AT-XP® High-Strength Acrylic Adhesive

AT-XP is an acrylic-based high-strength anchoring adhesive. AT-XP is a 10:1 ratio, two-component, anchoring adhesive for use in threaded rod and rebar into concrete (cracked and uncracked) and masonry (uncracked) under a wide range of conditions. AT-XP adhesive dispenses easily in cold or warm environments and in below-freezing temperatures with no need to warm the cartridge.

Features

- Excellent for use in cold weather conditions or applications where fast cure is required.
- Design flexibility — superior sustained load performance at elevated temperature
- Jobsite versatility — can be specified for dry and damp conditions when in-service temperatures range from -40°F (-40°C) to 180°F (82°C)
- Code listed for installation with the Speed Clean™ DXS system without any further cleaning

AT-XP Adhesive

Product Information

Mix Ratio/Type	10:1 acrylic
Mixed Color	Teal
Base Materials	Concrete — cracked and uncracked Masonry — uncracked
Base Material Conditions	Dry, water-saturated
Anchor Type	Threaded rod or rebar
Substrate Installation Temperature	14°F (-10°C) to 100°F (38°C)
In-Service Temperature Range	-40°F (-40°C) to 180°F (82°C)
Storage Temperature	14°F (10°C) and 80°F (27°C)
Shelf Life	18 months for AT-XP10 12 months for AT-XP13 and AT-XP30
Volatile Organic Compound (VOC)	30 g/L
Chemical Resistance	See pp. 268–269
Manufactured in the USA using global materials	

Test Criteria

AT-XP has been tested in accordance with ICC-ES AC308, AC58, ACI 355.4 and applicable ASTM test methods.

Code Reports, Standards and Compliance

Concrete — IAPMO UES ER-263 (including City of LA); FL16230.
Masonry — IAPMO UES ER-281 (including City of LA and Florida Building Code Supplement)"; FL16230.
ASTM C881 and AASHTO M235 — Types I/IV, Grade 3, Class A, B, and C except AT-XP is not an epoxy.
UL Certification — CDPH Standard Method v1.2.
NSF/ANSI/CAN 61 (43.2 in.^{2} / 1,000 gal.).

Installation Instructions

Installation instructions are located at the following locations: pp. 64–67; product packaging; or **strongtie.com/atxp**.

- Hole cleaning brushes are located on p. 68.

AT-XP Adhesive Cartridge System

Model No.	Capacity ounces (cubic in.)	Cartridge Type	Carton Qty.	Dispensing Tool	Mixing Nozzle
AT-XP10	9.4 (16.9)	Coaxial	6	CDT10S	AMN19Q
AT-XP13	12.5 (22.5)	Side-by-side	10	ADT813S	
AT-XP30	30 (54)	Side-by-side	5	ADT30S, ADTA30P or ADTA30CKT	

1. Cartridge estimation guidelines are available at **strongtie.com/softwareandwebapplications/category**.
2. Detailed information on dispensing tools, mixing nozzles and other adhesive accessories is available at **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 AT-XP adhesive performance.
4. One AMN19Q mixing nozzle and one nozzle extension are supplied with each cartridge.
5. Use of rodless pneumatic tools to dispense single-tube, coaxial adhesive cartridges is prohibited.

AT-XP® High-Strength Acrylic Adhesive

AT-XP Cure Schedule

Base Material Temperature		Gel Time (minutes)	Cure Time (hrs.)
°F	°C		
14	−10	30	24
32	0	15	8
50	10	7	3
68	20	4	1
85	30	1½	30 min.
100	38	1	20 min.

1. For water-saturated concrete, the cure times must be doubled.
2. For installation in temperatures below 14°F (-10°C), see p. 267 (Supplemental Section) for more information.

