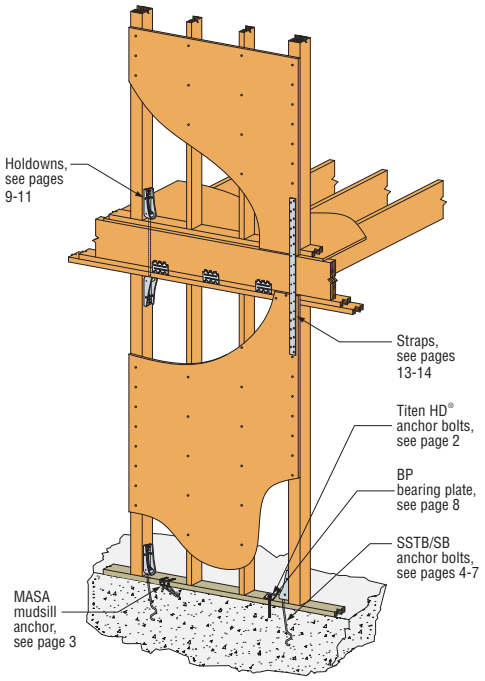
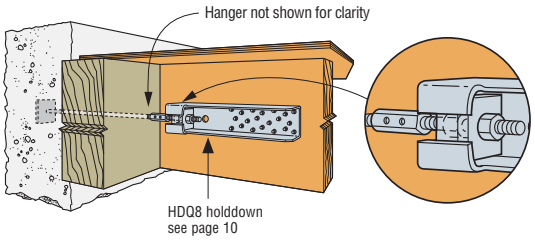
Technical Bulletin

City of Los Angeles RR Values for Connectors in Shear Walls and Wall Anchorage Assemblies

The City of Los Angeles Building Code (LABC) has different requirements for holdowns used in shear wall applications than those used in wall anchorage assemblies to flexible diaphragms. The purpose of this bulletin is to provide Designers the allowable loads of Simpson Strong-Tie® holdowns and other products used in both applications. The allowable loads in this document are based upon City of Los Angeles Research Reports (L.A.R.R.) with the appropriate adjustments in accordance with the provisions set forth in LABC.





Shear Wall Applications

Section 2305.5 of the 2014 LABC requires the allowable loads of holdowns used in shear wall applications be reduced 25% for seismic loading unless approved cyclic load values are used. Industry standards for testing such products are based on static testing. As such, all holdowns must comply with this requirement regardless of manufacturer. The allowable loads shown in this bulletin have already been reduced 25% and include a 1.6 wood load duration increase (C_d) for wind or seismic loads. Holdown deflection is given for the highest allowable load shown for the holdown. To calculate deflections of structural systems (such as shear walls), add the design deflection of the holdown to the cumulative deflection of the other elements of the system according to the code (for shear walls, see Section 2305.3 of the 2014 LABC). Unless otherwise noted, dimensions are in inches; loads are in pounds.

Flexible Diaphragm-to-Wall Assemblies

After the 1994 Northridge Earthquake, the City of Los Angeles Department of Building and Safety (LADBS) adopted criteria for the design of wall anchorage assemblies to flexible diaphragms due to failures observed from the event.These requirements included more restrictive strength and deformation limits than the code for new (Chapter 16) and retrofit (Division 91 or 96) construction. Due to recent changes in approved holdown test standards (ICC-ES AC155) and the building code, LADBS now requires holdown values be published in an L.A.R.R.

For more history on this topic, refer to LADBS P/BC 2002-071, Structural Engineers Association of California (SEAOC) Blue Book Article 9.02.010 (September 2008), or 1999 Recommended Lateral Force Requirements and Commentary (Section C108.2.8.1).

Table of Contents

City of Los Angeles RR Listings for Post-Installed Anchors

Anchor Designer Software® for ACI 318

Anchor Designer Software® is a professional-strength design application that analyzes and offers anchor solutions using the ACI 318, Appendix D strength design methodology. It provides cracked- and uncracked-concrete anchor solutions for many Simpson Strong-Tie® mechanical and adhesive anchors, such as those shown below.

With its easy-to-use graphical interface, *Anchor Designer Software for ACI 318* eliminates the need for tedious calculations by hand that would otherwise be necessary to determine cracked concrete anchor solutions.

To download this free software, go to **www.strongtie.com/software.**

SET-XP® Anchoring Adhesive

SET-XP is a 1:1 two-component, high-solids, epoxy-based anchoring adhesive formulated for optimum performance in both cracked and uncracked concrete. SET-XP has been rigorously tested in accordance with ICC-ES AC308 as well as 2011 LABC requirements and has proven to offer increased reliability in the most adverse conditions, including performance in cracked concrete under static and seismic loading. When properly mixed, SET-XP is teal in color in order to be identified as a high-performance adhesive for adverse conditions. Resin and hardener are dispensed and mixed simultaneously through the mixing nozzle. SET-XP exceeds the ASTM C881 specification for Type I and Type IV, Grade 3, Class C epoxy.

CODE: City of L.A. RR25744 (Concrete) and RR25966 (Masonry)

SET Anchoring Adhesive

SET Epoxy-Tie epoxy is a two-component, 1:1 ratio, high-solids, epoxy-based adhesive for use as a high-strength, non-shrink anchor grouting material. Resin and hardener are dispensed and mixed simultaneously through the mixing nozzle. SET meets or exceeds the ASTM C-881 specification for Type I, II, IV and V, Grade 3, Class B and C.

CODE: City of LA RR25279 (Masonry)

TITEN HD® Heavy-Duty Screw Anchor

U.S. Patent 5,674,035 and 6,623,228

The Titen HD is a patented, high-strength screw anchor for concrete and masonry. It is designed for optimum performance in both cracked and uncracked concrete; a requirement that the 2011 LABC places on post-installed anchors. The high-strength, easy-to-install Titen HD anchor has been tested and shown to provide outstanding performance in cracked and uncracked concrete under both static and seismic-loading conditions. The self-undercutting, non-expansion characteristics of the Titen HD anchor make it ideal for structural applications, even at reduced edge distances and spacings. Recommended for permanent application in dry, interior non-corrosive environments or temporary outdoor applications.

CODE: City of L.A. RR25741 (Concrete) and RR25560 (CMU)

STRONG-BOLT® 2 Wedge Anchor

The Strong-Bolt® 2 wedge anchor is designed for optimal performance in cracked and uncracked concrete. Following rigorous testing according to ICC-ES acceptance criteria, the Strong-Bolt 2 anchor received classification as a Category 1 anchor, the highest attainable anchor category for performance in cracked concrete under static and seismic loading. Also available in stainless steel, it is code-listed by ICC-ES under the 2012 IBC requirements for post-installed anchors in cracked and uncracked concrete.

CODE: City of L.A. RR25891 (Concrete) and RR25936 (Carbon Steel in CMU)

WEDGE-ALL® Wedge Anchor

The Wedge-All anchor is a non-bottom-bearing, wedge-style expansion anchor for use in grout-filled concrete masonry. A one-piece clip ensures uniform holding capacity that increases as tension is applied. The threaded stud version is available in eight diameters and multiple lengths. Threaded studs are set by tightening the nut.

CODE: City of L.A. RR24682 (CMU)

City of Los Angeles RR Values
MASA Mudsill Anchors

This product is preferable to similar connectors because of a) easier installation, b) higher loads, c) lower installed cost, or a combination of these features.

Mudsill anchors have always been a time-saving alternative to anchor bolts, and the MASA anchors provide even greater load-carrying capacity than our original MAS. As a result, the MASA provides an alternative for ⅝" and ½" mudsill anchor bolts on 2x, double-2x and 3x mudsills. It also eliminates the need for 3" square plate washers for seismic design and, in some cases, has load capacities that meet or exceed the parallel and perpendicular to plate shear capacity of other cast-in-place anchors. Two versions of the MASA are available – the standard MASA for installation on standard forms and the MASAP for panelized forms.

The MASA and MASAP have been tested to meet the requirements of ICC-ES acceptance criteria AC398 for cracked and uncracked concrete. New test data is reflected in the table below.

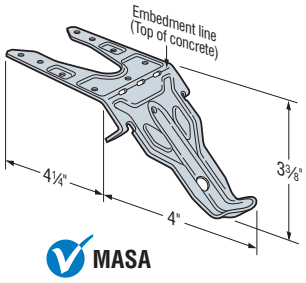
MATERIAL: 16 gauge

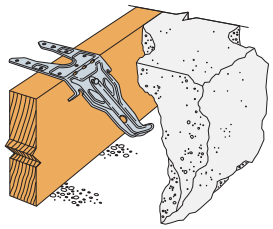
FINISH: Galvanized, all available in ZMAX® coating. See Corrosion Information in the current *Wood Construction Connectors* catalog.

INSTALLATION: • Use all specified fasteners. Refer to the current *Wood Construction Connectors* catalog.

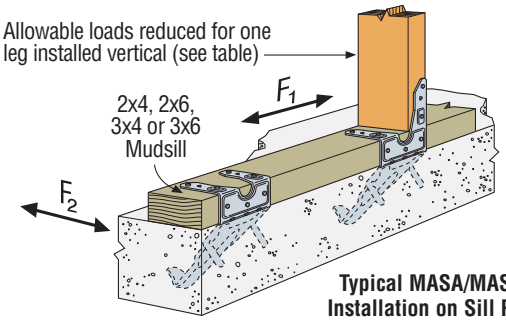
- **MASA/MASAP**
  - Spalling—Contact Simpson Strong-Tie for load reductions. Any exposed portion of the mudsill anchor must be protected against possible corrosion.
  - Testing shows that these mudsill anchors can be used in lieu of code required anchor bolts and square washer in high seismic zones. Refer to Simpson Strong-Tie flier F-MASA for additional information.

CODE: City of L.A. RR25851





Typical MASA Installation in Concrete



Typical MASA/MASAP Installation on Sill Plate

Allowable Stress Design (ASD) Loads for MASA and MASAP Foundation Anchor Straps

Wind and SDC A&B – Allowable Loads (lbs.)[1,2,4,5,6,7,8]								
Sill Size	Fasteners		Uncracked Concrete[3]			Cracked Concrete[3]		
	Sides	Top	Uplift	F_1	F_2	Uplift	F_1	F_2
STANDARD INSTALLATION								
2x4, 2x6	(3) 10dx1½	(6) 10dx1½	920	1,515	1,095	785	1,515	910
3x4, 3x6	(5) 10dx1½	(4) 10dx1½	650	1,215	725	495	1,215	725
ONE LEG UP INSTALLATION								
2x4, 2x6	(6) 10dx1½	(3) 10dx1½	785	1,005	995	595	1,005	965
3x4, 3x6	(7) 10dx1½	(2) 10dx1½	—	815	—	—	815	—
TWO LEGS UP INSTALLATION								
2x4, 2x6 3x4, 3x6	(9) 10dx1½	—	810	1,150	900	665	1,150	660
DOUBLE 2x SILL INSTALLATION								
DBL 2x4, DBL 2x6	(5) 10dx1½	(2) 10dx1½	875	1,075	785	660	1,075	785
SDC C–F – Allowable Loads (lbs.)[1,2,4,5,6,7,8]								
Sill Size	Fasteners		Uncracked Concrete[3]			Cracked Concrete[3]		
	Sides	Top	Uplift	F_1	F_2	Uplift	F_1	F_2
STANDARD INSTALLATION								
2x4, 2x6	(3) 10dx1½	(6) 10dx1½	745	1,235	1,045	660	1,235	765
3x4, 3x6	(5) 10dx1½	(4) 10dx1½	550	1,020	725	415	1,020	640
ONE LEG UP INSTALLATION								
2x4, 2x6	(6) 10dx1½	(3) 10dx1½	660	845	995	500	845	810
3x4, 3x6	(7) 10dx1½	(2) 10dx1½	—	665	—	—	685	—
TWO LEGS UP INSTALLATION								
2x4, 2x6 3x4, 3x6	(9) 10dx1½	—	740	965	755	560	965	550
DOUBLE 2x SILL INSTALLATION								
DBL 2x4, DBL 2x6	(5) 10dx1½	(2) 10dx1½	735	900	785	555	900	785

For SI: 1 in. = 25.4 mm, 1 lb. = 4.45 N, 1 psi. = 6.895 kPa, 1 plf. = 14.59 N/m.

1. Allowable loads are applicable to anchors fastened directly to the sill plate, stud, or both. For wood installations, the members must have a Specific Gravity of 0.50.
2. For designs under the 2014 LABC, sill plate size shall comply with the requirements of the 2008 Special Design Provisions for Wind and Seismic (SDPWS).
3. For simultaneous loads in more than one direction, the connector must be evaluated using the straight line interaction equation:

   Design Uplift/Allowable Uplift + Design Lateral Parallel to Plate / Allowable Lateral Parallel to Plate + Design Lateral Perpendicular to Plate / Allowable Lateral Perpendicular to Plate < 1.0.
4. Minimum specified concrete compressive strength, f'_c must be 2,500 psi.
5. For full allowable loads, the minimum anchor end distance is 4 inches, the minimum anchor spacing is 8 inches, and the minimum concrete stem wall width is 6 inches.
6. Multiply tabulated seismic and wind ASD load values by 1.4 or 1.6 respectively to obtain LRFD capacities.
7. Per Section 1613 of the 2014 LABC, detached one- and two-family dwellings assigned to Seismic Design Category (SDC) A, B, or C may use the "Wind and SDC A&B" allowable loads.
8. The allowable loads for anchors fastened to wood members are based on allowable stress design (ASD) and include the load duration factor (C_D) corresponding with wind and earthquake loading in accordance with the NDS (C_D = 1.6). No further increase is allowed.

City of Los Angeles RR Values
SSTB Anchor Bolt

The SSTB anchor bolt is designed for maximum performance as an anchor bolt for holdowns and Simpson Strong-Tie® Strong-Wall® shearwalls. Extensive testing has been done to determine the design load capacity of the SSTB when installed in many common applications.

