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ELC-4810
ICC-ES Listing Report

Reissued May 2024

This listing is subject to renewal May 2025.

CSI: DIVISION: 03 00 00—CONCRETE
Section: 03 16 00—Concrete Anchors

DIVISION: 05 00 00—METALS
Section: 05 05 19—Post-Installed Concrete Anchors

Product Certification System:

The ICC-ES product-certification system includes evaluating reports of tests of standard manufactured product, prepared by accredited testing laboratories and provided by the listee, to verify compliance with applicable codes and standards. The system also involves factory inspections, and assessment and surveillance of the listee's quality system.

Product: CCU+™ Carbon Steel and Stainless Steel Undercut Anchors In Cracked and Uncracked Concrete

Listee: DEWALT

Compliance with the following standards:

CCU+™ carbon steel and stainless steel undercut anchors in cracked and uncracked concrete, when applied in accordance with the manufacturer's instructions, conform to the following standards:

- Annex D, Anchorage of CSA A23.3-19, Design of Concrete Structures, CSA Group.

Compliance with the following codes:

CCU+™ carbon steel and stainless steel undercut anchors in cracked and uncracked concrete, as described in this listing report, are in conformance with CSA A23.3-19, Annex D, as referenced in the applicable section of the following code editions:

- *National Building Code of Canada*® 2020
  Applicable Section: Division B, Part 4, Section 4.3.3.

Description of anchors:

The CCU+ Undercut Anchors are displacement controlled undercut anchors. The anchors are available in carbon steel or stainless steel materials and are comprised of the following components: an anchor rod (threaded rod), internally threaded expander cone, expansion sleeve, washer and hex nut as illustrated in Figure 1. The anchors are installed into pre-drilled holes in concrete that have been undercut at the bottom, and after setting the expanded anchor sleeve creates a mechanical interlock with the surrounding concrete base material.

The CCU+ Undercut Anchors are available in preset and thrubolt versions (designated as PS and TB, respectively).

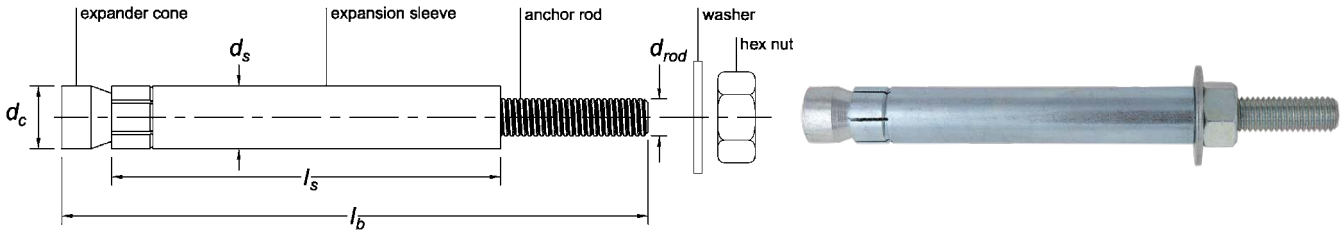


FIGURE 1—CCU+ UNDERCUT ANCHOR ASSEMBLY

Identification:

1. The ICC-ES mark of conformity, electronic labeling, or the listing report number (ELC-4810) along with the name, registered trademark, or registered logo of the listee must be included in the product label.
2. In addition, the CCU+ Undercut Anchors are identified by a length letter code head marking stamped on the exposed end of the rod, and packaging labeled with the company name and address, anchor name (CCU+) and anchor size.
3. The report holder's contact information is the following:

   DEWALT
   701 EAST JOPPA ROAD
   TOWSON, MARYLAND 21286
   (800) 524-3244
   www.DEWALT.com
   anchors@DEWALT.com

Installation: Installation parameters are described in Tables 1, 2, 3A, and 3B and Figures 1 through 4. Anchors must be installed in accordance with the manufacturer's printed installation instructions (MPII) and this report. Holes must be drilled normal to the concrete surface using carbide-tipped masonry drill bits complying with ANSI B212.15-1994. Undercut drill bits, stop drill bits, and setting sleeves must be supplied by DEWALT.