AT-XP Typical Properties

Property		Class A	Class B	Class C	Test Method
		(0°–40°F)	(40°–60°F)	(>60°F)	
Consistency		Non-sag	Non-sag	Non-sag	ASTM C881
Bond Strength, Slant Shear	Hardened to Hardened Concrete, 2-Day Cure[1]	1,900 psi	2,500 psi	3,200 psi	ASTM C882
	Hardened to Hardened Concrete, 14-Day Cure[1]	2,100 psi	3,750 psi	3,550 psi	
Compressive Yield Strength, 7-Day Cure[2]		11,800 psi	14,900 psi	18,800 psi	ASTM D695
Compressive Modulus, 7-Day Cure[2]		388,000 psi	565,000 psi	718,000 psi	ASTM D695
Heat Deflection Temperature, 7-Day Cure[3]		253°F (123°C)			ASTM D648
Glass Transition Temperature, 7-Day Cure[3]		266°F (130°C)			ASTM E1356
Decomposition Temperature, 24-Hour Cure[3]		450°F (230°C)			ASTM E2550
Water Absorption, 24-Hours, 7-Day Cure[3]		0.10%			ASTM D570
Shore D Hardness, 24-Hour Cure[3]		86			ASTM D2240
Linear Coefficient of Shrinkage, 7-Day Cure[3]		0.002 in./in.			ASTM D2566
Coefficient of Thermal Expansion[3]		3.2×10^{-5} in./in.°F			ASTM C531

1. Material and curing conditions: Class A at 35° ± 2°F, Class B at 40° ± 2°F, Class C at 60° ± 2°F.
2. Material and curing conditions: Class A at 0° ± 2°F, Class B at 40° ± 2°F, Class C at 60° ± 2°F.
3. Material and curing conditions: 73° ± 2°F.

AT-XP Installation Information and Additional Data for Threaded Rod and Rebar[1]

IBC *

Characteristic		Symbol	Units	Nominal Anchor Diameter d_a (in.) / Rebar Size						
				⅜ / #3	½ / #4	⅝ / #5	¾ / #6	⅞ / #7	1 / #8	1¼ / #10
Installation Information										
Drill Bit Diameter for Threaded Rod		d_{hole}	in.	7⁄16	9⁄16	11⁄16	13⁄16	1	1⅛	1⅜
Drill Bit Diameter for Rebar		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[2]	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} + 1¼		$h_{ef} + 2d_{hole}$				
Critical Edge Distance[2]		c_{ac}	in.	See foonote 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 318-14 and ACI 318-11.
2. $c_{ac} = h_{ef}(\tau_{k,uncr}/1{,}160)^{0.4} \times [3.1 - 0.7(h/h_{ef})]$, 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 p. 12 for an explanation of the load table icons.

AT-XP® Design Information — Concrete

SIMPSON Strong-Tie®

AT-XP Tension Strength Design Data for Threaded Rod[1]

IBC *

Characteristic			Symbol	Units	Nominal Anchor Diameter d_a (in.)						
					⅜	½	⅝	¾	⅞	1	1¼
Steel Strength in Tension											
Threaded Rod	Minimum Tensile Stress Area		A_{se}	in.²	0.078	0.142	0.226	0.334	0.462	0.606	0.969
Threaded Rod	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
Threaded Rod	Tension Resistance of Steel — ASTM A193, Grade B7		N_{sa}	lb.	9,750	17,750	28,250	41,750	57,750	75,750	121,125
Threaded Rod	Tension Resistance of Steel — Type 410 Stainless (ASTM A193, Grade B6)		N_{sa}	lb.	8,580	15,620	24,860	36,740	50,820	66,660	106,590
Threaded Rod	Tension Resistance of Steel — Type 304 and 316 Stainless (ASTM A193, Grade B8 and B8M)		N_{sa}	lb.	4,445	8,095	12,880	19,040	26,335	34,540	55,235
Threaded Rod	Strength Reduction Factor — Steel Failure		ϕ	—	0.75[6]						
Concrete Breakout Strength in Tension (2,500 psi ≤ f'_c ≤ 8,000 psi)											
Effectiveness Factor — Uncracked Concrete			k_{uncr}	—	24						
Effectiveness Factor — Cracked Concrete			k_{cr}	—	17						
Strength Reduction Factor — Breakout Failure			ϕ	—	0.65[8]						
Bond Strength in Tension (2,500 psi ≤ f'_c ≤ 8,000 psi)											
Uncracked Concrete [2,3,4]	Characteristic Bond Strength		$\tau_{k,uncr}$	psi	1,390	1,590	1,715	1,770	1,750	1,655	1,250
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[9,10,11]		$\tau_{k,cr}$	psi	1,085	1,035	980	950	815	800	700
Cracked Concrete [2,3,4]	Permitted Embedment Depth Range	Minimum	h_{ef}	in.	3	3	3⅛	3½	3¾	4	5
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			ϕ_{dry}	—	0.65[7]					0.55[7]	
Strength Reduction Factor — Water-Saturated Concrete			ϕ_{sat}	—	0.45[7]						
Additional Factor for Water-Saturated Concrete			K_{sat}	—	0.54[5]		0.77[5]			0.96[5]	
Bond Strength in Tension — Bond Strength Reduction Factors for Periodic Special Inspection											
Strength Reduction Factor — Dry Concrete			ϕ_{dry}	—	0.55[7]					0.45[7]	
Strength Reduction Factor — Water-Saturated Concrete			ϕ_{sat}	—	0.45[7]						
Additional Factor for Water-Saturated Concrete			K_{sat}	—	0.46[5]		0.65[5]			0.81[5]	

