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# ICC-ES Report

# ESR-3870

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Issued 01/2017  
This report is subject to renewal 01/2018.

**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**

**REPORT HOLDER:**

**SFS INTEC**

**1045 SPRING STREET  
WYOMISSING, PENNSYLVANIA 19610**

**EVALUATION SUBJECT:**

**SFS INTEC IMPAX® AND SFS-FLEX5® SELF-DRILLING STRUCTURAL FASTENERS**



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# ICC-ES Evaluation Report

**ESR-3870**

Issued January 2017

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**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**

**REPORT HOLDER:**

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**EVALUATION SUBJECT:**

**SFS INTEC IMPAX® AND SFS-FLEX5® SELF-DRILLING STRUCTURAL FASTENERS**

**1.0 EVALUATION SCOPE**

**Compliance with the following codes:**

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

**Property evaluated:**

Structural

**2.0 USES**

SFS intec Impax® and SFS intec Flex5 self-drilling fasteners are used for engineered connections of cold-formed steel members, connections of cold-formed steel to hot-rolled steel plates, and connections of sheet steel to cold-formed steel. The screws may be used under the IRC when an engineered design is submitted to the code official for approval in accordance with IRC Section R301.1.3.

**3.0 DESCRIPTION**

**3.1 General**

SFS intec fasteners are self-drilling tapping screws that comply with the performance requirements of ASTM C1513. Table 1 provides screw descriptions (size, tpi, length), nominal diameters, head styles, head diameters, point styles, drilling capacities and length of load-bearing area.

**3.2 SFS Intec IMPAX Fasteners**

SFS intec Impax® fasteners are made from carbon steel wire conforming to ASTM A510, grade 1018-1022, and are heat treated and case hardened to comply with ASTM C1513 hardness requirements and the manufacturer's specifications.

SFS intec Impax® fasteners include MAC® and ZAC® brand fasteners. MAC® fasteners are cupped hex washer head Impax screws which are assembled together at the manufacturing facility with a thin stainless steel cap that conforms to the shape of the Impax fastener head. The ZAC® hex washer head fasteners consist of an Impax screw and a zinc alloy cap, which are assembled together at the manufacturing facility. The ZAC® 6-lobe head screws consist of a carbon steel screw body (same material and processing as the Impax screws) and a zinc alloy cap, which are assembled together at the manufacturing facility.

The SFS intec Impax® line is divided into four main subgroups: Standard Drilling Capacity, Extended Drilling Capacity, Thin Gauge Drilling Capacity and Architectural Clip fasteners.

**3.2.1 Impax Standard Drilling Capacity:** Impax® Standard Drilling Capacity fasteners are #10, #12, and ¼-inch coarse threaded screws with hex washer heads (HWH) or cupped hex washer heads (CHWH) with 5/16 or 3/8 inch across the flats (AF) dimensions, or 6-lobe heads, and drill point sizes identified as SD2 and SD3.

Impax® Standard Drilling Capacity fasteners have a silver-colored coating layer, identified as VistaCoat, added over the zinc layer.

**3.2.2 Impax Extended Drilling Capacity:** Impax® Extended Drilling Capacity fasteners are #12 and ¼-inch fine threaded screws with HWH or CHWH; 5/16- or 3/8-inch AF dimensions; and drill point sizes identified as SD4, SD4.5, and SD5.

Impax® Extended Drilling Capacity fasteners have a silver-colored coating layer, identified as VistaCoat, added over the zinc layer.

**3.2.3 Impax Thin Gauge Drilling Capacity:** Impax® Thin Gauge Drilling Capacity fasteners are ¼-inch coarse threaded screws with HWH or CHWH; 5/16- or 3/8-inch AF dimension; and a drill point size identified as SD1.

Impax® Thin Gauge Drilling Capacity fasteners have a silver-colored coating layer, identified as VistaCoat, added over the zinc layer.

**3.2.4 Impax Architectural Clip Fasteners:** Impax® Architectural Clip fasteners are #10 and #12 coarse threaded screws with pancake heads with internal Philips square drives, and drill points identified as SD2.

### 3.3 Flex5 Fasteners:

SFS intec Flex5 fasteners are made from alloy steel complying with ASTM A29, grade 4037 and have a dual heat treatment. The drill point and lead threads of the screws are heat-treated to a relatively high hardness (minimum 52 HRC) to facilitate drilling and thread forming. The balance of the fastener is treated to a lower hardness complying with the hardness limits for SAE J429 grade 5. The threaded portion of the screw with the lower hardness, is considered the load-bearing area and is used to transfer loads between connected elements.

SFS Flex5 fasteners have a silver-colored coating layer, identified as VistaCorr.

The SFS Flex5 line is divided into two main subgroups: Standard Drilling Capacity fasteners and Extended Drilling Capacity fasteners.

**3.3.1 Flex5 Standard Drilling Capacity:** Flex5 Standard Drilling Capacity fasteners are #10, #12, and 1/4-inch coarse threaded screws with HWH; 5/16- or 3/8-inch AF dimensions; and a drill point size identified as SD3.

**3.3.2 Flex5 Extended Drilling Capacity:** Flex5 Extended Drilling Capacity fasteners are #12 and 1/4-inch fine threaded screws with HWH; 5/16- or 3/8-inch AF dimensions; and drill point sizes identified as SD4 and SD5.

