Adhesive anchoring systems offer many advantages for applications requiring high load capacities. Capsule type systems first appeared in the market in the late 1970's followed by the early co-axial type injection systems. Originally, these products were used in highway and bridge construction as a substitute for grouted anchors because of speed of installation. As industry realized the benefits of adhesive systems, their use in other building applications have gained general acceptance. Major features applicable to adhesive systems include the ability to be used with a variety of steel element materials, a small hole diameter compared to traditional grouting methods, no mechanical expansion forces exerted into the base material and a sealed anchor hole for weather resistance.

Typical two-part adhesive systems include an encapsulated glass design or plastic cartridge injection systems in various configurations. Adhesive anchors typically use an ester based resin or an epoxy to bond threaded steel rod or reinforcing bars into the anchor hole. Normally, the hole size is only slightly greater than the rod or bar diameter. The adhesive anchor bonds threaded rods, bolts, and reinforcing bars to the base material using cementitious materials or chemical adhesives. Loads are transferred to the base material by the bond formed between both the anchor and the walls of the drilled hole. Anchors of this type can have the highest load capacities because the base material does not have to withstand the high point load stresses often associated with typical mechanical anchors. Performance when subjected to dynamic or shock loads is typically superior.

Adhesive anchors achieve their load capacities based on the ability of the adhesive used to bond to the base material. This ability to bond, often referred to as "wetting action", will vary depending upon the adhesive and base material conditions. While the adhesive bonds to the base material, it also forms a mechanical interlock around the rod or bar. In order to form this interlock, it is important to use clean anchor steel which have some type of deformation. Examples would be threaded rod or deformed reinforcing bars. In addition to the ability to bond to the base material, the strength of the anchor steel used can be a critical factor.

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Legend ■ Suitable □ May be Suitable

ADHESIVE ANCHORS

Anchor Category		Injection Adhesive Anchors			Glass Capsule Adhesive Anchors		Anchor Hardware				
Product		AC100+ Gold	PE1000+	T308+	Chem-Stud	Hammer-Capsule	Straight Cut Anchor Rod	Chisel Point Anchor Rod	Internally Threaded Inserts (special order)	Stainless Steel Screen Tubes	Plastic Screen Tubes
Page		243	258	275	288	302	-	-	-	-	-
Base Material	Concrete	■	■	■	■	■	■	■	■		
	Lightweight Concrete	□	□	□	□	□	■	■	■		
	Hollow Core Plank	□	□				■	□		□	□
	Grout-filled Concrete Masonry	■	■	■	□	□	■	□	□		
	Hollow Concrete Masonry	■	□	■			■			■	■
	Solid Brick	■	■	■	□	□	■	□	□		
	Hollow Brick	■	□	□			■			■	■
	Unreinforced Masonry (URM)	□		■			■			■	□
	Stone	□	□	□	□	□	■	□	□		
	Structural Clay Tile	□		□			□			□	□
Anchor Diameter (Rebar Size)	1/4"		□				■			■	■
	3/8" (#3)	■	■	■	■	■	■		■	■	■
	1/2" (#4)	■	■	■	■	■	■	■	■	■	
	5/8" (#5)	■	■	■	■	■	■	■	■	■	
	3/4" (#6)	■	■	■	■	■	■	■	■	■	
	7/8" (#7)	■	■	■	■	■	■	■			
	1" (#8)	■	■	□	■	■	■	■			
	(#9)	■	■	□	■		■				
	1-1/4" (#10)	■	■	□	■		■				
	1-3/8" (#11)	□	□								
	1-1/2" (#12)	□	□								
Anchor Element	Zinc Plated Carbon Steel						■	■	■		
	Stainless Steel						■				
Chemistry	Epoxy		■	■							
	Vinylester	■			■	■					
Installed Hole Condition	Dry	■	■	■	■	■				■	■
	Water Saturated (Wet)	■	■	□	□	□				■	
	Water-filled hole (flooded)	■	■								
Installation Temperature	Base Material	14-104°F -10-40°C	41-104°F 5-40°C	50-104°F 10-40°C							
	Adhesive	32-95°F 0-35°C	41-104°F 5-40°C	65-95°F 18-35°C							
Max. Service Temperature	Short-Term	176°F 80°C	162°F 72°C	162°F 72°C							
	Long-Term	122°F 50°C	110°F 43°C	110°F 43°C							

AC100+ Gold® *Vinylester Injection Adhesive Anchoring System*

PRODUCT DESCRIPTION

The AC100+ Gold is a two-component vinylester adhesive anchoring system. The system includes injection adhesive in plastic cartridges, mixing nozzles, dispensing tools and hole cleaning equipment. The AC100+ Gold is designed for bonding threaded rod and reinforcing bar elements into drilled holes in concrete and masonry base materials.

GENERAL APPLICATIONS AND USES

Bonding threaded rod and reinforcing bar into hardened concrete and masonry
Evaluated for use in dry and water-saturated concrete including water filled holes
Suitable to resist structural 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 a range of embedments and for interior and exterior applications
- Versatile low odor formula with quick cure time
- Mixing nozzles proportion adhesive and provide simple delivery method into drilled holes
- Cartridge design allows for multiple uses using extra mixing nozzles

TESTING AND EVALUATION

+ Tested and evaluated by an accredited independent laboratory in accordance with ICC-ES AC308 criteria and ASTM E 1512 for anchoring in uncracked concrete, including but not limited to the following:
+ Reliability testing for freeze/thaw conditions
+ Reliability testing for sensitivity to hole cleaning, mixing effort and installation direction
+ Reliability testing for sustained loads, i.e. creep resistance (see applicable long-term and short-term temperature ranges)
+ Service condition testing at decreased and elevated temperatures
+ Service condition testing in low and high strength concrete
+ Service condition testing for resistance to alkalinity and sulfur exposure

APPROVALS AND LISTINGS

International Code Council, Evaluation Service (ICC-ES) ESR-2582
Code compliant with the 2006 IBC, 2006 IRC, 2003 IBC, 2003 IRC, 2000 IBC, 2000 IRC, 1997 UBC
Tested in accordance with ICC-ES AC308 for use in structural concrete and design with ACI 318 Appendix D (Strength Design) and as amended by provisions of ICC-ES AC308 Annex A, Section 3.3 (www.icc-es.org)
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 A & B (meets Type III with exception of 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 AC100+ Gold as supplied by Powers Fasteners, Inc., Brewster, NY. Anchors shall be installed in accordance with published instructions and requirements of the Authority Having Jurisdiction.

This Product Available In
PDA®
Powers Design Assist
Real Time Anchor Design Software
www.powersdesignassist.com

SECTION CONTENTS

General Information
Installation Specifications
Installation Instructions
Solid Base Materials
Hollow Base Materials
Reference Tables for Install
SD Performance Data
SD Factored Design Strength
ASD Performance Data
Masonry Performance Data
Ordering Information

AC100+ Gold coaxial cartridge with mixing nozzle

AC100+ Gold dual cartridge with mixing nozzle and extension

PACKAGING

Coaxial Cartridge
5 fl. oz. (150 ml or 9.2 in³)
10 fl. oz. (280 ml or 17.1 in³)

Dual (side-by-side) Cartridge
8 fl. oz. (235 ml or 14.3 in³)
12 fl. oz. (345 ml or 21.0 in³)
28 fl. oz. (825 ml or 50.3 in³)

STORAGE LIFE & CONDITIONS

Fifteen months in a dry, dark environment with temperature ranging from 32ºF and 86ºF (-0ºC to 30ºC)

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 (CMU)
Hollow concrete masonry (CMU)
Brick masonry

COMPRESSION ZONE UNCRACKED CONCRETE
NSF

INSTALLATION SPECIFICATIONS

Installation Specifications for Threaded Rod and Reinforcing Bar (Solid Concrete Base Materials)

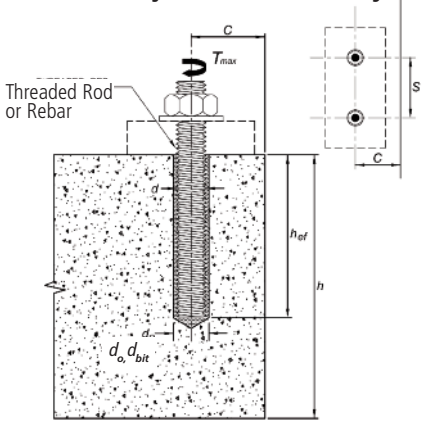
Dimension/Property		Notation	Units	Nominal Anchor Size								
Threaded rod		-	-	**3/8"**	**1/2"**	**5/8"**	**3/4"**	**7/8"**	**1"**	**-**	**1-1/4"**	**-**
Reinforcing bar		-	-	**#3**	**#4**	**#5**	**#6**	**#7**	**#8**	**#9**	**-**	**#10**
Nominal anchor diameter		d	in. (mm)	0.375 (9.5)	0.500 (12.7)	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 or 3/4 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[1,2]		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)	1-3/4 (44)	1-3/4 (44)	1-3/4 (44)	1-3/4 (44)	1-3/4 (44)	1-3/4 (44)	2-3/4 (70)	2-3/4 (70)	2-3/4 (70))
Maximum torque[2] (only possible after full cure time of adhesive)	A307 Grade C or F1554 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)	-

1. For use with the design provisions of ACI 318 Appendix D and ICC-ES AC308 Annex A, Section 3.3 and ESR-2582.
2. For installations between the minimum edge distance and 5 anchor diameters, the tabulated maximum torque must be reduced (multiplied) by a factor of 0.45.

Installation Specifications for Threaded Rod (Hollow Base Material)

Dimentions/property	Notation	Units	Nominal Size	
			3/8"	1/2"
Nominal threaded rod diameter	d	in (mm)	0.375 (9.5)	0.500 (12.7)
Nominal plastic or stainless steel tube dia.	-	in.	3/8	1/2
Nominal diameter of drilled hole	d_o, (d_{bit})	in	1/2 ANSI	5/8 ANSI
Maximum torque (only possible after full cure time of adhesive)	T_{max}	ft.-lb. (N-m)	10 (8)	10 (8)

Detail of Steel Hardware Elements used with Injection Adhesive System

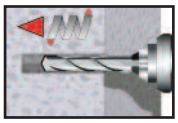


Threaded Rod and Deformed Reinforcing Bar Material Properties

Steel Description (General)	Steel Specification (ASTM)	Nominal Anchor Size (inch)	Minimum Yield Strength, f_y (ksi)	Minimum Ultimate Strength, f_u (ksi)
Carbon rod	A 36 or F1554 Grade 36	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
Grade 40 reinforcing bar	A 615 or A 767	3/8 through 3/4 (#3 through #6)	40.0	60.0

INSTALLATION INSTRUCTIONS (SOLID BASE MATERIAL)

DRILLING

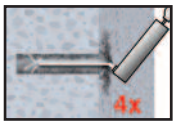


1- Drill a hole into the base material with a rotary hammer drill tool to the size and embedment required by the selected steel anchor element (*see installation specifications for threaded rod and reinforcing bar in solid concrete base material*). The tolerances of the carbide drill bit should meet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

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

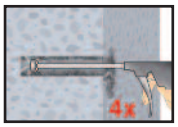
Note! After drilling and prior to hole cleaning, all standing water in the drilled bore hole must be removed if present (e.g. vacuum, compressed air, etc.)

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

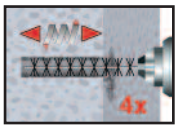


2a - Starting from the bottom or back of the anchor hole, blow the hole clean using a compressed air nozzle (min. 90 psi) or a hand pump (supplied by Powers Fasteners) a minimum of *four* times (4x).

• 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.

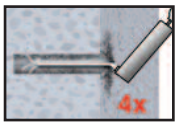


• Use a compressed air nozzle (min. 90 psi) for anchor rod 7/8" to 1-1/4" diameter and rebar sizes #7 to #10. A hand pump shall not be used with these anchor sizes.



2b - Determine wire brush diameter (*see 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}, *see hole cleaning equipment selection table*) or does not come into contact with the sides of the drilled hole.



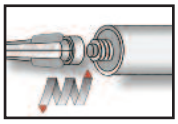
2c - Finally, blow the hole clean again a minimum of *four* times (4x).

• 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.

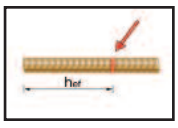
PREPARING



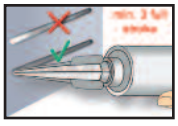
3- Check adhesive expiration date on cartridge label. Do not use expired product. Review Material Safety Data Sheet (MSDS) before use. Cartridge temperature must be between 32°F - 95°F (0°C - 35°C) when in use. Review gel (working) and cure time table. Consideration should be given to the reduced gel 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.

Note: Always use a new mixing nozzle with new cartridges of adhesive and also for all work interruptions exceeding the published working time of the adhesive.



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.



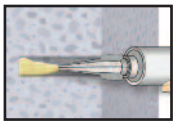
5- Adhesive must be properly mixed to achieve published properties. Prior to dispensing adhesive into the drilled hole, separately dispense at least three full strokes of adhesive through the mixing nozzle until the adhesive is a consistent ***gray*** color. Do not attach a used nozzle when changing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

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

(Continued on next page)

INSTALLATION INSTRUCTIONS (SOLID BASE MATERIAL)

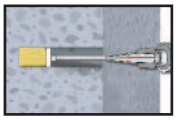
INSTALLATION



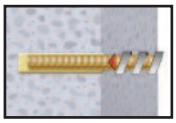
6- Fill the cleaned hole approximately two-thirds full with mixed adhesive starting from the bottom or back of the anchor hole. Slowly withdraw the mixing nozzle as the hole fills to avoid creating air pockets or voids. For embedment depth greater than 7-1/2" an extension nozzle (3/8" dia.) must be used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

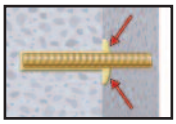
With Piston Plug:



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

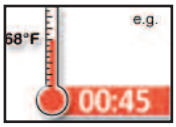


7- The anchor should be free of dirt, grease, oil or other foreign material. Push clean threaded rod or reinforcing bar into the anchor hole while turning slightly to ensure positive distribution of the adhesive until the embedment depth is reached. Observe the gel (working) time.



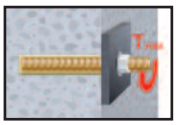
8- Be sure that the anchor is fully seated at the bottom of the hole and that some adhesive has flowed from the hole and all around the top of the anchor. If there is not enough adhesive in the hole, the installation must be repeated. The anchor shall not be moved after placement and during cure.

CURING AND LOADING



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

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

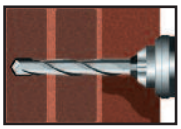


10- After full curing of the adhesive anchor, a fixture can be installed to the anchor and tightened up to the maximum torque *(see installation specifications for threaded rod and reinforcing bar in solid concrete base material)* by using a calibrated torque wrench.

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

INSTALLATION INSTRUCTIONS (HOLLOW BASE MATERIAL)

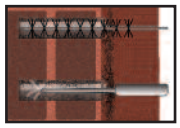
DRILLING



1- Drill a hole into the base material with a rotary drill tool to the size and embedment for the required screen size *(see installation specifications for threaded rod in hollow concrete base material)*. The tolerances of the drill bit used should meet the requirements of ANSI B212.15.

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

HOLE CLEANING → BLOW 2x, BRUSH 2x, BLOW 2x



2- Starting from the bottom or back of the anchor hole, blow the hole clean with a hand pump (min. volume 25 fl.oz. supplied by Powers Fasteners) or compressed air nozzle a minimum of *two* times (2x).

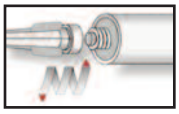
• Determine the wire brush diameter (*see hole cleaning equipment selection table*) and attach the brush with adaptor to a rotary drill tool or battery screw gun. Brush the hole with the selected wire brush a minimum of *two* times (2x). A brush extension (supplied by Powers Fasteners, Cat #08282) should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

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

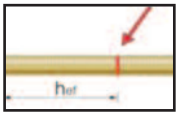
• Finally, blow the hole clean again a minimum of *two* times (2x)

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

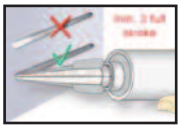
PREPARING



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 32°F - 95°F (0°C - 35°C) when in use. Review gel (working) time and curing time table. Consideration should be given to the reduced gel (working) 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.
Note: Always use a new mixing nozzle with new cartridges of adhesive and also for all work interruptions exceeding the published working time of the adhesive.

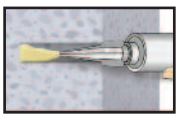


4- Prior to inserting the anchor rod into the filled screen tube, the position of the embedment depth has to be marked on the anchor. Verify anchor element is straight and free of surface damage.

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 ***gray*** color. Do not attach a used nozzle when changing to a new cartridge.

Review and note the published working and cure times (*see gel time and curing time table*) prior to injection of the mixed adhesive into the screen tube.

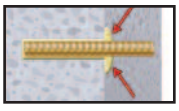
INSTALLATION



6- Insert a screen tube of suitable length into the cleaned anchor hole.

7- Fill the screen tube full with adhesive starting from the bottom or back of the tube. Slowly withdraw the mixing nozzle as the screen fills to avoid creating air pockets or voids. A plastic extension tube supplied by Powers Fasteners must be used with the mixing nozzle if the back of the screen tube cannot be reached.

8- Prior to inserting the anchor rod into the screen tube inspect it to ensure that it is free of dirt, grease, oil or other foreign material.

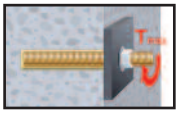


Push the threaded rod into the screen tube while turning slightly to ensure positive distribution of the adhesive until back of the tube is reached.

CURING AND FIXTURE

9- Allow the adhesive anchor to cure to the specified full curing time prior to applying any load.

Do not disturb, torque or load the anchor until it is fully cured (*see gel time and curing time table*).



10- After full curing of the adhesive anchor, a fixture can be installed to the anchor and tightened up to the maximum torque *(see installation specifications for threaded rod and reinforcing bar in hollow base material)* 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 Time Table for AC100+ Gold			
Temperature of base material		Gel (working) time	Full curing time
°F	°C		
14	-10	90 minutes	24 hours
23	-5	90 minutes	14 hours
32	0	45 minutes	7 hours
41	5	25 minutes	2 hours
50	10	15 minutes	90 minutes
68	20	6 minutes	45 minutes
86	30	4 minutes	25 minutes
95	35	2 minutes	20 minutes
104	40	1.5 minutes	15 minutes

The gel (working) times listed for 32°F to 95°F are also applicable for the temperature of the adhesive and use of mixing nozzes during installation.
For installations in base material tempertures between 14°F and 23°F the cartridge temperature must be conditioned to between 68°F and 95°F (20°C - 35 °C).

Hole Cleaning Equipment Selection Table for AC100+ Gold							
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
Solid Base Material							
3/8	#3	7/16	0.475	6-3/4	08284	Hand-pump (Cat# 08280) or compressed air nozzle	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		
5/8	#5	3/4	0.780	7-7/8	08278		
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	
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		
Hollow Base Material							
3/8	-	1/2	0.600	7-7/8	08285	Hand pump (Cat# 08280) or compressed air nozzle	2x blowing 2x brushing 2x blowing
1/2	-	5/8	0.735	7-7/8	08286		

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.
A brush extension (Cat#08282) should be used for holes drilled deeper than the listed brush length.

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.

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)[1,2,3]

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 depth		$h_{ef,min}$	in. (mm)	2-3/8 (60)	2-3/4 (70)	3-1/8 (79)	3-1/2 (89)	3-1/2 (89)	4 (102)	4-1/2 (114)	5 (127)
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 (298)	0.606 (391)	-	0.969 (625)
Steel strength in tension	Carbon rod (ASTM A 36 or F1554, Grade C)	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 (645)	-	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)
Steel strength in tension, Grade 40 reinforcing bars		N_{sa}	lb (kN)	6,600 (29.4)	12,000 (53.4)	18,600 (82.7)	26,400 (117.4)	-	-	-	-
Reduction factor for steel strength		ϕ	-	0.75 (0.65 for stainless steel rod)							
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[6]		c_{ac}	in. (mm)	$c_{ac} = 1.5h_{ef}$ for $h/h_{ef} \geq 2$; $c_{ac} = 1.5h_{ef}\ [3\text{-}h/h_{ef}]$ for $1.3h_{ef} < h < 2h_{ef}$; $c_{ac} = 2.55h_{ef}$ for $h/h_{ef} \geq 1.3$							
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	Characteristic bond strength, uncracked concrete (2,500 psi)	$\tau_{k,uncr}$	psi (N/mm^2)	1,450 (10.0)	1,450 (10.0)	1,450 (10.0)	1,450 (10.0)	1,450 (10.0)	1,305 (9.0)	1,160 (9.0)	1,030 (7.1)
	Reduction factor for bond strength	ϕ_d	-	0.65							
Water Saturated Concrete	Reduction factor for bond strength	ϕ_{ws}	-	0.55							
	Additional factor for water saturated concrete condition	K_{ws}	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Water-filled hole	Reduction factor for bond strength	ϕ_{wf}	-	0.45							
	Additional factor for water-filled hole condition	K_{ws}	-	0.77	0.77	0.77	0.77	0.70	0.69	0.68	0.67
BOND STRENGTH IN TENSION FOR TEMPERATURE RANGE B[4,5] Maximum long term temperature = 122°F (50°C), Maximum short term temperature = 176°F (80°C)											
Dry hole	Characteristic bond strength, uncracked concrete (2,500 psi)	$\tau_{k,uncr}$	psi (N/mm^2)	870 (6.0)	870 (6.0)	870 (6.0)	870 (6.0)	870 (6.0)	798 (5.5)	696 (4.8)	6.38 (4.4)
	Reduction factor for bond strength	ϕ_d	-	0.65							
Water Saturated Concrete	Reduction factor for bond strength	ϕ_{ws}	-	0.55							
	Additional factor for water saturated concrete condition	K_{ws}	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Water-filled hole	Reduction factor for bond strength	ϕ_{wf}	-	0.45							
	Additional factor for water-filled hole condition	K_{ws}	-	0.77	0.77	0.77	0.77	0.70	0.69	0.68	0.67

(Continued on next page)

SD PERFORMANCE DATA

(Continued)

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-2582.
2. Installation must comply with published instructions and details. 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-2582.
3. For ductility classification of steel anchor elements see ESR-2582.
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. Linear interpolation is permitted to determine the ratio c_{ac} for values or h/h_{ef} between 2 and 1.3 by calculation.

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)[1,2,3]

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 depth		$h_{ef,min}$	in. (mm)	2-3/8 (60)	2-3/4 (70)	3-1/8 (79)	3-1/2 (89)	3-1/2 (89)	4 (107)	4-1/2 (114)	5 (127)
STEEL STRENGTH IN SHEAR											
Steel strength in shear	Standard carbon rod (ASTM A 307, Grade C or F1554)	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)	16,740 (74.5)	23,760 (105.7)	32,400 (144.1)	42,660 (189.8)	54,000 (240.2)	68,580 (305.0)
Steel strength in shear, Grade 40 reinforcing bar		V_{sa}	lb (kN)	3,960 (17.6)	7,200 (32.0)	11,160 (49.6)	15,840 (70.5)	-	-	-	-
Reduction factor for steel strength		ϕ	-	0.65 (0.60 for stainless steel rod)							
BREAKOUT STRENGTH IN SHEAR											
Load bearing length of anchor		ℓ_e	in. (mm)	h_{ef} or $8d$ whichever is less							
Reduction factor for concrete breakout strength		ϕ	-	Condition B = 0.70							
CONCRETE PRYOUT STRENGTH IN SHEAR											
Coefficient for pryout strength		k_{cp}	-	1.0 for $h_{ef} < 2.5$ in., 2.0 for $h_{ef} \geq 2.5$ in.							
Reduction factor for pryout strength		ϕ	-	Condition B = 0.70							

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-2582.
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-2582.
3. For ductility classification of steel anchor elements see ESR-2582.

BOND STRENGTH DETERMINATION				
Concrete State	**Hole Drilling Method**	**Installation Condition**	**Bond Strength**	**Strength Reduction Factor**
Uncracked concrete	Hammer drill	Dry concrete	$\tau_{k,uncr}$	ϕ_d
		Water-saturated concrete	$\tau_{k,uncr} \cdot k_{ws}$	ϕ_{ws}
		Water-filled hole	$\tau_{k,uncr} \cdot k_{wf}$	ϕ_{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 $(f'_c / 2{,}500)^{0.13}$.

