57	0.79	0.79+0.79		

TABLE 2—BINDERHOLZ CLT BBS SYS PANEL LAYUPS (cont.)

BBS SYS LAYUP <sup>1</sup>	CLT THICKNESS $t_p$ <sup>2</sup>		LAMINATION ACTUAL THICKNESS <sup>3</sup>						
				⊥		⊥		⊥	
180-5s	[mm]	180	40	30	40	30	40		
	[in]	7.09	1.57	1.18	1.57	1.18	1.57		
180-5s-2	[mm]	180	20+20	30	40	30	40		
	[in]	7.09	0.79+0.79	1.18	1.57	1.18	1.57		
180-5s-3	[mm]	180	20+20	30	40	30	20+20		
	[in]	7.09	0.79+0.79	1.18	1.57	1.18	0.79+0.79		
180-5s-4	[mm]	180	20+40	20	20	20	40+20		
	[in]	7.09	0.79+1.57	0.79	0.79	0.79	1.57+0.79		
200-5s	[mm]	200	40	40	40	40	40		
	[in]	7.87	1.57	1.57	1.57	1.57	1.57		
200-5s-2	[mm]	200	20+20	40	40	40	40		
	[in]	7.87	0.79+0.79	1.57	1.57	1.57	1.57		
200-5s-3	[mm]	200	20+20	40	40	40	20+20		
	[in]	7.87	0.79+0.79	1.57	1.57	1.57	0.79+0.79		
200-5s-4	[mm]	200	20+40	20	40	20	40+20		
	[in]	7.87	0.79+1.57	0.79	1.57	0.79	1.57+0.79		
220-5s	[mm]	220	20+40	30	40	30	40+20		
	[in]	8.66	0.79+1.57	1.18	1.57	1.18	1.57+0.79		
240-5s	[mm]	240	20+40	40	40	40	40+20		
	[in]	9.45	0.79+1.57	1.57	1.57	1.57	1.57+0.79		
240-5s-2	[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		
240-5s-3	[mm]	240	20+20+40	20	40	20	40+40		
	[in]	9.45	0.79+0.79+1.57	0.79	1.57	0.79	1.57+1.57		
240-5s-4	[mm]	240	20+20+40	20	40	20	40+20+20		
	[in]	9.45	0.79+0.79+1.57	0.79	1.57	0.79	1.57+0.79+0.79		
260-7s	[mm]	260	20+40	20	40	20	40	20	40+20
	[in]	10.24	0.79+1.57	0.79	1.57	0.79	1.57	0.79	1.57+0.79
260-5s	[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		
260-5s-2	[mm]	260	20+20+40	30	40	30	40+40		
	[in]	10.24	0.79+0.79+1.57	1.18	1.57	1.18	1.57+1.57		
260-5s-3	[mm]	260	20+20+40	30	40	30	40+20+20		
	[in]	10.24	0.79+0.79+1.57	1.18	1.57	1.18	1.57+0.79+0.79		
280-7s	[mm]	280	20+40	40	20	40	20	40	40+20
	[in]	11.02	0.79+1.57	1.57	0.79	1.57	0.79	1.57	1.57+0.79
280-5s	[mm]	280	40+40	40	40	40	40+40		
	[in]	11.02	1.57+1.57	1.57	1.57	1.57	1.57+1.57		
280-5s-2	[mm]	280	20+20+40	40	40	40	40+40		
	[in]	11.02	0.79+0.79+1.57	1.57	1.57	1.57	1.57+1.57		
280-5s-3	[mm]	280	20+20+40	40	40	40	40+20+20		
	[in]	11.02	0.79+0.79+1.57	1.57	1.57	1.57	1.57+0.79+0.79		

For SI: 1 in. = 25.4 mm

<sup>1</sup>The panel layups are developed based on the ANSI/APA PRG 320, using visually graded sawn lumber noted in Section 3.2.1 of the evaluation report.<sup>2</sup>Gross thickness of CLT panels.<sup>3</sup>Actual 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—BINDERHOLZ CLT BBS XL PANEL LAYUPS

