ICC EVALUATION SERVICE

Most Widely Accepted and Trusted

ICC-ES Evaluation Report

ESR-2442

Reissued October 1, 2011

This report is subject to renewal in one year.

www.icc-es.org | (800) 423-6587 | (562) 699-0543 *A Subsidiary of the International Code Council®*

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

REPORT HOLDER:

GRK CANADA LTD.
1499 ROSSLYN ROAD
THUNDER BAY, ONTARIO P7E 6W1
CANADA
(807) 474-4300
www.grkfasteners.com
tech.info@grkfasteners.com

EVALUATION SUBJECT:

RSS™ RUGGED STRUCTURAL SCREWS, RSS™ LPS PANEL SCREWS, RSS™ LTF TIMBER FRAME SCREWS, RSS™ PHEinox STAINLESS STEEL SCREWS, RSS™ JTS TRUSS SCREWS AND CLIMATEK™ COATING

1.0 EVALUATION SCOPE

Compliance with the following codes:

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

Properties evaluated:

- Structural
- Corrosion resistance

2.0 USES

The RSS™ fasteners described in this report are alternate dowel-type, multi-purpose screws, less than $^1/_4$ inch (6.35 mm) in shank diameter, used in wood-to-wood connection applications. Climatek™ coated RSS™ screws are used, when approved, where carbon steel screws must exhibit corrosion resistance when exposed to adverse environmental conditions and/or preservative treated wood, and are alternates to stainless steel or hot-dip-zinc galvanized fasteners with a coating weight in compliance with ASTM A 153, Class D. The Climatek™ coated screws have been evaluated for use with wood chemically treated with waterborne alkaline copper quaternary (ACQ-D) preservative and copper azole (CA-B) preservative.

3.0 DESCRIPTION

3.1 General:

The RSS fasteners described in this report are self-tapping screws, manufactured using a cold-forming process, and, except for PHEinox stainless steel screws, are heat-treated. The fasteners, except for the PHEinox screws, have a proprietary finish (Climatek™ coating) for corrosion protection. The fasteners have a round head with built-in shield (washer type head), rolled threads, and a Type 17 point (Zip-Tip™). The RSS, LTF, and PHEinox series of screws have 7 threads per inch, while the LPS and JTS series of screws have 8 threads per inch. See Table 1 and Figure 1 of this report for the available screw dimensions for each type of screw.

3.2 Material:

3.2.1 Fasteners: The screws are made of hardened carbon steel wire, except the PHEinox screws, which are stainless steel, with allowable tension and shear capacities as listed in Table 1 of this report. The minimum bending yield strengths of the fasteners are also listed in Table 1. All of the fasteners are produced in accordance with the approved quality control manual.

3.2.2 Coating: The proprietary Climatek™ coating consists of multiple layers of various materials, including layers of zinc and polymer.

4.0 DESIGN AND INSTALLATION

4.1 Design:

Minimum wood specific gravity for use in design of connections with all screws evaluated in this report is 0.42. Design values for withdrawal connections must be as specified in Table 2. Design values for pull-through must be as specified in Table 2. Design values for lateral resistance in wood-to-wood connections loaded parallel and perpendicular to the grain, must be as specified in Table 3. Design details not covered in this section must be in accordance with Parts 10 and 11 of the NDS.

The allowable load for a single-screw connection in which the screw is subject to tension is the least of: (a) the allowable screw tension strength given in Table 1; (b) the reference withdrawal design value given in Table 2, adjusted by all applicable adjustment values; and (c) the reference head pull-through design value given in Table 2, adjusted by all applicable adjustment values.

The allowable lateral load for a single-screw connection is the lesser of: (a) the allowable screw shear strength given in Table 1; and (b) the reference lateral design value given in Table 3, adjusted by all applicable adjustment factors.

Connections containing multiple screws must be designed in accordance with Sections 10.1.2, 10.2.2 and 11.6 of the NDS.

Where the screws are subjected to combined lateral and withdrawal loads, connections must be designed in accordance with Section 11.4.1 of the NDS.

Design of connections using the Climatek™ coated RSS screws must be limited to use in typical applications and limitations defined in Table 5.

The Climatek™ coated RSS screws are recognized for use in wood treated with waterborne alkaline copper quaternary (ACQ-D) preservatives with a maximum retention of 0.40 pcf (6.4 kg/m³) or in wood treated with copper azole (CA-B) preservatives with a maximum retention of 0.40 pcf (6.4 kg/m³).

