ICC EVALUATION SERVICE

ICC-ES Evaluation Report

ESR-2236

Reissued January 2020
Revised July 2020
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DIVISION: 06 00 00—WOOD, PLASTICS, AND COMPOSITES
Section: 06 05 23—Wood, Plastic, and Composite Fastenings

REPORT HOLDER:

SIMPSON STRONG-TIE COMPANY INC.

EVALUATION SUBJECT:

SIMPSON STRONG-DRIVE SDS SCREWS

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2018, 2015, 2012, 2009 and 2006 *International Building Code*® (IBC)
- 2018, 2015, 2012, 2009 and 2006 *International Residential Code*® (IRC)

For evaluation for compliance with codes adopted by Los Angeles Department of Building and Safety (LADBS), see ESR-2236 LABC and LARC Supplement.

Properties evaluated:

- Structural
- Corrosion Resistance

2.0 USES

The Simpson Strong-Drive SDS screws described in this report are used for steel-to-wood and wood-to-wood connections that are designed in accordance with the IBC and IRC. Screws having the proprietary Double Barrier Coating may be used where fasteners are required to exhibit corrosion resistance when exposed to adverse environmental conditions and/or in chemically treated wood (subject to the limitations of Sections 4.2, 5.2 and Table 6), and are alternates to hot-dip zinc galvanized fasteners with a coating weight in compliance with ASTM A153, Class D. Screws having the proprietary Double Barrier Coating have been evaluated for use with wood chemically treated with waterborne alkaline copper quaternary, Type D (ACQ-D).

3.0 DESCRIPTION

3.1 General:

The SDS screws are manufactured using a standard cold-forming process, and consist of either heat-treated carbon steel or type 316L stainless steel. The screws have rolled threads, spaced 10 threads per inch (0.393 thread per millimeter), a plain (unslotted) hex washer head, and either a Type 17 drill (fluted) point or a proprietary four-cut (square-shank) point. The length of threads is approximately equal to two-thirds of the nominal screw length. The screws' major and minor diameters are 0.250 inch and 0.185 inch (6.4 mm and 4.7 mm), respectively, and the unthreaded shank diameter is 0.242 inch (6.1 mm). Table 1 provides a description of screws recognized in this report, and specifies the screws' nominal bending yield strength and allowable tensile and shear loads. See Figure 1 for a diagram of the SDS screw.

3.2 Materials:

3.2.1 SDS Screws: The SDS screws are manufactured from SAE J403 low-carbon steel wire, grade 1022; SAE J403 low-carbon-alloy steel wire, grade 10B21, or from type 316L stainless steel wire complying with ASTM A493. The carbon steel screws have either a type 17 point or a four-cut point. The carbon steel screws have either a yellow zinc finish or a proprietary coating that is identified as a Double Barrier Coating. The screws can be supplied with a hot-dipped galvanized (HDG) coating having a minimum average zinc coating thickness of 0.0021 inch (0.053 mm) and a minimum individual zinc coating thickness of 0.0017 inch (0.043 mm) in accordance with ASTM A153, Class D.

3.2.2 Wood Members: Wood members may be either sawn lumber having an assigned specific gravity of 0.50 or greater, or engineered wood (e.g. LVL, PSL, LSL) having a minimum *E* value of 0.8E for lateral loading and 1.55E for withdrawal loading. The engineered wood must be recognized in an ICC-ES evaluation report and must have a minimum equivalent specific gravity of 0.50. Assigned specific gravity for sawn lumber and wood structural panels must be determined in accordance with Tables 12.3.3A and 12.3.3B, respectively, of the 2018 and 2015 ANSI/AWC National Design Specification (NDS) for Wood Construction (Tables 11.3.3A and 11.3.3B of NDS-12 for the 2012 IBC; Tables 11.3.2A and 11.3.2B of NDS-05 for the 2009 and 2006 IBC). Sawn lumber members must have a moisture content of less than 19 percent both at time of screw installation, and in service. For engineered wood, the moisture content at the time of screw installation and in service must be in accordance with the applicable ICC-ES evaluation report on the engineered wood product. The thickness of the wood main member, t_m, must be equal to or greater than the screw length less the thickness of the side member. For wood-to-wood connections, the

actual thickness of the wood side member, t_s, must be either $1^1/_2$ or $1^3/_4$ inches (38.1 or 44.5 mm), as specified in Table 3. The wood side member thickness is an actual value, and is not a minimum or maximum value.

