ICC-ES Evaluation Report

ESR-2190

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

REPORT HOLDER:

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EVALUATION SUBJECT:

CINCH NUT™ SHRINKAGE COMPENSATION DEVICE: MODELS CNX3, CNX4, CNX5, CNX6, CNX7, CNX8, CNX9, CNX10, CNX11 AND CNX12

1.0 EVALUATION SCOPE

Compliance with the following codes:

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

Property evaluated:

Structural

2.0 USES

The shrinkage compensation devices described in this report are used in conjunction with hold-down and tension-tie connectors, as part of a restraint system in wood-frame construction, to remove slack from the system by compensating for shrinkage and settlement of the wood framing.

3.0 DESCRIPTION

3.1 General:

The Cinch Nut is a prefabricated assembly consisting of a housing, a housing top and bottom, four internally threaded ratcheting nut quadrants with springs in the top of each quadrant, and an internal C-ring. The housing is a hollow cylindrical piece containing the nut quadrants. The housing top and bottom are plates that are attached to the top and bottom of the housing with two screws. The nut quadrants are bound together by the spring-like internal C-ring within the housing. See Figures 1 and 2.

The Cinch Nut is installed on a threaded anchor rod and fastened to the wood framing of the structure. As the wood framing members shrink or settle the Cinch Nut ratchets downward along the axis of the threaded anchor rod without transferring any appreciable force into the anchor rod. When an uplift force is applied, the Cinch Nut engages and transfers a tensile force to the anchor rod and a bearing force through a steel bearing plate into the wood framing. The CNX3, CNX4, CNX5, CNX6, CNX7, CNX8, CNX9, CNX10, CNX11, and CNX12 models are designed, respectively, for $^{3}/_{8}$-inch-, $^{1}/_{2}$-inch-, $^{5}/_{8}$-inch-, $^{3}/_{4}$-inch-, $^{7}/_{8}$-inch-, 1-inch-, $1^{1}/_{8}$-inch-, $1^{1}/_{4}$-inch-, $1^{3}/_{8}$-inch-, and $1^{1}/_{2}$-inch-diameter (9.5 mm, 12.7 mm, 15.9 mm, 19.1 mm, 22.2 mm, 25.4 mm, 28.6 mm, 31.7 mm, 34.9 mm, and 38.1 mm) threaded rods. See Figure 1 for dimensions of each model.

3.2 Materials:

3.2.1 Cinch Nut: The Cinch Nut housing is manufactured from Chinese standard GB3077-88, 35CrMo steel, with a hardness of Rockwell 25-38 C. The housing top and bottom are manufactured from Chinese standard GB-T700-2006, Q235 steel, with a minimum hardness of Rockwell 45 B. The internally threaded nut quadrants are manufactured from Chinese standard GB3077-88, 35CrMo steel, with a hardness of Rockwell 30-40 C. The internal C-ring is manufactured from Chinese standard GB700-88 65Mn steel wire. The compression springs in the tops of the nut quarters are manufactured from Chinese standard GB4357-89 steel. Each of these parts has a zinc-plated finish, with the exception of the internal C-ring and compression springs.

3.2.2 Threaded Rod: Threaded rod used with the Cinch Nut must comply with the applicable code and the thread specifications noted in Table 1.

4.0 DESIGN AND INSTALLATION

The Cinch Nut is installed by inserting it over, and sliding it downward along, the threaded anchor rod until it rests on top of the bearing plate or hold-down device. The Cinch Nut must be positioned on the threaded rod such that the threaded rod extends a minimum of two full-thread pitches above the plane formed by the top surface of the Cinch Nut. The Cinch Nut must then be attached to the wood framing such that it maintains tight contact with the bearing plate as the wood framing shrinks or settles. Cinch Nuts used in plated systems must be secured into position through the steel bearing plate to the top of the wood sill plate or top plate using two $^{1}/_{4}$-inch-by-3-inch (6.4 mm by 76 mm) lag screws, as shown in Figure 2. Lag screws must be installed in accordance with applicable provisions

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of the ANSI/AWC *National Design Specification® for Wood Construction* (NDS). The threaded rod with which the Cinch Nut is used must be installed plumb, such that the offset angle between the top of the floor and the bottom of the top plates or bridge block above does not exceed 2.0 degrees from vertical. The Cinch Nut has an unlimited shrinkage and/or settling compensation capacity, provided there are no obstructions or discontinuities, such as couplers, located within the expected range of movement along the threaded rod.

