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Legacy report on the 1997 Uniform Building Code™

DIVISION: 06—WOOD AND PLASTICS
Section: 06090—Wood and Plastic Fastening

SIMPSON STRONG-TIE SSTB ANCHOR BOLTS, MSTC STRAPS AND HCA HINGE CONNECTORS

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1.0 SUBJECT

Simpson Strong-Tie SSTB Anchor Bolts, MSTC Straps and HCA Hinge Connectors.

2.0 DESCRIPTION

2.1 SSTB Anchor Bolts:

The SSTB Anchor Bolts series is designed to resist tension. The SSTB 16, 20, 24, 28, 34 and 36 series anchor bolts have an offset angle of 6 degrees, and a hoop and hook on the unthreaded embedded end as shown in Figure 1. The SSTB Anchor Bolts are either 5/8 inch (15.9 mm) or 7/8 inch (22 mm) in diameter, and have lengths of from 17 inches to 36 inches (432 mm to 914 mm). The L-Bolt series is of an "L" configuration, and has a 1 1/8-inch (28.6 mm) or 1 1/4-inch (31.7 mm) diameter and a 30-inch (762 mm) or 36-inch (914 mm) minimum embedment length, respectively. They are standard A-307 bolts with a 4-d extension. Minimum embedment, minimum end and edge distance, concrete compressive strength, dimensional characteristics and allowable loads are set forth in Table 1.

2.2 MSTC Straps:

The MSTC Straps are designed to resist tension forces. The straps are 3 inches (76 mm) wide and come in various lengths. The straps are prepunched to receive either 16d sinker nails or 10d x 1 1/2 common nails, as shown in Figure 2. The strap allowable tension loads, when using all the prepunched holes, are set forth in Table 2. The strap allowable loads, when used with a floor-to-floor clearance (as shown in Figure 3), are noted in Table 3.

2.3 HCA Hinge Connectors:

The hinge connectors support the end of one glulam timber beam on the end of another collinear glulam timber beam of the same width and top elevation. The connectors consist of a metal plate on each side of the wood beams, extending from the top edge of the supporting beam to the bottom edge of the supported beam. Steel-bearing plates welded [using 3/16-inch (4.8 mm) fillet welds] to the side plates allow bearing

on the top of the supporting beam and the bottom of the supported beam. To provide a flush surface, the top and bottom bearing plates must be dapped into the respective beams. See Figure 4 and Table 4 for descriptive information and allowable loads.

2.4 Materials:

2.4.1 Steel: The MSTC straps 28, 40 and 52 are fabricated from minimum No. 16 gage [0.058-inch (1.5 mm), uncoated base-metal thickness] steel, and the MSTC 66 and 78 are fabricated from minimum No. 14 gage [0.072-inch (1.8 mm), uncoated base-metal thickness] steel, meeting specifications for ASTM A 653 SQ Grade 40 Special steel having a minimum yield strength of 42,000 psi (290 MPa) and a minimum tensile strength of 56,000 psi (386 MPa) with a G60 galvanized coating.

The HCA Hinge Connector side plates are No. 7 gage [0.1793 inch (4.6 mm)] hot-rolled steel meeting ASTM A 570 Grade 33 specifications with a minimum yield strength of 33 ksi (228 MPa) and a minimum tensile strength of 58 ksi (400 MPa). The bearing plates meet ASTM A 36 specifications with a minimum yield strength of 36 ksi (248 MPa) and a minimum tensile strength of 58 ksi (400 MPa). The finish on the product is Simpson gray paint.

2.4.2 Concrete: The minimum compressive strength of the normal-weight concrete is 2,500 psi (17.2 MPa) at 28 days. Cement, aggregates and water used in concrete construction must comply with Section 1903 of the 1997 Uniform Building Code™ (UBC). The concrete foundation must comply with Section 1806 of the UBC. The minimum compressive strength for the concrete block shall be 2,000 psi (13.8 MPa) at 28 days.

2.4.3 Wood: The wood elements must be nominal-dimension lumber having dimensions consistent with the connector dimensions shown in Table 5. The lumber must have a minimum specific gravity of 0.5, such as does Douglas fir-larch or southern pine, and must have a moisture content not exceeding 19 percent.

2.4.4 Fasteners:

2.4.4.1 Bolts: The SSTB Anchor Bolts conform to ASTM A 36 for bolts, having a minimum yield strength of 36 ksi (248 MPa) and a minimum tensile strength of 58 ksi (400 MPa). Machine bolts for hinge connectors must comply with ASTM A 307 with a minimum yield strength of 45 ksi (310 MPa).

