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Technical Evaluation Report™

TER 2304-03

U2 Fasteners™ UNI and CS Screws:
Fastener Properties and Design Values – Canada

U2 Fasteners™

Product:
UNI and CS Screws

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DIVISION: 06 00 00 - WOOD, PLASTICS AND COMPOSITES

SECTION: 06 05 23 - Wood, Plastic, and Composite Fastenings

1 Innovative Products Evaluated[1]

1.1 UNI and CS Screws

1.1.1 UNI screws may also be referred to as Universal Screws.

1.1.2 CS screws may also be referred to as Construction Screws.

1.1.3 UNI Stainless Steel Screws

1.1.4 CS Stainless Steel Screws

2 Applicable Codes and Standards[2]

2.1 *Codes*

2.1.1 *NBC—10, 15, 20: National Building Code of Canada*

2.1.2 *O Reg. 332/12: Ontario Building Code (OBC)*[3]

2.2 *Standards and Referenced Documents*

2.2.1 *AISI S904: Standard Test Methods for Determining the Tensile and Shear Strengths of Screws*

2.2.2 *ASTM A153: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware*

2.2.3 *ASTM D1761: Standard Test Methods for Mechanical Fasteners in Wood*

2.2.4 *ASTM F1575: Standard Test Method for Determining Bending Yield Moment of Nails*

2.2.5 *AWC NDS: National Design Specification for Wood Construction*

2.2.6 *CSA O86: Engineering Design in Wood*

3 Performance Evaluation

3.1 Testing and related engineering evaluations are defined as intellectual property and/or trade secrets.

3.2 Any code compliance issues not specifically addressed in this section are outside the scope of this TER.

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1 For more information, visit drjcertification.org or call us at 608-310-6748.

2 Unless otherwise noted, all references in this TER are from the 2020 version of the NBC. This alternative solution is also approved for use with the 2010 and 2015 NBC and the standards referenced therein.

3 References in this TER to the National Building Code of Canada (NBC) apply to the Ontario Building Code (OBC), unless noted otherwise.

3.3 UNI and CS screws were tested and evaluated to determine their structural resistance properties, which are used to develop reference design values for limit states design (LSD) in accordance with CSA O86. The following conditions were evaluated:

3.3.1 Withdrawal resistance in accordance with ASTM D1761 per CSA O86 Clause 12.11.5 or Clause 12.6.5 as applicable

3.3.2 Bending yield in accordance with ASTM F1575

3.3.3 Tensile strength in accordance with AISI S904

3.3.4 Shear strength in accordance with AISI S904

3.3.5 Head pull-through in accordance with ASTM D1761 per CSA O86 Clause 12.11.5.3

3.3.6 Lateral resistance in accordance with ASTM D1761 per CSA O86 12.11.4 or 12.6.6 as applicable

3.3.7 Corrosion resistance of fasteners meeting or exceeding the protection afforded hot dipped galvanized fasteners in accordance with ASTM A153

3.4 Any engineering evaluation conducted for this TER was performed on the dates provided in this TER and within DrJ's professional scope of work.

4 Product Description and Materials

4.1 *General*

4.1.1 U2 fasteners are identified on the product packaging with the logo as shown in Figure 1.

Figure 1. U2 Fasteners™ Logo

4.2 A general description of the U2 fasteners is shown in Table 1.

Table 1. General Product Information

Product Name	Description	Type	Material	Wood Members	Coating Type (Application)
UNI Screw	An alternate dowel-type threaded fastener used for wood-to-wood connections	Universal Countersink Screw	Hardened carbon steel wire manufactured using a standard cold-forming process	Sawn lumber or species combinations must have a specific gravity of 0.36-0.55. Structural Composite Lumber (LVL, LSL, etc.) must have an equivalent specific gravity of 0.5 or higher	U2 Gold Color
CS Screw		Washer Head Construction Screw			

