

## **Product Description**

PC-Concrete Pro<sup>™</sup> is a code compliant, two component (1:1 mix ratio by volume), high performance epoxy anchoring system approved for use in cartridges and in bulk with threaded rod and reinforcing bar for cracked and uncracked concrete conditions, and internally threaded inserts in uncracked concrete, in accordance with ACI 355.4 and ICC-ES AC308. It has an extended application temperature range between 43 °F and 110 °F (6 °C and 43 °C) for structural applications per IAPMO ER-632 and between 38 °F and 125 °F (3 °C and 52 °C) for transportation infrastructure applications to AASHTO M235 & ASTM C881.

#### Specification

Anchoring adhesive shall be a two component, 1:1 ratio by volume, epoxy anchoring system supplied in pre-measured cartridges or bulk. 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 148 °F (64 °C) per ASTM D648 and have a compressive yield strength of 14,480 psi (99.8 MPa) at 75° F (24 °C) after a 7 day cure per ASTM D695. Adhesive shall be PC-Concrete Pro<sup>™</sup> from Protective Coating Company. Anchors shall be installed per the Manufacturer's Printed Installation Instructions (MPII) for PC-Concrete Pro<sup>™</sup> anchoring system.

### Availability

Protective Coating Co. products are available online and through select distributors providing all your construction needs. Please contact Protective Coating Co. for a distributor near you or visit www.pcepoxy.com.

## STANDARDS AND APPROVALS

CODE COMPLIANT:

## **IAPMO-UES ER-632**

IBC/IRC 2018, 2015, 2012, 2009

Florida Building Code (FBC) Compliant: 2017 & 2014

City of Los Angeles Code (LABC/LARC) Compliant: 2017

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



## **General Uses & Applications**

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

### Advantages & Features

- IAPMO ER-632 evaluation report for use in cracked and uncracked normal weight and lightweight concrete
- Code Compliant in cartridge and bulk dispensing systems, IBC/ IRC: 2018, 2015, 2012 & 2009
- ICC-ES AC308 and ACI 355.4 assessed for resisting short term loading conditions up to 205 °F (96 °C)
- Suitable for core drilled installations in dry or water saturated concrete
- Multiple anchor types: threaded rod, rebar & internally threaded inserts
- OSHA Table 1 compliant drilling/cleaning method using Milwaukee Tool hollow vacuum bit system
- Qualified for Seismic Design Categories A through F
- Florida Building Code (FBC) Compliant: 2017 & 2014
- City of Los Angeles Code (LABC/LARC) Compliant: 2017
- Made in the USA in accordance with CFR 49 section 50101

### Color & Ratio:

#### Storage & Shelf Life

- Part A (Resin) WhitePart B (Hardener) Dark Gray
- 24 months when stored in unopened containers in dry and dark conditions
- Mixed Ratio: 1:1 by volumeMixed Color Gray
- and dark conditions
  Store between 40 °F (4 °C) and 95 °F (35 °)
- xed Color Gray

#### Installation & Estimation:

Manufacturer's Printed Installation Instructions (MPII) are available in this Technical Data Sheet. Due to occasional updates and revisions, always verify that you are using the most current version of the MPII. In order to achieve maximum results, proper installation is imperative.

### Clean-Up:

Clean uncured materials from tools and equipment with mild solvents. Cured material can only be removed mechanically.

#### 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 PC-Concrete Pro™ Call Protective Coating Co. for more information at 610-432-3543.

# **ORDERING INFORMATION**

De de la cierci	8.6 fl. oz.	21.2 fl. oz.	10 Gallon (38 L) Kit				
Package Size	Cartridge	Cartridge	Resin	Hardener			
Part #	079003	072202	071007-A 071007-				
Manual Dispensing Tool	900550	993002	N/A				
Pneumatic Dispensing Tool	NI/A	996003	Pump <sup>1</sup>				
Battery Tool	N/A	996188	N/A				
Case Qty.	1	2	N	I/A			
Pallet Qty.	1,116	432	12 kits				
Recommended Mixing Nozzle	10 in (254 m 15.75 in (4	m) #072226 or 400 mm) #076224	076224				
SDS Brush Adaptor		BRD	DA01				
Brush Extension		BR	EXT				
Nozzle Extension Tubing		TE	ХТ				
Retention Wedge	WDGE						

## PART NUMBERS

TABLE 1: PC-Concrete Pro™ Adhesive, Dispensing Tools and Mixing Nozzles

1. For bulk dispensing pumps, contact Protective Coating Co. for recommended manufacturers.

## **Milwaukee Tool Dust Extraction System**

In order to reduce the risks to respirable crystalline silica, PC-Concrete Pro<sup>™</sup> has been tested and approved for use in conjunction with Milwaukee Tool's OSHA compliant, commercially available dust extraction products for use in combination with PC-Concrete Pro<sup>™</sup> installations in dry and water saturated (damp) concrete (see Table 2 for details). When used in accordance with the manufacturer's instructions, and in conjunction with PC-Concrete Pro<sup>™</sup>, these Vacuum Drill Bits along with the Dust Extractor with HEPA filter as specified by Milwaukee Tool, can completely replace the traditional blow-brush-blow cleaning method used to install threaded rod or rebar (see Installation Instructions (MPII) for more detail). Important: Prior to injecting the adhesive, the hole must always be clean, either by using self-cleaning vacuum bits or by using the blow-brush-blow cleaning method with a traditional hammer drill bit and dust shroud. Only vacuuming out a hole drilled with a standard masonry bit is NOT acceptable and will yield lower performance than published for the anchoring/doweling adhesive.

Part # <sup>1</sup>	Drill Type	Drill Bit Size in.	Overall Length in.	Useable Length in.				
48-20-2102		7/16	13	7 7/8				
48-20-2106		1/2	13	7 7/8				
48-20-2110	SDS+	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		5/8	23	15 3/4				
48-20-2156		3/4	23	15 3/4				
48-20-2160	CDC May	7/8	23	15 3/4				
48-20-2164	SDS-IVIAX	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 2: Milwaukee Vacuum Drill Components<sup>1</sup>

1. Vacuum drill accessories available from Milwaukee distributors nationwide.

Form No. 1.0

# **Technical Data Sheet**

				,			
Threaded Rod in.	Rebar	Drill Bit Diameter in.	Maximum Installation Torque ft-lbs. (N-m)	Brush Part #	Brush Length in.	Piston Plug Part #	Color
3/8		7/16	15 (20)	B6716		P0716	Plack
	#3	1/2		B6012		10/10	DIACK
1/2		9/16	30 (41)	B6916	6	P0916	Blue
	#4	5/8		B6058	Ū.	P058	Red
5/8	#5	3/4	60 (82)	B6034		P034	Yellow
3/4	#6	7/8	105 (142)	B6078		P078	Green
7/8	#7	1	125 (170)	B9001		P100	Black
1	#8	1 1/8	165 (224)	B9118		P118	Orange
1 1/4	#9	1 3/8	280 (381)	B9138	9	P138	Brown
	#10	1 1/2		B9112		P112	Gray

