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RESEARCH REPORT: RR 25931
(CSI # 03 16 00, 05 05 23, 09 22 16.23)

BASED UPON ICC ES EVALUATION
REPORT NO. ESR-1995

REEVALUATION DUE
DATE: April 1, 2015
Issued date: April 1, 2013
Code: 2011 LABC

GENERAL APPROVAL – Reevaluation - Powers 8mm Head Spiral CSI Pin, 10mm Head Drive Pin Power Driven Fasteners, and 8mm Head Spiral CSI Pin & Ceiling Clip Assembly.

DETAILS

The above assemblies and/or products are approved when in compliance with the description, use, identification and findings of Report No. ESR-1995, reissued September 1, 2011, revised October 2011, of the ICC Evaluation Service, Incorporated. The report, in its entirety, is attached and made part of this general approval.

The parts of Report No.ESR-1995 which are excluded on the attached copy have been removed by the Los Angeles City Building Department as not being included in this approval.

The approval is subject to the following conditions:

1. The fasteners or ceiling clip assemblies shall not be used to resist seismic loads, except for fasteners used with architectural, electrical, and mechanical components described in Section 13.1.4 of ASCE 7 per condition 5.4 of the attached Evaluation Service Report.
2. The fasteners may also be used to anchor non-building components including but not limited to drywall tracks, sprinkler pipes, furniture, cabinets, sheet metal duct work, electrical conduits, cable trays, cables, lighting, wood sill plates, acoustical ceiling, light gauge framing, and non-bearing-non-structural interior partitions.

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Powers Fasteners, Inc.

Re: Powers 8mm Head Spiral CSI Pin, 10mm Head Drive Pin Power Driven Fasteners, and 8mm Head Spiral CSI Pin & Ceiling Clip Assembly

3. The minimum concrete thickness shall be three times the embedment depth of the fastener and the minimum spacing between fasteners must be 4 inches on center for the 8mm Head Spiral CSI Pins and 5-1/2 inches on center for the 10mm Head Drive Pins, and minimum edge distance must be 3-1/2.
Installation into structural sand lightweight concrete filled steel decks shall comply with Figures 1A, 1B, and 1C of the attached Evaluation Service Report.
4. When the fasteners are installed in steel, minimum spacing between fasteners must be 1 inch and minimum edge distance must be 0.5 inch.
5. The allowable values listed in the attached report and tables are for the fasteners only. Connected members shall be checked for their capacity (which may govern).
6. The fasteners shall be installed per the manufacturer's instructions, a copy of which shall be available at each job site. Installation is limited to dry, interior locations.

DISCUSSION

The report is in compliance with the 2011 Los Angeles City Building Code.

The approval is based on tests in accordance with ICC-ES Acceptance Criteria for Fasteners Power-driven into Concrete, Steel and Masonry Elements (AC70), dated October 2011.

This general approval will remain effective provided the Evaluation Report is maintained valid and unrevised with the issuing organization. Any revisions to the report must be submitted to this Department for review with appropriate fee to continue the approval of the revised report.

Addressee to whom this Research Report is issued is responsible for providing copies of it, complete with any attachments indicated, to architects, engineers and builders using items approved herein in design or construction which must be approved by Department of Building and Safety Engineers and Inspectors.

Powers Fasteners, Inc.

Re: Powers 8mm Head Spiral CSI Pin, 10mm Head Drive Pin Power Driven Fasteners, and 8mm Head Spiral CSI Pin & Ceiling Clip Assembly

This general approval of an equivalent alternate to the Code is only valid where an engineer and/or inspector of this Department has determined that all conditions of this Approval have been met in the project in which it is to be used.

ALLEN PEERY, Chief
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RJG
RR25651/MSWord2010
R04/12/13
5A1/5C2/104.2.6/13.1.4 ASCE7-05

Attachment: ICC ES Evaluation Report No. ESR-1995 (6 Pages)

ICC-ES Evaluation Report

ESR-1995*

Reissued September 1, 2011

This report is subject to renewal in two years.

