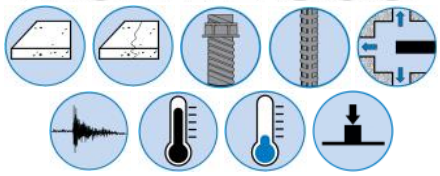
ULTRABOND® ACRYL-8CC



ICC ES ESR-4249

NSF

Product Description

ULTRABOND® ACRYL-8CC is a two-component, 10:1 mix ratio by volume, high strength, styrene-free, vinylester adhesive anchoring system tested for use with threaded rod and reinforcing bar for cracked and uncracked concrete conditions in accordance with ACI 355.4 and ICC-ES AC308. It has an installation temperature range between 14 °F to 104 °F (-10 °C to 40 °C) and an extended in-service temperature range between 14 °F to 248 °F (-10 °C to 120 °C).

General Uses & Applications

- Anchoring threaded rod and reinforcing bar (rebar) into cracked or uncracked concrete using a hammer drill
- Suitable for dry, water saturated and water-filled conditions using threaded rod or rebar
- Vertical down, horizontal, upwardly inclined and overhead installations

Advantages & Features

- ICC-ES ESR-4249 evaluation report for cracked and uncracked normal weight and lightweight concrete
- Building code compliant, IBC/IRC: 2018, 2015, 2012 & 2009
- City of Los Angeles Code (LABC/LARC) compliant: 2017
- Florida Building Code (FBC) compliant: 2017
- Abu Dhabi International Building and Residential Code (ADIBC/RC) compliant: 2013
- Certified - Drinking Water System Components (NSF/ANSI 61) Joining and Sealing
- LEED® EQc4.1 Credit: Low-Emitting materials; LEED (Leadership in Energy and Environmental Design) is the most widely used green building rating system in the world
- Resists static, wind and earthquake loading in tension and shear - (IBC Seismic Design Categories A through F)
- Full cure in 45 minutes at 70 °F (21 °C)
- Resists sustained loads in temperatures up to 161 °F (72 °C)
- Withstands freeze-thaw conditions

STANDARDS & APPROVALS

CODE COMPLIANT:
ICC-ES ESR-4249
IBC/IRC 2018, 2015, 2012, 2009
City of Los Angeles 2017
Florida Building Code 2017
Abu Dhabi International Building Code 2013
NSF/ANSI 61

ASTM C881-15 & AASHTO M235
Type I, II, IV & V Grade 3 Class A, B & C

(See ATC website for current Department of Transportation approvals throughout the United States)

- Acceptable for use in USDA inspected facilities
- Compatible with ATC's free Pro Anchor Design software

Availability: Adhesives Technology Corp. (ATC) products are available online and through select distributors providing all your construction needs. Please contact ATC for a distributor near you or visit www.atcepoxy.com for online purchasing options or to search for a distributor by zip code.

Color & Ratio: Part A (Resin) Light Beige: Part B (Hardener) Black, Mixed Ratio: 10:1 by volume, Mixed Color - Gray

Storage & Shelf Life: 18 months when stored in unopened containers in dry conditions. Store between 41 °F (5 °C) and 77°F (25 °C).

Installation: Manufacturer's Printed Installation Instructions (MPII) are available within this Technical Data Sheet (TDS). Due to occasional updates and revisions, always verify the most current MPII usage. In order to achieve maximum results, proper installation is imperative.

Clean-Up: Always wear appropriate personal protective equipment such as safety glasses and gloves. Clean uncured materials from tools and equipment using a mild solvent, such as a citrus based product. Cured material can only be removed mechanically using a sander or grinder.

Limitations & Warnings:

- Do not thin with solvents, as this will prevent cure
- For anchoring applications, concrete should be a minimum of 21 days old prior to anchor installation per ACI 355.4

Safety: Please refer to the Safety Data Sheet (SDS) for ULTRABOND ACRYL-8CC. Call ATC for more information at 1 -800-892-1880.

Specification: Anchoring adhesive shall be a two component, 10:1 ratio by volume, vinylester anchoring system supplied in pre-measured cartridges. Adhesive must meet the requirements of ICC-ES AC308, ACI 355.4 and ASTM C881-15 specification for Type I, II, IV, and V, Grade 3 Class A, B & C. Adhesive must have a heat deflection temperature of 192 °F (89 °C) per ASTM D648 and have a compressive yield strength of 11,430 psi (78.8 MPa) at 75 °F (24 °C) after a 7 day cure per ASTM D695. Adhesive shall be ULTRABOND ACRYL-8CC from Adhesives Technology Corp., Pompano Beach, Florida. Anchors shall be installed per the Manufacturer's Printed Installation Instructions (MPII) for ULTRABOND ACRYL-8CC anchoring system.

Revision 2.0

ORDERING INFORMATION

TABLE 1: ULTRABOND ACRYL-8CC Adhesive Packaging, Dispensing Tools and Accessories[1]

Package Size	9.5 fl. oz. (280 ml) Cartridge	28 fl. oz. (825 ml) Cartridge
Part #	A10-ACRYL8CC	A28-ACRYL8CC
Mixing Nozzle	T10-8CC	T28-8CC
Manual Dispensing Tool [2]	TM10	TM28HD
Pneumatic Dispensing Tool	N/A	TA28
Case Qty.	12	8
Pallet Qty.	900	240
Pallet Weight (lbs.)	1,364	921
SDS Brush Adaptor	BA-SDS	
Brush Extension	BA-EXT	
Nozzle Extension Tubing	T-8CCEXTPK	
Retention Wedge	WEDGE	

1. Each cartridge is packaged with one mixing nozzle.
2. For applications NOT requiring code approval, a TM9 manual dispensing tool may be substituted or a TM28HD may be used.

A10-ACRYL8CC

A28-ACRYL8CC

TABLE 2: ULTRABOND ACRYL-8CC Installation Parameters, Brushes and Piston Plugs

Characteristic			Symbol	Units	Threaded Rod Diameter (inch)							
					3/8	1/2	5/8	3/4	7/8	1	1 1/4	N/A
					Rebar Size							
					#3	#4	#5	#6	#7	#8	#9	#10
Threaded Rod	Nominal Anchor Diameter		d	in.	0.375	0.500	0.625	0.750	0.875	1.000	1.250	N/A
	Drill Size		d_o	in.	7/16	9/16	3/4	7/8	1	1 1/8	1 3/8	N/A
	Brush Part #		----	----	BA716	BA916	BA34	BA78	BA100	BA118	BA138	N/A
	Piston Plug Part #		----	----	----	----	PA34	PA78	PA100	PA118	PA138	N/A
	Piston Plug Color		----	----	----	----	Clear	Clear	Clear	Clear	Clear	N/A
	Maximum Tightening Torque	A36/A307 Carbon Steel	$T_{inst,max}$	Ft-lb (N-m)	10 (14)	25 (34)	50 (68)	90 (122)	125 (170)	165 (224)	280 (380)	N/A
		A193 B7 Carbon Steel or F593 SS			16 (22)	33 (45)	60 (81)	105 (142)	125 (170)	165 (224)	280 (380)	N/A
Rebar	Nominal Bar Diameter		d	in.	0.375	0.500	0.625	0.750	0.875	1.000	1.125	1.250
	Drill Size		d_o	in.	7/16	5/8	3/4	7/8	1	1 1/8	1 3/8	1 1/2
	Brush Part #		----	----	BA716	BA58	BA34	BA78	BA100	BA118	BA138	BA112
	Piston Plug Part #		----	----	----	----	PA34	PA78	PA100	PA118	PA138	PA112
	Piston Plug Color		----	----	----	----	Clear	Clear	Clear	Clear	Clear	Clear

MATERIAL SPECIFICATION

TABLE 3: ULTRABOND ACRYL-8CC performance to **ASTM C881-15**[1,2,3]

Property	Cure Time	ASTM Standard	Units	Sample Conditioning Temperature			
				Class A	Class B	Optional	Class C
				14 °F (-10 °C)	50 °F (10 °C)	75 °F (24 °C)	104 °F (40 °C)
Gel Time - 60 Gram Mass[4]	----	C881	min	16	8	5	5
Consistency or Viscosity	----	C881	----	Non-sag			
Compressive Yield Strength	7 day	D695	psi (MPa)	12,820 (88.4)	13,490 (93.0)	11,430 (78.8)	11,830 (81.6)
Compressive Modulus			psi (MPa)	497,300 (3,429)	491,600 (3,389)	374,400 (2,581)	299,100 (2,062)
Tensile Strength[5]		D638	psi (MPa)	2,510 (17.3)			
Tensile Elongation[5]			%	0.9			
Bond Strength Hardened to Hardened Concrete	2 day	C882	psi (MPa)	2,530 (17.4)	2,440 (16.8)	2,320 (16.0)	2,600 (17.9)
	14 day		psi (MPa)	1,870 (12.9)	3,020 (20.8)	2,940 (20.3)	3,130 (21.6)
Bond Strength Fresh to Hardened Concrete			psi (MPa)	2,510 (17.3)			
Heat Deflection Temperature	7 day	D648	°F (°C)	192 (89)			
Water Absorption	14 day	D570	%	0.74			
Linear Coefficient of Shrinkage	48 hr	D2566	%	0.005			

1. Product testing results based on representative lot(s). Average results will vary according to the tolerances of the given property.
2. Full cure time is listed above to obtain the given properties for each product characteristic.
3. Results may vary due to environmental factors such as temperature, moisture and type of substrate.
4. Gel time may be lower than the minimum required for ASTM C881 Type I and IV.
5. Optional testing for Grade 3 systems.

