Z4 PRODUCT CATALOG

Z4 BY MiTek®

08-01-17

MiTek®

THE NEW STANDARD

At MiTek®, we believe that better processes can empower your business; and we've learned three important things over the years:

- We've learned that when people collaborate well, great things can happen – that's about both strong collaboration within your teams, and also strong collaboration between you and your customers.

- We've learned that when we build a relationship focused on growing your ability to achieve a Higher Standard of performance and success year over year, that relationship will stand the test of time. We've also learned that when we help you deliver those kinds of relevant results and value to your customers year over year, you will build a relationship that will also stand the test of time.

- We've learned that our customers are the heroes of our story, and that when we continually get that right, all our efforts will yield the best results for our relationships.

And that is The New Standard that we are talking about from MiTek® these days. It's a new standard for what you can expect in optimizing your business performance, and a new standard for what you can expect from a strong, committed relationship that works well, day after day and stands the test of time.

Z4 Tie-Down System Components

Z4 Tie-Down System Design Examples

Wood Compression Post Capacities

Z4 Tie-Down System Typical Details

Z4 Concentric Ties

Photos

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

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

The CNX 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 ability to perpetually "travel" down the length of the threaded rod allows it to compensate for natural shrinkage and settlement which occurs in wood buildings, therefore keeping connections of Tie-Down Runs tight to the floor framing members for the life of the building.

The MiTek Z4 Tie-Down System with the CNX 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 structural damage.

This 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 MiTek 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.

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.

1. 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.

2. Building Officials confidently approve our systems because they assemble with code evaluated components that have an ESR listing.

3. 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.

1. MiTek reserves the right to modify Z4 Tie-Down System specifications and designs without notification or liability for such changes.

2. All materials used in the design of MiTek Z4 Tie-Down Systems are based on the specifications provided in this catalog. Contact MiTek Z4 Technical Support for related information.

3. Project specifications including load demand, rod elongation limits and floor level deflection limits are required prior to design of MiTek Z4 Tie-Down System.

4. Values for the products of MiTek Z4 Tie-Down System are provided in Allowable Stress Design (ASD). For LRFD design values, consult with MiTek Z4 Technical Support.

5. The MiTek Z4 Tie-Down System is designed to provide the overturning or uplift load capacity that meets the project demand. It is the responsibility of the EOR or qualified building designer to integrate the Tie-Down system designs into the structural system.

6. For wind load uplift Tie-Down systems, please refer to ICC-ES AC391 for recommended project design requirements and specifications.

7. For seismic and wind shear wall Tie-Down Systems, please refer to ICC-ES AC316 for recommended project design requirements and specifications.

8. Per Section 2304.3.3, 2015 IBC for wood walls and bearing partitions supporting more than two floors and a roof, the shrinkage effect of wood framing shall be analyzed as not to have any adverse effects on the building performance. MiTek Z4 shrinkage take-up devices (CNXs) are designed exclusively to compensate for potential effects of building settlements and deformations on the Tie-Down System.

9. The design of concrete anchorage for MiTek Z4 Tie-Down Systems and all foundation designs are the responsibility of the EOR or qualified building designer.

10. The integration of the MiTek Z4 Tie-Down System into the building structural system shall be the responsibility of the EOR or qualified building designer. Consult with MiTek Z4 Technical Support for any assistance when needed.

11. Compression members and multi-ply compression member connections within the shear wall Tie-Down System shall be specified by the EOR or qualified building designer. Consult with MiTek Z4 Technical Support for any assistance when needed.

12. All final MiTek Z4 Tie-Down System design structural documents shall be reviewed and approved by the EOR or qualified building designer.

13. Deviation from the MiTek Z4 Tie-Down System construction documents is not permitted. Any field alterations in installation requires consultation with MiTek Technical Service and EOR for review and approval.

14. The MiTek Z4 Tie-Down System does not require special inspection unless it is required by the local building jurisdiction.

15. Proper corrosion protection for all delivered Z4 products at the project job site shall be provided by others.

The MiTek Z4 CNX-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 Z-Rod with the building as it shrinks and compresses. The CNX 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-5

- Connecting Rod Diameter (1/8" Increments)
- CNX-Series Cinch Nut

CNX-Series Advantages

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

BPW-5, BPW-6 Installation

Code Reports

1. ESR-2190
2. LA City RR 25623
3. Florida Building Code - FL 17546

CINCH NUT (CNX)		
Model Number [1]	Connecting Rod Diameter (in.)	Allowable Load Capacity (lbs.) [2]
CNX-3	3/8	5,175
CNX-4	1/2	9,205
CNX-5	5/8	14,065
CNX-6	3/4	16,940
CNX-7	7/8	28,185
CNX-8	1	29,285
CNX-9	1 1/8	42,335
CNX-10	1 1/4	54,190
CNX-11	1 3/8	51,095
CNX-12	1 1/2	82,835

BPW-7 and Larger Installation

1. All CNX models fit within a nominal 4" wall depth.
2. Cinch Nut allowable loads have been evaluated and approved in ICC-ES ESR-2190.

Bearing Plate Washer (BPW)

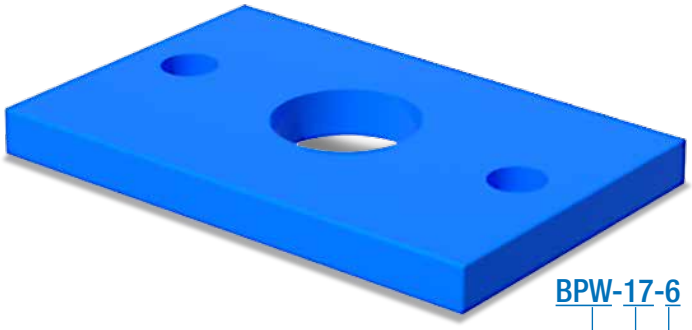
MiTek Z4 Bearing Plate Washers (BPW) are the interface between the Tie-Down System and the level of the building being anchored to the foundation. As the floor system is pulled upward by shear wall overturning forces, pressure is applied to the BPW/CNX assembly and transferred into the Z-Rod or all thread rod (ATR). The required bearing area is based on the design uplift to minimize crushing of the wood and the BPW thickness must be sufficient such that BPW flexural yielding 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



BPW-17-6

- 6" Nominal Wall Thickness
- Bearing Capacity based on DF-L
- Bearing Plate Washer (BPW)

BEARING PLATE WASHER (BPW) [1]

Model Number	Dimensions (in.)			Min. Nominal Wall Thickness (in.)	Color	Allowable Bearing Capacity (lbs.) [3, 4]			
	Width & Length (in.)	Thickness [2] (in.)	Hole Dia. (in.)			DF-L (625 psi.)	SP (565 psi.)	HF (405 psi.)	SPF (425psi.)
BPW-5	3 x 3	1/4	1 5/16″	4″	Brown	4,780[5,6]	4,320[5]	3,100	3,250
BPW-6	3 1/4 x 3 3/8	3/8	1 9/16″		Red	5,660	5,110	3,670	3,850
BPW-7	3 1/4 x 4 3/8	1/2			Yellow	7,690	6,950	4,980	5,230
BPW-9	3 1/4 x 5	5/8			Green	8,960	8,100	5,800	6,090
BPW-11	3 1/4 x 5 7/8	3/4			Blue	10,740	9,700	6,960	7,300
BPW-15	3 1/4 x 7 7/8	7/8			Black	14,800	13,380	9,590	10,060
BPW-20	3 1/4 x 10 1/4	1 1/4			White	19,620	17,740	12,710	13,340
BPW-25	3 1/2 x 11 3/4	1 1/2			Orange	24,500	22,150	15,880	16,660
BPW-30	3 1/2 x 14	1 3/4			Lt. Gray	29,430	26,600	19,070	20,010
BPW-17-6	5 x 5 7/8	5/8	1 9/16″	6″	Lt. Blue	17,160	15,510	11,120	11,670
BPW-27-6	5 x 9	1			Tan	26,930	24,340	17,450	18,310
BPW-36-6	5 x 12	1 1/2			Gray	36,300	32,820	23,520	24,690
BPW-43-6	5 x 14	1 3/4			Purple	42,550	38,470	27,570	28,940
BPW-46-6	5 x 15	1 7/8			Pink	45,680	41,290	29,600	31,060

1. Bearing Plate Washers are fabricated from ASTM A36 steel

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

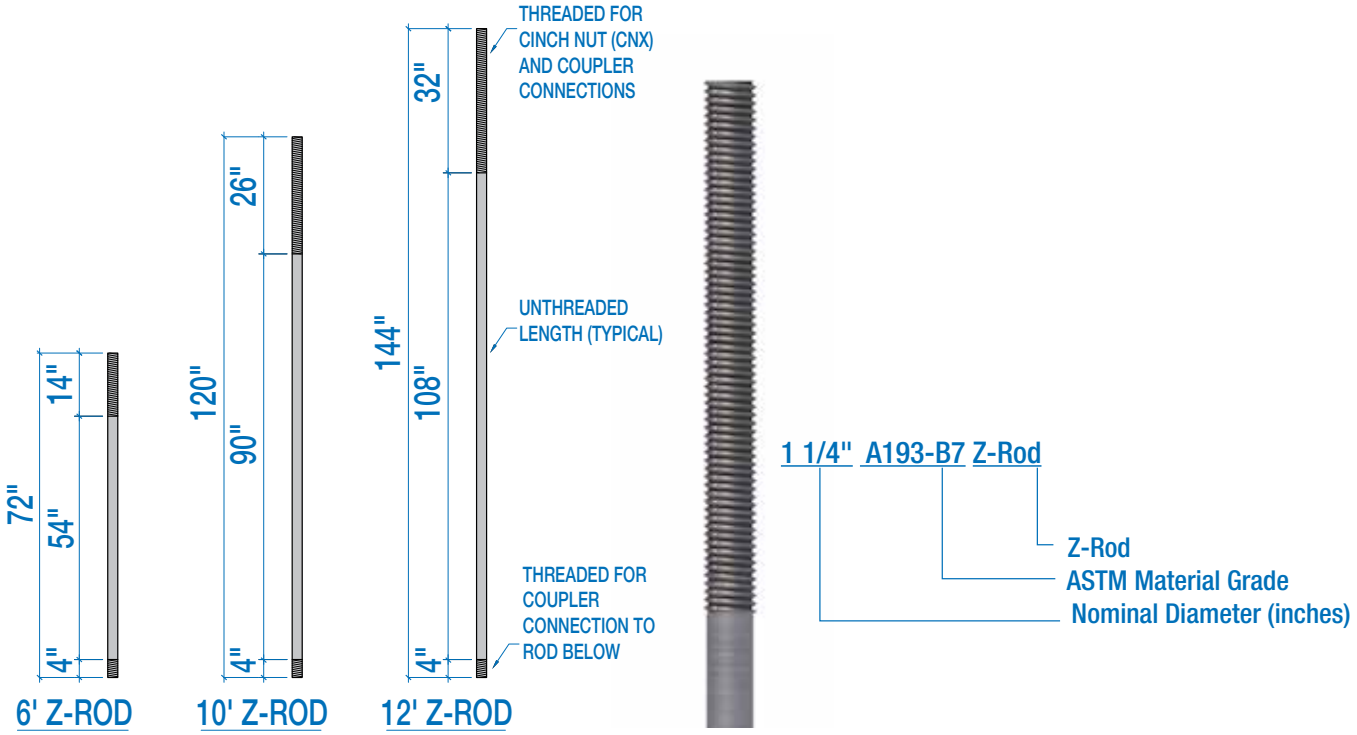
3. Bearing Plate Washer capacities are governed by compression of wood with no limitation to plate bending.

4. Allowable Bearing Capacity = $(A_{plate} - A_{hole})$x ($f'_{c\perp}$ of Wood Species); where $f'_{c\perp}$ = 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 Z4 Rod transfers load from Cinch Nuts (CNX) or standard hex nuts to the terminating structure (foundation, concrete slab, steel beam, wood beam). Rod may either be standard all threaded rod (ATR) or Z-Rod. Z-Rod are economical alternatives to ATR with the difference that the Z-Rod remains unthreaded except at its ends for connection assmebly. In terms of engineering strength and rod elongation, Z-Rod and ATR of similar nominal diameter and material grade behave identically. Z-Rod lengths are currently available in 6, 10, and 12 feet segments. Both ATR and Z-Rod are available in either ASTM A36 or ASTM A193-B7 steel grades.



