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: AC100+ Gold® Adhesive Anchor System in Cracked and Uncracked Concrete

Listee: DEWALT

Compliance with the following standards:

- Annex D, Anchorage, of CSA A23.3 (-14 and -19), Design of Concrete Structures, CSA Group.

Compliance with the following codes:

AC100+ Gold® adhesive anchor system in cracked and uncracked concrete, as described in this listing report, are in conformance with CSA A23.3 (-14 and -19), Annex D, as referenced in the applicable section of the following code edition:

- *National Building Code of Canada*® 2015 and 2020.
  Applicable Section: Division B, Part 4, Section 4.3.3.

Description of adhesive anchor system:

The AC100+ Gold Adhesive Anchor System is an injectable two-component vinylester adhesive filled in cartridges, static mixing nozzles, manual or powered dispensing tools, hole cleaning equipment, and adhesive injection accessories. The AC100+ Gold adhesive may be used with continuously threaded steel rods or deformed steel reinforcing bars. The primary components of the AC100+ Gold Adhesive Anchor System, including the AC100+ Gold adhesive cartridge, static mixing nozzle, the nozzle extension tube and steel anchor elements, are shown in Figure 1.

FIGURE 1—AC100+ GOLD ADHESIVE ANCHOR SYSTEM INCLUDING TYPICAL STEEL ANCHOR ELEMENTS

The AC100+ Gold adhesive two components are kept separate by means of a labelled dual-cylinder cartridge. The two components combine and react when dispensed through a static mixing nozzle, supplied by DEWALT, which is attached to the cartridge. AC100+ Gold is available in: coxial cartridges: 9.5-ounce (280 mL) and 14-ounce (420mL), and side-by-side cartridges:11.5-ounce (345 mL), and 28-ounce (825 mL). Each

cartridge label is marked with the adhesive expiration date. The shelf life, as indicated by the expiration date, applies to an unopened cartridge stored in a dry, dark, and cool environment.

Hole cleaning equipment is comprised of steel wire brushes supplied by DEWALT, and air blowers which are shown in Figure 3 of this report.

AC100+ Gold adhesive must be dispensed with manual dispensers, pneumatic dispensers, or electric powered dispensers supplied by DEWALT.

Identification:

1. The AC100+ Gold adhesive is identified by packaging labelled with the lot number; expiration date; company name; listing report number (ELC-2582); and the ICC-ES listing mark. Threaded rods, nuts, washers, and deformed reinforcing bars are standard steel anchor elements and must conform to applicable national specifications as set forth in Tables 1 and 3 of this listing report or equivalent.
2. 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: The installation parameters are illustrated in Table 1. Installation of the AC100+ Gold Adhesive Anchor System must conform to the manufacturer's printed installation instructions (MPII) as reproduced in each unit package as described in Figure 3. The injection tools, mixing nozzles, wire brushes, air blowers, and piston plugs along with the adhesive cartridges must be supplied by the manufacturer, as described in Figure 3.

The adhesive anchor system may be used for upwardly inclined orientation applications (e.g. overhead). Upwardly inclined and horizontal orientation applications are to be installed using piston plugs for the $^{5}/_{8}$-inch- through $1^{1}/_{4}$-inch-diameter threaded steel rods and No. 5 through No. 10 steel reinforcing bars, installed in the specified hole diameter, and attached to the mixing nozzle and extension tube supplied by DEWALT as described in Figure 3 in this report. Upwardly inclined and horizontal orientation installation for the $^{3}/_{8}$-inch- and $^{1}/_{2}$-inch-diameter threaded steel rods, and No. 3 and No. 4 steel reinforcing bars may be injected directly to the end of the hole using a mixing nozzle with a hole depth $h_0 \leq 10"$ (250 mm).

Installation of anchors in horizontal or upwardly inclined orientations shall be fully restrained from movement throughout the specified curing period through the use of temporary wedges, external supports, or other methods. Where temporary restraint devices are used, their use shall not result in impairment of the anchor shear resistance

The DEWALT drilling systems in Figure 2 collect and remove dust with a HEPA dust extractor during the hole drilling operation in dry base materials using hammer-drills (see Step 1 of the manufacturer's published installation instructions in Figure 3).

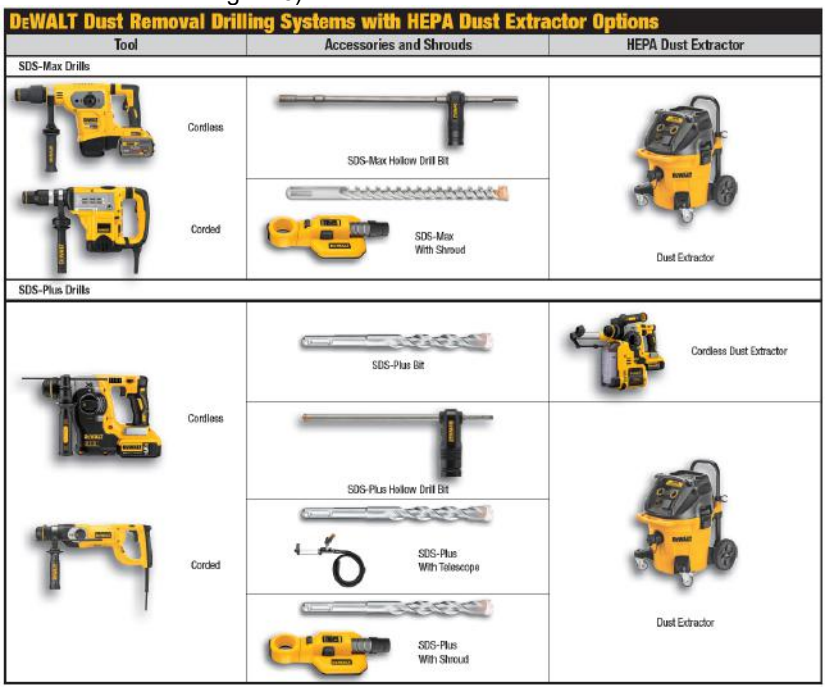

FIGURE 2—EXAMPLES DEWALT DUST REMOVAL DRILLING SYSTEMS WITH HEPA DUST EXTRACTORS FOR ILLUSTRATION

AC100+ Gold Instruction Card

DESCRIPTION:
AC100+ Gold is an easy dispensing, rapid-curing, anchoring adhesive which is formulated for use in anchoring applications by trained professionals. Please refer to installation instructions and SDS for additional detailed information.

PRECAUTION:
Safety glasses and dust masks should be used when drilling holes into concrete, stone and masonry. Wear gloves and safety glasses when handling and dispensing adhesive. Do not sand the adhesive and create silica dust which could be inhaled. Avoid skin and eye contact. Use a NIOSH-approved chemical mask to avoid respiratory discomfort if working indoors or in a confined area, or if sensitive to adhesive odors. Wash hands or other affected body parts with soap and water if skin contact occurs. Flush eyes with plenty of water and seek immediate medical attention if eye contact occurs. Move to fresh air if adhesive odor begins to cause discomfort.

