PE1000+™ *Epoxy Injection Adhesive Anchoring System*

ADHESIVES

PRODUCT DESCRIPTION

The PE1000+ is a two-component, high strength adhesive anchoring system. The system includes injection adhesive in plastic cartridges, mixing nozzles, dispensing tools and hole cleaning equipment. The PE1000+ is designed for bonding threaded rod and reinforcing bar hardware into drilled holes in concrete base and solid masonry materials.

GENERAL APPLICATIONS AND USES

- Bonding threaded rod and reinforcing bar into hardened concrete and grouted CMU
- Evaluated for installation and use in dry and water-saturated concrete including water-filled holes
- Suitable to resist loads in cracked or uncracked concrete base materials for cases where anchor design theory and criteria applies
- Can be installed in a wide range of base material temperatures

FEATURES AND BENEFITS

+ Designed for use with threaded rod and reinforcing bar hardware elements
+ Consistent performance in low and high strength concrete (2,500 to 8,500 psi)
+ Evaluated and recognized for freeze/thaw performance
+ Evaluated and recognized for long term and short term loading (see performance tables for applicable temperature ranges)
+ Evaluated and recognized for variable embedments (see installation specifications)
+ Cartridge design allows for multiple uses using extra mixing nozzles
+ Mixing nozzles proportion adhesive and provide simple delivery method into drilled holes
+ Easy dispensing reduces applicator fatique

APPROVALS AND LISTINGS

International Code Council, Evaluation Service (ICC-ES) ESR-2583
Code compliant with the 2006 IBC, 2006 IRC, 2003 IBC, 2003 IRC, 2000 IBC, 2000 IRC and 1997 UBC
Tested in accordance with AC308 for use in structural concrete according to ACI 318 Appendix D (Strength Design) and as amended by provisions of ICC-ES AC308 Annex A, Section 3.3 (www.icc-es.org)
Evaluated and qualified by an accredited independent testing laboratory for recognition in cracked and uncracked concrete including seismic and wind loading
Compliant with NSF/ANSI Standard 61 for drinking water system components – health effects; minimum requirements for materials in contact with potable water and water treatment
Conforms to requirements of ASTM C 881, Types I, II, IV and V, Grade 3, Classes B & C (also meets type III except for elongation)
Department of Transportation listings – see www.powers.com or contact transportation agency

GUIDE SPECIFICATIONS

CSI Divisions: *03151-Concrete Anchoring, 04081-Masonry Anchorage and 05090-Metal Fastenings*.
Adhesive anchoring system shall be PE1000+ as supplied by Powers Fasteners, Inc., Brewster, NY. Anchors shall be installed in accordance with published instructions and requirements of the Authority Having Jurisdiction.

SECTION CONTENTS Page No.

PE1000+ dual cartridge and mixing nozzle

PACKAGING

Dual (side-by-side) Cartridge
13 fl. oz. (385 ml)
20 fl. oz. (585ml)

STORAGE LIFE & CONDITIONS

Two years in a dry, dark environment with temperature ranging from 41ºF and 95ºF (5ºC to 35ºC)

ANCHOR SIZE RANGE (TYP.)

3/8" to 1-1/4" diameter threaded rod
No. 3 to No.10 reinforcing bar (rebar)

SUITABLE BASE MATERIALS

Normal-weight concrete
Grouted concrete masonry

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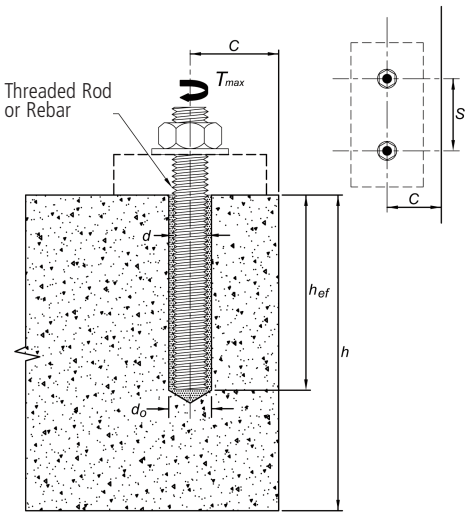
INSTALLATION SPECIFICATIONS

Installation Specifications for Threaded Rod and Reinforcing Bar

Dimension/Property		Notation	Units	Nominal Anchor Size								
Threaded rod		-	-	**3/8"**	**1/2"**	**5/8"**	**3/4"**	**7/8"**	**1"**	**-**	**1-1/4"**	**-**
Reinforcing bar		-	-	**#3**	**#4**	**#5**	**#6**	**#7**	**#8**	**#9**	**-**	**#10**
Nominal anchor diameter		d	in. (mm)	0.375 (9.5)	0.500 (12.7)	0.625 (15.9)	0.750 (19.1)	0.875 (22.2)	1.000 (25.4)	1.125 (28.6)	1.250 (31.8)	1.250 (31.8)
Nominal diameter of drilled hole		d_o, (d_{bit})	in.	7/16 ANSI	9/16 ANSI	11/16 ANSI	7/8 ANSI	1 ANSI	1-1/8 ANSI	1-3/8 ANSI	1-3/8 ANSI	1-1/2 ANSI
Minimum embedment[1]		$h_{ef,min}$	in. (mm)	2-3/8 (61)	2-3/4 (70)	3-1/8 (79)	3-1/2 (89)	3-1/2 (89)	4 (102)	4-1/2 (114)	5 (127)	5 (127)
Maximum embedment[1]		$h_{ef,max}$	in. (mm)	4-1/2 (114)	6 (153)	7-1/2 (191)	9 (229)	10-1/2 (267)	12 (305)	13-1/2 (343)	15 (381)	15 (381)
Minimum concrete member thickness[1]		h_{min}	in. (mm)	h_{ef} + 1-1/4 (h_{ef} + 30)		$h_{ef} + 2d_o$						
Minimum spacing distance[1]		s_{min}	in. (mm)	1-7/8 (48)	2-1/2 (62)	3-1/8 (80)	3-1/2 (95)	4-3/8 (111)	5 (127)	5-5/8 (143)	6-1/4 (159)	6-1/4 (159)
Minimum edge distance[1]		c_{min}	in. (mm)	1-7/8 (48)	2-1/2 (64)	3-1/8 (80)	3-1/2 (95)	4-3/8 (111)	5 (127)	5-5/8 (143)	6-1/4 (159)	6-1/4 (159)
Maximum torque (only possible after full cure time of adhesive)	A307 Grade C or F 1554 carbon steel rod	T_{max}	ft.-lb. (N-m)	10 (13)	25 (34)	50 (68)	90 (122)	125 (169)	165 (224)	-	280 (379)	-
	F593 Condition CW stainless steel rod or ASTM A193, Grade B7 carbon steel rod	T_{max}	ft.-lb. (N-m)	16 (22)	33 (45)	60 (81)	105 (142)	125 (169)	165 (224)	-	280 (379)	-
Effective cross sectional area of threaded rod		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)	-
Effective cross sectional area of reinforcing bar		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)

1. For use with the design provisions of ACI 318 Appendix D and ICC-ES AC308 Appendix A, Section 3.3 and ESR-2583.

Detail of Steel Hardware Elements used with Injection Adhesive System



Threaded Rod and Deformed Reinforcing Bar Material Properties				
Steel Description (General)	**Steel Specification** (ASTM)	**Nomial Anchor Size** (inch)	**Minimum Yield Strength,** f_y (ksi)	**Minimum Ultimate Strength,** f_u (ksi)
Carbon rod[1]	A 307, Grade C or F 1554	3/8 through 1-1/4	36.0	58.0
Stainless rod (Alloy 304 / 316)	F 593, Condition CW	3/8 through 5/8	65.0	100.0
		3/4 through 1-1/4	45.0	85.0
High strength carbon rod	A 193, Grade B7	3/8 through 1-1/4	105.0	120.0
Grade 60 reinforcing bar	A 615, A 706, A 767, or A 996	3/8 through 1-1/4 (#3 through #10)	60.0	90.0

1. ASTM A 36 carbon steel threaded rod is equivalent in listed properties.

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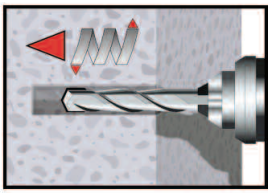
INSTALLATION INSTRUCTIONS (SOLID BASE MATERIALS)

DRILLING

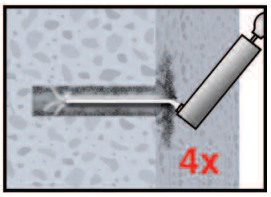


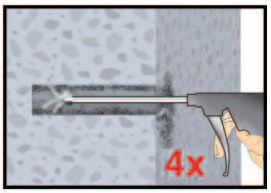
1 - Drill a hole into the base material with a rotary hammer drill tool to the size and embedment required by the selected anchor (*reference installation specifications for threaded rod and reinforcing bar*). The tolerances of the carbide drill bit should meet the requirements of ANSI Standard B212.15.

