



### EVALUATION SUBJECT: SIMPSON STRONG-TIE BOLT HOLD-DOWNS

#### REPORT HOLDER:

**Simpson Strong-Tie Company, Inc.**  
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**CSI Division: 06-WOOD, PLASTICS AND COMPOSITES**

**CSI Section: 06 05 23-Wood, Plastic, and Composite Fastenings**

### 1.0 SCOPE OF EVALUATION

#### 1.1 Compliance to the following codes & regulations:

- 2015 International Building Code® (IBC)
- 2015 International Residential Code® (IRC)
- 2012 International Building Code® (IBC)
- 2012 International Residential Code® (IRC)
- 2009 International Building Code® (IBC)
- 2009 International Residential Code® (IRC)
- 2006 International Building Code® (IBC)
- 2006 International Residential Code® (IRC)

#### 1.2 Evaluated in accordance with:

- ICC-ES AC155, Acceptance Criteria for Hold-Downs (Tie-Downs) Attached To Wood Members, Approved May 2015

#### 1.3 Properties assessed:

- Structural

### 2.0 PRODUCT USE

Simpson Strong-Tie bolt hold-down connectors are used as wood framing anchorage, such as to connect wood posts to concrete foundations or to connect an upper-story wood post to a lower-story supporting wood post, pursuant to 2015 IBC Sections 2304.10.3 and 2305.1, 2012 (2009) IBC Sections 2304.9.3, 2305.1, 2308.9.3.1, 2308.9.3.2, or 2006 IBC Sections 2304.9.3, 2305.1, 2305.3.2, 2305.3.7, 2305.3.8.2.4 and 2308.9.3.1, ANSI/AWC SDPWS-2015 Special Design Provisions for Wind and Seismic Sections 4.3.6.4.2 and 4.3.6.1.3 and AFP&A SDPWS-2008 (2005) Special Design Provisions for Wind and Seismic Sections 4.3.6.4.2 and 4.3.6.1.2. As required by IBC Section 1604.8, the hold-down connectors are used as anchorage of concrete and masonry walls to structural wood elements to provide lateral support for the walls.

When regulated under the IRC, the hold-down connectors may also be used when their tabulated load meets or exceeds that required by the IRC or when an engineered design is submitted in accordance with IRC Section R301.1.3 or in alternate braced wall panels per 2015 (2012) IRC Sections R602.10.2.2.1, R602.10.6.1, R602.10.6.2 and R602.10.7, 2009 IRC Sections R502.2.2.3, R602.10.1.4.1(2), R602.10.3.2, R602.10.3.3, R602.10.4.4, and R602.10.5.3, or 2006 IRC Sections R602.10.6.1 and R602.10.6.2. In addition, the hold-down connectors may be used as anchorage of concrete and masonry walls to structural wood elements to provide lateral support for the walls in accordance with 2015 IRC Sections 606.12.2.3 and R608.9.1, 2012 (2009) IRC Sections R606.12.2.3 and R611.9.1 or 2006 IRC Sections R606.12.2.2 and R611.8.2.1.

### 3.0 PRODUCT DESCRIPTION

#### 3.1 Product information

**3.1.1 HDA Bolt Hold-down:** HDA bolt hold-downs consist of a steel strap with bolt holes used to connect the hold-down to the wood member. The lowest bolt in the wood member is seven-bolt diameters from the end of the wood member, and is designed to obtain full load value, if the hold-down is placed flush onto the sill plate. HDA has a load transfer plate, installed in the seat element. This seat eliminates the need for an anchor bolt washer. The body is die-formed from No. 12 gage galvanized steel and the base plate component is manufactured from No. 7 gage galvanized steel. Figure 1, Table 1, and Table 3 of this report provide product dimensions, required fasteners, allowable loads, and displacements.

**3.1.2 HD Bolt Hold-downs:** The HD bolt hold-downs consist of a main structural steel component with pre-punched holes along their side for installation of bolts used to connect the hold-down to the wood member. They have a factory welded load transfer plate at the base with a pre-punched hole for an anchor rod or bolt. HD5 and HD7 are required to be installed raised off the sill plate to ensure the lowest bolt in the wood member is seven bolt diameters from the end of the wood member to obtain full load value. HD9, HD12 and HD19 hold-downs have a tapered leg that extends below the base, which positions the first bolt in the wood member seven bolt diameters from the end of the wood member. The HD5 body is die-formed from No. 7 gage steel. HD7, HD9, HD12 and HD19 bodies are formed from No. 3 gage steel. The base plate component is manufactured from No. 3 gage steel for the HD5, <sup>5</sup>/<sub>16</sub>-inch-thick (7.9 mm) steel for the HD7 and <sup>3</sup>/<sub>8</sub>-inch-thick (9.5mm) steel for the HD9, HD12 and HD19. Figure 1, Table 1 and Table 3 of this report provide product dimensions, required fasteners, allowable loads, and displacements.





