

May 26, 2022

Re: Simpson Strong-Tie Connectors for Cross-Laminated Timber Construction

To Whom It May Concern:

Simpson Strong-Tie has tested and created design values for the ABR105, ABR9020, AE116, E20/3 and ABR255. See Figures for a depiction of these connectors and fasteners. Tables 1 and 2 provide connector information, fastener schedules, and allowable loads based on Allowable Stress Design (ASD) in accordance with ICC-ES AC13 when used with CLT panels. Table 3 provides post-installed anchorage solutions. Multiple fastener types may be used with these connectors.

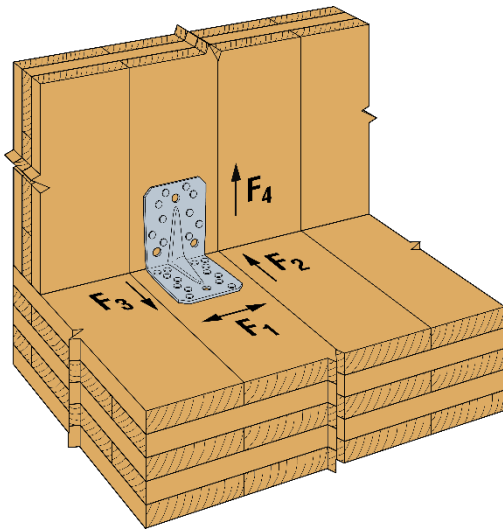


Figure 1: ABR105 – CLT Panel Connection

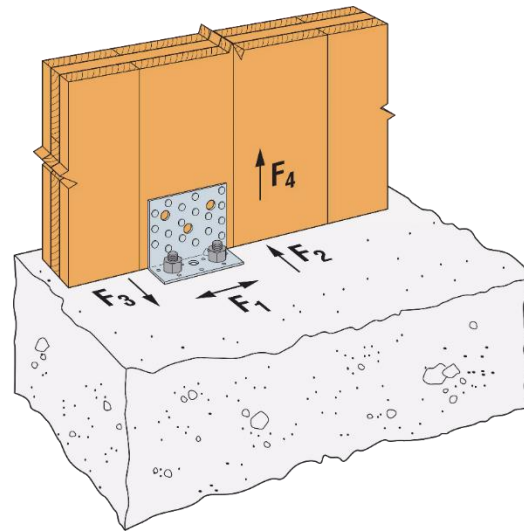


Figure 2: AE116 – CLT to Concrete

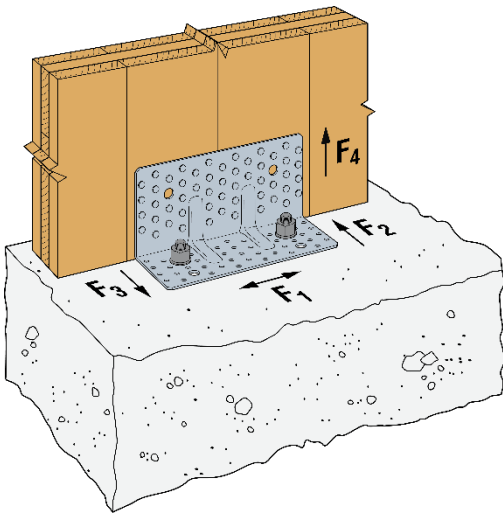


Figure 3: ABR255 – CLT to Concrete (Anchor Option 1)

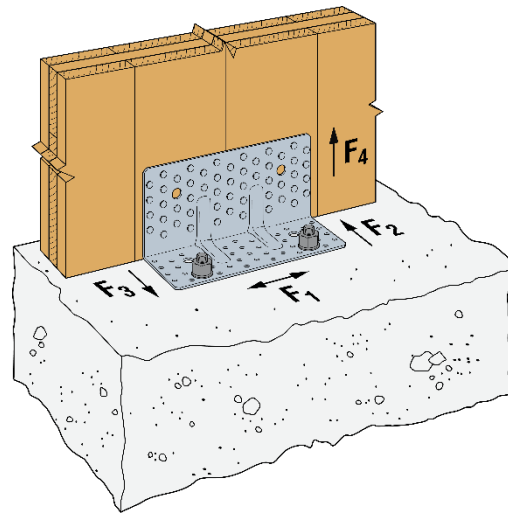


Figure 4: ABR255 – CLT to Concrete (Anchor Option 2)