The DEWALT drilling systems shown collect and remove dust with a HEPA dust extractor during the hole drilling operation in dry base materials using a rotary hammer-drill (see the manufacturer's printed installation instructions).

FIGURE 2—EXAMPLES OF DEWALT DUST REMOVAL DRILLING SYSTEMS WITH HEPA DUST EXTRACTORS FOR ILLUSTRATION

Anchor setting information:

TABLE 1—CCU+ UNDERCUT ANCHOR NOMINAL DIMENSIONAL CHARACTERISTICS[1,2,3]

Anchor Description, Nominal Size and Length (in.)	Anchor Rod Designation (ASTM)	Anchor Version	Rod Diameter, d_{rod} (mm)	Anchor Length, l_b (mm)	Expansion Sleeve		Expander Cone Dia., d_c (mm)	Max. Fixture Thickness, t_{max} (mm)
					Length, l_s (mm)	Diameter, d_s (mm)		
$^3/_8$ x 6	A36 or A193, Grade B7	Preset (PS)	9.5	152	102	17.5	17.5	22
		Thrubolt (TB)			124			
	A193, Grade B8M (316 SS)	Preset (PS)	9.5	152	102	17.5	17.5	22
		Thrubolt (TB)			149			
$^1/_2$ x 7$^1/_2$	A36 or A193, Grade B7	Preset (PS)	12.7	191	127	20.6	20.6	32
		Thrubolt (TB)			387			
	A193, Grade B8M (316 SS)	Preset (PS)	12.7	191	127	20.6	20.6	32
		Thrubolt (TB)			387			
$^1/_2$ x 8$^1/_4$	A36 or A193, Grade B7	Preset (PS)	12.7	210	127	20.6	20.6	51
		Thrubolt (TB)			178			
	A193, Grade B8M (316 SS)	Preset (PS)	12.7	210	127	20.6	20.6	51
		Thrubolt (TB)			178			
$^5/_8$ x 10$^3/_4$	A36 or A193, Grade B7	Preset (PS)	15.9	273	902	25.4	25.4	41
		Thrubolt (TB)			289			
	A193, Grade B8M (316 SS)	Preset (PS)	15.9	273	902	25.4	25.4	41
		Thrubolt (TB)			289			
$^5/_8$ x 11$^1/_2$	A36 or A193, Grade B7	Preset (PS)	15.9	292	902	25.4	25.4	60
		Thrubolt (TB)			308			
	A193, Grade B8M (316 SS)	Preset (PS)	15.9	292	902	25.4	25.4	60
		Thrubolt (TB)			308			
$^3/_4$ x 14	A36 or A193, Grade B7	Preset (PS)	19.1	356	254	31.8	31.8	51
		Thrubolt (TB)			305			
	A193, Grade B8M (316 SS)	Preset (PS)	19.1	356	254	31.8	31.8	51
		Thrubolt (TB)			305			
$^3/_4$ x 16	A36 or A193, Grade B7	Preset (PS)	19.1	406	254	31.8	31.8	102
		Thrubolt (TB)			356			
	A193, Grade B8M (316 SS)	Preset (PS)	19.1	406	254	31.8	31.8	102
		Thrubolt (TB)			356			

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

[1]Preset anchors are designed so the top of the expansion sleeve is approximately flush with the base material after setting.
Thrubolt anchors are designed so the expansion sleeve can be set through and can engage the fixture. See Figure 3 and Table 3A of this report.
[2]Anchor rod (threaded rod) conforming to ASTM F1554, Grade 105 is strength equivalent to the tabulated ASTM A193, Grade B7 designation.
[3]The listed anchor lengths are based on the anchor sizes commercially available at the time of publication; custom lengths can be produced by request. Custom length anchors not long enough to meet the minimum embedment requirements of this report are outside the scope of this report.