**3.1.3 HDB Bolt Hold-downs:** HD3B hold-down is a single-piece formed hold-down consisting of a steel strap with a four-ply formed seat element for an anchor bolt. The straight-strap portion of the hold-down has pre-punched bolt holes for installation of bolts used to connect the hold-down to the wood member. HD3B is die-formed from No. 12 gage galvanized steel. HD5B, HD7B and HD9B bolt hold-downs consist of a main structural steel component with pre-punched holes for installation of bolt fasteners used to connect the hold-down to the wood member. HD5B and HD7B bodies are formed from No. 10 gage galvanized steel. Crossbars are steel bar stock 3/8-inch (9.5 mm) thick by 3/4-inch (19 mm) deep and the washers are formed from 3/16-inch-thick (9.5mm) steel plate. The HD9B body is formed from No. 7 gage galvanized steel and its crossbars are 3/8 inch (9.5 mm) thick by 1 inch (25.4 mm) deep. The washer for HD9B is formed using 3/8-inch (9.5 mm) thick steel plate. Figure 2, Table 2 and Table 3 of this report provide product dimensions, required fasteners, allowable loads, and displacements.

### 3.2 Material information

**3.2.1 Steel:** HDA and HDB hold-downs described in this report are manufactured from ASTM A653 SS Grade 33 galvanized steel having a minimum yield strength ( $F_y$ ) of 33,000 psi (227 MPa) and a minimum ultimate tensile strength ( $F_u$ ) of 45,000 psi (310 MPa). HD hold-down's body and HD5, HD5B and HD7B base plate are fabricated from ASTM A1011 SS Grade 33 steel having a minimum yield strength of 33,000 psi (227 MPa) and a minimum ultimate strength of 52,000 psi (359 MPa). HD7, HD9, HD12, HD19 and HD9B base plates are manufactured from ASTM A36 steel having a minimum yield strength of 36,000 psi (248 MPa) and minimum ultimate strength of 58,000 psi (400 MPa). Base metal thicknesses for the bolt hold-downs in this report are as follows:

THICKNESS/ GAGE	BASE METAL THICKNESS (inches)
3/8 inch	0.3600
5/16 inch	0.2975
No. 3	0.2285
3/16 inch	0.1775
No. 7 (A 653)	0.1715
No. 7 (A 1011)	0.1705
No. 10	0.1275
No. 12	0.0975

For SI: 1 inch = 25.4 mm

HDA hold-downs have a minimum G90 zinc coating specification in accordance with ASTM A653. Some models may also be available with either a G185 zinc coating (indicated by model numbers ending in the letter Z) or with a batch hot-dipped galvanized coating with a minimum specified coating weight of 2.0 ounces of zinc per square foot

of surface area (600 g/m<sup>2</sup>), total for both sides in accordance with ASTM A123 (indicated by model numbers ending with the letters HDG). Model numbers do not list the Z or HDG ending in this report, but the information shown is applicable. HD series bolt hold-downs have a painted finish.

The holder of this report (Simpson Strong-Tie Company) or the lumber treater shall be notified for recommendations on minimum corrosion resistance of steel connectors in contact with the specific proprietary preservative-treated or fire-retardant -treated lumber.

**3.2.2 Wood:** Wood members connected to hold-downs shall be either sawn lumber or engineered lumber. Sawn lumber shall have a minimum specific gravity of 0.50 and a maximum moisture content of 19 percent. Engineered lumber shall have a minimum equivalent specific gravity of 0.50 and a maximum moisture content of 16 percent. Minimum wood member thickness (depth) is specified in Table 1 and Table 2 of this report.

### 3.2.3 Fasteners

**3.2.3.1 Bolts:** Machine bolts shall comply with ANSI/ASME Standard B18.2.1 and with ASTM A307. Minimum bending yield strength ( $F_{yb}$ ) of the bolt shall be 45,000 psi (310 MPa).

**3.2.3.2 Threaded Anchor Rods:** As a minimum, threaded steel anchor rods shall comply with ASTM F1554 Grade 36 or equivalent.

**3.2.3.3 Preservative-treated and fire-retardant-treated wood:** Fasteners used in contact with preservative-treated or fire-retardant-treated lumber shall comply with 2015 IBC Section 2304.10.5, 2012 (2009) (2006) IBC Section 2304.9.5 and 2015 (2012) (2009) IRC Section R317.3 or 2006 IRC Section R319.3. The report holder (Simpson Strong-Tie Company) or lumber treater shall be notified for recommendations on minimum corrosion resistance and connection capacities of fasteners used with the specific proprietary preservative-treated or fire-retardant-treated lumber.