IMPORTANT! Before using, read and review Safety Data Sheet (SDS).
This product contains crystalline silica and as supplied does not pose a dust hazard. IARC classifies crystalline silica (quartz sand) as a Group I carcinogen based upon evidence among workers in industries where there has been long-term and chronic exposure (via inhalation) to silica dust; e.g. mining, quarry, stone crushing, refractory brick and pottery workers. This product does not pose a dust hazard; therefore, this classification is not relevant. However, if reacted (fully cured) product is further processed (e.g. sanded, drilled) be sure to wear proper respiratory and eye protection to avoid health risk.

HANDLING AND STORAGE:
Store in a cool, dry, well ventilated area at temperatures between 32°F (0°C) and 86°F (30°C). Do not freeze. Store and keep away from flame, heat and light. Keep partially used containers closed when not in use. Protect from damage.

Note expiration date on product label before use. Do not use expired product.
Partially used cartridges may be stored with hardened adhesive in the attached mixing nozzle. **Note:** If the cartridge is reused, attach a new mixing nozzle and discard the initial quantity of the anchor adhesive as described in the setting instructions.

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701 East Joppa Road
Towson, MD 21286 U.S.A.

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P: (800) 524-3244 **[N]**

[V.] Adhesive piston plugs

Threaded rod diameter (inch)	Rebar size (no.)	Drill bit diameter (inch)	Plug Size (inch)	Piston Plug (Cat. #)	Horizontal and overhead installations[1,2]
5/8	#5	11/16	11/16	08258-PWR	
		3/4	3/4	08259-PWR	
3/4	#6	7/8	7/8	08300-PWR	
7/8	#7	1	1	08301-PWR	
1	#8	1 1/8	1 1/8	08303-PWR	
1 1/4	#9	1 3/8	1 3/8	08305-PWR	
-	#10	1 1/2	1 1/2	08309-PWR	

[1] A plastic extension tube (Cat# 08281) or equivalent approved by DEWALT must be used with piston plugs.
[2] All listed overhead anchor installations require piston plugs; horizontal installations with embedments greater than 8 inches require piston plugs.

[I.] Hole cleaning tools - wire brushes and air blowers

Threaded rod diameter (inch)	Rebar size (No.)	Drill bit size[1] (inch)	Brush length (inches)	Steel wire brush (Cat. #)	 Air blowers
3/8	#3	7/16	6 3/4	08284	Hand pump (volume 25 fl. oz.), Cat #08280-PWR or compressed air nozzle (min. 90 psi) 
1/2	-	9/16	6 3/4	08285	
-	#4	5/8	6 3/4	08275	
5/8	#5	11/16	7 7/8	08286	
		3/4	7 7/8	08278	
3/4	#6	7/8	7 7/8	08287	
7/8	#7	1	11 7/8	08288	Compressed air nozzle only (min. 90 psi), Cat #08292-PWR 
1	#8	1 1/8	11 7/8	08289	
1 1/4	#9	1 3/8	11 7/8	08290	
-	#10	1 1/2	11 7/8	08291	
A brush extension (Cat. #08282) must be used with brushes for holes drilled deeper than the listed brush length.					

[1] For installations with 5/8-inch threaded rod and #5 rebar size, the preferred ANSI drill bit diameter is 3/4-inch. If an 11/16-inch ANSI drill bit is used the user must check before injecting the adhesive to verify that the steel anchor element can be inserted into the cleaned hole without resistance.

[II.] Gel (working) times and curing times

Temperature of base material		Gel (working) time	Full curing time
14°F	-10°C	90 minutes	24 hours
23°F	-5°C	90 minutes	14 hours
32°F	0°C	45 minutes	7 hours
41°F	5°C	25 minutes	2 hours
68°F	20°C	6 minutes	45 minutes
86°F	30°C	4 minutes	25 minutes
104°F	40°C	1.5 minutes	15 minutes

Linear interpolation for intermediate base material temperatures is possible. For installations in base material temperature between 14°F and 23°F the cartridge temperature must be conditioned to between 68°F and 95°F (20°C - 35°C).

[III.] Installation parameters - Specifications for installation of threaded rods and reinforcing bars

Anchor property / Setting information	Threaded rod (inch) / reinforcing bar size (rebar)								
	3/8 or #3	1/2 #4	5/8 or #5	3/4 or #6	7/8 or #7	1 or #8	#9	1 1/4	#10
d = Threaded rod outside diameter (in.)	0.375	0.500	0.625	0.750	0.875	1.000	-	1.250	-
d = Nominal rebar diameter (in.)	0.375	0.500	0.625	0.750	0.875	1.000	1.125	-	1.250
d_o (d_{bit}) = Nominal ANSI drill bit size (in.)	7/16	9/16 5/8	11/16 or 3/4	7/8	1	1 1/8	1 3/8	1 3/8	1 1/2
$h_{ef,min}$ = Minimum embedment (inches)	2 3/8	2 3/4	3 1/8	3 1/2	4	4 1/2	5	5	
$h_{ef,max}$ = Maximum embedment (inches)	4 1/2	6	7 1/2	9	10 1/2	12	13 1/2	15	15
s_{min} = Minimum spacing (inches)	1 7/8	2 1/2	3 1/8	3 3/4	4 3/8	5	5 5/8	6 1/4	6 1/4
c_{min} = Minimum edge distance (inches)	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	2 3/4	2 3/4	2 3/4
h_{min} = Minimum member thickness (inches)	h_{ef} + 1 1/4		h_{ef} + $2d_o$						
T_{max} = Maximum rod torque (ft.-lb.)	15	33	60	105	125	165	-	280	-
T_{max} = Maximum torque (ft.-lb.) for A36/Grade 36 rod	10	25	50	90	125	165	-	280	-
T_{max} = Maximum torque (ft.-lb.) for Grade B8/B8M Class 1 rod	5	20	40	80	100	165	-	280	-

For installations between the minimum edge distance and 5d, the tabulated maximum torque must be reduced (multiplied) by a factor of 0.45.

[IV.] AC100+ Gold adhesive anchor system selection table

Injection tool		Plastic cartridge system	Mixing nozzle
Dispensers (caulking guns)	Cat. #08437-PWR – Manual tool Cat. #DCE560D1 – Cordless battery tool	AC100+ Gold 9.5 fl.oz. Quick-Shot w/nozzle	Mixing nozzle and extension tube Cat. #08293-PWR or PFC1641600
Manual dispensers	Cat. #08485-PWR – Manual tool	AC100+ Gold 11.5 fl.oz. dual cart. w/nozzle	
	Cat. #08414-PWR – Manual tool	AC100+ Gold 14 fl.oz. coaxial cart. w/nozzle	
Manual and powered dispensers	Cat. #08494-PWR – Manual tool Cat. #08496-PWR – Pneumatic tool Cat. #DCE595D1 – Cordless battery tool	AC100+ Gold 28 fl.oz. dual cart. w/nozzle	Long mixing nozzle and extension tube Cat. #08294-PWR or 08609-PWR

A plastic extension tube (Cat# 08281-PWR or 08297-PWR) or flexible extension hose (Cat.# PFC1640600) or equivalent approved by DEWALT must be used if the bottom or back of the anchor hole is not reached with the mixing nozzle only.