### 3.4 Connection Material

The connection material must comply with one of the ASTM specifications listed in Section A2.1.1 of AISI S100-12 and must have the minimum thickness, yield strength and tensile strength shown in the tables in this report.

## 4.0 DESIGN AND INSTALLATION

### 4.1 Design

**4.1.1 General:** Screw thread length and point style must be selected on the basis of thickness of the fastened material and thickness of the supporting steel, respectively, based on the length of load-bearing area and drilling capacity given in Table 1.

When tested for corrosion resistance in accordance with ASTM B117, the screws met the minimum requirement listed in ASTM F1941, as required by ASTM C1513, with no white corrosion after three hours and no red rust after 12 hours.

**4.1.2 Prescriptive Design:** SFS intec Impax® self-drilling screws with HWH are recognized for use where ASTM C1513 screws are prescribed in the IRC and in the AISI standards referenced in IBC Section 2211.

**4.1.3 Engineered Design:** SFS intec Impax® and SFS intec Flex5 self-drilling fasteners are recognized for use in engineered steel-to-steel connections. Design of connections for use in Allowable Strength Design (ASD) must comply with section E4 of AISI S100, using the allowable fastener tension and shear strength for the screws, shown in Table 2, and the allowable connection strengths for pull-out, pull-over, and shear (bearing) capacity for common sheet steel thicknesses provided in Tables 3, 4, and 5, respectively.

Instructions for calculating connection design strengths for use in Load Resistance Factor Design (LRFD) are found in the footnotes of these tables.

For connections subject to tension, the least of the allowable fastener tension strength, pull-out strength, and pull-over strength found in Tables 2, 3 and 4, respectively, must be used for design. For connections subject to shear, the lesser of the allowable fastener shear strength and the allowable shear (bearing) strength found in Tables 2 and 5, respectively, must be used for design.

For screws used in framing connections, in order for the screws to be considered fully effective, the minimum spacing between the fasteners and the minimum edge distance must be three times the nominal diameter of the screws, except when the edge is parallel to the direction of the applied force, the minimum edge distance must be 1.5 times the nominal screw diameter. When the spacing between screws is 2 times the fastener diameter, the connection shear strength values in Table 5 must be reduced by 20 percent (Refer to Section D1.5 of AISI S200).

For screws used in applications other than framing connections, the minimum spacing between the fasteners must be three times the nominal screw diameter and the minimum edge and end distance must be 1.5 times the nominal screw diameter.

The connection shear strengths are for connections where the connected steel elements are in direct contact with one another. Connected members must be checked for rupture in accordance with Section E6 of AISI S100-12 for the 2015 IBC (Section E5 of AISI S100-07/S2-10 for the 2012 IBC).

### 4.2 Installation

Installation of the SFS intec self-drilling tapping screws must be in accordance with 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.

The screws must be installed perpendicular to the work surface using a variable speed screw gun set not to exceed 2,500 RPM screw gun, with a depth-sensitive, or adjustable clutch nose piece.

When using SD4, SD4.5 or SD5 points for materials which are 1/4-inch (6.4 mm) thick or greater, a speed of 1,500 - 1,800 RPM is recommended by the manufacturer. Impact guns are not recommended.

The screws must penetrate through the supporting steel with a minimum of three full threads protruding past the back side of the supporting steel.

## 5.0 CONDITIONS OF USE

SFS intec self-drilling 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** Fasteners must be installed in accordance with the manufacturer's published installation instructions and this report. In the event of a conflict between this report and the manufacturer's published instructions, the more restrictive requirements govern.
- 5.2** The allowable strength values specified in Section 4.1 must not be increased when the screws are used to resist wind or seismic forces.
- 5.3** Drawings and calculations verifying compliance with this report and the applicable code must be submitted to code official for approval. The drawings and calculations are to be prepared by a registered design

professional when required by the statutes of the jurisdiction in which the project is to be constructed.

- 5.4 The use of the screws in engineered steel deck diaphragms has not been evaluated and is outside the scope of this evaluation report. Diaphragms constructed using the screws must be recognized in a current ICC-ES evaluation report based upon the ICC-ES Acceptance Criteria for Steel Deck Roof and Floor Systems (AC43).
- 5.5 Design provisions for tapping screw connections subjected to combined shear and tension loading are outside the scope of this evaluation report.
- 5.6 The SFS intec Impax and Flex5 fasteners 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 Tapping Screw Fasteners (AC118), dated February 2016.

## 7.0 IDENTIFICATION

- 7.1 SFS intec Impax® fasteners are marked with "SFS" on the fastener head, as shown in Figures 1 through 4, except for the ZAC fasteners, which are marked with "ZAC" on the fastener head, as shown in Figure 5.
- 7.2 SFS intec Flex5 fasteners are marked with "SFS 5" on the fastener head, as shown in Figures 6 & 7.
- 7.3 Packages of self-drilling tapping screws are labeled with the report holder name (SFS intec) and address, product brand name (Impax or Flex5), size and length, head style and size, point style, and the evaluation report number (ESR-3870).