Factored Design Strength (ϕN_n and ϕV_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 (ϕ) for steel strength and concrete breakout strength are based on ACI 318 Section 9.2 for load combinations. Condition B was assumed.
4. Strength reduction factors (ϕ) for bond strength are determined from reliability testing and qualification in accordance with ICC-ES AC308 and are tabulated in this product information and in ESR-2582.
5. Tabular values are permitted for static loads only, seismic loading is not considered 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-2582.
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-2582 for the supplement 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 including seismic considerations please see ACI 318-05 Appendix D and ICC-ES AC308 Annex A, Section 3.3 and ESR-2582.
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 AC100+ Gold Installed into Uncracked Concrete in Dry Hole Condition *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 No.)	Embed. Depth h_{ef} (in.)	Minimum Concrete Compressive Strength, f'_c (psi)									
		2,500		3,000		4,000		6,000		8,000	
		ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)
3/8 or #3	2-3/8	2,635	1,860	2,700	2,035	2,805	2,350	2,995	2,880	3,070	3,305
	3	3,330	2,565	3,410	2,810	3,540	3,245	3,735	3,975	3,873	4,590
	4-1/2	4,995	4,255	5,115	4,660	5,310	5,380	5,600	6,590	5,810	7,610
1/2 or #4	2-3/4	3,555	2,480	3,895	2,715	4,330	3,135	4,560	3,840	4,735	4,435
	4	5,920	4,230	6,065	4,630	6,295	5,350	6,635	6,550	6,890	7,565
	6	8,885	7,150	9,095	7,835	9,445	9,045	9,955	11,080	10,335	12,795
5/8 or #5	3-1/8	4,310	3,260	4,720	3,570	5,450	4,125	6,480	5,050	6,725	5,830
	5	8,720	6,420	9,475	7,030	9,835	8,120	10,370	9,945	10,765	11,480
	7-1/2	13,880	10,945	14,210	11,990	14,755	13,840	15,550	16,955	16,145	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	9,040	7,780
	6	11,465	9,365	12,560	10,255	14,165	11,845	14,930	14,505	15,500	16,750
	9	19,985	15,905	20,465	17,425	21,245	20,120	22,395	24,640	23,250	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	20,320	19,650	21,095	22,690
	10-1/2	26,540	21,580	27,855	23,640	28,920	27,295	30,485	33,430	31,645	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	26,545	25,580	27,555	29,535
	12	32,425	28,115	35,520	30,795	37,770	35,560	39,815	43,555	41,330	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	30,235	32,985	31,385	38,090
	13-1/2	38,690	36,065	41,445	39,510	43,020	45,620	45,350	55,875	47,080	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	33,180	39,770	34,445	45,925
	15	44,415	43,775	45,480	47,950	47,215	55,370	49,770	67,810	51,665	78,305
#10	5	8,720	9,915	9,555	10,860	11,030	12,545	13,510	15,360	15,290	17,740
	10	24,665	26,175	26,920	28,675	28,950	33,110	29,460	40,550	30,535	46,825
	15	39,435	44,390	40,385	48,625	41,920	56,150	44,190	68,765	45,875	79,405

Legend Concrete Breakout Strength   Bond Strength/Pryout Strength

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

Tension and Shear Design Strength for AC100+ Gold Installed into Uncracked Concrete in Dry Hole Cond.
Temperature Range B **(Bond or Concrete Strength) - see notes on previous page**
Maximum long term temperature = 122°F (50°C), Maximum short term temperature = 176°F (80°C)

STRENGTH DESIGN SD TABLES

Nominal Rod/Rebar Size (in. or No.)	Embed. Depth h_{ef} (in.)	Minimum Concrete Compressive Strength, f'_c (psi)									
		2,500		3,000		4,000		6,000		8,000	
		ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)
3/8 or #3	2-3/8	1,580	1,705	1,620	1,745	1,680	1,810	1,775	1,910	1,840	1,980
	3	2,000	2,565	2,045	2,810	2,125	3,245	2,240	3,975	2,325	4,590
	4-1/2	3,000	4,255	3,070	4,660	3,185	5,380	3,360	6,590	3,485	7,190
1/2 or #4	2-3/4	2,445	2,480	2,500	2,715	2,595	3,135	2,735	3,840	2,840	4,435
	4	3,555	4,230	3,640	4,630	3,775	5,350	3,980	6,550	4,135	7,565
	6	5,330	7,150	5,460	7,835	5,665	9,045	5,970	11,080	6,200	12,785
5/8 or #5	3-1/8	3,470	3,260	3,555	3,570	3,690	4,125	3,890	5,050	4,035	5,830
	5	5,550	6,420	5,685	7,030	5,900	8,120	6,220	9,945	6,460	11,480
	7-1/2	8,330	10,945	8,525	11,990	8,850	13,840	9,330	16,955	9,685	19,575
3/4 or #6	3-1/2	4,665	4,350	4,775	4,765	4,955	5,500	5,225	6,740	5,425	7,780
	6	7,995	9,365	8,185	10,255	8,500	11,845	8,960	14,505	9,300	16,750
	9	11,990	15,905	12,280	17,425	12,745	20,120	13,435	24,640	13,950	28,455
7/8 or #7	3-1/2	5,105	4,770	5,570	5,225	5,785	6,035	6,095	7,395	6,330	8,535
	7	10,880	12,685	11,140	13,895	11,565	16,045	12,195	19,650	12,660	22,690
	10-1/2	16,320	21,580	16,715	23,640	17,350	27,295	18,290	33,430	18,985	38,600
1 or #8	4	6,240	6,195	6,835	6,790	7,555	7,840	7,965	9,600	8,265	11,085
	8	14,215	16,510	14,555	18,085	15,110	20,885	15,925	25,580	16,535	29,535
	12	21,320	28,115	21,830	30,795	22,660	35,560	23,890	43,555	24,800	53,415
#9	4-1/2	7,445	8,090	8,155	8,860	8,770	10,230	9,245	12,530	9,595	14,465
	9	16,500	21,295	16,895	23,325	17,540	26,935	18,490	32,985	19,190	41,340
	13-1/2	24,750	36,065	25,340	39,510	26,310	45,620	27,730	51,450	28,790	62,005
1-1/4	5	8,720	9,605	9,095	10,525	9,445	12,150	9,955	14,880	10,335	17,185
	10	17,765	25,670	18,190	28,125	18,885	32,475	19,905	39,770	20,665	44,510
	15	26,650	43,775	27,290	47,950	28,330	55,370	29,860	59,730	31,000	66,765
#10	5	8,145	9,915	8,340	10,860	8,655	12,545	9,125	15,360	9,470	17,740
	10	16,285	26,175	16,675	28,675	17,310	33,110	18,250	40,550	18,945	44,510
	15	24,430	44,390	25,015	48,625	25,965	56,150	27,370	64,315	28,415	66,765

Legend Concrete Breakout Strength Bond Strength/Pryout Strength

Factored bond or concrete strength must be checked against factored steel strength to determine the controlling ultimate load.
Factored tension design strength = $\min|\phi N_{cb}\ or\ \phi N_a, \phi N_{sa}|$ and factored shear design strength = $\min|\phi V_{cb}\ or\ \phi V_{cr}, \phi V_{cp}|$

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 F1554		F 593 (SS), CW		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.)*
3/8 or #3	3,395	1,765	5,850	3,040	7,315	3,805	7,425
1/2 or #4	6,175	3,210	10,650	5,540	13,315	6,925	13,500
5/8 or #5	9,830	5,110	16,950	8,815	21,190	11,020	20,925
3/4 or #6	14,575	7,580	21,355	11,105	31,405	16,330	29,700
7/8 or #7	20,095	10,450	29,455	15,315	43,315	22,525	40,500
1 or #8	26,360	13,710	38,635	20,090	56,815	29,545	53,325
#9	-	-	-	-	-	-	67,500
1-1/4	42,150	21,920	61,775	32,190	90,845	47,240	-
#10	-	-	-	-	-	-	85,725

Legend Steel Strength

ASD PERFORMANCE DATA

Allowable Load Capacities for AC100+ Gold Installed into Normal-Weight Concrete with Threaded Rod and Reinforcing Bar (Based on Bond Strength/Concrete Capacity)[1,2,3,4,5,6]

Nominal Rod Diameter 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	1,000	1,035	1,065	1,095
	3-1/2	1,470	1,525	1,570	1,610
	4-1/2	1,890	1,960	2,015	2,065
1/2 or #4	2-3/4	1,545	1,605	1,655	1,690
	4-3/8	2,445	2,540	2,615	2,675
	6	3,370	3,500	3,600	3,685
5/8 or #5	3-1/8	2,200	2,285	2,355	2,410
	5-1/4	3,695	3,840	3,955	4,045
	7-1/2	5,275	5,480	5,640	5,770
3/4 or #6	3-1/2	2,955	3,070	3,160	3,235
	6-1/4	5,280	5,485	5,650	5,525
	9	7,600	7,890	8,125	7,800
7/8 or #7	3-1/2	3,050	3,170	3,260	3,340
	7	6,685	6,940	7,145	7,320
	10-1/2	10,315	10,705	11,020	11,290
1 or #8	4	3,725	3,870	3,980	4,075
	8	7,960	8,265	8,510	8,295
	12	12,190	12,655	13,030	12,505
#9	4-1/2	4,400	4,565	4,700	4,810
	9	9,035	9,380	9,660	9,890
	13-1/2	13,665	14,185	14,605	14,955
1-1/4	5	5,000	5,190	5,345	5,475
	10	10,000	10,380	10,690	10,945
	15	14,995	15,565	16,025	16,405
#10	5	5,000	5,190	5,345	5,475
	10	10,000	10,380	10,690	10,945
	15	14,995	15,565	16,025	16,405

1. Allowable load capacities listed are calculated using an applied safety factor of 4.0 which includes assessment of regional variations in concrete, freezing/thawing conditions and sensitivity to sustained loads (e.g. creep resistance). 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 2.5 times the embedment depth.
4. The tabulated load values are 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 loads.
6. Allowable bond strength/concrete capacity must be checked against allowable steel strength to determine the controlling allowable load. Allowable shear capacity is controlled by allowable steel strength for the given conditions.

ASD PERFORMANCE DATA

Allowable Load Capacities for AC100+ Gold Installed into Normal-Weight Concrete with Threaded Rod and Reinforcing Bar (Based on Steel Strength)[1,2,3]

Nominal Rod Diameter or Rebar Size (in. or #)	Steel Elements - Threaded Rod and Reinforcing Bar							
	A36/A307, Grade C or F1554		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	9,400
#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

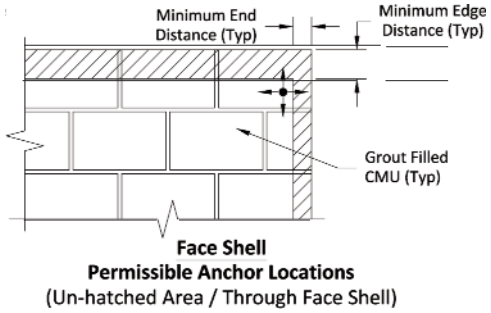
1. Allowable load capacities listed are calculated for the steel element type. Consideration of applying additional safety factors may be necessary depending on the application, such as life safety or overhead.
2. Allowable bond strength/concrete capacity must be checked against allowable steel strength to determine the controlling allowable load.
3. Allowable shear capacity is controlled by steel strength for the given conditions described on the previous page.

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

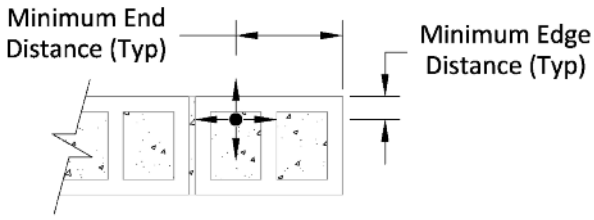
BASE MATERIAL TEMPERATURE		REDUCTION FACTOR FOR TEMPERATURE
°F	°C	
32	0	1.00
41	5	1.00
50	10	1.00
68	20	1.00
86	30	0.93
104	40	0.86
122	50	0.80
140	60	0.73
158	70	0.66
176	80	0.59

1. Linear interpolation may be used to derive reduction factors for base material temperatures between those listed.

MASONRY PERFORMANCE DATA



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



Top of Wall

Allowable Load Capacities for Threaded Rod Installed with AC100+ Gold into Grout Filled Concrete Masonry[1,2,3,4,5,6]

ANCHOR DIAMETER *d* (inch)	MINIMUM EMBEDMENT h_{nom} (inches)	MINIMUM EDGE DISTANCE (inches)	MINIMUM END DISTANCE (inches)	TENSION LOAD (pounds) Based on bond or masonry strength	Direction of Shear Loading	SHEAR LOAD (pounds) Based on bond or masonry strength
ANCHOR INSTALLED INTO GROUTED MASONRY WALL FACES[8]						
3/8	3	3	4	735[9]	Any	490[9]
		12	12	960[9]	Any	855[9]
1/2	4	3	3	740	Any	455
		4	4	985[9]	Any	655[9]
		12	12	960	Any	1,425
		7-3/4 (Bed Joint)	3	935	Load to Edge	460
5/8	5	3	3	745	Any	410
		12	12	1,095	Any	1,530
		7-3/4 (Bed Joint)	3	1,030	Load to Edge	590
3/4	6	4	4	790	Any	630
		12	12	1,155	Any	1,565
		7-3/4 (Bed Joint)	4	945	Load to Edge	565
ANCHOR INSTALLED INTO TOPS OF GROUTED MASONRY WALLS[7]						
1/2	2-3/4	1-3/4	4	595[9]	Any	300[9]
	4	1-3/4	4	520	Load to Edge	190
					Load to End	295
5/8	5	1-3/4	4	740	Any	235
3/4	6	2-3/4	4	1,260	Load to Edge	410
					Load to End	490

For SI: 1 inch = 25.4 mm, 1 psi = 6.89 kPa, 1 lbf = 4.45 N.

1. Tabulated load values are for anchors installed in nominal 8-inch-wide (203 mm) Grade N, Type II, lightweight, medium-weight or normal-weight grout-filled concrete masonry units conforming to ASTM C 90. If the specified compressive strength of the masonry, *f 'm*, is 2,000 psi (13.8 MPa) minimum the tabulated values may be increased by 4 percent.
2. The tabulated allowable loads are permitted to be increased for wind and seismic by 33-1/3 percent.
3. Allowable bond or masonry strength in tension and shear are calculated using a safety factor of 5.0 and must be checked against the allowable tension and shear load capacities for threaded rod based on steel strength to determine the controlling factor.
4. The AC100+ Gold adhesive experiences a reduction in tensile and shear capacity with increased concrete temperature. Reduction factors must be applied to the allowable values based on bond or masonry strength noted in the table when the anchors are installed in locations where the in-service concrete temperature may be greater than 75°F (24°C).
5. Anchors may be installed in the grouted cells, cell webs and bed joints not closer than 1-inch from head joints.
6. The tabulated values are applicable for anchors installed into grouted masonry wall faces and masonry wall tops at a critical spacing distance, scr, between anchors of 3 times the embedment depth.
7. Anchor installations into tops of grouted masonry walls are limited to one per masonry cell.
8. The critical spacing for use with the anchor values shown in this table is 16 anchor diameters. For 1/2 -, 5/8 - and 3/4 - inch diameter anchors ,the spacing may be reduced to a minimum of 8 anchor diameters when using a tension reduction factor of 0.85 and a shear reduction factor of 0.45. Linear interpolation may be used for spacing distances between the minimum and critical distances.
9. Tabulated load values also apply to anchors installed in nominal 6-inch-wide (152 mm) Grade N, Type II, lightweight, medium-weight or normal-weight grout-filled concrete masonry units conforming to ASTM C 90. These tabulated load values may not be increased for wind and seismic.

MASONRY PERFORMANCE DATA

Ultimate Load Capacities for Threaded Rod Installed with AC100+ Gold Into Hollow Concrete Masonry Walls with Stainless Steel and Plastic Screen Tubes[1,2,3]

Rod Diameter d in. (mm)	Drill Diameter d_{bit} (in.)	Screen Tube Length in. (mm)	Minimum End Distance in. (mm)	Minimum Edge Distance in. (mm)	Ultimate Load		Allowable Load	
					Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)
3/8 (9.5)	1/2	3-1/2 (88.9)	3-3/4 (95.2)	3-3/4 (95.2)	1,600 (7.2)	1,700 (7.6)	320 (1.4)	340 (1.5)
1/2 (12.7)	5/8	3-1/2 (88.9)	3-3/4 (95.2)	3-3/4 (95.2)	2,165 (9.6)	1,700 (7.6)	430 (1.9)	340 (1.5)

1. Tabulated load values are for anchors installed in minimum 8" wide, Grade N, Type II, lightweight, medium-weight or normal-weight concrete 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. Allowable loads are calculated using an applied safety factor of 5.0. Consideration of safety factors of 10 or higher may be necessary depending on the application, such as life safety.
3. Anchor spacing is limited to one anchor per masonry cell.

Ultimate Load Capacities for Threaded Rod Installed with AC100+ Gold into the Face of Brick Masonry Walls[1,2]

Rod Diameter d in. (mm)	Drill Diameter d_{bit} (in.)	Minimum Embedment Depth in. (mm)	Minimum End Distance in. (mm)	Minimum Edge Distance in. (mm)	Minimum Spacing in. (mm)	Ultimate Load		Allowable Load	
						Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)
3/8 (9.5)	1/2	3-1/2 (88.9)	6 (152.4)	6 (152.4)	6 (152.4)	5,845 (25.9)	4,580 (20.4)	1,170 (5.2)	915 (4.1)
1/2 (12.7)	5/8	6 (152.4)	8 (203.2)	8 (203.2)	8 (203.2)	11,500 (51.2)	9,300 (41.4)	2,300 (10.3)	1,860 (8.3)

1. Tabulated load values are for anchors installed in minimum 2 wythe, Grade SW, solid clay brick masonry conforming to ASTM C 62. Motar must be N, S or M.
2. Allowable loads are calculated using all applied safety factor or 5.0. Consideration of safety factors of 10 or higher may be necessary depending on the application, such as life safety.

ORDERING INFORMATION

AC100+ Gold Cartridges

Cat No.	Description	Std. Box	Std. Carton	Pallet
8462SD	AC100+ Gold 5 fl. oz. Push-Pak (DIY series)	12	36	-
8478SD	AC100+ Gold 10 fl. oz. Quik-Shot (DIY series)	12	36	972
8480SD	AC100+ Gold 8 fl. oz. dual cartridge	12	-	576
8486SD	AC100+ Gold 12 fl. oz. dual cartridge	12	-	864
8490SD	AC100+ Gold 28 fl. oz. dual cartridge	8	-	400

One AC100+ Gold mixing nozzle is packaged with each cartridge.
AC100+ Gold 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
08293	Extra mixing nozzle for AC100+ Gold (5 oz., 8 oz.,10 oz. & 12 oz.)	2	24
08294	Extra mixing nozzle (with 8" extension) for AC100+ Gold 28 oz.	2	24
08281	Mixing nozzle extension, 8" length minimum	2	24

Dispensing Tools for Injection Adhesive

Cat No.	Description	Std. Box	Std. Carton
08437	Manual caulking gun for Push-Pak and Quik-Shot	1	12
08479	High performance caulking gun for Push-Pak and Quik-Shot	1	6
08484	AC100+ Gold 8 oz. standard all metal manual tool	1	6
08485	AC100+ Gold 8 oz., 10 oz. & 12 oz. high performance manual tool	1	20
08494	AC100+ Gold 28 oz. standard all metal manual tool	1	-
08495	AC100+ Gold 28 oz. high performance manual tool	1	-
08496	AC100+ Gold 28 oz. pneumatic tool	1	-
08444	AC100+ Gold 28 oz. cordless power tool	1	-

ORDERING INFORMATION (Continued)

Hole Cleaning Tools and Accessories

Cat No.	Description	Length	Std. Pkg.
08284	Wire brush for 7/16" ANSI hole (3/8" rod or #3 rebar)	6-3/4"	1
08285	Wire brush for 9/16" ANSI hole (1/2" rod or #4 rebar)	6-3/4"	1
08286	Wire brush for 11/16" ANSI hole (5/8" rod or #5 rebar)	7-7/8"	1
08278	Wire brush for 3/4" ANSI hole (5/8" rod or #5 rebar)	7-7/8"	1
08287	Wire brush for 7/8" ANSI hole (3/4" rod or #6 rebar)	7-7/8"	1
08288	Wire brush for 1" ANSI hole (7/8" rod or #7 rebar)	11-7/8"	1
08289	Wire brush for 1-1/8" ANSI hole (1" rod or #8 rebar)	11-7/8"	1
08290	Wire brush for 1-3/8" ANSI hole (1-1/4" rod or #9 rebar)	11-7/8"	1
08291	Wire brush for 1-1/2" ANSI hole (#10 rebar)	11-7/8"	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	18"	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

Stainless Steel Screen Tubes

Cat. No.	Description	Drill Diameter	Standard Carton
07961	3/8" x 3-1/2" Screen Tube	1/2"	25
07962	3/8" x 6" Screen Tube*	1/2"	25
07963	3/8" x 8" Screen Tube*	1/2"	25
07964	3/8" x 10" Screen Tube*	1/2"	25
07959	3/8" x 12" Screen Tube*	1/2"	25
07965	1/2" x 3-1/2" Screen Tube	5/8"	25
07966	1/2" x 6" Screen Tube	5/8"	25
07967	1/2" x 8" Screen Tube*	5/8"	25
07968	1/2" x 10" Screen Tube*	5/8"	25

Screen tubes are made from a 300 series stainless steel. The nominal diameter of the screen listed indicates the matching rod diameter.
*Includes extension tubing.

Plastic Screen Tubes

Cat. No.	Description	Drill Diameter	Standard Carton
08310	3/8″ x 3-1/2″ Plastic Screen	1/2″	25
08311	3/8″ x 6″ Plastic Screen	1/2″	25
08313	3/8″ x 8″ Plastic Screen	1/2″	25
08315	1/2″ x 3-1/2″ Plastic Screen	3/4″	25
08317	1/2″ x 6″ Plastic Screen	3/4″	25

Adhesive Pistons

Cat. No.	Description	ANSI Drill Dia.	Reinforcing Bar Size	Threaded Rod Size	Std. Bag	Std. Ctd.
08300	7/8" Plug	7/8″	#6	3/4″	10	100
08301	1" Plug	1″	#7	7/8″	10	100
08303	1-1/8" Plug	1-1/8"	#8	1″	10	100
08305	1-3/8" Plug	1-3/8″	#9	1-1/4″	10	100
08309	1-1/2" Plug	1-1/2″	#10	-	10	100

PE1000+® *Epoxy Injection Adhesive 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 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
- Qualified for seismic and wind loading (see ESR-2583)
- 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

General Information
Installation Specifications
Installation Instructions
Performance Data
Ordering Information

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

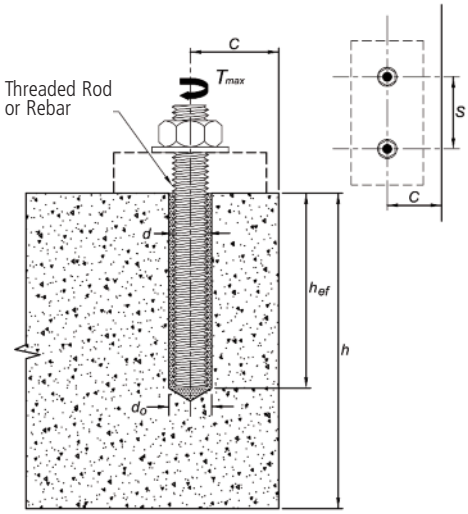
INSTALLATION SPECIFICATIONS

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

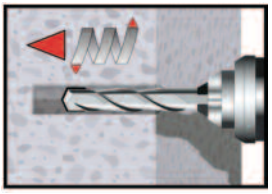


Threaded Rod and Deformed Reinforcing Bar Material Properties				
Steel Description (General)	**Steel Specification** (ASTM)	**Nomial Anchor Size** (inch)	**Minimum Yield Strength,** f_y (ksi)	**Minimum Ultimate Strength,** f_u (ksi)
Carbon rod[1]	A 307, Grade C or F 1554	3/8 through 1-1/4	36.0	58.0
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.

INSTALLATION INSTRUCTIONS (SOLID BASE MATERIALS)

DRILLING

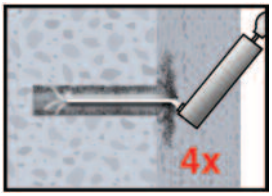


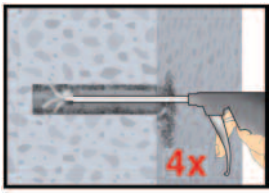
1 - Drill a hole into the base material with a rotary hammer drill tool to the size and embedment required by the selected anchor (*reference installation specifications for threaded rod and reinforcing bar*). The tolerances of the carbide drill bit should meet the requirements of ANSI Standard B212.15.

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

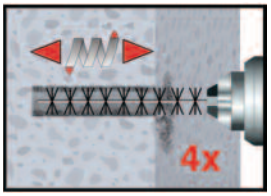




2a - Starting from the bottom or back of the anchor hole, blow the hole clean using a compressed air nozzle (min. 90 psi) or a hand pump (supplied by Powers Fasteners) a minimum of *four* times (4x).

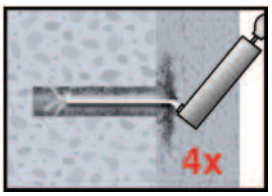
• Use a compressed air nozzle (min. 90 psi) or a hand pump (min. volume 25 fl. oz.) for anchor rod 3/8" to 3/4" diameter or reinforcing bar (rebar) sizes #3 to #6.

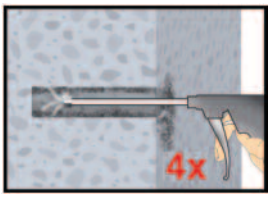
• Use a compressed air nozzle (min. 90 psi) for anchor rod 7/8" to 1-1/4" diameter and rebar sizes #7 to #10. A hand pump shall not be used with these anchor sizes.



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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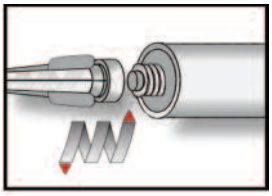
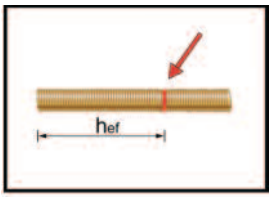
INSTALLATION INSTRUCTIONS (SOLID BASE MATERIALS)

PREPARING

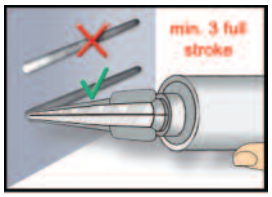


3- Check adhesive expiration date on cartridge label. Do not use expired product. Review Material Safety Data Sheet (MSDS) before use. Cartridge temperature must be between 41°F - 104°F (5°C - 40°C) when in use. Consideration should be given to the reduced gel time of the adhesive in warm temperatures.

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.



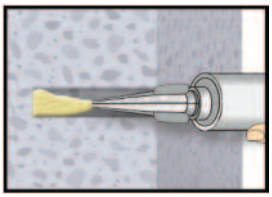
4- Prior to inserting the anchor rod or rebar into the filled bore hole, the position of the embedment depth has to be marked on the anchor. Verify anchor element is straight and free of surface damage.



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.