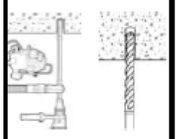
FIGURE 3—MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS (MPII)

AC100+ Gold - Instruction Card (continued)

Installation instructions for Adhesive Anchors in solid base material – For any application not covered by this document please contact DEWALT

SELECT HAMMER DRILLING AS SUITABLE FOR APPLICATION

HAMMER DRILLING



1. Drill a hole into the base material with rotary hammer drill (i.e. percussion drill) and a carbide drill bit to the size and embedment required by the selected steel hardware element (see Table III). Tolerances of carbide drill bits including hollow drill bits must meet ANSI Standard B212.15.

Precaution: Wear suitable eye and skin protection. Avoid inhalation of dusts during drilling and/or removal (see *dust extraction equipment by DEWALT to minimize dust emissions*).

Notes: In case of standing water in the drilled hole (flooded hole condition), all the water has to be removed from the hole (e.g. vacuum, compressed air, etc.) prior to cleaning.

Drilling in dry concrete is recommended when using hollow drill bits (vacuum must be on).

HOLE CLEANING DRY OR WET HOLES

2a. Starting from the bottom or back of the drilled anchor hole, blow the hole clean a minimum of *four* times (4x).

Use a compressed air nozzle (min. 90 psi) for all sizes of anchor rod and reinforcing bar (rebar). Alternatively a hand pump (min. volume 25 fl. oz. supplied by DEWALT) may be used for anchor rods 3/8" to 3/4" diameter or reinforcing bar (rebar) sizes #3 to #6 for embedments not more than 8 inches (a hand pump must not be used with larger anchor sizes).

2b. Determine brush diameter (see Table I) for the drilled hole and attach the brush with adaptor to a rotary drill tool or battery screw gun. Brush the hole with the selected wire brush a minimum of *four* times (4x).

A brush extension (supplied by DEWALT) must be used for holes drilled deeper than the listed brush length. The wire brush diameter must be checked periodically during use; the brush should resist insertion into the drilled hole, if not the brush is too small and must be replaced with the proper brush diameter (i.e. new wire brush).

2c. **Repeat Step 2a** again by blowing the hole clean a minimum of *four* times (4x).

When finished the hole should be clean and free of dust, debris, ice, grease, oil or other foreign material. → **Next go to Step 3.**

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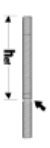
FOLLOW STEPS #1 THROUGH #10 FOR RECOMMENDED INSTALLATION

PREPARING



3. Check adhesive expiration date on cartridge label. Do not use expired product. Review Safety Data Sheet (SDS) before use. Cartridge temperature must be between 23°F - 104°F (-5°C - 40°C) when in use except as noted in Table II. Review published working and cure times. Consideration should be given to the reduced gel (working) time of the adhesive in warm temperatures. For the permitted range of the base material temperature see Table II.

Attach a supplied mixing nozzle to the cartridge. Do not modify the mixer in any way and make sure the mixing element is inside the nozzle. Load the cartridge into the correct dispensing tool.

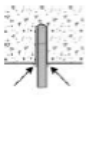
Note: Always use a new mixing nozzle with new cartridges of adhesive and also for all work interruptions exceeding the published gel (working) time of the adhesive.

4. Prior to inserting the anchor rod or rebar into the filled hole, the position of the embedment depth has to be marked on the anchor. Verify anchor element is straight and free of surface damage.

5. Adhesive must be properly mixed to achieve published properties. Prior to dispensing adhesive into the drilled hole, separately dispense at least three full strokes of adhesive through the mixing nozzle until the adhesive is a consistent *gray* color.

Review and note the published working and cure times (see Table II) prior to injection of the mixed adhesive into the cleaned anchor hole.

INSTALLATION



with piston plug:

6. Fill the cleaned hole approximately two-thirds full with mixed adhesive starting from the bottom or back of the anchor hole. If the bottom or back of the anchor hole is not reached with the mixing nozzle only, a plastic extension tube must be used (see Table IV). Slowly withdraw the mixing nozzle as the hole fills to avoid creating air pockets or voids.

Note: Piston plugs (see Table V) must be used with and attached to mixing nozzle and extension tube for overhead and horizontal installations with anchor rod 5/8" to 1-1/4" diameter and rebar size #5 to #10. Insert piston plug to the back of the drilled hole and inject as described in the method above. During installation the piston plug will be naturally extruded from the drilled hole by the adhesive pressure.

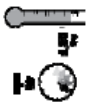
Attention! *Do not install anchors overhead without proper training and installation hardware provided by DEWALT; contact DEWALT prior to use.*

7. The anchor should be free of dirt, grease, oil or other foreign material. Push clean threaded rod or reinforcing bar into the anchor hole while turning slightly to ensure positive distribution of the adhesive until the embedment depth is reached. Observe the gel (working) time.

8. Ensure that the anchor element is installed to the specified embedment depth. Adhesive must completely fill the annular gap at the concrete surface. Following installation of the anchor element, remove excess adhesive. Protect the anchor element threads from fouling with adhesive.

For all installations the anchor element must be restrained from movement throughout the specified curing period (where necessary) through the use of temporary wedges, external supports, or other methods. Minor adjustments to the position of the anchor element may be performed during the gel time only.

CURING AND FIXTURE



9. Allow the adhesive anchor to cure to the specified full curing time prior to applying any load (see Table II).

Do not disturb, torque or load the anchor until it is fully cured.

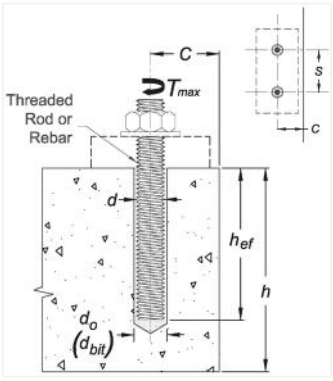
10. After full curing of the adhesive anchor, a fixture can be installed to the anchor and tightened up to the maximum torque (shown in Table III) by using a calibrated torque wrench.

Note: Take care not to exceed the maximum torque for the selected anchor.