4.2 Installation:

Screws must be installed in accordance with GRK Canada published installation instructions and this report. Screws must be installed with the minimum spacing, end distances, and edge distances to prevent splitting of the wood or as noted in Table 4, whichever is more restrictive. For screws installed in structural composite lumber (SCL) products, the minimum fastener end and edge distance and spacing must be in accordance with Table 4 of this report or in accordance with the recommendations of the SCL manufacturer, whichever is more restrictive. The screws must be installed by turning with Star Drive (Torx) bits, not by driving with a hammer.

5.0 CONDITIONS OF USE

The RSS™ 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 Installation must comply with this report, the manufacturer's published instructions and the applicable code. A copy of the manufacturer's published installation instructions must be available at the jobsite at all times during installation. In the event of a conflict between the manufacturer's published installation instructions and this report, this report governs.

5.2 When the capacity of a connection is controlled by fastener metal strength, rather than wood strength, the metal strength must not be multiplied by the adjustment factors specified in the NDS.

5.3 When designing a connection, the structural member must be checked for load-carrying capacity in accordance with Section 10.1.2 of the NDS, and local stresses within the connection must be checked against Appendix E in the NDS to ensure the capacity of the connection and fastener group.

5.4 Installation must be limited to connections between wood members used in dry in-service conditions where the wood moisture content does not exceed 19 percent.

5.5 Installation must be limited to connections between wood members each with a minimum specific gravity of 0.42.

5.6 The screws are manufactured and coated in Taiwan and in Germany under a quality control program with inspections by PFS Corporation (AA-652) and Ingenieurburo Eligehausen und Asmus (IEA) (AA-707), respectively.

6.0 EVIDENCE SUBMITTED

6.1 Data in accordance with the ICC-ES Acceptance Criteria for Alternate Dowel-type Threaded Fasteners (AC233), dated June 2011.

6.2 Data in accordance with the ICC-ES Acceptance Criteria for Corrosion-resistant Fasteners and Evaluation of Corrosion Effect of Wood Treatment Chemicals (AC257), dated October 2009.

7.0 IDENTIFICATION

The RSS™ screws with Climatek™ coating are identified by the designation "RSS", "LTF", "LPS", or "JTS" on the head of each screw, along with the diameter and length in millimeters. The stainless steel RSS PHEinox™ screw is similarly identified with "RSS" on the head along with the diameter and length in millimeters. See Figure 1 for typical head markings. Packaging labels for the RSS™ wood screws include the GRK Fasteners name and address, the evaluation report number (ESR-2442), the fastener designation, the fastener size and length, the coating designation where applicable, and the compatible treated wood types (0.40 pcf ACQ-D and 0.40 pcf CA-B) where applicable.

TABLE 1—RSS™ FASTENER SPECIFICATIONS

FASTENER DESIGNATION		LENGTH[1] (inches)	THREAD LENGTH[2] (inches)	MINOR THREAD DIAMETER[3] (inch)	SHANK DIAMETER[3] (inch)	OUTSIDE THREAD DIAMETER[3] (inch)	ALLOWABLE STEEL STRENGTH		
							BENDING YIELD STRENGTH[4] F_{yb} (psi)	TENSILE (lbf) [psi]	SHEAR (lbf) [psi]
RSS	1/4 x 2 1/2"	2 3/8	1 1/2	0.150	0.169	0.239	170,400	1112 [62,770]	754 [42,560]
	1/4 x 2 3/4"	2 3/4	1 3/4						
	1/4 x 3 1/8"	3 1/8	2						
	1/4 x 3 1/2"	3 1/2	2 3/8						
	5/16 x 2 1/2"	2 3/8	1 1/2	0.174	0.199	0.280	190,900	1415 [59,320]	982 [41,170]
	5/16 x 2 3/4"	2 3/4	1 3/4						
	5/16 x 3 1/8"	3 1/8	2 1/8						
	5/16 x 3 1/2"	3 1/2	2 1/2						
	5/16 x 4"	3 7/8	2 3/4						
	5/16 x 5 1/8"	5	3 1/2						
	5/16 x 6"	5 7/8	3 7/8						
	3/8 x 3 1/8"	3 1/8	2 1/8	0.191	0.223	0.310	178,000	1941 [67,920]	1231 [43,080]
	3/8 x 4"	3 7/8	2 3/4						
	3/8 x 5 1/8"	5 1/8	3 1/2						
	3/8 x 6"	5 7/8	4						
	3/8 x 7 1/4"	7	4 1/2						
	3/8 x 8"	7 7/8	4 3/8						
	3/8 x 10"	9 3/4	5						
	3/8 x 12"	11 7/8	5 7/8						
	3/8 x 14 1/8"	14 1/8	5 7/8						
	3/8 x 16"	15 5/8	5 3/4						
LPS	1/4 x 6"	5 7/8	2 7/8	0.152	0.172	0.238	172,600	1051 [57,610]	666 [36,510]
	1/4 x 8"	7 7/8	2 7/8						
	1/4 x 9"	9	2 7/8						
	1/4 x 10"	9 7/8	2 7/8						
	1/4 x 11"	10 7/8	2 7/8						
	1/4 x 12"	11 3/4	2 7/8						
	1/4 x 14"	13 7/8	2 7/8						
LTF	3/8 x 8"	7 7/8	3 7/8	0.191	0.220	0.310	167,600	1714 [59,770]	1094 [38,150]
	3/8 x 10"	9 7/8	3 7/8						
	3/8 x 12"	11 3/4	3 7/8						
	3/8 x 15"	14 3/4	3 7/8						
	3/8 x 18"	18	3 7/8						
	3/8 x 20"	19 5/8	3 7/8						
RSS PHEinox	1/4 x 2 1/2"	2 3/8	1 1/2	0.152	0.170	0.237	111,400	628 [34,650]	546 [30,050]
	1/4 x 3 1/8"	3 1/8	2						
	5/16 x 2 1/2"	2 3/8	1 5/8	0.171	0.195	0.276	118,300	806 [34,910]	668 [28,930]
	5/16 x 3 1/8"	3 1/8	2 1/8						
	5/16 x 4"	3 7/8	2 1/2						
	5/16 x 5 1/8"	5 1/8	3 3/8						
	5/16 x 6"	5 7/8	3 7/8						
JTS	1/4 x 3 3/8"	3 3/8	1 3/8	0.153	0.173	0.240	226,300	1104 [60,330]	769 [42,030]
	1/4 x 5"	5	1 5/8						
	1/4 x 6 3/4"	6 3/4	1 1/2						