**TABLE 3:** PC-Concrete Pro<sup>™</sup> **installation parameters**, brushes and piston plugs

# **MATERIAL SPECIFICATION**

TABLE 4: PC-Concrete Pro™ performance to ASTM C881-15<sup>1,2,3</sup>

					Sample	Conditioning Tem	perature			
		ASTM		Class A	Class B	Optional	Optional	Class C		
Property	Cure Time	Standard	Units	38 °F	50 °F	75 °F	110 °F	125 °F		
				(3 °C)	(10 °C)	(24 °C)	(43 °C)	(52 °C)		
Gel Time - 60 Gram Mass		C881	min	14	13	10	24	24		
Consistency or Viscosity		C881			•	Non-sag				
Compressive Vield Strength			psi	12,980	13,280	14,480	14,500	13,430		
Compressive field Strength	7 dav	D695	(MPa)	(89.5)	(91.6)	(99.8)	(100.0)	(92.6)		
Compressive Modulus	, duy	2000	psi	534,900	506,100	475,900	599,600	585,600		
			(MPa)	(3,688)	(3,489)	(3,281)	(4,134)	(4,038)		
	2 day		psi	2,700	2,770	2,780	3,150	2,050		
Bond Strength	2 day		(MPa)	(18.6)	(19.1)	(19.2)	(21.7)	(14.1)		
Hardened to Hardened Concrete		C002	psi	2,860	2,950	3,110	3,050	2,080		
	11 dov	0002	(MPa)	(19.7)	(20.3)	(21.4)	(21.0)	(14.3)		
Bond Strength	14 uay		psi	2.730						
Fresh to Hardened Concrete			(MPa)	(18.8)						
			psi			6 780				
Tensile Strength <sup>o</sup>		DC20	(MPa)			(46.7)				
	7 dav	D638				(40.7)				
Tensile Elongation <sup>o</sup>	. aay		%			1.0				
		D648	°F			148				
Heat Deflection Temperature		D040	(°C)	(64)						
Water Absorption	24 hr	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.

## **TABLE 5:** PC-Concrete Pro<sup>™</sup> **CURE SCHEDULE**<sup>1,2,3</sup>

Base Material Temperature °F (°C)	Working Time min	Full Cure Time hr
43 (6)	45	144
50 (10)	35	72
75 (24)	16	7
90 (32)	12	4
110 (43)	3	2

 Working and full cure times are approximate, may be linearly interpolated between listed temperatures and are based on cartridge/nozzle system performance.
 Application Temperature: Substrate and ambient air temperature should be

2. Application temperature: Substrate and ambient air temperature should be between 43 - 110 °F (6 - 43 °C).

3. When ambient or base material temperature falls below 70 °F (21 °C), condition the adhesive to 70 - 75 °F (21 - 24 °C) prior to use.

# **MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS**

## **Drilling and Cleaning**

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

1. (A) Recommended Dust Extractor System for drilling into dry and damp cracked and 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 the hole to the specified embedment depth.

GO TO STEP 6 FOR EITHER CARTRIDGE OR BULK SYSTEMS

(B) 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 & skin and 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. 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).
- 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, Water Saturated (Damp) Uncracked Concrete

- 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 & skin and 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 EITHER 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 Protective Coating Co. 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.

# **Technical Data Sheet**

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 & 7 above accordingly. Leave the mixing nozzle attached to the cartridge upon completion of work.

### GO TO STEP 11A

### **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  $\pm 2\%$ .

- 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 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. 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 & Overhead)

11. (A) NOTE: The engineering drawings must be followed. For any applications not covered by this document, or for any installation questions, please contact Protective Coating Co. 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 can be connected onto the outside of the tip of both the small mixing nozzle (072226) and the large mixing nozzle (076224) NOTE: When using a pneumatic dispensing tool, ensure that pressure is set at 90 psi (6.2 bar) maximum.

(B) 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.

12. (A) 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.

(B) 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.

(C) 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 - refer to <u>Table 5</u> for appropriate full cure time.

## **TECHNICAL DATA**

PC-Concrete Pro<sup>™</sup> 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 IAPMO-UES ER-632. The design process and parameters for PC-Concrete Pro<sup>™</sup> are shown in <u>Tables 6 - 18</u> for Strength Design.

# STRENGTH DESIGN

DESIGN	STRENGTH	Drilling Method	Threaded Rod	Rebar	Threaded Insert
Steel Strength	$N_{sa}, V_{sa}$		7	12	16
Concrete Breakout	$N_{cb},V_{cb},V_{cp}$		8	13	17
	Cracked Concrete	Hammor Drillod	9	14	
Strenath Desian Bond	Uncracked Concrete		9	14	18
Strength	Cracked Concrete		10		
(SD)	Uncracked Concrete	Vacuum bit Dimeu	10		
	Uncracked Concrete	Core Drilled	11	15	

## TABLE 6: PC-Concrete Pro™ DESIGN STRENGTH INDEX

## **TABLE 7: PC-Concrete Pro™ STEEL** design information for **THREADED ROD**<sup>1</sup>

	Dosia	n Information	Symbol	Unite				Threaded Ro	bd					
	Desig	minormation	Symbol	Onits	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/4"			
	Manainal	Anahan Diamatan	d	in.	0.375	0.500	0.625	0.750	0.875	1.000	1.250			
	Nominal	Anchor Diameter	a	(mm)	(9.5)	(12.7)	(15.9)	(19.1)	(22.2)	(25.4)	(31.8)			
	Thr	eaded Rod		in. <sup>2</sup>	0.078	0.142	0.226	0.335	0.462	0.606	0.969			
	Cross-S	Sectional Area <sup>₄</sup>	A <sub>se</sub>	(mm <sup>2</sup> )	(50)	(92)	(146)	(216)	(298)	(391)	(625)			
			N/	lb.	4,495	8,230	13,110	19,370	26,795	35,150	56,200			
	G	Nominal Strength as	IN <sub>sa</sub>	(kN)	(20.0)	(36.6)	(58.3)	(86.2)	(119.2)	(156.4)	(250.0)			
	е <u>3</u>	Governed by Steel	N/	lb.	2,695	4,940	7,865	11,625	16,080	21,900	33,720			
	ade Je 3	Strength	V <sub>sa</sub>	(kN)	(12.0)	(22.0)	(35.0)	(51.7)	(71.5)	(97.4)	(150.0)			
	A36 Gr 4 Grac	Reduction Factor for Seismic Shear	$\alpha_{V,seis}$		0.83	0.78	0.74	0.70	0.69	0.67	0.65			
_	STM / F155	Strength Reduction Factor for Tension <sup>3</sup>	φ			0.75								
ו Stee	<	Strength Reduction actor for Shear <sup>3</sup>	φ		0.65									
bor	Carboi 105	Nominal Strength as Governed by Steel Strength	N	lb.	9,690	17,740	28,250	41,750	57,750	75,750	121,125			
Car			IN <sub>sa</sub>	(kN)	(43.1)	(78.9)	(125.7)	(185.7)	(256.9)	(337.0)	(538.8)			
	de ,		V	lb.	5,815	10,645	16,950	25,050	34,650	45,450	72,675			
	3 E Srac		v sa	(kN)	(25.9)	(47.4)	(75.4)	(111.4)	(154.1)	(202.2)	(323.3)			
	M A19 554 G	Reduction Factor for Seismic Shear	α <sub>V,seis</sub>		0.60	0.58	0.57	0.55	0.53	0.50	0.46			
	AST TM F1	Strength Reduction Factor for Tension <sup>3</sup>	φ					0.75						
	AS	Strength Reduction Factor for Shear <sup>3</sup>	φ					0.65						
	s		N	lb	7,750	14,190	22,600	28,390	39,270	51,510	82,365			
	les	Nominal Strength as	IN <sub>sa</sub>	(kN)	(34.5)	(63.1)	(100.5)	(126.3)	(174.7)	(229.1)	(366.4)			
ē	tain 6	Strength	V	lb	4,650	8,515	13,560	17,035	23,560	30,905	49,420			
Ste	31 St	ouchgui	V sa	(kN)	(20.7	(37.9)	(60.3)	(75.8)	(104.8)	(137.5)	(219.8)			
nless	Stainless S M F593 CW Type 304 &	Reduction Factor for Seismic Shear	α <sub>V,seis</sub>		0.65	0.62	0.60	0.58	0.57	0.55	0.53			
Stai		Strength Reduction Factor for Tension <sup>2</sup>	φ					0.65						
	AST	Strength Reduction Factor for Shear <sup>2</sup>	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.