## 4.0 DESIGN AND INSTALLATION

### 4.1 Design

**4.1.1 Hold-Down Assembly:** As shown in Table 1 and Table 2 of this report, the allowable loads are for hold-down assemblies consisting of the following components: (1) hold-down device; (2) an anchor bolt/rod attached to the seat of the device; (3) a wood member having minimum specified dimensions and properties; (4) quantity and size of fasteners used to attach the hold-down device to the wood member; and, in one case as noted, (5) a standard cut washer (Type A plain steel washer (W)) with dimensions conforming to ASME B18.22.1. As shown in the product tables of this report, the allowable loads are based on allowable stress design (ASD). The load values include the load duration factor ( $C_D$ )



corresponding with the applicable loads in accordance with the ANSI/AWC NDS-2015 (2012) (2005) National Design Specification (NDS) for Wood Construction.

Where design load combinations include earthquake loads or effects, story drifts of the structure shall be determined in accordance with Section 12.8.6 of ASCE 7-10 (7-05) except for those structures analyzed using the Simplified Design Procedure pursuant to Section 12.14. When using the basic load combinations in accordance with IBC Section 1605.3.1, the tabulated allowable loads for the hold-down (tie-down) shall not be increased for wind or earthquake loading. When using the alternate basic load combinations in IBC Section 1605.3.2 that include wind or earthquake loads, the tabulated allowable loads for the hold-down (tie-down) shall not be increased by 33<sup>1</sup>/<sub>3</sub> percent, nor shall the alternative basic load combinations be reduced by a factor of 0.75.

Deflection of a shear wall restrained from overturning by hold-downs installed in accordance with this report shall be determined in accordance with 2015 (2012) IBC Section 2305.3 (2009 IBC Section 2305.1) (2006 IBC Section 2305.3.1).

Total deflection values  $\Delta_{all}$  and  $\Delta_s$  at ASD-level and strength-level forces, respectively, for hold-down assemblies shown in Tables 1 and Table 2 of this report, include all sources of hold-down device rotation and extension and anchor rod elongation where the length of the anchor rod is a maximum of 6 inches (152 mm) for the HDA and HDB hold-down and a maximum of 8 inches (203 mm) for the HD series hold-downs. Addition of the hold-down anchor rod elongation to the total elongation (deflection) of the hold-down assembly needs to be evaluated when the actual diameter, length or ASTM steel specification of the anchor rod differs from that shown in this report. When hold-downs are used in series, the cumulative deformation of all hold-downs within that series should be accounted for.

Symbol  $\Delta_s$  as used in this report refers to the symbol  $d_a$  in 2015 (2012) (2009) (2006) IBC Section 2305.3.2 and to the symbol  $\Delta_a$  in 2015 (2008) (2005) ANSI/AF&PA SDPWS Section 4.3.2.

Tabulated allowable loads are for hold-downs connected to wood used under continuously dry interior conditions and where sustained temperatures are 100°F (37.8°C) or less. Allowable loads shown in Table 1 and Table 2 of this report shall be adjusted by the wet service factor ( $C_m$ ) specified in the ANSI/AWC NDS-2015(2012, 2005) when hold-down are fastened to wood having a moisture content greater than 19 percent (16 percent for engineered lumber), or where wet service is anticipated.

Allowable loads shown in Table 1 and Table 2 in this report shall be adjusted by the temperature factor ( $C_t$ ) specified in the ANSI/AWC NDS-2015(2012, 2005) when hold-downs are fastened to wood that will experience sustained exposure to temperatures, exceeding 100°F (37.8°C).

Design of wood members fastened to bolt hold-down devices shall consider combined stresses due to axial tension and flexural bending induced by eccentricity in the connection. Stresses shall be evaluated at the critical net section and shall consider combined flexural bending due to hold-down (tie-down) eccentricity relative to the centroid of the connected wood member ( $M_{xx}$  and  $M_{yy}$ ), and tension (T).

**4.1.2 Hold-Down Devices Used as Anchorage of Structural Walls:** Allowable steel strengths are detailed in Table 3 of this report for the HDA, HDB and HD hold-down devices. Values are for the steel anchorage device independent of the bolts used to attach the hold-down to the wood member and anchor rod. Values are used when designing structural wall anchorage in accordance with Section 12.10 and 12.11.2 of ASCE 7-10 (7-05).

Hold-down assembly strengths in Table 1 and Table 2 of this report may be used for wall anchorage in accordance with 2015 IRC Sections 606.12.2.3 and R608.9.1, 2012 (2009) IRC Sections R606.12.2.3 and R611.9.1 or 2006 IRC Sections R606.12.2.2 and R611.8.2.1.

