TECHNICAL DATA SHEET

DESCRIPTION
ProAnchor Elite is two component, moisture tolerant, 100% solids, high modulus epoxy gel adhesive approved for use in cartridges and in bulk for anchoring in cracked and un-cracked concrete and internally threaded inserts in un-cracked concrete. Meets requirements of ACI 355.4 and ICC-ES AC308 per IAPMO ER-690.

USE
ProAnchor Elite is ideal for anchoring bolts, dowels, and reinforcing steel in concrete. It is also ideal for vertical and horizontal structural bonding and patching. It may also be used to seal cracks and set injection ports prior to injection grouting.

FEATURES
- High-strength structural adhesive
- Ideal for anchoring dowels, bolts, reinforcing steel and threaded rod
- Fast-setting
- Suitable for dry, water saturated and water-filled holes
- Qualified for Seismic Design Categories A through F.
- Made in the USA in accordance with CFR 49 section 50101.

CLASSIFIED C UL US WATER QUALITY

PROPERTIES
See Appendix A.
For a complete list of properties, tools, and accessories, refer to IAPMO ER-690

APPLICABLE STANDARDS
ASTM C881, AASHTO M235: Types I, II, IV & V; Grade 3; Classes A, B & C*
*Except for gel time due to fast set
Multiple state DOT approvals
IBC/IRC
UL Certified – Drinking Water System Components to NSF/ANSI/CAN 61
Acceptable for use in USDA inspected facilities

voc
ProAnchor Elite has a VOC content of 0 g/L . Compliant with all Canadian and U.S. VOC regulations including Federal EPA, OTC, LADCO, SCAQMD & CARB

Packaging

PRODUCT CODE	Packaging	Size oz	Milliliters/Liter
100861	Cartridge	8.6	254ml
100862	Cartridge	21.2	627ml
100863	Cartridge	53	1.6L
100864	Pails	10 gal	37.8L

STORAGE
The material should be stored at 40°-95°F (5°-35°C). Use prior to the "best used by date" on product label. Do not expose stored product to cold or freezing temperature below 35°F (2°C) for any length of time

Surface Preparation:
Ambient and substrate temperature conditions:
43° and 110°F (6° and 43°C) for structural applications per UES 690.
38° and 125°F (3° and 52°C) for transportation infrastructure applications to AASHTO M235 & ASTM C881.

Surface to be bonded must be clean and sound. Remove dust, dirt, grease, laitance, curing compounds and other foreign matter by sandblasting, mechanical abrasion or hydro blasting. For drilled holes, clean with a bristle brush.

Remove all water and dust with clean compressed air prior to installation. Air and surface temperature must be 38°F (3°C) or above.

Mixing
Condition material to 65°- 85°F (18°- 29°C) before using.

Cartridges:
Remove the protective cap and “pre-purge" the cartridge before putting on the static mixer to ensure uniform mixing. Screw on the static mixing nozzle and dispense epoxy until the product is a uniform gray with no streaking.

Bulk:
Premix each component, then mix equal volumes of Part A and Part B for 3 minutes with a low speed drill, a jiffy mixer or paddle. Mix only what can be used during the pot life. For bulk dispensing equipment for structural applications, refer to UES 690 Table 5. Under normal operation, the bulk pump must be capable of dispensing the individual components at a 1:1 mix ratio by volume with a tolerance of ± 2%.

Placement:
Step 1: Drill hole in concrete using a rotary-percussion power drill (rotary-hammer drill) and a carbide-tipped SDS or SDS-Plus type drill bit complying with ANSI B212.15-1994, to the diameter and embedment depth adhering to minimum spacing, minimum edge distance, and minimum concrete member thickness.

Caution: Wear suitable eye and skin protection. Avoid inhalation of dust during drilling and debris removal.

Step 2: Blow out hole using oil-free compressed air at a minimum of 70 psi with a nozzle. While blowing air, insert the nozzle into the hole until in contact with the bottom for not less than one second, and then withdraw.

Step 3: Insert a cleaning brush for the proper drill hole diameter. Thrust the brush to the bottom of the borehole while twisting. Once the brush is in contact with the bottom of the hole, turn the brush one-half revolution, and then quickly withdraw the brush with a vigorous, twisting pull. Repeat.

Step 4: Repeat blow out of hole with air as per Step 2 above. Concrete shall be dry before injection of adhesive.

Step 5: When using cartridge insert the cartridge into the extrusion tool, and attach the supplied mixing nozzle to the cartridge. Do not modify mixing nozzle. Prior to injection, dispense material through the mixing nozzle in a continuous bead until a uniform light gray color is achieved. Initial dispensed material will be darker gray in color and should not be used for installation. After uniform light gray color is achieved, insert the end of the mixing nozzle into the borehole until in contact with the bottom. Then, dispense the adhesive while slowly withdrawing the nozzle until borehole is approximately 1/2 - 2/3 full, and then withdraw the mixing nozzle. Keep the nozzle attached on partially used cartridges. A new mixing nozzle must be used if the gel time has been exceeded between injections.

Step 6: Mark the anchor rod with the required embedment depth. Insert the clean and oil-free anchor rod into the adhesive in the borehole, turning it slowly as it is pushed downward until contact with the bottom of the borehole. Make sure the hole is completely filled with adhesive and that no gaps appear between the anchor rod and borehole.

Step 7: Adjust the alignment of the anchor in the hole immediately. Do not disturb it between the Gel Time and the Minimum Cure Time. Do not torque or apply load to the anchor until the Recommended Cure Time.

CLEAN UP
Tools and Equipment: Clean before the epoxy sets. Use xylene or Citrus Cleaner J48.

LIMITATIONS

FOR PROFESSIONAL USE ONLY
Per ACI 355.4, for anchoring applications, concrete should be a minimum of 21 days old prior to anchor installation.
Building Code Requirements for Structural Concrete (ACI 318-11 /ACI 318-14) requires the Installer to be certified where adhesive anchors are to be installed in horizontal or overhead installations.
Do not thin with solvents
Surface and ambient temperature must be 38°F (3°C) or above
Do not expose stored product to cold or freezing temperature below 35°F (2°C) for any length of time

PRECAUTIONS

READ SDS PRIOR TO USING PRODUCT

- Component A – Irritant
- Component B – Corrosive
- Product is a strong sensitizer
- Use with adequate ventilation
- Wear protective clothing, gloves and eye protection (goggles, safety glasses and/or face shield)
- Keep out of the reach of children
- Do not take internally
- In case of ingestion, seek medical help immediately
- May cause skin irritation upon contact, especially prolonged or repeated. If skin contact occurs, wash immediately with soap and water and seek medical help as needed.
- If eye contact occurs, flush immediately with clean water and seek medical help as needed
- Dispose of waste material in accordance with federal, state and local requirements
- Cured epoxy resins are innocuous

MANUFACTURER

Dayton Superior Corporation
1125 Byers Road
Miamisburg, OH 45342
Customer Service: 888-977-9600
Technical Services: 877-266-7732
Website: www.daytonsuperior.com

WARRANTY

Dayton Superior Corporation ("Dayton") warrants for 12 months from the date of manufacture or for the duration of the published product shelf life, whichever is less, that at the time of shipment by Dayton, the product is free of manufacturing defects and conforms to Dayton's product properties in force on the date of acceptance by Dayton of the order. Dayton shall only be liable under this warranty if the product has been applied, used, and stored in accordance with Dayton's instructions, especially surface preparation and installation, in force on the date of acceptance by Dayton of the order. The purchaser must examine the product when received and promptly notify Dayton in writing of any non-conformity before the product is used and no later than 30 days after such non-conformity is first discovered. If Dayton, in its sole discretion, determines that the product breached the above warranty, it will, in its sole discretion, replace the non-conforming product, refund the purchase price or issue a credit in the amount of the purchase price. This is the sole and exclusive remedy for breach of this warranty. Only a Dayton officer is authorized to modify this warranty. The information in this data sheet supersedes all other sales information received by the customer during the sales process. THE FOREGOING WARRANTY SHALL BE EXCLUSIVE AND IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND ALL OTHER WARRANTIES OTHERWISE ARISING BY OPERATION OF LAW, COURSE OF DEALING, CUSTOM, TRADE OR OTHERWISE.

Dayton shall not be liable in contract or in tort (including, without limitation, negligence, strict liability or otherwise) for loss of sales, revenues or profits; cost of capital or funds; business interruption or cost of downtime, loss of use, damage to or loss of use of other property (real or personal); failure to realize expected savings; frustration of economic or business expectations; claims by third parties (other than for bodily injury), or economic losses of any kind; or for any special, incidental, indirect, consequential, punitive or exemplary damages arising in any way out of the performance of, or failure to perform, its obligations under any contract for sale of product, even if Dayton could foresee or has been advised of the possibility of such damages. The Parties expressly agree that these limitations on damages are allocations of risk constituting, in part, the consideration for this contract, and also that such limitations shall survive the determination of any court of competent jurisdiction that any remedy provided in these terms or available at law fails of its essential purpose.