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DIVISION: 03 00 00—CONCRETE
Section: 03 16 00—Concrete 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:
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(914) 235-6300 or (800) 524-3244
www.powers.com
engineering@powers.com
EVALUATION SUBJECT:
POWERS 8 mm HEAD SPIRAL CSI PIN and 10 mm HEAD DRIVE PIN POWER-DRIVEN FASTENERS; AND 8 mm HEAD SPIRAL CSI PIN AND CEILING CLIP ASSEMBLY
ADDITIONAL LISTEE:
MAX CO., LTD.
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JAPAN
03-3669-8131
intusa@max-ltd.co.jp
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

The Powers 8 mm Head Spiral CSI Pin and the 10 mm Head Drive Pin power-driven fasteners are used to attach building elements, such as wood and light gage steel, to uncracked, normal-weight and structural sand-lightweight concrete, steel decks with structural sand-lightweight concrete fill 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. They are also alternatives to standard bolts used to attach materials to structural steel described in IBC Section 2204.2. The 8 mm Head Spiral CSI Pin and ceiling clip assembly is used to attach wire for suspended ceilings to the supporting structure above. The fasteners and ceiling clip assemblies may be used under the IRC where an engineered design is submitted in accordance with IRC Section R301.1.3.

3.0 DESCRIPTION
3.1 Fasteners:

Powers 8 mm Head Spiral CSI Pin and 10 mm Head Drive Pin power-driven fasteners are manufactured from carbon steel complying with the manufacturer's quality documentation. See Figure 2 for images of the fasteners.

3.1.1 8 mm Head Spiral CSI Pin: The fasteners are power-driven pins manufactured from carbon steel conforming to ASTM A 510, Grade 1060, and austempered to a Rockwell C nominal core hardness of 51 to 55. The fasteners are zinc-plated in accordance with ASTM B 695, Class 5, Type 1, with a minimum coating thickness of 0.0002 inch (0.005 mm), and have spiral shanks. The fasteners have a head diameter of 8 millimeters (0.32 inch) and a shank diameter of 0.157 inch (4.0 mm) and are available in lengths ranging from ⁵/₈ inch to 2⁷/₈ inches (15.9 to 73 mm). The fasteners are available in boxes of individual pins or in collated strips.

3.1.2 10 mm Head Drive Pin: The fasteners are power-driven pins manufactured from carbon steel conforming to ASTM A 510, Grade 1060, and austempered to a Rockwell C nominal core hardness of 53-55. The fasteners are zinc-plated in accordance with ASTM B 695, Class 5, Type 1, with a minimum coating thickness of 0.0002 inch (0.005 mm), and have smooth straight shanks. The fasteners have a head diameter of 10 millimeters (0.39 inch) and a shank diameter of 0.177 inch (4.5 mm) and are available in lengths ranging from ³/₄ inch to 3¹/₄ inches (19 to 82 mm). The 10 mm Head Drive Pin fasteners are also sold by Max Company, Ltd., and are labeled as Powerlite 10 mm Head Drive Pins.

*Revised October 2011

3.2 8 mm Head Spiral CSI Pin Ceiling Clip Assembly:

The 8 mm head Spiral CSI ceiling clip assemblies are preassembled and consist of a power-driven fastener with a steel angle clip. Pins are described in Section 3.1.1 of this report. Clips have a 90-degree angle and are manufactured from 0.079-inch-thick (2.0 mm) steel conforming to SAE J403, Grade 1010-1020. The clips are zinc-plated in accordance with ASTM B 695, Class 5, Type 1, with a minimum coating thickness of 0.0002 inch (0.005 mm). See Figure 2.

3.3 Substrate Materials:

3.3.1 Concrete: Uncracked normal-weight and structural sand-lightweight concrete must conform to 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 the tables of this report.

3.3.2 Steel: Structural steel must comply with ASTM A 36, ASTM A 572, Grade 50, or ASTM A 992 as shown in the tables in this report, and must have a minimum thickness of $3/16$ inch (4.8 mm). Steel deck panel properties and configurations must be as described in the footnotes to Tables 4 and 5.

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 General: The allowable shear and tension loads for the fasteners installed in normal-weight concrete, structural sand-lightweight concrete, structural sand-lightweight concrete filled steel deck, and steel base materials can be found in Tables 1, 3, 4, 6 and 7. The allowable shear, tension and 45-degree loads for the ceiling clip assemblies installed in normal-weight concrete, structural sand-lightweight concrete filled steel deck and steel base materials, can be found in Tables 2, 5 and 8.