**4.1.3 Anchorage to Concrete or Masonry:** Adequate embedment length and anchorage details, including edge and end distances shall be determined in accordance with Chapters 19 or 21 of the IBC as applicable, for design of anchorage to concrete and masonry structural members except for those structures designed in accordance with the IRC or the conventional light-frame construction provisions of Section 2308 of the IBC.

**4.2 Installation:** Installation of the Simpson Strong-Tie hold-down connectors shall be in accordance with the manufacturer's published installation instructions and this evaluation report. Where a conflict exists between this report and the manufacturers published installation instructions, the more restrictive shall prevail.

### 4.3 Special Inspection

**4.3.1** A statement of special inspection shall be prepared by the registered design professional in responsible charge and submitted to the building official for approval when required by 2015 (2012) IBC Section 1704.3 or 2009 (2006) IBC Section 1705. A statement of responsibility shall be submitted to the building official for approval when required by 2015 (2012) IBC Section 1704.4, 2009 IBC Section 1709 or 2006 IBC Section 1706 as applicable.

**4.3.2** Periodic special inspection shall be conducted when the HDA, HDB or HD series hold-downs are components within the main wind-force-resisting system of structures constructed in areas listed in 2015 IBC Section 1705.11, 2012 IBC Section 1705.10, 2009 IBC Section 1706.1 or 2006 IBC Section 1705.4. Special inspection requirements do not apply to structures, or portions thereof, that qualify for an exception pursuant to 2015 IBC Sections 1704.2, 1705.3 or 1705.11.1, 2012 IBC Sections 1704.2, 1705.3 or 1705.10.1,



2009 IBC Sections 1704.1, 1704.4, 1706.2 or 1706.3 or 2006 IBC Sections 1704.1 or 1704.4.

**4.3.3** Periodic special inspection for seismic resistance shall be conducted in accordance with 2015 IBC Section 1705.12, 2012 IBC Section 1705.11 or 2009 (2006) Section 1707 where required. Special inspection requirements for seismic resistance do not apply to structures, or portions thereof, that qualify for an exception pursuant to 2015 IBC Sections 1704.2, 1705.12 or 1705.12.2, 2012 IBC Sections 1704.2, 1705.11 or 1705.11.2 or 2009 (2006) Sections 1704.1, 1705.3, 1707.3 or 1707.4.

**4.3.4** For installations under the IRC, special inspection is not normally required. However, when an engineered design is submitted or required pursuant to IRC Section 301.1.3, periodic special inspection requirements and exemptions are as stated in Sections 4.3.1, 4.3.2 and 4.3.3 of this report as applicable.

### 5.0 LIMITATIONS

Simpson Strong-Tie bolt hold-down connectors detailed in this report comply with or are acceptable alternatives to what is specified in those codes listed in Section 1.0 of this report subject to the following conditions:

**5.1** Hold-downs shall be manufactured, identified and installed in concurrence with the manufacturer’s published installation instructions and this report. Where conflicts occur, the more restrictive governs. During installation, a copy of the instructions shall be available at the jobsite at all times.

**5.2** Calculations, drawings, and details shall be submitted to the building official showing compliance with this report. A registered design professional shall prepare the calculations where required by the statutes of the jurisdiction in which the project is to be constructed.

**5.3** Adjustment factors shall be considered, where applicable, as noted in Section 4.1 of this report and the applicable codes. No further duration of load increase for wind or earthquake loading shall be allowed.

**5.4** Connected wood members and fasteners shall comply, respectively, with Sections 3.2.2 and 3.2.3 of this report.

**5.5** Use of hold-down connectors with fire-retardant-treated or preservative-treated lumber shall be in accordance with Section 3.2.1 of this report. Use of fasteners with fire-retardant-treated or preservative-treated lumber shall be in accordance with Section 3.2.3.3 of this report. All such uses are subject to the approval of the code official, since the effects of corrosion of metal in contact with chemically treated wood on the structural performance of the devices is outside the scope of this report.

**5.6** Anchorage to masonry structural members or concrete shall be provided in accordance with Section 4.1.3 of this report.

**5.7** Special inspections for the hold-downs shall be provided in accordance with Section 4.3 of this report.

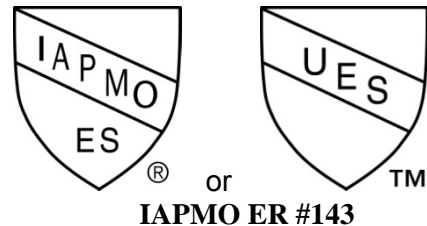
**5.8** Special inspections for anchor bolts in concrete or masonry shall be conducted in accordance with Section 1705.3 or 1705.4 of the 2015 (2012) IBC or Section 1704.4 or 1704.5 of the 2009 IBC.

