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DIVISION: 03 00 00—CONCRETE
SECTION: 03 16 00—CONCRETE ANCHORS
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SECTION: 04 05 19.16—MASONRY ANCHORS
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SECTION: 05 05 23—METAL FASTENINGS
DIVISION: 09 00 00—FINISHES
SECTION: 09 22 16.23—FASTENERS

REPORT HOLDER:

ITW RAMSET

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GLENDALE HEIGHTS, ILLINOIS 60139

EVALUATION SUBJECT:

**RAMSET AND DUO-FAST POWER-ACTUATED FASTENERS AND
CEILING CLIP ASSEMBLIES**



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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

DIVISION: 09 00 00—FINISHES
Section: 09 22 16.23—Fasteners

REPORT HOLDER:

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EVALUATION SUBJECT:

RAMSET AND DUO-FAST POWER-ACTUATED FASTENERS AND CEILING CLIP ASSEMBLIES

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2015, 2012, 2009 and 2006 *International Building Code*® (IBC)
- 2015, 2012, 2009 and 2006 *International Residential Code*® (IRC)

Property evaluated:

Structural

2.0 USES

Ramset and Duo-Fast 1500, TE Series fasteners and SP Series Power Point fasteners are power-actuated fasteners (PAFs) used for fastening of building components to normalweight concrete, sand-lightweight concrete, sand-lightweight concrete filled steel deck panels, concrete masonry and structural steel substrates. The fasteners are

used as alternatives to the cast-in-place concrete anchors described in 2015 IBC Section 1901.3 (2012 IBC Section 1908; 2009 and 2006 IBC Section 1911) for placement in concrete; the embedded anchors described in Section 8.1.3 of TMS 402-13 referenced in Section 2107 of the 2015 IBC (Section 2.1.4 of TMS 402-11, -08 and -05, referenced in Section 2107 of the 2012, 2009 and 2006 IBC, respectively); and to the welds and bolts used to attach to steel, described in IBC Sections 2204.1 and 2204.2. For structures regulated under the IRC, the fasteners may also be used where an engineered design is submitted in accordance with IRC Section R301.1.3.

Ramset SDC, SPC and TEC ceiling clip assemblies are used to attach wire for suspended ceilings to the supporting structure above. The ceiling clip assemblies are used as alternatives to cast-in-place concrete anchors described in 2015 IBC Section 1901.3 (2012 IBC Section 1908; 2009 and 2006 IBC Section 1911); and may also be used in structures regulated under the IRC where an engineered design is submitted in accordance with IRC Section R301.1.3.

3.0 DESCRIPTION

3.1 General:

See Table 1A in this report for shank descriptions fastener dimensions, coating information and applicable base materials. The fasteners are available in various lengths to achieve embedment depths as noted in Tables 2 through 9.

3.2 Ramset and Duo-Fast 1500 Series Fasteners:

The 1500 series fasteners are manufactured from steel complying with ASTM A510, Grade 1060 or 1062, and austempered to a Rockwell “C” core hardness of 52 to 56 for smooth-shank fasteners and 54 to 56 for knurled-shank fasteners.

The 1500 series fasteners have a nominal shank diameter of 0.145 inch (3.7 mm) and a nominal head diameter of 0.3 inch (7.6 mm). All of the 1500 series fasteners have a zinc-plated finish, except for the smooth-shank 1506B fasteners, which has a black oxide finish.

3.3 Ramset and Duo-Fast SP Series Power Point Fasteners:

The SP Series Power Point fasteners are straight or stepped shank series fasteners manufactured from steel wire complying with ASTM A510, Grade 1060 or 1062, and austempered to a Rockwell “C” hardness of 55 to 56.

The SP Series Power Point fasteners have a head diameter of 0.3 inch (7.62 mm). Fasteners having nominal

shank lengths of $7/8$ inch and less have a smooth, straight, nominally 0.150-inch diameter shank. Fasteners having a nominal shank length of 1 inch or longer have a smooth, stepped shank with a nominally 0.150-inch diameter shank at the tapered end and a nominally 0.180-inch diameter shank at the headed end. The SP Series Power Point fasteners have a zinc-plated finish.

3.4 Ramset True Embedment (TE) Series Fasteners:

The TE series fasteners are straight and tapered shank fasteners manufactured from steel wire complying with ASTM A510, Grade 1070, and austempered to a Rockwell "C" hardness of 55 to 58.

The TE series fasteners have a head diameter of 0.32 inch (8.1 mm). The smooth shank fasteners have a tapered point and a nominal straight shank diameter of 0.157 inch. The knurled fasteners have a straight shank with a nominal diameter of 0.157 inch. The TE series fasteners have a zinc-plated finish.