3.2.3 Steel Members: Steel side members must have a minimum tensile strength, F_u, equal to 45 ksi (310.1 MPa) when the steel member design thickness (base-metal thickness exclusive of any coatings) is from 0.0584 inch to 0.1795 inch (1.5 to 4.5 mm), i.e., Nos. 16 gage to 7 gage, and a minimum F_u equal to 52 ksi (358.3 MPa) when the steel member design thickness is 0.2405 inch (6.1 mm), i.e., No. 3 gage. The hole in the steel side member for the SDS screw must be predrilled or prepunched, and must have a standard round hole diameter no greater than 0.273 inch (6.9 mm) in diameter when the steel member thickness is from 0.0584 to 0.1795 inch (1.48 to 4.56 mm), and no greater than 0.305 inch (7.6 mm) in diameter when the steel member thickness is 0.2405 inch (6.1 mm). Hole sizes may deviate from these limitations when the screws are recognized in a current evaluation report for use with a specific steel member with larger holes.

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 General: Reference lateral and withdrawal design values in the report are for allowable stress design, and must be multiplied by all applicable adjustment factors, as applicable to wood screws, in accordance with the NDS to determine adjusted design values. When designing a connection, the structural members must be checked for load-carrying capacity in accordance with Section 11.1.2 of the NDS (Section 10.1.2 of NDS-12 and NDS-05 for the 2012, 2009 and 2006 IBC), and local stresses within multiple-fastener connections must be checked against Appendix E of the NDS to ensure the capacity of the connection and fastener group. Connections containing multiple screws must also be designed in accordance with Sections 11.2.2 and 12.6 of the NDS (Sections 10.2.2 and 11.6 of NDS-12 and NDS-05 for the 2012, 2009 and 2006 IBC). Where the screws are subjected to combined lateral and withdrawal loads, connections must be designed in accordance with Section 12.4.1 of the NDS (Section 11.4.1 of NDS-12 and NDS-05 for the 2012, 2009 and 2006 IBC). Design of connections having steel side members must comply with Section 11.2.3 of the NDS (Section 10.2.3 of NDS-12 and NDS-05 for the 2012, 2009 and 2006 IBC). Structural members forming the connection must be designed in accordance with the code.

4.1.2 Reference Lateral Design Values: Reference lateral (Z) design values for SDS screws for single shear steel-to-wood and wood-to-wood connections loaded perpendicular and parallel to grain are shown in Table 2 and Table 3, respectively. Minimum connection geometries must comply with Table 4.

4.1.3 Reference Withdrawal Design Values: Reference withdrawal (W) design values for SDS screws must be derived according to provisions for wood screws in the NDS. For purposes of determining NDS tabulated withdrawal design values, the SDS screws are classified as a No. 14 wood screw. The thread lengths for the SDS screws are provided in Table 1 of this report. The withdrawal design value in pounds per inch of thread penetration into the side grain of the main member of wood or engineered wood having a minimum specific gravity of 0.50 is shown in Table 5 of this report.

4.1.4 Pull-through Design Values: Pull-through (pull-over) design values for wood side members must be determined in accordance with Section 12.2.5 of the 2018 NDS.

4.2 Installation:

Installation of the SDS screws must be in accordance with the approved plans, the manufacturer's published installation instructions and this report. The manufacturer's published installation instructions must be available at the jobsite at all times during installation.

SDS screws are installed with a $^3/_8$-inch (9.5 mm) hex head driver and a low-speed drill. Installation may be performed without predrilling wood members. Edge distances, end distances and spacing of the screws must be sufficient to prevent splitting of the wood, or as required by Table 4 of this report, whichever is more restrictive. When use is in engineered wood products, the minimum fastener end and edge distances and spacing must be in accordance with Table 4 of this report or in accordance with the recommendations of the engineered wood product manufacturer, whichever is more restrictive. The bottom of the screw head must be installed flush to the surface of the member being connected. The screws must not be overdriven.