BBS XL LAYUP <sup>1</sup>	CLT THICKNESS $t_p$ <sup>2</sup>		LAMINATION ACTUAL THICKNESS <sup>3</sup>						
				⊥		⊥		⊥	
60-3s	[mm]	60	20	20	20				
	[in]	2.36	0.79	0.79	0.79				
80-3s	[mm]	80	20	40	20				
	[in]	3.15	0.79	1.57	0.79				
80-3s-2	[mm]	80	30	20	30				
	[in]	3.15	1.18	0.79	1.18				
90-3s	[mm]	90	30	30	30				
	[in]	3.54	1.18	1.18	1.18				
100-3s	[mm]	100	35	30	35				
	[in]	3.94	1.38	1.18	1.38				
100-3s-2	[mm]	100	30	40	30				
	[in]	3.94	1.18	1.57	1.18				
120-3s	[mm]	120	40	40	40				
	[in]	4.72	1.57	1.57	1.57				
120-3s-2	[mm]	120	20+20	40	40				
	[in]	4.72	0.79+0.79	1.57	1.57				
120-3s-3	[mm]	120	20+20	40	20+20				
	[in]	4.72	0.79+0.79	1.57	0.79+0.79				
160-3s	[mm]	120	20+40	40	40+20				
	[in]	4.72	0.79+1.57	1.57	1.57+0.79				
100-5s	[mm]	100	20	20	20	20	20		
	[in]	3.94	0.79	0.79	0.79	0.79	0.79		
120-5s	[mm]	120	20	30	20	30	20		
	[in]	4.72	0.79	1.18	0.79	1.18	0.79		
120-5s-2	[mm]	120	30	20	20	20	30		
	[in]	4.72	1.18	0.79	0.79	0.79	1.18		
140-5s	[mm]	140	40	20	20	20	40		
	[in]	5.51	1.57	0.79	0.79	0.79	1.57		
140-5s-2	[mm]	140	20+20	20	20	20	40		
	[in]	5.51	0.79+0.79	0.79	0.79	0.79	1.57		
140-5s-3	[mm]	140	20+20	20	20	20	20+20		
	[in]	5.51	0.79+0.79	0.79	0.79	0.79	0.79+0.79		
150-5s	[mm]	150	40	20	30	20	40		
	[in]	5.91	1.57	0.79	1.18	0.79	1.57		
150-5s-2	[mm]	150	20+20	20	30	20	40		
	[in]	5.91	0.79+0.79	0.79	1.18	0.79	1.57		
150-5s-3	[mm]	150	20+20	20	30	20	20+20		
	[in]	5.91	0.79+0.79	0.79	1.18	0.79	0.79+0.79		
160-5s	[mm]	160	40	20	40	20	40		
	[in]	6.30	1.57	0.79	1.57	0.79	1.57		
160-5s-2	[mm]	160	20+20	20	40	20	40		
	[in]	6.30	0.79+0.79	0.79	1.57	0.79	1.57		
160-5s-3	[mm]	160	20+20	20	40	20	20+20		
	[in]	6.30	0.79+0.79	0.79	1.57	0.79	0.79+0.79		
180-5s	[mm]	180	40	30	40	30	40		
	[in]	7.09	1.57	1.18	1.57	1.18	1.57		
180-5s-2	[mm]	180	20+20	30	40	30	40		
	[in]	7.09	0.79+0.79	1.18	1.57	1.18	1.57		
180-5s-3	[mm]	180	20+20	30	40	30	20+20		
	[in]	7.09	0.79+0.79	1.18	1.57	1.18	0.79+0.79		
180-5s-4	[mm]	180	20+40	20	20	20	40+20		
	[in]	7.09	0.79+1.57	0.79	0.79	0.79	1.57+0.79		

TABLE 3—BINDERHOLZ CLT BBS XL PANEL LAYUPS (cont.)

BBS XL LAYUP <sup>1</sup>	CLT THICKNESS $t_p$ <sup>2</sup>		LAMINATION ACTUAL THICKNESS <sup>3</sup>						
				⊥		⊥		⊥	
200-5s	[mm]	200	40	40	40	40	40		
	[in]	7.87	1.57	1.57	1.57	1.57	1.57		
200-5s-2	[mm]	200	20+20	40	40	40	40		
	[in]	7.87	0.79+0.79	1.57	1.57	1.57	1.57		
200-5s-3	[mm]	200	20+20	40	40	40	20+20		
	[in]	7.87	0.79+0.79	1.57	1.57	1.57	0.79+0.79		
200-5s-4	[mm]	200	20+40	20	40	20	40+20		
	[in]	7.87	0.79+1.57	0.79	1.57	0.79	1.57+0.79		
220-5s	[mm]	220	20+40	30	40	30	40+20		
	[in]	8.66	0.79+1.57	1.18	1.57	1.18	1.57+0.79		
240-5s	[mm]	240	20+40	40	40	40	40+20		
	[in]	9.45	0.79+1.57	1.57	1.57	1.57	1.57+0.79		
240-5s-2	[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		
240-5s-3	[mm]	240	20+20+40	20	40	20	40+40		
	[in]	9.45	0.79+0.79+1.57	0.79	1.57	0.79	1.57+1.57		
240-5s-4	[mm]	240	20+20+40	20	40	20	40+20+20		
	[in]	9.45	0.79+0.79+1.57	0.79	1.57	0.79	1.57+0.79+0.79		
260-5s	[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		
260-5s-2	[mm]	260	20+20+40	30	40	30	40+40		
	[in]	10.24	0.79+0.79+1.57	1.18	1.57	1.18	1.57+1.57		
260-5s-3	[mm]	260	20+20+40	30	40	30	40+20+20		
	[in]	10.24	0.79+0.79+1.57	1.18	1.57	1.18	1.57+0.79+0.79		
280-7s	[mm]	280	40	40	40	40	40	40	40
	[in]	11.02	1.57	1.57	1.57	1.57	1.57	1.57	1.57
280-5s	[mm]	280	40+40	40	40	40	40+40		
	[in]	11.02	1.57+1.57	1.57	1.57	1.57	1.57+1.57		
280-5s-2	[mm]	280	20+20+40	40	40	40	40+40		
	[in]	11.02	0.79+0.79+1.57	1.57	1.57	1.57	1.57+1.57		
280-5s-3	[mm]	280	20+20+40	40	40	40	40+20+20		
	[in]	11.02	0.79+0.79+1.57	1.57	1.57	1.57	1.57+0.79+0.79		

