



MITEK USA, INC.
14305 Southcross Drive, Suite 200
Burnsville, Minnesota 55306
(952) 898-8772
www.uspconnectors.com

USP HOLD-DOWN AND TENSION-TIE CONNECTORS

CSI Section:

06 05 23 Wood, Plastic and Composite Fastenings

1.0 RECOGNITION

MiTek USA, Inc. USP hold-down and tension-tie connectors recognized in this report has been evaluated for use as wood framing anchorage. The structural performance properties of the USP hold-down connectors complies with the intent of the provisions of the following codes and regulations:

- 2018, 2015, 2012, 2009 and 2006 International Building Code® (IBC)
- 2018, 2015, 2012, 2009 and 2006 International Residential Code® (IRC)
- 2017 Florida Building Code® (FBC, Building) – attached Supplement
- 2017 Florida Residential Code® (FBC, Residential) – attached Supplement

2.0 LIMITATIONS

Use of the USP hold-down and tension-tie connectors recognized in this report is subject to the following limitations:

2.1 The connectors shall be manufactured, identified and installed in accordance to this report and the manufacturer's published installation instructions. Where conflicts occur, the more restrictive shall govern. A copy of the manufacturer's published installation instructions shall be available at the jobsite at all times during installation.

2.2 Calculations and details showing compliance with this report shall be submitted to the code official. No further duration of load increase for earthquake or wind loading is allowed. The calculations and details shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

2.3 For compliance with the 2018, 2015, 2012, and 2009 IBC, a statement of special inspection shall be prepared by the registered design professional in responsible charge, and submitted to the code official for approval, where required by Section 1704.2.3 of the 2018, 2015 and 2012 IBC, and Section 1705 of the 2009 IBC.

2.4 For compliance with the 2006 IBC, a quality assurance plan shall be submitted to the code official for approval, where required by Section 1705 or 1706 of the 2006 IBC.

2.5 Connected wood members and fasteners shall comply with Sections 4.2 of this report.

2.6 Adjustment factors noted in Section 3.2.1 of this report and the applicable codes shall be considered, where applicable.

2.7 Use of steel hold-downs and fasteners in contact with preservative-treated or fire-retardant-treated wood shall be in accordance with Section 4.2.7 of this report.

2.8 Anchorage to concrete or masonry structural members shall be designed and detailed in accordance with Section 3.2.2 of this report.

2.9 Hold-downs are manufactured at USP facilities under a quality control program with inspections by IAPMO Uniform ES.

3.0 PRODUCT USE

3.1 General: The USP hold-down connectors described in this report 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, in accordance with the 2018 and 2015 IBC Sections 2304.10.3, 2305.1, 2308.6.5.1, and 2308.6.5.2, 2012 and 2009 IBC Sections 2304.9.3, 2305.1, 2308.9.3.1, and 2308.9.3.2; AF&PA SDPWS-2015 and -2008 (Special Design Provisions for Wind and Seismic) Sections 4.3.6.1.2 and 4.3.6.4.2; and 2006 IBC Sections 2304.9.3, 2305.1, 2305.3.2, 2305.3.7, 2305.3.8.2.4, and 2308.9.3.1; and also are used as anchorage of concrete and masonry walls to structural wood elements to provide lateral support for the walls as required by Section 1604.8 of the 2018, 2015, 2012, 2009 and 2006 IBC. The connectors may also be used in structures regulated under the IRC, when an engineered design is submitted in accordance with Section R301.1.3 of the 2018, 2015, 2012, 2009 and 2006 IRC.

3.2 Design:

3.2.1 Hold-down Assembly: The allowable loads shown in [Tables 1](#) through [6](#) of this report 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) fasteners of a quantity, type and size used to attach the hold-down device to the wood member; and (5) bearing plates or washers. The allowable loads provided in the tables for these assemblies are based on

allowable stress design (ASD) and include the load duration factor, C_D , corresponding to the applicable loads, and the group action factor, C_g , where applicable, in accordance with the ANSI/AWC National Design Specification (NDS) for Wood Construction. Allowable strength values are applicable for designs complying with Sections 12.10 and 12.11.2 of ASCE 7-10 and 7-05.



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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. When hold-downs are fastened to wood that will experience sustained exposure to temperatures exceeding 100°F (37.8°C), the allowable loads shown in [Tables 1](#) through [6](#) of this report shall be adjusted by the temperature factor, C_t , specified in the NDS.

When hold-downs are fastened to wood having a moisture content greater than 19 percent (16 percent for engineered lumber), or where wet service is expected, the allowable loads shown in [Tables 1](#) through [6](#) of this report shall be adjusted by the wet service factor, C_M , as specified in the NDS for lateral loads on dowel-type fasteners.

Hold-downs (tie-downs) in contact with preservative-treated and fire-retardant treated wood are subject to the approval of the code official, since the effects of corrosion of metal in contact with preservative and fire-retardant treated wood on the structural performance of the devices is outside the scope of this report.

Wood members to which the hold-downs are attached shall be analyzed for allowable capacity at the critical net section for total combined stresses in accordance with the NDS, where applicable. Total combined stresses at the critical net section consist of flexural stress due to hold-down eccentricities relative to the centroid of the connected wood member (M_{xx} and M_{yy}) combined with axial tension (T) stress. When using the basic load combinations in accordance with Section 1605.3.1 of the 2018, 2015, 2012, 2009 and 2006 IBC, 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 Section 1605.3.2 of the 2018, 2015, 2012, 2009 and 2006 IBC that include wind or earthquake loads, the tabulated allowable loads for the hold-down (tie-down) shall not be increased by 33-1/3 percent, nor shall the alternative basic load combinations be reduced by a factor of 0.75.

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 and 7-05 by using strength-level seismic forces without reduction for ASD. The deflection of a shear wall restrained from overturning by hold-downs installed in accordance with this report is calculated using Equation 23-2 shown in, Section 2305.3 of the 2018, 2015, 2012 and 2009 IBC, and Section 2305.3.2 of the 2006 IBC or Equation 4.3-1 shown in Section 4.3.2 on ANSI/AF&PA SDPWS-2015 and -2008 (Special Design Provisions for Wind and Seismic). The total deflection values, Δ_{all} and Δ_s , at ASD-level and strength-level forces, respectively, for hold-down assemblies shown in Tables 1 through 6 of this report include all sources of hold-down assembly elongation, such as fastener slip, hold-down device extension and rotation, and anchor rod elongation where the length of the anchor rod is a maximum of 5 inches (127 mm) above the foundation. The contribution of the hold-

down anchor rod elongation in the total elongation (deflection) of the hold-down assembly shall be considered when the actual diameter, length, or ASTM steel specification of the anchor rod differs from that described in this report. When hold-downs occur in series, the cumulative deflection of all hold-downs shall be considered in the design. The effects of wood shrinkage on deflections, loosening of connections and wood splitting at connections shall be considered in accordance with IBC Section 2303.7.

In calculating shear wall deflection at strength-level for earthquake, the symbol Δ_s as used in this report shall replace the symbol d_a in Section 2305.3 of the 2018, 2015, 2012 and 2009 IBC, Section 2305.3.2 of the 2006 IBC, and replace the symbol Δ_a in Section 4.3.2 of ANSI/AF&PA SDPWS-2015 and -2008.

3.2.2 Anchorage to Concrete or Masonry: Adequate embedment length and anchorage details, including edge and end distances, shall be determined in accordance with Chapter 19 or 21 of the 2018, 2015, 2012, 2009 and 2006 IBC, as applicable, for design of anchorage to concrete and masonry structural members.

