ICC EVALUATION SERVICE

ICC-ES Evaluation Report

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DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
Section: 06 05 23—Wood, Plastic, and Composite Fastenings

REPORT HOLDER:

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EVALUATION SUBJECT:

MITEK® Z4 CT CONTINUITY TIE AND T2 TENSION TIE CONNECTORS

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2018, 2015, 2012, 2009 and 2006 *International Building Code®* (IBC)
- 2018, 2015, 2012, 2009 and 2006 *International Residential Code®* (IRC)

For compliance with the codes adopted by the Los Angeles Department of Building and Safety (LADBS), see ESR-3105 LABC and LARC Supplement.

Property evaluated:

Structural

2.0 USES

The MiTek Z4 CT Continuity Tie and T2 Tension Tie connectors described in this report are mechanical connectors that are capable of transmitting forces induced by parts of wood-framing structures being connected to the element providing the resistance to those forces in accordance with applicable requirements set forth in Chapter 23 of the IBC and Chapter 6 of the IRC. The connectors may also be used in wood-framing structures regulated under the IRC when an engineered design is submitted in accordance with IRC Section R301.1.3.

3.0 DESCRIPTION

3.1 General:

The MiTek Z4 CT Continuity Tie and T2 Tension Tie connectors described in this report consist of steel tubes, steel end plates, all-threaded steel rods and the attaching bolts with approved washers and nuts. The steel end plates are on one end of the T2 Tension Tie connectors, and on both ends of the CT Continuity Tie connectors. Figure 1 shows the typical connector dimensions.

The MiTek Z4 CT Continuity Tie and T2 Tension Tie connectors, when attached to wood framing structural members in accordance with Figures 2 through 7, transmit tension forces to threaded steel rods. The CT Continuity Tie connectors can also transmit compressive forces when attached to wood framing structural members in accordance with Figure 2.

3.2 Material:

3.2.1 Steel Tubing: The cold-formed, welded steel tubes conform to Chinese National Standard GB/T 6728-2002. Steel used to manufacture steel tubes conforms to Chinese National Standard GB/T 700-2006, Grade Q235, with a minimum yield strength, Fy, of 34,100 psi (235 MPa) and a minimum tensile strength, Fu, of 53,700 psi (370 MPa). The tube section has holes for 20d common nails used to secure the tubes during installation, and holes for placement of ASTM A307 steel bolts used to attach the tubes to a wood member. See Figure 1 for the typical tube configurations.

3.2.2 Steel End Plates: The steel end plates conform to Chinese National Standard GB/T 700-2006, Grade Q235, with a minimum yield strength, Fy, of 34, 100 psi (235 MPa) and a minimum tensile strength, Fu, of 59,000 psi (407 MPa). The thickness of the steel end plates ranges from $^{3}/_{8}$ inch to $1^{3}/_{4}$ inches (9.5 mm to 44.5 mm). Each steel end plate has a centered hole for the placement of the threaded steel rod.

3.2.3 All-Threaded Steel Rods: The all-threaded steel rods must conform to ASTM F1554-07ae1 Grade 36, 55 and 105, ASTM A193-14 Grade B7, ASTM A311-04(2010) Grade 1045 B, ASTM A354-11 Grade BD, or ASTM A449-10, as specified in this report, and the threads must conform to ANSI B18.1 and have Class 2A tolerance. See Tables 1 through 3 for the steel rod size required for each connector.

3.2.4 Bolts: The headed steel bolts used to attach connectors to wood members must conform to ASTM A307 Grade A.

3.2.5 Washers and Nuts: Circular washers and nuts used with the threaded steel rods and bolts attaching the connectors to the wood members must conform to the following ASTM specifications:

3.2.5.1 Circular Washers: ASTM F436-11.

3.2.5.2 Nuts: ASTM A563-07a(2014) Grade A, for ASTM F1554-07ae1 Grade 36 and Grade 55 threaded rods and ASTM A307 bolts; or ASTM A194-14 Grade 2H or

ASTM A563-07a(2014) Grade DH for ASTM F1554-07ae1 Grade105, ASTM A193-14 Grade B7, ASTM A311-04(2010) Grade 1045 B, ASTM A354-11 Grade BD, and ASTM A449-10 threaded rods, respectively.

3.2.6 Threaded Rod Couplers: Threaded rod couplers used to splice the threaded rods or connect the threaded rods to the anchors in the concrete or masonry must comply with the same ASTM specifications that are required for nuts, including specified strength, material matching, dimensions, and thread engagement length. Additionally, couplers shall include a method, such as sight holes, to ensure proper thread engagement for in-field installation.

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 General: Calculations for the use of the CT connectors, plans detailing the location of the connectors, and the method of attachment to the concrete, where applicable, must be submitted to the code official for approval. Applied loads resisted by the connector assembly must be determined by structural analysis, and must not exceed the applicable allowable loads given in Tables 1 through 7 for the connector assembly. Attachment of the threaded rods to walls or embedment of the threaded rods into concrete foundations must be designed and detailed on the plans by a registered design professional, and must be approved by the code official. Couplers may be used to connect the threaded rods to other threaded rods, concrete or masonry anchors, or other base anchorage, where the anchors have been designed and detailed on the plans by a registered design professional, and approved by the code official.

The allowable loads given in Tables 1 through 7 are for allowable stress design (ASD) and include the load duration factor, C_D, corresponding to the applicable loads, and the group action factor, Cg, where applicable, in accordance with the ANSI/AWC *National Design Specification® for Wood Construction* (NDS). The allowable loads in Tables 1, 3, 5, and 7 are for the connectors used with visually graded No. 2 or higher grade Douglas fir–larch solid sawn lumber, except the grade must be No. 1 or higher grade for wood members that are nominally 5-by-5 and larger. The allowable loads for T2 connectors with visually graded No. 1 and higher grade Douglas fir-larch solid sawn lumber are noted in Table 5.

The applied axial compressive load on wood posts must not exceed the allowable stress design axial compressive load values shown in Table 7, based on the lower of the allowable compression perpendicular-to-grain, $P_{c\perp}$, and the allowable compression parallel-to-grain, Pc, of applicable wood members.

The allowable loads in this report are intended for use with the load combinations of IBC Section 1605.3, but may not be increased for material specific behavior in wind or seismic loading. Such behavior has already been considered.

The tabulated allowable loads are for the connectors connecting wood members that are under continuously dry interior conditions, and where sustained temperature is 100°F (37.8°C) or less. The tabulated allowable loads must be adjusted by the temperature factor, C_t, specified in the NDS, when wood members will experience sustained exposure to temperatures exceeding 100°F (37.8°C).

The tabulated allowable loads must be adjusted by the wet service factor, C_M, as specified in the NDS for lateral loads on dowel-type fasteners when the connectors are fastened to solid sawn wood members having moisture content greater than 19 percent, or where wet service is expected.

The tabulated allowable loads must not be adjusted by factors specified in Table A3.1 of AISC 341-16 under the 2018 IBC and IRC (Table A3.1 of AISC 340-10 under the 2015 and 2012 IBC and IRC and Table I-6-1 of AISC 341-05 under the 2009 and 2006 IBC and IRC) for steel end plates of the connectors.

4.1.2 Paired Connectors: The allowable tension loads shown in Tables 1 and 3 are for assemblies consisting of a pair of connectors and a single wood member, with a connector installed on the opposing faces of the wood member, as shown in Figures 2 and 3, with ASTM A307 bolts used in a double shear connection. The allowable tensile loads of wood members, when in control, must be determined based on the wood member net section and are noted in Tables 1 and 3. When paired connectors of CT Continuity Ties are used to resist compressive loads in the anchor rod, the allowable compressive load must be the least of the following: (1) the value from Table 1, (2) the allowable compressive force on the anchor rod shown in Table 2, and (3) the allowable compressive force on the wood member shown in Table 7. In addition, the wood member's design capacity must be checked for the combined axial compressive and flexural stresses in accordance with the applicable code.

