ICC-ES Evaluation Report

ESR-4201

Reissued April 2024

This report also contains:

- CBC Supplement

Subject to renewal April 2026

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DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES Section: 06 05 23—Wood, Plastic, and Composite Fastenings	REPORT HOLDER: KWANTEX RESEARCH INC. ADDITIONAL LISTEE: FASTENAL COMPANY	EVALUATION SUBJECT: SCREWS WITH KTCO COATING	

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2021, 2018, 2015, 2012, and 2009 *International Building Code®* (IBC)
- 2021, 2018, 2015, 2012, and 2009 *International Residential Code®* (IRC)

Property evaluated:

- Structural
- Corrosion resistance

2.0 USES

The Kwantex screws are used for wood-to-wood connections that are designed in accordance with the IBC. For structures regulated under the IRC, the screws may be used where an engineered design is submitted in accordance with IRC Section R301.1.3. The screws are intended for use in the Exposure Conditions shown in Table 5.

3.0 DESCRIPTION

3.1 General:

The Kwantex screws are proprietary, partially threaded dowel-type threaded fasteners used in wood. The screws have a countersunk flat head with tornado ribs and a star shaped driving recess. For screws more than 1 inch (25.4 mm) long, there is a reamer knurl between the smooth portion of the shank and the threads. The screw tip has a different thread than the screw body. These threads near the screw tip are designated as a Torpedo Thread. See Table 1 for designations and dimensions and Figure 1 for images of the screws. The product name and coating name used for the listee are as follows:

LISTEE	PRODUCT NAME	COATING NAME
Fastenal	High Performance Exterior Construction Screws	EcoGuard

3.2 Material:

The screws are manufactured from carbon steel wire complying with grade C1022 and are heat-treated to achieve case and core hardness in accordance with the manufacturer's specifications. The screws have a proprietary coating, designated as KTCO coating, consisting of multiple layers of protective materials which are specified in the manufacturer's quality documentation.

3.3 Wood Members:

For purposes of connection design, sawn lumber members must have an assigned specific gravity as indicated in the tables in this report. Assigned specific gravity for sawn lumber must be determined in accordance with Table 12.3.3A of the ANSI/AWC National Design Specification for Wood Construction® (NDS) (Table 11.3.3A of the NDS for the 2012 IBC, Table 11.3.2 of the NDS for the 2009 IBC). Unless otherwise noted, sawn lumber members must have a moisture content of 19 percent or less.

Use of the screws in engineered wood products is outside the scope of this report.

For wood-to-wood connections, the tabulated side member thickness is an absolute value (not a minimum or maximum value). The thickness of the wood main member must be equal to or greater than the screw length less the thickness of the side member.

4.0 DESIGN AND INSTALLATION

4.1 Design:

The design values in this report are intended to aid the designer in meeting the requirements of IBC Section 1604.2. For connections not completely described in this report, determination of the suitability of the Kwantex screws for the specific application is the responsibility of the designer and is outside the scope of this report. The designer is responsible for determining the available strengths for the connection, considering all applicable limit states, and for considering serviceability issues.

4.1.1 Screw Strength: Allowable screw tension and shear strengths and specified bending yield strengths are shown in Table 1.

4.1.2 Adjustments to Reference Design Values: The reference design values must be adjusted in accordance with the requirements for dowel-type fasteners in Section 11.3 of the NDS (Section 10.3 of the NDS for the 2012 and 2009 IBC), including the wet service factor, C_M, shown in the tables in this report, to determine allowable loads for use with ASD and/or design loads for use with LRFD. The reference design values must also be adjusted in accordance with Section 12.5 of the NDS (Section 11.5 of the NDS for the 2012 and 2009 IBC), as applicable.

4.1.3 Capacity Requirements for Wood Members: 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 the NDS for the 2012 and 2009 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.

4.1.4 Reference Withdrawal and Pull-through Design Values: Reference withdrawal (W) design values in pounds per inch of thread penetration, for screws installed perpendicular to the face of the wood member are shown in Table 2. Reference head pull-through values (W_H) are also shown in Table 2.

4.1.5 Lateral Connections in Accordance with the NDS: The Kwantex Research screws with KTCO coating have not been qualified for design of lateral connections in accordance with the NDS. Use in lateral connections is limited to the specific conditions described in Section 4.1.7.