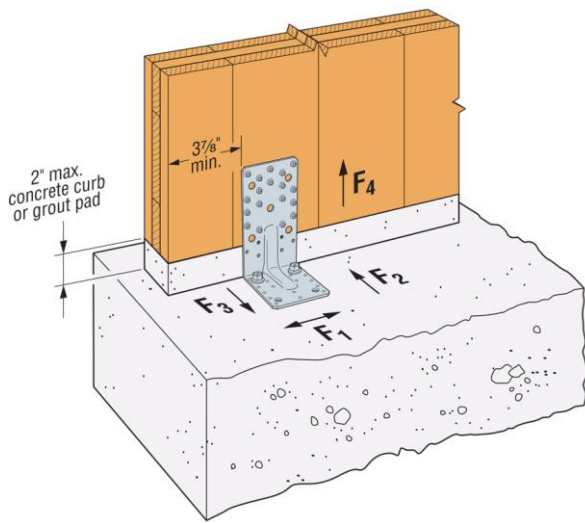


Figure 5: E20/3 – CLT to Concrete on Curb or Grout Pad

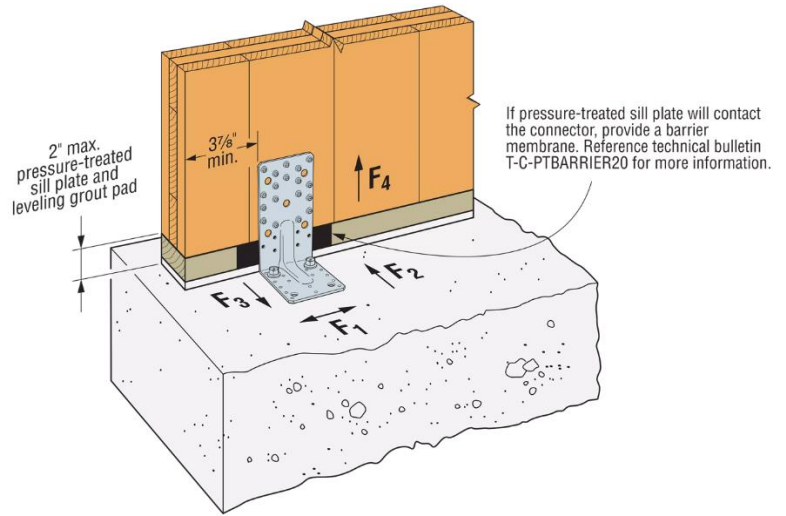
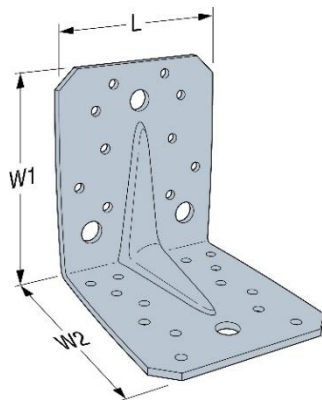
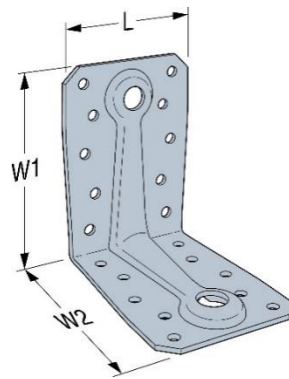


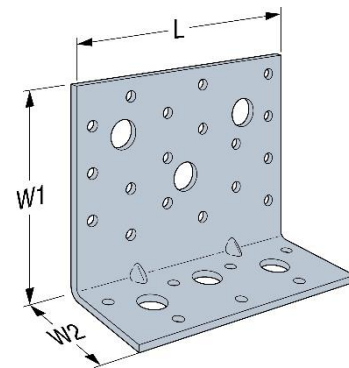
Figure 6: E20/3 – CLT to Concrete on Pressure-Treated Sill



