
PE1000+
PE1000+
PE1000+
PE1000+
NSF
ES
ICC-ES 2583
QC by IEA
BUILDING CODE COMPLIANT
20 fl. oz. (585 mL)
13 fl. oz. (385 mL)
Powers
FASTENERS
CODE LISTED
ICC-ES ESR-2583
CRACKED &
UNCRACKED CONCRETE
PE1000+®
High Strength Epoxy Anchoring System
Powers
FASTENING INNOVATIONS

PE1000+®

High Strength Epoxy Anchoring System

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 and solid masonry base materials.

GENERAL APPLICATIONS AND USES

- Bonding threaded rod and reinforcing bar into hardened concrete and grouted CMU
- Evaluated for use in dry and water-saturated concrete including water-filled holes
- Suitable to resist loads in 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 fatigue

APPROVALS AND LISTINGS

International Code Council, Evaluation Service (ICC-ES) ESR-2583

- Code compliant with the 2006 IBC, 2006 IRC, 2003 IBC, 2003 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 and 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.

PACKAGING

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

STORAGE LIFE & CONDITIONS

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

ANCHOR SIZE RANGE (TYP.)

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

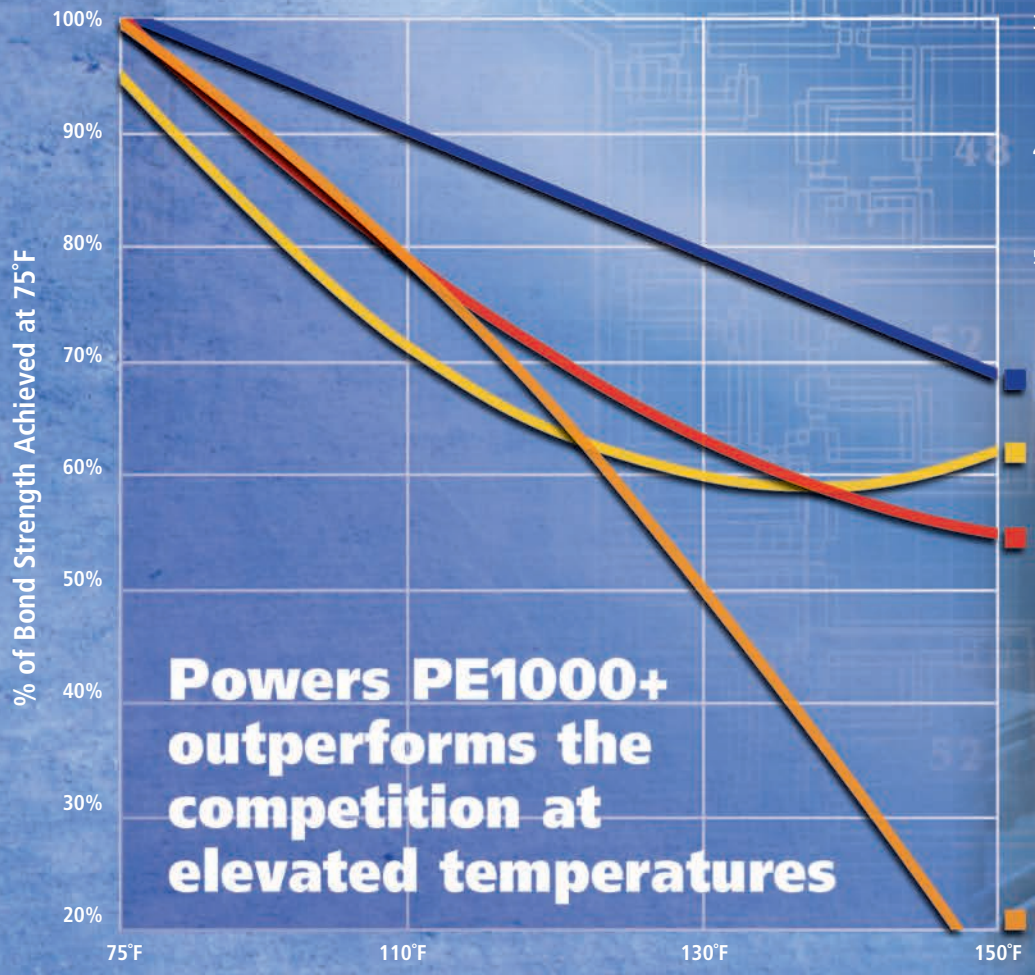
SUITABLE BASE MATERIALS

Normal-weight concrete
Grouted concrete masonry