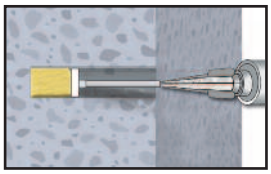
INSTALLATION



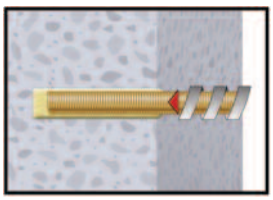
6- Fill the cleaned hole approximately two-thirds full with mixed adhesive starting from the bottom or back of the anchor hole. Slowly withdraw the mixing nozzle as the hole fills to avoid creating air pockets or voids. For embedment depth greater than 7-1/2" an extension nozzle (3/8" dia.) must be used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

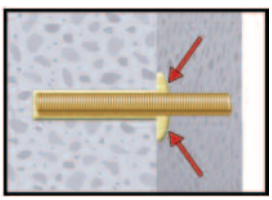
With Piston Plug



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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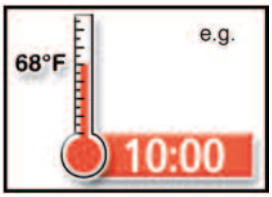
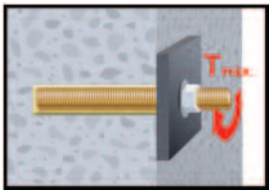
INSTALLATION INSTRUCTIONS (SOLID BASE MATERILAS)

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.

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		$k_{c,cr}$	-	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		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)	671 (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	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	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	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 = 110°F (43°C), Maximum short term temperature = 140°F (60°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	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	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	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 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.

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)[1,2,3]

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		ϕ	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		ϕ	-	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 $h_{ef} \geq 2.5$ in.							
Reduction factor for pryout strength		ϕ		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	$\tau_{k,uncr}$	ϕ_d
		Water-saturated concrete	$\tau_{k,uncr} \cdot \kappa_{ws}$	ϕ_{ws}
		Water-filled hole	$\tau_{k,uncr} \cdot \kappa_{wf}$	ϕ_{wf}
Cracked concrete	Hammer drill	Dry concrete	$\tau_{k,cr}$	ϕ_d
		Water-saturated concrete	$\tau_{k,cr} \cdot \kappa_{ws}$	ϕ_{ws}
		Water-filled hole	$\tau_{k,cr} \cdot \kappa_{wf}$	ϕ_{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 $(f'_c / 2{,}500)^{0.12}$.

Factored Design Strength (ϕN_n and ϕV_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 (ϕ) 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 (ϕ) 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)

		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.)	ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{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	13,015	6,550	9,045	7,565
	6	11,465	7,150	12,060	7,835	12,485	9,045	15,820	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

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 considered with these tables. For seismic design conditions, please see ACI 318-05 Appendix D and ICC-ES AC308 Annex A, Section 3.3 and ESR-2583.
6. Periodic special inspection must be performed where required by code or the Authority Having Jurisdiction (AHJ). See ESR-2583.
7. 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.
8. 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.
9. 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, including seismic, please see ACI 318-05 Appendix D and ICC-ES AC308 Annex A, Section 3.3 and ESR-2583.
10. 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.)	ϕN_{sa} Shear (lbs.)	ϕN_{sa} Tension (lbs.)	ϕN_{sa} Shear (lbs.)	ϕN_{sa} Tension (lbs.)	ϕN_{sa} Shear (lbs.)	ϕN_{sa} Tension (lbs.)	ϕN_{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 (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 (ϕ) 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 (ϕ) 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	
		ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{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 · Bond Strength/Pryout Strength

ADHESIVE ANCHORS

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 considered with these tables. For seismic design conditions, please see ACI 318-05 Appendix D and ICC-ES AC308 Annex A, Section 3.3 and ESR-2583.
6. Periodic special inspection must be performed where required by code or the Authority Having Jurisdiction (AHJ). See ESR-2583.
7. 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.
8. 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.
9. 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, including seismic, please see ACI 318-05 Appendix D and ICC-ES AC308 Annex A, Section 3.3 and ESR-2583.
10. 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.)	ϕN_{sa} Shear (lbs.)	ϕN_{sa} Tension (lbs.)	ϕN_{sa} Shear (lbs.)	ϕN_{sa} Tension (lbs.)	ϕN_{sa} Shear (lbs.)	ϕN_{sa} Tension (lbs.)	ϕN_{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 (ϕN_n and ϕV_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 (ϕ) 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 (ϕ) 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	
		ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{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	
	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.)
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

Factored Design Strength (ϕN_n and ϕV_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 considered with these tables. For seismic design conditions, please see ACI 318-05 Appendix D and ICC-ES AC308 Annex A, Section 3.3 and ESR-2583.
6. Periodic special inspection must be performed where required by code or the Authority Having Jurisdiction (AHJ). See ESR-2583.
7. 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.
8. 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.
9. 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, including seismic, please see ACI 318-05 Appendix D and ICC-ES AC308 Annex A, Section 3.3 and ESR-2583.
10. 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	
		ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕN_{cb} or ϕN_a Tension (lbs.)	ϕV_{cb} or ϕV_{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	
	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.)
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 Normal-Weight Concrete with Threaded Rod and Reinforcing Bar (Based on Bond Strength/Concrete Capacity)[1,2,3,4,5,6]

Nominal Rod/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 thickness is greater of [h_{ef} + 1-1/4"] and [h_{ef} +2 d_o].
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 Normal-Weight Concrete with Threaded Rod and Reinforcing Bar (Based on Steel Strength)[1,2,3,4,5]

Nominal Rod or Rebar Size (in. or #)	Steel Elements - Threaded Rod and Reinforcing Bar							
	A36/A307, Grade C or F1554		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. 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		Bond Strength 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]

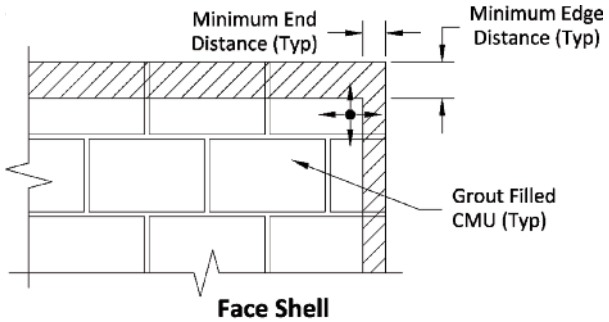
Rod Diameter *d* in. (mm)	Drill Diameter d_{bit} in.	Minimum Embedment Depth in. (mm)	Minimum Edge Distance in. (mm)	Minimum End Distance in. (mm)	Ultimate Load [3]		Allowable Load	
					Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)
3/8 (9.5)	7/16	3 (76.2)	2-1/2 (63.5)	2-1/2 (63.5)	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.

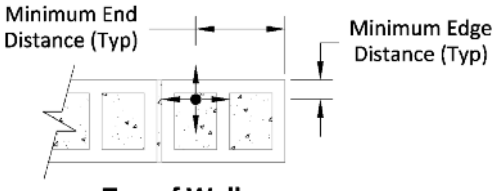
Ultimate Load Capacities for Threaded Rod Installed with PE1000+ into the Top of Grout-Filled Concrete Masonry Walls[1,2]

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

ADHESIVE ANCHORS

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	13 fl. oz. and 20 fl. oz.. Manual tool	1	6
08298C	13 fl. oz. / 20 fl. oz. High Performance manual tool	1	-
8497SD	20 fl. oz. Pnuematic tool	1	-

PE1000+ Epoxy Adhesive Anchor System

Hole Cleaning Tools and Accessories

Cat No.	Description	Length	Std. Pkg.
08284	Wire brush for 7/16" ANSI hole (3/8" rod or #3 rebar)	6-3/4"	1
08285	Wire brush for 9/16" ANSI hole (1/2" rod or #4 rebar)	6-3/4"	1
08286	Wire brush for 11/16" ANSI hole (5/8" rod or #5 rebar)	7-7/8"	1
08278	Wire brush for 3/4" ANSI hole (5/8" rod or #5 rebar)	7-7/8"	1
08287	Wire brush for 7/8" ANSI hole (3/4" rod or #6 rebar)	7-7/8"	1
08288	Wire brush for 1" ANSI hole (7/8" rod or #7 rebar)	11-7/8"	1
08289	Wire brush for 1-1/8" ANSI hole (1" rod or #8 rebar)	11-7/8"	1
08290	Wire brush for 1-3/8" ANSI hole (1-1/4" rod or #9 rebar)	11-7/8"	1
08291	Wire brush for 1-1/2" ANSI hole (#10 rebar)	11-7/8"	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	18"	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

T308+® *Adhesive Injection System*

PRODUCT DESCRIPTION

The T308+ is a two component epoxy adhesive anchoring system. The system includes injection adhesive in plastic cartridges, mixing nozzles, dispensing tools and hole cleaning equipment. The T308+ is designed for bonding steel threaded rod into drilled holes in hardened concrete and solid and hollow masonry base materials.

GENERAL APPLICATIONS AND USES

- Bonding steel threaded rod into hardened concrete and concrete masonry (CMU)
- Suitable to resist loads in uncracked concrete base materials for cases where anchor design theory and criteria applies
- Evaluated for installation into dry, clean holes only
- Can be installed in a wide range of base material temperatures

FEATURES AND BENEFITS

+ Made in the USA
+ Cartridge design allows for multiple uses using extra mixing nozzles
+ Mixing nozzles proportion adhesive and provide simple delivery method into drilled holes
+ Evaluated and recognized for variable embedments (see installation specifications)

APPROVALS AND LISTINGS

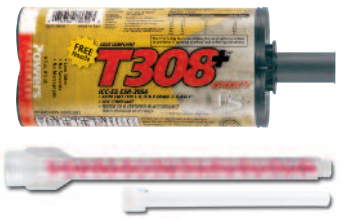
International Code Council, Evaluation Service (ICC-ES) ESR-3066
Conforms to requirements of ASTM C 881, Types I, II, IV & V, Grade 3, Class C (with exception of gel time)
Compliant with NSF/ANSI Standard 61 for drinking water system components – health effects; minimum requirements for materials in contact with potable water and water treatment
Department of Transportation listings (see www.powers.com or contact transportation agency)

GUIDE SPECIFICATIONS

CSI Divisions: *03151–Concrete Anchoring, 04081-Masonry Anchorage, 05090-Metal Fastenings.* Adhesive anchoring system shall be T308+ 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

General Information
Installation Specifications
Installation Instructions
Performance Data
Ordering Information



T308+ dual cartridge and mixing nozzle

PACKAGING

Coaxial Cartridge
8.5 fl. oz. (250ml)
Dual (side-by-side) Cartridge
14 fl. oz. (410 ml)
21.5 fl. oz. (630ml)
51 fl. oz. (1508 ml)

STORAGE LIFE & CONDITIONS

Two years in a dry, dark environment with temperature ranging from 40ºF and 95ºF

ANCHOR SIZE RANGE (TYP.)

3/8" to 7/8" diameter threaded rod

SUITABLE BASE MATERIALS

Normal-weight concrete
Grouted concrete masonry
Hollow concrete masonry
Brick masonry (URM)

This Product Available In PDA®
Powers Design Assist
Real Time Anchor Design Software
www.powersdesignassist.com

ADHESIVE ANCHORS

INSTALLATION SPECIFICATIONS (SOLID CONCRETE BASE MATERIALS)

Installation Specifications for Steel Threaded Rod

Dimension/Property	Notation	Units	Nominal Anchor Size									
			3/8″		1/2″		5/8″		3/4″		7/8″	
Nominal anchor diameter	d	in. (mm)	0.375 (9.5)		0.500 (12.7)		0.625 (15.9)		0.750 (19.1)		0.875 (31.8)	
Nominal diameter of drilled hole	d_o	in.	7/16 ANSI		9/16 ANSI		3/4 ANSI		7/8 ANSI		1 ANSI	
Minimum embedment[1]	h_{ef}	in. (mm)	2 (50)	3-3/8 (86)	2-1/2 (62)	4 (102)	3-1/4 (83)	5-5/8 (143)	3-3/8 (86)	6-3/4 (171)	4 (102)	7-7/8 (200)
Minimum concrete member thickness[1]	h_{min}	in. (mm)	4 (102)	5 (127)	5 (127)	6 (153)	6 (153)	9 (229)	7 (178)	10-1/8 (257)	8 (203)	12 (305)
Minimum spacing distance[1]	s_{min}	in. (mm)	3 (76)		3-3/4 (95)		4-7/8 (124)		5 (127)		8 (203)	
Critical edge distance	c_{ac}	in. (mm)	4 (102)	6-3/4 (171)	5 (127)	9-1/2 (241)	6-1/2 (165)	12 (305)	6-3/4 (171)	14-1/2 (368)	8 (203)	15-3/4 (400)
Maximum torque (only possible after curing)	T_{max}	ft.-lbs. (N-m)	14 (19)		25 (34)		70 (95)		120 (163)		140 (190)	

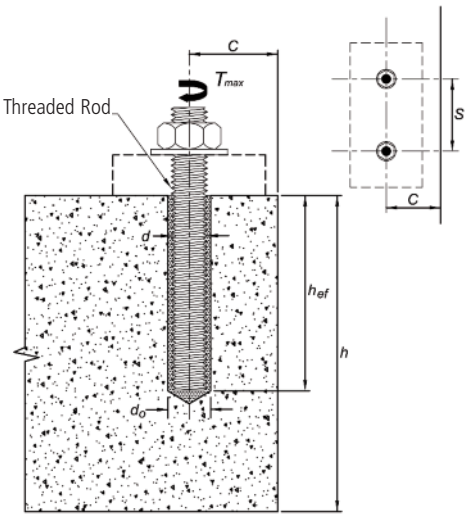
1. For use with the design provisions of ACI 318 Appendix D and ICC-ES AC308 Appendix A, Section 3.3.

Installation Specifications for Threaded Rod (Hollow Base Material)[1]

Dimentions/property	Notation	Units	Nominal Size	
			3/8″	1/2″
Nominal threaded rod diameter	d	in (mm)	0.375 (9.5)	0.500 (12.7)
Nominal stainless steel tube size	-	in.	3/8	1/2
Nominal diameter of drilled hole	d_o, (d_{bit})	in	1/2 ANSI	5/8 ANSI
Maximum torque (only possible after full cure time of adhesive)	T_{max}	ft.-lb. (N-m)	10 (8)	10 (8)

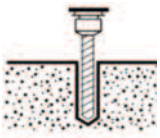
1. For unreinforced masonry (URM) see pages 285-286.

Detail of Steel Hardware Elements used with Injection Adhesive System

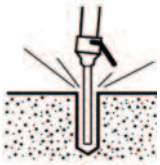


Threaded Rod Material Properties				
Steel Description (General)	**Steel Specification** (ASTM)	**Nomial Anchor Size** (inch)	**Minimum Yield Strength,** f_y (ksi)	**Minimum Ultimate Strength,** f_u (ksi)
Carbon rod	F1554 Grade 36	3/8 through 7/8	36.0	58.0
High strength carbon rod	A193, Grade B7	3/8 through 7/8	105.0	120.0
Stainless rod (Alloy 304/316)	F593, (Condition CW)	3/8 through 5/8	65.0	100.0
		3/4 through 7/8	45.0	85.0
Grade 60 reinforcing bar	A615, A706 A767 or A996	3/8 through 7/8 (#3 through #7)	60.0	90.0

INSTALLATION INSTRUCTIONS (SOLID BASE MATERIALS)



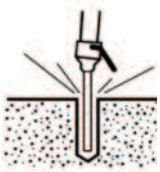
Step 1 - Drill hole in concrete using a rotary-percussion power drill (hammer drill) an ANSI standard carbide drill bit. Drill bit size should be 1/16″ larger than the anchor rod for sizes up to 1/2″ diameter; and 1/8″ larger for anchor rods 5/8″ through 7/8″ diameter.



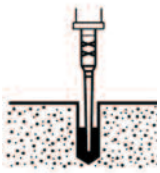
Step 2: Blow out hole using oil-free compressed air at a minimum of 70 psi with a nozzle. While blowing air, insert the nozzle into the hole until in contact with the bottom for not less than one second, and then withdraw. Repeat.

Step 3: Insert an appropriate size nylon cleaning brush into the hole with a thrusting, twisting motion. Once the brush is in contact with the bottom of the hole, turn the brush three revolution, and then quickly withdraw the brush with a vigorous, twisting pull.

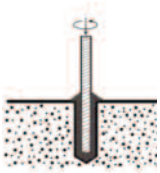
Step 4: Repeat brushing of the hole.



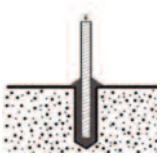
Step 5: Repeat blow out of hole with air as per item 2 above.



Step 6: Check cartridge for expiration date to confirm the material is within the expiration date and for any physical defects. Concrete temperature must be 50 °F minimum. Condition cartridge and contents to a temperature of 65 °F to 95 °F for easier dispensing. Insert the cartridge into the extrusion tool, and attach the supplied mixing nozzle to the cartridge. Prior to injection, dispense some mixed epoxy through the mixing nozzle and discard until the color of the extruded material becomes uniform. After uniform color is achieved, insert the end of the mixing nozzle into the borehole until it contacts the bottom. Then, dispense the adhesive while slowly withdrawing the nozzle until borehole is approximately 2/3 full, and then withdraw the mixing nozzle. Keep the nozzle attached on the partially used cartridges. A new mixing nozzle must be used if the gel time has been exceeded between injections.



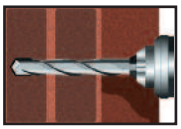
Step 7: Insert the clean and oil-free anchor rod into the adhesive in the hole with a counter-thread, turning motion until it contacts the bottom of the hole. Make sure the hole is completely filled with adhesive.



Step 8: Immediately adjust the alignment of the anchor in the hole. Check that the anchor remains fully in the hole. An air bubble in the hole could cause the anchor rod to rise after insertion. If this occurs, immediately turn the anchor with downward pressure to work the air out. Do not disturb the anchorage after the adhesive gel time. Do not torque or load the anchorage until the adhesive is fully cured.

INSTALLATION INSTRUCTIONS (HOLLOW BASE MATERIAL)

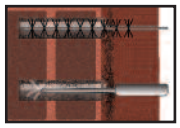
DRILLING



1 - Drill a hole into the base material with a rotary drill tool to the size and embedment for the required screen size. The tolerances of the drill bit used should meet the requirements of ANSI B212.15.

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

HOLE CLEANING → BLOW 2x, BRUSH 2x, BLOW 2x



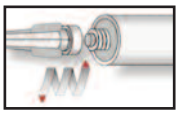
2 - Blow out hole using oil-free compressed air at a minimum of 70 psi with a nozzle. While blowing air, insert the nozzle into the hole until in contact with the bottom for not less than one second, and then withdraw. Repeat.

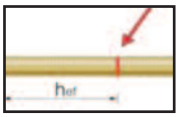
Insert an appropriate size nylon cleaning brush into the hole with a thrusting, twisting motion. Once the brush is in contact with the bottom of the hole, turn the brush three revolution, and then quickly withdraw the brush with a vigorous, twisting pull.

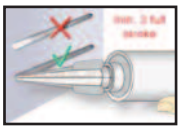
- Repeat brushing of the hole
- Repeat blow out of hole with compressed air as per above.

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 40°F - 95°F (0°C - 35°C) when in use. Review gel (working) time and curing time table. Consideration should be given to the reduced gel (working) time of the adhesive in warm temperatures.

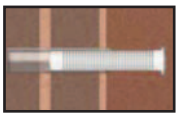
Attach a supplied mixing nozzle to the cartridge and load the cartridge into the correct dispensing tool. A new mixing nozzle must be used for every working interruption longer than the published working time (*see gel time and curing time table*) as well as for new cartridges.

4 - Prior to inserting the clean and oil free anchor rod. Verify anchor element is straight and free of surface damage.

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

Review and note the published working and cure times (*see gel time and curing time table*) prior to injection of the mixed adhesive into the screen tube.

INSTALLATION



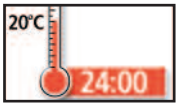
6 - Insert a screen tube of suitable length into the cleaned anchor hole.

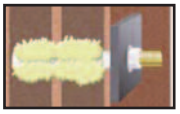
7 - Fill the screen tube completely full with adhesive starting from the bottom or back of the tube. Slowly withdraw the mixing nozzle as the screen fills to avoid creating air pockets or voids. A plastic extension tube supplied by Powers Fasteners must be used with the mixing nozzle if the back of the screen tube cannot be reached.

8 - Prior to inserting the anchor rod into the screen tube inspect it to ensure that it is free of dirt, grease, oil or other foreign material.

Push the threaded rod into the screen tube while turning slightly to ensure positive distribution of the adhesive until back of the tube is reached.

CURING AND FIXTURE





9 - Allow the adhesive anchor to cure to the specified full curing time prior to applying any load.

Do not disturb, torque or load the anchor until it is fully cured (*see gel time and curing time table*).

10 - After full curing of the adhesive anchor, a fixture can be installed to the anchor and tightened up to the maximum torque *(see installation specifications for threaded rod in hollow concrete base material)* 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	Curing time
°F	°C		
50	10	35 minutes	48 hours
60	15	20 minutes	36 hours
70	20	10 minutes	24 hours
80	25	7 minutes	24 hours
90	32	5 minutes	24 hours
100	37	3 minutes	12 hours

Hole Cleaning Equipment Selection Table for T308+			
Threaded rod diameter (inch)	ANSI drill bit diameter (inch)	Nylon brush (Cat. #)	Nylon brush length (in.)
3/8	7/16	07931	8-1/2
1/2	9/16	07932	8-1/2
5/8	3/4	07933	12
3/4	7/8	07933	13
7/8	1	07934	13
Compressed air nozzle (all hole sizes)		08292	1

PERFORMANCE DATA

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

Dimension/Property		Notation	Units	Nominal Anchor Size									
				3/8″		1/2″		5/8″		3/4″		7/8″	
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)	
ANSI Drill bit diameter		d_o	in.	7/16″		9/16″		3/4″		7/8″		1″	
Minimum embedment		h_{ef}	in. (mm)	2 (50)	3-3/8 (86)	2-1/2 (62)	4 (102)	3-1/4 (83)	5-5/8 (143)	3-3/8 (86)	6-3/4 (171)	4 (102)	
Minimum concrete member thickness[2]		h_{min}	in. (mm)	4 (102)	5 (127)	5 (127)	6 (153)	6 (153)	9 (229)	7 (178)	10-1/8 (257)	8 (203)	
Minimum spacing distance[2]		s_{min}	in. (mm)	3 (76)		3-3/4 (95)		4-7/8 (124)		5 (127)		8 (203)	
Critical edge distance[2]		c_{ac}	in. (mm)	4 (102)	6-3/4 (171)	5 (127)	9-1/2 (241)	6-1/2 (165)	12 (305)	6-3/4 (171)	14-1/2 (368)	8 (203)	
Minimum edge distance[2]		c_{min}	in. (mm)	3 (76)		3-3/4 (95)		4-7/8 (124)		5 (127)		6 (153)	
Maximum torque[3]		T_{max}	in. (mm)	14 (19)		25 (34)		73 (95)		119 (163)		144 (190)	
Effective tensile area		A_{se}	in.^{2}	0.0775		0.1419		0.2260		0.3345		0.4617	
Anchor Steel Yield Strength	F1554 Grade 36	f_y	lb./in.^{2}	36,000									
	A193 Grade B7			105,000									
Anchor Steel Ultimate Strength	F1554 Grade 36	f_{ut}	lb./in.^{2}	58,000									
	A193 Grade B7			125,000									
Nominal Steel of Single Anchor Tension	F1554 Grade 36	N_{sa}	lbf	4,495		8,230		13,110		19.400		26,780	
	A193 Grade B7			9,685		17,735		28,250		41,810		57,710	
Reduction factor for steel strength in tension		-		0.75									
Nominal Steel of Single Anchor Shear	F1554 Grade 36	V_{sa}	lbf	2,695		4,940		7,860		11,640		16,070	
	A193 Grade B7			4,845		10,640		16,950		25,085		34,625	
Reduction factor for steel strength in shear		-	-	0.65									
Effectiveness factor for uncracked concrete		$k_{c,uncr}$	-	24									
Strength reduction factor for tension, concrete failure modes, Condition B		ϕ	-	0.65									
Strength reduction factor for shear, concrete failure modes, Condition B		ϕ	-	0.70									
Anchor category, periodic inspection		-	-	2	2	2	2	3	3	3	3	3	
Strength reduction factor for bond strength, dry concrete, periodic inspection		ϕ_d	-	0.55	0.55	0.55	0.55	0.45	0.45	0.45	0.45	0.45	0.45
		k_d	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.7	
Anchor category, continuous inspection		-	-	1	1	1	1	2	2	2	2	3	
Strength reduction factor for bond strength, dry concrete, continuous inspection		ϕ_d	-	0.65	0.65	0.65	0.65	0.55	0.55	0.55	0.55	0.45	
		k_d	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.7	
Characteristic bond strength, uncracked concrete, Temperature Range A		$\tau_{k,uncr}$	psi	676		681		418		523		645	
Characteristic bond strength, uncracked concrete, Temperature Range B		$\tau_{k,uncr}$	psi	406		409		251		314		288	

1- The data presented is applicable to use with uncracked, normal-weight concrete having the compressive strength of between 2,500 to 8,500psi.
2- The T308+ is recognized for applications in dry concrete, non-acidic environment, minmum base material temperature of 50°F, and in holes drilled with a carbide drill bit used with a hammer drill.
3- Characteristic bond strength is dependent on temperature:
Temperature Range A: Maximum short term temperature = 110°F and maximum long term temperature = 75°F
Temperature Range A: Maximum short term temperature = 162°F and maximum long term temperature = 110°F
Short term elevated concrete temperatures are those that occur over brief intervals, such as due to diurnal cycling, and long term concrete temperatures are roughly constant over significant periods of time.
4- For short term loads such as due to wind, and for Temperature Range B only, the listed bond strength may be increased 40 percent.
5- The T308+ anchor system is suitable for installation in vertical down or horizontal installation applications.