Precaution: Wear suitable eye and skin protection. Avoid inhalation of dusts during drilling and/or removal.

Note! After drilling and prior to hole cleaning, all standing water in the drilled bore hole must be removed if present (e.g. vacuum, compressed air, etc.)

HOLE CLEANING → BLOW 4x, BRUSH 4x, BLOW 4x

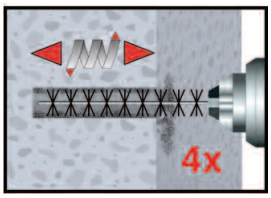




2a - Starting from the bottom or back of the anchor hole, blow the hole clean using a compressed air nozzle (min. 90 psi) or a hand pump (supplied by Powers Fasteners) a minimum of *four* times (4x).

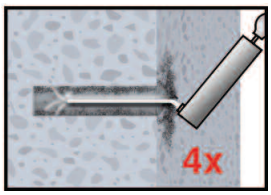
• Use a compressed air nozzle (min. 90 psi) or a hand pump (min. volume 25 fl. oz.) for anchor rod 3/8" to 3/4" diameter or reinforcing bar (rebar) sizes #3 to #6.

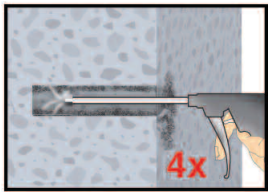
• Use a compressed air nozzle (min. 90 psi) for anchor rod 7/8" to 1-1/4" diameter and rebar sizes #7 to #10. A hand pump shall not be used with these anchor sizes.



2b - Determine wire brush diameter (*reference hole cleaning equipment selection table*) and attach the brush with adaptor to a rotary drill tool or battery screwgun. Brush the hole with the selected wire brush a minimum of *four* times (4x). A brush extension (supplied by Powers Fasteners, Cat. #08282) should be used for holes drilled deeper than the listed brush length.

The wire brush diameter should be checked periodically during use. The brush must be replaced if it becomes worn (less than D_{min}, *reference hole cleaning equipment selection table*) or does not come into contact with the sides of the drilled hole.





2c - Finally, blow the hole clean again a minimum of *four* times (4x).

• Use a compressed air nozzle (min. 90 psi) or a hand pump (min. volume 25 fl. oz.) for anchor rod 3/8" to 3/4" diameter or reinforcing bar (rebar) sizes #3 to #6.

• Use a compressed air nozzle (min. 90 psi) for anchor rod 7/8" to 1-1/4" diameter and rebar sizes #7 to #10. A hand pump shall not be used with these anchor sizes.

When finished the hole should be clean and free of dust, debris, ice, grease, oil or other foreign material.

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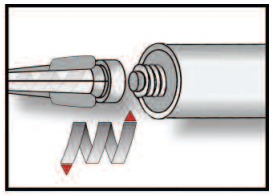
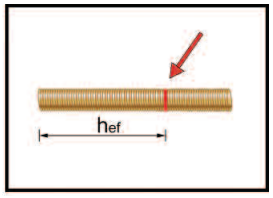
INSTALLATION INSTRUCTIONS (SOLID BASE MATERIALS)

PREPARING

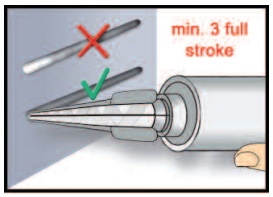


3- Check adhesive expiration date on cartridge label. Do not use expired product. Review Material Safety Data Sheet (MSDS) before use. Cartridge temperature must be between 41°F - 104°F (5°C - 40°C) when in use. Consideration should be given to the reduced gel time of the adhesive in warm temperatures.

Attach a supplied mixing nozzle to the cartridge. Do not modify the mixer in any way and make sure the mixing element is inside the nozzle. Load the cartridge into the correct dispensing tool.
A new mixing nozzle must be used for every working interruption longer than the published working times (*reference gel time and curing time table*) as well as for new cartridges.



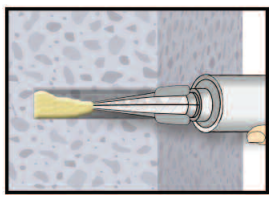
4- Prior to inserting the anchor rod or rebar into the filled bore hole, the position of the embedment depth has to be marked on the anchor. Verify anchor element is straight and free of surface damage.



5- For new cartridges and nozzles: prior to dispensing into the anchor hole, squeeze out separately a minimum three full strokes of the mixed adhesive. Discard non-uniform adhesive until the mixed adhesive shows a consistent ***red*** color.

Review and note the published working and cure times (*reference gel time and curing time table*) prior to injection of the mixed adhesive into the cleaned anchor hole.

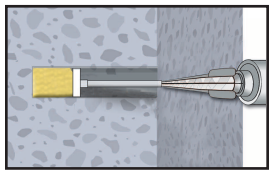
INSTALLATION



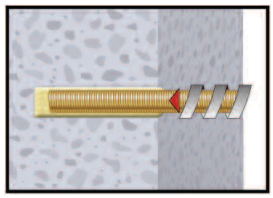
6- Fill the cleaned hole approximately two-thirds full with mixed adhesive starting from the bottom or back of the anchor hole. Slowly withdraw the mixing nozzle as the hole fills to avoid creating air pockets or voids. For embedment depth greater than 7-1/2" an extension nozzle (3/8" dia.) must be used with the mixing nozzle.

Piston plugs (see Adhesive Piston Plug Table) must be used with and attached to mixing nozzle and extension tube for horizontal and overhead installations with anchor rod from 3/4" to 1-1/4" diameter and rebar sizes #6 to #10. Insert piston plug to the back of the drilled hole and inject as described in the method above. During installation the piston plug will be naturally extruded from the drilled hole by the adhesive pressure.

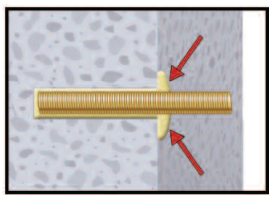
With Piston Plug



Attention! Do not install anchors overhead without proper training and installation hardware provided by Powers Fasteners. Contact Powers for details prior to use.



7- The anchor should be free of dirt, grease, oil or other foreign material. Push clean threaded rod or reinforcing bar into the anchor hole while turning slightly to ensure positive distribution of the adhesive until the embedment depth is reached. Air pockets are present when the threaded rod or rebar springs or air pockets burst during installation. In case of air pockets: remove rod or rebar, let the adhesive harden, re-drill the hole and repeat the complete installation.



8- Be sure that the anchor is fully seated at the bottom of the hole and that some adhesive has flowed from the hole and all around the top of the anchor. If there is not enough adhesive in the hole, the installation must be repeated. For overhead applications the anchor must be secured from moving/falling during the cure time (e.g. wedges). Minor adjustments to the anchor may be performed during the gel time but the anchor shall not be moved after final placement and during cure.

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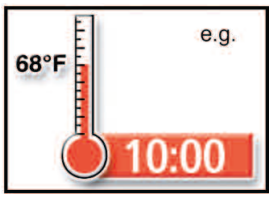
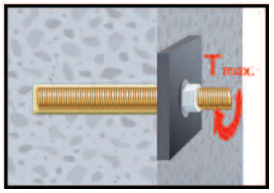
INSTALLATION INSTRUCTIONS (SOLID BASE MATERILAS)

CURING AND FIXTURE



9- Allow the adhesive anchor to cure to the specified full curing time prior to applying any load (*reference gel time and curing time table*).

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



10- After full curing of the adhesive anchor, a fixture can be installed to the anchor and tightened up to the maximum torque (*reference gel time and curing time table*) by using a calibrated torque wrench.

