



Z4 Tie-Down Systems Product Catalog



MiTek[®]_____

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Product Profile

MiTek[°]

Our mission is to provide the building industry with a simple, efficient, quality tie-down system with unparalleled customer service.

The Z4 Tie-Down System is used in multi-story buildings to transfer uplift tension forces that result from earthquake and wind loading, to the foundation. The CNX/CNXO Cinch Nut allows for easy, fast, and dependable one-step installation. Z4 Tie-Down Runs are engineered for maximum material and labor efficiency to provide the most economical system in the industry.

The CNX/CNXO Cinch Nut is a shrinkage take-up device that is evaluated under the IBC and the City of Los Angeles building codes and is accepted by building departments nation-wide. The CNX/CNXO ability to perpetually "travel" down the length of the threaded rod allows it to compensate for natural shrinkage and settlement that occurs in wood buildings, therefore keeping connections of Tie-Down Runs tight to the floor framing members for the life of the building.



The Z4 Tie-Down System with the CNX/CNXO Cinch Nut is designed to limit story drifts of multi-story buildings and eliminate additional structural damage caused by loose connections in the floor framing. The system was designed following the Northridge Earthquake when the effects of wood shrinkage, building settlement, and other building deformation were shown to be factors contributing to damage.

The Z4 design was the first in the industry to provide a continuous load path for uplift that perpetually adjusts its connections to the floor system as the building deforms. The Z4 Tie-Down System is engineered, tested, and code evaluated to perform. It continues to be an innovative leader in the multi-story building industry.

MiTek Structural Systems

The CNX/CNXO Cinch Nut and its application in the Z4 Tie-Down System is a solution included in a broad range of MiTek solutions for wood and light gauge steel framing. Other MiTek Builder Products include the Hardy Shear Wall System and MiTek Structural Connectors. For more information please visit: mitek-us.com.

Design, Technical and Customer Support

We offer comprehensive technical support, design of tie-down systems to meet engineered loads and deliver products packaged and labeled for easy identification in the field.

- For the Design Professional we provide pre-engineered standard runs as well as individual component capacities to design custom runs. We also offer turn-key, sealed designs when engineered loads are provided to us.
- Building Officials confidently approve our systems because they assemble with code evaluated components that have an ESR listing.
- For the installer, our products arrive on time and are packaged systematically for easy identification of parts and sequence of assembly. We offer typical installation details, immediate telephone support and personal training is available from a sales or customer service representative.

MiTek Tie-Down System

The Z4 CNX/CNXO-Series Cinch Nut is a shrinkage compensating take-up device that keeps connections of Tie-Down Runs tight to the floor framing members when shrinkage and compression of wood fibers occur. The Cinch Nut uses an internal self-ratcheting action that permits movement, or "travel" perpetually in one direction along the length of a threaded rod. When connected to the floor framing, the Cinch Nut travels down the Threaded rod with the building as it shrinks and compresses. The CNX/CNXO Series Cinch Nut is available in 1/8 inch increments for installation with threaded rods that are 3/8 inch through 1-1/2 inch diameter.



CNX/CNXO-Series Advantages

- Features perpetual ratcheting along the length of a threaded rod that is not limited like the energy stored in a spring loaded device.
- Simple, one-time installation that does not require pin or screw activation after the building is loaded.
- CNX/CNXO models are matched to the rod diameter specified for optimal tolerances.

BPW5, BPW6 Installation

BPW7 and Larger Installation



Code Reports

- ESR-2190
- LA City RR 25623
- Florida Building Code Building
- Florida Building Code Residential

CINCH NUT (CNX/CNXO)											
Model Number ¹	Connecting Rod Diameter (in.)	Allowable Load Capacity (lbs.) ²									
CNX/CNXO3	3/8	5,175									
CNX/CNXO4	1/2	9,205									
CNX/CNX05	5/8	14,065									
CNX/CNXO6	3/4	16,940									
CNX/CNX07	7/8	28,185									
CNX/CNX08	1	29,285									
CNX/CNXO9	1 1/8	42,335									
CNX/CNX010	1 1/4	54,190									
CNX/CNX011	1 3/8	51,095									
CNX/CNX012	1 1/2	82,835									

1. All CNX/CNXO models fit within a nominal 4" wall depth.

2. Cinch Nut allowable loads have been evaluated and approved in ICC-ES ESR-2190.

MiTek Tie-Down System

Z4 Bearing Plate Washers (BPW) are the interface between the Tie-Down System and the level of the building being anchored to the foundation. As the floor system is pulled upward by shear wall over-turning forces, pressure is applied to the BPW/CNX assembly and transferred into the threaded rod/all thread rod (ATR). The required bearing area is based on the design uplift to minimize crushing of the wood and the plate thickness must be sufficient that bending does not limit the capacity of the system. The wood species is also a factor when sizing. The pounds per square inch (psi) of compression cannot exceed the allowable compression perpendicular to the grain of the wood species it is bearing on.



Materials ASTM A36

Finish

Powder coated finish in various colors for easy identification

<u>Z4-BPW 17-6</u>

- 6 inch Nominal Wall Thickness

Bearing Capacity on DF-L

Bearing Plate Washer (BPW)

	BEARING PLATE WASHER (BPW) ¹													
	Dime	ensions (in.)		Nominal Wall			Allov	Allowable Bearing Capacity (lbs.) ^{3, 4}						
Model Number	Width & Length (in.)	Thickness ² (in.)	Hole Dia. (in.)	Thickness (in.)	Colo	r	DF-L (625 psi.)	SP (565 psi.)	HF (405 psi.)	SPF (425psi.)				
BPW5	3 x 3	1/4	1-5/16″		Brown		4,780 ^{5,6}	4,320 ⁵	3,100	3,250				
BPW6	3-1/4 x 3-3/8	3/8			Red		5,660	5,110	3,670	3,845				
BPW7	3-1/4 x 4-3/8	1/2			Yellow		7,690	6,950	4,980	5,230				
BPW9	3-1/4 x 5	5/8		4″	Green		8,960	8,100	5,800	6,090				
BPW11	3-1/4 x 5-7/8	3/4	1 0/16"		Blue		10,750	9,700	6,960	7,300				
BPW15	3-1/4 x 7-7/8	7/8		1-9/10	Black		14,800	13,400	9,590	10,060				
BPW20	3-1/4 x 10-1/4	1-1/4						White		19,600	17,750	12,700	13,350	
BPW25	3-1/2 x 11-3/4	1-1/2			Orange		24,500	22,150	15,900	16,650				
BPW30	3-1/2 x 14	1-3/4			Lt. Grey		29,450	26,600	19,050	20,000				
BPW17-6	5 x 5-7/8	5/8			Lt. Blue		17,150	15,500	11,100	11,650				
BPW27-6	5 x 9	1			Tan		26,950	24,350	17,450	18,300				
BPW36-6	5 x 12	1-1/2	1-9/16″	6″	Grey		36,300	32,800	23,500	24,700				
BPW43-6	5 x 14	1-3/4					Purple		42,550	38,450	27,550	28,950		
BPW46-6	5 x 15	1-7/8			Pink		45,700	41,300	29,600	31,050				

1. Bearing Plate Washer are fabricated from ASTM A36 steel

2. Thicknesses are such that allowable bearing capacity is not limited by plate bending.

3. Bearing Plate Washer capacities are governed by compression of wood with no limitation to plate bending.

4. Allowable Bearing Capacity = $(A_{plate} - A_{hole})x$ (f'_{c⊥} of Wood Species); where f'_{c⊥} = allowable compression perpendicular to grain

5. Allowable Bearing Capacity = 4,160 lbs. when used with CNX-3

6. Allowable Bearing Capacity = 4,445 lbs. when used with CNX-4

MiTek ______ Tie-Down System

The MiTek Z4 Tie-Down System begins by connecting the first level threaded rod to the hold down anchor in the foundation with a Coupler. At upper levels Couplers are used to connect Threaded rods end to end to create a continuous load path. Reducers are Couplers that connect two Rods that are different diameters.