Appendix A

TABLE 1 – ProAnchor Elite ADHESIVE DISPENSING TOOLS AND MIXING NOZZLES

Package Size	8.6 oz. (254 ml) Cartridge	21.2 oz. (627 ml) Cartridge	53 oz. (1.6 L) Cartridge	10 Gallon (38 L) Kit	
				Resin	Hardener
Part #	100861	100862	100863	100864A	100864B
Manual Dispensing Tool	100884	100889	----		
Pneumatic Dispensing Tool	-----	100891	100893	Pump	
Battery Tool		100892	----		
Recommended Mixing Nozzle	100878 or 100879			100879	
SDS Brush Adaptor	100876				
Brush Extension	100877				
Nozzle Extension Tubing	100882				
Retention Wedge	100883				

FIGURE 1 – ProAnchor Elite HIGH STRENGTH ADHESIVE ANCHOR SYSTEM TYPICAL ANCHOR ELEMENTS

FIGURE 2 – ProAnchor Elite HIGH STRENGTH ADHESIVE ANCHOR SYSTEM DISPENSING EQUIPMENT

FIGURE 3 – ProAnchor Elite HIGH STRENGTH ADHESIVE ANCHOR SYSTEM BRUSHES, NOZZLES, EXTENSION TUBES, AND PISTON PLUGS

TABLE 2 – ProAnchor Elite INSTALLATION INFORMATION FOR THREADED RODS

Characteristic		Symbol	Units	Nominal Anchor Element Size						
Fractional Threaded Rod	Size	d_a	in.	3/8	1/2	5/8	3/4	7/8	1	1 1/4
	Drill Size	d_o	in.	7/16	9/16	3/4	7/8	1	1 1/8	1 3/8
Maximum Tightening Torque	A36/A307 Carbon Steel	T_{inst}	Ft-lb (N-m)	10 (14)	25 (34)	50 (68)	90 (122)	125 (170)	165 (224)	280 (381)
	A193-B7 Carbon Steel or F593 SS			16 (22)	30 (45)	60 (81)	105 (142)	125 (170)	165 (224)	280 (381)
Brush Part No.		-	-	100865	100867	100869	100871	100872	100873	100874
Brush Length		-	in.	6	6	6	6	9	9	9
Piston Plug Part No.		-	-	100895	100897	100899	100901	100902	100903	100904
Piston Plug Color		-	-	Black	Blue	Yellow	Green	Black	Orange	Brown

TABLE 3 – ProAnchor Elite INSTALLATION INFORMATION FOR REINFORCING BARS

Characteristic		Symbol	Units	Nominal Anchor Element Size							
US Reinforcing Bar	Size	d_a	in.	#3 (0.375)	#4 (0.50)	#5 (0.625)	#6 (0.75)	#7 (0.875)	#8 (1.00)	#9 (1.128)	#10 (1.27)
	Drill Size	d_o	in.	½	5/8	3/4	7/8	1	1 1/8	1 3/8	1 1/2
Brush Part No.		-	-	100865	100868	100869	100871	100872	100873	100874	100875
Brush Length		-	in.	6	6	6	6	9	9	9	9
Piston Plug Part No.		-	-	100895	100898	100899	100901	100902	100903	100904	100905
Piston Plug Color		-	-	Black	Red	Yellow	Green	Black	Orange	Brown	Gray

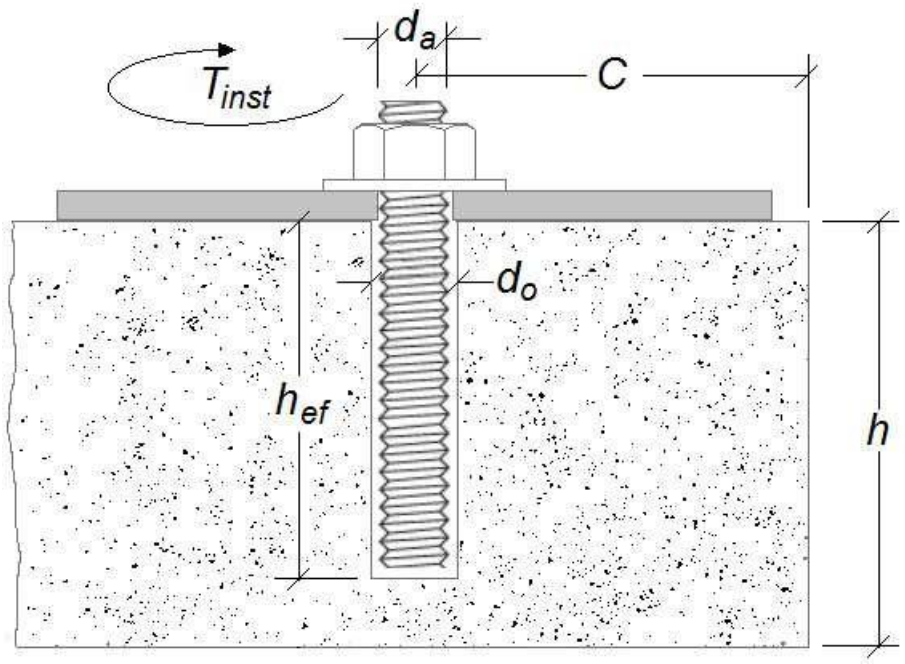

FIGURE 4 – ProAnchor Elite HIGH STRENGTH ADHESIVE ANCHOR WITH THREADED RODS

TABLE 4 – ProAnchor Elite INSTALLATION INFORMATION FOR INTERNALLY THREADED INSERT

Characteristic		Symbol	Units	Nominal Anchor Element Size				
Fractional Internally Threaded Insert	Insert Part #	----	----	PS2-38 or PS6-38	PS2-12 or PS6-12	PS2-58 or PS6-58	PS2-34 or PS6-34	PS2-1 or PS6-1
	Internal Thread Size	d_t	in.-TPI	3/8-16	1/2-13	5/8-11	3/4-10	1-8
	Drill Size	d_o	in.	1/2	5/8	7/8	1	1 1/2
	Thread Depth[1]	---	in.	1	1	1½	1½	2
Maximum Tightening Torque	A36/A307 Carbon Steel	T_{inst}	Ft-lb (N-m)	10 (14)	25 (34)	50 (68)	90 (122)	165 (224)
	A193 B7 Carbon Steel or F593 SS			16 (22)	30 (45)	60 (81)	105 (142)	165 (224)
Thread Depth[1]		h_t	in.	0.945	0.945	1.475	1.475	2.000
Brush Part No.		----	----	100866	100868	100871	100872	100875
Brush Length		----	in.	6	6	6	9	9
Piston Plug Part No.		----	----	100895	100898	100901	100902	100905
Piston Plug Color		----	----	Black	Red	Green	Black	Grey

For SI: 1 inch = 25.4 mm

[1] Minimum bolt length shall equal the sum of thread depth plus the thickness of attachments.

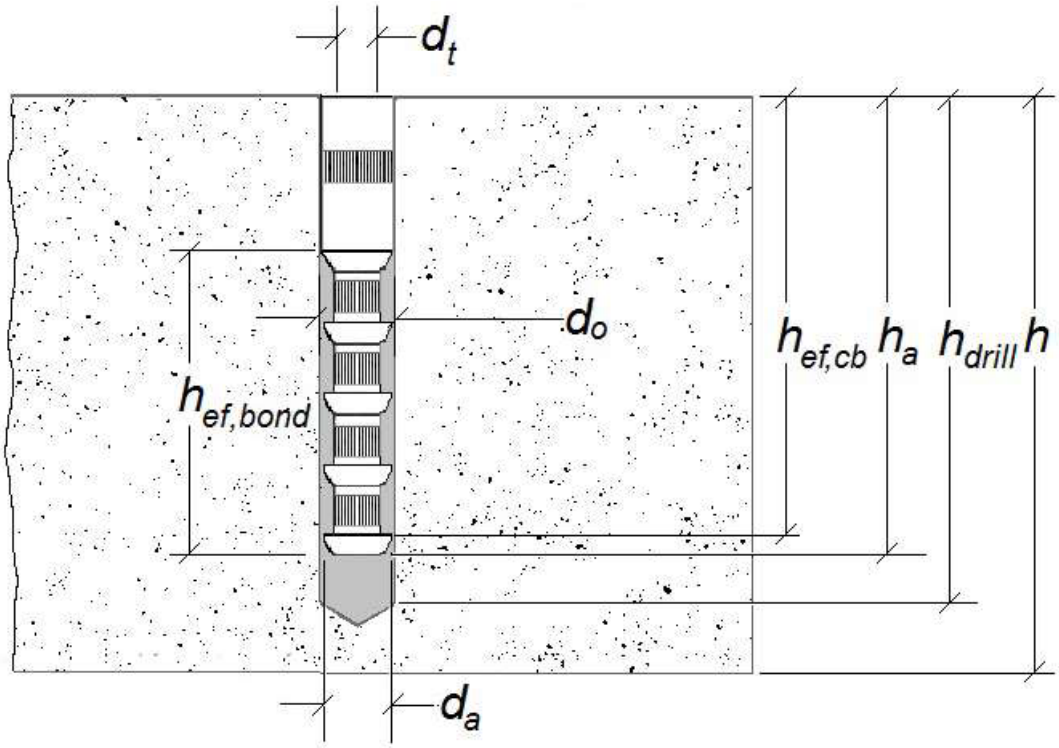

FIGURE 5 – ProAnchor Elite HIGH STRENGTH ADHESIVE ANCHOR WITH INTERNALLY THREADED INSERT

TABLE 5 – ProAnchor Elite WORKING TIME AND FULL CURE TIME SCHEDULE[1,2,3]

System	Concrete Temperature	Working Time[1]	Full Cure Time[2]
ProAnchor Elite	43 °F (6 °C)	45 minutes	144 hours
	50 °F (10 °C)	35 minutes	72 hours
	75 °F (24 °C)	16 minutes	7 hours
	90 °F (32 °C)	12 minutes	4 hours
	110 °F (43 °C)	3 minutes	2 hours

[1] Working and full cure times are approximate and may be linearly interpolated between listed temperatures and are based on cartridge/nozzle system performance.