TABLE 1—SFS INTEC SELF-DRILLING TAPPING SCREW DIMENSIONAL CHARACTERISTICS

PRODUCT LINE	SCREW TYPE	SIZE	NOMINAL DIAMETER (inch)	TPI	POINT TYPE	HEAD TYPE <sup>1</sup>	ACROSS FLATS (inch)	NOMINAL HEAD DIAMETER <sup>3</sup> (inch)	COATING	NOMINAL SHANK LENGTH (inch)	DRILL CAPACITY <sup>2</sup> (inch)		LENGTH OF LOAD BEARING AREA <sup>4</sup> (inch)
											Min.	Max.	
Standard Drilling Capacity	1	#10	0.190	16	SD3	HWH	5/16	0.400	VistaCoat	0.750	0.036	0.150	0.313
										1.000			0.563
										1.500			1.063
	2A	#12	0.216	14	SD3	HWH	5/16	0.415	VistaCoat	0.750	0.036	0.210	0.250
	2B	#12	0.216	14	SD3	HWH	5/16	0.421	VistaCoat	1.000	0.036	0.210	0.375
										1.250			0.625
										1.500			0.875
										2.000			1.375
										2.500			1.875
										3.000			2.375
	3.750	3.375											
	3A	#12	0.216	14	SD3	CHWH	5/16	0.580	VistaCoat	0.750	0.036	0.210	0.226
	3B	#12	0.216	14	SD3	CHWH	5/16	0.580	VistaCoat	1.000	0.036	0.210	0.349
										1.250			0.599
										1.500			0.849
	4	1/4	0.250	14	SD2	HWH	5/16	0.415	VistaCoat	1.000	0.048	0.150	0.349
										1.250			0.599
										1.500			0.849
	5	1/4	0.250	14	SD2	HWH	3/8	0.500	VistaCoat	1.000	0.048	0.150	0.334
										1.500			0.833
										0.750			0.171
	6A	1/4	0.250	14	SD2	HWH	3/8	0.500	VistaCoat	1.000	0.048	0.210	0.421
										1.250			0.671
										1.500			0.921
										2.000			1.421
										2.500			1.921
	6B	1/4	0.250	14	SD3	HWH	3/8	0.500	VistaCoat	3.000	0.048	0.210	2.421
										4.000			2.921
										1.000			0.353
	MAC IMPAX	7	#12	0.216	14	SD3	CHWH	5/16	0.580	VistaCoat	1.250	0.036	0.210
1.500											0.853		
2.000											1.353		
1.000											0.349		
ZAC IMPAX	8 <sup>6</sup>	#12	0.216	14	SD3	HWH	N/A	0.421	VistaCoat	1.250	0.036	0.210	0.599
										1.500			0.849
										2.000			1.349
										1.000			0.375
	9 <sup>6</sup>	#12	0.216	14	SD3	HWH	3/8	0.421	VistaCoat	1.250	0.036	0.210	0.625
										1.500			0.875
										2.000			1.375
										2.500			1.875
										3.000			2.375
	10	1/4	0.250	14	SD3	HWH	N/A	0.421	VistaCoat	1.250	0.048	0.210	0.584
	11	1/4	0.250	14	SD2	HWH	3/8	0.415	VistaCoat	1.000	0.048	0.150	0.349
										1.250			0.599
									1.500			0.849	

TABLE 1—SFS INTEC SELF-DRILLING TAPPING SCREW DIMENSIONAL CHARACTERISTICS (Continued)

	PRODUCT LINE	SCREW TYPE	SIZE	NOMINAL DIAMETER (inch)	TPI	POINT TYPE	HEAD TYPE <sup>1</sup>	ACROSS FLATS (inch)	NOMINAL HEAD DIAMETER <sup>3</sup> (inch)	COATING	NOMINAL SHANK LENGTH (inch)	DRILL CAPACITY <sup>2</sup> (inch)		LENGTH OF LOAD BEARING AREA <sup>4</sup> (inch)
												Min.	Max.	
Extended Drilling Capacity	IMPAX	12	#12	0.216	24	SD4	HWH	5/16	0.415	VistaCoat	0.875	0.075	0.250	0.315
		13	#12	0.216	24	SD4.5	HWH	5/16	0.415	VistaCoat	1.250	0.075	0.250	0.525
		14	#12	0.216	24	SD4.5	HWH	3/8	0.500	VistaCoat	1.250	0.075	0.375	0.525
		15	#12	0.216	24	SD5	HWH	5/16	0.415	VistaCoat	1.250	0.075	0.500	0.520
											1.500			0.770
											2.000			1.270
		16	1/4	0.250	20	SD5	HWH	3/8	0.500	VistaCoat	3.000	0.105	0.500	2.220
		17 <sup>5</sup>	1/4	0.250	20	SD5	HWH	3/8	0.500	VistaCoat	4.000			3.220
											5.000			4.220
											6.000			5.220
7.000	6.220													
8.000	7.220													
MAC IMPAX	18	#12	0.216	24	SD5	CHWH	5/16	0.580	VistaCoat	2.000	0.075	0.500	1.145	
ZAC IMPAX	19	#12	0.216	24	SD4.5	HWH	5/16	0.415	VistaCoat	1.250	0.075	0.375	0.525	
	20	#12	0.216	24	SD5	HWH	5/16	0.415	VistaCoat	1.250	0.075	0.500	0.520	
										1.500			0.770	
2.000	1.270													
Thin Gauge Drilling Capacity	IMPAX	21	1/4	0.250	14	SD1	HWH	5/16	0.415	VistaCoat	0.875	0.030	0.095	0.309
		22	1/4	0.250	14	SD1	CHWH	5/16	0.580	VistaCoat	0.875	0.030	0.095	0.341
	MAC IMPAX	23	1/4	0.250	14	SD1	CHWH	5/16	0.580	VistaCoat	0.875	0.030	0.095	0.326
	ZAC IMPAX	24	1/4	0.250	14	SD1	HWH	1/4	0.421	VistaCoat	0.875	0.030	0.095	0.326
		25	1/4	0.250	14	SD1	HWH	5/16	0.415	VistaCoat	0.875	0.030	0.095	0.326
Architectural Clip Fasteners	Clip IMPAX	26	#10	0.190	16	SD2	PC	n/a	0.435	E-zinc	1.000	0.036	0.150	0.613
											1.500			1.113
2.000	1.613													
Standard drilling capacity	Flex5	28	#10	0.190	16	SD3	HWH	5/16	0.399	VistaCorr	0.750	0.036	0.150	0.370
											0.875			0.390
		29	#12	0.216	14	SD3	HWH	5/16	0.415	VistaCorr	1.000	0.036	0.188	0.500
											1.500			1.000
											2.000			1.500
		30	#12	0.216	14	SD3	PUF	n/a	0.419	VistaCorr	1.000	0.036	0.188	0.500
31	1/4	0.250	14	SD3	HWH	3/8	0.500	VistaCorr	1.000	0.036	0.188	0.460		
									1.500			0.960		
2.000	1.460													
Extended Drilling Capacity	Flex5	32	#12	0.216	24	SD5	HWH	5/16	0.415	VistaCorr	1.750	0.036	0.188	1.015
											1.125			0.500
		33	1/4	0.250	20	SD4	HWH	3/8	0.500	VistaCorr	1.500	0.036	0.313	0.835
											2.000			1.335
											2.500			1.835