CODE LISTED
ICC-ES ESR-2583
CRACKED & UNCRACKED CONCRETE

BOND STRENGTH REDUCTION VS. ELEVATED TEMPERATURE

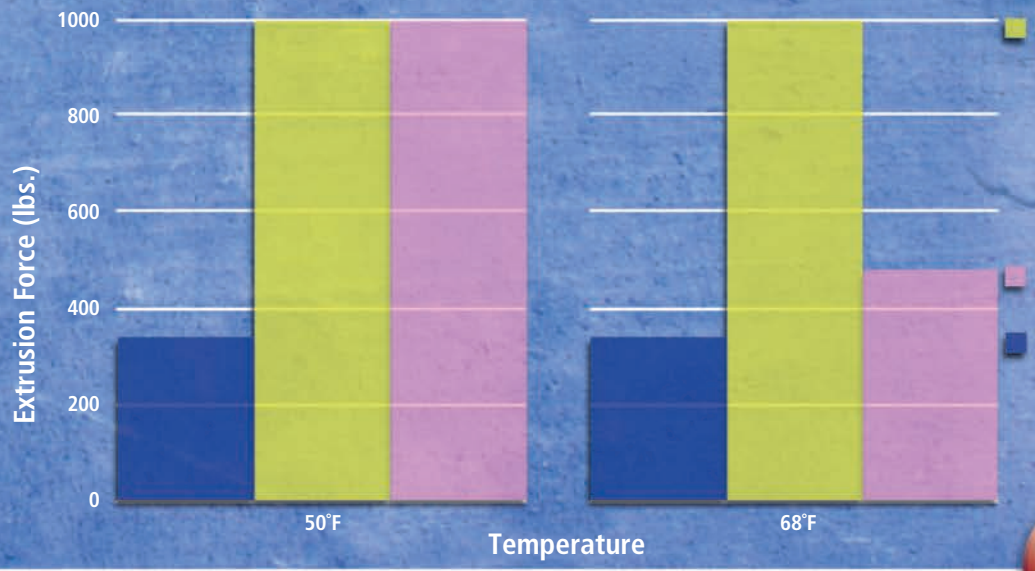
Bond Strength vs. Temperature Chart for Epoxy Adhesive Anchoring Systems Installed into Uncracked Normal-Weight Concrete with Threaded Rod [1,2,3,4,5]



1. Adhesives anchors were installed using the manufacturers recommended cleaning and installation procedures.
2. Anchors were allowed to cure for a minimum of 24 hours at 75 degree F.
3. The temperature of the concrete member containing the fully cured anchors was steadily elevated until it reached the desired test temperature. Anchors were then loaded in tension (confined) until adhesive bond failure occurred.
4. Individual tests were performed with the temperature of the concrete member at 75, 110, 130, and 150 degrees F. 1/2" dia. ASTM A 193, Grade B7 threaded rod was used for the tests.
5. The graph represents a 2nd order polynomial trend line using actual test data.

EXTRUSION (DISPENSING) FORCE COMPARISON

Extrusion Force Comparison for Epoxy Adhesive Anchoring Systems Based on Temperature of Cartridges



PE1000+ Easiest to Dispense

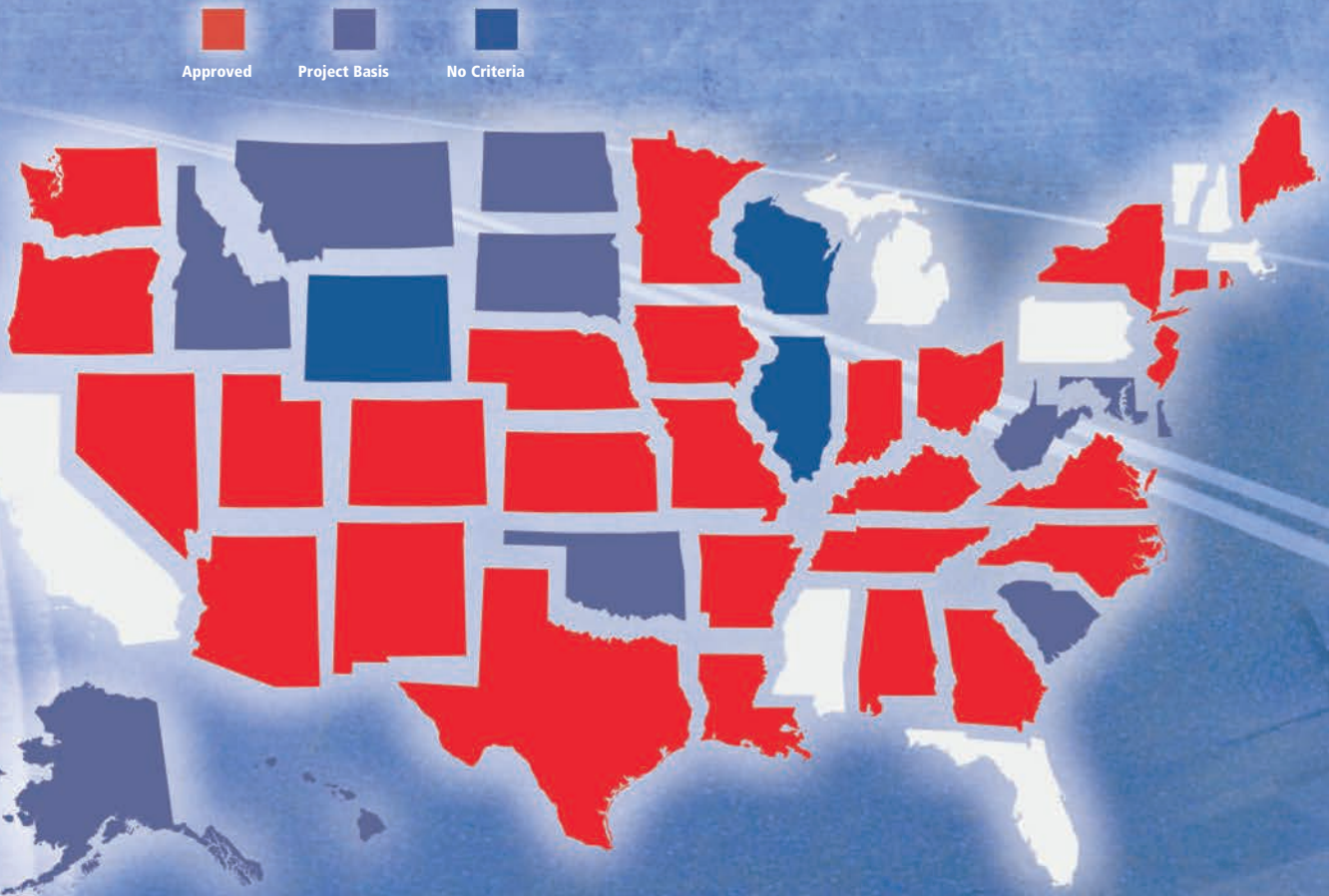
* The G5 and XP adhesive cartridges failed during extrusion testing while subjected to a temperature of 50°F.