TABLE 2—ANCHOR LENGTH CODE IDENTIFICATION SYSTEM

Length ID marking on anchor rod head		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
Anchor length, l_b, (mm)	From	38	51	64	76	89	102	114	127	140	152	165	178	191	203	216	229	241	254	279	305	330	356	381	406
	Up to but not including	51	64	76	89	102	114	127	140	152	165	178	191	203	216	229	241	254	279	305	330	356	381	406	432

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

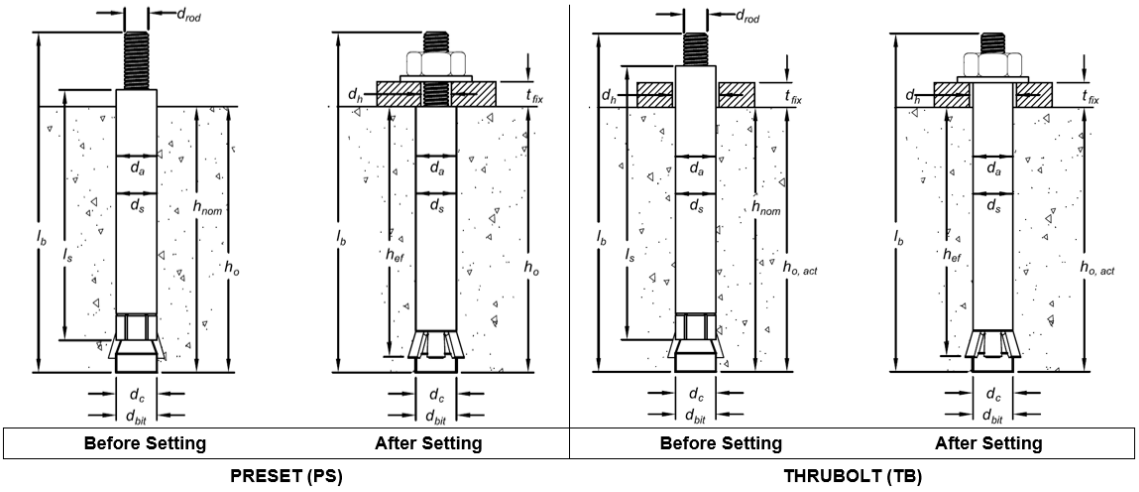


FIGURE 3—CCU+ UNDERCUT ANCHOR DETAIL

TABLE 3A—CCU+ UNDERCUT ANCHOR INSTALLATION SPECIFICATIONS AND SUPPLEMENTAL INFORMATION[1]