For SI: 1 in. = 25.4 mm

<sup>1</sup>The panel layouts are developed based on the ANSI/APA PRG 320, using visually graded sawn lumber noted in Section 3.2.1 of the evaluation report.<sup>2</sup>Gross thickness of CLT panels.<sup>3</sup>Actual 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 4—REFERENCE DESIGN VALUES FOR BINDERHOLZ CLT BBS SYS PANELS<sup>1,3</sup>

CLT LAYUP <sup>2</sup>	CLT PANEL THICKNESS (in)	MAJOR STRENGTH DIRECTION WITHOUT LARGE FINGER JOINTS				MAJOR STRENGTH DIRECTION WITH LARGE FINGER JOINTS			
		(F <sub>b</sub> S) <sub>eff,f,0</sub> (lb <sub>f</sub> -ft/ft)	(EI) <sub>eff,f,0</sub> (x10 <sup>6</sup> lb <sub>f</sub> - in. <sup>2</sup> /ft)	(GA) <sub>eff,f,0</sub> (x10 <sup>6</sup> lb <sub>f</sub> /ft)	V <sub>s,0</sub> (lb <sub>f</sub> /ft)	(F <sub>b</sub> S) <sub>eff,f,0</sub> (lb <sub>f</sub> -ft/ft)	(EI) <sub>eff,f,0</sub> (x10 <sup>6</sup> lb <sub>f</sub> - in. <sup>2</sup> /ft)	(GA) <sub>eff,f,0</sub> (x10 <sup>6</sup> lb <sub>f</sub> /ft)	V <sub>s,0</sub> (lb <sub>f</sub> /ft)
60-3s	2.36	953	19.1	0.32	850	715	19.1	0.32	850
80-3s	3.15	1,544	41.2	0.38	1,134	1,158	41.2	0.38	1,134
80-3s-2	3.15	1,730	46.2	0.48	1,134	1,298	46.2	0.48	1,134
90-3s	3.54	2,144	64.3	0.48	1,276	1,608	64.3	0.48	1,276
100-3s	3.94	2,673	89.1	0.56	1,417	2,005	89.1	0.56	1,417
100-3s-2	3.94	2,575	85.9	0.50	1,417	1,931	85.9	0.50	1,417
120-3s 120-3s-2 120-3s-3	4.72	3,811	152.5	0.64	1,701	2,858	152.5	0.64	1,701
160-3s	6.30	6,921	369.3	0.96	2,268	5,190	369.3	0.96	2,268
100-5s	3.94	2,193	73.1	0.64	1,417	1,645	73.1	0.64	1,417
120-5s	4.72	2,838	113.6	0.69	1,701	2,129	113.6	0.69	1,701
120-5s-2	4.72	3,493	139.8	0.80	1,701	2,619	139.8	0.80	1,701
140-5s 140-5s-2 140-5s-3	5.51	4,986	232.8	0.96	1,984	3,739	232.8	0.96	1,984
150-5s 150-5s-2 150-5s-3	5.91	5,617	281	1.14	2,126	4,213	281.0	1.14	2,126
160-5s 160-5s-2 160-5s-3	6.30	6,284	335.3	1.33	2,268	4,713	335.3	1.33	2,268
180-5s 180-5s-2 180-5s-3	7.09	7,513	451	1.28	2,551	5,635	451.0	1.28	2,551
180-5s-4	7.09	8,587	515.4	1.33	2,551	6,440	515.4	1.33	2,551
200-5s 200-5s-2 200-5s-3	7.87	8,772	585	1.29	2,835	6,579	585.0	1.29	2,835
200-5s-4	7.87	10,385	692.6	1.74	2,835	7,789	692.6	1.74	2,835
220-5s	8.66	12,156	891.80	1.62	3,118	9,117	891.8	1.62	3,118
240-5s	9.45	13,970	1,118.2	1.59	3,402	10,478	1,118.2	1.59	3,402
240-5s-2 240-5s-3 240-5s-4	9.45	15,315	1,225.7	2.18	3,402	11,486	1,225.7	2.18	3,402
260-7s	10.24	16,767	1,454.0	2.39	3,685	12,575	1,454.0	2.39	3,685
260-5s 260-5s-2 260-5s-3	10.24	17,600	1,526.0	1.99	3,685	13,200	1,526.0	1.99	3,685
280-7s	11.02	18,062	1,687.0	1.65	3,969	13,547	1,687.0	1.65	3,969
280-5s 280-5s-2 280-5s-3	11.02	19,942	1,862.2	1.93	3,969	14,957	1,862.2	1.93	3,969