4.3 *Fastener Specifications*

4.3.1 The fasteners evaluated in this TER are specified in Table 2 and Figure 1 through Figure 4.

Table 2. Fastener Specifications

Product Name	Fastener ID	Fastener Length in (mm)	Thread Length in (mm)[3]	Head Diameter in. (mm)	Unthreaded Shank Diameter in (mm)	Thread Diameter in (mm)		Specified Bending Yield, f_{yb} psi (M_{Pa})[4]	Factored Resistance lbf (kN)		
						Minor	Major		Tensile	Shear	
										Thread	Shank
UNI Universal Screw[1]	#9 x 2¾"	2¾ (70)	2 (51)	0.329 (8.4)	0.131 (3.3)	0.113 (2.9)	0.176 (4.5)	215,000 (1,482)	708 (3.15)	405 (1.80)	464 (2.06)
	#9 x 3⅛"	3⅛ (79)	1½ (38)								
	#10 x 2½"	2½ (64)		0.371 (9.4)	0.146 (3.7)	0.130 (3.3)	0.197 (5.0)	220,000 (1,517)	966 (4.30)	483 (2.15)	634 (2.82)
	#10 x 4½"	4½ (114)	3 (76)								
	#12 x 3½"	3½ (89)	2¼ (57)	0.441 (11.2)	0.172 (4.4)	0.154 (3.9)	0.237 (6.0)	235,000 (1,620)	1,334 (5.94)	725 (3.23)	926 (4.12)
	#12 x 6"	6 (152)	4 (102)								
CS Construction Screw[2]	#10 x 3⅛"	3⅛ (79)	1½ (38)	0.445 (11.3)	0.143 (3.6)	0.125 (3.2)	0.195 (5.0)	225,000 (1,551)	966 (4.30)	483 (2.15)	634 (2.82)
	5/16 x 2½"	2½ (64)		0.632 (16.1)	0.197 (5.0)	0.170 (4.3)	0.274 (7.0)	220,000 (1,517)	1,530 (6.81)	869 (3.87)	1,158 (5.15)
	5/16 x 3⅛"	3⅛ (79)									
	5/16 x 4"	4 (102)	2½ (64)								
	3/8 x 6"	6 (152)	3½ (89)	0.715 (18.2)	0.225 (5.7)	0.194 (4.9)	0.312 (7.9)	215,000 (1,482)	2,005 (8.92)	1,136 (5.05)	1,634 (7.27)
	3/8 x 7"	7 (178)									
Stainless Steel - Universal Screws[1]	#9 x 2"	2 (51)	1.32 (34)	0.328 (8.3)	0.135 (3.4)	0.112 (2.8)	0.172 (4.4)	165,000 (1,138)	570 (2.54)	382 (1.70)	-
	#10 x 2½"	2½ (64)	1.62 (41)	0.366 (9.3)	0.147 (3.7)	0.129 (3.3)	0.194 (4.9)	185,000 (1,276)	642 (2.86)	480 (2.14)	489 (2.17)
	#10 x 3"	3 (76)	1.96 (50)								
	#10 x 4"	4 (102)	2.50 (64)								
Stainless Steel - Construction Screws[2]	5/16 x 2½"	2½ (64)	1.59 (40)	0.621 (15.8)	0.201 (5.1)	0.176 (4.5)	0.275 (7.0)	200,000 (1,379)	1,281 (5.70)	931 (4.14)	1,049 (4.67)
	5/16 x 4"	4 (102)	2.53 (64)								
	5/16 x 5"	5 (127)	2.96 (75)								
	5/16 x 6"	6 (152)	3.97 (101)								

SI: 1 in = 25.4 mm, 1 lb = 4.45 N, 1 psi = 0.00689 MPa

1. Overall fastener length was measured from the top of the head to the bottom of the point.
2. Overall fastener length was measured from the underside of the head to the bottom of the point.
3. Thread length includes the point.
4. Bending yield strength was determined based on ASTM F1575 based on the minor (root) diameter.

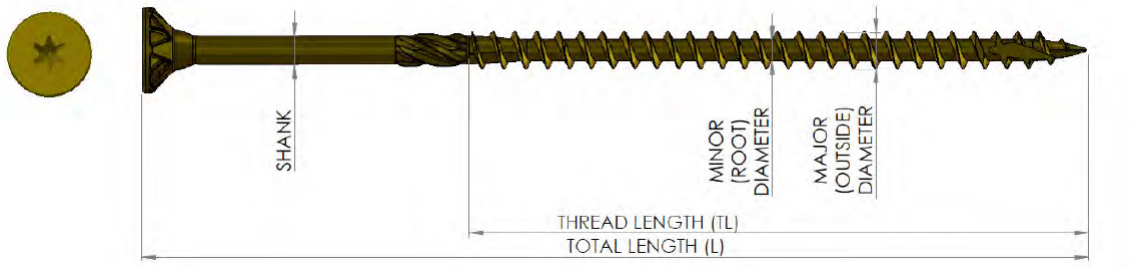

Figure 2. UNI Universal Screw

Figure 3. CS Construction Screw

5 Applications

5.1 *General*

5.1.1 UNI and CS screws are self-tapping fasteners for wood-to-wood connections in conventional light frame construction. They provide resistance against withdrawal, head pull-through, axial, and shear loads. See Section 6 for installation requirements.

5.1.2 UNI and CS screws can be used in applications including structural and general timber construction work.

5.1.3 UNI and CS screws are typically installed without lead holes, as prescribed in CSA O86 Article 12.11.2.1. However, lead holes are permitted to be used to avoid splitting.