Anchor Property / Setting Information		**Notation**	**Units**	**Nominal Anchor Size / Rod Diameter, d_{rod} (in.)**											
				$^3/_8$ inch			$^1/_2$ inch			$^5/_8$ inch			$^3/_4$ inch		
Anchor rod designation		ASTM	-	A36	A193, Gr. B7	A193, Gr. B8M (316 SS)	A36	A193, Gr. B7	A193, Gr. B8M (316 SS)	A36	A193, Gr. B7	A193, Gr. B8M (316 SS)	A36	A193, Gr. B7	A193, Gr. B8M (316 SS)
Outside anchor diameter / expansion sleeve diameter		d_a / d_s	mm (in.)	17.5 (0.6875)			20.6 (0.8125)			25.4 (1.00)			31.8 (1.25)		
Nominal drill bit diameter		d_{bit}	in.	$^{11}/_{16}$ ANSI			$^{13}/_{16}$ ANSI			1 ANSI			$1^1/_4$ ANSI		
Nominal embedment depth[2]		h_{nom}	mm	108			137			203			270		
Effective embedment depth		h_{ef}	mm	102			127			191			254		
Minimum hole depth, preset version (see note 3 for thrubolt version)		h_o	mm	108			137			203			270		
Min. concrete member thickness, preset version (see note 4 for thrubolt version)		h_{min}	mm	152			178			241			305		
Minimum edge distance		c_{min}	mm	64			76			114			152		
Minimum spacing distance		s_{min}	mm	76			95			143			191		
Minimum diameter of clearance hole in fixture	Preset (PS)	d_h	mm	11.1			14.3			17.5			20.6		
	Thrubolt (TB)			19.1			22.2			28.6			34.9		
Maximum thickness of fixture		t_{max}	in.	See Table 1			See Table 1			See Table 1			See Table 1		
Installation torque		T_{inst}	N-m	15	50		40	95		95	160		160	300	
Torque wrench / socket size		-	in.	11/16			7/8			1-1/16			1-1/4		
Nut height		-	mm	9.1			12.3			15.5			18.7		
Effective tensile stress area (anchor rod)		A_{se}	mm^2	50			91			146			215		
Minimum specified ultimate strength[5]		f_{uta}	N/mm^2	400	860	827	400	860	758	400	860	758)	400	860	758
Minimum specified yield strength		f_{ya}	N/mm^2	248	723	655	248	723	655	248	723	655	248	723	655
Stretch length of the anchor rod[6]		-	mm	$h_{nom} - 17.5 + t_{fix}$			$h_{nom} - 20.6 + t_{fix}$			$h_{nom} - 25.4 + t_{fix}$			$h_{nom} - 31.8 + t_{fix}$		
Mean axial stiffness[7]	Uncracked concrete	β_{uncr}	kN/mm	104.2			298.6			62.3			78.1		
	Cracked concrete	β_{cr}	kN/mm	69.7			130.3			77.9			62.0		

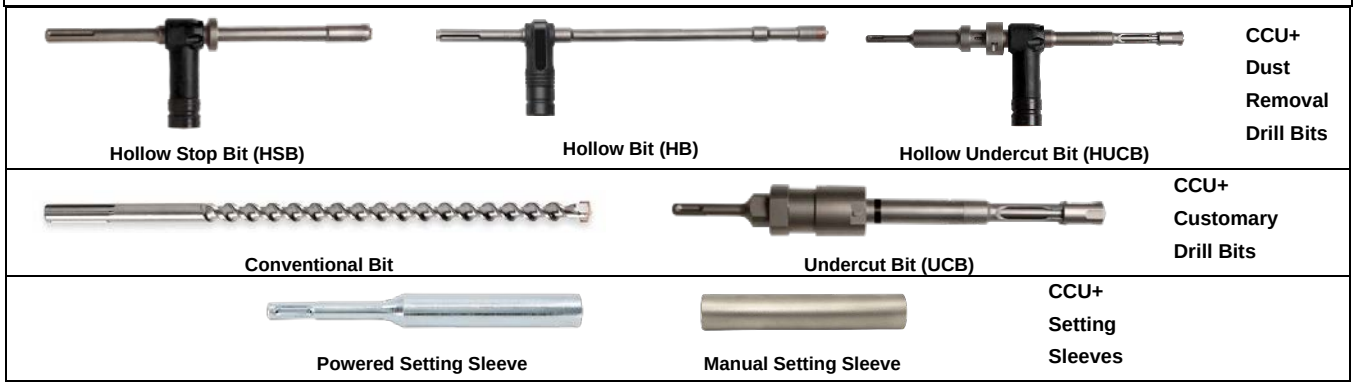
For **SI:** 1 inch = 25.4 mm, 1 ft-lbf = 1.356 N-m.