4.1.3 Sandwiched Connectors: The allowable tensile loads shown in Tables 5 and 6 are for assemblies consisting of two wood members and a single connector installed between the two wood members as shown in Figure 4. The allowable tensile loads of the wood member, when in control, are determined based on the tensile stress in two wood members at their net sections, and are noted in Table 5.

4.2 Installation:

Installation of the connectors must be in accordance with this report and the manufacturer's published installation instructions. In the event of a conflict between this report and the manufacturer's published installation instructions, the more restrictive requirement governs.

The connectors must be installed parallel to the grain of the connected wood members. Bolt holes in the main wood member must be a minimum of $^1/_{32}$ inch (0.8 mm) to a maximum of $^1/_{16}$ inch (1.6 mm) larger than the bolt nominal diameter. Placement of bolt holes must comply with the NDS for end and edge distances. The connectors must be bolted to the wood member using bolts complying with size and strength requirements noted in Tables 1 through 6.

For the CT Continuity Tie connectors, a threaded steel rod must be installed to connect the pair of connectors, or a wall element to a connector, as shown in Figure 2. A loose plate can be added to a T2 connector to form a CT connector when the threaded rod is subject to compressive loads. Nuts must be used to secure the threaded rod at both ends of the connector, as shown in Figure 2. All nuts for the threaded rod must be installed to have a final installation torque of 50±10 lbs-ft (69±13 N-m).

T2 Tension Tie connectors can also be installed in accordance with Figures 3 through 6, with a threaded steel rod installed to connect a group of in-line connectors, a foundation or other approved anchor, or a wall element to the connector.

Since the allowable compressive loads in Table 7 are based on the wood member's being continuously braced, the sheathing shown in Figure 2 or the sheathing attached to the compressive post members in hold-down connections must be adequately attached to laterally brace the wood member.

4.3 Special Inspection:

4.3.1 IBC: Periodic special inspection is required for installation of the 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, and F in accordance with 2018 and 2015 IBC Section 1705.12.2 (2015 and 2012 IBC Section 1705.11.2 and 2009 and 2006 IBC Section 1707.3 or 1707.4), excepting those structures that qualify under the Exceptions to 2018, 2015, and 2012 IBC Section 1704.2 (2009 and 2006 IBC Section 1704.1). The special inspector must be present as often as required in accordance with statement of special inspection. The duties of the special inspector include, but are not limited to, verifying compliance with the approved construction documents and the requirements of this evaluation report.

4.3.2 IRC: For installations under the IRC, special inspection is not normally required. However, for an engineered design where calculations are required to be signed by a registered design professional, periodic special inspection requirements and exemptions are as stated in Sections 4.3.1, 5.5, 5.6, and 5.7, as applicable for installations under the IRC.

5.0 CONDITIONS OF USE

The MiTek Z4 CT Continuity Tie and T2 Tension Tie connectors described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 The connectors must be manufactured, identified and installed in accordance with this report and the manufacturer's published installation instructions. A copy of the instructions must be available at the jobsite at all times during installation.

5.2 Drawings and details verifying compliance with this report must be submitted to the code official for approval. The drawings and calculations must be prepared and signed by a registered design professional when required by the statutes of the jurisdiction in which the project is to be constructed.

5.3 Adjustment factors noted in Section 4.1 and the applicable codes must be considered, where applicable. No further duration of load increase for wind and earthquake loading is allowed. Tabulated ASD allowable loads must not be adjusted by values specified in Table A3.1 of AISC 341-10 under the 2015 and 2012 IBC (Table I-6-1 of the AISC 341-05 under the 2009 and 2006 IBC) for steel end plates of the connectors.

5.4 Use of the connectors and fasteners in contact with preservative-treated wood members and fire-retardant-treated solid sawn wood members is subject to the approval of the code official, since the effect of corrosion of metal in contact with chemically and fire-retardant-treated wood has not been evaluated and is outside the scope of this report.

5.5 Anchor bolts of the connector attached to concrete or masonry structural members must be designed and detailed in accordance with applicable code and Section 4.1.1 of this report by a registered design professional. Special inspections for anchor bolts in concrete or masonry shall be conducted in accordance with Section 1705.3 of the 2018, 2015, and 2012 IBC (Section 1704.4 or 1704.5 of the 2009 and 2006 IBC).

5.6 Periodic special inspections for seismic and wind resistance shall be conducted in accordance with the appropriate section(s) of Chapter 17 of the IBC.

5.7 A statement of special inspection must be prepared by a registered design professional in responsible charge, and submitted to the code official for approval, in accordance with Section 1704.3 of the 2018, 2015, and 2012 IBC (Section 1705 of the 2009 and 2006 IBC, as applicable).

5.8 The MiTek Z4 CT Continuity Tie and T2 Tension Tie connectors in this report are manufactured under a quality control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Hold-downs (Tie-downs) Attached to Wood Members (AC155), dated May 2015 (editorially revised January 2018).

7.0 IDENTIFICATION

The MiTek Z4 CT Continuity Tie and T2 Tension Tie connectors are identified by markings that include the company name (MiTek); the product model designation; and the ICC-ES evaluation report number (ESR-3105).

TABLE 1 - CT PAIRED CONNECTION ASD CAPACITIES [1, 3, 4, 5, 6, 8, 9]
DF-L No. 2 Grade typ., No. 1 @ 5x5 & larger

CT Model [2] 2 rq'd	A36 Anchor Rod Diam, 2 rq'd (1/8" increments)	A307 Bolts Quantity & Diameter (in)	b min. width of attached member (depth) rq'd (in)	CT Paired Connection ASD Design Capacities (pounds)								
				min. t (in), length of bolt in wood members each side of CT (thickness)							Δ_S @ max. strength capacity [7]	Δ_{ASD} @ max. allow. capacity [7]
				1.5	2.5	3	3.5	5.125	5.5	7.25/7.50		
CT-43	4	(4) 3/8	3.5	5,010	6,989	6,993	6,997	7,004	7,004	7,007	0.189	0.132
CT-24	4	(2) 1/2	3.5	3,360	5,600	6,235	6,235	6,235	6,235	6,235	0.229	0.160
CT-44	5	(4) 1/2	3.5	6,637	11,118	12,395	12,405	12,420	12,430	12,457	0.209	0.146
CT-64	6	(6) 1/2	3.5	[7,138]	[11,897]	[14,276]	[16,656]	18,442	18,504	18,592	0.207	0.145
			5.5	9,679	16,395	18,330	18,383	18,442	18,504	18,592		
CT-84	7	(8) 1/2	3.5	[7,138]	[11,897]	[14,276]	[16,656]	[21,137]	[22,683]	24,590	0.217	0.152
			5.5	[10,662]	[17,769]	[21,323]	24,057	24,241	24,381	24,590		
			7.25/7.5	12,377	21,300	23,892	24,057	24,241	24,381	24,590		
CT-46	8	(4) 3/4	5.5	9,749	[16,453]	[19,744]	[23,034]	27,776	27,804	28,028	0.222	0.155
			7.25/7.5	9,749	16,464	19,817	23,184	27,776	27,804	28,028		
CT-48	9	(4) 1	5.5	[9,345]	[15,576]	[18,691]	[21,806]	[30,020]	[32,216]	43420 [4]	0.232	0.162
			7.25/7.5	[12,029]	[20,048]	[24,057]	[28,067]	[41,858]	43420 [4]	43420 [4]		
			9.25/9.5	12,591	21,513	25,939	30,460	44910 [4]	43420 [4]	43420 [4]		
CT-68	11	(6) 1	5.5	[9,345]	[15,576]	[18,691]	[21,806]	[30,020]	[32,216]	[43,931]	0.211	0.148
			7.25/7.5	[12,029]	[20,048]	[24,057]	[28,067]	[41,858]	[46,736]	[63,731]		
			9.25/9.5	[14,590]	[24,317]	[29,180]	[34,044]	[49,850]	[50,119]	64,593 [4]		
			11.25/11.5	[16,504]	[27,506]	[33,008]	[38,509]	[56,388]	[61,999]	64,593 [4]		
			13.25/13.5	16,622	29,652	36,167	42,901	64,541	64,593 [4]	64,593 [4]		

For **SI**: 1 inch (in) = 25.4 mm, 1 pound = 4.45 N

[1] Wood design capacities have been increased by a 1.60 load duration factor (C_D).

