SET-XP® High-Strength Epoxy Adhesive

SET-XP® epoxy anchoring adhesive is a high-strength formula for anchoring and doweling in cracked and uncracked concrete and masonry applications. It is a two-part system with the resin and hardener being simultaneously dispensed and mixed through the mixing nozzle. When properly mixed, adhesive will be a uniform teal color for easy post-installation identification.

Features

- 1:1 two-component, high-solids, epoxy-based anchoring adhesive formula
- Passed the demanding ICC-ES AC308 adverse-condition tests pertaining to elevated temperatures and long-term sustained loads
- Code listed under the IBC/IRC for cracked and uncracked concrete per ICC-ES ESR-2508
- Code listed under the IBC/IRC for masonry per IAPMO UES ER-265
- Suitable for use under static and seismic loading conditions in cracked and uncracked concrete and masonry
- Cure times: 24 hours at 70°F, 72 hours at 50°F
- Easy hole-cleaning – no power-brushing required
- Suitable for use in dry or water-saturated concrete
- For best results, store between 45°F and 90°F
- Available in 8.5 oz., 22 oz. and 56 oz. cartridges for application versatility
- Manufactured in the USA using global materials

SET-XP® Adhesive

Applications

- Threaded rod anchoring and rebar doweling into concrete and masonry
- Suitable for horizontal, vertical and overhead applications
- Multiple DOT listings – refer to **www.strongtie.com/DOT** for current approvals

Codes: ICC-ES ESR-2508 (concrete); IAPMO UES ER-265 (masonry); City of L.A. RR25744 (concrete), RR25965 (masonry); Florida FL-17449.2 (concrete), FL-16230.3 (masonry); AASHTO M-235 and ASTM C881 (Type I and IV, Grade 3, Class C); NSF/ANSI Standard 61 (216 in.^{2}/1,000 gal.)

Chemical Resistance

See pages 320–321.

Installation and Application Instructions

(See also pages 124–127.)

- Surfaces to receive epoxy must be clean.
- Base material temperature must be 50°F or above at the time of installation. For best results, material should be between 70°F and 80°F at time of application.
- To warm cold material, store cartridges in a warm, uniformly heated area or storage container. Do not immerse cartridges in water to facilitate warming.
- Mixed material in nozzle can harden in 30 minutes at temperatures of 70°F and above.

Design Example

See page 328.

Suggested Specifications

See **www.strongtie.com** for more information.

SET-XP® High-Strength Epoxy Adhesive

Test Criteria

Anchors installed with SET-XP® adhesive have been tested in accordance with ICC-ES *Acceptance Criteria for Post-Installed Adhesive Anchors in Masonry Elements* (AC58) and *Adhesive Anchors in Concrete Elements* (AC308).

Property	Test Method	Result*
Consistency	ASTM C881	Passed, non-sag
Glass transition temperature	ASTM E1356	155°F
Bond strength (moist cure)	ASTM C882	3,742 psi at 2 days
Water absorption	ASTM D570	0.10%
Compressive yield strength	ASTM D695	14,830 psi
Compressive modulus	ASTM D695	644,000 psi
Shore D Durometer	ASTM D2240	84
Gel time	ASTM C881	49 minutes
Volatile Organic Compound (VOC)	—	3 g/L

*Material and curing conditions: 73 ± 2°F, unless otherwise noted.

SET-XP® Cartridge System

Model No.	Capacity (ounces)	Cartridge Type	Carton Quantity	Dispensing Tool(s)	Mixing Nozzle
SET-XP10[4]	8.5	Single	12	CDT10S	EMN22i
SET-XP22-N[5]	22	Side-by-Side	10	EDT22S, EDTA22P, EDTA22CKT	
SET-XP56	56	Side-by-Side	6	EDTA56P	

1. Cartridge estimation guidelines are available at www.strongtie.com/apps.
2. Detailed information on dispensing tools, mixing nozzles and other adhesive accessories is available on pages 128 through 135, or at www.strongtie.com.
3. Use only Simpson Strong-Tie® mixing nozzles in accordance with Simpson Strong-Tie instructions. Modification or improper use of mixing nozzle may impair SET-XP adhesive performance.
4. Two EMN22i mixing nozzles and two nozzle extensions are supplied with each cartridge.
5. One EMN22i mixing nozzle and one nozzle extension are provided with each cartridge.

Cure Schedule

Base Material Temperature		Cure Time (hrs.)
°F	°C	
50	10	72
60	16	48
70	21	24
90	32	24
110	43	24

For water-saturated concrete, the cure times must be doubled.

SET-XP® Installation Information and Additional Data for Threaded Rod and Rebar in Normal-Weight Concrete[1]

IBC *

Characteristic		Symbol	Units	Nominal Anchor Diameter (in.) / Rebar Size						
				⅜ / #3	½ / #4	⅝ / #5	¾ / #6	⅞ / #7	1 / #8	1¼ / #10
Installation Information										
Drill Bit Diameter		d_{hole}	in.	½	⅝	¾	⅞	1	1⅛	1⅜
Maximum Tightening Torque		T_{inst}	ft.-lb.	10	20	30	45	60	80	125
Permitted Embedment Depth Range	Minimum	h_{ef}	in.	2⅜	2¾	3⅛	3½	3¾	4	5
	Maximum	h_{ef}	in.	7½	10	12½	15	17½	20	25
Minimum Concrete Thickness		h_{min}	in.	$h_{ef} + 5d_o$						
Critical Edge Distance[2]		c_{ac}	in.	See footnote 2						
Minimum Edge Distance		c_{min}	in.	1¾						2¾
Minimum Anchor Spacing		s_{min}	in.	3						6

1. The information presented in this table is to be used in conjunction with the design criteria of ACI 318-11.
2. $c_{ac} = h_{ef} (\tau_{k,uncr}/1160)^{0.4} \times [3.1 - 0.7(h/h_{ef})]$, where:
   $[h/h_{ef}] \leq 2.4$
   $\tau_{k,uncr}$ = the characteristic bond strength in uncracked concrete, given in the tables that follow $\leq k_{uncr} ((h_{ef} \times f'_c)^{0.5}/(\pi \times d_a))$
   h = the member thickness (inches)
   h_{ef} = the embedment depth (inches)

* See page 12 for an explanation of the load table icons.

SET-XP® Design Information — Concrete

SET-XP® Tension Strength Design Data for Threaded Rod in Normal-Weight Concrete[1]

Characteristic			Symbol	Units	Nominal Anchor Diameter (in.)						
					⅜	½	⅝	¾	⅞	1	1¼
Steel Strength in Tension											
Threaded Rod	Minimum Tensile Stress Area		A_{se}	in²	0.078	0.142	0.226	0.334	0.462	0.606	0.969
	Tension Resistance of Steel — ASTM F1554, Grade 36		N_{sa}	lb.	4,525	8,235	13,110	19,370	26,795	35,150	56,200
	Tension Resistance of Steel — ASTM A193, Grade B7				9,750	17,750	28,250	41,750	57,750	75,750	121,125
	Tension Resistance of Steel — Type 410 Stainless (ASTM A193, Grade B6)				8,580	15,620	24,860	36,740	50,820	66,660	106,590
	Tension Resistance of Steel — Type 304 and 316 Stainless (ASTM A193, Grade B8 & B8M)				4,445	8,095	12,880	19,040	26,335	34,540	55,235
	Strength Reduction Factor — Steel Failure		ϕ	—	0.75[7]						
Concrete Breakout Strength in Tension (2,500 psi ≤ f'_c ≤ 8,000 psi)[12]											
Effectiveness Factor — Uncracked Concrete			k_{uncr}	—	24						
Effectiveness Factor — Cracked Concrete			k_{cr}	—	17						
Strength Reduction Factor — Breakout Failure			ϕ	—	0.65[9]						
Bond Strength in Tension (2,500 psi ≤ f'_c ≤ 8,000 psi)[12]											
Uncracked Concrete[2,3,4]	Characteristic Bond Strength[5,13]		$\tau_{k,uncr}$	psi	770	1,150	1,060	970	885	790	620
	Permitted Embedment Depth Range	Minimum	h_{ef}	in.	2⅜	2¾	3⅛	3½	3¾	4	5
		Maximum			7½	10	12½	15	17½	20	25
Cracked Concrete[2,3,4]	Characteristic Bond Strength[5,10,11,13]		$\tau_{k,cr}$	psi	595	510	435	385	355	345	345
	Permitted Embedment Depth Range	Minimum	h_{ef}	in.	3	4	5	6	7	8	10
		Maximum			7½	10	12½	15	17½	20	25
Bond Strength in Tension — Bond Strength Reduction Factors for Continuous Special Inspection											
Strength Reduction Factor — Dry Concrete			$\phi_{dry,ci}$	—	0.65[8]						
Strength Reduction Factor — Water-saturated Concrete — $h_{ef} \leq 12d_a$			$\phi_{sat,ci}$	—	0.55[8]		0.45[8]				
Additional Factor for Water-saturated Concrete — $h_{ef} \leq 12d_a$			$K_{sat,ci}$[6]	—	N/A		1			0.84	
Strength Reduction Factor — Water-saturated Concrete — $h_{ef} > 12d_a$			$\phi_{sat,ci}$	—	0.45[8]						
Additional Factor for Water-saturated Concrete — $h_{ef} > 12d_a$			$K_{sat,ci}$[6]	—	0.57						
Bond Strength in Tension — Bond Strength Reduction Factors for Periodic Special Inspection											
Strength Reduction Factor — Dry Concrete			$\phi_{dry,pi}$	—	0.55[8]						
Strength Reduction Factor — Water-saturated Concrete — $h_{ef} \leq 12d_a$			$\phi_{sat,pi}$	—	0.45[8]						
Additional Factor for Water-saturated Concrete — $h_{ef} \leq 12d_a$			$K_{sat,pi}$[6]	—	1		0.93			0.71	
Strength Reduction Factor — Water-saturated Concrete — $h_{ef} > 12d_a$			$\phi_{sat,pi}$	—	0.45[8]						
Additional Factor for Water-saturated Concrete — $h_{ef} > 12d_a$			$K_{sat,pi}$[6]	—	0.48						

1. The information presented in this table is to be used in conjunction with the design criteria of ACI 318-11.
2. Temperature Range: Maximum short-term temperature of 150°F. Maximum long-term temperature of 110°F.
3. Short-term concrete temperatures are those that occur over short intervals (diurnal cycling).
4. Long-term concrete temperatures are constant temperatures over a significant time period.
5. For anchors that only resist wind or seismic loads, bond strengths may be increased b 72%.
6. In water-saturated concrete, multiply $\tau_{k,uncr}$ and $\tau_{k,cr}$ by K_{sat}.
7. The value of ϕ applies when the load combinations of ACI 318 Section 9.2 are used. If the load combinations of ACI 318 Appendix C are used, refer to Section D.4.4 to determine the appropriate value of ϕ.
8. The value of ϕ applies when both the load combinations of ACI 318 Section 9.2 are used and the requirements of Section D.4.4 (c) for Condition B are met. If the load combinations of ACI 318 Appendix C are used, refer to Section D.4.4 to determine the appropriate value of ϕ.
9. The value of ϕ applies when both the load combinations of ACI 318 Section 9.2 are used and the requirements of Section D.4.4 (c) for Condition B are met. If the load combinations of ACI 318 Section 9.2 are used and the requirements of Section D.4.4 (c) for Condition A are met, refer to Section D.4.4 to determine the appropriate value of ϕ. If the load combinations of ACI 318 Appendix C are used, refer to Section D.4.5 to determine the appropriate value of ϕ.
10. For anchors installed in regions assigned to Seismic Design Category C, D, E or F, the bond strength values for ⅞" anchors must be multiplied by $\alpha_{N,seis}$ = 0.80.
11. For anchors installed in regions assigned to Seismic Design Category C, D, E or F, the bond strength values for 1" anchors must be multiplied by $\alpha_{N,seis}$ = 0.92.
12. The values of f'_c used for calculation purposes must not exceed 8,000 psi (55.1 MPa) for uncracked concrete. The value of f'_c used for calculation purposes must not exceed 2,500 psi (17.2 MPa) for tension resistance in cracked concrete.
13. For applications where maximum short-term temperature is 110ºF (43ºC) and the maximum long-term temperature is 75ºF (24ºC), bond strengths may be increased 93%. No additional increase is permitted for anchors that only resist wind or seismic loads.

* See page 12 for an explanation of the load table icons.