5.2 *Corrosion Resistance*

5.2.1 UNI and CS screws are coated with U2-Gold Color. This multi-layered coating meets the requirements of ASTM A153, Class D and does not contain any Chrome 6 or other chemical amounts listed on Proposition 65.

5.2.2 UNI and CS fasteners may be used where the equilibrium moisture content of wood that has been pressure treated with waterborne Alkaline Copper Quaternary (ACQ) having a maximum retention of 0.60 pcf meets the dry service conditions of NDS with occasional exposure to high humidity.

5.2.3 UNI and CS fasteners may be used where they are exposed to freshwater and wood that has been pressure treated with waterborne ACQ having a maximum retention of 0.60 pcf.

5.2.4 UNI and CS screws are also available in stainless steel.

5.3 *Design*

5.3.1 Design of UNI and CS screws are governed by the applicable code and the provisions for wood screws in CSA O86.

5.3.2 Unless otherwise noted, modification factors shall be applied in accordance with the applicable code.

5.3.3 The design values in Table 3, Table 4, and Table 5 are for the standard load duration in a dry service condition. The wet service factor is given for certain results. Tabulated values shall be factored by all the appropriate adjustment factors per CSA O86.

5.3.4 Where the fasteners are subject to combined lateral and withdrawal loads, connections shall be designed in accordance with the applicable codes and standards.

5.3.5 The factored load for a single fastener where the fastener is loaded in tension shall be the lower of:

5.3.5.1 The factored design value shown in Table 4, adjusted by all applicable adjustment factors.

5.3.5.2 The factored head pull through design value shown in Table 5, adjusted by all applicable adjustment factors.

5.3.5.3 The factored screw tension strength as shown in Table 2.

5.3.6 The factored lateral load for a single fastener shall be the lower of:

5.3.6.1 The factored design value shown in Table 3, adjusted by all applicable adjustment factors.

5.3.6.2 The factored screw shear strength as shown in Table 2.

5.4 *UNI and CS Screws Factored Lateral Design Values (N_r)*

5.4.1 The factored lateral design values for shear load parallel-to-grain for UNI and CS screws are specified in Table 3.

Table 3. UNI and CS Screw Factored Lateral Resistance Values (N_r) for Wood-to-Wood Connections (Parallel to Grain)

Product Name	Fastener ID	Minimum Side Member Thickness, in (mm)	Main Member Penetration, in (mm)	Factored Lateral Design Values[1,5,6] lbf (kN)				
				Species[2,3,4] (Specific Gravity)				
				BF (0.36)	HF/SPF (0.42)	DF-L, SCL (0.50)	SP (0.55)	LVL Equiv. SG = 0.50
UNI Universal Screw	#9 x 2¾"	1½ (38)	1¼ (32)	360 (1.60)	435 (1.93)	535 (2.38)	600 (2.67)	540 (2.4)
	#9 x 3⅛"		1⅝ (41)	335 (1.49)	430 (1.91)	625 (2.78)	640 (2.85)	625 (2.78)
	#10 x 2½"		1 (25)	305 (1.36)	380 (1.69)	490 (2.18)	540 (2.40)	490 (2.18)
	#10 x 4½"	3½ (89)	1 (25)	400 (1.78)	490 (2.18)	690 (3.07)	675 (3.00)	690 (3.07)
	#12 x 6"		2½ (64)	550 (2.45)	810 (3.60)	1,080 (4.80)	1,375 (6.12)	1,080 (4.8)
CS Construction Screw	#10 x 3⅛"	1½ (38)	1⅝ (41)	425 (1.89)	585 (2.58)	735 (3.27)	920 (4.09)	735 (3.27)
	5/16 x 2½"		1 (25)	420 (1.87)	465 (2.07)	685 (3.05)	555 (2.47)	685 (3.05)
	5/16 x 3⅛"		1½ (38)	430 (1.91)	550 (2.45)	725 (3.22)	795 (3.54)	725 (3.22)
	5/16 x 4"	3½ (89)	½ (13)	790 (3.51)	850 (3.78)	965 (4.29)	985 (4.38)	965 (4.29)
	⅜ x 6"		2½ (64)	750 (3.34)	1,050 (4.67)	965 (4.29)	1,700 (7.56)	965 (4.29)
	⅜ x 7"		3½ (89)	1,175 (5.23)	1,365 (6.07)	1,410 (6.27)	1,780 (7.92)	1,410 (6.27)
Stainless Steel - Universal Screws	#9 x 2"	1½ (38)	½ (13)	304 (1.35)	366 (1.63)	336 (1.49)	440 (1.96)	516 (2.3)
	#10 x 2½"	1½ (38)	1 (25)	312 (1.39)	422 (1.88)	461 (2.05)	474 (2.11)	464 (2.07)
	#10 x 3"	1½ (38)	1½ (38)	555 (2.47)	573 (2.55)	583 (2.59)	667 (2.97)	795 (3.54)
	#10 x 4"	1½ (38)	1½ (38)	555 (2.47)	573 (2.55)	583 (2.59)	667 (2.97)	795 (3.54)
Stainless Steel - Construction Screws	5/16 x 2½"	1½ (38)	1 (25)	550 (2.45)	592 (2.63)	607 (2.70)	589 (2.62)	666 (2.96)
	5/16 x 4"	1½ (38)	2½ (64)	930 (4.14)	1,041 (4.63)	1,306 (5.81)	865 (3.85)	823 (3.66)
	5/16 x 5"	1½ (38)	2½ (64)	930 (4.14)	1,041 (4.63)	1,306 (5.81)	865 (3.85)	823 (3.66)
	5/16 x 6"	3½ (89)	2½ (64)	965 (4.30)	1,284 (5.71)	1,508 (6.71)	1,522 (6.77)	1,286 (5.72)