High Strength epoxy

PE1000+®

PE1000+ PRODUCT LISTINGS BY STATE DEPARTMENT OF TRANSPORTATION*

PE1000+ State DOT Listing Map



Adhesive DOT Listing

State	AC100+ Gold	PE1000+	Pure 50+	Pure 110+
Alabama	Approved	Approved	Approved	Submitted
Alaska	Project by Project	Project by Project	Project by Project	Project by Project
Arizona	Submitted	Approved	Submitted	Submitted
Arkansas	Approved	Approved	Approved	Submitted
California	-	-	-	-
Colorado	Approved	Approved	Approved	Approved
Connecticut	Approved	Approved	Submitted	Submitted
Deleware	Project by Project	Project by Project	Project by Project	Project by Project
Florida	-	-	Approved	Approved
Georgia	No Criteria	Approved	Approved	Approved
Hawaii	Project by Project	Project by Project	Project by Project	Project by Project
Idaho	Project by Project	Project by Project	Project by Project	Project by Project
Illinois	Approved	-	-	-
Indiana	Approved	Approved	Approved	Approved
Iowa	Approved	Approved	Approved	Approved
Kansas	Approved	Approved	Approved	Approved
Kentucky	Approved	Approved	Submitted	Submitted
Louisiana	Approved	Approved	Approved	Approved
Maine	Approved	Approved	Approved	Approved
Maryland	-	-	Approved	Submitted
Massachusetts	-	-	-	-
Michigan	Approved		Submitted	-
Minnesota	Approved	Approved	Approved	Submitted
Mississippi	Approved	-	-	-
Missouri	Approved	Approved	Approved	Approved
Montana	Project by Project	Project by Project	Project by Project	Project by Project
Nebraska	-	Approved	Approved	Submitted
Nevada	-	Approved	Submitted	Submitted
New Hampshire	Project by Project	Project by Project	Project by Project	Project by Project
New Jersey	Approved	Approved	Approved	Approved
New Mexico	-	Approved	Submitted	Submitted
New York	Approved	Approved	Approved	Approved
North Carolina	-	-	Approved	Approved
North Dakota	Project by Project	Project by Project	Project by Project	Project by Project
Ohio	Approved	Approved	-	-
Oklahoma	Project by Project	Project by Project	Project by Project	Project by Project
Oregon	-	Approved	Submitted	Submitted
Pennsylvania	-	-	-	-
Rhode Island	Approved	Approved	Submitted	Submitted
South Carolina	Project by Project	Project by Project	Project by Project	Project by Project
South Dakota	Project by Project	Project by Project	Project by Project	Project by Project
Tennessee	Approved	Approved	Approved	Approved
Texas	-	Approved	Approved	Approved
Utah	Approved	Approved	Approved	Submitted
Vermont	-	-	Approved	Submitted
Virginia	Approved	Approved	Submitted	Submitted
Washington	Approved	Approved	-	-
West Virginia	Project by Project	Project by Project	Project by Project	Project by Project
Wisconsin	Approved	No Criteria	No Criteria	No Criteria
Wyoming	Project by Project	Project by Project	Project by Project	Project by Project

PE1000+®

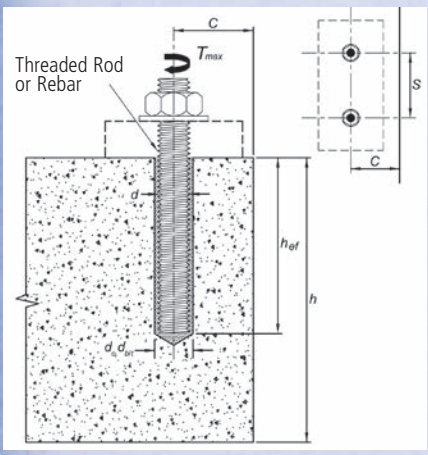
INSTALLATION SPECIFICATIONS

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 (64)	3-1/8 (80)	3-3/4 (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)	3-3/4 (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 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



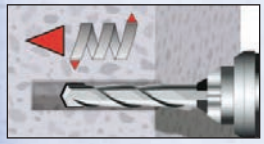
Threaded Rod and Deformed Reinforcing Bar Material Properties

Steel Description (General)	Steel Specification (ASTM)	Diameter (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	125.0
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 specification is equivalent in listed properties.

INSTALLATION INSTRUCTIONS (SOLID BASE MATERIALS)

Drilling

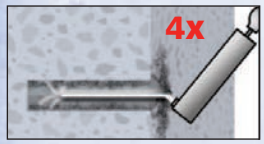


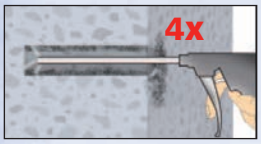
1 - Drill a hole into the base material with a hammer drill tool to the size and embedment required by the selected steel hardware element (see reference tables on page 3). The tolerances of the carbide drill bit must meet the requirements of ANSI Standard B212.15.