For SI: 1 inch = 25.4 mm.

<sup>1</sup> Heads styles: Hex washer head (HWH), Cupped hex washer head (CHWH), 6-lobe, Phillips undercut flat head (PUF), Pancake head (PC).

<sup>2</sup> The drilling capacity of a fastener refers to the minimum and maximum total substrate thickness that the fastener is designed to drill through.

<sup>3</sup> For capped fasteners, the tabulated head diameter is the dimension of the underlying screw head.

<sup>4</sup> The length of the load bearing area for IMPAX® fasteners is based on the nominal shank length of the screw minus the length of the point and the first three full threads. The length of load bearing area for Flex5 fasteners is based on the lesser of the length of the fully developed threaded portion heat treated to grade 5 specifications and the nominal shank length of the screw minus the length of the point and the first three full threads. See Figure 8.

<sup>5</sup> Fastener is partially threaded. Thread length is 3.63 inches.

<sup>6</sup> The underlying fastener head is a 6-lobe head. The final capped head is HWH.

TABLE 2—FASTENER TENSION AND SHEAR STRENGTH (lbf)<sup>1,2,3,4</sup>

SCREW TYPE	FASTENER DESCRIPTION	NOMINAL STRENGTH		ALLOWABLE STRENGTH (ASD) Ω = 3	
		Tensile, P <sub>ts</sub>	Shear, P <sub>ss</sub>	Tensile, P <sub>ts</sub> /Ω	Shear, P <sub>ss</sub> /Ω
<b>Impax® Standard Drilling Capacity and Thin Gauge Drilling Capacity Fasteners</b>					
1	#10-16	2798	1572	933	524
2A,2B,3A,3B,7,8,9	#12-14	4002	2508	1334	836
4,5,6A,6B,10,11,21-25	1/4-14	4191	2777	1397	926
<b>Impax® Extended Drilling Capacity Fasteners</b>					
12,13,14,15,18,19,20	#12-24	5037	2914	1679	971
16,17	1/4-20	6196	4081	2065	1360
<b>Architectural Clip Fasteners</b>					
26	#10-16	1611	1609	537	536
27	#12-14	2301	1790	767	597
<b>Flex5 Standard Drilling Capacity Fasteners</b>					
28	#10-16	1939	1358	646	453
29,30	#12-14	3310	2041	1103	680
31	1/4-14	4950	2813	1650	938
<b>Flex5 Extended Drilling Capacity Fasteners</b>					
32	#12-24	3902	2413	1301	804
33	1/4-20	4443	2801	1481	934

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

<sup>1</sup> Available strengths listed herein are based on laboratory testing.

<sup>2</sup> For tensile connections, the lowest of the allowable fastener tensile strength, pull-out strength, and pull-over strength values must be used for design.

<sup>3</sup> For shear connections, the lesser of the allowable fastener shear strength and the allowable shear (bearing) strength must be used for design.

<sup>4</sup> To determine the design strength value multiply the value by the applied safety factor of 3.0 and then multiply again by the LRFD resistance factor of 0.5.