3.5 Ramset Ceiling Clip Assemblies:

Ramset ceiling clip assemblies are comprised of a power-actuated fastener with a premounted steel clip. See Figure 4. See Table 1B for descriptions and applicable allowable load tables.

3.5.1 SDC100 and SDC125 Ceiling Clip Assemblies:

The fasteners used in the SDC 100 and SDC 125 ceiling clip assemblies are 1500 series, smooth, straight shank fasteners, described in Section 3.2, with shank lengths of 1 inch and $1\frac{1}{4}$ inches (25.4 and 31.7 mm), respectively. The clip angles have a 120-degree angle between the legs of the clip and are manufactured from $3/4$ -inch-wide steel strips conforming to ASTM A653 FS Type B and having a base-metal thickness of 0.074 inch (1.88 mm). One leg of the clip is $29/32$ inch long (23 mm) and the opposite leg is $3/4$ inch long (19.1 mm). The fasteners are inserted through a dimple formed in the longer leg of the clip angle. The other leg has a hole with a nominal diameter of 0.335 inch (8.5 mm) through which the ceiling wire is attached.

3.5.2 SPC78 and SPC114 Ceiling Clip Assemblies:

The fasteners used in the SPC 78 and SPC 114 ceiling clip assemblies are SP series Power Point smooth, straight shank fasteners, described in Section 3.3, with shank lengths of $7/8$ inch and $1\frac{1}{4}$ inches (22 and 31.7 mm), respectively. The clip angles have a 90-degree angle between the legs of the clips and are manufactured from $3/4$ -inch-wide (19.1 mm), No. 14 gage [0.0747 inch (1.90 mm) base-metal thickness], steel strips conforming to ASTM A653 CS Type B. One leg of the clip is 1 inch long (25.4 mm) and the opposite leg is $3/4$ inch long (19.1 mm). The fasteners are inserted through an eyelet which is inserted through the hole in the 1-inch-long (25.4 mm) leg of the clip. The eyelet is manufactured from 5052-0 grade aluminum having a thickness of 0.032 inch (0.81 mm). The $3/4$ -inch-long (19.1 mm) leg has a hole with a nominal diameter of 0.313 inch (8.0 mm) through which the ceiling wire is attached.

3.5.3 TEC100 Ceiling Clip Assemblies: The fastener used in the TEC100 ceiling clip assemblies is the TE series smooth shank fastener, described in Section 3.4, with a shank length of 1 inch (25.4 mm). The clip angle and eyelet are the same as for the SPC 78 and SPC 114 ceiling clip assemblies described in Section 3.5.2.

3.6 Substrate Materials:

3.6.1 Structural Steel: Structural steel used in supports must comply with the minimum requirements of ASTM A36 (see Table 5), ASTM A572 Grade 50 or ASTM A992 (see Table 6), and must have thicknesses as noted in Table 5 or 6.

3.6.2 Concrete: Normalweight and sand-lightweight concrete must comply with IBC Chapter 19 or IRC Section R402.2, as applicable. The minimum concrete compressive strength at the time of fastener installation must be as noted in applicable allowable load table.

3.6.3 Steel Deck Panels: Steel deck panels must conform to a code-referenced material standard, with the minimum thickness and minimum yield strength and specified tensile strength noted in Tables 4 and 9. See Figure 1 for panel configuration requirements.

3.6.4 Concrete Masonry: Concrete Masonry Units (CMUs) must be minimum 8-inch-thick, normal weight blocks conforming to ASTM C90. Mortar must be Type S mortar complying with ASTM C270. Grout must be coarse grout complying with ASTM C476.

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 General: Selection of fasteners must take into consideration the applicable base material and the length of the fastener. The minimum fastener length must be determined as follows:

- Unless otherwise noted, for installation into concrete, concrete-filled steel deck panels, concrete masonry and steel base materials, the minimum effective shank length shown in Table 1A must equal or exceed the sum of the thickness of the attached material and the minimum embedment depth (penetration) shown in the applicable tables in this report.
- For installation through steel base materials, the minimum effective shank length shown in Table 1A must equal or exceed the sum of the following: the thickness of the attached material, the thickness of the base material and the required point penetration shown in the applicable tables in this report.

4.1.2 Allowable Loads: The applicable allowable shear and tension load tables for the Ramset and Duo-Fast fasteners and ceiling clip assemblies driven into different base materials may be determined by referencing Tables 1A and 1B. The most critical applied loads, excluding seismic load effects, resulting from the load combinations in IBC Section 1605.3.1 or 1605.3.2 must not exceed the allowable loads described in this section. For fasteners which are subjected to seismic loads, see Section 4.1.5 for additional information.