1. The information presented in this table is to be used in conjunction with the design criteria of ACI 318-14 and ACI 318-11.
2. Temperature Range: Maximum short-term temperature of 180°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. In water-saturated concrete, multiply $\tau_{k,uncr}$ and $\tau_{k,cr}$ by K_{sat}.
6. The value of ϕ applies when the load combinations of ACI 318-14 5.3 or ACI 318-11 Section 9.2 are used. If the load combinations of ACI 318 Appendix C are used, refer to ACI 318-11 D.4.4 to determine the appropriate value of ϕ.
7. The value of ϕ applies when both the load combinations of ACI 318-14 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI 318-14 17.3.3 or ACI 318-11 D.4.3 (c) for Condition B are met. If the load combinations of ACI 318 Appendix C are used, refer to ACI 318-11 D.4.4 to determine the appropriate value of ϕ.
8. The value of ϕ applies when both the load combinations of ACI 318-14 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI 318-14 17.3.3 or ACI 318-11 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 ACI 318-11 D.4.3 (c) for Condition A are met, refer to ACI 318-11 D.4.4 to determine the appropriate value of ϕ. If the load combinations of ACI 318 Appendix C are used, refer to ACI 318-11 D.4.4 to determine the appropriate value of ϕ.
9. For anchors installed in regions assigned to Seismic Design Category C, D, E or F, the bond strength values for ½", ⅝", ¾" and 1" anchors must be multiplied by $\alpha_{N,seis}$ = 0.85.
10. For anchors installed in regions assigned to Seismic Design Category C, D, E or F, the bond strength values for 1¼" anchors must be multiplied by $\alpha_{N,seis}$ = 0.75.
11. 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 $\alpha_{N,seis}$ = 0.59.

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

AT-XP® Design Information — Concrete

AT-XP Tension Strength Design Data for Rebar[1]