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

REFERENCE TABLES FOR INSTALLATION

Gel (working) Time and Curing Table

Temperature of base material		Gel (working) time	Full curing time
°F	°C		
41	5	180 minutes	50 hours
50	10	120 minutes	24 hours
68	20	30 minutes	10 hours
86	30	20 minutes	6 hours
104	40	20 minutes	4 hours

Hole Cleaning Equipment Selection Table for PE1000+

Threaded rod diameter (inch)	Rebar size (no.)	ANSI drill bit diameter (inch)	Min. brush diameter, D_{min} (inches)	Brush length, L (inches)	Steel wire brush (Cat. #)	Blowout tool	Number of cleaning actions
3/8	#3	7/16	0.475	6-3/4	08284	Hand-pump cat# 08280 or compressed air nozzle (min. 90 psi)	4x blowing 4x brushing 4x blowing
1/2	#4	9/16	0.600	6-3/4	08285		
5/8	#5	11/16	0.735	7-7/8	08286		
3/4	#6	7/8	0.920	7-7/8	08287		
7/8	#7	1	1.045	11-7/8	08288	Compressed air nozzle only (min. 90 psi)	
1	#8	1-1/8	1.175	11-7/8	08289		
1-1/4	#9	1-3/8	1.425	11-7/8	08290		
-	#10	1-1/2	1.550	11-7/8	08291		

An SDS-plus adaptor (Cat. #08283) or Jacobs chuck style adaptor (Cat. #08296) is required to attach a steel wire brush to the drill tool.

Adhesive Piston Plugs

Threaded rod diameter (inch)	Rebar size (no.)	ANSI drill bit diameter (inch)	Plug Size (inch)	Plastic Plug (Cat. #)	Horizontal and overhead installations
3/4	#6	7/8	7/8	08300	
7/8	#7	1	1	08301	
1	#8	1-1/8	1-1/8	08303	
1-1/4	#9	1-3/8	1-3/8	08305	
-	#10	1-1/2	1-1/2	08309	

A plastic extension tube (3/8" dia., Cat# 08281) must be used with piston plugs.

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PERFORMANCE DATA

Tension Design Information for Threaded Rod and Reinforcing Bar in Normal-Weight Concrete (For use with load combinations taken from ACI 318 Section 9.2)[1,2]

Design Characteristic		Notation	Units	Nominal Anchor Size							
				3/8"	1/2"	5/8"	3/4"	7/8"	1"	-	1-1/4"
				#3	#4	#5	#6	#7	#8	#9	#10
Minimum embedment		$h_{ef,min}$	in. (mm)	2-3/8 (70)	2-3/4 (70)	3-1/8 (79)	3-1/2 (89)	3-1/2 (89)	4 (102)	4-1/2 (114)	5 (127)
STEEL STRENGTH IN TENSION[3]											
Effective cross sectional area of threaded rod		A_{se}	in.^{2} (mm^2)	0.078 (50)	0.142 (92)	0.226 (146)	0.335 (216)	0.462 (289)	0.606 (391)	-	0.969 (625)
Steel strength in tension	Carbon rod (ASTM A 307, Grade C or F 1554)	N_{sa}	lb (kN)	4,525 (20.1)	8,235 (36.6)	13,110 (58.3)	19,430 (86.4)	26,795 (119.2)	35,150 (156.3)	-	56,200 (250.0)
	Stainless steel rod - alloy 304/316 (ASTM F 593, Condition CW)	N_{sa}	lb (kN)	7,800 (34.7)	14,200 (63.2)	22,600 (100.5)	28,475 (126.7)	39,270 (174.7)	51,510 (229.1)	-	82,365 (366.4)
	High strength carbon rod (ASTM A 193, Grade B7)	N_{sa}	lb (kN)	9,360 (41.6)	17,040 (75.8)	27,120 (120.6)	40,200 (178.8)	55,440 (246.6)	72,720 (323.5)	-	116,280 (517.2)
Effective cross sectional area of reinforcing bar		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)
Steel strength in tension, Grade 60 reinforcing bars		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)
Reduction factor for steel strength		ϕ	-	0.75 (0.65 for ASTM F 593 Stainless)							
CONCRETE BREAKOUT STRENGTH IN TENSION											
Effectiveness factor for uncracked concrete		k_{uncr}	-	24	24	24	24	24	24	24	24
Modification factor for uncracked concrete		$\psi_{c,N}$	-	For all design cases use $\psi_{c,N} = 1.0$							
Critical edge distance		c_{ac}	in. (mm)	$1.7h_{ef}$ when $h \geq h_{ef} + 5(c_{a,min})^{0.75}$; otherwise $c_{ac} = 2.7h_{ef}$							
Critical spacing distance		s_{ac}	in. (mm)	$2c_{ac}$							
Reduction factor for concrete breakout strength		ϕ	-	0.65 (Condition B)							
BOND STRENGTH IN TENSION FOR TEMPERATURE RANGE A[4] Maximum long term temperature = 75°F (24°C), Maximum short term temperature = 104°F (40°C)											
Dry hole	Reduction factor for bond strength	ϕ_d	-	0.65							
	Characteristic bond strength, cracked concrete (2,500 psi)	$\tau_{k,cr}$	psi (N/mm^2)	N/A	930 (6.4)	765 (5.3)	712 (4.9)	371 (4.6)	N/A	N/A	N/A
	Characteristic bond strength, uncracked concrete (2,500 psi)	$\tau_{k,uncr}$	psi (N/mm^2)	2,049 (14.1)	1,925 (13.3)	1,836 (12.7)	1,765 (12.2)	1,708 (11.8)	1,659 (11.4)	1,618 (11.2)	1,582 (10.9)
Water saturated concrete	Reduction factor for bond strength	ϕ_{ws}	-	0.55	0.55	0.55	0.45	0.45	0.45	0.45	0.45
	Additional factor for water saturated concrete condition	K_{ws}	-	1.0	1.0	1.0	1.0	1.0	1.0	0.99	0.97
Water-filled hole	Reduction factor for bond strength	ϕ_{wf}	-	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
	Additional factor for water-filled hole condition	K_{wf}	-	0.89	0.80	0.73	0.68	0.63	0.60	0.57	0.55
BOND STRENGTH IN TENSION FOR TEMPERATURE RANGE B[4,5,6] Maximum long term temperature = 140°F (60°C), Maximum short term temperature = 110°F (43°C)											
Dry hole	Reduction factor for bond strength	ϕ_d	-	0.65							
	Characteristic bond strength, cracked concrete (2,500 psi)	$\tau_{k,cr}$	psi (N/mm^2)	N/A	512 (3.5)	421 (2.9)	392 (2.7)	369 (2.5)	N/A	N/A	N/A
	Characteristic bond strength, uncracked concrete (2,500 psi)	$\tau_{k,uncr}$	psi (N/mm^2)	1,126 (7.8)	1,059 (7.3)	1,009 (7.0)	971 (6.7)	939 (6.5)	912 (6.3)	890 (6.1)	870 (6.0)
Water saturated concrete	Reduction factor for bond strength	ϕ_{ws}	-	0.55	0.55	0.55	0.45	0.45	0.45	0.45	0.45
	Additional factor for water saturated concrete condition	K_{ws}	-	1.0	1.0	1.0	1.0	1.0	1.0	0.99	0.97
Water-filled hole	Reduction factor for bond strength	ϕ_{wf}	-	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
	Additional factor for water-filled hole condition	K_{wf}	-	0.89	0.80	0.73	0.68	0.63	0.60	0.57	0.55

1. The data in this table is intended to be used together with the design provisions of ACI 318 Appendix D and ICC-ES AC308 Annex A, Section 3.3 and ESR-2583.
2. Installation must comply with published instructions and details. Periodic special inspection must be performed where required by code or the Authority Having Jurisdiction (AHJ). See ESR-2583.
3. For ductility classification of steel anchor elements see ESR-2583.
4. Long term concrete temperatures are roughly constant over significant periods of time. Short-term elevated temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling.
5. For load combinations consisting of short term loads only such as wind, bond strength may be increased by 40% for Temperature Range B.
6. Maximum short term temperature for Temperature Range B may be increased to 162°F (72°C) provided the tabulated characteristic bond strengths are reduced by 10 percent.