Where design load combinations include earthquake loads or effects, the design strength of the anchorage to concrete shall be determined in accordance with Sections 1901.3 of the 2018, 2015 IBC, 1909 of the 2012 IBC and 1912 of the 2009 and 2006 IBC, except for detached one- and two-family dwellings, assigned to Seismic Design Category A, B or C, or located where the mapped short-period spectral response acceleration, S_s , is less than 0.4g as stated in Section 1613.1 of the 2018, 2015, 2012, 2009, and 2006 IBC.

3.3 Installation: Installation of the hold-down connectors shall be in accordance with this evaluation report and the manufacturer's published installation instructions. Where conflicts occur, the more restrictive shall govern. The location of the hold-downs shall be in accordance with the approved plans and fastener edge and end distances shall comply with this report.

When hold-down (tie-down) devices are attached to multiply framing members, the connection between laminations shall be designed in accordance with Section 15.3 of the ANSI/AWC National Design Specification for Wood Construction 2018, 2015, 2012 and 2005 Editions.

3.4 Special Inspection

3.4.1 IBC: Periodic special inspection is required for installation of connectors described in this report that are designated as components of the seismic-force-resisting system for structures in Seismic Design Categories C, D, E or F in accordance with Sections 1704.2 and 1705.12 of the 2018, 2015 IBC, Sections 1704.2 and 1705.11 of the 2012 IBC, Sections 1707.3 or 1707.4 of the 2009 and 2006 IBC.



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Special inspections for anchor bolts in concrete or masonry shall be conducted in accordance with Sections 1705.3 or 1705.4 of the 2018, 2015 and 2012 IBC, and 1704.4 or 1704.5 of the 2009 and 2006 IBC.

Periodic special inspection shall be conducted when the product series are components within the main wind-force-resisting system of structures constructed in areas listed in Section 1705.11 of the 2018, 2015 IBC, Section 1705.10 of the 2012 IBC, Section 1706.1 of the 2009 IBC, or 1705.4 of the 2006 IBC.

For those structures that qualify under the Exceptions to Section 1704.2 of the 2018, 2015 and 2012 IBC and Section 1704.1 of the 2009 and 2006 IBC, special inspections may be omitted, subject to the provisions of the specific exception.

3.4.2 IRC: Special inspections are not required for connectors used in structures regulated under the IRC.

4.0 PRODUCT DESCRIPTION

4.1 Product information

4.1.1 DTB-TZ Deck Tie Bracket Hold-down: The DTB-TZ deck tie bracket hold-down consists of a main structural steel component with prepunched holes for installation of USP WS15-GC wood screws used to connect the hold-down to the wood member, and a base component that provides a seat for an anchor rod, bolt, and nut, as shown in Figure 1 of this report. [Table 1](#) and [Figure 1](#) of this report summarize dimensions, fastener schedule, allowable loads and typical installation details.

4.1.2 LTS and LTTI Tension Tie Hold-downs: The LTS and LTTI tension tie consist of a steel strap with prepunched holes for installation of nails or bolts used to connect the hold-down to the wood member, and a base component that provides a seat for an anchor rod, bolt, and nut, as shown in [Figure 3](#) of this report. [Table 7](#) of this report describes steel thickness of each component in the LTS and LTTI tension tie hold-downs. [Table 3](#) and [Figure 3](#) of this report provide stock numbers, product dimensions, fastener schedule, allowable loads and typical installation details.

4.1.3 PHD and PHDA Hold-downs: The PHD and PHDA hold-downs consist of a main structural steel component with prepunched holes for installation of USP WS3 wood screws used to connect the hold-down to the wood member, and a base plate component that provides a seat for an anchor rod, bolt, and nut, as shown in [Figure 4](#) of this report. The USP WS3 wood screws are provided with the PHD and PHDA hold-downs. [Table 7](#) of this report describes the steel thickness of each component in the PHD and PHDA hold-downs. [Table 4](#) and [Figure 4](#) of this report summarize stock numbers, product dimensions, fastener schedule, allowable loads and typical installation details.

4.1.4 UPHD Hold-downs: The UPHD hold-downs consist of a main structural steel component with prepunched holes for installation of USP WS3 wood screws used to connect the hold-down to the wood member, and a base plate component that provides a seat for an anchor rod, bolt, and nut, as shown in [Figure 5](#) of this report. The USP WS3 wood screws are provided with the UPHD hold-downs. [Table 7](#) of this report describes the steel thickness of each component in the UPHD Hold-downs. [Table 5](#) and [Figure 5](#) of this report summarize stock numbers, product dimensions, fastener schedule, allowable loads and typical installation details.

4.1.5 TD and TDX Hold-downs: The TD and TDX hold-downs consist of a main structural steel component with prepunched holes for installation of bolts used to connect the hold-down to the wood member, and a base component that provides a seat for an anchor rod, bolt, and nut, as shown in [Figure 6](#) of this report. [Table 7](#) of this report describes the steel thickness of each component in the TD and TDX hold-downs. [Table 7](#) and [Figure 6](#) of this report summarize stock numbers, product dimensions, fastener schedule, allowable loads and typical installation details.

4.2 Materials

4.2.1 Steel: The specific types of steel and corrosion protection for each product are described in [Table 7](#) of this report. Minimum steel base-metal thicknesses for the different gages are shown in the following table:

GAGE NO.	DESIGN BASE-METAL THICKNESS (inch)	MINIMUM BASE-METAL THICKNESS (inch)
18	0.046	0.044
16	0.058	0.055
14	0.074	0.070
12	0.104	0.099
10	0.136	0.129
7	0.180	0.171
3	0.250	0.238

For **S**: 1 inch = 25.4 mm.

4.2.2 Wood: Wood members with which the hold-downs are used shall be sawn lumber with a minimum specific gravity of 0.50, or approved structural engineered lumber (structural composite lumber, alternative strand lumber, or prefabricated wood I-joists) with a minimum equivalent specific gravity of 0.50, unless otherwise noted in the applicable table within this report. The minimum dimensions of wood members are provided in the tables. Wood members shall have a moisture content not exceeding 19 percent (16 percent for structural engineered lumber), except as noted in Section 3.2 of this report. For connectors installed with nails or WS wood screws, the thickness of each wood member shall be sufficient such that the specified fasteners do not protrude through the opposite side of the member. For installations in structural engineered lumber, minimum nail or screw spacing and end distance, as specified in the applicable lumber evaluation report from an approved agency shall be observed. Section 4.2.7 of this report addresses issues related to treated wood.



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4.2.3 Fasteners and Threaded Rod: Required fastener types and sizes for use with the USP structural connectors described in this report are specified in this section and [Tables 1](#) through [6](#) of this report. Fasteners and threaded rods shall comply with Sections 4.2.4 through 4.2.6 of this report, as applicable.

4.2.4 Bolts and Threaded Rod: At a minimum, bolts and threaded rods shall comply with ASME 1318.2.1 and ASTM A307 Grade C or A 36 and shall have a tensile strength of 58,000 psi (310 MPa) and a minimum bending yield strength of 45,000 psi (310 MPa). Bolt and threaded rod diameters shall be as specified in the applicable tables of this report.