FIGURE 3—MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS (MPII) (CONTINUED)

Anchor setting information:

TABLE 1—ANCHOR SETTING FOR FRACTIONAL THREADED ROD AND REINFORCING BARS



PARAMETER	SYMBOL	UNITS	NOMINAL ROD DIAMETER (inch) / REINFORCING BAR SIZE								
			3/8 or #3	1/2 #4	5/8 or #5	3/4 or #6	7/8 or #7	1 or #8	#9	1 1/4	#10
Threaded rod outside diameter	d	mm (inch)	9.5 (0.375)	12.7 (0.500)	15.9 (0.625)	19.1 (0.750)	22.2 (0.875)	25.4 (1.000)	N/A[1]	31.8 (1.250)	N/A[1]
Rebar nominal outside diameter	d	mm (Inch)	9.5 (0.375)	12.7 (0.500)	15.9 (0.625)	19.1 (0.750)	22.2 (0.875)	25.2 (1.000)	28.7 (1.125)	N/A[1]	31.8 (1.250)
Carbide drill bit nominal size	d_o (d_{bit})	inch	7/16	9/16 5/8	11/16 or 3/4	7/8	1	1 1/8	1 3/8	1 3/8	1 1/2
Minimum embedment	$h_{ef,min}$	mm (inch)	60 (2 3/8)	70 (2 3/4)	70 (3 1/8)	89 (3 1/2)	89 (3 1/2)	102 (4)	114 (4 1/2)	127 (5)	127 (5)
Maximum embedment	$h_{ef,max}$	mm (inch)	114 (4 1/2)	152 (6)	191 (7 1/2)	229 (9)	267 (10 1/2)	306 (12)	343 (13 1/2)	381 (15)	381 (15)
Max. rod torque	T_{max}	N-m	20	45	81	142	170	224	N/A[1]	380	N/A[1]
Max. torque[2] (A36/Grade 36 rod)	T_{max}	N-m	14	34	68	122	170	224	N/A[1]	380	N/A[1]
Max. torque[3] (Class 1 SS rod)	T_{max}	N-m	7	27	54	81	136	224	N/A[1]	380	N/A[1]
Minimum anchor spacing	s_{min}	mm (inch)	48 (1 7/8)	64 (2 1/2)	79 (3 1/8)	95 (3 3/4)	111 (4 3/8)	127 (5)	143 (5 5/8)	159 (6 1/4)	159 (6 1/4)
Minimum edge distance	c_{min}	mm (inch)	5*d*;or see maximum torque subject to edge distance below (with reduced torque)								
Minimum member thickness	h_{min}	mm (inch)	h_{ef} + 30 (h_{ef} + 1 1/4)		$h_{ef} + 2d_o$						

For **SI:** 1 mm = 25.4 mm, 1 ft-lbf = 1.356 N-m. For **pound-inch** units: 1 mm = 0.03937 inch, 1 N-m = 0.7375 ft-lbf.

[1]N/A = Not Applicable.
[2]These values apply to ASTM A36 / F1554 Grade 36 carbon steel threaded rods.
[3]These values apply to ASTM A193 Grade B8/B8M (Class 1) stainless steel threaded rods.

For anchors that will be torqued during installation, the maximum torque, T_{max}, must be reduced for edge distances less than five anchor diameters (5d). T_{max} is subject to the edge distance, c_{min}, and anchor spacing, s_{min}, and shall comply with the following requirements:

MAXIMUM TORQUE SUBJECT TO EDGE DISTANCE			
NOMINAL ANCHOR SIZE, *d*	MIN. EDGE DISTANCE, c_{min}	MIN. ANCHOR SPACING, s_{min}	MAXIMUM TORQUE, T_{max}
all sizes	5*d*	5*d*	$1.0 \cdot T_{max}$
9.5 mm to 25.4 mm (3/8 in. to 1 in.)	45 (1.75 in.)	5*d*	$0.45 \cdot T_{max}$
31.8 mm (1 1/4 in.)	70 (2.75 in.)		

For values of T_{max}, see Table 1 and Figure 3 of this report.

Ultimate Limit States Design:

Design resistance of anchors for compliance with the 2015 and 2020 NBCC must be determined in accordance with CSA A23.3 (-14 and -19) Annex D, and this listing report.

Design parameters are provided in Table 2 through 8 of this listing report are based on the 2015 and 2020 NBCC (CSA A23.3 (-14 and -19)). The limit states design of anchors must comply with CSA A23.3 (-14 and -19) D.5.1, except as required in CSA A23.3(-14 and -19) D.4.3.1.

Material resistance factors must be ϕ_c = 0.65 and ϕ_s = 0.85 in accordance with CSA A23.3(-14 and 19) Sections 8.4.2 and 8.4.3, and resistance modification factor, *R,* as given in CSA A23.3(-14 and -19) Section D.5.3, and noted in Tables 4, 5 and 6 of this listing report, must be used for load combinations calculated in accordance with Division B, Part 4, Section 4.1.3 of the 2015 and 2020 NBCC, or Annex C of CSA A23.3(-14 and -19). The nominal strength, N_{sa} or V_{sa}, in Tables 4 and 5 of this listing report must be multiplied by ϕ_s and *R* to determine the factored resistance, N_{sar} or V_{sar}.

The bond strength must be adjusted by the permissible installation condition factors for dry concrete, R_d, water-saturated concrete, R_{ws}, and water-filled hole (flooded), R_{wf}, for the corresponding installation conditions. The bond strength must further be modified with the factor, κ_{wf}, for cases the holes are water-filled (flooded) as given in Tables 7 and 8.

For anchors to be installed in seismic regions described in NBCC 2015 and 2020. The factored resistance shear strength, V_{sar}, must be adjusted by $\alpha_{V,seis}$ as given in Tables 4 and 5 for the corresponding anchor steel. The nominal bond strength $\tau_{k,cr}$ must be adjusted by $\alpha_{N,seis}$ as given in Table 7 for threaded rods.

TABLE 2—SPECIFICATIONS AND PHYSICAL PROPERTIES OF COMMON FRACTIONAL THREADED CARBON AND STAINLESS STEEL ROD MATERIALS[1]

THREADED ROD SPECIFICATION		UNITS	MIN. SPECIFIED ULTIMATE STRENGTH, f_{uta}	MIN. SPECIFIED YIELD STRENGTH 0.2 PERCENT OFFSET, f_{ya}	$\frac{f_{uta}}{f_{ya}}$	ELONGATION MINIMUM PERCENT[8]	REDUCTION OF AREA MINIMUM PERCENT	NUT SPECIFICATION[9]
Carbon Steel	ASTM A36[2] and F1554[3] Grade 36	MPa	400	248	1.61	23	40[10]	ASTM A194 / A563 Grade A
	ASTM F1554[3] Grade 55	MPa	517	380	1.36	23	40	
	ASTM F1554[3] Grade 105	MPa	862	724	1.19	15	45	ASTM A194 / A563 Grade D
	ASTM A193[4] Grade B7	MPa	860	720	1.19	16	50	
	ASTM A449[5] ($\frac{3}{8}$ to 1 inch dia.)	MPa	828	635	1.30	14	35	ASTM A194 / A563 Grade DH
	ASTM A449[5] ($1\frac{1}{4}$ inch dia.)	MPa	720	559	1.30	14	35	
Stainless Steel (Types 304 and 316)	ASTM F593[6] CW1 ($\frac{3}{8}$ to $\frac{5}{8}$ inch dia.)	MPa	690	450	1.54	20	-[11]	ASTM F594 Alloy Group 1, 2 or 3
	ASTM F593[6] CW2 ($\frac{3}{4}$ to $1\frac{1}{4}$ inch dia.	MPa	590	310	1.89	25	-[11]	
	ASTM A193[7] Grade B8/B8M, Class 1	MPa	517	207	2.50	30	50	ASTM F594 Alloy Group 1, 2 or 3
	ASTM A193[7] Grade B8/B8M2, Class 2B	MPa	655	517	1.27	25	40	

For **SI:** 1 mm = 25.4 mm, 1 ft-lbf = 1.356 N-m. For **pound-inch** units: 1 mm = 0.03937 inch, 1 N-m = 0.7375 ft-lbf.