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PERFORMANCE DATA

Shear Design Information for Threaded Rod and Reinforcing Bar in Normal-Weight Concrete (For use with load combinations taken from ACI 318 Section 9.2)[1,2]

Design Characteristic		Notation	Units	Nominal Anchor Size							
				3/8"	1/2"	5/8"	3/4"	7/8"	1"	-	1-1/4"
				#3	#2	#5	#6	#7	#8	#9	#10
Minimum embedment		$h_{ef,min}$	in. (mm)	2-3/8 (60)	2-3/4 (70)	3-1/8 (79)	3-1/2 (89)	3-1/2 (89)	4 (102)	4-1/2 (114)	5 (127)
STEEL STRENGTH IN SHEAR[3]											
Steel strength in shear	Standard carbon rod (ASTM A 307, Grade C or F 1554)	V_{sa}	lb (kN)	2,715 (12.1)	4,940 (22.0)	7,865 (35.0)	11,660 (51.9)	16,075 (71.5)	21,090 (93.8)	-	33,720 (150.0)
	Stainless steel rod - alloy 304/316 (ASTM F 593, Condition CW)	V_{sa}	lb (kN)	4,680 (20.8)	8,520 (37.9)	13,560 (60.3)	17,085 (76.0)	23,560 (104.8)	30,905 (137.5)	-	49,420 (219.8)
	High strength carbon rod (ASTM A 193, Grade B7)	V_{sa}	lb (kN)	5,615 (25.0)	10,225 (45.5)	16,270 (72.4)	24,120 (107.3)	33,265 (148.0)	43,630 (194.1)	-	69,770 (310.3)
Steel strength in shear, Grade 60 reinforcing bar		V_{sa}	lb (kN)	5,940 (26.4)	10,800 (48.0)	16,710 (74.5)	23,760 (105.7)	32,400 (144.1)	42,660 (189.8)	54,000 (240.2)	68,580 (305.0)
Reduction factor for steel strength		ø	in. (mm)	0.65 (0.60 for ASTM F 593 Stainless)							
CONCRETE BREAKOUT STRENGTH IN SHEAR											
Load bearing length of anchor		ℓ_e	-	h_{ef} or 8d whichever is less							
Reduction factor for concrete breakout strength		ø	-	0.70 (Condition B)							
CONCRETE PRYOUT STRENGTH IN SHEAR											
Coefficient for pryout strength		$k_{cp,uncr}$	-	1.0 for h_{ef} < 2.5 in., 2.0 for h_{ef} ≥ 2.5 in.							
Reduction factor for pryout strength		ø		0.70 (Condition B)							

1. The data in this table is intended to be used together with the design provisions of ACI 318 Appendix D and ICC-ES AC308 Annex A, Section 3.3 and ESR-2583.
2. Installation must comply with published instructions and details. Periodic special inspection must be performed where required by code or the Authority Having Jurisdiction (AHJ). See ICC-ES AC308 Annex A, Section 14.4 and ESR-2583.
3. For ductility classification of steel anchor elements see ESR-2583.

BOND STRENGTH DETERMINATION				
Concrete State	**Hole Drilling Method**	**Installation Condition**	**Bond Strength**	**Strength Reduction Factor**
Uncracked concrete	Hammer drill	Dry concrete	$\tau_{k,uncr}$	$ø_d$
		Water-saturated concrete	$\tau_{k,uncr} \cdot \kappa_{ws}$	$ø_{ws}$
		Water-filled hole	$\tau_{k,uncr} \cdot \kappa_{wf}$	$ø_{wf}$
Cracked concrete	Hammer drill	Dry concrete	$\tau_{k,cr}$	$ø_d$
		Water-saturated concrete	$\tau_{k,cr} \cdot \kappa_{ws}$	$ø_{ws}$
		Water-filled hole	$\tau_{k,cr} \cdot \kappa_{wf}$	$ø_{wf}$

For concrete compressive strength between 2,500 psi and 8,000 psi, the tabulated characteristic bond strength for cracked concrete $\tau_{k,cr}$ or uncracked concrete $\tau_{k,uncr}$ may be increased by a factor of $(f'_c / 2{,}500)^{0.12}$.

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Factored Design Strength ($øN_n$ and $øV_n$) in Accordance with ACI 318 Appendix D and ICC-ES AC308 Annex A:

1. Tabular values are provided for illustration and are applicable for single anchors installed in uncracked normal-weight concrete with minimum slab thickness, $h_a = h_{min}$, and with the following conditions:
   - c_{a1} is greater than or equal to the critical edge distance, c_{ac} where $c_{ac} = 2.7\ h_{ef}$.
   - c_{a2} is greater than or equal to 1.5 times c_{a1}.
2. Calculations were performed according to ACI 318-05 Appendix D and ICC-ES AC308 Annex A, Section 3.3. The load level corresponding to the failure mode is listed (e.g. For tension: steel, concrete breakout or bond strength; For shear: steel, concrete breakout or pryout strength). The lowest load level controls.
3. Strength reduction factors (Ø) for steel strength and concrete breakout strength were based on ACI 318 Section 9.2 for load combinations. Condition B was assumed.
4. Strength reduction factors (Ø) for bond strength were determined from reliability testing and qualification in accordance with ICC-ES AC308 and are tabulated in this product supplement and ESR-2583.

(Notes continued on next page).

STRENGTH DESIGN SD TABLES

ADHESIVES

Tension and Shear Design Strength for PE1000+ Installed into Uncracked Concrete in Dry Hole Condition for Temperature Range A (Bond or Concrete Strength)

Maximum long term temperature = 75°F (24°C), Maximum short term temperature = 104°F (40°C)

		Minimum Concrete Compressive Strength, f'_c (psi)									
		2,500		3,000		4,000		6,000		8,000	
Nominal Rod/Rebar Size (in. or #)	Embed. Depth h_{ef} (in.)	$ØN_{cb}$ or $ØN_a$ Tension (lbs.)	$ØV_{cb}$ or $ØV_{cp}$ Shear (lbs.)	$ØN_{cb}$ or $ØN_a$ Tension (lbs.)	$ØV_{cb}$ or $ØV_{cp}$ Shear (lbs.)	$ØN_{cb}$ or $ØN_a$ Tension (lbs.)	$ØV_{cb}$ or $ØV_{cp}$ Shear (lbs.)	$ØN_{cb}$ or $ØN_a$ Tension (lbs.)	$ØV_{cb}$ or $ØV_{cp}$ Shear (lbs.)	$ØN_{cb}$ or $ØN_a$ Tension (lbs.)	$ØV_{cb}$ or $ØV_{cp}$ Shear (lbs.)
3/8 or #3	2 3/8	2,855	1,860	3,125	2,035	3,610	2,350	4,140	2,880	4,285	3,325
	3	4,055	2,565	4,440	2,810	4,980	3,245	5,230	3,975	5,410	4,590
	4 1/2	7,060	4,255	7,215	4,660	7,470	5,380	7,845	6,590	8,120	7,610
1/2 or #4	2 3/4	3,555	2,480	3,895	2,715	4,500	3,135	5,510	3,840	6,220	4,435
	4	6,240	4,230	6,835	4,630	7,895	5,350	8,735	6,550	9,045	7,565
	6	11,465	7,150	12,060	7,835	12,485	9,045	13,105	11,080	13,565	12,795
5/8 or #5	3 1/8	4,310	3,260	4,720	3,570	5,450	4,125	6,675	5,050	7,710	5,830
	5	8,720	6,420	9,555	7,030	11,030	8,120	8,735	9,945	13,470	11,480
	7 1/2	16,020	10,945	17,550	11,990	18,595	13,840	13,105	16,955	20,205	19,575
3/4 or #6	3 1/2	5,105	4,350	5,595	4,765	6,460	5,500	7,910	6,740	9,135	7,780
	6	11,465	9,365	12,560	10,255	14,500	11,845	17,760	14,505	18,650	16,750
	9	21,060	15,905	23,070	17,425	25,740	20,120	27,025	24,640	27,970	28,455
7/8 or #7	3 1/2	5,105	4,770	5,595	5,225	6,460	6,035	7,910	7,395	9,135	8,535
	7	14,445	12,685	15,825	13,895	18,275	16,045	22,380	19,650	24,565	22,690
	10 1/2	26,540	21,580	29,070	23,640	33,570	27,295	35,595	33,430	36,845	38,600
1 or #8	4	6,240	6,195	6,835	6,790	7,895	7,840	9,665	9,600	11,160	11,085
	8	17,650	16,510	19,335	18,085	22,325	20,885	27,340	25,580	31,160	29,535
	12	32,425	28,115	35,520	30,795	41,015	35,560	45,155	43,555	46,740	50,290
#9	4 1/2	7,445	8,090	8,155	8,860	9,420	10,230	11,535	12,530	13,320	14,465
	9	21,060	21,295	23,070	23,325	26,640	26,935	32,625	32,985	37,675	38,090
	13 1/2	38,690	36,065	42,380	39,510	48,940	45,620	55,740	55,875	57,695	64,515
1-1/4	5	8,720	9,605	9,555	10,525	11,030	12,150	13,510	14,880	15,600	17,185
	10	24,665	25,670	27,020	28,125	31,200	32,475	38,210	39,770	44,125	45,925
	15	45,315	43,775	49,640	47,950	57,320	55,370	67,280	67,810	69,645	78,305
#10	5	8,720	9,915	9,555	10,860	11,030	12,545	13,510	15,360	15,600	17,740
	10	24,665	26,175	27,020	28,675	31,200	33,110	38,210	40,550	44,125	46,825
	15	45,315	44,390	49,640	48,625	57,320	56,150	67,280	68,765	69,645	79,405