2.4.4.2 Nails: Steel nails must conform to nominal sizing specified in ASTM F 1667-95 (Federal Specification FSN-105B). The 16d sinker nail, 10d common nail and 10d x 1 1/2-inch (38 mm) common nail have a length of 3 1/4 inches, 3

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inches, and 1 $\frac{1}{2}$ inches (82 mm, 76 mm, and 38 mm), respectively. Each nail must have a shank diameter of 0.148 inch (3.8 mm) and a minimum bending yield strength, F_{yb} , of 90,000 psi (620.1 MPa).

2.4.4.3 Welding: The HCA Hinge connector, as described in this report, requires structural shop welding and inspection by an inspection agency.

2.5 Installation:

SSTB Bolts are installed prior to the concrete's being poured. Bolts are placed diagonally, at an angle of approximately 45 degrees with respect to the foundation wall and concrete block, in the direction indicated by the arrow stamped on the top of the bolt head. See Figure 1 for installation in concrete and grouted concrete block. Bolts are placed in concrete in compliance with Chapter 19 of the UBC.

2.6 Special Inspection:

The devices embedded in concrete or masonry may require special inspection, depending on which load-factor multiplier in Section 1923.2 of the UBC is stipulated by the design engineer. The inspector is responsible for verifying proper device size and placement with respect to embedment, spacing and edge distance.

2.7 Identification:

2.7.1 SSTB Anchor Bolt: The SSTB anchor bolt is identified with the size and the "not equal" symbol (\neq) stamped on the top of the anchor head. See Figure 1.

2.7.2 MSTC Strap and HCA Connector: Each MSTC strap and HCA connector is labeled with the manufacturer's name (Simpson Strong-Tie Company), the part name, the model number, and the evaluation report number (ER-4935).

3.0 EVIDENCE SUBMITTED

Descriptive data, drawings, load test results and calculations.

4.0 FINDINGS

That the Simpson Strong-Tie SSTB Anchors, MSTC Straps and HCA Hinge Connectors described in this report comply with the 1997 Uniform Building Code™, subject to the following conditions:

- 4.1 The anchors are identified and installed in accordance with this report and the manufacturer's instructions.
- 4.2 Allowable loads are as set forth in Tables 1, 2, 3 and 4.
- 4.3 Allowable loads are not increased for duration of load.
- 4.4 Allowable loads listed in this report are for connectors installed in wood seasoned to a moisture content of 19 percent or less and used under continuously dry conditions.
- 4.5 Allowable loads must be adjusted, in accordance with the code, for wet-service conditions in use, elevated temperatures and pressure-treated wood.
- 4.6 Use of connectors is limited to lumber that has not been treated with fire-retardant chemicals.
- 4.7 Calculations showing compliance with this report shall be submitted to the building official. Calculations shall be signed and sealed by a design professional as required by the local building official.

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

TABLE 1—SSTB ANCHOR BOLTS^{1,2}

MODEL NO.	DIAMETER (inches)	LENGTH L (inches)	MINIMUM EMBEDMENT, le (inches)	MINIMUM END DISTANCE, dc (inches)	MINIMUM EDGE DISTANCE, de (inches)	MINIMUM WALL WIDTH, b (inches)	ALLOWABLE TENSION LOADS (133) (pounds) ¹		
							Concrete $f'_c = 2500$ psi	Concrete Block ³	Concrete Block End ³
SSTB16	$\frac{5}{8}$	17	12	5	$1\frac{3}{4}$	6	4,420	4,780	1,850
SSTB20	$\frac{5}{8}$	21	16	5	$1\frac{3}{4}$	6	4,600	4,780	1,850
SSTB24	$\frac{5}{8}$	25	20	5	$1\frac{3}{4}$	6	5,175	4,780	1,850
SSTB28	$\frac{7}{8}$	29	24	5	$1\frac{3}{4}$	8	10,100	6,385	4,815
SSTB34	$\frac{7}{8}$	34	28	5	$1\frac{3}{4}$	8	10,100	6,385	4,815
SSTB36	$\frac{7}{8}$	36	28	5	$1\frac{3}{4}$	8	10,100	6,385	4,815
L BOLT	$1\frac{1}{8}$	—	30	5	$1\frac{3}{4}$	8	10,250	—	—
L BOLT	$1\frac{1}{4}$	—	36	5	$2\frac{3}{4}$	8	12,255	—	—

For SI: 1 inch = 25.4 mm, 1 psi = 6.89 kPa., 1 lbf = 4.45 N.