SET-XP® Design Information — Concrete

SIMPSON Strong-Tie®

IBC *

SET-XP® Tension Strength Design Data for Rebar in Normal-Weight Concrete[1]

Characteristic			Symbol	Units	Rebar Size #3	#4	#5	#6	#7	#8	#10
Steel Strength in Tension											
Rebar	Minimum Tensile Stress Area		A_{se}	in²	0.11	0.2	0.31	0.44	0.6	0.79	1.23
Rebar	Tension Resistance of Steel — Rebar (ASTM A615 Grade 60)		N_{sa}	lb.	9,900	18,000	27,900	39,600	54,000	71,100	110,700
Rebar	Strength Reduction Factor – Steel Failure		ϕ	—	0.65[7]						
Concrete Breakout Strength in Tension (2,500 psi ≤ f'c ≤ 8,000 psi)[10]											
Effectiveness Factor — Uncracked Concrete			k_{uncr}	—	24						
Effectiveness Factor — Cracked Concrete			k_{cr}	—	17						
Strength Reduction Factor — Breakout Failure			ϕ	—	0.65[9]						
Bond Strength in Tension (2,500 psi ≤ f'c ≤ 8,000 psi)[10]											
Uncracked Concrete[2,3,4]	Characteristic Bond Strength[5,11]		$\tau_{k,uncr}$	psi	895	870	845	820	795	770	720
Uncracked Concrete[2,3,4]	Permitted Embedment Depth Range	Minimum	h_{ef}	in.	2⅜	2¾	3⅛	3½	3¾	4	5
Uncracked Concrete[2,3,4]	Permitted Embedment Depth Range	Maximum	h_{ef}	in.	7½	10	12½	15	17½	20	25
Cracked Concrete[2,3,4]	Characteristic Bond Strength[5,11]		$\tau_{k,cr}$	psi	365	735	660	590	515	440	275
Cracked Concrete[2,3,4]	Permitted Embedment Depth Range	Minimum	h_{ef}	in.	3	4	5	6	7	8	10
Cracked Concrete[2,3,4]	Permitted Embedment Depth Range	Maximum	h_{ef}	in.	7½	10	12½	15	17½	20	25
Bond Strength in Tension — Bond Strength Reduction Factors for Continuous Special Inspection											
Strength Reduction Factor – Dry Concrete			$\phi_{dry,ci}$	—	0.65[8]						
Strength Reduction Factor – Water-saturated Concrete - $h_{ef} \le 12d_a$			$\phi_{sat,ci}$	—	0.55[8]		0.45[8]				
Additional Factor for Water-saturated Concrete - $h_{ef} \le 12d_a$			$K_{sat,ci}$[6]	—	N/A		1			0.84	
Strength Reduction Factor – Water-saturated Concrete - $h_{ef} > 12d_a$			$\phi_{sat,ci}$	—	0.45[8]						
Additional Factor for Water-saturated Concrete - $h_{ef} > 12d_a$			$K_{sat,ci}$[6]	—	0.57						
Bond Strength in Tension — Bond Strength Reduction Factors for Periodic Special Inspection											
Strength Reduction Factor – Dry Concrete			$\phi_{dry,pi}$	—	0.55[8]						
Strength Reduction Factor – Water-saturated Concrete - $h_{ef} \le 12d_a$			$\phi_{sat,pi}$	—	0.45[8]						
Additional Factor for Water-saturated Concrete - $h_{ef} \le 12d_a$			$K_{sat,pi}$[6]	—	1		0.93			0.71	
Strength Reduction Factor – Water-saturated Concrete - $h_{ef} > 12d_a$			$\phi_{sat,pi}$	—	0.45[8]						
Additional Factor for Water-saturated Concrete - $h_{ef} > 12d_a$			$K_{sat,pi}$[6]	—	0.48						

1. The information presented in this table is to be used in conjunction with the design criteria of ACI 318-11.
2. Temperature Range: Maximum short-term temperature of 150°F. Maximum long-term temperature of 110°F.
3. Short-term concrete temperatures are those that occur over short intervals (diurnal cycling).
4. Long-term concrete temperatures are constant temperatures over a significant time period.
5. For anchors that only resist wind or seismic loads, bond strengths may be increased b 72%.
6. In water-saturated concrete, multiply $\tau_{k,uncr}$ and $\tau_{k,cr}$ by K_{sat}.
7. The value of ϕ applies when the load combinations of ACI 318 Section 9.2 are used. If the load combinations of ACI 318 Appendix C are used, refer to Section D.4.5 to determine the appropriate value of ϕ.
8. The value of ϕ applies when both the load combinations of ACI 318 Section 9.2 are used and the requirements of Section D.4.4 (c) for Condition B are met. If the load combinations of ACI 318 Appendix C are used, refer to Section D.4.5 to determine the appropriate value of ϕ.
9. The value of ϕ applies when both the load combinations of ACI 318 Section 9.2 are used and the requirements of Section D.4.4 (c) for Condition B are met. If the load combinations of ACI 318 Section 9.2 are used and the requirements of Section D.4.4 (c) for Condition A are met, refer to Section D.4.4 to determine the appropriate value of ϕ. If the load combinations of ACI 318 Appendix C are used, refer to Section D.4.5 to determine the appropriate value of ϕ.
10. The values of f'_c used for calculation purposes must not exceed 8,000 psi (55.1 MPa) for uncracked concrete. The value of f'_c used for calculation purposes must not exceed 2,500 psi (17.2 MPa) for tension resistance in cracked concrete.
11. For applications where maximum short-term temperature is 110°F (43°C) and the maximum long-term temperature is 75°F (24°C), bond strengths may be increased 93%. No additional increase is permitted for anchors that only resist wind or seismic loads.

* See page 12 for an explanation of the load table icons.

SET-XP® Design Information — Concrete

SET-XP® Shear Strength Design Data for Threaded Rod in Normal-Weight Concrete[1]

	Characteristic	Symbol	Units	Nominal Anchor Diameter (in.)						
				⅜	½	⅝	¾	⅞	1	1¼
Steel Strength in Shear										
Threaded Rod	Minimum Shear Stress Area	A_{se}	in.²	0.078	0.142	0.226	0.334	0.462	0.606	0.969
Threaded Rod	Shear Resistance of Steel — ASTM F1554, Grade 36	V_{sa}	lb.	2,260	4,940	7,865	11,625	16,080	21,090	33,720
Threaded Rod	Shear Resistance of Steel — ASTM A193, Grade B7	V_{sa}	lb.	4,875	10,650	16,950	25,050	34,650	45,450	72,675
Threaded Rod	Shear Resistance of Steel — Type 410 Stainless (ASTM A193, Grade B6)	V_{sa}	lb.	4,290	9,370	14,910	22,040	30,490	40,000	63,955
Threaded Rod	Shear Resistance of Steel — Type 304 and 316 Stainless (ASTM A193, Grade B8 & B8M)	V_{sa}	lb.	2,225	4,855	7,730	11,420	15,800	20,725	33,140
Threaded Rod	Reduction for Seismic Shear — ASTM F1554, Grade 36	$\alpha_{V,seis}$[5]	—	0.87	0.78	0.68				0.65
Threaded Rod	Reduction for Seismic Shear — ASTM A193, Grade B7	$\alpha_{V,seis}$[5]	—	0.87	0.78	0.68				0.65
Threaded Rod	Reduction for Seismic Shear — Stainless (ASTM A193, Grade B6)	$\alpha_{V,seis}$[5]	—	0.69	0.82	0.75			0.83	0.72
Threaded Rod	Reduction for Seismic Shear — Stainless (ASTM A193, Grade B8 & B8M)	$\alpha_{V,seis}$[5]	—	0.69	0.82	0.75			0.83	0.72
Threaded Rod	Strength Reduction Factor — Steel Failure	ϕ	—	0.65[2]						
Concrete Breakout Strength in Shear										
	Outside Diameter of Anchor	d_o	in.	0.375	0.5	0.625	0.75	0.875	1	1.25
	Load Bearing Length of Anchor in Shear	ℓ_e	in.	h_{ef}						
	Strength Reduction Factor — Breakout Failure	ϕ	—	0.70[3]						
Concrete Pryout Strength in Shear										
	Coefficient for Pryout Strength	k_{cp}	—	1.0 for h_{ef} < 2.50"; 2.0 for $h_{ef} \geq$ 2.50"						
	Strength Reduction Factor — Pryout Failure	ϕ	—	0.70[4]						

1. The information presented in this table is to be used in conjunction with the design criteria of ACI 318-11.
2. The value of ϕ applies when the load combinations of ACI 318 Section 9.2 are used. If the load combinations of ACI 318 Appendix C are used, refer to Section D.4.4 to determine the appropriate value of ϕ.
3. The value of ϕ applies when both the load combinations of ACI 318 Section 9.2 are used and the requirements of Section D.4.3 (c) for Condition B are met. If the load combinations of ACI 318 Section 9.2 are used and the requirements of Section D.4.3 (c) for Condition A are met, refer to Section D.4.3 to determine the appropriate value of ϕ. If the load combinations of ACI 318 Appendix C are used, refer to Section D.4.4 to determine the appropriate value of ϕ.
4. The value of ϕ applies when both the load combinations of ACI 318 Section 9.2 are used and the requirements of Section D.4.3 (c) for Condition B are met. If the load combinations of ACI 318 Appendix C are used, refer to Section D.4.4 to determine the appropriate value of ϕ.
5. The values of V_{sa} are applicable for both cracked concrete and uncracked concrete. For anchors installed in regions assigned to Seismic Design Category C, D, E or F, V_{sa} must be multiplied by $\alpha_{V,seis}$ for the corresponding anchor steel type.

* See page 12 for an explanation of the load table icons.

SET-XP® Design Information — Concrete

SET-XP® Shear Strength Design Data for Rebar in Normal-Weight Concrete[1]

Characteristic		Symbol	Units	Rebar Size						
				#3	#4	#5	#6	#7	#8	#10
Steel Strength in Shear										
Rebar	Minimum Shear Stress Area	A_{se}	in²	0.11	0.2	0.31	0.44	0.6	0.79	1.23
	Shear Resistance of Steel — Rebar (ASTM A615 Grade 60)	V_{sa}	lb.	4,950	10,800	16,740	23,760	32,400	42,660	66,420
	Reduction for Seismic Shear — Rebar (ASTM A615 Grade 60)	$\alpha_{V,seis}$[5]	—	0.85	0.88	0.84		0.77		0.59
	Strength Reduction Factor — Steel Failure	ϕ	—	0.60[2]						
Concrete Breakout Strength in Shear										
Outside Diameter of Anchor		d_o	in.	0.375	0.5	0.625	0.75	0.875	1	1.25
Load-Bearing Length of Anchor in Shear		ℓ_e	in.	h_{ef}						
Strength Reduction Factor — Breakout Failure		ϕ	—	0.70[3]						
Concrete Pryout Strength in Shear										
Coefficient for Pryout Strength		k_{cp}	—	1.0 for $h_{ef} < 2.50$"; 2.0 for $h_{ef} \geq 2.50$"						
Strength Reduction Factor — Pryout Failure		ϕ	—	0.70[4]						

1. The information presented in this table is to be used in conjunction with the design criteria of ACI 318-11.
2. The value of ϕ applies when the load combinations of ACI 318 Section 9.2 are used. If the load combinations of ACI 318 Appendix C are used, refer to Section D.4.4 to determine the appropriate value of ϕ.
3. The value of ϕ applies when both the load combinations of ACI 318 Section 9.2 are used and the requirements of Section D.4.3 (c) for Condition B are met. If the load combinations of ACI 318 Section 9.2 are used and the requirements of Section D.4.3 (c) for Condition A are met, refer to Section D.4.3 to determine the appropriate value of ϕ. If the load combinations of ACI 318 Appendix C are used, refer to Section D.4.4 to determine the appropriate value of ϕ.
4. The value of ϕ applies when both the load combinations of ACI 318 Section 9.2 are used and the requirements of Section D.4.3 (c) for Condition B are met. If the load combinations of ACI 318 Appendix C are used, refer to Section D.4.4 to determine the appropriate value of ϕ.
5. The values of V_{sa} are applicable for both cracked concrete and uncracked concrete. For anchors installed in regions assigned to Seismic Design Category C, D, E or F, V_{sa} must be multiplied by $\alpha_{V,seis}$.

* See page 12 for an explanation of the load table icons.

SET-XP® Design Information — Concrete

SET-XP® Development Length for Rebar Dowels in Normal-Weight Concrete[1,2,3,4,5,6] IBC *

Rebar Size	Top Cover in. (mm)	Development Length, in. (mm)				
		f'_c = 2,500 psi (17.2 MPa) Concrete	f'_c = 3,000 psi (20.7 MPa) Concrete	f'_c = 4,000 psi (27.6 MPa) Concrete	f'_c = 6,000 psi (41.4 MPa) Concrete	f'_c = 8,000 psi (55.2 MPa) Concrete
#3 (9.5)	1½ (38)	12 (305)	12 (305)	12 (305)	12 (305)	12 (305)
#4 (12.7)	1½ (38)	15 (381)	14 (356)	12 (305)	12 (305)	12 (305)
#5 (15.9)	1½ (38)	18 (457)	17 (432)	15 (381)	12 (305)	12 (305)
#6 (19.1)	1½ (38)	22 (559)	20 (508)	18 (457)	14 (356)	13 (330)
#7 (22.2)	3 (76)	32 (813)	29 (737)	25 (635)	21 (533)	18 (457)
#8 (25.4)	3 (76)	36 (914)	33 (838)	29 (737)	24 (610)	21 (533)
#9 (28.7)	3 (76)	41 (1041)	38 (965)	33 (838)	27 (686)	23 (584)
#10 (32.3)	3 (76)	46 (1168)	42 (1067)	37 (940)	30 (762)	26 (660)
#11 (35.8)	3 (76)	51 (1295)	47 (1194)	41 (1041)	33 (838)	29 (737)

1. Tabulated development lengths are for static, wind and seismic load cases in Seismic Design Category A and B.
2. Rebar is assumed to be ASTM A615 Grade 60 or A706 (f_y = 60,000 psi). For rebar with a higher yield strength, multiply tabulated values by f_y / 60,000 psi.
3. Concrete is assumed to be normal-weight concrete. For lightweight concrete, multiply tabulated values by 1.33.
4. Tabulated values assume bottom cover of less than 12 inches cast below rebars (Ψ_t = 1.0).
5. Uncoated rebar must be used.
6. The value of K_{tr} is assumed to be 0. Refer to ACI 318 Section 12.2.3.