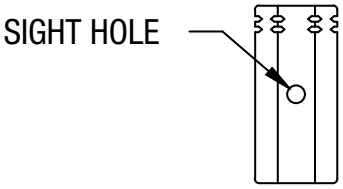
Z-Rod (Z-Rod/ATR)					
Model Number		Nominal Diameter, ϕ_N (in.)	Nominal Area, A_N (in.)	Effective Area, A_E (sq. in.)	Tensile Capacity (lbs)
ATR	Z-ROD				
3/8" A36 ATR 3/8" A193-B7 ATR	3/8" A36 Z-ROD 3/8" A193-B7 Z-ROD	3/8	0.1104	0.0913	2,485 5,175
1/2" A36 ATR 1/2" A193-B7 ATR	1/2" A36 Z-ROD 1/2" A193-B7 Z-ROD	1/2	0.1963	0.1651	4,420 9,205
5/8" A36 ATR 5/8" A193-B7 ATR	5/8" A36 Z-ROD 5/8" A193-B7 Z-ROD	5/8	0.3068	0.2493	6,905 14,380
3/4" A36 ATR 3/4" A193-B7 ATR	3/4" A36 Z-ROD 3/4" A193-B7 Z-ROD	3/4	0.4418	0.3652	9,940 20,710
7/8" A36 ATR 7/8" A193-B7 ATR	7/8" A36 Z-ROD 7/8" A193-B7 Z-ROD	7/8	0.6013	0.5011	13,530 28,185
1" A36 ATR 1" A193-B7 ATR	1" A36 Z-ROD 1" A193-B7 Z-ROD	1	0.7854	0.6570	17,670 36,815
1 1/8" A36 ATR 1 1/8" A193-B7 ATR	1 1/8" A36 Z-ROD 1 1/8" A193-B7 Z-ROD	1 1/8	0.9940	0.8294	22,365 46,595
1 1/4" A36 ATR 1 1/4" A193-B7 ATR	1 1/4" A36 Z-ROD 1 1/4" A193-B7 Z-ROD	1 1/4	1.2272	1.0423	27,610 57,525
1 3/8" A36 ATR 1 3/8" A193-B7 ATR	1 3/8" A36 Z-ROD 1 3/8" A193-B7 Z-ROD	1 3/8	1.4849	1.2528	33,410 69,605
1 1/2" A36 ATR 1 1/2" A193-B7 ATR	1 1/2" A36 Z-ROD 1 1/2" A193-B7 Z-ROD	1 1/2	1.7671	1.5162	39,760 82,835
1 3/4" A36 ATR 1 3/4" A193-B7 ATR	1 3/4" A36 Z-ROD 1 3/4" A193-B7 Z-ROD	1 3/4	2.4053	2.0523	54,120 112,750
2" A36 ATR 2" A193-B7 ATR	2" A36 Z-ROD 2" A193-B7 Z-ROD	2	3.1416	2.6880	70,685 147,260

1. Effective area, AE is determined directly by manufacture's item specification report and are not derived from nominal diameters.
2. Z-Rod are currently not provided in 3/8" and 1/2" nominal diameters.
3. For rod elongation calculations, AE is used for ATR and both threaded and unthreaded sections of Z-Rod.
4. For strength calculations, 0.75AN is used for ATR and both threaded and unthreaded sections of Z-Rod.
5. Ultimate stresses, Fu for ASTM A36 and ASTM A193-B7 rod material are 60 ksi and 125 ksi respectively.
6. Calculation of rod tensile capacities (ASD) adheres to AISC 360-10, Sect: J3.6 Tensile and Shear Strength of Bolts and Threaded Parts.

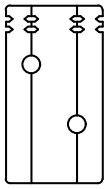
The MiTek Z4 Tie-Down System begins by connecting the first level Z-Rod to the hold down anchor in the foundation with a Coupler. At upper levels, Couplers are used to connect Z-Rods or ATRs end to end to create a continuous load path. Transition Couplers connect two Rods that are different diameters.

Coupler

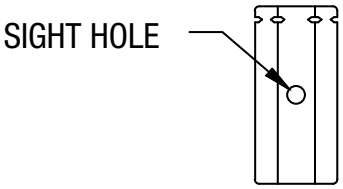
Reducer



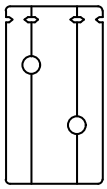
HS COUPLER NUT



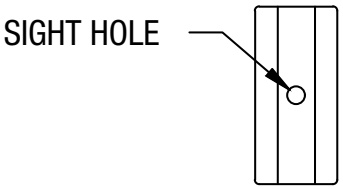
HS COUPLER NUT REDUCER



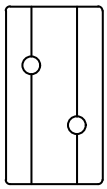
MS COUPLER NUT



MS COUPLER NUT REDUCER



STD COUPLER NUT



STD COUPLER NUT REDUCER

5/8"- 3/4" STD CPL

- Coupler Nut with Witness Hole (CPL)
- Rod Grade
- Larger Connecting Rod Diameter (1/8” increments)
- Smaller Connecting Rod Diameter (1/8” increments)

Advantages

1. All Couplers have a higher capacity than those of the adjoining rods. When joining rods with different tensile strengths, the Couplers capacity is higher than the rod with the smaller strength.

2. Reducers are Couplers used to connect rods of with different diameters to combine the most effective and most economical rod needed at each level.

3. Witness holes are provided to assure easy inspection and inspection.

Finish

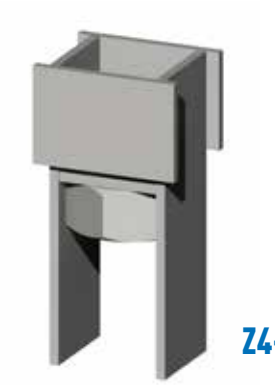
Plain Finish

Installation

Thread Coupler onto the two Z-Rods ends

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 plates and include a pre-welded nut, making the Tie-Down connection quick and easy. AT devices are available in 9 and 12 inch heights. Other heights available upon request. The 9 inch version with 1/4 inch plate steel legs is available for connecting 5/8" through 1-1/2" diameter threaded rod and the 12 inch version with twice the steel thickness at the legs is used for connecting up to 2" diameter rod.

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 Tie's 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.



Z4-AT32

Z4-AT65

Z4-AT 32-3

- Rod Diameter (1/8" increments)
- Allowable ASD Uplift
- Anchor Tie

ANCHOR TIE (AT) [1, 2, 3]						
Model Number	Dimensions (in.)			Connecting Rod Diameter (in.)	Allowable Uplift (lbs.) [4]	
	Height	Width	Depth		ASD	LRFD
Z4-AT32-3	9	3 1/2	3	3/8	32,400	48,600
Z4-AT32-4				1/2		
Z4-AT32-5				5/8		
Z4-AT32-6				3/4		
Z4-AT32-7				7/8		
Z4-AT32-8				1		
Z4-AT32-9				1 1/8		
Z4-AT32-10				1 1/4		
Z4-AT32-11				1 3/8		
Z4-AT32-12				1 1/2		
Z4-AT65-5	11 3/4	4 1/4	3 1/2	5/8	64,800	97,200
Z4-AT65-6				3/4		
Z4-AT65-7				7/8		
Z4-AT65-8				1		
Z4-AT65-9				1 1/8		
Z4-AT65-10				1 1/4		
Z4-AT65-11				1 3/8		
Z4-AT65-12				1 1/2		
Z4-AT65-16				2		

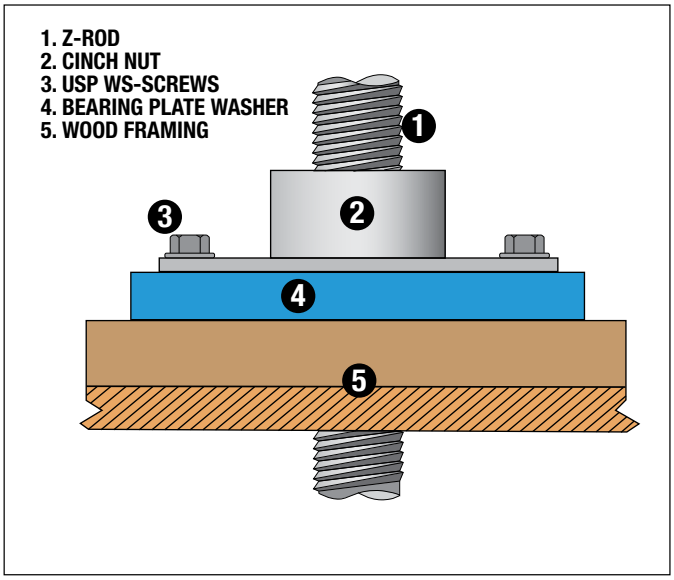
1. Weld size to steel member below is 1/4" for AT32 and 5/16" for AT65. Weld length is 3 inches for each leg, one side for AT32 and two sides for AT65.

2. Design of the steel member below the Anchor Tie is the responsibility of the EOR.

3. All plate material is ASTM A36.

4. Allowable uplift loads are per AISC no increase permitted.

5. 16" height available.

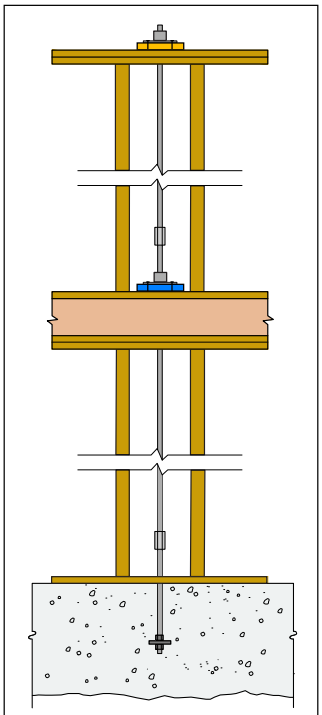


MiTek® Z4 Tie-Down Systems utilize CNX-Series Cinch Nuts to compensate for wood shrinkage and building settlement that cause connections to loosen over time. The Cinch Nut uses a self-ratcheting action that permits the cinch nut to move (the rod doesn't move) or "travel" perpetually in one direction 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 Cinch Nut has been code evaluated and published in ESR-2190.

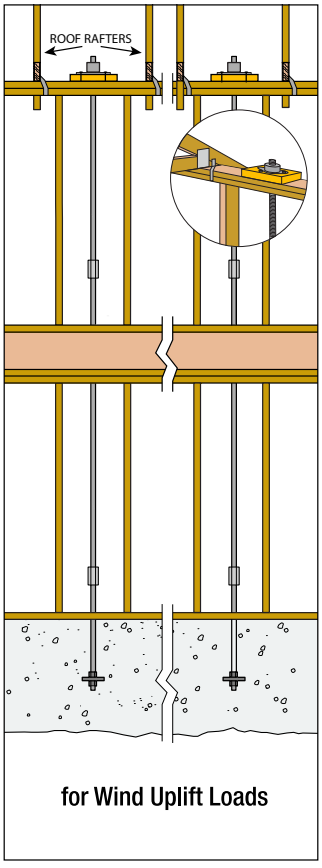
- Place the specified Bearing Plate Washer onto the bottom plate of a wood framed wall.
- With the "wings" oriented downward, place Cinch Nut over the Z-Rod extending from below and push down until it seats firmly on the Bearing Plate Washer.
- Install 1/4 inch diameter USP WS-Series screws through the 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 WS-Series screws.

BPW5, BPW6 Installation

BPW7 and larger Installation



for Lateral Loads



for Wind Uplift Loads

MiTek® Z4 Tie-Down System for Lateral Loads

To resist tension loads due to overturning moments in multi-story buildings the CNX 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, Z-Rods/ATRs and Couplers all available from **MiTek®**.

MiTek® Z4 Tie-Down System for Wind Uplift

For resisting roof uplift loads resulting from wind the Z4 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 Z-Rods / ATRs and Couplers that form a load path to the foundation.

The MiTek 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 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 MiTek 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 three Design Examples that utilize MiTek Z4 components to resist tension loads.

1. Design by referencing the Quick Reference Table (Assumes 10 foot rod lengths and 0.0200 inch deflection limit)

2. Design by using the catalog tables for each individual component including the CNX, BPW, Z-R and CNW

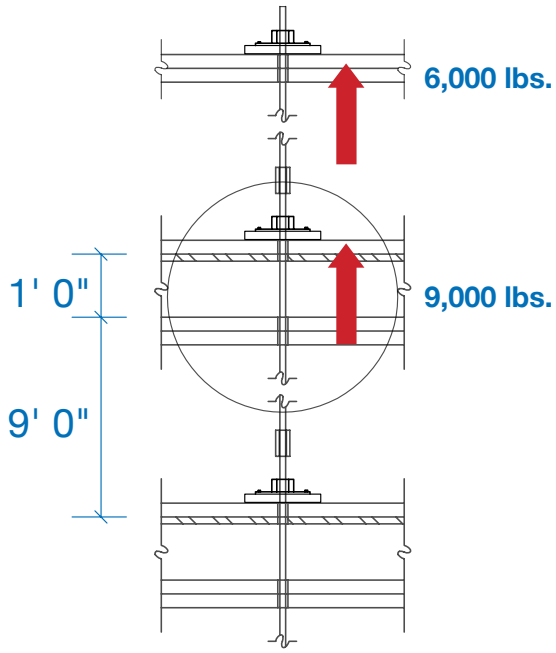
3. Design by using USP Specifier Design Software.

Design Example

By Quick Reference Table

GIVEN

Wood Type: Douglas Fir-Larch
Code: 2012 IBC
Maximum Rod Elongation Per Floor = 0.200"
Maximum Total Deformation Per Floor = 0.200"
Story Height: 9' 0"
Floor System Depth = 1' 0"
Use: Z-Rod Length = 2nd Floor Story Height + Floor System Depth = 10' Z-Rod
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



LOOKUP BY ALLOWABLE LOADS

A. Refer to Quick Reference Table 10.2:
Z-Rod Length = 10' **OK!**
Maximum Total Deformation Per Floor = 0.200" **OK!**

B. Refer to Cumulative Load column:
Find value > Cumulative ASD Design Uplift Load
Select 16,050 lbs. > 15,000 lbs. **OK!**

C. Refer to the Individual Floor Load – DF-L column:
Find value > ASD Design Uplift Load
Select 10,750 lbs. > 9,000 lbs. **OK!**

D. Follow Row Across to Determine Components:
- ZR-8 STD
- CNX-8
- BPW11 (3-1/4 x 5-7/8)

Note:
This example uses 0.200" deflection limit and a 10 ft. rod length. Design criteria may vary by building jurisdiction and job specific requirements.