TABLE 4: ULTRABOND ARCYL-8CC **NSF/ANSI CERTIFICATION**[1]

ANSI Certification	Description	Application	Water Contact Temperature	Anchor Sizes Installed in Concrete
NSF 61	Drinking Water System Components - Health Effects	Joining and Sealing Materials	Domestic Hot 60 +/- 2 °C (140 +/- 4 °F)	Threaded Rod and Rebar ≤ 1 1/4 in. Diameter

1. ULTRABOND ACRYL-8CC is certified as a joining and sealing material. Mix Ratio: Part A (Resin): Part B (Hardener) = 10:1 by volume. Application method: Dispensing mixing nozzle system. Final Cure Time: 45 minutes at 70 °F (21 °C).

TABLE 5: ULTRABOND ACRYL-8CC **CURE SCHEDULE**[1,2,3]

Concrete Temperature °F (°C)	Working Time	Full Cure Time
14 (-10)	90 min	24 hr
23 (-5)	90 min	14 hr
32 (0)	45 min	7 hr
41 (5)	25 min	2 hr
50 (10)	15 min	90 min
70 (21)	6 min	45 min
86 (30)	4 min	25 min
95 (35)	2 min	20 min
104 (40)	1.5 min	15 min

[1]For installations between 14 °F and 23 °F (-10 °C and -5 °C), the cartridge temperature must be conditioned between 70 °F and 75 °F (21 °C and 24 °C).
[2]Store adhesive in dry cool location free from sun and rain.
[3]Storage temperature is 41 °F to 77 °F (5 °C to 25 °C).

ULTRABOND ACRYL-8CC has been tested and assessed by an accredited independent testing laboratory in accordance with ICC-ES AC308, ACI 355.4 and ASTM E488 for use in cracked and uncracked normal weight and lightweight concrete, for loading conditions including seismic and wind, for structural design to ACI 318-14 Chapter 17 (ACI 318-11/08 Appendix D) and is approved per ICC-ES ESR-4249. The design process and parameters for ULTRABOND ACRYL-8CC are shown in Figure 1 and Tables 7 - 12 for Strength Design (SD) and Tables 13 - 16 for Allowable Stress Design (ASD).

FIGURE 1 – ULTRABOND ACRYL-8CC FLOW CHART FOR THE ESTABLISHMENT OF DESIGN STRENGTH

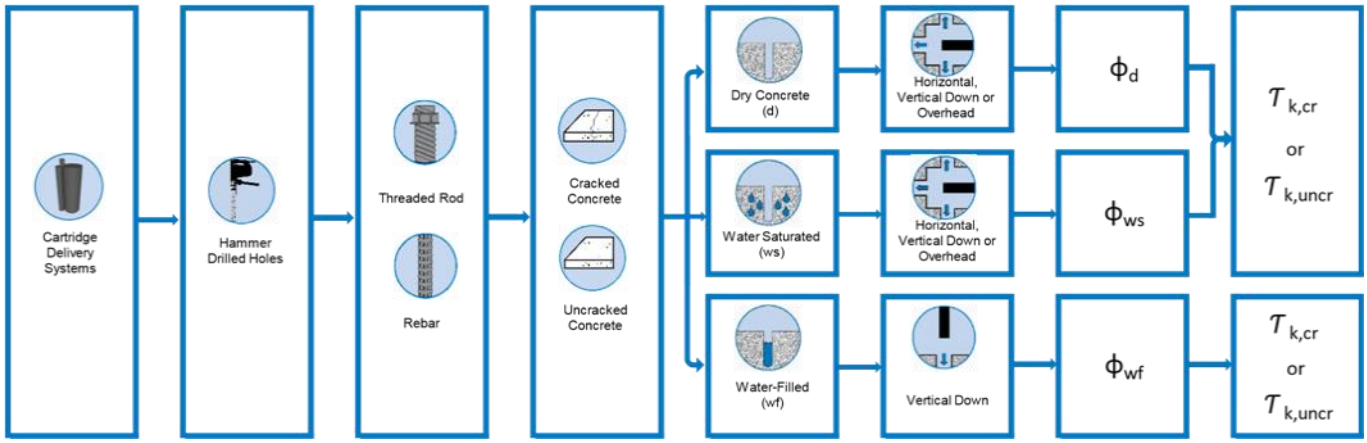


TABLE 6: ULTRABOND ACRYL-8CC **DESIGN STRENGTH INDEX**

DESIGN STRENGTH		Threaded Rod	Rebar
Steel Strength	Nsa, Vsa	Table 7	Table 10
Concrete Breakout	Ncb, Vcb, Vcp	Table 8	Table 11
Strength Design Bond Strength (SD)	Cracked Concrete	Table 9	Table 12
	Uncracked Concrete		
Allowable Stress Design (ASD)	Allowable Tension Load	Table 13	Table 15
	Allowable Shear Load	Table 14	Table 16

TABLE 7: ULTRABOND ACRYL-8CC **STEEL** design information for **THREADED ROD**[1]

Design Information		Symbol	Units	Threaded Rod						
				3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/4"
Nominal Anchor Diameter		d	in. (mm)	0.375 (9.5)	0.500 (12.7)	0.625 (15.9)	0.750 (19.1)	0.875 (22.2)	1.000 (25.4)	1.250 (31.8)
Threaded Rod Cross-Sectional Area		A_{se}	in.^{2} (mm^2)	0.078 (50)	0.142 (92)	0.226 (146)	0.335 (216)	0.462 (298)	0.606 (391)	0.969 (625)
ASTM A36 Grade 36 F1554 Grade 36	Nominal Strength as Governed by Steel Strength	N_{sa}	lb. (kN)	4,495 (20.0)	8,230 (36.6)	13,110 (58.3)	19,400 (86.3)	26,780 (119.1)	35,130 (156.3)	56,210 (250.0)
		V_{sa}	lb. (kN)	2,695 (12.0)	4,940 (22.0)	7,860 (35.0)	11,640 (51.8)	16,070 (71.5)	21,080 (93.8)	33,725 (150.0)
	Reduction Factor for Seismic Shear	$\alpha_{V,seis}$	----	Not Applicable	0.85				0.80	
	Strength Reduction Factor for Tension[3]	ϕ	----	0.75						
	Strength Reduction actor for Shear[3]	ϕ	----	0.65						
ASTM A193 B7 ASTM F1554 Grade 105	Nominal Strength as Governed by Steel Strength	N_{sa}	lb. (kN)	9,685 (43.1)	17,735 (78.9)	28,250 (125.7)	41,810 (186.0)	57,710 (256.7)	75,710 (336.8)	121,135 (538.8)
		V_{sa}	lb. (kN)	4,845 (21.5)	10,640 (47.3)	16,950 (75.4)	25,085 (111.6)	34,625 (154.0)	45,425 (202.1)	72,680 (323.3)
	Reduction Factor for Seismic Shear	$\alpha_{V,seis}$	----	Not Applicable	0.85				0.80	
	Strength Reduction Factor for Tension[3]	ϕ	----	0.75						
	Strength Reduction Factor for Shear[3]	ϕ	----	0.65						
ASTM F593 CW1 Stainless Types 304 & 316	Nominal Strength as Governed by Steel Strength	N_{sa}	lb (kN)	7,750 (34.5)	14,190 (63.1)	22,600 (100.5)	28,430 (126.5)	39,245 (174.6)	51,485 (229.0)	82,370 (366.4)
		V_{sa}	lb (kN)	4,650 (20.7)	8,515 (37.9)	13,560 (60.3)	17,060 (75.9)	23,545 (104.7)	30,890 (137.4)	49,425 (219.9)
	Reduction Factor for Seismic Shear	$\alpha_{V,seis}$	----	Not Applicable	0.85				0.80	
	Strength Reduction Factor for Tension[2]	ϕ	----	0.65						
	Strength Reduction Factor for Shear[2]	ϕ	----	0.60						