Allowable loads, deflection at allowable loads, and average travel and seating increments, Δ_R, for Cinch Nuts are given in Table 1. The design of other elements within the restraint system, including threaded rods, bearing plates, anchors, and wood framing members, must be performed by others to the satisfaction of the code official.

5.0 CONDITIONS OF USE

The Cinch Nut shrinkage compensation devices described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 The devices must be manufactured and identified in accordance with this report.

5.2 The devices must be installed in accordance with this report, the manufacturer's published installation instructions and the plans approved by the code official. In the event of a conflict between this report and the manufacturer's published installation instructions, this report governs.

5.3 The design values given in this report are for the Cinch Nut device alone. Calculations, demonstrating that the design loads do not exceed the allowable loads, must be submitted to the code official for approval. The calculations must be prepared by a registered design professional when required by the statutes of the jurisdiction in which the project is to be constructed.

5.4 When using the basic allowable stress design load combinations in accordance with IBC Section 1605.3.1, or the alternative allowable stress design load combinations in accordance with IBC Section 1605.3.2, allowable loads are not permitted to be increased for wind or earthquake loading. No increase in allowable loads or reduction of applied loads for wind or earthquake is allowed when design uses the IRC.

5.5 The devices are limited to installations in dry, interior locations.

5.6 Use of the devices in contact with preservative-treated wood is outside of the scope of this report.

5.7 The Cinch Nut must not be used to support any dead load other than its own weight.

5.8 When the devices are used in continuous rod systems that resist light-frame shear wall overturning forces, calculations shall be submitted to the code official confirming that the total vertical displacement, which would include steel rod elongation and the shrinkage compensating device deflection, is less than or equal to 0.200 inch (5 mm) for each story, or between restraints, whichever is more restrictive, using allowable stress design (ASD). Shear wall drift limit calculations shall consider the 0.200-inch (5 mm) vertical displacement limit. This 0.200-inch (5 mm) vertical displacement limit may be exceeded when it can be demonstrated that the shear wall story drift limit and the deformation compatibility requirements of IBC Section 1604.4 are met when all sources of vertical displacement are considered.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Shrinkage Compensating Devices (AC316), dated June 2013 (Editorially revised March 2015).

7.0 IDENTIFICATION

Cinch Nuts are packaged in boxes with labels identifying the company name (MiTek® USA, Inc.), the model number, and the evaluation report number (ESR-2190). Additionally, each individual component, other than the bottom, C-ring and compression ring, of the Cinch Nut bears a stamp identifying the lot number, and the housing top bears additional stamps identifying the model number and the evaluation report number (ESR-2190).

TABLE 1—THREAD SPECIFICATIONS, ALLOWABLE LOADS, AND DEFLECTION AT ALLOWABLE LOADS FOR CINCH NUTS

PARAMETER	CINCH NUT MODEL DESIGNATION									
	CNX3	**CNX4**	**CNX5**	**CNX6**	**CNX7**	**CNX8**	**CNX9**	**CNX10**	**CNX11**	**CNX12**
Thread specification required for threaded rod used with Cinch Nut (per ANSI/ASME B1.1)	3/8 - 16 UNC-2A	1/2 - 13 UNC-2A	5/8 - 11 UNC-2A	3/4 - 10 UNC-2A	7/8 - 9 UNC-2A	1 – 8 UNC-2A	1 1/8 - 7 UNC-2A	1 1/4 - 7 UNC-2A	1 3/8 - 6 UNC-2A	1 1/2 - 6 UNC-2A
Maximum permissible F_u of the threaded rod used with the Cinch Nut [1] (lbf/in^2)	125,000	125,000	123,627	113,061	125,000	111,481	119,152	121,323	107,942	125,000
Maximum allowable demand load on Cinch Nut [2] (pounds) where F_u = 125,000 psi	5,177	9,204	14,067	16,942	28,187	29,283	42,337	54,190	51,093	82,835
Allowable load for Cinch Nut[3] (pounds)	5,177	9,204	14,223	18,731	28,187	32,834	44,415	55,832	60,106	82,835
Deflection at allowable load[4, 6], Δ_A (inches)	0.0157	0.0217	0.0187	0.0224	0.0234	0.0241	0.0233	0.0287	0.0268	0.0361
Device average travel and seating increment [5, 6], Δ_R (inches)	0.029	0.048	0.0514	0.0578	0.0506	0.0549	0.0524	0.0754	0.0804	0.0717

For **SI:** 1 pound = 4.448 N, 1 inch = 25.4 mm, 1 lbf/in^2 = 6.895 kPa.

[1]The specified minimum tensile strength, F_u, of the threaded rod used with the Cinch Nut must not exceed the tabulated F_u values, except as noted in footnote 2.