1. Design values shall be multiplied by all applicable adjustment factors in accordance with CSA O86, Section 12.2.1.6 through 12.2.1.9.
   a. Exceptions:
      i. The service-condition factor, K_{SF} for connections fabricated with dry lumber and where the service condition is "wet" shall be 0.7 for SG up to 0.55. For SG = 0.55. The wet service factor shall be 0.6.
      ii. Where fastener strength controls the design, no adjustment factors shall be used.
2. The specific gravity used shall be the specific gravity assigned to the lumber or wood structural panels in accordance with NDS Table 12.3.3A or 12.3.3B, respectively. For LVL, use the equivalent specific gravity assigned per the manufacturer published data.
3. When the specific gravity of the side and main member differ, use the lower of the two.
4. Design values apply to fasteners installed into the side grain of the main member with the fastener installed perpendicular to the wood fibers.
5. Tabulated values are for standard term loading (K_d = 1.0) and dry service condition (K_{sf} = 1.0). Values may be adjusted for other conditions per CSA O86, Clause 12.6.6.1
6. Values are for a single fastener. For connections with multiple fasteners, see CSA O86, clause 12.2.2.3.

5.5 *UNI and CS Screws Factored withdrawal Design Values (P_{rw})*

5.5.1 The design provisions for withdrawal noted in CSA O86 Subsection 12.11.5 apply to UNI and CS screws, unless otherwise noted in this Listing. Factored withdrawal design values for UNI and CS screws in select lumber species are specified in Table 4.

Table 4. UNI and CS Screws Factored Withdrawal Resistance Values (P_{rw}) in Side Grain Applications

Product Name	Fastener ID	Fastener Length, in (mm)	Thread Length, in (mm)	Minimum Penetration Depth in (mm)	Factored Withdrawal Values[1,2,5,6] lbf/in (N/mm)				
					Species[3,4] (Relative Density)				
					BF (0.36)	HF/SPF (0.42)	DF-L, SCL (0.50)	SP (0.55)	LVL Equiv. SG = 0.50
UNI Universal Screw	#9 x 2¾"	2 ¾" (70)	2 (51)	1¼ (32)	225 (39)	290 (51)	455 (80)	430 (75)	430 (75)
	#9 x 3⅛"	3⅛" (79)	1½ (38)	1⅝ (41)	230 (40)	270 (47)	420 (74)	365 (64)	365 (64)
	#10 x 2½"	2½" (64)		1 (25)	220 (39)	280 (49)	475 (83)	400 (70)	400 (70)
	#10 x 4½"	4½" (114)	3 (76)	3 (76)	325 (57)	375 (66)	485 (85)	485 (85)	485 (85)
	#12 x 6"	6" (152)	4 (102)	4½ (114)	290 (51)	360 (63)	515 (90)	515 (90)	515 (90)
CS Construction Screw	#10 x 3⅛"	3⅛" (79)	1½ (38)	1½ (38)	270 (47)	295 (52)	445 (78)	350 (61)	350 (61)
	5/16 x 2½"	2½" (64)		1 (25)	335 (59)	415 (73)	485 (85)	590 (103)	590 (103)
	5/16 x 3⅛"	3⅛" (79)		1½ (38)	355 (62)	410 (72)	500 (88)	530 (93)	530 (93)
	5/16 x 4"	4" (102)	2½ (64)	2½ (64)	375 (66)	450 (79)	560 (98)	615 (108)	615 (108)
	3/8 x 6"	6" (152)	3½ (89)	4½ (114)	340 (60)	425 (74)	595 (104)	610 (107)	610 (107)
	3/8 x 7"	7" (178)		5½ (140)	320 (56)	455 (80)	645 (113)	740 (130)	740 (130)
Stainless Steel - Universal Screws	#9 x 2"	2 (51)	1 5/16 (34)	½ (13)	315 (55)	388 (68)	471 (83)	471 (83)	390 (68)
	#10 x 2½"	2½ (64)	1 5/8 (41)	1 (25)	401 (70)	392 (69)	455 (80)	455 (80)	443 (78)
	#10 x 3"	3 (76)	2 (51)	1½ (41)	529 (93)	520 (91)	569 (100)	569 (100)	550 (96)
	#10 x 4"	4 (102)	2.5 (64)	2½ (64)	529 (93)	520 (91)	569 (100)	569 (100)	550 (96)
Stainless Steel - Construction Screws	5/16 x 2½"	2½ (64)	1 9/16 (40)	1 (25)	439 (77)	506 (89)	544 (95)	621 (109)	520 (91)
	5/16 x 4"	4 (102)	2.5 (64)	2½ (64)	439 (77)	506 (89)	544 (95)	621 (109)	520 (91)
	5/16 x 5"	5 (127)	3 (76)	3½ (89)	439 (77)	506 (89)	544 (95)	621 (109)	520 (91)
	5/16 x 6"	6 (152)	4 (102)	4½ (114)	442 (78)	539 (94)	548 (96)	553 (97)	531 (93)

