

ICC-ES Evaluation Report

ESR-2249

Reissued April 1, 2013

This report is subject to renewal April 1, 2014.

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DIVISION: 03 00 00—CONCRETE
Section: 03 16 00—Concrete Anchors

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:

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EVALUATION SUBJECT:
POWERS TRAK-IT C4 FASTENERS
ADDITIONAL LISTEE:

MAX COMPANY, LTD.
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1.0 EVALUATION SCOPE
Compliance with the following codes:

- * ■ ~~2012~~, 2009, 2006 and ~~2003~~ *International Building Code*® (IBC)
- * ■ ~~2012~~, 2009, ~~2006~~ and ~~2003~~ *International Residential Code*® (IRC)

Property evaluated:

Structural

2.0 USES

- Powers Trak-It C4 fasteners are used to attach building elements, such as wood and steel, to uncracked, normal-weight and sand-lightweight concrete, and metal decks with sand-lightweight concrete fill. The fasteners are alternatives to the cast-in-place anchors described in IBC Section 1908 (2009 and 2006 IBC Sections 1911 and 1912; ~~2003 IBC Sections 1912 and 1913~~) for placement in concrete. 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 C4 Fasteners:

Powers Trak-It C4 fasteners are manufactured from steel complying with ASTM A510, Grade 1060, and austempered to a Rockwell C51-55 core hardness.

The Trak-It C4 fasteners are also sold by Max Company, Ltd., and are labeled as Powerlite. The Trak-It C4 fasteners are illustrated in Figure 1.

3.1.1 Tapered Shank Fasteners: The tapered shank fasteners have a 0.137-inch nominal shank diameter and a 0.25-inch (6.4 mm) head diameter. The fasteners are supplied collated into plastic strips or as single fasteners with premounted vinyl flutes. The fasteners are zinc-plated in accordance with ASTM B695, Class 65.

3.1.2 Straight Shank Fasteners: The straight shank fasteners have a 0.145-inch 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) zinc plating per ASTM B633.

3.1.3 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. The fasteners are supplied collated into plastic strips and have a minimum 0.0002-inch (5 µm) zinc plating per ASTM B633.

3.2 Normal-weight Concrete:

Normal-weight concrete must be of stone-aggregate and comply with Chapter 19 of the IBC or Section R402.2 of the IRC, as applicable. The minimum concrete compressive strength at the time of fastener installation is noted in Tables 1 and 2.

3.3 Sand-Lightweight Concrete:

Lightweight concrete must be sand-lightweight and must comply with Chapter 19 of the IBC. The minimum concrete compressive strength at the time of fastener installation is noted in Tables 3 and 4.

3.4 Steel Deck:

Steel deck properties must be as described in the footnotes of Table 3 and Table 4, and Figure 2, of this report.

4.0 DESIGN AND INSTALLATION
4.1 Design:

4.1.1 General: The allowable tension and shear loads for Powers Trak-It C4 fasteners installed in accordance with this report are shown in Tables 1 through 4.

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

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 C4 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 C4 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 C4 fasteners.

4.1.3 Seismic Considerations:

4.1.3.1 Use with Structural Components: Resistance to seismic loads is outside the scope of this report. Therefore, the suitability of the fasteners for use with structural components that are subjected to seismic loads is outside the scope of this report.

4.1.3.2 Use with Nonstructural Components: Seismic load resistance is outside the scope of this report, except when use is with architectural, mechanical and electrical components described in Section 13.1.4 of ASCE 7, and as follows:

- Concrete base materials: The fasteners installed in concrete may be used to support acoustical tile or lay-in panel suspended ceiling systems, distributed systems and distribution systems where the service load on any individual fastener does not exceed the lesser of 90 lbf (400 N) or the published allowable load in Tables 1 through 4, as applicable.
- For interior, nonstructural walls that are not subject to sustained tension loads and are not a bracing application, the fasteners may be used to attach steel track to concrete or steel in all Seismic Design Categories. In Seismic Design Categories D, E, and F, the allowable shear load due to transverse pressure must be no more than 90 pounds (400 N) when attaching to concrete; or 250 pounds (1,112 N) when attaching to steel. Substantiating calculations must be submitted addressing the fastener-to-base-material capacity and the fastener-to-attached-material capacity.

~~* Interior nonstructural walls are limited to locations where bearing walls, shear walls or braced walls are not required by the approved plans. The design load on the fastener must not exceed the allowable load established in this report for the concrete or steel base material. *~~

4.2 Installation:

Fasteners must be installed in accordance with this report and the manufacturer's published installation instructions. The fasteners must not be installed 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 C4 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 instructions. In the event of a conflict between the instructions in this report and the manufacturer's instructions, this report governs.
- 5.2** Allowable tension and shear values must comply with Section 4.1.1 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** Fasteners must be installed in concrete with a minimum thickness of three times the fastener penetration.
- 5.4** Allowable tension and shear values are as noted in Section 4.1.1. 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 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** See Section 4.1.3 for seismic considerations.

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 2013.

7.0 IDENTIFICATION

The Powers Trak-It C4 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-2249).