A **QUICK REFERENCE TABLE 10.2: FOR 10-FT Z-ROD, TOTAL LEVEL DISPLACEMENT ≤ 0.200" [1]** **D**

Model Number	Minimum Wall Framing Nominal Depth	Allowable Uplift (lbs.)						Vertical Displacement (in.)					Components		
		Cumulative Load (lbs)[2]	Individual Floor Load (lbs) [3]					Elongation of Z-Rod (in) [4]	Total Level Displacement (in) [5]				Cinch Nut (CNX) [6]	Z-Rod (ZR)	Bearing Plate Washer (BPW) Dimensions
			DF-L	HF	SPF	SP			DF-L	HF	SPF	SP			
Z-3STD-3 x 3	4"		2,400	2,400		2,400		0.099	0.157	0.161	0.159	0.157	CNX-3	ZR-3 STD	3 x 3
Z-4STD-3 x 3	4"		4,270	3,100		4,270		0.099	0.190	0.194	0.194	0.196	CNX-4	ZR-4 STD	3 x 3
Z-4STD-3-1/4 x 3-3/8			-	3,670		-			-	0.195	0.196	-			3-1/4 x 3-3/8
Z-8STD-3-1/4 x 4-3/8			7,690	4,980		6,950			0.192	0.190	0.190	0.191			3-1/4 x 4-3/8
Z-8STD-3-1/4 x 5			8,960	5,800		8,100			0.193	0.191	0.191	0.192			3-1/4 x 5
Z-8STD-3-1/4 x 5-7/8	4"	16,050	10,750	6,960	7,300	9,700		0.091	0.195	0.191	0.192	0.194	CNX-8	ZR-8 STD	3-1/4 x 5-7/8
Z-8STD-3-1/4 x 7-7/8			14,800	9,590	10,050	13,400			0.198	0.194	0.194	0.197			3-1/4 x 7-7/8

B **C**

QUICK REFERENCE TABLE 10.2: FOR 10-FT Z-ROD, TOTAL LEVEL DISPLACEMENT ≤ 0.200" [1]

Model Number	Minimum Wall Framing Nominal Depth	Allowable Uplift (lbs.)					Vertical Displacement (in.)					Components		
		Cumulative Load (lbs) [2]	Individual Floor Load (lbs) [3]				Elongation of Z-Rod (in) [4]	Total Level Displacement (in) [5]				Cinch Nut (CNX) [6]	Z-Rod (ZR)	Bearing Plate Washer (BPW) Dimensions
			DF-L	HF	SPF	SP		DF-L	HF	SPF	SP			
Z-3STD-3 x 3	4"	2,400	2,400	2,400	2,400	2,400	0.099	0.157	0.161	0.159	0.157	CNX-3	ZR-3 STD	3 x 3
Z-4STD-3 x 3	4"	4,270	4,270	3,100	3,250	4,270	0.099	0.190	0.194	0.194	0.196	CNX-4	ZR-4 STD	3 x 3
Z-4STD-3-1/4 x 3-3/8			-	3,670	3,850	-		-	0.195	0.196	-			3-1/4 x 3-3/8
Z-4STD-3-1/4 x 4-3/8			-	4,270	4,270	-		-	0.188	0.185	-			3-1/4 x 4-3/8
Z-5STD-3 x 3	4"	6,680	4,780	3,100	3,250	4,320	0.098	0.196	0.194	0.194	0.195	CNX-5	ZR-5 STD	3 x 3
Z-5STD-3-1/4 x 3-3/8			5,660	3,670	3,850	5,110		0.197	0.194	0.195	0.196			3-1/4 x 3-3/8
Z-5STD-3-1/4 x 4-3/8			6,680	4,980	5,230	6,680		0.190	0.196	0.196	0.196			3-1/4 x 4-3/8
Z-5STD-3-1/4 x 5			-	5,800	6,090	-		-	0.197	0.198	-			3-1/4 x 5
Z-5STD-3-1/4 x 5-7/8			-	6,680	6,680	-		-	0.196	0.193	-			3-1/4 x 5-7/8
Z-6STD-3 x 3	4"	8,840	4,780	3,100	3,250	4,320	0.089	0.194	0.191	0.192	0.193	CNX-6	ZR-6 STD	3 x 3
Z-6STD-3-1/4 x 3-3/8			5,660	3,670	3,850	5,110		0.195	0.192	0.192	0.194			3-1/4 x 3-3/8
Z-6STD-3-1/4 x 4-3/8			7,690	4,980	5,230	6,950		0.197	0.194	0.194	0.196			3-1/4 x 4-3/8
Z-6STD-3-1/4 x 5			8,840	5,800	6,090	8,100		0.198	0.195	0.195	0.198			3-1/4 x 5
Z-6STD-3-1/4 x 5-7/8			-	6,960	7,300	8,840		-	0.196	0.197	0.194			3-1/4 x 5-7/8
Z-6STD-3-1/4 x 7-7/8			-	8,840	8,840	-		-	0.194	0.192	-			3-1/4 x 7-7/8
Z-6STD-5 x 5-7/8	6"		-	8,840	8,840	-		-	0.187	0.185	-			5 x 5-7/8
Z-7STD-3 x 3	4"	13,100	4,780	3,100	3,250	4,320	0.097	0.191	0.190	0.190	0.191	CNX-7	ZR-7 STD	3 x 3
Z-7STD-3-1/4 x 3-3/8			5,660	3,670	3,850	5,110		0.192	0.190	0.191	0.192			3-1/4 x 3-3/8
Z-7STD-3-1/4 x 4-3/8			7,690	4,980	5,230	6,950		0.194	0.192	0.192	0.193			3-1/4 x 4-3/8
Z-7STD-3-1/4 x 5			8,960	5,800	6,090	8,100		0.195	0.192	0.192	0.194			3-1/4 x 5
Z-7STD-3-1/4 x 5-7/8			10,750	6,960	7,300	9,700		0.196	0.193	0.193	0.195			3-1/4 x 5-7/8
Z-7STD-3-1/4 x 7-7/8			13,100	9,590	10,050	13,100		0.191	0.195	0.196	0.197			3-1/4 x 7-7/8
Z-7STD-3-1/4 x 10-1/4			-	12,700	13,100	-		-	0.198	0.197	-			3-1/4 x 10-1/4
Z-7STD-3-1/2 x 11-3/4			-	13,100	-	-		-	0.188	-	-			3-1/2 x 11-3/4
Z-7STD-5 x 5-7/8	6"		-	11,100	11,650	13,100		-	0.197	0.197	0.189			5 x 5-7/8
Z-7STD-5 x 9			-	13,100	13,100	-		-	0.183	0.182	-			5 x 9
Z-8STD-3 x 3	4"	16,050	4,780	3,100	3,250	4,320	0.091	0.190	0.188	0.188	0.189	CNX-8	ZR-8 STD	3 x 3
Z-8STD-3-1/4 x 3-3/8			5,660	3,670	3,850	5,110		0.190	0.189	0.189	0.190			3-1/4 x 3-3/8
Z-8STD-3-1/4 x 4-3/8			7,690	4,980	5,230	6,950		0.192	0.190	0.190	0.191			3-1/4 x 4-3/8
Z-8STD-3-1/4 x 5			8,960	5,800	6,090	8,100		0.193	0.191	0.191	0.192			3-1/4 x 5
Z-8STD-3-1/4 x 5-7/8			10,750	6,960	7,300	9,700		0.195	0.191	0.192	0.194			3-1/4 x 5-7/8
Z-8STD-3-1/4 x 7-7/8			14,800	9,590	10,050	13,400		0.198	0.194	0.194	0.197			3-1/4 x 7-7/8
Z-8STD-3-1/4 x 10-1/4			16,050	12,700	13,350	16,050		0.188	0.196	0.197	0.193			3-1/4 x 10-1/4
Z-8STD-3-1/2 x 11-3/4			-	15,900	16,050	-		-	0.199	0.197	-			3-1/2 x 11-3/4
Z-8STD-3-1/2 x 14			-	16,050	-	-		-	0.190	-	-			3-1/2 x 14
Z-8STD-5 x 5-7/8	6"		16,050	11,100	11,650	15,500		0.195	0.195	0.195	0.199			5 x 5-7/8
Z-8STD-5 x 9			-	16,050	16,050	16,050		-	0.194	0.192	0.184			5 x 9
Z-10STD-3 x 3	4"	20,300	4,780	3,100	3,250	4,320	0.073	0.191	0.190	0.190	0.191	CNX-10	ZR-10 STD	3 x 3
Z-10STD-3-1/4 x 3-3/8			5,660	3,670	3,850	5,110		0.191	0.190	0.190	0.191			3-1/4 x 3-3/8
Z-10STD-3-1/4 x 4-3/8			7,690	4,980	5,230	6,950		0.192	0.191	0.191	0.192			3-1/4 x 4-3/8
Z-10STD-3-1/4 x 5			8,960	5,800	6,090	8,100		0.193	0.191	0.192	0.193			3-1/4 x 5
Z-10STD-3-1/4 x 5-7/8			10,750	6,960	7,300	9,700		0.194	0.192	0.192	0.193			3-1/4 x 5-7/8
Z-10STD-3-1/4 x 7-7/8			14,800	9,590	10,050	13,400		0.196	0.193	0.194	0.195			3-1/4 x 7-7/8
Z-10STD-3-1/4 x 10-1/4			19,600	12,700	13,350	17,750		0.199	0.195	0.195	0.198			3-1/4 x 10-1/4
Z-10STD-3-1/2 x 11-3/4			20,300	15,900	16,650	20,300		0.189	0.197	0.197	0.194			3-1/2 x 11-3/4
Z-10STD-3-1/2 x 14			-	19,050	20,000	-		-	0.198	0.199	-			3-1/2 x 14

QUICK REFERENCE TABLE 10.2: FOR 10-FT Z-ROD, TOTAL LEVEL DISPLACEMENT ≤ 0.200" [1]

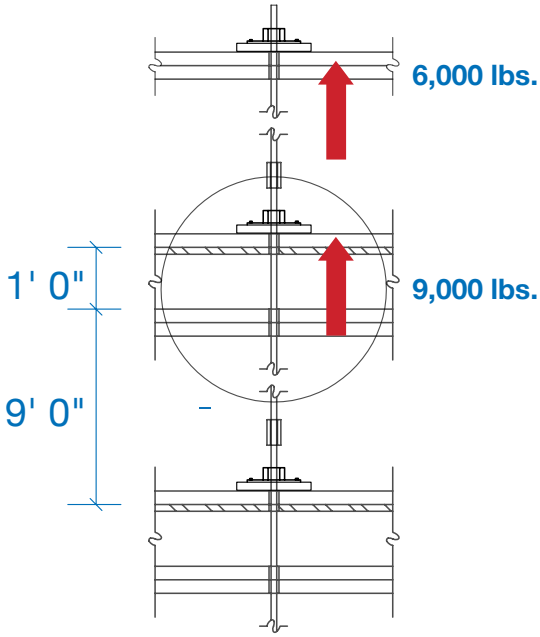
Model Number	Minimum Wall Framing Nominal Depth	Allowable Uplift (lbs.)					Vertical Displacement (in.)					Components		
		Cumulative Load (lbs) [2]	Individual Floor Load (lbs) [3]				Elongation of Z-Rod (in) [4]	Total Level Displacement (in) [5]				Cinch Nut (CNX) [6]	Z-Rod (ZR)	Bearing Plate Washer (BPW) Dimensions
			DF-L	HF	SPF	SP		DF-L	HF	SPF	SP			
Z-10STD-5 x 5-7/8	6"	21,300	17,150	11,100	11,650	15,500	0.073	0.197	0.194	0.195	0.197	CNX-10	ZR-10 STD	5 x 5-7/8
Z-10STD-5 x 9			20,300	17,450	18,300	20,300		0.184	0.198	0.198	0.189			5 x 9
Z-12STD-5 x 12			-	20,300	20,300	-		-	0.191	0.188	-			5 x 12
Z-9STD-3 x 3	4"	21,400	4,780	3,100	3,250	4,320	0.096	0.191	0.190	0.190	0.191	CNX-9	ZR-9 STD	3 x 3
Z-9STD-3-1/4 x 3-3/8			5,660	3,670	3,850	5,110		0.191	0.190	0.190	0.191			3-1/4 x 3-3/8
Z-9STD-3-1/4 x 4-3/8			7,690	4,980	5,230	6,950		0.192	0.191	0.191	0.192			3-1/4 x 4-3/8
Z-9STD-3-1/4 x 5			8,960	5,800	6,090	8,100		0.193	0.191	0.192	0.193			3-1/4 x 5
Z-9STD-3-1/4 x 5-7/8			10,750	6,960	7,300	9,700		0.194	0.192	0.192	0.194			3-1/4 x 5-7/8
Z-9STD-3-1/4 x 7-7/8			14,800	9,590	10,050	13,400		0.196	0.194	0.194	0.196			3-1/4 x 7-7/8
Z-9STD-3-1/4 x 10-1/4			19,600	12,700	13,350	17,750		0.199	0.195	0.196	0.198			3-1/4 x 10-1/4
Z-9STD-3-1/2 x 11-3/4			21,400	15,900	16,650	21,400		0.192	0.197	0.197	0.198			3-1/2 x 11-3/4
Z-9STD-3-1/2 x 14			-	19,050	20,000	-		-	0.199	0.199	-			3-1/2 x 14
Z-9STD-5 x 5-7/8	6"		17,150	11,100	11,650	15,500		0.198	0.194	0.195	0.197			5 x 5-7/8
Z-9STD-5 x 9			21,400	17,450	18,300	21,400		0.188	0.198	0.198	0.193			5 x 9
Z-12STD-5 x 12			-	21,400	21,400	-		-	0.195	0.192	-			5 x 12
Z-11STD-3-1/4 x 3-3/8	4"	22,300	5,660	3,670	3,850	5,110	0.067	0.190	0.189	0.189	0.190	CNX-11	ZR-11 STD	3-1/4 x 3-3/8
Z-11STD-3-1/4 x 4-3/8			7,690	4,980	5,230	6,950		0.191	0.190	0.190	0.191			3-1/4 x 4-3/8
Z-11STD-3-1/4 x 5			8,960	5,800	6,090	8,100		0.192	0.190	0.190	0.191			3-1/4 x 5
Z-11STD-3-1/4 x 5-7/8			10,750	6,960	7,300	9,700		0.193	0.191	0.191	0.192			3-1/4 x 5-7/8
Z-11STD-3-1/4 x 7-7/8			14,800	9,590	10,050	13,400		0.195	0.192	0.192	0.194			3-1/4 x 7-7/8
Z-11STD-3-1/4 x 10-1/4			19,600	12,700	13,350	17,750		0.197	0.194	0.194	0.196			3-1/4 x 10-1/4
Z-11STD-3-1/2 x 11-3/4			22,300	15,900	16,650	22,150		0.193	0.195	0.196	0.199			3-1/2 x 11-3/4
Z-11STD-3-1/2 x 14			-	19,050	20,000	22,300		-	0.197	0.197	0.189			3-1/2 x 14
Z-11STD-5 x 5-7/8	6"		17,150	11,100	11,650	15,500		0.196	0.193	0.193	0.195			5 x 5-7/8
Z-11STD-5 x 9			22,300	17,450	18,300	22,300		0.188	0.196	0.197	0.193			5 x 9
Z-12STD-5 x 12			-	22,300	22,300	-		-	0.195	0.193	-			5 x 12
Z-12STD-3-1/4 x 3-3/8	4"	30,000	5,660	3,670	3,850	5,110	0.075	0.189	0.188	0.188	0.189	CNX-12	ZR-12 STD	3-1/4 x 3-3/8
Z-12STD-3-1/4 x 4-3/8			7,690	4,980	5,230	6,950		0.190	0.189	0.189	0.189			3-1/4 x 4-3/8
Z-12STD-3-1/4 x 5			8,960	5,800	6,090	8,100		0.190	0.189	0.189	0.190			3-1/4 x 5
Z-12STD-3-1/4 x 5-7/8			10,750	6,960	7,300	9,700		0.191	0.189	0.190	0.191			3-1/4 x 5-7/8
Z-12STD-3-1/4 x 7-7/8			14,800	9,590	10,050	13,400		0.193	0.191	0.191	0.192			3-1/4 x 7-7/8
Z-12STD-3-1/4 x 10-1/4			19,600	12,700	13,350	17,750		0.195	0.192	0.192	0.194			3-1/4 x 10-1/4
Z-12STD-3-1/2 x 11-3/4			24,500	15,900	16,650	22,150		0.197	0.193	0.194	0.196			3-1/2 x 11-3/4
Z-12STD-3-1/2 x 14			29,450	19,050	20,000	26,600		0.199	0.195	0.195	0.198			3-1/2 x 14
Z-12STD-5 x 5-7/8	6"		17,150	11,100	11,650	15,500		0.194	0.191	0.192	0.193			5 x 5-7/8
Z-12STD-5 x 9			26,950	17,450	18,300	24,350		0.198	0.194	0.194	0.197			5 x 9
Z-12STD-5 x 12			30,000	23,500	24,700	30,000		0.189	0.197	0.197	0.194			5 x 12
Z-12STD-5 x 14			-	27,550	28,950	-		-	0.198	0.199	-			5 x 14
Z-12STD-5 x 15			-	29,600	30,000	-		-	0.199	0.197	-			5 x 15