4.1.6 Two-member Wood-to-wood Connections Based on Testing: Reference lateral design values for individual screws based on testing are shown in Table 3.

4.1.6.1 Governing Design Values: The allowable load for a two-member, single-screw connection in which the screw is subject to tension is the least of: (a) the reference withdrawal design load value given in Table 2, multiplied by the embedded thread length, and adjusted by all applicable adjustment factors; (b) the reference head pull-through design value given in Table 2, adjusted by all applicable factors; and (c) the allowable screw tension strength given in Table 1. The allowable load for a two-member, single-screw connection subject to lateral load 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.

4.1.6.2 Combined Loading: Use of the screws when subjected to combined lateral and withdrawal loads is outside the scope of this report.

4.2 Corrosion Resistance:

The Kwantex screws may be used in wood treated with ACQ-D preservatives with a maximum retention of 0.40 pcf (6.4 kg/m³), as alternates to hot-dip galvanized fasteners prescribed in IBC Section 2304.10.6 (2018 and 2015 IBC Section 2304.10.5, 2012 and 2009 IBC Section 2304.9.5), when subject to the Exposure Conditions shown in Table 5.

4.3 Installation:

Kwantex screws must be installed in accordance with the report holder's published installation instructions and this report. The screws must be installed perpendicular to the face of the wood member. Screws must be installed with the minimum spacing, end distances, and edge distances needed to prevent splitting of the wood or as noted in Table 4, whichever is more restrictive. The top of the screw head must be flush with the surface of the wood side member. Screws must not be overdriven. Installation must be performed without predrilling. The screws must be installed by turning with a power driver, not by driving with a hammer.

5.0 CONDITIONS OF USE:

The Kwantex 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 report holder's published installation instructions and this report. In the case of a conflict between this report and the report holder's instructions, this report governs.

5.2 Design loads for the screws must not exceed the available strengths described in Section 4.1.

5.3 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.

5.4 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 Dowel-type Threaded Fasteners Used in Wood (AC233), dated October 2020 (editorially revised December 2020).

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 January 2021).

7.0 IDENTIFICATION

7.1 The fastener heads are marked with the letters "FNL". Packages of screws are identified with the listee product name (High Performance Exterior Construction Screws), the listee name (Fastenal), the screw size (# and length), the coating name and the evaluation report number (ESR-4201).

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

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NO. 7 LANE 376, ZONG-ZENG ROAD
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TAINAN, 718012
TAIWAN R.O.C.
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7.3 The additional listee's contact information is the following:

FASTENAL COMPANY
2001 THEURER BOULEVARD
WINONA, MINNESOTA 55987
(507) 454-5374
www.fastenal.com

TABLE 1—KWANTEX SCREW DIMENSIONS AND STRENGTHS

NOMINAL DIAMETER (inch)	OVERALL LENGTH[1] (inches)	THREAD LENGTH[2] (inches)	HEAD DIAMETER (inch) (DRIVE SIZE)	UNTHREADED SHANK DIAMETER (inch)	MINOR THREAD (ROOT) DIAMETER, D_r (inch)	OUTSIDE THREAD DIAMETER, D (inch)	SPECIFIED BENDING YIELD STRENGTH[3] F_{yb} (psi)	ALLOWABLE SCREW STRENGTH	
								Tension (lbf)	Shear (lbf)
#8	1	Full	0.305 (T-20)	0.120	0.108	0.165	Not specified	646	388
	$1^1/_4$	$^7/_8$							
	$1^1/_2$	1							
	$1^5/_8$	$1^1/_8$							
	2	$1^1/_4$					179,000		
#9	2	$1^1/_4$	0.325 (T-20)	0.137	0.122	0.189	185,000	773	459
	$2^1/_2$	$1^5/_8$							
	$2^3/_4$	$1^7/_8$							
	3	2							
#10	$1^1/_2$	1	0.365 (T-25)	0.144	0.130	0.201	Not specified	915	492
	2	$1^1/_4$					177,000		
	$2^1/_2$	$1^5/_8$							
	3	2							
	$3^1/_2$	$2^3/_8$					197,000		
	4	$2^5/_8$							
	$4^1/_2$	3							
	5	3							
	6	3							

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

[1]Measured from the top of the head to bottom of the tip.
[2]Length of thread includes tip.
[3]Bending yield strength determined in accordance with ASTM F1575 using the minor thread diameter.