[2] Base material and ambient air temperature shall be from 43 to 110 °F (6 to 43 °C) during installation.

[3] When ambient or base material temperature falls below 70 °F (21 °C), the adhesive shall be conditioned to 70 to 75 °F (21 to 24 °C) prior to use. A high-flow mixing nozzle (100879) may also be used to ease dispensing at colder temperatures or to increase the flow rate.

TABLE 6 – MILWAUKEE TOOL VACUUM DRILL COMPONENTS

Part #	Drill Type	Drill Bit Size in.	Overall Length in.	Useable Length in.
48-20-2102	SDS+	7/16	13	7 7/8
48-20-2106		1/2	13	7 7/8
48-20-2110		9/16	14	9 1/2
48-20-2114		5/8	14	9 1/2
48-20-2118		3/4	14	9 1/2
48-20-2152	SDS-Max	5/8	23	15 3/4
48-20-2156		3/4	23	15 3/4
48-20-2160		7/8	23	15 3/4
48-20-2164		1	25	17 1/2
48-20-2168		1 1/8	35	27
48-20-2172		1 3/8	35	27
8960-20	8 Gallon Dust Extractor Vacuum			

TABLE 7 – ProAnchor Elite DESIGN STRENGTH TABLE INDEX

Design Strength		Drilling Method	Threaded Rod	Reinforcing Bar	Internally Threaded Insert
Steel Strength	N_{sa}, V_{sa}	----	8	13	17
Concrete Breakout	N_{cb}, V_{cb}, V_{cp}	----	9	14	18
Bond Strength Design (SD)	Cracked Concrete	Hammer Drill	10	15	----
	Uncracked Concrete		10	15	19
	Cracked Concrete	Vacuum Bit Drill	11	----	----
	Uncracked Concrete		11	----	----
	Uncracked Concrete	Core Drill	12	16	----

TABLE 8 – ProAnchor Elite 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_a	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[4]			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)
Carbon	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)	19,370 (86.2)	26,795 (119.2)	35,150 (156.4)	56,200 (250.0)
			V_{sa}	lb. (kN)	2,695 (12.0)	4,940 (22.0)	7,865 (35.0)	11,625 (51.7)	16,080 (71.5)	21,900 (97.4)	33,720 (150.0)
		Reduction Factor for Seismic Shear	$\alpha_{V,seis}$	----	0.83	0.78	0.74	0.70	0.69	0.67	0.65
		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)	9,690 (43.1)	17,740 (78.9)	28,250 (125.7)	41,750 (185.7)	57,750 (256.9)	75,750 (337.0)	121,125 (538.8)
			V_{sa}	lb. (kN)	5,815 (25.9)	10,645 (47.4)	16,950 (75.4)	25,050 (111.4)	34,650 (154.1)	45,450 (202.2)	72,675 (323.3)
		Reduction Factor for Seismic Shear	$\alpha_{V,seis}$	----	0.60	0.58	0.57	0.55	0.53	0.50	0.46
		Strength Reduction Factor for Tension[3]	ϕ	----	0.75						
		Strength Reduction Factor for Shear[3]	ϕ	----	0.65						
Stainless	ASTM F593 CW1&CW2 Type 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)	28,390 (126.3)	39,270 (174.7)	51,510 (229.1)	82,365 (366.4)
			V_{sa}	Lb (kN)	4,650 (20.7)	8,515 (37.9)	13,560 (60.3)	17,035 (75.8)	23,560 (104.8)	30,905 (137.5)	49,420 (219.8)
		Reduction Factor for Seismic Shear	$\alpha_{V,seis}$	----	0.65	0.62	0.60	0.58	0.57	0.55	0.53
		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, 1 MPa = 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 shall 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 shall 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 shall be determined in accordance with ACI 318-11 D4.4. Values correspond to a ductile steel element.
[4] Cross-sectional area is the minimum stress area applicable for either tension or shear.

TABLE 9 –ProAnchor Elite 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 3/4 (95)	4 (102)	5 (127)
Maximum Embedment Depth	$h_{ef,max}$	in. (mm)	7 1/2 (191)	10 (254)	12 1/2 (318)	15 (381)	17 1/2 (445)	20 (508)	25 (635)
Effectiveness Factor for Cracked Concrete	$k_{c,cr}$	---- SI	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)	2 3/16 (56)	2 13/16 (71)	3 3/4 (95)	4 3/8 (111)	5 (127)	5 5/8 (143)	6 7/8 (175)
Minimum Concrete Thickness	h_{min}	in. (mm)	$h_{ef} + 1.25$, $[\geq 3.937]$ $(h_{ef} + 30, [\geq 100])$		$h_{ef} + 2d_0$ where d_o is the hole diameter				
Critical Edge Distance (Uncracked Concrete Only)	c_{ac}	----	Section 3.2.6 of this report						
Strength Reduction Factor for Tension, Concrete Failure Mode, Condition B[1,2,3]	ϕ	----	0.65						
Strength Reduction Factor for Shear, Concrete Failure Mode, Condition B[1,2]	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, 1 MPa = 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.
[2] 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 shall be determined in accordance with ACI 318-11 D.4.4.
[3] The anchor category, as set forth in ACI 318-14 17.3.3 (ACI 318-11 D.4.3), is Category 1.

TABLE 10 –ProAnchor Elite BOND STRENGTH DESIGN INFORMATION FOR THREADED ROD IN HAMMER DRILLED HOLES[1,2,3,4]

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 3/4 (95)	4 (102)	5 (127)
Maximum Embedment Depth			$h_{ef,max}$	in. (mm)	7 1/2 (191)	10 (254)	12 1/2 (318)	15 (381)	17 1/2 (445)	20 (508)	25 (635)
Maximum Short Term Temperature **150 °F** (66 °C)	Cracked Concrete Characteristic Bond Strength	With Sustained Load	$T_{k,cr}$	psi (MPa)	1,231 (8.5)	1,088 (7.5)	1,231 (8.5)	979 (6.7)	1,044 (7.2)	1,153 (7.9)	1,109 (7.6)
		No Sustained Load		psi (MPa)	1,414 (9.7)	1,248 (8.6)	1,414 (9.7)	1,127 (7.8)	1,201 (8.3)	1,327 (9.1)	1,275 (8.8)
	Uncracked Concrete Characteristic Bond Strength	With Sustained Load	$T_{k,uncr}$	psi (MPa)	2,171 (15.0)	2,084 (14.4)	2,001 (13.8)	1,914 (13.2)	1,831 (12.6)	1,744 (12.0)	1,575 (10.9)
		No Sustained Load		psi (MPa)	2,497 (17.2)	2,397 (16.5)	2,301 (15.9)	2,201 (15.2)	2,105 (14.5)	2,005 (13.8)	1,810 (12.5)
Maximum Short Term Temperature **180 °F** (82 °C)	Cracked Concrete Characteristic Bond Strength	With Sustained Load	$T_{k,cr}$	psi (MPa)	1,083 (7.5)	957 (6.6)	1,083 (7.5)	861 (5.9)	918 (6.3)	1,018 (7.0)	974 (6.7)
		No Sustained Load		psi (MPa)	1,244 (8.6)	1,101 (7.6)	1,244 (8.6)	992 (6.8)	1,057 (7.3)	1,170 (8.1)	1,118 (7.7)
	Uncracked Concrete Characteristic Bond Strength	With Sustained Load	$T_{k,uncr}$	psi (MPa)	1,910 (13.2)	1,836 (12.7)	1,762 (12.1)	1,683 (11.6)	1,610 (11.1)	1,536 (10.6)	1,388 (9.6)
		No Sustained Load		psi (MPa)	2,197 (15.1)	2,110 (14.5)	2,027 (14.0)	1,936 (13.3)	1,849 (12.7)	1,766 (12.2)	1,596 (11.0)
Maximum Short Term Temperature **205 °F** (96 °C)	Cracked Concrete Characteristic Bond Strength	With Sustained Load	$T_{k,cr}$	psi (MPa)	493 (3.4)	437 (3.0)	493 (3.4)	391 (2.7)	419 (2.9)	465 (3.2)	446 (3.1)
		No Sustained Load		psi (MPa)	567 (3.9)	502 (3.5)	567 (3.9)	451 (3.1)	479 (3.3)	535 (3.7)	512 (3.5)
	Uncracked Concrete Characteristic Bond Strength	With Sustained Load	$T_{k,uncr}$	psi (MPa)	870 (6.0)	837 (5.8)	800 (5.5)	767 (5.3)	735 (5.1)	698 (4.8)	650 (4.5)
		No Sustained Load		psi (MPa)	1,000 (6.9)	963 (6.6)	921 (6.3)	884 (6.1)	846 (5.8)	800 (5.5)	725 (5.0)
Reduction Factor for Seismic Tension[5]			$\alpha_{N,seis}$	----	1.00			0.77	1.00	0.97	0.96
Continuous Inspection	Strength Reduction Factors for Permissible Installation Conditions[6,7,8]	Dry Concrete	ϕ_d	----	0.65						
		Water Saturated Concrete	ϕ_{ws}	----	0.65		0.55				
		Water-Filled Holes in Concrete	ϕ_{wf}	----	0.55					0.45	
			K_{wf}	----	1.00					0.96	0.88
Periodic Inspection	Strength Reduction Factors for Permissible Installation Conditions[6,7,8]	Dry Concrete	ϕ_d	----	0.65						
		Water Saturated Concrete	ϕ_{ws}	----	0.55		0.45				
		Water-Filled Holes in Concrete	ϕ_{wf}	----	0.45						
			K_{wf}	----	1.00					0.92	0.75