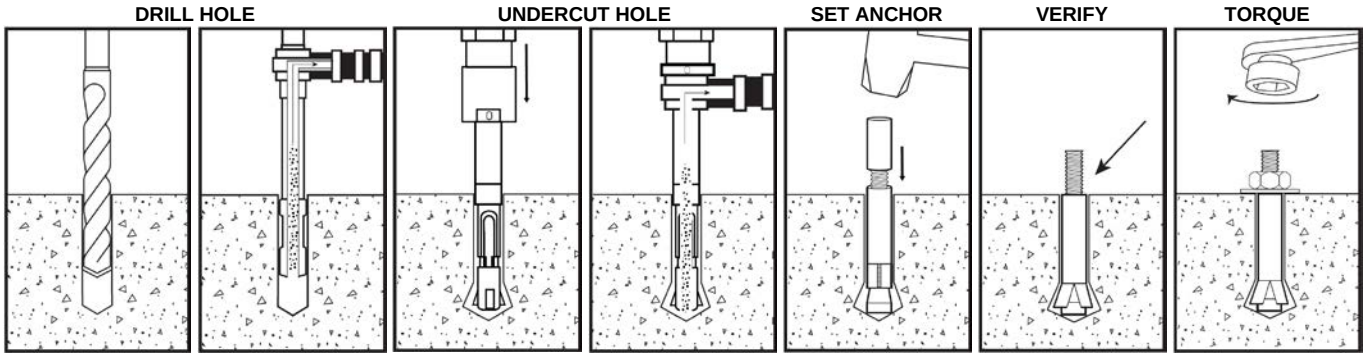
[1]The information presented in this table is to be used in conjunction with the design criteria of CSA A23.3-19 Annex D.
[2]The embedment depth, h_{nom}, is measured from the outside surface of the concrete member to the embedded end of the anchor and equal to the hole depth.
[3]For thrubolt applications the actual hole depth, $h_{o,act}$ is dependent on the actual fixture thickness, t_{fix} and determined by taking the minimum hole depth plus the maximum thickness of fixture for the selected anchor less the thickness of the actual part(s) being fastened to the base material ($h_{o,act} = h_o + t_{max} - t_{fix}$).
[4]For thrubolt applications the minimum concrete member thickness, $h_{min,act}$ is dependent on the actual fixture thickness, t_{fix} and determined by taking the minimum concrete member thickness plus the maximum thickness of fixture for the selected anchor less the thickness of the actual part(s) being fastened to the base material ($h_{min,act} = h_{min} + t_{max} - t_{fix}$).
[5]The anchor rod for the $^3/_8$-inch stainless steel anchors is manufactured with a minimum specified ultimate strength of 827 N/mm^2.
[6]For CCU+ undercut anchors, the anchor rod, d_{rod} replaces the outside anchor diameter, d_a (i.e. expansion sleeve diameter, d_s) for determination of stretch length and stretch length ratio.
[7]Mean values shown, actual stiffness varies considerably depending on concrete strength, loading and geometry of application.

TABLE 3B—CCU+ UNDERCUT ANCHOR INSTALLATION ACCESSORIES AND TOOLS[1,2]

Nominal Anchor Size	Nominal Hole Diameter	Anchor Version	Primary Drill Bits			Undercut Drill Bits		Rotary Hammer Drill	Setting Sleeves	
			Hollow Stop Bit	Hollow Bit	Conventional Bit	Hollow Undercut Bit	Undercut Bit		Powered	Manual
3/8"	11/16"	Preset (PS)	DFX11380 (SDS-Plus)	DWA54116 (SDS-Plus)	DW5808 4-Cutter (SDS-Max)	DFX21380 (SDS-Plus)	DFX21381 (SDS-Plus)	DCH416 or D25416 (SDS-Plus)	DFX313825 (SDS-Plus)	DFX313805
		Thrubolt (TB)	-							
1/2"	13/16"	Preset (PS)	DFX11120 (SDS-Plus)	DWA54316 (SDS-Plus)	DW5814 4-Cutter (SDS-Max)	DFX21120 (SDS-Plus)	DFX21121 (SDS-Plus)	DCH416 or D25416 (SDS-Plus)	DFX311230 (SDS-Plus)	DFX311210
		Thrubolt (TB)	-							
5/8"	1"	Preset (PS)	DFX11580 (SDS-Max)	DWA58001 (SDS-Max)	DW5852 4-Cutter (SDS-Max)	DFX21580* (SDS-Plus)	DFX21581* (SDS-Plus)	DCH614 or D25614 (SDS-Max)	DFX315835 (SDS-Max)	DFX315815
		Thrubolt (TB)	-							
3/4"	1-1/4"	Preset (PS)	DFX11340 (SDS-Max)	DWA58114 (SDS-Max)	DW5855 4-Cutter (SDS-Max)	DFX21340 (SDS-Max)	DFX21341 (SDS-Max)	DCH614 or D25614 (SDS-Max)	DFX313440 (SDS-Max)	DFX313420
		Thrubolt (TB)	-							