[1]Adhesive must be used with continuously threaded carbon or stainless steels (all-thread) that have thread characteristics comparable with ANSI B1.1 UNC Coarse Thread Series. Tabulated values correspond to anchor diameters included in this report. See CSA A23.3 (-14 and -19) D.2 for ductility of steel anchor elements.
[2]*Standard Specification for Carbon Structural Steel.*
[3]*Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.*
[4]*Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications.*
[5]*Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use.*
[6]*Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.*
[7]*Standard Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.*
[8]Based on 2-inch (50 mm) gauge length except ASTM A193, which are based on a gauge length of 4d.
[9]Nuts of other grades and style having specified proof load stress greater than the specified grade and style are also suitable. Nuts must have specified proof load stresses equal to or greater than the minimum tensile strength of the specified threaded rod. Material types of the nuts and washers must be matched to the threaded rods.
[10]Minimum percent reduction of area reported in ASTM A36 is 50 percent.
[11]Minimum percent reduction of area not reported in the referenced ASTM standard.

TABLE 3—SPECIFICATIONS AND PHYSICAL PROPERTIES OF COMMON STEEL REINFORCING BARS[1]

REINFORCING SPECIFICATION	UNITS	MINIMUM SPECIFIED ULTIMATE STRENGTH, f_{uta}	MINIMUM SPECIFIED YIELD STRENGTH, f_{ya}
ASTM A615[2], A767[4], Grade 75	MPa	690	520
ASTM A615[2], A767[4], Grade 60	MPa	620	414
ASTM A706[3], A767[4], Grade 60	MPa	550	414
ASTM A615[2], A767[4], Grade 40	MPa	415	275

For **SI:** 1 mm = 25.4 mm, 1 ft-lbf = 1.356 N-m. For **pound-inch** units: 1 mm = 0.03937 inch, 1 N-m = 0.7375 ft-lbf.

[1]Adhesive must be used with specified deformed reinforcing bars. Tabulated values correspond to bar sizes included in this report.
[2]*Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.* Grade 60 and Grade 40 bars may be considered ductile elements. In accordance with CSA A23.3 (-14 and -19) D.4.3.5.3(a)(ii)(4), deformed reinforcing bars meeting this specification used as ductile steel elements to resist earthquake effects shall be limited to reinforcing bars satisfying the requirements of CSA A23.3 (-14 and -19) Section 21. Grade 75 bars furnished to specification are considered brittle elements.
[3]*Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.* Bars furnished to specification are considered ductile elements.
[4]*Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.* Bars furnished to specification are considered brittle elements.

TABLE 4—STEEL DESIGN INFORMATION FOR FRACTIONAL THREADED ROD

DESIGN INFORMATION		SYMBOL	UNITS	NOMINAL ROD DIAMETER (inch)[1]						
				3/8	1/2	5/8	3/4	7/8	1	1 1/4
Threaded rod nominal outside diameter		*d*	mm (inch)	9.5 (0.375)	12.7 (0.500)	15.9 (0.625)	19.1 (0.750)	22.2 (0.875)	25.4 (1.000)	31.8 (1.250)
Threaded rod effective cross-sectional area		A_{se}	mm² (inch²)	50 (0.0775)	92 (0.1419)	146 (0.2260)	216 (0.3345)	298 (0.4617)	391 (0.6057)	625 (0.9691)
ASTM A36 and F1554, Grade 36	Nominal strength as governed by steel strength (for a single anchor)	N_{sa}	kN	20.0	36.6	58.3	86.3	119.1	156.3	250.0
		V_{sa}	kN	12.0	22.0	35.0	51.8	71.4	93.8	150.0
	Reduction factor for seismic shear	$\alpha_{V,seis}$	-	Not applicable	0.85	0.85	0.85	0.85	0.80	0.80
	Resistance modification factor for tension[2]	*R*	-	0.80						
	Resistance modification factor for shear[2]	*R*	-	0.75						
ASTM F1554, Grade 55	Nominal strength as governed by steel strength (for a single anchor)	N_{sa}	kN	25.9	47.3	75.4	111.6	154.0	202.0	323.3
		V_{sa}	kN	15.5	28.4	45.2	67.0	92.4	121.2	194.0
	Reduction factor for seismic shear	$\alpha_{V,seis}$	-	Not applicable	0.85	0.85	0.85	0.85	0.80	0.80
	Resistance modification factor for tension[2]	*R*	-	0.80						
	Resistance modification factor for shear[2]	*R*	-	0.75						
ASTM A193 Grade B7 and F1554, Grade 105	Nominal strength as governed by steel strength (for a single anchor)	N_{sa}	kN	43.1	78.9	125.7	186.0	256.7	336.8	538.8
		V_{sa}	kN	25.9	7.3	75.4	111.6	154.0	202.1	323.3
	Reduction factor for seismic shear	$\alpha_{V,seis}$	-	Not applicable	0.85	0.85	0.85	0.85	0.80	0.80
	Resistance modification factor for tension[2]	*R*	-	0.80						
	Resistance modification factor for shear[2]	*R*	-	0.75						
ASTM A449	Nominal strength as governed by steel strength (for a single anchor)	N_{sa}	kN	41.4	75.7	120.6	178.5	248.7	282.9	452.6
		V_{sa}	kN	24.8	45.4	72.4	107.1	149.2	169.7	271.6
	Reduction factor for seismic shear	$\alpha_{V,seis}$	-	Not applicable	0.80	0.80	0.80	0.80	0.80	0.80
	Resistance modification factor for tension[2]	*R*	-	0.80						
	Resistance modification factor for shear[2]	*R*	-	0.75						
ASTM F593 CW Stainless (Types 304 and 316)	Nominal strength as governed by steel strength (for a single anchor)	N_{sa}	kN	34.5	63.1	100.5	126.5	174.6	229.0	366.4
		V_{sa}	kN	20.7	37.9	60.3	75.9	104.7	137.4	219.8
	Reduction factor for seismic shear	$\alpha_{V,seis}$	-	Not applicable	0.85	0.85	0.85	0.85	0.80	0.80
	Resistance modification factor for tension[3]	*R*	-	0.70						
	Resistance modification factor for shear[3]	*R*	-	0.65						
ASTM A193 Grade B8/B8M, Class 1 Stainless (Types 304 and 316)	Nominal strength as governed by steel strength (for a single anchor)[4]	N_{sa}	kN	19.7	36.0	57.3	84.8	117.1	153.6	245.7
		V_{sa}	kN	11.8	21.6	34.4	50.9	70.2	92.1	147.4
	Reduction factor for seismic shear	$\alpha_{V,seis}$	-	Not applicable	0.85	0.85	0.85	0.85	0.80	0.80
	Resistance modification factor for tension[2]	*R*	-	0.80						
	Resistance modification factor for shear[2]	*R*	-	0.75						
ASTM A193 Grade B8/B8M2, Class 2B Stainless (Types 304 and 316)	Nominal strength as governed by steel strength (for a single anchor)	N_{sa}	kN	32.8	60.0	95.5	141.3	195.1	256.0	409.5
		V_{sa}	kN	19.7	36.0	57.3	84.8	117.1	153.6	245.7
	Reduction factor for seismic shear	$\alpha_{V,seis}$	-	Not applicable	0.85	0.85	0.85	0.85	0.80	0.80
	Resistance modification factor for tension[2]	*R*	-	0.80						
	Resistance modification factor for shear[2]	*R*	-	0.75						

For **SI:** 1 inch = 25.4 mm, 1 lbf = 4.448 N. For **pound-inch** units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf.