Legend Concrete Breakout | Bond Strength/ Pryout Strength

d

Factored Design Strength (ϕN_n and ϕV_n) in Accordance with ACI 318 Appendix D and ICC-ES AC308 Annex A (Continued):

(Continued)

5. Tabular values are permitted for static loads only, seismic loading is not permitted with these tables. Periodic special inspection must be performed where required by code or the Authority Having Jurisdiction (AHJ). See ESR-2583.
6. Tabular values are not permitted for anchors subjected to tension resulting from sustained loading. Please see ICC-ES AC308 Annex A, Section 3.3 and ESR-2583 for supplemental design requirement for this loading condition.
7. For designs that include combined tension and shear, the interaction of tension and shear loads must be calculated in accordance with ACI 318-05 Appendix D.
8. Interpolation is not permitted to be used with the tabular values. For intermediate base material compressive strengths, please see ACI 318-05 Appendix D, ICC-ES AC308 Annex A, Section 3.3 and information included in this product supplement. For other design conditions please see ACI 318-05 Appendix D and ICC-ES AC308 Annex A, Section 3.3 and ESR-2583
9. Long term concrete temperatures are roughly constant over significant periods of time. Short-term elevated temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling.

Tension and Shear Design Strength of Steel Elements (Steel Strength)

Nominal Rod/Rebar Size (in. or #)	Steel Elements - Threaded Rod and Reinforcing Bar							
	A 307, Grade C or F 1554		F 593, CW (SS)		A 193, Grade B7		Grade 60 Rebar	
	ϕN_{sa} Tension (lbs.)	ϕV_{sa} Shear (lbs.)	ϕN_{sa} Tension (lbs.)	ϕV_{sa} Shear (lbs.)	ϕN_{sa} Tension (lbs.)	ϕV_{sa} Shear (lbs.)	ϕN_{sa} Tension (lbs.)	ϕV_{sa} Shear (lbs.)
3/8 or #3	3,395	1,765	5,070	2,810	7,315	3,805	7,425	3,860
1/2 or #4	6,175	3,210	9,230	5,110	13,315	6,925	13,500	7,020
5/8 or #5	9,830	5,110	14,690	8,135	21,190	11,020	20,925	10,880
3/4 or #6	14,575	7,580	18,510	10,250	31,405	16,330	29,700	15,455
7/8 or #7	20,095	10,450	25,525	14,135	43,315	22,525	40,500	21,060
1 or #8	26,360	13,710	33,480	18,545	56,815	29,545	53,325	27,730
#9	-	-	-	-	-	-	67,500	35,100
1-1/4	42,150	21,920	53,535	29,650	90,845	47,240	-	-
#10	-	-	-	-	-	-	85,725	44,575

Legend Steel Strength

Factored Design Strength ($\emptyset N_n$ and $\emptyset V_n$) in Accordance with ACI 318 Appendix D and ICC-ES AC308 Annex B:

1. Tabular values are provided for illustration and are applicable for single anchors installed in uncracked normal-weight concrete with minimum slab thickness, $h_a = h_{min}$, and with the following conditions:
   - c_{a1} is greater than or equal to the critical edge distance, c_{ac} where $c_{ac} = 2.7\ h_{ef}$.
   - c_{a2} is greater than or equal to 1.5 times c_{a1}.
2. Calculations were performed according to ACI 318-05 Appendix D and ICC-ES AC308 Annex A, Section 3.3. The load level corresponding to the failure mode is listed (e.g. For tension: steel, concrete breakout or bond strength; For shear: steel, concrete breakout or pryout strength). The lowest load level controls.
3. Strength reduction factors (Ø) for steel strength and concrete breakout strength were based on ACI 318 Section 9.2 for load combinations. Condition B was assumed.
4. Strength reduction factors (Ø) for bond strength were determined from reliability testing and qualification in accordance with ICC-ES AC308 and are tabulated in this product supplement and ESR-2583.

(Notes continued on next page).

Tension and Shear Design Strength for PE1000+ Installed into Uncracked Concrete in Dry Hole Condition for Temperature Range B (Bond or Concrete Strength)

Maximum long term temperature = 110°F (43°C), Maximum short term temperature = 140°F (60°C)

Nominal Rod/Rebar Size (in. or #)	Embed. Depth h_{ef} (in.)	Minimum Concrete Compressive Strength, f'_c (psi)									
		2,500		3,000		4,000		6,000		8,000	
		$ØN_{cb}$ or $ØN_a$ Tension (lbs.)	$ØV_{cb}$ or $ØV_{cp}$ Shear (lbs.)	$ØN_{cb}$ or $ØN_a$ Tension (lbs.)	$ØV_{cb}$ or $ØV_{cp}$ Shear (lbs.)	$ØN_{cb}$ or $ØN_a$ Tension (lbs.)	$ØV_{cb}$ or $ØV_{cp}$ Shear (lbs.)	$ØN_{cb}$ or $ØN_a$ Tension (lbs.)	$ØV_{cb}$ or $ØV_{cp}$ Shear (lbs.)	$ØN_{cb}$ or $ØN_a$ Tension (lbs.)	$ØV_{cb}$ or $ØV_{cp}$ Shear (lbs.)
3/8 or #3	2 3/8	2,050	1,860	2,095	2,035	2,165	2,335	2,275	2,450	2,355	2,535
	3	2,585	2,565	2,645	2,810	2,735	3,245	2,875	3,975	2,975	4,590
	4 1/2	3,880	4,255	3,965	4,660	4,105	5,380	4,310	6,590	4,460	7,610
1/2 or #4	2 3/4	2,975	2,480	3,040	2,715	3,145	3,135	3,305	3,840	3,420	4,435
	4	4,325	4,230	4,420	4,630	4,575	5,350	4,805	6,550	4,975	7,565
	6	6,490	7,150	6,630	7,835	6,865	9,045	7,205	11,080	7,460	12,795
5/8 or #5	3 1/8	4,025	3,260	4,115	3,570	4,260	4,125	4,470	5,050	4,625	5,830
	5	6,440	6,420	6,580	7,030	6,810	8,120	7,150	9,945	7,405	11,480
	7 1/2	9,660	10,945	9,870	11,990	10,220	13,840	10,730	16,955	11,105	19,575
3/4 or #6	3 1/2	5,105	4,350	5,320	4,765	5,505	5,500	5,780	6,740	5,985	7,780
	6	8,925	9,365	9,120	10,255	9,440	11,845	9,910	14,505	10,260	16,750
	9	13,385	15,905	13,680	17,425	14,160	20,120	14,865	24,640	15,390	28,455
7/8 or #7	3 1/2	5,105	4,770	5,595	5,225	6,215	6,035	6,525	7,395	6,750	8,535
	7	11,745	12,685	12,005	13,895	12,425	16,045	13,045	19,650	13,505	22,690
	10 1/2	17,615	21,580	18,005	23,640	18,640	27,295	19,570	33,430	20,255	38,600
1 or #8	4	6,240	6,195	6,835	6,790	7,880	7,840	8,275	9,600	8,565	11,085
	8	14,900	16,510	15,230	18,085	15,765	20,885	16,550	25,580	17,130	29,535
	12	22,350	28,115	22,840	30,795	23,645	35,560	24,825	43,555	25,695	50,290
#9	4 1/2	7,445	8,090	8,155	8,860	9,420	10,230	10,220	12,530	10,580	14,465
	9	18,400	21,295	18,810	23,325	19,470	26,935	20,440	32,985	21,160	38,090
	13 1/2	27,600	36,065	28,210	39,510	29,205	45,620	30,660	55,875	31,735	64,515
1-1/4	5	8,720	9,605	9,555	10,525	11,030	12,150	12,335	14,880	12,765	17,185
	10	22,205	25,670	22,700	28,125	23,495	32,475	24,665	39,770	25,535	45,925
	15	33,310	43,775	34,050	47,950	35,245	55,370	37,000	67,810	38,300	78,305
#10	5	8,720	9,915	9,555	10,860	11,030	12,545	12,335	15,360	12,765	17,740
	10	22,205	26,175	22,700	28,675	23,495	33,110	24,665	40,550	25,535	46,825
	15	33,310	44,390	34,050	48,625	35,245	56,150	37,000	68,765	38,300	79,405