* See page 12 for an explanation of the load table icons.

SET-XP® Design Information — Concrete

SET-XP® Tension Design Strength for Threaded Rod Anchors in Normal-Weight Concrete (f'_c = 2,500 psi)

IBC *

Rod Dia. (in.)	Nominal Embed. Depth (in.)	Minimum Dimensions for Uncracked (in.)		Minimum Dimensions for Cracked (in.)		Tension Design Strength Based on Concrete or Bond (lb.)							
						Edge Distances = c_{ac} on all sides				Edge Distances = 1¾" on one side and c_{ac} on three sides			
						SDC A-B[6]		SDC C-F[7,8]		SDC A-B[6]		SDC C-F[7,8]	
		h_a	c_{ac}	h_a	c_{ac}	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked
⅜	2⅜	4¼ 5¾	3¾ 3⅝	—	—	1,185	—	890	—	675 800	—	505 600	—
	3	4⅞ 7¼	5 4½	4⅞	3¼	1,500	1,150	1,125	865	635 880	775	475 660	585
	4½	6⅜ 10⅞	8⅛ 6¾	6⅜	3¼	2,250	1,725	1,685	1,295	590 880	1,165	445 660	875
	6	7⅞ 14½	11⅛ 9	7⅞	4⅜	2,995	2,300	**2,250**	1,725	570 880	1,555	430 660	1,165
	7½	9⅜ 18	14¼ 11¼	9⅜	5⅜	3,745	2,875	**2,810**	2,160	560 880	1,945	420 660	1,455
½	2¾	5¼ 6⅝	5⅛ 5⅛	—	—	2,730	—	2,050	—	1,470 1,470	—	1,105 1,105	—
	4	6½ 9⅝	7⅞ 6	6½	5⅛	3,975	1,755	2,980	1,315	1,400 1,935	945	1,050 1,450	710
	6	8½ 14½	12⅝ 9	8½	5⅛	5,960	2,635	**4,470**	1,975	1,300 1,935	1,420	975 1,450	1,065
	8	10½ 19¼	17½ 12	10½	5¼	7,950	3,510	**5,960**	2,635	1,260 1,935	1,890	945 1,450	1,420
	10	12½ 24	22¼ 15	12½	6⅜	9,935	4,390	**7,450**	3,290	1,235 1,935	2,365	925 1,450	1,775
⅝	3⅛	6¼ 7½	6¼ 6¼	—	—	3,580	—	2,685	—	1,805 1,805	—	1,355 1,355	—
	5	8⅛ 12	9½ 7½	8⅛	6¼	5,730	2,335	4,295	1,750	1,875 2,590	1,175	1,405 1,945	885
	7½	10⅝ 18	15⅜ 11¼	10⅝	6¼	8,595	3,500	6,445	2,625	1,745 2,590	1,765	1,310 1,945	1,325
	12½	15⅝ 30	26⅞ 18¾	15⅝	7⅝	14,320	5,830	**10,740**	4,375	1,655 2,590	2,945	1,240 1,945	2,210
¾	3½	7¼ 8½	7⅛ 7⅛	—	—	4,385	—	3,290	—	2,120 2,120	—	1,590 1,590	—
	6	9¾ 14½	11 9	9¾	7⅛	7,520	3,000	5,640	2,250	2,335 3,230	1,450	1,750 2,420	1,090
	9	12¾ 21⅝	17¾ 13½	12¾	7⅛	11,280	4,500	8,460	3,375	2,175 3,230	2,180	1,630 2,420	1,635
	15	18¾ 36	31⅛ 22½	18¾	9	18,795	7,505	**14,100**	5,625	2,060 3,230	3,630	1,545 2,420	2,720
⅞	3¾	8⅛ 9	7⅞ 7⅞	—	—	5,020	—	3,010	—	2,355 2,355	—	1,410 1,410	—
	7	11⅜ 16⅞	12⅜ 10½	11⅜	7⅞	9,365	3,745	5,620	2,250	2,795 3,865	1,755	1,680 2,320	1,055
	10½	14⅞ 25¼	19⅞ 15¾	14⅞	7⅞	14,050	5,620	8,430	3,370	2,605 3,865	2,635	1,560 2,320	1,580
	17½	21⅞ 42	35 26¼	21⅞	10	23,415	9,365	**14,050**	5,620	2,465 3,865	4,390	1,480 2,320	2,635
1	4	9 9⅝	8½ 8½	—	—	5,455	—	3,765	—	2,505 2,505	—	1,730 1,730	—
	8	13 19¼	13½ 12	13	8½	10,905	4,755	7,525	3,280	3,155 4,360	2,185	2,175 3,010	1,510
	12	17 28⅞	21¾ 18	17	8½	16,360	7,135	11,290	4,920	2,935 4,360	3,280	2,025 3,010	2,265
	20	25 48	38¼ 30	25	12¼	27,265	11,890	**18,815**	8,205	2,785 4,360	5,465	1,920 3,010	3,770
1¼	5	11¼ 12	9½ 9½	—	—	6,705	—	5,030	—	—	—	—	—
	10	16¼ 24	15⅜ 15	16¼	9½	13,415	7,430	10,060	5,570	—	—	—	—
	15	21¼ 36	24¾ 22½	21¼	11⅛	20,120	11,145	15,090	8,360	—	—	—	—
	25	31¼ 60	43⅜ 37½	31¼	15⅝	33,530	18,575	25,150	13,930	—	—	—	—

Threaded Rod Dia. (in.)	Tension Design Strength of Threaded Rod Steel (lb)					
	ASTM F1554, GR 36	ASTM F1554, GR 55	ASTM F1554, GR 105	ASTM A193, B6	ASTM A193, B7	ASTM A193, B8/B8M
⅜	3,370	4,360	7,270	6,395	7,270	3,310
½	6,175	7,990	13,315	11,715	13,315	6,070
⅝	9,835	12,715	21,190	18,645	21,190	9,660
¾	14,530	18,790	31,315	27,555	31,315	14,280
⅞	20,095	25,990	43,315	38,115	43,315	19,750
1	26,365	34,090	56,815	49,995	56,815	25,905
1¼	42,150	54,505	90,845	79,945	90,845	41,425

1. Tension design strength must be the lesser of the concrete, bond or threaded rod steel design strength.
2. Tension design strengths are based on the strength design provisions of ACI 318-11 Appendix D assuming dry concrete, periodic inspection, short-term temperature of 150°F and long-term temperature of 110°F.
3. Tabulated values are for a single anchor with no influence of another anchor.
4. Interpolation between embedment depths is not permitted.
5. Strength reduction factor, ϕ, is based on using a load combination from ACI 318-11 Section 9.2.
6. The tension design strength listed for SDC (Seismic Design Category) A-B may also be used in SDC C-F when the tension component of the strength-level seismic design load on the anchor does not exceed 20% of the total factored tension load on the anchor associated with the same load combination.
7. When designing anchorages in SDC C-F, the Designer shall consider the ductility requirements of ACI 318-11 Section D.3.3. Design strengths in **Bold** indicate that the anchor ductility requirements of D.3.3.4.3 (a)1 to 3 are satisfied when using ASTM F1554 Grade 36 threaded rod. Any other ductility requirements must be satisfied.
8. Tension design strengths in SDC C-F have been adjusted by 0.75 factor in accordance with ACI 318-11 Section D.3.3.4.4.

* See page 12 for an explanation of the load table icons.

SET-XP® Design Information — Concrete

SET-XP® Allowable Tension Loads for Threaded Rod Anchors in Normal-Weight Concrete (f'_c = 2,500 psi) — Static Load

Rod Dia. (in.)	Nominal Embed. Depth (in.)	Minimum Dimensions for Uncracked (in.)		Minimum Dimensions for Cracked (in.)		Allowable Tension Load Based on Concrete or Bond (lb.)			
						Edge distances = c_{ac} on all sides		Edge Distances = 1¾" on one side and C_{ac} on three sides	
		h_a	c_{ac}	h_a	c_{ac}	Uncracked	Cracked	Uncracked	Cracked
⅜	2⅜	4¼ 5¾	3¾ 3⅝	—	—	845	—	480 570	—
	3	4⅞ 7¼	5 4½	4⅞	3¼	1,070	820	455 630	555
	4½	6⅜ 10⅞	8⅛ 6¾	6⅜	3¼	1,605	1,230	420 630	830
	6	7⅞ 14½	11⅛ 9	7⅞	4⅜	2,140	1,645	405 630	1,110
	7½	9⅜ 18	14¼ 11¼	9⅜	5⅜	2,675	2,055	400 630	1,390
½	2¾	5¼ 6⅝	5⅛ 5⅛	—	—	1,950	—	1,050 1,050	—
	4	6½ 9⅝	7⅞ 6	6½	5⅛	2,840	1,255	1,000 1,380	675
	6	8½ 14½	12⅝ 9	8½	5⅛	4,255	1,880	930 1,380	1,015
	8	10½ 19¼	17½ 12	10½	5¼	5,680	2,505	900 1,380	1,350
	10	12½ 24	22¼ 15	12½	6⅜	7,095	3,135	880 1,380	1,690
⅝	3⅛	6¼ 7½	6¼ 6¼	—	—	2,555	—	1,290 1,290	—
	5	8⅛ 12	9½ 7½	8⅛	6¼	4,095	1,670	1,340 1,850	840
	7½	10⅝ 18	15⅜ 11¼	10⅝	6¼	6,140	2,500	1,245 1,850	1,260
	12½	15⅝ 30	26⅞ 18¾	15⅝	7⅝	10,230	4,165	1,180 1,850	2,105
¾	3½	7¼ 8½	7⅛ 7⅛	—	—	3,130	—	1,515 1,515	—
	6	9¾ 14½	11 9	9¾	7⅛	5,370	2,145	1,670 2,305	1,035
	9	12¾ 21⅝	17¾ 13½	12¾	7⅛	8,055	3,215	1,555 2,305	1,555
	15	18¾ 36	31⅛ 22½	18¾	9	13,425	5,360	1,470 2,305	2,595
⅞	3¾	8⅛ 9	7⅞ 7⅞	—	—	3,585	—	1,680 1,680	—
	7	11⅜ 16⅞	12⅜ 10½	11⅜	7⅞	6,690	2,675	1,995 2,760	1,255
	10½	14⅞ 25¼	19⅞ 15¾	14⅞	7⅞	10,035	4,015	1,860 2,760	1,880
	17½	21⅞ 42	35 26¼	21⅞	10	16,725	6,690	1,760 2,760	3,135
1	4	9 9⅝	8½ 8½	—	—	3,895	—	1,790 1,790	—
	8	13 19¼	13½ 12	13	8½	7,790	3,395	2,255 3,115	1,560
	12	17 28⅞	21¾ 18	17	8½	11,685	5,095	2,095 3,115	2,345
	20	25 48	38¼ 30	25	12¼	19,475	8,495	1,990 3,115	3,905
1¼	5	11¼ 12	9½ 9½	—	—	4,790	—	—	—
	10	16¼ 24	15⅜ 15	16¼	9½	9,580	5,305	—	—
	15	21¼ 36	24¾ 22½	21¼	11⅛	14,370	7,960	—	—
	25	31¼ 60	43⅜ 37½	31¼	15⅝	23,950	13,270	—	—

Threaded Rod Dia. (in.)	Allowable Tension Load of Threaded Rod Steel (lb.)					
	ASTM F1554, GR 36	ASTM F1554, GR 55	ASTM F1554, GR 105	ASTM A193, B6	ASTM A193, B7	ASTM A193, B8/B8M
⅜	2,405	3,115	5,195	4,570	5,195	2,365
½	4,410	5,705	9,510	8,370	9,510	4,335
⅝	7,025	9,080	15,135	13,320	15,135	6,900
¾	10,380	13,420	22,370	19,680	22,370	10,200
⅞	14,355	18,565	30,940	27,225	30,940	14,105
1	18,830	24,350	40,580	35,710	40,580	18,505
1¼	30,105	38,930	64,890	57,105	64,890	29,590

1. Allowable tension load must be the lesser of the concrete, bond or threaded rod steel load.
2. Allowable tension loads are calculated based on the strength design provisions of ACI 318-11 Appendix D assuming dry concrete, periodic inspection, short-term temperature of 150°F and long-term temperature of 110°F. Tension design strengths are converted to allowable tension loads using a conversion factor of a = 1.4. The conversion factor a is based on the load combination 1.2D + 1.6L assuming 50% dead load and 50% live load: 1.2(0.5) + 1.6(0.5) = 1.4.
3. Tabulated values are for a single anchor with no influence of another anchor.
4. Interpolation between embedment depths is not permitted.