For **SI**: 1 inch = 25.4 mm, 1lbf = 4.448 N, 1 psi = 0.006897 MPa
For pound-inch units: 1 mm = 0.03937 inch, 1 N = 0.2248 lbf, 1MPa = 145.0 psi

1. Values provided for common rod material types are based on specified strength and calculated in accordance with ACI 318-14 Eq. 17.4.1.2 and Eq. 17.5.1.2b or ACI 318-11 Eq. (D-2) and Eq. (D-29), as applicable. Nuts and washers must be appropriate for the rod strength and type.
2. For use with load combinations of IBC Section 1605.2, ACI 318-14 5.3 or ACI 318-11 9.2, as applicable, as set forth in ACI 318-14 17.3.3 or ACI 318-11 D.4.3. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ must be determined in accordance with ACI 318-11 D4.4. Values correspond to a brittle steel element.
3. For use with load combinations of IBC Section 1605.2, ACI 318-14 5.3 or ACI 318-11 9.2, as applicable, as set forth in ACI 318-14 17.3.3 or ACI 318-11 D.4.3. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ must be determined in accordance with ACI 318-11 D4.4. Values correspond to a ductile steel element.

TABLE 8: ULTRABOND ACRYL-8CC **CONCRETE BREAKOUT** design information for **THREADED ROD**

Design Information	Symbol	Units	Threaded Rod						
			3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/4"
Minimum Embedment Depth	$h_{ef,min}$	in. (mm)	2 3/8 (60)	2 3/4 (70)	3 1/8 (79)	3 1/2 (89)	3 1/2 (89)	4 (102)	5 (127)
Maximum Embedment Depth	$h_{ef,max}$	in. (mm)	4 1/2 (114)	6 (152)	7 1/2 (191)	9 (229)	10 1/2 (267)	12 (305)	15 (381)
Effectiveness Factor for Cracked Concrete	$k_{c,cr}$	---- SI	Not Applicable	17 (7.1)					
Effectiveness Factor for Uncracked Concrete	$k_{c,uncr}$	---- SI	24 (10)						
Minimum Spacing Distance	s_{min}	in. (mm)	$S_{min} = C_{min}$						
Minimum Edge Distance	c_{min}	in. (mm)	1 7/8 (48)	2 1/2 (64)	3 1/8 (79)	3 3/4 (95)	4 3/8 (111)	5 (127)	6 1/4 (159)
Minimum Concrete Thickness	h_{min}	in. (mm)	h_{ef} + 1.25 , [≥ 3.937] (h_{ef} + 30 , [≥ 100])		h_{ef} + 2d_0 where d_o is the hole diameter				
Critical Edge Distance (Uncracked Concrete Only)	c_{ac}	in.	$C_{ac} = h_{ef} \cdot \left(\frac{\min(\tau_{k,uncr}\,;\,\tau_{k,max})}{1160} \right)^{0.4} \cdot \max\left[\left(3.1 - 0.7\,\frac{h}{h_{ef}} \right); 1.4 \right]$						
		mm	$C_{ac} = h_{ef} \cdot \left(\frac{\min(\tau_{k,uncr}\,;\,\tau_{k,max})}{8} \right)^{0.4} \cdot \max\left[\left(3.1 - 0.7\,\frac{h}{h_{ef}} \right); 1.4 \right]$						
Strength Reduction Factor for Tension, Concrete Failure Mode, Condition B[1]	ϕ	----	0.65						
Strength Reduction Factor for Shear, Concrete Failure Mode, Condition B[1]	ϕ	----	0.70						

For **SI**: 1 inch = 25.4 mm, 1lbf = 4.448 N, 1 psi = 0.006897 MPa
For pound-inch units: 1 mm = 0.03937 inch, 1 N = 0.2248 lbf, 1MPa = 145.0 psi

1. Values provided for post-installed anchors with category as determined from ACI 355.4 given for Condition B. Condition B applies without supplementary reinforcement or where pullout (bond) or pryout govern, as set forth in ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable, while condition A requires supplemental reinforcement. Values are for use with the load combinations Section 1605.2 of the IBC, ACI 318-14 5.3 or ACI 318-11 Section 9.2, as applicable, as set forth in ACI 318-11 D.4.3. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ must be determined in accordance with ACI 318-11 D.4.4.

TABLE 9: ULTRABOND ACRYL-8CC **BOND STRENGTH** design information for **THREADED ROD**[1,3,4]

Design Information				Symbol	Units	Threaded Rod						
						3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/4"
Minimum Embedment Depth				$h_{ef,min}$	in. (mm)	2 3/8 (60)	2 3/4 (70)	3 1/8 (79)	3 1/2 (89)	3 1/2 (89)	4 (102)	5 (127)
Maximum Embedment Depth				$h_{ef,max}$	in. (mm)	4 1/2 (114)	6 (152)	7 1/2 (191)	9 (229)	10 1/2 (267)	12 (305)	15 (381)
Dry and Water Saturated Concrete	Maximum Long Term Temperature **122 °F** (50 °C) Maximum Short Term Temperature **176 °F** (80 °C)	Cracked Concrete	Characteristic Bond Strength with Sustained Load	$T_{k,cr}$	psi (MPa)	----	498 (3.4)	519 (3.6)	519 (3.6)	519 (3.6)	519 (3.6)	525 (3.6)
			Characteristic Bond Strength without Sustained Load		psi (MPa)	----	712 (4.9)	742 (5.1)	742 (5.1)	742 (5.1)	742 (5.1)	751 (5.2)
		Uncracked Concrete[2]	Characteristic Bond Strength with Sustained Load	$T_{k,uncr}$	psi (MPa)	823 (5.7)	823 (5.7)	823 (5.7)	823 (5.7)	823 (5.7)	743 (5.1)	588 (4.1)
			Characteristic Bond Strength without Sustained Load		psi (MPa)	1,177 (8.1)	1,177 (8.1)	1,177 (8.1)	1,177 (8.1)	1,177 (8.1)	1,062 (7.3)	841 (5.8)
	Maximum Long Term Temperature **161 °F** (72 °C) Maximum Short Term Temperature **248 °F** (120 °C)	Cracked Concrete	Characteristic Bond Strength with Sustained Load	$T_{k,cr}$	psi (MPa)	----	245 (1.7)	255 (1.8)	255 (1.8)	255 (1.8)	255 (1.8)	255 (1.8)
			Characteristic Bond Strength without Sustained Load		psi (MPa)	----	544 (3.8)	566 (3.9)	566 (3.9)	566 (3.9)	566 (3.9)	566 (3.9)
		Uncracked Concrete[2]	Characteristic Bond Strength with Sustained Load	$T_{k,uncr}$	psi (MPa)	405 (2.8)	405 (2.8)	405 (2.8)	405 (2.8)	405 (2.8)	366 (2.5)	----
			Characteristic Bond Strength without Sustained Load		psi (MPa)	899 (6.2)	899 (6.2)	899 (6.2)	899 (6.2)	899 (6.2)	813 (5.6)	----
	Reduction Factors for Dry Holes in Concrete			ϕ_d	----	0.65						
	Reduction Factors for Water Saturated Holes in Concrete			ϕ_{ws}	----	0.55						
Water-Filled Holes in Concrete	Maximum Long Term Temperature **122 °F** (50 °C) Maximum Short Term Temperature **176 °F** (80 °C)	Cracked Concrete	Characteristic Bond Strength with Sustained Load	$T_{k,cr}$	psi (MPa)	----	388 (2.7)	405 (2.8)	405 (2.8)	363 (2.5)	358 (2.5)	352 (2.4)
			Characteristic Bond Strength without Sustained Load		psi (MPa)	----	555 (3.8)	579 (4.0)	579 (4.0)	520 (3.6)	512 (3.5)	503 (3.5)
		Uncracked Concrete[2]	Characteristic Bond Strength with Sustained Load	$T_{k,uncr}$	psi (MPa)	642 (4.4)	642 (4.4)	642 (4.4)	642 (4.4)	576 (4.0)	----	----
			Characteristic Bond Strength without Sustained Load		psi (MPa)	918 (6.3)	918 (6.3)	918 (6.3)	918 (6.3)	824 (5.7)	----	----
	Maximum Long Term Temperature **161 °F** (72 °C) Maximum Short Term Temperature **248 °F** (120 °C)	Cracked Concrete	Characteristic Bond Strength with Sustained Load	$T_{k,cr}$	psi (MPa)	----	191 (1.3)	199 (1.4)	199 (1.4)	179 (1.2)	176 (1.2)	171 (1.2)
			Characteristic Bond Strength without Sustained Load		psi (MPa)	----	424 (2.9)	442 (3.0)	442 (3.0)	396 (2.7)	391 (2.7)	379 (2.6)
		Uncracked Concrete[2]	Characteristic Bond Strength with Sustained Load	$T_{k,uncr}$	psi (MPa)	316 (2.2)	316 (2.2)	316 (2.2)	316 (2.2)	----	----	----
			Characteristic Bond Strength without Sustained Load		psi (MPa)	701 (4.8)	701 (4.8)	701 (4.8)	701 (4.8)	----	----	----
	Reduction Factors for Water-Filled Holes in Concrete			ϕ_{wf}	----	0.45						
Reduction Factor for Seismic Tension[5]				$\alpha_{N,seis}$	----	0.95						