For SI: 1 in. = 25.4 mm; 1 ft. = 304.8 mm; 1 lb<sub>f</sub> = 4.448 N<sup>1</sup>The tabulated values are reference design values intended for Allowable Stress Design (ASD) and must be adjusted in accordance with Section 4.2.<sup>2</sup>The CLT layups are developed based on the ANSI/APA PRG 320, using visually graded sawn lumber noted in Section 3.2.1 of the evaluation report.<sup>3</sup>Binderholz CLT BBS SYS panels are only used in the major strength direction.



TABLE 5—REFERENCE DESIGN VALUES FOR BINDERHOLZ CLT BBS XL PANELS<sup>1</sup>

CLT LAYUP <sup>2</sup>	CLT PANEL THICKNESS (in)	MAJOR STRENGTH DIRECTION				MINOR STRENGTH DIRECTION			
		$(F_b S)_{eff,f,0}$ (lb <sub>f</sub> -ft/ft)	$(EI)_{eff,f,0}$ (x10 <sup>6</sup> lb <sub>f</sub> - in. <sup>2</sup> /ft)	$(GA)_{eff,f,0}$ (x10 <sup>6</sup> lb <sub>f</sub> /ft)	$V_{s,0}$ (lb <sub>f</sub> /ft)	$(F_b S)_{eff,f,90}$ (lb <sub>f</sub> -ft/ft)	$(EI)_{eff,f,90}$ (x10 <sup>6</sup> lb <sub>f</sub> - in. <sup>2</sup> /ft)	$(GA)_{eff,f,90}$ (x10 <sup>6</sup> lb <sub>f</sub> /ft)	$V_{s,90}$ (lb <sub>f</sub> /ft)
60-3s	2.36	953	19.1	0.32	850	129	0.7	0.32	283
80-3s	3.15	1,544	41.2	0.38	1,134	517	5.9	0.66	567
80-3s-2	3.15	1,730	46.2	0.48	1,134	129	0.7	0.35	283
90-3s	3.54	2,144	64.3	0.48	1,276	291	2.5	0.48	425
100-3s	3.94	2,673	89.1	0.56	1,417	291	2.5	0.49	425
100-3s-2	3.94	2,575	85.9	0.50	1,417	517	5.9	0.64	567
120-3s 120-3s-2 120-3s-3	4.72	3,811	152.5	0.64	1,701	517	5.9	0.64	567
160-3s	6.30	6,921	369.3	0.96	2,268	517	5.9	0.69	567
100-5s	3.94	2,193	73.1	0.64	1,417	1,121	19.1	0.64	850
120-5s	4.72	2,838	113.6	0.69	1,701	2,035	46.2	0.96	1,134
120-5s-2	4.72	3,493	139.8	0.80	1,701	1,121	19.1	0.66	850
140-5s 140-5s-2 140-5s-3	5.51	4,986	232.8	0.96	1,984	1,121	19.1	0.69	850
150-5s 150-5s-2 150-5s-3	5.91	5,617	281.0	1.14	2,126	1,462	29.0	0.72	992
160-5s 160-5s-2 160-5s-3	6.30	6,284	335.3	1.33	2,268	1,817	41.2	0.76	1,134
180-5s 180-5s-2 180-5s-3	7.09	7,513	451	1.28	2,551	3,029	85.9	1.01	1,417
180-5s-4	7.09	8,587	515.4	1.33	2,551	1,121	19.1	0.76	850
200-5s 200-5s-2 200-5s-3	7.87	8,772	585	1.29	2,835	4,484	152.5	1.29	1,701
200-5s-4	7.87	10,385	692.6	1.74	2,835	1,817	41.2	0.83	1,134
220-5s	8.66	12,156	891.8	1.62	3,118	3,029	85.9	1.07	1,417
240-5s	9.45	13,970	1,118.2	1.59	3,402	4,484	152.5	1.33	1,701
240-5s-2 240-5s-3 240-5s-4	9.45	15,315	1225.7	2.18	3,402	1,817	41.2	0.91	1,134
260-5s 260-5s-2 260-5s-3	10.24	17,600	1,526.0	1.99	3,685	3,029	85.9	1.14	1,417
280-7s	11.02	15,515	1,448.8	1.93	3,969	10,320	585.0	1.93	2,835
280-5s 280-5s-2 280-5s-3	11.02	19,942	1,862.2	1.93	3,969	4,484	152.5	1.38	1,701

For **SI**: 1 in. = 25.4 mm; 1 ft. = 304.8 mm; 1 lb<sub>f</sub> = 4.448 N

<sup>1</sup>The tabulated values are reference design values intended for Allowable Stress Design (ASD) and must be adjusted in accordance with Section 4.2.