IBC *

Characteristic			Symbol	Units	Rebar Size #3	#4	#5	#6	#7	#8	#10
Steel Strength in Tension											
Rebar	Minimum Tensile Stress Area		A_{se}	in.^{2}	0.11	0.2	0.31	0.44	0.6	0.79	1.27
	Tension Resistance of Steel — Rebar (ASTM A615 Grade 60)		N_{sa}	lb.	9,900	18,000	27,900	39,600	54,000	71,100	114,000
	Tension Resistance of Steel — Rebar (ASTM A706 Grade 60)				8,800	16,000	24,800	35,200	48,000	63,200	101,600
	Strength Reduction Factor — Steel Failure		ϕ	—	0.75[6]						
Concrete Breakout Strength in Tension (2,500 psi ≤ f'$_c$ ≤ 8,000 psi)											
Effectiveness Factor — Uncracked Concrete			k_{uncr}	—	24						
Effectiveness Factor — Cracked Concrete			k_{cr}		17						
Strength Reduction Factor — Breakout Failure			ϕ	—	0.65[8]						
Bond Strength in Tension (2,500 psi ≤ f'$_c$ ≤ 8,000 psi)											
Uncracked Concrete [2,3,4]	Characteristic Bond Strength		$\tau_{k,uncr}$	psi	1,010	990	970	955	935	915	875
	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		$\tau_{k,cr}$	psi	340	770	780	790	795	795	820
	Permitted Embedment Depth Range	Minimum	h_{ef}	in.	3	3	3⅛	3½	3¾	4	5
		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			ϕ_{dry}	—	0.65[7]					0.55[7]	
Strength Reduction Factor — Water-Saturated Concrete			ϕ_{sat}	—	0.45[7]						
Additional Factor for Water-Saturated Concrete			K_{sat}	—	0.54[5]		0.77[5]			0.96[5]	
Bond Strength in Tension — Bond Strength Reduction Factors for Periodic Special Inspection											
Strength Reduction Factor — Dry Concrete			ϕ_{dry}	—	0.55[7]					0.45[7]	
Strength Reduction Factor — Water-Saturated Concrete			ϕ_{sat}	—	0.45[7]						
Additional Factor for Water-Saturated Concrete			K_{sat}	—	0.46[5]		0.65[5]			0.81[5]	

1. The information presented in this table is to be used in conjunction with the design criteria of ACI 318-14 and ACI 318-11.
2. Temperature Range: Maximum short-term temperature of 180°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. In water-saturated concrete, multiply $\tau_{k,uncr}$ and $\tau_{k,cr}$ by K_{sat}.
6. The value of ϕ applies when the load combinations of ACI 318-14 5.3 or ACI 318-11 Section 9.2 are used. If the load combinations of ACI 318 Appendix C are used, refer to ACI 318-11 D.4.4 to determine the appropriate value of ϕ.
7. The value of ϕ applies when both the load combinations of ACI 318-14 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI 318-14 17.3.3 or ACI 318-11 D.4.3 (c) for Condition B are met. If the load combinations of ACI 318 Appendix C are used, refer to ACI 318-11 D.4.4 to determine the appropriate value of ϕ.
8. The value of ϕ applies when both the load combinations of ACI 318-14 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI 318-14 17.3.3 or ACI 318-11 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 ACI 318-11 D.4.3 (c) for Condition A are met, refer to ACI 318-11 D.4.4 to determine the appropriate value of ϕ. If the load combinations of ACI 318 Appendix C are used, refer to ACI 318-11 D.4.4 to determine the appropriate value of ϕ.

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

AT-XP® Design Information — Concrete

AT-XP Shear Strength Design Data for Threaded Rod[1]