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. Except for fasteners used with architectural, electrical and mechanical components described in Section 13.1.4 of ASCE/SEI 7 as exempt from seismic design requirements, use of fasteners to resist earthquake loads is beyond the scope of this report.

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

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

where:

- ρ = 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 Steel or Concrete: Reference lateral design values for nails with diameters equal to or less than the diameter of the 8 mm Head Spiral CSI Pin or the 10 mm Head Drive Pin as applicable, and penetration into the main member of 10 times the shank diameter, determined in accordance with Part 11 and Table 11N of ANSI/AF&PA NDS, are applicable to the 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 shank diameter of the fasteners.

4.2 Installation:

4.2.1 General: The Powers 8 mm Head Spiral CSI Pin, 10 mm Head Drive Pin power-driven fasteners and 8 mm

head Spiral CSI Pin ceiling clip assembly must be installed in accordance with this report and the manufacturer's published installation instructions. A copy of the instructions must be available on the jobsite at all times during installation. Installation is limited to dry, interior locations.

Fastener placement requires the use of a low-velocity powder-actuated tool used in accordance with Powers published installation instructions.

4.2.2 Fastening to Concrete: Fasteners must be driven into the concrete after the concrete attains the specified compressive strength. Minimum spacing between fasteners must be 4 inches (102 mm) on center for the 8 mm Head Spiral CSI Pins and $5\frac{1}{2}$ inches (140 mm) on center for the 10 mm Head Drive Pins, and minimum edge distance must be $3\frac{1}{2}$ inches (89 mm). Concrete thickness must be a minimum of three times the embedment depth of the fastener.

4.2.3 Fastening to Structural Lightweight Concrete Filled Steel Deck: Installation into structural sand-lightweight concrete filled steel decks, including deck configuration, concrete thickness, spacing and edge distances for fasteners must comply with Figures 1A, 1B and 1C, as applicable, and the applicable footnotes to Tables 4 and 5.

4.2.4 Fastening to Steel: When installed in steel, minimum spacing between fasteners must be 1 inch (25.4 mm) and minimum edge distance must be 0.5 inch (12.7 mm).

5.0 CONDITIONS OF USE

The Powers 8 mm Head Spiral CSI Pin and 10 mm Head Drive Pin power-driven fasteners and the 8 mm Head Spiral CSI Pin ceiling clip assembly 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 products must be identified and installed in accordance with this report and the manufacturer's published installation instructions. In the event of conflict between this report and the manufacturer's published installation instructions, this report governs.
- 5.2** 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 to be constructed.
- 5.3** Allowable tension, shear and 45° 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.
- 5.4** Except for fasteners used with architectural, electrical and mechanical components described in Section 13.1.4 of ASCE/SEI 7 as exempt from seismic design requirements, use of fasteners to resist earthquake loads is beyond the scope of this report.
- 5.5** Use of fasteners is limited to dry, interior locations.
- 5.6** The use of fasteners is limited to installation in uncracked concrete. Cracking occurs when $f_t > f_r$ due to service loads or deformations.
- 5.7** 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 2011.

7.0 IDENTIFICATION

Each fastener is identified by a “P” stamped onto the head of the fastener, as shown in Figure 2. Each package of fasteners and ceiling clip assemblies is labeled with the report holder or listee name (Powers Fasteners, Inc., or Max Co., Ltd.), as applicable and the fastener catalog number, length and diameter, and evaluation report number (ESR-1995).

8.0 OTHER CODES

8.1 Scope:

In addition to the 2009 IBC and IRC, the products 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 Powers 8 mm Head Spiral CSI Pin and 10 mm Head Drive Pin power-driven 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. They are also alternatives to bolts used to attach materials to structural steel. The 8 mm Head Spiral CSI Pin and ceiling clip assembly is used to attach wire for suspended ceilings to the supporting structure above. ~~The fasteners and ceiling clip assemblies may be used where an engineered design is submitted in accordance with 2006 and 2003 IRC Section R301.1.3.~~ *

8.3 Description:

8.3.1 Fasteners: See Section 3.1.

8.3.2 Substrate Materials:

* **8.3.2.1 Concrete:** See Section 3.2.1. ~~Under the UBC, concrete must conform to Section 1903.~~

8.3.2.2 Steel Substrates: See Section 3.2.2.

8.4 Design and Installation:

8.4.1 Design: See Section 4.1. ~~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.~~ Except for fasteners used with architectural, electrical and mechanical components as described in ~~Section 9.6.1 of ASCE/SEI 7-02 (2003 IBC and 2003 IRC)~~ or Section 13.1.4 of ASCE/SEI 7-05 (2006 IBC and ~~2006 IRC~~), use of fasteners to resist earthquake loads is outside the scope of this report.