<sup>2</sup>The CLT layups are developed based on the ANSI/APA PRG 320, using visually graded sawn lumber noted in Section 3.2.1 of the evaluation report.



TABLE 6—REFERENCE DESIGN VALUES FOR IN-PLANE SHEAR OF THE BINDERHOLZ CLT BBS SYS PANELS<sup>1</sup>

CLT LAYOUT <sup>5</sup>	CLT PANEL THICKNESS $t_p$ (in)	FACE LAMINATION ORIENTATION <sup>2</sup> (psi)		FACE LAMINATION ORIENTATION <sup>3</sup> (lb/ft of width)	
		<sup>4</sup>	⊥ <sup>4</sup>	<sup>4</sup>	⊥ <sup>4</sup>
60-3s	2.36	-	235	-	6,700
80-3s	3.15	-	235	-	8,900
80-3s-2	3.15	-	235	-	8,900
90-3s	3.54	-	235	-	10,000
100-3s	3.94	-	235	-	11,100
100-3s-2	3.94	-	235	-	11,100
120-3s 120-3s-2 120-3s-3	4.72	-	235	-	13,300
160-3s	6.30	-	235	-	17,800
100-5s	3.94	-	235	-	11,100
120-5s	4.72	-	235	-	13,300
120-5s-2	4.72	-	235	-	13,300
140-5s 140-5s-2 140-5s-3	5.51	-	235	-	15,500
150-5s 150-5s-2 150-5s-3	5.91	-	235	-	16,700
160-5s 160-5s-2 160-5s-3	6.30	-	235	-	17,800
180-5s 180-5s-2 180-5s-3	7.09	-	235	-	20,000
180-5s-4	7.09	-	235	-	20,000
200-5s 200-5s-2 200-5s-3	7.87	-	235	-	22,200
200-5s-4	7.87	-	235	-	22,200
220-5s	8.66	-	235	-	24,400
240-5s	9.45	-	235	-	26,600
240-5s-2 240-5s-3 240-5s-4	9.45	-	235	-	26,600
260-7s	10.24	-	235	-	28,900
260-5s 260-5s-2 260-5s-3	10.24	-	235	-	28,900
280-7s	11.02	-	235	-	31,100
280-5s 280-5s-2 280-5s-3	11.02	-	235	-	31,100

For SI: 1 psi = 6,895 Pa

<sup>1</sup>The tabulated values are reference design values intended for Allowable Stress Design (ASD).

<sup>2</sup>The tabulated values are ASD reference edgewise shear stress of CLT in the major strength direction ( $F_{v,e,0}$ ) and minor strength direction ( $F_{v,e,90}$ ).

<sup>3</sup>The tabulated values are ASD reference edgewise shear capacity of the full thickness of the CLT in the major strength direction ( $F_{v,e,0} t_p$ ) and minor strength direction ( $F_{v,e,90} t_p$ ). The values shall be reduced when the CLT panel thickness is less than the full thickness of the CLT panels ( $t_p$ ) specified in Table 2.

<sup>4</sup>"||" indicates the loads applied parallel to the major strength direction of the CLT. "⊥" indicates the loads applied perpendicular to the major strength direction of the CLT.

<sup>5</sup>The CLT layouts are developed based on the ANSI/APA PRG 320, using visually graded sawn lumber noted in Section 3.2.1 of the evaluation report.