The SSTB anchor bolt is code-listed by ICC-ES under the 2012 IBC® and IRC® to meet the requirements of ICC-ES acceptance criteria (AC) 399. ICC-ES ESR-2611 is the industry's first code report issued for proprietary anchor bolts evaluated to the criteria of AC399.

Special Features:

- Identification on the bolt head showing embedment angle and model
- Offset angle reduces side bursting and provides more concrete cover
- Rolled thread for higher tensile capacity
- Stamped embedment line aids installation
- Available with a hot-dipped galvanized (HDG) finish for additional corrosion resistance

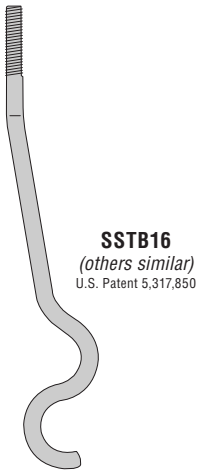
MATERIAL: ASTM F-1554, Grade 36

FINISH: None. May be ordered HDG; contact Simpson Strong-Tie.

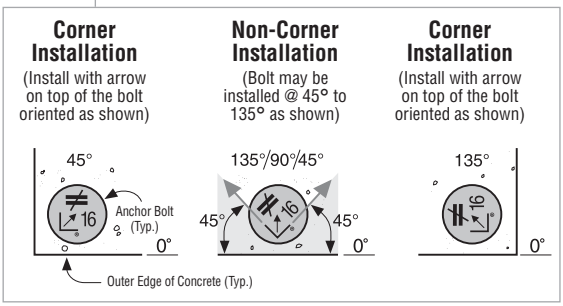
INSTALLATION:

- SSTB is suitable for monolithic and two-pour concrete applications.
- Nuts and washers for holdown attachment are not supplied with the SSTB; install standard nuts, couplers and/or washers as required.
- On HDG SSTB anchors, chase the threads to use standard nuts or couplers or use overtapped products in accordance with ASTM A563, for example Simpson Strong-Tie® NUT⅝-OST or NUT⅞-OST.
- Install SSTB before the concrete pour using Simpson Strong-Tie AnchorMate® anchor bolt holders.Install the SSTB per the plan view detail.
- Minimum concrete compressive strength is 2,500 psi.
- When rebar is required it does not need to be tied to the SSTB.
- Order SSTBL Models *(example: SSTB16L)* for longer thread length (16L = 5½", 20L = 6½", 24L = 6", 28L = 6½"). SSTB and SSTBL load values are the same. SSTB34 and SSTB36 feature 4½" and 6½" of thread, respectively, and are not available in "L" versions.

CODE: City of L.A. RR25827



SSTB16
(others similar)
U.S. Patent 5,317,850

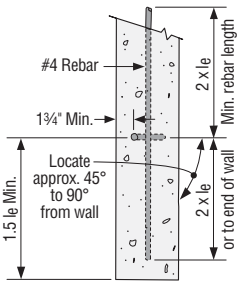


Plan View of SSTB Placement in Concrete

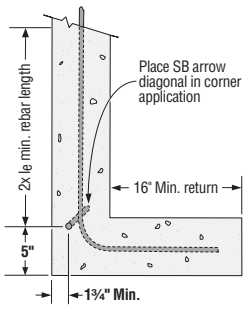
SSTB Bolts at Stemwall

Model No.	Dimensions				Allowable Tension Loads (lbs.)					
	Stemwall Width (in.)	Dia. (in.)	Length (in.)	Min. Embed. (l_e)	Wind			SDC C–F		
					Midwall	Corner	End-of-Wall[1]	Midwall	Corner	End-of-Wall[1]
SSTB16	6	⅝	17⅝ (16L = 19⅝)	12⅝	3,610	3,610	3,610	2,550	2,550	2,550
SSTB20	6	⅝	21⅝ (20L = 24⅝)	16⅝	4,315	4,040	4,040	3,145	2,960	2,960
SSTB24	6	⅝	25⅝ (24L = 28⅛)	20⅝	5,025	4,470	4,470	3,740	3,325	3,325
SSTB28	8	⅞	29⅞ (28L = 32⅞)	24⅞	9,900	8,710	7,615	8,315	7,315	6,395
SSTB34	8	⅞	34⅞	28⅞	9,900	8,710	7,615	8,315	7,315	6,395
SSTB36	8	⅞	36⅞	28⅞	9,900	8,710	7,615	8,315	7,315	6,395

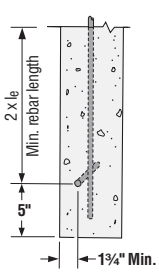
1. SSTB28, SSTB34 and SSTB36 with 3⅞" end distance allowable loads are 6,605 lbs. (Wind) and 5,550 lbs. (SDC C-F).



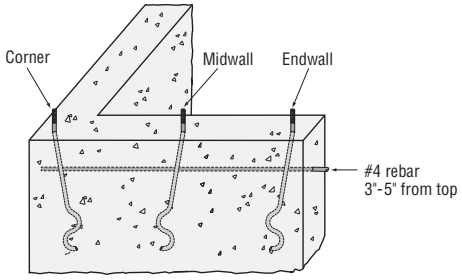
Midwall



Corner



End-Of-Wall



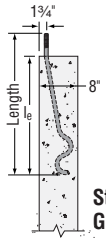
Perspective View

STEMWALL PLAN VIEWS

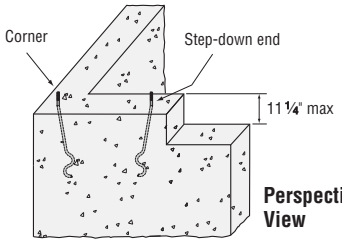
City of Los Angeles RR Values
SSTB Anchor Bolt

SSTB Bolts at Stemwall: Garage Front

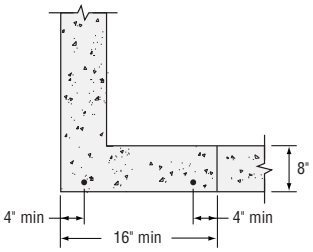
Model No.	Dimensions (in.)				Allowable Tension Loads (lbs.)			
					Wind		SDC C–F	
	Stemwall Width	Dia.	Length	Min. Embed. (l_e)	Step-Down End	Corner	Step-Down End	Corner
SSTB28	8	7/8	29 7/8	24 7/8	7,015	7,045	5,895	5,920



Stemwall Garage Front



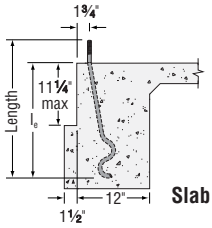
Perspective View



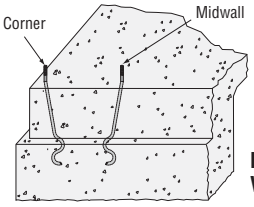
Plan View

SSTB Bolts at Slab on Grade: Edge

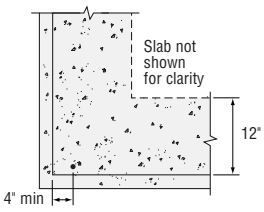
Model No.	Dimensions (in.)				Allowable Tension Loads (lbs.)			
					Wind		SDC C–F	
	Footing Width	Dia.	Length	Min. Embed. (l_e)	Midwall	Corner	Midwall	Corner
SSTB16	12	5/8	17 5/8	12 5/8	5,355	5,355	3,780	3,780
SSTB20	12	5/8	25 5/8	16 5/8	6,550	6,550	4,785	4,785
SSTB24	12	5/8	25 5/8	20 5/8	6,675	6,675	5,790	5,790
SSTB28	12	7/8	29 7/8	24 7/8	13,080	13,080	11,060	11,645
SSTB34	12	7/8	34 7/8	28 7/8	13,080	13,080	11,060	11,645
SSTB36	12	7/8	36 7/8	28 7/8	13,080	13,080	11,060	11,645



Slab Edge



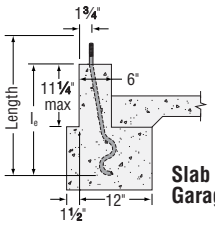
Perspective View



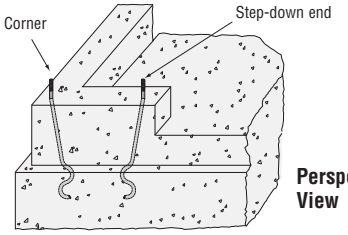
Plan View

SSTB Bolts at Slab on Grade: Garage Curb

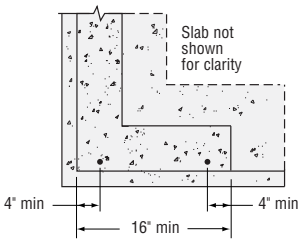
Model No.	Dimensions (in.)				Allowable Tension Loads (lbs.)			
					Wind		SDC C–F	
	Curb Width	Dia.	Length	Min. Embed. (l_e)	Step-Down End	Corner	Step-Down End	Corner
SSTB28	6	7/8	29 7/8	24 7/8	10,085	12,375	8,475	10,395



Slab Garage Curb



Perspective View



Plan View

Notes to the Designer:

1. Rebar is required at top of stemwall foundations but is not required for slab-on-grade edge and garage curb, or stemwall garage front installations.
2. Minimum end distances for SSTB bolts are as shown in graphics.
3. Multiply the tabulated ASD wind or seismic loads by 1.6 or 1.4, respectively, to obtain LRFD capacities.
4. Per Section 1613 of the LABC, detached one- and two-story dwellings in SDC C may use "Wind" allowable loads.
5. See L.A. RR25827 for additional information.
6. Midwall loads apply when anchor is 1.5 l_e or greater from the end. For bolts acting in tension simultaneously, the minimum bolt center-to-center spacing is 3 l_e.

City of Los Angeles RR Values
SB Anchor Bolt

The ⅝"x24" SB anchor bolt offers a load-tested anchorage solution that exceeds the capacity of all of our holdowns that call for a ⅝" dia. anchor. Similarly, the 1"x30" SB anchor bolt covers holdowns utilizing a 1" diameter anchor that exceed the capacity of our SSTB bolts. The ⅞"x24" SB anchor bolt is designed to maximize performance with minimum embedment for holdowns utilizing a ⅞" diameter anchor.

SB anchor bolts are code listed by ICC-ES under the 2012 IBC® and IRC® to meet the requirements of ICC-ES acceptance criteria AC399. ICC-ES ESR-2611 is the industry's first code report issued for proprietary anchor bolts evaluated to the criteria of AC399.

Special Features:

- Indentification on the bolt head showing embedment angle and model
- Sweep geometry to optimize position in form
- Rolled thread for higher tensile capacity
- Hex nuts and plate washer fixed in position
- Available with a hot-dipped galvanized (HDG) finish for additional corrosion resistance

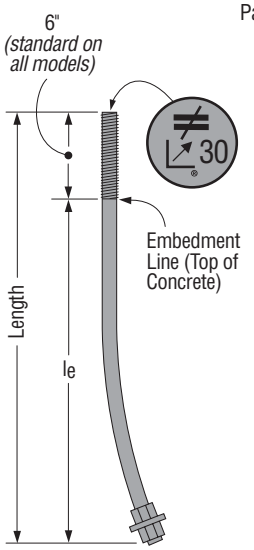
MATERIAL: ASTM F-1554, Grade 36

FINISH: None. May be ordered HDG. Contact Simpson Strong-Tie.

INSTALLATION:

- SB is only for concrete applications poured monolithically.
- Top nuts and washers for holdown attachment are not supplied with the SB; install standard nuts, couplers and/or washers as required.
- On HDG SB anchors, chase the threads to use standard nuts or couplers or use overtapped products in accordance with ASTM A563, for example Simpson Strong-Tie® NUT⅝-OST, NUT⅞-OST and NUT1-OST.
- Install SB before the concrete pour using Simpson Strong-Tie AnchorMates® anchor bolt holders. Install the SB per the plan view detail.
- Minimum concrete compressive strength is 2,500 psi.
- When rebar is required it does not need to be tied to the SB.