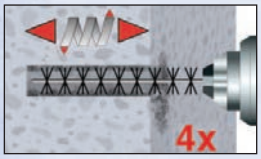
Precaution: Wear suitable eye and skin protection. Avoid inhalation of dusts during drilling and/or removal.

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







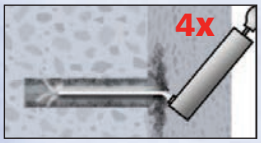
2a - Starting from the bottom or back of the anchor hole, blow the hole clean using a compressed air nozzle (min. 90 psi) or a hand pump (supplied by Powers Fasteners) a minimum of four times (4X).

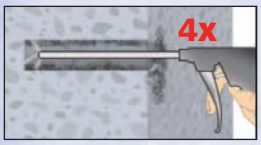
Use a compressed air nozzle (min. 90 psi) or a hand pump (min. volume 25 fl. oz. supplied by Powers Fasteners) for anchor rod 3/8" to 3/4" diameter or reinforcing bar (rebar) sizes #3 to #6.

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 must not be used with these anchor sizes.

2b - Determine brush diameter (see reference tables on page 6) for the drilled hole and attach the brush with adaptor to a rotary drill tool or battery screw gun. Brush the hole with the selected wire brush a minimum of four times (4x). A brush extension (supplied by Powers Fasteners) must be used for holes drilled deeper than the listed brush length.

The wire brush diameter must 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 in 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.

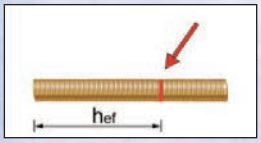
Use a compressed air nozzle (min. 90 psi) for anchor rod 7/8" to 1-1/4" diameter and rebar sizes #7 to #10. A hand pump must not be used with these anchor sizes.

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

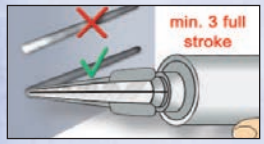
Preparing

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 - 95°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. Always use a new mixing nozzle with new cartridges of adhesive; and for all work interruptions exceeding the published working time of the adhesive (reference gel time and curing time table).



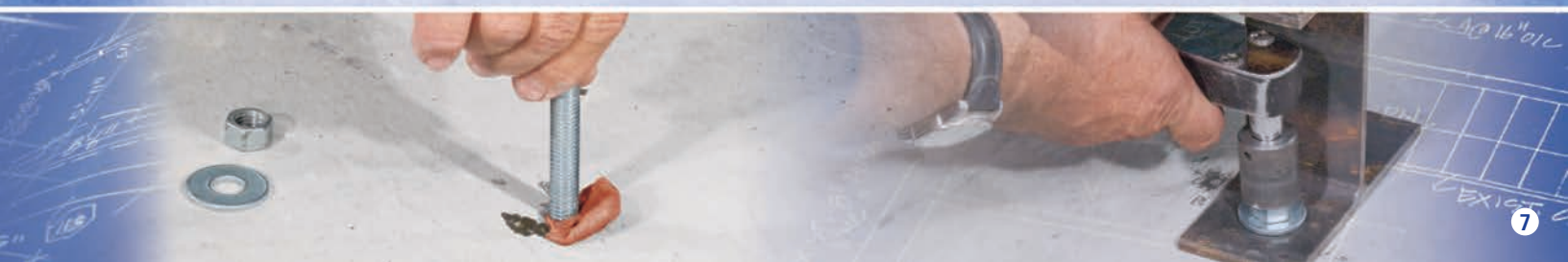
4 - Prior to inserting the anchor rod or rebar into the filled bore hole, the position of the embedment depth has to be marked on the anchor. Verify anchor element is straight and free of surface damage.



5 - Adhesive must be properly mixed to achieve published properties. Prior to dispensing adhesive into the drilled hole, separately dispense at least three full strokes of adhesive through the mixing nozzle until the adhesive is a consistent **red** color. Do not attach a used nozzle when changing to a new cartridge.

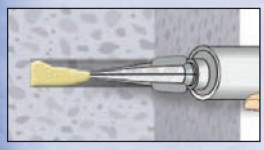
Review and note the published working and cure times (see reference tables on page 9) prior to injection of the mixed adhesive into the cleaned anchor hole.

(Installation Instructions Continued on Following Page)



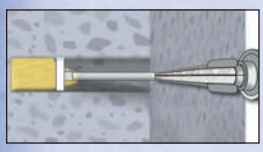
PE1000+®

INSTALLATION INSTRUCTIONS (CONTINUED)



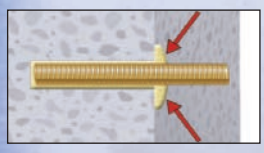
6 - Fill the cleaned hole approximately two-thirds full with mixed adhesive starting from the bottom or back of the anchor hole. Slowly withdraw the mixing nozzle as the hole fills to avoid creating air pockets or voids. For embedment depths greater than 7-1/2" an extension nozzle (3/8" dia.) must be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



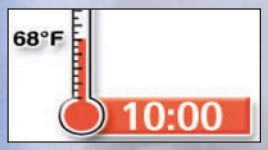
Attention! Do not install anchors overhead without proper training and installation hardware provided by Powers Fasteners. Contact Powers for details prior to use.

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.

Curing and Loading



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 Times

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

It is recommended that the cartridge temperature when in use does not differ significantly from the temperature of the base material.

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) Cat. #08292	
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.