IBC *

Characteristic		Symbol	Units	Nominal Anchor Diameter (in.)						
				3/8	1/2	5/8	3/4	7/8	1	1 1/4
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
	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
	Shear Resistance of Steel — ASTM A193, Grade B7			4,875	10,650	16,950	25,050	34,650	45,450	72,675
	Shear Resistance of Steel — Type 410 Stainless (ASTM A193, Grade B6)			4,290	9,370	14,910	22,040	30,490	40,000	63,955
	Shear Resistance of Steel — Type 304 and 316 Stainless (ASTM A193, Grade B8 and B8M)			2,225	4,855	7,730	11,425	15,800	20,725	33,140
	Reduction for Seismic Shear — ASTM F1554, Grade 36	$\alpha_{V,seis}$[5]	—	0.85						
	Reduction for Seismic Shear — ASTM A193, Grade B7			0.85						
	Reduction for Seismic Shear — Type 410 Stainless (ASTM A193, Grade B6)			0.85	0.75					0.85
	Reduction for Seismic Shear — Type 304 and 316 Stainless (ASTM A193, Grade B8 and B8M)			0.85	0.75					0.85
	Strength Reduction Factor — Steel Failure	ϕ	—	0.65[2]						
Concrete Breakout Strength in Shear										
Diameter of Anchor		d_a	in.	0.375	0.5	0.625	0.75	0.875	1	1.25
Load-Bearing Length of Anchor in Shear		ℓ_e	in.	Min. of h_{ef} and 8 times anchor diameter						
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 318-14 and ACI 318-11.
2. The value of ϕ applies when the load combinations of ACI 318-14 5.3 or ACI 318-11 Section 9.2 are used. If the load combinations of ACI 318 Appendix C are used, refer to ACI 318-11 D.4.4 to determine the appropriate value of ϕ.
3. The value of ϕ applies when both the load combinations of ACI 318-14 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI 318-14 17.3.3 or ACI 318-11 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 ACI 318-11 D.4.3 (c) for Condition A are met, refer to ACI 318-11 D.4.4 to determine the appropriate value of ϕ. If the load combinations of ACI 318 Appendix C are used, refer to ACI 318-11 D.4.4 to determine the appropriate value of ϕ.
4. The value of ϕ applies when both the load combinations of ACI 318-14 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI 318-14 17.3.3 or ACI 318-11 D.4.3 (c) for Condition B are met. If the load combinations of ACI 318 Appendix C are used, refer to ACI 318-11 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 p. 12 for an explanation of the load table icons.

AT-XP® Design Information — Concrete

AT-XP Shear Strength Design Data for Rebar[1]

Characteristic		Symbol	Units	Rebar Size						
				#3	#4	#5	#6	#7	#8	#10
Steel Strength in Shear										
Rebar	Minimum Shear Stress Area	A_{se}	in.^{2}	0.11	0.2	0.31	0.44	0.6	0.79	1.27
	Shear Resistance of Steel — Rebar (ASTM A615 Grade 60)	V_{sa}	lb.	4,950	10,800	16,740	23,760	32,400	42,660	68,580
	Shear Resistance of Steel — Rebar (ASTM A706 Grade 60)			4,400	9,600	14,880	21,120	28,800	37,920	60,960
	Reduction for Seismic Shear — Rebar (ASTM A615 Grade 60)	$\alpha_{V,seis}$[5]	—	0.56			0.80			
	Reduction for Seismic Shear — Rebar (ASTM A706 Grade 60)			0.56			0.80			
	Strength Reduction Factor — Steel Failure	ϕ		0.65[2]						
Concrete Breakout Strength in Shear										
Diameter of Anchor		d_a	in.	0.375	0.5	0.625	0.75	0.875	1	1.25
Load-Bearing Length of Anchor in Shear		ℓ_e	in.	Min. of h_{ef} and 8 times anchor diameter						
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 318-14 and ACI 318-11.
2. The value of ϕ applies when the load combinations of ACI 318-14 5.3 or ACI 318-11 Section 9.2 are used. If the load combinations of ACI 318 Appendix C are used, refer to ACI 318-11 D.4.4 to determine the appropriate value of ϕ.
3. The value of ϕ applies when both the load combinations of ACI 318-14 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI 318-14 17.3.3 or ACI 318-11 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 ACI 318-11 D.4.3 (c) for Condition A are met, refer to ACI 318-11 D.4.4 to determine the appropriate value of ϕ. If the load combinations of ACI 318 Appendix C are used, refer to ACI 318-11 D.4.4 to determine the appropriate value of ϕ.
4. The value of ϕ applies when both the load combinations of ACI 318-14 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI 318-14 17.3.3 or ACI 318-11 D.4.3 (c) for Condition B are met. If the load combinations of ACI 318 Appendix C are used, refer to ACI 318-11 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.

For additional load tables, visit **strongtie.com/atxp**.