TABLE 1—ALLOWABLE TENSION VALUES FOR TRAK-IT C4 FASTENERS INSTALLED IN NORMAL WEIGHT CONCRETE^{1,2}

SHANK TYPE	SHANK DIAMETER (inch)	MINIMUM EMBEDMENT (inch)	MINIMUM SPACING (inches)	MINIMUM EDGE DISTANCE (inches)	ALLOWABLE TENSION LOAD (lbf)	
					f'c = 2,500 psi	f'c = 3,000 psi
Straight	0.145	3/4	4	3	65	70
Straight	0.145	7/8	4	3	125	135
Step	0.145	3/4	4	3	80	85
Step	0.145	1	4	3	125	135
Taper	0.137	3/4	4	1 3/4	80	85
Taper	0.137	1	4	1 3/4	90	100

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 3 times the embedment depth of the fastener.

TABLE 2—ALLOWABLE SHEAR VALUES FOR TRAK-IT C4 FASTENERS INSTALLED IN NORMAL WEIGHT CONCRETE^{1,2}

SHANK TYPE	SHANK DIAMETER (inch)	MINIMUM EMBEDMENT (inch)	MINIMUM SPACING (inches)	MINIMUM EDGE DISTANCE (inches)	ALLOWABLE SHEAR LOAD (lbf)	
					f'c = 2,500 psi	f'c = 3,000 psi
Straight	0.145	3/4	4	3	105	110
Straight	0.145	7/8	4	3	105	110
Step	0.145	3/4	4	3	215	235
Step	0.145	1	4	3	245	265
Taper	0.137	3/4	4	1 3/4	90	95
Taper	0.137	1	4	1 3/4	70	75

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 3 times the embedment depth of the fastener.

TABLE 3—ALLOWABLE TENSION VALUES FOR TRAK-IT C4 FASTENERS INSTALLED IN SAND-LIGHTWEIGHT CONCRETE AND SAND-LIGHTWEIGHT CONCRETE OVER STEEL DECK^{1,2,3}

SHANK TYPE	SHANK DIAMETER (inch)	MINIMUM EMBEDMENT (inch)	MINIMUM SPACING (inches)	MINIMUM EDGE DISTANCE (inches)	LOCATION	ALLOWABLE TENSION (lbf) f'c = 3000 psi
Straight	0.145	3/4	4	3	Top	115
				1 1/8	Lower Flute	80
					Upper Flute	110

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.

²The steel deck must have a minimum base material thickness of 0.035 inch (0.89 mm), minimum yield strength, Fy, of 33 ksi, and conform to the profile shown in Figure 2.

³Concrete thickness must be a minimum of 3 times the embedment depth of the fastener.

TABLE 4—ALLOWABLE SHEAR VALUES FOR TRAK-IT C4 FASTENERS INSTALLED IN SAND-LIGHTWEIGHT CONCRETE AND SAND-LIGHTWEIGHT CONCRETE OVER STEEL DECK^{1,2,3}

SHANK TYPE	SHANK DIAMETER (inch)	MINIMUM EMBEDMENT (inch)	MINIMUM SPACING (inches)	MINIMUM EDGE DISTANCE (inches)	LOCATION	ALLOWABLE SHEAR (lbf) f'c = 3000 psi
Straight	0.145	3/4	4	3	Top	165
				1 1/8	Lower Flute	200
					Upper Flute	220

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.

²The steel deck must have a minimum base material thickness of 0.035 inch (0.89 mm), minimum yield strength, Fy, of 33 ksi, and conform to the profile shown in Figure 2.

³Concrete thickness must be a minimum of 3 times the embedment depth of the fastener.



0.145-inch Diameter (3.7 mm) Straight Shank C4 Fasteners



0.145-inch Diameter (3.7 mm) Step Shank C4 Fasteners



0.137-inch Diameter (3.5 mm) Taper Shank C4 Fasteners

FIGURE 1—TRAK-IT C4 FASTENERS

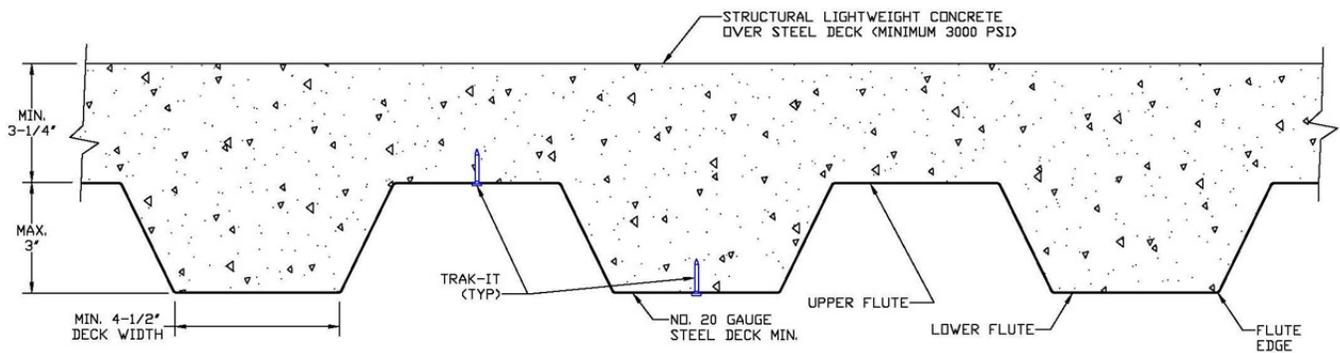


FIGURE 2—FASTENER INSTALLATION LOCATION IN COMPOSITE DECK