### 6.0 SUBSTANTIATING DATA

Data in accordance with ICC-ES Acceptance Criteria for Hold-Downs (Tie-Downs) Attached to Wood Members (AC155), Approved May 2015, inclusive of tests and calculations. Test results are from laboratories in compliance with ISO/IEC 17025.

### 7.0 IDENTIFICATION

Products described in this report are identified with a die-stamped label indicating the name of the manufacturer (Simpson Strong-Tie), the model number, and the number of the index evaluation report (ER-143) that identifies products recognized in this report.



*Brian Gerber*

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Vice President, Technical Operations  
Uniform Evaluation Service

*Richard Beck*

**Richard Beck, PE, CBO, MCP**  
Vice President, Uniform Evaluation Service

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For additional information about this evaluation report please visit [www.uniform-es.org](http://www.uniform-es.org) or email at [info@uniform-es.org](mailto:info@uniform-es.org)



**TABLE 1 — ALLOWABLE TENSION LOADS AND DISPLACEMENTS FOR HDA AND HD BOLT HOLD-DOWN ASSEMBLIES<sup>1,2,3</sup>**

MODEL NO.	DIMENSIONS (in.)							FASTENERS			MINIMUM WOOD MEMBER THK <sup>10</sup> (in.)	ALLOWABLE TENSION LOADS <sup>4</sup> , P <sub>all</sub> (lbs) C <sub>D</sub> =1.6	DISPLACEMENT <sup>5,6</sup> Δ, (in.)	
	HB <sup>9</sup>	SB	W	H	B	SO	CL	ANCHOR BOLT DIA. (in.)	WOOD MBR BOLTS <sup>8</sup>				Δ <sub>all</sub>	Δ <sub>s</sub>
									QTY.	DIA. (in.)				
HD2A	4 <sup>9</sup> / <sub>16</sub>	2½	2¼	8	2 <sup>9</sup> / <sub>16</sub>	¾	1 <sup>7</sup> / <sub>16</sub>	⅝	2	⅝	1½	1,900	0.142	0.195
											2½	2455	0.146	0.207
											3	2455	0.158	0.223
											3½	2475	0.151	0.219
HD5	5¼	3	2¾	6¾	3½	3¾	2½	¾	2	¾	1½	2,405	0.153	0.198
											2½	3,835	0.153	0.197
											3	4,055	0.178	0.250
											3½	4,875	0.157	0.250
											4½	5,010	0.159	0.234
HD7	6⅞	3½	3½	11¾	3¾	2⅞	2½	1⅞	3	⅞	3	6,600	0.151	0.200
											3½	6,600	0.098	0.149
											4½	6,600	0.103	0.144
											5½	6,600	0.112	0.157
HD9	7	4	3½	16½	4 <sup>7</sup> / <sub>16</sub>	3¾	2½	1⅞	3	1	3	8,810	0.159	0.192
											3½	10,330	0.143	0.179
											4½	12,185	0.154	0.215
											5½	12,185	0.108	0.162
HD12 <sup>7</sup>	7	4	3½	20 <sup>5</sup> / <sub>16</sub>	4 <sup>7</sup> / <sub>16</sub>	3¾	2½	1	4	1	3½	11,775	0.171	0.244
								4½			13,335	0.177	0.250	
								5½ <sup>11</sup>			14,295	0.184	0.250	
								1⅞	4	1	4½	14,475	0.192	0.250
								7¼			15,435	0.194	0.250	
								5½ <sup>11</sup>			15,510	0.162	0.227	
HD19 <sup>7</sup>	7	4	3½	24½	4 <sup>7</sup> / <sub>16</sub>	3¾	2½	1⅞	5	1	7¼	16,735	0.191	0.250
								5½ <sup>11</sup>			16,775	0.200	0.250	
								1¼	5	1	7¼	19,360	0.180	0.249
								5½ <sup>11</sup>			18,550	0.133	0.198	
								5½ <sup>12</sup>			19,070	0.137	0.207	

SI: 1 inch = 25.4 mm, 1 lbs = 4.45 N.

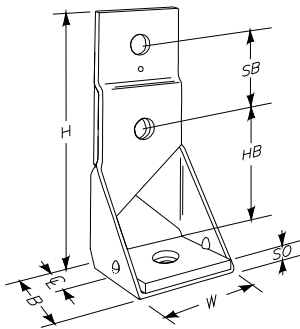
1. Tabulated allowable loads are for a hold-down assembly consisting of the hold-down device attached to a wood structural member(s) with the fasteners as specified in this table (Table 1).
2. Allowable loads for the hold-down assemblies are based on allowable stress design (ASD) and include the load duration factor, C<sub>D</sub> = 1.6, corresponding with wind/earthquake loading in accordance with the NDS. No further increase is allowed. The tabulated values shall be reduced where other load durations govern.
3. Anchorage to concrete or masonry shall be determined in accordance with Section 4.1.3 of this report. Anchorage to concrete or masonry walls shall be in accordance with Section 4.1.2 of this report.
4. Tabulated allowable (ASD) tension loads shall be multiplied by 1.4 to obtain the strength-level resistance loads related with the tabulated Δ<sub>s</sub> deformations.
5. Tabulated displacement values, Δ<sub>all</sub> and Δ<sub>s</sub>, for hold-down assemblies include all sources of hold-down assembly elongation, such as hold-down device extension and rotation fastener slip, and anchor rod elongation, at ASD-level and strength level forces respectively.
6. Elongation of the hold-down anchor rod shall be calculated when the actual unbraced length is greater than 6 inches for the HD2A hold-down, or greater than 8 inches for the HD series hold-downs, or the ASTM steel specification of the anchor rod differs from that described in the Section 3.2.4 of