[2] CT ab-y

CT = paired continuity tie
a = number of bolts
b = diameter of bolts (in 1/8 inch increments)
y = diameter of All-thread/Anchor Rod specified by designer (in 1/8 inch increments)

[3] Design capacity controlled by the tension capacity of the net cross-section of wood member at bolts are shown in [# #].

[4] These capacities are limited by the All-thread/Anchor anchor rod tension design capacity.

[5] The minimum end distance, from the end of the wood member to the centerline of the first CT bolt, is seven (7) CT bolt diameters. End distance may be increased with no decrease in design capacities.

[6] The capacity of the concrete anchor must be equal to or greater than the design capacity of the connector being specified.

[7] Deflections at loads less than maximum P_S or P_{ASD} may be determined by multiplying by the ratio of the lesser load to the maximum load. Strength loads are the P_{ASD} shown times 1.4. Tabulated displacement consists of deformation and rotation of the hold-down (tie-down), and fastener slip of (bolt rotation) used to attach the hold-down (tie-down) to the wood member. Shrinkage of supporting wood members and anchor bolt/rod elongation shall be the responsibility of the registered design professional.

[8] The user should note that hold-downs used in series shall account for the cumulative deformation of all hold-downs (tie-downs) within said series.

[9] The assembliy must havew an allowable strength equal to greater than the required strength of the assembly under the action of the ASD load combinations referenced in the applicablwe code.

TABLE 2 ALL-THREAD ROD ASD DESIGN TENSION & COMPRESSION CAPACITIES FOR TWO ASTM F 1554 GRADE 36 RODS (pounds) [4, 5, 6, 7]

		ALL-THREAD ROD DIAMETER, D_r, (inches) [1]							
		(2) 1/2	(2) 5/8	(2) 3/4	(2) 7/8	(2) 1	(2) 1 1/8	(2) 1 1/4	(2) 1 3/8
		Rod Tension Capacities, P_{RT}							
		8,541	13,346	19,218	26,157	34,165	43,240	53,383	64,593
L [2] (inches)	K [3]	Rod Compression Capacities, P_{RC}							
12	1.00	3,200	6,448	10,741	15,863	21,724	28,188	36,689	44,400
18		[1,478]	[3,746]	7,778	12,684	18,333	24,596	32,868	40,397
24		[830]	[2,108]	[4,616]	8,795	14,252	20,313	28,347	35,681
30		[532]	[1,348]	[2,954]	[5,630]	[9,690]	15,317	23,134	30,279
36		[370]	[936]	[2,052]	[3,910]	[6,728]	[10,684]	[17,224]	24,162
42		[272]	[688]	[1,508]	[2,872]	[4,944]	[7,850]	[12,654]	[17,970]

For **SI**: 1 inch = 25.4 mm, 1 pound = 4.45 N

[1] All-thread rod must comply with ASTM F 1554 Grade 36.

[2] Unsupported length of rod shown in Figure 2.

[3] K is the slenderness factor. A K value of 1.00 is used for pinned ends.

[4] When using the CT connector to transfer compression loads the design engineer shall check the wood members design capacity for the most critical load combination (i.e. bending about one or both principal axes and axial compression).

[5] When $K L / r > C_c$ or 200, $F_e = 12 \pi^2 E / 23 (K L / r)$ and shown in [# #], where $r = (D_r - 0.9743/n)$, and n = threades per inch, $C_c = (2 \pi^2 E / Fy)^{1/2}$, where F_y = yield strength of rod steel and E = modulus of elasticity of rod steel.

[6] The tabulated ASD capacities are a measure of steel strength of the device when tested on a steel jig with a safety factore of 2.5 applied to the lowest maximum test load.

[7] The tabulated ASD capacities are applicable for designs complying with Sections 12.10 and 12.11.2 of ACSE 7.

TABLE 3 - T2 PAIRED CONNECTION ASD CAPACITIES [1, 3, 5, 6, 8, 9]
DF-L No. 2 Grade typ., No. 1 @ 5x5 & larger

T2 Model [2] 2 rq'd	Min A36 Anchor Rod Diam, 2 rq'd (1/8" increments)	A307 Bolts Quantity & Diameter (in)	b min. width of attached member (depth) rq'd (in)	T2 Paired Connection ASD Design Capacities (pounds)								
				min. t (in), length of bolt in wood members each side of T2 (thickness)							Δ_S @ max. strength capacity [7]	Δ_{ASD} @ max. allow. capacity [7]
				1.5	2.5	3	3.5	5.125	5.5	7.25/7.50		
T2-43	4	(4) 3/8	3.5	5,010	6,989	6,993	6,997	7,004	7,004	7,007	0.189	0.132
T2-24	4	(2) 1/2	3.5	3,360	5,600	6,235	6,235	6,235	6,235	6,235	0.229	0.160
T2-44	5	(4) 1/2	3.5	6,637	11,118	12,395	12,405	12,420	12,430	12,457	0.209	0.146
T2-64	6	(6) 1/2	3.5	[7,138]	[11,897]	[14,276]	[16,656]	18,442	18,504	18,592	0.207	0.145
			5.5	9,679	16,395	18,330	18,383	18,442	18,504	18,592		
T2-84	7	(8) 1/2	3.5	[7,138]	[11,897]	[14,276]	[16,656]	[21,137]	[22,683]	24,590	0.217	0.152
			5.5	[10,662]	[17,769]	[21,323]	24,057	24,241	24,381	24,590		
			7.25/7.5	12,377	21,300	23,892	24,057	24,241	24,381	24,590		
T2-46	8	(4) 3/4	5.5	9,749	[16,453]	[19,744]	[23,034]	27,776	27,804	28,028	0.222	0.155
			7.25/7.5	9,749	16,464	19,817	23,184	27,776	27,804	28,028		
T2-48	9	(4) 1	5.5	[9,345]	[15,576]	[18,691]	[21,806]	[30,020]	[32,216]	43,420 [4]	0.232	0.162
			7.25/7.5	[12,029]	[20,048]	[24057]	[28,067]	[41858]	43,420 [4]	43,420 [4]		
			9.25/9.5	12,591	21,513	25,939	30,460	43,420 [4]	43,420 [4]	43,420 [4]		
T2-68	11	(6) 1	5.5	[9,345]	[15,576]	[18,691]	[21,806]	[30,020]	[32,216]	[43,931]	0.211	0.148
			7.25/7.5	[12,029]	[20,048]	[24,057]	[28,067]	[41,858]	[46,736]	[63,731]		
			9.25/9.5	[14,590]	[24,317]	[29,180]	[34,044]	[49,850]	[50,119]	64,593 [4]		
			11.25/11.5	[16,504]	[27,506]	[33,008]	[38,509]	[56,388]	[61,999]	64,593 [4]		
			13.25/13.5	16,622	29,652	36,167	42,901	64,541	64,593 [4]	64,593 [4]		

For **SI**: 1 inch (in) = 25.4 mm, 1 pound = 4.45 N

[1] Wood design capacities have been increased by a 1.60 load duration factor (C_D) .