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 \$\phi\$ must be determined in accordance with ACI 318-11 D.4.4. Values correspond to a brittle steel element.
 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 \$\phi\$ must be determined in accordance with 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 \$\phi\$ must be determined in accordance with 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 \$\phi\$ must be determined in accordance with ACI 318-11 D.4.4. Values correspond to a ductile steel element.
 Cross-sectional area is minimum stress area applicable for either tension or shear.

# **Technical Data Sheet**

					Threaded Rod						
Design Information	Symbol	Units	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/4"		
Minimum Each admount Doubh	<i>h</i>	in.	2 3/8	2 3/4	3 1/8	3 1/2	3 3/4	4	5		
Minimum Embedment Depth	n <sub>ef,min</sub>	(mm)	(60)	(70)	(79)	(89)	(95)	(102)	(127)		
Movimum Embodmont Donth	h	in.	7 1/2	10	12 1/2	15	17 1/2	20	25		
Maximum Embedment Depth	Hef,max	(mm)	(191)	(254)	(318)	(381)	(445)	(508)	(635)		
Effectiveness Factor for	k					17					
Cracked Concrete	∧ <sub>c,cr</sub>	SI				(7.1)					
Effectiveness Factor for	k					24					
Uncracked Concrete	N <sub>c</sub> ,uncr	SI				(10)					
Minimum Spacing Distance	Smin	in.			S	$ = C_{min} $					
	Ghim	(mm)			Smi	n Cmin					
Minimum Edge Distance	Cmin	in.	2 3/16	2 13/16	3 3/4	4 3/8	5	5 5/8	6 7/8		
	Unim.	(mm)	(56)	(71)	(95)	(111)	(127)	(143)	(175)		
Minimum Concrete Thickness	hmin	in.	h <sub>ef</sub> + 1.25	, [ ≥ 3.937 ]	h	f + 2d₀ whe	re d₀ is the h	ole diamete	r		
		(mm)	(h <sub>ef</sub> + 30	, [ ≥ 100 ])					-		
Critical Edge Distance	6	in.	C	$C_{\alpha} = h_{ef} \cdot \left(\frac{\mathrm{mi}}{\mathrm{mi}}\right)$	$\frac{\ln(\tau_{k,war};\tau_{k})}{1160}$	$(\max)$ ) <sup>0.4</sup> · m	$ax\left[\left(3.1-0\right)\right]$	$\left(7 \frac{h}{h_{ef}}\right)$ ;1.4	]		
(Uncracked Concrete Only)	Critical Edge Distance ncracked Concrete Only)				$C_{\alpha} = h_{ef} \cdot \left(\frac{\min(\tau_{k, uner}; \tau_{k, \max})}{8}\right)^{0.4} \cdot \max\left[\left(3.1 - 0.7 \frac{h}{h_{ef}}\right); 1.4\right]$						
Strength Reduction Factor for Tension, Concrete Failure Mode, Condition B <sup>1</sup>	φ		0.65								
Strength Reduction Factor for Shear, Concrete Failure Mode, Condition B <sup>1</sup>	φ					0.70					

**TABLE 8:** PC-Concrete Pro™ **CONCRETE BREAKOUT** design information for **THREADED ROD** 

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  $\phi$  must be determined in accordance with ACI 318-11 D.4.4.

# **Technical Data Sheet**

## TABLE 9: PC-Concrete Pro™ BOND STRENGTH design information for THREADED ROD IN HAMMER DRILLED HOLES<sup>1,2,3,4,9</sup>

	Desis	un lufo un oti o u		Cumphel	Unite			TI	hreaded R	Rod		
	Desig	in information		Symbol	Units	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/4"
	Minimum	Embedment Depth		h <sub>ef,min</sub>	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	1	h <sub>ef,max</sub>	in. (mm)	7 1/2 (191)	10 (254)	12 1/2 (318)	15 (381)	17 1/2 (445)	20 (508)	25 (635)
м	aximum Service	Cracked Concrete Characteristic	With Sustained Load	T <sub>k,cr</sub>	psi (MPa) psi	1,231 (8.5) 1 414	1,088 (7.5)	1,231 (8.5) 1 414	979 (6.7) 1 127	1,044 (7.2)	1,153 (7.9)	1,109 (7.6)
Short -	Temperature Term <b>150 °F</b> (66 °C)	Bond Strength Uncracked	Load With Sustained		(MPa) psi	(9.7) 2,171	(8.6) 2,084	(9.7) 2,001	(7.8) 1,914	(8.3)	(9.1) 1,744	(8.8) 1,575
Long 7	Term <b>110 °F</b> (43 °C)	Concrete Characteristic Bond Strength	No Sustained Load	T <sub>k,uncr</sub>	(MPa) psi (MPa)	(15.0) 2,497 (17.2)	(14.4) 2,397 (16.5)	(13.8) 2,301 (15.9)	(13.2) 2,201 (15.2)	(12.6) 2,105 (14.5)	(12.0) 2,005 (13.8)	(10.9) 1,810 (12.5)
Maximum Service		Cracked Concrete	With Sustained Load	$-\tau_{k,cr}$	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)
Chort	Temperature	Bond Strength	No Sustained Load With Sustained		psi (MPa) psi	1,244 (8.6) 1,910	1,101 (7.6) 1,836	1,244 (8.6) 1,762	992 (6.8) 1,683	1,057 (7.3) 1,610	(8.1) 1,536	1,118 (7.7) 1,388
Long Term <b>110 °F</b> (43 °C)		Concrete Characteristic	Load No Sustained	$T_{k,uncr}$	(MPa) psi	(13.2) 2,197	(12.7) 2,110	(12.1) 2,027	(11.6) 1,936	(11.1) 1,849	(10.6)	(9.6)
		Cracked Concrete	With Sustained Load		(MPa) psi (MPa)	(15.1) 493 (3.4)	(14.5) 437 (3.0)	(14.0) 493 (3.4)	(13.3) 391 (2.7)	(12.7) 419 (2.9)	465 (3.2)	446 (3.1)
M	aximum Service Temperature	Characteristic Bond Strength	No Sustained Load	I k, cr	psi (MPa)	567 (3.9)	502 (3.5)	567 (3.9)	451 (3.1)	479 (3.3)	535 (3.7)	512 (3.5)
Short Long	Term <b>205 °F</b> (96 °C) Term <b>110 °F</b> (43 °C)	Uncracked Concrete Characteristic Bond Strength	No Sustained	T <sub>k,uncr</sub>	(MPa) psi (MPa)	(6.0) (6.0) (6.9)	837 (5.8) 963 (6.6)	(5.5) 921	(5.3) 884 (6.1)	735 (5.1) 846 (5.8)	(4.8) 800 (5.5)	(4.5) 725
	Reduction Fac	tor for Seismic Ten	sion <sup>5</sup>	α <sub>N,seis</sub>		(0.9)	1.00	(0.3)	0.77	1.00	0.97	0.96
			Dry Concrete	<b>\$</b> \$\$					0.65			
inuous ection	Strength R Factors for P	eduction ermissible	Water Saturated Concrete	<b>\$</b> ws		0.6	5			0.55		
Cont Insp	Installation Co	onditions <sup>6,7,8</sup>	Water-Filled Holes	<b>\$</b> wf				0.55			0.45	5
			in Concrete	K <sub>wf</sub>				1.00			0.98	0.88
. E	Dry Cor		Dry Concrete Water Saturated	<b>\$\$</b>					0.65			
eriodic	Strength R Factors for P	eduction ermissible	Concrete	\$\$\$\$		0.5	5		0.45	0.45		
Ч su	installation CC	Installation Conditions <sup>6,7,8</sup>		φ <sub>wf</sub>			0.45			0.75		
				$\Lambda_{Wf}$				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, 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 ( $f_c / 2,500$ )<sup>0.1</sup> (for SI: ( $f_c / 17.2$ )<sup>0.1</sup>). 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 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 shall be multiplied by  $\alpha_{n,seis}$ .