The SDS screws with a proprietary Double Barrier Coating are recognized for use in wood treated with waterborne alkaline copper quaternary, Type D (ACQ-D), to a maximum retention level of 0.40 pcf (6.4 kg/m^3), or in other treated wood products that have been demonstrated to have lower levels of corrosivity. These fasteners must be limited to use in the applications and limitations defined in Table 6.

The stainless steel SDS screws may be used in the applications described in IBC Section 2304.10.5 (2012, 2009 and 2006 IBC Section 2304.9.5) and IRC Section R317.3 (2006 IBC Section R319.3) where stainless steel fasteners are prescribed.

5.0 CONDITIONS OF USE

The Simpson Strong-Drive SDS screws 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 screws must be installed in accordance with the approved plans, the manufacturer's published installation instructions and this report. In the event of a conflict between this report and the manufacturer's published installation instructions, the more restrictive requirements govern.

5.2 Calculations and details demonstrating compliance with this report must be submitted to the code official. The calculations and details 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 When the capacity of a connection is controlled by fastener or side plate metal strength, rather than wood strength, the allowable strength of the connection is not permitted to be multiplied by the adjustment factors specified in the NDS.

5.4 Use of carbon steel SDS screws in locations exposed to saltwater or saltwater spray is outside the scope of this evaluation report.

5.5 The screws are manufactured under a quality control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

6.1 Data in accordance with the ICC-ES Acceptance Criteria for Alternate Dowel-type Threaded Fasteners (AC233), dated October 2018.

6.2 Data in accordance with the ICC-ES Acceptance Criteria for Corrosion-resistant Fasteners and Evaluation of Corrosion Effects of Wood Treatments (AC257), dated October 2009 (editorially revised March 2018).

7.0 IDENTIFICATION

7.1 The packaging for the SDS screws is labeled with the designation "Simpson Strong-Drive SDS," the Simpson Strong-Tie Co. name and address, the fastener size, point type (four-cut or type 17), coating type (yellow zinc or Double Barrier) and the ICC-ES evaluation report number (ESR-2236). Each screw head is marked with the not-equal-to symbol (≠), and the letter S followed by a number designating the screw length, as shown in Table 1.

7.2 The report holder's contact information is the following:

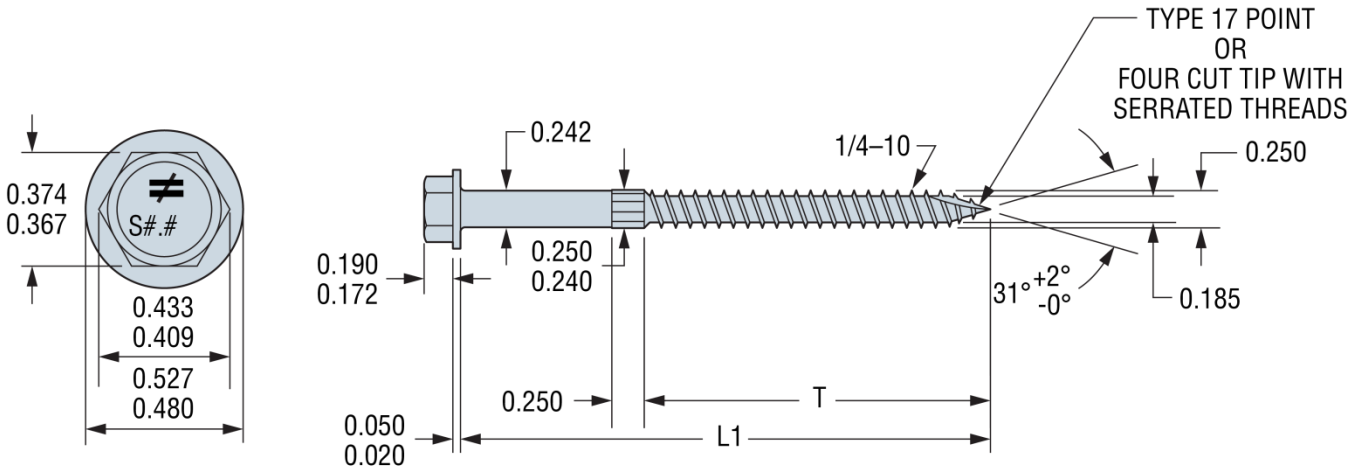
SIMPSON STRONG-TIE COMPANY INC.
5956 WEST LAS POSITAS BOULEVARD
PLEASANTON, CALIFORNIA 94588
(800) 999-5099
www.strongtie.com

