

AT-3G™ High-Strength Hybrid Acrylic Adhesive

AT-3G Cure Schedule

Base Material Temperature		Gel Time (minutes)	Cure Time (hr.)
°F	°C		
23	-5	50	5
32	0	25	3½
41	5	15	2
50	10	10	1
59	15	6	40 min.
68	20	3	30 min.
86	30	2	30 min.
104	40	2	30 min.

1. For water-saturated concrete, the cure times must be doubled.
2. Cartridge temperature must be between 41°F (5°C) and 104°F (40°C) at the time of installation.
3. For installation in temperatures below 23°F (-5°C), see p. 241 (Supplemental Section) for more information.

AT-3G Typical Properties

Property		Class A (35°–40°F)	Class B (40°–60°F)	Class C (>60°F)	Test Method
Consistency		Non-sag	Non-sag	Non-sag	ASTM C881
Bond Strength, Slant Shear	Hardened-to-Hardened Concrete, 2-Day Cure ¹	2,800 psi	2,800 psi	2,820 psi	ASTM C882
	Hardened-to-Hardened Concrete, 14-Day Cure ¹	3,200 psi	3,100 psi	3,250 psi	
Compressive Yield Strength, 7-Day Cure ²		10,300 psi	13,400 psi	15,000 psi	ASTM D695
Compressive Modulus, 7-Day Cure ²		1,400,000 psi	1,550,000 psi	1,650,000 psi	ASTM D695
Heat Deflection Temperature, 7-Day Cure ³		258°F (126°C)			ASTM D648
Glass Transition Temperature, 7-Day Cure ³		237°F (114°C)			ASTM E1640
Decomposition Temperature, 24-Hour Cure ³		480°F (250°C)			ASTM E2550
Water Absorption, 24 Hours, 7-Day Cure ³		0.90%			ASTM D570
Shore D Hardness, 24-Hour Cure ³		81			ASTM D2240
Linear Coefficient of Shrinkage, 7-Day Cure ³		0.000 in./in.			ASTM D2566
Coefficient of Thermal Expansion ³		2.6 × 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-3G Installation Information and Additional Data for Threaded Rod and Rebar in Normal-Weight Concrete¹



Characteristic	Symbol	Units	Nominal Rod Diameter (in.) / Rebar Size						
			¾ / #3	½ / #4	¾ / #5	¾ / #6	¾ / #7	1 / #8	1¼ / #9
Drill Bit Diameter for Threaded Rod	d_{hole}	in.	7/16	9/16	1 1/16	7/8	1	1 1/8	1 3/8
Drill Bit Diameter for Rebar	d_{hole}	in.	1/2	5/8	3/4	7/8	1	1 1/8	1 3/8
Maximum Tightening Torque for Threaded Rod	T_{inst}	ft.-lb.	15	30	44	66	96	147	221
Maximum Tightening Torque for Rebar	T_{inst}	ft.-lb.	15	30	44	66	96	147	185
Minimum Embedment Depth for Threaded Rod or Rebar	$h_{ef, min}$	in.	2¾	2¾	3 1/8	3 1/2	3 1/2	4	5
Maximum Embedment Depth for Threaded Rod	$h_{ef, max}$	in.	7 1/2	10	12 1/2	15	17 1/2	20	25
Maximum Embedment Depth for Rebar	$h_{ef, max}$	in.	7 1/2	10	12 1/2	15	17 1/2	20	22 1/2
Minimum Concrete Thickness	h_{min}	in.	$h_{ef} + 1 1/4$			$h_{ef} + 2d_{hole}$			
Critical Edge Distance	c_{ac}	in.	See footnote 2						
Minimum Edge Distance	c_{min}	in.	1 3/8	1 1/4	2	2 3/8	2 1/2	2 3/4	3 1/4
Minimum Anchor Spacing	s_{min}	in.	1 3/8	2 1/2	3	3 3/4	4 1/4	4 3/4	5 3/8

1. The information presented in this table is to be used in conjunction with the design criteria of ACI 318-19, 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. 14 for an explanation of the load table icons.