* See page 12 for an explanation of the load table icons.

SET-XP® Design Information — Concrete

SIMPSON Strong-Tie®

SET-XP® Allowable Tension Loads for Threaded Rod Anchors in Normal-Weight Concrete (f'_c = 2,500 psi) — Wind Load

Rod Dia. (in.)	Nominal Embed. Depth (in.)	Minimum Dimensions for Uncracked (in.)		Minimum Dimensions for Cracked (in.)		Allowable Tension Load Based on Concrete or Bond (lb.)			
						Edge distances = c_{ac} on all sides		Edge Distances = 1¾" on one side and c_{ac} on three sides	
		h_a	c_{ac}	h_a	c_{ac}	Uncracked	Cracked	Uncracked	Cracked
⅜	2⅜	4¼	3¾	—	—	710	—	405	—
		5¾	3⅝					480	
	3	4⅞	5	4⅞	3¼	900	690	380	465
		7¼	4½					530	
	4½	6⅜	8⅛	6⅜	3¼	1,350	1,035	355	700
		10⅞	6¾					530	
	6	7⅞	11⅛	7⅞	4⅜	1,795	1,380	340	935
		14½	9					530	
	7½	9⅜	14¼	9⅜	5⅜	2,245	1,725	335	1,165
		18	11¼					530	
½	2¾	5¼	5⅛	—	—	1,640	—	880	—
		6⅝	5⅛					880	
	4	6½	7⅞	6½	5⅛	2,385	1,055	840	565
		9⅝	6					1160	
	6	8½	12⅝	8½	5⅛	3,575	1,580	780	850
		14½	9					1,160	
	8	10½	17½	10½	5¼	4,770	2,105	755	1,135
		19¼	12					1,160	
	10	12½	22¼	12½	6⅜	5,960	2,635	740	1,420
		24	15					1,160	
⅝	3⅛	6¼	6¼	—	—	2,150	—	1,085	—
		7½	6¼					1,085	
	5	8⅛	9½	8⅛	6¼	3,440	1,400	1,125	705
		12	7½					1,555	
	7½	10⅝	15⅜	10⅝	6¼	5,155	2,100	1,045	1,060
		18	11¼					1,555	
	12½	15⅝	26⅞	15⅝	7⅝	8,590	3,500	995	1,765
		30	18¾					1,555	
¾	3½	7¼	7⅛	—	—	2,630	—	1,270	—
		8½	7⅛					1,270	
	6	9¾	11	9¾	7⅛	4,510	1,800	1,400	870
		14½	9					1,940	
	9	12¾	17¾	12¾	7⅛	6,770	2,700	1,305	1,310
		21⅝	13½					1,940	
	15	18¾	31⅛	18¾	9	11,275	4,505	1,235	2,180
		36	22½					1,940	
⅞	3¾	8⅛	7⅞	—	—	3,010	—	1,415	—
		9	7⅞					1,415	
	7	11⅜	12⅜	11⅜	7⅞	5,620	2,245	1,675	1,055
		16⅞	10½					2,320	
	10½	14⅞	19⅞	14⅞	7⅞	8,430	3,370	1,565	1,580
		25¼	15¾					2,320	
	17½	21⅞	35	21⅞	10	14,050	5,620	1,480	2,635
		42	26¼					2,320	
1	4	9	8½	—	—	3,275	—	1,505	—
		9⅝	8½					1,505	
	8	13	13½	13	8½	6,545	2,855	1,895	1,310
		19¼	12					2,615	
	12	17	21¾	17	8½	9,815	4,280	1,760	1,970
		28⅞	18					2,615	
	20	25	38¼	25	12¼	16,360	7,135	1,670	3,280
		48	30					2,615	
1¼	5	11¼	9½	—	—	4,025	—	—	—
		12	9½						
	10	16¼	15⅜	16¼	9½	8,050	4,460	—	—
		24	15						
	15	21¼	24¾	21¼	11⅛	12,070	6,685	—	—
		36	22½						
	25	31¼	43⅜	31¼	15⅝	20,120	11,145	—	—
		60	37½						

Threaded Rod Dia. (in.)	Allowable Tension Load of Threaded Rod Steel (lb.)					
	ASTM F1554 GR 36	ASTM F1554 GR 55	ASTM F1554 GR 105	ASTM A193 B6	ASTM A193 B7	ASTM A193 B8/B8M
⅜	2,020	2,615	4,360	3,835	4,360	1,985
½	3,705	4,795	7,990	7,030	7,990	3,640
⅝	5,900	7,630	12,715	11,185	12,715	5,795
¾	8,720	11,275	18,790	16,535	18,790	8,570
⅞	12,055	15,595	25,990	22,870	25,990	11,850
1	15,820	20,455	34,090	29,995	34,090	15,545
1¼	25,290	32,705	54,505	47,965	54,505	24,855

1. Allowable tension load must be the lesser of the concrete, bond or threaded rod steel load.
2. Allowable tension loads are calculated based on the strength design provisions of ACI 318-11 Appendix D assuming dry concrete, periodic inspection, short-term temperature of 150°F and long-term temperature of 110°F. Tension design strengths are converted to allowable tension loads using a conversion factor of $\alpha = 1/0.6 = 1.67$. The conversion factor α is based on the load combination assuming 100% wind load.
3. Tabulated values are for a single anchor with no influence of another anchor.
4. Interpolation between embedment depths is not permitted.

* See page 12 for an explanation of the load table icons.

SET-XP® Design Information — Concrete

SET-XP® Allowable Tension Loads for Threaded Rod Anchors in Normal-Weight Concrete (f'_c = 2,500 psi) — Seismic Load

*

Nom. Insert Diam. (in.)	Embed. Depth, h_{ef} (in.)	Minimum Dimensions for Uncracked (in.)		Minimum Dimensions for Cracked (in.)		Allowable Tension Load Based on Concrete or Bond (lb.)							
						Edge Distances = c_{ac} on all sides				Edge Distances = 1¾" on one side and c_{ac} on three sides			
						SDC A-B[5]		SDC C-F[6,7]		SDC A-B[5]		SDC C-F[6,7]	
		h_a	c_{ac}	h_a	c_{ac}	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked
⅜	2⅜	4¼ 5¾	3¾ 3⅝	—	—	830	—	625	—	475 560	—	355 420	—
	3	4⅞ 7¼	5 4½	4⅞	3¼	1,050	805	790	605	445 615	545	335 460	410
	4½	6⅜ 10⅞	8⅛ 6¾	6⅜	3¼	1,575	1,210	1,180	905	415 615	815	310 460	615
	6	7⅞ 14½	11⅛ 9	7⅞	4⅜	2,095	1,610	**1,575**	1,210	400 615	1,090	300 460	815
	7½	9⅜ 18	14¼ 11¼	9⅜	5⅜	2,620	2,015	**1,965**	1,510	390 615	1,360	295 460	1,020
½	2¾	5¼ 6⅝	5⅛ 5⅛	—	—	1,910	—	1,435	—	1,030 1,030	—	775 775	—
	4	6½ 9⅝	7⅞ 6	6½	5⅛	2,785	1,230	2,085	920	980 1,355	660	735 1,015	495
	6	8½ 14½	12⅝ 9	8½	5⅛	4,170	1,845	**3,130**	1,385	910 1,355	995	685 1,015	745
	8	10½ 19¼	17½ 12	10½	5¼	5,565	2,455	**4,170**	1,845	880 1,355	1,325	660 1,015	995
	10	12½ 24	22¼ 15	12½	6⅜	6,955	3,075	**5,215**	2,305	865 1,355	1,655	650 1,015	1,245
⅝	3⅛	6¼ 7½	6¼ 6¼	—	—	2,505	—	1,880	—	1,265 1,265	—	950 950	—
	5	8⅛ 12	9½ 7½	8⅛	6¼	4,010	1,635	3,005	1,225	1,315 1,815	825	985 1,360	620
	7½	10⅝ 18	15⅜ 11¼	10⅝	6¼	6,015	2,450	4,510	1,840	1,220 1,815	1,235	915 1,360	930
	12½	15⅝ 30	26⅞ 18¾	15⅝	7⅝	10,025	4,080	**7,520**	3,065	1,160 1,815	2,060	870 1,360	1,545
¾	3½	7¼ 8½	7⅛ 7⅛	—	—	3,070	—	2,305	—	1,485 1,485	—	1,115 1,115	—
	6	9¾ 14½	11 9	9¾	7⅛	5,265	2,100	3,950	1,575	1,635 2,260	1,015	1,225 1,695	765
	9	12¾ 21⅝	17¾ 13½	12¾	7⅛	7,895	3,150	5,920	2,365	1,525 2,260	1,525	1,140 1,695	1,145
	15	18¾ 36	31⅛ 22½	18¾	9	13,155	5,255	**9,870**	3,940	1,440 2,260	2,540	1,080 1,695	1,905
⅞	3¾	8⅛ 9	7⅞ 7⅞	—	—	3,515	—	2,105	—	1,650 1,650	—	985 985	—
	7	11⅜ 16⅞	12⅜ 10½	11⅜	7⅞	6,555	2,620	3,935	1,575	1,955 2,705	1,230	1,175 1,625	740
	10½	14⅞ 25¼	19⅞ 15¾	14⅞	7⅞	9,835	3,935	5,900	2,360	1,825 2,705	1,845	1,090 1,625	1,105
	17½	21⅞ 42	35 26¼	21⅞	10	16,390	6,555	**9,835**	3,935	1,725 2,705	3,075	1,035 1,625	1,845
1	4	9 9⅝	8½ 8½	—	—	3,820	—	2,635	—	1,755 1,755	—	1,210 1,210	—
	8	13 19¼	13½ 12	13	8½	7,635	3,330	5,270	2,295	2,210 3,050	1,530	1,525 2,105	1,055
	12	17 28⅞	21¾ 18	17	8½	11,450	4,995	7,905	3,445	2,055 3,050	2,295	1,420 2,105	1,585
	20	25 48	38¼ 30	25	12¼	19,085	8,325	**13,170**	5,745	1,950 3,050	3,825	1,345 2,105	2,640
1¼	5	11¼ 12	9½ 9½	—	—	4,695	—	3,520	—	—	—	—	—
	10	16¼ 24	15⅜ 15	16¼	9½	9,390	5,200	7,040	3,900	—	—	—	—
	15	21¼ 36	24¾ 22½	21¼	11⅛	14,085	7,800	10,565	5,850	—	—	—	—
	25	31¼ 60	43⅜ 37½	31¼	15⅝	23,470	13,005	17,605	9,750	—	—	—	—

Threaded Rod Dia. (in.)	Allowable Tension Load of Threaded Rod Steel (lb.)					
	ASTM F1554 GR 36	ASTM F1554 GR 55	ASTM F1554 GR 105	ASTM A193 B6	ASTM A193 B7	ASTM A193 B8/B8M
⅜	2,360	3,050	5,090	4,475	5,090	2,315
½	4,325	5,595	9,320	8,200	9,320	4,250
⅝	6,885	8,900	14,835	13,050	14,835	6,760
¾	10,170	13,155	21,920	19,290	21,920	9,995
⅞	14,065	18,195	30,320	26,680	30,320	13,825
1	18,455	23,865	39,770	34,995	39,770	18,135
1¼	29,505	38,155	63,590	55,960	63,590	29,000

1. Allowable tension load must be the lesser of the concrete, bond or threaded rod steel load.
2. Allowable tension loads are calculated based on the strength design provisions of ACI 318-11 Appendix D assuming dry concrete, periodic inspection, short-term temperature of 150°F and long-term temperature of 110°F. Tension design strengths are converted to allowable tension loads using a conversion factor of $\alpha = 1/0.7 = 1.43$. The conversion factor α is based on the load combination assuming 100% seismic load.
3. Tabulated values are for a single anchor with no influence of another anchor.
4. Interpolation between embedment depths is not permitted.
5. The allowable tension load listed for SDC (Seismic Design Category) A-B may also be used in SDC C-F when the tension component of the strength-level seismic design load on the anchor does not exceed 20% of the total factored tension load on the anchor associated with the same load combination.
6. When designing anchorages in SDC C-F, the Designer shall consider the ductility requirements of ACI 318-11 Section D.3.3. Design strengths in **Bold** indicate that the anchor ductility requirements of D.3.3.4.3 (a)1 to 3 are satisfied when using ASTM F1554 Grade 36 threaded rod. Any other ductility requirements must be satisfied.
7. Allowable tension loads in SDC C-F have been adjusted by 0.75 factor in accordance with ACI 318-11 Section D.3.3.4.4.