6. The tabulated value of  $\phi$  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  $\phi$  shall be determined in accordance with ACI 318 D.4.4.

7. The values of  $\phi$  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  $\phi$  shall be determined.

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

9. K factor not listed for conditions where K = 1.0.

# **Technical Data Sheet**

	Deal			0. maked	Unite			Threaded Ro	ed Rod		
	Desig	gn Information		Symbol	Units	5/8"	3/4"	7/8"	1"	1 1/4"	
	Minimum	Embedment Depth		h <sub>ef,min</sub>	in. (mm)	3 1/8 (79)	3 1/2 (89)	3 3/4 (95)	4 (102)	5 (127)	
	Maximum	Embedment Depth		h <sub>ef,max</sub>	in. (mm)	12 1/2 (318)	15 (381)	17 1/2 (445)	20 (508)	25 (635)	
		Cracked Concrete	With Sustained Load	-	psi (MPa)	1,022 (7.0)	874 (6.0)	900 (6.2)	1,031 (7.1)	992 (6.8)	
M	laximum Service Temperature	Characteristic Bond Strength	No Sustained Load	T <sub>k,cr</sub>	psi (MPa)	1,175 (8.1)	1,005 (6.9)	1,031 (7.1)	1,183 (8.2)	1,140 (7.9)	
Short Long	Term <b>150 °F</b> (66 °C) Term <b>110 °F</b> (43 °C)	Uncracked Concrete	With Sustained Load	π	psi (MPa)	1,831 (12.6)	1,766 (12.2)	1,701 (11.7)	1,636 (11.3)	1,505 (10.4)	
		Characteristic Bond Strength	No Sustained Load	I k,uncr	psi (MPa)	2,101 (14.5)	2,027 (14.0)	1,953 (13.5)	1,879 (13.0)	1,727 (11.9)	
		Cracked Concrete	With Sustained Load	τ	psi (MPa)	900 (6.2)	770 (5.3)	792 (5.5)	909 (6.3)	874 (6.0)	
N	Maximum Service Characteristic Temperature Bond Strength		No Sustained Load	T k, cr	psi (MPa)	1,035 (7.1)	883 (6.1)	909 (6.3)	1,044 (7.2)	1,005 (6.9)	
Short Term <b>180 °F</b> (82 °C) Long Term <b>110 °F</b> (43 °C)		Uncracked Concrete	With Sustained Load	τ.	psi (MPa)	1,610 (11.1)	1,553 (10.7)	1,496 (10.3)	1,440 (9.9)	1,327 (9.1)	
		Bond Strength	No Sustained Load	- K, uno	psi (MPa)	1,849 (12.7 <u>)</u>	1,784 (12.3)	1,718 (11.8)	1,653 (11.4)	1,523 (10.5)	
M	avimum Son <i>i</i> co	Cracked Concrete	With Sustained Load	T <sub>k cr</sub>	psi (MPa)	409 (2.8)	349 (2.4)	358 (2.5)	414 (2.9)	400 (2.8)	
IV	Temperature	Characteristic Bond Strength	No Sustained Load	- 1,0	psi (MPa)	470 (3.2)	405 (2.8)	414 (2.9)	474 (3.3)	456 (3.1)	
Short Long	Term <b>205 °F</b> (96 °C) Term <b>110 °F</b> (43 °C)	Uncracked Concrete	With Sustained Load	τ	psi (MPa)	735 (5.1)	707 (4.9)	684 (4.7)	656 (4.5)	650 (4.5)	
		Characteristic Bond Strength	No Sustained Load	- K,unor	psi (MPa)	842 (5.8)	814 (5.6)	781 (5.4)	753 (5.2)	693 (4.8)	
	Reduction Fac	ctor for Seismic Ten	sion <sup>5</sup>	𝒫 <sub>N,seis</sub>		1.00	0.77	1.00	0.97	0.96	
sno	Strength Reduction	Dry C	oncrete	$oldsymbol{\phi}_{d}$				0.65		•	
ontinuc spectio	Pactors for Permissible Installation	Water	Saturated	$\phi_{ws}$		0.	45	0.	.55	0.65	
ĕ S	Conditions <sup>6,7,8</sup>	Cor	ncrete	$\kappa_{ws}$				1.00			
ъц	Strength Reduction	Dry C	oncrete	$\pmb{\phi}_{d}$				0.65			
<sup>5</sup> eriodi spectic	Factors for Permissible Installation	Water Saturated		$\phi_{ws}$		0.45 0.55				0.55	
느므	Conditions <sup>6,7,8</sup>	Cor	ncrete	K <sub>ws</sub>		0.89 0.96 1.00					

## TABLE 10: PC-Concrete Pro<sup>™</sup> BOND STRENGTH design information for THREADED ROD in MILWAUKEE VACUUM BIT DRILLED HOLES<sup>1,2,3,4,9</sup>

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)<sup>0.1</sup> (for SI: (f'c /17.2)<sup>0.1</sup>). For cracked concrete, no increase in bond strength is permitted.

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. 2.

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

6. The tabulated value of  $\phi$  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  $\phi$  shall be determined in accordance with ACI 318 D.4.4.

7. The values of  $\phi$  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. 16 the load combinations in ACI 318-11 Appendix C are used, the corresponding value of  $\phi$  shall be determined. 8. The values of  $\phi$  correspond to the anchor category as set forth in ACI 318-14 17.3.3 (ACI 318-11 D.4.3). The  $\phi$  factor of 0.65 represents a Category 1, 0.55 a Category 2 and 0.45 a

Category 3.

9. K factor not listed for conditions where K = 1.0.

# **Technical Data Sheet**

### TABLE 11: PC-Concrete Pro™ BOND STRENGTH design information for THREADED ROD IN CORE DRILLED HOLES<sup>1,2,3,4,5</sup>

