

ICC-ES Evaluation Report

ESR-1955

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DIVISION: 03 00 00—CONCRETE
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

REPORT HOLDER:

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EVALUATION SUBJECT:

RAMSET T3 POWER DRIVEN FASTENERS

1.0 EVALUATION SCOPE

Compliance with the following codes:

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

Property evaluated:

Structural

2.0 USES

Ramset T3 power-driven fasteners are used to fasten building components such as light-gage cold-formed steel framing to normal-weight concrete, sand-lightweight concrete, sand-lightweight concrete filled steel deck panels, concrete masonry units (CMUs) and structural steel substrate materials.

3.0 DESCRIPTION

3.1 Ramset T3 Power Driven Fasteners:

Ramset T3 power-driven fasteners are manufactured from steel complying with ASTM A510, Grade 1060, and austempered to a Rockwell "C" 52 to 56 core hardness. All fasteners have a straight smooth shank with a 0.125-inch (3.2 mm) nominal diameter. Fasteners for installation into concrete have either a black oxide or a zinc-plated finish. Fasteners for installation into steel and CMUs must have a zinc-plated finish. The T3 series fasteners are available in lengths to achieve embedment depths as noted in the tables of this report.

3.2 Substrate Materials:

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

3.2.2 Sand-lightweight Concrete: Sand-lightweight concrete must comply with IBC Chapter 19. The minimum concrete compressive strength at the time of fastener installation is noted in Table 2.

3.2.3 Steel Deck Panels: Steel deck panels must conform to a code-referenced material standard, with the minimum thickness and minimum yield strength noted in Table 2. See Figure 1 for panel configuration requirements.

3.2.4 Concrete Masonry Units (CMUs): CMUs must be minimum 8-inch-thick blocks, normal-weight blocks conforming to ASTM C90 mortar must be minimum Type N in accordance with Section 2103 of the IBC or Section R607 of the IRC, as applicable. Concrete-masonry construction must have a minimum prism compressive strength f'_m of 1,500 psi (10.3 MPa) at the time of fastener installation. Grout must comply with IBC Section 2103 or IRC Section R609.

3.2.5 Structural Steel: Structural steel used in supports must comply with the minimum strength requirements of ASTM A36, ASTM A572 Grade 50 or ASTM A992, and must have thicknesses as noted in Tables 4 and 5, as applicable.

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 Allowable Loads: The allowable shear and tension (pullout) values in the tables of this report are for use in allowable stress design, and are for fasteners driven into the base materials specified in the tables. Design of the connection to the attached material must comply with the applicable requirements of the IBC. The stress increases and load reductions described in IBC Section 1605.3 are not allowed for wind loads acting alone or combined with vertical loads. No adjustments are allowed for vertical loads acting alone.

Allowable shear and tension values for Ramset T3 fasteners driven into normal-weight concrete are shown in Table 1 of this report. Allowable shear and tension values for T3 fasteners driven into sand-lightweight concrete with or without metal deck are shown in Table 2. Allowable tension and shear values for T3 fasteners driven into CMUs are shown in Table 3. Allowable shear and tension

values for T3 fasteners driven into steel are shown in Tables 4 and 5.

The allowable loads for T3 fasteners subjected to combined shear and tension loads must be determined using the following equation:

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

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 Seismic Considerations:

4.1.2.1 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.

4.1.2.2 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 base materials 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 shown in Tables 1 and 2, as applicable.
- **Steel Base Materials:** The fasteners installed in steel may be used where the service load on any individual fastener does not exceed the lesser of 250 lbf (1112 N) or the published allowable load shown in Tables 4 and 5, as applicable.
- **Interior, Nonstructural Walls:** For interior, nonstructural walls that are not subject to sustained tension loads and are not a bracing application, the power-driven fasteners described in Section 3.0 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 are 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 shown in Tables 1, 2, 4, and 5, as applicable.

4.2 Installation:

The fasteners must be installed in accordance with this report and the ITW Ramset published installation instructions. A copy of these instructions must be available on the jobsite at all times during installation.