* See page 12 for an explanation of the load table icons.

SET-XP® Design Information — Concrete

SET-XP® Tension Design Strength for Rebar in Normal-Weight Concrete (f'_c = 2,500 psi)

Rebar Size	Nominal Embed. Depth (in.)	Minimum Dimensions for Uncracked (in.)		Minimum Dimensions for Cracked (in.)		Tension Design Strength Based on Concrete or Bond (lb.)							
						Edge Distances = c_{ac} on all sides				Edge Distances = 1¾" on one side and C_{ac} on three sides			
						SDC A-B[6]		SDC C-F[7,8]		SDC A-B[6]		SDC C-F[7,8]	
		h_a	c_{ac}	h_a	c_{ac}	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked
#3	2⅜	4¼ 5¾	4 3⅜	—	—	1,380	—	1,035	—	765 895	—	575 670	—
	3	4⅞ 7¼	5⅜ 4½	4⅞	3½	1,740	700	1,305	525	720 995	455	540 745	340
	4½	6⅜ 10⅞	8⅝ 6¾	6⅜	3½	2,615	1,055	1,960	790	670 995	685	505 745	510
	6	7⅞ 14½	11⅞ 9	7⅞	3½	3,485	1,405	2,615	1,055	650 995	910	485 745	685
	7½	9⅜ 18	15⅛ 11¼	9⅜	3½	4,355	1,755	3,265	1,315	635 995	1,140	475 745	855
#4	2¾	5¼ 6⅝	4½ 4½	—	—	2,065	—	1,550	—	1,180 1,180	—	885 885	—
	4	6½ 9⅝	7 6	6½	4½	3,005	2,525	2,255	1,895	1,090 1,505	1,440	815 1,130	1,080
	6	8½ 14½	11⅜ 9	8½	5½	4,510	3,790	3,380	2,840	1,015 1,505	2,035	760 1,130	1,525
	8	10½ 19¼	15⅝ 12	10½	6⅝	6,015	5,050	4,510	3,790	980 1,505	2,525	735 1,130	1,895
	10	12½ 24	19⅞ 15	12½	7⅝	7,515	6,315	5,635	4,735	960 1,505	2,995	720 1,130	2,245
#5	3⅛	6¼ 7½	5½ 5½	—	—	2,860	—	2,145	—	1,500 1,500	—	1,125 1,125	—
	5	8⅛ 12	8¾ 7½	8⅛	5½	4,575	3,560	3,430	2,670	1,520 2,105	1,865	1,140 1,575	1,400
	7½	10⅝ 18	14 11¼	10⅝	6⅞	6,860	5,340	5,145	4,005	1,415 2,105	2,640	1,060 1,575	1,980
	12½	15⅝ 30	24⅝ 18¾	15⅝	9⅝	11,435	8,895	8,575	6,670	1,340 2,105	4,005	1,005 1,575	3,005
#6	3½	7¼ 8½	6½ 6½	—	—	3,725	—	2,795	—	1,845 1,845	—	1,385 1,385	—
	6	9¾ 14½	10⅜ 9	9¾	6½	6,385	4,555	4,790	3,415	2,000 2,765	2,260	1,500 2,075	1,695
	9	12¾ 21⅝	16⅝ 13½	12¾	8⅛	9,575	6,835	7,180	5,125	1,860 2,765	3,235	1,395 2,075	2,425
	15	18¾ 36	29⅛ 22½	18¾	11⅜	15,960	11,390	11,970	8,545	1,765 2,765	4,965	1,325 2,075	3,725
#7	3¾	8⅛ 9	7½ 7½	—	—	4,505	—	3,380	—	2,145 2,145	—	1,610 1,610	—
	7	11⅜ 16⅞	11⅞ 10½	11⅜	7½	8,415	5,430	6,310	4,070	2,525 3,485	2,585	1,890 2,615	1,940
	10½	14⅞ 25¼	19⅛ 15¾	14⅞	9⅛	12,620	8,145	9,465	6,110	2,350 3,485	3,740	1,760 2,615	2,805
	17½	21⅞ 42	33½ 26¼	21⅞	12¾	21,035	13,575	15,775	10,180	2,225 3,485	5,770	1,670 2,615	4,330
#8	4	9 9⅝	8⅜ 8⅜	—	—	5,330	—	3,995	—	2,455 2,455	—	1,845 1,845	—
	8	13 19¼	13⅜ 12	13	8⅜	10,660	6,095	7,995	4,570	3,085 4,265	2,810	2,315 3,200	2,110
	12	17 28⅞	21½ 18	17	9¾	15,985	9,145	11,990	6,860	2,870 4,265	4,070	2,155 3,200	3,055
	20	25 48	37⅞ 30	25	13¾	26,645	15,240	19,985	11,430	2,720 4,265	6,380	2,040 3,200	4,785
#10	5	11¼ 12	10⅛ 10⅛	—	—	7,765	—	5,825	—	—	—	—	—
	10	16¼ 24	16¼ 15	16¼	10⅛	15,530	5,940	11,645	4,455	—	—	—	—
	15	21¼ 36	26⅛ 22½	21¼	10⅛	23,295	8,910	17,470	6,680	—	—	—	—
	25	31¼ 60	46 37½	31¼	13½	38,825	14,850	29,115	11,135	—	—	—	—

Rebar Size	Tension Design Strength of Rebar Steel (lb.)	
	ASTM A615 GR 60	ASTM A706 GR 60
#3	6,435	5,720
#4	11,700	10,400
#5	18,135	16,120
#6	25,740	22,880
#7	35,100	31,200
#8	46,215	41,080
#10	74,100	66,040

1. Tension design strength must be the lesser of the concrete, bond or rebar steel design strength.
2. Tension design strengths are based on the strength design provisions of ACI 318-11 Appendix D assuming dry concrete, periodic inspection, short-term temperature of 150°F and long-term temperature of 110°F.
3. Tabulated values are for a single anchor with no influence of another anchor.
4. Interpolation between embedment depths is not permitted.
5. Strength reduction factor, ϕ, is based on using a load combination from ACI 318-11 Section 9.2.
6. The tension design strength listed for SDC (Seismic Design Category) A-B may also be used in SDC C-F when the tension component of the strength-level seismic design load on the anchor does not exceed 20% of the total factored tension load on the anchor associated with the same load combination.
7. When designing anchorages in SDC C-F, the Designer shall consider the ductility requirements of ACI 318-11 Section D.3.3.
8. Tension design strengths in SDC C-F have been adjusted by 0.75 factor in accordance with ACI 318-11 Section D.3.3.4.4.

* See page 12 for an explanation of the load table icons.

SET-XP® Design Information — Concrete

SIMPSON Strong-Tie®

SET-XP® Allowable Tension Loads for Rebar in Normal-Weight Concrete (f'_c = 2,500 psi) — Static Load

IBC *

Rebar Size	Nominal Embed. Depth (in.)	Minimum Dimensions for Uncracked (in.)		Minimum Dimensions for Cracked (in.)		Allowable Tension Load Based on Concrete or Bond (lb.)			
						Edge Distances = c_{ac} on all sides		Edge Distances = 1¾" on one side and c_{ac} on three sides	
		h_a	c_{ac}	h_a	c_{ac}	Uncracked	Cracked	Uncracked	Cracked
#3	2⅜	4¼	4	—	—	985	—	545	—
		5¾	3⅝					640	
	3	4⅞	5⅜	4⅞	3½	1,245	500	515	325
		7¼	4½					710	
	4½	6⅜	8⅝	6⅜	3½	1,870	755	480	490
		10⅞	6¾					710	
	6	7⅞	11⅞	7⅞	3½	2,490	1,005	465	650
		14½	9					710	
	7½	9⅜	15⅛	9⅜	3½	3,110	1,255	455	815
		18	11¼					710	
#4	2¾	5¼	4½	—	—	1,475	—	845	—
		6⅝	4½					845	
	4	6½	7	6½	4½	2,145	1,805	780	1,030
		9⅝	6					1,075	
	6	8½	11⅜	8½	5½	3,220	2,705	725	1,455
		14½	9					1,075	
	8	10½	15⅝	10½	6⅝	4,295	3,605	700	1,805
		19¼	12					1,075	
	10	12½	19⅞	12½	7⅝	5,370	4,510	685	2,140
		24	15					1,075	
#5	3⅛	6¼	5½	—	—	2,045	—	1,070	—
		7½	5½					1,070	
	5	8⅛	8¾	8⅛	5½	3,270	2,545	1,085	1,330
		12	7½					1,505	
	7½	10⅝	14	10⅝	6⅞	4,900	3,815	1,010	1,885
		18	11¼					1,505	
	12½	15⅝	24⅝	15⅝	9⅝	8,170	6,355	955	2,860
		30	18¾					1,505	
#6	3½	7¼	6½	—	—	2,660	—	1,320	—
		8½	6½					1,320	
	6	9¾	10⅜	9¾	6½	4,560	3,255	1,430	1,615
		14½	9					1,975	
	9	12¾	16⅝	12¾	8⅛	6,840	4,880	1,330	2,310
		21⅝	13½					1,975	
	15	18¾	29⅛	18¾	11⅜	11,400	8,135	1,260	3,545
		36	22½					1,975	
#7	3¾	8⅛	7½	—	—	3,220	—	1,530	—
		9	7½					1,530	
	7	11⅜	11⅞	11⅜	7½	6,010	3,880	1,805	1,845
		16⅞	10½					2,490	
	10½	14⅞	19⅛	14⅞	9⅛	9,015	5,820	1,680	2,670
		25¼	15¾					2,490	
	17½	21⅞	33½	21⅞	12¾	15,025	9,695	1,590	4,120
		42	26¼					2,490	
#8	4	9	8⅜	—	—	3,805	—	1,755	—
		9⅝	8⅜					1,755	
	8	13	13⅜	13	8⅜	7,615	4,355	2,205	2,005
		19¼	12					3,045	
	12	17	21½	17	9¾	11,420	6,530	2,050	2,905
		28⅞	18					3,045	
	20	25	37⅞	25	13¾	19,030	10,885	1,945	4,555
		48	30					3,045	
#10	5	11¼	10⅛	—	—	5,545	—	—	—
		12	10⅛						
	10	16¼	16¼	16¼	10⅛	11,095	4,245	—	—
		24	15						
	15	21¼	26⅛	21¼	10⅛	16,640	6,365	—	—
		36	22½						
	25	31¼	46	31¼	13½	27,730	10,605	—	—
		60	37½						

Rebar Size	Allowable Tension Load of Rebar Steel (lb.)	
	ASTM A615 GR 60	ASTM A706 GR 60
#3	4,595	4,085
#4	8,355	7,430
#5	12,955	11,515
#6	18,385	16,345
#7	25,070	22,285
#8	33,010	29,345
#10	52,930	47,170

1. Allowable tension load must be the lesser of the concrete, bond or rebar steel load.
2. Allowable tension loads are calculated based on the strength design provisions of ACI 318-11 Appendix D assuming dry concrete, periodic inspection, short-term temperature of 150°F and long-term temperature of 110°F. Tension design strengths are converted to allowable tension loads using a conversion factor of α = 1.4. The conversion factor α is based on the load combination 1.2D + 1.6L assuming 50% dead load and 50% live load: 1.2(0.5) + 1.6(0.5) = 1.4.
3. Tabulated values are for a single anchor with no influence of another anchor.
4. Interpolation between embedment depths is not permitted.

* See page 12 for an explanation of the load table icons.