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 10-foot Z-Rod length (L) and wood design values in accordance with 2012 NDS per species shown.
2. The allowable cumulative load is the Z-Rod (ZR) capacity to resist tension forces equal to the sum of individual floor loads from each level above the Cinch Nut (CNX) connection being considered.
3. The allowable individual floor load is the Cinch Nut (CNX) and Bearing Plate Washer (BPW) capacity to transfer uplift forces from the single level being considered into the Z-Rod (ZR).
4. Elongation of the Z-Rod is determined by calculating $(PL_T/A_TE) + (PL_U/A_UE)$; where P = cumulative tension force, L_T = length of rod with threads (.25L), L_U = length of rod without threads (.75L), A_T = effective cross sectional area of rod length with threads, A_U = net cross sectional area of rod length without threads, and E = Modulus of Elasticity ($29x10^6$) .
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), and total Z-Rod (ZR) elongation per floor.
6. Cinch Nut model numbers CNX-5 through CNX-12 are evaluated and approved per ICC-ES (ESR-2190); CNX-3 & CNX-4 are ESR pending.

GIVEN

Wood Type: Douglas Fir-Larch
Code: 2012 IBC
Maximum Rod Elongation Per Floor = 0.200"
Maximum Total Deformation Per Floor = 0.200"
Story Height: 9' 0"
Floor System Depth = 1' 0"
Use: Z-Rod Length = 2nd Floor Story Height + Floor System Depth = 10' Z-Rod
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. Standard-Grade Z-Rod (ZR) Capacity > Cumulative ASD Design Uplift Load:
ZR-8 STD Capacity = 17,080 lbs. > 15,000 lbs. **OK!**

C. Cinch Nut (CNX) Hole Diameter = Z-Rod (ZR) Diameter:
CNX-8 (1" hole diameter) = ZR-8 STD (1" diameter)

D. Check: Cinch Nut (CNX) Capacity > ASD Design Uplift Load:
CNX-8 capacity = 29,285 lbs. > 9,000 lbs. **OK!**

Note:
This example uses 0.200" deflection limit and a 10 ft. rod length. Design criteria may vary by building jurisdiction and job specific requirements.

STEP 2. CALCULATE TOTAL FLOOR DEFORMATION

$\Delta_T = \Sigma (\Delta_L + \Delta_M + \Delta_W)$

Δ_L = Z-Rod Elongation
Δ_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.**

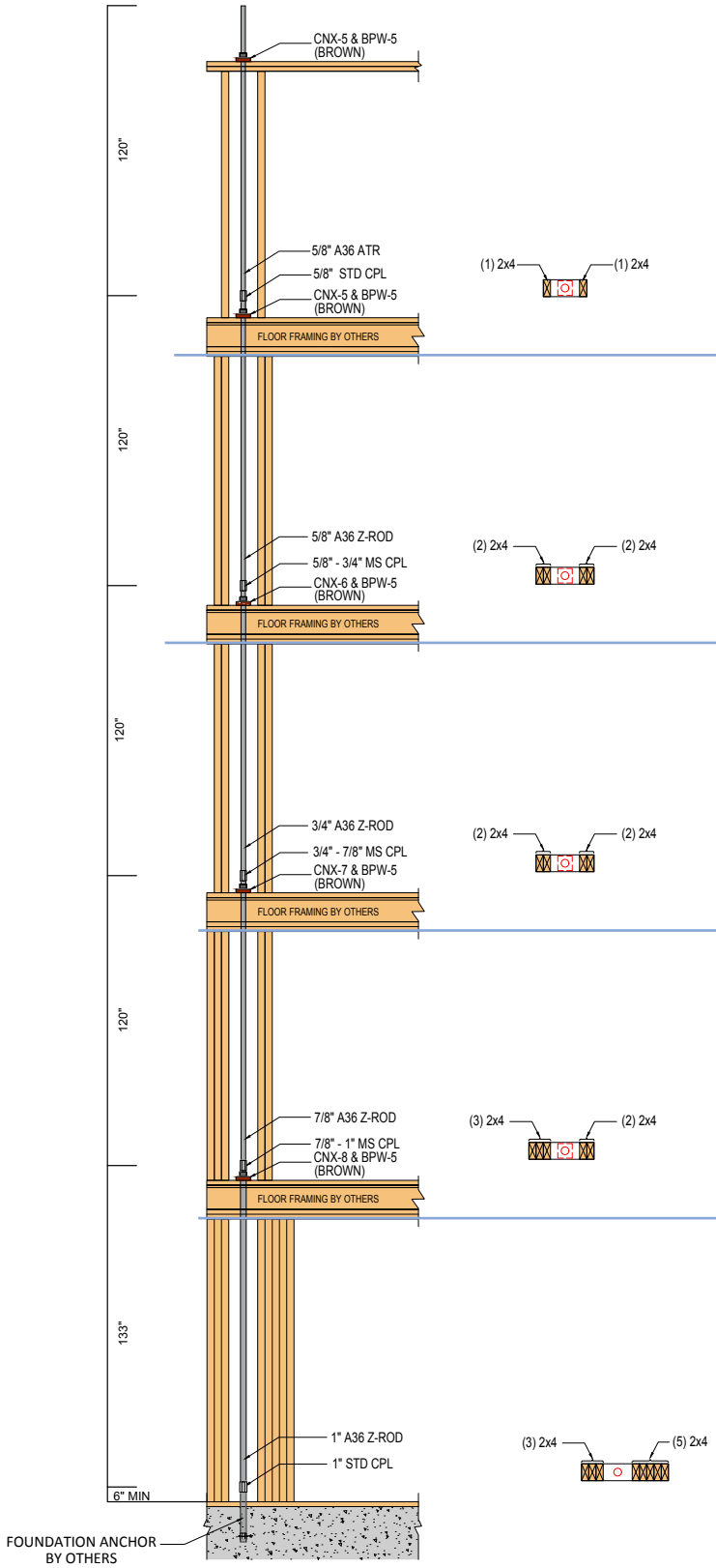

CNX-5 & BPW-5
(BROWN)
120"
5/8" A36 ATR
5/8" STD CPL
CNX-5 & BPW-5
(BROWN)
FLOOR FRAMING BY OTHERS
(1) 2x4
(1) 2x4
120"
5/8" A36 Z-ROD
5/8" - 3/4" MS CPL
CNX-6 & BPW-5
(BROWN)
FLOOR FRAMING BY OTHERS
(2) 2x4
(2) 2x4
120"
3/4" A36 Z-ROD
3/4" - 7/8" MS CPL
CNX-7 & BPW-5
(BROWN)
FLOOR FRAMING BY OTHERS
(2) 2x4
(2) 2x4
120"
7/8" A36 Z-ROD
7/8" - 1" MS CPL
CNX-8 & BPW-5
(BROWN)
FLOOR FRAMING BY OTHERS
(3) 2x4
(2) 2x4
133"
1" A36 Z-ROD
1" STD CPL
6" MIN
FOUNDATION ANCHOR
BY OTHERS
(3) 2x4
(5) 2x4

TABLE 2.1- DF: COMPRESSION CAPACITIES FOR DOUGLAS FIR-LARCH [1, 2]

Nominal Wall Depth, b^3 (in)	Nominal Lumber Dimensions	Lumber Grade	$P_{c\perp}$ Maximum Compression Capacity Perpendicular to Grain (lbs.) [4, 5]	P_c - Maximum Design Compression Capacity Parallel to Grain (lbs.) [6, 7, 8, 9]				
				Nominal Wall Height (ft.) [10]				
				8	9	10	11	12
4"	2x4	No. 2	3,280	3,370	2,680	2,180	1,805	1,520
	2x4	Stud	3,280	2,825	2,280	1,870	1,555	1,315
	3x4	No. 2	5,470	5,615	4,470	3,635	3,010	2,530
	3x4	Stud	5,470	4,710	3,800	3,120	2,595	2,190
	4x4	No. 1	7,655	8,425	6,705	5,450	4,510	3,790
	4x6	No. 1	12,030	13,195	10,510	8,545	7,080	5,950
	4x8	No. 1	15,860	17,325	13,815	11,245	9,315	7,835
	4x10	No. 1	20,235	22,010	17,570	14,310	11,860	9,980
	4x12	No. 1	24,610	26,770	21,370	17,405	14,425	12,140
6"	2x6	No. 2	5,155	11,090	9,280	7,780	6,570	5,600
	2x6	Stud	5,155	8,095	7,135	6,205	5,375	4,660
	3x6	No. 2	8,595	18,485	15,465	12,965	10,950	9,335
	3x6	Stud	8,595	13,495	11,890	10,345	8,955	7,765
	6x4	No. 1	12,030	27,595	23,105	19,380	16,375	13,960
	6x6	No. 1	18,905	34,385	30,165	26,140	22,575	19,535
	6x8	No. 1	25,780	46,890	41,130	35,650	30,785	26,640
	6x10	No. 1	32,655	59,395	52,100	45,155	38,995	33,740
	6x12	No. 1	39,530	71,900	63,070	54,660	47,205	40,845
8"	2x8	No. 2	7,030	20,810	18,815	16,730	14,730	12,920
	3x8	No. 2	11,720	34,685	31,360	27,880	24,545	21,535
	4x8	No. 1	16,405	51,645	46,735	41,595	36,645	32,165
	6x8	No. 1	25,780	57,070	53,880	50,145	46,030	41,800
	8x8	No. 1	35,155	77,820	73,475	68,380	62,770	57,000
	8x10	No. 1	44,530	98,570	93,065	86,610	79,510	72,200
	8x12	No. 1	53,905	119,325	112,660	104,845	96,250	87,400

TABLE 2.1- HF: COMPRESSION CAPACITIES FOR HEM-FIR [1, 2]

Nominal Wall Depth, b^3 (in)	Nominal Lumber Dimensions	Lumber Grade	$P_{c\perp}$ Maximum Compression Capacity Perpendicular to Grain (lbs.) [4, 5]	P_c - Maximum Design Compression Capacity Parallel to Grain (lbs.) [6, 7, 8, 9]				
				Nominal Wall Height (ft.) [10]				
				8	9	10	11	12
4"	2x4	No. 2	2,125	2,745	2,180	1,770	1,465	1,230
	2x4	Stud	2,125	2,450	1,970	1,615	1,345	1,135
	3x4	No. 2	3,545	4,570	3,630	2,950	2,440	2,050
	3x4	Stud	3,545	4,085	3,285	2,690	2,240	1,890
	4x4	No. 1	4,960	7,430	5,915	4,810	3,980	3,350
	4x6	No. 1	7,795	11,635	9,270	7,540	6,245	5,255
	4x8	No. 1	10,275	15,275	12,185	9,920	8,220	6,915
	4x10	No. 1	13,110	19,410	15,495	12,625	10,470	8,815
	4x12	No. 1	15,945	23,605	18,850	15,355	12,730	10,720
6"	2x6	No. 2	3,340	9,385	7,735	6,425	5,395	4,580
	2x6	Stud	3,340	7,285	6,340	5,465	4,700	4,060
	3x6	No. 2	5,570	15,640	12,890	10,710	8,995	7,635
	3x6	Stud	5,570	12,140	10,565	9,105	7,835	6,765
	6x4	No. 1	7,795	24,455	20,450	17,140	14,475	12,340
	6x6	No. 1	12,250	28,450	24,785	21,370	18,395	15,880
	6x8	No. 1	16,705	38,795	33,795	29,145	25,080	21,655
	6x10	No. 1	21,160	49,140	42,810	36,915	31,770	27,430
	6x12	No. 1	25,615	59,485	51,820	44,685	38,460	33,205
8"	2x8	No. 2	4,555	18,660	16,475	14,355	12,445	10,800
	3x8	No. 2	7,595	31,100	27,460	23,925	20,745	18,000
	4x8	No. 1	10,630	46,115	41,630	36,970	32,520	28,515
	6x8	No. 1	16,705	47,960	45,070	41,715	38,085	34,410
	8x8	No. 1	22,780	65,400	61,455	56,885	51,930	46,925
	8x10	No. 1	28,855	82,840	77,845	72,050	65,780	59,440
	8x12	No. 1	34,930	100,280	94,235	87,220	79,630	71,950