Advantages

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- All Couplers and Reducers have a higher capacity than those of the threaded rods being connected. When joining threaded rods with different tensile strengths the Coupler capacity is higher than the rod with the higher strength.
- · Witness holes are provided to assure easy inspection.



All Threaded Rod (ATR) components transfer load from the Cinch Nuts (CNX/CNXO) or standard hex nuts to the terminating structure (foundation, concrete slab, steel beam, wood beam). ATR components are typically sourced in lengths up to 12 feet and either ASTM A36 or ASTM A193-B7 steel grades. ATR capacity and elongation are both critical aspects to consider when designing the overall system.

THREADED ROD CAPACITIES													
Model Number	Nominal Diameter, ø _N (in.)	Nominal Area, A _N (in.²)	Effective Area, A _E (in. ²) ^{1, 2}	Tensile Capacity (lbs.) ^{3, 4, 5}									
3/8" A36 ATR	3/8	0.1104	0.0013	2,485									
3/8" A193-B7 ATR	5/0	0.1104	0.0313	5,175									
1/2" A36 ATR	1/2	0 1063	0 1651	4,415									
1/2" A193-B7 ATR	1/2	0.1305	0.1001	9,200									
5/8" A36 ATR	5/8	0 3068	0.2403	6,905									
5/8" A193-B7 ATR	5/0	0.3000	0.2495	14,380									
3/4" A36 ATR	2/4	0.4419	0.2652	9,940									
3/4" A193-B7 ATR	5/4	0.4410	0.3032	20,710									
7/8" A36 ATR	7/8	0.6013	0.5011	13,530									
7/8" A193-B7 ATR	110	0.0015	0.0011	28,185									
1" A36 ATR	. 1	0 7854	0.6570	17,670									
1" A193-B7 ATR	1	0.7004	0.0070	36,815									
1 1/8" A36 ATR	11/8	0 00/0	0.8294	22,365									
1 1/8" A193-B7 ATR	1 1/0	0.00+0	0.0234	46,595									
1 1/4" A36 ATR	1 1/4	1 2272	1 0423	27,610									
1 1/4" A193-B7 ATR	1 17 1	1.2272	1.0420	57,525									
1 3/8" A36 ATR	1.3/8	1 4849	1 2528	33,410									
1 3/8" A193-B7 ATR	10/0	1.1010	1.2020	69,605									
1 1/2" A36 ATR	1 1/2	1 7671	1 5162	39,760									
1 1/2" A193-B7 ATR	1 1/2	1.1011	1.0102	82,835									
1 3/4" A36 ATR	1.3/4	2 4053	2 0523	54,120									
1 3/4" A193-B7 ATR	10/1	2.1000	2.0020	112,750									
2" A36 ATR	2	3.1416	2,6880	70,685									
2" A193-B7 ATR	_	3.110		147,265									

1 1/4" A193-B7 ATR ASTM Material Grade

- —— Nominal Diameter (inches)
- Effective area, A_E is determined directly by manufacture's item specification report and are not derived from nominal diameters.
- **2.** For rod elongation calculations, A_F is used.
- **3.** For strength calculations, $0.75A_N$ is used.
- Ultimate stresses, F_u for ASTM A36 and ASTM A193-B7 rod material are 60 ksi and 125 ksi respectively.
- Calculation of rod tensile capacities (ASD) adheres to AISC 360, Sect: J3.6 Tensile and Shear Strength of Bolts and Threaded Parts.

The Anchor Tie is a structural component designed for connecting Z4 Tie-Down Runs to steel members. Anchor Ties are fabricated from ASTM Grade A36 steel plate and include a pre-welded nut, making the Tie-Down connection quick and easy. ATs are available in 16 inch height. Other heights available upon request.

Common applications include connecting to steel plates at concrete decks and steel beams where Tie-Down runs terminate. When installing at concrete decks, steel plates are designed by the Engineer of Record to resist the uplift loads. After concrete is poured, the AT is welded to the plate and a threaded rod is connected to the Anchor Ties' pre-welded nut enabling the Tie-Down Run from above to attach. Steel beam installations are designed by the EOR. The Anchor Tie is welded to the beam prior to floor framing then attachment of the threaded rod and Tie-Down Run completes the installation.



AT32L





ANCHOR TIE (AT) CAPACITIES ^{1, 2, 3, 4}												
	D	imensions (iı	ı.)	Connecting Bod	Allowable Uplift (lbs.) ⁵							
Model Number	Height	Width	Depth	Diameter (in.)	ASD	LRFD						
AT32L-3				3/8								
AT32L-4				1/2								
AT32L-5				5/8								
AT32L-6				3/4								
AT32L-7	16	3 1/2	3	7/8	32 /00	48 600						
AT32L-8	10	01/2		1	52,400	40,000						
AT32L-9				1 1/8								
AT32L-10				1 1/4								
AT32L-11				1 3/8								
AT32L-12				1 1/2								
AT65L-5				5/8								
AT65L-6				3/4								
AT65L-7				7/8								
AT65L-8				1								
AT65L-9	16	4 1/4	3 1/2	1 1/8	64,800	97,200						
AT65L-10				1 1/4								
AT65L-11				1 3/8								
AT65L-12				1 1/2								
AT65L-16				2								
AT100L-11				1 3/8								
AT100L-12				1 1/2								
AT100L-14				1 3/4								
AT100L-16				2								

1. Weld size to steel member below is 1/4" for AT32L, 5/16" for AT65L, and 3/8" for AT100L.

- **2.** Weld length is 3" for each leg on AT32L and AT65L and 3.25" for AT100L, one side for AT32L and two sides for AT65L and AT100L.
- **3.** Design of the steel member below the Anchor Tie is the responsibility of the EOR.
- 4. All plate material is ASTM A36.
- 5. Allowable uplift loads are per AISC, no increase permitted.

AT65L

MiTek[®] Tie-Down System



Z4 Tie-Down Systems utilize CNX/CNXO-Series Cinch Nuts to compensate for wood shrinkage and building settlement that cause connections to loosen over time. The Cinch Nut uses a self-ratcheting action that permits the cinch nut to move (the rod doesn't move) or "travel" perpetually in one direction only down the rod. Available for installation with threaded rods that are 3/8 inch through 1-1/2 inch diameter in 1/8 inch increments, the CNX/CNXO Cinch Nut has been code evaluated and published in ESR-2190.

- Place the specified Bearing Plate Washer onto the bottom plate of a wood framed wall.
- With the "wings" oriented downward, place Cinch Nut over the Threaded rod extending from below and push down until it seats firmly on the Bearing Plate Washer.
- Install 1/4 inch diameter MiTek WS-Series screws through the wings, penetrating 1 -1/2 inches (minimum) into the wood bottom plate.
- Model numbers BPW5 and BPW6 fit in-between the screws fastening the wings.
- Model numbers BPW7 (3-1/4 x 4-3/8) and larger are provided with two screw holes. Align the wing and the Bearing Plate Washer screw holes to allow installation of 1/4 inch diameter MiTek WS-Series screws.