SET-XP® Design Information — Concrete

SET-XP® Allowable Tension Loads for Rebar in Normal-Weight Concrete (f'_c = 2,500 psi) — Wind Load *

Rebar Size	Nominal Embed. Depth (in.)	Minimum Dimensions for Uncracked (in.)		Minimum Dimensions for Cracked (in.)		Allowable Tension Load Based on Concrete or Bond (lb.)			
						Edge Distances = c_{ac} on all sides		Edge Distances = 1¾" on one side and c_{ac} on three sides	
		h_a	c_{ac}	h_a	c_{ac}	Uncracked	Cracked	Uncracked	Cracked
#3	2⅜	4¼	4	—	—	830	—	460	—
		5¾	3⅝					535	
	3	4⅞	5⅜	4⅞	3½	1,045	420	430	275
		7¼	4½					595	
	4½	6⅜	8⅝	6⅜	3½	1,570	635	400	410
		10⅞	6¾					595	
	6	7⅞	11⅞	7⅞	3½	2,090	845	390	545
		14½	9					595	
	7½	9⅜	15⅛	9⅜	3½	2,615	1,055	380	685
		18	11¼					595	
#4	2¾	5¼	4½	—	—	1,240	—	710	—
		6⅝	4½					710	
	4	6½	7	6½	4½	1,805	1,515	655	865
		9⅝	6					905	
	6	8½	11⅜	8½	5½	2,705	2,275	610	1,220
		14½	9					905	
	8	10½	15⅝	10½	6⅝	3,610	3,030	590	1,515
		19¼	12					905	
	10	12½	19⅞	12½	7⅝	4,510	3,790	575	1,795
		24	15					905	
#5	3⅛	6¼	5½	—	—	1,715	—	900	—
		7½	5½					900	
	5	8⅛	8¾	8⅛	5½	2,745	2,135	910	1,120
		12	7½					1,265	
	7½	10⅝	14	10⅝	6⅞	4,115	3,205	850	1,585
		18	11¼					1,265	
	12½	15⅝	24⅝	15⅝	9⅝	6,860	5,335	805	2,405
		30	18¾					1,265	
#6	3½	7¼	6½	—	—	2,235	—	1,105	—
		8½	6½					1,105	
	6	9¾	10⅜	9¾	6½	3,830	2,735	1,200	1,355
		14½	9					1,660	
	9	12¾	16⅝	12¾	8⅛	5,745	4,100	1,115	1,940
		21⅝	13½					1,660	
	15	18¾	29⅛	18¾	11⅜	9,575	6,835	1,060	2,980
		36	22½					1,660	
#7	3¾	8⅛	7½	—	—	2,705	—	1,285	—
		9	7½					1,285	
	7	11⅜	11⅞	11⅜	7½	5,050	3,260	1,515	1,550
		16⅞	10½					2,090	
	10½	14⅞	19⅛	14⅞	9⅛	7,570	4,885	1,410	2,245
		25¼	15¾					2,090	
	17½	21⅞	33½	21⅞	12¾	12,620	8,145	1,335	3,460
		42	26¼					2,090	
#8	4	9	8⅜	—	—	3,200	—	1,475	—
		9⅝	8⅜					1,475	
	8	13	13⅜	13	8⅜	6,395	3,655	1,850	1,685
		19¼	12					2,560	
	12	17	21½	17	9¾	9,590	5,485	1,720	2,440
		28⅞	18					2,560	
	20	25	37⅞	25	13¾	15,985	9,145	1,630	3,830
		48	30					2,560	
#10	5	11¼	10⅛	—	—	4,660	—	—	—
		12	10⅛						
	10	16¼	16¼	16¼	10⅛	9,320	3,565	—	—
		24	15						
	15	21¼	26⅛	21¼	10⅛	13,975	5,345	—	—
		36	22½						
	25	31¼	46	31¼	13½	23,295	8,910	—	—
		60	37½						

Rebar Size	Allowable Tension Load of Rebar Steel (lb.)	
	ASTM A615 GR 60	ASTM A706 GR 60
#3	3,860	3,430
#4	7,020	6,240
#5	10,880	9,670
#6	15,445	13,730
#7	21,060	18,720
#8	27,730	24,650
#10	44,460	39,625

1. Allowable tension load must be the lesser of the concrete, bond or rebar steel load.
2. Allowable tension loads are calculated based on the strength design provisions of ACI 318-11 Appendix D assuming dry concrete, periodic inspection, short-term temperature of 150°F and long-term temperature of 110°F. Tension design strengths are converted to allowable tension loads using α conversion factor of $\alpha = 1/0.6 = 1.67$. The conversion factor α is based on the load combination assuming 100% wind load.
3. Tabulated values are for a single anchor with no influence of another anchor.
4. Interpolation between embedment depths is not permitted.

* See page 12 for an explanation of the load table icons.

SET-XP® Allowable Tension Loads for Rebar in Normal-Weight Concrete (f'_c = 2,500 psi) — Seismic Load

IBC *

Rebar Size	Nominal Embed. Depth (in.)	Minimum Dimensions for Uncracked (in.)		Minimum Dimensions for Cracked (in.)		Allowable Tension Load Based on Concrete or Bond (lb.)							
						Edge Distances = c_{ac} on all sides				Edge Distances = 1¾" on one side and c_{ac} on three sides			
						SDC A-B[5]		SDC C-F[6,7]		SDC A-B[5]		SDC C-F[6,7]	
		h_a	c_{ac}	h_a	c_{ac}	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked
#3	2⅜	4¼ 5¾	4 3⅝	—	—	965	—	725	—	535 625	—	405 470	—
	3	4⅞ 7¼	5⅜ 4½	4⅞	3½	1,220	490	915	370	505 695	320	380 520	240
	4½	6⅜ 10⅞	8⅝ 6¾	6⅜	3½	1,830	740	1,370	555	470 695	480	355 520	355
	6	7⅞ 14½	11⅞ 9	7⅞	3½	2,440	985	1,830	740	455 695	635	340 520	480
	7½	9⅜ 18	15⅛ 11¼	9⅜	3½	3,050	1,230	2,285	920	445 695	800	335 520	600
#4	2¾	5¼ 6⅝	4½ 4½	—	—	1,445	—	1,085	—	825 825	—	620 620	—
	4	6½ 9⅝	7 6	6½	4½	2,105	1,770	1,580	1,325	765 1,055	1,010	570 790	755
	6	8½ 14½	11⅜ 9	8½	5½	3,155	2,655	2,365	1,990	710 1,055	1,425	530 790	1,070
	8	10½ 19¼	15⅝ 12	10½	6⅝	4,210	3,535	3,155	2,655	685 1,055	1,770	515 790	1,325
	10	12½ 24	19⅞ 15	12½	7⅝	5,260	4,420	3,945	3,315	670 1,055	2,095	505 790	1,570
#5	3⅛	6¼ 7½	5½ 5½	—	—	2,000	—	1,500	—	1,050 1,050	—	790 790	—
	5	8⅛ 12	8¾ 7½	8⅛	5½	3,205	2,490	2,400	1,870	1,065 1,475	1,305	800 1,105	980
	7½	10⅝ 18	14 11¼	10⅝	6⅞	4,800	3,740	3,600	2,805	990 1,475	1,850	740 1,105	1,385
	12½	15⅝ 30	24⅝ 18¾	15⅝	9⅝	8,005	6,225	6,005	4,670	940 1,475	2,805	705 1,105	2,105
#6	3½	7¼ 8½	6½ 6½	—	—	2,610	—	1,955	—	1,290 1,290	—	970 970	—
	6	9¾ 14½	10⅜ 9	9¾	6½	4,470	3,190	3,355	2,390	1,400 1,935	1,580	1,050 1,455	1,185
	9	12¾ 21⅝	16⅝ 13½	12¾	8⅛	6,705	4,785	5,025	3,590	1,300 1,935	2,265	975 1,455	1,700
	15	18¾ 36	29⅛ 22½	18¾	11⅜	11,170	7,975	8,380	5,980	1,235 1,935	3,475	930 1,455	2,610
#7	3¾	8⅛ 9	7½ 7½	—	—	3,155	—	2,365	—	1,500 1,500	—	1,125 1,125	—
	7	11⅜ 16⅞	11⅞ 10½	11⅜	7½	5,890	3,800	4,415	2,850	1,770 2,440	1,810	1,325 1,830	1,360
	10½	14⅞ 25¼	19⅛ 15¾	14⅞	9⅛	8,835	5,700	6,625	4,275	1,645 2,440	2,620	1,230 1,830	1,965
	17½	21⅞ 42	33½ 26¼	21⅞	12¾	14,725	9,505	11,045	7,125	1,560 2,440	4,040	1,170 1,830	3,030
#8	4	9 9⅝	8⅜ 8⅜	—	—	3,730	—	2,795	—	1,720 1,720	—	1,290 1,290	—
	8	13 19¼	13⅜ 12	13	8⅜	7,460	4,265	5,595	3,200	2,160 2,985	1,965	1,620 2,240	1,475
	12	17 28⅞	21½ 18	17	9¾	11,190	6,400	8,395	4,800	2,010 2,985	2,850	1,510 2,240	2,140
	20	25 48	37⅞ 30	25	13¾	18,650	10,670	13,990	8,000	1,905 2,985	4,465	1,430 2,240	3,350
#10	5	11¼ 12	10⅛ 10⅛	—	—	5,435	—	4,080	—	—	—	—	—
	10	16¼ 24	16¼ 15	16¼	10⅛	10,870	4,160	8,150	3,120	—	—	—	—
	15	21¼ 36	26⅛ 22½	21¼	10⅛	16,305	6,235	12,230	4,675	—	—	—	—
	25	31¼ 60	46 37½	31¼	13½	27,180	10,395	20,380	7,795	—	—	—	—

Rebar Size	Allowable Tension Load of Rebar Steel (lb.)	
	ASTM A615 GR 60	ASTM A706 GR 60
#3	4,505	4,005
#4	8,190	7,280
#5	12,695	11,285
#6	18,020	16,015
#7	24,570	21,840
#8	32,350	28,755
#10	51,870	46,230

1. Allowable tension load must be the lesser of the concrete, bond or rebar steel load.
2. Allowable tension loads are calculated based on the strength design provisions of ACI 318-11 Appendix D assuming dry concrete, periodic inspection, short-term temperature of 150°F and long-term temperature of 110°F. Tension design strengths are converted to allowable tension loads using α conversion factor of $\alpha = 1/0.7 = 1.43$. The conversion factor α is based on the load combination assuming 100% seismic load.
3. Tabulated values are for a single anchor with no influence of another anchor.
4. Interpolation between embedment depths is not permitted.
5. The allowable tension load listed for SDC (Seismic Design Category) A-B may also be used in SDC C-F when the tension component of the strength-level seismic design load on the anchor does not exceed 20% of the total factored tension load on the anchor associated with the same load combination.
6. When designing anchorages in SDC C-F, the Designer shall consider the ductility requirements of ACI 318-11 Section D.3.3.
7. Allowable tension loads in SDC C-F have been adjusted by 0.75 factor in accordance with ACI 318-11 Section D.3.3.4.4.

* See page 12 for an explanation of the load table icons.

SET-XP® Design Information — Masonry

SIMPSON Strong-Tie®

SET-XP® Allowable Tension and Shear Loads for Threaded Rod and Rebar in the Face of Fully Grouted CMU Wall Construction [1, 3, 4, 5, 6, 8, 9, 10, 11]

IBC *

Diameter (in.) or Rebar Size No.	Drill Bit Diameter (in.)	Minimum Embedment[2] (in.)	Allowable Load Based on Bond Strength[7] (lb.)	
			Tension Load	Shear Load
Threaded Rod Installed in the Face of CMU Wall				
⅜	½	3⅜	1,490	1,145
½	⅝	4½	1,825	1,350
⅝	¾	5⅝	1,895	1,350
¾	⅞	6½	1,895	1,350
Rebar Installed in the Face of CMU Wall				
#3	½	3⅜	1,395	1,460
#4	⅝	4½	1,835	1,505
#5	¾	5⅝	2,185	1,505

1. Allowable load shall be the lesser of the bond values shown in this table and steel values, shown on page 61.
2. Embedment depth shall be measured from the outside face of masonry wall.
3. Critical and minimum edge distance and spacing shall comply with the information on page 55. Figure 2 on page 55 illustrates critical and minimum edge and end distances.
4. Minimum allowable nominal width of CMU wall shall be 8 inches. No more than one anchor shall be permitted per masonry cell.
5. Anchors shall be permitted to be installed at any location in the face of the fully grouted masonry wall construction (cell, web, bed joint), except anchors shall not be installed within 1½ inches of the head joint, as show in Figure 2 on page 55.
6. Tabulated allowable load values are for anchors installed in fully grouted masonry walls.
7. Tabulated allowable loads are based on a safety factor of 5.0 .
8. Tabulated allowable load values shall be adjusted for increased base material temperatures in accordance with Figure 1 below, as applicable.
9. Threaded rod and rebar installed in fully grouted masonry walls are permitted to resist dead, live, seismic and wind loads.
10. Threaded rod shall meet or exceed the tensile strength of ASTM F1554, Grade 36 steel, which is 58,000 psi.
11. For installations exposed to severe, moderate or negligible exterior weathering conditions, as defined in Figure 1 of ASTM C62, allowable tension loads shall be multiplied by 0.80.

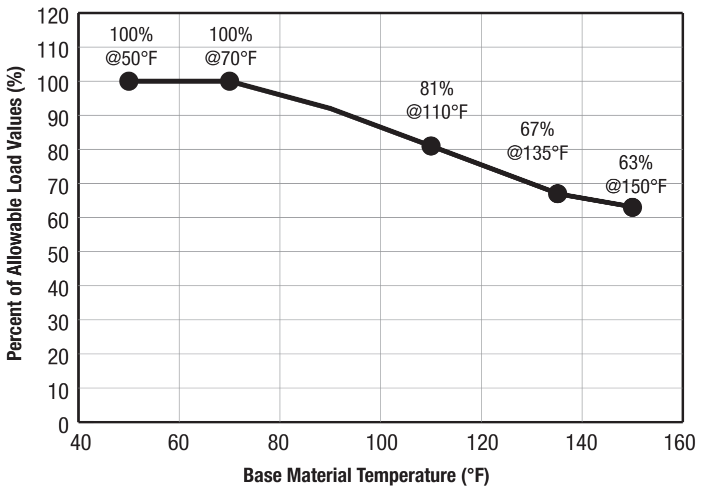


Figure 1. Load capacity based on in-service temperature for SET-XP® epoxy adhesive in the face of fully grouted CMU wall construction

* See page 12 for an explanation of the load table icons.