[2] T2 ab-y
T2 = paired continuity tie
a = number of bolts
b = diameter of bolts (in 1/8 inch increments)
y = diameter of All-thread/Anchor Rod specified by designer (in 1/8 inch increments)

[3] Design capacity controlled by the tension capacity of the net cross-section of wood member at bolts are shown in [##].

[4] These capacities are limited by the All-thread/Anchor anchor rod tension design capacity.

[5] The minimum end distance, from the end of the wood member to the centerline of the first T2 bolt, is seven (7) T2 bolt diameters. End distance may be increased with no decrease in design capacities.

[6] The capacity of the concrete anchor must be equal to or greater than the design capacity of the connector being specified.

[7] Deflections at loads less than maximum P_S or P_{ASD} may be determined by multiplying by the ratio of the lesser load to the maximum load. Strength loads are the P_{ASD} shown times 1.4. Tabulated displacement consists of deformation and rotation of the hold-down (tie-down), and fastener slip of (bolt roatation) used to attach the hold-down (tie-down) to the wood member. Shrinkage of supporting wood members and anchor bolt/rod elongation shall be the responsibility of the registered design professional.

[8] The user should note that hold-downs used in series shall account for the cumulative deformation of all hold-downs (tie-downs) within said series.

[9] The assembliy must havew an allowable strength equal to greater than the required strength of the assembly under the action of the ASD load combinations referenced in the applicablwe code.

TABLE 4 ALL-THREAD ROD ASD DESIGN TENSION CAPACITIES
FOR TWO ASTM F 1554 GRADE 36 RODS (pounds) [1, 2, 3]

	ALL-THREAD ROD DIAMETER, D_r, (inches)							
	(2) 1/2	(2) 5/8	(2) 3/4	(2) 7/8	(2) 1	(2) 1 1/8	(2) 1 1/4	(2) 1 3/8
	Tension Capacities							
	8,541	13,346	19,218	26,157	34,165	43,240	53,383	64,593

For **SI**: 1 inch = 25.4 mm, 1 pound = 4.45 N

[1] All-thread rod must comply with ASTM F 1554 GRADE 36.

[2] The tabulated ASD capacities are a measure of steel strength of the device when tested on a steel jig with a safety factore of 2.5 applied to the lowest maximum test load.

[3] The tabulated ASD capacities are applicable for designs complying with Sections 12.10 and 12.11.2 of ACSE 7.

TABLE 5 - T2- SANDWICH CONNECTION (wood posts each side) ASD CAPACITIES [1, 3, 5, 6, 9, 10]
DF-L No. 1 or better (2x4) & No. 2 Grade typ. except No. 1 @ 5x5 & larger

T2-Model [2]	Min HS Anchor Rod Diam (1/8" increments)	A307 Bolts Quantity & Diameter (in)	b min. width of attached member (depth) rq'd (in)	T2 Sandwich Connection ASD Design Capacities (pounds)								
				min. t (in), length of bolt in wood members each side of T2 (thickness)							Δ_s @ max. strength capacity [7]	Δ_{ASD} @ max. allow. capacity [7]
				1.5 #1+	1.5	2.5	3	3.5	5.125	≥ 5.5		
T2-43	4	(4) 3/8	3.5	6,457	6,457	7,001	7,001	7,005	7,007	7,009	0.145	0.102
T2-24	4	(2) 1/2		4,984	4,984	6,235	6,235	6,235	6,235	6,235	0.121	0.085
T2-44	5	(4) 1/2		9,904	9,904	12,422	12,432	12,436	12,445	12,449	0.152	0.108
T2-64	6	(6) 1/2	3.5	14,637	[14,276]	18,465	18,499	18,533	18,573	18,597	0.179	0.128
			5.5	14,637	14,637	18,465	18,499	18,533	18,573	18,597		
T2-84	7	(8) 1/2	3.5	[16,920]	[14,276]	**23,417** [8]	**23,417** [8]	**23,417** [8]	**23,417** [8]	**23,417** [8]	0.181	0.129
			5.5	19,077	19,077	**23,417** [8]	**23,417** [8]	**23,417** [8]	**23,417** [8]	**23,417** [8]		
T2-46	8	(4) 3/4	5.5	**19,385** [8]	**19,385** [8]	**19,385** [8]	**19,385** [8]	**19,385** [8]	**19,385** [8]	**19,385** [8]	0.159	0.114
T2-48S	9	(4) 1	5.5	[22,152]	[18,691]	[31,151]	[37,382]	42,141	42,867 [4]	42,867 [4]	0.172	0.122
			7.25/7.5	25,963	[24,057]	36,671	39,152	42,141	42,867 [4]	42,867 [4]		
T2-68S	11	(6) 1	5.5	[22,152]	[18,691]	[31,151]	[37,382]	[43,612]	64,036 [4]	64,036 [4]	0.150	0.210
			7.25/7.5	[30,888]	[24,057]	[40,095]	[48,114]	[56,133]	64,036 [4]	64,036 [4]		
			9.25/9.5	36,171	[31,833]	52,474	56,276	61,061	64,036 [4]	64,036 [4]		

For **SI**: 1 inch (in) = 25.4 mm, 1 pound = 4.45 N

[1] Wood design capacities have been increased by a 1.60 load duration factor (C_D) .

[2] T2-ab-y
T2 = tension tie (bearing plate at top only)
a = number of bolts
b = diameter of bolts (in 1/8 inch increments)
y = diameter of All-thread/Anchor Rod specified by designer (in 1/8 inch increments)

[3] Design capacity controlled by the tension capacity of the net cross-section of wood member at bolts are shown in [##].

[4] These capacities are limited by the All-thread/Anchor anchor rod tension design capacity.

[5] The minimum end distance, from the end of the wood member to the centerline of the first T2 bolt, is seven (7) T2 bolt diameters. End distance may be increased with no decrease in design capacities.

[6] The capacity of the concrete anchor must be equal to or greater than the design capacity of the connector being specified.

[7] Deflections at loads less than maximum P_s or P_{ASD} may be determined by multiplying by the ratio of the lesser load to the maximum load. Strength loads are the P_{ASD} shown times 1.4. Tabulated displacement consists of deformation and rotation of the hold-down (tie-down), and fastener slip of (bolt roatation) used to attach the hold-down (tie-down) to the wood member. Shrinkage of supporting wood members and anchor bolt/rod elongation shall be the responsibility of the registered design professional.

[8] Design capacity controlled by the tested device capacity/2.5 are shown in **bold**.

[9] The user should note that hold-downs used in series shall account for the cumulative deformation of all hold-downs (tie-downs) within said series.

[10] The assembliy must havew an allowable strength equal to greater than the required strength of the assembly under the action of the ASD load combinations referenced in the applicablwe code.

TABLE 6—T2 - SANDWICH CONNECTION (wood posts each side)
ASD CAPACITIES (for use by component manufacturers only) [1, 2, 3, 4]

T2-Model	End Plate Thickness	Anchor Rod Dia. (1/8" increments)[2]	A307 Bolts	SC Maximum Capacities Based on Device and Assembly Tests (lbs)[1]	Δ_{ASD} @ maximum allowable capacity[3]	
			Quantity & Diameter (in)			
	(in)				$\Delta_{ASD\text{-}DF\text{-}L}$	$P_{ASD\text{-}DF\text{-}L}$
T2-1	3/8	4-5	(4) 3/8	10,973	0.104	7,009
T2-2	3/8	5-8	(2) 1/2	9,985	0.087	6,235
T2-3	3/8	5-8	(4) 1/2	9,985	0.087	9,985
T2-4	1/2	5-8	(6) 1/2	15,289	0.105	15,289
T2-5	5/8	5-8	(8) 1/2	17,556	0.097	17,556
T2-6	1/2	7-10	(4) 3/4	19,385	0.114	19,385
T2-7	1/2	8-11	(2) 1	18,361	0.053	18,361
T2-8	1	8-11	(4) 1	38,770	0.111	38,770
T2-9	1 1/2	8-11	(6) 1	51,755	0.121	51,755

For **SI:** 1 inch (in) = 25.4 mm, 1 pound = 4.45 N

[1] Design capacity may be controlled by the net section tension capacity of the wood member. Capacities for bolts in wood members shall be calculated using the latest NDS, Section 11.3. Final design capacity shall be the minimum of the NDS calculated or the Table 6 capacity. Wood design capacities may be increased by a 1.60 load duration factor (CD).