TABLE 2.1- SPF: COMPRESSION CAPACITIES FOR SPRUCE-PINE-FIR [1, 2]

Nominal Wall Depth, b^3 (in)	Nominal Lumber Dimensions	Lumber Grade	$P_{c\perp}$ Maximum Compression Capacity Perpendicular to Grain (lbs.) [4, 5]	P_c - Maximum Design Compression Capacity Parallel to Grain (lbs.) [6, 7, 8, 9]				
				Nominal Wall Height (ft.) [10]				
				8	9	10	11	12
4"	2x4	No. 2	2,230	2,930	2,340	1,905	1,575	1,325
	2x4	Stud	2,230	2,415	1,955	1,605	1,335	1,130
	3x4	No. 2	3,720	4,885	3,895	3,175	2,630	2,210
	3x4	Stud	3,720	4,030	3,255	2,670	2,225	1,880
	4x4	No. 1	5,205	6,840	5,455	4,440	3,680	3,095
	4x6	No. 1	8,180	10,710	8,550	6,965	5,775	4,860
	4x8	No. 1	10,785	14,060	11,235	9,160	7,600	6,400
	4x10	No. 1	13,760	17,850	14,285	11,655	9,675	8,150
	4x12	No. 1	16,735	21,710	17,375	14,175	11,765	9,910
6"	2x6	No. 2	3,505	9,600	8,055	6,770	5,725	4,885
	2x6	Stud	3,505	6,915	6,100	5,310	4,605	3,995
	3x6	No. 2	5,845	16,000	13,425	11,280	9,545	8,145
	3x6	Stud	5,845	11,525	10,165	8,850	7,670	6,655
	6x4	No. 1	8,180	22,040	18,585	15,665	13,280	11,350
	6x6	No. 1	12,855	25,545	22,840	20,115	17,580	15,340
	6x8	No. 1	17,530	34,835	31,150	27,430	23,970	20,915
	6x10	No. 1	22,205	44,125	39,455	34,740	30,360	26,495
	6x12	No. 1	26,880	53,415	47,760	42,055	36,755	32,075
8"	2x8	No. 2	4,780	17,875	16,215	14,465	12,770	11,230
	3x8	No. 2	7,970	29,790	27,025	24,110	21,285	18,715
	4x8	No. 1	11,155	40,420	36,880	33,090	29,350	25,895
	6x8	No. 1	17,530	40,930	39,070	36,850	34,330	31,620
	8x8	No. 1	23,905	55,810	53,280	50,255	46,810	43,115
	8x10	No. 1	30,280	70,695	67,485	63,655	59,295	54,615
	8x12	No. 1	36,655	85,580	81,695	77,055	71,780	66,110

TABLE 2.1- SP: COMPRESSION CAPACITIES FOR SOUTHERN PINE [1, 2]

Nominal Wall Depth, b^3 (in)	Nominal Lumber Dimensions	Lumber Grade	$P_{c\perp}$ Maximum Compression Capacity Perpendicular to Grain (lbs.) [4, 5]	P_c - Maximum Design Compression Capacity Parallel to Grain (lbs.) [6, 7, 8, 9]				
				Nominal Wall Height (ft.) [10]				
				8	9	10	11	12
4"	2x4	No. 2	2,965	2,980	2,365	1,920	1,590	1,335
	2x4	Stud	2,965	2,615	2,105	1,725	1,435	1,210
	3x4	No. 2	4,945	4,970	3,945	3,200	2,650	2,225
	3x4	Stud	4,945	4,360	3,510	2,875	2,390	2,015
	4x4	No. 1	6,920	7,910	6,280	5,100	4,215	3,545
	4x6	No. 1	10,875	12,345	9,820	7,980	6,605	5,555
	4x8	No. 1	14,335	16,180	12,890	10,485	8,685	7,305
	4x10	No. 1	18,290	20,500	16,360	13,325	11,050	9,300
	4x12	No. 1	22,245	24,855	19,855	16,180	13,420	11,295
6"	2x6	No. 2	4,660	10,165	8,380	6,965	5,850	4,970
	2x6	Stud	4,660	7,520	6,605	5,730	4,955	4,290
	3x6	No. 2	7,770	16,940	13,970	11,610	9,750	8,280
	3x6	Stud	7,770	12,530	11,005	9,550	8,255	7,150
	6x4	No. 1	10,875	26,450	21,945	18,305	15,410	13,110
	6x6	No. 1	17,090	30,025	26,820	23,595	20,610	17,975
	6x8	No. 1	23,305	40,940	36,575	32,180	28,105	24,515
	6x10	No. 1	29,520	51,860	46,325	40,760	35,595	31,050
	6x12	No. 1	35,735	62,775	56,080	49,340	43,090	37,585
8"	2x8	No. 2	6,355	19,750	17,540	15,355	13,365	11,625
	3x8	No. 2	10,595	32,915	29,235	25,595	22,270	19,375
	4x8	No. 1	14,830	50,260	45,060	39,770	34,815	30,420
	6x8	No. 1	23,305	48,185	45,970	43,335	40,340	37,130
	8x8	No. 1	31,780	65,705	62,690	59,095	55,010	50,630
	8x10	No. 1	40,255	83,225	79,405	74,850	69,680	64,130
	8x12	No. 1	48,730	100,745	96,125	90,610	84,345	77,635

Notes

1. Wood compression members are not a Z4 product and are not provided with Z4 Tie-Down Systems.

2. All values assume single species installation. The Engineer of Record is responsible for designs with more than one species or for heights not listed in these tables.

3. Wall depth (b) = 3.5 inches for nominal 4-inch, 5.5 inches for nominal 6-inch, and 7.25 inches for nominal 8-inch wall depths

4. Maximum design compression capacities perpendicular to grain, Pc are based on wood compressive strengths equal to 625 psi for DF-L, 405 psi for HF, 425 psi for SPF, and 565 psi for SP.

5. The Bearing Area factor, C_b, is not included in table values. For bearing areas located 3" or more from the end of the horizontal member, perpendicular to grain capacities, $P_{c\perp}$, may be multiplied by the following factor:

Thickness of Horizontal Member (in)	1.5	2.5	3.5	5.5	≥ 6.0
C_b Factor	1.25	1.15	1.11	1.07	1.00

6. Maximum design compression capacities parallel to grain, P_c are based on the tabulated wood species, effective length, cross-sectional area, and grade in compliance with the 2015 National Design Specification (NDS).

7. Loads shown are for axial compression of individual single member capacities. Individual capacities may be combined when multiple members are installed, stitch nailing not required.

8. Parallel to grain capacities P_c include a load duration factor, C_D. Increase equal to 1.60.

9. Shaded cells represent capacities governed by compression parallel to grain.

10. The lumber effective length (le) for an 8-ft nominal wall height is equal to 92-1/4" for DF-L and 92-5/8" for HF, SPF, and SP. $l_e / b \leq 50$.

SYSTEM DESCRIPTION

MITEK ZONE FOUR (Z4) IS A CONTINUOUS ROD TIE-DOWN SYSTEM USED IN WOOD FRAMED SHEAR WALLS CONSISTING OF CINCH NUT (CNX) DEVICES, Z4 STEEL ROD (ATR AND/OR Z-ROD), AND STEEL BEARING PLATES. THE SYSTEM WILL RESIST SHEAR WALL UPLIFT WHILE COMPENSATING FOR SETTLEMENT, SHRINKAGE, AND COMPRESSION LOADING BY THE CONTINUAL DOWNWARD ACTUATION OF THE CNX DEVICES AS RECOGNIZED IN LA CITY RR 25623 AND ICC (ESR 2190) REPORTS.

GENERAL NOTES

1. CINCH NUT (CNX) - SEE DETAIL 1
   - A. THE Z4 CINCH NUT IS A SHRINKAGE COMPENSATION DEVICE THAT CONNECTS THE WOOD FRAMING TO THE Z4 ROD TIE-DOWN SYSTEM. WHEN THE WOOD FRAMING SHRINKS OR SETTLES, THE CINCH NUT RATCHETS DOWN THE THREADS OF THE Z4 ROD SYSTEM TO PROVIDE PERPETUAL SHRINKAGE COMPENSATION.
   - B. CINCH NUT IS IN COMPLIANCE WITH IBC 2009, 2012, CBC 2010, 2013, 2016, LABC 2011, 2014, 2017. TESTING OF THE CNX IS IN ACCORDANCE WITH ICC-ES AC316. RESEARCH REPORT: COLA RR 25623, ICC-ES REPORT ESR-2190.
   - C. CINCH NUTS USED IN THE CONTINUOUS TIE DOWN SYSTEM ATTACH TO THE WOOD WITH (2) ¼" LAG SCREWS WITH MINIMUM WOOD PENETRATION OF 1".

2. BEARING PLATE WASHER (BPW) - SEE DETAIL 2
   - A. Z4 BEARING PLATE WASHERS MAY BE PAINTED DIFFERENT COLORS TO VISUALLY DIFFERENTIATE LOAD CAPACITIES AND IMPROVE INSTALLATION ACCURACY.
   - B. Z4 BEARING PLATE WASHERS ARE MANUFACTURED WITH ASTM A36 STEEL AND ARE REQUIRED TO BE INSTALLED TIGHT AGAINST THE WOOD TOP PLATE MEMBER.

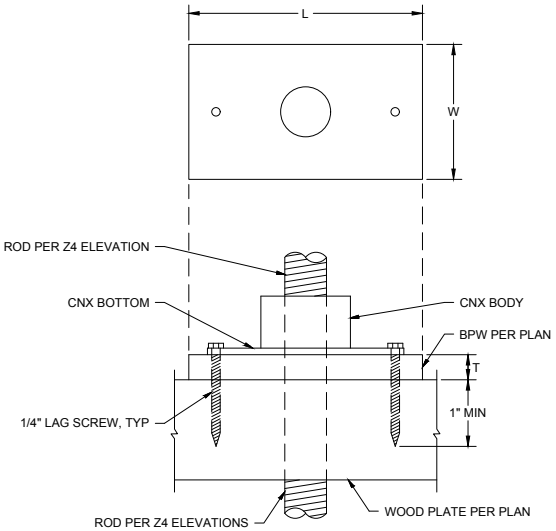
3. COUPLING NUT - SEE DETAIL 3
   - A. SIGHT HOLES ARE INCLUDED WITH ALL Z4 COUPLER NUTS.
   - B. COUPLER REDUCING NUTS MAY BE REQUIRED AT FOUNDATION OR FLOOR TO FLOOR CONNECTIONS.
   - C. REDUCING COUPLERS SHOULD HAVE THE LARGER DIAMETER ROD FULLY SEATED FIRST, BEFORE TIGHTENING THE SMALLER ROD.
   - D. STANDARD (STD) COUPLERS CONFORM TO ASTM A-563 GRADE A, SAE GRADE 2.
   - E. MID STRENGTH (MS) COUPLERS CONFORM TO ASTM A-563 GRADE B OR SAE GRADE 5 AND ARE DIFFERENTIATED WITH A SINGLE "SAW CUT" MARKING AS INDICATED IN DETAIL 3.
   - F. HIGH STRENGTH (HS) COUPLERS CONFORM TO ASTM A-563 GRADE DH, ASTM A194-2H, OR SAE GRADE 8 AND ARE DIFFERENTIATED WITH A DOUBLE "SAW CUT" MARKING AS INDICATED IN DETAIL 3.
   - G. CONTRACTOR TO VERIFY COUPLERS ARE THREADED HALF WAY INTO COUPLER FROM EACH SIDE.
   - H. SIGHT HOLES ARE PROVIDED TO ENSURE PROPER INSTALLATION DURING INSPECTION.

4. THREADED ROD - SEE DETAIL 4 & 6
   - A. Z4 USES STANDARD GRADE AND HIGH STRENGTH Z-ROD AND/OR ALL THREAD ROD (ATR). STANDARD GRADE ROD CONFORMS WITH ASTM A36. HIGH STRENGTH ROD CONFORMS WITH ASTM A193-B7 AND IS IDENTIFIED BY RED PAINT ON THE ENDS AND CENTER WITH A STAMP LOCATED EITHER AT THE ENDS OR THE CENTER OF THE ROD.
   - B. Z4 USES UNIFORM NATIONAL COURSE (UNC) THREADS FOR THE ROD.
   - C. THREADED ROD INSTALLATION AT BOTTOM PLATE AND FLOOR FRAMING SHOULD USE OVERSIZE HOLES PER DETAIL 4 & 9. HOLES IN THE FLOOR FRAMING THAT ARE NOT OVERSIZED CAN BIND AND BOW THE ROD AS THE BUILDING SETTLES.
   - D. MAXIMUM OUT OF PLUMB FOR ROD IS 2" FOR EVERY 100" OF FLOOR HEIGHT. (SEE DETAIL 4)
   - E. 1ST FLOOR ROD CAN BE A LARGER DIAMETER THAN THE FOUNDATION ANCHOR AS THE DESIGN MAY BE CONTROLLED BY ELONGATION UNDER TENSION WHILE THE FOUNDATION ANCHOR MAY BE DESIGNED FOR TENSION ONLY.

5. COMPRESSION POSTS - SEE DETAIL 5
   - A. ENGINEER OF RECORD (EOR) SHALL CHECK COMPRESSION POST DESIGN CAPACITY FOR CONDITIONS SUBJECT TO ADDITIONAL LOADS SUCH AS BEAM OR HEADER REACTIONS.
   - B. WHERE QUANTITY OF COMPRESSION POSTS ARE GREATER THAN THE SPACE BETWEEN ROD OR BEARING PLATE WASHER AND THE END OF THE SHEAR WALL, THE ADDITIONAL POSTS REQUIRED WILL BE ADDED TO THE OPPOSITE SIDE OF THE ROD.
   - C. COMPRESSION POST SHALL BE OF SIZE, GRADE & SPECIES SPECIFIED. POSTS NOT SPECIFIED HEREIN SHALL BE THE RESPONSIBILITY OF THE EOR.