* **8.4.1.1 Wood to Steel or Concrete:** See Section 4.1.1. Reference lateral design values for fasteners determined in accordance with Part 11 of ANSI/AF&PA NDS (2006 & ~~2003 IBC and 2006 & 2003 IRC~~) or ~~Section 2318.3 of the UBC, as applicable,~~ are applicable to the 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 2 through 8. The stress increases and load reductions described in Section 1605.3 of the ~~2003 and 2006 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 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 9.6.1 of ASCE/SEI 7-02 (2003 IBC and IRC) or Section 13.1.4 of ASCE/SEI 7-05 (2006 IBC and IRC)~~, as applicable, 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 into Concrete, Steel and Masonry Elements (AC70), dated October 2006.

8.7 Identification:

See Section 7.0.

TABLE 1—ALLOWABLE LOADS FOR FASTENERS INSTALLED IN NORMAL-WEIGHT CONCRETE (lbf)^{1,2,3,4,5}

| FASTENER DESCRIPTION | SHANK DIAMETER (inch) | MINIMUM EMBEDMENT (inches) | MINIMUM CONCRETE COMPRESSIVE STRENGTH, <i>f</i> _c | | | | | |
|--------------------------|-----------------------|-------------------------------|--|-------|-----------|-------|-----------|-------|
| | | | 2,500 psi | | 3,000 psi | | 4,500 psi | |
| | | | Tension | Shear | Tension | Shear | Tension | Shear |
| 8 mm Head Spiral CSI Pin | 0.157 | ³ / ₄ | 120 | 170 | 130 | 190 | – | – |
| | | 1 | 195 | 245 | 225 | 280 | – | – |
| | | 1 ¹ / ₄ | 310 | 385 | 340 | 420 | – | – |
| 10 mm Head Drive Pin | 0.177 | ³ / ₄ | 70 | 95 | – | – | 70 | 100 |
| | | 1 ¹ / ₄ | 215 | 210 | – | – | 160 | 170 |

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

¹The fasteners must not be driven until the concrete has reached the minimum designated compressive strength.

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

³The allowable tension and shear values are for the fasteners only. Steel or wood members connected to the concrete must be investigated for compliance with the applicable code.

⁴Earthquake load resistance is outside the scope of this report, except as noted in Sections 4.1.1, 5.4 and 8.5.2 of this report.

* ⁵The stress increases described in Section 1605.3.2 of the IBC, and ~~Section 1612.3.2 of the UBC,~~ are not allowed for wind loads acting alone or when combined with gravity loads. No increase is allowed for vertical loads acting alone.

TABLE 2—ALLOWABLE LOADS FOR CEILING CLIP ASSEMBLIES INSTALLED IN NORMAL-WEIGHT CONCRETE^{1,2,3,4}

| FASTENER DESCRIPTION | SHANK DIAMETER (inch) | MINIMUM EMBEDMENT (inch) | MINIMUM CONCRETE COMPRESSIVE STRENGTH, <i>f</i> _c | | |
|--|-----------------------|--------------------------|--|-----------|-------------|
| | | | 3,000 psi | | |
| | | | Tension (lbf) | 45° (lbf) | Shear (lbf) |
| 8 mm Head Spiral CSI Pin Ceiling Clip Assembly | 0.157 | 3/4 | 100 | 130 | 175 |
| | | 1 | 170 | 215 | 230 |

For **SI**: 1 lbf = 4.448 N, 1 inch = 25.4 mm, 1 psi = 6.897 kPa.

¹The fasteners must not be driven until the concrete has reached its minimum design compressive strength.

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

³Earthquake load resistance is outside the scope of this report, except as noted in Section 4.1.1, 5.4 and 8.5.2 of this report.