*For rotary hammer drill connector options, designated drill bits can be considered for use with a DW5891 SDS-Max to SDS-Plus adapter.
[1]The listed anchor installation accessories and tools are are based on DEWALT equipment commercially available at the time of publication.
[2]CCU+ dust removal drill bits (e.g. HSB, HB, HUCB) are used with a vacuum dust extractor (e.g. DWV010, DWV015, DCV585).





1. Using the proper drill bit size, drill a hole into the base material to the required depth. The tolerances of the drill bit used should meet the requirements of ANSI Standard B212.15.

2. Remove dust and debris from the hole during drilling (e.g. hollow stop bit, hollow bit, dust extractor) or following drilling (e.g. suction, forced air) to extract loose particles created by drilling. Note: removing dust and debris after drilling is not required for overhead (ceiling) installations.

3. Insert the proper size undercut bit to the bottom of the hole. Start the rotary hammer (begin at a slow speed) and undercut the hole. Undercutting is complete when the stopper sleeve on the undercut bit is fully compressed (i.e. the gap is closed).

4. Remove dust and debris from the hole during undercutting (hollow undercut bit) or following undercutting (e.g. suction, forced air). Note: removing dust and debris after drilling is not required for overhead (ceiling) installations.

5. Insert anchor into the hole. Place setting sleeve over anchor rod and drive expansion sleeve over expander cone. Use the proper size powered setting sleeve or manual setting sleeve.

6. Verify that the setting mark is visible on the anchor rod (threaded rod) above the expansion sleeve.

7. Apply the proper installation torque to tighten the connection.

FIGURE 4—CCU+ UNDERCUT ANCHOR INSTALLATION INSTRUCTIONS

Ultimate Limit States Design:

Design resistance of anchors for compliance with the 2020 NBCC must be determined in accordance with CSA A23.3-19 Annex D, and this listing report.

Design parameters provided in Tables 1, 3A, 3B and of this listing report are based on the 2020 NBCC (CSA A23.3-19). The limit states design of anchors must comply with CSA A23.3-19 D.5.1, except as required in CSA A23.3-19 D.4.3.1.

Material resistance factors must be $\phi_c = 0.65$ and $\phi_s = 0.85$ in accordance with CSA A23.3-19 Sections 8.4.2 and 8.4.3, and resistance modification factor, R, as given in CSA A23.3-19 Section D.5.3, and noted in Table 4 of this listing report, must be used for load combinations calculated in accordance with Division B, Part 4, Section 4.1.3 of the 2020 NBCC, or Annex C of CSA A23.3-19. The nominal steel strength N_{sa} or V_{sa}, in Table 4 of this listing report must be multiplied by ϕ_s and R to determine the factored resistance N_{sar} or V_{sar}. The nominal pullout strengths $N_{p,uncr}$, $N_{p,cr}$ or $N_{p,eq}$ in Table 4 of this listing report must be multiplied by ϕ_c and R to determine the factored resistance $N_{cpr,uncr}$, $N_{cpr,cr}$, or $N_{cpr,eq}$, respectively.