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

AT-XP® Design Information — Masonry

AT-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	1,265	1,135
½	⅝	4½	1,910	1,660
⅝	¾	5⅝	2,215	1,810
¾	⅞	6¾	2,260	1,810
Rebar Installed in the Face of CMU Wall				
#3	½	3⅜	1,180	1,315
#4	⅝	4½	1,720	1,565
#5	¾	5⅝	1,835	1,565

1. Allowable load shall be the lesser of the bond values shown in this table and steel values, shown on p. 62.
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 p. 61. Figure 2 on p. 61 illustrates critical and minimum edge and end distances.
4. Minimum allowable nominal width of CMU wall shall be 8". 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" of the head joint, as show in Figure 2 on p. 61.
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.

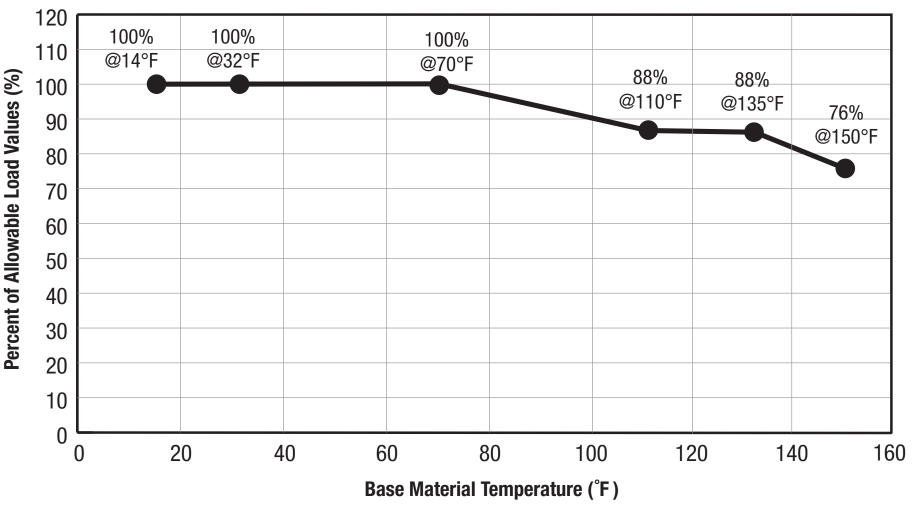

Figure 1. Load Capacity Based on In-Service Temperature for AT-XP Adhesive in the Face of Fully Grouted CMU Wall Construction

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

AT-XP® Design Information — Masonry

AT-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	1.00	0.76	0.94	8	1.00	4	1.00	1.00
½	4½	12	1.00	4	0.90	0.57	0.94	8	1.00	4	1.00	1.00
⅝	5⅝	12	1.00	4	0.72	0.47	0.94	8	1.00	4	1.00	1.00
¾	6¾	12	1.00	4	0.72	0.47	0.94	8	1.00	4	1.00	1.00
#3	3⅜	12	1.00	4	1.00	0.62	0.95	8	1.00	4	1.00	1.00
#4	4½	12	1.00	4	1.00	0.37	0.82	8	1.00	4	1.00	0.89
#5	5⅝	12	1.00	4	1.00	0.37	0.82	8	1.00	4	1.00	0.89

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 3 below). Perpendicular and parallel shear load reduction factors are cumulative when the anchor is located between the critical minimum edge and end distance.

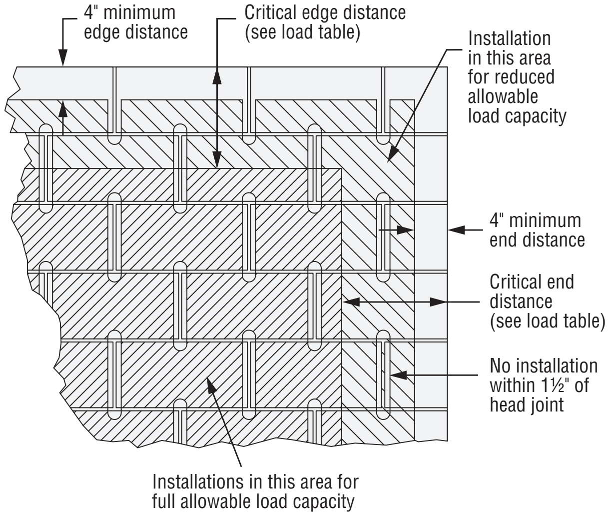

Figure 2. Allowable Anchor Locations for Full and Reduced Load Capacity When Installation Is in the Face of Fully Grouted CMU Masonry Wall Construction