* ⁴The stress increases described in Section 1605.3.2 of the IBC, and ~~Section 1612.3.2 of the UBC~~, are not allowed for wind loads acting alone or when combined with gravity loads. No increase is allowed for vertical loads acting alone.

TABLE 3—ALLOWABLE LOADS FOR FASTENERS INSTALLED IN STRUCTURAL SAND-LIGHTWEIGHT CONCRETE WITH *f*_c = 3,000 psi (lbf)^{1,2,3,4,5}

| FASTENER DESCRIPTION | SHANK DIAMETER (inch) | MINIMUM EMBEDMENT (inches) | TENSION | SHEAR |
|--------------------------|-----------------------|----------------------------|---------|-------|
| 8 mm Head Spiral CSI Pin | 0.157 | 1 | 155 | 180 |
| 10 mm Head Drive Pin | 0.177 | 1 1/4 | 195 | 205 |
| | | 1 5/8 | 410 | 395 |

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

¹The fasteners must not be driven until the concrete has reached the minimum designated compressive strength.

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

³The allowable tension and shear values are for the fasteners only. Steel or wood members connected to the concrete must be investigated for compliance with the applicable code.

⁴Earthquake load resistance is outside the scope of this report, except as noted in Sections 4.1.1, 5.4 and 8.5.2 of this report.

* ⁵The stress increases described in Section 1605.3.2 of the IBC, and ~~Section 1612.3.2 of the UBC~~, are not allowed for wind loads acting alone or when combined with gravity loads. No increase is allowed for vertical loads acting alone.

TABLE 4—ALLOWABLE LOADS FOR FASTENERS INSTALLED THROUGH STEEL DECK PANEL INTO STRUCTURAL SAND-LIGHTWEIGHT CONCRETE WITH *f*_c = 3,000 psi (lbf)^{1,2,3,7,8,11}

| FASTENER DESCRIPTION | SHANK DIAMETER (inch) | MINIMUM EMBEDMENT (inches) | 3-INCH-DEEP COMPOSITE STEEL DECK PANEL ⁹ | | | | 1 1/2-INCH-DEEP COMPOSITE STEEL DECK PANEL ¹⁰ | |
|--------------------------|-----------------------|----------------------------|---|--------------------------|--|--|--|-------------|
| | | | Installation in Upper Flute | | Installation in Lower Flute ⁴ | | Installation in Upper or Lower Flute ⁴ | |
| | | | Tension (lbf) | Shear ⁵ (lbf) | Tension (lbf) | Shear Towards Free Edge ⁵ (lbf) | Tension (lbf) | Shear (lbf) |
| 8 mm Head Spiral CSI Pin | 0.157 | 1 | 120 | 305 | 120 | 305 | 200 | 410 |
| | | 1 1/4 | 260 | 545 | 140 | 370 | 210 | 415 |
| | | 1 1/2 | 260 | 545 | 225 | 450 | - | - |
| 10 mm Head Drive Pin | 0.177 | 1 1/4 | 285 | 425 | 145 | 270 ⁶ | - | - |
| | | 1 5/8 | 315 | 485 | 170 | 280 ⁶ | - | - |

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

¹The fasteners must not be driven until the concrete has reached the minimum designated compressive strength.

²The allowable tension and shear values are for the fasteners only. Steel or wood members connected to the concrete must be investigated for compliance with the applicable code.

³The tabulated allowable load values are applicable to fasteners installed through the underside of a steel deck into structural sand-lightweight concrete.

⁴For fasteners installed into the lower flute of the deck, the minimum edge distance is as shown in Figure 1A, 1B or 1C, as applicable.

⁵Shear loads for fasteners installed through steel deck panels into structural sand-lightweight concrete may be applied in any direction.

⁶The tabulated allowable shear load values for these fasteners may be increased to 315 pounds when loading in shear is parallel to the edge of the flute.

⁷Earthquake load resistance is outside the scope of this report, except as noted in Sections 4.1.1, 5.4 and 8.5.2 of this report.

* ⁸The stress increases described in Section 1605.3.2 of the IBC and ~~Section 1612.3.2 of the UBC~~, are not allowed for wind loads acting alone or when combined with gravity loads. No increase is allowed for vertical loads acting alone.