¹Allowable loads have been increased 33% for wind or seismic forces with no further increases allowed.

²Bolts are ASTM A 36.

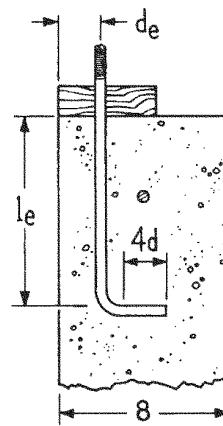
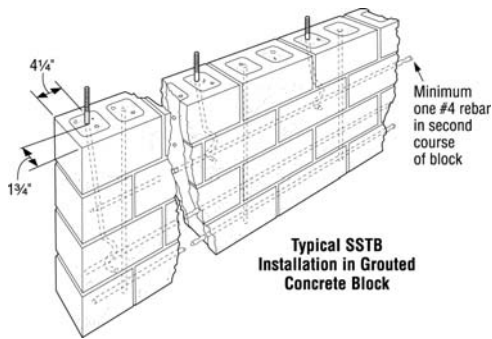
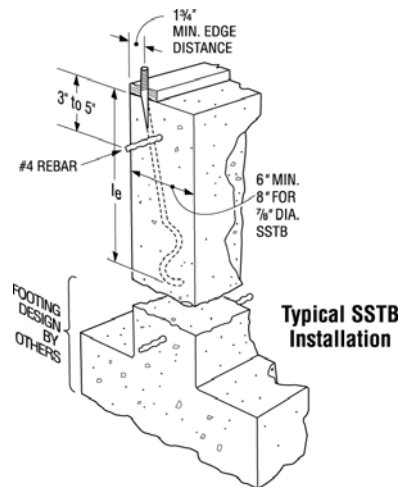
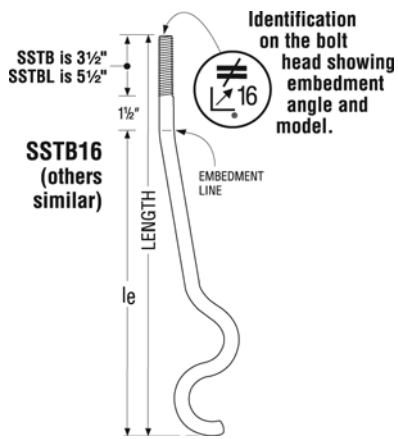
³For the CMU assembly, the minimum grout compressive strength (f'_g) shall be 2,000 psi; and the minimum compressive strength of masonry (f'_m) shall be 1,500 psi.

⁴Minimum spacing of anchors is twice the required embedment depth (le).

⁵For concrete block installation, the minimum edge distance is $1\frac{3}{4}$ inches and the minimum end distance is $4\frac{1}{4}$ inches.

⁶Maximum allowable load is 8,150 pounds for SSTB28, 34 and 36 when used 5 inches from the end of a concrete foundation. Use full table load when installed 24 inches from the end or installed in a corner condition (see Figure 1).

⁷SSTB34 has $4\frac{1}{4}$ inches of thread and SSTB36 has $6\frac{1}{2}$ inches. These two models are not available in SSTBL versions.



L-Bolt

Typical Plan Views

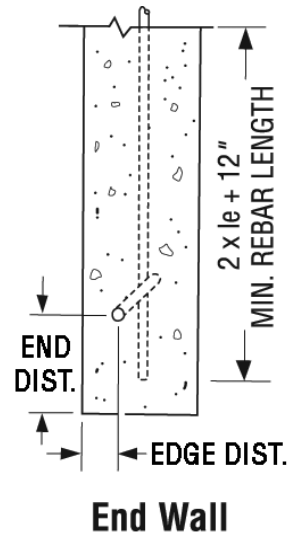
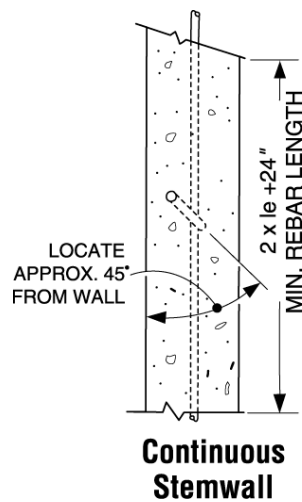
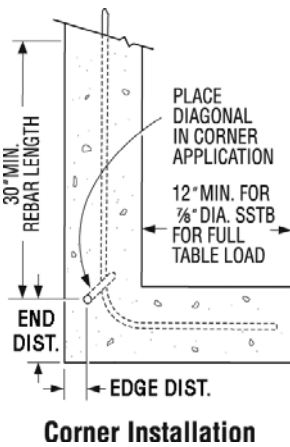