Legend Concrete Breakout (green) — Bond Strength/Pryout Strength (yellow)

Factored Design Strength (ϕN_n and ϕV_n) in Accordance with ACI 318 Appendix D and ICC-ES AC308 Annex B (Continued):

(Continued)

5. Tabular values are permitted for static loads only, seismic loading is not permitted with these tables. Periodic special inspection must be performed where required by code or the Authority Having Jurisdiction (AHJ). See ESR-2583.
6. Tabular values are not permitted for anchors subjected to tension resulting from sustained loading. Please see ICC-ES AC308 Annex A, Section 3.3 and ESR-2583 for supplemental design requirement for this loading condition.
7. For designs that include combined tension and shear, the interaction of tension and shear loads must be calculated in accordance with ACI 318-05 Appendix D.
8. Interpolation is not permitted to be used with the tabular values. For intermediate base material compressive strengths, please see ACI 318-05 Appendix D, ICC-ES AC308 Annex A, Section 3.3 and information included in this product supplement. For other design conditions please see ACI 318-05 Appendix D and ICC-ES AC308 Annex A, Section 3.3 and ESR-2583
9. Long term concrete temperatures are roughly constant over significant periods of time. Short-term elevated temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling.

Tension and Shear Design Strength of Steel Elements (Steel Strength)

Nominal Rod/Rebar Size (in. or #)	Steel Elements - Threaded Rod and Reinforcing Bar							
	A 307, Grade C or F 1554		F 593, CW (SS)		A 193, Grade B7		Grade 60 Rebar	
	ϕN_{sa}	ϕV_{sa}	ϕN_{sa}	ϕV_{sa}	ϕN_{sa}	ϕV_{sa}	ϕN_{sa}	ϕV_{sa}
3/8 or #3	3,395	1,765	5,070	2,810	7,315	3,805	7,425	3,860
1/2 or #4	6,175	3,210	9,230	5,110	13,315	6,925	13,500	7,020
5/8 or #5	9,830	5,110	14,690	8,135	21,190	11,020	20,925	10,880
3/4 or #6	14,575	7,580	18,510	10,250	31,405	16,330	29,700	15,455
7/8 or #7	20,095	10,450	25,525	14,135	43,315	22,525	40,500	21,060
1 or #8	26,360	13,710	33,480	18,545	56,815	29,545	53,325	27,730
#9	-	-	-	-	-	-	67,500	35,100
1-1/4	42,150	21,920	53,535	29,650	90,845	47,240	-	-
#10	-	-	-	-	-	-	85,725	44,575

Legend Steel Strength

Factored Design Strength ($ØN_n$ and $ØV_n$) in Accordance with ACI 318 Appendix D and ICC-ES AC308 Annex A:

1. Tabular values are provided for illustration and are applicable for single anchors installed in uncracked normal-weight concrete with minimum slab thickness, $h_a = h_{min}$, and with the following conditions:
   - c_{a1} is greater than or equal to the critical edge distance, c_{ac} where $c_{ac} = 2.7\ h_{ef}$.
   - c_{a2} is greater than or equal to 1.5 times c_{a1}.
2. Calculations were performed according to ACI 318-05 Appendix D and ICC-ES AC308 Annex A, Section 3.3. The load level corresponding to the failure mode is listed (e.g. For tension: steel, concrete breakout or bond strength; For shear: steel, concrete breakout or pryout strength). The lowest load level controls.
3. Strength reduction factors (Ø) for steel strength and concrete breakout strength were based on ACI 318 Section 9.2 for load combinations. Condition B was assumed.
4. Strength reduction factors (Ø) for bond strength were determined from reliability testing and qualification in accordance with ICC-ES AC308 and are tabulated in this product supplement and ESR-2583.

(Notes continued on next page).

Tension and Shear Design Strength for PE1000+ Installed into Cracked Concrete in Dry Hole Condition for Temperature Range A (Bond or Concrete Strength)

Maximum long term temperature = 75°F (24°C), Maximum short term temperature = 104°F (40°C)

Nominal Rod/Rebar Size (in. or #)	Embed. Depth h_{ef} (in.)	Minimum Concrete Compressive Strength, f'_c (psi)									
		2,500		3,000		4,000		6,000		8,000	
		$ØN_{cb}$ or $ØN_a$ Tension (lbs.)	$ØV_{cb}$ or $ØV_{cp}$ Shear (lbs.)	$ØN_{cb}$ or $ØN_a$ Tension (lbs.)	$ØV_{cb}$ or $ØV_{cp}$ Shear (lbs.)	$ØN_{cb}$ or $ØN_a$ Tension (lbs.)	$ØV_{cb}$ or $ØV_{cp}$ Shear (lbs.)	$ØN_{cb}$ or $ØN_a$ Tension (lbs.)	$ØV_{cb}$ or $ØV_{cp}$ Shear (lbs.)	$ØN_{cb}$ or $ØN_a$ Tension (lbs.)	$ØV_{cb}$ or $ØV_{cp}$ Shear (lbs.)
1/2 or #4	2 3/4	2,520	1,770	2,670	1,940	2,765	2,240	2,900	2,740	3,000	3,165
	4	3,800	3,020	3,880	3,310	4,020	3,820	4,220	4,680	4,365	5,405
	6	5,695	5,110	5,825	5,595	6,030	6,460	6,330	7,915	6,550	9,140
5/8 or #5	3 1/8	3,050	2,330	3,120	2,550	3,230	2,945	3,390	3,610	3,510	4,165
	5	4,880	4,585	4,990	5,020	5,165	5,800	5,425	7,100	5,615	8,200
	7 1/2	7,325	7,815	7,485	8,565	7,745	9,885	8,135	12,110	8,420	13,985
3/4 or #6	3 1/2	3,620	3,105	3,900	3,405	4,040	3,930	4,240	4,815	4,390	5,555
	6	6,545	6,690	6,685	7,325	6,920	8,460	7,265	10,360	7,525	11,965
	9	9,815	11,360	10,030	12,445	10,385	14,370	10,900	17,600	11,285	20,325
7/8 or #7	3 1/2	3,620	3,410	3,965	3,735	4,440	4,310	4,660	5,280	4,825	6,095
	7	8,395	9,060	8,580	9,925	8,880	11,460	9,320	14,035	9,650	16,210
	10 1/2	12,590	15,415	12,865	16,885	13,320	19,495	13,985	23,880	14,475	27,570

Legend Concrete Breakout   Bond Strength/Pryout Strength

Tension and Shear Design Strength of Steel Elements (Steel Strength)

Nominal Rod/Rebar Size (in. or #)	Steel Elements - Threaded Rod and Reinforcing Bar							
	A 307, Grade C or F 1554		F 593, CW (SS)		A 193, Grade B7		Grade 60 Rebar	
	$ØN_{sa}$ Tension (lbs.)	$ØV_{sa}$ Shear (lbs.)	$ØN_{sa}$ Tension (lbs.)	$ØV_{sa}$ Shear (lbs.)	$ØN_{sa}$ Tension (lbs.)	$ØV_{sa}$ Shear (lbs.)	$ØN_{sa}$ Tension (lbs.)	$ØV_{sa}$ Shear (lbs.)
1/2 or #4	6,175	3,210	9,230	5,540	13,315	6,925	13,500	7,020
5/8 or #5	9,830	5,110	14,690	8,815	21,190	11,020	20,925	10,880
3/4 or #6	14,575	7,580	18,510	11,105	31,405	16,330	29,700	15,455
7/8 or #7	20,095	10,450	25,525	15,315	43,315	22,525	40,500	21,060

Legend Steel Strength

d

Factored Design Strength ($\emptyset N_n$ and $\emptyset V_n$) in Accordance with ACI 318 Appendix D and ICC-ES AC308 Annex B:

(Continued)

5. Tabular values are permitted for static loads only, seismic loading is not permitted with these tables. Periodic special inspection must be performed where required by code or the Authority Having Jurisdiction (AHJ). See ESR-2583.
6. Tabular values are not permitted for anchors subjected to tension resulting from sustained loading. Please see ICC-ES AC308 Annex A, Section 3.3 and ESR-2583 for the supplemental design requirement for this loading condition.
7. For designs that include combined tension and shear, the interaction of tension and shear loads must be calculated in accordance with ACI 318-05 Appendix D.
8. Interpolation is not permitted to be used with the tabular values. For intermediate base material compressive strengths, please see ACI 318-05 Appendix D, ICC-ES AC308 Annex A, Section 3.3 and information included in this product supplement. For other design conditions please see ACI 318-05 Appendix D and ICC-ES AC308 Annex A, Section 3.3 and ESR-2583.
9. Long term concrete temperatures are roughly constant over significant periods of time. Short-term elevated temperatures are those that occur over brief intervals, e.g. as a result of diurnal cycling.