⁹The steel deck panel must have a minimum base-metal thickness of 0.034 inch, a yield strength of 40 ksi, and must conform to dimensions shown in Figure 1A. Structural lightweight concrete fill depth must be a minimum of 3 1/4 inches above the deck.

¹⁰The steel deck panel must have a minimum base-metal thickness of 0.034 inch, a yield strength of 40 ksi, and must conform to dimensions shown in Figure 1B or 1C as applicable. For fastener installation in lower flute, structural lightweight concrete fill depth must be a minimum of 2 1/4 inches above the deck as shown in Figure 1B. For fastener installation in upper flute, structural lightweight concrete fill depth must be a minimum of 3 1/2 inches above the deck as shown in Figure 1C.

¹¹Minimum spacing between fasteners must be 4 inches on center for 8 mm Head Spiral CSI Pins and 5 1/2 inches for 10 mm Head Drive Pins.

TABLE 5—ALLOWABLE SERVICE LOADS FOR CEILING CLIP ASSEMBLIES INSTALLED THROUGH STEEL DECK PANEL INTO STRUCTURAL SAND-LIGHTWEIGHT CONCRETE WITH $f_c = 3,000$ psi (lbf)^{1,2,5,6}

| FASTENER DESCRIPTION | SHANK DIAMETER (inch) | MINIMUM EMBEDMENT (inches) | 3-INCH DEEP COMPOSITE STEEL DECK PANEL ³ | | |
|--|-----------------------|----------------------------|---|-----------|--------------------------|
| | | | Tension (lbf) | 45° (lbf) | Shear ⁴ (lbf) |
| 8 mm Head Spiral CSI Pin Ceiling Clip Assembly | 0.157 | 1 | 75 | 105 | 295 |

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

¹The fasteners must not be driven until the concrete has reached the minimum designated compressive strength.

²The tabulated allowable load values are applicable to fasteners installed through the underside of a steel deck into structural sand-lightweight concrete. The steel deck must have a minimum base-metal thickness of 0.034 inch, and a yield strength of 40 ksi, and must conform to dimensions shown in Figure 1A. Structural lightweight concrete fill depth must be a minimum of 3 inches above the deck.

³For fasteners installed into the lower flute of the deck, minimum spacing between fasteners must be 4 inches and the minimum edge distance must be 1 1/8 inches from the edge of the deck rib.

⁴Shear loads for fasteners installed through steel deck into structural sand-lightweight concrete may be applied in any direction.

⁵Earthquake load resistance is outside the scope of this report, except as noted in Sections 5.4 and 8.5.2 of this report.

* ⁶The stress increases described in Section 1605.3.2 of the IBC and ~~Section 1612.3.2 of the UBC~~, are not allowed for wind loads acting alone or when combined with gravity loads. No increase is allowed for vertical loads acting alone.

TABLE 6—ALLOWABLE LOADS FOR FASTENERS INSTALLED IN ASTM A 36 STEEL (lbf)^{1,4,5}

| FASTENER DESCRIPTION | SHANK DIAMETER (inch) | STEEL THICKNESS (inch) | | | | | | | | | |
|-------------------------|-----------------------|------------------------|-------|-------------------|-------|------------------|-------|------------------|-------|------------------|-------|
| | | 1/8 ² | | 3/16 ² | | 1/4 ² | | 3/8 ² | | 1/2 ³ | |
| | | Tension | Shear | Tension | Shear | Tension | Shear | Tension | Shear | Tension | Shear |
| 8mm Head Spiral CSI Pin | 0.157 | 280 | 540 | 515 | 585 | 735 | 535 | 615 | 495 | 535 | 565 |
| 10 mm Head Drive Pin | 0.177 | – | – | 95 | 545 | 150 | 545 | 245 | 755 | 640 | 600 |

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

¹The allowable tension and shear values are for the fasteners only. Steel or wood members connected to the steel must be investigated for compliance with the applicable code.

²Fasteners must be driven to obtain full embedment with the point of the fastener penetrating through the steel base material.

³The fasteners must be embedded a minimum of 0.50 inch into the steel.

⁴Earthquake load resistance is outside the scope of this report, except as noted in Sections 4.1.1, 5.4 and 8.5.2 of this report.