4.2.5 WS Wood Screws: WS3 wood screws are provided with the PHD, PHDA and UPHD series hold-downs. WS3 wood screws have a major diameter of 0.242 inch (6.1 mm) and a length of 3.0 inches (76.2 mm) and a minimum bending yield strength of 180,000 psi (1240 MPa). WS15-GC wood screws are provided with DTB-TZ hold-downs. WS15-GC wood screws have a major diameter of 0.242 inch (6.1 mm), a length of 1½ inches (38.1 mm) and a minimum bending yield strength of 180,000 psi (1,240 MPa). Additional details are available in the current ICC-ES ESR-2761.

4.2.6 Nails: Nails used for connectors described in this report shall comply with material requirements, physical properties, tolerances, workmanship, protective coating and finishes, and packaging and package marking requirements specified in ASTM F1667; and shall have lengths, diameters and bending yield strengths, F_{yb} , as shown in the following table:

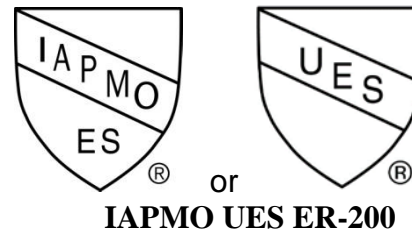
FASTENER DESIGNATION	FASTENER LENGTH (inches)	SHANK DIAMETER (inch)	MINIMUM REQUIRED F_{yb} (lbf/in ²)
10d x 1½	1.5	0.148	90,000
10d common	3.0	0.148	90,000
16d common	3.5	0.162	90,000

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

4.2.7 Use in Preservative and Fire-Retardant Treated Wood: Connectors and fasteners used in contact with preservative-treated or fire-retardant-treated wood shall comply with Section 2304.10.5 of the 2018 and 2015 IBC, Section 2304.9.5 of the 2018, 2015, 2012, 2009 and 2006 IBC, and Section R317.3 of the 2018, 2015, 2012 and 2009 IRC, or Section R319.3 of the 2006 IRC. The lumber treater or the report holder (USP Structural Connectors-Mitek USA), or both, shall be contacted for recommendations on the appropriate level of corrosion resistance to specify for the connectors and fasteners as well as the connection capacities of the fasteners used with the specific proprietary preservative-treated or fire-retardant-treated wood.

5.0 IDENTIFICATION

The hold-down devices described in this report are identified by the product model (stock) number, the number of the IAPMO UES evaluation report for MiTek USA (ER-200) which identifies the products listed in this report, one or more of the following designations: USP or United Steel Products Company, and either UES Mark of Conformity as shown below:



6.0 SUBSTANTIATING DATA

Testing and analytical data submitted is in compliance with the ICC-ES Acceptance Criteria for Hold-Downs, (Tie-Downs) Attached to Wood Members (AC155), approved May 2015, Editorially revised January 2018. Test results are from laboratories in compliance with ISO/IEC 17025.

7.0 STATEMENT OF RECOGNITION

This evaluation report describes the results of research carried out by IAPMO Uniform Evaluation Service on MiTek USA, Inc. USP hold-down and tension-tie connectors to assess conformance to the codes shown in Section 1.0 of this report and serves as documentation of the product certification.

Brian Gerber, P.E., S.E.
Vice President, Technical Operations
Uniform Evaluation Service

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

GP Russ Chaney
CEO, The IAPMO Group

For additional information about this evaluation report please visit www.uniform-es.org or email us at info@uniform-es.org

TABLE 1 - DTB DECK TIE BRACKET HOLDOWN

STOCK NUMBER	STEEL GAUGE	DIMENSIONS (inches)				FASTENER SCHEDULE					MINIMUM WOOD MEMBER THICKNESS (inches) ⁶	ALLOWABLE LOADS (lbs) ^{3, 4}		DEFLECTION AT ALLOWABLE DESIGN LOADS (inches)		STRENGTH LEVEL DEFORMATION Δ _s @ 160% (inches) ⁵
						Bolt ¹		Screws ²								
		W	L	D	CL	Qty.	Type	Qty.	Size	Designation		100%	160%	Δ At 100%	Δ At 160%	
DTB-TZ	14	1 ¹³ / ₁₆	6	2 ¹ / ₄	1 ¹ / ₈	1	1/2	8	1 ¹ / ₄ " x 1 ¹ / ₂ "	WS15	1 ¹ / ₂	1835	1835	0.119	0.119	0.245

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

¹Minimum ASTM A307 bolt or threaded rod with cut washer and hex nut.

²WS15 denotes USP Wood Screw, 1/4 inch diameter 1 1/2 inch long.

³Allowable loads include a 60% duration of load increase for wind or seismic load conditions. No further increase shall be permitted.

⁴Allowable load values of the holdown (tie-down) device are a measure of the strength of the assembly with a safety factor of 3.0 applied to the lowest maximum test load.

⁵The design of holdown (tie-down) devices used in series shall account for the cumulative deformation of all holdowns (tie-downs) within said series.

⁶The design of the framing member is outside the scope of this report. The structural designer shall select a framing member sized to prevent fasteners from splitting the wood and of adequate strength properties to resist the anticipated loads in accordance with Section 4.1.1 of this report. Figure 7 lists the nearest fastener hole distance so required fastener end and edge distance, per ESR-2761, can be provided. Minimum width shall be 3 1/2 inches.

⁷Tabulated allowable loads shall be multiplied by 1.4 to obtain the strength or LRFD level loads corresponding to the tabulated strength level deformation Δ_s .

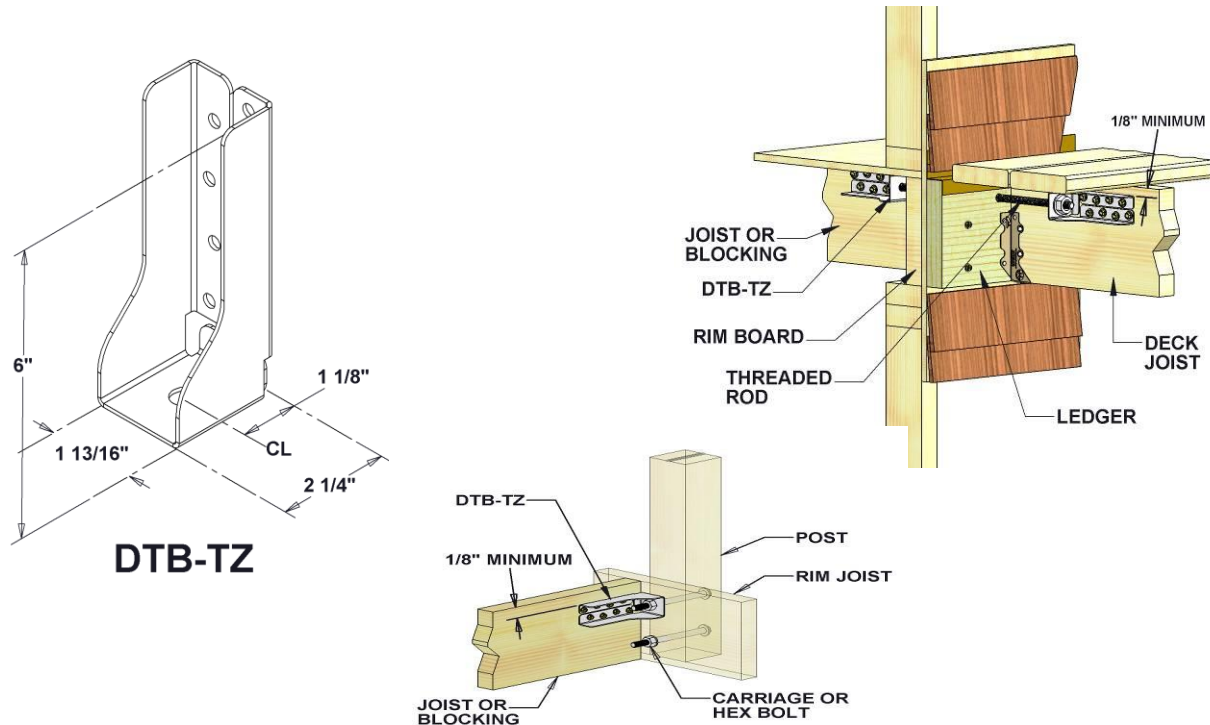


FIGURE 1 – DTB-TZ DECK TIE BRACKET HOLDOWNS



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TABLE 3 - LTS and LTTI TENSION TIE HOLDOWN SERIES