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, 1 MPa = 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 $(f'_c/2{,}500)^{0.1}$ (for SI: $(f'_c/17.2)^{0.1}$). For cracked concrete, no increase in bond strength is permitted.

[2] Lightweight concrete may be used by applying a reduction factor as given in ACI 318-14 17.2.6 or ACI 318-11 D.3.6 as applicable.

[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. The maximum long-term service temperature is 110 °F (43 °C).

[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 shall be multiplied by $\alpha_{n,seis}$.

[6] The tabulated value of ϕ applies when load combinations of Section 1605.2 of the IBC or ACI 318-14 5.3 (ACI 318-11 9.2), are used in accordance with ACI 318-14 17.3.3 (ACI 318-11 D.4.3). If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕshall be determined in accordance with ACI 318 D.4.4.

[7] The values of ϕ correspond to Condition B as described in ACI 318-14 17.3.3 (ACI 318-11 D.4.3) for post-installed anchors designed using the load combinations of IBC Section 1605.2. If the load combinations in ACI 318-11 Appendix C are used, the corresponding value of ϕ shall be determined.

[8] The values of ϕ correspond to the anchor category as set forth in ACI 318-14 17.3.3 (ACI 318-11 D.4.3). The ϕ factor of 0.65 represents Category 1, 0.55 Category 2, and 0.45 Category 3.

TABLE 11 –ProAnchor Elite BOND STRENGTH DESIGN INFORMATION FOR THREADED ROD IN MILWAUKEE TOOL VACUUM BIT DRILLED HOLES[1,2,3,4]

Design Information			Symbol	Units	Threaded Rod				
					5/8"	3/4"	7/8"	1"	1 1/4"
Minimum Embedment Depth			$h_{ef,min}$	in. (mm)	3 1/8 (79)	3 1/2 (89)	3 3/4 (95)	4 (102)	5 (127)
Maximum Embedment Depth			$h_{ef,max}$	in. (mm)	12 1/2 (318)	15 (381)	17 1/2 (445)	20 (508)	25 (635)
Maximum Short Term Temperature **150 °F** (66 °C)	Cracked Concrete Characteristic Bond Strength	With Sustained Load	$T_{k,cr}$	psi (MPa)	1,022 (7.0)	874 (6.0)	900 (6.2)	1,031 (7.1)	992 (6.8)
		No Sustained Load		psi (MPa)	1,175 (8.1)	1,005 (6.9)	1,031 (7.1)	1,183 (8.2)	1,140 (7.9)
	Uncracked Concrete Characteristic Bond Strength	With Sustained Load	$T_{k,uncr}$	psi (MPa)	1,831 (12.6)	1,766 (12.2)	1,701 (11.7)	1,636 (11.3)	1,505 (10.4)
		No Sustained Load		psi (MPa)	2,101 (14.5)	2,027 (14.0)	1,953 (13.5)	1,879 (13.0)	1,727 (11.9)
Maximum Short Term Temperature **180 °F** (82 °C)	Cracked Concrete Characteristic Bond Strength	With Sustained Load	$T_{k,cr}$	psi (MPa)	900 (6.2)	770 (5.3)	792 (5.5)	909 (6.3)	874 (6.0)
		No Sustained Load		psi (MPa)	1,035 (7.1)	883 (6.1)	909 (6.3)	1,044 (7.2)	1,005 (6.9)
	Uncracked Concrete Characteristic Bond Strength	With Sustained Load	$T_{k,uncr}$	psi (MPa)	1,610 (11.1)	1,553 (10.7)	1,496 (10.3)	1,440 (9.9)	1,327 (9.1)
		No Sustained Load		psi (MPa)	1,849 (12.7)	1,784 (12.3)	1,718 (11.8)	1,653 (11.4)	1,523 (10.5)
Maximum Short Term Temperature **205 °F** (96 °C)	Cracked Concrete Characteristic Bond Strength	With Sustained Load	$T_{k,cr}$	psi (MPa)	409 (2.8)	349 (2.4)	358 (2.5)	414 (2.9)	400 (2.8)
		No Sustained Load		psi (MPa)	470 (3.2)	405 (2.8)	414 (2.9)	474 (3.3)	456 (3.1)
	Uncracked Concrete Characteristic Bond Strength	With Sustained Load	$T_{k,uncr}$	psi (MPa)	735 (5.1)	707 (4.9)	684 (4.7)	656 (4.5)	650 (4.5)
		No Sustained Load		psi (MPa)	842 (5.8)	814 (5.6)	781 (5.4)	753 (5.2)	693 (4.8)
Reduction Factor for Seismic Tension[5]			$\alpha_{N,seis}$	----	1.00	0.77	1.00	0.97	0.96
Continuous Inspection	Strength Reduction Factors for Permissible Installation Conditions[6,7,8]	Dry Concrete	ϕ_d	----	0.65				
		Water Saturated Concrete	ϕ_{ws}	----	0.45		0.55		0.65
			K_{ws}	----	1.00				
Periodic Inspection	Strength Reduction Factors for Permissible Installation Conditions[6,7,8]	Dry Concrete	ϕ_d	----	0.65				
		Water Saturated Concrete	ϕ_{ws}	----	0.45	0.45	0.45	0.45	0.55
			K_{ws}	----	0.89	0.96	1.00	1.00	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, 1 MPa = 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 $(f'_c/2{,}500)^{0.1}$ (for SI: $(f'_c/17.2)^{0.1}$). For cracked concrete, no increase in bond strength is permitted.

[2] Lightweight concrete may be used by applying a reduction factor as given in ACI 318-14 17.2.6 or ACI 318-11 D.3.6 as applicable.

[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. The maximum long-term service temperature is 110 °F (43 °C).

[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 shall be multiplied by $\alpha_{N,seis}$.

[6] The tabulated value of ϕ applies when load combinations of Section 1605.2 of the IBC or ACI 318-14 5.3 (ACI 318-11 9.2), are used in accordance with ACI 318-14 17.3.3 (ACI 318-11 D.4.3). If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ shall be determined in accordance with ACI 318 D.4.4.

[7] The values of ϕ correspond to Condition B as described in ACI 318-14 17.3.3 (ACI 318-11 D.4.3) for post-installed anchors designed using the load combinations of IBC Section 1605.2. If the load combinations in ACI 318-11 Appendix C are used, the corresponding value of ϕ shall be determined.

[8] The values of ϕ correspond to the anchor category as set forth in ACI 318-14 17.3.3 (ACI 318-11 D.4.3). The ϕ factor of 0.65 represents Category 1, 0.55 Category 2, and 0.45 Category 3.

