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COUNTERSINK UNIVERSAL SCREW WASHER HEAD CONSTRUCTION SCREW

CSI Section:

06 05 23 Wood, Plastic and Composite Fastenings

1.0 RECOGNITION

The Countersink Universal Screws and Washer Head Construction Screws manufactured by U2 Fasteners recognized in this report are dowel-type fasteners for use in construction. The physical, structural, and corrosion-resistance properties of the Countersink Universal Screws and Washer Head Construction Screws complies with the intent of the provisions of the following codes and regulations:

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

The screws are recognized for the structural performance characteristics described and tabulated in this evaluation report and for use with ACQ preservative treated wood.

2.0 LIMITATIONS

Use of the U2 Countersink Universal Screws and Washer Head Construction Screws recognized in this report are subject to the following limitations:

2.1 Use of the U2 Fasteners Countersink Universal Screws and Washer Head Construction Screws shall comply with this report and the applicable code.

2.2 The minimum fastener end and edge distances and spacing shall be in accordance with [Table 5](#) of this report or in accordance with the recommendations of the engineered wood product manufacturer, whichever is more restrictive.

2.3 Where installation creates splitting of the wood, holes are required to be pre-drilled in accordance with the NDS for wood-screw installation.

2.4 When designing a connection, the connection shall comply with provisions in Section 10.1.2, 10.2.2, and 11.6 of the NDS to ensure the capacity of the connection and fastener group.

2.5 The U2 fasteners shall be installed only in exposure conditions described in [Table 6](#) of this report.

3.0 PRODUCT USE

U2 Fasteners Countersink Universal Screws and Washer Head Construction Screws are used as fasteners for wood-to-wood and engineered wood connections. The screws may be used where fasteners are required to exhibit corrosion resistance when exposed to adverse environmental conditions and/or preservative treated wood, and are alternatives to hot-dip-zinc galvanized fasteners with a coating weight in compliance with ASTM A153, Class D. The screws were evaluated for use with wood chemically treated with waterborne alkaline copper quaternary (ACQ-D) preservative.

3.1 Design:

3.1.1 General: Structural members forming the connection shall be designed in accordance with the IBC or IRC. Reference lateral and withdrawal design values in this report are for allowable stress design, and shall be multiplied by the applicable adjustment factors including wet service conditions specified in the ANSI/AWC National Design Specification (NDS) and this report to determine adjusted design values. Where the screws are subject to combined lateral and withdrawal loads, connections shall be designed in accordance with Section 11.4.1 of the NDS. When designing a connection, the structural members shall be analyzed for load-carrying capacity in accordance with Section 10.1.2 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 reference withdrawal design value given in [Table 2](#) of this report, adjusted by all applicable adjustment factors; (b) the reference head pull-through design value given in [Table 4](#) of this report, adjusted by all applicable adjustment factors; and (c) the allowable screw tension strength given in [Table 1](#) of this report.

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

Connections containing multiple screws shall be designed in accordance with Sections 10.2.2 and 11.6 of the NDS. Local stresses within the connection shall be checked against Appendix E in the NDS to ensure the capacity of the connection and fastener group.

3.1.2 Lateral Design Values: Reference lateral design values for Universal Screw and Connection Screws for



single shear wood-to-wood connections loaded parallel to grain are shown in [Table 3](#) of this report. Minimum connection geometries shall comply with Table 5 of this report, as applicable.

3.1.3 Reference Withdrawal Design Values: Reference withdrawal design values for U2 Universal Screws and Construction Screws are shown in [Table 2](#) of this report. Loads are given in pounds per inch of thread penetration into the main member.

3.1.4 Pull-Through Design Values: Pull-through design values are shown in [Table 4](#) of this report.

3.2 Installation: Countersink Universal Screws and Washer Head Construction Screws shall be installed in accordance with the manufacturer’s installation instructions, the evaluation report and the codes listed in Section 1.0, using a low speed drill. Where conflicts occur, the more restrictive shall govern. Installation may be performed without pre-drilling wood members. Edge distances, end distances, and spacing of the screws shall be sufficient to prevent splitting of the wood, or as required by [Table 5](#) of this report, whichever is most restrictive. For the U2 Universal Screw, the top of the screw head shall be installed flush with the surface of the side member being connected. For the Construction Screw, the underside of the head shall be installed flush with the surface of the side member being connected.

