

ICC-ES Evaluation Report**ESR-3275**

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Section: 03 16 00—Concrete Anchors**DIVISION: 04 00 00—MASONRY**
Section: 04 05 19.16—Masonry Anchors**DIVISION: 05 00 00—METALS**
Section: 05 05 23—Metal Fastenings**DIVISION: 06 00 00—WOOD, PLASTICS AND
COMPOSITES**
**Section: 06 05 23—Wood, Plastic, and Composite
Fastenings****DIVISION: 09 00 00—FINISHES**
Section: 09 22 16.23—Fasteners**REPORT HOLDER:****POWERS FASTENERS, INC.**
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BREWSTER, NEW YORK 10509
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www.powers.com
engineering@powers.com**EVALUATION SUBJECT:****POWERS TRAK-IT C5 FASTENERS****ADDITIONAL LISTEE:****MAX COMPANY, LTD.**
6-6 NIHONBASHI-HAKAZAKI-CHO
CHOU-KU, TOKYO
JAPAN
+(03) 3669-8131**1.0 EVALUATION SCOPE****Compliance with the following codes:**

- 2009 *International Building Code*® (2009 IBC)
- 2009 *International Residential Code*® (2009 IRC)
- 2006 *International Building Code*® (2006 IBC)*
- 2006 *International Residential Code*® (2006 IRC)*
- 2003 *International Building Code*® (2003 IBC)*
- 2003 *International Residential Code*® (2003 IRC)*
- 1997 *Uniform Building Code*™ (UBC)*

*Codes indicated with an asterisk are addressed in Section 8.0.

Property evaluated:

Structural

2.0 USES

Powers Trak-It C5 fasteners are used to attach building elements, such as wood and steel, to uncracked, normal-weight and structural sand-lightweight concrete, metal decks with structural sand-lightweight concrete fill, concrete masonry and steel base materials. The fasteners are alternatives to the cast-in-place anchors described in IBC Sections 1911 and 1912 for placement in concrete; the embedded anchors described in Section 2.1.4 of TMS 402/ACI 530/ASCE 5 (which is referenced in IBC Section 2107); and the bolts used to attach materials to steel described in IBC Section 2204.2. The fasteners may be used where an engineered design is submitted in accordance with IRC Section R301.1.3.

3.0 DESCRIPTION**3.1 Trak-It C5 Fasteners:**

Powers Trak-It C5 fasteners are manufactured from steel complying with ASTM A 510, Grade 1060, and austempered to a Rockwell C51-55 core hardness. The Trak-It C5 fasteners are illustrated in Figure 1.

The Trak-It C5 fasteners are also sold by Max Company, Ltd., and are labeled as Max Concrete Pins.

3.1.1 Straight Shank Fasteners: Straight shank fasteners are available with a 0.102-inch (2.6 mm) or 0.145-inch (3.7 mm) nominal shank diameter and a 0.25-inch (6.4 mm) head diameter. The fasteners are supplied collated into plastic strips and have a minimum 0.0002-inch (5 µm) electrodeposited zinc coating per ASTM B 633.

3.1.2 Stepped Shank Fasteners: The stepped shank fasteners have shank diameters of 0.145 inch (3.7 mm) and 0.102 inch (2.6 mm), and a 0.25-inch (6.4 mm) head diameter, except for the 1/2-inch-long fastener, which has shank diameters of 0.120 and 0.102 inch (3.0 and 2.6 mm). The fasteners are supplied collated into plastic strips and have a minimum 0.0002-inch (5 µm) electrodeposited zinc coating per ASTM B 695.

3.2 Normal-weight Concrete:

Normal-weight concrete must be of stone-aggregate and comply with Section 1905 of the IBC or Section R402.2 of the IRC, as applicable. The minimum concrete compressive strength at the time of fastener installation must be as noted in Table 1.

3.3 Structural Lightweight Concrete:

Structural lightweight concrete must be sand-lightweight and must comply with Section 1905 of the IBC. The minimum concrete compressive strength at the time of fastener installation must be as noted in Table 2.

3.4 Concrete Masonry Units (CMUs):

CMUs must be minimum 8-inch-thick (203 mm), normal-weight blocks conforming to ASTM C 90. Mortar must comply with ASTM C 270 Type M or S, in accordance with IBC Section 2103.8 or IRC Section R607, as applicable.

3.5 Steel Deck Panels:

Steel deck panel properties must be as described in the footnotes of Table 2 and Figures 2 and 3, as applicable.

3.6 Steel Substrates:

Structural steel must comply with the minimum requirements of ASTM A 36, A 572 Grade 50, or A 992, as shown in Tables 4 and 5.