BPW5, BPW6 Installation

BPW7 and larger Installation



for Lateral Loads



Z4 Tie-Down System for Lateral Loads

To resist tension loads due to overturning moments in multi-story buildings the CNX/CNXO Cinch Nut is installed over a Bearing Plate Washer at each level in a fast and easy application. At the upper-most level a Cinch Nut is installed over a Bearing Plate Washer above the top plates. At walls below that bear on wood floor systems, the Cinch Nut and Bearing Plate Washer are installed over the bottom plate. Tension loads are gathered at each level and transferred into the foundation through a continuous system of Cinch Nuts, Bearing Plate Washers, Threaded Rods/ATRs and Couplers all available from MiTek[®].

Z4 Tie-Down System for Wind Uplift

For resisting roof uplift loads resulting from wind the Cinch Nut is installed over a Bearing Plate Washer above the top plates with roof framing above to create a tie-down system. Uplift forces are transferred into a continuous system of Threaded Rods / ATRs and Couplers that form a load path to the foundation.

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The Z4 Tie-Down System is comprised of multiple threaded rods joined with coupling nuts to create a continuous, multi-story Tie-Down Run that is connected to the structure at each floor with a Z4 CNX/CNXO Cinch Nut installed over a Z4 Bearing Plate Washer.

Overturning of the building shear walls create an uplift force on the floor below that is resisted by the Z4 Tie –Down System. In multi-story structures the uplift tension forces are transferred into the rods at each floor and/or roof level and are cumulative from the top to the bottom of the Run.

- In this catalog we provide two Design Examples that utilize Z4 components to resist tension loads.
- Design by referencing the Quick Reference Table (Assumes 12 foot rod lengths and 0.0200 inch deflection limit)
- Design by using the catalog tables for each individual component including the CNX/CNXO, BPW, A36 ATR and CNW

Design Example

By Quick Reference Table



A. <u>Refer to Quick Reference Table 10.2:</u> ATR Length = 12' Maximum Total Deformation Per Floor = 0.200"

B. Refer to Cumulative Load column:

Find value > Cumulative ASD Design Uplift Load Select 17,671 lbs. > 15,000 lbs.

C. Refer to the Individual Floor Load – DF-L column:

Find value > ASD Design Uplift Load Select 10,735 lbs. > 9,000 lbs.

D. Follow Row Across to Determine Components:

- Z4 -1" A36 ATR-BPW-11
- CNX-8/CNXO-8
- BPW11 (3-1/4 x 5-7/8)



Note:

This example uses 0.200" deflection limit and a 12 ft. rod length. Design criteria may vary by building jurisdiction and job specific requirements.

	JICK REFE	RENCE T	ABL	E 12.2	: FOR	12-FT	THREA	DED ROD, T	OTAL I	EVEL	DISPLA	CEME	NT ≤ 0.200)" ¹		
\smile	Minimum		Allo	wable	Uplift (lbs.)		Vertic	al Disp	laceme	nt (in.)		Components			
Model Number	Wall Framing Nominal	Wall Framing Nominal	Model Number Framing		tive	Individual Floor Load (lbs) ^{3,4}		or 1	Elongation	Total Level Displacement (in) ⁵				Cinch Nut	All Threaded	Bearing Plate
	Depth	Load (It) ²	DF-L	HF	SPF	SP	of ATR (in) ⁴	DF-L	HF	SPF	SP	CNXO)	Rod (ATR)	Washer (BPW)	
Z4-3/8" A36 ATR-BPW-5	4"			2,485	2,485		2,485	0.135	0.162	0.173	0.170	0.164	CNX/ CNXO-3	3/8" A36 ATR	BPW-5	
Z4-1/2" A36 ATR-BPW-5	A."	B		3,097	3,250	l	4,085	0 1 2 2	0.186	0.189	0.189	0.191	CNX/		BPW-5	
Z4-1/2" A36 ATR-BPW-6				3,666	3,847		- 0.13	0.133	0.175 0.190	0.190	0.182	CNXO-4	1/2 A30 AIR	BPW-6		
								$\overline{}$								
Z4-1" A36 ATR-BPW-7		7	5	7,688	4,98]	6,950		0.189	0.187	0.187	0.189			BPW-7	
Z4-1" A36 ATR-BPW-9				8,958	5,805	1	8,098		0.191	0.188	0.188	0.190]		BPW-9	
Z4-1" A36 ATR-BPW-11	4"	17,671		10,735	6,956	7,300	9,705	0.134	0.192	0.189	0.189	0.191	CNX/ CNXO-8	1" A36 ATR	BPW-11	
74-1" A36 ATB-BPW-15				14 798	9 589	10.062	2 13 377	-	0 195	0 191	0 191	0 194	-		BPW-15	