TABLE 2—REFERENCE WITHDRAWAL (*W*) AND PULL-THROUGH (W_H) DESIGN VALUES FOR INSTALLATION INTO THE FACE OF THE WOOD MEMBER[1,2]

NOMINAL SCREW DIAMETER (inch)	WITHDRAWAL[3]			PULL-THROUGH[5]		
	Minimum Embedded Thread Length[4] (inches)	Reference Withdrawal, *W* (lbf/ in.) for G ≥ 0.55	Wet Service Factor, C_M	Nominal Head Diameter (inch)	Reference Pull-through, W_H (lbf) for G ≥ 0.55	Wet Service Factor, C_M
#8	$^9/_{16}$	77	0.7	0.305	80	0.7
	$1^1/_4$	108				
#9	$1^1/_4$	107	0.7	0.325	91	0.7
	2	141				
#10	1	91	0.7	0.365	107	0.7
	$2^3/_8$	141				

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

[1]Tabulated values must be multiplied by all adjustment factors included in the NDS for dowel-type fasteners to determine allowable loads for use with ASD and/or design loads for use with LRFD.
[2]Tabulated values are applicable to screws installed perpendicular to the faces of the wood members.
[3]The tabulated reference withdrawal design value is in pounds-force per inch of thread embedment into the main member.
[4]Embedded thread length is that portion of the screw held in the main member including the screw tip.
[5]Tabulated pull-through design values are based on a minimum side member thickness of $^3/_4$ inch.

TABLE 3—REFERENCE LATERAL DESIGN VALUES (*Z*) FOR TWO-MEMBER WOOD-TO-WOOD CONNECTIONS[1,2,3,4]

NOMINAL SCREW DIAMETER (inch)	MINIMUM OVERALL LENGTH (inches)	SIDE MEMBER THICKNESS, (inches)	MINIMUM PENETRATION INTO MAIN MEMBER (inches)	REFERENCE LATERAL DESIGN VALUE, *Z* (lbf) FOR SPECIFIC GRAVITY, G ≥ 0.55:		WET SERVICE FACTOR, C_M
				Parallel to Grain, $Z_\parallel$	Perpendicular to Grain, $Z_\perp$	
#8	2	1	1	78	68	0.7
#9	$2^1/_2$	1	$1^1/_2$	116	98	
#10	$2^1/_2$	1	$1^1/_2$	127	109	

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

[1]Tabulated values must be multiplied by all adjustment factors included in the NDS for dowel-type fasteners to determine allowable loads for use with ASD and/or design loads for use with LRFD.
[2]Tabulated values are applicable to screws installed perpendicular to the faces of the wood members.
[3]The wood main member thickness must be equal to or greater than the screw length less the thickness of the wood side member.
[4]The tabulated lateral design values are based on both wood members having the same specific gravity.

TABLE 4—CONNECTION GEOMETRY REQUIREMENTS[1,2,3]