TABLE 7—REFERENCE DESIGN VALUES FOR IN-PLANE SHEAR OF THE BINDERHOLZ CLT BBS XL PANELS<sup>1</sup>

CLT LAYOUT <sup>5</sup>	CLT PANEL THICKNESS $t_p$ (in)	FACE LAMINATION ORIENTATION <sup>2</sup> (psi)		FACE LAMINATION ORIENTATION <sup>3</sup> (lb/ft of width)	
		<sup>4</sup>	⊥ <sup>4</sup>	<sup>4</sup>	⊥ <sup>4</sup>
60-3s	2.36	155	240	4,400	6,800
80-3s	3.15	155	240	5,900	9,100
80-3s-2	3.15	155	240	5,900	9,100
90-3s	3.54	155	240	6,600	10,200
100-3s	3.94	155	240	7,300	11,300
100-3s-2	3.94	155	240	7,300	11,300
120-3s 120-3s-2 120-3s-3	4.72	155	240	8,800	13,600
160-3s	6.30	155	240	11,700	18,100
100-5s	3.94	155	240	7,300	11,300
120-5s	4.72	155	240	8,800	13,600
120-5s-2	4.72	155	240	8,800	13,600
140-5s 140-5s-2 140-5s-3	5.51	155	240	10,300	15,900
150-5s 150-5s-2 150-5s-3	5.91	155	240	11,000	17,000
160-5s 160-5s-2 160-5s-3	6.30	155	240	11,700	18,100
180-5s 180-5s-2 180-5s-3	7.09	155	240	13,200	20,400
180-5s-4	7.09	155	240	13,200	20,400
200-5s 200-5s-2 200-5s-3	7.87	155	240	14,600	22,700
200-5s-4	7.87	155	240	14,600	22,700
220-5s	8.66	155	240	16,100	24,900
240-5s	9.45	155	240	17,600	27,200
240-5s-2 240-5s-3 240-5s-4	9.45	155	240	17,600	27,200
260-5s 260-5s-2 260-5s-3	10.24	155	240	19,000	29,500
280-7s	11.02	155	240	20,500	31,700
280-5s 280-5s-2 280-5s-3	11.02	155	240	20,500	31,700

For SI: 1 psi = 6,895 Pa

<sup>1</sup>The tabulated values are reference design values intended for Allowable Stress Design (ASD).

<sup>2</sup>The tabulated values are ASD reference edgewise shear stress of CLT in the major strength direction ( $F_{v,e,0}$ ) and minor strength direction ( $F_{v,e,90}$ ).

<sup>3</sup>The tabulated values are ASD reference edgewise shear capacity of the full thickness of the CLT in the major strength direction ( $F_{v,e,0} t_p$ ) and minor strength direction ( $F_{v,e,90} t_p$ ). The values shall be reduced when the CLT panel thickness is less than the full thickness of the CLT panels ( $t_p$ ) specified in Table 3.

<sup>4</sup>"||" indicates the loads applied parallel to the major strength direction of the CLT. "⊥" indicates the loads applied perpendicular to the major strength direction of the CLT.

<sup>5</sup>The CLT layouts are developed based on the ANSI/APA PRG 320, using visually graded sawn lumber noted in Section 3.2.1 of the evaluation report.