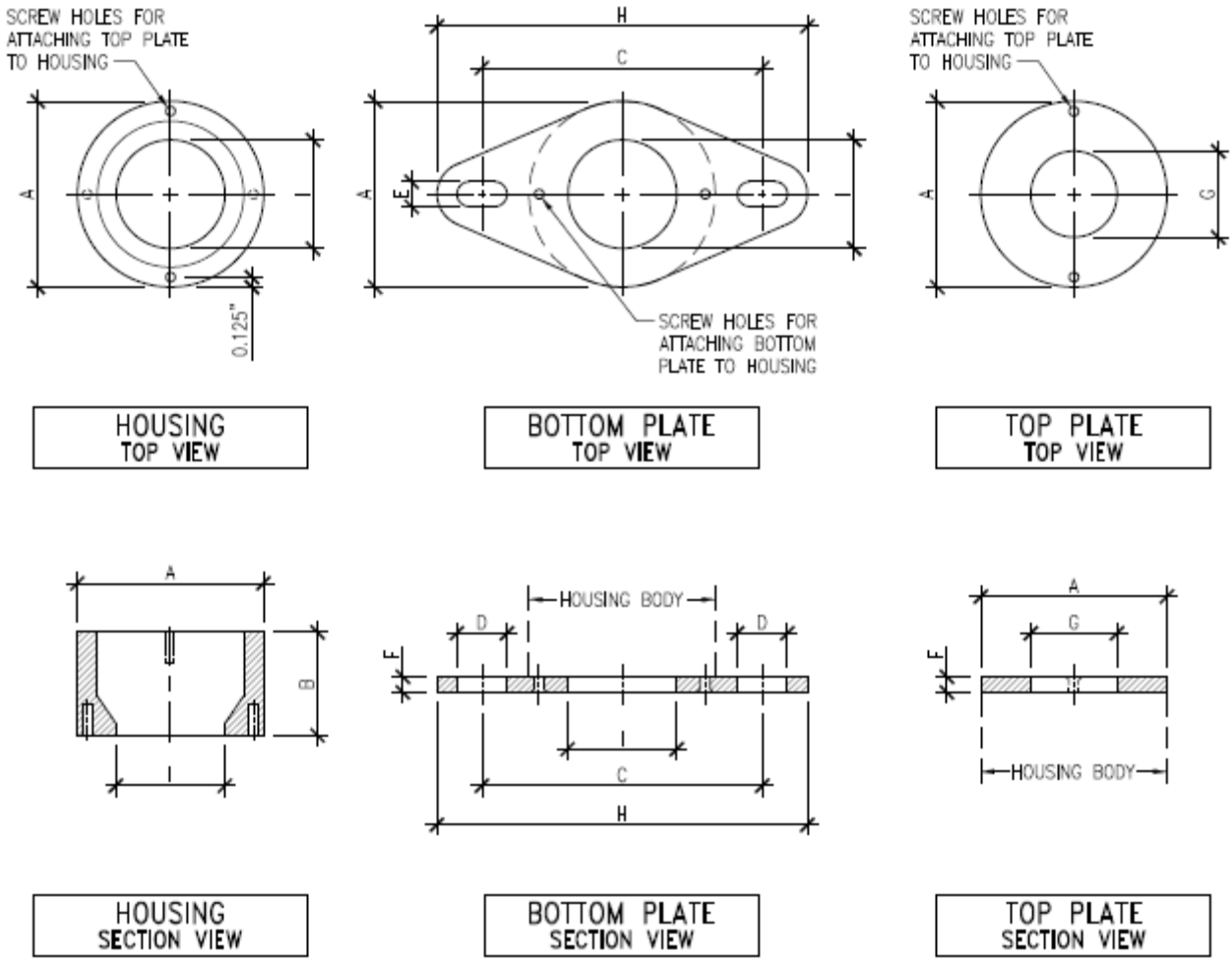
[2]When the demand load on the Cinch Nut does not exceed the tabulated loads in this row, the maximum permissible F_u of the threaded rod is 125,000 (lbf/in^2).

[3]Allowable load values are for Cinch Nuts only. The attached components (including anchors, tension rods, bearing plates, wood framing members, etc.) must be designed to resist design loads in accordance with the applicable code.

[4]Values of deflection at allowable load are for the Cinch Nut devices only. They do not include movement due to bolt elongation, wood compression, etc.

[5]The average travel and seating increment, Δ_R, is defined as the average of the movement required to cause incremental motion from a seated position and the opposite movement required to reseat the device after ratcheting.