TABLE 3—ALLOWABLE TENSILE PULL-OUT CAPACITY OF SCREW CONNECTIONS (lbf)<sup>1,2,4,5,6,7,8</sup>

SCREW TYPE	FASTENER DESCRIPTION	NOMINAL DIAMETER (inch)	POINT STYLE	NOMINAL THICKNESS OF MEMBER NOT IN CONTACT WITH THE FASTENER HEAD (inch)										
				0.030	0.036	0.048	0.060	0.075	0.105	0.125 <sup>3</sup>	0.141 <sup>3</sup>	0.187 <sup>3</sup>	0.250 <sup>3</sup>	0.313 <sup>3</sup>
<b>Impax® Standard Drilling Capacity Fasteners</b>														
1	#10-16	0.190	SD3	*	70	103	128	-	343	-	441	*	*	*
2A, 2B,3A,3B, 7,8,9	#12-14	0.216	SD3	*	84	115	133	-	350	-	-	972	*	*
4,5,11	1/4-14	0.250	SD2	*	104	136	166	-	410	-	-	1153	*	*
6A,6B,10	1/4-14	0.250	SD3	*	*	112	125	194	329	-	-	828	*	*
<b>Impax® Extended Drilling Capacity Fasteners</b>														
12	#12-24	0.216	SD4	*	*	*	*	194	299	441	-	-	627	*
13, 14,19	#12-24	0.216	SD4.5	*	*	*	*	186	336	552	-	-	1257	-
15,18,20	#12-24	0.216	SD5	*	*	*	*	186	336	552	-	-	1257	-
16	1/4-20	0.250	SD5	*	*	*	*	*	302	527	433	906	-	-
<b>Impax® Thin Gauge Drilling Capacity Fasteners</b>														
21-25	1/4-14	0.250	SD1	101	110	150	158	-	*	*	*	*	*	*
<b>Impax® Architectural Clip Fasteners</b>														
26	#10-16	0.190	SD2	*	85	118	139	222	373	-	-	*	*	*
27	#12-14	0.216	SD2	*	92	127	143	218	185	-	-	-	*	*
<b>Flex5 Standard Drilling Capacity Fasteners</b>														
28	#10-16	0.190	SD3	*	82	120	135	215	-	-	466	*	*	*
29,30	#12-14	0.216	SD3	*	80	117	138	-	357	-	-	915	*	*
31	1/4-14	0.250	SD3	*	*	111	138	-	337	572	-	924	*	*
<b>Flex5 Extended Drilling Capacity Fasteners</b>														
32	#12-24	0.216	SD5	*	*	*	125	-	279	-	-	821	-	1037
33	1/4-20	0.250	SD4	*	*	*	124	-	337	-	-	923	-	1322

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

<sup>1</sup> Available Strengths listed herein are based on laboratory testing.

<sup>2</sup> Except where noted otherwise, Values are based on grade 33 steel members with a minimum yield strength of  $F_y = 33$  ksi and a minimum tensile strength of  $F_u = 45$  ksi.

<sup>3</sup> Values are based on steel members complying with ASTM A36, with a minimum yield strength of  $F_y = 36$  ksi and a minimum tensile strength of  $F_u = 58$  ksi.

<sup>4</sup> For tensile connections, the lowest of the allowable fastener tensile strength, pull-out strength, or pull-over strength values must be used for design.

<sup>5</sup> Available capacity for other member thicknesses may be determined by interpolating within the table.

<sup>6</sup> To determine the design strength value multiply the tabulated value by the applied safety factor of 3.0 and then multiply again by the LRFD resistance factor of 0.5.

<sup>7</sup> “\*” Indicates the given steel member thickness is outside the given fastener’s drill capacity limits.

<sup>8</sup> “-” Indicates the given steel member thickness was not tested.



TABLE 4—ALLOWABLE TENSILE PULL-OVER CAPACITY OF SCREW CONNECTIONS (lbf)<sup>1,2,3,4,5,6</sup>

SCREW TYPE	FASTENER DESCRIPTION	NOMINAL DIAMETER (inch)	HEAD TYPE	NOMINAL EFFECTIVE PULL-OVER DIAMETER (inch)	NOMINAL THICKNESS OF MEMBER IN CONTACT WITH THE FASTENER HEAD (inch)									
					0.030	0.036	0.048	0.060	0.075	0.105	0.125	0.187	0.250	0.313
<b>Standard Drilling Capacity Impax® Fasteners</b>														
1	#10-16	0.190	HWH	0.400	*	309	403	510	637	873	1006	*	*	*
2A	#12-14	0.216	HWH	0.415	*	321	419	530	663	908	1047	1605	*	*
2B,8,9	#12-14	0.216	HWH	0.421	*	326	425	538	673	921	1062	1628	*	*
4,11	1/4-14	0.250	HWH	0.415	*	321	419	530	663	908	1047	1605	*	*
5,6A,6B	1/4-14	0.250	HWH	0.500	*	387	505	639	799	1094	1261	1934	*	*
10	1/4-14	0.250	HWH	0.421	*	*	425	538	673	921	1062	1628	*	*
<b>Extended Drilling Capacity Impax® Fasteners</b>														
12,13,15,19,20	#12-24	0.216	HWH	0.415	*	*	*	*	663	908	1047	1605	2163	*
14	#12-24	0.216	HWH	0.500	*	*	*	*	799	1094	1261	1934	2607	3516
16	1/4-20	0.250	HWH	0.500	*	*	*	*		1094	1261	1934	2607	3516
<b>Thin Gauge Drilling Capacity Impax® Fasteners</b>														
21,25	1/4-14	0.250	HWH	0.415	265	321	419	530	663	*	*	*	*	*
24	1/4-14	0.250	HWH	0.421	269	326	425	538	673	*	*	*	*	*
<b>Architectural Clip Impax® Fasteners</b>														
26	#10-16	0.190	PC	0.435	*	337	439	556	695	951	1097	*	*	*
27	#12-14	0.216	PC	0.435	*	337	439	556	695	951	1097	1682	*	*

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

<sup>1</sup> Values are based on grade 33 steel members with minimum yield strengths of  $F_y = 33$  ksi and tensile strengths of  $F_u = 45$  ksi.