TABLE 1—SDS SCREW SPECIFICATIONS, BENDING YIELD STRENGTH, AND FASTENER ALLOWABLE STEEL STRENGTH

FASTENER DESIGNATION		HEAD MARKING	SCREW SPECIFICATIONS (inches)				SPECIFIED BENDING YIELD STRENGTH[3], F_{yb} (psi)	FASTENER ALLOWABLE STEEL STRENGTH[4] (lbf)	
Carbon Steel	Stainless Steel		Screw Length, *L1*	Thread Length[1], *T*	Unthreaded Shank Length, *L1 – T*	Minor Thread (root) Diameter[2], D_r		Tension	Shear
SDS25112	SDS25112SS	S1.5	1 1/2	1	1/2	0.185	164,000	1,430	800
SDS25134	—	S1.75	1 3/4	1 1/4	1/2				
SDS25200	SDS25200SS	S2	2	1 1/4	3/4				
SDS25212	SDS25212SS	S2.5	2 1/2	1 1/2	1				
SDS25300	SDS25300SS	S3	3	2	1				
SDS25312	SDS25312SS	S3.5	3 1/2	2 1/4	1 1/4				
SDS25412	—	S4.5	4 1/2	2 3/4	1 3/4				
SDS25500	—	S5	5	2 3/4	2 1/4				
SDS25600	—	S6	6	3 1/4	2 3/4				
SDS25800	—	S8	8	3 1/4	4 3/4				

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

[1] Length of thread includes tip. See Figure 1.
[2] Minor thread diameter shown in the table is the nominal diameter with manufacturing tolerances from a minimum of 0.183 inch to a maximum of 0.193 inch.
[3] Bending yield strength determined in accordance with ASTM F1575 using the minor thread (root) diameter, D_r.
[4] Allowable fastener strengths are based on steel properties of the screw. Refer to Tables 2 and 3 for allowable reference lateral (*Z*) design values for steel-to-wood and wood-to-wood connections, respectively.



U.S. Patent 6,109,850; 5,897,280; 7,101,133

FIGURE 1—SDS SCREW

TABLE 2—REFERENCE LATERAL DESIGN VALUES (*Z*) FOR SINGLE SHEAR STEEL-TO-WOOD CONNECTIONS WITH SDS SCREWS[1,2]

SCREW LENGTH (inches)	STEEL SIDE MEMBER DESIGN THICKNESS[3,4], t_s (inches)					
	0.0584 (No. 16 gage)	0.0721 (No. 14 gage)	0.1026 (No. 12 gage)	0.1342 (No. 10 gage)	0.1795 (No. 7 gage)	0.2405 (No. 3 gage)
	Lateral Design Value (*Z*)[5,6,7] (lbf)					
$1^1/_2$	250	250	250	250	250	250
$1^3/_4$	250	250	250	250	250	250
2	250	290	290	290	290	290
$2^1/_2$	250	390	390	420	420	420
3	250	420	420	420	420	420
$3^1/_2$	250	420	420	420	420	420
$4^1/_2$	250	420	420	420	420	420
5	250	420	420	420	420	420
6	250	420	420	420	420	420
8	250	420	420	420	420	420

For **SI:** 1 inch = 25.4 mm, 1 lbf = 4.45 N, 1 ksi = 6.89 MPa.