	Design	Information		Symbol	Unito			Threa	ded Rod		
	Design	mormation		Symbol	Units	1/2"	5/8"	3/4"	7/8"	1"	1 1/4"
	Minimum E	mbedment Depth		h <sub>ef,min</sub>	in. (mm)	2 3/4 (70)	3 1/8 (79)	3 1/2 (89)	3 3/4 (95)	4 (102)	5 (127)
	Maximum E	mbedment Depth		h <sub>ef,max</sub>	in. (mm)	10 (254)	12 1/2 (318)	15 (381)	17 1/2 (445)	20 (508)	25 (635)
М	Maximum Service Temperature Concrete		With Sustained Load		psi (MPa)	866 (6.0)	866 (6.0)	866 (6.0)	866 (6.0)	866 (6.0)	866 (6.0)
Short Term <b>150 °F</b> (66 °C) Long Term <b>110 °F</b> (43 °C)		Characteristic Bond Strength	No Sustained Load	psi (MPa)	996 (6.9)	996 (6.9)	996 (6.9)	996 (6.9)	996 (6.9)	996 (6.9)	
Maximum Service Temperature		Uncracked Concrete	With Sustained Load	τ	psi (MPa)	766 (5.3)	766 (5.3)	766 (5.3)	766 (5.3)	766 (5.3)	766 (5.3)
Short Long	Term <b>180 °F</b> (82 °C) Term <b>110 °F</b> (43 °C)	Bond Strength	No Sustained Load	I k,uncr	psi (MPa)	879 (6.1)	879 (6.1)	879 (6.1)	879 (6.1)	879 (6.1)	879 (6.1)
sr			Dry Concrete	$\phi_{d}$				0	.65		
Continuou Inspectio	Strength Reduction Factors for Permissible Installation Conditions <sup>6,7,8</sup>		Water Saturated Concrete	$\phi_{ws}$		0.65					
ic on	Strongth Poductic	on Eactors for	Dry Concrete	$\phi_{d}$				0	.65		
Period Inspecti	Permissible Installation Conditions <sup>6,7,8</sup>		Water Saturated Concrete	<b>ø</b> ws				0	.55		
For SI: 1	$inch = 25.4 \text{ mm} \ 1 \text{ lbf} = 4$	$448 \text{ N} \ 1 \text{ nsi} = 0.000$	3897 MPa								

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'<sub>c</sub> /2,500)<sup>0.1</sup> (for SI: (f'<sub>c</sub> /17.2)<sup>0.1</sup>). 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 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. K factor not listed for conditions where K = 1.0.

6. The tabulated value of  $\phi$  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  $\phi$  shall be determined in accordance with ACI 318 D.4.4.

7. The values of  $\phi$  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  $\phi$  shall be determined.

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

# **Technical Data Sheet**

Rebar Size													
Design I	nformation	Symbol	Units	#3	#1	#5	#6	#7	#8	#9	#10		
			in	#3	#4	#5	#0	#1	#0	#3	#10		
Nor	ninal Anchor Diameter	da	(mm)	0.375	0.500	0.625	0.750	0.875	1.000	1.127	1.270		
	Dahar		(1111) in <sup>2</sup>	(3.3)	0.200	0.310	0.440	0.600	0.700	(20.0)	(32.3)		
С	Rebar ross-Sectional Area <sup>4</sup>	Ase	$(mm^2)$	(71)	(120)	(200)	(284)	(387)	(510)	(645)	(810)		
			(IIIII) Ib	(71)	(129)	(200)	(204)	(307)	(510)	(043)	(019)		
	Nominal Strength	N <sub>sa</sub>	ID.	6,000	12,000	10,000	20,400						
	as Governed by		(KIN)	(29.4)	(53.4)	(82.7)	(117.4)	Grade 40 reinforcing bars					
	Steel Strength	V <sub>sa</sub>	D.	3,960	7,200	11,160	15,840		are only avai	lable in sizes			
615 40			(KN)	(17.6)	(32.0)	(49.6)	(70.5)	ASTM A615					
STM A Grade	Reduction Factor for Seismic Shear	𝒫 <sub>V,seis</sub>		0.70	0.74	0.78	0.82						
AS O	Strength Reduction Factor for Tension <sup>3</sup>	φ					0.	75					
	Strength Reduction Factor for Shear <sup>3</sup>	Strength Reduction Factor for Shear <sup>3</sup> \$0.65\$\$\$\$\$\$\$\$\$\$											
		N	lb.	8,800	16,000	24,800	35,200	48,000	63,200	80,000	101,600		
	Nominal Strength	IN <sub>sa</sub>	(kN)	(39.1)	(71.2)	(110.3)	(156.6)	(213.5)	(281.1)	(355.9)	(451.9)		
Steel Strength	Steel Strength	V	lb.	5,280	9,600	14,880	21,120	28,800	37,920	48,000	60,960		
00	0	V <sub>sa</sub>	(kN)	(23.5)	(42.7)	(66.2)	(93.9)	(128.1)	(168.7)	(213.5)	(271.2)		
3TM A7 srade 6	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 Re Factor for Te	Strength Reduction Factor for Tension <sup>3</sup>	φ					0.	75					
	Strength Reduction Factor for Shear <sup>3</sup>	φ		0.65									
		Ν/	lb.	9,900	18,000	27,900	39,600	54,000	71,100	90,000	114,300		
	Nominal Strength	N <sub>sa</sub>	(kN)	(44.0)	(80.1)	(124.1)	(176.1)	(240.2)	(316.3)	(400.3)	(508.4)		
	as Governed by Steel Strength		lb.	5,940	10,800	16,740	23,760	32,400	42,660	54,000	68,580		
15	eteel et engli	V <sub>sa</sub>	(kN)	(26.4)	(48.0)	(74.5)	(105.7)	(144.1)	(189.8)	(240.2)	(305.1)		
TM A6	Reduction Factor for Seismic Shear	𝒫 <sub>V,seis</sub>		0.70	0.74	0.78	0.82	0.73	0.63	0.53	0.42		
AS G	Strength Reduction Factor for Tension <sup>3</sup>	φ					0.	75					
	Strength Reduction Factor for Shear <sup>3</sup>	φ					0.0	65					
			lb.	11,000	20,000	31,000	44,000	60,000	79,000	100,000	127,000		
	Nominal Strength	N <sub>sa</sub>	(kN)	(48.9)	(89.0)	(137.9)	(195.7)	(266.9)	(351.4)	(444.8)	(564.9)		
	as Governed by Steel Strength		lb.	6,600	12,000	18,600	26,400	36,000	47,400	60,000	76,200		
2	etter etterigti	V <sub>sa</sub>	(kN)	(29.4)	(53.4)	(82.7)	(117.4)	(160.1)	(210.8)	(266.9)	(339.0)		
ASTM A615 Grade 75	Reduction Factor for Seismic Shear	𝒫 <sub>V,seis</sub>		0.70	0.74	0.78	0.82	0.73	0.63	0.53	0.42		
	Strength Reduction Factor for Tension <sup>2</sup>	φ					0.0	65	L				
	Strength Reduction Factor for Shear <sup>2</sup>	φ					0.0	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  $\phi$  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  $\phi$  must be determined in accordance with ACI 318-11 D4.4. Values correspond to a ductile steel element. 4. Cross-sectional area is minimum stress area applicable for either tension or shear.