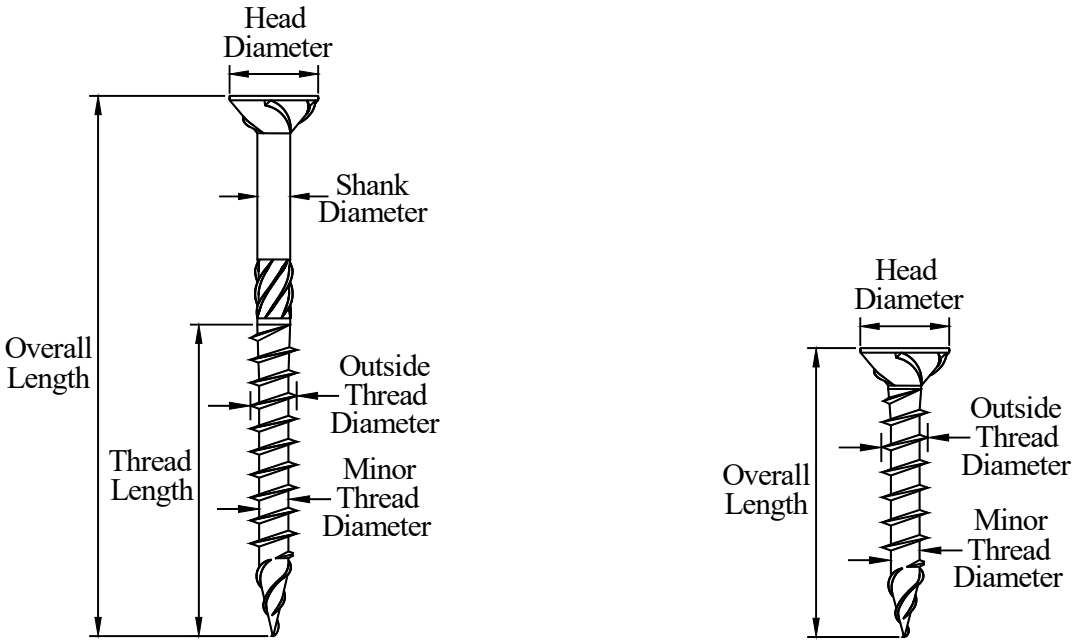
CONDITION			REQUIRED DIMENSION
			G ≥ 0.55
End distance	Tension loading parallel to grain (fastener bearing toward end)		20D
	Compression loading parallel to grain (fastener bearing away from end)		15D
	Loading perpendicular to grain		15D
	Axial loading (fastener withdrawal or pull-through)		10D
Edge distance	Loading parallel to grain		7D
	Loading perpendicular to grain	Load toward edge	12D
		Load away from edge	7D
	Axial Loading		4D
Spacing between fasteners in a row (parallel to grain of main member)	Loading parallel to grain		15D
	Loading perpendicular to grain		15D
	Axial loading		7D
Spacing between rows (perpendicular to grain of main member)	Lateral loading	In-line rows	7D
		Staggered rows[4]	3D
	Axial loading		4D

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

[1]End distances, edge distances and fastener spacing must be sufficient to prevent splitting of the wood, or as required by this table, whichever is the more restrictive.
[2]Wood member stresses must be checked in accordance with Section 11.1.2 and Appendix E of the NDS, and end distances, edge distances and fastener spacing may need to be increased accordingly.
[3]D refers to the outside thread diameter.
[4]Values for spacing between staggered rows apply where fasteners in adjacent rows are offset by half of the spacing between fasteners in a row.

TABLE 5—APPLICABLE EXPOSURE CONDITIONS

EXPOSURE CONDITION	TYPICAL APPLICATIONS	LIMITATIONS
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.
2	Aboveground with coastal salt exposure	Limited to use in clean untreated wood and materials without known corrosion effects greater than that of clean untreated wood.
3	General construction	Limited to freshwater and chemically treated wood exposure, i.e., no saltwater exposure.
4	Coastal construction	No limitations with respect to moisture and chemically treated wood except that chemical wood treatment must have the same or lesser corrosion effects as qualification conditions.



Typical Screw **#8 x 1" screw**

FIGURE 1—KWANTEX SCREWS

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

REPORT HOLDER:

KWANTEX RESEARCH INC.

EVALUATION SUBJECT:

SCREWS WITH KTCO COATING

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that Kwantex screws, described in ICC-ES evaluation report ESR-4201, have also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2019 *California Building Code* (CBC)

For evaluation of applicable chapters adopted by the California Office of Statewide Health Planning and Development (OSHPD) AKA: California Department of Health Care Access and Information (HCAI) and the Division of State Architect (DSA), see Sections 2.1.1 and 2.1.2 below.

- 2019 *California Residential Code* (CRC)

2.0 CONCLUSIONS

2.1 CBC:

The Kwantex screws, described in Sections 2.0 through 7.0 of the evaluation report ESR-4201, comply with CBC Chapter 23, provided the design and installation are in accordance with the 2018 *International Building Code*® (IBC) provisions noted in the evaluation report and the additional requirements of CBC Chapters 16, 17 and 23, as applicable.

2.1.1 OSHPD:

The applicable OSHPD Sections and Chapters of the CBC are beyond the scope of this supplement.

2.1.2 DSA:

The applicable DSA Sections and Chapters of the CBC are beyond the scope of this supplement.

2.2 CRC:

The Kwantex screws, described in Sections 2.0 through 7.0 of the evaluation report ESR-4201, comply with the CRC, provided the design and installation are in accordance with the 2018 *International Residential Code*® (IRC) provisions noted in the evaluation report and the additional requirements of CRC Chapter 3, as applicable.

This supplement expires concurrently with the evaluation report, reissued April 2024.