For **SI:** 1 inch = 25.4 mm; 1 psi =6.9 kPa; 1 lbf = 4.4 N.

[1]The length of fasteners is measured from the underside of the head to bottom of the tip. See Figure 1.
[2]Length of thread includes tip. See Figure 1.
[3]Minor thread, shank and outside thread diameters are shown in table without manufacturing tolerances.
[4]Bending yield strength determined in accordance with ASTM F 1575 using the minor thread diameter.
[5]See Figure 1 for additional dimensional information.

TABLE 2—RSS™ REFERENCE WITHDRAWAL (*W*) AND PULL-THROUGH (*P*) DESIGN VALUES[1,2,4]

FASTENER DESIGNATION		THREAD LENGTH (inches)	*W* (lbf/ in.)[2]		P (lbf)[3]	
			For Specific Gravities of:			
			0.42	0.55	0.42	0.55
RSS	1/4 x 2 1/2"	1 1/2	151	186	165	275
	1/4 x 2 3/4"	1 3/4				
	1/4 x 3 1/8"	2				
	1/4 x 3 1/2"	2 3/8				
	5/16 x 2 1/2"	1 1/2	165	227	207	418
	5/16 x 2 3/4"	1 3/4				
	5/16 x 3 1/8"	2 1/8				
	5/16 x 3 1/2"	2 1/2				
	5/16 x 4"	2 3/4				
	5/16 x 5 1/8"	3 1/2				
	5/16 x 6"	3 7/8				
	3/8 x 3 1/8"	2 1/8	180	259	196	351
	3/8 x 4"	2 3/4				
	3/8 x 5 1/8"	3 1/2				
	3/8 x 6"	4				
	3/8 x 7 1/4"	4 1/2				
	3/8 x 8"	4 3/8				
	3/8 x 10"	5				
	3/8 x 12"	5 7/8				
	3/8 x 14 1/8"	5 7/8				
	3/8 x 16"	5 3/4				
LPS	1/4 x 6"	2 7/8	128	201	136	395
	1/4 x 8"	2 7/8				
	1/4 x 9"	2 7/8				
	1/4 x 10"	2 7/8				
	1/4 x 11"	2 7/8				
	1/4 x 12"	2 7/8				
	1/4 x 14"	2 7/8				
LTF	3/8 x 8"	3 7/8	163	216	202	373
	3/8 x 10"	3 7/8				
	3/8 x 12"	3 7/8				
	3/8 x 15"	3 7/8				
	3/8 x 18"	3 7/8				
	3/8 x 20"	3 7/8				
PHEinox	1/4 x 2 1/2"	1 1/2	134	187	162	306
	1/4 x 3 1/8"	2				
	5/16 x 2 1/2"	1 5/8	136	202	199	254
	5/16 x 3 1/8"	2 1/8				
	5/16 x 4"	2 1/2				
	5/16 x 5 1/8"	3 3/8				
	5/16 x 6"	3 7/8				
JTS	1/4 x 3 3/8"	1 3/8	152	191	154	372
	1/4 x 5"	1 5/8				
	1/4 x 6 3/4"	1 1/2				

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

[1]Values must be multiplied by all applicable adjustment factors, except wet service factors, C_m (See NDS Table 10.3.1). Fasteners are limited to dry service conditions only.