The allowable shear and tension (pullout) values in the tables of this report are for use in allowable stress design (ASD). The allowable loads apply to the interaction between the fasteners and the specified base materials only, and limit states such as pull-over and lateral bearing, which are governed by the properties of attached materials, are outside the scope of this report. Design of the connection to the attached material must comply with the applicable requirements of the IBC. When designing the connection of wood members to the base material, the bending yield strength of the PAFs can be assumed to be the same as that of a nail with the same shank diameter. The stress increases and load reductions described in IBC Section 1605.3 are not allowed.

4.1.3 Combined Loading: For fasteners subjected to both shear and tension loads, compliance with the following interaction equation must be verified:

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

where:

ρ = Actual applied tension load on fastener, lbf (N).

P_a = Allowable tension load for the fastener, lbf (N).

v = Actual applied shear load on fastener, lbf (N).

V_a = Allowable shear load for the fastener, lbf (N).

4.1.4 Steel-to-steel Connections: When the Ramset and Duo-Fast fasteners listed in Tables 5 and 6 are used in connections of two steel elements in accordance with Section E5 of AISI S100-12, connection capacity must be determined in accordance with Sections 4.1.4.1 and 4.1.4.2, as applicable.

4.1.4.1 Connection Strength - Tension: To determine tensile connection strength in accordance with Section E5.2 of AISI S100-12, the fastener tension strength, pull-out strength and pull-over strength must be known. These characteristics must be determined as follows:

- **PAF Tensile Strength:** The allowable fastener tension strengths must be calculated in accordance with Section E5.2.1 of AISI S100-12 using a value of 260,000 psi for F_{uh} .
- **Pull-out Strength:** See Table 5 or 6, as applicable, for available pull-out strength.
- **Pull-over Strength:** The available pull-over strengths must be calculated in accordance with Section E5.2.3 of AISI S100-12.

4.1.4.2 Connection Strength - Shear: To determine shear connection strength in accordance with Section E5.3 of AISI S100-12, the fastener shear strength, bearing and tilting strength, pull-out strength in shear, net section rupture strength and shear strength limited by edge distance must be known. These characteristics must be determined as follows:

- **PAF Shear Strength:** The allowable fastener shear strengths must be calculated in accordance with Section E5.3.1 of AISI S100-12 using a value of 260,000 psi for F_{uh} .
- **Bearing and Tilting Strength:** The available bearing and tilting strengths must be calculated in accordance with Section E5.3.2 of AISI S100-12.
- **Pull-out Strength in Shear:** The available pull-out strength in shear must be the applicable allowable shear strength from Table 5 or 6, as applicable, or must be calculated in accordance with Section E5.3.3 of AISI S100-12.
- **Net Section Rupture Strength and Shear Strength Limited by Edge Distance:** The net section rupture strength must be determined in accordance with Section E5.3.4 of AISI S100-12 and the shear strength limited by edge distance must be determined in accordance with Section E5.3.5 of AISI S100-12.

4.1.5 Seismic Considerations: The fasteners are recognized for use when subjected to seismic loads as follows:

1. The Ramset and Duo-Fast fasteners may be used for attachment of nonstructural components listed in Section 13.1.4 of ASCE 7, which are exempt from the requirements of ASCE 7.
2. 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 in Tables 2, 3, 4, 8, and 9, as applicable.

3. Steel Base Materials: The fasteners installed in steel may be used for attaching nonstructural components 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 5 and 6, as applicable.

4. Interior, Nonstructural Walls: For interior, nonstructural walls that are not subject to sustained tension loads and are not a bracing application, the power-actuated 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 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 shown in Tables 2 through 6, as applicable.

4.2 Installation:

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

A low-velocity, powder-actuated fastening tool, recommended by ITW Ramset or ITW Brands - Duo-Fast, must be used to install the fasteners. The fastener penetration, spacing and edge distances must be as noted in the tables of this report. For fasteners installed into concrete, the fasteners must not be driven until the concrete has reached the designated compressive strength.

4.2.2 Use with Treated Lumber: The Ramset and Duo-Fast fasteners described in Table 1 may be used in contact with fire-retardant-treated wood in dry, interior locations only, in accordance with 2015 IBC Section 2304.10.5.4 (2012 and 2009 IBC Section 2304.9.5.4) and ITW Ramset's recommendations. Use of fasteners in contact with preservative-treated wood or fire-retardant-treated wood in exterior applications is outside the scope of this report.