Tension and Shear Design Strength for PE1000+ Installed into Cracked Concrete in Dry Hole Condition for Temperature Range B (Bond or Concrete Strength)

Maximum long term temperature = 110°F (43°C), Maximum short term temperature = 140°F (60°C)

Nominal Rod/Rebar Size (in. or #)	Embed. Depth h_{ef} (in.)	Minimum Concrete Compressive Strength, f'_c (psi)									
		2,500		3,000		4,000		6,000		8,000	
		$\emptyset N_{cb}$ or $\emptyset N_a$ Tension (lbs.)	$\emptyset V_{cb}$ or $\emptyset V_{cp}$ Shear (lbs.)	$\emptyset N_{cb}$ or $\emptyset N_a$ Tension (lbs.)	$\emptyset V_{cb}$ or $\emptyset V_{cp}$ Shear (lbs.)	$\emptyset N_{cb}$ or $\emptyset N_a$ Tension (lbs.)	$\emptyset V_{cb}$ or $\emptyset V_{cp}$ Shear (lbs.)	$\emptyset N_{cb}$ or $\emptyset N_a$ Tension (lbs.)	$\emptyset V_{cb}$ or $\emptyset V_{cp}$ Shear (lbs.)	$\emptyset N_{cb}$ or $\emptyset N_a$ Tension (lbs.)	$\emptyset V_{cb}$ or $\emptyset V_{cp}$ Shear (lbs.)
1/2 or #4	2 3/4	1,440	1,770	1,470	1,940	1,520	2,240	1,595	2,740	1,655	3,165
	4	2,090	3,020	2,135	3,310	2,210	3,820	2,325	4,680	2,405	5,180
	6	3,135	5,110	3,205	5,595	3,320	6,460	2,485	7,505	3,605	7,770
5/8 or #5	3 1/8	1,680	2,330	1,715	2,550	1,775	2,945	1,865	3,610	1,930	4,160
	5	2,685	4,585	2,745	5,020	2,840	5,800	2,985	6,425	3,090	6,655
	7 1/2	4,030	7,815	4,120	8,565	4,265	9,185	4,475	9,640	4,635	9,980
3/4 or #6	3 1/2	2,100	3,105	2,150	3,405	2,225	3,930	2,335	4,815	2,415	5,205
	6	3,600	6,690	3,680	7,325	3,810	8,210	4,000	8,620	4,140	8,290
	9	5,405	11,360	5,525	11,895	5,715	12,315	6,000	12,925	6,215	13,380
7/8 or #7	3 1/2	2,310	3,410	2,360	3,735	2,440	4,310	2,565	5,280	2,655	5,715
	7	4,615	9,060	4,715	9,925	4,885	10,515	5,125	11,040	5,305	11,430
	10 1/2	6,925	14,910	7,075	15,240	7,325	15,775	7,690	16,565	7,960	17,145

Legend Concrete Breakout Bond Strength/PryoutStrength

Tension and Shear Design Strength of Steel Elements (Steel Strength)

Nominal Rod/Rebar Size (in. or #)	Steel Elements - Threaded Rod and Reinforcing Bar							
	A 307, Grade C or F 1554		F 593, CW (SS)		A 193, Grade B7		Grade 60 Rebar	
	$\emptyset N_{sa}$ Tension (lbs.)	$\emptyset V_{sa}$ Shear (lbs.)	$\emptyset N_{sa}$ Tension (lbs.)	$\emptyset V_{sa}$ Shear (lbs.)	$\emptyset N_{sa}$ Tension (lbs.)	$\emptyset V_{sa}$ Shear (lbs.)	$\emptyset N_{sa}$ Tension (lbs.)	$\emptyset V_{sa}$ Shear (lbs.)
1/2 or #4	6,175	3,210	9,230	5,540	13,315	6,925	13,500	7,020
5/8 or #5	9,830	5,110	14,690	8,815	21,190	11,020	20,925	10,880
3/4 or #6	14,575	7,580	18,510	11,105	31,405	16,330	29,700	15,455
7/8 or #7	20,095	10,450	25,525	15,315	43,315	22,525	40,500	21,060

Legend Steel Strength

Allowable Load Capacities for PE1000+ Installed into Uncracked Normal-Weight Concrete with Threaded Rod and Reinforcing Bar (Based on Bond Strength/Concrete Capacity)[1,2,3,4,5,6]

Nominal Rod or Rebar Size (in. or #)	Minimum Embedment Depth (in.)	Minimum Concrete Compressive Strength, (*f'c*)			
		3,000 psi	4,000 psi	5,000 psi	6,000 psi
		Tension (lbs)			
3/8 or #3	2 3/8	1,215	1,260	1,290	1,320
	3 1/2	1,785	1,850	1,895	1,940
	4 1/2	2,290	2,370	2,435	2,490
1/2 or #4	2 3/4	1,770	1,830	1,880	1,925
	4 3/8	2,820	2,920	3,000	3,065
	6	3,870	4,005	4,115	4,205
5/8 or #5	3 1/8	2,400	2,485	2,550	2,610
	5 1/4	4,030	4,170	4,285	4,380
	7 1/2	5,755	5,955	6,120	6,255
3/4 or #6	3 1/2	2,850	2,950	3,030	3,095
	6 1/4	5,415	5,605	5,760	5,885
	9	7,980	8,260	8,485	8,670
7/8 or #7	3 1/2	2,850	2,950	3,030	3,095
	7	6,665	6,900	7,085	7,240
	10 1/2	10,475	10,845	11,135	11,385
1 or #8	4	3,480	3,600	3,700	3,780
	8	8,395	8,685	8,925	9,120
	12	13,305	13,770	14,145	14,460
#9	4 1/2	4,155	4,300	4,420	4,515
	9	10,295	10,655	10,950	11,190
	13 1/2	16,435	17,010	17,475	17,860
1-1/4	5	4,870	5,040	5,180	5,290
	10	12,360	12,795	13,145	13,430
	15	19,850	20,545	21,105	21,570
#10	5	4,870	5,040	5,180	5,290
	10	12,360	12,795	13,145	13,430
	15	19,850	20,545	21,105	21,570

1. Allowable load capacities listed are calculated using an applied safety factor of 4.0. Consideration of safety factors of 10 or higher may be necessary depending on the application, such as life safety or overhead.
2. Linear interpolation may be used to determine allowable loads for intermediate embedments and compressive strengths.
3. The tabulated load values are applicable to single anchors installed at critical edge and spacing distances and where the minimum member thickess is 2.7 times the embedment depth.
4. The tabulated load values are for applicable for dry concrete. Holes must be drilled with a hammer drill and an ANSI carbide drill bit. Installations in wet concrete or in water-filled holes may require a reduction in capacity. Contact Powers Fasteners for more information concerning these installation conditions.
5. Adhesives experience reductions in capacity at elevated temperatures. See the in-service temperature chart for allowable load capacities.
6. Allowable bond strength/concrete capacity must be checked against allowable steel strength in tension to determine the controlling allowable load.