4.0 PRODUCT DESCRIPTION

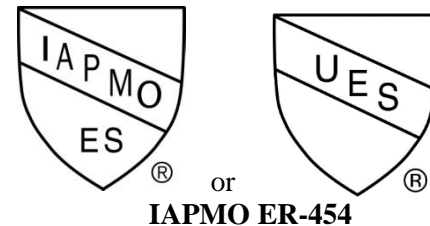
The Countersink Universal Screws and Washer Head Construction Screws described in this report are alternative dowel-type threaded and self-tapping fasteners used for wood-to-wood and engineered wood connections. The screws are made of heat-treated hardened carbon steel wire, and are manufactured using a cold-forming process. The screws have rolled threads and a proprietary point. The Countersink Universal Screws have flat heads with a star-drive recess. The Washer Head Construction Screws have washer heads with a star-drive recess. The screws are available in multiple lengths and diameters as described in [Table 1](#) of this report.

4.1 Corrosion-resistant Coating: The fasteners are coated with U2 Gold Color for corrosion protection. The coated screws are recognized for use in wood pressure-treated with waterborne alkaline copper quaternary (ACQ) preservative with a maximum retention of 0.60 pcf (9.6 kg/m³).

5.0 IDENTIFICATION

The packaging for U2 Fasteners is labeled with the U2 Fastener name and address, the fastener designation and model identification, and the IAPMO UES evaluation Report Number (ER-454). The designations “Universal Screw” or

“Construction Screw” for the Countersink Universal Screws and Washer Head Construction Screws, respectively, are included in the identification. The compatible treated wood type (0.60 pcf ACQ-D) is included, where applicable. Additionally, the Construction screws are identified with an imprint on the head of each screw’s diameter and length. The identification includes the IAPMO Uniform Evaluation Service Mark of Conformity. Either Mark of Conformity may be used as follows:



6.0 SUBSTANTIATING DATA

6.1 Data in accordance with AC233, the ICC-ES Acceptance Criteria for Alternate Dowel-Type Fasteners, approved April 2015, editorially revised August 2015.

6.2 Data in accordance with AC257, the ICC-ES Acceptance Criteria for Corrosion-Resistant Fasteners and Evaluation of Corrosion Effects of Wood Treatment Chemicals, approved October 2009, editorially revised May 2015.

7.0 STATEMENT OF RECOGNITION

This evaluation report describes the results of research carried out by IAPMO Uniform Evaluation Service on U2 Fasteners Countersink Universal Screws and Washer Head Construction Screws packaged in Thunder Bay, Ontario, under a quality control program with inspections by Applied Testing & Geosciences, to assess their conformance to the codes shown in Section 1.0 of this report, and documents the product’s certification.

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For additional information about this evaluation report please visit www.uniform-es.org or email us at info@uniform-es.org

TABLE 1 - U2 COUNTERSINK UNIVERSAL SCREW AND WASHER HEAD CONSTRUCTION SCREW ALLOWABLE BENDING YIELD STRENGTH AND FASTENER ALLOWABLE STEEL STRENGTH