For SI: 1 inch = 25.4 mm, 1 lbf = 4.448 N, 1 psi = 0.006897 MPa
For pound-inch units: 1 mm = 0.03937 inch, 1 N = 0.2248 lbf, 1MPa = 145.0 psi

1. Characteristic bond strength values correspond to concrete compressive strength f'_c =2,500 psi (17.2 MPa). For uncracked concrete compressive strength f'_c between 2,500 psi (17.2 MPa) and 8,000 psi (55.2 MPa), 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. Lightweight concrete may be used by applying a reduction factor as given in ACI 318-14 17.2.6 or ACI 318-11 Appendix D section D3.6 as applicable.
3. Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a results of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.
4. Characteristic bond strength values are for sustained loads (when noted), including dead and live loads.
5. For structures in regions assigned to Seismic Design Category C, D, E, or F the bond strength values must be multiplied by $\alpha_{n,seis}$.

TABLE 10: ULTRABOND ACRYL-8CC **STEEL** design information for **REBAR**[1]

Design Information		Symbol	Units	Rebar Size							
				#3	#4	#5	#6	#7	#8	#9	#10
Nominal Anchor Diameter		d	in. (mm)	0.375 (9.5)	0.500 (12.7)	0.625 (15.9)	0.750 (19.1)	0.875 (22.2)	1.000 (25.4)	1.125 (28.6)	1.250 (31.8)
Rebar Cross-Sectional Area		A_{se}	in^2 (mm^2)	0.110 (71)	0.200 (129)	0.310 (200)	0.440 (284)	0.600 (387)	0.790 (510)	1.000 (645)	1.270 (819)
ASTM A615 Grade 40	Nominal Strength as Governed by Steel Strength	N_{sa}	lb. (kN)	6,600 (29.4)	12,000 (53.4)	18,600 (82.7)	26,400 (117.4)	Grade 40 reinforcing bars are only available in sizes #3 through #6 per ASTM A615			
		V_{sa}	lb. (kN)	3,960 (17.6)	7,200 (32.0)	11,160 (49.6)	15,840 (70.5)				
	Reduction Factor for Seismic Shear	$\alpha_{V,seis}$	----	Not Applicable	0.70						
	Strength Reduction Factor for Tension[2]	ϕ		0.65							
	Strength Reduction Factor for Shear[2]	ϕ	----	0.60							
ASTM A615 Grade 60	Nominal Strength as Governed by Steel Strength	N_{sa}	lb. (kN)	9,900 (44.0)	18,000 (80.1)	27,900 (124.1)	39,600 (176.1)	54,000 (240.2)	71,100 (316.3)	90,000 (400.3)	114,300 (508.4)
		V_{sa}	lb. (kN)	5,940 (26.4)	10,800 (48.0)	16,740 (74.5)	23,760 (105.7)	32,400 (144.1)	42,660 (189.8)	54,000 (240.2)	68,580 (305.1)
	Reduction Factor for Seismic Shear	$\alpha_{V,seis}$	----	Not Applicable	0.70						
	Strength Reduction Factor for Tension[2]	ϕ	----	0.65							
	Strength Reduction Factor for Shear[2]	ϕ	----	0.60							

For **SI**: 1 inch = 25.4 mm, 1lbf = 4.448 N, 1 psi = 0.006897 MPa
For pound-inch units: 1 mm = 0.03937 inch, 1 N = 0.2248 lbf, 1MPa = 145.0 psi

1. Values provided for common rod material types are based on specified strength and calculated in accordance with ACI 318-14 Eq. 17.4.1.2 and Eq. 17.5.1.2b or ACI 318-11 Eq. (D-2) and Eq. (D-29), as applicable. Nuts and washers must be appropriate for the rod strength and type.
2. For use with load combinations of IBC Section 1605.2, ACI 318-14 5.3 or ACI 318-11 9.2, as applicable, as set forth in ACI 318-14 17.3.3 or ACI 318-11 D.4.3. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ must be determined in accordance with ACI 318-11 D4.4. Values correspond to a brittle steel element.

TABLE 11: ULTRABOND ACRYL-8CC **CONCRETE BREAKOUT** design information for **REBAR**

Design Information	Symbol	Units	Rebar Size							
			#3	#4	#5	#6	#7	#8	#9	#10
Minimum Embedment Depth	$h_{ef,min}$	in. (mm)	2 3/8 (60)	2 3/4 (70)	3 1/8 (79)	3 1/2 (89)	3 1/2 (89)	4 (102)	4 1/2 (114)	5 (127)
Maximum Embedment Depth	$h_{ef,max}$	in. (mm)	4 1/2 (114)	6 (152)	7 1/2 (191)	9 (229)	10 1/2 (267)	12 (305)	13 1/2 (343)	15 (381)
Effectiveness Factor Cracked Concrete	$k_{c,cr}$	---- SI	Not Applicable	17 (7.1)						
Effectiveness Factor Uncracked Concrete	$k_{c,uncr}$	---- SI	24 (10)							
Minimum Spacing Distance	s_{min}	in. (mm)	$S_{min} = C_{min}$							
Minimum Edge Distance	c_{min}	in. (mm)	1 7/8 (48)	2 1/2 (64)	3 1/8 (79)	3 3/4 (95)	4 3/8 (111)	5 (127)	5 5/8 (143)	6 1/4 (159)
Minimum Concrete Thickness	h_{min}	in. (mm)	h_{ef} + 1.25 , [≥ 3.937] (h_{ef} + 30 , [≥ 100])		$h_{ef} + 2d_o$ where d_o is the hole diameter					
Critical Edge Distance (Uncracked Concrete Only)	c_{ac}	in.	$C_{ac} = h_{ef} \cdot \left(\frac{\min(\tau_{k,uncr}; \tau_{k,max})}{1160} \right)^{0.4} \cdot \max\left[\left(3.1 - 0.7 \frac{h}{h_{ef}} \right); 1.4 \right]$							
		mm	$C_{ac} = h_{ef} \cdot \left(\frac{\min(\tau_{k,uncr}; \tau_{k,max})}{8} \right)^{0.4} \cdot \max\left[\left(3.1 - 0.7 \frac{h}{h_{ef}} \right); 1.4 \right]$							
Strength Reduction Factor Tension, Concrete Failure Mode, Condition B[1]	ϕ	----	0.65							
Strength Reduction Factor Shear, Concrete Failure Mode, Condition B[1]	ϕ	----	0.70							

For **SI**: 1 inch = 25.4 mm, 1lbf = 4.448 N, 1 psi = 0.006897 MPa
For pound-inch units: 1 mm = 0.03937 inch, 1 N = 0.2248 lbf, 1MPa = 145.0 psi

1. Values provided for post-installed anchors with category as determined from ACI 355.4 given for Condition B. Condition B applies without supplementary reinforcement or where pullout (bond) or pryout govern, as set forth in ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable, while condition A requires supplemental reinforcement. Values are for use with the load combinations Section 1605.2 of the IBC, ACI 318-14 5.3 or ACI 318-11 Section 9.2, as applicable, as set forth in ACI 318-11 D.4.3. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ must be determined in accordance with ACI 318-11 D.4.4.