TABLE 4—DESIGN INFORMATION FOR CARBON STEEL AND STAINLESS STEEL CCU+ UNDERCUT ANCHORS[1,2,8]

Anchor Property / Setting Information		**Notation**	**Units**	**Nominal Anchor Size / Rod Diameter, d_{rod} (in.)**											
				$^3/_8$			**$^1/_2$**			**$^5/_8$**			**$^3/_4$**		
Anchor category		-	-	1			1			1			1		
Anchor rod designation		ASTM	-	A36	A193, Gr. B7	A193, Gr.B8M (316SS)	. A36	A193, Gr. B7	A193, Gr.B8M (316SS)	A36	A193, Gr. B7	A193, Gr.B8M (316SS)	A36	A193, Gr. B7	A193, Gr.B8M (316SS)
Outside diameter of anchor		d_a	mm (in.)	17.5 (0.6875)			(20.6) (0.8125)			25.4 (1.00)			31.8 (1.25)		
Nominal embedment depth		h_{nom}	mm	108			137			203			270		
Effective embedment depth		h_{ef}	mm	102			127			190			254		
STEEL STRENGTH IN TENSION, STEEL STRENGTH IN SHEAR, AND STEEL STRENGTH IN SHEAR FOR SEISMIC APPLICATIONS															
Steel strength in tension, static/seismic		N_{sa}	kN	20.1	43.4	41.6	36.6	79.0	69.5	58.3	125.7	110.6	86.2	185.7	163.4
Resistance modification factor for steel strength, tension[3,4]		R	-	0.80											
Preset (PS)	Steel strength in shear, static	V_{sa}	kN	10.1	21.7	22.7	18.3	39.5	39.4	29.1	62.8	64.9	43.1	92.9	99.4
	Steel strength in shear, seismic	$V_{sa,eq}$	kN	7.0	19.5	20.5	12.8	35.5	36.2	20.4	56.6	58.5	30.2	83.6	89.4
Thrubolt (TB)	Steel strength in shear, static	V_{sa}	kN	10.1	63.2	79.2	18.3	83.3	107.7	29.1	128.9	172.6	43.1	185.2	256.9
	Steel strength in shear, seismic	$V_{sa,eq}$	kN	7.0	56.9	48.5	12.8	74.9	86.1	20.4	116.0	139.4	30.2	148.2	205.4
Resistance modification factor for steel strength, shear[3,4]		R	-	0.75											
CONCRETE BREAKOUT STRENGTH IN TENSION															
Critical edge distance (uncracked concrete)[7]		c_{ac}	mm	152			191			241			305		
Effectiveness factor, uncracked concrete		k_{uncr}	-	12.6			12.6			12.6			12.6		
Effectiveness factor, cracked concrete		k_{cr}	-	10			10			10			10		
Modification factor for cracked and uncracked concrete[5]		$\psi_{c,N}$	-	1.0 (see note 5)			1.0 (see note 5)			1.0 (see note 5)			1.0 (see note 5)		
Resistance modification factor for tension, concrete failure modes[4]		R	-	1.00 (Condition B, no supplementary reinforcement) or 1.15 (Condition A, supplementary reinforcement present)											
PULLOUT STRENGTH IN TENSION AND PULLOUT STRENGTH IN TENSION FOR SEISMIC APPLICATIONS															
Characteristic pullout strength, uncracked concrete (17.2MPa)		$N_{p,uncr}$	kN	See note 6			See note 6			See note 6			See note 6		
Characteristic pullout strength, cracked concrete (17.2MPa)		$N_{p,cr}$	kN	See note 6			See note 6			See note 6			See note 6		
Characteristic pullout strength, seismic (17.2MPa)		$N_{p,eq}$	kN	See note 6			See note 6			See note 6			See note 6		
Resistance modification factor for tension, pullout strength. Condition B[4]		R	-	1.00											
CONCRETE BREAKOUT STRENGTH IN SHEAR AND PRYOUT STRENGTH IN SHEAR															
Load bearing length of anchor		ℓ_e	mm	102			127			190			254		
Coefficient for pryout strength		k_{cp}	-	2.0			2.0			2.0			2.0		
Resistance modification factor for shear, concrete failure modes[4]		R	-	1.00 (Condition B, no supplementary reinforcement) or 1.15 (Condition A, supplementary reinforcement present)											
Resistance modification factor for shear, pryout strength. Condition B [4]		R	-	1.00											