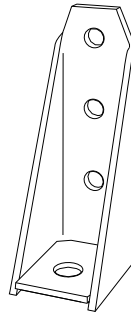
this report. In lieu of calculating the elongation of the hold-down anchor rod for hold-downs raised 6 inches to 18 inches above the concrete for the HD2A and 8 inches to 18 inches for the HD series, it is permitted to add an additional anchor rod elongation of 0.01 to the tabulated hold-down deflection.

7. HD12 and HD19 require a standard cut washer, conforming to Section 4.1.1 of this report, to be installed between the anchor bolt nut and the seat of the hold-down when a 1 1/8 inches diameter anchor bolt is used.
8. Hold-down bolts attaching the hold-down to the wood member shall be in accordance with Section 3.2.3.1 of this report and they each shall have a minimum of a standard cut washer installed between the wood post and the nut.
9. HB is the required minimum distance from the end of the post to the center of the first post bolt hole. End distance may be increased as necessary for installation. Tension values are valid for hold-downs installed flush to, or raised off of, the sill plate provided that the minimum HB distance is maintained.
10. Wood structural member(s) shall have a minimum width of 3½ inches and be a minimum Grade No. 2 with specific gravity of 0.50 to satisfy NDS Appendix E for tension loading, unless otherwise noted.
11. Wood structural member(s) shall have a minimum width of 5½ inches and be a minimum Grade No. 2 with specific gravity of 0.50 to satisfy NDS Appendix E for tension loading.
12. Wood structural member(s) shall have a minimum width of 5½ inches and be a minimum Grade No. 1 with specific gravity of 0.50 to satisfy NDS Appendix E for tension loading.

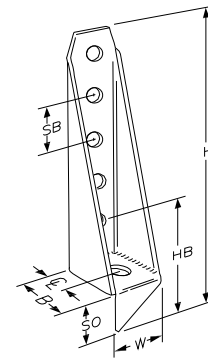
**FIGURE 1 – HDA AND HD BOLT HOLD-DOWNS**