TABLE 12 –ProAnchor Elite BOND STRENGTH DESIGN INFORMATION FOR THREADED ROD IN CORE DRILLED HOLES [1,2,3,4]

Design Information			Symbol	Units	Threaded Rod					
					1/2"	5/8"	3/4"	7/8"	1"	1 1/4"
Minimum Embedment Depth			$h_{ef,min}$	in. (mm)	2¾ (70)	3⅛ (79)	3½ (89)	3¾ (95)	4 (102)	5 (127)
Maximum Embedment Depth			$h_{ef,max}$	in. (mm)	10 (254)	12 1/2 (318)	15 (381)	17 1/2 (445)	20 (508)	25 (635)
Maximum Short Term Temperature **150 °F** (66 °C)	Uncracked Concrete Characteristic Bond Strength	With Sustained Load	$T_{k,uncr}$	psi (MPa)	866 (6.0)	866 (6.0)	866 (6.0)	866 (6.0)	866 (6.0)	866 (6.0)
		No Sustained Load		psi (MPa)	996 (6.9)	996 (6.9)	996 (6.9)	996 (6.9)	996 (6.9)	996 (6.9)
Maximum Short Term Temperature **180 °F** (82 °C)	Uncracked Concrete Characteristic Bond Strength	With Sustained Load	$T_{k,uncr}$	psi (MPa)	766 (5.3)	766 (5.3)	766 (5.3)	766 (5.3)	766 (5.3)	766 (5.3)
		No Sustained Load		psi (MPa)	879 (6.1)	879 (6.1)	879 (6.1)	879 (6.1)	879 (6.1)	879 (6.1)
Continuous Inspection	Strength Reduction Factors for Permissible Installation Conditions[5,6,7]	Dry Concrete	ϕ_d	----	0.65					
		Water Saturated Concrete	ϕ_{ws}	----	0.65					
			K_{ws}	----	1.00					
Periodic Inspection	Strength Reduction Factors for Permissible Installation Conditions[5,6,7]	Dry Concrete	ϕ_d	----	0.65					
		Water Saturated Concrete	ϕ_{ws}	----	0.55					
			K_{ws}	----	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, 1 MPa = 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 $(f'_c/2{,}500)^{0.1}$ (for SI: $(f'_c/17.2)^{0.1}$).
[2] Lightweight concrete may be used by applying a reduction factor as given in ACI 318-14 17.2.6 or ACI 318-11 D.3.6 as applicable.
[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. The maximum long-term service temperature is 110 °F (43 °C).
[4] Characteristic bond strength values are for sustained loads (when noted), including dead and live loads.
[5] The tabulated value of ϕ applies when load combinations of Section 1605.2 of the IBC or ACI 318-14 5.3 (ACI 318-11 9.2), are used in accordance with ACI 318-14 17.3.3 (ACI 318-11 D.4.3). If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕshall be determined in accordance with ACI 318 D.4.4.
[6] The values of ϕ correspond to Condition B as described in ACI 318-14 17.3.3 (ACI 318-11 D.4.3) for post-installed anchors designed using the load combinations of IBC Section 1605.2. If the load combinations in ACI 318-11 Appendix C are used, the corresponding value of ϕshall be determined.
[7] The values of ϕ correspond to the anchor category as set forth in ACI 318-14 17.3.3 (ACI 318-11 D.4.3). The ϕfactor of 0.65 represents Category 1 and 0.55 Category 2.

TABLE 13 –ProAnchor Elite STEEL DESIGN INFORMATION FOR REINFORCING BARS[1]

Design Information		Symbol	Units	Rebar Size							
				#3	#4	#5	#6	#7	#8	#9	#10
Nominal Anchor Diameter		d_a	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)	1.127 (28.6)	1.270 (32.3)
Reinforcing Bar Cross-Sectional Area[4]		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	$\alpha_{V,seis}$	----	0.70	0.74	0.78	0.82				
	Strength Reduction Factor for Tension[3]	ϕ	----	0.75							
	Strength Reduction Factor for Shear[3]	ϕ	----	0.65							
ASTM A706 Grade 60	Nominal Strength as Governed by Steel Strength	N_{sa}	lb. (kN)	8,800 (39.1)	16,000 (71.2)	24,800 (110.3)	35,200 (156.6)	48,000 (213.5)	63,200 (281.1)	80,000 (355.9)	101,600 (451.9)
		V_{sa}	lb. (kN)	5,280 (23.5)	9,600 (42.7)	14,880 (66.2)	21,120 (93.9)	28,800 (128.1)	37,920 (168.7)	48,000 (213.5)	60,960 (271.2)
	Reduction Factor for Seismic Shear	$\alpha_{V,seis}$	----	0.70	0.74	0.78	0.82	0.73	0.63	0.53	0.42
	Strength Reduction Factor for Tension[3]	ϕ	----	0.75							
	Strength Reduction Factor for Shear[3]	ϕ	----	0.65							
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	$\alpha_{V,seis}$	----	0.70	0.74	0.78	0.82	0.73	0.63	0.53	0.42
	Strength Reduction Factor for Tension[3]	ϕ	----	0.75							
	Strength Reduction Factor for Shear[3]	ϕ	----	0.65							
ASTM A615 Grade 75	Nominal Strength as Governed by Steel Strength	N_{sa}	lb. (kN)	11,000 (48.9)	20,000 (89.0)	31,000 (137.9)	44,000 (195.7)	60,000 (266.9)	79,000 (351.4)	100,000 (444.8)	127,000 (564.9)
		V_{sa}	lb. (kN)	6,600 (29.4)	12,000 (53.4)	18,600 (82.7)	26,400 (117.4)	36,000 (160.1)	47,400 (210.8)	60,000 (266.9)	76,200 (339.0)
	Reduction Factor for Seismic Shear	$\alpha_{V,seis}$	----	0.70	0.74	0.78	0.82	0.73	0.63	0.53	0.42
	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, 1 MPa = 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 shall 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 shall 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 shall be determined in accordance with ACI 318-11 D4.4. Values correspond to a ductile steel element.

[4] Cross-sectional area is the minimum stress area applicable for either tension or shear

TABLE 14 –ProAnchor Elite CONCRETE BREAKOUT DESIGN INFORMATION FOR REINFORCING BARS

Design Information	Symbol	Units	Reinforcing Bar Size							
			#3	#4	#5	#6	#7	#8	#9	#10
Minimum Embedment Depth	$h_{ef,min}$	in. (mm)	2⅜ (60)	2 ¾ (70)	3⅛ (79)	3½ (89)	3¾ (95)	4 (102)	4½ (114)	5 (127)
Maximum Embedment Depth	$h_{ef,max}$	in. (mm)	7 1/2 (191)	10 (254)	12 1/2 (318)	15 (381)	17 1/2 (445)	20 (508)	22 1/2 (572)	25 (635)
Effectiveness Factor Cracked Concrete	$k_{c,cr}$	---- SI	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)	2 3/16 (56)	2 13/16 (71)	3 3/4 (95)	4 3/8 (111)	5 (127)	5 5/8 (143)	6 1/4 (159)	6 7/8 (175)
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}	----	Section 3.2.6 of this report							
Strength Reduction Factor for Tension, Concrete Failure Mode, Condition B[1,2]	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, 1 MPa = 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 shall be determined in accordance with ACI 318-11 D.4.4.
[2] The anchor category, as set forth in ACI 318-14 17.3.3 (ACI 318-11 D.4.3), is Category 1.

TABLE 15 –ProAnchor Elite BOND STRENGTH DESIGN INFORMATION FOR REINFORCING BARS IN HAMMER DRILLED HOLES[1,2,3,4]

Design Information			Symbol	Units	Reinforcing Bar Size							
					#3	#4	#5	#6	#7	#8	#9	#10
Minimum Embedment Depth			$h_{ef,min}$	in. (mm)	2⅜ (60)	2¾ (70)	3⅛ (79)	3½ (89)	3¾ (95)	4 (102)	4 1/2 (114)	5 (127)
Maximum Embedment Depth			$h_{ef,max}$	in. (mm)	7 1/2 (191)	10 (254)	12 1/2 (318)	15 (381)	17 1/2 (445)	20 (508)	22 1/2 (572)	25 (635)
Maximum Short Term Temperature **150 °F** (66 °C)	Cracked Concrete Characteristic Bond Strength	With Sustained Load	$T_{k,cr}$	psi (MPa)	1,262 (8.7)	1,235 (8.5)	1,214 (8.4)	1,188 (8.2)	1,127 (7.8)	1,066 (7.3)	1,005 (6.9)	940 (6.5)
		No Sustained Load		psi (MPa)	1,449 (10.0)	1,422 (9.8)	1,396 (9.6)	1,366 (9.4)	1,296 (8.9)	1,227 (8.5)	1,157 (8.0)	1,079 (7.4)
	Uncracked Concrete Characteristic Bond Strength	With Sustained Load	$T_{k,uncr}$	psi (MPa)	1,897 (13.1)	1,823 (12.6)	1,749 (12.1)	1,675 (11.5)	1,605 (11.1)	1,531 (10.6)	1,457 (10.0)	1,370 (9.4)
		No Sustained Load		psi (MPa)	2,179 (15.0)	2,097 (14.5)	2,010 (13.9)	1,927 (13.3)	1,844 (12.7)	1,762 (12.1)	1,675 (11.5)	1,575 (10.9)
Maximum Short Term Temperature **180 °F** (82 °C)	Cracked Concrete Characteristic Bond Strength	With Sustained Load	$T_{k,cr}$	psi (MPa)	1,109 (7.6)	1,088 (7.5)	1,070 (7.4)	1,044 (7.2)	992 (6.8)	940 (6.5)	887 (6.1)	827 (5.7)
		No Sustained Load		psi (MPa)	1,275 (8.8)	1,248 (8.6)	1,231 (8.5)	1,201 (8.3)	1,140 (7.9)	1,079 (7.4)	1,018 (7.0)	948 (6.5)
	Uncracked Concrete Characteristic Bond Strength	With Sustained Load	$T_{k,uncr}$	psi (MPa)	1,666 (11.5)	1,601 (11.0)	1,540 (10.6)	1,475 (10.2)	1,409 (9.7)	1,344 (9.3)	1,279 (8.8)	1,209 (8.3)
		No Sustained Load		psi (MPa)	1,914 (13.2)	1,840 (12.7)	1,770 (12.2)	1,697 (11.7)	1,618 (11.2)	1,544 (10.6)	1,470 (10.1)	1,392 (9.6)
Maximum Short Term Temperature **205 °F** (96 °C)	Cracked Concrete Characteristic Bond Strength	With Sustained Load	$T_{k,cr}$	psi (MPa)	507 (3.5)	498 (3.4)	488 (3.4)	474 (3.3)	451 (3.1)	428 (2.9)	405 (2.8)	377 (2.6)
		No Sustained Load		psi (MPa)	581 (4.0)	572 (3.9)	563 (3.9)	544 (3.8)	516 (3.6)	493 (3.4)	465 (3.2)	432 (3.0)
	Uncracked Concrete Characteristic Bond Strength	With Sustained Load	$T_{k,uncr}$	psi (MPa)	758 (5.2)	730 (5.0)	702 (4.8)	670 (4.6)	650 (4.5)	650 (4.5)	Not Applicable	
		No Sustained Load		psi (MPa)	870 (6.0)	837 (5.8)	809 (5.6)	772 (5.3)	739 (5.1)	707 (4.9)	670 (4.6)	650 (4.5)
Reduction Factor for Seismic Tension[5]			$\alpha_{N,seis}$	----	1.00					0.97	0.97	0.96
Continuous Inspection	Strength Reduction Factors for Permissible Installation Conditions[6,7,8]	Dry Concrete	ϕ_d	----	0.65							
		Water Saturated Concrete	ϕ_{ws}	----	0.65		0.55					
		Water-Filled Holes in Concrete	ϕ_{wf}	----	0.55					0.45		
			K_{wf}	----	1.00					0.96	0.92	0.88
Periodic Inspection	Strength Reduction Factors for Permissible Installation Conditions[6,7,8]	Dry Concrete	ϕ_d	----	0.65							
		Water Saturated Concrete	ϕ_{ws}	----	0.55		0.45					
		Water-Filled Holes in Concrete	ϕ_{wf}	----	0.45							
			K_{wf}	----	1.00					0.92	0.83	0.75