[2]Withdrawal Design Values (*W*):

Fastener withdrawal design values were tested in accordance with ASTM D 1761.

Tabulated withdrawal design values are in pounds per inch of thread penetration into the side grain of the main member.

Reference withdrawal design values must be multiplied by the thread length embedded in the side grain of the main member in order to get the total withdrawal design value in pounds.

[3]Pull-Through Design Values (*P*):

Fastener pull-through testing was performed in accordance with ASTM D 1037 with 3/4 inch-thick side members.

Tabulated pull-through design values apply to connections having a minimum side member thickness of 3/4 inch. Connections having a side member thickness greater than 3/4 inch must use the tabulated pull-through values listed in the table.

[4]For specific gravities between 0.42 and 0.55, use the values for specific gravity equal to 0.42.

TABLE 3—RSS™ REFERENCE LATERAL DESIGN VALUES (*Z*) FOR SINGLE SHEAR (TWO-MEMBER) CONNECTIONS[1,3]
[For Sawn Lumber or SCL with Both Members of Identical Specific Gravity]

FASTENER DESIGNATION		SIDE MEMBER THICKNESS, t^s (inches)	FASTENER PENETRATION INTO MAIN MEMBER[2], *p* (inches)	REFERENCE LATERAL DESIGN VALUE, *Z* (lbf)[2],4 FOR SPECIFIC GRAVITIES OF:			
				0.42		0.55	
				Parallel to Grain, $Z_\parallel$	Perpendicular to Grain, $Z_\perp$	Parallel to Grain, $Z_\parallel$	Perpendicular to Grain, $Z_\perp$
RSS	1/4 x 2 1/2"	3/4	1 5/8	153	137	175	175
	1/4 x 2 3/4"	3/4	2				
	1/4 x 3 1/8"	3/4	2 3/8				
	1/4 x 3 1/2"	3/4	2 3/4				
	5/16 x 2 1/2"	3/4	1 5/8	168	133	214	178
	5/16 x 2 3/4"	3/4	2				
	5/16 x 3 1/8"	3/4	2 3/8				
	5/16 x 3 1/2"	3/4	2 3/4				
	5/16 x 4"	1 1/2	2 3/8	239	236	333	257
	5/16 x 5 1/8"	1 1/2	3 1/2				
	5/16 x 6"	2	3 7/8	265	299	472	289
	3/8 x 3 1/8"	3/4	2 3/8	188	156	251	220
	3/8 x 4"	1 1/2	2 3/8	224	205	274	264
	3/8 x 5 1/8"	1 1/2	3 5/8				
	3/8 x 6"	2	3 7/8	270	296	325	288
	3/8 x 7 1/4"	2 3/4	4 1/4	423	291	593	304
	3/8 x 8"	3 1/2	4 3/8				
	3/8 x 10"	3 1/2	6 1/4				
	3/8 x 12"	3 1/2	8 3/8				
	3/8 x 14 1/8"	3 1/2	10 5/8				
	3/8 x 16"	3 1/2	12 1/8				
LPS	1/4 x 6"	3	2 7/8	249	257	358	219
	1/4 x 8"	5	2 7/8				
	1/4 x 9"	6	3				
	1/4 x 10"	7	2 7/8				
	1/4 x 11"	8	2 7/8				
	1/4 x 12"	9	2 3/4				
	1/4 x 14"	11	2 7/8				
LTF	3/8 x 8"	4	3 7/8	433	315	556	402
	3/8 x 10"	6	3 7/8				
	3/8 x 12"	8	3 3/4				
	3/8 x 15"	11	3 3/4				
	3/8 x 18"	14	4				
	3/8 x 20"	16	3 5/8				
PHEinox	1/4 x 2 1/2"	3/4	1 5/8	162	134	215	185
	1/4 x 3 1/8"	3/4	2 3/8				
	5/16 x 2 1/2"	3/4	1 5/8	151	149	181	175
	5/16 x 3 1/8"	3/4	2 3/8				
	5/16 x 4"	1 1/2	2 3/8	249	229	337	272
	5/16 x 5 1/8"	1 1/2	3 5/8				
	5/16 x 6"	2	3 7/8	302	340	449	358
JTS	1/4 x 3 3/8"	1 3/4	1 5/8	157	168	217	217
	1/4 x 5"	1 3/4	3 1/4	168	221	241	237
	1/4 x 6 3/4"	1 3/4	5				