ABBREVIATIONS

AB	ANCHOR BOLT	HS	HIGH STRENGTH
ATR	ALL THREAD ROD	HT.	HEIGHT
BPW	BEARING LATE WASHER	MS	MID STRENGTH
CL	CENTERLINE	MIN	MINIMUM
CNX	CINCH NUT	PL	PLATE
CONST	CONSTRUCTION	SP	SOUTHERN YELLOW PINE
CP	COMPRESSION POST(S)	SPF	SPRUCE-PINE-FIRE
CPL	COUPLER	STD	STANDARD
DF	DOUGLAS-FIR LARCH	TYP	TYPICAL
DIA	DIAMETER	OC	ON CENTER
EA	EACH	U.N.O.	UNLESS NOTED OTHERWISE
EN	EDGE NAILING	UNC	UNIFORM NATIONAL COURSE
EOR	ENGINEER OF RECORD	USP	UNITED STEEL PRODUCTS (COMPANY BY MITEK)
F.F.	FINISHED FLOOR	WS	WOOD SCREW
HF	HEM-FIR	Z4	ZONE FOUR

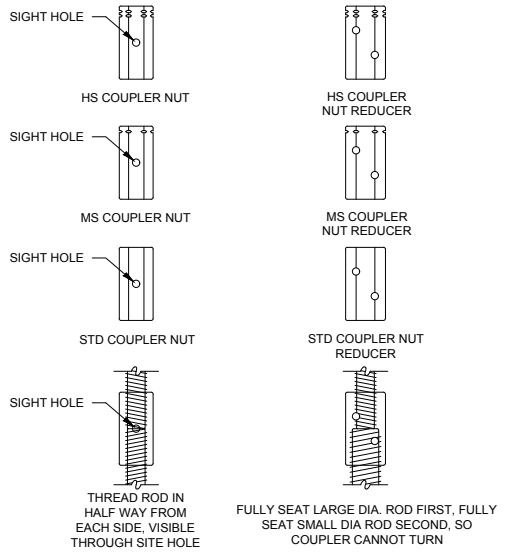


1 CINCH NUT (CNX) INSTALLATION

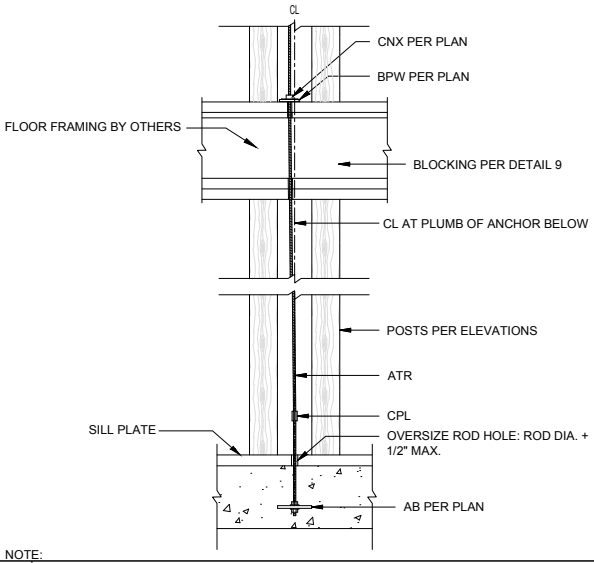
MIN WALL THICKNESS	BEARING PLATE WASHER (BPW) DIMENSIONS [IN]					
	DESIGNATION		W	L	T	HOLE DIA
4"	BPW-5	(BROWN)	3	3	1/4	1 5/16
	BPW-6	(RED)	3 1/4	3 3/8	3/8	1 9/16
	BPW-7	(YELLOW)	3 1/4	4 3/8	1/2	1 9/16
	BPW-9	(GREEN)	3 1/4	5	5/8	1 9/16
	BPW-11	(BLUE)	3 1/4	5 7/8	3/4	1 9/16
	BPW-15	(BLACK)	3 1/4	7 7/8	7/8	1 9/16
	BPW-20	(WHITE)	3 1/4	10 1/4	1 1/4	1 9/16
	BPW-25	(ORANGE)	3 1/4	11 3/4	1 1/2	1 9/16
	BPW-30	(LIGHT GRAY)	3 1/4	14	1 3/4	1 9/16
6"	BPW17-6	(LIGHT BLUE)	5	5 7/8	5/8	1 9/16
	BPW27-6	(TAN)	5	9	1	1 9/16
	BPW36-6	(GRAY)	5	12	1 1/2	1 9/16
	BPW43-6	(PURPLE)	5	14	1 3/4	1 9/16
	BPW46-6	(PINK)	5	15	1 7/8	1 9/16

NOTE:
1. SEE DETAIL 1 FOR BPW DIMENSION DEFINITIONS.

2 BEARING PLATE WASHER (BPW) DIMENSIONS

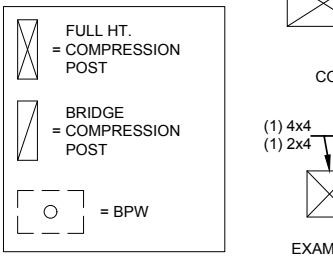


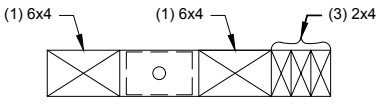
3 COUPLING NUT & DESCRIPTIONS



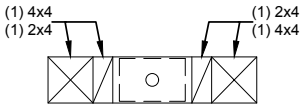
NOTE:

4 ALLOWABLE ROD OFFSET





EXAMPLE FULL HEIGHT COMPRESSION POST LAYOUT

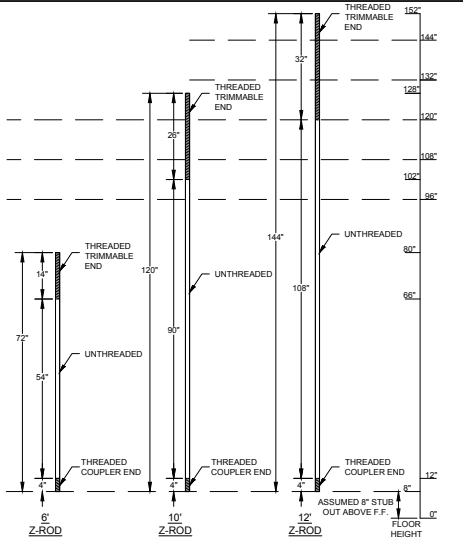


EXAMPLE BRIDGE COMPRESSION POST LAYOUT WITH BRIDGE

NOTES:

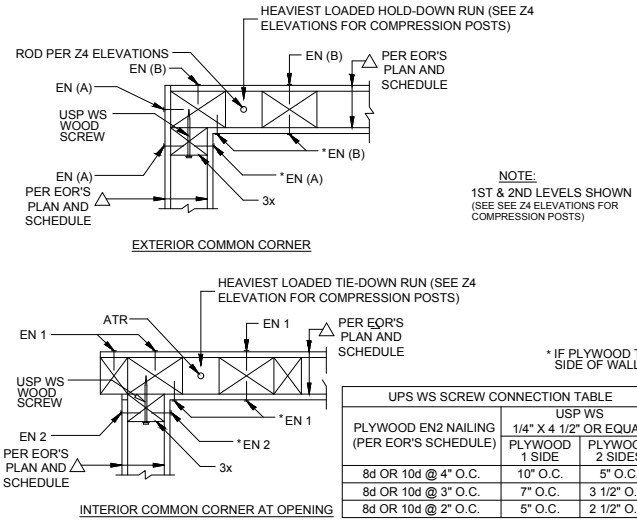
1. EXAMPLES SHOWN FOR 4" WALL FRAMING. 6" WALL FRAMING AND LARGER IS SIMILAR.
2. COMPRESSION POSTS SHOWN ARE THE MINIMAL REQUIREMENT TO EQUAL THE UPLIFT TENSION FORCES CALLED OUT BY THE STRUCTURAL DRAWINGS. ADDITIONAL COMPRESSION STUDS OR POSTS MAY BE REQUIRED BY STRUCTURAL ENGINEER OF RECORD. APPLIES TO ALL HOLDOWN RUNS.
3. COMPRESSION POSTS MUST BE LOCATED WITH THE BEARING ZONE AS SHOWN IN DETAILS 9 & 12.
4. ADJACENT FULL HEIGHT SHEARWALL FRAMING CAN BE USED AS COMPRESSION POSTS PROVIDED THEY ARE LOCATED WITHIN THE BEARING ZONE AS SHOWN IN DETAILS 9 & 12.

5 COMPRESSION POST LAYOUT



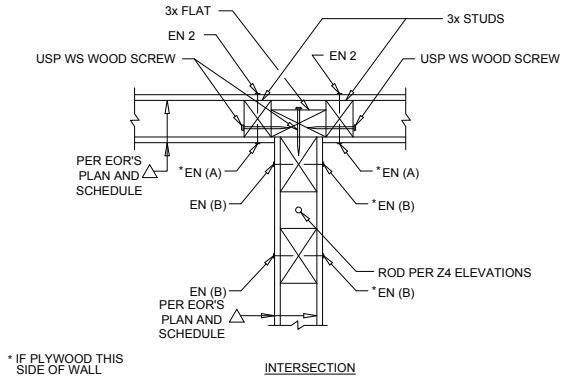
EXAMPLE ASSUMING 8" STUB OUT ABOVE FINISHED FLOOR

6 Z-ROD DIMENSIONS



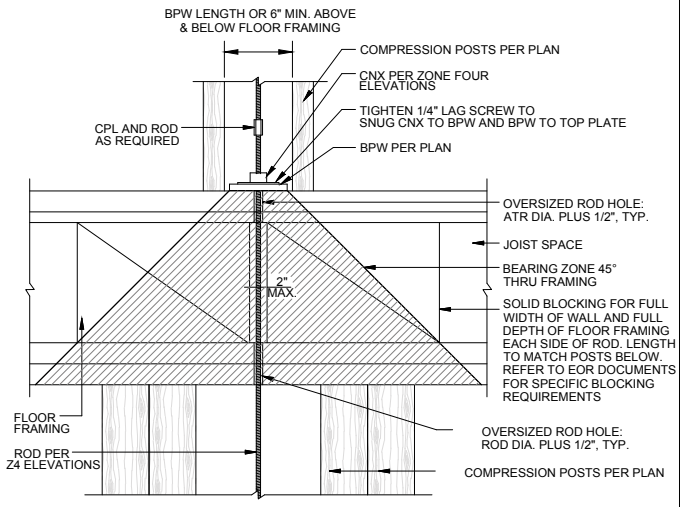
UPS WS SCREW CONNECTION TABLE		
PLYWOOD EN2 NAILING (PER EOR'S SCHEDULE)	USP WS 1/4" X 4 1/2" OR EQUAL	
	PLYWOOD 1 SIDE	PLYWOOD 2 SIDES
8d OR 10d @ 4" O.C.	10" O.C.	5" O.C.
8d OR 10d @ 3" O.C.	7" O.C.	3 1/2" O.C.
8d OR 10d @ 2" O.C.	5" O.C.	2 1/2" O.C.

7 Z4 TIE-DOWN SYSTEM AT COMMON CORNER

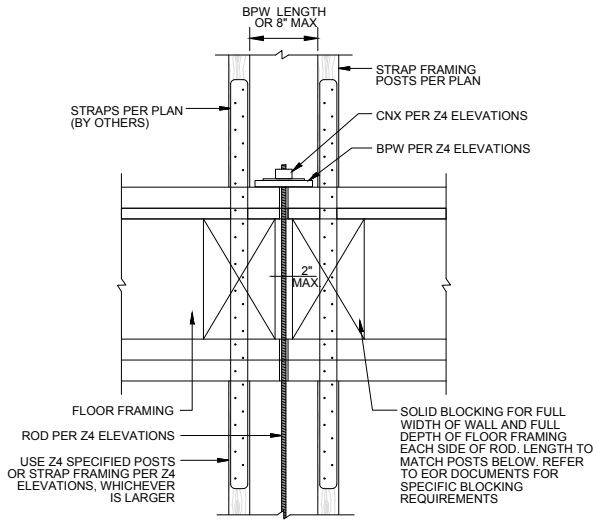


UPS WS SCREW CONNECTION TABLE		
PLYWOOD EN2 NAILING (PER EOR'S SCHEDULE)	USP WS 1/4" X 4 1/2" OR EQUAL	
	PLYWOOD 1 SIDE	PLYWOOD 2 SIDES
8d OR 10d @ 4" O.C.	10" O.C.	5" O.C.
8d OR 10d @ 3" O.C.	7" O.C.	3 1/2" O.C.
8d OR 10d @ 2" O.C.	5" O.C.	2 1/2" O.C.