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, 1 MPa = 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 $(f'_c/2{,}500)^{0.1}$ (for SI: $(f'_c/17.2)^{0.1}$). For cracked concrete, no increase in bond strength is permitted.

[2] Lightweight concrete may be used by applying a reduction factor as given in ACI 318-14 17.2.6 or ACI 318-11 D.3.6 as applicable.

[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. The maximum long-term service temperature is 110 °F (43 °C).

[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 shall be multiplied by $\alpha_{n,seis}$.

[6] The tabulated value of ϕ applies when load combinations of Section 1605.2 of the IBC or ACI 318-14 5.3 (ACI 318-11 9.2), are used in accordance with ACI 318-14 17.3.3 (ACI 318-11 D.4.3). If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ shall be determined in accordance with ACI 318 D.4.4.

[7] The values of ϕ correspond to Condition B as described in ACI 318-14 17.3.3 (ACI 318-11 D.4.3) for post-installed anchors designed using the load combinations of IBC Section 1605.2. If the load combinations in ACI 318-11 Appendix C are used, the corresponding value of ϕ shall be determined.

[8] The values of ϕ correspond to the anchor category as set forth in ACI 318-14 17.3.3 (ACI 318-11 D.4.3). The ϕ factor of 0.65 represents Category 1, 0.55 Category 2, and 0.45 Category 3.

TABLE 16 –ProAnchor Elite BOND STRENGTH DESIGN INFORMATION FOR REINFORCING BARS IN CORE DRILLED HOLES[1,2,3,4]

Design Information			Symbol	Units	Reinforcing Bar Size						
					#4	#5	#6	#7	#8	#9	#10
Minimum Embedment Depth			$h_{ef,min}$	in.	2 3/4	3 1/8	3 1/2	3 3/4	4	4 1/2	5
				(mm)	(70)	(79)	(89)	(95)	(102)	(114)	(127)
Maximum Embedment Depth			$h_{ef,max}$	in.	10	12 1/2	15	17 1/2	20	22 1/2	25
				(mm)	(254)	(318)	(381)	(445)	(508)	(572)	(635)
Maximum Short Term Temperature **150 °F** (66 °C)	Uncracked Concrete Characteristic Bond Strength	With Sustained Load	$T_{k,uncr}$	psi	1,335	1,300	1,200	1,105	1,010	910	800
				(MPa)	(9.2)	(8.9)	(8.3)	(7.6)	(7.0)	(6.3)	(5.5)
		No Sustained Load		psi	1,530	1,490	1,380	1,270	1,155	1,045	920
				(MPa)	(10.6)	(10.3)	(9.5)	(8.8)	(8.0)	(7.2)	(6.3)
Maximum Short Term Temperature **180 °F** (82 °C)	Uncracked Concrete Characteristic Bond Strength	With Sustained Load	$T_{k,uncr}$	psi	1,175	1,145	1,055	975	885	800	705
				(MPa)	(8.1)	(7.9)	(7.3)	(6.7)	(6.1)	(5.5)	(4.9)
		No Sustained Load		psi	1,350	1,315	1,215	1,120	1,020	920	810
				(MPa)	(9.3)	(9.1)	(8.4)	(7.7)	(7.0)	(6.3)	(5.6)
Continuous Inspection	Strength Reduction Factors for Permissible Installation Conditions[5,6,7]	Dry Concrete	ϕ_d	----	0.65						
		Water Saturated Concrete	ϕ_{ws}	----	0.65						
			K_{ws}	----	1.00						
Periodic Inspection	Strength Reduction Factors for Permissible Installation Conditions[5,6,7]	Dry Concrete	ϕ_d	----	0.65						
		Water Saturated Concrete	ϕ_{ws}	----	0.55						
			K_{ws}	----	1.00						

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] 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 $(f'_c/2{,}500)^{0.1}$ (for SI: $(f'_c/17.2)^{0.1}$). For cracked concrete, no increase in bond strength is permitted.

[2] Lightweight concrete may be used by applying a reduction factor as given in ACI 318-14 17.2.6 or ACI 318-11 D.3.6 as applicable.

[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. The maximum long-term service temperature is 110 °F (43 °C).

[4] Characteristic bond strength values are for sustained loads (when noted), including dead and live loads.

[5] The tabulated value of ϕ applies when load combinations of Section 1605.2 of the IBC or ACI 318-14 5.3 (ACI 318-11 9.2), are used in accordance with ACI 318-14 17.3.3 (ACI 318-11 D.4.3). If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ shall be determined in accordance with ACI 318 D.4.4.

[6] The values of ϕ correspond to Condition B as described in ACI 318-14 17.3.3 (ACI 318-11 D.4.3) for post-installed anchors designed using the load combinations of IBC Section 1605.2. If the load combinations in ACI 318-11 Appendix C are used, the corresponding value of ϕ shall be determined.

[7] The values of ϕ correspond to the anchor category as set forth in ACI 318-14 17.3.3 (ACI 318-11 D.4.3). The ϕ factor of 0.65 represents Category 1 and 0.55 Category 2.

TABLE 17 –ProAnchor Elite STEEL DESIGN INFORMATION FOR INTERNALLY THREADED INSERT[1]

Design Information		Symbol	Units	PS2-38	PS2-12	PS2-58	PS2-34	PS2-1
Nominal Anchor Diameter		d_a	in. (mm)	0.484 (12.3)	0.591 (15.0)	0.819 (20.8)	0.898 (22.8)	1.450 (36.8)
Cross-Sectional Area[4]		A_{se}	in.^{2} (mm^2)	0.102 (66)	0.135 (87)	0.302 (195)	0.385 (248)	0.785 (506)
Specified Tensile Strength		F_{uta}	psi	64,000				
ASTM A29 Grade 1020 Carbon Steel	Nominal Strength as Governed by Steel Strength	N_{sa}	lb. (kN)	6,625 (29.5)	8,805 (39.2)	19,625 (87.3)	25,015 (111.3)	51,050 (227.1)
		V_{sa}	lb. (kN)	3,975 (17.7)	5,285 (23.5)	11,775 (52.4)	15,010 (66.8)	30,630 (136.2)
	Strength Reduction Factor for Tension[3]	ϕ	----	0.75				
	Strength Reduction Factor for Shear[3]	ϕ	----	0.65				
Design Information		**Symbol**	**Units**	**PS6-38**	**PS6-12**	**PS6-58**	**PS6-34**	**PS6-1**
Nominal Anchor Diameter		d_a	in. (mm)	0.484 (12.3)	0.591 (15.0)	0.819 (20.8)	0.898 (22.8)	1.450 (36.8)
Cross-Sectional Area		A_{se}	in.^{2} (mm^2)	0.102 (66)	0.135 (87)	0.302 (195)	0.385 (248)	0.785 (506)
Specified Tensile Strength		F_{uta}	psi	100,000		85,000		
Type 316 Stainless Steel	Nominal Strength as Governed by Steel Strength	N_{sa}	lb. (kN)	10,195 (45.3)	13,550 (60.3)	30,190 (134.3)	32,710 (145.5)	66,760 (297.0)
		V_{sa}	lb. (kN)	6,115 (27.2)	8,130 (36.2)	18,115 (80.6)	19,625 (87.3)	40,055 (178.2)
	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, 1 lbf = 4.448 N, 1 psi = 0.006897 MPa
For pound-inch units: 1 mm = 0.03937-inch, 1 N = 0.2248 lbf, 1 MPa = 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 shall 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 shall 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 shall be determined in accordance with ACI 318-11 D4.4. Values correspond to a ductile steel element.
[4] Cross-sectional area is the minimum stress area applicable for either tension or shear.