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Quick Reference Table

	QUICK REFERENCE TABLE 12.2: FOR 12-FT ATR, TOTAL LEVEL DISPLACEMENT \leq 0.200" 1														
	Minimum	Allo	owable	Uplift (l	bs.)		Vertic	cal Disp	laceme	ent (in.)		Components			
Model Number	Wall Framing Nominal	Cumulative	Individ	ual Flo	or Load	(lbs) ^{3,6}	Elongation	Di	Total splacer	Level nent (ir	I) ⁵	Cinch Nut	All Threaded	Bearing Plate	
	Depth	Load (lbs) ²	DF-L	HF	SPF	SP	of ATR (in) 4	DF-L	HF	SPF	SP	ĊNXO)	Rod (ATR)	Washer (BPW)	
Z4-3/8" A36 ATR-BPW-5	4"	2,485	2,485	2,485	2,485	2,485	0.135	0.162	0.173	0.170	0.164	CNX/CNXO-3	3/8" A36 ATR	BPW-5	
Z4-1/2" A36 ATR-BPW-5			4,418	3,097	3,250	4,321		0.186	0.189	0.189	0.191			BPW-5	
Z4-1/2" A36 ATR-BPW-6	4"	4,418	-	3,666	3,847	4,418	0.133	0.175	0.190	0.190	0.182	CNX/ CNXO-4	1/2" A36 ATR	BPW-6	
Z4-1/2" A36 ATR-BPW-7			-	4,418	4,418	-		0.167	0.183	0.180	0.169			BPW-7	
Z4-5/8" A36 ATR-BPW-5			4,779	3,097	3,250	4,321		0.193	0.191	0.191	0.192			BPW-5	
Z4-5/8" A36 ATR-BPW-6			5,657	3,666	3,847	5,114		0.194	0.191	0.192	0.193			BPW-6	
Z4-5/8" A36 ATR-BPW-7	4"	6,903	6,903	4,982	5,228	6,903	0.137	0.188	0.193	0.193	0.195	CNX/ CNX0-5	5/8" A36 ATR	BPW-7	
Z4-5/8" A36 ATR-BPW-9			-	5,805	6,091	-		0.179	0.194	0.195	0.185			BPW-9	
Z4-5/8" A36 ATR-BPW-11			-	6,903	6,903	-		0.173	0.195	0.192	0.175			BPW-11	
Z4-3/4" A36 ATR-BPW-5			4,779	3,097	3,250	4,321		0.192	0.189	0.190	0.191			BPW-5	
Z4-3/4" A36 ATR-BPW-6			5,657	3,666	3,847	5,114		0.193	0.190	0.190	0.192			BPW-6	
Z4-3/4" A36 ATR-BPW-7			7,688	4,982	5,228	6,950		0.195	0.192	0.192	0.194			BPW-7	
Z4-3/4" A36 ATR-BPW-9	4"	9 940	8,958	5,805	6,091	8,098	0 135	0.197	0.193	0.193	0.196	CNX/	3/4"	BPW-9	
Z4-3/4" A36 ATR-BPW-11	_	0,010	9,940	6,956	7,300	9,705		0.193	0.194	0.195	0.198	CNXU-6	A36 ATR -	BPW-11	
Z4-3/4" A36 ATR-BPW-15]		-	9,589	9,940	9,940		0.177	0.198	0.198	0.179			BPW-15	
Z4-3/4" A36 ATR-BPW-20			-	9,940	-	-		0.172	0.182	0.180	0.174			BPW-20	
Z4-3/4" A36 ATR-BPW-17-6	6"		9,940	9,940	9,940	9,940		0.174	0.191	0.187	0.176			BPW-17-6	
Z4-7/8" A36 ATR-BPW-5			4,779	3,097	3,250	4,321		0.187	0.185	0.186	0.187		-	BPW-5	
Z4-7/8" A36 ATR-BPW-6	-		5,657	3,666	3,847	5,114		0.188	0.186	0.186	0.187			BPW-6	
Z4-7/8" A36 ATR-BPW-7			7,688	4,982	5,228	6,950		0.189	0.187	0.187	0.189			BPW-7	
Z4-7/8" A36 ATR-BPW-9	- 4"		8,958	5,805	6,091	8,098		0.190	0.188	0.188	0.190			BPW-9	
Z4-7/8" A36 ATR-BPW-11	-	13,530	10,735	6,956	7,300	9,705	0.134	0.192	0.189	0.189	0.191	CNX/	7/8"	BPW-11	
Z4-7/8" A36 ATR-BPW-15		-,	13,530	9,589	10,062	13,377		0.188	0.191	0.191	0.194	-		BPW-15	
Z4-7/8" A36 ATR-BPW-20	-		-	12,715	13,343	13,530		0.173	0.193	0.194	0.177			BPW-20	
Z4-7/8" A36 ATR-BPW-25			-	13,530	13,530	-		0.169	0.183	0.180	0.171		-	BPW-25	
Z4-7/8" A36 ATR-BPW-17-6	- 6"		13,530	11,120	11,669	13,530		0.178	0.192	0.193	0.185			BPW-17-6	
Z4-7/8" A36 ATR-BPW-27-6			-	13,530	13,530	-		0.168	0.178	0.175	0.169			BPW-27-6	
Z4-1" A36 ATR-BPW-5	-		4,779	3,097	3,250	4,321		0.187	0.186	0.186	0.187			BPW-5	
Z4-1" A36 ATR-BPW-6	-		5,657	3,666	3,847	5,114		0.188	0.186	0.186	0.187			BPW-6	
Z4-1" A36 ATR-BPW-7	_		7,688	4,982	5,228	6,950		0.189	0.187	0.187	0.189			BPW-7	
Z4-1" A36 ATR-BPW-9			8,958	5,805	6,091	8,098		0.191	0.188	0.188	0.190			BPW-9	
Z4-1" A36 ATR-BPW-11	4"		10,735	6,956	7,300	9,705		0.192	0.189	0.189	0.191			BPW-11	
Z4-1" A36 ATR-BPW-15	-	17,671	14,798	9,589	10,062	13,377	0.134	0.195	0.191	0.191	0.194	CNX/	1"	BPW-15	
Z4-1" A36 ATR-BPW-20	-	,	17,671	12,715	13,343	17,671		0.190	0.194	0.194	0.197	UNAU-6	A30 ATK	BPW-20	
Z4-1" A36 ATR-BPW-25	-		-	15,879	16,663	-		0.177	0.196	0.197	0.183			BPW-25	
Z4-1" A36 ATR-BPW-30			-	17,671	17,671	-		0.174	0.192	0.189	0.176			BPW-30	
Z4-1" A36 ATR-BPW-17-6	-		17,161	11,120	11,669	15,513		0.197	0.192	0.193	0.196			BPW-17-6	
Z4-1" A36 ATR-BPW-27-6	6"		17,671	17,448	17,671	17,671		0.176	0.198	0.195	0.178			BPW-27-6	
Z4-1" A36 ATR-BPW-36-6			-	17,671	-	-		0.171	0.179	0.177	0.172			BPW-36-6	
Z4-1-1/8" A36 ATR-BPW-5	-		4,779	3,097	3,250	4,321		0.186	0.185	0.185	0.185			BPW-5	
Z4-1-1/8" A36 ATR-BPW-6	-		5,657	3,666	3,847	5,114		0.186	0.185	0.185	0.186			BPW-6	
Z4-1-1/8" A36 ATR-BPW-7	4		7,688	4,982	5,228	6,950		0.187	0.186	0.186	0.187			BPW-7	
Z4-1-1/8" A36 ATR-BPW-9	-		8,958	5,805	6,091	8,098		0.188	0.186	0.186	0.188	CNY/	1 1/8"	BPW-9	
Z4-1-1/8" A36 ATR-BPW-11	4"	22,365	10,735	6,956	7,300	9,705	0.134	0.189	0.187	0.187	0.188	CNXO-9	A36 ATR	BPW-11	
Z4-1-1/8" A36 ATR-BPW-15	-	-	14,798	9,589	10,062	13,377		0.191	0.188	0.189	0.190		ASOAIN	BPW-15	
Z4-1-1/8" A36 ATR-BPW-20	-		19,622	12,715	13,343	17,738		0.194	0.190	0.190	0.193			BPW-20	
Z4-1-1/8" A36 ATR-BPW-25	-		22,365	15,879	16,663	22,152		0.189	0.192	0.192	0.195			BPW-25	
Z4-1-1/8" A36 ATR-BPW-30			-	19,068	20,010	22,365		0.178	0.194	0.194	0.184			BPW-30	