Factored Design Strength (ϕN_n and ϕV_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}.
   - 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 (ϕ) 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 (ϕ) for bond strength were determined from reliability testing and qualification in accordance with ICC-ES AC308 and are tabulated in this product information supplement and ESR-3066 *(Notes continued on next page).*

Tension Design Strength for T308+ Installed into Uncracked Concrete in Dry Hole Conition for Temperature Range A (Continuous Inspection)

Maximum long term temperature = 75°F (24°C), Maximum short term temperature = 110°F (43°C)

Nominal Anchor Size (in.)	Embedment Depth h_{ef} in.	Min. Concrete Compressive Strength, f'_c (psi)	Steel Threaded Rod	
		2,500 to 8,000	F1554 Grade 36	A193 Grade B7
		ϕN_a Tension (lbs.)	ϕN_{sa}	ϕN_{sa}
3/8	2	1,035	3,395	7,315
	3-3/8	1,745		
1/2	2-1/2	1,740	6,175	13,315
	3-1/4	2,260		
	4	2,780		
5/8	3-1/4	1,465	9,830	21,190
	4-1/2	2,030		
	5-5/8	2,540		
3/4	3-3/8	2,285	14,575	31,405
	5-1/4	3,555		
	6-3/4	4,575		
7/8	4	2,870	20,095	43,315
	6	4,305		
	7-7/8	5,655		

Shear Design Strength for T308+ Installed into Uncracked Concrete in Dry Hole Condition for Temperature Range A

Maximum long term temperature = 75°F (24°C), Maximum short term temperature = 110°F (43°C)

Nominal Anchor Size (in.)	Embed. Depth h_{ef} in.	Min. Concrete Compressive Strength, f'_c (psi)					Steel Threaded Rod	
		2,500	3,000	4,000	6,000	8,000	F1554 Grade 36	A193 Grade B7
		ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕV_{sa}	ϕV_{sa}
3/8	2	1,115	1,115	1,115	1,115	1,115	1,765	3,805
	3-3/8	2,775	3,020	3,490	3,765	3,765		
1/2	2-1/2	2,495	2,730	3,155	3,745	3,745	3,210	6,925
	4	4,530	4,965	5,735	5,990	5,990		
5/8	3-1/4	3,735	3,735	3,735	3,735	3,735	5,110	11,020
	5-5/8	6,465	6,465	6,465	6,465	6,465		
3/4	3-3/8	4,865	5,330	5,825	5,825	5,825	7,580	16,330
	6-3/4	11,575	11,645	11,645	11,645	11,645		
7/8	4	4,920	5,390	6,225	7,620	8,800	10,450	22,525
	7-7/8	15,440	16,915	19,530	19,550	19,550		

Legend Concrete Breakout | Bond Strength/Pryout Strength | Steel Strength

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

(Continued)

5. Tabular values are permitted for static loads only, seismic loading is not considered with these tables. For seismic design requirements, please see ACI 318-05 Appendix D and ICC-ES AC308 Annex A, Section 3.3.
6. Special inspection must be performed where required by code or the Authority Having Jurisdiction (AHJ) See ICC-ESR-3066.
7. Tabular values are not permitted for anchors subjected to tension resulting from sustained loading. Please see ICC-ES AC308 Annex A, Section 3.3 for the supplemental design requirement for this loading condition.
8. 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.
9. Interpolation is not permitted to be used with the tabular values. For other design conditions, including seismic, please see ACI 318-05 Appendix D and ICC-ES AC308 Annex A, Section 3.3.
10. 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 Design Strength for T308+ Installed into Uncracked Concrete in Dry Hole Condition for Temperature Range B (Continuous Inspection)

Maximum long term temperature = 110°F (43°C), Maximum short term temperature = 162°F (72°C)

Nominal Anchor Size (in.)	Embedment Depth h_{ef} in.	Min. Concrete Compressive Strength, f'_c (psi)	Steel Threaded Rod	
		2,500 to 8,000	F1554 Grade 36	A193 Grade B7
		ϕN_a Tension (lbs.)	ϕN_{sa}	ϕN_{sa}
3/8	2	620	3,395	7,315
	3-3/8	1,050		
1/2	2-1/2	1,045	6,175	13,315
	3-1/4	1,360		
	4	1,670		
5/8	3-1/4	880	9,830	21,190
	4-1/2	1,220		
	5-5/8	1,525		
3/4	3-3/8	1,375	14,575	31,405
	5-1/4	2,135		
	6-3/4	2,745		
7/8	4	1,730	20,095	43,315
	6	2,590		
	7-7/8	3,400		

Shear Design Strength for T308+ Installed into Uncracked Concrete in Dry Hole Condition for Temperature Range B

Maximum long term temperature = 75°F (24°C), Maximum short term temperature = 162°F (72°C)

Nominal Anchor Size (in.)	Embed. Depth h_{ef} in.	Min. Concrete Compressive Strength, f'_c (psi)					Steel Threaded Rod	
		2,500	3,000	4,000	6,000	8,000	F1554 Grade 36	A193 Grade B7
		ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕV_{cb} or ϕV_{cp} Shear (lbs.)	ϕV_{sa}	ϕV_{sa}
3/8	2	670	670	670	670	670	1,765	3,805
	3-3/8	2,260	2,260	2,260	2,260	2,260		
1/2	2-1/2	2,250	2,250	2,250	2,250	2,250	3,210	6,925
	4	3,600	3,600	3,600	3,600	3,600		
5/8	3-1/4	2,240	2,240	2,240	2,240	2,240	5,110	11,020
	5-5/8	3,880	3,880	3,880	3,880	3,880		
3/4	3-3/8	3,495	3,495	3,495	3,495	3,495	7,580	16,330
	6-3/4	6,990	6,990	6,990	6,990	6,990		
7/8	4	4,920	5,390	5,975	5,975	5,975	10,450	22,525
	7-7/8	11,760	11,760	11,760	11,760	11,760		

Legend Concrete Breakout | Bond Strength/Pryout Strength | Steel Strength

Ultimate Load Capacities for T308+ Installed with ASTM A 193 Grade B7 Steel Threaded Rod into Normal-Weight Concrete[1,2,3,4] (based on bond strength/concrete capacity)

Rod Diameter d_{bit} in.	Drill Diameter d_{bit} in.	Minimum Embedment Depth in.	Minimum Concrete Compressive Strength (f'_c)	
			2,500 psi	4,000 psi
			Tension lbs.	
3/8	7/16	2	3,830	4,060
		2-1/2	5,605	6,065
		3	7,380	8,075
		3-3/8	8,710	9,580
1/2	9/16	2-1/2	6,470	6,890
		3	9,090	9,735
		3-1/2	11,710	12,575
		4	14,330	15,420
5/8	3/4	3-1/4	8,190	8,810
		4	13,510	14,495
		4-1/2	17,060	18,285
		5-5/8	25,040	26,810
3/4	7/8	3-3/8	9,480	10,160
		4-1/2	16,300	17,035
		6	25,395	26,205
		6-3/4	29,940	30,790
7/8	1	4	13,560	14,600
		5	17,490	18,695
		6	21,420	22,785
		7-7/8	28,790	30,460

1. The values listed above are ultimate load capacities which should be reduced by a minimum safety factor of 4.0 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.
2. Allowable bond strength/concrete capacity must be checked against allowable steel strength to determine the controlling allowable load. Shear capacity is controlled by allowable steel strengths for the given conditions.
3. The tabulated data is applicable to single anchors at critical edge distance in uncracked concrete, normal-weight concrete having a compressive strength as listed. Values are for dry concrete in holes drilled with a hammer drill and an ANSI carbide drill bit. Application is limited to vertical down or horizontal installation direction. Minimum base material temperature shall be 50°F and may not exceed 110°F.
4. Linear interpolation may be used to determine ultimate loads for intermediate compressive strengths.

Ultimate Load Capacities for Steel Threaded Rod Installed with T308+ into the Block Face of Grout-Filled Concrete Masonry Walls[1,2]

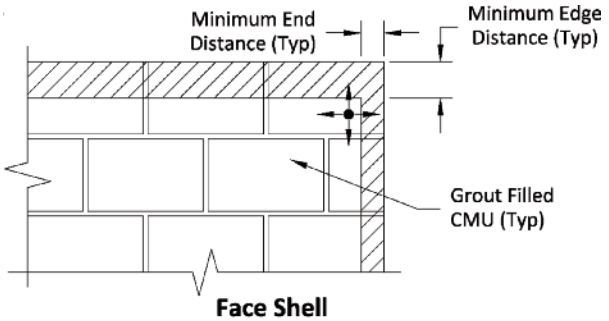
Rod Diameter d in. (mm)	Drill Diameter d_{bit} in.	Minimum Embedment Depth in. (mm)	Minimum Edge Distance in. (mm)	Minimum End Distance in. (mm)	Ultimate Load [3]		Allowable Load	
					Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)
1/2 (12.7)	9/16	4 (101.6)	3-3/4 (95.2)	4 (101.6)	3,525 (15.6)	2,950 (13.0)	705 (3.1)	590 (2.6)
5/8 (15.9)	3/4	5 (127)	3-3/4 (95.2)	4 (101.6)	5,150 (22.8)	2,950 (13.0)	1,030 (4.5)	590 (2.6)

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.

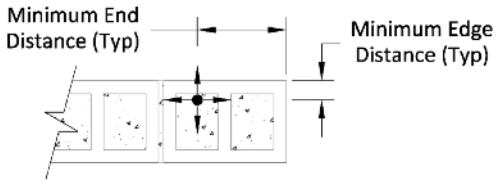
Ultimate Load Capacities for Steel Threaded Rod Installed with T308+ into the Top of Grout-Filled Concrete Masonry Walls[1,2]

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 [3]		Allowable Load	
					Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)
1/2 (12.7)	9/16	4 (101.6)	1-3/4 (44.5)	4 (101.6)	3,525 (15.6)	1,400 (6.2)	705 (3.1)	280 (1.2)
5/8 (15.9)	3/4	5 (127)	1-3/4 (44.5)	4 (101.6)	5,150 (22.8)	1,400 (6.2)	1,030 (4.5)	280 (1.2)

1. Tabulated load values are for anchors installed in minimum 8" wide, 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)

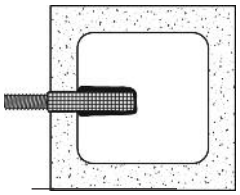


Top of Wall

Capacities for Steel Threaded Rod Installed with T308+ Into Hollow Concrete Masonry Walls with Stainless Steel Screen Tubes[1,3,4]

Rod Diameter *d* in. (mm)	Drill Diameter d_{bit} (in.)	Screen Tube Length in. (mm)	Minimum End Distance in. (mm)	Minimum Edge Distance in. (mm)	Ultimate Load[2]		Allowable Load	
					Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)
3/8 (9.5)	1/2	3-1/2 (88.9)	3-3/4 (95.2)	3-3/4 (95.2)	1,400 (6.2)	1,725 (7.6)	280 (1.2)	345 (1.5)
1/2 (12.7)	5/8	3-1/2 (88.9)	3-3/4 (95.2)	3-3/4 (95.2)	1,500 (6.6)	1,725 (7.6)	300 (1.3)	345 (1.5)

1. Tabulated load values are for anchors installed in minimum Type II, Grade N, lightweight concrete masonry units conforming to ASTM C90.
2. 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.
3. Anchor installations are limited to one per masonry cell. Shear loads may be applied in any direction.
4. The consistency of hollow concrete block masonry base materials can vary greatly. Consideration of job site testing should be given to verify conformance of base materials and anchor performance in actual conditions.



PERFORMANCE DATA

Allowable Bond Strength Capacities for Threaded Rods and Reinforcing Bars for T308+ Epoxy Installed in Unreinforced Masonry[1,2]

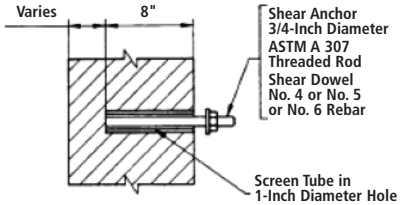


Figure 1

Shear Anchor – Configuration A (See Figure 1)					
Rod Dia. or Rebar Size *d* in. (mm)	Minimum Embed. h_v in. (mm)	Minimum Wall Thickness in. (mm)	Allowable Tension lbs. (kN)	Allowable Shear lbs. (kN)	Maximum Torque ft.-lbs. (Nm)
3/4 (19.1)	8 (203.2)	13 (330.2)	–	1,000 (4.5)	60 (81.3)
No. 4	8 (203.2)	13 (330.2)	–	500 (2.3)	40 (54.2)
No. 5	8 (203.2)	13 (330.2)	–	750 (3.4)	50 (67.8)
No. 6	8 (203.2)	13 (330.2)	–	1,000 (4.5)	60 (81.3)

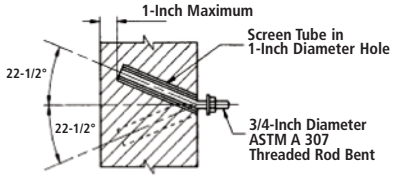


Figure 2

22-1/2° Combination Anchor – Configuration B (See Figure 2)					
Rod Dia. or Rebar Size *d* in. (mm)	Minimum Embed. h_v in. (mm)	Minimum Wall Thickness in. (mm)	Allowable Tension lbs. (kN)	Allowable Shear lbs. (kN)	Maximum Torque ft.-lbs. (Nm)
3/4 (19.1)	Within 1 inch of opposite wall surface	13 (330.2)	1,200 (5.4)	1,000 (4.5)	60 (81.3)

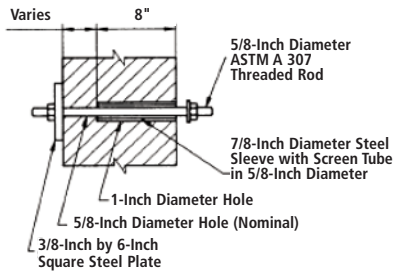


Figure 3

Through Anchor – Configuration C (See Figure 3)					
Rod Dia. or Rebar Size *d* in. (mm)	Minimum Embed. h_v in. (mm)	Minimum Wall Thickness in. (mm)	Allowable Tension lbs. (kN)	Allowable Shear lbs. (kN)	Maximum Torque ft.-lbs. (Nm)
5/8 (15.9)	8 inches from interior wall surface	13 (330.2)	1,200 (5.4)	750 (3.4)	50 (67.8)

1. Allowable shear values are applicable only to anchors where in-place shear tests indicate minimum mortar strength of 50 psi net.
2. No increase for lateral loading is permitted, such as loading induced by wind or earthquake.

PERFORMANCE DATA

Spacing and Edge Distance Requirements for T308+ Epoxy Adhesive Installed in Unreinforced Masonry

Anchor Description	Minimum Vertical Spacing in.	Minimum Horizontal Spacing in.	Minimum Edge Distance in.
Shear Anchor Configuration A – (See Figure 1)	18	18	24
22-1/2° Combination Anchor Configuration B – (See Figure 2)	18	24	16
Through-bolt Anchor Configuration C – (See Figure 3)	18	18	24

ORDERING INFORMATION

T308+ Cartridges

Cat No.	Description	Std. Carton	Pallet
8558SD	T308+ 8.5 fl. oz. Quik-Shot Cartridge (15.3 in³)	12	432
8503SD	T308+ 14 fl. oz. Side by Side Cartridge (25.0 in³)	12	960
8523SD	T308+ 21.5 fl. oz. Side by Side Cartridge (38.5 in³)	12	432
8536SD	T308+ 51 fl. oz. Side by Side Cartridge (92.0 in³)	8	216

One T308+ mixing nozzle is packaged with each cartridge. T308+ 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
07908	Extra mixing nozzle for T308+ (with a 9" extension)	2	24
07919	Extra mixing nozzle for T308+ (bulk quantity)	-	400
07921	Extra turbo nozzle for T308+	2	24

Dispensing Tools for Injection Adhesive

Cat No.	Description	Std. Box	Std. Carton
08409	21.5 fl. oz. Standard metal manual tool	1	10
08437	10 fl. oz. Heavy duty metal caulking gun (Quik-Shot)	1	12
08479	10 fl. oz. High performance caulking gun (Quik-Shot)	1	10
08415	14 fl. oz. High performance manual tool	1	10
08416	14 fl. oz. Standard metal manual tooll	1	10
08421	21.5 fl. oz. High performance manual tool	1	10
08442	21.5 fl. oz. Battery powered tool (cordless)	1	-
08438	51 fl. oz. High performance pnuematic tool	1	-

T308+ Epoxy Adhesive Anchor System Components

Nylon Brushes for Hole Cleaning

Cat No.	Description	Brush Length	Std. Carton
07931	1/2" diameter nylon brush	8-1/2"	1
07932	3/4" diameter nylon brush	8-1/2"	1
07933	1" diameter nylon brush	12"	1
07934	1-1/4" diameter nylon brush	13"	1
08292	Air compressor nozzle with extension	-	1

ORDERING INFORMATION

Stainless Steel Screen Tubes

Screen tubes are made from a 300 series stainless steel. The nominal diameter of the screen listed indicates the matching rod diameter.

Cat. No.	Description	Drill Dia.	Std.Ctn.
7862	1/4" x 6" Screen Tube †	3/8″	25
7864	1/4" x 8" Screen Tube †	3/8″	25
7866*	1/4" x 10" Screen Tube †	3/8″	25
7961	3/8" x 3-1/2" Screen Tube †	1/2″	25
7962	3/8" x 6" Screen Tube †	1/2″	25
7963	3/8" x 8" Screen Tube †	1/2″	25
7964	3/8" x 10" Screen Tube †	1/2″	25
7959	3/8" x 12" Screen Tube †	1/2″	25
7965	1/2" x 3-1/2" Screen Tube	5/8″	25
7966	1/2" x 6" Screen Tube	5/8″	25
7967	1/2" x 8" Screen Tube †	5/8″	25
7968	1/2" x 10" Screen Tube †	5/8″	25
7969	5/8" x 4-1/2" Screen Tube	3/4″	20
7970	5/8" x 6" Screen Tube	3/4″	20
7971	5/8" x 8" Screen Tube †	3/4″	20
7972	5/8″ x 10″ Screen Tube †	3/4″	20
7973	3/4″ x 6″ Screen Tube	7/8″	10
7977	3/4″ x 8″ Screen Tube	7/8″	10
7974	3/4″ x 10″ Screen Tube	7/8″	107
7975	3/4″ x 13″ Screen Tube	7/8″	10
7865	15/16″ x 8″ Screen Tube	1"	10
7867	15/16″ x 13″ Screen Tube	1″	10
7869	15/16″ x 17″ Screen Tube †	1″	10
7955	Adhesive Shear Tube (steel sleeve)	-	10

** Discontinued item once current stock exhausted. † Includes extension tubing*

Plastic Screen Tubes

The nominal diameter of the screen listed indicate the matching rod diameter.
Note: hole size required for plastic screen tubes are different than that for the stainless steel tubes.

Cat. No.	Description	Drill Dia.	Std.Ctn.
8470	1/4" x 1-3/4" Screen Tube	1/2"	25
8473	3/8" x 2-3/4" Screen Tube	9/16"	25
8310	3/8" x 3-1/2" Screen Tube	9/16"	25
8311	3/8" x 6" Screen Tube	9/16"	25
8313	3/8" x 8" Screen Tube	9/16"	25
8315	1/2" x 3-1/2" Screen Tube	3/4"	25
8317	1/2" x 6" Screen Tube	3/4"	25
8321	5/8" x 6" Screen Tube	7/8"	25
8323	3/4" x 6" Screen Tube	1"	10

Chem-Stud® *Spin-Type Capsule Adhesive Anchor System*

PRODUCT DESCRIPTION

The Chem-Stud anchor systems consists of self contained two-part glass capsules and matching chisel pointed anchor rods which are installed using a rotary hammer and rod adapters. The Chem-Stud adhesive, is an ester based resin material packaged in single use glass capsules designed for installation of 3/8" through 1-1/2" threaded rods in solid concrete and masonry materials. It can also be used with reinforcing bars.

Chem-Stud Capsule – The outer capsule contains epoxy acrylate resin (vinyl ester) in which quartz aggregate is suspended. The inner capsule contains a benzoyl peroxide hardening agent. When the components are combined, they form an adhesive mortar which mechanically bonds the anchor rod to solid base materials. This type of system must be used with a chisel pointed anchor rod and must be spun into the anchor hole using a rotary hammer drill.

Chem-Stud Chisel Pointed Hardware – The threaded anchor rods have a 45° chisel point cut on one end to properly mix the components contained in the capsule during installation. A 90° point is formed on the internally threaded inserts. The threaded rod or reinforcing bar used must have a chisel point to mix the components contained in the capsule during installation.

GENERAL APPLICATIONS AND USES

- Heavy duty anchoring such as threaded anchor rods and rebars in solid concrete.
- Steel erection including anchoring of equipment and column base plates.
- Resists vibratory loads introduced from machinery, moving vehicles, etc.
- Internally threaded inserts option for removable or adjustable anchorage.

FEATURES AND BENEFITS

+ High strength adhesive anchoring system
+ Pre-measured chemical component volumes – no waste and simplified placement
+ Fast cure minimizes downtime
+ Over 30 years of product installation history
+ Glass capsule fragments scrape and roughen hole during installation
+ Components are mixed mechanically during installation of rod or rebar
+ Excellent chemical resistance

APPROVALS AND LISTINGS

Independently tested and qualified to ASTM E 1512 and AC58 Criteria, including creep resistance and freeze-thaw cycling

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.*

Capsule adhesive anchoring system shall be Chem-Stud as supplied by Powers Fasteners, Inc., Brewster, NY

SECTION CONTENTS

General Information
Material and Installation Specifications
Steel Element Specifications
Performance Data
Design Criteria
Ordering Information

Chem-Stud Capsule

Chisel Pointed Threaded Rod or Reinforcing Bar
(Bar Not Pictured)

Internally Threaded Insert
(Optional for Removability)
Special Order

ANCHOR SIZE RANGE (TYP.)

3/8" to 1-1/2" diameter rod
No. 3 to No. 11 reinforcing bar

SUITABLE BASE MATERIALS

Normal-weight Concrete
Heavy-weight Concrete
Grouted Concrete Masonry (CMU)

MATERIAL AND INSTALLATION SPECIFICATIONS

Physical Properties

Shelf Life	2 Years
Storage Conditions	Store dry at 40° to 90°F and keep out of direct sunlight
Installation Temperature	Condition material to 60°F minimum for best results
Color	Mixed adhesive mortar – amber
Consistency (mixed, prior to curing)	Mortar

Curing Times[1]

Minimum Base Material Temperature	Minimum Curing Time
68°F (20°C)	20 minutes
50°F (10°C)	30 minutes
32°F (0°C)	1 hour
23°F (-5°C)	5 hours
14°F (-10°C)	10 hours

1. Cure time should be doubled for wet concrete.

Chem-Stud Capsule[1,2]

Dimension	Chem-Stud Capsule, Nominal Size						
	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1-1/4"
Capsule Diameter (in.)	0.43	0.51	0.67	0.87	0.87	0.95	1.30
Capsule Length (in.)	3.15	3.75	3.75	6.63	6.89	8.25	10.50
Mortar Volume (in^3)	0.35	0.55	0.95	2.55	3.25	4.65	11.70
Mortar Volume (fl. oz.)	0.19	0.30	0.52	1.40	1.79	2.56	6.44

1. The mortar volume listed is for the mixed material.
2. The diameter and length may be different than capsules offered by other suppliers because of variations in air content. When comparing capsules, use the installed mortar volume.

Chisel Pointed Threaded Rod in Normal-Weight Concrete[1]

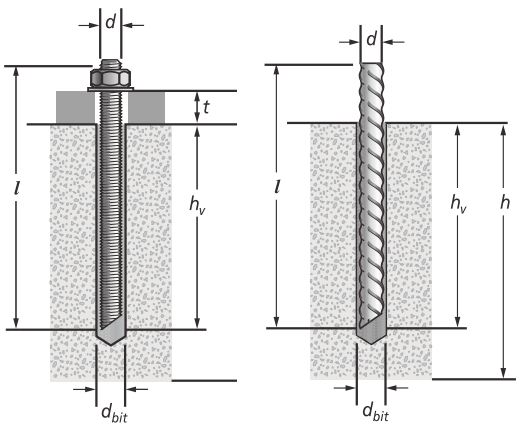
Dimension	Chisel Pointed Threaded Rod Diameter, *d*								
	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1-1/4"	1-3/8"	1-1/2"
A_{nom} = Nominal area of threaded rod (in^2)	0.111	0.196	0.307	0.442	0.601	0.785	1.227	1.484	1.766
A_{se} = Tensile stress area of rod (in^2)	0.078	0.142	0.226	0.335	0.462	0.606	0.969	1.155	1.405
d_{bit} = Nominal bit diameter (in.)	7/16	9/16	11/16	7/8	1	1 1/8	1 1/2	1 5/8	1 3/4
h_v = Minimum Embedment Depth (in.)	3-1/2	4-1/4	5	6-5/8	7	8 1/4	10 1/4	10 1/4	10 1/4
T_{max} = Max. tightening torque range (ft.-lbs.)	15-20	30-40	68-90	120-160	150-200	225-300	375-500	375-500	375-500
Mortar per inch (in^3)	0.094	0.133	0.184	0.326	0.390	0.478	0.917	1.042	1.133

1. All threaded rod must have a 45° chisel point to mix the components contained in the capsule during installation.

Reinforcing Bar in Normal-Weight Concrete[1]

Dimension	Reinforcing Bar Size								
	No.3	No.4	No.5	No.6	No.7	No.8	No.9	No.10	No.11
A_{nom} = Nominal area of threaded rod (in^2)	0.110	0.200	0.310	0.440	0.600	0.790	1.000	1.270	1.560
d_{bit} = Nominal bit diameter (in.)	1/2	5/8	3/4	7/8	1	1-1/4	1-3/8	1-5/8	1-3/4
h_v = Minimum Embedment Depth (in.)	3-1/2	4-1/2	5	7	7	8-1/2	9	10	10
Mortar per inch (in^3)	0.111	0.142	0.176	0.220	0.252	0.537	0.594	0.932	0.961

1. All reinforcing bar must have a 45° chisel point to mix the components contained in the capsule during installation. Adhesive mortar volume required for installation of reinforcing bar is based on smooth bars. Actual mortar volume required will be less due to raised deformations on bars.