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 General: The allowable tension and shear loads for Powers Trak-It C5 fasteners installed in accordance with this report are shown in Tables 1 through 5.

The allowable tension and shear loads with required embedment depths, for fasteners installed in normal-weight concrete, are shown in Table 1. The allowable tension and shear loads for fasteners installed in structural sand-lightweight concrete and structural sand-lightweight concrete over steel deck are shown in Table 2. The allowable tension and shear loads with required embedment depths, for fasteners installed in concrete masonry units, are shown in Table 3. The allowable tension and shear loads for fasteners installed in structural steel are shown in Tables 4 and 5.

Allowable loads for fasteners subjected to combined shear and tension forces are determined by the following formula:

$$(p/P_a) + (v/V_a) \leq 1$$

where:

p = Actual tension load, lbf (N).

P_a = Allowable tension load, lbf (N).

v = Actual shear load, lbf (N).

V_a = Allowable shear load, lbf (N).

4.1.2 Wood to Concrete: Reference lateral design values for nails, with diameters less than or equal to the diameter of the Trak-It C5 fasteners, and with penetration into the main member of 10D, determined in accordance with Part 11 and/or Table 11N of ANSI/AF&PA NDS, are applicable to the Trak-It C5 fasteners. The wood element is the side member. The fastener bending yield strength is allowed to be taken as the value noted in the footnotes to Table 11N of the ANSI/AF&PA NDS, based on the diameter of the Trak-It C5 fasteners.

4.2 Installation:

Fasteners must be installed with a power-actuated fastening tool in accordance with Powers' recommendations. The fasteners must not be installed into concrete until the base material has reached the minimum designated concrete compressive strength. The minimum embedment depth, fastener spacing, edge distance and base material must comply with the requirements of this report.

5.0 CONDITIONS OF USE

The Powers Trak-It C5 fasteners 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 fasteners must be identified and installed in accordance with this report and the manufacturer's published installation instructions. In the event of a conflict between the instructions in this report and the manufacturer's published installation instructions, this report governs.
- 5.2** Allowable tension and shear values must comply with Section 4.1 of this report. Calculations demonstrating that the applied loads are less than the allowable loads described in this report must be submitted to the code official for approval. The calculations must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is constructed.
- 5.3** For fasteners installed in concrete, the concrete must have a minimum thickness of three times the fastener penetration depth, unless noted otherwise.
- 5.4** Allowable tension and shear values are as noted in Section 4.1. The stress increases described in Section 1605.3.2 of the IBC are not allowed for wind loads acting alone or when combined with gravity loads. No increase is allowed for vertical loads acting alone.
- 5.5** The use of fasteners in concrete is limited to installation in uncracked concrete. Cracking occurs when $f_t > f_r$ due to service loads or deformations.
- 5.6** The use of the fasteners in this report is limited to installation in dry, interior environments.
- 5.7** Use of the fasteners to resist earthquake loads is outside the scope of this report, except when used with architectural, electrical and mechanical components described in Section 13.1.4 of ASCE/SEI 7 as exempt from seismic design requirements.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Fasteners Power-driven into Concrete, Steel, and Masonry Elements (AC70), dated February 2011.

7.0 IDENTIFICATION

The Powers Trak-It C5 fasteners are identified by a "P" stamped onto the head of the drive pin. Packages bear the company name (Powers Fasteners, Inc., or Max Co., Ltd.) and information that includes the fastener shank type, length and diameter, and the evaluation report number (ESR-3275).

8.0 OTHER CODES

8.1 Evaluation Scope:

In addition to the 2009 IBC and the 2009 IRC referenced in Section 1.0, the products described in this report were evaluated for compliance with the requirements of the following codes:

- 2006 *International Building Code*® (2006 IBC)
- 2006 *International Residential Code*® (2006 IRC)
- 2003 *International Building Code*® (2003 IBC)
- 2003 *International Residential Code*® (2003 IRC)
- 1997 *Uniform Building Code*™ (UBC)

8.2 Uses:

The Trak-It C5 fasteners are used to connect materials as described in Section 2.0. The fasteners are alternatives to the cast-in-place anchors described in 2006 IBC Sections 1911 and 1912, 2003 IBC Sections 1912 and 1913 and UBC Section 1923.1, for placement in concrete; the embedded anchors described in Section 2.1 of ACI 530 (which is referenced in 2006 and 2003 IBC Section 2107) for placement in grouted masonry; and the bolts used to attach materials to steel, described in 2006 and 2003 IBC Section 2204.2. The fasteners may be used where an engineered design is submitted in accordance with 2006 or 2003 IRC Section R301.1.3.