FASTENER DESIGNATION		FASTENER ID	FASTENER LENGTH, L (in.)	THREAD LENGTH, L _t (in.)	MINOR THREAD (ROOT) DIAMETER, d _r (in.)	UNTHREADED SHANK DIAMETER (in.)	MAJOR THREAD (OUTSIDE) DIAMETER, d (in.)	FASTENER ALLOWABLE STEEL STRENGTH		
								Bending Yield Strength (F _{yb}) (psi)	Tensile (lbf)	Shear (lbf)
U2	Universal Screws (Countersink Screws)	9 x 2 3/4"	2 3/4"	2"	0.113	0.131	0.176	215,000	590	337
		9 x 3 1/8"	3 1/8"	1 1/2"						
		10 x 2 1/2"	2 1/2"	1 1/2"	0.130	0.146	0.197	220,000	805	403
		10 x 4 1/2"	4 1/2"	3"						
		12 x 6"	6"	4"						
CS	Construction Screws (Washer Head Screws)	10 x 3 1/8"	3 1/8"	1 1/2"	0.125	0.143	0.195	225,000	768	413
		5/16 x 2 1/2"	2 1/2"	1 1/2"						
		5/16 x 3 1/8"	3 1/8"	1 1/2"	0.170	0.197	0.274	220,000	1275	724
		5/16 x 4"	4"	2 1/2"						
		3/8 x 6"	6"	3 1/2"						
				3/8 x 7"	7"	3 1/2"	0.194	0.225	0.312	215,000

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

- For fasteners with countersink-type heads, overall fastener length shall be measured from the top of the head to the bottom of the point. For fasteners with washer-type heads, overall fastener length shall be measured from the underside of the head to the bottom of the point.
- Thread length includes the point, as shown in [Figure 1](#) of this report.
- Bending yield strength determined per methods specified in ASTM F1575 and based on the minor thread (root) diameter.

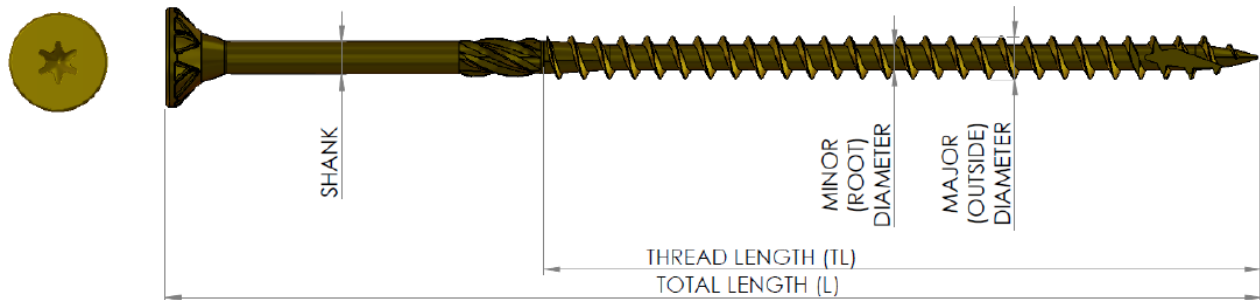


FIGURE 1 – U2 COUNTERSINK UNIVERSAL SCREW

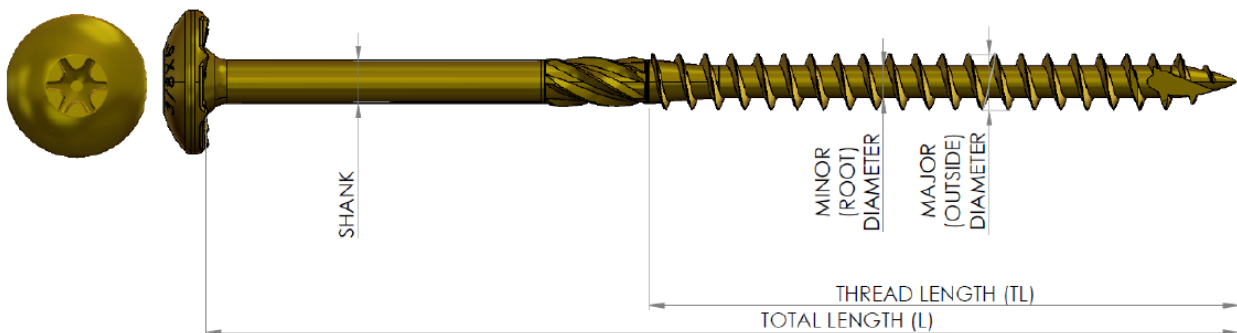


FIGURE 2 – WASHER HEAD CONSTRUCTION SCREW



TABLE 2 - REFERENCE WITHDRAWAL (W) DESIGN VALUES FOR WOOD-TO-WOOD CONNECTIONS WITH UNIVERSAL SCREW AND CONSTRUCTION SCREW^{1,2,3,4,5}