# **Technical Data Sheet**

Design Information	Symphol	Unite				Rebar Size           #6         #7         #8         #9           3         1/2         3         3/4         4         4         1/2           (89)         (95)         (102)         (114)         15         17         1/2         20         22         1/2           (381)         (445)         (508)         (572)         17         (7.1)         24           (10)         Smin = Cmin         14         3/8         5         5         5/8         6         1/4           (111)         (127)         (143)         (159)         heft + 2d_0 where d_0 is the hole diameter           k_wwer ; $\tau_{k,max}$ $)$ $\cdot \max \left[ \left( 3.1 - 0.7 \frac{h}{h_{eft}} \right); 1.4 \right]$ $\cdot \max \left[ \left( 3.1 - 0.7 \frac{h}{h_{eft}} \right); 1.4 \right]$ 0.65						
Design mormation	Symbol	Units	#3	#4	#5	#6	#7	#8	#9	#10		
Minimum Embedment Denth	b	in.	2 3/8	2 3/4	3 1/8	3 1/2	3 3/4	4	4 1/2	5		
	l'ef,min	(mm)	(60)	(70)	(79)	(89)	(95)	(102)	(114)	(127)		
Maximum Embedment Depth	harman	in.	7 1/2	10	12 1/2	15	17 1/2	20	22 1/2	25		
	rrei,max	(mm)	(191)	(254)	(318)	(381)	(445)	(508)	(572)	(635)		
Effectiveness Factor	<i>k</i>			17								
Cracked Concrete	NC, Cr	SI				(7.1	)					
Effectiveness Factor	Kaupar					24						
Uncracked Concrete	NC,UNCT	SI				(10)						
Minimum Spacing Distance	Smin	in.				$S_{min} = 0$	~					
	Cillini	(mm)				5min (						
Minimum Edge Distance	Cmin	in.	2 3/16	2 13/10	6 3 3/4	4 3/8	5	5 5/8	6 1/4	6 7/8		
	- 11111	(mm)	(56)	(/1)	(95)	(111)	(127)	(143)	(159)	(175)		
Minimum Concrete Thickness	h <sub>min</sub>	in.	$h_{ef} + 1.2$	5,[≥3.937]		h <sub>ef</sub> +	2d <sub>0</sub> where d <sub>0</sub>	is the hole d	iameter			
		(mm)	$(n_{ef} + 3)$	0,[≥100])		0,	° °					
Critical Edge Distance		in.	$\begin{array}{c c} (1.1) \\ 24 \\ (10) \\ \hline \\ S_{min} = C_{min} \\ \hline \\ \hline \\ (56) \\ (71) \\ (56) \\ (71) \\ (95) \\ (111) \\ (127) \\ (143) \\ (143) \\ (159) \\ (143) \\ (159) \\ (159) \\ (111) \\ (127) \\ (143) \\ (159) \\ (143) \\ (159) \\ (111) \\ (159) \\ (111) \\ (127) \\ (143) \\ (159) \\ (143) \\ (159) \\ (111) \\ (159) \\ (111) \\ (127) \\ (143) \\ (159) \\ (143) \\ (150) \\ (150) \\ (143) \\ (150) \\ (143) \\ (150) \\ (143) \\ (150) \\ (143) \\ (150) \\ (143) \\ (150) \\ (143) \\ (150) \\ (143) \\ (150) \\ (143) \\ (150) \\ (143) \\ (150) \\ (143) \\ (150) \\ (143) \\ (150) \\ (150) \\ (143) \\ (150) \\ (143) \\ (150) \\ (143) \\ (150) \\ (143) \\ (150) \\ (150) \\ (150) \\ (150) \\ (150) \\ (150) \\ (150) \\ (150) \\ (150) \\ (150) \\ (150) \\ (150) \\ (150) \\ (150) \\ (150) $									
(Uncracked Concrete Only)	Cac						) A (	,	、 <b>「</b>			
(		mm		C <sub>ac</sub> =	$= h_{ef} \cdot \left( \frac{\min(n)}{n} \right)$	τ <sub>k,uncr</sub> ;τ <sub>k,max</sub> 8	$\frac{(1)}{(1)}$ · max	$3.1 - 0.7 \frac{h}{h}$	$\begin{array}{c c c c c c c c c c c c c c c c c c c $			
Strength Reduction Factor for Tension, Concrete Failure Mode, Condition B <sup>1</sup>	φ					0.65	5					
Strength Reduction Factor for Shear, Concrete Failure Mode, Condition B <sup>1</sup>	φ					0.70	)					

TABLE 13: PC-Concrete Pro™ CONCRETE BREAKOUT design information for REBAR<sup>1</sup>

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  $\phi$  must be determined in accordance with ACI 318-11 D.4.4.

# **Technical Data Sheet**

TABLE 14: PC-Concrete Pro™ BOND STRENGTH design information for REBAR IN HAMMER DRILLED HOLES<sup>1,2,3,4</sup>

			Den				mation		Dehe				
	Desig	n Information		Symbol	Units	#3	#4	#5	Reba	ar Size #7	#8	#9	#10
	Minimum E	Embedment Dept	h	h <sub>ef,min</sub>	in. (mm)	2 3/8	2 3/4	3 1/8 (79)	3 1/2 (89)	3 3/4	4 (102)	4 1/2	5 (127)
Maximum Embedment Depth		h <sub>ef,max</sub>	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 Service Temperature	Cracked Concrete Characteristic	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)	
Te	emperature	Bond Strength	NO Sustained Load	1,0	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)
Long	(66 °C) Term <b>110 °F</b> (43 °C)	Uncracked Concrete Characteristic	With Sustained Load	Thurse	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)
	(12-2)	Bond Strength	No Sustained Load	• K,UNCT	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)	#9         4 1/2         (114)         22 1/2         (572)         1,005         (6.9)         1,157         (8.0)         1,457         (10.0)         1,675         (11.5)         887         (6.1)         1,018         (7.0)         1,279         (8.8)         1,470         (10.1)         405         (2.8)         465         (3.2)         Not App         670         (4.6)         0.97	1,575 (10.9)
Movi	Cracked Concrete Iaximum Service Temperature Bond	Cracked Concrete	With Sustained Load	Ŧ	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)
Te	emperature	Bond Strength	No Sustained Load	I k,cr	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)
Long	(82 °C)	Uncracked Concrete	With Sustained Load	π.	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)
	(43 C)	Bond Strength	No Sustained Load	I k,uncr	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 Service	Cracked Concrete	With Sustained Load	т	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)	
Te	emperature	Bond Strength	No Sustained Load	I k,cr	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)
Long	(96 °C) Term <b>110 °F</b>	Uncracked Concrete	With Sustained Load	ained		758 (5.2)	730 (5.0)	702 (4.8)	670 (4.6)	650 (4.5)	650 (4.5)	Not App	blicable
	(43 C)	Bond Strength	No Sustained Load	I k,uncr	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 Fac	tor - Seismic Ten	sion⁵	α <sub>N,seis</sub>				1.00			0.97	0.97	0.96
			Dry Concrete	$\pmb{\phi}_{d}$					0	.65			
ntinuous pection	Strength Factors for	Reduction Permissible	Water Saturated Concrete	$\phi_{ws}$		0.	.65			0.	55		
Cor Ins	Installation Conditions <sup>6,7</sup>		Water-	$\pmb{\phi}_{wf}$				0.55				0.45	
			in Concrete	K <sub>wf</sub>				1.00			0.96	0.92	0.88
			Dry Concrete	$\pmb{\phi}_{d}$					0	.65			
<sup>&gt;</sup> eriodic spectior	Strength Factors for Installation (	Reduction Permissible Conditions <sup>6,7,8</sup>	Water Saturated Concrete	<b>\$</b> ws		0.	.55			0.	45		
<u> </u>		-	vvater- Filled Holes	$\phi_{wf}$					0	.45			
			in Concrete	K <sub>wf</sub>			1.00 0.92 0.83 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, 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)<sup>0.1</sup> (for SI: (f'c /17.2)<sup>0.1</sup>). 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 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 shall be multiplied by an,seis.

6. The tabulated value of  $\phi$  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 \$\phi\$ shall be determined in accordance with ACI 318 D.4.4.
The values of \$\phi\$ 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  $\phi$  shall be determined.

The values of  $\phi$  correspond to the anchor category as set forth in ACI 318-14 17.3.3 (ACI 318-11 D.4.3). The  $\phi$  factor of 0.65 represents a Category 1, 0.55 a Category 2 and 0.45 a Category 3. 8 9. K factor not listed for conditions where K = 1.0.