STOCK NUMBER	STEEL GAGE		DIMENSIONS (inches)				FASTENER SCHEDULE ^{1,2,3}							MINIMUM WOOD MEMBER THICKNESS (inches) ⁹	ALLOWABLE LOADS (lbs) ^{4,7}		DEFLECTION AT ALLOWABLE DESIGN LOADS (inches)	STRENGTH LEVEL DEFORMATION Δs (inches) ⁸
							Anchor Bolts ⁵		Nails		Bolts				For Nailed Configuration	For Bolted Configuration ⁶		
	Strap	Plate	W	L	D	CL	Qty.	Type	Spacing	Qty.	Type	Qty.	Diameter (inches)					
LTS19	16	3	1 3/4	22 1/4	3	1 1/2	1	3/4	2 1/2	8	10dC	--	--	3	1205	--	0.132	0.206
LTS20	12	3	2	20	3	1 1/2	1	1/2	3 3/4	10	10d x 11/2" 16dC	--	--	1 1/2 3	1100 1105	-- --	0.080 0.064	0.231 0.245
LTS20B	12	3	2	20	3	1 1/2	1	3/4	3 3/4	10	10d x 11/2" 16dC	2	1/2	1 1/2 3	1100 1105	1175	0.128	0.234
LTTI31	18	3	3 3/4	31	2 5/8	1 3/8	1	5/8	3	18	10d x 11/2"	--	--	1 1/2	2805	--	0.175	0.234

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

¹A 10d x 1 1/2" nail is 1 1/2 inches long and 0.148 inches in diameter.

²A 10d Common nail is 3 inches long and 0.148 inches in diameter.

³A 16d Common nail is 3 1/2 inches long and 0.162 inches in diameter.

⁴Allowable loads include a 60% duration of load increase for wind or seismic load conditions. No further increase shall be permitted.

⁵The designer must specify anchor bolt type, nut, washer, length and embedment depth.

⁶Bolts connecting the LTS20B require a minimum length of 1 1/2 inches in vertical member for listed load.

⁷Allowable load values of the holdown (tie-down) device are a measure of the strength of the assembly with a safety factor of 3.0 applied to the lowest maximum test load.

⁸The design of holdown (tie-down) devices used in series shall account for the cumulative deformation of all holdowns (tie-downs) within said series.

⁹The design of the framing member is outside the scope of this report. The structural designer shall select a framing member sized to prevent fasteners from splitting the wood and of adequate strength properties, to resist the anticipated loads in accordance with Section 4.1.1 of this report.

Figure 7 lists the nearest fastener hole distance so required fastener end and edge distance, per NDS, can be provided.

Minimum width shall be 3 1/2 inches for the LTS series and 4 inches for the LTTI31.

¹⁰Tabulated allowable loads shall be multiplied by 1.4 to obtain the strength or LRFD level loads corresponding to the tabulated strength level deformation Δ_s .

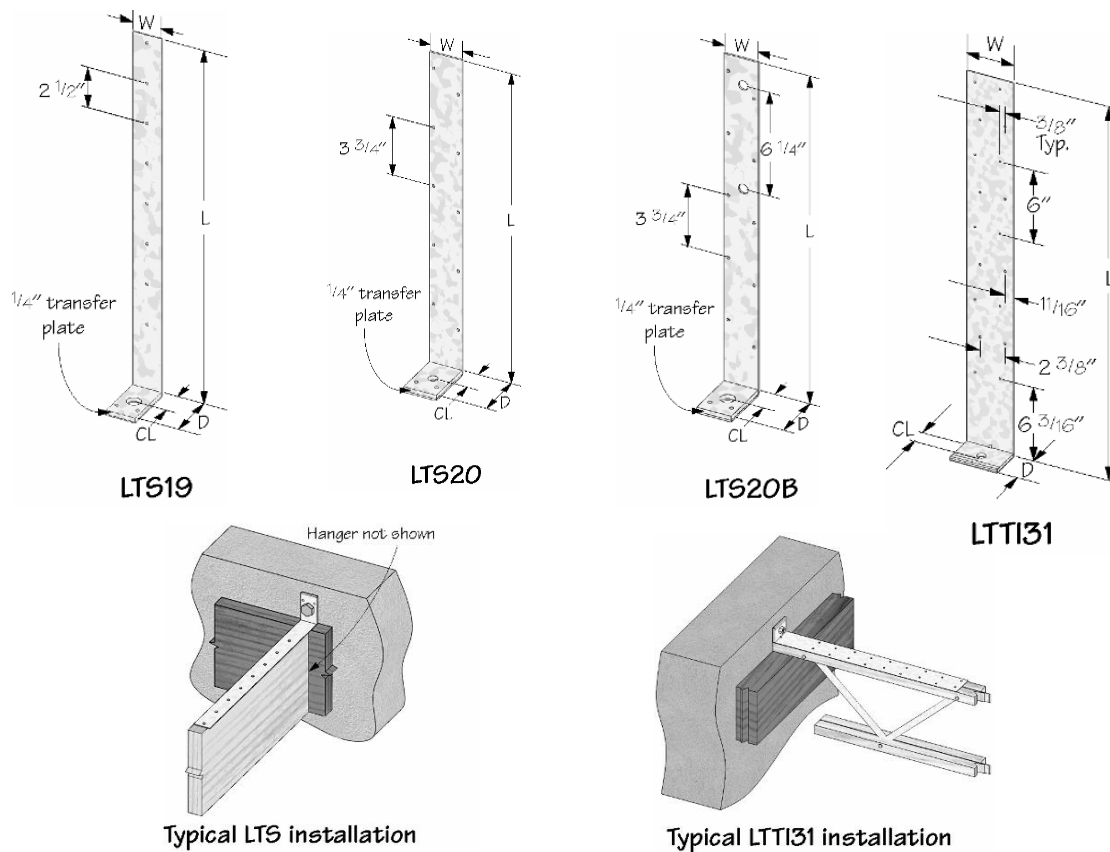


FIGURE 3 – LTS and LTTI TENSION TIE HOLDOWNS



TABLE 4 - PHD & PHDA HOLDOWN SERIES

STOCK NUMBER	STEEL GAGE	DIMENSIONS (inches)				FASTENER SCHEDULE				MINIMUM WOOD MEMBER THICKNESS (inches) ⁶	ALLOWABLE LOADS (lbs) ^{2, 3}	DEFLECTION AT ALLOWABLE DESIGN LOADS (inches)	STRENGTH LEVEL DEFORMATION (inches) ⁴
		Anchor Bolts ⁵		Wood Screws ¹									
Qty.	Dia (in)	Qty.	Type										
PHD2	12	3 1/4	7 1/2	3	1 3/8	1	5/8	10	WS3	3	4,815	0.058	0.096
PHD5	12	3 1/4	10 1/8	3	1 1/8	1	5/8	14	WS3	3	5,540	0.056	0.085
PHD6	12	3 1/4	13 1/16	3	1 1/8	1	1/8	18	WS3	3	7,295	0.061	0.105
PHD8	12	3 1/4	16 1/2	3	1 1/8	1	1/8	24	WS3	3	8,185	0.062	0.111
PHD2A	14	3 1/4	7 1/4	2 7/8	1 1/8	1	5/8	6	WS3	3	3,215	0.155	0.191
PHD4A	14	3 1/4	9 1/4	2 7/8	1 1/8	1	5/8	10	WS3	3	5,215	0.137	0.177
PHD5A	14	3 1/4	11 11/16	2 7/8	1 1/8	1	5/8	14	WS3	3	6,525	0.135	0.177
PHD8A	10	3 1/4	15 1/2	2 7/8	1 1/8	1	1/8	20	WS3	3	8,540	0.079	0.110