FASTENER DESIGNATION	FASTENER ID	THREAD LENGTH, L _t (in.)	REFERENCE WITHDRAWAL DESIGN VALUES, W (lbf/in.)					WET SERVICE FACTOR, C _M
			SG = 0.36	SG = 0.42	SG = 0.50	SG = 0.55	LVL Equiv. SG = 0.50	
U2	Universal Screws (Countersink Screws)	9 x 2 3/4"	2	75	96	125	143	0.70
		9 x 3 1/8"	1 1/2	76	90	109	121	
		10 x 2 1/2"	1 1/2	74	93	117	133	
		10 x 4 1/2"	3	109	125	147	161	
		12 x 6"	4	97	119	152	171	
C3	Construction Screws (Washer Head Screws)	10 x 3 1/8"	1 1/2	90	98	109	116	
		5/16 x 2 1/2"	1 1/2	112	139	174	196	
		5/16 x 3 1/8"	1 1/2	118	137	161	177	
		5/16 x 4"	2 1/2	125	150	184	205	
		3/8 x 6"	3 1/2	114	142	180	203	
		3/8 x 7"	3 1/2	106	151	210	247	215

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

1. Values shall be multiplied by all applicable adjustment factors as set forth in the NDS unless fastener strength controls connection strength, in which case values shall not be multiplied by any adjustment factors.
2. Reference withdrawal design values shall be multiplied by the length of thread penetration in the main member. Length includes tapered tip. Minimum penetration shall be one inch.
3. Specific Gravity (SG) shall be the assigned specific gravity for sawn lumber or wood structural panels per NDS Table 11.3.3A or 11.3.3B, respectively, or the engineered wood product equivalent specific gravity given in the applicable evaluation report.
4. Test data generated with samples within +/-10 percent of stated nominal specific gravity values.
5. Screws shall be installed straight into the side grain of the wood main members with the screw axis at a 90-degree angle to the wood fibers.

TABLE 3 - REFERENCE LATERAL (Z) DESIGN VALUES FOR WOOD-TO-WOOD CONNECTIONS (PARALLEL TO GRAIN) WITH UNIVERSAL SCREW AND CONSTRUCTION SCREW^{1,2,3,4,5}

FASTENER DESIGNATION	FASTENER ID	SIDE MEMBER THICKNESS, T _s (in.)	MAIN MEMBER FASTENER PENETRATION, P (in.)	ALLOWABLE SHEAR LOADS (lbf)					WET SERVICE FACTOR ⁶ , C _M	
				SG = 0.36	SG = 0.42	SG = 0.50	SG = 0.55	LVL Equiv. SG = 0.50		
U2	Universal Screws (Countersink Screws)	9 x 2 3/4"	1 1/2	1 1/4	90	109	134	150	134	0.70 ⁶
		9 x 3 1/8"	1 1/2	1 1/2	84	108	140	161	157	
		10 x 2 1/2"	1 1/2	1	80	99	125	143	125	
		10 x 4 1/2"	3 1/2	1	100	122	151	169	173	
		12 x 6"	3 1/2	2 1/2	152	202	290	344	269	
C3	Construction Screws (Washer Head Screws)	10 x 3 1/8"	1 1/2	1 1/2	106	145	198	230	184	
		5/16 x 2 1/2"	1 1/2	1	106	139	185	210	185	
		5/16 x 3 1/8"	1 1/2	1 1/2	122	161	223	258	223	
		5/16 x 4"	3 1/2	1 1/2	197	212	233	246	241	
		3/8 x 6"	3 1/2	2 1/2	212	262	362	425	290	
		3/8 x 7"	3 1/2	3 1/2	294	341	405	445	353	