Quick Reference Table

	QUICK REFERENCE TABLE 12.2: FOR 12-FT ATR, TOTAL LEVEL DISPLACEMENT \leq 0.200" ¹														
	Minimum	Allo	owable	Uplift (l	lbs.)		Vertic	al Disp	laceme	ent (in.)		Components			
Model Number	Wall Framing Nominal	Cumulative	Individ	ual Flo	or Load	(Ibs) ^{3,6}	Elongation	Di	Total splacer	Level nent (in) ⁵	Cinch Nut	All Threaded	Bearing Plate	
	Depth	Load (lbs) ²	DF-L	HF	SPF	SP	of ATR (in) ⁴	DF-L	HF	SPF	SP	ĊNXO)	Rod (ATR)	Washer (BPW)	
Z4-1-1/8" A36 ATR-BPW-17-6			17,161	11,120	11,669	15,513		0.193	0.189	0.189	0.192			BPW-17-6	
Z4-1-1/8" A36 ATR-BPW-27-6	6"	22,365	22,365	17,448	18,310	22,365	0.134	0.183	0.193	0.193	0.189	CNX/ CNXO-9	1 1/8" A36 ATR	BPW-27-6	
Z4-1-1/8" A36 ATR-BPW-36-6			-	22,365	22,365	-		0.172	0.192	0.188	0.174		1.007.011	BPW-36-6	
Z4-1-1/4" A36 ATR-BPW-5			4,779	3,097	3,250	4,321		0.187	0.186	0.186	0.187		1 1/4" A36 ATR	BPW-5	
Z4-1-1/4" A36 ATR-BPW-6			5,657	3,666	3,847	5,114		0.188	0.187	0.187	0.187			BPW-6	
Z4-1-1/4" A36 ATR-BPW-7			7,688	4,982	5,228	6,950		0.189	0.187	0.188	0.188			BPW-7	
Z4-1-1/4" A36 ATR-BPW-9			8,958	5,805	6,091	8,098		0.189	0.188	0.188	0.189			BPW-9	
Z4-1-1/4" A36 ATR-BPW-11	4"		10,735	6,956	7,300	9,705		0.190	0.188	0.189	0.190			BPW-11	
Z4-1-1/4" A36 ATR-BPW-15			14,798	9,589	10,062	13,377		0.193	0.190	0.190	0.192			BPW-15	
Z4-1-1/4" A36 ATR-BPW-20	27,612	27 612	19,622	12,715	13,343	17,738	0 132	0.195	0.191	0.192	0.194	CNX/		BPW-20	
Z4-1-1/4" A36 ATR-BPW-25		21,012	24,505	15,879	16,663	22,152	0.102	0.198	0.193	0.194	0.196	CNXO-10		BPW-25	
Z4-1-1/4" A36 ATR-BPW-30			27,612	19,068	20,010	26,602		0.195	0.195	0.195	0.199			BPW-30	
Z4-1-1/4" A36 ATR-BPW-17-6			17,161	11,120	11,669	15,513		0.194	0.191	0.191	0.193			BPW-17-6	
Z4-1-1/4" A36 ATR-BPW-27-6			26,927	17,448	18,310	24,342		0.199	0.194	0.194	0.198			BPW-27-6	
Z4-1-1/4" A36 ATR-BPW-36-6	6"		27,612	23,523	24,685	27,612		0.182	0.197	0.198	0.188			BPW-36-6	
Z4-1-1/4" A36 ATR-BPW-43-6	4		-	27,573	27,612	-		0.177	0.199	0.196	0.179			BPW-43-6	
Z4-1-1/4" A36 ATR-BPW-46-6			-	27,612	-	-		0.176	0.194	0.191	0.178			BPW-46-6	
Z4-1-3/8" A36 ATR-BPW-6	_		5,657	3,666	3,847	5,114		0.189	0.188	0.189	0.189			BPW-6	
Z4-1-3/8" A36 ATR-BPW-7	_		7,688	4,982	5,228	6,950		0.191	0.189	0.189	0.190			BPW-7	
Z4-1-3/8" A36 ATR-BPW-9	_		8,958	5,805	6,091	8,098		0.191	0.190	0.190	0.191			BPW-9	
Z4-1-3/8" A36 ATR-BPW-11	4"		10,735	6,956	7,300	9,705		0.192	0.190	0.190	0.192			BPW-11	
Z4-1-3/8" A36 ATR-BPW-15	_		14,798	9,589	10,062	13,377		0.194	0.192	0.192	0.194		1 3/8" A36 ATR	BPW-15	
Z4-1-3/8" A36 ATR-BPW-20	-		19,622	12,715	13,343	17,738		0.197	0.193	0.193	0.196	CNV/		BPW-20	
Z4-1-3/8" A36 ATR-BPW-25	_	33,410	24,505	15,879	16,663	22,152	0.132	0.199	0.195	0.195	0.198	CNXO-11		BPW-25	
Z4-1-3/8" A36 ATR-BPW-30		-	28,792	19,068	20,010	26,466		0.200	0.196	0.197	0.200			BPW-30	
Z4-1-3/8" A36 ATR-BPW-17-6	-		17,161	11,120	11,669	15,513		0.195	0.192	0.193	0.195			BPW-17-6	
Z4-1-3/8" A36 ATR-BPW-27-6	-		26,738	17,448	18,310	24,342		0.200	0.196	0.196	0.199			BPW-27-6	
Z4-1-3/8" A36 ATR-BPW-36-6	6"		33,410	23,523	24,685	31,484		0.198	0.199	0.199	0.200			BPW-36-6	
Z4-1-3/8" A36 ATR-BPW-43-6	-		-	27,275	28,393	33,410		0.188	0.200	0.200	0.194			BPW-43-6	
Z4-1-3/8" A36 ATR-BPW-46-6			-	28,931	30,103	-		0.184	0.200	0.200	0.190			BPW-46-6	
Z4-1-1/2" A36 ATR-BPW-6	-		5,657	3,666	3,847	5,114		0.185	0.184	0.184	0.185			BPW-6	
Z4-1-1/2" A36 ATR-BPW-7	-		7,688	4,982	5,228	6,950		0.186	0.185	0.185	0.186			BPW-7	
Z4-1-1/2" A36 ATR-BPW-9	-		8,958	5,805	6,091	8,098		0.187	0.185	0.185	0.186			BPW-9	
Z4-1-1/2" A36 ATR-BPW-11	4"		10,735	6,956	7,300	9,705		0.187	0.186	0.186	0.187			BPW-11	
Z4-1-1/2" A36 ATR-BPW-15	-		14,798	9,589	10,062	13,377		0.189	0.187	0.187	0.189			BPW-15	
Z4-1-1/2" A36 ATR-BPW-20	-		19,622	12,715	13,343	17,738		0.191	0.188	0.189	0.190	CNX/	1-1/2"	BPW-20	
Z4-1-1/2" A36 ATR-BPW-25	4	39,761	24,505	15,879	16,663	22,152	0.130	0.193	0.190	0.190	0.192	CNX0-12	A36 ATR	BPW-25	
Z4-1-1/2" A36 ATR-BPW-30			29,427	19,068	20,010	26,602		0.196	0.191	0.191	0.194			BPW-30	
Z4-1-1/2" A36 ATR-BPW-17-6	-		17,161	11,120	11,669	15,513		0.190	0.188	0.188	0.190			BPW-17-6	
Z4-1-1/2" A36 ATR-BPW-27-6	-		26,927	17,448	18,310	24,342		0.194	0.190	0.191	0.193			BPW-27-6	
Z4-1-1/2" A36 ATR-BPW-36-6	6"		36,302	23,523	24,685	32,817		0.199	0.193	0.194	0.197			BPW-36-6	
Z4-1-1/2" A36 ATR-BPW-43-6	-		39,761	27,573	28,935	38,467		0.195	0.195	0.195	0.200			BPW-43-6	
Z4-1-1/2" A36 ATR-BPW-46-6			-	29,598	31,060	39,761		0.190	0.196	0.196	0.197			BPW-46-6	

Notes:

1. The values in this table are Allowable Stress Design (ASD) excluding a 1.33 stress increase and pertain to a maximum 0.20 in. total vertical displacement per floor. Values shown pertain to a 12-foot All Thread Rod length (L) and wood design values in accordance with 2012 NDS per species shown.

2. The allowable cumulative load is the All Thread Rod (ATR) capcaity to resist tension forces equal to the sum of individual floor loads from each level above the Cinch Nut (CNX/CNXO) connection being considered.