PE1000+®

SD 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" #3	1/2" #4	5/8" #5	3/4" #6	7/8" #7	1" #8	- #9	1-1/4" #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 TENSION											
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		ø	-	0.75 (0.65 for ASM F593 Stainless)							
CONCRETE BREAKOUT STRENGTH IN TENSION											
Effectiveness factor for uncracked concrete		$k_{c,cr}$	-	Not Applicable	17 (7.1)	17 (7.1)	17 (7.1)	17 (7.1)	Not Applicable	Not Applicable	Not Applicable
Effectiveness factor for uncracked concrete		$k_{c,uncr}$	-	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		ø	-	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	$ø_d$	-	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 (1.4)	1,618 (11.2)	1,582 (10.9)
Water saturated concrete	Reduction factor for bond strength	$ø_{ws}$	-	0.55	0.55	0.55	0.45	0.45	0.45	0.45	0.45
	Additional factor for water saturated concrete condition	κ_{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	$ø_{wf}$	-	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
	Additional factor for water-filled hole condition	κ_{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	$ø_d$	-	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	$ø_{ws}$	-	0.55	0.55	0.55	0.45	0.45	0.45	0.45	0.45
	Additional factor for water saturated concrete condition	κ_{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	$ø_{wf}$	-	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
	Additional factor for water-filled hole condition	κ_{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 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.

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											
Steel strength in shear	Standard carbon rod (ASTM A 307, Grade C)	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			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)							
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 ESR-2583.

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

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)

Factored Design Strength ($\emptyset N_n$ and $\emptyset V_n$) 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 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)

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.)
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 Strength (green) Bond Strength/Pryout Strength (yellow)

(Notes continued from previous page)

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 ICC-ES AC308 Annex A, Section 14.4 and 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 No.)	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.)
3/8 or #3	3,395	1,765	5,850	3,040	7,315	3,805	7,425	3,860
1/2 or #4	6,175	3,210	10,650	5,540	13,315	6,925	13,500	7,020
5/8 or #5	9,830	5,110	16,950	8,815	21,190	11,020	20,925	10,880
3/4 or #6	14,575	7,580	21,355	11,105	31,405	16,330	29,700	15,455
7/8 or #7	20,095	10,450	29,455	15,315	43,315	22,525	40,500	21,060
1 or #8	26,360	13,710	38,635	20,090	56,815	29,545	53,325	27,730
#9	-	-	-	-	-	-	67,500	35,100
1-1/4	42,150	21,920	61,775	32,190	90,845	47,240	-	-
#10	-	-	-	-	-	-	85,725	44,575

Legend Steel Strength

Factored Design Strength (ϕN_n and ϕV_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	
		$\emptyset N_{cb}$ 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.)
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 Strength (green); Bond Strength/Pryout Strength (yellow)

(Notes continued from previous page)

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 ICC-ES AC308 Annex A, Section 14.4 and 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 (SS), CW		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.)
3/8 or #3	3,395	1,765	5,850	3,040	7,315	3,805	7,425	3,860
1/2 or #4	6,175	3,210	10,650	5,540	13,315	6,925	13,500	7,020
5/8 or #5	9,830	5,110	16,950	8,815	21,190	11,020	20,925	10,880
3/4 or #6	14,575	7,580	21,355	11,105	31,405	16,330	29,700	15,455
7/8 or #7	20,095	10,450	29,455	15,315	43,315	22,525	40,500	21,060
1 or #8	26,360	13,710	38,635	20,090	56,815	29,545	53,325	27,730
#9	-	-	-	-	-	-	67,500	35,100
1-1/4	42,150	21,920	61,775	32,190	90,845	47,240	-	-
#10	-	-	-	-	-	-	85,725	44,575

Legend Steel Strength

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

STRENGTH DESIGN SD TABLES

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 Strength Bond Strength/Pryout Strenth

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	9,330	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	25,515	15,315	43,315	22,525	40,500	21,060

Legend Steel Strength

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

(Notes continued from previous page)

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 ICC-ES AC308 Annex A, Section 14.4 and 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 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	
		$ØN_{cb}$ 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	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 Strength Bond Strength/Pryout Strenth

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, (SS), CW		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	9,330	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	25,515	15,315	43,315	22,525	40,500	21,060

Legend Steel Strength

ASD PERFORMANCE DATA

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 thickness is 2.7 times the applicable embedment depth.
4. 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 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.
6. Allowable bond strength/concrete capacity must be checked against allowable steel strength in tension to determine the controlling allowable load. Allowable shear capacity is controlled by allowable steel strength for the given conditions.