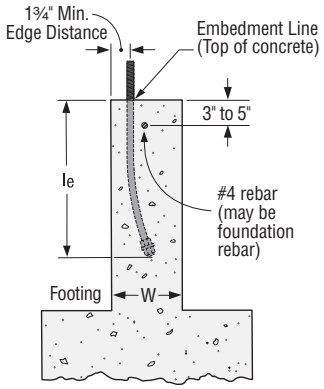
CODE: City of L.A. RR25827



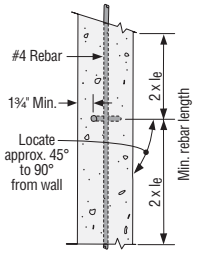
SB1x30
(Other models similar)

SB Bolts at Stemwall

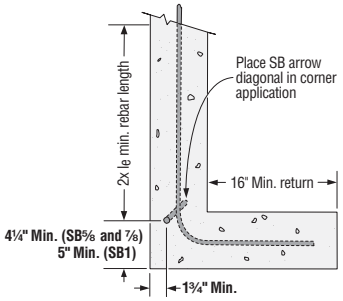
Model No.	Dimensions (in.)				Allowable Tension Loads (lbs.)					
					Wind			SDC C–F		
	Stemwall Width	Dia.	Length	Min. Embed. (l_e)	Midwall	Corner	End-of-Wall	Midwall	Corner	End-of-Wall
SB⅝x24	6	⅝	24	18	6,675	6,675	6,675	6,675	5,730	5,730
SB⅞x24	8	⅞	24	18	10,470	9,355	6,820	8,795	7,855	5,730
SB1x30	8	1	30	24	13,665	9,905	7,220	11,470	8,315	6,065



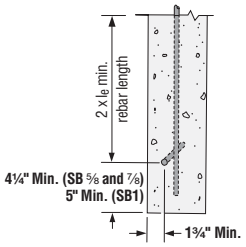
Typical SB Installation



Midwall

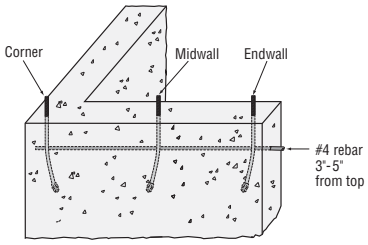


Corner

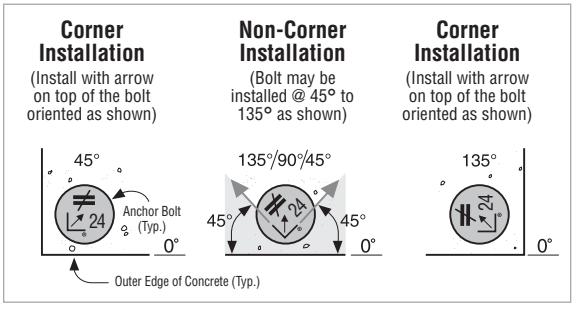


End-Of-Wall

STEMWALL PLAN VIEWS



Perspective View

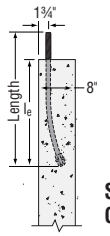


Plan View of SB Placement in Concrete

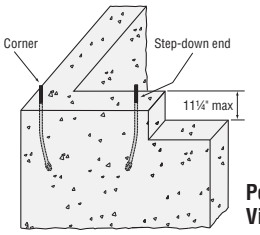
City of Los Angeles RR Values
SB Anchor Bolt

SB Bolts at Stemwall: Garage Front

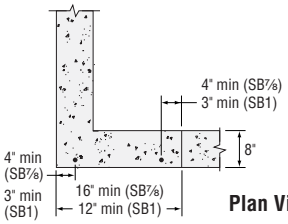
Model No.	Dimensions (in.)				Allowable Tension Loads (lbs.)			
					Wind		SDC C–F	
	Stemwall Width	Dia.	Length	Min. Embed. (l_e)	Step-Down End	Corner	Step-Down End	Corner
SB⅞x24	8	⅞	24	18	7,225	7,660	6,070	6,435
SB1x30	8	1	30	24	11,305	9,635	9,495	8,030



Stemwall Garage Front



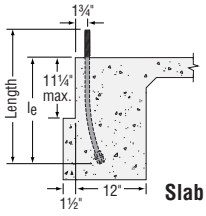
Perspective View



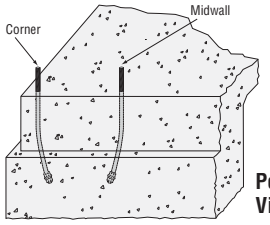
Plan View

SB Bolts at Slab on Grade: Edge

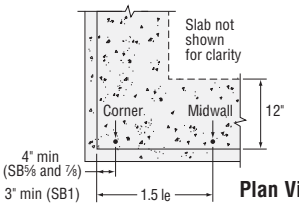
Model No.	Dimensions (in.)				Allowable Tension Loads (lbs.)			
					Wind		SDC C–F	
	Footing Width	Dia.	Length	Min. Embed. (l_e)	Midwall	Corner	Midwall	Corner
SB⅝x24	12	⅝	24	18	6,675	6,675	6,675	5,730
SB⅞x24	12	⅞	24	18	13,080	12,135	12,320	10,190
SB1x30	12	1	30	24	17,080	15,580	16,300	13,090



Slab Edge



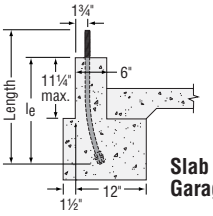
Perspective View



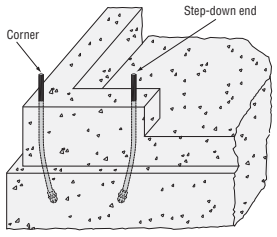
Plan View

SB Bolts at Slab on Grade: Garage Curb

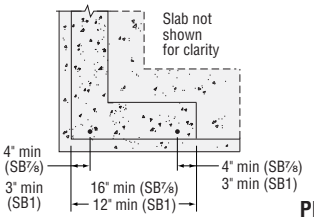
Model No.	Dimensions (in.)				Allowable Tension Loads (lbs.)			
					Wind		SDC C–F	
	Curb Width	Dia.	Length	Min. Embed. (l_e)	Step-Down End	Corner	Step-down End	Corner
SB⅞x24	6	⅞	24	18	9,175	11,075	7,705	9,305
SB1x30	6	1	30	24	15,580	15,580	13,090	13,090



Slab Garage Curb



Perspective View



Plan View

Notes to the Designer:

1. Rebar is required at top of stemwall foundations but is not required for slab-on-grade edge and garage curb, or stemwall garage front installations.
2. Minimum end distances for SB bolts are as shown in graphics.
3. Multiply the tabulated ASD wind or seismic loads by 1.6 or 1.4, respectively, to obtain LRFD capacities.
4. Per Section 1613 of the LABC, detached one- and two-story dwellings in SDC C may use "Wind" allowable loads.
5. See L.A. RR25827 for additional information.
6. Midwall loads apply when anchor is 1.5 l_e or greater from the end. For bolts acting in tension simultaneously, the minimum bolt center-to-center spacing is 3 l_e.

City of Los Angeles RR Values
BP Bearing Plates

BP bearing plates give greater bearing surface than standard cut washers and help distribute the load at these critical connections. The bearing plate is designed to meet the City of Los Angeles Building Code Section 2305.5 requirements for holdown studs/post bolts and the 2008 SDPWS Section 4.3.6.4.3 for sill plate anchors.

MATERIAL: See table

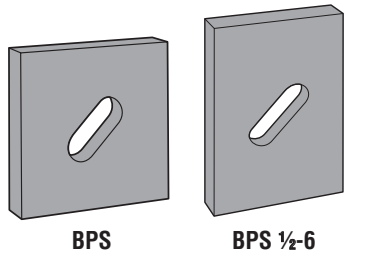
FINISH: None. (HDG) available, contact Simpson Strong-Tie.

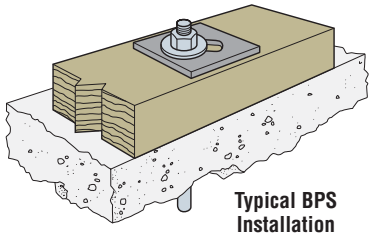
INSTALLATION: Refer to the current *Wood Construction Connectors* catalog for General Notes and warranty information.

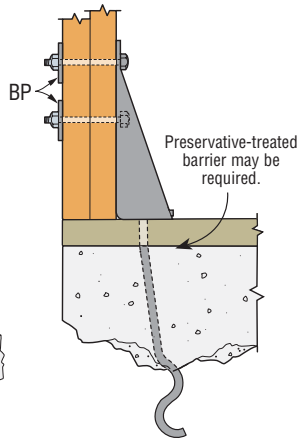
CODES: Prescriptive; 2008 SDPWS 4.3.6.4.3

Model No.	Thickness	Dimensions (in.)		Bolt Dia. (in.)
		W	L	
BPS½-3	3 ga.	3	3	½
BPS⅝-3	3 ga.	3	3	⅝
BP½-3	3 ga.	3	3	½
BP⅝-3	3 ga.	3	3	⅝
BPS¾-3	3 ga.	3	3	¾
BPS½-6	3 ga.	3	4.5	½
BPS⅝-6	3 ga.	3	4.5	⅝
BPS¾-6	3 ga.	3	4.5	¾
BP⅞	5/16"	3	3	⅞
BP1	⅜"	3½	3½	1

1. Standard cut washer required with BPS½-3, BPS⅝-3, and BPS¾-3 *(not provided)* per the 2014 LABC.







Typical BPS Installed with a Holdown
(required for City of L.A.)

City of Los Angeles RR Values
Simpson Strong-Tie® Strong-Drive® SDS HEAVY-DUTY CONNECTOR Screws

The Simpson Strong-Tie® Strong-Drive® SDS Heavy-Duty Connector screw is a ¼"-diameter structural wood screw ideal for various connector installations as well as wood-to-wood applications. It installs with no pre-drilling and has been extensively tested in various applications. The screw features a patented easy driving 4CUT™ tip and a corrosion resistant double-barrier coating.

MATERIAL: Heat-treated carbon steel, type-316 stainless steel available

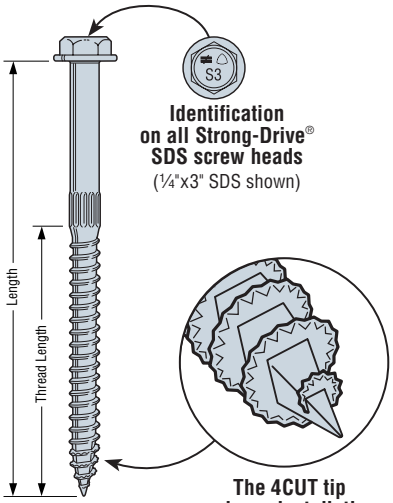
FINISH: Double-barrier coating. Strong-Drive SDS Heavy-Duty Connector screws may also be available in HDG or stainless steel. *(Not all sizes are available in all coatings. Contact Simpson Strong-Tie for product availability and ordering information.)*

CODE: City of L.A. RR25711

Strong-Drive® SDS HEAVY-DUTY CONNECTOR Screw

Size (in.)	Model No.	Thread Length (in.)	Fasteners per Carton	DF/SP Allowable Loads					
				Shear (100)					Withdrawal[5] (100)
				Wood Side Plate[3]		Steel Side Plate			
				1½"	1¾" SCL	16 ga.	14 ga. and 12 ga.	10 ga. or Greater	Wood or Steel Side Plate
¼ x 1½	SDS25112	1	1,500	—	—	250	250	250	170
¼ x 2	SDS25200	1¼	1,300	—	—	250	290	290	215
¼ x 2½	SDS25212	1½	1,100	190	—	250	390	420	255
¼ x 3	SDS25300	2	950	280	—	250	420	420	345
¼ x 3½	SDS25312	2¼	900	340	340	250	420	420	385
¼ x 4½	SDS25412	2¾	800	350	340	250	420	420	475
¼ x 5	SDS25500	2¾	500	350	340	250	420	420	475
¼ x 6	SDS25600	3¼	600	350	340	250	420	420	560
¼ x 8	SDS25800	3¼	400	350	340	250	420	420	560

1. Screws may be provided with the 4CUT or Type 17 tip.
2. Strong-Drive® SDS Heavy-Duty Connector screws install best with a low speed ½" drill with a ⅜" hex head driver.
3. All applications are based on full penetration into the main member.
4. Allowable loads are shown at the wood load duration factor of C_D = 1.00. Loads may be increased for load duration per the building code up to a C_D = 1.60.
5. Withdrawal loads shown are in pounds (lbs.) and are based on the entire threaded section installed into the main member. If thread penetration into the main member is less than the thread length as shown in the table, reduce allowable load by 172 lbs. x inches of thread not in main member. Use 121 lbs./inch for SPF.
6. LSL wood-to-wood applications that require 4½", 5", 6" or 8" Strong-Drive SDS Heavy-Duty Connector screws are limited to interior-dry use only.



Identification on all Strong-Drive® SDS screw heads
(¼"x3" SDS shown)

The 4CUT tip reduces installation torque and makes driving easier.

Strong-Drive® ¼"x3" SDS HEAVY-DUTY CONNECTOR Screw
U.S. Patent 6,109,850; 5,897,280; 7,101,133

For more information about the Strong-Drive® SDS Heavy-Duty Connector screw and other applications, visit ***strongtie.com*** *or access the Simpson Strong-Tie® Fastening Systems catalog.*

City of Los Angeles RR Values
HDU Holdowns in Shear Walls

See Pages 15-17 for Wall Anchorage Assemblies

HDU holdowns are pre-deflected during the manufacturing process, virtually eliminating deflection under load due to material stretch. They use Simpson Strong-Tie® Strong-Drive® SDS Heavy-Duty Connector screws, which install easily and provide reduced fastener slip. Using SDS screws typically results in a greater net section when compared to bolts.

The DTT2Z tension tie is suitable for lighter-duty holdown applications on single or double 2x posts, and installs easily with Strong-Drive SDS screws *(included)*.

For more information on holdown options, contact Simpson Strong-Tie.

HDU SPECIAL FEATURES:

- Pre-deflected body virtually eliminates deflection due to material stretch.
- Uses SDS screws which install easily, reduce fastener slip, and typically results in a greater net section area of the post compared to bolts.
- Strong-Drive SDS Heavy-Duty Connector screws are supplied with the holdowns to ensure proper fasteners are used.
- No stud bolts to countersink at openings.