AT-3G™ Design Information — Concrete

AT-3G Tension Strength Design Data for Threaded Rod^{1,8}



Characteristic	Symbol	Units	Nominal Rod Diameter (in.)							
			3/8	1/2	5/8	3/4	7/8	1	1 1/4	
Steel Strength in Tension										
Minimum Tensile Stress Area	A_{se}	in. ²	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.	4,495	8,230	13,110	19,400	26,780	35,130	56,210	
Tension Resistance of Steel — ASTM F1554, Grade 55			5,815	10,645	16,950	25,090	34,630	45,430	72,685	
Tension Resistance of Steel — ASTM A193, Grade B7 and ASTM F1554, Grade 105			9,685	17,735	28,250	41,810	57,710	75,710	121,135	
Tension Resistance of Steel — ASTM A449			9,300	17,030	27,120	40,140	55,405	72,685	101,755	
Tension Resistance of Steel — ASTM F593 CW (Types 304 and 316 Stainless Steel)			7,750	17,190	22,600	28,430	39,245	51,485	82,370	
Tension Resistance of Steel — ASTM A193, Grade B8/B8M, Class 2B (Types 304 and 316 Stainless Steel)			7,365	13,480	21,470	31,780	43,860	57,540	92,065	
Strength Reduction Factor for Tension — Steel Failure	ϕ	—	0.75 ⁶							
Concrete Breakout Strength in Tension (2,500 psi ≤ f_c ≤ 8,000 psi)										
Effectiveness Factor for Cracked Concrete	$k_{c,cr}$	—	17							
Effectiveness Factor for Uncracked Concrete	$k_{c,uncr}$	—	24							
Strength Reduction Factor — Concrete Breakout Failure in Tension	ϕ	—	0.65 ⁶							
Bond Strength in Tension (2,500 psi ≤ f_c ≤ 8,000 psi)⁷										
Minimum Embedment	$h_{ef,min}$	in.	2 3/8	2 3/4	3 1/8	3 1/2	3 1/2	4	5	
Maximum Embedment	$h_{ef,max}$	in.	7 1/2	10	12 1/2	15	17 1/2	20	25	
Temperature Range A ^{2,5}	Characteristic Bond Strength in Uncracked Concrete ⁹	$\tau_{k,uncr}$	psi	2,600	2,415	2,260	2,140	2,055	2,000	1,990
	Characteristic Bond Strength in Cracked Concrete ⁹	$\tau_{k,cr}$	psi	1,040	1,040	1,110	1,220	1,210	1,205	1,145
Temperature Range B ^{3,5}	Characteristic Bond Strength in Uncracked Concrete ⁹	$\tau_{k,uncr}$	psi	2,265	2,100	1,970	1,865	1,785	1,740	1,730
	Characteristic Bond Strength in Cracked Concrete ⁹	$\tau_{k,cr}$	psi	905	905	965	1,060	1,055	1,050	995
Temperature Range C ^{4,5}	Characteristic Bond Strength in Uncracked Concrete ⁹	$\tau_{k,uncr}$	psi	1,630	1,515	1,420	1,345	1,290	1,255	1,250
	Characteristic Bond Strength in Cracked Concrete ⁹	$\tau_{k,cr}$	psi	650	655	695	765	760	755	720
Anchor Category	Dry Concrete	—	1							
Strength Reduction Factor	Dry Concrete	ϕ_{dry}	0.65 ⁶							
Anchor Category	Water-Saturated Concrete	—	2							
Strength Reduction Factor	Water-Saturated Concrete	ϕ_{ws}	0.55 ⁶							
Anchor Category	Water-Filled Hole	—	3							
Strength Reduction Factor	Water-Filled Hole	ϕ_{wf}	0.45 ⁶							
Reduction Factor for Seismic Tension	$\alpha_{N,seis}$ ¹⁰	—	0.95							