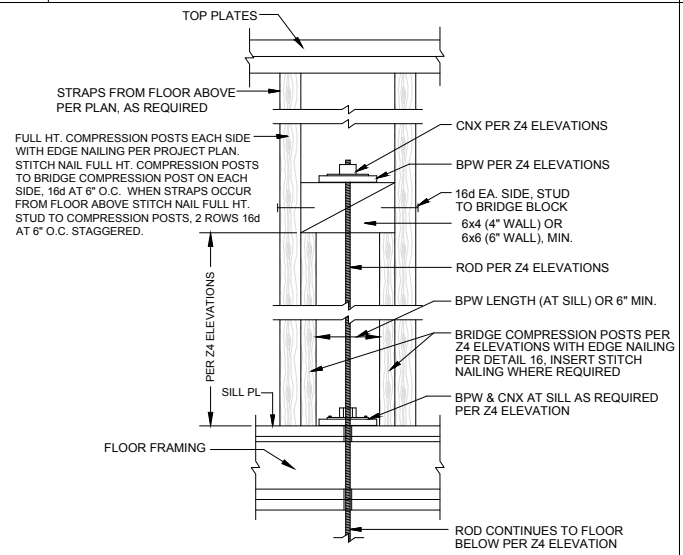
8 Z4 TIE-DOWN SYSTEM AT INTERSECTION



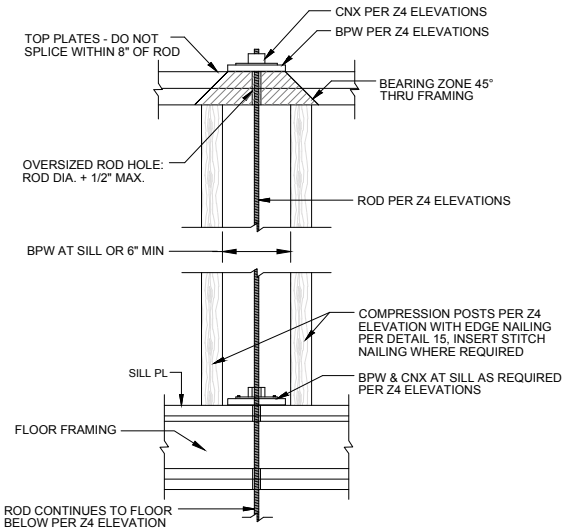
9 TYPICAL Z4 TIE-DOWN SYSTEM INSTALLATION DETAIL



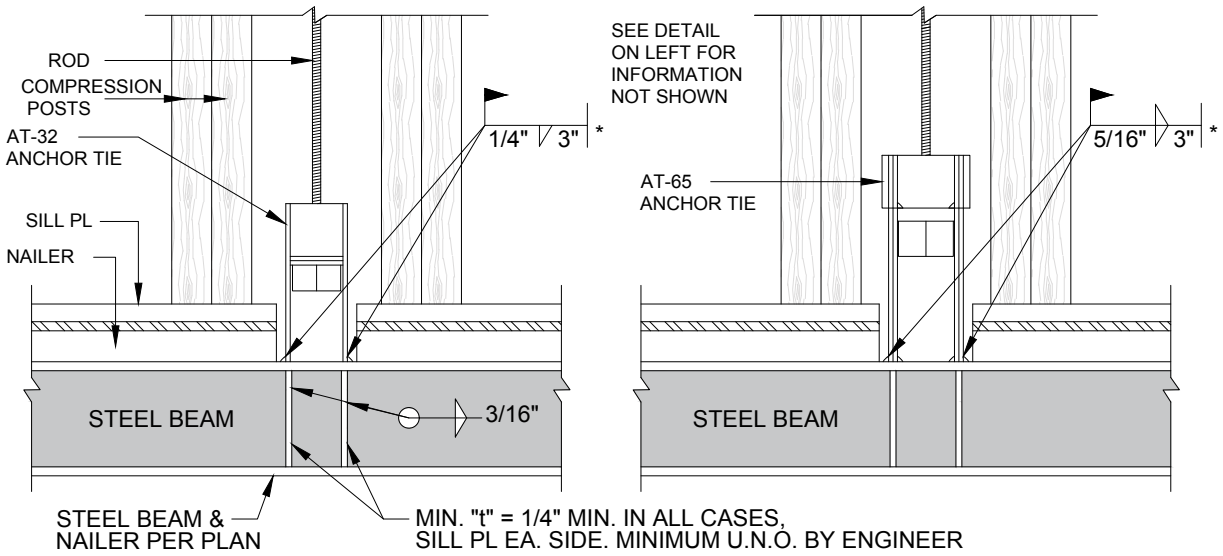
10 STRAP TERMINATION OPTION



11 BRIDGE TERMINATION OPTION AT TOP LEVEL



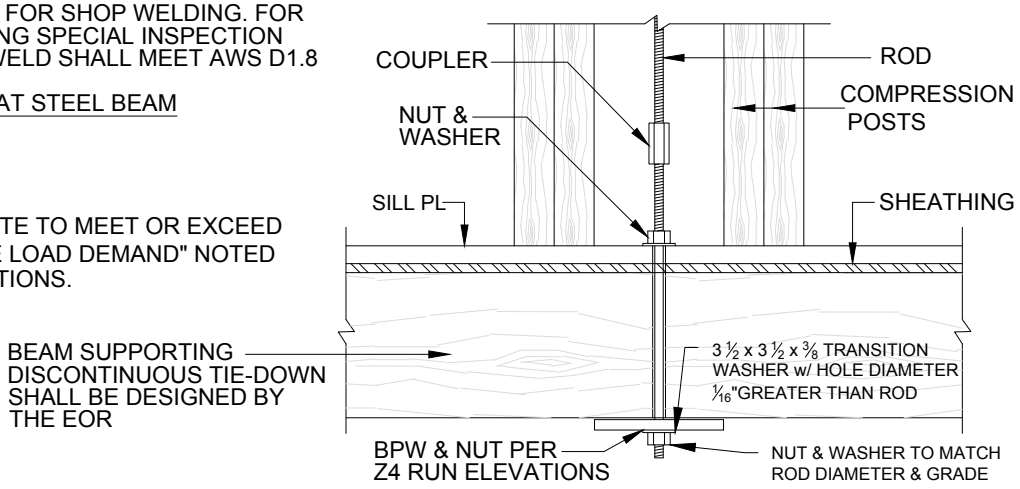
12 TOP PLATE TERMINATION OPTION



* SPECIAL INSPECTION OR APPROVED FABRICATOR FOR SHOP WELDING. FOR FIELD WELDING SPECIAL INSPECTION REQUIRED. WELD SHALL MEET AWS D1.8

TERMINATION AT STEEL BEAM

NOTE:
BEARING PLATE TO MEET OR EXCEED "CUMULATIVE LOAD DEMAND" NOTED ON Z4 ELEVATIONS.

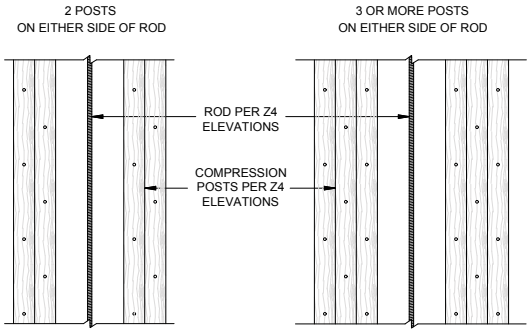


TERMINATION AT WOOD BEAM

13 | OPTIONAL ANCHOR AT BEAM

EN PER EOR'S PLAN AND SCHEDULE	EDGE NAIL SPACING TO EACH POST EACH SIDE	
	2 POSTS	3+ POSTS
2 O.C.	4" O.C.	6" O.C.
3 O.C.	6" O.C.	9" O.C.
4 O.C.	8" O.C.	12" O.C.
6 O.C.	12" O.C.	12" O.C.

NOTE:
FOR SINGLE POST EACH SIDE OF ROD, NAIL PER SHEARWALL SCHEDULE.

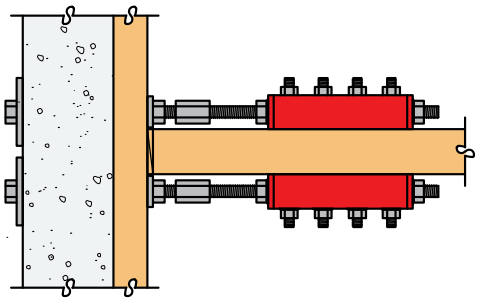


14 | COMPRESSION POST EDGE NAILING

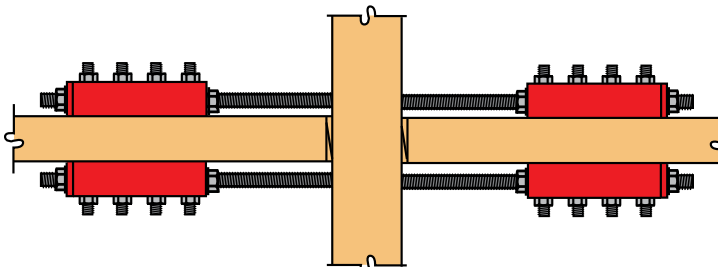
INTENTIONALLY LEFT BLANK

Code Reports

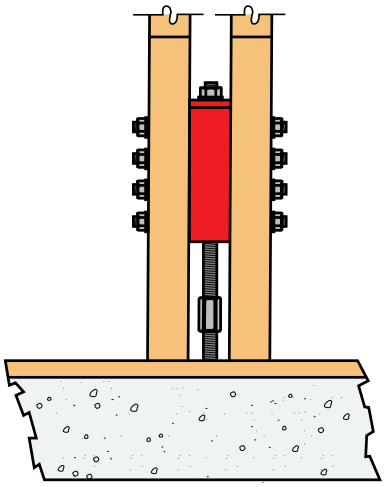
- ESR-3105
- LA City RR 25334



Paired CT Wall Tie



Paired CT Purlin Tie

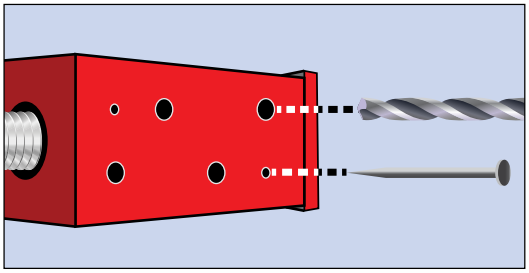


Sandwiched T2
As Concentric Hold-Down

MiTek Z4 Continuity Tie

The MiTek Z4 "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.

MiTek Z4 Tension Tie

The MiTek Z4 "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.

Z4-CT 2 4 - 4
- Anchor Rod. Dia. (1/8" Increments)
- Fastening Bolt Dia. (1/8" Increments)
- Fastening Bolt Quantity
- Continuity Tie

Z4-T2 - 4 8 - 9
- Anchor Rod. Dia. (1/8" Increments)
- Fastening Bolt Dia. (1/8" Increments)
- Fastening Bolt Quantity
- Tension Tie

TABLE 3.0- DIMENSIONS AND FASTENERS FOR THE CT & T2

Description	Model Number	Fastening Bolts [1, 2]	Anchor Rod Diameter		Tube Dimensions (in.)			
		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"	n/a	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"		3/16"	4"	3"	7-1/4"
	Z4-T2-48-9S	(4) 1"	1-1/8"		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"	n/a	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"		1"	3/16"	4"	3"	7-3/4"
	Z4-CT-48-9	(4) 1"		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:

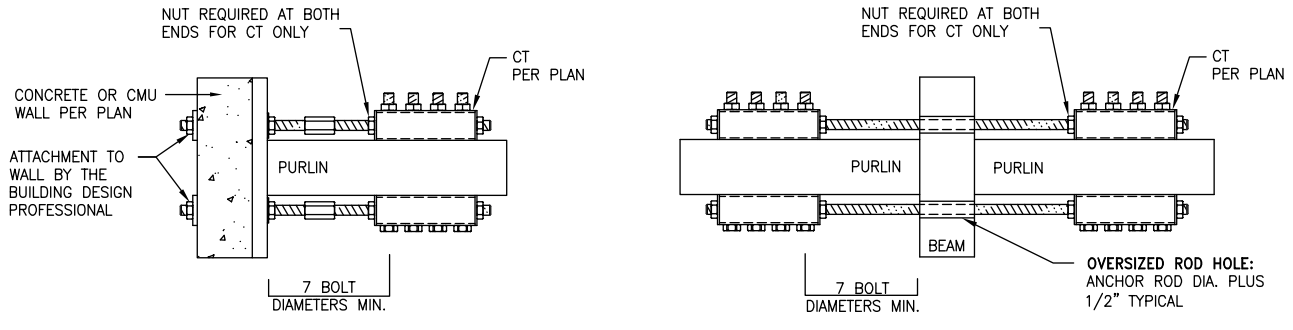
1. Fastening Bolts must comply with ASTM A307. Standard round washers and hex nuts, for tightening the CT or T2 to adjacent wood member(s), must comply with F844 and A563A respectively.

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).



PLAN

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.)	Allowable Tension Load (lbs.) [5, 6], Thickness of Attached Wood Member (in.)							Displacement @ Allowable Tension Load (in.) [7]
			1.5	2.5	3	3.5	5.125	5.5	7.25 / 7.5	
Sandwiched T2 Concentric Hold Down	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
		5.5	19,077							
	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	42,141	42,867	42,867	42,867	0.122
		7.25 / 7.5	24,057	36,671	39,152					
	Z4-T2-68-11S	5.5	18,691	31,151	37,382	43,612	64,036	64,036	64,036	0.210
		7.25 / 7.5	24,057	40,095	48,114	56,133				
		9.25 / 9.5	31,833	52,474	56,276	61,061				
Paired CT Wall & Purlin Ties	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	18,504	18,592	0.145
		5.5	9,679	16,395	18,330	18,383	18,442			
	Z4-CT-84-7	3.5	7,138	11,897	14,276	16,656	21,137	22,683	24,590	0.152
		5.5	10,662	17,769	21,323	24,057	24,241	24,381		
		7.25 / 7.5	12,377	21,300	23,892					
	Z4-CT-46-8	5.5	9,749	16,453	19,744	23,034	27,776	27,804	28,028	0.155
		7.25 / 7.5		16,464	19,817	23,184				
	Z4-CT-48-9	5.5	9,345	15,576	18,691	21,806	30,020	32,216	43,240	0.162
		7.25 / 7.5	12,029	20,048	24,057	28,067	41,858	43,240		
		9.25 / 9.5	12,591	21,513	25,939	30,460	43,240			
	Z4-CT-68-11	5.5	9,345	15,576	18,691	21,806	30,020	32,216	43,931	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	
		11.25 / 11.5	16,504	27,506	33,008	38,509	56,388	61,999		
		13.25 / 13.5	16,622	29,652	36,167	42,901	64,541	64,593		

Notes:

1. 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	n/a in Compression					
			5/8”	13,231						
			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_D.