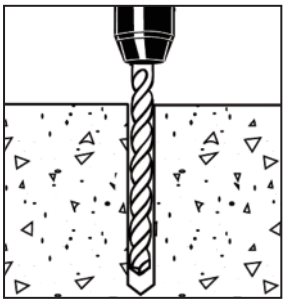


Nomenclature

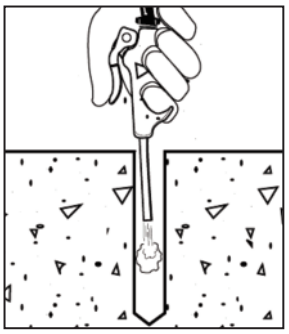
- d = Diameter of threaded rod or reinforcing bar (rebar)
- d_{bit} = Diameter of drill bit
- d_h = Diameter of fixture clearance hole
- h = Base material thickness. The minimum value of h should be $1.5h_v$
- h_v = Minimum embedment depth
- l = Overall length of rod or rebar
- t = Fixture thickness
- T_{max} = Maximum tightening torque (only possible after minimum curing time)

INSTALLATION GUIDELINES

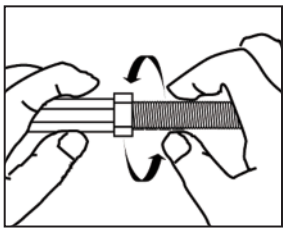
1. Drill a hole to the size and embed-ment required. The tolerances of the drill bit used should meet the requirements of ANSI B212.15.



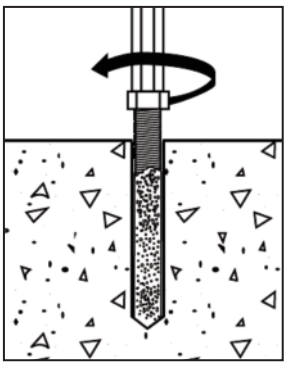
2. Starting from the bottom or back of the anchor hole, blow clean with compressed air, brush the hole with a nylon or wire brush, and blow it clean again. Vacuuming only is not sufficient. Blow out bulbs generally do not provide enough dust removal for most drilled anchor holes. Holes should be clean and sound. Anchor holes may be dry or damp, but should be free of standing water or frost. If using reinforcing bar, be sure the bar will fit into the drilled hole. If a larger hole is required, the diameter should be as close as possible to the diameter of the reinforcing bar. Prior to installing check the capsule to be sure it is not damaged and invert several times at 60°F or above to confirm all of the resin is in a liquid state. Insert the capsule into the hole. Either end of the capsule may be inserted first.



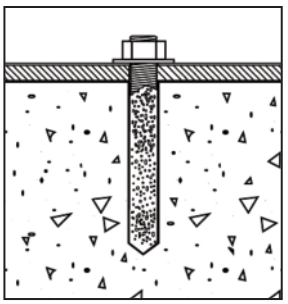
3. Select the drive unit, insert it into a rotary hammer drill and engage the coupling to be used. Insert the chisel point of the rod or rebar into the hole to break the glass capsule. Spin it into the capsule at a speed of 250 to 500 RPM until it is fully embedded.



4. Once the rod or bar is fully embedded, turn the rotary hammer drill off immediately. If installing threaded rod, pull the driver out of the coupling while holding the rod. Hold the hex nut with a wrench to unthread the coupler. If using reinforcing bar, release the set lever and slide the coupler off the bar.



5. Allow the adhesive to cure for the specified time prior to applying any load. Do not disturb, torque or load the anchor until it is fully cured.



Note! Consideration must be given to installation direction. Overhead installations with glass capsules are sensitive and extremely dependent upon the skill and care taken by the user; additional equipment not supplied by Powers may be required. Consequently Powers does not recommend the use of the Chem-Stud for overhead applications at this time. Use of the product in adverse installation conditions should not be done without proper training and direct supervision by the Design Professional.

STEEL SPECIFICATIONS

Material Properties for Threaded Rod and Reinforcing Bar

Anchor Type	Steel Description	Steel Specification (ASTM)	Rod Dia. or Rebar Size (inch or No.)	Minimum Yield Strength, f_y (ksi)	Minimum Ultimate Strength, f_u (ksi)
Threaded Rod	Standard carbon rod	A36	All	36.0	58.0
		A 307, Grade C or F 1554, Grade 36	3/8 thru 4	36.0	58.0
	High strength carbon rod	A 193, Grade B7	3/8 thru 2-1/2	105.0	120.0
	Stainless Rod (Type 304 / 316 SS)	F 593, Condition CW	3/8 thru 5/8	65.0	100.0
			3/4 thru 1-1/2	45.0	85.0
Reinforcing Bar	Grade 40 Rebar	A 615, A 706, A 767 or A 996	All	40.0	70.0
	Grade 60 Rebar			60.0	90.0

Allowable Steel Strength Capacities for Threaded Rod

Anchor Diameter *d* in. (mm)	Allowable Tension				Allowable Shear			
	ASTM A36 lbs. (kN)	ASTM A307 Grade C or F 1554, Grade 36 lbs. (kN)	ASTM A193 Grade B7 lbs. (kN)	ASTM F593 304/316 SS lbs. (kN)	ASTM A36 lbs. (kN)	ASTM A307 Grade C or F 1554, Grade 36 lbs. (kN)	ASTM A193 Grade B7 lbs. (kN)	ASTM F593 304/316 SS lbs. (kN)
3/8 (9.5)	2,115 (9.5)	2,115 (9.5)	4,375 (19.7)	3,630 (16.3)	1,090 (4.9)	1,090 (4.9)	2,255 (10.1)	1,870 (8.4)
1/2 (12.7)	3,755 (16.9)	3,755 (16.9)	7,775 (35.0)	6,470 (29.1)	1,940 (8.7)	1,940 (8.7)	4,055 (18.2)	3,330 (15.0)
5/8 (15.9)	5,870 (26.4)	5,870 (26.4)	12,150 (54.7)	10,130 (45.6)	3,025 (13.6)	3,025 (13.6)	6,260 (28.2)	5,210 (23.4)
3/4 (19.1)	8,455 (38.0)	8,455 (38.0)	17,495 (78.7)	12,400 (55.8)	4,355 (19.6)	4,355 (19.6)	9,010 (40.5)	6,390 (28.8)
7/8 (22.2)	11,510 (51.8)	11,510 (51.8)	23,810 (107.1)	16,860 (75.9)	5,930 (26.7)	5,930 (26.7)	12,265 (55.2)	8,680 (39.1)
1 (25.4)	15,035 (67.7)	15,035 (67.7)	31,100 (140.0)	22,020 (99.1)	7,745 (34.9)	7,745 (34.9)	16,020 (72.1)	11,340 (51.0)
1-1/4 (31.8)	23,485 (105.7)	23,485 (105.7)	48,560 (218.5)	34,420 (154.9)	12,100 (54.5)	12,100 (54.5)	25,035 (112.7)	17,730 (79.8)
1-3/8 (34.9)	28,400 (127.8)	28,400 (127.8)	58,760 (264.4)	41,625 (187.3)	14,630 (65.8)	14,630 (65.8)	30,270 (136.2)	21,440 (96.5)
1-1/2 (38.1)	33,800 (152.1)	33,800 (152.1)	69,930 (314.7)	49,535 (222.9)	17,410 (78.3)	17,410 (78.3)	36,025 (162.1)	25,515 (114.8)

Allowable Steel Strength Capacities for Reinforcing Bar

Bar Size	Tension lbs. (kN)		Shear lbs. (kN)	
	Grade 40	Grade 60	Grade 40	Grade 60
No. 3 (3/8")	2,200 (9.9)	2,640 (11.9)	1,310 (5.9)	1,680 (7.6)
No. 4 (1/2")	4,000 (18.0)	4,800 (21.6)	2,380 (10.7)	3,060 (13.8)
No. 5 (5/8")	6,200 (27.9)	7,440 (33.5)	3,690 (16.6)	4,740 (21.3)
No. 6 (3/4")	8,800 (39.6)	10,560 (47.5)	5,235 (23.6)	6,730 (30.3)
No. 7 (7/8")	12,000 (54.0)	14,400 (64.8)	7,140 (32.1)	9,180 (41.3)
No. 8 (1")	15,800 (71.1)	18,960 (85.3)	9,400 (42.3)	12,085 (54.4)
No. 9 (1-1/8")	20,000 (90.0)	24,000 (108.0)	11,900 (53.6)	15,300 (68.9)
No. 10 (1-1/4")	25,400 (114.3)	30,480 (137.2)	15,115 (68.0)	19,430 (87.4)
No. 11 (1-3/8")	31,200 (140.4)	37,440 (168.5)	16,920 (76.1)	20,305 (91.4)

Allowable steel strength capacities are based on the requirements of ASTM A 615.

Note:
Allowable design load must be the lesser of allowable steel strength (as shown on this page) and the allowable bond capacities.

Allowable steel strength values for threaded rod are based on the following equations:

$T = 0.33 * f_u * A_{nom}$
$V = 0.17 * f_u * A_{nom}$

And, the allowable steel strength values for reinforcing bar are based on the following equations:

$T = f_s * A_{br}$
$V = 0.17 * f_u * A_{br}$

Where:
T = Allowable tension load (pounds).
V = Allowable shear load (pounds).
f_u = Minimum specified ultimate strength (psi)
f_s = Tensile stress area in reinforcement (psi)
A_{nom} = Nominal cross-sectional area of threaded rod (in^2).
A_{br} = Nominal cross-sectional area of reinforcing bar (in^2).

PERFORMANCE DATA

Ultimate Load Capacities for Threaded Rod Installed with Chem-Stud Capsules in Normal-Weight and Heavy-weight Concrete[1,2]

Anchor Dia. d in. (mm)	Min. Embed. Depth h_v in. (mm)	Capsules Required	Minimum Concrete Compressive Strength (f'_c)									
			2,000 psi (13.8 MPa)		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)	Shear lbs. (kN)	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 (9.5)	3-1/2 (88.9)	One 3/8"	6,300 (28.4)	6,660 (30.0)	7,540 (33.9)	6,660 (30.0)	7,840 (3.5)	6,660 (30.0)	7,840 (35.0)	6,660 (30.0)	7,840 (35.0)	6,660 (30.0)
	5-1/4 (133.4)	Two 3/8"	9,450 (42.5)	6,660 (30.0)	11,295 (50.8)	6,660 (30.0)	11,760 (52.5)	6,660 (30.0)	11,760 (52.5)	6,660 (30.0)	11,760 (52.5)	6,660 (30.0)
	7 (177.8)	Two 3/8"	12,600 (56.7)	6,660 (30.0)	15,060 (67.8)	6,660 (30.0)	15,680 (70.0)	6,660 (30.0)	15,680 (70.0)	6,660 (30.0)	15,680 (70.0)	6,660 (30.0)
1/2 (12.7)	4-1/4 (108.0)	One 1/2"	10,040 (45.2)	11,655 (52.4)	11,880 (53.5)	11,655 (52.4)	12,680 (56.6)	11,655 (52.4)	12,680 (56.6)	11,655 (52.4)	12,680 (56.6)	11,655 (52.4)
	6-3/8 (161.9)	One 1/2" & One 3/8"	15,060 (67.8)	11,655 (52.4)	17,700 (79.7)	11,655 (52.4)	19,040 (85.0)	11,655 (52.4)	19,040 (85.0)	11,655 (52.4)	19,040 (85.0)	11,655 (52.4)
	8-1/2 (215.9)	Two 1/2"	20,080 (90.4)	11,655 (52.4)	23,600 (106.2)	11,655 (52.4)	25,380 (113.3)	11,655 (52.4)	25,380 (113.3)	11,655 (52.4)	25,380 (113.3)	11,655 (52.4)
5/8 (15.9)	5 (127.0)	One 5/8"	13,840 (62.3)	18,745 (84.4)	16,240 (73.1)	18,745 (84.4)	18,620 (83.8)	18,745 (84.4)	18,660 (83.3)	18,745 (84.4)	18,660 (83.3)	18,745 (84.4)
	7-1/2 (190.5)	One 5/8" & One 1/2"	20,760 (93.4)	18,745 (84.4)	24,345 (109.6)	18,745 (84.4)	27,930 (125.7)	18,745 (84.4)	27,980 (124.9)	18,745 (84.4)	27,980 (124.9)	18,745 (84.4)
	10 (254.0)	Two 5/8"	27,680 (124.6)	18,745 (84.4)	32,460 (146.1)	18,745 (84.4)	37,240 (167.6)	18,745 (84.4)	37,320 (166.6)	18,745 (84.4)	37,320 (166.6)	18,745 (84.4)
3/4 (19.1)	6-5/8 (168.3)	One 3/4"	22,300 (100.4)	30,060 (135.3)	26,100 (117.5)	30,060 (135.3)	28,540 (128.4)	30,060 (135.3)	29,660 (132.4)	30,060 (135.3)	29,660 (132.4)	30,060 (135.3)
	10 (254.0)	One 3/4" & One 5/8"	33,660 (151.5)	30,060 (135.3)	38,235 (172.1)	30,060 (135.3)	42,810 (192.6)	30,060 (135.3)	44,780 (199.9)	30,060 (135.3)	44,780 (199.9)	30,060 (135.3)
	13-1/4 (336.6)	Two 3/4"	44,600 (200.7)	30,060 (135.3)	50,840 (228.8)	30,060 (135.3)	57,080 (256.9)	30,060 (135.3)	59,340 (264.9)	30,060 (135.3)	59,340 (264.9)	30,060 (135.3)
7/8 (22.2)	7 (177.8)	One 7/8"	23,480 (105.7)	36,065 (162.3)	28,020 (126.1)	36,065 (162.3)	32,560 (146.5)	36,065 (162.3)	36,580 (163.3)	36,065 (162.3)	36,580 (163.3)	36,065 (162.3)
	10-1/4 (260.4)	Two 3/4"	35,220 (158.5)	36,065 (162.3)	42,030 (189.1)	36,065 (162.3)	48,840 (219.8)	36,065 (162.3)	53,560 (239.1)	36,065 (162.3)	53,560 (239.1)	36,065 (162.3)
	14 (355.6)	Two 7/8"	46,960 (211.3)	36,065 (162.3)	56,040 (252.2)	36,065 (162.3)	65,120 (293.0)	36,065 (162.3)	73,140 (326.5)	36,065 (162.3)	73,140 (326.5)	36,065 (162.3)
1 (25.4)	8-1/4 (209.6)	One 1"	32,360 (145.6)	53,135 (239.1)	39,540 (177.9)	53,135 (239.1)	46,700 (210.2)	53,135 (239.1)	49,260 (219.9)	53,135 (239.1)	49,260 (219.9)	53,135 (239.1)
	12-3/8 (314.3)	One 1" & One 7/8"	48,530 (218.4)	53,135 (239.1)	59,290 (266.8)	53,135 (239.1)	70,050 (315.2)	53,135 (239.1)	73,900 (329.9)	53,135 (239.1)	73,900 (329.9)	53,135 (239.1)
	16-1/2 (419.1)	Two 1"	64,700 (291.2)	53,135 (239.1)	79,050 (355.7)	53,135 (239.1)	93,400 (420.3)	53,135 (239.1)	98,520 (439.8)	53,135 (239.1)	98,520 (439.8)	53,135 (239.1)
1-1/4 (31.8)	10-1/4 (260.4)	One 1-1/4"	58,380 (262.7)	68,000 (306.0)	64,900 (292.1)	68,000 (306.0)	71,400 (321.3)	68,000 (306.0)	76,500 (341.5)	68,000 (306.0)	76,500 (341.5)	68,000 (306.0)
	15 (381.0)	One 1-1/4" & One 1"	85,435 (384.5)	68,000 (306.0)	94,355 (424.6)	68,000 (306.0)	103,280 (464.8)	68,000 (306.0)	111,240 (500.6)	68,000 (306.0)	119,200 (536.4)	68,000 (306.0)
	20-1/2 (520.7)	Two 1-1/4"	116,760 (525.4)	68,000 (306.0)	129,780 (584.0)	68,000 (306.0)	140,200 (630.9)	68,000 (306.0)	141,390 (636.3)	68,000 (306.0)	142,580 (641.6)	68,000 (306.0)
1-3/8 (34.9)	10-1/4 (260.4)	One 1 14"	63,000 (283.5)	82,000 (369.0)	68,500 (308.3)	82,000 (369.0)	74,000 (333.0)	82,000 (369.0)	84,160 (375.7)	82,000 (369.0)	84,160 (375.7)	82,000 (369.0)
	15 (381.0)	One 1-1/4" & One 1"	92,225 (415.0)	82,000 (369.0)	100,155 (450.7)	82,000 (369.0)	108,085 (486.4)	82,000 (369.0)	116,540 (524.4)	82,000 (369.0)	123,160 (549.8)	82,000 (369.0)
	20-1/2 (520.7)	Two 1-1/4"	126,040 (567.2)	82,000 (369.0)	134,270 (604.2)	82,000 (369.0)	142,500 (641.3)	82,000 (369.0)	145,750 (655.9)	82,000 (369.0)	149,000 (670.5)	82,000 (369.0)
1-1/2 (38.1)	10-1/4 (260.4)	One 1-1/4"	67,000 (301.5)	94,500 (425.3)	72,500 (326.3)	94,500 (425.3)	78,000 (351.0)	94,500 (425.3)	88,000 (396.0)	94,500 (425.3)	91,800 (409.8)	94,500 (425.3)
	15 (381.0)	One 1-1/4" & One 1"	100,460 (452.1)	94,500 (425.3)	108,725 (489.3)	94,500 (425.3)	116,995 (526.5)	94,500 (425.3)	127,195 (572.4)	94,500 (425.3)	134.360 (599.8)	94,500 (425.3)
	20-1/2 (520.7)	Two 1-1/4"	134,000 (603.0)	94,500 (425.3)	139,500 (627.8)	94,500 (425.3)	145,000 (652.5)	94,500 (425.3)	147,000 (661.5)	94,500 (425.3)	149,000 (670.5)	94,500 (425.3)

1. Ultimate load capacities should be reduced by a minimum safety factor of 4.0 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 or overhead.
2. Linear interpolation may be used to determine ultimate load capacities for intermediate embedments and compressive strengths.

PERFORMANCE DATA

Allowable Load Capacities for Threaded Rod Installed with Chem-Stud Capsules in Normal-Weight and Heavy-weight Concrete[1,2,3]

Anchor Dia. d in. (mm)	Min. Embed. Depth h_v in. (mm)	Capsules Required	Minimum Concrete Compressive Strength (f'_c)									
			2,000 psi (13.8 MPa)		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)	Shear lbs. (kN)	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 (9.5)	3-1/2 (88.9)	One 3/8"	1,575 (7.1)	1,665 (7.5)	1,885 (8.5)	1,665 (7.5)	1,960 (8.8)	1,665 (7.5)	1,960 (8.8)	1,665 (7.5)	1,960 (8.8)	1,665 (7.5)
	5-1/4 (133.4)	Two 3/8"	2,365 (10.6)	1,665 (7.5)	2,825 (12.7)	1,665 (7.5)	2,940 (13.1)	1,665 (7.5)	2,940 (13.1)	1,665 (7.5)	2,940 (13.1)	1,665 (7.5)
	7 (177.8)	Two 3/8"	3,150 (14.2)	1,665 (7.5)	3,765 (16.9)	1,665 (7.5)	3,920 (17.5)	1,665 (7.5)	3,920 (17.5)	1,665 (7.5)	3,920 (17.5)	1,665 (7.5)
1/2 (12.7)	4-1/4 (108.0)	One 1/2"	2,510 (11.3)	2,915 (13.1)	2,970 (13.4)	2,915 (13.1)	3,170 (14.2)	2,915 (13.1)	3,170 (14.2)	2,915 (13.1)	3,170 (14.2)	2,915 (13.1)
	6-3/8 (161.9)	One 1/2" & One 3/8"	3,765 (16.9)	2,915 (13.1)	4,425 (19.9)	2,915 (13.1)	4,760 (21.3)	2,915 (13.1)	4,760 (21.3)	2,915 (13.1)	4,760 (21.3)	2,915 (13.1)
	8-1/2 (215.9)	Two 1/2"	5,020 (22.6)	2,915 (13.1)	5,900 (26.6)	2,915 (13.1)	6,345 (28.3)	2,915 (13.1)	6,345 (28.3)	2,915 (13.1)	6,345 (28.3)	2,915 (13.1)
5/8 (15.9)	5 (127.0)	One 5/8"	3,460 (15.6)	4,685 (21.1)	4,060 (18.3)	4,685 (21.1)	4,655 (20.9)	4,685 (21.1)	4,665 (20.8)	4,685 (21.1)	4,665 (20.8)	4,685 (21.1)
	7-1/2 (190.5)	One 5/8" & One 1/2"	5,190 (23.4)	4,685 (21.1)	6,085 (27.4)	4,685 (21.1)	6,985 (31.4)	4,685 (21.1)	6,995 (31.2)	4,685 (21.1)	6,995 (31.2)	4,685 (21.1)
	10 (254.0)	Two 5/8"	6,920 (31.1)	4,685 (21.1)	8,115 (36.5)	4,685 (21.1)	9,310 (41.9)	4,685 (21.1)	9,330 (41.7)	4,685 (21.1)	9,330 (41.7)	4,685 (21.1)
3/4 (19.1)	6-5/8 (168.3)	One 3/4"	5,575 (25.1)	7,515 (33.8)	6,525 (29.4)	7,515 (33.8)	7,135 (32.1)	7,515 (33.8)	7,415 (33.1)	7,515 (33.8)	7,415 (33.1)	7,515 (33.8)
	10 (254.0)	One 3/4" & One 5/8"	8,415 (37.9)	7,515 (33.8)	9,560 (43.0)	7,515 (33.8)	10,705 (48.2)	7,515 (33.8)	11,195 (50.0)	7,515 (33.8)	11,195 (50.0)	7,515 (33.8)
	13-1/4 (336.6)	Two 3/4"	11,150 (50.2)	7,515 (33.8)	12,710 (57.2)	7,515 (33.8)	14,270 (64.2)	7,515 (33.8)	14,835 (66.2)	7,515 (33.8)	14,835 (66.2)	7,515 (33.8)
7/8 (22.2)	7 (177.8)	One 7/8"	5,870 (26.4)	9,015 (40.6)	7,005 (31.5)	9,015 (40.6)	8,140 (36.6)	9,015 (40.6)	9,145 (40.8)	9,015 (40.6)	9,145 (40.8)	9,015 (40.6)
	10-1/4 (260.4)	Two 3/4"	8,805 (39.6)	9,015 (40.6)	10,510 (47.3)	9,015 (40.6)	12,210 (54.9)	9,015 (40.6)	13,390 (59.8)	9,015 (40.6)	13,390 (59.8)	9,015 (40.6)
	14 (355.6)	Two 7/8"	11,740 (52.8)	9,015 (40.6)	14,010 (63.0)	9,015 (40.6)	16,280 (73.3)	9,015 (40.6)	18,285 (81.6)	9,015 (40.6)	18,285 (81.6)	9,015 (40.6)
1 (25.4)	8-1/4 (209.6)	One 1"	8,090 (36.4)	13,285 (59.8)	9,885 (44.5)	13,285 (59.8)	11,675 (52.5)	13,285 (59.8)	12,315 (55.0)	13,285 (59.8)	12,315 (55.0)	13,285 (59.8)
	12-3/8 (314.3)	One 1" & One 7/8"	12,135 (54.6)	13,285 (59.8)	14,825 (66.7)	13,285 (59.8)	17,515 (78.8)	13,285 (59.8)	18,475 (82.5)	13,285 (59.8)	18,475 (82.5)	13,285 (59.8)
	16-1/2 (419.1)	Two 1"	16,175 (72.8)	13,285 (59.8)	19,765 (88.9)	13,285 (59.8)	23,350 (105.1)	13,285 (59.8)	24,630 (110.0)	13,285 (59.8)	24,630 (110.0)	13,285 (59.8)
1-1/4 (31.8)	10-1/4 (260.4)	One 1-1/4"	14,595 (65.7)	17,000 (76.5)	16,225 (73.0)	17,000 (76.5)	17,850 (80.3)	17,000 (76.5)	19,125 (85.4)	17,000 (76.5)	19,125 (85.4)	17,000 (76.5)
	15 (381.0)	One 1-1/4" & One 1"	21,360 (96.1)	17,000 (76.5)	23,590 (106.2)	17,000 (76.5)	25,820 (116.2)	17,000 (76.5)	27,810 (125.1)	17,000 (76.5)	27,990 (125.0)	17,000 (76.5)
	20-1/2 (520.7)	Two 1-1/4"	29,190 (131.4)	17,000 (76.5)	32,445 (146.0)	17,000 (76.5)	35,050 (157.7)	17,000 (76.5)	35,350 (159.1)	17,000 (76.5)	35,645 (160.4)	17,000 (76.5)
1-3/8 (34.9)	10-1/4 (260.4)	One 1 14"	15,750 (70.9)	20,500 (92.3)	17,125 (77.1)	20,500 (92.3)	18,500 (83.3)	20,500 (92.3)	21,040 (93.9)	20,500 (92.3)	21,040 (93.9)	20,500 (92.3)
	15 (381.0)	One 1-1/4" & One 1"	23,055 (103.7)	20,500 (92.3)	25,040 (112.7)	20,500 (92.3)	27,020 (121.6)	20,500 (92.3)	29,135 (131.1)	20,500 (92.3)	30,790 (137.5)	20,500 (92.3)
	20-1/2 (520.7)	Two 1-1/4"	31,510 (141.8)	20,500 (92.3)	33,570 (151.1)	20,500 (92.3)	35,625 (160.3)	20,500 (92.3)	36,440 (164.0)	20,500 (92.3)	37,250 (167.6)	20,500 (92.3)
1-1/2 (38.1)	10-1/4 (260.4)	One 1-1/4"	16,750 (75.4)	23,625 (106.3)	18,125 (81.6)	23,625 (106.3)	19,500 (87.8)	23,625 (106.3)	22,000 (99.0)	23,625 (106.3)	22,950 (102.5)	23,625 (106.3)
	15 (381.0)	One 1-1/4" & One 1"	25,115 (113.0)	23,625 (106.3)	27,180 (122.3)	23,625 (106.3)	29,250 (131.6)	23,625 (106.3)	31,800 (143.1)	23,625 (106.3)	33,590 (150.0)	23,625 (106.3)
	20-1/2 (520.7)	Two 1-1/4"	33,500 (150.8)	23,625 (106.3)	34,875 (156.9)	23,625 (106.3)	36,250 (163.1)	23,625 (106.3)	36,750 (165.4)	23,625 (106.3)	37,250 (167.6)	23,625 (106.3)

1. Allowable bond capacities 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 bond capacities for intermediate embedments and compressive strengths.
3. Allowable design load should be the lesser of the allowable bond or allowable steel strength.