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

¹WS3 denotes USP Wood Screw, 1/4 inch diameter 3 inches long

²Allowable loads include a 60% duration of load increase for wind or seismic load conditions. No further increase shall be permitted.

³Allowable load values of the holdown (tie-down) device are a measure of the strength of the assembly with a safety factor of 3.0 applied to the lowest maximum test load.

⁴The design of holdown (tie-down) devices used in series shall account for the cumulative deformation of all holdowns (tie-downs) within said series.

⁵The designer must specify anchor bolt type, nut, washer, length and embedment depth.

⁶The design of the framing member is outside the scope of this report. The structural designer shall select a framing member sized to prevent fasteners from splitting the wood and of adequate strength properties to resist the anticipated loads in accordance with Section 4.1.1 of this report. Figure 7 lists the nearest fastener hole distance so required fastener end and edge distance, per ESR-2761, can be provided. Minimum width shall be 3 1/2 inches.

⁷Tabulated allowable loads shall be multiplied by 1.4 to obtain the strength or LRFD level loads corresponding to the tabulated strength level deformation Δ_s .

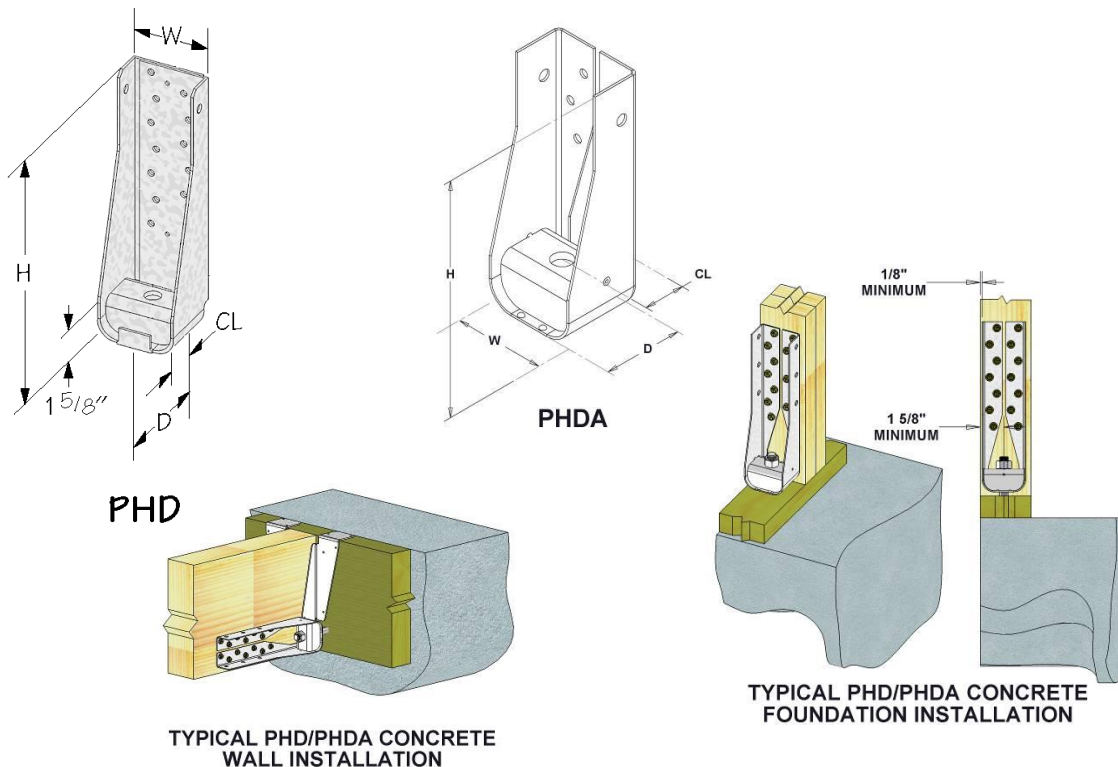


FIGURE 4 – PHD AND PHDA HOLDOWNS



TABLE 5 - UPHD HOLDOWN SERIES

STOCK NUMBER	STEEL GAGE	DIMENSIONS (inches)				FASTENER SCHEDULE				MINIMUM WOOD MEMBER THICKNESS (inches) ⁶	ALLOWABLE LOADS (lbs) ^{2,3}	DEFLECTION AT ALLOWABLE DESIGN LOADS (inches)	STRENGTH LEVEL DEFORMATION (inches) ⁴
		W	H	D	CL	Anchor Bolts ⁵		Wood Screws ¹					
						Qty.	Dia (in)	Qty.	Type				
UPHD8	10	3 1/4	17 1/4	3 1/8	1 3/8	1	1/8	24	WS3	3.5	9,165	0.075	0.100
UPHD9	10	3 1/4	17 1/4	3 1/2	1 1/2	1	1	24	WS3	5.5	11,270	0.057	0.077
UPHD11	7	3	15 1/8	3 1/2	1 1/2	1	1	24	WS3	5.5	14,395	0.077	0.106
UPHD14	7	3	18 3/4	3 1/2	1 1/2	1	1	30	WS3	5.5	16,695	0.082	0.109

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

¹WS3 denotes USP Wood Screw, 1/4 inch diameter 3 inches long

²Allowable loads include a 60% duration of load increase for wind or seismic load conditions. No further increase shall be permitted.

³Allowable load values of the holdown (tie-down) device are a measure of the strength of the assembly with a safety factor of 3.0 applied to the lowest maximum test load.

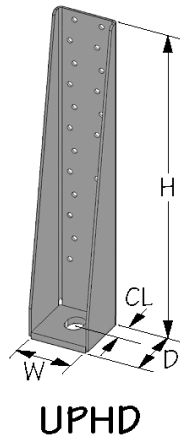
⁴The design of holdown (tie-down) devices used in series shall account for the cumulative deformation of all holdowns (tie-downs) within said series.

⁵The designer must specify anchor bolt type, nut, washer, length and embedment depth.

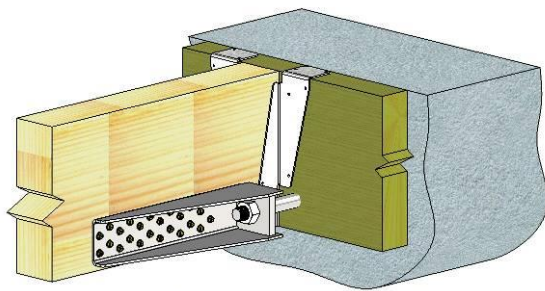
⁶The design of the framing member is outside the scope of this report. The structural designer shall select a framing member sized to prevent fasteners from splitting the wood and of adequate strength properties to resist the anticipated loads in accordance with Section 4.1.1 of this report. Figure 7 lists the nearest fastener hole distance so required fastener end and edge distance, per ESR-2761, can be provided.