5.0 CONDITIONS OF USE

The ITW Ramset and ITW Brands - Duo-Fast power-actuated fasteners and ceiling clip assemblies 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.
- 5.2** Fastener installation complies with this report and ITW Ramset or ITW Brands - Duo-Fast published installation instructions. In the event of a conflict between this report and the published installation instructions, the more restrictive requirements govern.
- 5.3** Calculations demonstrating that the applied loads are less than the maximum allowable loads described in this report 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.

- 5.4 For steel-to-steel connections that meet the applicability requirements of Section E5 of AISI S100-12, calculations demonstrating that the available connection strength has been determined in accordance with Section E5 of AISI S100-12 and Section 4.1.4 of this report, and equals to or exceeds the applied load, 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.
- 5.5 Refer to Section 4.1.5 for seismic considerations.
- 5.6 The minimum concrete thickness must be three times the fastener embedment in concrete, except where noted otherwise in this report.
- 5.7 The use of fasteners is limited to uncracked concrete or masonry. Cracking occurs when $f_t > f_r$ due to service loads or deformations.
- 5.8 Installation must be limited to dry interior environments, which include exterior walls which are protected by an exterior wall envelope.
- 5.9 Refer to Section 4.2.2 regarding the use of fasteners in contact with preservative-treated or fire-retardant-treated.

5.10 The Ramset and Duo-Fast products addressed in this report are manufactured under a quality-control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Power-actuated Fasteners Driven into Concrete, Steel and Masonry Elements (AC70), dated February 2016.

7.0 IDENTIFICATION

The containers of the fasteners are labeled with the company name (ITW Ramset or ITW Brands - Duo-Fast); the fastener product name, length, catalog number, and quantity; the evaluation report number (ESR-1799); and the manufacturing date. In addition, the ITW Ramset 1500 series and SP series fasteners are identified by the letter “R” stamped into the fastener head, the ITW Brands - DUO-FAST 1500 series and SP series fasteners have a semi-circle stamped on the fastener head and the TE Series fasteners have the nominal length marked on the fastener head. See Figure 3.

TABLE 1A—FASTENER DESCRIPTIONS AND APPLICATIONS

FASTENER ¹		SHANK TYPE	SHANK DIAMETER (inch)	HEAD DIAMETER (inch)	MAXIMUM POINT LENGTH (inch)	MINIMUM EFFECTIVE SHANK LENGTH (inch)	FASTENER COATING	APPLICABLE BASE MATERIAL	APPLICABLE LOAD TABLES
1500 Series	1506B	Smooth, straight	0.145	0.300	0.280	Designated shank length – 0.03 inch (2.84 inch for 1524 fastener)	Black Oxide	Concrete	2
	Zinc						Concrete	2, 3	
		15##			Conc.-filled deck	4			
1503K	Knurled, straight	0.300	Designated shank length	Zinc	Steel	5, 6			
SP Powerpoint Series	SP12 SP58 SP34	Smooth, straight	0.150	0.300	0.335	Designated shank length	Zinc	Concrete	2
	SP100 SP114 SP178	Smooth, stepped	0.150/0.180	0.300	0.335	Designated shank length	Zinc	Concrete	2, 3
True Embedment (TE) Series	TE##	Smooth, straight and tapered	0.157	0.320	0.40	Shank length + 1/16 inch	Zinc	Concrete	2, 3
								Conc.-filled deck	4
	TE##	Knurled, straight	0.157	0.320	0.30	Shank length	Zinc	CMU	7
								Steel	5, 6

For SI: 1 inch = 25.4 mm.

¹## denotes numbers used in fastener designation.

TABLE 1B—CEILING CLIP ASSEMBLY DESCRIPTIONS AND APPLICATIONS

ASSEMBLY	FASTENER	CLIP DESCRIPTION	CLIP MATERIAL & FINISH	APPLICABLE BASE MATERIAL	APPLICABLE LOAD TABLES
SDC100	1508	0.074 inch thick, 120° clip angle 0.335 inch diameter hole	Carbon steel, zinc coating	Concrete	8
SDC125	1510			Conc.-filled deck	9
SPC78	SP78	0.074 inch thick, 90° clip angle 0.313 inch diameter hole	Carbon steel, zinc coating	Concrete	8
SPC114	SP114			Conc.-filled deck	9
TEC100	TE100	0.074 inch thick, 90° clip angle 0.313 inch diameter hole	Carbon steel, zinc coating	Concrete	8
				Conc.-filled deck	9

For SI: 1 inch = 25.4 mm.