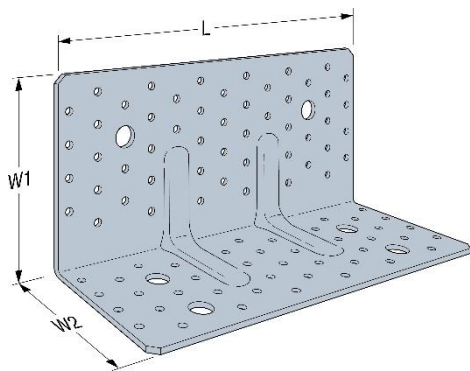
ABR105



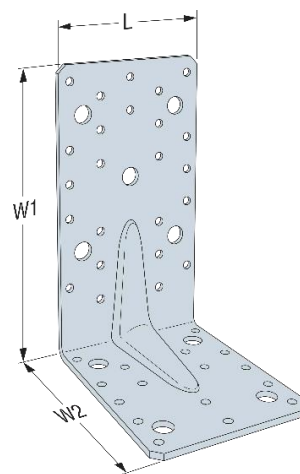
ABR9020



AE116



ABR255



E20/3

Figure 7: Simpson Strong-Tie Connectors

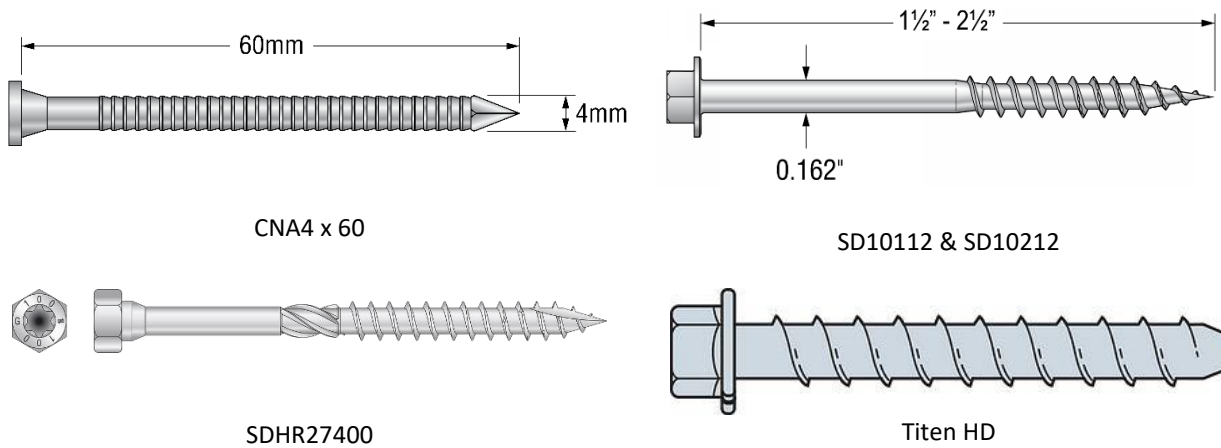


Figure 8: Simpson Strong-Tie Fasteners & Anchors

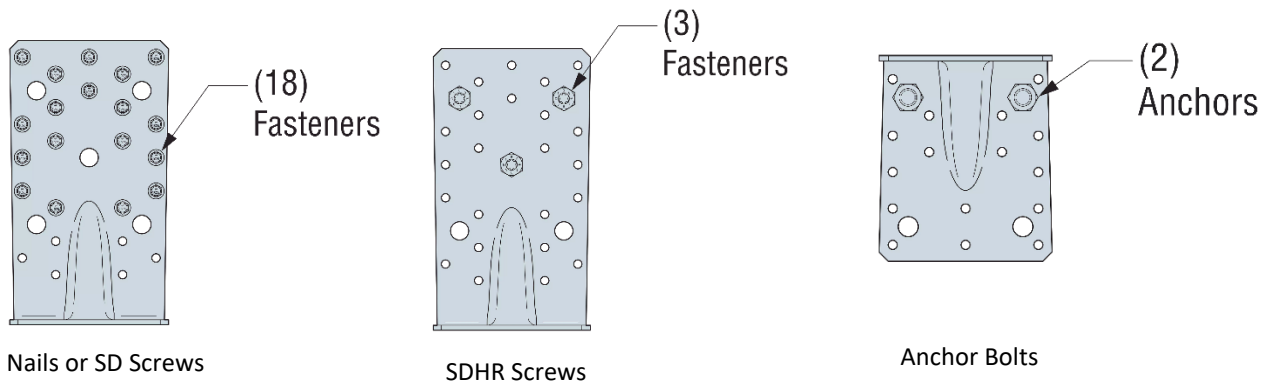


Figure 9: E20/3 Fastener Patterns

The information in this letter is valid until **12/31/23** when it will be re-evaluated by Simpson Strong-Tie. Please visit strongtie.com for additional pertinent information. If you have questions or need further assistance regarding this matter, please contact the Simpson Strong-Tie engineering department at 800.999.5099.