		Docian Inform	ation	Symbol	Rebar Size									
Design mormation 5		Symbol	Units	#4	#5	#6	#7	#8	#9	#10				
Minimum Embedme		nent Depth	h <sub>ef,min</sub>	in. (mm)	2 3/4 (70)	3 1/8 (79)	3 1/2 (89)	3 3/4 (95)	4 (102)	4 1/2 (114)	5 (127)			
	Ma	aximum Embedr	nent Depth	h <sub>ef,max</sub>	in. (mm)	10 (254)	12 1/2 (318)	15 (381)	17 1/2 (445)	20 (508)	20 22 1/2 25 508) (572) (63			
Maximum Service Temperature		Uncracked Concrete	With Sustained Load	τ.	psi (MPa)	1,335 (9.2)	1,300 (9.0)	1,200 (8.3)	1,105 (7.6)	1,010 (7.0)	910 (6.3)	800 (5.5)		
Short Te Long Te	erm <b>150 °F</b> (66 °C) erm <b>110 °F</b> (43 °C)	Characteristic Bond Strength	No Sustained Load	I K,Cr	psi (MPa)	1,530 (10.5)	1,490 (10.3)	1,380 (9.5)	1,270 (8.8)	1,155 (8.0)	#9           4 1/2 (114)           22 1/2 (572)           910 (6.3)           1,045 (7.2)           800 (5.5)           920 (6.3)	920 (6.3)		
Maximum Service Temperature         Uncrac Concr           Short Term 180 °F (82 °C)         Charact           Long Term 110 °F (43 °C)         Bond Str		Uncracked Concrete	With Sustained Load	Τ <sub>k,cr</sub>	psi (MPa)	1,175 (8.1)	1,145 (7.9)	1,055 (7.3)	975 (6.7)	885 (6.1)	800 (5.5)	705 (4.9)		
		Characteristic Bond Strength	No Sustained Load		psi (MPa)	1,350 (9.3)	1,315 (9.1)	1,215 (8.4)	1,120 (7.7)	1,020 (7.0)	920 (6.3)	810 (5.6)		
nuous ection	Strength Re Factors for Pe	eduction ermissible	Dry Concrete	¢ d		0.65								
Installation Co		nditions <sup>6,7,8</sup>	Water Saturated Concrete	Ø <sub>ws</sub>		0.65								
iodic	Strength Re Factors for Pe	eduction ermissible	Dry Concrete	φ <sub>d</sub>					0.65					
Peri Inspe	Installation Cor	nditions <sup>6,7,8</sup>	Water Saturated Concrete	φ <sub>ws</sub>			0.55							

# TABLE 15: PC-Concrete Pro™ BOND STRENGTH design information for REBAR in CORE DRILLED HOLES<sup>1,2,3,4,5</sup>

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)0.1 (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 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. *K* factor not listed for conditions where K = 1.0.

6. The tabulated value of  $\phi$  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  $\phi$  shall be determined in accordance with ACI 318 D.4.4.

7. The values of  $\phi$  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  $\phi$  shall be determined.

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

## **Technical Data Sheet**

TABLE 16: PC-Concrete Pro™ STEEL design information for POWER-SERT INTERNALLY THREADED INSERT<sup>1</sup>

		-										
D	esign Information	Symbol	Units	PS2-38	PS2-12	PS2-58	PS2-34	PS2-1				
Non	ninal Anchor Diameter	d	in.	0.484	0.591	0.819	0.898	1.450				
NOI		ŭ	(mm)	(12.3)	(15.0)	(20.8)	(22.8)	(36.8)				
Cross-Sectional Area <sup>2</sup>		Δ	in. <sup>2</sup>	0.102	0.135	0.302	0.385	0.785				
		Ase	(mm <sup>2</sup> )	(66)	(87)	(195)	(248)	(506)				
Specified Tensile Strength		F <sub>uta</sub>	psi		64,000							
		N	lb.	6,625	8,805	19,625	25,015	51,050				
_	Nominal Strength	IN <sub>sa</sub>	(kN)	(29.5)	(39.2)	(87.3)	(111.3)	(227.1)				
I02( eel	Steel Strength	V	lb.	3,975	5,285	11,775	15,010	30,630				
ISI ,	5	V <sub>sa</sub>	(kN)	(17.7)	(23.5)	(52.4)	(66.8)	(136.2)				
AE - A Carbor	Strength Reduction Factor for Tension <sup>3</sup>	φ				0.75						
S	Strength Reduction Factor for Shear <sup>3</sup>	φ				0.65	PS2-34         PS3           0.898         1.4           (22.8)         (36           0.385         0.7           (248)         (50           25,015         51,           (111.3)         (22           15,010         30,           (66.8)         (13           PS6-34         PS           0.898         1.4           (22.8)         (36           0.898         1.4           (22.8)         (36           0.385         0.7           (248)         (50           32,710         66,           (145.5)         (29           19,625         40,           (87.3)         (17					
D	esign Information	Symbol	Units	PS6-38	PS6-12	PS6-58	PS6-34	PS6-1				
Non	ainal Anabar Diamatar	d	in.	0.484	0.591	0.819	0.898	1.450				
NO	linai Anchor Diameler	a	(mm)	(12.3)	(15.0)	(20.8)	(22.8)	(36.8)				
0	con Sectional Area <sup>2</sup>	Δ	in. <sup>2</sup>	0.102	0.135	0.302	0.898         (22.8)         (           0.385         (         (           0.385         (         (           (248)         (         (           25,015         55         (         (111.3)           15,010         3         (66.8)         (           0.898         (         (         (           0.898         (         (         (           0.898         (         (         (           0.385         (         (         (           0.385         (         (         (           85,000         32,710         6         (         (           (145.5)         (         (         (         (           19,625         4         (         (         (           (87.3)         (         (         (         (	0.785				
	USS-Sectional Area	Ase	(mm²)	(66)	(87)	(195)	(248)	(506)				
Spe	cified Tensile Strength	F <sub>uta</sub>	psi	100	100,000		85,000					
		N	lb.	10,195	13,550	30,190	32,710	66,760				
	Nominal Strength	IN <sub>sa</sub>	(kN)	(45.3)	(60.3)	(134.3)	(145.5)	(297.0)				
-	as Governed by		lh	6 1 1 5	8 130	18 115	10 625	40 055				
tee 0	Steel Strength	17	ID.	0,110	0,100	10,115	13,025	10,000				
e 316 ss Stee	Steel Strength	V <sub>sa</sub>	(kN)	(27.2)	(36.2)	(80.6)	(87.3)	(178.2)				
Type 316 Stainless Stee	Steel Strength Strength Reduction Factor for Tension <sup>4</sup>	V <sub>sa</sub>	(kN)	(27.2)	(36.2)	(80.6) 0.65	(87.3)	(178.2)				

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. Cross-sectional area is minimum stress area applicable for either tension or shear.

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  $\phi$  shall be determined in accordance with ACI 318-11 D.4.4. Values correspond to a ductile steel element.

4. 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  $\phi$  shall be determined in accordance with ACI 318-11 D.4.4. Values correspond to a brittle steel element.