<sup>2</sup> For tensile connections, the lowest of the allowable fastener tensile strength, pull-out strength, or pull-over strength values must be used for design.

<sup>3</sup> Available capacity for other member thicknesses may be determined by interpolating within the table.

<sup>4</sup> To determine the design strength value multiply the value by the applied safety factor of 3.0 and then multiply again by the LRFD resistance factor of 0.5

<sup>5</sup> "\*" Indicates the given steel member thickness is outside the given fastener's drill capacity limits.

<sup>6</sup> Shading indicates that the value exceeds the allowable fastener tensile strength from Table 2, and will not govern the design of the connection.

TABLE 5—ALLOWABLE SHEAR (BEARING) CAPACITY OF SCREW CONNECTIONS (Ibf)<sup>2,3,4,5,6,7,8</sup>

SCREW TYPE	FASTENER DESCRIPTION	NOMINAL OUTER DIAMETER	POINT STYLE	NOMINAL THICKNESS OF STEEL IN CONTACT WITH THE HEAD (inch)	NOMINAL THICKNESS OF STEEL NOT IN CONTACT WITH THE HEAD (inch)											
					0.030	0.036	0.048	0.060	0.075	0.105	0.125	0.187	0.250	0.313	0.375	
<b>Standard Drilling Capacity Impax® Fasteners</b>																
1	#10-16	0.190	SD3	0.030	143	154	178	201	231	231	231	*	*	*	*	
				0.036	143	188	203	219	238	277	277	*	*	*	*	
				0.048	143	188	289	301	317	348	*	*	*	*	*	*
				0.060	143	188	289	404	410	*	*	*	*	*	*	*
				0.075	143	188	289	404	564	*	*	*	*	*	*	*
				0.105	143	188	289	*	*	*	*	*	*	*	*	*
				0.125	143	*	*	*	*	*	*	*	*	*	*	*
2A, 2B, 8,9	#12-14	0.216	SD3	0.030	152	167	196	225	262	262	262	*	*	*	*	
				0.036	152	200	220	240	265	315	315	*	*	*	*	
				0.048	152	200	308	325	347	391	420	*	*	*	*	
				0.060	152	200	308	430	441	464	479	*	*	*	*	
				0.075	152	200	308	430	601	616	626	*	*	*	*	
				0.105	152	200	308	430	601	919	*	*	*	*	*	
				0.125	152	200	308	430	601	*	*	*	*	*	*	
4,5, 11	1/4-14	0.250	SD2	0.030	164	182	220	257	304	304	304	*	*	*	*	
				0.036	164	215	241	267	300	365	365	*	*	*	*	
				0.048	164	215	331	355	386	446	*	*	*	*	*	
				0.060	164	215	331	463	480	*	*	*	*	*	*	
				0.075	164	215	331	463	647	*	*	*	*	*	*	
				0.105	164	215	331	*	*	*	*	*	*	*	*	
				0.125	164	215	*	*	*	*	*	*	*	*	*	
6A, 6B,10	1/4-14	0.250	SD3	0.030	164	182	220	257	304	304	304	*	*	*	*	
				0.036	164	215	241	267	300	365	365	*	*	*	*	
				0.048	164	215	331	355	386	446	486	*	*	*	*	
				0.060	164	215	331	463	480	514	537	*	*	*	*	
				0.075	164	215	331	463	647	677	697	*	*	*	*	
				0.105	164	215	331	463	647	1063	*	*	*	*	*	
				0.125	164	215	331	463	647	*	*	*	*	*	*	
<b>Thin Gauge Drilling Capacity Impax® Fasteners</b>																
21, 24,25	1/4-14	0.250	SD1	0.030	164	182	220	257	*	*	*	*	*	*	*	
				0.036	164	215	241	267	*	*	*	*	*	*	*	
				0.048	164	215	331	*	*	*	*	*	*	*	*	
				0.060	164	215	*	*	*	*	*	*	*	*	*	
<b>Architectural Clip Impax® Fasteners</b>																
26	#10-16	0.190	SD2	0.030	143	154	178	201	231	231	231	*	*	*	*	
				0.036	143	188	203	219	238	277	277	*	*	*	*	
				0.048	143	188	289	301	317	348	*	*	*	*	*	
				0.060	143	188	289	404	410	*	*	*	*	*	*	
				0.075	143	188	289	404	564	*	*	*	*	*	*	
				0.105	143	188	289	*	*	*	*	*	*	*	*	
				0.125	143	*	*	*	*	*	*	*	*	*	*	
27	#12-14	0.216	SD2	0.030	152	167	196	225	262	262	262	*	*	*	*	
				0.036	152	200	220	240	265	315	315	*	*	*	*	
				0.048	152	200	308	325	347	391	420	*	*	*	*	
				0.060	152	200	308	430	441	464	479	*	*	*	*	
				0.075	152	200	308	430	601	616	626	*	*	*	*	
				0.105	152	200	308	430	601	919	*	*	*	*	*	
				0.125	152	200	308	430	601	*	*	*	*	*	*	

TABLE 5—SHEAR (BEARING) CAPACITY OF SCREW CONNECTIONS (Ibf)<sup>2,3,4,5,6,7</sup> (Continued)