PERFORMANCE DATA

Ultimate Load Capacities for Reinforcing Bar Installed with Chem-Stud Capsules in Normal-Weight and Heavy-weight Concrete[1,2]

Rebar Size No. (in.)	Min. Embed. Depth h_v in. (mm)	Capsules Required	Minimum Concrete Compressive Strength (f'_c)									
			2,000 psi (13.8 MPa)		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)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)
No.3 (3/8)	3-1/2 (88.9)	One 3/8"	7,400 (33.3)	6,480 (29.2)	7,840 (35.0)	6,480 (29.2)	7,840 (35.0)	6,480 (29.2)	7,840 (35.0)	6,480 (29.2)	7,840 (35.0)	6,480 (29.2)
	5-1/4 (133.4)	Two 3/8"	11,100 (50.0)	6,480 (29.2)	11,760 (52.5)	6,480 (29.2)	11,760 (52.5)	6,480 (29.2)	11,760 (52.5)	6,480 (29.2)	11,760 (52.5)	6,480 (29.2)
	7 (177.8)	Two 3/8"	14,800 (66.6)	6,480 (29.2)	15,680 (70.0)	6,480 (29.2)	15,680 (70.0)	6,480 (29.2)	15,680 (70.0)	6,480 (29.2)	15,680 (70.0)	6,480 (29.2)
No.4 (1/2)	4-1/2 (114.3)	One 1/2"	10,450 (47.0)	11,120 (50.0)	12,680 (56.6)	11,120 (50.0)	12,680 (56.6)	11,120 (50.0)	12,680 (56.6)	11,120 (50.0)	12,680 (56.6)	11,120 (50.0)
	6-3/4 (171.5)	One 1/2" & One 3/8"	15,675 (70.5)	11,120 (50.0)	17,700 (79.7)	11,120 (50.0)	19,040 (85.0)	11,120 (50.0)	19,040 (85.0)	11,120 (50.0)	19,040 (85.0)	11,120 (50.0)
	9 (228.6)	Two 1/2"	20,900 (94.1)	11,120 (50.0)	23,600 (106.2)	11,120 (50.0)	25,380 (113.3)	11,120 (50.0)	25,380 (113.3)	11,120 (50.0)	25,380 (113.3)	11,120 (50.0)
No.5 (5/8)	5 (127.0)	One 5/8"	15,460 (69.6)	17,660 (79.5)	18,660 (83.3)	17,660 (79.5)	18,660 (83.3)	17,660 (79.5)	18,660 (83.3)	17,660 (79.5)	18,660 (83.3)	17,660 (79.5)
	7-1/2 (190.5)	One 5/8" & One 1/2"	23,190 (104.4)	17,660 (79.5)	27,980 (124.9)	17,660 (79.5)	27,980 (124.9)	17,660 (79.5)	27,980 (124.9)	17,660 (79.5)	27,980 (124.9)	17,660 (79.5)
	10 (254.0)	Two 5/8"	30,920 (139.1)	17,660 (79.5)	37,320 (166.6)	17,660 (79.5)	37,320 (166.6)	17,660 (79.5)	37,320 (166.6)	17,660 (79.5)	37,320 (166.6)	17,660 (79.5)
No.6 (3/4)	7 (177.8)	One 3/4"	22,760 (102.4)	21,900 (98.6)	27,890 (125.5)	21,900 (98.6)	29,660 (132.4)	21,900 (98.6)	29,660 (132.4)	21,900 (98.6)	29,660 (132.4)	21,900 (98.6)
	10-1/2 (266.7)	One 3/4" & One 5/8"	34,140 (153.6)	21,900 (98.6)	41,835 (188.3)	21,900 (98.6)	44,780 (199.9)	21,900 (98.6)	44,780 (199.9)	21,900 (98.6)	44,780 (199.9)	21,900 (98.6)
	14 (355.6)	Two 3/4"	45,520 (204.8)	21,900 (98.6)	55,780 (251.0)	21,900 (98.6)	59,340 (264.9)	21,900 (98.6)	59,340 (264.9)	21,900 (98.6)	59,340 (264.9)	21,900 (98.6)
No.7 (7/8)	7 (177.8)	One 7/8"	26,500 (119.3)	36,060 (162.3)	31,750 (142.9)	36,060 (162.3)	36,580 (163.3)	36,060 (162.3)	36,580 (163.3)	36,060 (162.3)	36,580 (163.3)	36,060 (162.3)
	10-1/2 (266.7)	Two 3/4"	39,750 (178.9)	36,060 (162.3)	47,625 (214.3)	36,060 (162.3)	53,560 (239.1)	36,060 (162.3)	53,560 (239.1)	36,060 (162.3)	53,560 (239.1)	36,060 (162.3)
	14 (355.6)	Two 7/8"	53,000 (238.5)	36,060 (162.3)	63,500 (285.8)	36,060 (162.3)	73,140 (326.5)	36,060 (162.3)	73,140 (326.5)	36,060 (162.3)	73,140 (326.5)	36,060 (162.3)
No.8 (1)	8-1/2 (215.9)	One 1"	36,650 (164.9)	53,140 (239.1)	45,075 (202.8)	53,140 (239.1)	49,260 (219.9)	53,140 (239.1)	49,260 (219.9)	53,140 (239.1)	49,260 (219.9)	53,140 (239.1)
	12-3/4 (323.9)	One 1" & One 3/4"	54,975 (247.4)	53,140 (239.1)	67,613 (304.3)	53,140 (239.1)	73,900 (329.9)	53,140 (239.1)	73,900 (329.9)	53,140 (239.1)	73,900 (329.9)	53,140 (239.1)
	17 (431.8)	Two 1"	73,300 (329.9)	53,140 (239.1)	90,150 (405.7)	53,140 (239.1)	98,520 (439.8)	53,140 (239.1)	98,520 (439.8)	53,140 (239.1)	98,520 (439.8)	53,140 (239.1)
No.9 (1-1/8)	9 (228.6)	One 1"	49,440 (222.5)	68,300 (307.4)	56,645 (254.9)	68,300 (307.4)	63,850 (287.3)	68,300 (307.4)	69,775 (314.0)	68,300 (307.4)	75,700 (340.7)	68,300 (307.4)
	13-1/2 (342.9)	One 1" & One 7/8"	74,160 (333.7)	68,300 (307.4)	84,968 (382.4)	68,300 (307.4)	95,775 (431.0)	68,300 (307.4)	104,663 (471.0)	68,300 (307.4)	111,960 (499.8)	68,300 (307.4)
	18 (457.2)	Two 1"	98,880 (445.0)	68,300 (307.4)	113,290 (509.8)	68,300 (307.4)	127,700 (574.7)	68,300 (307.4)	139,550 (628.0)	68,300 (307.4)	151,400 (681.3)	68,300 (307.4)
No.10 (1-1/4)	10 (254.0)	One 1 14"	57,000 (256.5)	83,460 (375.6)	64,735 (291.3)	83,460 (375.6)	72,470 (326.1)	83,460 (375.6)	82,435 (371.0)	83,460 (375.6)	84,160 (375.7)	83,460 (375.6)
	15 (381.0)	One 1-1/4" & One 7/8"	85,500 (384.8)	83,460 (375.6)	97,103 (437.0)	83,460 (375.6)	108,705 (489.2)	83,460 (375.6)	117,353 (528.1)	83,460 (375.6)	123,160 (549.8)	83,460 (375.6)
	20 (508.0)	Two 1-1/4"	114,000 (513.0)	83,460 (375.6)	129,470 (582.6)	83,460 (375.6)	144,940 (652.2)	83,460 (375.6)	148,470 (668.1)	83,460 (375.6)	152,000 (684.0)	83,460 (375.6)
No.11 (1-3/8)	10 (254.0)	One 1-1/4"	65,000 (292.5)	97,460 (438.6)	70,500 (317.3)	97,460 (438.6)	76,000 (342.0)	97,460 (438.6)	85,000 (382.5)	97,460 (438.6)	91,800 (409.8)	97,460 (438.6)
	15 (381.0)	One 1-1/4" & One 7/8"	92,000 (414.0)	97,460 (438.6)	103,000 (463.5)	97,460 (438.6)	114,000 (513.0)	97,460 (438.6)	119,000 (535.5)	97,460 (438.6)	124,000 (558.0)	97,460 (438.6)
	20 (508.0)	Two 1-1/4"	126,000 (567.0)	97,460 (438.6)	137,000 (616.5)	97,460 (438.6)	148,000 (666.0)	97,460 (438.6)	151,000 (679.5)	97,460 (438.6)	154,000 (693.0)	97,460 (438.6)

1. Ultimate load capacities should be reduced by a minimum safety factor of 4.0 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 or overhead.
2. Linear interpolation may be used to determine ultimate load capacities for intermediate embedments and compressive strengths.

PERFORMANCE DATA

Allowable Load Capacities for Reinforcing Bar Installed with Chem-Stud Capsules in Normal-Weight and Heavy-weight Concrete[1,2,3]

Rebar Size No. (in.)	Min. Embed. Depth h_v in. (mm)	Capsules Required	Minimum Concrete Compressive Strength (f'_c)									
			2,000 psi (13.8 MPa)		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)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)
No.3 (3/8)	3-1/2 (88.9)	One 3/8"	1,850 (8.3)	1,620 (7.3)	1,960 (8.8)	1,620 (7.3)	1,960 (8.8)	1,620 (7.3)	1,960 (8.8)	1,620 (7.3)	1,960 (8.8)	1,620 (7.3)
	5-1/4 (133.4)	Two 3/8"	2,775 (12.5)	1,620 (7.3)	2,940 (13.1)	1,620 (7.3)	2,940 (13.1)	1,620 (7.3)	2,940 (13.1)	1,620 (7.3)	2,940 (13.1)	1,620 (7.3)
	7 (177.8)	Two 3/8"	3,700 (16.7)	1,620 (7.3)	3,920 (17.5)	1,620 (7.3)	3,920 (17.5)	1,620 (7.3)	3,920 (17.5)	1,620 (7.3)	3,920 (17.5)	1,620 (7.3)
No.4 (1/2)	4-1/2 (114.3)	One 1/2"	2,615 (11.8)	2,780 (12.5)	3,170 (13.2)	2,780 (12.5)	3,170 (13.2)	2,780 (12.5)	3,170 (13.2)	2,780 (12.5)	3,170 (13.2)	2,780 (12.5)
	6-3/4 (171.5)	One 1/2" & One 3/8"	3,920 (17.6)	2,780 (12.5)	4,425 (19.9)	2,780 (12.5)	4,760 (21.3)	2,780 (12.5)	4,760 (21.3)	2,780 (12.5)	4,760 (21.3)	2,780 (12.5)
	9 (228.6)	Two 1/2"	5,225 (23.5)	2,780 (12.5)	5,900 (26.6)	2,780 (12.5)	6,345 (28.3)	2,780 (12.5)	6,345 (28.3)	2,780 (12.5)	6,345 (28.3)	2,780 (12.5)
No.5 (5/8)	5 (127.0)	One 5/8"	3,865 (17.4)	4,415 (19.9)	4,665 (20.8)	4,415 (19.9)	4,665 (20.8)	4,415 (19.9)	4,665 (20.8)	4,415 (19.9)	4,665 (20.8)	4,415 (19.9)
	7-1/2 (190.5)	One 5/8" & One 1/2"	5,800 (26.1)	4,415 (19.9)	6,995 (31.2)	4,415 (19.9)	6,995 (31.2)	4,415 (19.9)	6,995 (31.2)	4,415 (19.9)	6,995 (31.2)	4,415 (19.9)
	10 (254.0)	Two 5/8"	7,730 (34.8)	4,415 (19.9)	9,330 (41.7)	4,415 (19.9)	9,330 (41.7)	4,415 (19.9)	9,330 (41.7)	4,415 (19.9)	9,330 (41.7)	4,415 (19.9)
No.6 (3/4)	7 (177.8)	One 3/4"	5,690 (25.6)	5,475 (24.6)	6,975 (31.4)	5,475 (24.6)	7,415 (33.1)	5,475 (24.6)	7,415 (33.1)	5,475 (24.6)	7,415 (33.1)	5,475 (24.6)
	10-1/2 (266.7)	One 3/4" & One 5/8"	8,535 (38.4)	5,475 (24.6)	10,460 (47.1)	5,475 (24.6)	11,195 (50.0)	5,475 (24.6)	11,195 (50.0)	5,475 (24.6)	11,195 (50.0)	5,475 (24.6)
	14 (355.6)	Two 3/4"	11,380 (51.2)	5,475 (24.6)	13,945 (62.8)	5,475 (24.6)	14,835 (66.2)	5,475 (24.6)	14,835 (66.2)	5,475 (24.6)	14,835 (66.2)	5,475 (24.6)
No.7 (7/8)	7 (177.8)	One 7/8"	6,625 (29.8)	9,015 (40.6)	7,940 (35.7)	9,015 (40.6)	9,145 (40.8)	9,015 (40.6)	9,145 (40.8)	9,015 (40.6)	9,145 (40.8)	9,015 (40.6)
	10-1/2 (266.7)	Two 3/4"	9,940 (44.7)	9,015 (40.6)	11,905 (53.6)	9,015 (40.6)	13,390 (59.8)	9,015 (40.6)	13,390 (59.8)	9,015 (40.6)	13,390 (59.8)	9,015 (40.6)
	14 (355.6)	Two 7/8"	13,250 (59.6)	9,015 (40.6)	15,875 (71.4)	9,015 (40.6)	18,285 (81.6)	9,015 (40.6)	18,285 (81.6)	9,015 (40.6)	18,285 (81.6)	9,015 (40.6)
No.8 (1)	8-1/2 (215.9)	One 1"	9,165 (41.2)	13,285 (59.8)	11,270 (50.7)	13,285 (59.8)	12,315 (55.0)	13,285 (59.8)	12,315 (55.0)	13,285 (59.8)	12,315 (55.0)	13,285 (59.8)
	12-3/4 (323.9)	One 1" & One 3/4"	13,745 (61.9)	13,285 (59.8)	16,905 (76.1)	13,285 (59.8)	18,475 (82.5)	13,285 (59.8)	18,475 (82.5)	13,285 (59.8)	18,475 (82.5)	13,285 (59.8)
	17 (431.8)	Two 1"	18,325 (82.5)	13,285 (59.8)	22,540 (101.4)	13,285 (59.8)	24,630 (110.0)	13,285 (59.8)	24,630 (110.0)	13,285 (59.8)	24,630 (110.0)	13,285 (59.8)
No.9 (1-1/8)	9 (228.6)	One 1"	12,360 (55.6)	17,075 (76.8)	14,160 (63.7)	17,075 (76.8)	15,965 (71.8)	17,075 (76.8)	17,445 (78.5)	17,075 (76.8)	18,925 (85.2)	17,075 (76.8)
	13-1/2 (342.9)	One 1" & One 7/8"	18,540 (83.4)	17,075 (76.8)	21,240 (95.6)	17,075 (76.8)	23,945 (107.8)	17,075 (76.8)	26,165 (117.7)	17,075 (76.8)	27,990 (125)	17,075 (76.8)
	18 (457.2)	Two 1"	24,720 (111.2)	17,075 (76.8)	28,325 (127.5)	17,075 (76.8)	31,925 (143.7)	17,075 (76.8)	34,890 (157.0)	17,075 (76.8)	37,850 (170.3)	17,075 (76.8)
No.10 (1-1/4)	10 (254.0)	One 1 14"	14,250 (64.1)	20,865 (93.9)	16,185 (72.8)	20,865 (93.9)	18,120 (81.5)	20,865 (93.9)	20,610 (92.7)	20,865 (93.9)	21,040 (93.9)	20,865 (93.9)
	15 (381.0)	One 1-1/4" & One 7/8"	21,375 (96.2)	20,865 (93.9)	24,275 (109.2)	20,865 (93.9)	27,175 (122.3)	20,865 (93.9)	29,340 (132.0)	20,865 (93.9)	30,790 (137.5)	20,865 (93.9)
	20 (508.0)	Two 1-1/4"	28,500 (128.3)	20,865 (93.9)	32,370 (145.7)	20,865 (93.9)	36,235 (163.1)	20,865 (93.9)	37,120 (167.0)	20,865 (93.9)	38,000 (171.0)	20,865 (93.9)
No.11 (1-3/8)	10 (254.0)	One 1-1/4"	16,250 (73.1)	24,365 (109.6)	17,625 (79.3)	24,365 (109.6)	19,000 (85.5)	24,365 (109.6)	21,250 (95.6)	24,365 (109.6)	22,950 (102.5)	24,365 (109.6)
	15 (381.0)	One 1-1/4" & One 7/8"	23,000 (103.5)	24,365 (109.6)	25,750 (115.9)	24,365 (109.6)	28,500 (128.3)	24,365 (109.6)	29,750 (133.9)	24,365 (109.6)	31,000 (139.5)	24,365 (109.6)
	20 (508.0)	Two 1-1/4"	31,500 (141.8)	24,365 (109.6)	34,250 (154.1)	24,365 (109.6)	37,000 (166.5)	24,365 (109.6)	37,750 (169.9)	24,365 (109.6)	38,500 (173.3)	24,365 (109.6)

1. Allowable bond capacities 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 bond capacities for intermediate embedments and compressive strengths.
3. Allowable design load should be the lesser of the allowable bond or allowable steel strength.

PERFORMANCE DATA

Ultimate Load Capacities for Internally Threaded Inserts Installed with Chem-Stud Capsules in Normal-Weight and Heavy-weight Concrete[1,2]

Anchor Dia. d in. (mm)	Drill Bit Dia. d_{bit} in.	Min. Embed. Depth h_v in. (mm)	Capsules Required	Minimum Concrete Compressive Strength (f'_c)									
				2,000 psi (13.8 MPa)		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)	Shear lbs. (kN)	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 (9.5)	5/8	3-1/2 (88.9)	One 3/8"	7,630 (34.3)	6,480 (29.2)	7,935 (35.7)	6,480 (29.2)	8,240 (37.1)	6,480 (29.2)	9,050 (40.7)	6,480 (29.2)	9,860 (44.4)	6,480 (29.2)
1/2 (12.7)	11/16	4-1/4 (108.0)	One 1/2"	9,670 (43.5)	11,120 (50.0)	10,985 (49.4)	11,120 (50.0)	12,300 (55.4)	11,120 (50.0)	13,585 (61.1)	11,120 (50.0)	14,870 (66.9)	11,120 (50.0)
5/8 (15.9)	1	5 (127.0)	One 5/8"	15,230 (68.5)	17,650 (79.4)	18,340 (82.5)	17,650 (79.4)	21,450 (96.5)	17,650 (79.4)	22,445 (101.0)	17,650 (79.4)	23,440 (105.5)	17,650 (79.4)
3/4 (19.1)	1-1/8	6-5/8 (168.3)	One 3/4"	23,420 (105.4)	27,385 (123.2)	25,920 (116.6)	27,385 (123.2)	28,420 (127.9)	27,385 (123.2)	32,130 (144.6)	27,385 (123.2)	35,840 (161.3)	27,385 (123.2)

1. Ultimate load capacities should be reduced by a minimum safety factor of 4.0 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.
2. Linear interpolation may be used to determine ultimate load capacities for intermediate compressive strengths.

Allowable Load Capacities for Internally Threaded Inserts Installed with Chem-Stud Capsules in Normal-Weight and Heavy-weight Concrete[1,2,3]

Anchor Dia. d in. (mm)	Drill Bit Dia. d_{bit} in.	Min. Embed. Depth h_v in. (mm)	Capsules Required	Minimum Concrete Compressive Strength (f'_c)									
				2,000 psi (13.8 MPa)		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)	Shear lbs. (kN)	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 (9.5)	5/8	3-1/2 (88.9)	One 3/8"	1,910 (8.6)	1,620 (7.3)	1,985 (8.9)	1,620 (7.3)	2,060 (9.3)	1,620 (7.3)	2,265 (10.2)	1,620 (7.3)	2,465 (11.1)	1,620 (7.3)
1/2 (12.7)	11/16	4-1/4 (108.0)	One 1/2"	2,420 (10.9)	2,780 (12.5)	2,745 (12.4)	2,780 (12.5)	3,075 (13.8)	2,780 (12.5)	3,395 (15.3)	2,780 (12.5)	3,720 (16.7)	2,780 (12.5)
5/8 (15.9)	1	5 (127.0)	One 5/8"	3,810 (17.1)	4,415 (19.9)	4,585 (20.6)	4,415 (19.9)	5,365 (24.1)	4,415 (19.9)	5,610 (25.2)	4,415 (19.9)	5,860 (26.4)	4,415 (19.9)
3/4 (19.1)	1-1/8	6-5/8 (168.3)	One 3/4"	5,855 (26.3)	6,845 (30.8)	6,480 (29.2)	6,845 (30.8)	7,105 (32.0)	6,845 (30.8)	8,035 (36.2)	6,845 (30.8)	8,960 (40.3)	6,845 (30.8)

1. Allowable bond capacities 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.
2. Linear interpolation may be used to determine allowable bond capacities for intermediate compressive strengths.
3. Allowable design load should be the lesser of the allowable bond or allowable steel strength.

DESIGN CRITERIA

Ultimate and Allowable Load Capacities for Chem-Stud in Grout-filled Concrete Masonry[1,2]

ANCHORS INSTALLED INTO TOPS OF GROUTED MASONRY WALLS[3]									
Anchor Diameter *d* in. (mm)	Minimum Embedment Depth, h_v in. (mm)	Capsules Required	Minimum Edge Distance inches (mm)	Minimum End Distance inches (mm)	Minimum Masonry Compressive Strength, f'_m = 1,500 psi (10.4 MPa)				
					Tension		Shear		
					Ultimate Load lbs. (kN)	Allowable Load lbs. (kN)	Ultimate Load lbs. (kN)	Allowable Load lbs. (kN)	Direction of Loading
3/8 (9.5)	3-1/2 (88.9)	One 3/8"	1-3/4 (44)	4 (101)	2,830 (12.6)	565 (2.5)	1,155 (5.1)	230 (1.0)	Any
1/2 (12.7)	4-1/4 (108.0)	One 1/2"	1-3/4 (44)	4 (101)	3,515 (15.6)	700 (3.1)	1,155 (5.1)	230 (1.0)	Any
5/8 (15.9)	5 (127.0)	One 5/8"	1-3/4 (44)	4 (101)	5,165 (23.0)	1,035 (4.6)	1,155 (5.1)	230 (1.0)	Any
							2,015 (9.0)	400 (1.8)	∥ to Wall Edge
							2,070 (9.0)	415 (1.9)	⊥ to Wall Edge, To Opposite Edge
	10 (254.0)	Two 5/8"	1-3/4 (44)	11-1/4 (286)	10,035 (44.4)	2,005 (8.9)	1,155 (5.1)	230 (1.0)	Any
							2,015 (9.0)	400 (1.8)	∥ to Wall Edge
							2,070 (9.0)	415 (1.9)	⊥ to Wall Edge, To Opposite Edge
			2-3/4 (70)	11-1/4 (286)	10,035 (44.4)	2,005 (8.9)	1,155 (5.1)	230 (1.0)	Any
							4,950 (22.0)	990 (4.4)	∥ to Wall Edge
3/4 (19.1)	6-5/8 (168.3)	One 3/4"	1-3/4 (44)	4 (101)	6,160 (27.4)	1,230 (5.5)	1,155 (5.1)	230 (1.0)	Any
							2,015 (9.0)	400 (1.8)	∥ to Wall Edge
							2,450 (10.9)	490 (2.2)	⊥ to Wall Edge, To Opposite Edge
	13-1/4 (336.6)	Two 3/4"	2-3/4 (70)	11-1/4 (286)	10,240 (45.6)	2,045 (9.1)	1,155 (5.1)	230 (1.0)	Any
							4,950 (22.0)	990 (4.4)	∥ to Wall Edge
7/8 (22.2)	7 (177.8)	One 7/8"	2-3/4 (70)	11-1/4 (286)	8,715 (38.8)	1,740 (7.7)	2,135 (9.5)	425 (1.9)	Any
1 (25.4)	8-1/4 (209.6)	One 1"	2-3/4 (70)	11-1/4 (286)	8,840 (39.3)	1,765 (7.9)	2,450 (10.9)	490 (2.2)	Any
1-1/4 (31.2)	10-1/4 (260.4)	One 1-1/4"	2-3/4 (70)	11-1/4 (286)	6,625 (29.5)	1,325 (5.9)	2,955 (13.1)	590 (2.6)	Any
			3-1/4 (83)	11-1/4 (286)	9,895 (44.0)	1,980 (8.8)			

1. Tabulated load capacities are for anchors installed in minimum Grade N, Type II, lightweight, medium-weight or normal-weight concrete masonry units conforming to ASTM C 90 that are fully grouted and have reached a designated minimum compressive strength at the time of installation. Mortar must be Types N, S or M.
2. The allowable loads are calculated using a safety factor of 5.0. Consideration of safety factors of 10 or higher may be necessary depending on the application, such as life safety.
3. Masonry members must have a minimum nominal width of 8 inches with the exception of 3/8" and 1/2" diameter anchors which may be installed in minimum nominal 6-inch width masonry members.

NOTE:

∥ Denotes Parallel

⊥ Denotes Perpendicular

DESIGN CRITERIA (ALLOWABLE STRESS DESIGN)

Combined Loading

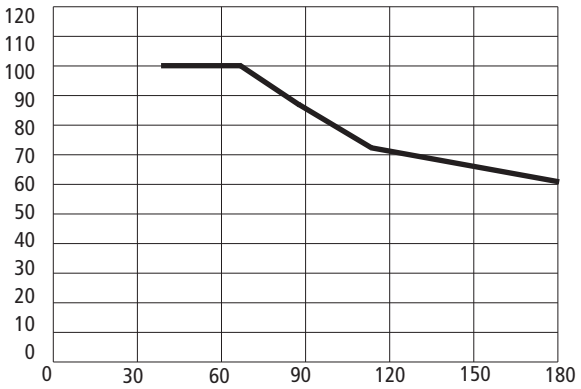
For anchors loaded in both shear and tension, the combination of loads should be proportioned as follows:

$$\left(\frac{N_u}{N_n}\right)^{\frac{5}{3}} + \left(\frac{V_u}{V_n}\right)^{\frac{5}{3}} \leq 1 \quad \text{OR} \quad \left(\frac{N_u}{N_n}\right) + \left(\frac{V_u}{V_n}\right) \leq 1$$

Where: N_u = Applied Service Tension Load
N_n = Allowable Tension Load
V_u = Applied Service Shear Load
V_n = Allowable Shear Load

In-Service Temperature

Allowable tension and shear load bond strength reduction based on in-service temperature for the Chem-Stud capsule adhesive.