FIGURE 1

TABLE 2 - MSTC STRAPS

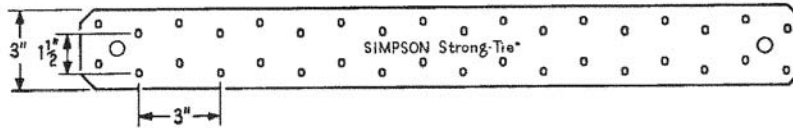
MODEL NO.	MAT'L GA	DIMENSIONS		TOTAL FASTENERS AND TYPE ¹	ALLOWABLE UPLIFT LOADS ²	
		W (in)	L(in)		100 (lb)	133 ³ (lb)
MSTC28	16	3	28¼	36 - 16d Sinkers	2070	2760
MSTC40	16	3	40¼	54 - 16d Sinkers	2990	3985
MSTC52	16	3	52¼	70 - 16d Sinkers	3555	4740
MSTC66	14	3	67¼	90 - 16d Sinkers	4390	5855
MSTC78	14	3	79¼	106 - 16d Sinkers	4390	5855
MSTC28	16	3	28¼	36 - 10d x 1½	1675	2230
MSTC40	16	3	40¼	54 - 10d x 1½	2420	3225
MSTC52	16	3	52¼	70 - 10d x 1½	3160	4215
MSTC66	14	3	67¼	90 - 10d x 1½	4135	5515
MSTC78	14	3	79¼	106 - 10d x 1½	4390	5855

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N.

¹10d commons may be substituted where 16d Sinkers are specified at 100% of the table loads.

²Allowable loads are based on having half of the total fasteners installed on each end of strap.

³Loads have been increased 33% for wind or seismic forces with no further increase allowed.



TYPICAL MSTC STRAP

FIGURE 2

TABLE 3 - MSTC STRAPS, FOR FLOOR TO FLOOR CLEAR SPAN TABLE:

MODEL NO.	CLEAR SPAN (in)	FASTENERS (TOTAL)	ALLOWABLE LOADS ^{1,2}
			133 (lb)
MSTC28	18	12 - 16d Sinkers	920
MSTC28	16	16 - 16d Sinkers	1225
MSTC40	18	28 - 16d Sinkers	2145
MSTC40	16	36 - 16d Sinkers	2455
MSTC52	18	44 - 16d Sinkers	3375
MSTC52	16	48 - 16d Sinkers	3680
MSTC66	18	64 - 16d Sinkers	5035
MSTC66	16	68 - 16d Sinkers	5350
MSTC78	18	80 - 16d Sinkers	5855
MSTC78	16	80 - 16d Sinkers	5855

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N.

¹Loads have been increased 33% for wind or seismic forces with no further increase allowed.

²Allowable loads are based on having half of the total fasteners installed on each end of strap.