SCREW TYPE	FASTENER DESCRIPTION	NOMINAL OUTER DIAMETER	POINT STYLE	NOMINAL THICKNESS OF STEEL IN CONTACT WITH THE HEAD (IN)	NOMINAL THICKNESS OF STEEL NOT IN CONTACT WITH THE HEAD (IN)											
					0.030	0.036	0.048	0.060	0.075	0.105	0.125	0.187	0.250	0.313	0.375	
<b>Extended Drilling Capacity Impax® Fasteners</b>																
12	#12-24	0.216	SD4	0.030	152	167	196	225	262	262	262	262	*	*	*	
				0.036	152	200	221	242	268	320	320	320	320	*	*	*
				0.048	152	200	308	325	347	391	420	420	420	*	*	*
				0.060	152	200	308	430	441	464	479	525	525	*	*	*
				0.075	152	200	308	430	601	616	626	656	656	*	*	*
				0.105	152	200	308	430	601	919	919	919	919	*	*	*
				0.125	152	200	308	430	601	919	1094	*	*	*	*	*
13, 14, 19	#12-24	0.216	SD4.5	0.030	152	167	196	225	262	262	262	262	262	*	*	
				0.036	152	200	221	242	268	320	320	320	320	*	*	
				0.048	152	200	308	325	347	391	420	420	420	*	*	
				0.060	152	200	308	430	441	464	479	525	525	*	*	
				0.075	152	200	308	430	601	616	626	656	656	*	*	
				0.105	152	200	308	430	601	919	919	919	919	*	*	
				0.125	152	200	308	430	601	919	1094	1094	1094	*	*	
15, 20	#12-24	0.216	SD5	0.030	152	167	196	225	262	262	262	262	262	262	262	
				0.036	152	200	221	242	268	320	320	320	320	320	320	
				0.048	152	200	308	325	347	391	420	420	420	420	420	
				0.060	152	200	308	430	441	464	479	525	525	525	525	
				0.075	152	200	308	430	601	616	626	656	656	656	656	
				0.105	152	200	308	430	601	919	919	919	919	919	919	
				0.125	152	200	308	430	601	919	1094	1094	1094	1094	1094	
16	1/4-20	0.250	SD5	0.030	164	182	220	257	304	304	304	304	304	304	304	
				0.036	164	215	241	267	300	365	365	365	365	365	365	
				0.048	164	215	331	355	386	446	486	486	486	486	486	
				0.060	164	215	331	463	480	514	537	608	608	608	608	
				0.075	164	215	331	463	647	677	697	759	759	759	759	
				0.105	164	215	331	463	647	1063	1063	1063	1063	1063	1063	
				0.125	164	215	331	463	647	1063	1266	1266	1266	1266	1266	
28	#10-16	0.190	SD3	0.036	-	249	-	-	-	*	*	*	*	*		
				0.048	-	-	333	-	-	*	*	*	*	*		
				0.060	-	-	-	433	-	*	*	*	*	*		
				0.075	-	-	446	-	490	*	*	*	*	*		

**Flex5 Standard Drilling Capacity Fasteners<sup>1</sup>**

TABLE 5—SHEAR (BEARING) CAPACITY OF SCREW CONNECTIONS (lbf)<sup>2,3,4,5,6,7</sup> (Continued)

SCREW TYPE	FASTENER DESCRIPTION	NOMINAL OUTER DIAMETER	POINT STYLE	NOMINAL THICKNESS OF STEEL IN CONTACT WITH THE HEAD (IN)	NOMINAL THICKNESS OF STEEL NOT IN CONTACT WITH THE HEAD (IN)										
					0.030	0.036	0.048	0.060	0.075	0.105	0.125	0.187	0.250	0.313	0.375
<b>Flex5 Standard Drilling Capacity Fasteners<sup>1</sup> (continued)</b>															
29, 30	#12-14	0.216	SD3	0.036	-	266	-	-	-	-	-	*	*	*	*
				0.048	-	-	343	-	-	-	-	*	*	*	*
				0.060	-	-	-	515	-	-	-	*	*	*	*
				0.075	-	-	655	-	669	-	*	*	*	*	*
				0.105	-	-	-	-	-	657	*	*	*	*	*
31	1/4-14	0.250	SD3	0.036	-	257	-	-	-	-	-	*	*	*	*
				0.048	-	-	349	-	-	-	-	*	*	*	*
				0.060	-	-	-	516	-	-	-	*	*	*	*
				0.075	-	-	614	-	709	-	*	*	*	*	*
				0.105	-	-	-	-	-	847	*	*	*	*	*
<b>Flex5 Extended Drilling Capacity Fasteners<sup>1</sup></b>															
32	#12-24	0.216	SD5	0.048	-	-	334	-	-	-	-	-	-	-	-
				0.060	-	-	-	465	-	-	-	-	-	-	-
				0.075	-	-	617	-	639	-	-	-	-	-	-
				0.105	-	-	-	-	-	773	-	-	-	-	-
				0.187	-	-	-	-	-	-	-	-	836	-	*
33	1/4-20	0.250	SD4	0.048	-	-	338	-	-	-	-	-	-	*	*
				0.060	-	-	-	496	-	-	-	-	-	*	*
				0.075	-	-	615	-	712	-	-	-	*	*	*
				0.105	-	-	-	-	-	843	-	-	*	*	*
				0.187	-	-	-	-	-	-	-	*	912	*	*

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

<sup>1</sup> Available strengths are based on laboratory tests.

<sup>2</sup> Values are based on grade 33 steel members with minimum yield strengths of  $F_y = 33$  ksi and tensile strengths of  $F_u = 45$  ksi.