**HD2A**

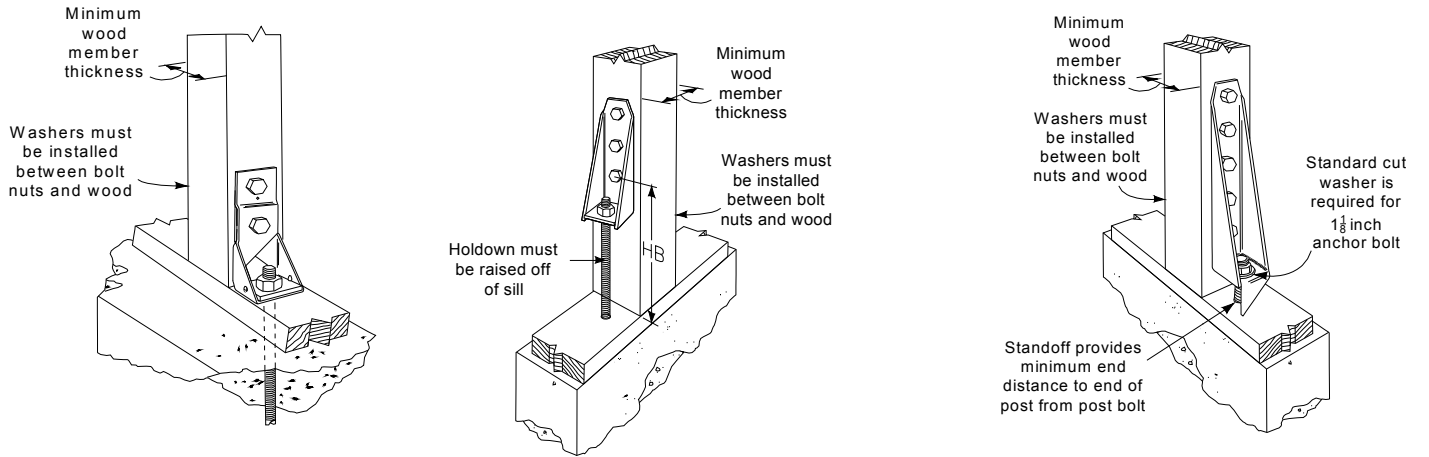


**HD7**  
*(HD5 Similar)*



**HD19**  
*(HD9 and HD12 Similar)*

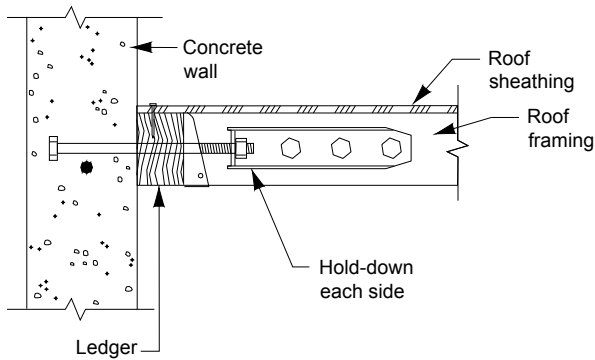
**FIGURE 1 – HDA AND HD BOLT HOLD-DOWNS (CON'T)**



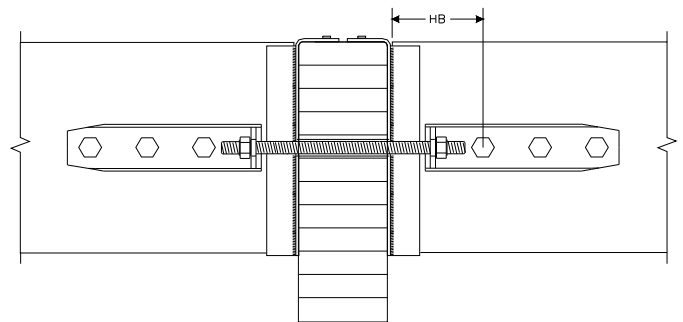
**HD2A Vertical Installation**

**HD7 Vertical Typical Installation (HD5 Similar)**

**HD19 Vertical Typical Installation (HD9 and HD12 Similar)**



**HD7 Horizontal Typical Installation (HD5 Similar)**



**HD7 Horizontal Purlin Installation (HD5 Similar)**



**TABLE 2 — ALLOWABLE TENSION LOADS AND DISPLACEMENTS FOR HDB BOLT HOLD-DOWN ASSEMBLIES <sup>1,2</sup>**

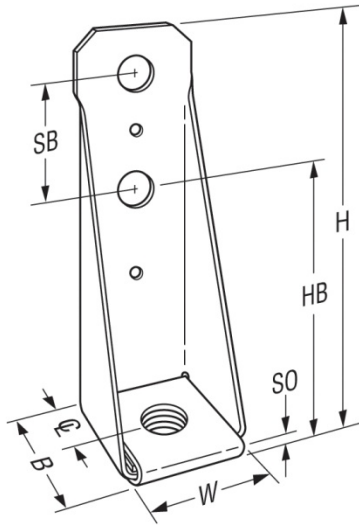
MODEL NO.	DIMENSIONS (in.)							FASTENERS		MINIMUM WOOD MEMBER THK <sup>8</sup> (in.)	ALLOWABLE TENSION LOADS <sup>3</sup> P <sub>all</sub> (lbs.) C <sub>D</sub> =1.6	DISPLACEMENT <sup>4,5</sup> Δ, (in.)		
	HB	SB	W	H	B	SO	CL	ANCHOR BOLT DIA (in.)	WOOD MEMBER BOLTS			Δ <sub>all</sub>	Δ <sub>s</sub>	
									QTY.					DIA. (in.)
HD3B	4½	2½	2½	7¾	2	¾	1½	¾	2	⅝	1½	1,895	0.156	0.207
											2½	2,525	0.169	0.250
											3	3,130	0.120	0.239
HD5B	5¼	3	2½	9¾	2½	2	1¼	¾	2	¾	2½	3,750	0.129	0.181
											3	4,505	0.156	0.223
											3½	4,935	0.150	0.202
HD7B	5¼	3	2½	12¾	2½	2	1¼	¾	3	¾	3	6,645	0.142	0.198
											3½	7,310	0.154	0.238
HD9B	6¾	3½	2¾	14	2½	2¾	1¼	¾	3	¾	3½	7,740	0.159	0.250
											4½	9,920	0.178	0.238
											7¼	10,035	0.179	0.241

SI: 1 inch = 25.4 mm, 1 lbs = 4.45 N.