[1]Values provided for threaded rod material types based on minimum specified strengths and calculated in accordance with CSA A23.3 (-14 and -19) Eq. D.2 and Eq. D.31. Nuts must be appropriate for the rod, as listed in Table 1 of this report.

[2]The tabulated value of the material resistance factors ϕ_c *and* ϕ_s, and resistance modification factor, *R,* applies when the load combinations of Division B, Part 4, Section 4.1.3 of the 2015 and 2020 NBCC or Annex C of CSA A23.3 (-14 and -19) are used. The *R* values correspond to ductile steel elements.

[3]The tabulated value of the material resistance factors ϕ_c *and* ϕ_s, and resistance modification factor, *R*, applies when the load combinations of Division B, Part 4, Section 4.1.3 of the 2015 and 2020 NBCC or Annex C of CSA A23.3 (-14 and -19) are used. The *R* values correspond to brittle steel elements.

[4]In accordance with CSA A23.3 (-14 and -19) D.6.1.2 and D.7.1.2 the calculated values for nominal tension and shear strength for ASTM A193 Grade B8/B8M Class 1 stainless steel threaded rods are based on limiting the specified tensile strength of the anchor steel to $1.9f_y$ or 57,000 psi (393 MPa).

TABLE 5—STEEL DESIGN INFORMATION FOR REINFORCING BARS

DESIGN INFORMATION		SYMBOL	UNITS	NOMINAL REINFORCING BAR SIZE (REBAR)[1]							
				No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10
Rebar nominal outside diameter		d	mm (inch)	9.5 (0.375)	12.7 (0.500)	15.9 (0.625)	19.1 (0.750)	22.2 (0.875)	25.4 (1.000)	28.7 (1.125)	32.3 (1.250)
Rebar effective cross-sectional area		A_{se}	mm^2 ($inch^2$)	71 (0.110)	129 (0.200)	200 (0.310)	284 (0.440)	387 (0.600)	510 (0.790)	645 (1.000)	819 (1.270)
ASTM A615, Grade 75	Nominal strength as governed by steel strength (for a single anchor)	N_{sa}	kN	48.9	89.0	137.9	195.7	266.9	351.4	444.8	564.9
		V_{sa}	kN	29.4	53.4	82.7	117.4	160.1	210.8	266.9	338.9
	Reduction factor for seismic shear	$\alpha_{V,seis}$	-	Not applicable	0.70	0.70	0.70	0.70	0.70	0.70	0.70
	Resistance modification factor for tension[3]	R	-	0.70							
	Resistance modification factor for shear[3]	R	-	0.65							
ASTM A615, Grade 60	Nominal strength as governed by steel strength (for a single anchor)	N_{sa}	kN	44.0	80.1	124.1	176.1	240.2	316.3	400.3	508.4
		V_{sa}	kN	26.4	48.0	74.5	105.7	144.1	189.8	240.2	305.0
	Reduction factor for seismic shear	$\alpha_{V,seis}$	-	Not applicable	0.70	0.70	0.70	0.70	0.70	0.70	0.70
	Resistance modification factor for tension[2]	R	-	0.70							
	Resistance modification factor for shear[2]	R	-	0.65							
ASTM A706, Grade 60	Nominal strength as governed by steel strength (for a single anchor)	N_{sa}	kN	39.1	71.2	110.3	156.6	213.5	281.1	355.9	452.0
		V_{sa}	kN	23.5	42.7	66.2	94.0	128.1	168.7	213.5	271.2
	Reduction factor for seismic shear	$\alpha_{V,seis}$	-	Not applicable	0.70	0.70	0.70	0.70	0.70	0.70	0.70
	Resistance modification factor for tension[2]	R	-	0.80							
	Resistance modification factor for shear[2]	R	-	0.75							
ASTM A615, Grade 40	Nominal strength as governed by steel strength (for a single anchor)	N_{sa}	kN	29.4	53.4	82.7	117.4	In accordance with ASTM A615, Grade 40 bars are furnished only in sizes No. 3 through No. 6			
		V_{sa}	kN	17.6	32.0	49.6	70.5				
	Reduction factor for seismic shear	$\alpha_{V,seis}$	-	Not applicable	0.70	0.70	0.70				
	Resistance modification factor for tension[2]	R	-	0.70							
	Resistance modification factor for shear[2]	R	-	0.65							

For **SI:** 1 inch = 25.4 mm, 1 lbf = 4.448 N. For **pound-inch** units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf.

[1]Values provided for reinforcing bar material types based on minimum specified strengths and calculated in accordance with CSA A23.3 (-14 and -19) Eq. D.2 and Eq. D.31.

[2]The tabulated value of the material resistance factors ϕ_c *and* ϕ_s, and resistance modification factor, *R,* applies when the load combinations of Division B, Part 4, Section 4.1.3 of the 2015 and 2020 NBCC or Annex C of CSA A23.3 (-14 and -19) are used. The *R* values correspond to ductile steel elements. In accordance with CSA A23.3(-14 and -19) D.4.3.5.3(a)(ii)(4), deformed reinforcing bars meeting this specification used as ductile steel elements to resist earthquake effects shall be limited to reinforcing bars satisfying the requirements of CSA A23.3(-14 and -19) Section 21.

[3]The tabulated value of the material resistance factors ϕ_c *and* ϕ_s, and resistance modification factor, *R,* applies when the load combinations of Division B, Part 4, Section 4.1.3 of the 2015 and 2020 NBCC or Annex C of CSA A23.3 (-14 and -19) are used. The *R* values correspond to brittle steel elements.