TABLE 18 –ProAnchor Elite CONCRETE BREAKOUT DESIGN INFORMATION FOR INTERNALLY THREADED INSERT

Design Information	Symbol	Units	PS2-38 PS6-38	PS2-12 PS6-12	PS2-58 PS6-58	PS2-34 PS6-34	PS2-1 PS6-1
Minimum Embedment Depth	h_a	in. (mm)	2 3/4 (70)	3 11/16 (94)	5 3/4 (146)	6 1/2 (165)	8 1/2 (216)
Effective Embedment Depth for Concrete Breakout Design	$h_{ef,cb}$	in. (mm)	2½ (64)	3½ (89)	5½ (140)	6.2 (157)	8.2 (208)
Maximum Embedment Depth	$h_{ef,max}$	in. (mm)	Not Applicable				
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)	2 1/2 (64)	3 1/8 (79)	4 3/8 (111)	5 (127)	7 1/2 (191)
Minimum Concrete Thickness	h_{min}	in. (mm)	4 1/2 (114)	5 3/8 (137)	8 (203)	9½ (241)	12 1/2 (318)
Critical Edge Distance (Uncracked Concrete Only)	c_{ac}	in.	Section 3.2.6 of this report				
Strength Reduction Factor for Tension, Concrete Failure Mode, Condition B[1,2]	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, 1 MPa = 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 shall be determined in accordance with ACI 318-11 D.4.4.
[2] The anchor category, as set forth in ACI 318-14 17.3.3 (ACI 318-11 D.4.3), is Category 1.

TABLE 19 –ProAnchor Elite BOND STRENGTH DESIGN INFORMATION FOR INTERNALLY THREADED INSERT IN HAMMER DRILLED HOLES[1,2,3,4]

Design Information			Symbol	Units	PS2-38 PS6-38	PS2-12 PS6-12	PS2-58 PS6-58	PS2-34 PS6-34	PS2-1 PS6-1
Internal Thread Diameter			d_t	in.-TPI	3/8 - 16	1/2 - 13	5/8 - 11	3/4 - 10	1 - 8
Drill Bit Diameter			d_o	in.	1/2	5/8	7/8	1	1 1/2
Recommended Drill Depth			h_{drill}	in. (mm)	3 1/4 (83)	4 1/8 (105)	6 1/4 (159)	7 1/2 (191)	9 1/2 (241)
Overall Anchor Length			h_a	in. (mm)	2 3/4 (70)	3 11/16 (94)	5 3/4 (146)	6 1/2 (165)	8 1/2 (216)
Bond Effective Embedment Depth			$h_{ef,bond}$	in. (mm)	1.550 (39)	2.488 (63)	3.750 (95)	3.744 (95)	5.000 (127)
Maximum Short Term Temperature **150 °F** (66 °C)	Uncracked Concrete Characteristic Bond Strength	With Sustained Load	$T_{k,uncr}$	psi (MPa)	1,905 (13.1)	1,814 (12.5)	1,627 (11.2)	1,562 (10.8)	1,096 (7.6)
		No Sustained Load		psi (MPa)	2,184 (15.1)	2,084 (14.4)	1,866 (12.9)	1,792 (12.4)	1,257 (8.7)
Maximum Short Term Temperature **180 °F** (82 °C)	Uncracked Concrete Characteristic Bond Strength	With Sustained Load	$T_{k,uncr}$	psi (MPa)	1,675 (11.5)	1,596 (11.0)	1,431 (9.9)	1,375 (9.5)	966 (6.7)
		No Sustained Load		psi (MPa)	1,923 (13.3)	1,831 (12.6)	1,644 (11.3)	1,575 (10.9)	1,109 (7.6)
Maximum Short Term Temperature **205 °F** (96 °C)	Uncracked Concrete Characteristic Bond Strength	With Sustained Load	$T_{k,uncr}$	psi (MPa)	820 (5.7)	780 (5.4)	700 (4.8)	670 (4.6)	Not Applicable
		No Sustained Load		psi (MPa)	874 (6.0)	837 (5.8)	749 (5.2)	716 (4.9)	Not Applicable
Continuous Inspection	Strength Reduction Factors for Permissible Installation Conditions[5,6,7]	Dry Concrete	ϕ_d	----	0.65				
		Water Saturated Concrete	ϕ_{ws}	----	0.65	0.55			
Periodic Inspection	Strength Reduction Factors for Permissible Installation Conditions[5,6,7]	Dry Concrete	ϕ_d	----	0.65				
		Water Saturated Concrete	ϕ_{ws}	----	0.55	0.45			

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, 1 MPa = 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 $(f'_c/2{,}500)^{0.1}$ (for SI: $(f'_c/17.2)^{0.1}$).
[2] Lightweight concrete may be used by applying a reduction factor as given in ACI 318-14 17.2.6 or ACI 318-11 D.3.6 as applicable.
[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. The maximum long-term service temperature is 110 °F (43 °C).
[4] Characteristic bond strength values are for sustained loads (when noted), including dead and live loads.
[5] The tabulated value of ϕ applies when load combinations of Section 1605.2 of the IBC or ACI 318-14 5.3 (ACI 318-11 9.2), are used in accordance with ACI 318-14 17.3.3 (ACI 318-11 D.4.3). If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ shall be determined in accordance with ACI 318 D.4.4.
[6] The values of ϕ correspond to Condition B as described in ACI 318-14 17.3.3 (ACI 318-11 D.4.3) for post-installed anchors designed using the load combinations of IBC Section 1605.2. If the load combinations in ACI 318-11 Appendix C are used, the corresponding value of ϕ shall be determined.
[7] The values of ϕ correspond to the anchor category as set forth in ACI 318-14 17.3.3 (ACI 318-11 D.4.3). The ϕ factor of 0.65 represents Category 1, 0.55 Category 2, and 0.45 Category 3.

TABLE 20 – ProAnchor Elite PERMITTED INSTALLATIONS

Anchor Type	Hole Drilling Method	Concrete Condition					
		Uncracked			Cracked		
		Installation Condition					
		Dry	Water Saturated Holes	Water-Filled Holes	Dry	Water Saturated Holes	Water-Filled Holes
Threaded Rod	Hammer Drill	✓	✓	✓	✓	✓	✓
	Vacuum Drill	✓	✓	-	✓	✓	-
	Core Drill	✓	✓	-	-	-	-
Reinforcing Bar	Hammer Drill	✓	✓	✓	✓	✓	✓
	Core Drill	✓	✓	-	-	-	-
Internally Threaded Insert	Hammer Drill	✓	✓	-	-	-	-

TABLE 21: ProAnchor Elite Performance to ASTM C881-15[1,2,3]

Property	Cure Time	ASTM Standard	Units	Sample Conditioning Temperature				
				Class A	Class B	Optional	Optional	Class C
				38 °F (3 °C)	50 °F (10 °C)	75 °F (24 °C)	110 °F (43 °C)	125 °F (52 °C)
Gel Time – 60 Gram Mass[4]	----	C881	Min	14	13	10	2[4]	2[4]
Consistency or Viscosity			----	Non-sag				
Compressive Yield Strength	7 day	D695	PSI (MPa)	12,980 (89.5)	13,280 (91.6)	14,480 (99.8)	14,500 (100.0)	13,430 (92.6)
Compressive Modulus			PSI (MPa)	534,900 (3,688)	506,100 (3,489)	475,900 (3,281)	599,600 (4,134)	585,600 (4,038)
Bond Strength Hardened to Hardened Concrete	2 day	C882	PSI (MPa)	2,700 (18.6)	2,770 (19.1)	2,780 (19.2)	3,150 (21.7)	2,050 (14.1)
	14 Day		PSI (MPa)	2,860 (19.7)	2,950 (20.3)	3,110 (21.4)	3,050 (21.0)	2,080 (14.3)
Bond Strength Fresh to Hardened Concrete			PSI (MPa)	2,730 (18.8)				
Tensile Strength[5]	7 day	D638	PSI (MPa)	6,780 (46.7)				
Tensile Elongation[5]			%	1.0				
Heat Deflection Temperature		D648	°F (°C)	148 (64)				
Water Absorption	14 day	D570	%	0.02				
Linear Coefficient of Shrinkage	----	D2566	%	0.0003				

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.
5. Optional testing for ASTM C881 Grade 3.

FIGURE 6 – MPII FOR ProAnchor Elite HIGH STRENGTH ANCHORING EPOXY

DRILLING AND CLEANING

Hammer Drilled Holes - Dry, Water Saturated (Damp) or Water-Filled (Wet) in Cracked and Uncracked Concrete

1a. Recommended Dust Extractor System for drilling into dry and damp uncracked concrete - Attach appropriate size drill bit to the Dust Extractor Vacuum System. The drill bit should conform to ANSI B212.15 and be the appropriate size for the anchor diameter to be installed. Drill hole to the specified embedment depth.