[2] The capacity of the concrete anchor must be equal to or greater than the design capacity of the connector being specified.

[3] Deflections at loads less than maximum P_{ASD} may be determined by multiplying by the ratio of the lesser load to the maximum load. Strength loads are the P_{ASD} shown times 1.4. Tabulated displacement consists of deformation and rotation of the hold-down (tie-down), and fastener slip of (bolt rotation) used to attach the hold-down (tie-down) to the wood member. Shrinkage of supporting wood members and anchor bolt/rod elongation shall be the responsibility of the registered design professional.

[4] The user should note that hold-downs used in series shall account for the cumulative deformation of all hold-downs (tie-downs) within said series.

TABLE 7 - COMPRESSION DESIGN CAPACITIES (pounds) for WOOD STUDS or POSTS [1, 2]

b [6] (inches)	l_e (inches)	C_D [7]	$P_{c\perp}$ [3, 5] or P_c [4] (pounds)	t (inches), length of bolt in wood member [8]							
				1.5 #1+	1.50	2.00	2.50	3.00	3.50	5.50	7.25
3.5		1.00	$P_{c\perp max}$		3,281	4,375	5,469	6,563	7,656	12,031	15,859
		1.60			N/A	N/A	N/A	N/A	N/A	N/A	N/A
	91.5	1.00	$P_{c\,max}$		3,234	4,312	5,390	6,468	7,546	11,764	15,369
		1.60			3,367	4,489	5,611	6,733	7,856	12,280	16,093
	103.5	1.00	$P_{c\,max}$		2,619	3,492	4,366	5,239	6,112	9,551	12,513
		1.60			2,694	3,592	4,490	5,389	6,287	9,843	12,921
	115.5	1.00	$P_{c\,max}$		2,152	2,869	3,586	4,303	5,020	7,857	10,311
		1.60			2,197	2,929	3,662	4,394	5,126	8,033	10,557
	127.5	1.00	$P_{c\,max}$		1,793	2,390	2,988	3,586	4,183	6,553	8,609
		1.60			1,822	2,429	3,037	3,644	4,251	6,666	8,766
b [6] (inches)	l_e (inches)	C_D [7]	$P_{c\perp}$ [3, 5] or P_c [4] (pounds)		t (inches), length of bolt in wood member [8]						
					1.50	2.00	2.50	3.00	3.50	5.50	7.50
5.5		1.00	$P_{c\perp max}$		5,156	6,875	8,594	10,313	12,031	18,906	25,781
		1.60			N/A	N/A	N/A	N/A	N/A	N/A	N/A
	91.5	1.00	$P_{c\,max}$		8,885	11,847	14,809	17,771	20,733	25,802	35,185
		1.60			10,329	13,772	17,215	20,657	24,100	31,792	43,353
	103.5	1.00	$P_{c\,max}$		7,930	10,574	13,217	15,860	18,504	24,201	33,001
		1.60			8,873	11,831	14,788	17,746	20,704	28,877	39,378
	115.5	1.00	$P_{c\,max}$		6,968	9,291	11,614	13,937	16,260	22,346	30,472
		1.60			7,569	10,092	12,615	15,138	17,661	25,782	35,158
	127.5	1.00	$P_{c\,max}$		6,077	8,103	10,129	12,155	14,181	20,347	27,746
		1.60			6,463	8,618	10,772	12,927	15,081	22,770	31,050
	139.5	1.00	$P_{c\,max}$		5,294	7,058	8,823	10,588	12,352	18,337	25,005
		1.60			5,549	7,398	9,248	11,097	12,947	20,017	27,296
7.25 @ ≤ 3.5 7.5 @ ≥ 5.5		1.00	$P_{c\perp max}$		6,797	9,063	11,328	13,594	15,859	25,781	35,156
		1.60			N/A	N/A	N/A	N/A	N/A	N/A	N/A
	103.5	1.00	$P_{c\,max}$		12,475	16,634	20,792	24,950	29,109	37,417	51,023
		1.60			15,252	20,337	25,421	30,505	35,589	47,638	64,961
	115.5	1.00	$P_{c\,max}$		11,730	15,640	19,550	23,461	27,371	36,243	49,422
		1.60			13,918	18,557	23,196	27,835	32,474	45,365	61,862
	127.5	1.00	$P_{c\,max}$		10,887	14,516	18,145	21,775	25,404	34,849	47,521
		1.60			12,528	16,704	20,880	25,056	29,232	42,723	58,259
	139.5	1.00	$P_{c\,max}$		9,989	13,319	16,648	19,978	23,308	33,237	45,323
		1.60			11,180	14,907	18,633	22,360	26,087	39,793	54,263
	163.5	1.00	$P_{c\,max}$		8,222	10,963	13,704	16,444	19,185	29,486	40,208
		1.60			8,833	11,778	14,722	17,667	20,611	33,622	45,849
	187.5	1.00	$P_{c\,max}$		6,701	8,935	11,169	13,403	15,637	25,455	34,712
		1.60			7,028	9,370	11,713	14,055	16,398	27,891	38,034

For **SI**: 1 inch = 25.4 mm, 1 pound = 4.45 N

[1] Table is based on wood type and grade, Douglas Fir-Larch, No. 2 typ., No. 1 @ 5 x 5 and larger.

[2] Tables are for axial compression load only and are for the design capacity of one wood member.

[3] $P_{c\perp max}$ = Maximum Design Capacity in Compression Perpendicular to Grain, based on an allowable compression perpendicular to grain stress of 625 psi (load duration factor C_D not applicable).

[4] $P_{c\,max}$ = Maximum Design Capacity in Compression Parallel to Grain, with effective length of member = l_e (l_e / b ≤ 50).

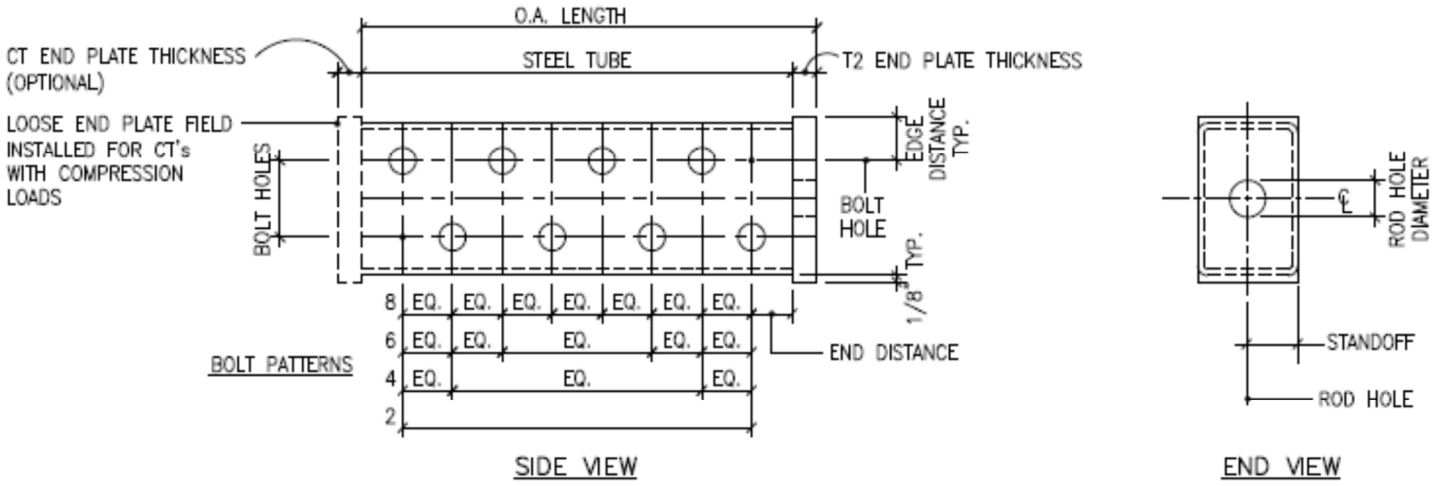
[5] $P_{c\perp}$ max may be multiplied by C_b for bearings not nearer than 3" to the end of a member:

t (inches)	1.50	2.00	2.50	3.00	3.50	5.50	≥ 6.00
C_b	1.25	1.17	1.15	1.13	1.11	1.07	1.00

[6] b = width (depth) of wood stud or post, unbraced dimension.

[7] C_D = load duration factor

[8] t = thickness (breadth) of stud or post, braced dimension



CT, T2 MODEL	TUBE SIZE (in)	T2 O. A. LENGTH (in)	CT O. A. LENGTH (in)	EDGE DISTANCE (in)	END DISTANCE (in)	STANDOFF (in)	BOLTS			END PLATE		
							NUMBER	HOLE DIAM. (in)	STAGGERED SPACING (in)	T2 END PLATE	CT END PLATE	ROD HOLE DIAM. (in)
43-4	2 1/2x2 1/2x1/8	4 7/8	5 1/4	7/8	3/4	1 1/4	4	7/16	1	3/8	3/8	9/16
24-4	3x3x1/8	2 7/8	3 1/4	1	3/4	1 1/2	2	9/16	1	3/8	3/8	9/16
44-5	3x3x1/8	5	5 1/2	1	3/4	1 1/2	4	9/16	1	1/2	1/2	11/16
64-6e	3x3x1/8	7 1/8	7 3/4	1	3/4	1 1/2	6	9/16	1	5/8	5/8	13/16
84-7	3x3x1/8	9 1/4	10	1	3/4	1 1/2	8	9/16	1	3/4	3/4	15/16
46-6	4x3x3/16	7 1/4	7 3/4	1 1/4	1 1/8	1 1/2	4	13/16	1 1/2	1/2	1/2	1 1/16
48-9	5x3x3/16	9 5/8	10 1/4	1 1/2	1 1/2	1 1/2	4	1 1/16	2	5/8	5/8	1 3/16
66-11	5x3x3/16	14	15	1 1/2	1 1/2	1 1/2	6	1 1/16	2	1	1	1 7/16
48-9S	5x3x3/16	10 3/8	-	1 1/2	1 1/2	1 1/2	4	1 1/16	2	1 3/8	-	1 3/16
68-11S	5x3x3/16	14 3/4	-	1 1/2	1 1/2	1 1/2	6	1 1/16	2	1 3/4	-	1 7/16
For SI: 1 inch (in) = 25.4 mm												