TABLE 2—ALLOWABLE TENSION AND SHEAR VALUES FOR FASTENERS INSTALLED IN NORMALWEIGHT CONCRETE¹

PART NUMBER SERIES	NOMINAL SHANK DIAMETER (inch)	SHANK DESCRIPTION	MINIMUM EMBEDMENT DEPTH (inches)	MINIMUM SPACING (inches)	MINIMUM EDGE DISTANCE (inches)	ALLOWABLE LOADS (lbf)					
						2000 psi		4000 psi		6000 psi	
Concrete Compressive Strength:						Tension	Shear	Tension	Shear	Tension	Shear
1500	0.145	Smooth-straight	3/4	5.1	3.2	50	66	100	104	—	—
			1			152	166	157	182	—	—
			1 1/4			159	265	179	267	—	—
			1 1/2			154	340	209	342	—	—
SP	0.150	Smooth-straight	3/4	5.1	3.2	—	—	150	105	81	82
SP	0.150/0.180	Smooth-stepped	1	5.1	3.5	154	200	243	175	189	210
			1 1/4			207	230	298	218	213	305
			1 1/2			—	—	384	391	239	594
TE	0.157	Smooth-tapered	3/4	5.1	2.75	71	116	71	116	109	117
			1			197	216	258	216	214	383
			1 1/4			264	283	377	317	415	349

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

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

TABLE 3—ALLOWABLE TENSION AND SHEAR VALUES FOR FASTENERS INSTALLED IN MINIMUM 3000 psi SAND-LIGHTWEIGHT CONCRETE¹

PART NUMBER SERIES	NOMINAL SHANK DIAMETER (inch)	SHANK DESCRIPTION	MINIMUM EMBEDMENT DEPTH (inches)	MINIMUM SPACING (inches)	MINIMUM EDGE DISTANCE (inches)	ALLOWABLE LOADS (lbf)	
						Tension	Shear
1500	0.145	Smooth-straight	3/4	4	3.2	167	179
			1			200	228
			1 1/4			333	400
			1 1/2			391	410
SP	0.150/0.180	Smooth-stepped	1	4	3.5	226	250
			1 1/4			329	377
			1 1/2			406	380
TE	0.157	Smooth-tapered	3/4	5.1	3.0	152	159
			1			325	347
			1 1/4			358	437
			1 1/2			466	478

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

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

TABLE 4—ALLOWABLE TENSION AND SHEAR VALUES FOR FASTENERS INSTALLED THROUGH METAL DECK INTO MINIMUM 3000 psi SAND-LIGHTWEIGHT CONCRETE¹

PART NUMBER SERIES	NOMINAL SHANK DIAMETER (inch)	SHANK DESCRIPTION	MINIMUM EMBEDMENT DEPTH (inches)	MINIMUM SPACING (inches)	ALLOWABLE LOADS (lbf)							
					3-INCH DEEP W TYPE STEEL DECK ^{2,3}		1 1/2-INCH DEEP B TYPE STEEL DECK ^{4,5}					
Deck Type:					Lower Flute		Upper Flute		Lower Flute			
Fastener Location:					Tension		Shear		Tension		Shear	
Load Direction:					Tension		Shear		Tension		Shear	
1500	0.145	Smooth-straight	3/4	4	76	260	-	-	-	-	-	-
			1		134	265						
			1 1/4		157	269						
			1 1/2		233	346						
SP	0.150/0.180	Smooth-stepped	1	4	119	336	-	-	-	-	-	-
			1 1/4		175	372						
			1 1/2		179	426						
TE	0.157	Smooth-tapered	3/4	5.1	106	265	131	261	154	307		
			1		152	327	156	273	138	265		
			1 1/4		164	330	-	-	-	-		
			1 1/2		238	448	-	-	-	-		

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

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

²The fastener must be installed through the lower flutes of the metal deck with a minimum edge distance of 1 1/8 inches from the edge of the steel deck web and 4 inches (5.1 inches for TE fasteners) from the end of the deck. Concrete thickness above the deck must be a minimum of 3 1/2 inches (2 1/4 inches for TE fasteners). See Figure 1 of this report.

³The steel deck must be configured as shown in Figure 1, have a minimum base-metal thickness of 0.035 inch, and have a minimum yield strength of 50 ksi and a minimum tensile strength of 65 ksi.

⁴The fastener must be installed through the upper or lower flutes of the metal deck at the center of the flute and a minimum of 5.1 inches from the end of the deck. Concrete thickness above the deck must be a minimum of 2 1/4 inches. See Figure 2 of this report.

⁵The steel deck must be configured as shown in Figure 2, have a minimum base-metal thickness of 0.035 inch, and have a minimum yield strength of 50 ksi and a minimum tensile strength of 65 ksi.