SI: 1 in = 25.4 mm, 1 lb = 4.45 N

1. Design values shall be multiplied by all applicable adjustment factors in accordance with CSA O86, Section 12.2.1.6 through 12.2.1.9
   a. Exceptions:
      i. The service-condition factor, K_{SF} for connections fabricated with dry lumber and where the service condition is "wet" shall be 0.7.
2. Design values shall be multiplied by the length of the thread penetration into the main member not including the tip.
3. The specific gravity used shall be the specific gravity assigned to the lumber or wood structural panels in accordance with NDS Table 12.3.3A or 12.3.3B, respectively. For LVL, use the equivalent specific gravity assigned per the manufacturer published data.
4. Design values apply to fasteners installed into the side grain of the main member with the fastener installed perpendicular to the wood fibers.
5. Tabulated values are for standard term loading (K_d = 1.0) and dry service condition (K_{sf} = 1.0). Values may be adjusted for other conditions per CSA O86, Clause 12.6.5.1.
6. Values are for a single fastener, for connections with multiple fasteners, see CSA O86, clause 12.2.2.3.

5.6 *UNI and CS Screws Factored Head Pull-Through Design Values (P_{pt})*

5.6.1 The factored design value for head pull-through for UNI and CS screws are specified in Table 5.

Table 5. UNI and CS Screw Factored Head Pull-Through Resistance Values (P_{pt})

Product Name	Fastener ID	Side Member Thickness, in (mm)	Factored Head Pull-Through Values[1,2,3,4,5] lbf (N) (Specific Gravity)			
			BF (0.36)	HF/SPF (0.42)	DF-L, SCL (0.50)	SP (0.55)
UNI Universal Screw	#9 x 2¾"	1½ (38)	124 (552)	138 (614)	336 (1,495)	168 (747)
	#9 x 3⅛"		124 (552)	138 (614)	336 (1,495)	168 (747)
	#10 x 2½"		150 (667)	172 (765)	408 (1,815)	220 (979)
	#10 x 4½"		150 (667)	172 (765)	408 (1,815)	220 (979)
	#12 x 6"		144 (641)	186 (827)	532 (2,366)	276 (1,228)
CS Construction Screw	#10 x 3⅛"		338 (1,503)	468 (2,082)	774 (3,443)	750 (3,336)
	5/16 x 2½"		584 (2,598)	588 (2,616)	990 (4,404)	596 (2,651)
	5/16 x 3⅛"		584 (2,598)	588 (2,616)	990 (4,404)	596 (2,651)
	5/16 x 4"		584 (2,598)	588 (2,616)	990 (4,404)	596 (2,651)
	3/8 x 6"		622 (2,767)	710 (3,158)	1,084 (4,822)	900 (4,003)
	3/8 x 7"		622 (2,767)	710 (3,158)	1,084 (4,822)	900 (4,003)
Stainless Steel-Universal Screw	#9 x 2"	1½ (38)	229 (1,021)	285 (1,270)	403 (1,794)	403 (1,794)
	#10 x 2½"		265 (1,181)	322 (1,434)	440 (1,957)	440 (1,957)
	#10 x 3"		457 (2,036)	552 (2,455)	610 (2,715)	610 (2,715)
	#10 x 4"		457 (2,036)	552 (2,455)	610 (2,715)	610 (2,715)
Stainless Steel - Construction Screws	5/16 x 2½"		1,411 (6,277)	1,580 (7,032)	1,608 (7,156)	1,998 (8,889)
	5/16 x 4"		1,411 (6,277)	1,580 (7,032)	1,608 (7,156)	1,998 (8,889)
	5/16 x 5"		1,411 (6,277)	1,580 (7,032)	1,608 (7,156)	1,998 (8,889)
	5/16 x 6"		1,411 (6,277)	1,580 (7,032)	1,608 (7,156)	1,998 (8,889)