Minimum width shall be 3 1/2 inches for the UPHD8 and 5 1/2 inches for the UPHD9, UPHD11 and UPHD14.

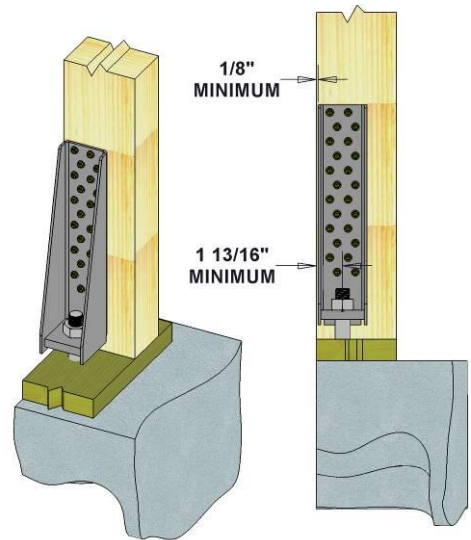
⁷Tabulated allowable loads shall be multiplied by 1.4 to obtain the strength or LRFD level loads corresponding to the tabulated strength level deformation Δ_s .



UPHD



TYPICAL UPHD CONCRETE WALL INSTALLATION



TYPICAL UPHD CONCRETE FOUNDATION INSTALLATION

FIGURE 5 - UPHD HOLDOWNS



EVALUATION REPORT

Number:

200

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TABLE 6 - TDX & TD Holdown Series

STOCK NUMBER	STEEL GAGE	DIMENSIONS (inches)				FASTENER SCHEDULE					LENGTH OF BOLT IN VERTICAL MEMBER (inches) ⁶	ALLOWABLE LOADS (lbs) ^{2,3}	DEFLECTION AT ALLOWABLE DESIGN LOADS (inches)	STRENGTH LEVEL DEFORMATION Δ_s (in) ⁴
						Anchor Bolts ⁵		Bolts ¹						
		W	H	D	CL	Qty.	Type	Min. End Distance	Qty.	Type		160%	Δ At 160%	
TDX2	12	2 ¹ / ₁₆	8 ¹ / ₈	2 ³ / ₄	1 ¹ / ₂	1	5 ⁵ / ₈	4 ¹ / ₂	2	5 ⁵ / ₈	1 ¹ / ₂	1910	0.150	0.186
											3	2345	0.167	0.218
											3 ¹ / ₂	3130	0.140	0.196
											5 ¹ / ₂	3130	0.140	0.196
TD5	7	3	6 ³ / ₈	3 ³ / ₄	2 ¹ / ₈	1	3 ³ / ₄	5 ¹ / ₄	2	3 ³ / ₄	1 ¹ / ₂	2405	0.122	0.160
											3	4040	0.140	0.246
											3 ¹ / ₂	4040	0.140	0.246
											5 ¹ / ₂	4040	0.140	0.246
TD7	3	3 ³ / ₈	11 ⁷ / ₈	3 ⁵ / ₈	2 ¹ / ₈	1	1 ¹ / ₈	6 ¹ / ₈	3	7 ⁷ / ₈	1 ¹ / ₂	4600	0.095	0.117
											3	8195	0.125	0.165
											3 ¹ / ₂	9420	0.139	0.188
											5 ¹ / ₂	10510	0.152	0.213
TD9	3	3 ³ / ₈	16 ¹ / ₂	4 ¹ / ₄	2 ¹ / ₈	1	1 ¹ / ₈	7	3	1	3	9330	0.146	0.184
											3 ¹ / ₂	10715	0.160	0.208
											4 ¹ / ₂	13370	0.169	0.225
											5 ¹ / ₂	13500	0.170	0.227
TD12	3	3 ¹ / ₂	20 ¹ / ₂	4 ¹ / ₄	2 ¹ / ₈	1	1 ¹ / ₈	7	4	1	3	12070	0.132	0.160
											3 ¹ / ₂	13960	0.142	0.178
											4 ¹ / ₂	16550	0.185	0.240
											5 ¹ / ₂	16550	0.185	0.240
TD15	3	3 ¹ / ₂	25	4 ³ / ₈	2 ¹ / ₈	1	1 ¹ / ₄	7	5	1	3	14505	0.167	0.195
											3 ¹ / ₂	16845	0.178	0.213
											4 ¹ / ₂	17755	0.202	0.239
											5 ¹ / ₂	17755	0.202	0.239

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

¹ Bolts shall conform to ASTM A307 Grade A or better.

² Allowable loads include a 60% duration of load increase for wind or seismic load conditions. No further increase shall be permitted.

³ Allowable load values of the holdown (tie-down) device are a measure of the strength of the assembly with a safety factor of 3.0 applied to the lowest maximum test load.

⁴ The design of holdown (tie-down) devices used in series shall account for the cumulative deformation of all holdowns (tie-downs) within said series.

⁵ The designer must specify anchor bolt type, nut, washer, length and embedment depth.

⁶ The design of the framing member is outside the scope of this report. The structural designer shall select a framing member sized to prevent fasteners from splitting the wood and of adequate strength properties to resist the anticipated loads in accordance with Section 4.1.1 of this report. The location of the holdown on the post shall comply with Figure 6 of this report. Minimum member size and grade for each model number shall equal or exceed sizes provided in Table 6A.

⁷ Tabulated allowable loads shall be multiplied by 1.4 to obtain the strength or LRFD level loads corresponding to the tabulated strength level deformation Δ_s .