# **Technical Data Sheet**

TABLE 17: PC-Concrete Pro™ CONCRETE BREAKOUT design information for POWER-SERT INTERNALLY THREADED INSERT<sup>1</sup>

			PS2-38	PS2-12	PS2-58	PS2-34	PS2-1		
Design Information	Symbol	Units	PS6-38	PS6-12	PS6-58	PS6-34	PS6-1		
Minimum Embodmont Donth	Ь	in.	2 3/4	3 11/16	5 3/4	6 1/2	8 1/2		
Minimum Embedment Depth	11 <sub>a</sub>	(mm)	(70)	(94)	(146)	$\begin{array}{c c} \mathbf{PS2-34} \\ \mathbf{PS6-34} \\ \hline 6 \ 1/2 \\ (165) \\ \hline 6.2 \\ (157) \\ \mathbf{e} \end{array}$	(216)		
Effective Embedment Depth for	h	in.	2.5	3.5	5.5	6.2	8.2		
Concrete Breakout Design	l lef,cb	(mm)	(64)	(89)	(140)	(157)	(208)		
Maximum Embedment Denth	h	in.			Not Applicable	$\frac{(165)}{(165)} = (21) \\ (157) = (20) \\ (157) = (20) \\ (157) = (20) \\ (157) = (20) \\ (157) = (20) \\ (20) = (20) $			
	l'ef,max	(mm)							
Effectiveness Factor for	k				24				
Uncracked Concrete	NC, UNC	SI			PS6-12         PS6-58         PS6-34           3 11/16         5 3/4         6 1/2           (94)         (146)         (165)           3.5         5.5         6.2           (89)         (140)         (157)           Not Applicable           24           (10)         Smin= Cmin           3 1/8         4 3/8         5           (79)         (111)         (127)           5 3/8         8         9 1/2           (137)         (203)         (241) $\min(\tau_{k,unxr}; \tau_{k,max})^{0.4} \cdot \max\left[ \left( 3.1 - 0.7 \frac{J}{J_{k}} \right)^{0.4} \cdot \max\left[ \left( 3.1 - 0.7 \frac{J}{J_{k}} \right)^{0.4} \right]^{0.4} \cdot \max\left[ \left( 3.1 - 0.7 \frac{J}{J_{k}} \right)^{0.4} \right]^{0.4} \right]^{0.4}$				
Minimum Spacing Distance	Smin	in.			$S_{min} = C_{min}$				
		(mm)		$\begin{array}{c c c c c c c c c c c c c c c c c c c $					
Minimum Edge Distance	Cmin	in.	2 1/2	3 1/8	4 3/8	5	7 1/2		
	- 11111	(mm)	(64)	(79)	(111)	$\begin{array}{c c} \mathbf{PS2-34} \\ \mathbf{PS6-34} \\ \hline 6 & 1/2 \\ \hline (165) \\ \hline 6.2 \\ \hline (157) \\ \hline \\$	(191)		
Minimum Concrete Thickness	h <sub>min</sub>	in.	4 1/2	5 3/8	8	9 1/2	12 1/2		
		(mm)	(114)	(137)	(203)	(241)	(318)		
Critical Edge Distance	<u>,</u>	in.	$C_{\alpha} = h_{ef} \cdot \left(\frac{\min(\tau_{k, uxer}; \tau_{k, \max})}{1160}\right)^{0.4} \cdot \max\left[\left(3.1 - 0.7 \frac{h}{h_{ef}}\right); 1.4\right]$						
(Uncracked Concrete Only)	Cac	mm	$C_{\alpha\epsilon} = h_{\epsilon_f}$	$\cdot \left(\frac{\min(\tau_{k,umr};}{8}\right)$	$\left(\frac{\tau_{k,\max}}{1-\tau_{k,\max}}\right)^{0.4} \cdot m$	8         PS2-34         PS           8         PS6-34         PS           6         1/2         8           (165)         (2           6.2         8           (157)         (2           :able           ***********************************	$\left(\frac{h}{h_{ef}}\right)$ ;1.4		
Strength Reduction Factor for Tension, Concrete Failure Mode, Condition B <sup>1</sup>	φ				0.65				
Strength Reduction Factor for Shear, Concrete Failure Mode, Condition B <sup>1</sup>	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.

# **Technical Data Sheet**

	PU	WER-SERT INTE						OLE5 .,,.		
	Des	sign Information		Symbol	Units	PS2-38	PS2-12	PS2-58	PS2-34	PS2-1
						F 30-30	F 30-12	F 30-30	F 30-34	F 30-1
	Intern	al Thread Diameter		$d_t$	inTPI	3/8 - 16	1/2 - 13	5/8 - 11	3/4 - 10	1 - 8
Drill Bit Diameter					in.	1/2	5/8	7/8	1	1 1/2
	Recom	h <sub>drill</sub>	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					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					in. (mm)	1.550 (39)	2.488 (63)	3.750 (95)	3.744 (95)	5.000 (127)
M	aximum Service Temperature	Uncracked Concrete	With Sustained Load	-	psi (MPa)	1,905 (13.1)	1,814 (12.5)	1,627 (11.2)	1,562 (10.8)	1,096 (7.6)
Short Long	Term <b>150 °F</b> (66 °C) Term <b>110 °F</b> (43 °C)	Characteristic Bond Strength	No Sustained Load	I k,uncr	psi (MPa)	2,184 (15.1)	2,084 (14.4)	1,866 (12.9)	1,792 (12.4)	1,257 (8.7)
Maximum Service Temperature		Uncracked Concrete	With Sustained Load	τ	psi (MPa)	1,675 (11.5)	1,596 (11.0)	1,431 (9.9)	1,375 (9.5)	966 (6.7)
Short - Long -	Term <b>180 °F</b> (82 °C) Term <b>110 °F</b> (43 °C)	Characteristic Bond Strength	No Sustained Load	I k,uncr	psi (MPa)	1,923 (13.3)	1,831 (12.6)	1,644 (11.3)	1,575 (10.9)	1,109 (7.6)
М	Maximum Service Temperature Uncracked Concrete		With Sustained Load	τ	psi (MPa)	820 (5.7)	780 (5.4)	700 (4.8)	670 (4.6)	Not
Short Long	Term <b>205 °F</b> (96 °C) Term <b>110 °F</b> (43 °C)	Characteristic Bond Strength	No Sustained Load	I k,uncr	psi (MPa)	874 (6.0)	837 (5.8)	749 (5.2)	716 (4.9)	Applicable
nuous ction	Strength Reduc	tion Factors for	Dry Concrete	${oldsymbol{\phi}}_{d}$				0.65		
Contir Inspe	Permissible Installa	ation Conditions <sup>6,7,8</sup>	Water Saturated Concrete	<b>\$</b> ws		0.65	20         780         700         670         Annu         Not           .7)         (5.4)         (4.8)         (4.6)         Applicat           74         837         749         716         Applicat           .0)         (5.8)         (5.2)         (4.9)         Applicat           0.65         0.55         0.55         0.55			
odic ction	Strength Reduc	tion Factors for	Dry Concrete	$\phi_{d}$				0.65		
Peri	Permissible Installa	ation Conditions <sup>5,6,7</sup>	Water Saturated Concrete	<b>\$</b> ws		0.55		0.	PS2-34         PS6-34         3/4 - 10         1         7 1/2         (191)         6 1/2         (165)         3.744         (95)         1,562         (10.8)         1,792         (12.4)         1,375         (9.5)         1,575         (10.9)         670         (4.6)         716         (4.9)         55	

### TABLE 18: PC-Concrete Pro<sup>™</sup> BOND STRENGTH design information for POWER-SERT INTERNALLY THREADED INSERT IN HAMMER DRILLED HOLES<sup>1,2,3</sup>

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 ( $f'_{c}/2,500$ )<sup>0.1</sup> (for SI: ( $f'_{c}/7.2$ )<sup>0.1</sup>).

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. The tabulated value of  $\phi$  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  $\phi$  shall be determined in accordance with ACI 318 D.4.4

6. The values of ¢ 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  $\phi$  shall be determined. 7. The values of  $\phi$  correspond to the anchor category as set forth in ACI 318-14 17.3.3 (ACI 318-11 D.4.3). The  $\phi$  factor of 0.65 represents a Category 1, 0.55 a Category 2 and 0.45

a Category 3.

8. *K* factor not listed for conditions where K = 1.0.