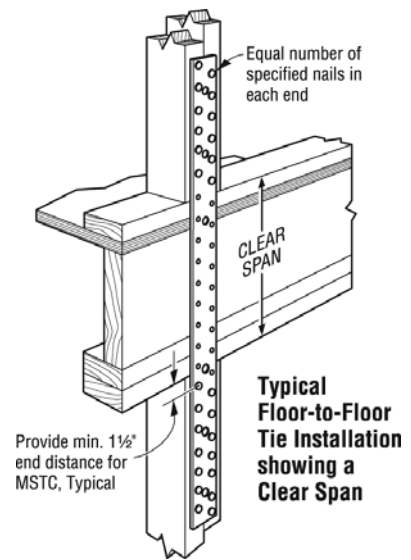


FIGURE 3

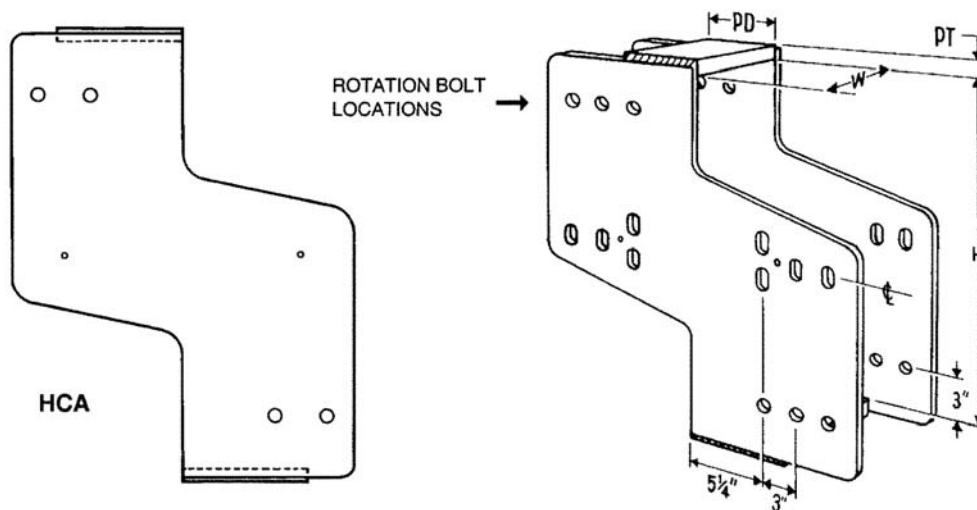


FIGURE 4

TABLE 4—ALLOWABLE LOADS (pounds) AND DESCRIPTIONS FOR HCA SERIES HINGE CONNECTORS^{1,3,7}

MODEL NO.	DIMENSIONS			TWO ROTATIONS BOLTS PER BEAM				THREE ROTATIONS BOLTS PER BEAM			
	W (in.)	PT (in.)	PD (in.)	410 psi		560 psi		410 psi		560 psi	
				Min. H ^{4,5}	Allowable Roof Loads (125) ^{2,6}	Min. H ^{4,5}	Allowable Roof Loads (125) ^{2,6}	Min. H ^{4,5}	Allowable Roof Loads (125) ^{2,6}	Min. H ^{4,5}	Allowable Roof Loads (125) ^{2,6}
HCA5-5	5 1/4	3/4	5	13	10505	16	14350	11	10505	13	14350
HCA5-6	5 1/4	3/4	6	16	12605	20	17220	13	12605	16	17220
HCA5-7	5 1/4	3/4	7	20	14705	25	20090	16	14705	19	20090
HCA5-9	5 1/4	3/4	9	29	18910	37	25830	22	18910	27	25830
HCA7-5	6 7/8	1	5	16	13835	19	18900	13	13835	16	18900
HCA7-6	6 7/8	1	6	20	16605	24	22680	15	16605	19	22680
HCA7-7	6 7/8	1	7	24	19370	31	26460	18	19370	23	16460
HCA7-9	6 7/8	1	9	36	24905	40	28865	26	24905	33	34020
HCA9-5	8 7/8	1 1/4	5	18	17935	23	24500	14	17935	17	24500
HCA9-6	8 7/8	1 1/4	6	24	21525	30	29400	18	21525	22	29400
HCA9-7	8 7/8	1 1/4	7	30	25110	38	34300	22	25110	28	34300
HCA9-9	8 7/8	1 1/4	9	40	28865	40	28865	32	32285	40	42865
HCA11-5	10 7/8	1 1/2	5	21	22035	26	30100	16	22035	20	30100
HCA11-6	10 7/8	1 1/2	6	27	26445	35	36120	21	16445	16	26120
HCA11-7	10 7/8	1 1/2	7	35	30850	40	36970	26	30850	33	42140
HCA11-9	10 7/8	1 1/2	9	40	28865	40	28865	38	39665	40	42865

For SI: 1 inch = 25.4 mm, 1 psi = 6.89 kPa, 1 lbf = 4.45 N.

1. The hinge connectors are designed for use with glued-laminated beams of Douglas fir–larch or southern pine ($G = 0.50$). Special analysis is required for other wood species.
2. The allowable loads are based on (a) seat bearing at 410 and 560 pounds per square inch and (b) connector values are code values for bolts. Allowable loads are increased for seven-day duration roof loads, and no further increase is permitted.
3. No uplift loads are permitted on the connectors. Loads are to be reduced where member shear capacity results in lower values.
4. The depth of the hinge connector varies as the depth of the supported beam.
5. Where minimum depth of glulam being carried exceeds the dimension shown allowable loads are not subject to an increase in value. For minimum depth of glulam small than the tabulated, allowable loads are to be decreased in direct proportion to the two depths.
6. Values apply to connections of seasoned lumber used in dry locations at 68°F. Special analysis considering requirements in Sections 2316 and 2318 is required where other service conditions are encountered.