Sincerely,
SIMPSON STRONG-TIE COMPANY INC.

Table 1: Allowable Loads – CLT Panel to Panel Connection

Model No.	Gauge	Dimensions (in.)			Fastener Schedule		Allowable Load (lbs.), $C_D = 1.60$			
		W_1	W_2	L	Horizontal Leg	Vertical Leg	F_1	F_2	F_3	F_4
ABR9020	14	$3\frac{7}{16}$	$3\frac{7}{16}$	$2\frac{9}{16}$	(10) CNA4x60	(10) CNA4x60	1085	780	1330	590
					(10) SD#10x2½"	(10) SD#10x2½"	1480	1200	1330	1010
					(10) 0.162"x2½"	(10) 0.162"x2½"	980	425	1330	510
ABR105	11	$4\frac{1}{8}$	$4\frac{1}{8}$	$3\frac{9}{16}$	(14) CNA4x60	(10) CNA4x60	1350	835	2300	1020
					(14) SD#10x2½"	(10) SD#10x2½"	1880	1235	2300	1475
					(14) 0.162"x2½"	(10) 0.162"x2½"	1220	580	2020	415
AE116	11	$3\frac{9}{16}$	$1\frac{7}{8}$	$4\frac{9}{16}$	(7) CNA4x60	(18) CNA4x60	1720	1225	1550	650
					(7) SD#10x1½"	(18) SD#10x1½"	1545	805	1545	775
					(7) SD#10x2½"	(18) SD#10x2½"	1850	1445	1850	1035
					(7) 0.162"x2½"	(18) 0.162"x2½"	1440	840	1440	395
ABR255	11	$4\frac{3}{4}$	$3\frac{15}{16}$	10	(41) CNA4x60	(52) CNA4x60	3530	2370	4080	2385
					(41) SD#10x2½"	(52) SD#10x2½"	3805	4430	3165	3970
					(41) 0.162"x2½"	(52) 0.162"x2½"	3800	2715	4315	2080

1. See table notes below.

Table 2: Allowable Loads – CLT Panel to Concrete Connection

Model No.	Gauge	Dimensions (in.)			Fastener Schedule		Allowable Load (lbs.), $C_D = 1.60$			
		W_1	W_2	L	Horizontal Leg	Vertical Leg	F_1	F_2	F_3	F_4
AE116	11	$3\frac{9}{16}$	$1\frac{7}{8}$	$4\frac{9}{16}$	(2) ½" Bolt	(18) SD#10x1½"	1845	1080	2730	1905
					(2) ½" Bolt	(18) SD#10x2½"	3765	1445	3175	1905
					(2) ½" Bolt	(18) 0.162"x2½"	2565	1030	3085	2310
ABR255	11	$4\frac{3}{4}$	$3\frac{15}{16}$	10	Anchor Option 1 - (2) ½" Bolt	(52) 0.162"x2½"	3910	2505	3605	2475
					Anchor Option 2 - (2) ½" Bolt	(52) 0.162"x2½"	3805	2505	3885	1080
E20/3	11	$6\frac{3}{4}$	$4\frac{1}{2}$	$3\frac{3}{4}$	(2) ¾" Bolt	(18) SD#10x2½"	1565	790	700	1885
					(2) ¾" Bolt	(18) 0.162"x2½"	1625	610	725	1835
					(2) ¾" Bolt	(3) SDHR27400	705	360	860	1865