For **SI:** 1 inch = 25.4 mm, 1 ksi = 6.895 MPa (N/mm^2), 1 lbf = 0.0044 kN, 1 in^2 = 645 mm^2.

[1]The data in this table is intended to be used with the design provisions of CSA A23.3 -19 Annex D; for anchors resisting seismic load combinations the additional requirements of CSA A23.3 -19 D4.3 shall apply.
[2]Installation must comply with manufacturer's printed installation instructions and details.
[3]The anchors are considered a ductile steel element in tension as defined by CSA A23.3-19 D.2.
[4]All values of *R* for use with the load combinations of Division B, Part 4, Section 4.1.3 of the 2020 NBCC, CSA A23.3-19 Annex C. Condition B applies where supplementary reinforcement in conformance with CSA A23.3-19 D.5.3(c) is not provided, or where pullout or pryout strength governs. For cases where the presence of supplementary reinforcement can be verified, the strength reduction factors associated with Condition A may be used.
[5]Select the appropriate effectiveness factor for cracked concrete (k_{cr}) or uncracked concrete (k_{uncr}) and use $\psi_{c,N}$ = 1.0.
[6]Pullout strength does not control design of indicated anchors and does not need to be calculated for indicated anchor size and embedment.
[7]See CSA A23.3 -19 D6.2 concerning the requirements for critical edge distance, c_{ac}.
[8]Anchors are permitted to be used in lightweight concrete in accordance with CSA A23.3-19 D.4.

Conditions of listing:

1. The listing report addresses only conformance with the standards and code sections noted above.
2. Approval of the product's use is the sole responsibility of the local code official.
3. The listing report applies only to the materials tested and as submitted for review by ICC-ES.
4. Anchor sizes, dimensions, minimum embedment depths and other installation parameters are as set forth in this listing report.
5. Anchors must be limited to use in concrete with a specified strength, f′c, from 2,500 to 8,500 psi (17.2 to 58.6 MPa).
6. The values of f′c used for calculation purposes must not exceed 8,000 psi (55.1 MPa).
7. Limit states design values must be established in accordance with this listing report.
8. The use of fatigue or shock loading for these anchors under such conditions is beyond the scope of this listing report.
9. Anchors may be used to resist short-term loading due to wind or seismic forces in locations designed according to NBCC 2020.
10. Where not otherwise prohibited in the code as referenced in CSA A23.3-19, CCU+ anchors are permitted for installation in fire-resistance rated construction provided that at least one of the following conditions is fulfilled:
    a. Anchors are used to resist wind or seismic forces only.
    b. Anchors that support a fire-resistance-rated envelope or a fire-resistance-rated membrane are protected by approved fire-resistance-rated materials, or have been evaluated for resistance to fire exposure in accordance with recognized standards.
    c. Anchors are used to support nonstructural elements.
11. Use of zinc-coated carbon steel anchors must be limited to dry, interior locations.
12. Use of anchors made of stainless steel as specified in this report are permitted for exterior exposure or damp environments.
13. Steel anchoring materials in contact with preservative-treated wood and fire-retardant-treated wood must be of zinc-coated carbon steel or stainless steel. The minimum coating weights for zinc-coated steel must comply with ASTM A153.