TABLE 12: ULTRABOND ACRYL-8CC **BOND STRENGTH** design information for **REBAR**[1,3,4]

Design Information				Symbol	Units	Rebar Size							
						#3	#4	#5	#6	#7	#8	#9	#10
Minimum Embedment Depth				$h_{ef,min}$	in. (mm)	2 3/8 (60)	2 3/4 (70)	3 1/8 (79)	3 1/2 (89)	3 1/2 (89)	4 (102)	4 1/2 (114)	5 (127)
Maximum Embedment Depth				$h_{ef,max}$	in. (mm)	4 1/2 (114)	6 (152)	7 1/2 (191)	9 (229)	10 1/2 (267)	12 (305)	13 1/2 (343)	15 (381)
Dry and Water Saturated Concrete	Maximum Long Term Temperature **122 °F** (50 °C) Maximum Short Term Temperature **176 °F** (80 °C)	Cracked Concrete	Characteristic Bond Strength with Sustained Load	$T_{k,cr}$	psi (MPa)	----	331 (2.3)	345 (2.4)	345 (2.4)	345 (2.4)	345 (2.4)	349 (2.4)	349 (2.4)
			Characteristic Bond Strength without Sustained Load		psi (MPa)	----	473 (3.3)	493 (3.4)	493 (3.4)	493 (3.4)	493 (3.4)	499 (3.4)	499 (3.4)
		Uncracked Concrete[2]	Characteristic Bond Strength with Sustained Load	$T_{k,uncr}$	psi (MPa)	823 (5.7)	823 (5.7)	823 (5.7)	823 (5.7)	823 (5.7)	743 (5.1)	668 (4.6)	588 (4.1)
			Characteristic Bond Strength without Sustained Load		psi (MPa)	1,177 (8.1)	1,177 (8.1)	1,177 (8.1)	1,177 (8.1)	1,177 (8.1)	1,062 (7.3)	955 (6.6)	841 (5.8)
	Maximum Long Term Temperature **161 °F** (72 °C) Maximum Short Term Temperature **248 °F** (120 °C)	Cracked Concrete	Characteristic Bond Strength with Sustained Load	$T_{k,cr}$	psi (MPa)	----	163 (1.1)	170 (1.2)	170 (1.2)	170 (1.2)	170 (1.2)	172 (1.2)	172 (1.2)
			Characteristic Bond Strength without Sustained Load		psi (MPa)	----	362 (2.5)	377 (2.6)	377 (2.6)	377 (2.6)	377 (2.6)	382 (2.6)	382 (2.6)
		Uncracked Concrete[2]	Characteristic Bond Strength with Sustained Load	$T_{k,uncr}$	psi (MPa)	405 (2.8)	405 (2.8)	405 (2.8)	405 (2.8)	405 (2.8)	366 (2.5)	329 (2.3)	----
			Characteristic Bond Strength without Sustained Load		psi (MPa)	899 (6.2)	899 (6.2)	899 (6.2)	899 (6.2)	899 (6.2)	813 (5.6)	730 (5.0)	----
	Reduction Factors for Dry Holes in Concrete			ϕ_d	----	0.65							
	Reduction Factors for Water Saturated Holes in Concrete			ϕ_{ws}	----	0.55							
Water-Filled Holes in Concrete	Maximum Long Term Temperature **122 °F** (50 °C) Maximum Short Term Temperature **176 °F** (80 °C)	Cracked Concrete	Characteristic Bond Strength with Sustained Load	$T_{k,cr}$	psi (MPa)	----	258 (1.8)	269 (1.9)	269 (1.9)	242 (1.7)	238 (1.6)	237 (1.6)	234 (1.6)
			Characteristic Bond Strength without Sustained Load		psi (MPa)	----	369 (2.5)	385 (2.7)	385 (2.7)	346 (2.4)	340 (2.3)	339 (2.3)	335 (2.3)
		Uncracked Concrete[2]	Characteristic Bond Strength with Sustained Load	$T_{k,uncr}$	psi (MPa)	642 (4.4)	642 (4.4)	642 (4.4)	642 (4.4)	576 (4.0)	----	----	----
			Characteristic Bond Strength without Sustained Load		psi (MPa)	918 (6.3)	918 (6.3)	918 (6.3)	918 (6.3)	824 (5.7)	----	----	----
	Maximum Long Term Temperature **161 °F** (72 °C) Maximum Short Term Temperature **248 °F** (120 °C)	Cracked Concrete	Characteristic Bond Strength with Sustained Load	$T_{k,cr}$	psi (MPa)	----	127 (0.9)	133 (0.9)	133 (0.9)	119 (0.8)	117 (0.8)	117 (0.8)	115 (0.8)
			Characteristic Bond Strength without Sustained Load		psi (MPa)	----	282 (1.9)	295 (2.0)	295 (2.0)	264 (1.8)	260 (1.8)	260 (1.8)	255 (1.8)
		Uncracked Concrete[2]	Characteristic Bond Strength with Sustained Load	$T_{k,uncr}$	psi (MPa)	316 (2.2)	316 (2.2)	316 (2.2)	316 (2.2)	----	----	----	----
			Characteristic Bond Strength without Sustained Load		psi (MPa)	702 (4.8)	702 (4.8)	702 (4.8)	702 (4.8)	----	----	----	----
	Reduction Factors for Water-Filled Holes in Concrete			ϕ_{wf}	----	0.45							
Reduction Factor for Seismic Tension[5]				$\alpha_{N,seis}$	----	1.00							

For SI: 1 inch = 25.4 mm, 1 lbf = 4.448 N, 1 psi = 0.006897 MPa
For pound-inch units: 1 mm = 0.03937 inch, 1 N = 0.2248 lbf, 1MPa = 145.0 psi

1. Characteristic bond strength values correspond to concrete compressive strength f'_c =2,500 psi (17.2 MPa). For uncracked concrete compressive strength f'_c between 2,500 psi (17.2 MPa) and 8,000 psi (55.2 MPa), 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. Lightweight concrete may be used by applying a reduction factor as given in ACI 318-14 17.2.6 or ACI 318-11 Appendix D section D3.6 as applicable.
3. Short term elevated concrete temperatures are those that occur over brief intervals, e.g., as a results of diurnal cycling. Long term concrete temperatures are roughly constant over significant periods of time.
4. Characteristic bond strength values are for sustained loads (when noted), including dead and live loads.
5. For structures in regions assigned to Seismic Design Category C, D, E, or F the bond strength values must be multiplied by $\alpha_{n,seis}$.

TABLE 13: ULTRABOND ACRYL-8CC allowable **TENSION** loads for **THREADED ROD** in normal-weight concrete[1]

Threaded Rod Diameter in.	Nominal Drill Bit Diameter in.	Embedment Depth in. (mm)		Allowable Tension Load Based on Bond Strength / Concrete Capacity[2,3] lbs. (kN)		Allowable Tension Load Based on Steel Strength[4]					
				$f'_c \geq 2{,}500$ psi (17.4 MPa)		ASTM F1554 Grade 36 lbs. (kN)		ASTM A193 Grade B7 lbs. (kN)		ASTM F593 304/316 SS lbs. (kN)	
3/8	7/16	2 3/8	(60)	1,011	(4.5)	2,114	(9.4)	4,556	(20.3)	3,645	(16.2)
		3 3/8	(86)	1,437	(6.4)						
		4 1/2	(114)	1,916	(8.5)						
1/2	9/16	2 3/4	(70)	1,540	(6.8)	3,758	(16.7)	8,099	(36.0)	6,480	(28.8)
		4 1/2	(114)	2,555	(11.4)						
		6	(152)	3,407	(15.2)						
5/8	3/4	3 1/8	(79)	2,129	(9.5)	5,872	(26.1)	12,655	(56.3)	10,124	(45.0)
		5 5/8	(143)	3,992	(17.8)						
		7 1/2	(191)	5,323	(23.7)						
3/4	7/8	3 1/2	(86)	2,810	(13.7)	8,456	(37.6)	18,224	(81.1)	12,392	(55.1)
		6 3/4	(171)	5,749	(25.6)						
		9	(229)	7,665	(34.1)						
7/8	1	3 1/2	(89)	2,728	(12.1)	11,509	(51.2)	24,804	(110.3)	16,867	(75.0)
		7 7/8	(200)	7,825	(34.8)						
		10 1/2	(267)	10,433	(46.4)						
1	1 1/8	4	(102)	3,415	(15.2)	15,033	(66.9)	32,398	(144.1)	22,030	(98.0)
		9	(229)	9,226	(41.0)						
		12	(305)	12,302	(54.7)						
1 1/4	1 3/8	5	(127)	4,798	(21.3)	23,488	(104.5)	50,621	(225.2)	34,423	(153.1)
		11 1/4	(286)	11,409	(50.7)						
		15	(381)	15,212	(67.7)						