- The allowable loads are based on the use of SPF Grade 2 cross-laminated timber (CLT) material conforming to APA PRG-320.
- Installation and fastener schedule in Table 1 assumes platform framing, i.e., install vertical leg at bottom edge of CLT wall panel, and horizontal leg on CLT floor panel with 3½ in. min. edge distance.
- Allowable loads have been increased for wind or earthquake loading with no further increase allowed. Reduce for other load durations as required by code.
- The designer must specify the anchor bolt type, length, and embedment. Allowable load shall be taken as lower of anchorage capacity per designer and table load. See Table 3 for Titen HD Anchorage Loads.
- For ABR255 anchor installation options, see Figure 3 and 4.
- Nails: CNA4x60 = 4 mm diameter x 60 mm long proprietary ring-shank nail. 0.162"x2½" = 0.162 in. diameter x 2.5 in. long.
- Screws: SD10x1½" and SD#10x2½" = 0.162 in. shank diameter x 1.5 in. long and 2.5 in. long Simpson Strong-Drive® SD CONNECTOR screw respectively. SDHR27400 = 0.275 in. shank diameter x 4 in. long Simpson Strong-Drive® SDHR COMBO-HEAD screw.

Table 3: Allowable Loads – Titen HD Anchorage

Model No.	Anchor	Min. Concrete Thickness (in.)	Min. Edge Distance (in.)	Min. End Distance (in.)	Allowable Load (lbs.)			
					F ₁	F ₂	F ₃	F ₄
Uncracked Concrete, Wind & Seismic in SDC A&B								
AE116	THD50400H	6	5	10	2765	3025	5370	1685
			5	24	5260	3025	5370	1685
E20/3	THD37300H	4½	5	10	2055	2240	2505	1820
			5	24	2505	2240	2505	1820
	THD37400H	5½	5	10	2360	2570	3175	2300
			5	24	3175	2570	3175	2300
Cracked Concrete, Wind & Seismic in SDC A&B								
AE116	THD50400H	6	5	10	1975	2160	5370	1350
			5	24	3755	2160	5370	1350
E20/3	THD37300H	4½	5	10	1465	1600	1775	1300
			5	24	1775	1600	1775	1300
	THD37400H	5½	5	10	1685	1835	2250	1640
			5	24	2250	1835	2250	1640
Cracked Concrete, Seismic in SDC C-F								
AE116	THD50400H	6	5	10	2305	2520	4025	1450
			5	24	4025	2520	4025	1450
E20/3	THD37300H	4½	5	10	1710	1865	2070	1140
			5	24	2070	1865	2070	1140
	THD37400H	5½	5	10	1965	2145	2400	1435
			5	24	2400	2145	2400	1435

1. Allowable anchor capacities have been determined using ACI318-14 Chapter 17 calculations with a minimum concrete compressive strength (f'_c) of 4,000 psi in normal weight concrete.
2. Load values are for group anchors based on ACI318, Condition B, no supplemental edge reinforcement, $\Psi_{c,v} = 1.0$ for cracked concrete and periodic inspection.
3. Allowable Stress Design (ASD) values were determined by multiplying the LFRD capacities by a conversion factor, Alpha (a), of 0.7 for seismic and 0.6 of wind loads.
4. Tabulated allowable ASD loads for Wind and Seismic in SDC A&B are based on a wind conversion factor and may be increased by 1.17 for SDC A&B only.
5. Design loads shall include seismic overstrength factor per ASCE7 Section 12.4.3, as required.
6. Allowable load shall be taken as lower of anchorage capacity or the connector capacity. Anchors subjected to both tension and shear loads shall be evaluated per ACI318 Section 17.6.

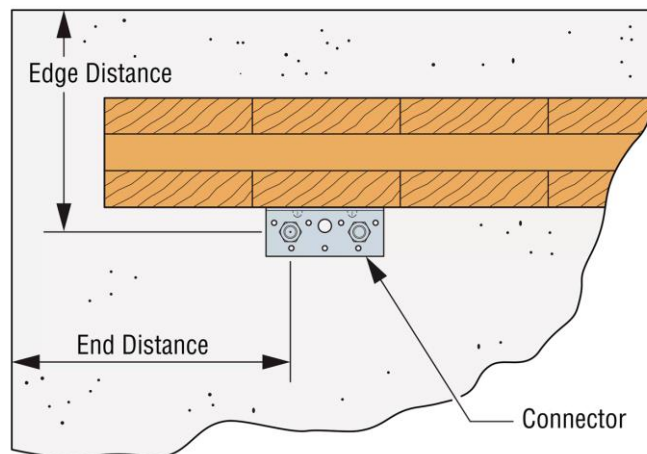


Figure 10: Anchor End and Edge Distance