* ⁵The stress increases described in Section 1605.3.2 of the IBC and ~~Section 1612.3.2 of the UBC~~, are not allowed for wind loads acting alone or when combined with gravity loads. No increase is allowed for vertical loads acting alone.

TABLE 7—ALLOWABLE LOADS FOR FASTENERS INSTALLED IN ASTM A 572 GRADE 50 OR ASTM A 992 STEEL (lbf)^{1,4,5}

| FASTENER DESCRIPTION | SHANK DIAMETER (inch) | STEEL THICKNESS (inch) | | | | | | | | | |
|-------------------------|-----------------------|------------------------|-------|-------------------|-------|------------------|---------|------------------|-------|------------------|-------|
| | | 1/8 ² | | 3/16 ² | | 1/4 ² | | 3/8 ² | | 1/2 ³ | |
| | | Tension | Shear | Tension | Shear | Tension | Tension | Tension | Shear | Tension | Shear |
| 8mm Head Spiral CSI Pin | 0.157 | 325 | 510 | 550 | 630 | 795 | 580 | 660 | 535 | 580 | 610 |
| 10 mm Head Drive Pin | 0.177 | – | – | 215 | 650 | 295 | 735 | 355 | 785 | – | – |

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

¹The allowable tension and shear values are for the fasteners only. Steel or wood members connected to the steel must be investigated for compliance with the applicable code.

²Fasteners must be driven to obtain full embedment with the point of the fastener penetrating through the steel base material.

³The fasteners must be embedded a minimum of 0.50 inch into the steel.

⁴Earthquake load resistance is outside the scope of this report, except as noted in Sections 4.1.1, 5.4 and 8.5.2 of this report.

* ⁵The stress increases described in Section 1605.3.2 of the IBC and ~~Section 1612.3.2 of the UBC~~, are not allowed for wind loads acting alone or when combined with gravity loads. No increase is allowed for vertical loads acting alone.

TABLE 8—ALLOWABLE LOADS FOR CEILING CLIP ASSEMBLIES INSTALLED INTO ASTM A 36, ASTM A 572 GRADE 50 OR ASTM A 992 STEEL (lbf)^{1,2,3}

| FASTENER DESCRIPTION | SHANK DIAMETER (inch) | STEEL THICKNESS (inch) | | |
|--|-----------------------|------------------------|-----------|--------------------------|
| | | 1/4 | | |
| | | Tension (lbf) | 45° (lbf) | Shear ⁴ (lbf) |
| 8 mm Head Spiral CSI Pin Ceiling Clip Assembly | 0.157 | 350 | 390 | 420 |

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

¹Fasteners must be driven to obtain the minimum embedment with the point of the fastener point penetrating through the steel base material.

²Earthquake load resistance is outside the scope of this report, except as noted in Sections 4.1.1, 5.4 and 8.5.2 of this report.

* ³The stress increases described in Section 1605.3.2 of the IBC and ~~Section 1612.3.2 of the UBC~~, are not allowed for wind loads acting alone or when combined with gravity loads. No increase is allowed for vertical loads acting alone.

⁴Shear loads for fasteners installed in steel may be applied in any direction.