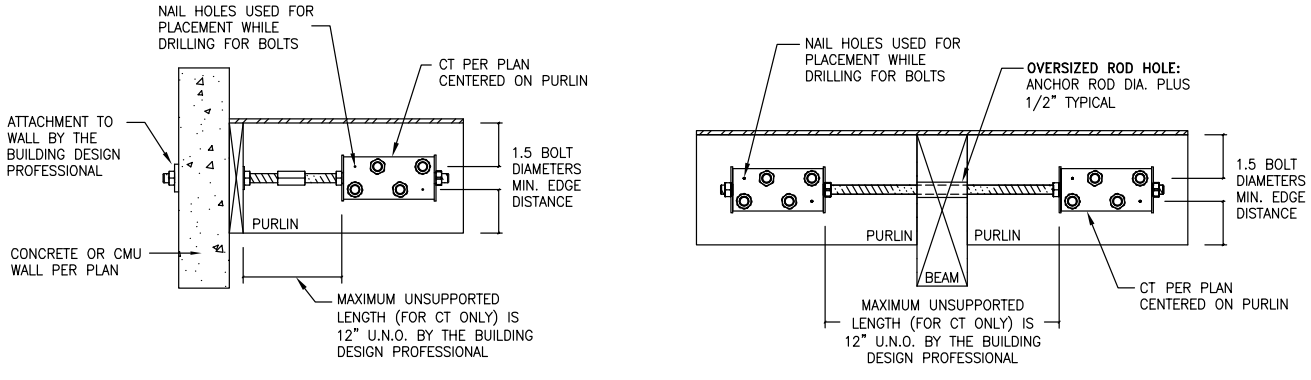
2. STD indicates rods complying with ASTM F1554 Grade 36. HS indicates rods complying with ASTM A311 Grade 1045.

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, $C_c = (2\pi^2 E / F_y)^{1/2}$, E = Modulus of Elasticity of rod, (29×10^6) 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.



ELEVATION

Hardy Frame® Code Evaluations

ICC-Evaluation Service ESR-2089
LA City Research Report RR-25759

Hardy Frames has been leading the pre-manufactured shear wall industry from its beginning. Hardy Frames 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.

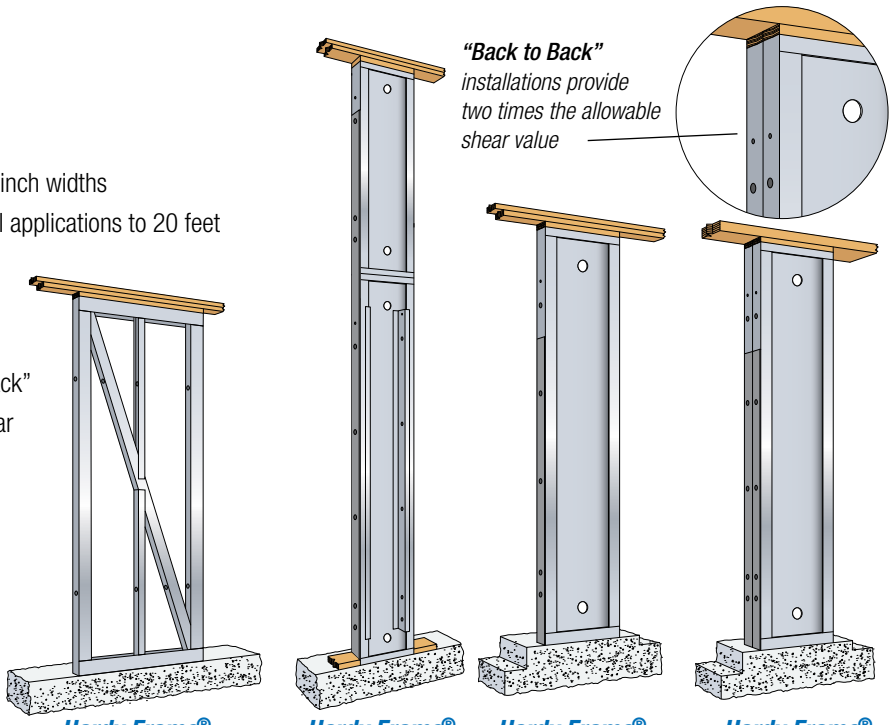
All ***Hardy Frame***® Panels and Brace Frames are code listed and include installations on concrete, raised floor and upper floor systems.

Hardy Frame® HFX-Series Panels

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

Hardy Frame® HFX-Series Brace Frames

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

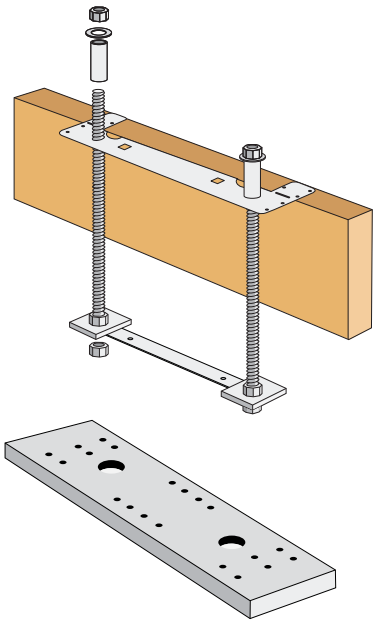


Hardy Frame® Brace Frame | *Hardy Frame*® Balloon Wall | *Hardy Frame*® Panel | *Hardy Frame*® Panel Back to Back

Template Kit (HFXTK)

Includes:

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



Hardy Frame® Bearing Plate (HFXBP)

7. 3/4" thick x 3 1/2" wide ASTM A36 steel
8. Length extends 3" beyond Panel edges. Check for outside corner conditions!
9. Reduces wood deformation from overturning forces
10. 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.

SidePlate Code Evaluations

Included in the Standard AISC 358

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

Hardy Frame® Special 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 Frame***® Special 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 Frame***® Special Moment Frame installation is fast and framer friendly. We have delivered truckload quantities of up to 30 Special Moment Frames that were installed in a single day. That is an accomplishment that cannot be matched by conventional or assembly-required Special Moment Frames.

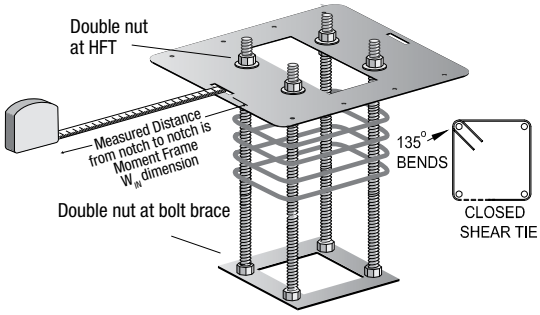
Custom Sizes and Custom Calculations

We offer over 300 standard dimension Special 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 Hardy Frames we understand that Special Moment Frames require job-specific considerations. We work with contractors to meet their needs without treating adjustments as a custom order.

Special Moment Frame Template Kits

Template Kits are included with the purchase of the ***Hardy Frame***® Special 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 Special 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.

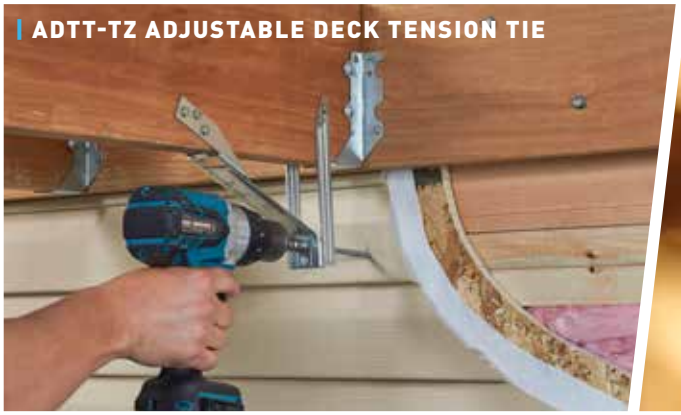


AT MITEK WE BELIEVE THAT BETTER PROCESSES CAN EMPOWER YOUR BUSINESS.

And we've learned three important things over the years:

- We've learned that when people collaborate well, great things can happen – that's about both strong collaboration within your teams, and also strong collaboration between you and your customers.
- We've learned that when we build a relationship focused on growing your ability to achieve a Higher Standard of performance and success year over year, that relationship will stand the test of time. We've also learned that when we help you deliver those kinds of relevant results and value to your customers year over year, you will build a relationship that will also stand the test of time.
- We've also learned that our customers are the heroes of our story, and that when we continually get that right, all our efforts will yield the best results for our relationships.

ADTT-TZ ADJUSTABLE DECK TENSION TIE



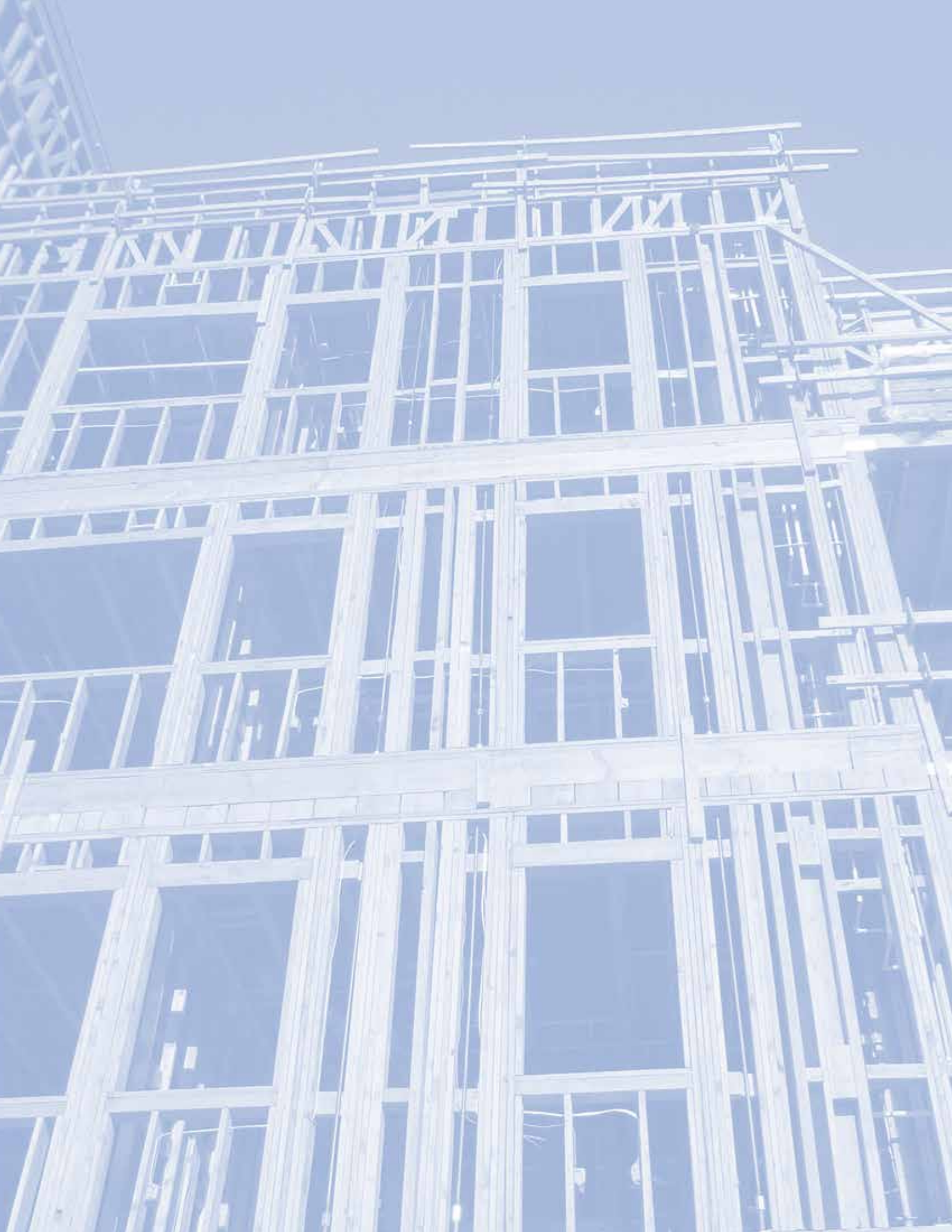
MITEK® SAPPHIRE™ SUPPLY SOFTWARE

FWH FIRE WALL HANGER

PRO SERIES WOOD SCREWS

ANCHORING SOLUTIONS

And that is **THE NEW STANDARD** that we are talking about from MiTek these days. It's a new standard for what you can expect in optimizing your business performance, and a new standard for what you can expect from a strong, committed relationship that works well, day after day and stands the test of time.



ADDITIONAL PUBLICATIONS FROM MiTek, USA

Hardy Frames is a wholly owned subsidiary of MiTek, USA. Along with USP Structural Connectors and the Z4 Tie-Down System our combined team serves the construction industry with a full range of structural and design solutions.

Hardy Frame® Product Catalog

The Hardy Frame® Product Catalog provides complete information for Engineers, Architects and Designers to specify our shear wall system. There is a complete listing of all Panels, Brace Frames and Accessories, allowable shear loads, corresponding uplift and drift, pre-engineered anchorage information, specification tips, photos and Typical Installation Details.The Installation Details in the Product Catalog conveniently match our ACad version that can be included as supplemental sheets to plan submittals.

Hardy Frame® Installation Guide

The Hardy Frame® Installation Guide was written specifically for Suppliers and Installers. This publication provides all HFX 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.

USP Structural Connectors Product Catalog

The 2015-2016 USP Catalog is a comprehensive 236 page guide to the United States product line. It features all new product and application illustrations, detailed installation instructions, fastening schedules and load ratings. EWP and Plated Truss connectors are included.

USP Structural Connectors Anchoring Solutions Guide

Detailed descriptions and specifications for the complete line of epoxy products; CIA-GEL 7000-C for Cracked Concrete, CIA GEL 7000 Masonry epoxy, CIA GEL 6000-GP General Purpose & Department of Transportation (DOT) epoxy, CIA-EA Un-cracked Concrete epoxy and Acrylate, Incredi-Bond® multi-purpose epoxy. 16 pages. #2278 April 2017

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