The fasteners are installed with a power fastening tool in accordance with ITW Ramset recommendations. The fastener penetration, spacing and edge distances must be as noted in the tables of this report.

Attachment of cold-formed steel tracks to the perimeter of concrete is allowed under the following conditions:

1. Cold joints must not exist between the slab and foundation below the track.
2. Cold-formed steel tracks must not be installed on slabs supported by concrete block foundation walls.

5.0 CONDITIONS OF USE

The ITW Ramset T3 power driven 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 manufactured and identified in accordance with this report.

Fastener installation must comply with this report and ITW Ramset published installation instructions. In the event of a conflict between this report and the ITW Ramset published installation instructions, this report governs.

- 5.2** Calculations demonstrating that the applied loads are less than the allowable loads described in Section 4.1.1 must be submitted to the code official. The calculations must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.
- 5.3** Refer to Section 4.1.2 for seismic considerations.
- 5.4** The minimum concrete thickness must be three times the fastener embedment, except where noted otherwise in this report.
- 5.5** The use of fasteners is limited to uncracked concrete or masonry. Cracking occurs when $f_t > f_r$ due to service loads or deformations.
- 5.6** Installation must be limited to dry interior environments.
- 5.7** The use of fasteners in contact with preservative-treated or fire-retardant-treated wood is outside the scope of this report.

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 containers of the fasteners must be labeled with the manufacturer's name (ITW Ramset); the product name, length catalog number, and quantity; the evaluation report number (ESR-1955); and the manufacturing date. In addition, all the fasteners must be identified by the letter "R" stamped into the fastener head.

**TABLE 1—ALLOWABLE TENSION AND SHEAR VALUES FOR T3 FASTENERS
INSTALLED IN NORMAL-WEIGHT CONCRETE¹ (lbf)**

NOMINAL SHANK DIAMETER (inch)	MINIMUM EDGE DISTANCE (inches)	MINIMUM SPACING (inches)	MINIMUM EMBEDMENT DEPTH (inch)	CONCRETE COMPRESSIVE STRENGTH			
				2,000 psi		4,000 psi	
				Tension	Shear	Tension	Shear
0.125	3.2	4.0	$\frac{5}{8}$ $\frac{3}{4}$	83	109	78	80
				107	156	104	195

For **SI**: 1 inch = 25.4 mm, 1 psi = 6.89 kPa, 1 lbf = 4.45 N.

¹The fasteners must not be driven until the concrete has reached the designated minimum compressive strength. Minimum concrete thickness is three times the fastener embedment into the concrete.

**TABLE 2—ALLOWABLE TENSION AND SHEAR VALUES FOR T3 FASTENERS
INSTALLED IN MINIMUM 3,000 psi SAND-LIGHTWEIGHT CONCRETE¹ (lbf)**

NOMINAL SHANK DIAMETER (inch)	MINIMUM SPACING (inches)	MINIMUM EMBEDMENT DEPTH (inch)	FASTENER INSTALLED THROUGH STEEL DECK INTO CONCRETE ^{2,3}		FASTENER INSTALLED INTO CONCRETE		
			Lower Flute Tension	Lower Flute Shear	Minimum Edge Distance (inches)	Tension	Shear
0.125	4.0	$\frac{5}{8}$ $\frac{3}{4}$	72	242	3.2	84	108
			93	288		108	173

For **SI**: 1 inch = 25.4 mm, 1 psi = 6.89 kPa, 1 lbf = 4.45 N.

¹The fasteners must not be driven until the concrete has reached the designated minimum compressive strength. Minimum concrete thickness is three times the fastener embedment into the concrete, unless noted otherwise.

²For fasteners installed through steel deck, the fastener must be installed through the lower flutes of the deck with a minimum edge distance of $1\frac{1}{8}$ inches from the edge of the steel deck and 4 inches from the end of the deck. Concrete thickness above the deck must be a minimum of $3\frac{1}{2}$ inches. See Figure 1 of this report.

³The steel deck must have a minimum base-metal thickness of 0.035 inch, a minimum yield strength of 38 ksi, and a profile as noted in Figure 1.