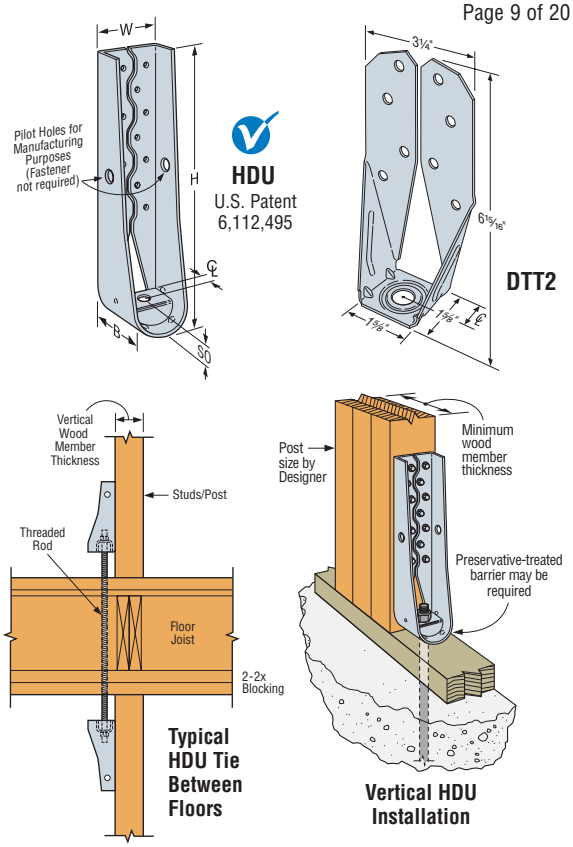
MATERIAL: See table

FINISH: HDU – Galvanized; DTT2Z – ZMAX® coating or stainless steel

INSTALLATION:

- Use all specified fasteners. See the current *Wood Construction Connectors* catalog.
- For use in vertical and horizontal applications.
- The HDU requires no additional washer, the DTT2Z requires a standard cut washer *(included)* be installed between the nut and the seat.
- To tie multiple 2x members together, the Designer must determine the fasteners required to join the members without splitting the wood. See page 8 for Strong-Drive SDS Heavy-Duty Connector screws values.
- See SB and SSTB anchor bolts on pages 4–7 for anchorage options.
- SDS screws install best with a low-speed, high-torque drill with a ⅜" hex-head driver.
- Anchor bolt nut should be finger tight plus ⅓ to ½ turn with a hand wrench, with consideration given to possible future wood shrinkage. Care should be taken not to over-tighten the nut. Impact wrenches should not be used.

CODE: City of L.A. RR 25720



HDU/DTT Holdowns for Use in Shearwall Applications (Loads have been reduced 25% per Section 2305.5 of 2014 LABC)

Model No.	Ga.	Dimensions (in.)					Fasteners		Minimum Wood Member Thickness[3] (in.)	Allowable Tension Loads (lbs.) (160)	
		W	H	B	℄	SO	Anchor Bolt Dia. (in.)	Strong-Drive® SDS Screws		DF/SP	Deflection at Allowable Load[5] (in.)
DTT2Z	14	3 1/4	6 15/16	1 5/8	13/16	3/16	1/2	(8) 1/4"x1 1/2" SDS	1 1/2	1,370	0.079
									3	1,610	0.096
HDU2	14	3	8 11/16	3 1/4	15/16	1 3/8	5/8	(6) 1/4"x1 1/2" SDS	3	1,360	0.052
HDU2-SDS2.5								(6) 1/4"x2 1/2" SDS	3	2,305	0.066
HDU4	14	3	10 15/16	3 1/4	15/16	1 3/8	5/8	(10) 1/4"x1 1/2" SDS	3	2,330	0.062
HDU4-SDS2.5								(10) 1/4"x2 1/2" SDS	3	3,425	0.086
HDU5	14	3	13 3/16	3 1/4	15/16	1 3/8	5/8	(14) 1/4"x1 1/2" SDS	3	2,970	0.082
HDU5-SDS2.5								(14) 1/4"x2 1/2" SDS	3	4,235	0.086
									3 1/2	4,255	0.086
HDU8	10	3	16 5/8	3 1/2	1 3/8	1 1/2	7/8	(20) 1/4"x1 1/2" SDS	3	4,485	0.065
HDU8-SDS2.5								(20) 1/4"x2 1/2" SDS	3	4,485	0.065
									3 1/2	5,230	0.076
									4 1/2	5,905	0.086
HDU11-SDS2.5	10	3	22 1/4	3 1/2	1 3/8	1 1/2	1	(30) 1/4"x2 1/2" SDS	5 1/2	7,150	0.088
									7 1/4	8,380	0.103
HDU14-SDS2.5	7	3	25 11/16	3 1/2	1 9/16	1 9/16	1	(36) 1/4"x2 1/2" SDS	7 1/4	10,795[4]	0.129
									5 1/2 x 5 1/2	10,835[4]	

1. Allowable loads have been increased for earthquake or wind load durations with no further increase allowed; reduce where other load durations govern.
2. The Designer must specify anchor bolt type, length and embedment. See SB and SSTB Anchor bolts *(pages 4–7)*.
3. Post design by Specifier. Allowable loads are based on a minimum 3½" wide post except as noted. Post may consist of multiple members provided they are connected independently of the holdown fasteners.
4. Requires heavy hex anchor nut to achieve tabulated loads *(supplied with holdown)*.
5. Deflection includes fastener slip, holdown deformation and anchor rod elongation for holdowns installed up to 6" above top of concrete. Holdowns may be installed raised up to 18" above top of concrete with no load reduction provided additional elongation is accounted for *(an additional 0.010" is conservative)*.

City of Los Angeles RR Values
HDQ8, HHDQ and HDC10 Holdowns in Shear Walls

See Pages 15-17 for Wall Anchorage Assemblies

The HHDQ holdown combines low deflection and high loads with ease of installation. The unique seat design of the HDQ8 greatly minimizes deflection under load. Both styles of holdown employ Simpson Strong-Tie® Strong-Drive® SDS Heavy-Duty Connector screws, which install easily, reduce fastener slip and typically result in a greater net section area of the post when compared to bolts. They may be installed either flush or raised off the mudsill without a reduction in load value.

SPECIAL FEATURES:

- Uses Strong-Drive SDS Heavy-Duty Connector screws that install easily, reduce fastener slip and typically result in a greater net section area of the post compared to bolts.
- Strong-Drive SDS Heavy-Duty Connector screws are supplied with the holdowns to ensure proper fasteners are used.
- No stud bolts to countersink at openings.

MATERIAL: HDQ8—7 gauge; HHDQ—Body: 7 gauge, washer: ½" plate

FINISH: HDQ8—Galvanized; HHDQ— Simpson Strong-Tie gray paint

INSTALLATION: • Use all specified fasteners. See the current *Wood Construction Connectors* catalog.

- For use in vertical and horizontal applications *(see page 15)*.
- No additional washer is required.
- To tie multiple 2x members together, the Designer must determine the fasteners required to join members without splitting the wood.
- Strong-Drive SDS Heavy-Duty Connector screws install best with a low-speed, high-torque drill with a ⅜" hex-head driver.
- Anchor bolt nut should be finger tight plus ⅓ to ½ turn with a hand wrench, with consideration given to possible future wood shrinkage. Care should be taken not to over-tighten the nut. Impact wrenches should not be used.

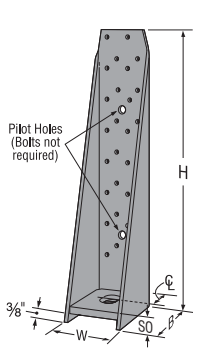
HDQ8:

- ⅝" of adjustability perpendicular to the wall.
- See SSTB anchor bolts, pages 4-5, for anchorage options. For 2-2x and 3x sill plates use SSTBL models. The Designer may specify any alternate anchorage calculated to resist the tension load for a specific job. Anchorage length should take the bearing plate/washer height into account, to ensure adequate length of threads to engage the nut.

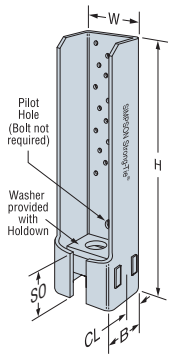
HHDQ11/14:

- No additional washer is required.
- HHDQ14 requires a heavy hex anchor nut *(supplied with holdown)*
- See SB and SSTB anchor bolts, pages 4-7, for anchorage options.

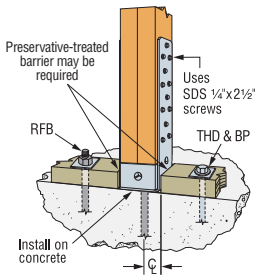
CODE: City of L.A. RR25720



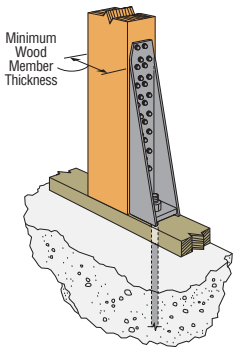
HHDQ11
(HHDQ14 similar)



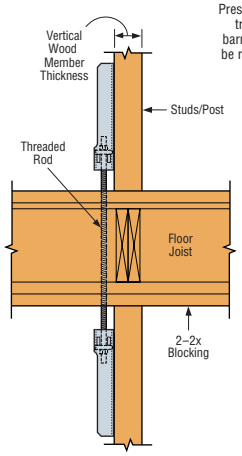
HDQ8
U.S. Patents 6,006,487 and 6,327,831



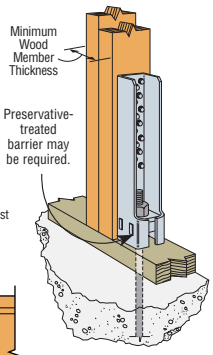
Typical HDC Installation with 2-2x4 Studs



Vertical HHDQ11 Installation
(HHDQ14 similar)



HDQ Floor-to-Floor Installation



HDQ8 Vertical Installation

Loads have been reduced 25% per Section 2305.5 of 2014 City of L.A. Building Code for Seismic Loads.

Model No.	Ga.	Dimensions (in.)					Fasteners		Minimum Wood Member Thickness[3] (in.)	Allowable Tension Loads (lbs.) (160)	
		W	H	B	℄	SO	Anchor Bolt Dia. (in.)	Strong-Drive® SDS Screw		DF/SP	Deflection at Allowable Load[5] (in.)
HDQ8	7	2⅞	14	2½	1¼	2⅜	⅞	(20) ¼"x1½" SDS	3	4,285	0.055
								(20) ¼"x2½" SDS	3	4,285	0.055
									4½	5,460	0.068
HDQ8-SDS3								(20) ¼"x3" SDS	3	4,285	0.055
									3½	5,720	0.064
									4½	6,920	0.071
HHDQ11-SDS2.5	7	3	15⅛	3½	1½	⅞	1	(24) ¼"x2½" SDS	5½	8,860	0.098
HHDQ14-SDS2.5	7	3	18¾	3½	1½	⅞	1	(30) ¼"x2½" SDS	7¼	9,760[4]	0.076
									5½ x 5½	10,280[4]	0.080
HDC10/22	10	3⅛	14⅜	3	1 9⁄16	–	⅞	(24) ¼"x2½" SDS	(2) 2x4	6,850[6]	0.054
HDC10/4	10	3 9⁄16	14⅛	3	1 13⁄16	–	⅞	(24) ¼"x2½" SDS	4x4	6,850[6]	0.054

1. Allowable loads have been increased for earthquake or wind load durations with no further increase allowed; reduce where other load durations govern.
2. The Designer must specify anchor bolt type, length and embedment. See SB and SSTB Anchor bolts *(pages 4-7)*.
3. Post design by Specifier. Allowable loads are based on a minimum 3½" wide post except as noted. Post may consist of multiple members provided they are connected independently of the holdown fasteners.
4. Requires heavy hex anchor nut to achieve tabulated loads *(supplied with holdown)*.
5. Deflection includes fastener slip, holdown deformation and anchor rod elongation for holdowns installed up to 6" above top of concrete. Holdowns may be installed raised up to 18" above top of concrete with no load reduction provided additional elongation is accounted for *(an additional 0.010" is conservative)*.
6. The HDC holdown resists compression loads. The allowable compression loads for the HDC10/22 are 7,070 lbs. (C_D = 1.0) and 9,255 lbs. (C_D = 1.6) with a maximum displacement, Δ, of 0.027 inches. The allowable compression loads for the HDC10/4 are 9,600 lbs. (C_D = 1.0) and 10,550 lbs. (C_D = 1.6) with a maximum displacement, Δ, of 0.029 inches.

City of Los Angeles RR Values
HD/HDB Holdowns in Shear Walls

See Pages 15-17 for Wall Anchorage Assemblies

Simpson Strong-Tie® offers a wide range of bolted holdowns offering low-deflection performance for a range of load requirements. All of these holdowns may be used in vertical and horizontal applications *(see page 16)*.

The HD3B is light-duty holdown designed for use in shear walls and braced-wall panels, as well as other lateral applications.

The HD5B, HD7B and HD9B bolted holdowns incorporate the proven design of our HDQ8 SDS-style holdown and feature a unique seat design which greatly minimizes deflection under load. HDB holdowns are self jigging, ensuring that the code-required minimum of seven bolt diameters from the end of the post is met. They can be installed directly on the sill plate or raised above it and are suitable for back-to-back applications where eccentricity is a concern. HDBs are designed to provide loads for intermediate-load-range shear walls, braced-wall panels and lateral applications.

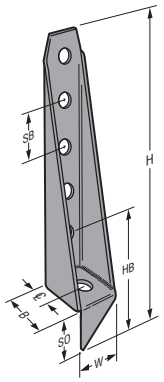
HD holdowns offer the highest allowable loads, providing high capacity for both vertical and horizontal applications *(see page 16)*. The HD12 and HD19 are self-jigging, ensuring that the code-required minimum of seven bolt diameters from the end of the post is met. They can be installed back-to-back when eccentricity is an issue.

MATERIAL: See table below

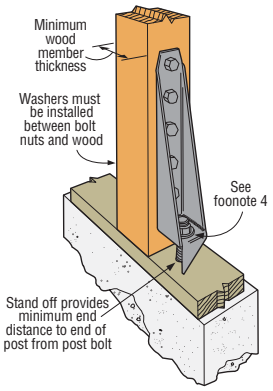
FINISH: HD3B/HD5B/HD7B/HD9B – Galvanized; HD – Simpson Strong-Tie gray paint

INSTALLATION:
- Use all specified fasteners. See current *Wood Construction Connectors* catalog.
- Bolt holes shall be a minimum of 1/32" to a maximum of 1/16" larger than the bolt diameter *(per NDS, section 11.1.3)*.
- Stud bolts should be snugly tightened with washers between the wood and nut.
- The Designer must specify anchor bolt type, length, and embedment. See SB and SSTB Anchor bolts *(pages 4-7)*.
- To tie multiple 2x members together, the Designer must determine the fasteners required to join members without splitting the wood.
- Anchor bolt nut should be finger tight plus 1/3 to 1/2 turn with a hand wrench, with consideration given to possible future wood shrinkage. Care should be taken not to over-tighten the nut. Impact wrenches should not be used.