[6]The device average travel and seating increment, Δ_R, and deflection at allowable load, Δ_A, describe the total movement of the device at allowable load, Δ_T, and are additive. For design loads, P_D, less than the allowable load, P_A, the total movement of the device is calculated as follows: $\Delta_T = \Delta_R + \Delta_A(P_D / P_A)$.



CINCH NUT DIMENSIONS (inches)

DIMENSION DESIGNATION	CNX3	CNX4	CNX5	CNX6	CNX7	CNX8	CNX9	CNX10	CNX11	CNX12
A	1.551	1.695	1.861	2.010	2.164	2.325	2.498	2.686	2.905	3.092
B	0.854	0.868	0.881	1.015	1.150	1.288	1.430	1.555	1.703	1.828
C	3.500	3.500	3.500	3.500	3.500	3.500	3.500	3.500	3.617	3.711
D	0.625	0.625	0.625	0.625	0.625	0.625	0.625	0.625	0.508	0.414
E	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
F	0.194	0.194	0.194	0.194	0.194	0.194	0.194	0.194	0.194	0.194
G	0.450	0.575	0.700	0.825	0.950	1.075	1.200	1.325	1.450	1.575
H	4.625	4.625	4.625	4.625	4.625	4.625	4.625	4.625	4.625	4.625
I	0.668	0.793	0.940	1.077	1.217	1.360	1.510	1.698	1.885	2.072

For SI: 1 inch = 25.4 mm

FIGURE 1—CINCH NUT DIMENSIONS

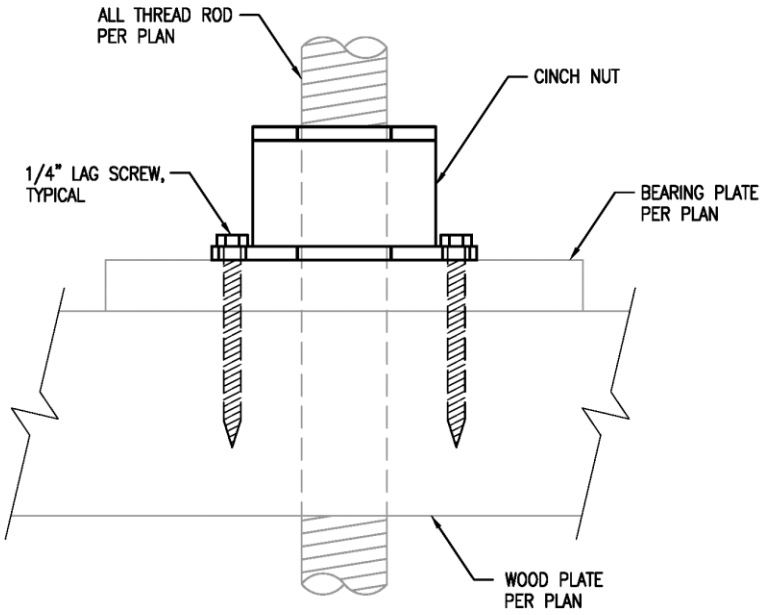


FIGURE 2—CINCH NUT INSTALLATION DETAIL—PLATED SYSTEM

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ESR-2190 CBC Supplement

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1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that Cinch Nut™ Shrinkage Compensation Device Models CNX3, CNX4, CNX5, CNX6, CNX7, CNX8, CNX9, CNX10, CNX11 AND CNX12, recognized in ICC-ES master evaluation report ESR-2190, have also been evaluated for compliance with Chapter 23 of the code noted below.

Applicable code edition:

2016 *California Building Code* (CBC)

2.0 CONCLUSIONS

The Cinch Nut™ Shrinkage Compensation Device Models CNX3, CNX4, CNX5, CNX6, CNX7, CNX8, CNX9, CNX10, CNX11 AND CNX12, described in Sections 2.0 through 7.0 of the master evaluation report ESR-2190, comply with CBC Chapter 23, provided the design and installation are in accordance with the 2015 *International Building Code®* (IBC) provisions noted in the master report and the additional requirements of the CBC Chapters 16, 16A, 17, 17A and 23, as applicable. Section 5.4 of the master report must be revised to read as follows: When using the basic allowable stress design load combinations in accordance with CBC Section 1605.3.1 or 1605A.3.1, or the alternative allowable stress design load combinations in accordance with CBC Section 1605.3.2 or 1605A.3.2, allowable loads are not permitted to be increased for wind or earthquake loading.

This supplement expires concurrently with the master report, reissued June 2016 and revised January 2017.