SI: 1 in = 25.4 mm, 1 lb = 4.45 N

1. Resistance values shall be multiplied by all applicable adjustment factors in accordance with CSA O86, Section 12.2.1.6 through 12.2.1.9.
   a. Exceptions:
      i. The service-condition factor, K_{SF} for connections fabricated with dry lumber and where the service condition is "wet" shall be 0.7.
2. Tabulated resistance values are for a standard load duration. Values shall be factored by all applicable modification factors per CSA O86 for wood screws.
3. The specific gravity used shall be the specific gravity assigned to the lumber or wood structural panels in accordance with NDS Table 12.3.3A or 12.3.3B, respectively. For LVL, use the equivalent specific gravity assigned per the manufacturer published data.
4. Resistance values apply to fasteners installed into the side grain of the main member with the fastener installed perpendicular to the wood fibers.
5. Resistance values are based on a 1½" (38mm) thick side member.

5.7 *Special Applications*

5.7.1 *Connection of Ledger to Studs:*

5.7.1.1 The UNI #12 x 3½ fastener was developed specifically for the connection of 1½" SP and LVL side members to SP vertical members as shown in Figure 4. Design of this connection shall be in accordance with Table 6.

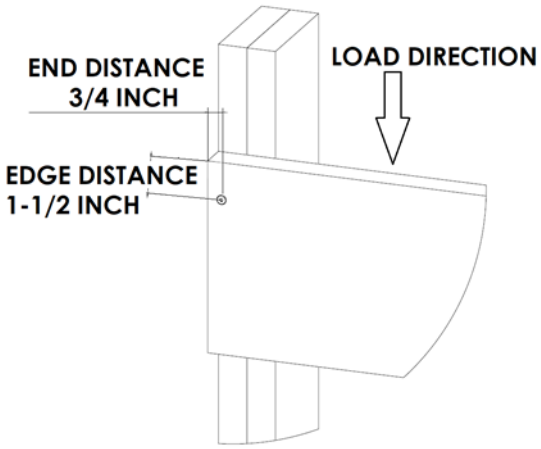

Figure 4. Connection Detail applicable to Table 6

Table 6. Factored Lateral Strength Values for No. 12 x 3½″ Universal Screws to Connect SP Lumber or LVL Side Members to SP Main Members in accordance with Figure 4

Product Name	Fastener ID	Side Member Thickness (in.)	Minimum fastener penetration into Main Member (in.)	Factored Lateral Strength[1,2,3,4,5,6,7,8] lbf (kN)	
				SP	LVL
UNI Universal Screw	#12 x 3½	1½	2	985 (#)	950 (#)

1. Factored lateral strength values are additive where multiple screws are used.
2. Minimum screw spacing in the same row with loading parallel grain shall be 2⅝".
3. Minimum screw spacing in the same row with loading perpendicular to grain shall be 1¾".
4. Minimum fastener end distance into side member is ¾".
5. Minimum fastener edge distance in main member is ¾".
6. Minimum fastener edge distance in side member is 1½" from loaded edge.
7. SP Specific gravity is assumed to be 0.55, LVL minimum equivalent specific gravity shall be 0.5.
8. Capacities listed in table are applicable to longer Universal Screw No. 12 fasteners.

5.8 Where the application exceeds the limitations set forth herein, design shall be permitted in accordance with accepted engineering procedures, experience, and technical judgment.

6 Installation

6.1 Installation shall comply with the manufacturer installation instructions, this TER, the approved construction documents, and the applicable building code.

6.2 In the event of a conflict between the manufacturer installation instructions this TER and the applicable building code, the more restrictive shall govern.

6.3 *Installation Procedure*

6.3.1 UNI and CS screws shall be installed using a high-torque low speed drill or impact driver in accordance with the manufacturer installation instructions, applicable code, the approved construction documents, this TER, CSA O86, and standard framing practice as applied to wood fasteners.