SET-XP® Design Information — Masonry

SET-XP® Edge Distance and Spacing Requirements and Allowable Load Reduction Factors – Threaded Rod and Rebar in the Face of Fully Grouted CMU Wall Construction[7]

IBC *

Rod Dia. (in.) or Rebar Size No.	Minimum Embed. Depth (in.)	Edge or Edge Distance[1,8]						Spacing[2,9]				
		Critical (Full Anchor Capacity)[3]		Minimum (Reduced Anchor Capacity)[4]				Critical (Full Anchor Capacity)[5]		Minimum (Reduced Anchor Capacity)[6]		
		Critical Edge or End Distance, C_{cr} (in.)	Allowable Load Reduction Factor	Minimum Edge or End Distance, C_{min} (in.)	Allowable Load Reduction Factor			Critical Spacing, S_{cr} (in.)	Allowable Load Reduction Factor	Minimum Spacing, S_{min} (in.)	Allowable Load Reduction Factor	
		Load Direction		Load Direction				Load Direction		Load Direction		
		Tension or Shear	Tension or Shear	Tension or Shear	Tension	Shear[10] Perp.	Shear[10] Para.	Tension or Shear	Tension or Shear	Tension or Shear	Tension	Shear
⅜	3⅜	12	1.00	4	0.91	0.72	0.94	8	1.00	4	1.00	1.00
½	4½	12	1.00	4	1.00	0.58	0.87	8	1.00	4	0.82	1.00
⅝	5⅝	12	1.00	4	1.00	0.48	0.87	8	1.00	4	0.82	1.00
¾	6½	12	1.00	4	1.00	0.44	0.85	8	1.00	4	0.82	1.00
#3	3⅜	12	1.00	4	0.96	0.62	0.84	8	1.00	4	0.87	0.91
#4	4½	12	1.00	4	0.88	0.54	0.82	8	1.00	4	0.87	0.91
#5	5⅝	12	1.00	4	0.88	0.43	0.82	8	1.00	4	0.87	1.00

1. Edge distance (C_{cr} or C_{min}) is the distance measured from anchor centerline to edge or end of CMU masonry wall. Refer to Figure 2 below for an illustration showing critical and minimum edge and end distances.
2. Anchor spacing (S_{cr} or S_{min}) is the distance measured from centerline to centerline of two anchors.
3. Critical edge distance, C_{cr}, is the least edge distance at which tabulated allowable load of an anchor is achieved where a load reduction factor equals 1.0 (no load reduction).
4. Minimum edge distance, C_{min}, is the least edge distance where an anchor has an allowable load capacity which shall be determined by multiplying the allowable loads assigned to anchors installed at critical edge distance, C_{cr}, by the load reduction factors shown above.
5. Critical spacing, S_{cr}, is the least anchor spacing at which tabulated allowable load of an anchor is achieved such that anchor performance is not influenced by adjacent anchors.
6. Minimum spacing, S_{min}, is the least spacing where an anchors has an allowable load capacity, which shall be determined by multiplying the allowable loads assigned to anchors installed at critical spacing distance, S_{cr}, by the load reduction factors shown above.
7. Reduction factors are cumulative. Multiple reduction factors for more than one spacing or edge or end distance shall be calculated separately and multiplied.
8. Load reduction factor for anchors loaded in tension or shear with edge distances between critical and minimum shall be obtained by linear interpolation.
9. Load reduction factor for anchors loaded in tension with spacing between critical and minimum shall be obtained by linear interpolation.
10. Perpendicular shear loads act towards the edge or end. Parallel shear loads act parallel to the edge or end (see Figure 5 on page 57). Perpendicular and parallel shear load reduction factors are cumulative when the anchor is located between the critical minimum edge and end distance.

Shaded Area = Placement for Full and Reduced Allowable Load Capacity in Grout-Filled CMU

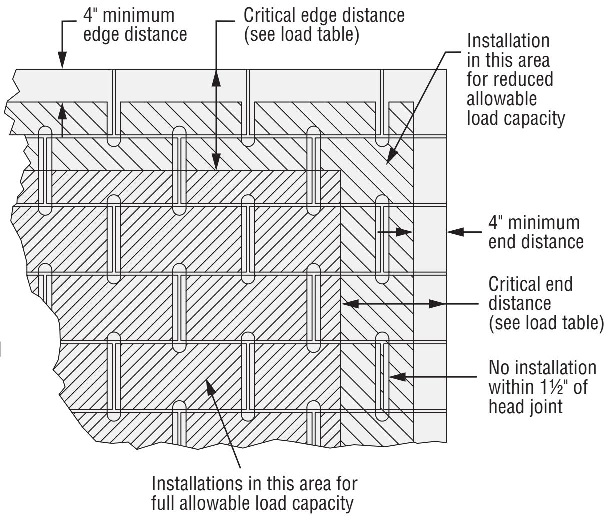


Figure 2. Allowable anchor locations for full and reduced load capacity when installation is in the face of fully grouted CMU masonry wall construction

* See page 12 for an explanation of the load table icons.

SET-XP® Design Information — Masonry

SIMPSON Strong-Tie®

SET-XP® Allowable Tension and Shear Loads for Threaded Rod and Rebar in the Top of Fully Grouted CMU Wall Construction[1, 2, 4, 5, 6, 7, 9, 10, 11, 12]

IBC *

Diameter (in.) or Rebar Size No.	Drill Bit Diameter (in.)	Minimum Embedment[3] (in.)	Allowable Load Based on Bond Strength[7, 8] (lb.)		
			Tension Load	Shear Perp.	Shear Parallel
Threaded Rod Installed in the Top of CMU Wall					
½	⅝	4½	1,485	590	1,050
		12	2,440	665	1,625
⅝	¾	5⅝	1,700	565	1,435
		15	2,960	660	1,785
¾	⅞	6½	1,610	735	1,370
		21	4,760	670	1,375
Rebar Installed in the Top of CMU Wall					
#4	⅝	4½	1,265	550	865
		12	2,715	465	1,280
#5	¾	5⅝	1,345	590	1,140
		15	3,090	590	1,285

1. Allowable load shall be the lesser of the bond values shown in this table and steel values, shown on page 61.
2. Allowable loads are for installation in the grouted CMU core opening.
3. Embedment depth shall be measured from the horizontal surface of the grouted CMU core opening on top of the masonry wall.
4. Critical and minimum edge distance, end distance and spacing shall comply with the information on pages 57 and 58. Figures 3A and 3B on page 57 illustrate critical and minimum edge and end distances.
5. Minimum allowable nominal width of CMU wall shall be 8 inches (203 mm).
6. Anchors are permitted to be installed in the CMU core opening shown in Figures 3A and 3B on page 57. Anchors are limited to one installation per CMU core opening.
7. Tabulated allowable load values are for anchors installed in fully grouted masonry walls.
8. Tabulated allowable loads are based on a safety factor of 5.0 .
9. Tabulated allowable load values shall be adjusted for increased base material temperatures in accordance with Figure 1 on page 54, as applicable.
10. Threaded rod and rebar installed in fully grouted masonry walls with SET-XP® adhesive are permitted to resist dead, live, seismic and wind loads.
11. Threaded rod shall meet or exceed the tensile strength of ASTM F1554, Grade 36 steel, which is 58,000 psi.
12. For installations exposed to severe, moderate or negligible exterior weathering conditions, as defined in Figure 1 of ASTM C62, allowable tension loads shall be multiplied by 0.80.

* See page 12 for an explanation of the load table icons.

SET-XP® Design Information — Masonry

SET-XP® Edge and End Distance Requirements and Allowable Load Reduction Factors — Threaded Rod and Rebar in the Top of Fully Grouted CMU Wall Construction[1,4,5]

IBC *

Rod Dia. (in.) or Rebar Size No.	Minimum Embed. Depth (in.)	Critical (Full Anchor Capacity)[2]			Minimum End (Reduced Anchor Capacity)[3]				Minimum Edge (Reduced Anchor Capacity)[6]			
		Critical Edge, C_{cr} (in.)	Critical End Distance, C_{cr} (in.)	Allowable Load Reduction Factor	Minimum End Distance, C_{min} (in.)	Min. End Allowable Load Reduction Factor			Minimum Edge, C_{min} (in.)	Allowable Load Reduction Factor		
		Load Direction			Load Direction				Load Direction			
		Tension or Shear	Tension or Shear	Tension or Shear	Tension or Shear	Tension	Shear[6] Perp.	Shear[6] Parallel	Tension or Shear	Tension	Shear[6] Perp.	Shear[6] Parallel
½	4½	2¾	20	1.00	3 13/16	0.88	0.84	0.66	1¾	0.83	0.63	0.77
	12	2¾	20	1.00	3 13/16	0.64	0.91	0.34	1¾	0.95	0.55	0.69
⅝	5⅝	2¾	20	1.00	4¼	0.90	1.00	0.50	1¾	0.82	0.57	0.71
	15	2¾	20	1.00	4¼	0.38	0.85	0.29	1¾	0.91	0.72	0.73
⅞	7⅞	2¾	20	1.00	4¼	0.98	0.72	0.57	—	—	—	—
	21	2¾	20	1.00	4¼	0.63	0.96	0.64	—	—	—	—
#4	4½	2¾	20	1.00	4¼	0.96	0.90	0.76	—	—	—	—
	12	2¾	20	1.00	4¼	0.58	1.00	0.46	—	—	—	—
#5	5⅝	2¾	20	1.00	4¼	1.00	0.86	0.60	—	—	—	—
	15	2¾	20	1.00	4¼	0.41	0.76	0.49	—	—	—	—

1. Edge and end distances (C_{cr} or C_{min}) are the distances measured from anchor centerline to edge or end of CMU masonry wall. Refer to Figures 3A and 3B below for illustrations showing critical and minimum edge and end distances.
2. Critical edge and end distances, C_{cr}, are the least edge distances at which tabulated allowable load of an anchor is achieved where a load reduction factor equals 1.0 (no load reduction).
3. Minimum edge and end distances, C_{min}, are the least edge distances where an anchor has an allowable load capacity, which shall be determined by multiplying the allowable loads assigned to anchors installed at critical edge distance, C_{cr}, by the load reduction factors shown above.
4. Reduction factors are cumulative. Multiple reduction factors for more than one spacing or edge or end distance shall be calculated separately and multiplied.
5. Load reduction factor for anchors loaded in tension or shear with edge distances between critical and minimum shall be obtained by linear interpolation.
6. Perpendicular shear loads act towards the edge or end. Parallel shear loads act parallel to the edge or end (see Figure 5 below). Perpendicular and parallel shear load reduction factors are cumulative when the anchor is located between the critical minimum edge and end distance.

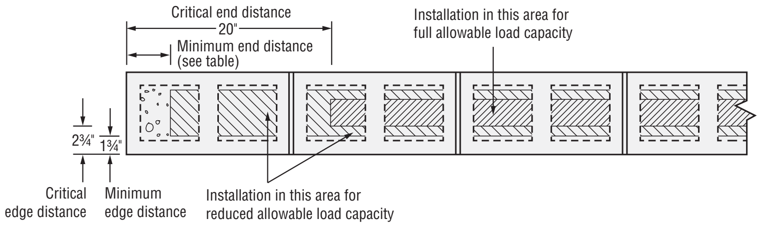


Figure 3A. Allowable anchor locations of ½"- and ⅝"-diameter threaded rod for full and reduced load capacity when installation is in the top of fully grouted CMU masonry wall construction

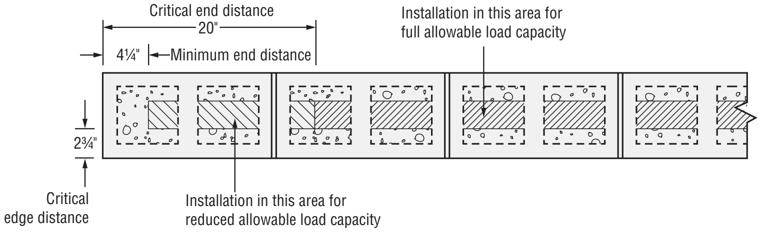
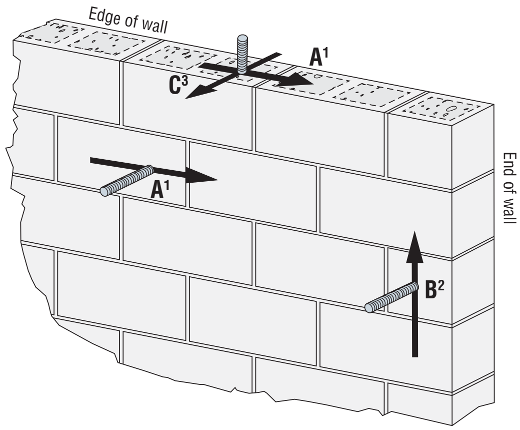


Figure 3B. Allowable anchor locations of ⅞"-diameter threaded rod and #4 and #5 rebar for full and reduced load capacity when installation is in the top of fully grouted CMU masonry wall construction



1. Direction of shear load A is parallel to edge of wall and perpendicular to end of wall.
2. Direction of shear load B is parallel to end of wall and perpendicular to edge of wall.
3. Direction of shear load C is perpendicular to edge of wall.