<sup>3</sup> For shear connections, the lesser of the allowable fastener shear strength and the allowable shear (bearing) strength must be used for design.

<sup>4</sup> Available capacity for other member thicknesses may be determined by interpolating within the table.

<sup>5</sup> To determine the design strength value multiply the value by the applied safety factor of 3.0 and then multiply again by the LRFD resistance factor of 0.5

<sup>6</sup> “\*\*” Indicates the given steel member thickness is outside the given fastener’s drill capacity limits.

<sup>7</sup> “-” Indicates the given steel member thickness was not tested or calculated.

<sup>8</sup> Shading indicates that the value exceeds the allowable fastener shear strength from Table 2, and will not govern the design of the connection.

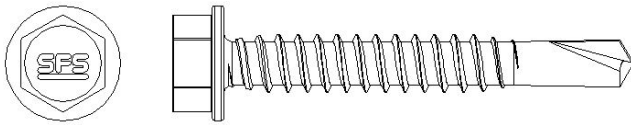


FIGURE 1—IMPAX® HEX WASHER HEAD

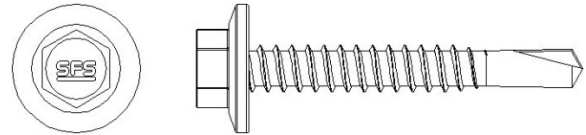


FIGURE 2—IMPAX® CUPPED HEX WASHER HEAD

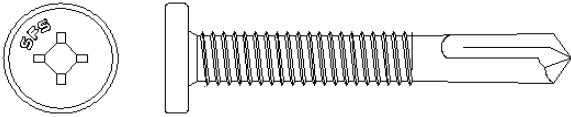


FIGURE 3—CLIP IMPAX® PANCAKE HEAD

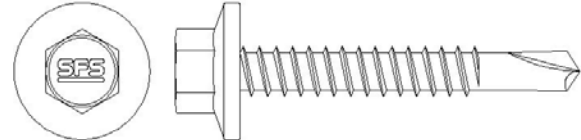


FIGURE 4—IMPAX® STAINLESS STEEL MAC CAP

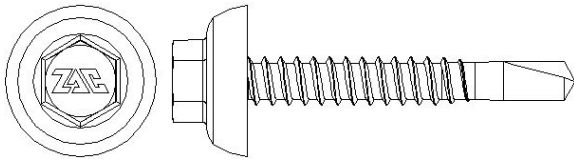


FIGURE 5—IMPAX® ZINC-ALLOY ZAC CAP

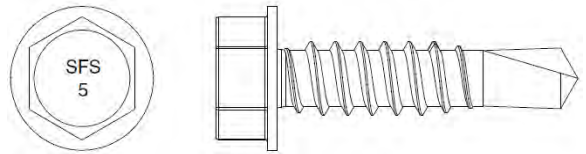


FIGURE 6—FLEX5 HEX WASHER HEAD

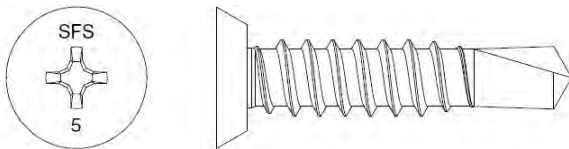


FIGURE 7—FLEX5 UNDERCUT FLAT HEAD

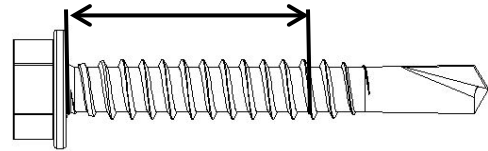


FIGURE 8—LOAD BEARING AREA

## ICC-ES Evaluation Report

## ESR-3870 FBC Supplement

Issued January 2017

This report is subject to renewal January 2018.

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### EVALUATION SUBJECT:

**SFS INTEC IMPAX® AND SFS-FLEX5® SELF-DRILLING STRUCTURAL FASTENERS**

### 1.0 REPORT PURPOSE AND SCOPE

#### Purpose:

The purpose of this evaluation report supplement is to indicate that the SFS intec Impax® and SFS intec Flex5® self-drilling tapping screws, recognized in ICC-ES master evaluation report ESR-3870, have also been evaluated for compliance with the codes noted below.

#### Applicable code editions:

- 2014 *Florida Building Code—Building*
- 2014 *Florida Building Code—Residential*

### 2.0 CONCLUSIONS

The SFS intec Impax® and SFS intec Flex5® self-drilling tapping screws, described in Sections 2.0 through 7.0 of the master evaluation report ESR-3870, comply with the *Florida Building Code—Building* and the *Florida Building Code—Residential*, provided the design and installation are in accordance with the 2012 *International Building Code*® provisions noted in the master report, and the following conditions apply:

- Design wind loads must be based on Section 1609 of the *Florida Building Code—Building* or Section 301.2.1 of the *Florida Building Code—Residential*, as applicable.
- Load combinations must be in accordance with Section 1605.2 or Section 1605.3 of the *Florida Building Code—Building*, as applicable.
- The self-drilling screws must be limited to dry, interior locations, which include exterior walls which are protected by an exterior wall envelope.

Use of the SFS intec Impax® and SFS intec Flex5® self-drilling tapping 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* under the following condition:

Design wind loads must meet the requirements of Section 1620 of the *Florida Building Code—Building*.

For products falling under Florida Rule 9N-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 master report, issued January 2017.