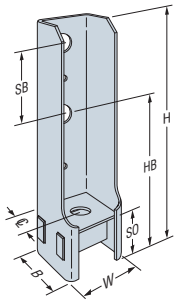
CODE: City of L.A. RR25828



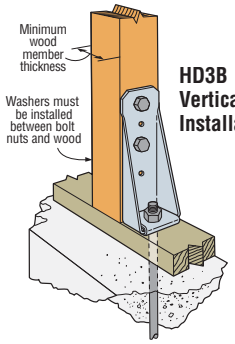
HD19
(HD12 similar)



Vertical HD19 Installation



HD5B
(HD7B and HD9B similar)



HD3B Vertical Installation

HDB and HD Holdowns for Use in Shear Wall Applications (Loads have been reduced 25% per Section 2305.5 of 2014 LABC)

Model No.	Material		Dimensions (in.)							Fasteners		Minimum Wood Member Thickness (in.)	Allowable Tension Loads DF/SP (lbs.) (160)	Deflection at Allowable Load[5] (in.)
	Base (in.)	Body (Ga)	HB[6]	SB	W	H	B	℄	SO	Anchor Bolt Dia.	Stud Bolts			
HD3B	—	12	4¾	2½	2½	8⅝	2	1⅜	⅜	⅝	(2) ⅝	1½	1,420	0.117
												2½	1,895	0.127
												3	2,350	0.090
HD5B	3/16	10	5¼	3	2½	9⅜	2½	1¼	2	⅝	(2) ¾	2½	2,815	0.097
												3	3,380	0.117
												3½	3,700	0.113
HD7B	3/16	10	5¼	3	2½	12⅜	2½	1¼	2	⅞	(3) ¾	3	4,985	0.107
												3½	5,485	0.116
HD9B	⅜	7	6⅛	3½	2⅞	14	2⅜	1¼	2⅜	⅞	(3) ⅞	3½	5,805	0.119
												4½	7,440	0.134
												7¼	7,525	0.134
HD12	⅜	3	7	4	3½	20 5/16	4 7/16	2⅛	3⅝	1⅛	(4) 1	3½	8,830	0.128
												4½	10,000	0.133
												5½	10,720	0.138
												(3) 2x6	10,855	0.144
												7¼	11,575	0.146
												5½ x 5½	11,635	0.122
HD19	⅜	3	7	4	3½	24½	4 7/16	2⅛	3⅝	1 1/8[4]	(5) 1	7¼	12,550	0.143
												5½ x 5½	12,580	0.150
										1¼	(5) 1	7¼	14,520	0.135
												5½ x 5½	14,305	0.103

1. Allowable loads have been increased for earthquake or wind load durations with no further increase allowed; reduce where other load durations govern.
2. The Designer must specify anchor bolt type, length and embedment. See SB and SSTB Anchor bolts *(pages 4-7)*.
3. Post design by Specifier. Allowable loads are based on a minimum 3½" wide post except as noted. Post may consist of multiple members provided they are connected independently of the holdown fasteners.
4. Standard cut washer is required under anchor nut.
5. Deflection includes fastener slip, holdown deformation and anchor rod elongation for holdowns installed up to 6" above top of concrete. Holdowns may be installed raised up to 18" above top of concrete with no load reduction provided additional elongation is accounted for *(an additional 0.010" is conservative)*.
6. HD and HDB holdowns are self-jigging and will ensure minimum bolt end distance, HB, when installed flush with the sill plate.

City of Los Angeles RR Values
HTT/LTT Tension Ties in Shear Walls

See Pages 15-17 for Wall Anchorage Assemblies

Tension ties are designed to resist tension loads that are fastened with nails.

The HTT4 and HTT5 feature an optimized nailing pattern resulting in better performance with less deflection.

The LTT19 light tension tie is designed for 2x joists or purlins and the LTT20B is for nail-on or bolt-on applications. The 3" nail spacing makes the LTT20B suitable for wood I-joists with 10dx1½. The LTTI31 is designed for wood chord open web truss attachments to concrete or masonry walls and may also be installed vertically on a minimum 2x6 stud.

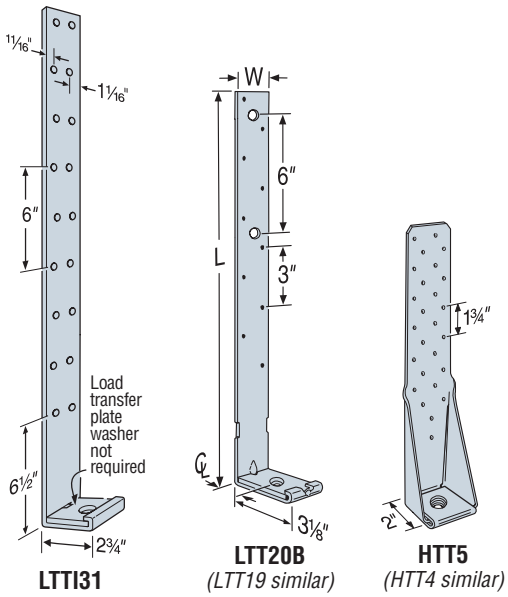
MATERIAL: See table

FINISH: Galvanized. May be ordered with a hot-dipped galvanized (HDG) finish; contact Simpson Strong-Tie.

INSTALLATION: • Use all specified fasteners. See the current *Wood Construction Connectors* catalog.

- Anchor bolt nut should be finger tight plus ⅓ to ½ turn with a hand wrench, with consideration given to possible future wood shrinkage. Care should be taken not to over-tighten the nut. Impact wrenches should not be used.
- For use in vertical and horizontal applications *(see page 16)*.
- To tie multiple 2x members together, the Designer must determine the fasteners required to join members without splitting the wood.
- The Designer shall specify anchor bolt type, length and embedment. See SB and SSTB anchor bolts on pages 4-7.

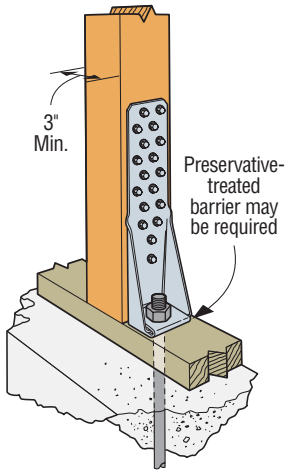
CODE: City of L.A. RR25818



LTTI31 | **LTT20B** *(LTT19 similar)* | **HTT5** *(HTT4 similar)*

Loads have been reduced 25% per Section 2305.5 of 2014 City of LA Building Code for Seismic Loads.

Model No.	Material (Ga)		Dimensions			Fasteners		Allowable Tension Load, DF/SP (lbs.) (160)	Deflection at Allowable Load[5] (in.)
	Strap	Plate	W	L	℄	Anchor Bolt Dia. (in.)	Fasteners		
LTT19	16	3	1¾	19⅛	1⅜	½, ⅝, or ¾	(8) 10dx1½	985	0.135
							(8) 10d	1,005	0.118
LTT20B	12	3	2	19¾	1½	½, ⅝, or ¾	(10) 10dx1½	1,015	0.146
							(8) 10d	1,125	0.139
							(2) ½" Bolt	1,220	0.137
LTTI31	18	3	3¾	31	1⅜	⅝	(18) 10dx1½	1,010	0.145
HTT4	11	—	2½	12⅜	1⅜	⅝	(18) 10dx1½	2,705	0.065
							(18) 16dx2½	3,175	0.092
HTT5	11	—	2½	16	1⅜	⅝	(26) 10dx1½	3,265	0.090
							(26) 10d	3,505	0.087
							(26) 16dx2½	3,820[6]	0.101



Vertical HTT4 Installation

1. Allowable loads have been increased for earthquake or wind load durations with no further increase allowed; reduce where other load durations govern.
2. The Designer must specify anchor bolt type, length and embedment. See SB and SSTB Anchor bolts *(pages 4-7)*.
3. Post design by Specifier. Allowable loads are based on a minimum 3"x3½" post *(in a 3½" wall)*. Post may consist of multiple members provided they are connected independently of the holdown fasteners.
4. Standard cut washer is required under anchor nut when using ½" or ⅝" anchor bolts. No additional washer is required when using a ¾" anchor bolt.
5. Deflection includes fastener slip, holdown deformation and anchor rod elongation for holdowns installed up to 4½" above top of concrete. Holdowns may be installed raised up to 18" above top of concrete with no load reduction provided additional elongation is accounted for *(an additional 0.010" is conservative)*.
6. Allowable tension loads for HTT5 with bearing washer BP⅝-2 is 3,970 lbs. (Δall = 0.095).
7. **NAILS:** 10d x 1½" = 0.148"x1½"; 10d = 0.148" dia. x 3" long; 16dx2½" = 0.162" dia. x 2½" long.

City of Los Angeles RR Values
Straps

Straps are designed to transfer tension loads in a wide variety of applications.

LSTA and MSTA—Designed for use on the edge of 2x members, with a nailing pattern that reduces the potential for splitting.

LSTI—Light straps that are suitable where pneumatic-nailing is necessary through diaphragm decking and wood chord open web trusses.

MST—Splitting may be a problem with installations on lumber smaller than 3½"; either fill every nail hole with 10dx1½" nails or fill every other hole with 16d common nails. Reduce the allowable load based upon the size and quantity of fasteners used.

MSTC—High-capacity strap that utilizes a staggered nail pattern to help minimize wood splitting. Nail slots have been countersunk to provide a lower nail head profile.

FINISH: Galvanized. Some products are available in stainless steel or ZMAX® coating. See Corrosion Information in the current *Wood Construction Connectors* catalog.

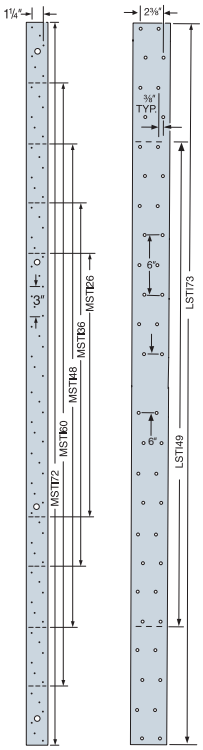
Loads have been reduced 25% for Section 2305.5 of 2014 City of L.A. Building Code for Seismic Loads

Model No.	Ga.	Dimensions (in.)		Fasteners (Total)	Allowable Tension Loads (DF/SP)	
					Straps Used as Holdowns in Shear Walls (25% Reduction)	Straps Not Used as Holdowns in Shear Walls[6]
		W	L		(160)	(160)
LSTA9	20	1 1/4	9	(8) 10d	555	740
LSTA12		1 1/4	12	(10) 10d	695	925
LSTA15		1 1/4	15	(12) 10d	830	1,110
LSTA18		1 1/4	18	(14) 10d	925	1,235
LSTA21		1 1/4	21	(16) 10d	925	1,235
LSTA24		1 1/4	24	(18) 10d	925	1,235
ST292		2 1/16	9 5/16	(12) 16d	950	1,265
ST2122		2 1/16	12 13/16	(16) 16d	1,150	1,530
ST2115		1/4	16 5/16	(10) 16d	495	660
ST2215		2 1/16	16 5/16	(20) 16d	1,405	1,875
LSTA30	18	1 1/4	30	(22) 10d	1,230	1,640
LSTA36		1 1/4	36	(24) 10d	1,230	1,640
LSTI49		3 3/4	49	(32) 10dx1 ½	2,230	2,975
LSTI73		3 3/4	73	(48) 10dx1 ½	3,155	4,205
MSTA9		1 1/4	9	(8) 10d	560	750
MSTA12		1 1/4	12	(10) 10d	705	940
MSTA15		1 1/4	15	(12) 10d	850	1,130
MSTA18		1 1/4	18	(14) 10d	985	1,315
MSTA21		1 1/4	21	(16) 10d	1,130	1,505
MSTA24		1 1/4	24	(18) 10d	1,230	1,640
MSTA30	16	1 1/4	30	(22) 10d	1,540	2,050
MSTA36		1 1/4	36	(26) 10d	1,514	2,050
MSTA49		1 1/4	49	(26) 10d	1,515	2,020
ST6215		2 1/16	16 5/16	(20) 16d	1,570	2,095
ST6224		2 1/16	23 5/16	(28) 16d	1,905	2,540
ST9		1 1/4	9	(8) 16d	665	885
ST12		1 1/4	11 5/8	(10) 16d	830	1,105
ST18		1 1/4	17 3/4	(14) 16d	1,065	1,420
ST22		1 1/4	21 5/8	(18) 16d	1,065	1,420
MSTC28		3	28 1/4	(36) 16d sinkers	2,590	3,455
MSTC40		3	40 1/4	(52) 16d sinkers	3,560	4,745
MSTC52		3	52 1/4	(62) 16d sinkers	3,560	4,745
MSTC66	14	3	65 3/4	(76) 16d sinkers	4,395	5,860
MSTC78		3	77 3/4	(76) 16d sinkers	4,395	5,860
ST6236		2 1/16	33 13/16	(40) 16d	2,885	3,845
MSTI26	12	2 1/16	26	(26) 10dx1 ½	2,060	2,745
MSTI36		2 1/16	36	(36) 10dx1 ½	2,850	3,800
MSTI48		2 1/16	48	(48) 10dx1 ½	3,800	5,065
MSTI60		2 1/16	60	(60) 10dx1 ½	3,810	5,080
MSTI72		2 1/16	72	(72) 10dx1 ½	3,810	5,080

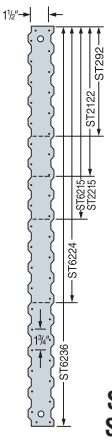
INSTALLATION: Use all specified fasteners.
See the current *Wood Construction Connectors* catalog.