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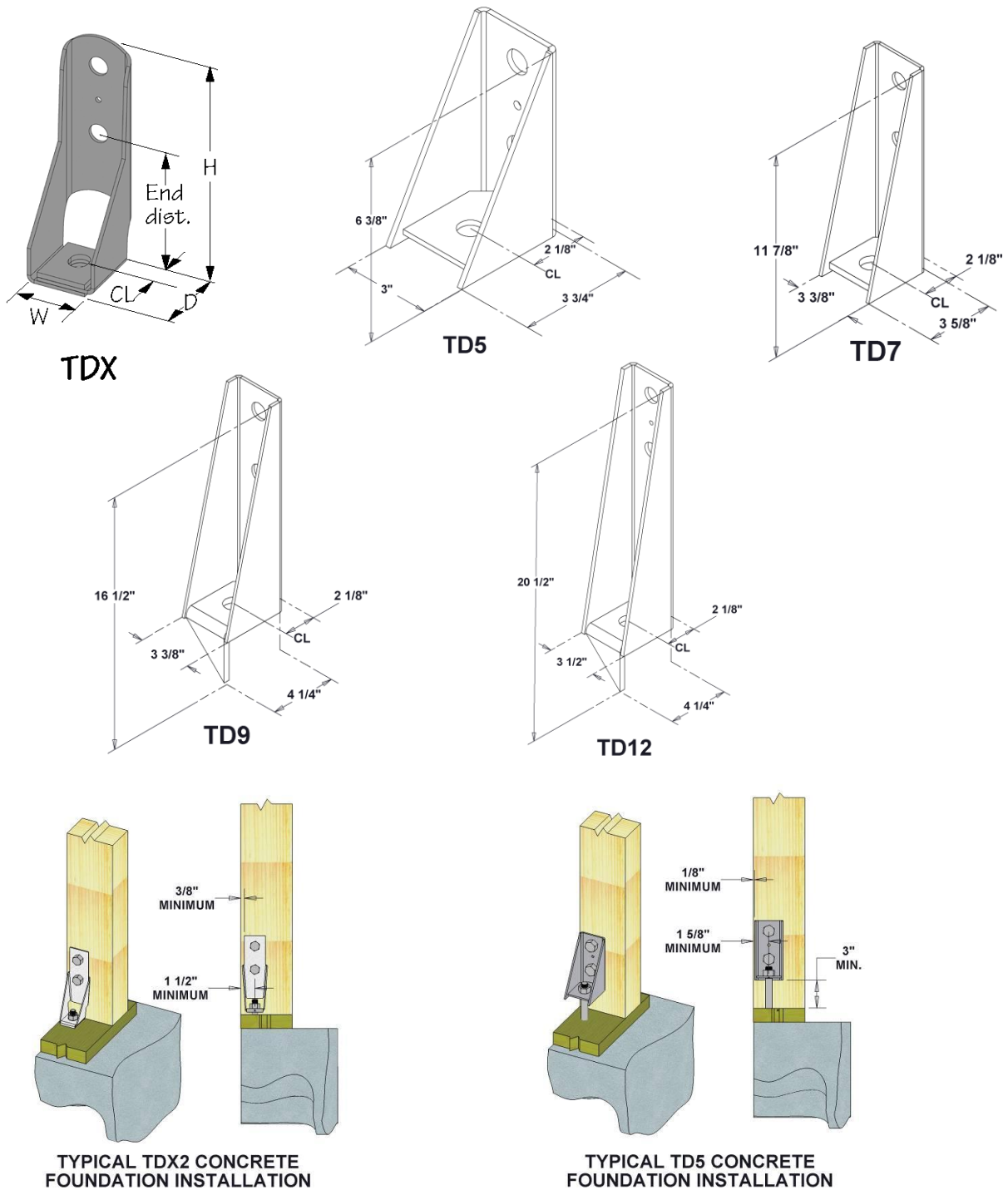


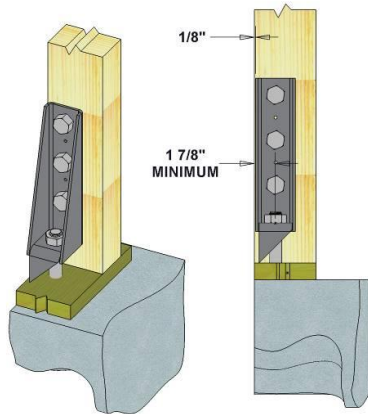
FIGURE 6 – TD AND TDX HOLDDOWNS



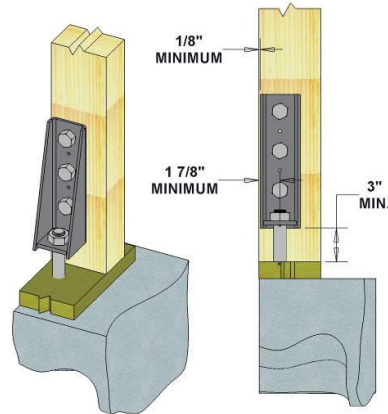
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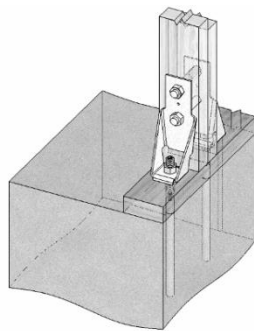
Valid Through: 02/28/2021



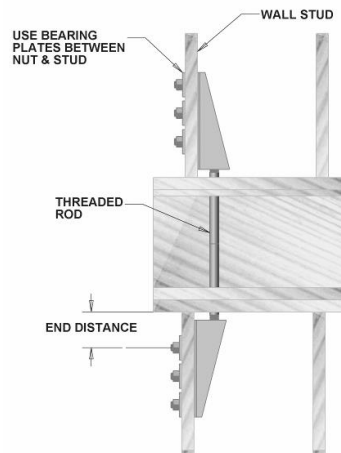
**TYPICAL TD9 CONCRETE
FOUNDATION INSTALLATION
(TD12 & TD15 SIMILAR)**



**TYPICAL TD7 CONCRETE
FOUNDATION INSTALLATION**



**Typical TDX2
back-to-back
installation**




**HOLDOWN INSTALLATION
BETWEEN FLOORS**

FIGURE 6 (Continued) – TD AND TDX HOLDOWNS



TABLE 6A
TDX&TD Matrix of Possible Solutions to Framing Members Sizes Using
Douglas-Fir Larch of Various Commercial Grades 2

STOCK NUMBER	Vertical Member Thickness (in)	Stud or Timber Size	No. of Plies	Commercial Grade				
				Stud	No. 2	No. 1	No. 1 & Btr	Select Str.
TDX2	1 1/2	2x4	1					
	3	2x4	2					
	3 1/2	4x4	1					
	5 1/2	4x6	1					
TD5	1 1/2	2x4	1					
	3	2x4	2					
	3 1/2	4x4	1					
	5 1/2	4x6	1					
TD7	1 1/2	2x6	1					
	3	2x6	2					
	3 1/2	4x6	1					
	5 1/2	4x6	1	--				
TD9	3	2x6	2					
	3 1/2	4x6	1					
	4 1/2	2x6	3					
	5 1/2	6x6	1	--	--			
TD12	3	2x6	2	--				
	3 1/2	4x6	1	--				
	4 1/2	2x6	3	--				
	5 1/2	6x6	1	--				
TD15	3	2x6	2	--	--	--		
	3 1/2	4x6	1	--	--	--		
	4 1/2	2x6	3	--				
	5 1/2	6x6	1	--				

¹To achieve the allowable loads listed in TABLE 6 (above), acceptable solutions to framing member sizes are indicated thus. 

²Analysis based on 2018 Edition of the AF&PA National Design Specification for Wood Construction Appendix E