Figure 5. Direction of shear load in relation to edge and end of wall

* See page 12 for an explanation of the load table icons.

SET-XP® Design Information — Masonry

SET-XP® Spacing Distance Requirements and Allowable Load Reduction Factors — Threaded Rod and Rebar in the Top of Fully Grouted CMU Wall Construction[1,4,5]

Rod Dia. (in.) or Rebar Size No.	Minimum Embed. Depth (in.)	Critical Spacing (Full Anchor Capacity)[2]		Minimum Spacing (Reduced Anchor Capacity)[3]		
		Critical Spacing, S_{cr} (in.)	Allowable Load Reduction Factor	Minimum Spacing, S_{cr} (in.)	Allowable Load Reduction Factor	
		Load Direction		Load Direction		
		Tension or Shear	Tension or Shear	Tension or Shear	Tension	Shear
½	4½	18	1.00	8	0.80	0.92
	12	48	1.00	8	0.63	0.98
⅝	5⅝	22.5	1.00	8	0.86	1.00
	15	60	1.00	8	0.56	1.00
⅞	7⅞	31.5	1.00	8	0.84	0.82
	21	84	1.00	8	0.51	0.98
#4	4½	18	1.00	8	0.97	0.93
	12	48	1.00	8	0.75	1.00
#5	5⅝	22.5	1.00	8	1.00	1.00
	15	60	1.00	8	0.82	1.00

1. Anchor spacing (S_{cr} or S_{min}) is the distance measured from centerline to centerline of two anchors.
2. Critical spacing, S_{cr}, is the least anchor spacing at which tabulated allowable load of an anchor is achieved such that anchor perofrmance is not influenced by adjacent anchors.
3. Minimum spacing, S_{min}, is the least spacing where an anchor has an allowable load capacity, which shall be determined by multiplying the allowable loads assigned to anchors installed at critical spacing distance, S_{cr}, by the load reduction factors shown above.
4. Reduction factors are cumulative. Multiple reduction factors for more than one spacing or edge or end distance shall be calculated separately and multiplied.
5. Load reduction factor for anchors loaded in tension or shear with edge distances between critical and minimum shall be obtained by linear interpolation.

* See page 12 for an explanation of the load table icons.

SET-XP® Design Information — Masonry

SIMPSON Strong-Tie®

SET-XP® Allowable Tension and Shear Loads – Threaded Rod in the Face of Hollow CMU Wall Construction[1,3,4,5,6,8,9,10,11]

*

Diameter (in.)	Drill Bit Diameter (in.)	Minimum Embed[2] (in.)	Allowable Load Based on Bond Strength[7] (lb.)	
			Tension	Shear
⅜	9⁄16	1¼	245	415
½	¾	1¼	245	505
⅝	⅞	1¼	290	530

1. Allowable load shall be the lesser of bond values shown in this table and steel values shown on page 61.
2. Embedment depth is considered the minimum wall thickness of 8" x 8" x 16" ASTM C90 concrete masonry blocks, and is measured from the outside to the inside face of the block wall. The minimum length Opti-Mesh plastic screen tube for use in hollow CMU is 3½".
3. Critical and minimum edge distance and spacing shall comply with the information provided on page 60. Figure 4 on page 60 illustrates critical and minimum edge and end distances.
4. Anchors are permitted to be installed in the face shell of hollow masonry wall construction as shown in Figure 4.
5. Anchors are limited to one or two anchors per masonry cell and must comply with the spacing and edge distance requirements provided.
6. Tabulated load values are for anchors installed in hollow masonry walls.
7. Tabulated allowable loads are based on a safety factor of 5.0.
8. Tabulated allowable load values shall be adjusted for increased base material temperatures in accordance with Figure 1 on page 54, as applicable.
9. Threaded rods installed in hollow masonry walls with SET-XP® adhesive are permitted to resist dead, live load and wind load applications.
10. Threaded rods must meet or exceed the tensile strength of ASTM F1554, Grade 36, which is 58,000 psi.
11. For installations exposed to severe, moderate or negligible exterior weathering conditions, as defined in Figure 1 of ASTM C62, allowable tension loads must be multiplied by 0.80.

Adhesive Anchors

* See page 12 for an explanation of the load table icons.

SET-XP® Design Information — Masonry

SET-XP® Edge, End and Spacing Distance Requirements and Allowable Load Reduction Factors — Threaded Rod in the Face of Hollow CMU Wall Construction[7]

IBC *

Rod Diameter (in.)	Edge or End Distance[1,8]					Spacing[2,9]				
	Critical (Full Anchor Capacity)[3]		Minimum (Reduced Anchor Capacity)[4]			Critical (Full Anchor Capacity)[5]		Minimum (Reduced Anchor Capacity)[6]		
	Critical Edge or End Distance, C_{cr} (in.)	Allowable Load Reduction Factor	Minimum Edge or End Distance, C_{min} (in.)	Allowable Load Reduction Factor		Critical Spacing, S_{cr} (in.)	Allowable Load Reduction Factor	Minimum Spacing, S_{min} (in.)	Allowable Load Reduction Factor	
	Load Direction		Load Direction			Load Direction		Load Direction		
	Tension or Shear	Tension or Shear	Tension or Shear	Tension	Shear[10]	Tension or Shear	Tension or Shear	Tension or Shear	Tension	Shear
⅜	12	1.00	4	0.71	0.57	8	1.00	4	0.56	0.92
½	12	1.00	4	0.73	0.51	8	1.00	4	0.61	0.85
⅝	12	1.00	4	0.66	0.49	8	1.00	4	0.65	0.76

1. Edge and end distances (C_{cr} or C_{min}) are the distances measured from anchor centerline to edge or end of CMU masonry wall. Refer to Figure 4 below for an illustration showing critical and minimum edge and end distances.
2. Anchor spacing (S_{cr} or S_{min}) is the distance measured from centerline to centerline of two anchors.
3. Critical edge and end distances, C_{cr}, are the least edge distances at which tabulated allowable load of an anchor is achieved where a load reduction factor equals 1.0 (no load reduction).
4. Minimum edge and end distances, C_{min}, are the least edge distances where an anchor has an allowable load capacity which shall be determined by multiplying the allowable loads assigned to anchors installed at critical edge distance, C_{cr}, by the load reduction factors shown above.
5. Critical spacing, S_{cr}, is the least anchor spacing at which tabulated allowable load of an anchor is achieved such that anchor performance is not influenced by adjacent anchors.
6. Minimum spacing, S_{min}, is the least spacing where an anchors has an allowable load capacity, which shall be determined by multiplying the allowable loads assigned to anchors installed at critical spacing distance, S_{cr}, by the load reduction factors shown above.
7. Reduction factors are cumulative. Multiple reduction factors for more than one spacing or edge or end distance shall be calculated separately and multiplied.
8. Load reduction factor for anchors loaded in tension or shear with edge distances between critical and minimum shall be obtained by linear interpolation.
9. Load reduction factor for anchors loaded in tension with spacing between critical and minimum shall be obtained by linear interpolation.
10. Perpendicular shear loads act toward the edge or end. Parallel shear loads act parallel to the edge or end (see Figure 5 on page 57). Perpendicular and parallel shear load reduction factors are cumulative when the anchor is located between the critical minimum edge and end distance.

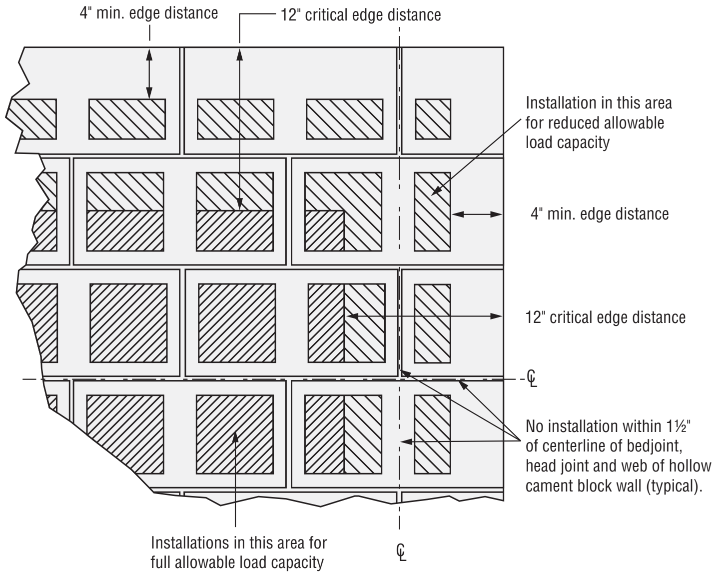


Figure 4. Allowable anchor locations for full and reduced load capacity when installation is in the face of hollow CMU masonry wall construction

* See page 12 for an explanation of the load table icons.

SET-XP® Design Information — Masonry

SET-XP® Allowable Tension and Shear Loads — Threaded Rod Based on Steel Strength[1]

IBC *

Threaded Rod Diameter (in.)	Tensile Stress Area (in.²)	Tension Load Based on Steel Strength[2] (lb.)				Shear Load Based on Steel Strength [3] (lb.)			
				Stainless Steel				Stainless Steel	
		ASTM F1554 Grade 36[4]	ASTM A193 Grade B7[6]	ASTM A193 Grade B6[5]	ASTM A193 Grades B8 and B8M[7]	ASTM F1554 Grade 36[4]	ASTM A193 Grade B7[6]	ASTM A193 Grade B6[5]	ASTM A193 Grades B8 and B8M[7]
⅜	0.078	1,495	3,220	2,830	1,930	770	1,660	1,460	995
½	0.142	2,720	5,860	5,155	3,515	1,400	3,020	2,655	1,810
⅝	0.226	4,325	9,325	8,205	5,595	2,230	4,805	4,225	2,880
¾	0.334	6,395	13,780	12,125	8,265	3,295	7,100	6,245	4,260
⅞	0.462	8,845	19,055	16,770	11,435	4,555	9,815	8,640	5,890

1. Allowable load shall be the lesser of bond values given on pages 54, 56 or 59 and steel values in the table above.
2. Allowable Tension Steel Strength is based on the following equation: $F_v = 0.33 \times F_u \times$ Tensile Stress Area.
3. Allowable Shear Steel Strength is based on the following equation: $F_v = 0.17 \times F_u \times$ Tensile Stress Area.
4. Minimum specified tensile strength (F_u = 58,000 psi) of ASTM F1554, Grade 36 used to calculate allowable steel strength.
5. Minimum specified tensile strength (F_u = 110,000 psi) of ASTM A193, Grade B6 used to calculate allowable steel strength.
6. Minimum specified tensile strength (F_u = 125,000 psi) of ASTM A193, Grade B7 used to calculate allowable steel strength.
7. Minimum specified tensile strength (F_u = 75,000 psi) of ASTM A193, Grades B8 and B8M used to calculate allowable steel strength.

SET-XP® Allowable Tension and Shear Loads — Deformed Reinforcing Bar Based on Steel Strength[1]

IBC *

Rebar Size	Tensile Stress Area (in.²)	Tension Load (lb.)		Shear Load (lb.)	
		Based on Steel Strength		Based on Steel Strength	
		ASTM A615 Grade 40[2]	ASTM A615 Grade 60[3]	ASTM A615 Grade 40[4,5]	ASTM A615 Grade 60[4,6]
#3	0.11	2,200	2,640	1,310	1,685
#4	0.20	4,000	4,800	2,380	3,060
#5	0.31	6,200	7,400	3,690	4,745

1. Allowable load shall be the lesser of bond values given on pages 54, 56 or 59 and steel values in the table above.
2. Allowable Tension Steel Strength is based on AC58 Section 3.3.3 (20,000 psi x tensile stress area) for Grade 40 rebar.
3. Allowable Tension Steel Strength is based on AC58 Section 3.3.3 (24,000 psi x tensile stress area) for Grade 60 rebar.
4. Allowable Shear Steel Strength is based on AC58 Section 3.3.3 ($F_v = 0.17 \times F_u \times$ Tensile Stress Area.)
5. F_u = 70,000 psi for Grade 40 rebar.
6. F_u = 90,000 psi for Grade 60 rebar.

* See page 12 for an explanation of the load table icons.