OPTIONS: Special sizes can be made to order.
Contact Simpson Strong-Tie®.

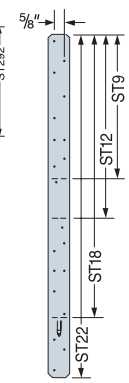
CODES: City of L.A. RR25713



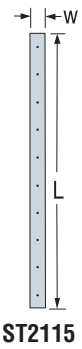
MSTI **LSTI**



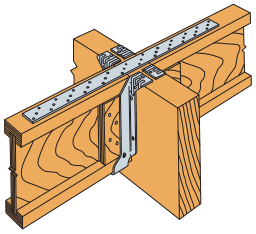
ST



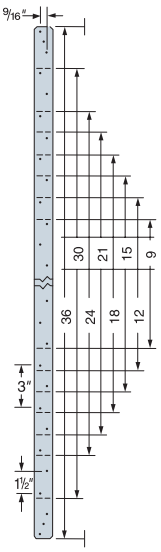
ST9, ST12, ST18, ST22



ST2115



Typical MSTI Installation
(MIT hanger shown)
(LSTI similar)

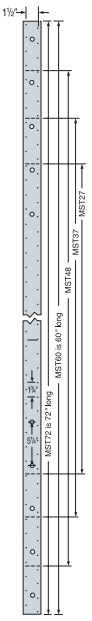


LSTA
(Pilot holes not shown)

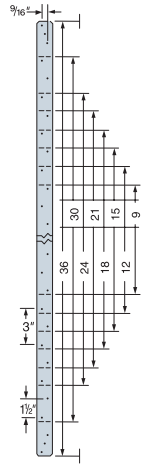
1. Allowable loads have been increased for earthquake or wind load durations with no further increase allowed; reduce where other load durations govern.
2. 10dx1½" nails may be substituted where 16d sinkers or 10d are specified at 100% of the table loads except where straps are installed over sheathing.
3. 10d commons may be substituted where 16d sinkers are specified at 100% of table loads.
4. 16d sinkers (0.148" dia. x 3¼" long) or 10d commons may be substituted where 16d commons are specified at 0.84 of the table loads.
5. Use half of the nails in each member being connected to achieve the listed loads.
6. Subject to building department approval, where used in wall anchorage systems in a rigid wall/flexible diaphragm building, the ASD wall anchorage force (f_p) must be multiplied by 1.4 or 1.7 *(steel strength design factor)* per LABC Chapter 16 or 91/96, respectively. Additionally, when designing per LABC Chapters 91/96, the allowable tabulated loads shall be reduced by (100/160).
7. **NAILS:** 16d = 0.162" dia. x 3½" long, 16d Sinker = 0.148" dia. x 3¼" long, 10d = 0.148" dia. x 3" long. 10dx1½ = 0.148" dia. x 1½" long. See the current *Wood Construction Connectors* catalog for other nail sizes and information.

City of Los Angeles RR Values
Straps

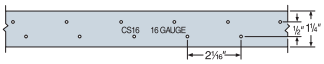
Model No.	Clear Span (in.)	Fasteners (Total)	Allowable Tension Loads DF/SP (lbs.)	
			Straps Used as Holdowns in Shear Walls (25% Reduction)	Straps Not Used as Holdowns in Shear Walls
			(160)	(160)[4]
MSTA49	18	(26) 10d	1,515	2,020
	16	(26) 10d	1,515	2,020
MSTC28	18	(12) 16d sinkers	865	1,155
	16	(16) 16d sinkers	1,155	1,540
MSTC40	18	(28) 16d sinkers	2,020	2,695
	16	(36) 16d sinkers	2,600	3,465
MSTC52	18	(44) 16d sinkers	3,175	4,235
	16	(48) 16d sinkers	3,465	4,620
MSTC66	18	(64) 16d sinkers	4,395	5,860
	16	(68) 16d sinkers	4,395	5,860
MSTC78	18	(76) 16d sinkers	4,395	5,860
	16	(76) 16d sinkers	4,395	5,860
MST37	18	(20) 16d	1,850	2,465
	16	(22) 16d	2,035	2,710
MST48	18	(32) 16d	2,770	3,695
	16	(34) 16d	2,770	3,695
MST60	18	(46) 16d	3,625	4,830
	16	(48) 16d	3,625	4,830
MST72	18	(46) 16d	3,625	4,830
	16	(48) 16d	3,625	4,830



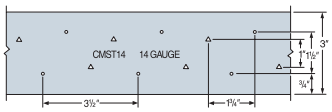
MST



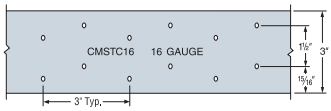
MSTA
(Pilot holes not shown)



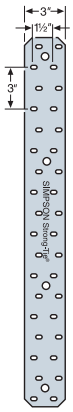
CS16 Hole Pattern
(all other CS straps similar)



CMST14 Hole Pattern
(CMST12 similar)

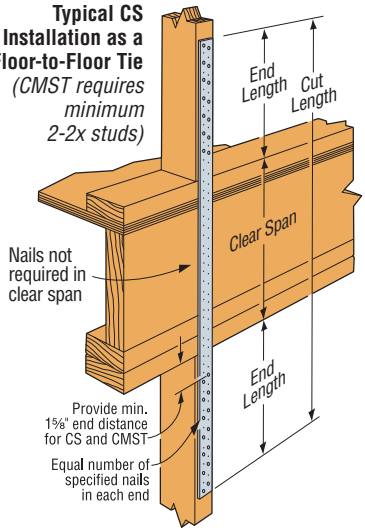


CMSTC16 Hole Pattern



MSTC28

Typical CS Installation as a Floor-to-Floor Tie
(CMST requires minimum 2-2x studs)



CMSTC provides nail slots for easy installation and coined edges; it can be cut to length. CS are continuous utility straps which can be cut to length on the job site. Packaged in 40-pound cartons.

FINISH: Galvanized. Some products available in ZMAX® coating; see current *Wood Construction Connectors* catalog and corrosion information.

INSTALLATION: • Use all specified fasteners. See the current *Wood Construction Connectors* catalog.

- Wood shrinkage after strap installation across horizontal wood members may cause strap to buckle outward.
- Refer to the applicable code for minimum nail penetration and minimum wood edge and end distances.
- The table shows the maximum allowable loads and the nails required to obtain them. Fewer nails may be used; reduce the allowable load as shown in footnote #3.
- The cut length of the strap shall be equal to twice the "End Length" noted in the table plus the clear span dimension.
- CMST only–Use every other round hole if the wood tends to split. Use round and triangle holes for comparable MST loads, providing wood does not tend to split.
- For lap splice and alternate nailing information, refer to technical bulletin T-CMST.
- CS straps are available in 25' lengths, order CS14-R, CS16-R, CS18-R, CS20-R or CS22-R.

CODES: City of L.A. RR25713

Model No.	Total Length (ft.)	Ga.	DF/SP		Allowable Tension Loads DF/SP (lbs.)	
			Fasteners (Total)	End Length (in.)	Straps Used as Holdowns in Shear Walls (25% Reduction)	Straps Not Used as Holdowns in Shear Walls[4]
					(160)	(160)
CMST12	40	12	(84) 16d	38	6,910	9,215
			(98) 10d	44	6,910	9,215
CMST14	52.5	14	(66) 16d	30	4,870	6,490
			(78) 10d	36	4,870	6,490
CMSTC16	54	16	(56) 16d sinker	22	3,440	4,585
CS14	100	14	(30) 10d	17	1,870	2,490
			(36) 8d	20	1,870	2,490
CS16	150	16	(22) 10d	13	1,280	1,705
			(26) 8d	15	1,280	1,705
CS18	200	18	(18) 10d	11	1,030	1,370
			(22) 8d	13	1,030	1,370
CS20	250	20	(14) 10d	9	775	1,030
			(18) 8d	11	775	1,030
CS22	300	22	(12) 10d	7	635	845
			(14) 8d	9	635	845

1. Loads include a 60% wood load duration increase on the fasteners for wind or seismic loading.
2. Use half of the required nails in each member being connected to achieve the listed loads.
3. Calculate the connector value for a reduced number of nails as follows:

$$\text{Allowable Load} = \frac{\text{No. of Nails Used}}{\text{No. of Nails in Table}} \times \text{Table Load}$$

Example: CMSTC16 in DF/SP with 40 nails total.
(Half of the nails in each member being connected)

$$\text{Allowable Load} = \frac{40 \text{ Nails (Used)}}{50 \text{ Nails (Table)}} \times 4{,}585 \text{ lbs.} = 3{,}668 \text{ lbs.}$$

4. Subject to building department approval, where used in wall anchorage systems in a rigid wall/flexible diaphragm building, the ASD wall anchorage force (f_p) must be multiplied by 1.4 or 1.7 *(steel strength design factor)* per LABC Chapter 16 or 91/96, respectively. Additionally, when designing per LABC Chapters 91/96, the allowable tabulated loads shall be reduced by (100/160).
5. **NAILS:** 16d = 0.162" dia. x 3½" long, 16d Sinker = 0.148" dia. x 3¼" long, 10d = 0.148" dia. x 3" long. See the current *Wood Construction Connectors* catalog for other nail sizes and information.
6. 10d common nails may be substituted where 16d sinkers are specified at 100% of the table loads.
7. 16d sinkers (0.148" dia. x 3¼" long) or 10d commons may be substituted where 16d commons are specified at 0.84 of the table loads.
8. Straps not installed over sheathing with 10d (0.148 dia. x 3" long) nails specified may be substituted with 10dx1½ (0.148 dia. x 1½" long) with no reduction in load.

City of Los Angeles RR Values
Flexible Diaphragm-to-Wall Anchorage Assemblies

HDU Holdowns for Use in Concrete or Masonry Wall Anchorage Assemblies to Flexible Diaphragm Applications

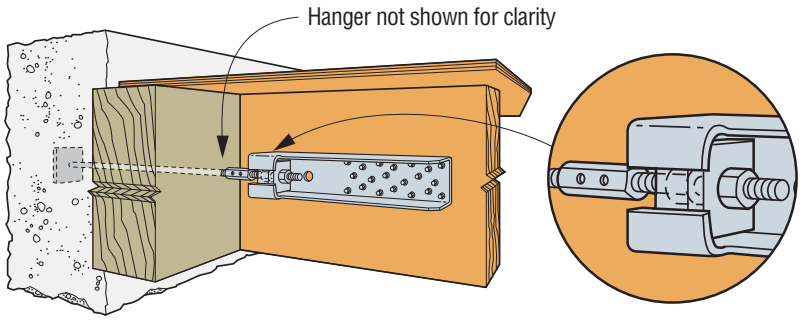
Model No.	Fasteners		Minimum Wood Member Thickness (in.)	Allowable Tension Loads (lbs.) and Governing Load Case[a,b,c]	
	Anchor Bolt Dia. (in.)	Strong-Drive® SDS Screws		Chapter 16	Chapters 91 and 96
HDU2	5/8	(6) ¼"x1½" SDS	3	1,810[c]	1,500[c]
HDU2-SDS2.5		(6) ¼"x2½" SDS		2,445[a]	2,055[a]
HDU4	5/8	(10) ¼"x1½" SDS	3	3,105[a]	2,500[c]
HDU4-SDS2.5		(10) ¼"x2½" SDS		3,485[a]	2,630[b]
HDU5	5/8	(14) ¼"x1½" SDS	3	3,960[a]	2,440[b]
HDU5-SDS2.5		(14) ¼"x2½" SDS		3,960[a]	3,325[a]
HDU8	7/8	(20) ¼"x1½" SDS	3	5,980[a]	5,000[b]
HDU8-SDS2.5		(20) ¼"x2½" SDS			
		(20) ¼"x2½" SDS	3½	6,945[a]	4,215[b]
		(20) ¼"x2½" SDS	4½	6,945[a]	5,345[b]
HDU11-SDS2.5[5]	1	(30) ¼"x2½" SDS	5½	8,315[a]	4,540[b]
			5½	8,315[a]	5,500[b]
HDU14-SDS2.5[5]	1	(36) ¼"x2½" SDS	7¼	9,850[a]	5,550[b]
			5½ x 5½	9,960[a]	5,575[b]

1. The ASD wall anchorage force (f_p) does not need to be multiplied by 1.4 or 1.7 *(steel strength design factor)* per LABC Chapters 16 or 91/96, respectively, as they have already been accounted for in the determination of the allowable loads.
2. For holdown dimensions, see pages 9-12.
3. The Designer must specify anchor bolt type, length and embedment.
4. Requires heavy-hex anchor nut to achieve tabulated loads *(supplied with holdown)*.
5. Tabulated loads may be doubled when the holdown is installed on opposite sides of the wood members. For screw and nail holdowns, either the wood member must be large enough to prevent opposing holdown fastener interference or the holdowns must be offset to elimnate fastener interferences. The Designer must evaluate the capacity of the wood member and the anchorage.
6. Standard cut washer is required under anchor nut for HD19 with 1⅛" anchor.
7. **NAILS:** 16dx2½ = 0.162" dia. x 2½" long; 10d = 0.148" dia. x 3" long; 10d x 1½ = 0.148" dia. x 1½" long.