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

1. Values shall be multiplied by all applicable adjustment factors as set forth in the NDS unless fastener strength controls connection strength, in which case values shall not be multiplied by any adjustment factors.
2. Specific Gravity (SG) shall be the assigned specific gravity for sawn lumber or wood structural panels per NDS Table 11.3.3A or 11.3.3B, respectively, or the engineered wood product equivalent specific gravity given in the applicable evaluation report.
3. Test data generated with samples within +/-10 percent of stated nominal specific gravity values. When the specific gravities or equivalent specific gravities of the main or side member are different, the design values of the wood with the lowest specific gravity shall be used.
4. Screws shall be installed straight into the side grain of the wood main members with the screw axis at a 90-degree angle to the wood fibers.
5. Minimum fastener penetration shall be equal to the screw length less the thickness of the wood side plate.
6. For SG = 0.55, the Wet Service Factor shall be C_M = 0.6 maximum.



TABLE 4 - REFERENCE PULL-THROUGH (P) DESIGN VALUES FOR WOOD-TO-WOOD CONNECTIONS WITH UNIVERSAL SCREW AND CONSTRUCTION SCREW^{1,2,3,4}

FASTENER DESIGNATION	FASTENER ID	MINIMUM SIDE MEMBER THICKNESS, T _s (in.)	REFERENCE PULL-THROUGH DESIGN VALUES, P (lbf)					WET SERVICE FACTOR, C _M
			SG = 0.36	SG = 0.42	SG = 0.50	SG = 0.55	LVL Equiv. SG = 0.50	
U2 Universal Screws (Countersink Screws)	9 x 2 3/4"	1 1/2	62	69	78	84	168	0.70
	9 x 3 1/8"							
	10 x 2 1/2"							
	10 x 4 1/2"							
12 x 6"	75		86	101	110	204		
C2 Construction Screws (Washer Head Screws)	10 x 3 1/8"		72	93	121	138	266	
	5/16 x 2 1/2"		169	234	321	375	387	
	5/16 x 3 1/8"		292	294	370	398	495	
	5/16 x 4"							
	3/8 x 6"		311	355	413	450	542	
	3/8 x 7"							

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

- Values shall be multiplied by all applicable adjustment factors as set forth in the NDS unless fastener strength controls connection strength, in which case values shall not be multiplied by any adjustment factors.
- Specific Gravity shall be the assigned specific gravity for sawn lumber or wood structural panels per NDS Table 11.3.3A or 11.3.3B, respectively, or the engineered wood product equivalent specific gravity given in the applicable evaluation report.
- Test data generated with samples within +/-10 percent of stated nominal specific gravity values.
- Screws shall be installed straight into the side grain of the wood main members with the screw axis at a 90-degree angle to the wood fibers.

TABLE 5 - CONNECTION GEOMETRY FOR UNIVERSAL SCREW AND CONSTRUCTION SCREW

CONDITION	NDS C11.1.5.7	MINIMUM DISTANCE OR SPACING (inches)					
		#9	#10	#12	5/16	3/8	
End Distance	Loading Toward End	15D	2 3/16	2 5/16	2 5/8	3 3/16	3 1/2
	Loading Away From End	10D	1 7/16	1 9/16	1 3/4	2 1/8	2 3/8
	Loading Perpendicular to Grain	10D	1 7/16	9/16	1 3/4	2 1/8	2 3/8
Edge Distance	Any Load Direction	2.5D	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
Spacing Between Fasteners	Loading Parallel To Grain	15D	2 3/16	2 5/16	2 5/8	3 3/16	3 1/2
	Loading Perpendicular To Grain	10D	1 7/16	1 9/16	1 3/4	2 1/8	2 3/8
Spacing Between Rows	In-Line Rows	5D	3/4	13/16	7/8	1 1/16	1 3/16
	Staggered Rows	2.5D	3/8	7/16	7/16	9/16	5/8

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

- End distances, edge distances, and screw spacing shall be sufficient to prevent splitting of the wood, or as required by this table, whichever is the most restrictive.
- 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 6 - 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. The fasteners are not for use saltwater exposure.