TABLE 6—CONCRETE BREAKOUT AND PRYOUT DESIGN INFORMATION FOR FRACTIONAL THREADED ROD AND REINFORCING BARS IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT[1,3]

DESIGN INFORMATION	SYMBOL	UNITS	NOMINAL ROD DIAMETER (inch) / REINFORCING BAR SIZE							
			3/8 or #3	1/2 or #4	5/8 or #5	3/4 or #6	7/8 or #7	1 or #8	#9	1 1/4 or #10
Effectiveness factor for cracked concrete	$k_{c,cr}$[4]	SI (-)	Not Applicable	7.1 (17)						
Effectiveness factor for uncracked concrete	$k_{c,uncr}$[4]	SI (-)	10.0 (24)							
Minimum embedment	$h_{ef,min}$	mm (inch)	60 (2 3/8)	70 (2 3/4)	79 (3 1/8)	89 (3 1/2)	89 (3 1/2)	102 (4)	114 (4 1/2)	127 (5)
Maximum embedment	$h_{ef,max}$	mm (inch)	114 (4 1/2)	152 (6)	191 (7 1/2)	229 (9)	267 (10 1/2)	305 (12)	343 (13 1/2)	381 (15)
Minimum anchor spacing	s_{min}	mm (inch)	48 (1 7/8)	64 (2 1/2)	79 (3 1/8)	95 (3 3/4)	111 (4 3/8)	127 (5)	143 (5 5/8)	159 (6 1/4)
Minimum edge distance	c_{min}	mm (inch)	5*d* where *d* is nominal outside diameter of the anchor; see Table 1 of this report for design with reduced minimum edge distances (with reduced torque)							
Minimum member thickness	h_{min}[5]	mm (inch)	h_{ef} + 30 (h_{ef} + 1 1/4)		h_{ef} + 2d_o where d_o is hole diameter; for installation parameters see Figure 3 of this report					
Critical edge distance—splitting (for uncracked concrete only)	c_{ac}[6]	mm (inch)	$2h_{ef}$							
Resistance modification factor for tension, concrete failure modes, Condition B[2]	*R*	-	1.00							
Resistance modification factor for shear, concrete failure modes, Condition B[2]	*R*	-	1.00							

For **SI:** 1 inch = 25.4 mm, 1 lbf = 4.448 N. For **pound-inch** units: 1 mm = 0.03937 inch, 1 N = 0.2248 lbf.

[1]Additional setting information is described in the installation instructions, Figure 3 of this report.
[2]Condition A requires supplemental reinforcement, while Condition B applies where supplemental reinforcement is not provided or where pryout governs, as set forth in CSA A23.3(-14 and -19) D.5.3. The tabulated value of the material resistance factors ϕ_c *and* ϕ_s, and resistance modification factor, *R,* applies when the load combinations of Division B, Part 4, Section 4.1.3 of the 2015 and 2020 NBCC or Annex C of CSA A23.3 (-14 and -19) are used.
[3]Refer to CSA A23.3 (-14 and -19) D.6.2.1 for concrete breakout resistance of anchor in tension, and CSA A23.3 (-14 and -19) D.7.2.1 for concrete breakout resistance of anchor in shear.
[4]Refer to CSA A23.3 (-14 and -19) D.6.2.2 using the selected values of $k_{c,cr}$ and $k_{c,uncr}$ as provided in the table. Where analysis indicates no cracking in accordance with CSA A23.3 (-14 and -19) D.6.2.6 $\Psi_{c,N}$ shall be taken as 1.0.
[5]The minimum member thicknesses must be observed for anchor design and installation.
[6]Refer to CSA A23.3 (-14 and -19) D.9.7

TABLE 7—BOND STRENGTH DESIGN INFORMATION FOR FRACTIONAL THREADED RODS IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT[1,8]

DESIGN INFORMATION		SYMBOL	UNITS	NOMINAL ROD DIAMETER (inch)						
				3/8	1/2	5/8	3/4	7/8	1	1 1/4
Minimum embedment		$h_{ef,min}$	mm (inch)	60 ($2^3/_8$)	70 ($2^3/_4$)	79 ($3^1/_8$)	89 ($3^1/_2$)	89 ($3^1/_2$)	102 (4)	127 (5)
Maximum embedment		$h_{ef,max}$	mm (inch)	114 ($4^1/_2$)	152 (6)	191 ($7^1/_2$)	229 (9)	267 ($10^1/_2$)	305 (12)	381 (15)
122°F (50°C) Maximum long-term service temperature; 176°F (80°C) maximum short-term service temperature[2,3]	Characteristic bond strength in cracked concrete[4,6]	$\tau_{k,cr}$[9]	N/mm²	Not applicable	3.4	3.6	3.6	3.6	3.6	3.6
	Characteristic bond strength in cracked concrete, short-term loads only[6]	$\tau_{k,cr}$[9]	N/mm²	Not applicable	4.9	5.1	5.1	5.1	5.1	5.2
	Characteristic bond strength in uncracked concrete[4,7]	$\tau_{k,uncr}$[9]	N/mm²	5.7	5.7	5.7	5.7	5.7	5.1	4.1
									Not applicable in water-filled hole installation condition	
	Characteristic bond strength in uncracked concrete, short-term loads only[7]	$\tau_{k,uncr}$[9]	N/mm²	8.1	8.1	8.1	8.1	8.1	7.3	5.8
									Not applicable in water-filled hole installation condition	
162°F (72°C) Maximum long-term service temperature; 248°F (120°C) maximum short-term service temperature[2,3]	Characteristic bond strength in cracked concrete[4,6]	$\tau_{k,cr}$[9]	N/mm²	Not applicable	1.7	1.8	1.8	1.8	1.8	1.8
	Characteristic bond strength in cracked concrete, short-term loads only[6]	$\tau_{k,cr}$[9]	N/mm²	Not applicable	3.7	3.9	3.9	3.9	3.9	3.9
	Characteristic bond strength in uncracked concrete[4,7]	$\tau_{k,uncr}$[9]	N/mm²	2.8	2.8	2.8	2.8	2.8	2.5	Not applicable
								Not applicable in water-filled hole installation condition		
	Characteristic bond strength in uncracked concrete, short term loads only[7]	$\tau_{k,uncr}$[9]	N/mm²	6.2	6.2	6.2	6.2	6.2	5.6	Not applicable
								Not applicable in water-filled hole installation condition		
Permissible installation conditions[5]	Dry concrete	R_d	-	1.00				1.00	1.00	1.00
	Water-saturated concrete	R_{ws}	-	0.85				0.85	0.85	0.85
	Water-filled hole (flooded)	R_{wf}	-	0.75				0.75	0.75	0.75
		κ_{wf}	-	0.78				0.70	0.69	0.67
Reduction factor for seismic tension		$\alpha_{N,seis}$	-	0.95						

For **SI:** 1 inch = 25.4 mm, 1 psi = 0.006894 MPa. For **pound-inch** units: 1 mm = 0.03937 inch, 1 MPa = 145.0 psi.

[1]Bond strength values correspond to concrete compressive strength f'_c = 2,500 psi. For concrete compressive strength, f'_c between 2,500 psi and 8,000 psi, the tabulated characteristic bond strength may be increased by a factor of $(f'_c / 2{,}500)^{0.13}$ [For **SI:** $(f'_c / 17.2)^{0.13}$]..

[2]Long-term and short-term temperatures meet and exceed the requirements of Section 8.5 of ACI 355.4 and Table 9.1 in accordance with D.4.3.4 CSA A23.3 (-14 and -19), Temperature Category A.

[3]Short-term elevated concrete temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling. Long-term concrete temperatures are roughly constant over significant periods of time.

[4]Characteristic bond strengths are for sustained loads including dead and live loads.

[5]Permissible installation conditions include dry concrete, water-saturated concrete and water-filled holes. Water-filled holes include applications in dry or water-saturated concrete where the drilled holes contain standing water at the time of anchor installation. For installation instructions see Figure 3 of this report.