FIGURE 1—CT AND T2 CONNECTOR CONFIGURATION & DIMENSIONS

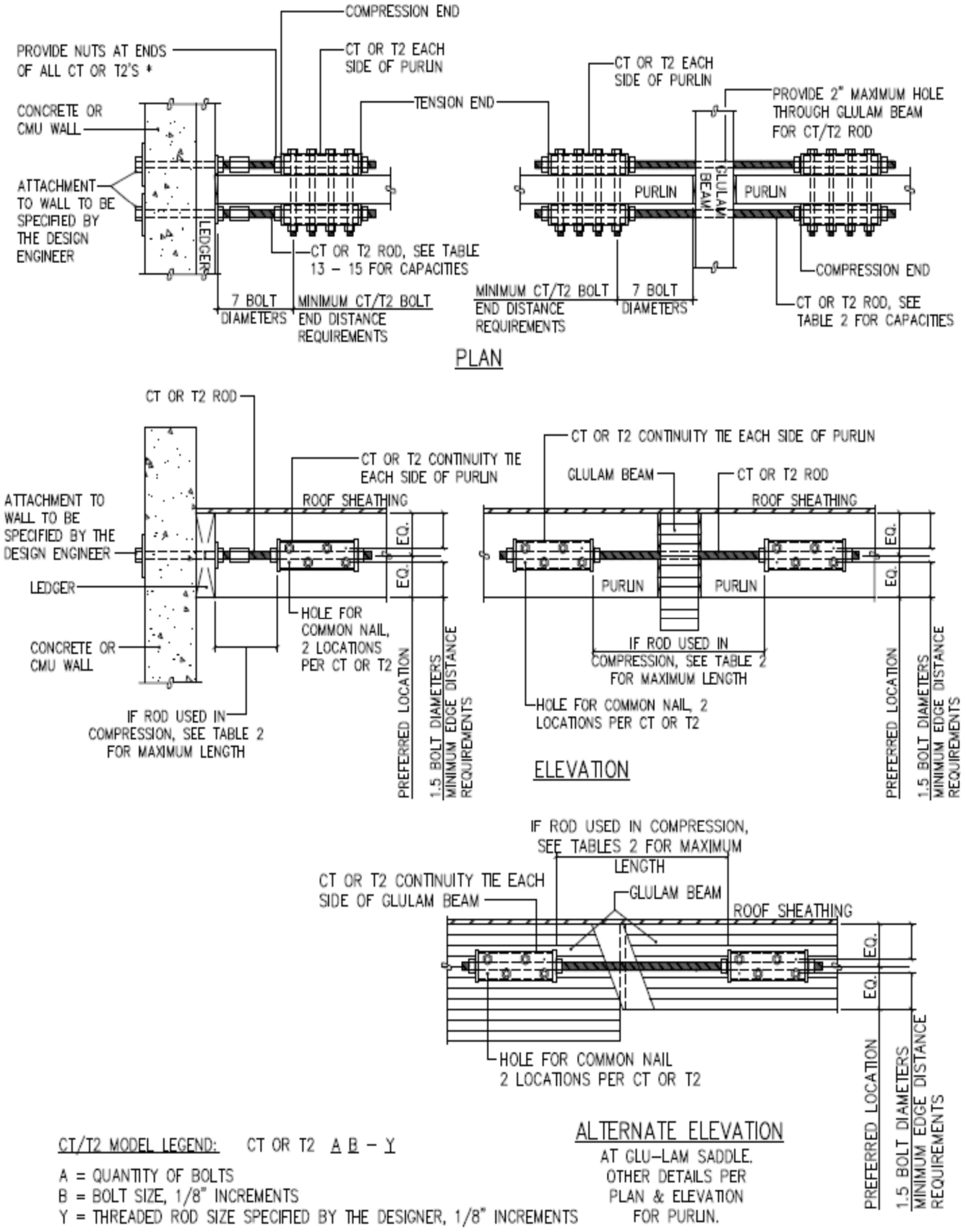


FIGURE 2—TYPICAL ROOF CONNECTIONS USING CT OR T2 CONNECTOR

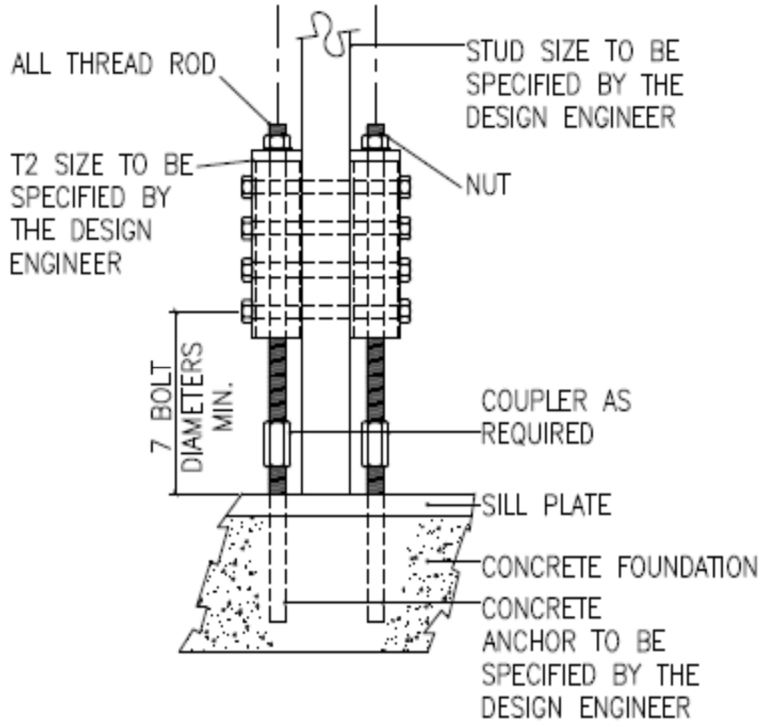


FIGURE 3—PAIRED CONNECTION

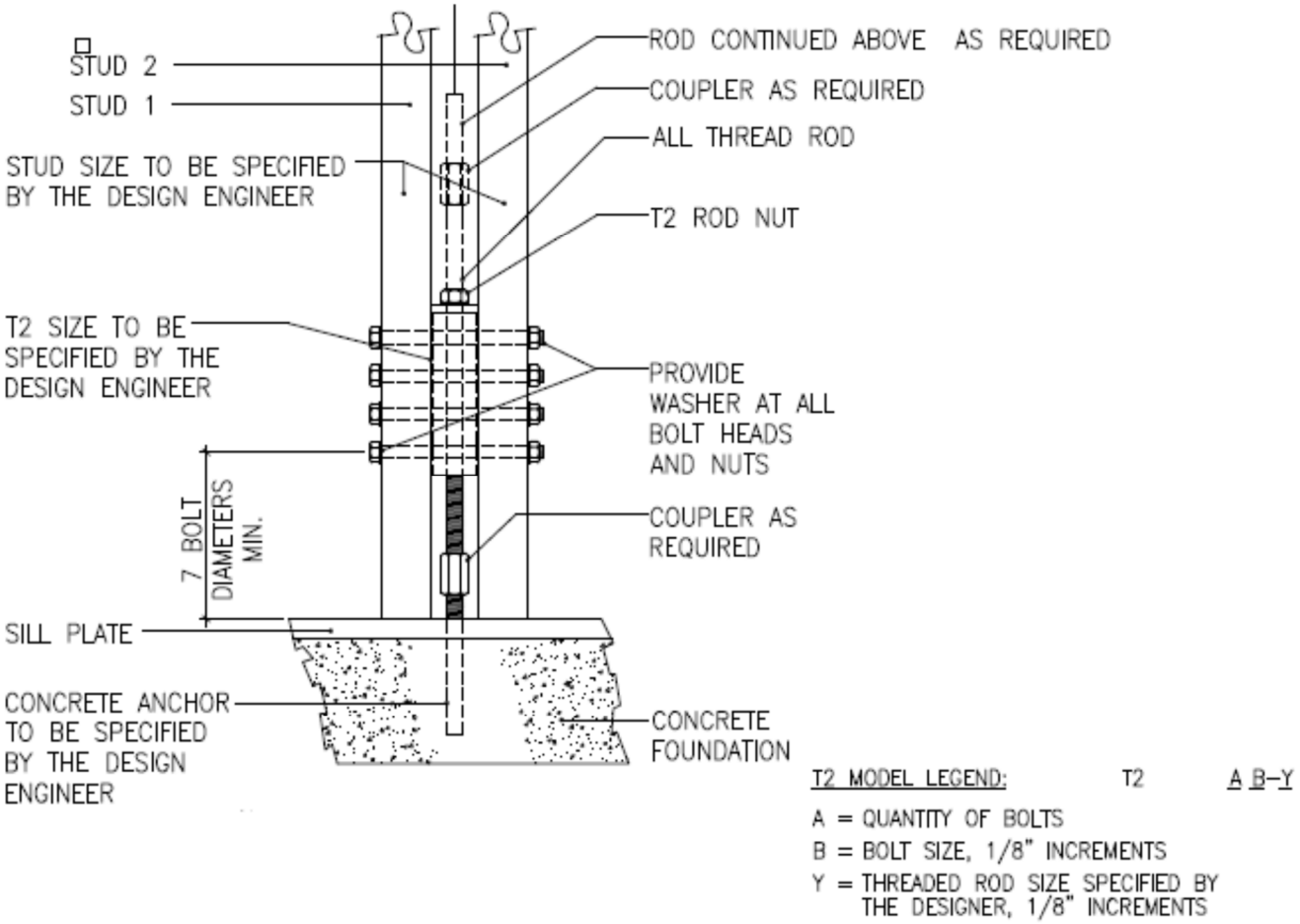


FIGURE 4—SANDWICH CONNECTION

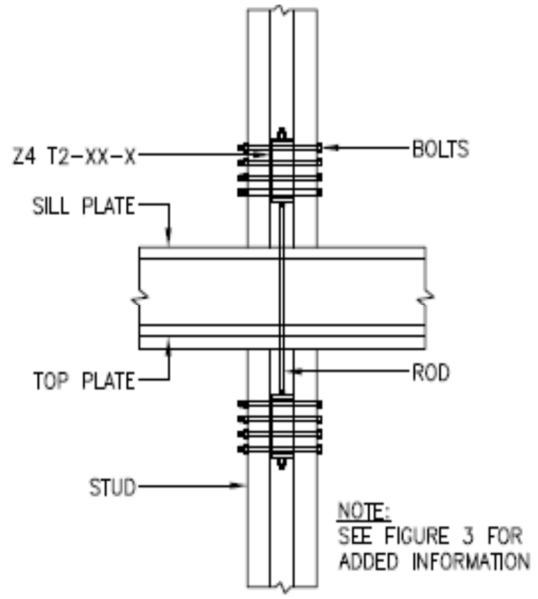


FIGURE 5—SANDWICH CONNECTION ABOVE AND BELOW RAISED FLOOR

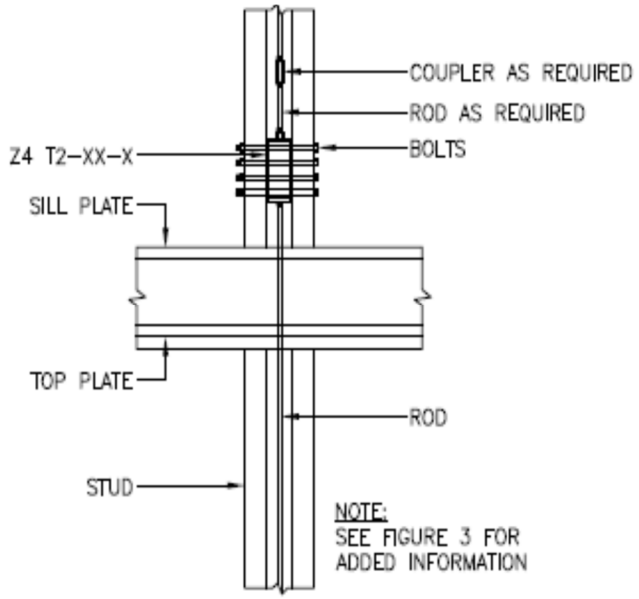


FIGURE 6—SANDWICH CONNECTION AT RAISED FLOOR TO CONTINUOUS ROD

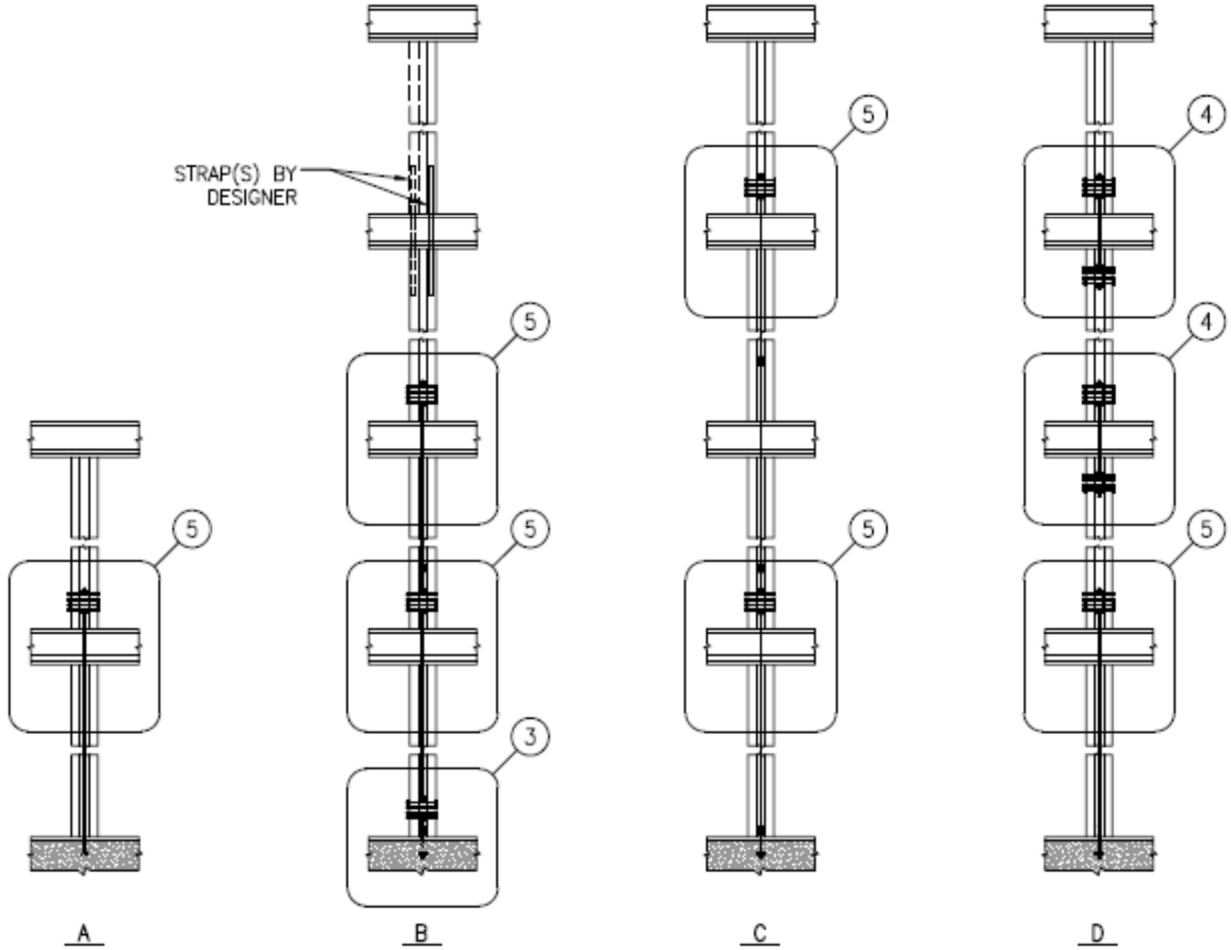


FIGURE 7—MULTI-LEVEL SANDWICH CONNECTION SAMPLE COMBINATIONS

DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
Section: 06 05 23—Wood, Plastic, and Composite Fastenings

REPORT HOLDER:

MITEK® USA, INC.

EVALUATION SUBJECT:

MITEK® Z4 CT CONTINUITY TIE AND T2 TENSION TIE CONNECTORS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the MiTek Z4 CT Continuity Tie and T2 Tension Tie Connectors, described in ICC-ES evaluation report ESR-3105, have also been evaluated for compliance with the codes noted below as adopted by the Los Angeles Department of Building and Safety (LADBS).

Applicable code editions:

- 2020 *City of Los Angeles Building Code* (LABC)
- 2020 *City of Los Angeles Residential Code* (LARC)

2.0 CONCLUSIONS

The MiTek Z4 CT Continuity Tie and T2 Tension Tie Connectors, described in Sections 2.0 through 7.0 of the evaluation report ESR-3105, comply with the LABC Chapter 23, and the LARC, and are subjected to the conditions of use described in this supplement.

3.0 CONDITIONS OF USE

The MiTek Z4 CT Continuity Tie and T2 Tension Tie Connectors described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report ESR-3105.
- The design, installation, conditions of use and identification of the MiTek Continuity Tie and Tension Tie Connectors are in accordance with the 2018 *International Building Code®* (2018 IBC) provisions noted in the evaluation report ESR-3105.
- The design, installation and inspection are in accordance with additional requirements of LABC Chapters 16 and 17 Sections 2305 and 2306, as applicable.
- Under the LARC, an engineered design in accordance with LARC Section R301.1.3 must be submitted.