For **SI**: 1 inch = 25.4 mm, 1lbf = 4.448 N, 1 psi = 0.006897 MPa.
For pound-inch units: 1 mm = 0.03937 inch, 1 N = 0.2248 lbf, 1MPa = 145.0 psi

1. The lower value of either the allowable bond strength/concrete capacity or steel strength should be used as the allowable tension value for design.
2. Allowable tension loads calculated based on strength design provisions of IBC Section 1605.3 with the following assumptions: Temperature range A: Maximum short term temperature of 176 °F (80 °C), Maximum long term temperature of 122 °F (50°C). Load combination from ACI based on 1.2D + 1.6L assuming dead load of 0.3 and live load of 0.7 giving a weighted average of 1.48. f'_c = 2,500 psi normal-weight uncracked concrete. Single anchor, vertically down with periodic special inspection and no seismic loading. ϕ_d 0.65 for dry concrete, $C_{a1} \geq 1.5 \times h_{ef}$, $h_{min} \geq 1.5 \times C_{a1}$, $C_{a2} \geq 1.5 \times C_{a1}$. Load values based on characteristic uncracked bond strength with sustained load.
3. For long term temperature exposure greater than 122 °F (50 °C) and up to 161 °F (72°C), with short term temperatures up to 248 °F (120 °C), apply a reduction factor of 0.49 to the allowable tension load.
4. Allowable steel strengths calculated in accordance with AISC Manual of Steel Construction: Tensile = $0.33 * F_u * A_{nom}$.

TABLE 14: ULTRABOND ACRYL-8CC allowable **SHEAR** loads for **THREADED ROD** in normal-weight concrete[1]

Threaded Rod Diameter in.	Nominal Drill Bit Diameter in.	Embedment Depth in. (mm)		Allowable Shear Load Based on Bond Strength / Concrete Capacity[2,3] lbs. (kN)		Allowable Shear Load Based on Steel Strength[4]					
				$f'_c \geq 2{,}500$ psi (17.4 MPa)		ASTM F1554 Grade 36 lbs. (kN)		ASTM A193 Grade B7 lbs. (kN)		ASTM F593 304/316 SS lbs. (kN)	
3/8	7/16	2 3/8	(60)	1,089	(4.8)	1,089	(4.8)	2,347	(10.4)	1,878	(8.4)
		3 3/8	(86)	3,095	(13.8)						
		4 1/2	(114)	4,127	(18.4)						
1/2	9/16	2 3/4	(70)	2,401	(10.7)	1,936	(8.6)	4,172	(18.6)	3,338	(14.8)
		4 1/2	(114)	5,503	(24.5)						
		6	(152)	7,337	(32.6)						
5/8	3/4	3 1/8	(79)	3,163	(14.1)	3,025	(13.5)	6,519	(29.0)	5,216	(23.2)
		5 5/8	(143)	8,598	(38.2)						
		7 1/2	(191)	11,465	(51.0)						
3/4	7/8	3 1/2	(86)	4,024	(17.9)	4,356	(19.4)	9,388	(41.8)	6,384	(28.4)
		6 3/4	(171)	12,382	(55.1)						
		9	(229)	16,509	(73.4)						
7/8	1	3 1/2	(89)	4,117	(18.3)	5,929	(26.4)	12,778	(56.8)	8,689	(38.7)
		7 7/8	(200)	16,205	(72.1)						
		10 1/2	(267)	22,471	(100.0)						
1	1 1/8	4	(102)	5,255	(23.4)	7,744	(34.4)	16,690	(74.2)	11,349	(50.5)
		9	(229)	19,830	(88.2)						
		12	(305)	26,496	(117.9)						
1 1/4	1 3/8	5	(127)	7,374	(32.8)	12,100	(53.8)	26,078	(116.0)	17,733	(78.9)
		11 1/4	(286)	24,573	(109.3)						
		15	(381)	32,764	(145.7)						

For **SI**: 1 inch = 25.4 mm, 1lbf = 4.448 N, 1 psi = 0.006897 MPa.
For pound-inch units: 1 mm = 0.03937 inch, 1 N = 0.2248 lbf, 1MPa = 145.0 psi

1. The lower value of either the allowable bond strength/concrete capacity or steel strength should be used as the allowable tension value for design.
2. Allowable tension loads calculated based on strength design provisions of IBC Section 1605.3 with the following assumptions: Temperature range A: Maximum short term temperature of 176 °F (80 °C), Maximum long term temperature of 122 °F (50°C). Load combination from ACI based on 1.2D + 1.6L assuming dead load of 0.3 and live load of 0.7 giving a weighted average of 1.48. f'_c = 2,500 psi normal-weight uncracked concrete. Single anchor, vertically down with periodic special inspection and no seismic loading. ϕ_d 0.65 for dry concrete, $C_{a1} \geq 1.5 \times h_{ef}$, $h_{min} \geq 1.5 \times C_{a1}$, $C_{a2} \geq 1.5 \times C_{a1}$. Load values based on characteristic uncracked bond strength with sustained load.
3. For long term temperature exposure greater than 122 °F (50 °C) and up to 161 °F (72°C), with short term temperatures up to 248 °F (120 °C), apply a reduction factor of 0.49 to the allowable shear load.
4. Allowable steel strengths calculated in accordance with AISC Manual of Steel Construction: Shear = $0.17 * F_u * A_{nom}$..

TABLE 15: ULTRABOND ACRYL-8CC allowable **TENSION** loads for **REBAR** in normal-weight concrete[1]

Rebar Size	Nominal Drill Bit Diameter in.	Embedment Depth in. (mm)		Allowable Tension Load Based on Bond Strength / Concrete Capacity[2,3] lbs. (kN)		Allowable Tension Load Based on Steel Strength[4]			
				$f'_c \geq 2{,}500$ psi (17.4 MPa)		ASTM A615 Grade 60 lbs. (kN)		ASTM A615 Grade 40 lbs. (kN)	
#3	1/2	2 3/8	(60)	1,011	(4.5)	2,640	(11.7)	1,760	(7.8)
		3 3/8	(86)	1,437	(6.4)				
		4 1/2	(114)	1,916	(8.5)				
#4	5/8	2 3/4	(70)	1,540	(6.8)	4,800	(21.4)	3,200	(14.2)
		4 1/2	(114)	2,555	(11.4)				
		6	(152)	3,407	(15.2)				
#5	3/4	3 1/8	(79)	2,129	(9.5)	7,440	(33.1)	4,960	(22.1)
		5 5/8	(143)	3,992	(17.8)				
		7 1/2	(191)	5,323	(23.7)				
#6	7/8	3 1/2	(89)	2,810	(13.7)	10,560	(47.0)	7,040	(31.3)
		6 3/4	(171)	5,749	(25.6)				
		9	(229)	7,665	(34.1)				
#7	1 1/8	3 1/2	(89)	2,728	(12.1)	14,400	(64.1)	Grade 40 reinforcing bars are only available in sizes #3 through #6 per ASTM A615	
		7 7/8	(200)	7,825	(34.8)				
		10 1/2	(267)	10,433	(46.4)				
#8	1 1/4	4	(102)	3,415	(15.2)	18,960	(84.3)		
		9	(229)	9,226	(41.0)				
		12	(305)	12,302	(54.7)				
#9	1 3/8	4 1/2	(114)	5,031	(22.4)	24,000	(106.8)		
		10 1/8	(257)	16,980	(75.5)				
		13 1/2	(343)	26,142	(116.3)				
#10	1 1/2	5	(127)	4,798	(21.3)	30,480	(135.6)		
		11 1/4	(286)	11,409	(50.7)				
		15	(381)	15,212	(67.7)				

For **SI**: 1 inch = 25.4 mm, 1lbf = 4.448 N, 1 psi = 0.006897 MPa.
For pound-inch units: 1 mm = 0.03937 inch, 1 N = 0.2248 lbf, 1MPa = 145.0 psi

1. The lower value of either the allowable bond strength/concrete capacity or steel strength should be used as the allowable tension value for design.
2. Allowable tension loads calculated based on strength design provisions of IBC Section 1605.3 with the following assumptions: Temperature range A: Maximum short term temperature of 176 °F (80 °C), Maximum long term temperature of 122 °F (50°C). Load combination from ACI based on 1.2D + 1.6L assuming dead load of 0.3 and live load of 0.7 giving a weighted average of 1.48. f'_c = 2,500 psi normal-weight uncracked concrete. Single anchor, vertically down with periodic special inspection and no seismic loading. ϕ_d 0.65 for dry concrete, $C_{a1} \geq 1.5 \times h_{ef}$, $h_{min} \geq 1.5 \times C_{a1}$, $C_{a2} \geq 1.5 \times C_{a1}$. Load values based on characteristic uncracked bond strength with sustained load.
3. For long term temperature exposure greater than 122 °F (50 °C) and up to 161 °F (72°C), with short term temperatures up to 248 °F (120 °C), apply a reduction factor of 0.49 to the allowable tension load.
4. Allowable steel strengths calculated in accordance with AISC Manual of Steel Construction: Tensile = $0.33 * F_u * A_{nom}$.