**TABLE 3—ALLOWABLE TENSION AND SHEAR VALUES FOR T3 FASTENERS
INSTALLED IN HOLLOW CONCRETE MASONRY UNITS (CMUs)^{1,2} (lbf)**

NOMINAL SHANK DIAMETER (inch)	MINIMUM EDGE DISTANCE (inches)	MINIMUM SPACING (inches)	MINIMUM EMBEDMENT DEPTH (inch)	FACE SHELL		HORIZONTAL MORTAR JOINT	
				Tension	Shear	Tension	Shear
0.125	2	4	$\frac{5}{8}$	133	—	20	34

For **SI**: 1 inch = 25.4 mm, 1 lbf = 4.45 N.

¹Fasteners are limited to the horizontal mortar joint or bed joint and cannot be installed in the head joint of the CMU wall construction.

²Value applies to loads both parallel and perpendicular to the bed joint.

TABLE 4—ALLOWABLE TENSION AND SHEAR VALUES FOR T3 FASTENERS
INSTALLED IN ASTM A36 STEEL¹ (lbf)

NOMINAL SHANK DIAMETER (inch)	MINIMUM EDGE DISTANCE (inch)	MINIMUM SPACING (inch)	STEEL THICKNESS (inch)					
			³ / ₁₆		¹ / ₄		³ / ₈ ²	
			Tension	Shear	Tension	Shear	Tension	Shear
0.125	0.5	1.0	63	162	239	211	113	197

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N.

¹The allowable tension and shear values are for fastenings that have the point end of the fastener driven through the steel base material.

²Fastener penetration in ³/₈ inch steel is a minimum of 0.29 inch.

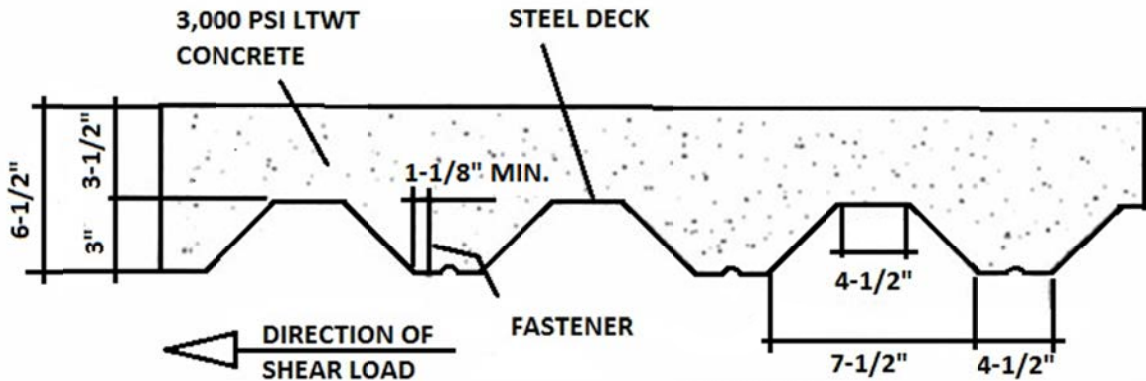
TABLE 5—ALLOWABLE TENSION AND SHEAR VALUES FOR T3 FASTENERS
INSTALLED IN ASTM A572 GRADE 50 OR ASTM A992 STEEL¹ (lbf)

NOMINAL SHANK DIAMETER (inch)	MINIMUM EDGE DISTANCE (inch)	MINIMUM SPACING (inch)	STEEL THICKNESS (inch)					
			³ / ₁₆		¹ / ₄		³ / ₈ ²	
			Tension	Shear	Tension	Shear	Tension	Shear
0.125	0.5	1.0	103	222	147	119	147	112

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N.

¹The allowable tension and shear values are for fastenings that have the pointed end of the fastener driven through the steel base material.

²Fastener penetration in ³/₈ inch steel is a minimum of 0.27 inch.



For SI: 1 inch = 25.4 mm.

FIGURE 1—FASTENER INSTALLATION SAND-LIGHTWEIGHT CONCRETE FILLED STEEL DECK