TABLE 5—ALLOWABLE TENSION AND SHEAR VALUES FOR FASTENERS INSTALLED IN ASTM A36 STEEL¹

PART NUMBER SERIES	NOMINAL SHANK DIAMETER (inch)	TYPE OF SHANK	MINIMUM SPACING (inches)	MINIMUM EDGE DISTANCE (inches)	ALLOWABLE LOADS (lbf)											
					Steel Thickness (inch):		3/16		1/4		3/8		1/2		≥ 3/4	
Load Direction:					Tension ⁴		Shear		Tension ⁴		Shear		Tension ⁴		Shear	
1500 (excluding 1506B)	0.145	Smooth	1	1/2	81	373	181	273	397	489	243 ²	277 ²	—	—		
1500K	0.145	Knurled	1	1/2	296	636	584	659	680	730	253 ²	293 ²	—	—		
SP	0.150	Smooth	1	1/2	385	662	445	477	393	574	948 ⁴	597	234 ²	356 ²		
TE	0.157	Knurled	1	1/2	323	606	562	673	934	820	603 ⁴	766	343 ³	496 ³		

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

¹Except where noted otherwise in this table, the allowable load values shown are for fastenings that have the entire pointed end of the fastener driven through the steel plate.

²Fastener penetration into steel must be a minimum of 7/16 inch.

³Fastener penetration into steel must be a minimum of 3/8 inch.

⁴For steel-to-steel connections designed in accordance with Section 4.1.4, the tabulated allowable load may be increased by a factor of 1.25, and the design strength may be taken as the tabulated allowable load multiplied by a factor of 2.0.

TABLE 6—ALLOWABLE LOADS FOR FASTENERS INSTALLED IN ASTM A572 GRADE 50 OR ASTM A992 STEEL¹ (lbf)

PART NUMBER SERIES	NOMINAL SHANK DIAMETER (inch)	TYPE OF SHANK	MINIMUM SPACING (inch)	MINIMUM EDGE DISTANCE (inch)	ALLOWABLE LOADS (lbf)									
					³ / ₁₆		¹ / ₄		³ / ₈		¹ / ₂		²³ / ₄	
Steel Thickness (inch):					Tension ⁴	Shear	Tension ⁴	Shear	Tension	Shear	Tension	Shear	Tension	Shear
1500K (excluding 1506B)	0.145	Knurled	1	¹ / ₂	260	499	579	725	383 ²	595 ²	—	—	—	—
SP	0.150	Smooth	1	¹ / ₂	356	569	554	637	604 ⁴	602	814 ³	820 ³	243 ⁴	381 ⁴
TE	0.157	Knurled	1	¹ / ₂	442	676	630	662	760 ⁴	725	582 ⁴	532	311 ²	467 ²

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

¹Except where noted otherwise in this table, the allowable load values shown are for fastenings that have the entire pointed end of the fasteners driven through the steel plate.

²Fastener penetration into the steel must be a minimum of ³/₈ inch.

³Fastener penetration into the steel must be a minimum of ¹/₂ inch.

⁴Fastener penetration into the steel must be a minimum of ⁷/₁₆ inch.

⁴For steel-to-steel connections designed in accordance with Section 4.1.4, the tabulated allowable load may be increased by a factor of 1.25, and the design strength may be taken as the tabulated allowable load multiplied by a factor of 2.0.

TABLE 7—ALLOWABLE LOADS FOR FASTENERS DRIVEN INTO CONCRETE MASONRY UNITS^{1,2}

PART NUMBER SERIES	SHANK DIAMETER (inch)	MINIMUM EMBEDMENT (inch)	ALLOWABLE LOADS (lbf)									
			HOLLOW UNGROUTED CMU				GROUT-FILLED CMU					
Masonry Type:			Face Shell ³		Mortar Joint ⁴		Face Shell ³		Mortar Joint ⁴		Top of Grouted Cell ^{3,6}	
Fastener Location:			Tension	Shear ⁷	Tension	Shear ⁵	Tension	Shear ⁷	Tension	Shear ⁵	Tension	Shear ⁷
TE	0.157	1	33	100	42	68	139	145	91	127	165	171

For SI: 1 inch = 25.4 mm, 1 lbf = 4.4 N.

¹See Section 3.6.4 for CMU, mortar and grout requirements.

²Fasteners must be installed a minimum of 5.1 inches from the end of the wall.

³Fasteners must be installed at the center of the CMU cell. No more than one fastener may be installed in an individual CMU cell.

⁴Applicable to fasteners installed in the horizontal mortar joint (bed joint). Minimum fastener spacing must be 5.1 inches.

⁵Allowable shear load value applies to load applied perpendicular to the mortar joint.