➔ GO TO STEP 6 FOR CARTRIDGE OR BULK SYSTEMS

1b. Traditional Drilling Method for dry, damp and wet cracked and uncracked concrete: Using a rotary hammer drill, and while following the manufacturer's operations manual, select appropriate size drill bit in compliance with ANSI B212.15, drill hole into the base material to the specified embedment depth. **CAUTION:** Always wear appropriate personal protection equipment (PPE) for eyes, ears and skin. Avoid inhalation of dust during the drilling and cleaning process. Refer to the Safety Data Sheet (SDS) for details prior to proceeding.

BLOW (2X) - BRUSH (2X) - BLOW (2X)

2. BLOW - NOTE: Remove any standing water from hole prior to beginning the cleaning process by using oil-free compressed air using a minimum pressure of 87 psi (6 bar). Insert the air wand to the bottom of the drilled hole and blow out the debris with an up/down motion for a minimum of 2 seconds/cycles (2X).

3. BRUSH - Select the correct wire brush size for the drilled hole diameter, making sure that the brush is long enough to reach the bottom of the drilled hole. Reaching the bottom of the hole (use brush extension if required), brush in an up/down and twisting motion for 2 cycles (2X). **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.

4. BLOW - Blow the hole out once more to remove brush debris using oil free compressed air with a minimum pressure of 87 psi (6 bar). Insert the air wand to the bottom of the drilled hole and blow out the debris with an up/down motion for a minimum of 2 seconds/cycles (2X). Visually inspect the hole to confirm it is clean. **NOTE:** If installation will be delayed for any reason, cover cleaned holes to prevent contamination.

➔ GO TO STEP 6 FOR EITHER CARTRIDGE OR BULK SYSTEMS

Core Drilled Holes - Dry or Water Saturated (Damp) in Uncracked Concrete

1. Using a core drill, and while following the manufacturer's operations manual, select appropriate size drill bit. Drill hole into the base material to the specified embedment depth. Remove center core and ensure that the specified embedment depth can be achieved. **CAUTION:** Always wear appropriate personal protection equipment (PPE) for eyes, ears and skin. Avoid inhalation of dust during the drilling and cleaning process. Refer to the Safety Data Sheet (SDS) for details prior to proceeding.

2. FLUSH - Using pressurized water, place the tip of the water nozzle at the bottom or back of the drilled hole. Rinse the drilled hole with pressurized water until the water flows clean and free of debris.

BLOW (2X) - BRUSH (2X) - BLOW (2X)

3. BLOW - NOTE: Remove any standing water from hole prior to beginning the cleaning process. Using oil-free compressed air with a minimum pressure of 87 psi (6 bar), insert the air wand to the bottom of the drilled hole and blow out the debris with an up/down motion for a minimum of 2 seconds/cycles (2X).

4. BRUSH - Select the correct wire brush size for the drilled hole diameter, making sure that the brush is long enough to reach the bottom of the drilled hole. Reaching the bottom of the hole (use brush extension if required), brush in an up/down and twisting motion for 2 cycles (2X). **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.

5. BLOW - Blow the hole out once more to remove brush debris using oil free compressed air with a minimum pressure of 87 psi (6 bar). Insert the air wand to the bottom of the drilled hole and blow out the debris with an up/down motion for a minimum of 2 seconds/cycles (2X). Visually inspect the hole to confirm it is clean. **NOTE:** If installation will be delayed for any reason, cover cleaned holes to prevent contamination.

➔ GO TO STEP 6 FOR CARTRIDGE OR BULK SYSTEMS

DISPENSING PREPARATION

Cartridge Systems

6. CAUTION: Check the expiration date on the cartridge to ensure it is not expired. **Do not use expired product!** Remove the protective cap from the cartridge and insert the cartridge into the recommended dispensing tool. 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.

7. Only after the cartridge has been balanced, screw on the proper Dayton Superior Corporation mixing nozzle to the cartridge. Do not modify mixing nozzle and confirm that internal mixing element is in place prior to dispensing adhesive. Take note of the air and base material temperatures and review the working/full cure time chart prior to starting the injection process.

8. Dispense an initial amount of material from the mixing nozzle onto a disposable surface until the product is a uniform gray color with no streaks, as adhesive must be properly mixed in order to perform as published. Dispose of the initial amount of adhesive according to federal, state and local regulations prior to injection into the drill hole. **CAUTION:** When changing cartridges, never re-use nozzles. For a new cartridge (or if working time has been exceeded), ensure that cartridge opening is clean, install a new nozzle and repeat Steps 6 and 7 accordingly. Leave the mixing nozzle attached to the cartridge upon completion of work.

➔ GO TO STEP 11

FIGURE 6 – MPII FOR ProAnchor Elite HIGH STRENGTH ANCHORING EPOXY (continued)

Bulk Systems

The bulk pump uses a two component delivery system whereby metering individual components and mixing of the two components are automatically controlled during dispensing through a metering manifold and disposable mixing nozzle. The bulk pump has a minimum input air pressure requirement of 80-90 psi @ 15 CFM, supplied through a regulator which reduces the pressure in order to control the rate of dispensing. The two individual adhesive components stay separate throughout the system, until they reach the specified disposable mixing nozzle via a manifold at the end of the bulk pump wand. Under normal operation, the bulk pump must be capable of dispensing the individual components at a 1:1 mix ratio by volume with a tolerance of ± 2%.

6. **CAUTION:** Check the expiration date on each product container to ensure it is not expired. **Do not use expired product!** Epoxy materials may separate. This is normal and can be expected when stored over a period of time. Part A Resin should not be remixed. Part B Hardener should be remixed with a clean 5 gallon paint stick in a "butter churning" motion to homogenize the product prior to pouring the hardener into the appropriate side of the bulk dispensing pump. **CAUTION:** Stir carefully to avoid whipping air into product.

7. **NOTE: Review Bulk Pump Operations Manual thoroughly before proceeding and follow all steps necessary for set- up and operation of the pump.** Pour Resin into Side A pump reservoir. Close lid on Side A. Pour Hardener into Side B pump reservoir. Close lid on Side B. **NOTE:** Fill hoppers at least one-half full. Incoming air supply pressure should be maintained at approximately 100 psi (6.9 bar). Follow bulk pump instructions for filling the metering pump and outlet assembly, then bleed the air from the system and fill the hose and applicator.

8. Balance the bulk pump machine following instructions in the Bulk Pump Operations Manual. **NOTE:** Be sure to establish proper flow of both materials at the applicator tip prior to attaching mixing nozzle. A ratio check should always be performed before installation begins to ensure that equal volumes of Part A and Part B are being dispensed.

9. After the proper pump dispensing ratio has been verified, place the appropriate mixing nozzle onto the bulk pump wand. Do not modify mixing nozzle. Confirm that the internal mixing element is in place prior to dispensing adhesive. Never use without the mixing nozzle.

10. Dispense the initial amount of material from the mixing nozzle onto a disposable surface until the product Dispose of the initial amount of adhesive according to federal, state and local regulations prior to injection into the drill hole. Take note of the air and base material temperatures and review the working/full cure time chart prior to starting the injection process.

INSTALLATION AND CURING
Vertical Down, Horizontal and Overhead

11. **NOTE:** The engineering drawings must be followed. For any applications not covered by this document, or for installation questions, please contact Dayton Superior Corporation. Insert the mixing nozzle, using an extension tube if necessary, to the bottom of the hole and fill from the bottom to the top approximately 2/3 full, being careful not to withdraw the nozzle too quickly as this may trap air in the adhesive. For internally threaded inserts only fill the hole to approximately half. **NOTE:** Building Code Requirements for Structural Concrete (ACI 318-11 / ACI 318-14) requires the Installer to be certified where adhesive anchors are to be installed in horizontal or overhead installations. If extension tubing is needed, it may be connected onto the outside of the tip of both the small mixing nozzle and the large mixing nozzle. **NOTE:** When using a pneumatic dispensing tool, ensure that pressure is set at 90 psi (6.2 bar) maximum.

12. Piston plugs must be used for overhead installations and those between horizontal and overhead. Select the proper piston plug for the drill hole diameter. The piston plug fits directly onto the tip of both the small and large mixing nozzle. Extension tubing may also be used if needed in order to reach the bottom of the drill hole.

13. Prior to inserting the threaded rod or rebar into the hole, make sure it is straight, clean and free of oil and dirt and that the necessary embedment depth is marked on the anchor element. Insert the anchor element 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 anchor. For installing the internally threaded inserts, thread a bolt into the insert and press it into the hole with a slight twisting motion. To finish, drive the insert down with sharp blows to the head of the bolt with a hammer until it is flush with the surface of the concrete. **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.

14. For overhead installations, horizontal and inclined (between horizontal and overhead), wedges should be used to support the anchor while the adhesive is curing. Take appropriate steps to protect the exposed threads of the anchor element from uncured adhesive until after the full cure time has elapsed.

15. Do not disturb, torque or apply any load to the installed anchor until the specified full cure time has passed. The amount of time needed to reach full cure is base material temperature dependent.