6.3.2 Pre-drilling of pilot holes is not required but may be used where lumber is prone to splitting.

6.3.3 All fastener spacing, edge distance, and end distance shall be per Table 6 and Table 7.

Table 7. Edge, End and Spacing Distances for UNI and CS Screws

Condition		NDS C12.1.5.7 Requirements	Minimum Spacing[1,2] in (mm)				
			Labelled Screw Size				
			#9	#10	#12	5/16	3/8
Edge Distance	Loading parallel or perpendicular to Grain	2.5D	1¾	1¾	See Note 1	1¾	1¾
End Distance[3]	Loading Toward End	15D	2 3/16	2 5/16	2 5/8	3 3/16	3½
	Loading Away from End	10D	1 7/16	1 9/16	1¾	2⅛	2⅜
	Loading Perpendicular to Grain	10D	1 7/16	1 9/16	See Note 1	2⅛	2⅜
Spacing Between Fasteners in a Row	Loading Parallel to grain	15D	2 3/16	2 5/16	2 5/8	3 3/16	3½
	Loading Perpendicular to grain	10D	1 7/16	1 9/16	1¾	2⅛	2⅜
Spacing Between Rows of Fasteners	In-Line Rows	5D	¾	13/16	7/8	1 1/16	1 3/16
	Staggered Rows[4]	2.5D	⅜	7/16	7/16	9/16	5/8

SI: 1 in = 25.4 mm

1. Refer to Table 7 for required spacing in applicable to the special application. Where the conditions of Table 7 do not apply, use the values calculated per NDS.
2. Unthreaded shank diameter was used as D for calculations.
3. End distances, edge distances and screw spacing must be sufficient to prevent wood splitting or as shown in this table, whichever is more restrictive, or as permitted in Table 6. Pilot holes may be used to aid in preventing splitting.
4. Values for spacing between staggered rows apply where the spacing between screws in adjacent rows are offset by ½ of the spacing between fasteners in a row.

6.3.4 Minimum penetration is 1" (25.4 mm) unless otherwise stated in this TER.

6.3.5 Install UNI Universal screws with head flush to the surface of the wood member. Install CS Construction screws with the underside of the head flush with the surface of the side member being connected.

7 Substantiating Data

7.1 Testing has been performed under the supervision of a professional engineer and/or under the requirements of ISO/IEC 17025 as follows:

7.1.1 Withdrawal in accordance with ASTM D1761

7.1.2 Lateral strength in accordance with ASTM D1761

7.1.3 Head pull-through in accordance with ASTM D1761

7.1.4 Bending yield in accordance with ASTM F1575

7.1.5 Tensile strength in accordance with AISI S904

7.1.6 Shear strength in accordance with AISI S904

7.2 Information contained herein is the result of testing and/or data analysis by sources that conform to the evaluation requirements of NBC Volume 1 Relationship of the NBC to Standards Development and Conformity Assessment and/or professional engineering regulations. DrJ relies upon accurate data to perform its ISO/IEC 17065 evaluations.

7.3 Where appropriate, DrJ's analysis is based on provisions that have been codified into law through provincial, territorial, or local adoption of codes and standards. The providers of the codes and standards are legally responsible for their content. DrJ analysis may use code-adopted provisions as a control sample. A control sample versus a test sample establishes a product as being equivalent to that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety.

7.4 Where the accuracy of the provisions provided herein is reliant upon the published properties of materials, DrJ relies upon the grade mark, grade stamp, mill certificate, and/or test data provided by material suppliers to be minimum properties. DrJ analysis relies upon these properties to be accurate.

8 Findings

8.1 As delineated in Section 3, UNI and CS Screws have performance characteristics that were tested and/or meet pertinent standards and is suitable for use pursuant to its specified purpose.

8.2 When used and installed in accordance with this TER and the manufacturer installation instructions, UNI and CS Screws shall be approved for the following applications:

8.2.1 UNI and CS screws meet the requirements of the NBC Article 4.3.1.1.

8.2.2 UNI and CS screws are an alternative to wood screws specified in NBC Article 9.23.3.3.

8.3 These innovative products have been evaluated in the context of the codes listed in Section 2 and is compliant with all known provincial, territorial, and local building codes. Where there are known variations in provincial, territorial, or local codes applicable to this TER, they are listed here.

8.3.1 No known variations

8.4 NBC Volume 1 Relationship of the NBC to Standards Development and Conformity Assessment:

> **Certification**
> Certification is the confirmation by an independent organization that a product, service, or system meets a requirement…Certification bodies publish lists of certified products and companies…Several organizations, including the Canadian Construction Materials Centre (CCMC), offer such evaluation services.
>
> **Evaluation**
> An evaluation is a written opinion by an independent professional organization that a product will perform its intended function. An evaluation is very often done to determine the ability of an innovative product, for which no standards exist, to satisfy the intent of the Code requirement...