The allowable individual floor load is the Cinch Nut (CNX/CNX0) and Bearing Plate Washer (BPW) capacity to transfer uplift forces from the single level being considered into the All Thread Rod (ATR).
 Elongation of the All Thread Rod (ATR) is determined by calculating PL/AE; where P = cumulative tension force, L = length of All Thread Rod, A = effective cross sectional area of rod, and E = Modulus of Elasticity (29x106).

5. Total vertical displacement is the sum of wood deformation due to compression of the Bearing Plate Washer (BPW), total movement of the Cinch Nut (CNX/CNXO), and total All Thread Rod (ATR) elongation per floor.

6. Individual Floor Load has been reduced in some cases to meet 0.20 in. total vertical displacement per floor.

GIVEN

 Wood Type: Douglas Fir-Larch

 Code: 2018 IBC

 Maximum Rod Elongation Per Floor = 0.200"

 Maximum Total Deformation Per Floor = 0.200"

 Story Height: 11' 0"

 Floor System Depth = 1' 0"

 Use: ATR Length = 2nd Floor Story Height + Floor System Depth = 12' ATR

 Top Floor ASD Design Uplift Load = 6.0 Kips

 ASD Design Uplift Load of floor being considered = 9.0 Kips

 Cumulative ASD Design Uplift Load = 6.0 Kips + 9.0 Kips = 15.0 Kips



STEP 1. LOOKUP COMPONENT CAPACITIES

- **A.** Bearing Plate Washer (BPW) Capacity > ASD Design Uplift Load: BPW 11 (3-1/4 x 5-7/8) Capacity = 10,750 lbs. > 9,000 lbs **OK!**
- **B.** <u>Standard-Grade All Thread Rod (ATR) Capacity > Cumulative ASD Design Uplift Load:</u> 1" A36 ATR Capacity = 17,670 lbs. > 15,000 lbs. <u>OK!</u>
- **C.** <u>Cinch Nut (CNX/CNXO) Hole Diameter = All Thread Rod (ATR) Diameter:</u> CNX-8 /CNXO-8 (1" hole diameter) = 1" A36 All Thread Rod (ATR) diameter (1" diameter)
- D. Check: Cinch Nut (CNX/CNX0) Capacity > ASD Design Uplift Load:

 CNX-8/CNX0-8 capacity = 29,285 lbs. > 9,000 lbs.

 OK!

Note:

This example uses 0.200" deflection limit and a 12 ft. rod length. Design criteria may vary by building jurisdiction and job specific requirements.

STEP 2. CALCULATE TOTAL FLOOR DEFORMATION

 $\Delta_{\rm T}~=\Sigma~(\Delta_{\rm L}+\Delta_{\rm M}+\Delta_{\rm W}~)$

 $\Delta_{I} = Z$ -Rod Elongation

 $\Delta_{\rm M}$ = Cinch Nut Movement

 Δ_{W} = Bearing Plate Washer Deformation into Wood

STEP 3 Check total floor deformation < code limit

The ICC-Evaluation Service Acceptance Criteria for Shrinkage Compensating Devices (AC316) requires the Building Design Professional to consider a 0.20-inch (5 mm) vertical displacement limit for shear wall drift limit calculations.

The 0.20-inch vertical displacement limit can be exceeded when:

- All sources of vertical displacement are considered
- The shear wall story drift limit is not exceeded
- The deformation compatibility requirements of IBC Section 1604.4 are being met.

Code Reports

- ESR-3105
- LA City RR 25334



Paired CT Wall Tie



Paired CT Purlin Tie



Sandwiched T2 As Concentric Hold-Down



Anchor Rod. Dia. (1/8" Increments) Fastening Bolt Dia. (1/8" Increments) Fastening Bolt Quantity Continuity Tie

Continuity Tie

The "CT" is a steel tube with steel end plates welded to both ends designed to transfer tension and compression forces from one beam to another (Purlin Splice application) or from a beam to a perpendicular wall (Wall Tie application). Connections are made by bolting the tube to a wood member and attaching to a threaded rod for transferring forces.

Accurate Placement and Installation



Step 1: Use the two 3/16" holes provided to nail CT or T2 at desired location on wood member

Step 2: Use the CT or T2 as a template to accurately drill holes for bolting

Step 3: Make bolted connection to the wood member per plans and specifications

Step 4: Make threaded rod connection per plans and specifications.

Tension Tie

The "T2" is a steel tube with a steel end plate welded to one end designed to transfer tension forces with a single concentric hold-down device. Sandwiched Installations are made by through bolting two wood members with a T2 between. The tube is then attached to a threaded rod to transfer the tension loads.



11

TABLE 3.0- DIMENSIONS AND FASTENERS FOR THE CT & T2										
		Fastening Bolts 1, 2	Anchor Rod I	Tube Dimensions (in.)						
Description	Model Number	Qty & Size	Single Assembly (1 HS Rod) ³	Paired Assembly (2 STD Rods) ^{4, 5}	Thickness	Width	Depth	Length		
"T2" Tension Tie	Z4-T2-24-4	(2) 1/2"	1/2"		1/8"	3"	3"	2-7/8"		
	Z4-T2-43-4	(4) 3/8"	1/2"		1/8"	2-1/2"	2-1/2"	4-7/8"		
	Z4-T2-44-5	(4) 1/2"	5/8"		1/8"	3"	3"	5"		
	Z4-T2-46-8	(4) 3/4"	1"	n/o	3/16"	4"	3"	7-1/4"		
	Z4-T2-48-9S	(4) 1"	1-1/8"	11/a	3/16"	5"	3"	10-3/8"		
	Z4-T2-64-6	(6) 1/2"	3/4"	-	1/8"	3"	3"	7-1/8"		
	Z4-T2-68-11S	(6) 1"	1-3/8"		3/16"	5"	3"	14-3/4"		
	Z4-T2-84-7	(8) 1/2"	7/8"	-	1/8"	3"	3"	9-1/4"		
"CT" Continuity Tie	Z4-CT-24-4	(2) 1/2"		1/2"	1/8"	3"	3"	3-1/4"		
	Z4-CT-43-4	(4) 3/8"		1/2"	1/8"	2-1/2"	2-1/2"	5-1/4"		
	Z4-CT-44-5	(4) 1/2"		5/8"	1/8"	3"	3"	5-1/2"		
	Z4-CT-46-8	(4) 3/4"	n/a	1"	3/16"	4"	3"	7-3/4"		
	Z4-CT-48-9	(4) 1"	11/a	1-1/8"	3/16"	5"	3"	10-1/4"		
	Z4-CT-64-6	(6) 1/2"]	3/4"	1/8"	3"	3"	7-3/4"		
	Z4-CT-68-11	(6) 1"]	1-3/8"	3/16"	5"	3"	15"		
	Z4-CT-84-7	(8) 1/2"]	7/8"	1/8"	3"	3"	10"		

Notes:

- **1.** Fastening Bolts must comply with ASTM A307. Standard round washers and hex nuts, for tightening the CT or T2 to adjacent wood member(s), must comply with F844 and A563A respectively.
- 2. The minimum required distance from the end of the wood member to the centerline of the first bolt is seven bolt diameters. Increasing the end distance has no effect on the allowable tension load.
- **3.** Single (Sandwiched) Assemblies are applicable to Tension Ties (T2) when one Tie is sandwiched between and through-bolted to two wood members. One Tie and one HS rod required.
- **4.** For Paired Assemblies, threaded rods must comply with ASTM F1554 Grade 36 (minimum) connecting the CT with one standard (F844) round washer and one A563A hex nut. For Single (Sandwiched) Assemblies, threaded rod must comply with ASTM A311 Grade 1045 (minimum).
- **5.** Paired Assemblies of Continuity Ties (CT) require two Ties bolted together with a single wood member between. Two Ties and two STD rods required (one per Tie).