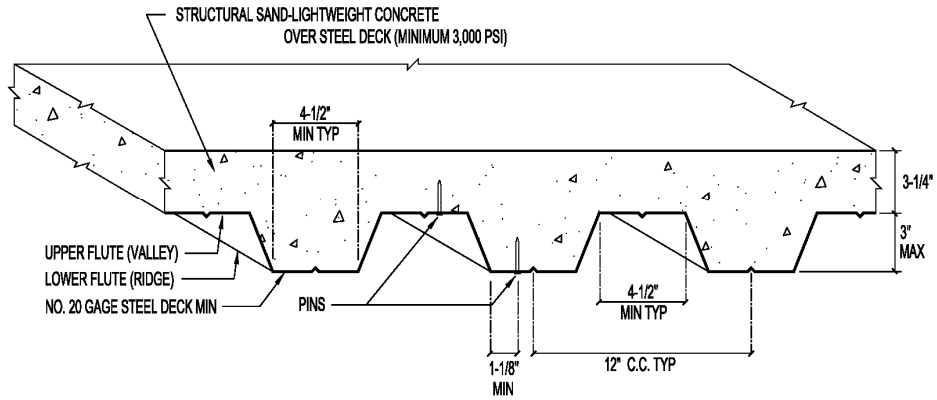


FIGURE 1A—FASTENER INSTALLATION IN UPPER AND LOWER FLUTES OF 3-INCH-DEEP STEEL DECK PROFILES

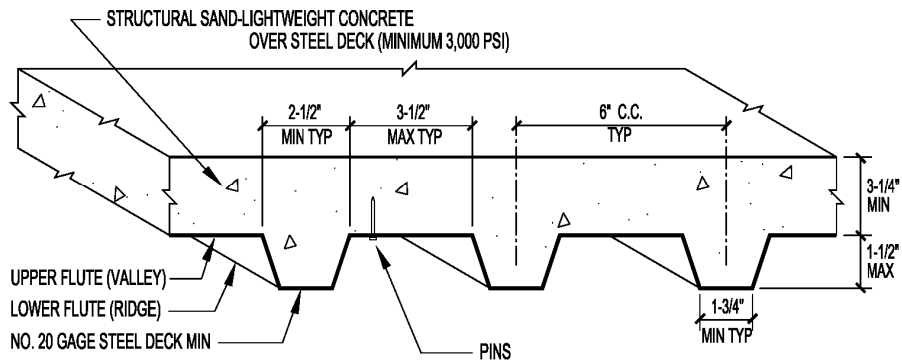


FIGURE 1B—FASTENER INSTALLATION IN UPPER FLUTES OF 1 1/2-INCH-DEEP STEEL DECK PROFILES

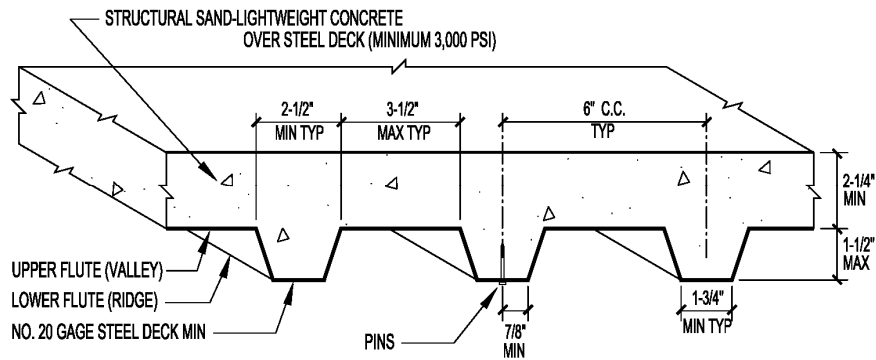


FIGURE 1C—FASTENER INSTALLATION IN LOWER FLUTES OF 1 1/2-INCH-DEEP STEEL DECK PROFILES

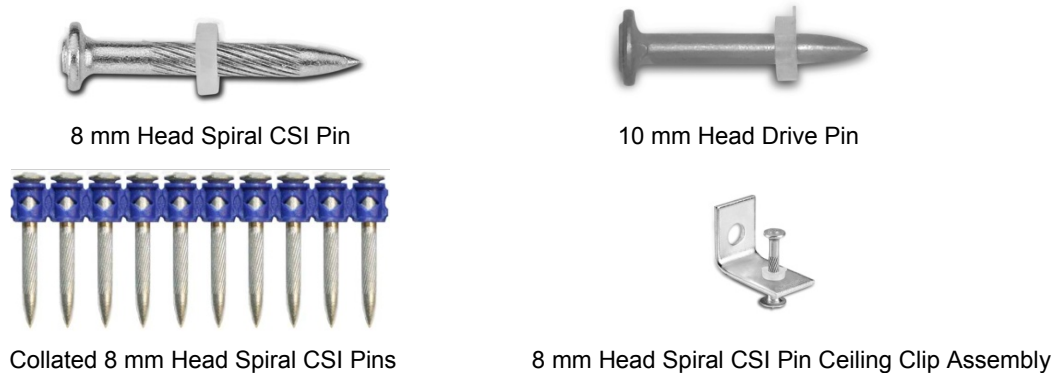


FIGURE 2—FASTENER TYPES