⁶Fastener must be installed vertically at the top, center of grouted cell.

⁷Shear load can be in any direction perpendicular to the axis of the fastener.

TABLE 8—ALLOWABLE TENSION AND SHEAR VALUES FOR CEILING CLIP ASSEMBLIES INSTALLED IN NORMALWEIGHT CONCRETE¹

PART NUMBER	NOMINAL SHANK DIAMETER (inch)	MINIMUM EMBEDMENT DEPTH (inches)	MINIMUM SPACING (inches)	MINIMUM EDGE DISTANCE (inches)	ALLOWABLE LOADS (lbf)			
					4000 psi		6000 psi	
Concrete Compressive Strength:					Tension	Shear	Tension	Shear
SDC100	0.145	⁷ / ₈	4	3.2	115	120	—	—
SDC125	0.145	¹ / ₈	4	3.2	130	167	—	—
SPC78	0.150	³ / ₄	5.1	3.2	155	188	150	153
SPC114	0.150/0.180	¹ / ₈	5	3.5	127	226	169	300
TEC100	0.157	⁷ / ₈	5.1	3.5	207	—	—	—

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

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

TABLE 9—ALLOWABLE TENSION AND SHEAR VALUES FOR CEILING CLIP ASSEMBLIES INSTALLED IN MINIMUM 3000 psi SAND-LIGHTWEIGHT CONCRETE FILLED STEEL DECK PANEL ^{1,2,3}

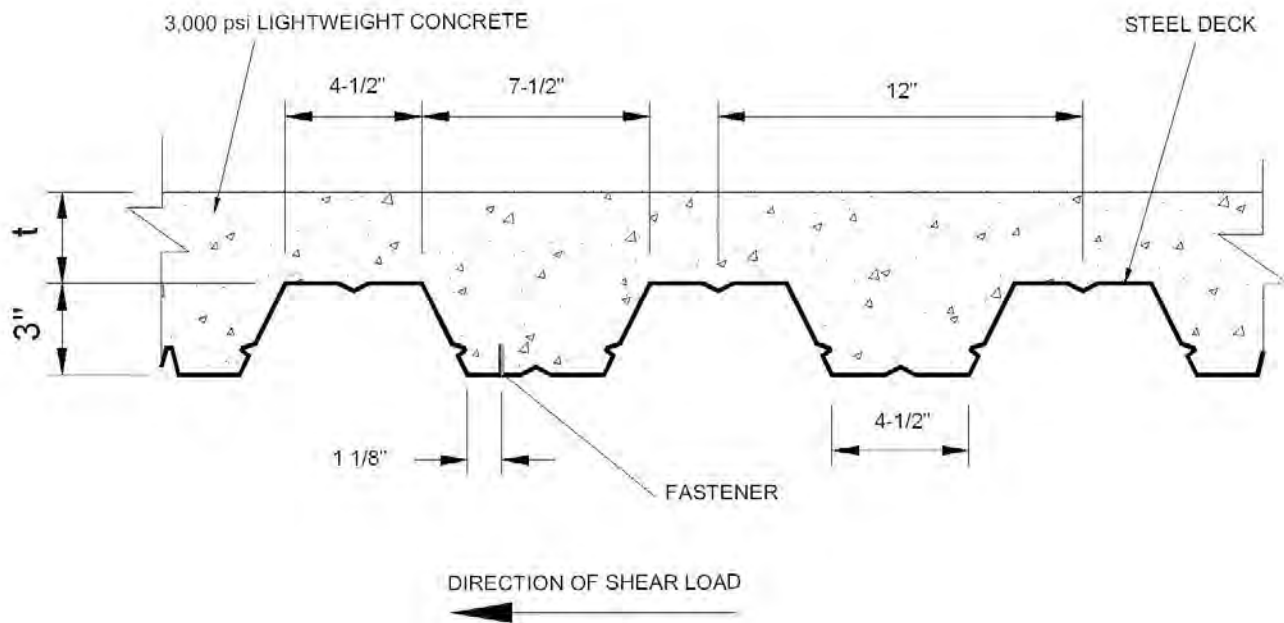
PART NUMBER	NOMINAL SHANK DIAMETER (inch)	MINIMUM EMBEDMENT DEPTH (inches)	MINIMUM SPACING (inches)	ALLOWABLE LOADS (lbf)			
				Lower Flute Tension	Lower Flute Shear	Upper Flute Tension	Upper Flute Shear
Fastener Installation Location and Loading Condition:							
SDC100	0.145	7/8	4	67	237	104	310
SDC125	0.145	1 1/8	4	94	276	106	319
SPC78	0.150	7/8	4	59	202	84	324
SPC114	0.150/0.180	1 1/8	4	157	272	180	334
TEC100	0.157	7/8	5.1	88	—	—	—

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

¹The fasteners must not be driven until the concrete has reached the designated minimum compressive strength. Minimum concrete thickness above the deck must be a minimum of 3 1/2 inches (2 1/4 inches for TEC fasteners).