Temperature Conversion		
Degree Fahrenheit (°F)	Degree Celsius (°C)	Percent Allowable Load (%)
40	5	100
70	21	100
90	32	87
120	49	72
150	65	66
180	82	62

Load Adjustment Factors for Spacing and Edge Distances

Anchor Installed in Normal-Weight Concrete[1]					
Anchor Dimension	Load Type	Critical Distance (Full Anchor Capacity)	Critical Load Factor	Minimum Distance (Reduced Capacity)	Minimum Load Factor
Spacing (s)	Tension and Shear	$s_{cr} = 16d$	$F_{N_s} = F_{V_s} = 1.0$	$s_{min} = 8d$	$F_{N_s} = F_{V_s} = 0.65$
Edge Distance (c)	Tension	$c_{cr} = 10d$	$F_{N_c} = 1.0$	$c_{min} = 4d$	$F_{N_c} = 0.65$
	Shear[2]	$c_{cr} = 12d$	$F_{V_c} = 1.0$	$c_{min} = 4d$	$F_{V_c} = 0.20$

1. Minimum anchor spacing distance (s_{min}) for tension in normal-weight concrete may be further reduced from 8 diameters ($8d$) to 4 diameters ($4d$) provided that the allowable load values in the table are reduced by an additional 15 percent. Linear interpolation is allowed for spacing distances between 8 diameters and 4 diameters.
2. Minimum edge distance (c_{min}) for anchors loaded in shear parallel to the edge is equal to 4 anchor diameters ($4d$) at which the anchor achieves 60% of load.

DESIGN CRITERIA (ALLOWABLE STRESS DESIGN)

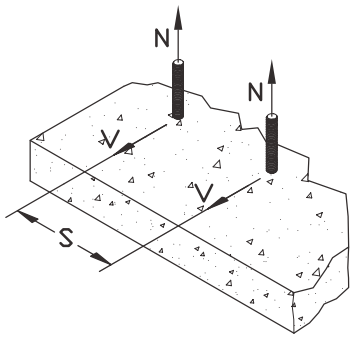
Load Adjustment Factors for Threaded Rod in Normal-Weight Concrete

Spacing, Tension (F_{N_s}) & Shear (F_{V_s})

Dia. (in.)		1/4	3/8	1/2	5/8	3/4	7/8	1	1-1/4	1-3/8	1-1/2
s_{cr} (in.)		4	6	8	10	12	14	16	20	22	24
s_{min} (in.)		2	3	4	5	6	7	8	10	11	12
Spacing, s (inches)	2	0.65									
	3	0.83	0.65								
	4	1.00	0.77	0.65							
	5		0.88	0.74	0.65						
	6		1.00	0.83	0.72	0.65					
	7			0.91	0.79	0.71	0.65				
	8			1.00	0.86	0.77	0.70	0.65			
	10				1.00	0.88	0.80	0.74	0.65		
	11					0.94	0.85	0.78	0.69	0.65	
	12					1.00	0.90	0.83	0.72	0.68	0.65
	14						1.00	0.91	0.79	0.75	0.71
	16							1.00	0.86	0.81	0.77
	20								1.00	0.94	0.88
	22									1.00	0.94
	24										1.00

Notes: For anchors loaded in tension and shear, the critical spacing (s_{cr}) is equal to 16 anchor diameters (16d) at which the anchor achieves 100% of load.

Minimum spacing (s_{min}) is equal to 8 anchor diameters (8d) at which the anchor achieves 65% of load.

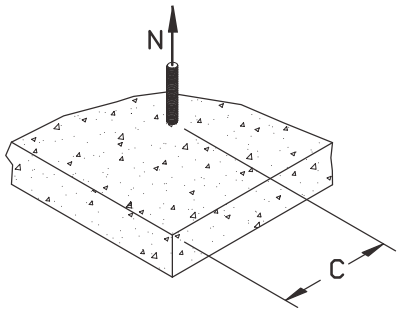


Edge Distance, (F_{N_c}) Tension

Dia. (in.)		1/4	3/8	1/2	5/8	3/4	7/8	1	1-1/4	1-3/8	1-1/2
c_{cr} (in.)		2-1/2	3-3/4	5	6-1/4	7-1/2	8-3/4	10	12-1/2	13-3/4	15
c_{min} (in.)		1	1-1/2	2	2-1/2	3	3-1/2	4	5	5-1/2	6
Edge Distance, c (inches)	1	0.65									
	1-1/2	0.77	0.65								
	2	0.88	0.73	0.65							
	2-1/2	1.00	0.81	0.71	0.65						
	3		0.88	0.77	0.70	0.65					
	3-1/2		0.96	0.83	0.74	0.69	0.65				
	3-3/4		1.00	0.85	0.77	0.71	0.67				
	4			0.88	0.79	0.73	0.68	0.65			
	5			1.00	0.88	0.81	0.75	0.71	0.65		
	5-1/2				0.93	0.84	0.78	0.74	0.67	0.65	
	6				0.98	0.88	0.82	0.77	0.70	0.67	0.65
	6-1/4				1.00	0.90	0.83	0.78	0.71	0.68	0.66
	7-1/2					1.00	0.92	0.85	0.77	0.73	0.71
	8-3/4						1.00	0.93	0.83	0.79	0.76
	10							1.00	0.88	0.84	0.81
	12-1/2								1.00	0.95	0.90
	13-3/4									1.00	0.95
	15										1.00

Notes: For anchors loaded in tension, the critical edge distance (c_{cr}) is equal to 10 anchor diameters (10d) at which the anchor achieves 100% of load.

Minimum edge distance (c_{min}) is equal to 4 anchor diameters (4d) at which the anchor achieves 65% of load.



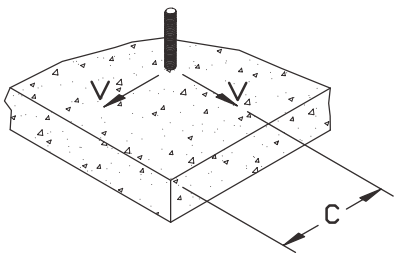
Edge Distance, Shear (F_{V_c})

Dia. (in.)		1/4	3/8	1/2	5/8	3/4	7/8	1	1-1/4	1-3/8	1-1/2
c_{cr} (in.)		3	4-1/2	6	7-1/2	9	10-1/2	12	15	16-1/2	18
c_{min} (in.)		1	1-1/2	2	2-1/2	3	3-1/2	4	5	5-1/2	6
Edge Distance, c (inches)	1	0.20									
	1-1/2	0.40	0.20								
	2	0.60	0.33	0.20							
	2-1/2	0.80	0.47	0.30	0.20						
	3	1.00	0.60	0.40	0.28	0.20					
	3-1/2		0.73	0.50	0.36	0.27	0.20				
	4		0.87	0.60	0.44	0.33	0.26	0.20			
	4-1/2		1.00	0.70	0.52	0.40	0.31	0.25			
	5			0.80	0.60	0.47	0.37	0.30	0.20		
	5-1/2			0.90	0.68	0.53	0.43	0.35	0.24	0.20	
	6			1.00	0.76	0.60	0.49	0.40	0.28	0.24	0.20
	7-1/2				1.00	0.80	0.66	0.55	0.40	0.35	0.30
	9					1.00	0.83	0.70	0.52	0.45	0.40
	10-1/2						1.00	0.85	0.64	0.56	0.50
	12							1.00	0.76	0.67	0.60
	15								1.00	0.89	0.80
	16-1/2									1.00	0.90
	18										1.00

Notes: For anchors loaded in shear, the critical edge distance (c_{cr}) is equal to 12 anchor diameters (12d) at which the anchor achieves 100% of load.

Minimum edge distance (c_{min}) is equal to 4 anchor diameters (4d) at which the anchor achieves 20% of load.

Minimum edge distance (c_{min}) for anchors loaded in shear parallel to the edge is equal to 4 anchor diameters (4d) at which the anchor achieves 60% of load.



ORDERING INFORMATION

Chem-Stud Capsules

Cat. No.	Description	Standard Box	Standard Carton	Wt./100
06502	3/8" Chem-Stud Capsule	10	500	4
06503	1/2" Chem-Stud Capsule	10	200	5
06504	5/8" Chem-Stud Capsule	10	200	9
06505	3/4" Chem-Stud Capsule	5	50	19
06506	7/8" Chem-Stud Capsule	5	50	20
06507	1" Chem-Stud Capsule	5	50	32
06508	1-1/4" Chem-Stud Capsule	5	25	84

ASTM A307 Standard Carbon Steel, Chisel Pointed Threaded Rod Zinc Plated (ASTM B633)

Cat. No.	Description	Standard Box	Standard Carton	Wt./100
06512	3/8" x 5-1/8"	10	50	12
06513	1/2" x 6-1/2"	10	50	28
06514	5/8" x 7-1/2"	10	40	51
06515	3/4" x 9-5/8"	10	40	96
06516	7/8" x 10-1/4"	-	10	140
06517	1" x 12"	–	10	213
06518	1-1/4" x 15"	–	5	433

Hex nut and washer included.

ASTM A193 Grade B7 High Strength Carbon Steel, Chisel Pointed Threaded Rod Zinc Plated (ASTM B633)

Cat. No.	Description	Standard Box	Standard Carton	Wt./100
06523	1/2" x 6-1/2"	10	50	28
06524	5/8" x 7-1/2"	10	40	51

Hex nut and washer included.

Internally Threaded Inserts, Zinc Plated, Carbon Steel (Special Order)

Cat. No.	Description	O.D.	Min. Depth	Thread Depth	Std. Box	Std. Carton	Wt./100
06592	3/8" x 3-1/2"	0.55"	3-1/2"	1-1/2"	10	40	20
06593	1/2" x 4-1/4"	0.65"	4-1/4"	1-5/8"	10	40	44
06594	5/8" x 5"	0.90"	5"	2-3/8"	10	40	68
06595	3/4" x 6-5/8"	1.00"	6-5/8"	2-3/4"	10	40	125

ORDERING INFORMATION

Chisel Pointed Anchor Rod Installation Tools

Rod Couplers

Cat. No.	Description	Standard Box	Standard Carton
06562	3/8" Coupler	1	10
06563	1/2" Coupler	1	10
06564	5/8" Coupler	1	10
06565	3/4" Coupler	1	5
06566	7/8" Coupler	1	5
06567	1" Coupler	1	5
06568	1-1/4" Coupler	1	5

Drivers for Threaded Rod Couplers – Hex

Cat. No.	Hex Size	Fits Coupler Size	Standard Box	Standard Carton
06570	1/4"	3/8" to 5/8"	1	10
06572	3/8"	3/4" to 1-1/4"	1	10

Drivers for Threaded Rod Couplers – SDS Plus

Cat. No.	Hex Size	Fits Coupler Size	Standard Box	Standard Carton
06574	1/4"	3/8" to 5/8"	1	10
06576	3/8"	3/4" to 1-1/4"	1	10

Drivers for Threaded Rod Couplers – Spline

Cat. No.	Hex Size	Fits Coupler Size	Standard Box	Standard Carton
06580	1/4"	3/8" to 5/8"	1	10
06582	3/8"	3/4" to 1-1/4"	1	10

Drivers for Threaded Rod Couplers – SDS Max

Cat. No.	Hex Size	Fits Coupler Size	Standard Box	Standard Carton
06559	1/4"	3/8" to 5/8"	1	10
06561	3/8"	3/4" to 1-1/4"	1	10

Reinforcing Bar Installation Tools

Cat. No.	Description	Standard Box	Standard Carton
06533	#3 Coupler	1	10
06534	#4 Coupler	1	10
06535	#5 Coupler	1	10
06536	#6 Coupler	1	10
06537	#7 Coupler	1	10
06538	#8 Coupler	1	10
06539	#9 Coupler	1	10
06540	#10 Coupler	1	10
06590	Spline Driver Extension	1	1
06596	SDS-Max Driver Extension	1	1

Internally Threaded Insert Tools*

Cat. No.	Description	Standard Box	Standard Carton
06862	3/8"	1	1
06863	1/2"	1	1
06864	5/8"	1	1
06865	3/4"	1	1

Hammer-Capsule® *Drive-In Capsule Adhesive*

PRODUCT DESCRIPTION

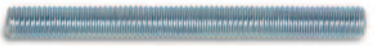
The Hammer-Capsule system consists of a self contained, single use, two-part glass capsule into which threaded anchor rod or reinforcing bars can be directly driven without the need for a chisel point or spinning action. It is designed for use in the installation of 3/8" through 1" diameter threaded rod in solid concrete and masonry materials. It can also be used to install reinforcing bars.

A mixture of hardener and quartz aggregate is contained in the upper portion of the capsule while the lower portion contains an epoxy acrylate resin. Unlike traditional capsule anchors which required the use of chisel-pointed anchor rod and special installation tools, the Hammer-Capsule is designed for use with straight cut anchor rod.

SECTION CONTENTS

General Information
Material Specifications
Installation Specifications
Steel Element Specifications
Performance Data
Design Criteria
Ordering Information

Hammer-Capsule



Straight Cut Threaded Rod

GENERAL APPLICATIONS AND USES

- Anchoring rebar (doweling), and threaded anchor rods in solid concrete and grouted concrete masonry
- Steel erection including anchoring of equipment and column base plates
- Resistant to vibratory loads introduced from machinery, moving vehicles, etc
- Barriers, fencing and railing attachments

FEATURES AND BENEFITS

+ Fast, easy installation - no special adaptors required for setting
+ Excellent chemical resistance
+ Components are mixed during installation of rod or rebar
+ Pre-measured chemical component volumes – no waste and simplified placement
+ Ideal for small projects

APPROVALS AND LISTINGS

Various North American Departments of Transportation (DOT) – See www.powers.com
Independently tested to ASTM E1512 and AC58 Criteria including creep resistance

GUIDE SPECIFICATIONS

CSI Divisions: *03151-Concrete Anchoring, 04081-Masonry Anchorage* and *05090-Metal Fastenings.* Capsule adhesive anchoring system shall be Hammer-Capsule as supplied by Powers Fasteners, Inc., Brewster, NY.

ANCHOR SIZE RANGE (TYP.)

3/8" to 1" diameter rod
No. 3 to No. 8 reinforcing bar

SUITABLE BASE MATERIALS

Normal-Weight Concrete
Grouted Concrete Masonry

MATERIAL SPECIFICATIONS

Physical Properties

Shelf Life	2 Years
Storage Conditions	Store dry at 40° to 90°F and out of direct sunlight
Installation Temperature	Condition capsules to 60°F minimum for best results
Color	Mixed adhesive mortar – amber
Consistency (mixed, prior to curing)	Paste mortar

Curing Times[1]

Minimum Base Material Temperature	Curing Time
68°F (20°C)	1 hour
50°F (10°C)	2 hours
32°F (0°C)	5 hours

1. Cure time should be doubled for wet concrete.

INSTALLATION SPECIFICATIONS

Hammer-Capsule[1,2]

Dimension	Hammer-Capsule, Nominal Size					
	3/8"	1/2"	5/8"	3/4"	7/8"	1"
Capsule Diameter (in.)	0.43	0.51	0.67	0.78	0.87	0.95
Capsule Length (in.)	3.50	4.30	5.00	5.50	6.89	8.25
Mortar Volume (in^3)	0.40	0.70	1.40	2.05	3.25	4.50
Mortar Volume (fl. oz.)	0.22	0.39	0.77	1.13	1.79	2.48

1. The mortar volume listed is for the mixed material.
2. The diameter and length may be different than capsules offered by other suppliers because of variations in air content. When comparing capsules, use the installed mortar volume.

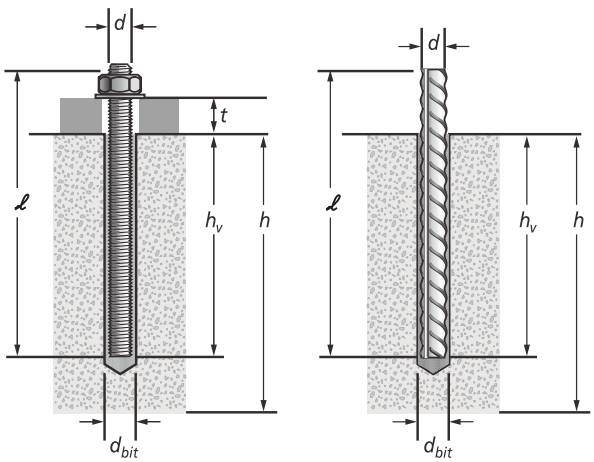
Threaded Rod in Normal-Weight Concrete

Dimension	Hammer-Capsule, Nominal Size					
	3/8"	1/2"	5/8"	3/4"	7/8"	1"
A_{nom} = Nominal area of threaded rod (in^2)	0.111	0.196	0.307	0.442	0.601	0.785
A_{se} = Tensile stress area of rod (in^2)	0.078	0.142	0.226	0.335	0.462	0.606
d_{bit} = Nominal bit diameter (in.)	7/16	9/16	11/16	7/8	1	1 1/8
h_v = Minimum Embedment Depth (in.)	3-1/2	4-1/4	5	6-5/8	7	8 1/4
T_{max} = Max. tightening torque range (ft.-lbs.)	7.5-10	11-15	26-35	56-75	75-100	112-150
Mortar per inch (in^3)	0.094	0.133	0.184	0.326	0.390	0.478

Reinforcing Bar in Normal-Weight Concrete[1]

Dimension	Reinforcing Bar Size					
	No.3	No.4	No.5	No.6	No.7	No.8
A_{nom} = Nominal area of threaded rod (in^2)	0.110	0.200	0.310	0.440	0.600	0.790
d_{bit} = Nominal bit diameter (in.)	1/2	5/8	3/4	7/8	1	1-1/8
h_v = Minimum Embedment Depth (in.)	3-1/2	4-1/4	5	6	7	8 1/4
Mortar per inch (in^3)	0.111	0.142	0.176	0.220	0.252	0.537

1. Adhesive mortar volumes for reinforcing bar are based on smooth bars. Actual mortar volume required will be less due to raised deformations on bars.

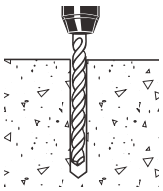


Nomenclature

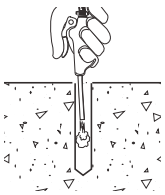
- d = Diameter of anchor
- d_{bit} = Diameter of drill bit
- d_h = Diameter of fixture clearance hole
- h = Base material thickness. The minimum value of h should be $1.5h_v$
- h_v = Minimum embedment depth
- ℓ = Overall length of anchor
- t = Fixture thickness
- T_{max} = Maximum tightening torque (only possible after curing time)

Installation Guidelines

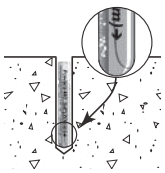
1. Drill a hole using a carbide tipped bit meeting the diameter requirements of ANSI B212.15 to the minimum depth required as shown in the chart.



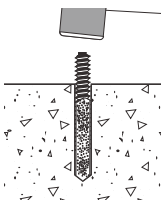
2. Starting from the bottom or back of the anchor hole, blow clean with compressed air, brush the hole with a nylon brush, and blow it clean again. Anchor holes may be dry or damp, but should be free of standing water or frost. Vacuuming only is not sufficient. Blow out bulbs generally do not provide enough dust removal for most drilled anchor holes. Holes should be clean and sound.



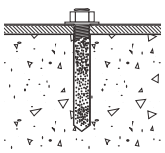
3. Prior to installation check the capsule to be sure it is not damaged and invert several times at 60°F or above to confirm all of the resin is in a liquid state. Insert the capsule into the hole.
Note! Be careful to observe the direction of insertion. The arrow on the capsule should point toward the bottom of the hole.



4. Drive the threaded rod or reinforcing bar into the anchor hole through the capsule until it is fully embedded. A 2-pound hammer and eye protection are recommended. A rotary hammer set in the hammering only mode and Chem-Stud drive adapters can also be used. Stop driving immediately upon reaching the bottom of the anchor hole.



5. Allow the Hammer-Capsule to cure for specified time before loading anchor. Do not disturb, torque or load the anchor once the material has begun to set.



Note! Consideration must be given to installation direction. Overhead installations with glass capsules are sensitive and extremely dependent upon the skill and care taken by the user; additional equipment not supplied by Powers may be required. Consequently Powers does not recommend the use of the Hammer Capsule for overhead applications at this time. Use of the product in adverse installation conditions should not be done without proper training and direct supervision by the Design Professional.

STEEL SPECIFICATIONS

Material Properties for Threaded Rod and Reinforcing Bar

Anchor Type	Steel Description	Steel Specification (ASTM)	Rod Dia. or Rebar Size (inch or No.)	Minimum Yield Strength, f_y (ksi)	Minimum Ultimate Strength, f_u (ksi)
Threaded Rod	Standard carbon rod	A36	All	36.0	58.0
		A307 Grade C or F1554, Grade 36	3/8 thru 4	36.0	58.0
	High strength carbon rod	A 193, Grade B7	3/8 thru 2-1/2	105.0	120.0
	Stainless Rod (Type 304 / 316 SS)	F 593, Condition CW	3/8 thru 5/8	65.0	100.0
			3/4 thru 1-1/2	45.0	85.0
Reinforcing Bar	Grade 40 Rebar	A 615, A 706, A 767 or A996	All	40.0	70.0
	Grade 60 Rebar			60.0	90.0

Allowable Steel Strength Capacities for Threaded Rod

Anchor Diameter d in. (mm)	Allowable Tension				Allowable Shear			
	ASTM A36 lbs. (kN)	ASTM F1554, Grade 36 lbs. (kN)	ASTM A193 Grade B7 lbs. (kN)	ASTM F593 304/316 SS lbs. (kN)	ASTM A36 lbs. (kN)	ASTM F1554, Grade 36 lbs. (kN)	ASTM A193 Grade B7 lbs. (kN)	ASTM F593 304/316 SS lbs. (kN)
3/8 (9.5)	2,115 (9.5)	2,115 (9.5)	4,375 (19.7)	3,630 (16.3)	1,090 (4.9)	1,090 (4.9)	2,255 (10.1)	1,870 (8.4)
1/2 (12.7)	3,755 (16.9)	3,755 (16.9)	7,775 (35.0)	6,470 (29.1)	1,940 (8.7)	1,940 (8.7)	4,055 (18.2)	3,330 (15.0)
5/8 (15.9)	5,870 (26.4)	5,870 (26.4)	12,150 (54.7)	10,130 (45.6)	3,025 (13.6)	3,025 (13.6)	6,260 (28.2)	5,210 (23.4)
3/4 (19.1)	8,455 (38.0)	8,455 (38.0)	17,495 (78.7)	12,400 (55.8)	4,355 (19.6)	4,355 (19.6)	9,010 (40.5)	6,390 (28.8)
7/8 (22.2)	11,510 (51.8)	11,510 (51.8)	23,810 (107.1)	16,860 (75.9)	5,930 (26.7)	5,930 (26.7)	12,265 (55.2)	8,680 (39.1)
1 (25.4)	15,035 (67.7)	15,035 (67.7)	31,100 (140.0)	22,020 (99.1)	7,745 (34.9)	7,745 (34.9)	16,020 (72.1)	11,340 (51.0)

1. Allowable steel strength capacities are based on the stresses listed in the Table J3.2 of AISC 335.

Allowable Steel Strength Capacities for Reinforcing Bar

Bar Size	Tension lbs. (kN)		Shear lbs. (kN)	
	Grade 40	Grade 60	Grade 40	Grade 60
No. 3 (3/8")	2,200 (9.9)	2,640 (11.9)	1,310 (5.9)	1,680 (7.6)
No. 4 (1/2")	4,000 (18.0)	4,800 (21.6)	2,380 (10.7)	3,060 (13.8)
No. 5 (5/8")	6,200 (27.9)	7,440 (33.5)	3,690 (16.6)	4,740 (21.3)
No. 6 (3/4")	8,800 (39.6)	10,560 (47.5)	5,235 (23.6)	6,730 (30.3)
No. 7 (7/8")	12,000 (54.0)	14,400 (64.8)	7,140 (32.1)	9,180 (41.3)
No. 8 (1")	15,800 (71.1)	18,960 (85.3)	9,400 (42.3)	12,085 (54.4)

1. Allowable steel strength capacities are based on the requirements of ASTM A 615.

Note:
Allowable design load must be the lesser of allowable steel strength (as shown on this page) and the allowable bond capacities.

Allowable steel strength values for threaded rod are based on the following equations:

$T = 0.33 * f_u * A_{nom}$
$V = 0.17 * f_u * A_{nom}$

And, the allowable steel strength values for reinforcing bar are based on the following equations:

$T = f_s * A_{br}$
$V = 0.17 * f_u * A_{br}$

Where:
T = Allowable tension load (pounds).
V = Allowable shear load (pounds).
f_u = Minimum specified ultimate strength (psi).
f_s = Tensile stress area in reinforcement (psi).
A_{nom} = Nominal cross-sectional area of threaded rod (in^2).
A_{br} = Nominal cross-sectional area of reinforcing bar (in^2).