HDQ8 and HHDQ Holdowns for Use in Concrete or Masonry Wall Anchorage Assemblies to Flexible Diaphragm Applications

Model No.	Fasteners		Minimum Wood Member Thickness (in.)	Allowable Tension Loads (lbs.) and Governing Load Case[a,b,c]	
	Anchor Bolt Dia. (in.)	Strong-Drive® SDS Screws		Chapter 16	Chapters 91 and 96
HDQ8	7/8	(20) ¼"x1½" SDS	3	5,715[a]	5,000[c]
		(20) ¼"x2½" SDS	3	5,715[a]	5,000[c]
			4½	7,280[a]	5,665[b]
HDQ8-SDS3		(20) ¼"x3" SDS	3	5,715[a]	5,000[c]
			3½	7,280[a]	5,665[b]
			4½	9,060[a]	6,965[b]
HHDQ11-SDS2.5[5]	1	(24) ¼"x2½" SDS	5½	8,550[a]	5,770[b]
HHDQ14-SDS2.5[5]	1	(30) ¼"x1½" SDS	7¼	10,160[a]	8,535[a]

Legend of Governing Criteria
a = ultimate load value on steel jig ÷ (3 x 1.4) (Chapter 16) or ultimate load value on steel jig ÷ (5) (Chapters 91 and 96)
b = deflection on wood assembly at 3/8" ÷ 3 (Chapter 16) or at 3/8" ÷ 5 (Chapters 91 and 96)
c = the fastener value in accordance with 2014 LABC with load duration of 160 (Chapter 16) or 100 (Chapters 91 and 96)
Note: Lowest load of three tested conditions or average load of six tested conditions were taken for criteria "a" and "b" above.

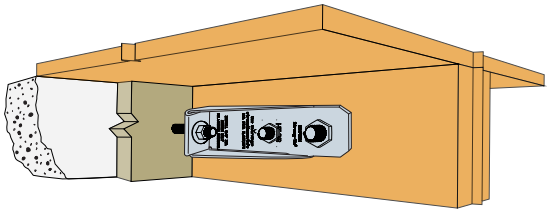


City of Los Angeles RR Values
Flexible Diaphragm-to-Wall Anchorage Assemblies

HD and HDB Holdowns for Use in Concrete or Masonry Wall Anchorage Assemblies to Flexible Diaphragm Applications

Model No.	Fasteners		Minimum Wood Member Thickness (in.)	Allowable Tension Loads (lbs.) and Governing Load Case[a,b,c]	
	Anchor Bolt Dia. (in.)	Stud Bolts		Chapter 16	Chapters 91 and 96
HD3B	5/8	(2) 5/8	1 1/2	1,420[b]	750[b]
			2 1/2	1,955[b]	1,250[b]
			3	2,815[b]	1,960[c]
HD5B	5/8	(2) 3/4	2 1/2	3,660[b]	2,135[b]
			3 1/2	3,980[b]	2,245[b]
HD7B	7/8	(3) 3/4	3	5,620[a]	2,955[b]
HD9B	7/8	(3) 7/8	3 1/2	6,045[b]	3,680[b]
			4 1/2	5,505[b]	2,225[b]
HD12	1 1/8	(4) 1	3 1/2	7,225[b]	3,555[b]
			4 1/2	9,180[b]	5,545[b]
			5 1/2	8,610[b]	4,130[b]
			7 1/4	6,550[b]	3,175[b]
			5 1/2 x 5 1/2	10,680[a]	5,135[b]
HD19[7]	1 1/8	(5) 1	7 1/4	8,595[b]	4,315[b]
			5 1/2 x 5 1/2	7,405[b]	3,785[b]
	1 1/4	(5) 1	7 1/4	11,135[b]	4,865[b]
			5 1/2 x 5 1/2	16,270[a]	9,925[b]

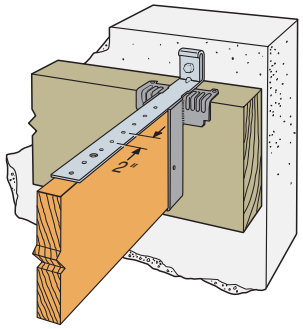
1. The ASD wall anchorage force (f_p) does not need to be multiplied by 1.4 or 1.7 *(steel strength design factor)* per LABC Chapters 16 or 91/96, respectively, as they have already been accounted for in the determination of the allowable loads.
2. For holdown dimensions, see pages 9–12.
3. The Designer must specify anchor bolt type, length and embedment.
4. Requires heavy hex anchor nut to achieve tabulated loads *(supplied with holdown)*.
5. Tabulated loads may be doubled when the holdown is installed on opposite sides of the wood members. For screw and nail holdowns, either the wood member must be large enough to prevent opposing holdown fastener interference or the holdowns must be offset to elimnate fastener interferences. The Designer must evaluate the capacity of the wood member and the anchorage.
6. Standard cut washer is required under anchor nut for HD19 with 1 1/8" anchor.
7. **Nails**: 16dx2 1/2 = 0.162" dia. x 2 1/2" long; 10d = 0.148" dia. x 3" long; 10d x 1 1/2 = 0.148" dia. x 1 1/2" long.



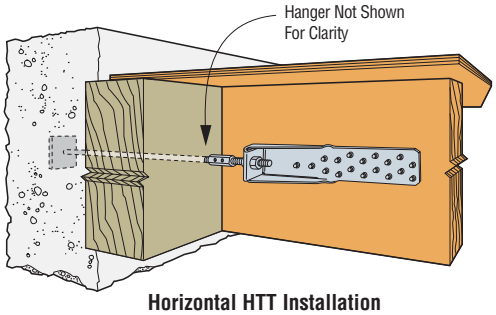
Horizontal HDB Installation

LTT and HTT Tension Ties for Use in Concrete or Masonry Wall Anchorage Assemblies to Flexible Diaphragm Applications

Model No.	Fasteners		Minimum Wood Member Thickness (in.)	Allowable Tension Loads (lbs.) and Governing Load Case[a,b,c]	
	Anchor Bolt Dia. (in.)	Fasteners		Chapter 16	Chapters 91 and 96
LTT19	1/2, 5/8, or 3/4	(8) 10dx1 1/2	3	825[b]	455[b]
		(8) 10d		865[b]	370[b]
LTT20B	1/2, 5/8, or 3/4	(10) 10dx1 1/2	3	535[b]	385[b]
		(10) 10d		630[b]	320[b]
		(2) 1/2" Bolt		840[b]	490[b]
LTTI31	5/8	(18) 10dx1 1/2	3	490[b]	265[b]
HTT4	5/8	(18) 10dx1 1/2	3	3,610[a]	2,665[c]
		(18) 16dx2 1/2		3,650[a]	2,645[b]
HTT5	5/8	(26) 10dx1 1/2	3	3,685[a]	2,110[b]
		(26) 10d		3,685[a]	3,095[a]
		(26) 16dx2 1/2		3,685[a]	3,085[b]
HTT5KT	5/8	(26) SD #10x2 1/2	3		
HTT5-3/4	3/4	(26) 10dx1 1/2	3		
		(26) SD #10x1 1/2			
		(26) 16dx2 1/2			



Horizontal LTT19 Installation
(LTT20B similar)



Horizontal HTT Installation

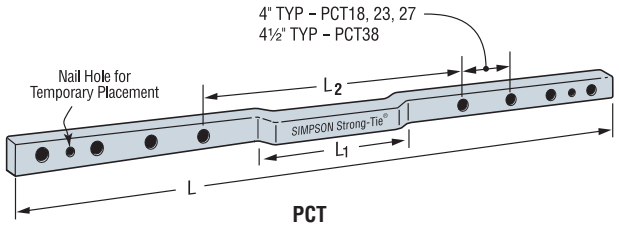
Legend of Governing Criteria
a = ultimate load value on steel jig ÷ (3 x 1.4) (Chapter 16) or ultimate load value on steel jig ÷ (5) (Chapters 91 and 96)
b = deflection on wood assembly at 3/8" ÷ 3 (Chapter 16) or at 3/8" ÷ 5 (Chapters 91 and 96)
c = the fastener value in accordance with 2014 LABC with load duration of 160 (Chapter 16) or 100 (Chapters 91 and 96)
Note: Lowest load of three tested conditions or average load of six tested conditions were taken for criteria "a" and "b" above.

City of Los Angeles RR Values
PCT Purlin Cross Tie *(Used in Flexible Diaphragm-to-Wall Anchorage Assemblies)*

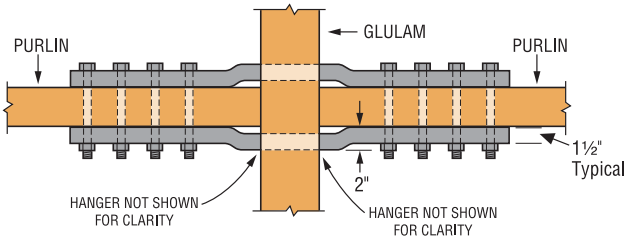
FEATURES:
- Designed using a section that works in both tension and compression.
- Tube section helps with drilling alignment, through the purlin.
- Offset angle to allow drilling access through glulam.

MATERIAL: 1½" square tube steel ASTM A500 Grade B
FINISH: Galvanized.
INSTALLATION:
- Use all specified fasteners. Refer to the current Simpson Strong-Tie® *Wood Construction Connector* catalog for General Notes and warranty information.
- PCT18 and 23 are sized to span a maximum hanger seat depth ("B" dimension) of 4".
  PCT27 and 38 are sized to span a maximum hanger seat depth ("B" dimension) of 6".
- 2½" or a 2⁹⁄₁₆" diameter hole required.
- Install in pairs.

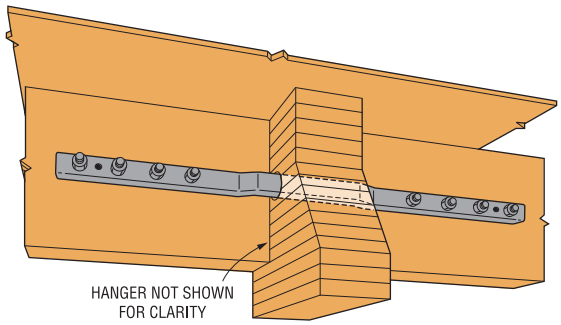
OPTIONS: Contact Simpson Strong-Tie for other lengths.
CODES: City of L.A. RR25719.



PCT
U.S. Patent 6,862,854



PCT Installed in Pairs
(Top View)



Typical PCT Installation

PCT Purlin Cross Ties for Use in Concrete Masonry Wall Anchorage Assemblies to Flexible Diaphragm Applications

Model No.	Dimensions (in.)			Total Length (in.)	Fasteners Dia.	Allowable Load per Pair of PCT (lbs.)						
						Steel Tension[6]	Steel Compression[6]	Bolts (Double Shear) Length of Bolt in Purlin – DF/SP				
	L	L_1	L_2					3⅛"	3½"	5⅛"	5½"	6¾"
Wall Anchorage Design per LABC Chapter 16 (C_D = 1.6)												
PCT18	44¾	14	17¾	44¾	(8) ⅝" MB	17,620[a]	13,690[a]	17,235[c]	18,170[b]	18,170[b]	18,170[b]	18,170[b]
PCT23	52¾	14	17¾	52¾	(10) ⅝" MB	17,620[a]	13,690[a]	18,170[b]	18,170[b]	18,170[b]	18,170[b]	18,170[b]
PCT27	66¾	19½	23½	66⅝	(12) ⅝" MB	28,335[a]	20,475[a]	24,855[c]	27,705[c]	28,400[c]	28,430[c]	28,255[c]
PCT38	71⅝	19½	23½	71⅝	(12) ¾" MB	25,260[a]	18,595[a]	25,540[b]	25,540[b]	25,540[b]	25,540[b]	25,540[b]
Wall Anchorage Design per LABC Chapters 91 and 96 (C_D = 1.0)												
PCT18	44¾	14	17¾	44¾	(8) ⅝" MB	14,800[a]	11,500[a]	10,770[c]	10,900[b]	10,900[b]	10,900[b]	10,900[b]
PCT23	52¾	14	17¾	52¾	(10) ⅝" MB	14,800[a]	11,500[a]	10,900[b]	10,900[b]	10,900[b]	10,900[b]	10,900[b]
PCT27	66¾	19½	23½	66⅝	(12) ⅝" MB	23,800[a]	17,200[a]	15,535[c]	17,315[c]	17,730[b]	17,730[b]	17,660[c]
PCT38	71⅝	19½	23½	71⅝	(12) ¾" MB	15,620[a]	15,618[a]	15,320[b]	15,320[b]	15,320[b]	15,320[b]	15,320[b]

1. Loads shall not be increased for short-term wood load duration factor nor the one-third steel stress increase.
2. Install PCT purlin crossties in pairs.
3. Minimum bolt length is: Purlin width + 3" (PCT) + 1" (nut).
4. Allowable loads for bolts assume a purlin with a minimum depth of 10½".
5. Designer is responsible for evaluating all wood members.
6. The ASD wall anchorage force (f_p) does not need to be multiplied by 1.4 or 1.7 *(steel strength design factor)* per LABC Chapters 16 or 91/96, respectively, as they have already been accounted for in the determination of the allowable loads.
7. Designer to take lower of steel or bolt value.

Legend of Governing Criteria
a = ultimate load value on steel jig ÷ (3 x 1.4) (Chapter 16) or ultimate load value on steel jig ÷ (5) (Chapters 91 and 96)
b = deflection on wood assembly at ⅜" ÷ 3 (Chapter 16) or at ⅜" ÷ 5 (Chapters 91 and 96)
c = the fastener value in accordance with 2014 LABC with load duration of 160 (Chapter 16) or 100 (Chapters 91 and 96)

Example 1: Design per 2014 LABC Chapter 16 Using This Bulletin and City of Los Angeles RR25828 into Concrete

Determine out-of-plane wall anchorage force, F_p (strength), for a **tilt-up concrete** building designed per **Chapter 16** of the 2014 Los Angeles City Building Code. Divide the wall anchorage design force, F_p (strength), by 1.4 to convert to allowable stress design (ASD). For this example, assume F_p (strength) = 6,500 lbs.:

Therefore, F_p = 6,575 lbs. / 1.4 = 4,642 lbs.