[1]The side member must be steel having a minimum tensile strength (F_u) equal to 45 ksi when the steel member design thickness is from 0.0584 inch to 0.1795 inch, and a minimum F_u equal to 52 ksi when the steel member design thickness is 0.2405 inch.
[2]The main member must be wood having a minimum assigned specific gravity of 0.50, such as Douglas fir–larch, and must be sufficiently sized to accommodate the screw length less the thickness of the side member. Values are also applicable for fasteners installed into the face of engineered wood described in Section 3.2.2.
[3]The uncoated minimum steel thickness of the cold-formed product delivered to the jobsite must not be less than 95 percent of the tabulated design thickness, t_s.
[4]Holes in the steel side member must be predrilled or prepunched. Hole diameter must comply with Section 3.2.3 of this report.
[5]Tabulated lateral design values (*Z*) must be multiplied by all applicable adjustment factors, including the load duration factor, C_D, from the NDS as referenced in the IBC or IRC.
[6]Screws must be installed into the side grain of the wood main member with the screw axis perpendicular to wood fibers.
[7]Minimum fastener penetration must be equal to the screw length less the thickness of the metal side plate.

TABLE 3—REFERENCE LATERAL DESIGN VALUES (*Z*) FOR SINGLE SHEAR WOOD-TO-WOOD CONNECTIONS WITH SDS SCREWS

SCREW LENGTH (inches)	WOOD SIDE MEMBER ACTUAL THICKNESS[1], *ts* (inches)	
	$1^1/_2$	$1^3/_4$
	Lateral Design Value (*Z*)[2,3,4,5] (lbf)	
$2^1/_2$	190	—
3	280	—
$3^1/_2$	340	340
$4^1/_2$	350	340
5	350	340
6	350	340
8	350	340

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

[1]The actual thickness of the wood side member, t_s, must be either $1^1/_2$ or $1^3/_4$ inches, as specified in the table. The wood side member thickness is an absolute value, and is not a minimum or maximum value.
[2]The tabulated lateral design values (*Z*) are based on wood members having a minimum assigned specific gravity of 0.50, such as Douglas fir–larch. Values are also applicable for fasteners installed into the face of engineered wood described in Section 3.2.2.
[3]The wood main member must be equal to or greater than the screw length less the thickness of the wood side member.
[4]Tabulated lateral design values (*Z*) must be multiplied by all applicable adjustment factors, including the load duration factor, C_D, from the NDS as referenced in the IBC or IRC.
[5]Screws must be installed into the side grain of the wood members with the screw axis perpendicular to wood fibers.

TABLE 4—CONNECTION GEOMETRY

CONDITION[1]		MINIMUM DISTANCE OR SPACING (in.)
Edge distance	Perpendicular to grain loading (Loaded or unloaded edge)	$1^1/_2$
	Parallel to grain loading	1
End distance	Perpendicular to grain loading	4
	Parallel to grain loading (Loading toward or away from end)	3
Spacing (Loading parallel or perpendicular to grain)	Between fasteners in a row	3
	Between rows	3
	Between staggered rows	$1^1/_2$

For **SI:** 1 inch = 25.4 mm.

[1]Edge distances, end distances and spacing of the screws must be sufficient to prevent splitting of the wood, or as required by this table, whichever is the more restrictive.
[2] Values for spacing between staggered rows apply where screws in adjacent rows are offset by half of the spacing between screws in a row.

TABLE 5—REFERENCE WITHDRAWAL DESIGN VALUE FOR SDS SCREWS INSTALLED IN THE SIDE GRAIN OF A WOOD MAIN MEMBER

SDS SCREW DIMENSIONS (in.)		REFERENCE WITHDRAWAL DESIGN VALUE[2,3,4], *W* (lbs/inch)
Screw Length, *L1*	Thread Length[1], *T*	
$1^1/_2$	1	172
$1^3/_4$	$1^1/_4$	
2	$1^1/_4$	
$2^1/_2$	$1^1/_2$	
3	2	
$3^1/_2$	$2^1/_4$	
$4^1/_2$	$2^3/_4$	
5	$2^3/_4$	
6	$3^1/_4$	
8	$3^1/_4$	

For **SI:** 1 inch = 25.4 mm, 1 lbf/inch = 4.44 kPa.