²For fasteners installed through steel deck, the fastener must be installed through and into the upper or lower flute of the deck with a minimum edge distance of 1 1/8 inches from the edge of the steel deck and 4 inches (5.1 inches for TE fasteners) from the end of the deck panel.

³The steel deck panel must be configured as shown in Figure 1 and have a minimum base-metal thickness of 0.035 inch and minimum yield strength of 50 ksi and a minimum tensile strength of 65 ksi.



For SI: 1 inch = 25.4 mm.

See Tables 4 and 9.

t = 3 1/2" for 1500 and SP Series Fasteners (See Table 4)

t = 3 1/2" for SDC100, SDC125, SPC78, and SPC114 (See Table 9)

t = 2 1/4" for TE Series Fasteners (See Tables 4 and 9)

FIGURE 1—FASTENER INSTALLATION LOCATION IN SAND-LIGHTWEIGHT CONCRETE FILLED 3 INCH DEEP STEEL DECK

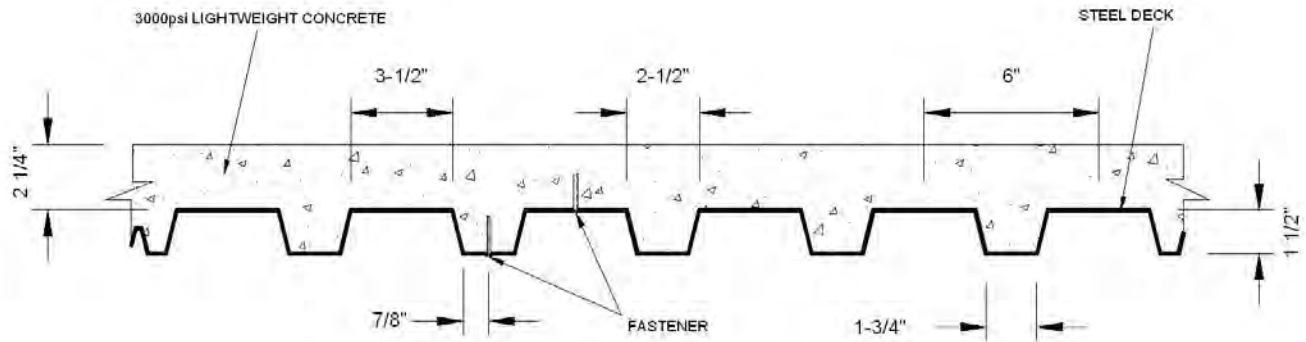


FIGURE 2—FASTENER INSTALLATION LOCATION IN SAND-LIGHTWEIGHT CONCRETE FILLED 1 1/2 INCH DEEP STEEL DECK



TE FASTENERS



ITW RAMSET



ITW BRANDS - DUO-FAST

FIGURE 3—FASTENER MARKING



SDC



SPC

FIGURE 4—RAMSET CEILING CLIP ASSEMBLIES

ICC-ES Evaluation Report

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EVALUATION SUBJECT:

RAMSET AND DUO-FAST POWER-ACTUATED FASTENERS AND CEILING CLIP ASSEMBLIES

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that Ramset and Duo-Fast Power-Actuated Fasteners and Ceiling Clip Assemblies, recognized in ICC-ES master evaluation report ESR-1799, have also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2016 *California Building Code* (CBC)
- 2016 *California Residential Code* (CRC)

2.0 CONCLUSIONS

2.1 CBC:

The Ramset and Duo-Fast Power-Actuated Fasteners and Ceiling Clip Assemblies, described in Sections 2.0 through 7.0 of the master evaluation report ESR-1799, comply with CBC Chapters 19, 19A, 21, 21A, 22, and 22A, provided the design and installation are in accordance with the 2015 *International Building Code*® provisions noted in the master report and the additional requirements of CBC Chapters 16, 16A, 17, 17A, 19, 19A, 21, 21A, 22 and 22A, as applicable.

2.2 CRC:

The Ramset and Duo-Fast Power-Actuated Fasteners and Ceiling Clip Assemblies, described in Sections 2.0 through 7.0 of the master evaluation report ESR-1799, comply with the CRC, provided the design and installation are in accordance with the 2015 *International Residential Code*® provisions noted in the master report.

This supplement expires concurrently with the master report, reissued June 2017.