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

[1]Values shall be multiplied by all applicable adjustment factors, except the wet service factor, C_m (see NDS Table 10.3.1). Fasteners are limited to dry service conditions only.
[2]When penetration, *p*, into the main member is less than 10*D* (*D* = shank diameter from Table 1) the values in the table shall be multiplied by the following penetration depth factor: Cd = p/10D ≤ 1.0. Minimum penetration, p = 6D
[3]Lateral load testing was performed in accordance with ASTM D 1761.
[4]For specific gravities between 0.42 and 0.55, use the values for specific gravity equal to 0.42.

TABLE 4—CONNECTION GEOMETRY

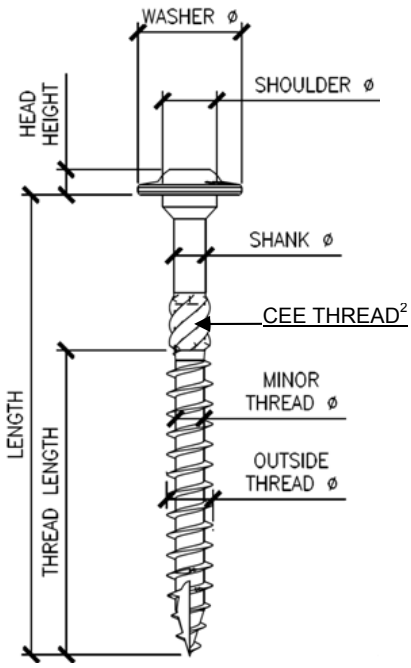
CONNECTION GEOMETRY/ CRITERIA	DIAMETERS[1]	RSS, LPS, JTS & RSS PHEinox 1/4" NOMINAL DIAMETER (inches)	RSS & RSS PHEinox 5/16" NOMINAL DIAMETER (inches)	RSS & LTF 3/8" NOMINAL DIAMETER (inches)
Minimum Edge Distance				
Loading Parallel to Grain	8	1 1/2	1 5/8	1 7/8
Loading Perpendicular to Grain, Loaded Edge	8	1 1/2	1 5/8	1 7/8
Loading Perpendicular to Grain, Unloaded Edge	8	1 1/2	1 5/8	1 7/8
Minimum End Distance				
Tension Load Parallel to Grain	15	2 5/8	3	3 3/8
Compression Load Parallel to Grain	10	1 3/4	2	2 1/4
Load Perpendicular to Grain	10	1 3/4	2	2 1/4
Spacing (Pitch) Between Fasteners in a Row.				
Parallel to Grain	15	2 5/8	3	3 3/8
Perpendicular to Grain	10	1 3/4	2	2 1/4
Spacing (Gage) Between Rows of Fasteners				
In-Line	5	7/8	1	1 1/8
Staggered	2 1/2	1/2	1/2	5/8
Minimum Penetration into Main Member for Single Shear Connections	6[2]	1 1/8	1 1/4	1 3/8

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

[1]Diameter is the shank diameter as specified in Table 1.

TABLE 5—EXPOSURE CONDITIONS FOR FASTENERS WITH INTENDED USE AND LIMITATIONS OF RECOGNITION

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



SCREW TYPE	HEAD STAMP	WASHER Ø ± 0.020 inch	HEAD HEIGHT ± 0.010 inch	SHOULDER Ø ± 0.010 inch	CEE THREAD[2] (inches)
RSS & RSS PHEinox $^1/_4$ (6.00 mm)		0.533	0.110	0.244	LENGTH ≥ $3^1/_8$
RSS & RSS PHEinox $^5/_{16}$ (7.00 mm)		0.620	0.157	0.301	LENGTH ≥ $3^1/_8$
RSS $^3/_8$ (8.0 mm)		0.689	0.181	0.364	LENGTH ≥ $3^1/_8$
LTF $^3/_8$ (8.0 mm)		0.688	0.181	0.364	LENGTH ≥ $3^1/_8$
LPS $^1/_4$ (6.0 mm)		0.535	0.090	0.244	NO
JTS $^1/_4$ (6.3 mm)		0.534	0.090	0.244	LENGTH ≥ 5

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

NOTES:
1. See Table 1 for length, thread length, shank diameter, outside thread diameter and minor thread diameter.
2. CEE thread on screws with lengths greater than or equal to those indicated. Not used for calculations.
3. Dimensions given if not otherwise stated are in inches.

FIGURE 1—FASTENER DIMENSIONS