[1]The tabulated reference withdrawal design value (*W* = 172 lbs/inch) is in pounds per inch of the thread penetration into the side grain of the main member.
[2]Tabulated reference withdrawal design values (*W* = 172 lbs/inch) must be multiplied by all applicable adjustment factors from the NDS as referenced in the IBC or IRC.
[3]Embedded thread length is that portion held in the main member including the screw tip.
[4]The tabulated withdrawal design value (W) is based on wood members having a minimum assigned specific gravity of 0.50, such as Douglas fir–larch. Values are also applicable for fasteners installed into the face of engineered wood described in Section 3.2.2.

TABLE 6—RECOGNIZED EXPOSURE CONDITIONS FOR SIMPSON STRONG-TIE SDS FASTENERS WITH DOUBLE BARRIER COATING

EXPOSURE CONDITION	TYPICAL APPLICATIONS	RECOGNITION LIMITATIONS
1	Treated Wood in dry use applications	Limited to use where equilibrium moisture content of the chemically treated wood meets the dry services condition as described in the NDS
3	General construction	Limited to freshwater and chemically treated wood exposure, e.g., no saltwater exposure

DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
Section: 06 05 23—Wood, Plastic, and Composite Fastenings

REPORT HOLDER:

SIMPSON STRONG-TIE COMPANY INC.

EVALUATION SUBJECT:

SIMPSON STRONG-DRIVE SDS SCREWS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that Simpson Strong-Drive SDS screws, described in ICC-ES evaluation report ESR-2236, have also been evaluated for compliance with the codes noted below as adopted by the Los Angeles Department of Building and Safety (LADBS).

Applicable code editions:

- 2020 *City of Los Angeles Building Code* (LABC)
- 2020 *City of Los Angeles Residential Code* (LARC)

2.0 CONCLUSIONS

The Simpson Strong-Drive SDS screws, described in Sections 2.0 through 7.0 of the evaluation report ESR-2236, comply with LABC Chapter 23, and the LARC, and are subjected to the conditions of use described in this supplement.

3.0 CONDITIONS OF USE

The Simpson Strong-Drive SDS screws described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report ESR-2236.
- The design, installation, conditions of use and identification of the Simpson Strong-Drive SDS screws are in accordance with the 2018 *International Building Code*® (2018 IBC) provisions noted in the evaluation report ESR-2236.
- The design, installation and inspection are in accordance with additional requirements of LABC Chapters 16, 17 and 23, as applicable.
- Under the LARC, an engineered design in accordance with LARC Section R301.1.3 must be submitted.

This supplement expires concurrently with the evaluation report, reissued January 2020 and revised July 2020.

DIVISION: 06 00 00—WOOD, PLASTIC AND COMPOSITES
Section: 06 05 23—Wood, Plastic and Composite Fastenings

REPORT HOLDER:

SIMPSON STRONG-TIE COMPANY INC.

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SIMPSON STRONG-DRIVE SDS SCREWS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that Simpson Strong-Drive SDS Screws, described in ICC-ES evaluation report ESR-2236, has also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2020 and 2017 *Florida Building Code—Building*
- 2020 and 2017 *Florida Building Code—Residential*

2.0 CONCLUSIONS

The Simpson Strong-Drive SDS Screws, described in Sections 2.0 through 7.0 of ICC-ES evaluation report ESR-2236, complies with the *Florida Building Code—Building* and *Florida Building Code—Residential*, provided the design requirements are determined in accordance with the *Florida Building Code-Building* or the *Florida Building Code-Residential,* as applicable. The installation requirements noted in ICC-ES evaluation report ESR-2236 for the 2018 and 2015 *International Building Code®* meet the requirements of the *Florida Building Code-Building* or the *Florida Building Code-Residential,* as applicable.

Use of the Simpson Strong-Drive SDS Screws has also been found to be in compliance with the High-Velocity Hurricane Zone provisions of the *Florida Building Code-Building* and the *Florida Building Code-Residential* with the following condition:

a) For connections subject to uplift, the connection must be designed for no less than 700 pounds (3114 N).

For products falling under Florida Rule 61G20-3, verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission for the type of inspections being conducted is the responsibility of an approved validation entity (or the code official when the report holder does not possess an approval by the Commission).

This supplement expires concurrently with the evaluation report, reissued January 2020 and revised July 2020.