8.3 Description:

8.3.1 Fasteners: See Section 3.1.

8.3.2 Concrete: See Sections 3.2 and 3.3. Under the UBC, concrete must conform to Section 1903.

8.3.3 Concrete Masonry Units: See Section 3.4.

8.3.4 Steel Deck Panels: See Section 3.5.

8.3.5 Steel Substrates: See Section 3.6.

8.4 Design and Installation:

8.4.1 Design:

8.4.1.1 General: See Section 4.1.1 and Conditions of Use 8.5.1 and 8.5.2.

8.4.1.2 Wood to Concrete: See Section 4.1.2. Reference lateral design values for fasteners determined in accordance with Section 4.1.2 (2006 IBC), Part 11 of

ANSI/AF&PA NDS (2003 IBC and IRC) or UBC Section 2318.3, as applicable, are applicable to the Trak-It C5 fasteners of equal or greater diameters.

8.4.2 Installation: See Section 4.2.

8.5 Conditions of Use:

See Section 5.0 and the following:

8.5.1 Allowable tension and shear values are as noted in Tables 1 through 5. The stress increases and load reductions described in Section 1605.3 of the 2006 and 2003 IBC and the stress increases described in UBC Section 1612.3.2, are not allowed for wind loads acting alone or when combined with gravity loads. No increase is allowed for vertical loads acting alone.

8.5.2 Except for fasteners used with architectural, electrical and mechanical components as described in Section 13.1.4 of ASCE/SEI 7-05 (2006 IBC) or Section 9.6.1 of ASCE/SEI 7-02 (2003 IBC and IRC) as exempt from seismic design requirements, use of fasteners to resist earthquake loads is outside the scope of this report.

8.6 Evidence Submitted:

Data in accordance with the ICC-ES Acceptance Criteria for Fasteners Power-driven in Concrete, Steel and Masonry Elements (AC70), dated October 2006.

8.7 Identification:

See Section 7.0.

TABLE 1—ALLOWABLE LOADS FOR TRAK-IT C5 FASTENERS INSTALLED IN NORMAL WEIGHT CONCRETE^{1,2,3,4}

SHANK TYPE	SHANK DIAMETER (inch)	MINIMUM EMBEDMENT (inch)	MINIMUM SPACING (inches)	MINIMUM EDGE DISTANCE (inches)	CONCRETE COMPRESSIVE STRENGTH			
					<i>f</i> _c = 2,500 psi		<i>f</i> _c = 3,000 psi	
					Tension	Shear	Tension	Shear
Straight	0.102	³ / ₄	4	3	70	25	70	25
		⁷ / ₈	4	3	70	25	70	25
	0.145	³ / ₄	4	3	65	105	70	110
		⁷ / ₈	4	3	125	105	135	110
Step	0.145/0.102	³ / ₄	4	3	80	215	85	235
		1	4	3	125	245	135	265

For **SI**: 1 lbf = 4.48 N, 1 inch = 25.4 mm, 1 psi = 6.895 kPa.

¹Fasteners must not be driven until the concrete has reached the tabulated compressive strength.

²Concrete thickness must be a minimum of three times the embedment depth of the fastener.

³The tabulated allowable load values are for the fastener only. Wood or steel members connected to the steel substrate must be investigated in accordance with accepted design criteria.

⁴The stress increases and load reductions described in Section 1605.3 of the IBC and the stress increases described in Section 1612.3.2 of the UBC are not allowed for wind loads acting alone or when combined with gravity loads. No adjustment is allowed for vertical loads acting alone.

TABLE 2—ALLOWABLE LOADS FOR TRAK-IT C5 FASTENERS INSTALLED IN STRUCTURAL SAND-LIGHTWEIGHT CONCRETE AND STRUCTURAL SAND-LIGHTWEIGHT CONCRETE OVER STEEL DECK^{1,2,3,4}

SHANK TYPE	SHANK DIAMETER (inch)	MINIMUM EMBEDMENT (inch)	MINIMUM SPACING (inches)	MINIMUM EDGE DISTANCE (inches)	INSTALLED INTO CONCRETE		INSTALLED THROUGH METAL DECK <i>f</i> 'c = 3,000 psi				
							Tension	Shear	Deck Type	Tension	
					Upper Flute	Lower Flute				Upper Flute	Lower Flute
Straight	0.102	³ / ₄	4	1	—	—	Note 5	80	80	105	105
		⁷ / ₈	4	1	—	—	Note 5	85	85	120	120
	0.145	³ / ₄	4	¹ / ₈	—	—	Note 6	110	80	220	200
		³ / ₄	4	3	115	165	—	—	—	—	—

For SI: 1 lbf = 4.48 N, 1 inch = 25.4 mm, 1 psi = 6.895 kPa.