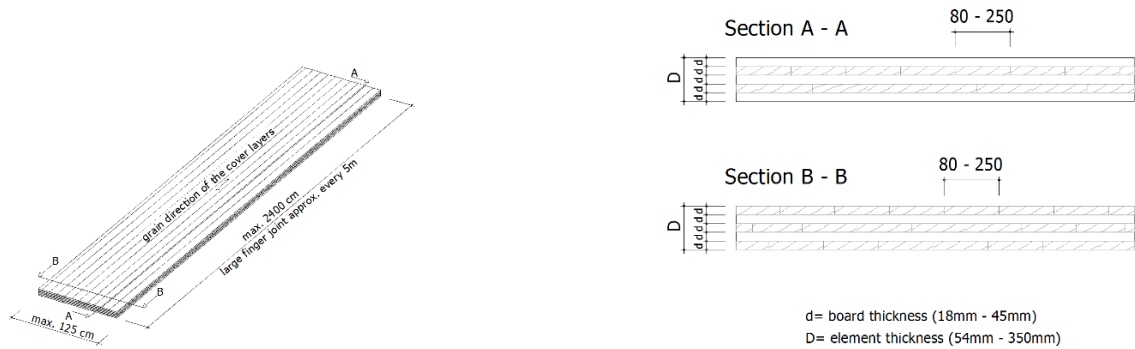


FIGURE 1—BINDERHOLZ CLT BBS System Format PANEL AND SECTION STRUCTURE

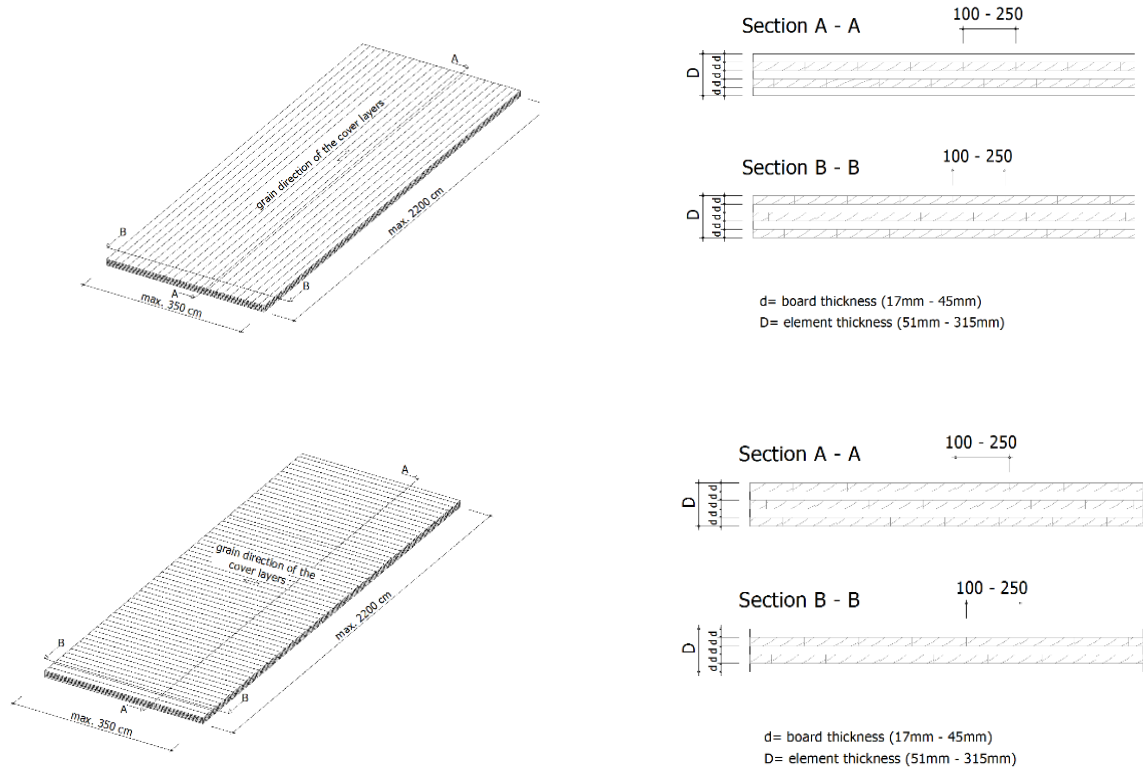


FIGURE 2—BINDERHOLZ CLT BBS XL PANEL AND SECTION STRUCTURE



FIGURE 3—COMPANY LOGO FOR BINDERHOLZ BAUSYSTEME GMBH



FIGURE 4—EXAMPLE OF BINDERHOLZ CLT BBS System Format STANDARD FORMAT



FIGURE 5—EXAMPLE OF BINDERHOLZ CLT BBS XL STANDARD FORMAT

DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES

Section: 06 17 19—Cross-laminated Timber

## REPORT HOLDER:

BINDERHOLZ BAUSYSTEME GMBH

## EVALUATION SUBJECT:

BINDERHOLZ CLT BBS

## 1.0 REPORT PURPOSE AND SCOPE

## Purpose:

The purpose of this evaluation report supplement is to indicate that the Binderholz CLT BBS, described in ICC-ES evaluation report [ESR-4081](#), has also been evaluated for compliance with the codes noted below as adopted by the Los Angeles Department of Building and Safety (LADBS).

## Applicable code editions:

- 2020 City of Los Angeles Building Code (LABC)
- 2020 City of Los Angeles Residential Code (LARC)

## 2.0 CONCLUSIONS

The Binderholz CLT BBS, described in Sections 2.0 through 7.0 of the evaluation report [ESR-4081](#), complies with the LABC Chapters 6 and 23, and the LARC, and is subject to the conditions of use described in this supplement.

## 3.0 CONDITIONS OF USE

The Binderholz CLT BBS described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report [ESR-4081](#).
- The design, installation, conditions of use and identification of the Binderholz CLT BBS is in accordance with the 2018 *International Building Code*® (IBC) provisions noted in the evaluation report [ESR-4081](#).
- The design, installation and inspection are in accordance with additional requirements of LABC Chapters 16 and 17, as applicable.
- Under the LARC, an engineered design in accordance with LARC Section R301.1.3 must be submitted.

This supplement expires concurrently with the evaluation report ESR-4081, reissued June 2022 and revised December 2022.

# ICC-ES Evaluation Report

# ESR-4081 CBC and CRC Supplement

Reissued June 2022

Revised December 2022

This report is subject to renewal June 2024.

[www.icc-es.org](http://www.icc-es.org) | (800) 423-6587 | (562) 699-0543

A Subsidiary of the International Code Council®

**DIVISION: 06 00 00—WOOD, PLASTIC AND COMPOSITES**

**Section: 06 17 19—Cross-laminated Timber**

## REPORT HOLDER:

**BINDERHOLZ BAUSYSTEME GMBH**

## EVALUATION SUBJECT:

**BINDERHOLZ CLT BBS**

## 1.0 REPORT PURPOSE AND SCOPE

### Purpose:

The purpose of this evaluation report supplement is to indicate that the Binderholz CLT BBS, described in ICC-ES evaluation report ESR-4081, has also been evaluated for compliance with the codes noted below.

### Applicable code editions:

- 2019 *California Building Code* (CBC)

For evaluation of applicable chapters adopted by the California Office of Statewide Health Planning and Development (OSHPD) AKA: California Department of Health Care Access and Information (HCAI) and the Division of State Architect (DSA), see Sections 2.1.1 and 2.1.2 below.