8.5 Valid evaluations are obtained from independent professional organizations, which include but are not limited to ISO/IEC 17065 accredited evaluation services and professional engineers.[4]

8.6 ISO/IEC 17065 accreditation bodies, including but not limited to SCC and ANAB, confirm that product certification bodies have the expertise to provide evaluation services within their scope of accreditation. All SCC and ANAB product certification bodies meet NBC requirements to offer evaluation services for alternative solutions.[5]

8.6.1 DrJ is an ISO/IEC 17065 ANAB-Accredited Product Certification Body – Accreditation #1131, and employs professional engineers.[6]

8.7 Product certification organizations, accredited by the SCC and ANAB, are defined as equivalent evaluation services:

8.7.1 Canada-United States-Mexico Agreement (CUSMA), Article 11.6 Conformity Assessment confirms mutual recognition by stating, "*...each Party shall accord to conformity assessment bodies located in the territory of another Party treatment no less favorable than that it accords to conformity assessment bodies located in its own territory or in the territory of the other Party*."

8.7.2 The SCC National Conformity Assessment Principles states, "*SCC is a member of a number of international organizations developing voluntary conformity assessment agreements that help ensure the international acceptance of Canadian conformity assessment results. Signatories to these agreements (like SCC) recognize each other's accreditations as being equivalent to their own*."[7]

8.8 Building official approval of a licensed professional engineer is performed by verifying the professional engineer and/or their business entity are listed by the licensing board of the relevant jurisdiction.

9 Conditions of Use

9.1 The UNI and CS screws covered in this TER shall be installed in accordance with this TER and the manufacturer installation instructions.

9.2 Where installation causes splitting of the wood, pilot holes shall be pre-drilled in accordance with CSA O86, section 12.11.2.1.

9.3 Use of fasteners in locations exposed to saltwater or saltwater spray is outside the scope of this TER.

9.4 For conditions not covered in this TER, connections shall be designed in accordance with generally accepted engineering practice. 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 CSA O86.

9.5 Where required by the authority having jurisdiction (AHJ) in which the project is to be constructed:

9.5.1 This TER and the installation instructions shall be submitted at the time of permit application.

9.5.2 Any calculations required to show compliance with this TER, incorporated as part of the construction documents that are to be examined for conformance to the requirements of the pertinent laws shall conform to accepted engineering practice, and be approved when requirements of the pertinent laws are met.

9.6 Any generally accepted engineering calculations needed to show compliance with this TER shall be submitted to the AHJ for review and approval.

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4 NBC Division C Article 2.2.1.2

5 NBC Division A Clause A-1.2.1.1.(1)(b) provides information on code compliance via alternative solutions and defines alternative solutions as "...achiev[ing] at least the minimum level of performance required by Division B." NBC Division C Section 2.3 includes additional guidance for documentation of alternative solutions.

6 Through ANAB accreditation and the IAF MLA, DrJ certification can be used to obtain material, product, design, or method of construction approval in any jurisdiction or country that has IAF MLA Members & Signatories to meet the Purpose of the MLA – "*certified once, accepted everywhere*".

7 The National Conformity Assessment Principles states, "*Product regulations and standards may vary from country to country. If these are set arbitrarily, they could be deemed as protectionist. The World Trade Organization (WTO) Agreement on Technical Barriers to Trade (TBT Agreement) is intended to ensure that technical regulations, standards and conformity assessment procedures of member countries do not create unnecessary obstacles to trade. Under the TBT Agreement, members of the WTO agree to use international standards, including conformity assessment standards and guides, as a basis for their technical requirements.*"

9.7 Design loads shall be determined in accordance with the building code adopted by the jurisdiction in which the project is to be constructed and/or by the designer (i.e., owner).

9.8 At a minimum, these innovative products shall be installed per Section 6 of this TER.

9.9 These innovative products have an internal quality control program and a third-party quality assurance program in accordance with ISO/IEC 17065 certification procedures.

9.10 The actual design, suitability, and use of this TER, for any particular building, is the responsibility of the owner or the owner's authorized agent.

9.11 This TER shall be reviewed for code compliance by the AHJ in concert with the duties and powers granted to the building official by the provincial regulations governing such duties and powers.

9.12 The implementation of this TER for these innovative products is dependent on the design, quality control, third-party quality assurance, proper implementation of installation instructions, inspections, and any other code or regulatory requirements that may apply.

10 Identification

10.1 The innovative products listed in Section 1.1 are identified by a label on the board or packaging material bearing the manufacturer name, product name, TER number, and other information to confirm code compliance.

10.2 Additional technical information can be found at u2fasteners.com.

11 Review Schedule

11.1 This TER is subject to periodic review and revision. For the most recent version, visit drjcertification.org.

11.2 For information on the status of this TER, contact DrJ Certification.