¹Fasteners must not be driven until the concrete has reached the tabulated compressive strength.

²Concrete thickness must be a minimum of three times the embedment depth of the fastener.

³The tabulated allowable load values are for the fastener only. Wood or steel members connected to the steel substrate must be investigated in accordance with accepted design criteria.

⁴The stress increases and load reductions described in Section 1605.3 of the IBC and the stress increases described in Section 1612.3.2 of the UBC are not allowed for wind loads acting alone or when combined with gravity loads. No adjustment is allowed for vertical loads acting alone.

⁵The steel deck must have a minimum base material thickness of 0.034 inch, minimum yield strength, *F*_y, of 33 ksi, and conform to the profile shown in Figure 2. Concrete fill must be at least ³/₄ inches above the top ribs.

⁶The steel deck must have a minimum base material thickness of 0.035 inch, minimum yield strength, *F*_y, of 33 ksi, and conform to the profile shown in Figure 3. Concrete fill must be at least ³/₄ inches above the top ribs.

TABLE 3—ALLOWABLE LAODS FOR TRAK-IT C5 FASTENERS INSTALLED IN CONCRETE MASONRY UNITS^{1,2,3}

SHANK TYPE	SHANK DIAMETER (inch)	MINIMUM EMBEDMENT (inch)	MINIMUM SPACING (inches)	MINIMUM EDGE DISTANCE (inches)	HOLLOW CMU (ANY LOCATION)	
					Tension (lbs)	Shear (lbs)
Straight	0.102	⁷ / ₈	4	³ / ₄	65	80

For SI: 1 lbf = 4.48 N, 1 inch = 25.4 mm, 1 psi = 6.895 kPa.

¹The allowable tension and shear values are for the fasteners only. Members connected to the concrete masonry must be investigated in accordance with accepted design criteria.

²Concrete masonry units must be normal weight units conforming to ASTM C 90.

³Fasteners must be placed into unit face only. Face shell thickness of the concrete masonry units must be ¹/₄ inches, minimum.

TABLE 4—ALLOWABLE LOADS FOR TRAK-IT C5 FASTENERS INSTALLED IN ASTM A 36 STEEL¹

FASTENER TYPE	MINIMUM SPACING (inch)	MINIMUM EDGE DISTANCE (inch)	STEEL THICKNESS (inch)							
			³ / ₁₆ ²		¹ / ₄ ³		³ / ₈ ³		¹ / ₂ ³	
			Tension (lbs)	Shear (lbs)	Tension (lbs)	Shear (lbs)	Tension (lbs)	Shear (lbs)	Tension (lbs)	Shear (lbs)
¹ / ₂ -inch-long step shank	1	¹ / ₂	130	120	115	120	115	120	110	120

For SI: 1 lbf = 4.48 N, 1 inch = 25.4 mm, 1 psi = 6.895 kPa.

¹The allowable tension and shear values are for the fasteners only. Steel members connected to the steel must be investigated in accordance with accepted design criteria.

²Fasteners installed in ³/₁₆-inch-thick steel must penetrate the steel such that the shank pierces the steel and protrudes ¹/₈ inch.

³Fasteners installed in ¹/₄-, ³/₈-, and ¹/₂-inch-thick steel must have a minimum embedment depth of ¹/₄ inch.

TABLE 5—ALLOWABLE LOADS FOR TRAK-IT C5 FASTENERS INSTALLED IN ASTM A572 GRADE 50 OR ASTM A 992 STEEL¹

FASTENER TYPE	MINIMUM SPACING (inch)	MINIMUM EDGE DISTANCE (inch)	STEEL THICKNESS (inch)					
			¹ / ₄ ²		³ / ₈ ²		¹ / ₂ ³	
			Tension (lbs)	Shear (lbs)	Tension (lbs)	Shear (lbs)	Tension (lbs)	Shear (lbs)
¹ / ₂ -inch-long step shank	1	¹ / ₂	95	115	65	90	25	55

For SI: 1 lbf = 4.48 N, 1 inch = 25.4 mm, 1 psi = 6.895 kPa.

¹The allowable tension and shear values are for the fasteners only. Steel members connected to the steel must be investigated in accordance with accepted design criteria.

²Fasteners installed in ¹/₄- and ³/₈-inch-thick steel must have a minimum embedment of ³/₁₆ inch.