TABLE 16: ULTRABOND ACRYL-8CC allowable **SHEAR** loads for **REBAR** in normal-weight concrete[1]

Rebar Size	Nominal Drill Bit Diameter in.	Embedment Depth in. (mm)		Allowable Shear Load Based on Bond Strength / Concrete Capacity[2,3] lbs. (kN)		Allowable Shear Load Based on Steel Strength[4]			
				$f'_c \geq 2{,}500$ psi (17.4 MPa)		ASTM A615 Grade 60 lbs. (kN)		ASTM A615 Grade 40 lbs. (kN)	
#3	1/2	2 3/8	(60)	1,089	(4.8)	1,683	(7.5)	1,122	(5.0)
		3 3/8	(86)	3,095	(13.8)				
		4 1/2	(114)	4,127	(18.4)				
#4	5/8	2 3/4	(70)	2,401	(10.7)	3,060	(13.6)	2,040	(9.1)
		4 1/2	(114)	5,503	(24.5)				
		6	(152)	7,337	(32.6)				
#5	3/4	3 1/8	(79)	3,163	(14.1)	4,743	(21.1)	3,162	(14.1)
		5 5/8	(143)	8,598	(38.2)				
		7 1/2	(191)	11,465	(51.0)				
#6	7/8	3 1/2	(86)	4,024	(13.7)	6,732	(29.9)	4,488	(20.0)
		6 3/4	(171)	12,382	(55.1)				
		9	(229)	16,509	(73.4)				
#7	1 1/8	3 1/2	(89)	4,117	(18.3)	9,180	(40.8)	Grade 40 reinforcing bars are only available in sizes #3 through #6 per ASTM A615	
		7 7/8	(200)	16,205	(72.1)				
		10 1/2	(267)	22,471	(100.0)				
#8	1 1/4	4	(102)	5,255	(23.4)	12,087	(53.8)		
		9	(229)	19,830	(88.2)				
		12	(305)	26,496	(117.9)				
#9	1 3/8	4 1/2	(114)	6,175	(27.5)	15,300	(68.1)		
		10 1/8	(257)	23,460	(104.4)				
		13 1/2	(343)	37,123	(165.1)				
#10	1 1/2	5	(127)	7,258	(32.3)	19,431	(86.4)		
		11 1/4	(286)	24,573	(109.3)				
		15	(381)	32,764	(145.7)				

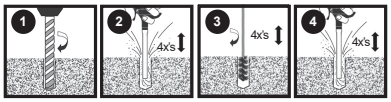
For **SI**: 1 inch = 25.4 mm, 1lbf = 4.448 N, 1 psi = 0.006897 MPa.
For pound-inch units: 1 mm = 0.03937 inch, 1 N = 0.2248 lbf, 1MPa = 145.0 psi

1. The lower value of either the allowable bond strength/concrete capacity or steel strength should be used as the allowable tension value for design.
2. Allowable tension loads calculated based on strength design provisions of IBC Section 1605.3 with the following assumptions: Temperature range A: Maximum short term temperature of 176 °F (80 °C), Maximum long term temperature of 122 °F (50°C). Load combination from ACI based on 1.2D + 1.6L assuming dead load of 0.3 and live load of 0.7 giving a weighted average of 1.48. f'_c = 2,500 psi normal-weight uncracked concrete. Single anchor, vertically down with periodic special inspection and no seismic loading. ϕ_d 0.65 for dry concrete, $C_{a1} \geq 1.5 \times h_{ef,}$ $h_{min} \geq 1.5 \times C_{a1}$, $C_{a2} \geq 1.5 \times C_{a1}$. Load values based on characteristic uncracked bond strength with sustained load.
3. For long term temperature exposure greater than 122 °F (50 °C) and up to 161 °F (72°C), with short term temperatures up to 248 °F (120 °C), apply a reduction factor of 0.49 to the allowable shear load.
4. Allowable steel strengths calculated in accordance with AISC Manual of Steel Construction: Shear = 0.17 * F_u * A_{nom}..

ULTRABOND® ACRYL-8CC Adhesive Anchor Installation Instructions

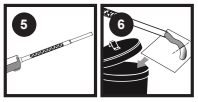
Installation Instructions

Drilling and Cleaning - Hammer Drilled Holes



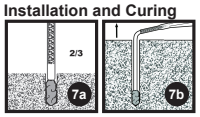
1. Drill hole to specified diameter and depth while taking care to avoid inhalation of dust during the drilling and cleaning process.
2. Remove standing water, blow out hole for 4 seconds/cycles.
3. Brush for 4 cylces (ensure wire brush contacts walls of drilled hole-replace if worn) - use brush extension if required.
4. Blow out hole for 4 seconds/cycles.

Dispensing Preparation



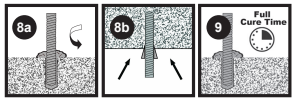
5. Remove cap, place cartridge into dispensing tool - DO NOT USE EXPIRED PRODUCT! Screw on only appropriate, non-modified ATC mixing nozzle.
6. Dispense and waste enough material to ensure uniform gray color before injecting into hole - NEVER RE-USE NOZZLES and DO NOT ATTEMPT TO FORCE ADHESIVE OUT OF A HARDENED MIXING NOZZLE- If needed, use a new nozzle and repeat steps 5 and 6.

Installation and Curing



7a. Fill hole 2/3 full with mixed adhesive starting at the bottom and slowly withdraw as hole fills.

7b. Piston plugs must be used with the extension tubing attached to the nozzle for horizontal and overhead installations with anchor sizes 5/8" to 1 1/4" diameter and rebar sizes of #5 to #10. See the appropriate TDS table or opposite side of this instruction card for piston plug sizes.



8a. Fully insert clean threaded rod or rebar with slow turning motion to bottom of hole - note working time and ensure excess adhesive is visible around anchor after installation.

8b. For overhead installations, horizontal and inclined, wedges should be used to support the anchor while adhesive is curing.

9. Do not disturb, torque or apply load until full cure time has passed. Proper hole cleaning, cartridge preparation and intallation is critical in order to achieve published anchor performance.

Reference Commentary

Drilling and Cleaning - Hammer Drilled Holes

Read and follow manufacturer's operations manual for the selected rotary drill.

R1. Standard carbide drill bit should conform to ANSI B212.15. Refer to the installation tables on the opposite side of this instruction card for ULTRABOND ACRYL-8CC for applicable hole diameters and embedment depth ranges. **CAUTION:** Always wear appropriate personal protection equipment (PPE) for eyes, ears and skin to help avoid inhalation of dust during the drilling and cleaning process. Refer to the Safety Data Sheet (SDS) for details prior to proceeding.

R2. **BLOW (4X) – BRUSH (4X) – BLOW (4X)**. Ensure that the compressed air is oil free. The compressed air wand should be inserted to the bottom of the hole, have a minimum pressure of 90 psi (6 bar) and be moved in an up/down motion to remove debris.

R3. Refer to the installation tables on the opposite side of this instruction card for ULTRABOND ACRYL-8CC for wire brush selection. **CAUTION:** The brush should be clean and contact the walls of the hole. If it does not, the brush is either too worn or small and should be replaced with a new brush of the correct diameter. The wire brush diameter must be checked periodically during use.

R4. After final blow step is completed, visually inspect the hole to confirm it is clean and free of dust, debris, ice, grease, oil or other foreign material. **NOTE:** If installation will be delayed for any reason, cover cleaned holes to prevent contamination.

Dispensing Preparation

R5. Review Safety Data Sheet (SDS) before use. Review working and cure times on the opposite side of this instruction card. Consideration should be given to the reduced gel (working) time of the adhesive in warm temperatures. For permitted range of base material see the Cure Schedule on the opposite side of this instruction card. Check the expiration date on the cartridge to ensure it is not expired. Cartridge temperature must be between 70 °F - 75 °F (21 °C - 24 °C) for installations between 14 °F and 23 °F (-10 °C and - 5 °C).