TABLE 3.1-DF-L: CT & T2 ALLOWABLE LOADS WHEN CONNECTED TO DOUGLAS FIR-LARCH ¹											
Installation ^{2, 3, 4}	Model Number	Width of Attached Wood Member (in.)		Displacement @							
				Allowable Tension							
			1.5	2.5	3	3.5	5.125	5.5	7.25 / 7.5	Load (In.)	
Sandwiched T2	Z4-T2-24-4	3.5	4,984	6,235	6,235	6,235	6,235	6,235	6,235	0.085	
	Z4-T2-43-4	3.5	6,457	7,001	7,001	7,005	7,007	7,009	7,009	0.102	
	Z4-T2-44-5	3.5	9,904	12,422	12,432	12,436	12,445	12,449	12,449	0.108	
	Z4-T2-64-6	3.5	14,276	18,465	18,499	18,533	18,573	18,597	18,597	0.128	
		5.5	14,637								
	Z4-T2-84-7	3.5	14,276	23,417	23,794	23,417	23,417	23,417	23,417	0.129	
Concentric Hold Down		5.5	19,077								
Hold Down	Z4-T2-46-8	5.5	19,385	19,385	19,385	19,385	19,385	19,385	19,385	0.114	
	Z4-T2-48-9S	5.5	18,691	31,151	37,382	40 1 41	10 967	10 067	42,867	0.122	
		7.25 / 7.5	24,057	36,671	39,152	42,141	42,007	42,007			
	Z4-T2-68-11S	5.5	18,691	31,151	37,382	43,612			64,036	0.210	
		7.25 / 7.5	24,057	40,095	48,114	56,133	64,036	64,036			
		9.25 / 9.5	31,833	52,474	56,276	61,061					
	Z4-CT-24-4	3.5	3,360	5,600	6,235	6,235	6,235	6,235	6,235	0.160	
	Z4-CT-43-4	3.5	5,010	6,989	6,993	6,997	7,004	7,004	7,007	0.132	
	Z4-CT-44-5	3.5	6,637	11,118	12,395	12,405	12,420	12,430	12,457	0.146	
	Z4-CT-64-6	3.5	7,138	11,897	14,276	16,656	18,442	10 504	19 502	0.145	
		5.5	9,679	16,395	18,330	18,383	18,442	16,504	16,592		
	Z4-CT-84-7	3.5	7,138	11,897	14,276	16,656	21,137	22,683		0.152	
Define d OT		5.5	10,662	17,769	21,323	24.057	24 241 24 291		24,590		
Wall & Purlin Ties		7.25 / 7.5	12,377	21,300	23,892	24,037	24,241	24,301			
	Z4-CT-46-8	5.5	0.740	16,453	19,744	23,034	27,776	27,804	28,028	0.155	
		7.25 / 7.5	9,749	16,464	19,817	23,184					
	Z4-CT-48-9	5.5	9,345	15,576	18,691	21,806	30,020	32,216			
		7.25 / 7.5	12,029	20,048	24,057	28,067	41,858 42,240	43,240	0.162		
		9.25 / 9.5	12,591	21,513	25,939	30,460	43,240	43,240			
		5.5	9,345	15,576	18,691	21,806	30,020	32,216	43,931		
		7.25 / 7.5	12,029	20,048	24,057	28,067	41,858	46,736	63,731		
	Z4-CT-68-11	9.25 / 9.5	14,590	24,317	29,180	34,044	49,850	50,119		0.148	
		11.25 / 11.5	16,504	27,506	33,008	38,509	56,388	61,999	64,593		
		13.25 / 13.5	16,622	29,652	36,167	42,901	64,541	64,593			

Notes:

Values in this table are Allowable Stress Design (ASD) for No. 1 grade Douglas Fir-Larch and include a 1.60 stress increase factor, C_D, for short-term load duration as permitted by the National Design Specification (NDS 2012).

- 2. Paired Assemblies of Continuity Ties (CT) require two ties to be connected to a standard grade anchor rod and the ties bolted together with a single wood member between.
- **3.** Single (Sandwiched) Assemblies are applicable when one Tension Tie (T2) is sandwiched between and through-bolted to two wood members. One Tie and one HS rod and bolts required.
- 4. For compression loading the minimum required distance from the end of the wood member to the centerline of the first bolt is seven bolt diameters allowable tension load.
- 5. The capacity of the anchor rod must be equal to or greater than the allowable tension load of the Tie being attached. See table 3.2 for anchor rod capacities.
- 6. Allowable tension loads consider
 - Tested CT or T2 capacity divided by 2.5
 - Maximum anchor rod capacity
 - Cross sectional area of the attached wood member where it is drilled for the bolted connection
- **7.** Displacement at tension loads less than the respective allowable load are determined by proportioning the design load to the allowable load. Shrinkage of supporting wood members and anchor rod elongation are the responsibility of the Building Design Professional. Tabulated displacement values consists of:
 - a) Vertical displacement of the CT or T2 Tie due to rotation.
 - b) Fastener slip where the CT or T2 Tie connects to the wood member.

TABLE 3.2- ROD DESIGN TENSION AND COMPRESSION CAPACITIES FOR THE CT & T2 ¹														
Installation	Anchor Rod Grade ²	Quantity	Diameter (in.)	Allowable Tension Capacity (lbs.)	Allowable Compression Capacity (lbs.) ^{3, 4, 5}									
					Maximum Unsupported Length, L (in.) ⁶									
					12	18	24	30	36	42				
Single (Sandwiched) Assembly (1 Tie)	HS	1	1/2"	8,468										
			5/8"	13,231	n/a in Compression									
			3/4"	19,052										
			7/8"	25,932										
			1"	33,870										
			1-1/8"	42,867										
			1-1/4"	52,922										
			1-3/8"	64,036										
Paired Assembly (2 Ties)	STD	2	1/2"	8,541	3,200	1,478	830	532	370	272				
			5/8"	13,346	6,448	3,746	2,108	1,348	936	688				
			3/4"	19,218	10,741	7,778	4,616	2,954	2,052	1,508				
			7/8"	26,157	15,863	12,684	8,795	5,630	3,910	2,872				
			1"	34,165	21,724	18,333	14,252	9,690	6,728	4,944				
			1-1/8"	43,240	28,188	24,596	20,313	15,317	10,684	7,850				
			1-1/4"	53,383	36,689	32,868	28,347	23,134	17,224	12,654				
			1-3/8"	64,593	44,400	40,397	35,681	30,279	24,162	17,970				

Notes:

1. The values in this table are Allowable Stress Design (ASD), excluding a 1.33 duration of load stress increase factor, C_n.