³Fasteners installed in ¹/₂-inch-thick steel must have a minimum embedment of ¹/₈ inch.



0.145-inch Diameter (3.7 mm) Straight Shank C5 Fasteners



0.102-inch Diameter (2.6 mm) Straight Shank C5 Fasteners



0.145/0.102-inch Diameter (3.7/2.6 mm) Step Shank C5 Fasteners



0.120/0.102-inch Diameter (3.0/2.6 mm) 1/2-inch long Step Shank C5 Fasteners

FIGURE 1—TRAK-IT C5 FASTENERS

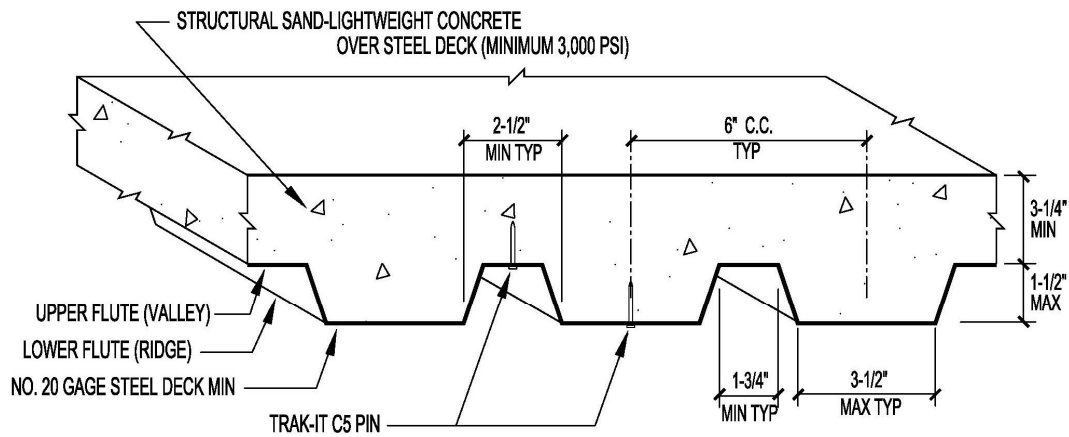


FIGURE 2—FASTENER INSTALLATION LOCATION IN 1 1/2-INCH-DEEP COMPOSITE DECK

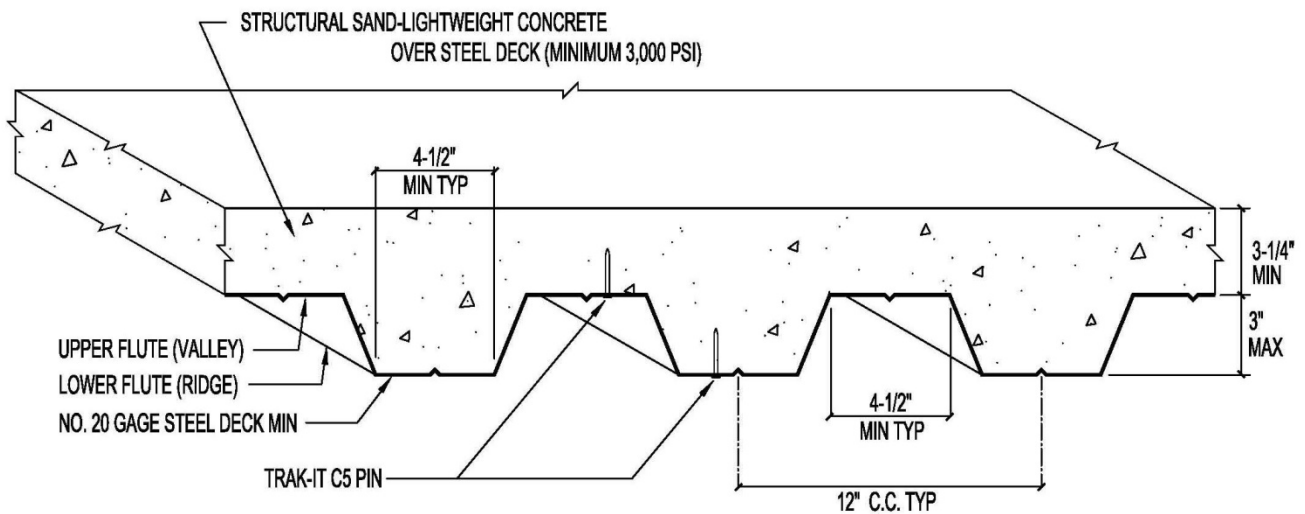


FIGURE 3—FASTENER INSTALLATION LOCATION IN 3-INCH-DEEP COMPOSITE DECK