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. Shelf life of ULTRABOND ACRYL-8CC is 18 months when stored at temperatures between 41 °F (5 °C) and 77 °F (25 °C). **Optional**: Before attaching mixing nozzle, balance the cartridge by dispensing a small amount of material until both components are flowing evenly. For a cleaner environment, hand mix the two components and let cure prior to disposal in accordance with local regulations.

R6. Test bead of mixed adhesive must be uniform in color and free of streaks, as adhesive must be properly mixed in order to perform as published. Dispose of the test bead according to federal, state and local regulations. **CAUTION:** When changing cartridges, never re-use nozzles and do not attempt to force adhesive out of a hardened mixing nozzle. Leave the mixing nozzle attached to the cartridge upon completion of work.

Installation and Curing

NOTE: Building Code Requirements for Structural Concrete (ACI 318-14 and later) requires the Installer to be certified where adhesive anchors are to be installed in horizontal to vertically inclined (overhead) installations. The engineering drawings must be followed. For all applications not covered by this document, or for all installation questions, please contact Adhesives Technology Corp.

R7a. Be careful not to withdraw the mixing nozzle too quickly as this may trap air in the adhesive. Use an extension tube as needed.

R7b. Refer to the installation tables on the opposite side of this instruction card for ULTRABOND ACRYL-8CC for piston plug selection. Use piston plugs for overhead and vertically inclined installations, all installations with drill hole depth > 10" (250 mm), with anchor rod 5/8" to 1-1/4" (M16 to M30) diameter and rebar sizes #5 to #10 (Ø14 to Ø32). Insert piston plug to the back of the drilled hole and inject as stated in step 7a. During installation the piston plug will be naturally extruded from the drilled hole by the adhesive pressure. **CAUTION:** In addition to the installer being certified, do not install adhesive anchors overhead or vertically inclined without installation hardware supplied by ATC.

R8a. Prior to inserting the threaded rod or rebar into the hole, make sure it is straight, clean and free of oil/dirt and that the necessary embedment depth is marked on the anchor element. Insert the anchor elements into the hole while turning 1 - 2 rotations prior to the anchor reaching the bottom of the hole. Excess adhesive should be visible on all sides of the fully installed rod or rebar. Reinforcing bars must not be bent after installation except as set forth in ACI 318-14 Section 26.6.3.1 (b) or ACI 318-11 Section 7.3.2, as applicable, with the additional condition that the bars must be bent cold, and heating of reinforcing bars to facilitate field bending is not permitted. **CAUTION:** Use extra care with deep embedment or high temperature installations to ensure that the working time has not elapsed prior to the anchor being fully installed. Adjustments to the anchor alignment may only performed during the published working time for a given temperature.

R8b. Ensure the anchor is fully seated at the bottom of the hole and that some adhesive has flowed from the hole and all around the top of the anchor. If not, the installation must be repeated. Take appropriate steps to protect the exposed threads of the anchor element from uncured adhesive until after the full cure time has elapsed.

R9. The amount of time needed to reach full cure is base material dependent. Refer to the chart on the opposite side of this instruction card for appropriate full cure time for a given temperature. Refer to the installation tables for ULTRABOND ACRYL-8CC to ensure proper torque is used.Take care not to exceed the maximum torque for the selected anchor. After full cure time has passed, a fixture can be installed to the anchor and tightened up to the maximum torque.

ULTRABOND® ACRYL-8CC Adhesive Anchor Installation Instructions

INSTALLATION PARAMETERS FOR THREADED ROD AND REBAR

Characteristic			Symbol	Units	Threaded Rod Diameter (inch)							
					3/8	1/2	5/8	3/4	7/8	1	1 1/4	N/A
					Rebar Size							
					#3	#4	#5	#6	#7	#8	#9	#10
Threaded Rod	Nominal Anchor Diameter		d	in.	0.375	0.500	0.625	0.750	0.875	1.000	1.250	
	Drill Size		d_o	in.	7/16	9/16	3/4	7/8	1	1 1/8	1 3/8	
	Brush Part #		----	----	BA716	BA916	BA34	BA78	BA100	BA118	BA138	
	Piston Plug Part #		----	----	----	----	PA34	PA78	PA100	PA118	PA138	N/A
	Piston Plug Color		----	----	----	----	Clear					
	Maximum Tightening Torque	A36/A307 Carbon Steel	$T_{inst,max}$	Ft-lb (N-m)	10 (14)	25 (34)	50 (68)	90 (122)	125 (170)	165 (224)	280 (380)	
		A193 B7 Carbon Steel or F593 SS			16 (22)	33 (45)	60 (81)	105 (142)	125 (170)	165 (224)	280 (380)	
Rebar	Nominal Bar Diameter		d	in.	0.375	0.500	0.625	0.750	0.875	1.000	1.125	1.250
	Drill Size		d_o	in.	7/16	5/8	3/4	7/8	1	1 1/8	1 3/8	1 1/2
	Brush Part #		----	----	BA716	BA58	BA34	BA78	BA100	BA118	BA138	BA112
	Piston Plug Part #		----	----	----	----	PA34	PA78	PA100	PA118	PA138	PA112
	Piston Plug Color		----	----	----	----	Clear					

CONCRETE BREAKOUT DESIGN INFORMATION FOR THREADED ROD AND REBAR

Design Information	Symbol	Units	Threaded Rod Diameter (inch)							
			3/8	1/2	5/8	3/4	7/8	1	N/A	1 1/4
			Rebar Size							
			#3	#4	#5	#6	#7	#8	#9	#10
Minimum Embedment Depth	$h_{ef,min}$	in. (mm)	2 3/8 (60)	2 3/4 (70)	3 1/8 (79)	3 1/2 (89)	3 1/2 (89)	4 (102)	4 1/2 (114)	5 (127)
Maximum Embedment Depth	$h_{ef,max}$	in. (mm)	4 1/2 (114)	6 (152)	7 1/2 (191)	9 (229)	10 1/2 (267)	12 (305)	13 1/2 (343)	15 (381)
Minimum Spacing Distance	s_{min}	in. (mm)	1 7/8 (48)	2 1/2 (64)	3 1/8 (79)	3 3/4 (95)	4 3/8 (111)	5 (127)	5 5/8 (143)	6 1/4 (159)
Minimum Edge Distance	c_{min}	in. (mm)	1 7/8 (48)	2 1/2 (64)	3 1/8 (79)	3 3/4 (95)	4 3/8 (111)	5 (127)	5 5/8 (143)	6 1/4 (159)
Minimum Concrete Thickness	h_{min}	in. (mm)	h_{ef} + 1.25 , [≥ 3.937] (h_{ef} + 30 , [≥ 100])		h_{ef} + 2d_0 where d_o is the hole diameter					

For SI: 1 inch = 25.4 mm, 1 lbf = 4.448 N, 1 psi = 006894 MPa. For pound-inch units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf, 1 MPa = 145.0 psi.

CURE SCHEDULE[1,2,3]

Concrete Temperature °F (°C)	Working Time	Full Cure Time
14 (-10)	90 min	24 hr
23 (-5)	90 min	14 hr
32 (0)	45 min	7 hr
41 (5)	25 min	2 hr
50 (10)	15 min	90 min
70 (21)	6 min	45 min
86 (30)	4 min	25 min
95 (35)	2 min	20 min
104 (40)	1.5 min	15 min

[1]For installations between 14 °F and 23 °F (-10 °C and -5 °C) the cartridge temperature must be conditioned between 70 °F and 75 °F (21 °C and 24 °C).

[2]Store adhesive in dry cool location free from sun and rain.

[3]Storage temperature is 41 °F to 77 °F (5 °C to 25 °C).

ADHESIVE DISPENSING TOOLS AND MIXING NOZZLES[1]

Package Size	9.5 fl. oz. (280 ml) Cartridge	28 fl. oz. (825 ml) Cartridge
Part #	A10-ACRYL8CC	A28-ACRYL8CC
Mixing Nozzle	T10-8CC	T28-8CC
Manual Dispensing Tool [2]	TM10	TM28HD
Pneumatic Dispensing Tool	N/A	TA28
Case Qty.	12	8
Pallet Qty.	900	240
Pallet Weight (lbs.)	1,364	921
SDS Brush Adaptor	BA-SDS	
Brush Extension	BA-EXT	
Nozzle Extension Tubing	T-8CCEXTPK	
Retention Wedge	WEDGE	

[1]Each cartridge is packaged with one mixing nozzle.

[2]For applications NOT requiring code approval, a TM9 manual dispensing tool may be substituted or a TM28HD may be used.

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ADHESIVES TECHNOLOGY® CORP.