Allowable Load Capacities for PE1000+ Installed into Uncracked Normal-Weight Concrete with Threaded Rod and Reinforcing Bar (Based on Steel Strength)[1,2,3,4,5,6]

Nominal Rod or Rebar Size (in. or #)	Steel Elements - Threaded Rod and Reinforcing Bar							
	A36/A307, Grade C		A 193, Grade B7		F 593, CW (SS)		Grade 60 Rebar	
	Tension (lbs)	Shear (lbs)	Tension (lbs)	Shear (lbs)	Tension (lbs)	Shear (lbs)	Tension (lbs)	Shear (lbs)
3/8 or #3	1,485	760	3,085	1,585	2,565	1,315	2,655	1,320
1/2 or #4	2,725	1,395	5,655	2,900	4,685	2,410	4,710	2,345
5/8 or #5	4,325	2,225	8,990	4,625	7,480	3,845	7,370	3,670
3/4 or #6	6,420	3,295	13,320	6,845	9,465	4,865	10,592	5,285
7/8 or #7	8,855	4,550	18,390	9,445	13,070	6,715	14,425	7,195
1 or #8	11,630	5,970	24,115	12,395	17,150	8,810	18,840	9,595
#9	-	-	-	-	-	-	23,845	11,890
1-1/4	18,595	9,555	38,585	19,830	27,430	14,095		
#10	-	-	-	-	-	-	29,435	14,680

1. Allowable load capacities listed are calculated for the steel element type. Consideration of applying additional safety factors may be necessary depending on the application, such as life safety or overhead.
2. The tabulated load values are applicable to single anchors at critical edge and spacing distances and where the minimum member thickess is 2.7 times the embedment depth.
3. The tabulated load values are for dry concrete. Holes must be drilled with a hammer drill and an ANSI carbide drill bit. Installation in wet concrete or installations in water-filled holes may require a reduction in capacity. Contact Powers Fasteners for more information concerning these installation conditions.
4. Allowable shear capacity is controlled by steel strength for the given conditions.
5. Adhesives experience reductions in capacity at elevated temperatures. See the in-service temperature chart for allowable load capacities.
6. Allowable bond strength/concrete capacity must be checked against allowable steel strength in tension to determine the controlling allowable load.

In-Service Temperature Chart for Allowable Load Capacities[1]

Base Material Temperature		Reduction Factor for Temperature
°F	°C	
41	5	1.00
50	10	1.00
68	20	1.00
75	14	0.97
104	40	0.85
110	43	0.82
122	50	0.76
140	60	0.69

1. Linear interpolation may be used to derive reduction factors between those listed.

Ultimate Load Capacities for Threaded Rod Installed with PE1000+ into the Block Face of Grout-Filled Concrete Masonry Walls[1,2]

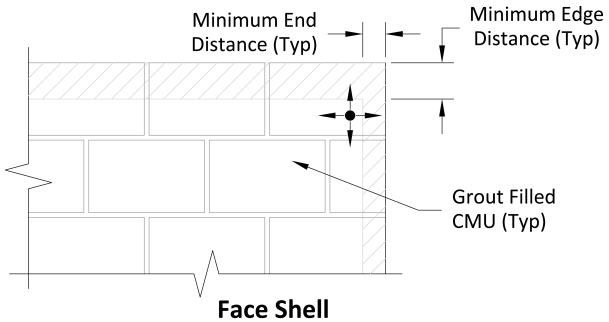
Rod Diameter *d* in. (mm)	Drill Diameter d_{bit} in.	Minimum Embedment Depth in. (mm)	Minimum Edge Distance in. (mm)	Minimum End Distance in. (mm)	Ultimate Load [3]		Allowable Load	
					Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)
3/8 (9.5)	7/16	3 (76.2)	2-1/2 (63.5)	2-1/2 (63.5)	3,350 (14.9)	2,100 (9.3)	670 (2.9)	420 (1.9)
1/2 (12.7)	9/16	4 (101.6)	3 (76.2)	3 (76.2)	4,575 (20.3)	2,550 (11.3)	915 (4.1)	510 (2.3)
5/8 (15.9)	11/16	5 (127.0)	3-3/4 (95.3)	4 (101.6)	6,900 (30.7)	5,275 (23.5)	1,380 (6.1)	1,055 (4.7)

1. Tabulated load values are for anchors installed in minimum 8" wide, minimum Grade N, Type II, lightweight, medium-weight or normal-weight concrete masonry units conforming to ASTM C 90 that have reached a designated minimum compressive strength at the time of installation ($f'_m \geq 1{,}500$ psi). Mortar must be type N, S or M.
2. Anchor installations are limited to one per masonry cell. Shear loads may be applied in any direction.
3. The values listed are ultimate load capacities which should be reduced by a minimum safety factor of 5.0 or greater to determine the allowable working load. Consideration of safety factors of 10 or higher may be necessary depending on the application, such as life safety.

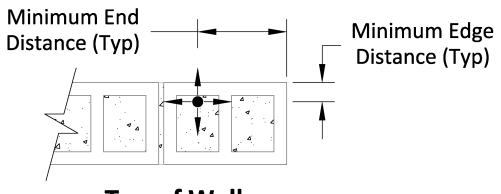
Ultimate Load Capacities for Threaded Rod Installed with PE1000+ into the Top of Grout-Filled Concrete Masonry Walls[1,2]

Rod Diameter *d* in. (mm)	Drill Diameter d_{bit} in.	Minimum Embedment Depth in. (mm)	Minimum Edge Distance in. (mm)	Minimum End Distance in. (mm)	Ultimate Load [2]		Allowable Load	
					Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)
1/2 (12.7)	9/16	6 (152.4)	1-3/4 (44.5)	3 (76.2)	5,950 (26.4)	1,450 (6.5)	1,190 (5.3)	290 (1.3)
5/8 (15.9)	11/16	8 (203.2)	1-3/4 (44.5)	4 (101.6)	9,450 (42.0)	1,700 (7.5)	1,890 (8.4)	340 (1.4)

1. Tabulated load values are for anchors installed in a minimum Grade N, Type II, lightweight, medium-weight or normal-weight masonry units conforming to ASTM C 90 that have reached a designated ultimate compressive strength at the time of installation ($f'm \geq 1{,}500$ psi). Mortar must be type N, S or M.
2. Anchor installations are limited to one per masonry cell. Shear loads may be applied in any direction.
3. The values listed are ultimate load capacities which should be reduced by a minimum safety factor of 5.0 or greater to determine the allowable working load. Consideration of safety factors of 10 or higher may be necessary depending on the application, such as life safety.



Face Shell
Permissible Anchor Locations
(Un-hatched Area / Through Face Shell)



Top of Wall

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ORDERING INFORMATION

PE1000+ Cartridges

Cat No.	Description	Std. Carton	Pallet
0500SD	PE1000+ 13 fl. oz. dual cartridge	12	540
0502SD	PE1000+ 20 fl. oz. dual cartridge	12	540

One PE1000+ mixing nozzle is packaged with each cartridge.
PE1000+ mixing nozzles must be used to ensure complete and proper mixing of the adhesive.

Cartridge System Mixing Nozzles

Cat No.	Description	Std. Pack/Box	Std. Carton
08294	Extra mixing nozzle (with a 8" extension) for PE1000+	2	24
08281	Mixing nozzle extension, 8" minimum	2	24

Dispensing Tools for Injection Adhesive

Cat No.	Description	Std. Box	Std. Carton
08295	13 fl. oz. Manual tool	1	12
08298	20 fl. oz. Manual tool 13oz. and 20 oz.	1	6
08298C	13 fl. oz. / 20 fl. oz. High preformance tool	1	-

PE1000+ Epoxy Adhesive Anchor System

Hole Cleaning Tools and Accessories

Cat No.	Description	Std. Package
08284	Wire brush for 7/16"ANSI hole (3/8" rod or #3 rebar)	1
08285	Wire brush for 9/16"ANSI hole (1/2" rod or #4 rebar)	1
08286	Wire brush for 11/16"ANSI hole (5/8" rod or #5 rebar)	1
08287	Wire brush for 7/8"ANSI hole (3/4" rod or #6 rebar)	1
08288	Wire brush for 1"ANSI hole (7/8" rod or #7 rebar)	1
08289	Wire brush for 1-1/8"ANSI hole (1" rod or #8 rebar)	1
08290	Wire brush for 1-3/8"ANSI hole (1-1/4" rod or #9 rebar)	1
08291	Wire brush for 1-1/2"ANSI hole (#10 rebar)	1
08283	SDS-plus adapter for steel brushes	1
08296	Standard drill adapter for steel brushes (e.g. Jacobs Chuck)	1
08282	Steel brush extension, 12"	1
08280	Hand pump/dust blower (25 fl. oz. cylinder volume)	1
08292	Air compressor nozzle with extension	1
08465	Adjustable torque wrench with 1/2" square drive (10 to 150 ft.-lbs.)	1
08466	Adjustable torque wrench with 1/2" square drive (25 to 250 ft.-lbs.)	1
52073	Adhesive cleaning kit, includes 4 wire brushes (08284, 08285, 08286, 08287), steel brush extension (08282), SDS-plus adapter (08283), standard drill adapter (08296), hand pump/dust blower (08280), gloves and safety glasses	1

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