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TABLE 7 - STEEL, TYPE, STRENGTH, AND CORROSION RESISTANCE

PRODUCT	Welded ¹	PART	STEEL GAGE	STEEL SPECIFICATION	SPECIFIED YIELD STRENGTH (lbf/in ²)	SPECIFIED TENSILE STRENGTH (lbf/in ²)	COATING
DTB-TZ		Body	14	ASTM A 653, SS designation Grade 40S	42,000	56,000	G-185 ²
HTT		Body	12	ASTM A 653, SS designation Grade 40S	42,000	56,000	G90 ²
LTS19		Strap	16	ASTM A 653, SS designation Grade 40S	42,000	56,000	G90 ²
		Washer	3	ASTM A 36	36,000	58,000	Painted
LTS20B		Strap	12	ASTM A 653, SS designation Grade 40S	42,000	56,000	G90 ²
		Washer	3	ASTM A 36	36,000	58,000	Painted
LTTI31		Strap	18	ASTM A 653, SS designation Grade 40S	42,000	56,000	G90 ²
		Plate	3	ASTM A 36	36,000	58,000	Painted
PHD		Body	12	ASTM A 653, SS designation Grade 40S	42,000	56,000	G90 ²
		Washer	3	ASTM A 36	36,000	58,000	Painted
PHDA		Body	14	ASTM A 653, SS designation Grade 40S	42,000	56,000	G90 ²
		Washer	3	ASTM A 36	36,000	58,000	Painted
UPHD8	X	Body	10	ASTM A 1011, designation, Grade 33	33,000	45,000	Painted
		Base Plate	1/2" Steel Plate	ASTM A 36	36,000	58,000	Painted
UPHD9	X	Body	10	ASTM A 1011, designation, Grade 33	33,000	45,000	Painted
		Base Plate	5/8" Steel Plate	ASTM A 36	36,000	58,000	Painted
UPHD11 and UPHD14	X	Body	7	ASTM A 1011, designation, Grade 33	33,000	45,000	Painted
		Base Plate	5/8" Steel Plate	ASTM A 36	36,000	58,000	Painted
TD5	X	Body	7	ASTM A 1011, designation, Grade 33	33,000	45,000	Painted
		Base Plate	7	ASTM A 1011, designation, Grade 33	33,000	45,000	Painted
TD7, TD9 TD12 and TD15	X	Body	3	ASTM A 36	36,000	58,000	Painted
		Base Plate	3/8" Steel Plate	ASTM A 36	36,000	58,000	Painted
TDX2-TZ		Body	12	ASTM A 653, SS designation Grade 40S	42,000	56,000	G-185
		Washer	10	ASTM A 653, SS designation Grade 33	33,000	45,000	G90 ²

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

¹ Products are factory welded at the USP manufacturing facilities in Largo, FL; Livermore, CA; and Montgomery, MN under a quality control program with inspections by IAPMO Uniform ES.

² Corrosion protection is a zinc coating of sheet steel in accordance to ASTM A 653.

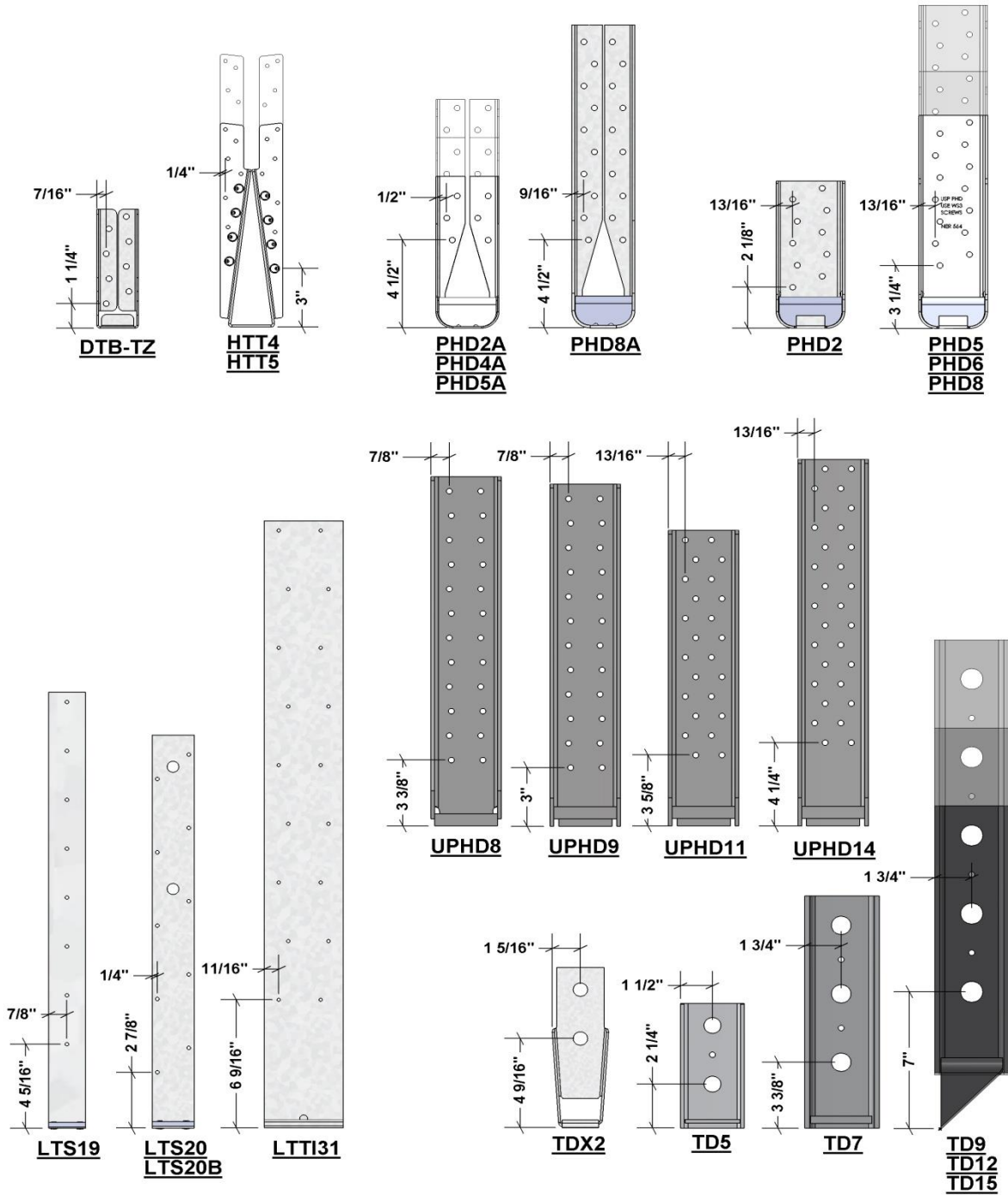


FIGURE 7 – FASTENER LOCATIONS



FLORIDA SUPPLEMENT

EVALUATION SUBJECT: USP HOLD-DOWN AND TENSION-TIE CONNECTORS

REPORT HOLDER:

MITEK USA, INC.

14305 Southcross Drive, Suite 200

Burnsville, Minnesota 55306

(952) 898-8772

www.uspconnectors.com

CSI Section:

06 05 23 Wood, Plastic and Composite Fastenings

1.0 RECOGNITION

MiTek USA, Inc. USP hold-down and tension-tie connectors recognized in this report has been evaluated for use as wood framing anchorage. The structural performance properties of the USP hold-down connectors complies with the intent of the provisions of the following codes and regulations:

- 2017 Florida Building Code® (FBC, Building)
- 2017 Florida Residential Code® (FBC, Residential)

2.0 LIMITATIONS

Use of the USP hold-down and tension-tie connectors recognized in this report is subject to the following limitations:

2.1 The connectors shall be manufactured, identified and installed in accordance to this report and the manufacturer's published installation instructions. Where conflicts occur, the more restrictive shall govern. A copy of the manufacturer's published installation instructions shall always be available at the job site during installation.

2.2 FBC Building: All provisions of ER-200 referencing the 2015, IBC shall apply to use under the 2017 FBC, Building respectively.

2.3 FBC Residential: All provisions of ER-200 referencing the 2015, IRC shall apply to use under the 2017 FBC, Residential, along with Section R302 of the FBC, Residential, as applicable.

3.0 ADDITIONAL REQUIREMENTS

3.1 Evaluation to the high-velocity hurricane zone provisions in Section 1409 of the FBC, Building and Chapter 44 of the FBC, Residential is outside the scope of this report.

3.2 Verification shall be provided that a quality assurance agency audits the manufacturers quality assurance program and audits the production quality of products, in accordance with Section (5)(d) of Florida Rule 61G20-3.008. The quality assurance agency shall be approved by the Commission (or the building official when the report holder does not possess an approval by the Commission).