1) Pre-manufactured holdown connector check:
From page 16 of this bulletin, or Table B of RR25828, the allowable capacity of a Simpson Strong-Tie® HD3B with (2) ⅝" diameter bolts used in the wall anchorage assembly is 2,815 lbs. Use **one HD3B holdown** on each side of 4x purlin for concentric anchorage (total two HD3B).

Allowable capacity = $\mathbf{P_{all}}$ = 2,815 lbs. x 2 = 5,630 lbs. > 4,696 lbs. **OK**

Note: for this example, the governing limit state is deflection as indicated in the footnotes on page 16.

2) Anchor bolt in concrete wall check per 2014 LABC Chapter 19 (Strength):
Assume the following:
- 9" thick concrete wall
- Minimum 10" edge distance from edge of wall panel
- f'c = 3,000 psi concrete compressive strength
- Cracked concrete
- No supplementary reinforcement

One **⅝" diameter anchor bolt**. for each HD3B each side of 4x purlin
Actual spacing between the HD3B, ⅝" diameter anchors = (1⅜" x 2) + 3½" = 6¼"

Using the Simpson Strong-Tie® Anchor Designer Software for ACI 318 in accordance with Appendix D, (2) ⅝" diameter headed anchor bolts embedded 5½" and spaced 6¼" apart have a concrete breakout strength of 12,274 lbs. The design is governed by concrete and is considered to be a brittle failure. Over-strength was not applied in this example in accordance with 2014 LABC Section 1905.1.9. For further information, refer to the 2011 LABC. The 2011 LABC Section 1908.1.9 exempted anchors resisting wall out-of-plane forces from the requirements of ACI 318 Section D3.3.5, or the strength reduction factor, 0.4, for brittle failure. This is a change from 2008 LABC Section 1908.1.16.

Therefore, (2) Simpson Strong-Tie HD3B holdowns with (2) ⅝" diameter bolts into the purlin and ⅝" diameter anchor bolts embedded 5½" are adequate. See Figure 1 for Anchorage Detail. The design of the 9" concrete wall and 4x purlin is outside the scope of this example. The Designer shall design these elements in accordance with all applicable codes.

Details for Example 1: Design per 2014 LABC Chapter 16 Using This Technical Bulletin

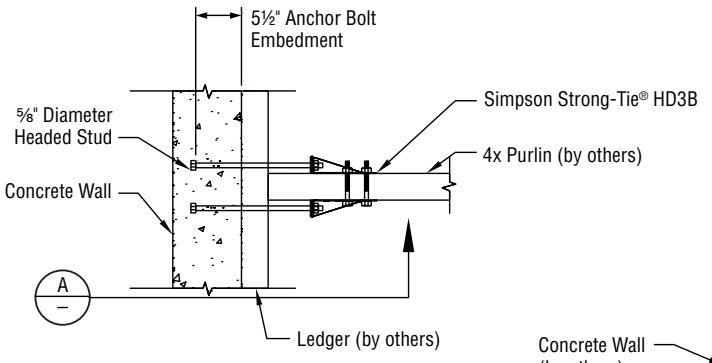


Figure 1A – Plan View of Wall Anchorage

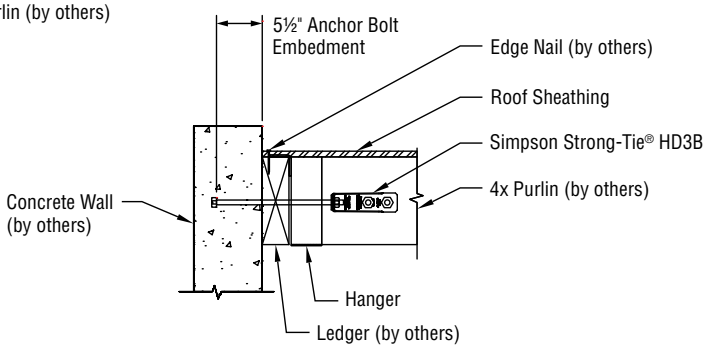


Figure 1B – Section A

Example 2: Design per 2014 LABC Chapter 16 using this bulletin and City of Los Angeles RR25720 in CMU

Determine out of plane wall anchorage force, F_p (strength), for a **CMU** building designed per **Chapter 16** of the 2014 Los Angeles City Building Code. Divide the wall anchorage design force, F_p (strength), by 1.4 to convert to allowable stress design (ASD). For this example, assume F_p (strength) = 4,000 lbs.

Design force: $\mathbf{F_p}$ = 4,000 lbs. / 1.4 = 2,857 lbs. (ASD)

1) Pre-manufactured anchor connector check:
From page 15 of the bulletin or Table I of Research Report RR 25720, the allowable capacity of Simpson Strong-Tie® **HDU2** with ¼"x1½" Strong-Drive® SDS Heavy-Duty Connector screws used in the wall anchorage assembly is 1,810 lbs.

Use one **HDU2** on each side of 4x purlin for concentric anchorage (total two HDU2).
Allowable capacity = $\mathbf{P_{all}}$ = 1,810 lbs. x 2 = 3,620 lbs > 2,857 lbs. **OK**

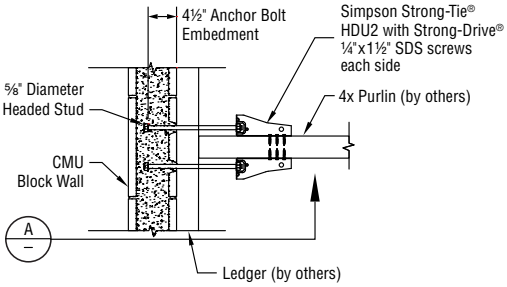


Figure 1A – Plan View of Wall Anchorage

2A) Anchor bolt in 8" CMU wall check per 2014 LABC 2107.1 (ASD):

f'_m = 1,500 psi, No special inspection, Length of headed stud bolt embedment = l_b = 3½".
One **⅝" diameter anchor bolts** for each HDU2 on each side of 4x purlin.

Allowable load in tension, B_a, shall be the lesser of the following per ACI 530-11 Section 2.1.4.3.1.1:

$B_{ab} = 1.25A_{pt}\sqrt{(f'm)}$ $\quad B_{as} = 0.6A_bf_y$

Where: $A_{pt} = \pi l_b^2$ with any adjustments per Section 1.17.2

Actual spacing between the HDU2, ⅝" diameter anchors = (1⅜" x 2) + 3½" = 6¼", which is 6.25/3.5 = 1.79 times the embedment depth or 1.79 l_b.

Reduction due to anchor tension cone overlap (Ref. Reinf. Masonry Engin. Hdbk. Table ASD-7c) = R; Therefore, from RMEH Table ASD-7c, R = 0.97.

$A_{pt} = \pi l_b^2 = \pi\ (3.5)^2 = 38.5\ in^2$
$B_{ab} = 1.25A_{pt}\sqrt{(f'm)}$ (R)(1.33) = 1.25 (38.5) $\sqrt{1500}$ (0.97) (1.33) = 2,405 lbs. (ASD) **governs**
$B_{as} = 0.6A_bf_y$ = 0.6 (0.307) (36,000) (1.33) = 8,819 lbs. (ASD)

$\mathbf{P_t}$ = 2,405 lbs. x (2 anchor bolts) = 4,810 lbs. > 2,857 lbs. (ASD) **OK**

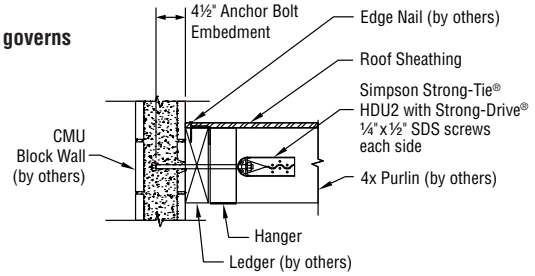


Figure 1B – Section A

OR

2B) Anchor bolt in 8" CMU wall check per 2014 LABC 2108.1 (Strength Design):

f'_m = 1,500 psi, Special inspection required, Length of embedment = l_b = 3½".

One **⅝" diameter A.B.** for each HDU2 on each side of 4x purlin.

Actual spacing between the HDU2, ⅝" diameter anchors = (1⅜" x 2) + 3½" = 6¼", which is 6.25/3.5 = 1.79 times the embedment depth or 1.79 l_b.

Reduction due to anchor tension cone overlap (Reference Reinforced Masonry Engineering Handbook Table ASD-7c) = R; Therefore, from RMEH Table ASD-7c, R = 0.97

Per ACI 530-11, Section 3.1.3, the design tensile strength = ϕB_{an}.

Per Section 3.1.6.3.1.1, B_{an} is taken as the lower of:
$B_{an} = 4\ A_{pt}\sqrt{(f'm)}$ (R)
$B_{ans} = A_b\ f_y$

$A_{pt} = \pi l_b^2 = \pi\ (3.5)^2 = 38.5\ in^2$
$B_{anb} = 4\ A_{pt}\sqrt{(f'm)}$ (R) = 4 (38.5) $\sqrt{1500}$ (0.97) = 5,785 lbs. **governs**
$B_{ans} = A_b\ f_y$ = (0.307) (36,000) = 11,052 lbs.

In accordance with Section 3.1.4.1, ϕ shall be taken as 0.50 when anchor design is controlled by masonry breakout.
Thus, ϕB_{an} = 0.50 (5,785 lbs.) (2 anchor bolts) = 5,785 lbs. > 4,000 lbs. (Strength) **OK**

Therefore, (2) Simpson Strong-Tie HDU2 holdowns with ¼"x1½" Strong-Drive® SDS Heavy-Duty Connector screws and ⅝" diameter anchor bolts embedded 4½" are adequate. The design of the CMU block wall and 4x purlin is outside the scope of this example. The Designer shall design these elements in accordance with all applicable codes.

Example 3: Design per 2014 LABC Chapter 91 or 96 using this bulletin and City of Los Angeles RR25828 into Concrete

Determine the out-of-plane allowable stress design level wall anchorage design force (F) for a **tilt-up concrete** building designed per **Chapter 91 or 96** of the 2014 Los Angeles City Building Code. For this example, assume F(ASD) = 3,150 lbs.

Design force: **F(ASD)** = 3,150 lbs.

1) Pre-manufactured anchor connector allowable capacity for design per 2014 LABC Chapter 91 or 96:

From page 16 of this bulletin or Table B of Research Report RR 25828, the allowable capacity of Simpson Strong-Tie® HD5B bolt holdowns used in the wall anchorage assembly is 2,135 lbs. Use one **HD5B holdown** on each side of 3x purlin for concentric anchorage.

Allowable capacity = $\mathbf{P_{all}}$ = 2,135 lbs. x 2 = 4,270 lbs. > 3,150 lbs. **OK**

2) Anchor bolt in concrete wall check per 2014 LABC Chapter 19 (Strength):

One **⅝" diameter F1554, Grade 36 all-thread rod** embedded into Simpson Strong-Tie® SET-XP® high-strength anchoring adhesive for each HD5B each side of 3x purlin. Assume the following:

- 9" thick concrete wall
- Minimum 14" edge distance from top of wall
- 2,500 psi concrete compressive strength
- Cracked concrete
- No supplementary reinforcement
- Calculated strength force = ASD x 2.0 per Section 9108.2. 3,150 lbs. x 2 = 6,300 lbs.

Actual spacing between HD5B, ⅝" diameter anchors = (1¼" x 2) + 3½" = 6"

The design is governed by concrete and is considered to be a brittle failure. Over-strength was not applied in this example in accordance with 2014 LABC Section 1905.1.9. For further information, refer to the 2011 LABC. The 2011 LABC Section 1908.1.9 exempted anchors resisting wall out-of-plane forces from the requirements of ACI 318 Section D3.3.5, or the strength reduction factor, 0.4, for brittle failure. This is a change from 2008 LABC Section 1908.1.16

Therefore, use (2) Simpson Strong-Tie HD5B holdowns with ⅝" dia. ASTM F1554 GR36 all-thread rods embedded 5½" with Simpson Strong-Tie SET-XP. The evaluation of the existing purlin and concrete wall is outside the scope of this example. The Designer shall evaluate these elements in accordance with all applicable codes.

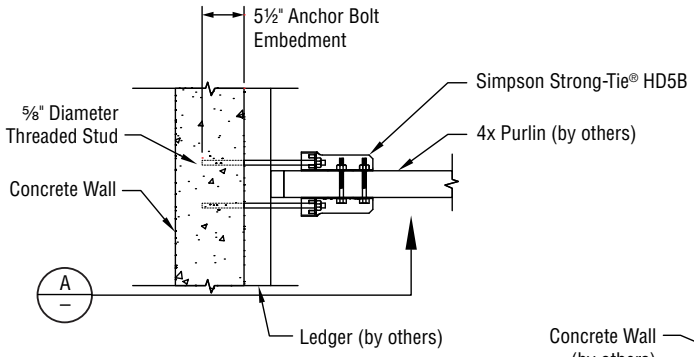


Figure 1A – Plan View of Wall Anchorage

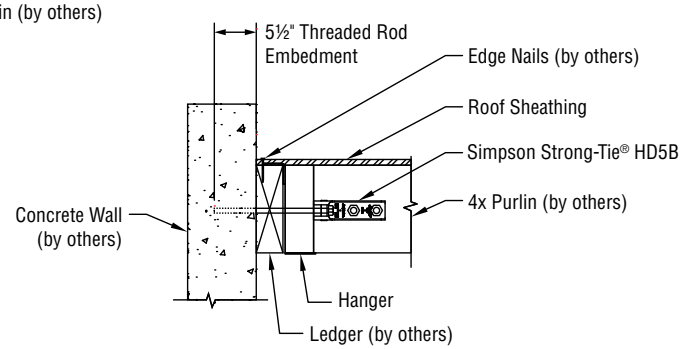


Figure 1B – Section A