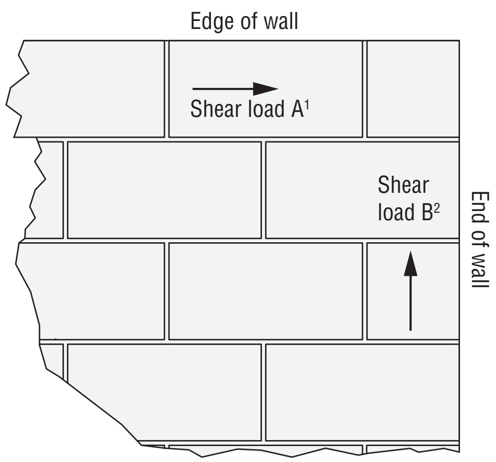

Figure 3. Direction of Shear Load in Relation to Edge and End of Wall

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.

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

AT-XP® Design Information — Steel

AT-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

1. Allowable load shall be the lesser of bond values given on p. 60 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.

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

IBC *

Drill Bit Diameter (in.)	Minimum Embedment[2] (in.)	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	7,440	3,690	4,745

1. Allowable load shall be the lesser of bond values given on p. 60 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 ($F_v = 0.17 \times F_u$ x Tensile Stress Area).
5. F_u = 70,000 psi for Grade 40 rebar.
6. F_u = 90,000 psi for Grade 60 rebar

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

AT-XP® Design Information — Masonry

AT-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 Embedment Depth[2] (in.)	Allowable Load Based on Bond Strength[7] (lb.)	
			Tension	Shear
3/8	9/16	1 1/4	225	275
1/2	3/4	1 1/4	220	315
5/8	7/8	1 1/4	215	355

1. Allowable load shall be the lesser of bond values shown in this table and steel values shown on p. 62.
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 p. 63. Figure 4 on p. 63 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 p. 60, as applicable.
9. Threaded rods installed in hollow masonry walls with AT-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.

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

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
3/8	12	1.00	4	1.00	1.00	8	1.00	4	0.74	1.00
1/2	12	1.00	4	1.00	1.00	8	1.00	4	0.76	0.89
5/8	12	1.00	4	1.00	0.89	8	1.00	4	0.78	0.77

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 (on the right) 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 3 on p. 61). Perpendicular and parallel shear load reduction factors are cumulative when the anchor is located between the critical minimum edge and end distance.

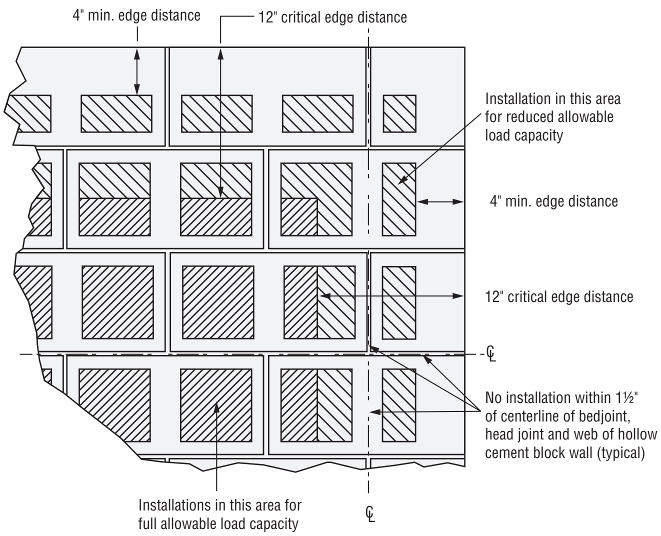

Figure 4. Allowable Anchor Locations for Full and Reduced Load Capacity When Installation Is in the Face of Hollow CMU Masonry Wall Construction

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