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.) (mm)	Minimum Concrete Compressive Strength, (f'c)			
		3,000 psi (20.7 MPa)	4,000 psi (27.6 MPa)	5,000 psi (34.5 MPa)	6,000 psi (41.4 MPa)
		Tension (lbs) (kN)			
3/8 or #3	2-3/8 (60.3)	1,215 (5.4)	1,260 (5.6)	1,290 (5.7)	1,320 (5.8)
	3-1/2 (88.9)	1,785 (7.9)	1,850 (8.2)	1,895 (8.4)	1,940 (8.6)
	4-1/2 (114.3)	2,290 (10.1)	2,370 (10.5)	2,435 (10.8)	2,490 (11.1)
1/2 or #4	2-3/4 (69.8)	1,770 (7.9)	1,830 (8.1)	1,880 (8.4)	1,925 (8.6)
	4-3/8 (111.1)	2,820 (12.5)	2,920 (13.0)	3,000 (13.3)	3,065 (13.6)
	6 (152.4)	3,870 (17.2)	4,005 (17.8)	4,115 (18.3)	4,205 (18.7)
5/8 or #5	3-1/8 (79.3)	2,400 (10.7)	2,485 (11.0)	2,550 (11.3)	2,610 (11.6)
	5-1/4 (133.4)	4,030 (17.9)	4,170 (18.5)	4,285 (19.1)	4,380 (19.5)
	7-1/2 (190.5)	5,755 (25.6)	5,955 (26.5)	6,120 (27.2)	6,255 (27.8)
3/4 or #6	3-1/2 (88.9)	2,850 (12.7)	2,950 (13.1)	3030 (13.5)	3,095 (13.8)
	6-1/4 (158.8)	5,415 (24.1)	5,605 (24.9)	5,760 (25.6)	5,885 (26.2)
	9 (228.6)	7,980 (35.5)	8,260 (36.7)	8,485 (37.7)	8,670 (38.6)
7/8 or #7	3-1/2 (88.9)	2,850 (12.7)	2,950 (13.1)	3030 (13.5)	3,095 (13.8)
	7 (177.8)	6,665 (29.6)	6,900 (30.7)	7,085 (31.5)	7,240 (32.2)
	10-1/2 (266.7)	10,475 (46.6)	10,845 (48.2)	11,135 (49.5)	11,385 (50.6)
1 or #8	4 (101.6)	3,480 (15.5)	3,600 (16.0)	3,700 (16.5)	3,780 (16.8)
	8 (203.2)	8,395 (37.3)	8,685 (38.6)	8,925 (39.7)	9,120 (40.6)
	12 (304.8)	13,305 (59.2)	13,770 (61.3)	14,145 (62.9)	14,460 (64.3)
#9	4-1/2 (114.3)	4,155 (18.5)	4,300 (19.1)	4,420 (19.7)	4,515 (20.1)
	9 (228.6)	10,295 (45.8)	10,655 (47.4)	10,950 (48.7)	11,190 (49.8)
	13-1/2 (342.9)	16,435 (73.1)	17,010 (75.7)	17,475 (77.7)	17,860 (79.4)
1-1/4	5 (127)	4,870 (21.7)	5,040 (22.4)	5,180 (23.0)	5,290 (23.5)
	10 (254)	12,360 (55.0)	12,795 (56.9)	13,145 (58.5)	13,430 (59.7)
	15 (381)	19,850 (88.3)	20,545 (91.4)	21,105 (93.9)	21,570 (96.0)
#10	5 (127)	4,870 (21.7)	5,040 (22.4)	5,180 (23.0)	5,290 (23.5)
	10 (254)	12,360 (55.0)	12,795 (56.9)	13,145 (58.5)	13,430 (59.7)
	15 (381)	19,850 (88.3)	20,545 (91.4)	21,105 (93.9)	21,570 (96.0)

ASD PERFORMANCE DATA

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 thickness 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 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. 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							
	A307, Grade C or F 1554		A 193, Grade B7		F 593 SS, CW		Grade 60 Rebar	
	Tension (lbs) (kN)	Shear (lbs) (kN)	Tension (lbs) (kN)	Shear (lbs) (kN)	Tension (lbs) (kN)	Shear (lbs) (kN)	Tension (lbs) (kN)	Shear (lbs) (kN)
3/8 or #3	1,480 (6.6)	760 (3.4)	3,075 (13.7)	1,585 (7.0)	2,560 (11.4)	1,315 (5.8)	2,650 (11.8)	1,320 (5.9)
1/2 or #4	2,720 (12.1)	1,395 (6.2)	5,640 (25.1)	2,900 (12.9)	4,675 (20.8)	2,410 (10.7	4,695 (20.9)	2,345 (10.4)
5/8 or #5	4,315 (19.2)	2,225 (9.9)	8,965 (39.9)	4,625 (20.6)	7,460 (33.2)	3,845 (17.1)	7,350 (32.7)	3,670 (16.3)
3/4 or #6	6,405 (28.5)	3,295 (14.6)	13,285 (59.0)	6,845 (30.4)	9,440 (42.0)	4,865 (21.6)	10,565 (47.0)	5,285 (23.5)
7/8 or #7	8,830 (39.3)	4,550 (20.2)	18,340 (81.6)	9,445 (42.0)	13,035 (58.0)	6,715 (29.9)	14,385 (64.0)	7,195 (32.0)
1 or #8	11,600 (51.6)	5,970 (26.6)	24,050 (107.0)	12,395 (55.1)	17,105 (76.1)	8,810 (39.2)	18,790 (83.6)	9,595 (42.7)
#9							23,780 (105.8)	11,890 (52.9)
1-1/4	18,545 (82.5)	9,555 (42.5)	38,495 (171.2)	19,830 (88.2)	27,355 (121.7)	14,095 (62.7)		
#10							29,360 (130.6)	14,680 (65.3)

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

Base Material Temperature		Bond Strength Reduction Factor for Temperature
°F	°C	
41	5	1.00
50	10	1.00
68	20	1.00
86	30	0.97
104	40	0.85
110	43	0.82
122	50	0.76
140	60	0.69

It is recommended that the cartridge temperature when in use does not differ significantly from the temperature of the base material.