- In accordance with LABC Section 2305.5, allowable seismic load values of The MiTek Z4 CT Continuity Tie and T2 Tension Tie connectors used as hold-down connectors must be 75 percent of those in the evaluation report ESR-3105.
- The seismic design provisions for hillside buildings referenced in LABC Section 2301.1 have not been considered and are outside of the scope of this supplement.
- The seismic design provisions in accordance with City of Los Angeles Information Bulletin P/BC 2020-071 for the design of wall anchorage assemblies to flexible diaphragms, have not been considered, and are outside of the scope of this supplement.

This supplement expires concurrently with the evaluation report, reissued August 2019 and revised February 2020.

DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
Section: 06 05 23—Wood, Plastic, and Composite Fastenings

REPORT HOLDER:

MITEK® USA, INC.

EVALUATION SUBJECT:

MITEK® Z4 CT CONTINUITY TIE AND T2 TENSION TIE CONNECTORS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that MiTek Z4 CT Continuity Tie and T2 Tension Tie Connectors, recognized in ICC-ES report ESR-3105, have also been evaluated for compliance with Chapter 23 of the code noted below.

Applicable code edition(s):

2019 *California Building Code* (CBC)

For evaluation of applicable chapters adopted by the California Office of Statewide Health Planning and Development (OSHPD) and Division of State Architect (DSA), see Sections 2.1.1 and 2.1.2 below.

2.0 CONCLUSIONS

2.1 CBC:

The MiTek Z4 CT Continuity Tie and T2 Tension Tie Connectors, described in Sections 2.0 through 7.0 of the evaluation report ESR-3105, comply with CBC Chapter 23, provided the design and installation are in accordance with the 2018 *International Building Code*® (IBC) provisions noted in the evaluation report and the additional requirements of CBC Chapter 23, as applicable.

2.1.1 OSHPD:

The applicable OSHPD Sections of the CBC are beyond the scope of this supplement.

2.1.2 DSA:

Thee applicable DSA Sections of the CBC are beyond the scope of this supplement.

This supplement expires concurrently with the evaluation report, reissued August 2019 and revised February 2020.