- 2. STD indicates rods complying with ASTM F1554 Grade 36. HS indicates rods complying with ASTM A311 Grade 1045.
- **3.** When using Continuity Ties (CT) to transfer compression loads, the Building Design Professional is responsible for checking the wood member(s) design capacity for the most critical load combination (i.e. bending about one or both principal axes and axial compression).
- **4.** Compression capacities shown in blue apply to KL / $r > C_C$, where: $r = (D_R .9743 / n) / 4$, where n = threads per inch, $C_c = (2\pi^2 \text{ E} / F_u)^{1/2}$, E = Modulus of Elasticity of rod, (29 x 10⁶) and Fy = yield strength of rod steel (36 ksi).
- **5.** Compression capacities assume a slenderness factor, K, of 1.00 or for installations with both ends of the rod pinned. When both ends of the rod are approximately fixed, K = 0.65.
- 6. Compression capacities are for Continuity Ties (CT) spaced no greater than the specified maximum unsupported length.



Installation Photos



Code Evaluations

ICC-Evaluation Service ESR-2089

Hardy Frames has been leading the pre-manufactured shear wall industry from its beginning. We were the first to be recognized by ICBO-ES and LA City, first to gain approval for multi-story applications, first Balloon Wall application and first to be recognized to comply with the 2003 and 2006 IBC and IRC Building Codes. Today we are the first, and only, to offer a 9 inch Panel width and a Balloon Wall application that is fully assembled in the manufacturing plant and ships as a one piece unit.

All MiTek Hardy Panels and Brace Frames are code listed and include installations on concrete, raised floor and upper floor systems.

HFX-Series Panels

- Panels are available in 9, 12, 15, 18, 21 and 24 inch widths
- Standard Heights range from 78 inches for portal applications to 20 feet for Balloon Walls
- Custom heights are manufactured routinely
- R Value for design = 6.5, Cd = 4.0
- With proper detailing and anchorage "Back to Back" a installations provide two times the allowable shear value without increasing the wall width

HFX-Series Brace Frames

- Brace Frames are available in 32 and 44 inch widths
- Standard Heights range from nominal 8 to 13 feet
- Custom heights are manufactured routinely
- R Value for design = 6.5, Cd = 4.0
- For a given shear load, installing a wider shear wall results in reduced overturning



Hardy Brace Frame

Hardy Balloon Wall Hardy Panel

Hardy Panel Back to Back



Template Kit (HFXTK)

Includes:

- One Template for accurate anchor spacing and alignment
- One Bolt Brace for installation at embed end of anchors to prevent independent sway while pouring concrete
- Two 1-1/8 inch diameter hold down anchors
- Six Grade 8 hex nuts
- Two hardened round washers
- Two 1/2 x 3 x 3 plate washers are included when high strength (HS) anchors are specified

Hardy Bearing Plate (HFXBP)

- 3/4" thick x 3 1/2" wide ASTM A36 steel
- Length extends 3" beyond Panel edges. Check for outside corner conditions!
- · Reduces wood deformation from overturning forces
- Reduces effects of shrinkage by eliminating bottom plate Note: The allowable values in raised floor and upper floor tables assume installation of HFXBP. Installation without a HFXBP may result in a reduction of allowable loads.

MiTek[®]

SidePlate Code Evaluations

IAPMO ER-525

Hardy Frames introduced the first standardized, prefabricated Special Moment Frame in 2006. Since then we have delivered thousands of Moment Frames that have been successfully installed. Our Special Moment Frames provide maximum structural capacities and enable large openings in architectural design.

MiTek Hardy Moment Frames utilize the SidePlate moment connection which has now been approved by the Connection Prequalification Review Panel (CPRP) for inclusion in the AISC 358 Prequalified Moment Connection Standard. Typically, Hardy Moment Frames are delivered to the jobsite in one-piece, completely prefabricated with wood nailers attached, and ready to be installed with no assembly. No field welding and or special inspection is required.

On production framing jobs the Hardy Moment Frame can't be beat. We have delivered truckload quantities of up to 30 Moment Frames that were installed in a single day. That is an accomplishment that cannot be matched by conventional or assembly-required moment frames.

Custom Sizes and Custom Calculations

We offer over 300 standard dimension Moment Frames, but we don't stop there. We also offer calculations and solutions for sizes beyond our standard listing. We commonly provide solutions for two-story and multi-story frames as well as for fixed base connections.

At MiTek we understand that Moment Frames require jobspecific considerations. We work with contractors to meet their needs without treating adjustments as a custom order.



Moment Frame Template Kits

Template Kits are included with the purchase of the Hardy Moment Frame and are a stock item that can be shipped within one business day. The Kit includes all embed anchors, nuts, washers and Templates so the concrete pour can proceed prior to the Moment Frame delivery. Correctly locating the anchors is easy with a slot provided in the Template to measure the "W_{in}", (inside steel-to-steel) dimension.



MiTek[®].

MiTek is the leading provider of structural connectors, software, and a range of engineered products to component manufacturers and building material suppliers in the residential construction industry. The MiTek legacy is built upon innovation that dates back to 1933 when the original timber connectors were conceived and standardized. Over the years the legacy grew by combining TECO, Silver, Lumberlok, Kant Sag, Hughes, Covert and Renown, some of the most recognizable brands in the industry. These brands combined through the years to

eventually form one company - "United Steel Products". In March, 2011 USP Structural Connectors was purchased by MiTek, a Berkshire Hathaway subsidiary.

Today. MiTek Structural Connectors is the branded product line from MiTek that provides a complete line of code approved engineered structural connectors, anchoring solutions, and design software solutions for the residential, commercial and DIY markets. The MiTek product line offers more than 4,000 SKUs that are made in the USA, and backed by professional engineering technical support and a sales team that serves the United States and Canada.







Complete line of high-performance epoxy applications



Over 4000 SKUS made in the USA





FWH Series Fire Wall Hanger attaches floor framing to two-hour, fire-rated wall assemblies in wood-frame construction



Tie-Down System

MiTek Typical Details



MiTek[®] Typical Details

Tie-Down System



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MiTek Typical Detail



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Additional MiTek Builder Products Tools and Publications



MiTek Structural Connectors Product Catalog

MiTek Structural Connectors offers builders and engineers code evaluated connectors, framing hardware, fasteners and anchors. Our product catalog is a comprehensive guide to the entire Structural Connectors product line. It includes product and application illustrations, installation instructions, fastening schedules and load ratings. US and Canadian versions. Available as an iPad App.

HFX-Series Catalog

The HFX-Series Product Catalog provides complete information for designing and detailing with HFX-Series products. This catalog provides a complete listing of all HFX-Series Panels, Brace Frames and Accessories, product descriptions, photographs, allowable design values for various bearing surfaces, Typical Installation Details and standard anchorage information





Installation Guide

The Installation Guide was written specifically for Suppliers and Installers. This publication provides all HFX-Series model numbers, dimensions, bolt and screw patterns, connectors, installation illustrations, attachments with self-tapping screws and information regarding Template Kit (HFXTK) and Floor to Floor Connector Kit (HFTC)components.

Moment Frame Catalog

Includes instructions for designing with Hardy Moment Frames, allowable values, typical Installation details and a Non-Standard form for submittal when project conditions require a custom design.





MiTek Specifier[™]

Free project management and cost control software simplifies access to information on over 3000 structural connectors through an intuitive and graphical desktop interface.

MiTek[®] Supply

MiTek Supply, our 3D whole-house framing design software, is tailored to the lumber dealers' design and estimating operations. Its companion module, SAPPHIRE Viewer, shares the 3D model with builders and trades, creating an efficient and accurate estimating process. SAPPHIRE Supply is available exclusively to dealers stocking MiTek Structural Connectors.





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