PE1000+®

MASONRY PERFORMANCE DATA

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

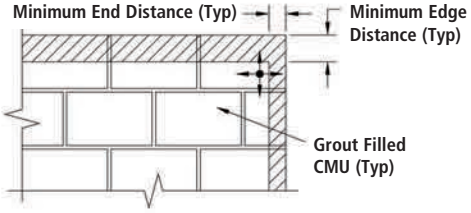
Rod Diameter d. in. (mm)	Drill Diameter dbit in.	Minimum Embedment Depth in. (mm)	Minimum Edge Distance in. (mm)	Minimum End Distance in. (mm)	Ultimate Load[3]		Allowable Load	
					Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)
3/8 (9.5)	7/16	3 (76.2)	2-1/2 (63.5)	2-1/2 (63.5)	3,350 (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)	4,575 (20.3)	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)	6,900 (30.7)	1,380 (6.1)	1,055 (4.7)

1. Tabulated load values are for anchors installed in minimum 8" wide, minimum Grade N, Type ll, 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.

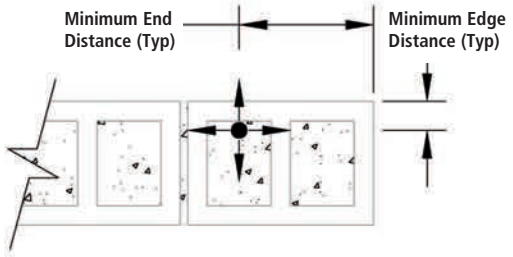
Load Capacities for Threaded Rod Installed with PE1000+ into the Top of Grout-Filled Concrete Masonry Walls [1,2]

Rod Diameter d. in. (mm)	Drill Diameter dbit 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)
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 ll, lightweight, medium-weight or normal-weight 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.



FACE SHELL
Permissable Anchor Locations
Un-hatched Area / Through Face Shell



TOP OF WALL

ORDERING INFORMATION

PE1000+ Cartridge System

Cat No.	Description	Std. Ctn.	Pallet
0500SD	PE1000+ 13 fl. oz. dual cartridge w/mixing nozzle and extension tube	12	540
0502SD	PE1000+ 20 fl. oz. dual cartridge w/mixing nozzle and extension tube	12	540

Extra Mixing Nozzles

Cat No.	Description	Std. Pack/Box	Std. Carton
08294	Extra mixing nozzle (with an 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 dispenser	1	12
08298	13 & 20 fl. oz. manual dispenser	1	6
08497SD	20 fl. oz. pneumatic tool	1	-

Hole Cleaning Tools and Accessories

Cat No.	Description	Std. Pkg.
08284	Wire brush for 7/16" ANSI hole (3/8" rod or #3 rebar), 6-3/4" length	1
08285	Wire brush for 9/16" ANSI hole (1/2" rod or #4 rebar), 6-3/4" length	1
08286	Wire brush for 11/16" ANSI hole (5/8" rod or #5 rebar), 7-7/8" length	1
08287	Wire brush for 7/8" ANSI hole (3/4" rod or #6 rebar), 7-7/8" length	1
08288	Wire brush for 1" ANSI hole (7/8" rod or #7 rebar), 11-7/8" length	1
08289	Wire brush for 1-1/8" ANSI hole (1" rod or #8 rebar), 11-7/8" length	1
08290	Wire brush for 1-3/8" ANSI hole (1-1/4" rod or #9 rebar), 11-7/8" length	1
08291	Wire brush for 1-1/2" ANSI hole (#10 rebar), 11-7/8" length	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" length	1
08280	Hand pump/dust blower (25 fl. oz. cylinder volume)	1
08292	Air compressor nozzle with extension, 18" length	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

Notes

PRODUCT SUBMITTAL / SUBSTITUTION REQUEST

TO:

PROJECT:

SPECIFIED ITEM:

Section *Page* *Paragraph* *Description*

PRODUCT SUBMITTAL / SUBSTITUTION REQUESTED:

The attached submittal package includes the product description, specifications, drawings, and performance data for use in the evaluation of the request.

SUBMITTED BY:

Name: *Signature:*

Company:

Address:

Date: *Telephone:* *Fax:*

FOR USE BY THE ARCHITECT AND/OR ENGINEER

○ ***Approved*** ○ ***Approved as Noted*** ○ ***Not Approved***

(If not approved, please briefly explain why the product was not accepted.)

By: *Date:*

Remarks:

POWERS FASTENERS **BRANCH INFORMATION**

USA LOCATIONS

CITY	ADDRESS	CONTACT	PHONE	FAX
Alabama	5405 Buford Hwy Suite 410 Norcross, GA 30071-3984	Jeff Hatchett	205-520-6044	678-966-9242
Atlanta	5405 Buford Hwy Suite 410 Norcross, GA 30071-3984	Ryan Raica	678-966-0000	678-966-9242
Boston	2 Powers Lane, Brewster, NY 10509	Jack Armour	800-524-3244	914-576-6483
Charlotte	349 L West Tremont Avenue, Charlotte, NC 28203	Bob Aurisy	704-375-5012	704-376-5517
Chicago	2472 Wisconsin Avenue, Downers Grove, IL 60515	Dan Gilligan	630-960-3156	630-960-3912
Dallas	1300 IH 35 North, Suite #118, Carrollton TX 75006	Matt Henderson	972-506-9258	972-506-9290
Denver	2475 West Second Street #35, Denver, CO 80223	Jared Hemmert	303-922-9202	303-922-9228
Detroit	21600 Wyoming Avenue, Oak Park, MI 48237	Glen Gaskill	248-543-8600	248-543-8601
Florida	2412 Lynx Lane, Orlando, FL 32804	John Christy	813-626-4500	813-626-4545
Houston	13833 North Promenade, Suite 100, Stafford, TX 77477	Vaughn Eshelman	281-491-0351	281-491-0367
Indianapolis	15290 Stony Creek Way, Noblesville, IN 46060	Bill Trainor	317-773-1668	317-773-1690
Kansas City / St Louis	716 East 16th Avenue, North Kansas City, MO 64116	Don James, Jr.	816-472-5038	816-472-5040
Los Angeles	2761 Dow Avenue, Tustin, CA 92780	Trevor Gillespie	714-731-2500	714-731-2566
Maryland	3137-B Pennsy Drive, Landover, MD 20785	Chris Van Syckle	301-773-1722	301-341-5119
Milwaukee	12020 W. Feerick Street, Milwaukee, WI 53222	Donn Raduenz	414-466-2400	414-466-3993
Minneapolis	351 Wilson Street, NE Minneapolis, MN 55413	Josh Nelson	612-331-3770	612-331-3549
Nashville/Memphis	221 Blanton Avenue, Nashville, TN 37210	Jamie Utley	615-248-2667	615-248-2676
New Orleans	102 Sampson Street, Houston, TX 77003	Cal Zenor	713-228-1524	713-228-1528
New York	2 Powers Lane, Brewster, NY 10509	John Partridge	914-235-6300	914-576-6483
Philadelphia	2 Powers Lane, Brewster, NY 10509	Greg Stephenson	800-524-3244	914-576-6483
Phoenix	3602 E. Southern Ave, Suite 5 Phoenix, AZ 85040	Patrick Stysly	602-431-8024	602-431-8027
Pittsburgh	1360 Island Avenue, Mckees Rocks, PA 15136	Bill Dugan	412-771-3010	412-771-9858
Portland	18808 142nd Ave NE, Suite 4A, Woodinville, WA 98072	Jim Swink	360-608-6845	206-762-5817
Rochester	36 Van Auker Blvd., Rochester, NY 14608	Mark Harper	800-524-3244 / 585-529-4188	914-576-6483/ 585-529-5319
Salt Lake City	3120 W. California Ave, Suite E, Salt Lake City, UT 84104	Don Manning	801-466-9428	801-466-3083
San Francisco	28970 Hopkins Street, Suite B+C, Hayward, CA 94545	John O'Brien/Craig Hering	510-293-1500	510-293-1505
Seattle	18808 142nd Ave NE, Suite 4A, Woodinville, WA 98072	Darin Arnold/Jim Swink	206-762-5812	206-762-5817

INTERNATIONAL LOCATIONS

COUNTRY/REGION	ADDRESS	CONTACT	PHONE	FAX
Australia	Factory 3, 205 Abbotts Road, Dandenong, South Victoria 3175	Peter Pratis	+61 3 8787 5888	+61 3 8787 5899
Canada	6950 Edwards Blvd. Mississauga, Ontario L5T 2W2	Mark Russell	905-673-7295	905-673-6490
China	Metropolitan Business Centre, East Nandan Road, Lane 300, No. 9, Room 604 Xuhui District, Shanghai, China 200030	Jake Olsen	+86-21-3363-2880	+86-21-5080-5389
Europe	Westrak 208, 1771 SV Wieringerwerf, Netherlands	Colin Earl	+31 888 769 377	+31 227 594 759
Manitoba	1810 Dublin Avenue Man. Winnipeg, R3H 0H3	Distributor	204-633-0064	204-694-1261
New Zealand	PO Box 302 076 North Harbour Auckland	Clay Sesto	+64 9415 2425	+64 9415 2627
Quebec	721 Meloche Avenue, Dorval, Quebec H9P 2S5	Allan Hill	514-631-4216	514-631-2583

LATIN & CARIBBEAN DISTRIBUTION INQUIRIES

COUNTRY/REGION	ADDRESS	CONTACT	PHONE	FAX
Latin America		Allan Herbert	01150767477749	914-576-6483

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Colombia	Electrogeno, S.A., Carrera 52 #71c-38, Bogota, Colombia		(57) 1 6600 9436	
Costa Rica	Electro Mechanics Supply, La Uruca Contiguo Banco Ntnl., De Costa Rica Condominio, Horizontal Bodega #9, San Jose, Costa Rica		(506) 2233-2595	
Dominican Republic	Calle Estancia Nueva #17 E Esquina Cul-De-Sac 9, San Geronimo, Santo Domingo	Rodfor Team	809-224-5615	809-472-8640
Ecuador	Acero Comercial Ecuatoriano S.A., Av. La Prensa N45-14 y Telégrafo 1 – Quito Av. Juan Tanca Marengo Km. 1.7 – Guayaquil	infouio@acerocomercial.com infogye@acerocomercial.com	(593-2) 2454 333 (593-4) 2683 060	(593-2) 2454 455 (593-4) 2683 059
Guatemala	Tecnofijaciones, 6 Avenue 8-56 Zona 9, Zona 9, Guatemala	Oscar Lucas Penagos	502-233-4-3478	
Panama	Centro-Industrial, Via Cincuentenario, No. 7910, Ciudad Panama, Panama		(507) 302-8022	
Peru	Powers Peruana SAC, Av. Santa Catalina, 555 La Victoria, Lima 13, Peru (www.powersperuana.com)	Martin Vasquez	(011) 511 265 8500	(011) 511 330 0909
Venezuela	Calle Sucre/Qta. Maudora, #1721 Entre Cec Acosta Y San Ignacio Chacao, Caracas	Distributor	58 212 264 1313	58 212 263 0219
Trinidad - Tobago	Ft. Farfan, 3-5 Ibis Avenue, Ibis Acres, San Juan	Derek Cumming	(868) 674-7896	

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