- 2019 *California Residential Code* (CRC)

## 2.0 CONCLUSIONS

### 2.1 CBC:

The Binderholz CLT BBS, described in Sections 2.0 through 7.0 of the evaluation report ESR-4081, complies with CBC Chapters 6 and 23, provided the design and installation are in accordance with the 2018 *International Building Code*® (IBC) provisions noted in the evaluation report and the additional requirements of the CBC Chapters 6, 16, 17 and 23, as applicable.

#### 2.1.1 OSHPD:

The applicable OSHPD Sections of the CBC are beyond the scope of this supplement.

#### 2.1.2 DSA:

The applicable DSA Sections of the CBC are beyond the scope of this supplement.

### 2.2 CRC:

The Binderholz CLT BBS, described in Sections 2.0 through 7.0 of the evaluation report ESR-4081, complies with CRC Chapters 5, 6 and 8, provided the design and installation are in accordance with the 2018 *International Residential Code*® (IRC) provisions noted in the evaluation report.

This supplement expires concurrently with the evaluation report ESR-4081, reissued June 2022 and revised December 2022.

DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES  
Section: 06 17 19—Cross-laminated Timber

## REPORT HOLDER:

BINDERHOLZ BAUSYSTEME GmbH

## EVALUATION SUBJECT:

BINDERHOLZ CLT BBS

## 1.0 REPORT PURPOSE AND SCOPE

## Purpose:

The purpose of this evaluation report supplement is to indicate that the **Binderholz CLT BBS** panels, described in ICC-ES evaluation report **ESR-4081**, have also been evaluated for compliance with the Chicago Construction Codes (Title 14 of the Chicago Municipal Code) as noted below.

## Applicable code edition:

- 2019 *Chicago Building Code* (Title 14B)

## 2.0 CONCLUSIONS

The Binderholz CLT BBS panels, described in Sections 2.0 through 7.0 of the evaluation report ESR-4081, comply with Chapters 6 and 23 of Title 14B, and are subject to the conditions of use described in this supplement.

## 3.0 CONDITIONS OF USE

The Binderholz CLT BBS panels, described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report ESR-4081.
- The design, installation, conditions of use and identification of the Binderholz CLT BBS panels are in accordance with the 2018 *International Building Code*® (IBC) provisions noted in the evaluation report ESR-4081, except that the use of Binderholz CLT BBS panels in roof and floor decks in Type III (interior floor decks only), IV and V construction in accordance with Chapter 6 of Title 14B.
- The design, installation and inspection are in accordance with additional requirements of Chapters 16 and 17 of Title 14B, as applicable.

This supplement expires concurrently with the evaluation report ESR-4081, reissued June 2022 and revised December 2022.



# ICC-ES Evaluation Report

# ESR-4081 FBC Supplement

Reissued June 2022

Revised December 2022

This report is subject to renewal June 2024.

[www.icc-es.org](http://www.icc-es.org) | (800) 423-6587 | (562) 699-0543

A Subsidiary of the International Code Council®

**DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES**

**Section: 06 17 19—Cross-laminated Timber**

## REPORT HOLDER:

**BINDERHOLZ BAUSYSTEME GMBH**

## EVALUATION SUBJECT:

**BINDERHOLZ CLT BBS**

## 1.0 REPORT PURPOSE AND SCOPE

### Purpose:

The purpose of this evaluation report supplement is to indicate that the Binderholz CLT BBS, described in ICC-ES evaluation report ESR-4081, has also been evaluated for compliance with the codes noted below.

### Applicable code editions:

- 2017 *Florida Building Code—Building*
- 2017 *Florida Building Code—Residential*

## 2.0 CONCLUSIONS

The Binderholz CLT BBS, described in Sections 2.0 through 7.0 of ICC-ES evaluation report ESR-4081, complies with the 2017 *Florida Building Code—Building* Chapters 6 and 23, and the 2017 *Florida Building Code—Residential* Chapters 5, 6 and 8, provided the design requirements are determined in accordance with the 2017 *Florida Building Code—Building* and the 2017 *Florida Building Code—Residential*, as applicable. The installation requirements noted in ICC-ES evaluation report ESR-4081 for the 201 *International Building Code*® meet the requirements of the 2017 *Florida Building Code—Building* and the 2017 *Florida Building Code—Residential*, as applicable, with the following conditions:

Use of the Binderholz CLT BBS has also been found to be in compliance with the High-Velocity Hurricane Zone provisions of the 2017 *Florida Building Code—Building* and the 2017 *Florida Building Code—Residential*.

For products falling under Florida Rule 61G20-3, verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission for the type of inspections being conducted is the responsibility of an approved validation entity (or the code official when the report holder does not possess an approval by the Commission).

This supplement expires concurrently with the evaluation report ESR-4081, reissued June 2022 and revised December 2022.