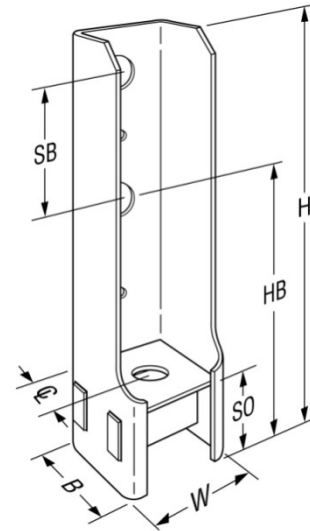
1. Allowable loads for the hold-down assemblies are based on allowable stress design (ASD) and include the load duration factor, C<sub>D</sub> = 1.6, corresponding with wind/earthquake loading in accordance with the NDS. No further increase is allowed. Tabulated loads may be reduced where other load durations govern.
2. Anchorage to concrete or masonry shall be determined in accordance with Section 4.1.3 of this report. Anchorage to concrete or masonry walls shall be in accordance with Section 4.1.2 of this report.
3. Tabulated allowable (ASD) tension loads shall be multiplied by 1.4 to obtain the strength-level resistance loads associated with the tabulated Δ<sub>s</sub> deformations.
4. Tabulated displacement values, Δ<sub>all</sub> and Δ<sub>s</sub>, for hold-down assemblies include all sources of hold-down assembly elongation, such as fastener slip, hold-down device extension and rotation, and 6 inches of anchor rod elongation, at ASD-level and strength level forces respectively.
5. Elongation of the hold-down anchor rod shall be calculated when the actual unbraced length is greater than 6 inches, or the ASTM steel specification of the anchor rod differs from that described in the Section 3.2.4 of this report. In lieu of calculating the elongation of the hold-down anchor rod for hold-downs raised 6 inches to 18 inches above the concrete, it is permitted to add an additional anchor rod elongation of 0.01 inch to the tabulated hold-down deflection.
6. Hold-down bolts attaching the hold-down to the wood member shall be in accordance with Section 3.2.3.1 of this report and each shall have a minimum of a standard cut washer installed between the wood post and the nut.
7. Allowable Tension loads are valid for hold-downs installed flush to, or raised off of, the sill plate.
8. Wood structural member(s) shall have a minimum width of 3½ inches wide and be a minimum Grade No. 2 with specific gravity of 0.50



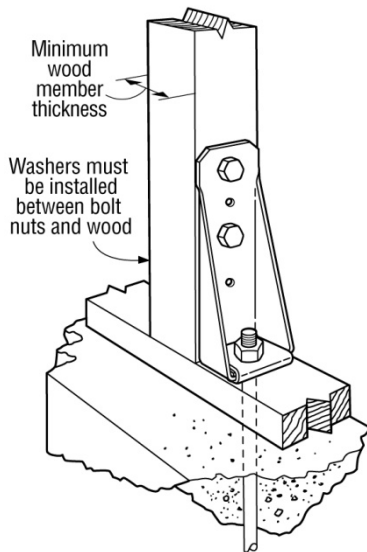
**FIGURE 2 – HDB BOLT HOLD-DOWNS**



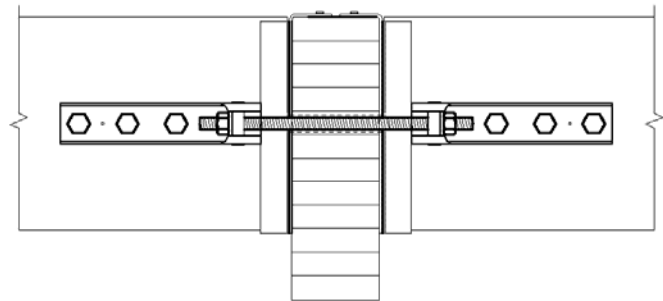
**HD3B**



**HD5B**  
(HD7B, HD9B Similar)



**HD3B**  
**Vertical**  
**Installation**



**HD7B Horizontal**  
**Purlin Installation**



**TABLE 3 — ALLOWABLE STEEL STRENGTH FOR HDA, HDB, AND HD BOLT HOLD-DOWN CONNECTORS<sup>1</sup>**

MODEL NO.	ASD STEEL STRENGTH (lbs.)
HD2A	4,375
HD3B	3,940
HD5B	6,700
HD7B	8,330
HD9B	11,290
HD5	6,190
HD7	6,600
HD9	12,185
HD12	15,510
HD19 <sup>2</sup> (1½" A.B)	21,965
HD19 (1¼" A.B)	23,630

SI: 1 inch = 25.4 mm, 1 lbs = 4.45 N.

1. Steel strengths are provided when designing per Section 12.10 and 12.11.2 of ASCE 7.
2. HD19 requires a standard cut washer, conforming to Section 4.1.1 of this report, to be installed between the anchor bolt nut and seat of hold-down when a 1½ inch diameter anchor bolt is used.