[6]For structures to be installed in seismic regions described in NBCC 2015 and 2020 as referenced in CSA A23.3(-14 and -19), bond strength values for cracked concrete must be adjusted by an additional reduction factor, $\alpha_{N,seis}$, as given in the table.

[7]Bond strength values for uncracked concrete are applicable for structures assigned in non-seismic regions.

[8]Refer to CSA A23.3 (-14 and -19) D.6.5 for bond strength of adhesive anchor in tension.

[9]Bond strength values must further be modified with the factor κ_{wf} for cases the holes are water-filled at the time of anchor installation.

TABLE 8—BOND STRENGTH DESIGN INFORMATION FOR REINFORCING BARS IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT[1,8]

DESIGN INFORMATION		SYMBOL	UNITS	REINFORCING BAR SIZE							
				#3	#4	#5	#6	#7	#8	#9	#10
Minimum embedment		$h_{ef,min}$	mm (inch)	60 ($2^3/_8$)	70 ($2^3/_4$)	79 ($3^1/_8$)	89 ($3^1/_2$)	89 ($3^1/_2$)	102 (4)	114 ($4^1/_2$)	127 (5)
Maximum embedment		$h_{ef,max}$	mm (inch)	1154 ($4^1/_2$)	152 (6)	191 ($7^1/_2$)	229 (9)	267 ($10^1/_2$)	305 (12)	343 ($13^1/_2$)	381 (15)
122°F (50°C) Maximum long-term service temperature; 176°F (80°C) maximum short-term service temperature[2,3]	Characteristic bond strength in cracked concrete[4,6]	$\tau_{k,cr}$[9]	N/mm²	Not applicable	2.3	2.4	2.4	2.4	2.4	2.4	2.4
	Characteristic bond strength in cracked concrete, short-term loads only[6]	$\tau_{k,cr}$[9]	N/mm²	Not applicable	3.3	3.4	3.4	3.4	3.4	3.4	3.4
	Characteristic bond strength in uncracked concrete[4,7]	$\tau_{k,uncr}$[9]	N/mm²	5.7	5.7	5.7	5.7	5.7	5.1	5.1	4.1
									Not applicable in water-filled hole installation condition		
	Characteristic bond strength in uncracked concrete, short-term loads only[7]	$\tau_{k,uncr}$[9]	N/mm²	8.1	8.1	8.1	8.1	8.1	7.3	6.6	5.8
									Not applicable in water-filled hole installation condition		
162°F (72°C) Maximum long-term service temperature; 248°F (120°C) maximum short-term service temperature[2,3]	Characteristic bond strength in cracked concrete[4,6]	$\tau_{k,cr}$[9]	N/mm²	Not applicable	1.1	1.2	1.2	1.2	1.2	1.2	1.2
	Characteristic bond strength in cracked concrete, short-term loads only[6]	$\tau_{k,cr}$[9]	N/mm²	Not applicable	2.5	2.6	2.6	2.6	2.6	2.6	2.6
	Characteristic bond strength in uncracked concrete[4,7]	$\tau_{k,uncr}$[9]	N/mm²	2.8	2.8	2.8	2.8	2.8	2.5	2.3	Not applicable
								Not applicable in water-filled hole installation condition			
	Characteristic bond strength in uncracked concrete, short-term loads only[7]	$\tau_{k,uncr}$[9]	N/mm²	6.2	6.2	6.2	6.2	6.2	5.6	5.0	Not applicable
								Not applicable in water-filled hole installation condition			
Permissible installation conditions[5]	Dry concrete	R_d	-	1.00				1.00	1.00	1.00	1.00
	Water-saturated concrete	R_{ws}	-	0.85				0.85	0.85	0.85	0.85
	Water-filled hole (flooded)	R_{wf}	-	0.75				0.75	0.75	0.75	0.75
		κ_{wf}	-	0.78				0.70	0.69	0.68	0.67
Reduction factor for seismic tension		$\alpha_{N,seis}$	-	1.0							

For **SI:** 1 inch = 25.4 mm, 1 psi = 0.006894 MPa. For **pound-inch** units: 1 mm = 0.03937 inch, 1 MPa = 145.0 psi.

[1]Bond strength values correspond to concrete compressive strength f'_c = 2,500 psi. For concrete compressive strength, f'_c between 2,500 psi and 8,000 psi, the tabulated characteristic bond strength may be increased by a factor of $(f'_c / 2{,}500)^{0.13}$ [For **SI:** $(f'_c / 17.2)^{0.13}$].

[2]Long-term and short-term temperatures meet and exceed the requirements of Section 8.5 of ACI 355.4 and Table 9.1 in accordance with D.4.3.4 CSA A23.3 (-14 and -19), Temperature Category A.

[3]Short-term elevated concrete temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling. Long-term concrete temperatures are roughly constant over significant periods of time.

[4]Characteristic bond strengths are for sustained loads including dead and live loads.

[5]Permissible installation conditions include dry concrete, water-saturated concrete and water-filled holes. Water-filled holes include applications in dry or water-saturated concrete where the drilled holes contain standing water at the time of anchor installation. For installation instructions see Figure 3 of this report.

[6]For anchors to be installed in seismic regions described in NBCC 2015 and 2020, the tabulated bond strength values for cracked concrete do not require an additional reduction factor applied for seismic tension ($\alpha_{N,seis}$ = 1.0), where seismic design is applicable.

[7]Bond strength values for uncracked concrete are applicable for structures assigned innon-seismic regions.

[8]Refer to CSA A23.3 (-14 and -19) D.6.5 for bond strength of adhesive anchor in tension.

[9]Bond strength values must further be modified with the factor κ_{wf} for cases the holes are water-filled at the time of anchor installation.

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 cracked and uncracked normal-weight concrete and lightweight concrete having a specified compressive strength, f'_c, of 2,500 psi (17.2 MPa) to 8,500 psi (58.6 MPa).
6. The values of f'_c, used for calculation purposes must not exceed 55 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 2015 and 2020.

10. Where not otherwise prohibited in the code as referenced in CSA A23.3 (-14 and -19), AC100+ Gold Adhesive Anchor System are permitted for use with 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 is limited to dry, interior locations.

12. Use of anchors made of stainless steel as specified in this report are permitted for exterior exposure and 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.

14. Installation of anchors in horizontal or upwardly inclined orientations to resist sustained tension loads shall be performed by personnel certified by an applicable certification program, and the certification shall include written and performance tests in accordance with the ACI/CRSI Adhesive Anchor Installer Certification program, or equivalent in accordance with CSA A23.3 (-14 and -19) D.10.2.3. The installation shall be continuously inspected during installation by an inspector specially approved for that purpose. The special inspector shall furnish a report to the licensed design professional and building official that the work covered by the report has been performed and that the materials used and the installation procedures used conform with the approved contract documents and the MPII in accordance with CSA A23.3 (-14 and -19) D.10.2.4.

15. Anchors shall not be used for installations where the in-service concrete temperature can vary from 40°F (5°C) or less to 80°F (27°C) or higher within a 12-hour period. Such applications may include but are not limited to anchorage of building facade systems and other applications subject to direct sun exposure.