PERFORMANCE DATA

Ultimate Load Capacities for Threaded Rod Installed with Hammer-Capsule in Normal-Weight Concrete[1,2]

Anchor Dia. d in. (mm)	Min. Embed. Depth h_v in. (mm)	Capsules Required	Minimum Concrete Compressive Strength (f'_c)									
			2,000 psi (13.8 MPa)		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)	Shear lbs. (kN)	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 (9.5)	3-1/2 (88.9)	One 3/8"	4,920 (22.1)	4,440 (20.0)	5,880 (26.5)	4,440 (20.0)	6,120 (27.5)	4,440 (20.0)	6,320 (28.2)	4,440 (20.0)	6,320 (28.2)	4,440 (20.0)
	7 (177.8)	Two 3/8"	9,840 (44.3)	4,440 (20.0)	11,760 (52.9)	4,440 (20.0)	12,240 (55.1)	4,440 (20.0)	12,640 (56.4)	4,440 (20.0)	12,640 (56.4)	4,440 (20.0)
1/2 (12.7)	4-1/4 (108.0)	One 1/2"	8,235 (37.1)	10,720 (48.2)	10,240 (45.7)	10,720 (48.2)	10,240 (45.7)	10,720 (48.2)	10,240 (45.7)	10,720 (48.2)	10,240 (45.7)	10,720 (48.2)
	8-1/2 (215.9)	Two 1/2"	16,470 (74.1)	10,720 (48.2)	20,460 (91.3)	10,720 (48.2)	20,460 (91.3)	10,720 (48.2)	20,460 (91.3)	10,720 (48.2)	20,460 (91.3)	10,720 (48.2)
5/8 (15.9)	5 (127.0)	One 5/8"	10,160 (45.7)	17,160 (77.2)	13,080 (58.9)	17,160 (77.2)	15,060 (67.2)	17,160 (77.2)	15,060 (67.2)	17,160 (77.2)	15,060 (67.2)	17,160 (77.2)
	10 (254.0)	Two 5/8"	20,320 (91.4)	17,160 (77.2)	26,160 (117.7)	17,160 (77.2)	30,100 (134.4)	17,160 (77.2)	30,100 (134.4)	17,160 (77.2)	30,100 (134.4)	17,160 (77.2)
3/4 (19.1)	6 (152.4)	One 3/4"	13,080 (58.9)	24,990 (112.5)	17,125 (77.1)	24,990 (112.5)	17,990 (81.0)	24,990 (112.5)	19,190 (86.4)	24,990 (112.5)	20,390 (91.8)	24,990 (112.5)
	12 (304.8)	Two 3/4"	26,160 (117.7)	24,990 (112.5)	34,250 (154.1)	24,990 (112.5)	35,980 (161.9)	24,990 (112.5)	38,380 (172.7)	24,990 (112.5)	40,780 (183.5)	24,990 (112.5)
7/8 (22.2)	7 (177.8)	One 7/8"	16,265 (73.2)	35,600 (160.2)	21,065 (94.8)	35,600 (160.2)	24,640 (110.9)	35,600 (160.2)	28,425 (127.9)	35,600 (160.2)	29,500 (32.9)	35,600 (160.2)
	14 (355.6)	Two 7/8"	32,530 (146.4)	35,600 (160.2)	42,130 (189.6)	35,600 (160.2)	49,280 (221.8)	35,600 (160.2)	56,850 (255.8)	35,600 (160.2)	59,000 (263.4)	35,600 (160.2)
1 (25.4)	8-1/4 (209.6)	One 1"	28,720 (129.2)	46,840 (210.8)	32,265 (145.2)	46,840 (210.8)	32,495 (146.2)	46,840 (210.8)	35,205 (158.4)	46,840 (210.8)	37,920 (170.6)	46,840 (210.8)
	16-1/2 (419.1)	Two 1"	57,440 (258.5)	46,840 (210.8)	64,530 (290.4)	46,840 (210.8)	64,990 (292.5)	46,840 (210.8)	70,410 (316.8)	46,840 (210.8)	75,840 (341.3)	46,840 (210.8)

1. Ultimate load capacities should be reduced by a minimum safety factor of 4.0 or greater to determine the allowable working load. Consideration of safety factors of 10.0 or higher may be necessary depending on the application, such as life safety.
2. Linear interpolation may be used to determine ultimate load capacities for intermediate embedments and compressive strengths.

Allowable Load Capacities for Threaded Rod Installed with Hammer-Capsule in Normal-Weight Concrete[1,2,3]

Anchor Dia. d in. (mm)	Min. Embed. Depth h_v in. (mm)	Capsules Required	Minimum Concrete Compressive Strength (f'_c)									
			2,000 psi (13.8 MPa)		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)	Shear lbs. (kN)	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 (9.5)	3-1/2 (88.9)	One 3/8"	1,230 (5.5)	1,110 (5.0)	1,470 (6.6)	1,110 (5.0)	1,530 (6.9)	1,110 (5.0)	1,580 (7.1)	1,110 (5.0)	1,580 (7.1)	1,110 (5.0)
	7 (177.8)	Two 3/8"	2,460 (11.1)	1,110 (5.0)	2,940 (13.2)	1,110 (5.0)	3,060 (13.8)	1,110 (5.0)	3,160 (14.1)	1,110 (5.0)	3,160 (14.1)	1,110 (5.0)
1/2 (12.7)	4-1/4 (108.0)	One 1/2"	2,060 (9.3)	2,680 (12.1)	2,560 (11.4)	2,680 (12.1)	2,560 (11.4)	2,680 (12.1)	2,560 (11.4)	2,680 (12.1)	2,560 (11.4)	2,680 (12.1)
	8-1/2 (215.9)	Two 1/2"	4,120 (18.5)	2,680 (12.1)	5,115 (22.8)	2,680 (12.1)	5,115 (22.8)	2,680 (12.1)	5,115 (22.8)	2,680 (12.1)	5,115 (22.8)	2,680 (12.1)
5/8 (15.9)	5 (127.0)	One 5/8"	2,540 (11.4)	4,290 (19.3)	3,270 (14.7)	4,290 (19.3)	3,765 (16.8)	4,290 (19.3)	3,765 (16.8)	4,290 (19.3)	3,765 (16.8)	4,290 (19.3)
	10 (254.0)	Two 5/8"	5,080 (22.9)	4,290 (19.3)	6,540 (29.4)	4,290 (19.3)	7,525 (33.6)	4,290 (19.3)	7,525 (33.6)	4,290 (19.3)	7,525 (33.6)	4,290 (19.3)
3/4 (19.1)	6 (152.4)	One 3/4"	3,270 (14.7)	6,250 (28.1)	4,280 (19.3)	6,250 (28.1)	4,500 (20.3)	6,250 (28.1)	4,800 (21.6)	6,250 (28.1)	5,100 (23.0)	6,250 (28.1)
	12 (304.8)	Two 3/4"	6,540 (29.4)	6,250 (28.1)	8,565 (38.5)	6,250 (28.1)	8,995 (40.5)	6,250 (28.1)	9,595 (43.2)	6,250 (28.1)	10,195 (45.9)	6,250 (28.1)
7/8 (22.2)	7 (177.8)	One 7/8"	4,065 (18.3)	8,900 (40.1)	5,265 (23.7)	8,900 (40.1)	6,160 (27.7)	8,900 (40.1)	7,105 (32.0)	8,900 (40.1)	7,375 (32.9)	8,900 (40.1)
	14 (355.6)	Two 7/8"	8,135 (36.6)	8,900 (40.1)	10,535 (47.4)	8,900 (40.1)	12,320 (55.4)	8,900 (40.1)	14,215 (64.0)	8,900 (40.1)	14,750 (65.0)	8,900 (40.1)
1 (25.4)	8-1/4 (209.6)	One 1"	7,180 (32.3)	11,710 (52.7)	8,065 (36.3)	11,710 (52.7)	8,125 (36.6)	11,710 (52.7)	8,800 (39.6)	11,710 (52.7)	9,480 (42.7)	11,710 (52.7)
	16-1/2 (419.1)	Two 1"	14,360 (64.6)	11,710 (52.7)	16,135 (72.6)	11,710 (52.7)	16,250 (73.1)	11,710 (52.7)	17,605 (79.2)	11,710 (52.7)	18,960 (85.3)	11,710 (52.7)

1. Allowable bond capacities are calculated using an applied safety factor of 4.0. Consideration of safety factors of 10.0 or higher may be necessary depending on the application, such as life safety.
2. Linear interpolation may be used to determine allowable bond capacities for intermediate embedments and compressive strengths.
3. Allowable design load should be the lesser of the bond or allowable steel strength.

PERFORMANCE DATA

Ultimate Load Capacities for Reinforcing Bar Installed with Hammer-Capsule in Normal-Weight Concrete[1,2]

Rebar Size No. (in)	Min. Embed. Depth h_v in. (mm)	Capsules Required	Minimum Concrete Compressive Strength (f'_c)									
			2,000 psi (13.8 MPa)		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)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)
No.3 (3/8)	3-1/2 (88.9)	One 3/8"	7,840 (35.3)	6,600 (29.7)	10,520 (47.3)	6,600 (29.7)	13,200 (59.4)	6,600 (29.7)	6,320 (28.2)	6,600 (29.7)	6,320 (29.7)	6,600 (29.7)
	7 (177.8)	Two 3/8"	15,680 (70.6)	6,600 (29.7)	21,040 (94.7)	6,600 (29.7)	26,400 (118.8)	6,600 (29.7)	12,640 (56.4)	6,600 (29.7)	12,640 (56.4)	6,600 (29.7)
No.4 (1/2)	4-1/2 (114.3)	One 1/2"	12,720 (57.2)	12,000 (54.0)	10,240 (45.7)	12,000 (54.0)	10,240 (45.7)	12,000 (54.0)	10,240 (45.7)	12,000 (54.0)	10,240 (45.7)	12,000 (54.0)
	9 (228.6)	Two 1/2"	25,440 (114.5)	12,000 (54.0)	20,460 (91.3)	12,000 (54.0)	20,460 (91.3)	12,000 (54.0)	20,460 (91.3)	12,000 (54.0)	20,460 (91.3)	12,000 (54.0)
No.5 (5/8)	5 (127.0)	One 5/8"	16,160 (72.7)	18,600 (83.7)	18,280 (82.3)	18,600 (83.7)	15,060 (67.2)	18,600 (83.7)	15,060 (67.2)	18,600 (83.7)	15,060 (67.2)	18,600 (83.7)
	10 (254.0)	Two 5/8"	32,320 (145.4)	18,600 (83.7)	36,560 (164.5)	18,600 (83.7)	30,100 (134.4)	18,600 (83.7)	30,100 (134.4)	18,600 (83.7)	30,100 (134.4)	18,600 (83.7)
No.6 (3/4)	7 (177.8)	One 3/4"	18,840 (84.8)	26,400 (118.8)	20,480 (92.2)	26,400 (118.8)	21,220 (95.5)	26,400 (118.8)	28,600 (128.7)	26,400 (118.8)	34,330 (154.5)	26,400 (118.8)
	14 (355.6)	Two 3/4"	37,680 (169.6)	26,400 (118.8)	40,960 (184.3)	26,400 (118.8)	42,440 (191.0)	26,400 (118.8)	57,200 (257.4)	26,400 (118.8)	68,660 (309.0)	26,400 (118.8)
No.7 (7/8)	7 (177.8)	One 7/8"	21,200 (95.4)	36,000 (162.0)	22,660 (102.0)	36,000 (162.0)	25,730 (115.8)	36,000 (162.0)	34,920 (157.1)	36,000 (162.0)	38,400 (172.8)	29,500 (131.7)
	14 (355.6)	Two 7/8"	42,400 (190.8)	36,000 (162.0)	45,320 (203.9)	36,000 (162.0)	51,460 (231.6)	36,000 (162.0)	69,840 (314.3)	36,000 (162.0)	76,800 (345.6)	59,000 (263.4)
No.8 (1)	8-1/2 (215.9)	One 1"	22,520 (101.3)	47,400 (213.3)	26,290 (118.3)	47,400 (213.3)	35,070 (157.8)	47,400 (213.3)	38,905 (175.1)	47,400 (213.3)	47,600 (214.2)	47,400 (213.3)
	17 (431.8)	Two 1"	45,040 (202.7)	47,400 (213.3)	52,580 (236.6)	47,400 (213.3)	70,140 (315.6)	47,400 (213.3)	77,810 (350.1)	47,400 (213.3)	95,200 (428.4)	47,400 (213.3)

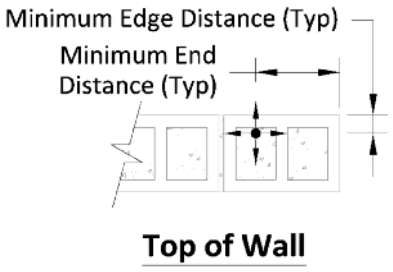
1. Ultimate load capacities should be reduced by a minimum safety factor of 4.0 or greater to determine the allowable working load. Consideration of safety factors of 10.0 or higher may be necessary depending on the application, such as life safety.
2. Linear interpolation may be used to determine ultimate load capacities for intermediate embedments and compressive strengths.

Allowable Load Capacities for Reinforcing Bar Installed with Hammer-Capsule in Normal-Weight Concrete[1,2,3]

Rebar Size No. (in)	Min. Embed. Depth h_v in. (mm)	Capsules Required	Minimum Concrete Compressive Strength (f'_c)									
			2,000 psi (13.8 MPa)		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)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)
No.3 (3/8)	3-1/2 (88.9)	One 3/8"	1,960 (8.8)	1,650 (7.4)	2,630 (11.8)	1,650 (7.4)	3,300 (14.9)	1,650 (7.4)	1,580 (17.1)	1,650 (7.4)	1,580 (17.1)	1,650 (7.4)
	7 (177.8)	Two 3/8"	3,920 (17.6)	1,650 (7.4)	5,260 (23.7)	1,650 (7.4)	6,600 (29.7)	1,650 (7.4)	3,160 (14.1)	1,650 (7.4)	3,160 (14.1)	1,650 (7.4)
No.4 (1/2)	4-1/2 (114.3)	One 1/2"	3,180 (14.3)	3,000 (13.5)	2,560 (11.4)	3,000 (13.5)	2,560 (11.4)	3,000 (13.5)	2,560 (11.4)	3,000 (13.5)	2,560 (11.4)	3,000 (13.5)
	9 (228.6)	Two 1/2"	6,360 (28.6)	3,000 (13.5)	5,115 (22.8)	3,000 (13.5)	5,115 (22.8)	3,000 (13.5)	5,115 (22.8)	3,000 (13.5)	5,115 (22.8)	3,000 (13.5)
No.5 (5/8)	5 (127.0)	One 5/8"	4,040 (18.2)	4,650 (20.9)	4,570 (20.6)	4,650 (20.9)	3,765 (16.8)	4,650 (20.9)	3,765 (16.8)	4,650 (20.9)	3,765 (16.8)	4,650 (20.9)
	10 (254.0)	Two 5/8"	8,080 (36.4)	4,650 (20.9)	9,140 (41.1)	4,650 (20.9)	7,525 (33.6)	4,650 (20.9)	7,525 (33.6)	4,650 (20.9)	7,525 (33.6)	4,650 (20.9)
No.6 (3/4)	7 (177.8)	One 3/4"	4,710 (21.2)	6,600 (29.7)	5,120 (23.0)	6,600 (29.7)	5,305 (23.9)	6,600 (29.7)	7,150 (32.2)	6,600 (29.7)	8,585 (38.6)	6,600 (29.7)
	14 (355.6)	Two 3/4"	9,420 (42.4)	6,600 (29.7)	10,240 (46.1)	6,600 (29.7)	10,610 (47.7)	6,600 (29.7)	14,300 (64.4)	6,600 (29.7)	17,165 (77.2)	6,600 (29.7)
No.7 (7/8)	7 (177.8)	One 7/8"	5,300 (23.9)	9,000 (40.5)	5,665 (25.5)	9,000 (40.5)	6,435 (29.0)	9,000 (40.5)	8,730 (39.3)	9,000 (40.5)	7,375 (32.9)	9,000 (40.5)
	14 (355.6)	Two 7/8"	10,600 (47.7)	9,000 (40.5)	11,330 (51.0)	9,000 (40.5)	12,865 (57.9)	9,000 (40.5)	17,460 (78.6)	9,000 (40.5)	14,750 (65.8)	9,000 (40.5)
No.8 (1)	8-1/2 (215.9)	One 1"	5,630 (25.3)	11,850 (53.3)	6,575 (29.6)	11,850 (53.3)	8,770 (39.5)	11,850 (53.3)	9,725 (43.8)	11,850 (53.3)	11,900 (53.6)	11,850 (53.3)
	17 (431.8)	Two 1"	11,260 (50.7)	11,850 (53.3)	13,145 (59.2)	11,850 (53.3)	17,535 (78.9)	11,850 (53.3)	19,455 (87.5)	11,850 (53.3)	23,800 (107.1)	11,850 (53.3)

1. Allowable bond capacities are calculated using an applied safety factor of 4.0. Consideration of safety factors of 10.0 or higher may be necessary depending on the application, such as life safety.
2. Linear interpolation may be used to determine allowable bond capacities for intermediate embedments and compressive strengths.
3. Allowable design load should be the lesser of the bond or allowable steel strength.

PERFORMANCE DATA



1. Tabulated load capacities are for anchors installed in minimum Grade N, Type II, lightweight, medium-weight or normal-weight concrete masonry units conforming to ASTM C 90 that are fully grouted and have reached a designated minimum compressive strength at the time of installation. Mortar must be Types N, S or M.
2. The allowable loads are calculated using a safety factor of 5.0. Consideration of safety factors of 10 or higher may be necessary depending on the application, such as life safety.
3. Masonry members must have a minimum nominal width of 8 inches with the exception of 3/8" and 1/2" diameter anchors which may be installed in minimum nominal 6-inch width masonry members.

Ultimate Load Capacities for Threaded Rod Installed with Hammer-Capsule in Grout-Filled Concrete Masonry[1,2,3]

Anchor installed in Cell Opening (Top of Wall) For Sill Plates and Other Attachments							
Anchor Diameter d in. (mm)	Drill Bit Diameter d_{bit} in.	Minimum Block Width in. (mm)	Minimum Embedment Depth h_v in. (mm)	Minimum Edge Distance in. (mm)	Minimum End Distance in. (mm)	Tension lbs. (kN)	Shear Towards the Edge lbs. (kN)
3/8 (9.5)	7/16	6 (152.4)	3-1/2 (88.9)	2-1/4 (57.2)	4 (101.6)	2,756 (12.4)	1,622 (7.3)
1/2 (12.7)	9/16	6 (152.4)	4-1/4 (108.0)	2-3/4 (69.9)	4 (101.6)	4,902 (22.0)	2,086 (9.3)
5/8 (15.9)	11/16	8 (203.2)	5 (127.0)	2-3/4 (69.9)	11-1/4 (285.8)	6,189 (27.7)	1,877 (8.4)
3/4 (19.1)	7/8	8 (203.2)	6-5/8 (168.3)	2-3/4 (69.9)	11-1/4 (285.8)	7,887 (35.3)	2,005 (9.0)
7/8 (22.2)	1	8 (203.2)	7 (177.8)	3-3/4 (95.3)	11-1/4 (285.8)	8,648 (38.8)	3,379 (15.1)
1 (25.4)	1-1/8	8 (203.2)	8 1/4 (209.6)	3-3/4 (95.3)	11-1/4 (285.8)	10,679 (47.9)	3,139 (14.1)

DESIGN CRITERIA (ALLOWABLE STRESS DESIGN)

Combined Loading

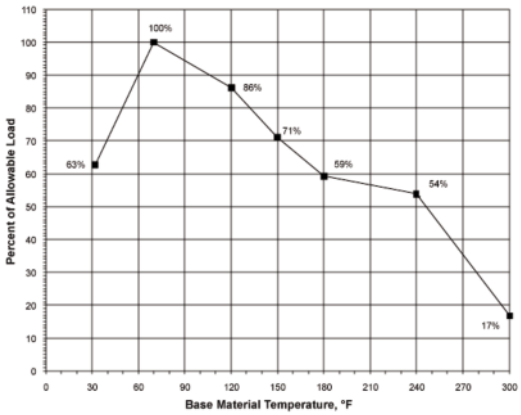
For anchors loaded in both shear and tension, the combination of loads should be proportioned as follows:

$$\left(\frac{N_u}{N_n}\right) + \left(\frac{V_u}{V_n}\right) \leq 1$$

Where: N_u = Applied Service Tension Load
N_n = Allowable Tension Load
V_u = Applied Service Shear Load
V_n = Allowable Shear Load

In-Service Temperature

Allowable tension and shear load bond strength reduction based on in-service temperature for the Hammer-Capsule adhesive.



Temperature Conversion		
Degree Fahrenheit (°F)	Degree Celsius (°C)	Percent Allowable Load (%)
32	0	63
70	21	100
120	49	86
150	65	71
180	82	59
240	115	54
300	149	17

Load Adjustment Factors for Spacing and Edge Distances

Anchor Installed in Normal-Weight Concrete					
Anchor Dimension	Load Type	Critical Distance (Full Anchor Capacity)	Critical Load Factor	Minimum Distance (Reduced Capacity)	Minimum Load Factor
Spacing (s)	Tension and Shear	$s_{cr} = 8d$	$F_{N_s} = F_{V_s} = 1.0$	$s_{min} = 4d$	$F_{N_s} = F_{V_s} = 0.70$
Edge Distance (c)	Tension	$c_{cr} = 8d$	$F_{N_c} = 1.0$	$c_{min} = 4d$	$F_{N_c} = 0.60$
	Shear	$c_{cr} = 12d$	$F_{V_c} = 1.0$	$c_{min} = 4d$	$F_{V_c} = 0.50$

DESIGN CRITERIA (ALLOWABLE STRESS DESIGN)

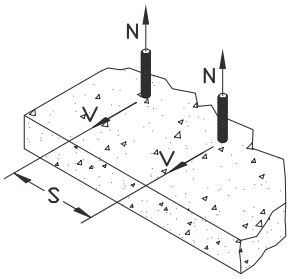
Load Adjustment Factors for Threaded Rod in Normal-Weight Concrete

Spacing, Tension (F_{N_s}) & Shear (F_{V_s})

Dia. (in.)		1/4	3/8	1/2	5/8	3/4	7/8	1
s_{cr} (in.)		2	3	4	5	6	7	8
s_{min} (in.)		1	1-1/2	2	2-1/2	3	3-1/2	4
Spacing, s (inches)	1	0.70						
	1-1/2	0.85	0.70					
	2	1.00	0.80	0.70				
	2-1/2		0.90	0.78	0.70			
	3		1.00	0.85	0.76	0.70		
	3-1/2			0.93	0.82	0.75	0.70	
	4			1.00	0.88	0.80	0.74	0.70
	5				1.00	0.90	0.83	0.78
	5-1/2					0.95	0.87	0.81
	6					1.00	0.91	0.85
	7						1.00	0.93
	8							1.00

Notes: For anchors loaded in tension and shear, the critical spacing (s_{cr}) is equal to 8 anchor diameters ($8d$) at which the anchor achieves 100% of load.

Minimum spacing (s_{min}) is equal to 4 anchor diameters ($4d$) at which the anchor achieves 70% of load.

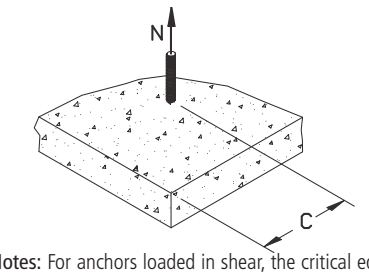


Edge Distance, Tension (F_{N_c})

Dia. (in.)		1/4	3/8	1/2	5/8	3/4	7/8	1
c_{cr} (in.)		2	3	4	5	6	7	8
c_{min} (in.)		1	1-1/2	2	2-1/2	3	3-1/2	4
Edge Distance, c (inches)	1	0.60						
	1-1/2	0.80	0.60					
	2	1.00	0.73	0.60				
	2-1/2		0.87	0.70	0.60			
	3		1.00	0.80	0.68	0.60		
	3-1/2			0.90	0.76	0.67	0.60	
	4			1.00	0.84	0.73	0.66	0.60
	5				1.00	0.87	0.77	0.70
	6					1.00	0.89	0.80
	7						1.00	0.90
	8							1.00

Notes: For anchors loaded in tension, the critical edge distance (c_{cr}) is equal to 8 anchor diameters ($8d$) at which the anchor achieves 100% of load.

Minimum edge distance (c_{min}) is equal to 4 anchor diameters ($4d$) at which the anchor achieves 60% of load.

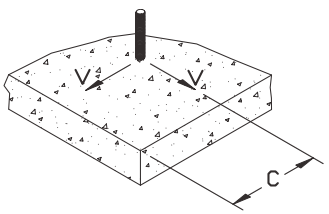


Edge Distance, Shear (F_{V_c})

Dia. (in.)		1/4	3/8	1/2	5/8	3/4	7/8	1
c_{cr} (in.)		3	4-1/2	6	7-1/2	9	10-1/2	12
c_{min} (in.)		1	1-1/2	2	2-1/2	3	3-1/2	4
Edge Distance, c (inches)	1-1/2	0.63	0.50					
	2	0.75	0.58	0.50				
	2-1/2	0.88	0.67	0.56	0.50			
	3	1.00	0.75	0.63	0.55	0.50		
	3-1/2		0.83	0.69	0.60	0.54	0.50	
	4		0.92	0.75	0.65	0.58	0.54	0.50
	4-1/2		1.00	0.81	0.70	0.63	0.57	0.53
	5			0.88	0.75	0.67	0.61	0.56
	5-1/2			0.94	0.80	0.71	0.64	0.59
	6			1.00	0.85	0.75	0.68	0.63
	7-1/2				1.00	0.88	0.79	0.72
	9					1.00	0.89	0.81
	10-1/2						1.00	0.91
	12							1.00

Notes: For anchors loaded in shear, the critical edge distance (c_{cr}) is equal to 12 anchor diameters ($12d$) at which the anchor achieves 100% of load.

Minimum edge distance (c_{min}) is equal to 4 anchor diameters ($4d$) at which the anchor achieves 50% of load.



ORDERING INFORMATION

Hammer-Capsule

Cat. No.	Description	Standard Box	Std. Carton
6702	3/8" Hammer-Capsule	10	500
6703	1/2" Hammer-Capsule	10	200
6704	5/8" Hammer-Capsule	10	100
6705	3/4" Hammer-Capsule	5	50
6706	7/8" Hammer-Capsule	5	50
6707	1" Hammer-Capsule	5	50

For availability of threaded rod please contact Powers Fasteners