- The information presented in this table is to be used in conjunction with the design criteria of ACI 318-19, ACI 318-14 and ACI 318-11.
- Temperature Range A: Maximum short-term temperature = 176°F, Maximum long-term temperature = 122°F.
- Temperature Range B: Maximum short-term temperature = 248°F, Maximum long-term temperature = 161°F.
- Temperature Range C: Maximum short-term temperature = 320°F, Maximum long-term temperature = 212°F.
- Short-term concrete temperatures are those that occur over short intervals (diurnal cycling). Long-term temperatures are roughly constant over significant periods of time.
- The tabulated value of ϕ applies when the load combinations from the IBC or ACI 318 are used and the requirements of ACI 318-19 17.5.3, ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable, are met. If the load combinations of ACI 318-11 Appendix C are used, refer to ACI 318-11 D.4.4 to determine the appropriate value of ϕ .
- Bond strength values shown are for normal-weight concrete having a compressive strength of $f'_c = 2,500$ psi. For higher compressive strengths up to 8,000 psi, the tabulated characteristic bond strength may be increased by a factor of $(f'_c/2,500)^{0.10}$.
- For lightweight concrete, the modification factor for bond strength shall be as given in ACI 318-19 17.2.4, ACI 318-14 17.2.6 or ACI 318-11 D.3.6, as applicable, where applicable.
- Characteristic bond strength values are for sustained loads, including dead and live loads. For load combinations consisting of short-term loads only such as wind, bond strengths may be increased by 23% for Temperature Range C.
- For anchors installed in regions assigned to Seismic Design Category C, D, E or F, the bond strength values must be multiplied by $\alpha_{N,seis}$.

⁸See p. 14 for an explanation of the load table icons.

AT-3G™ Design Information — Concrete

AT-3G Tension Strength Design Data for Rebar^{1,8}



Characteristic	Symbol	Units	Rebar Size							
			#3	#4	#5	#6	#7	#8	#9	
Steel Strength in Tension										
Minimum Tensile Stress Area	A_{se}	in. ²	0.11	0.20	0.31	0.44	0.60	0.79	1.00	
Tension Resistance of Steel — ASTM A615 Grade 60	N_{sa}	lb.	9,900	18,000	27,900	39,600	54,000	71,100	90,000	
Tension Resistance of Steel — ASTM A706 Grade 60			8,800	16,000	24,800	35,200	48,000	63,200	80,000	
Tension Resistance of Steel — ASTM A615 Grade 40			6,600	12,000	18,600	26,400	Sizes not available			
Strength Reduction Factor for Tension — Steel Failure — ASTM A615 Grades 40 and 60	ϕ	—	0.65 ⁶							
Strength Reduction Factor for Tension — Steel Failure — ASTM A706	ϕ	—	0.75 ⁶							
Concrete Breakout Strength in Tension (2,500 psi ≤ f'_c ≤ 8,000 psi)										
Effectiveness Factor for Cracked Concrete	$k_{c,cr}$	—	17							
Effectiveness Factor for Uncracked Concrete	$k_{c,uncr}$	—	24							
Strength Reduction Factor — Concrete Breakout Failure in Tension	ϕ	—	0.65 ⁶							
Bond Strength in Tension (2,500 psi ≤ f'_c ≤ 8,000 psi)⁷										
Minimum Embedment	$h_{ef,min}$	in.	2¾	2¾	3⅞	3½	3½	4	4½	
Maximum Embedment	$h_{ef,max}$	in.	7½	10	12½	15	17½	20	22½	
Temperature Range A ^{2,5}	Characteristic Bond Strength in Uncracked Concrete ⁹	$\tau_{k,uncr}$	psi	2,200	2,100	2,030	1,970	1,920	1,880	1,845
	Characteristic Bond Strength in Cracked Concrete ⁹	$\tau_{k,cr}$	psi	1,090	1,055	1,130	1,170	1,175	1,155	1,140
Temperature Range B ^{3,5}	Characteristic Bond Strength in Uncracked Concrete ⁹	$\tau_{k,uncr}$	psi	1,915	1,830	1,765	1,715	1,670	1,635	1,615
	Characteristic Bond Strength in Cracked Concrete ⁹	$\tau_{k,cr}$	psi	945	915	980	1,015	1,020	1,005	995
Temperature Range C ^{4,5}	Characteristic Bond Strength in Uncracked Concrete ⁹	$\tau_{k,uncr}$	psi	1,380	1,315	1,270	1,235	1,205	1,180	1,155
	Characteristic Bond Strength in Cracked Concrete ⁹	$\tau_{k,cr}$	psi	680	660	705	735	735	725	715
Anchor Category	Dry Concrete	—	—	1						
Strength Reduction Factor	Dry Concrete	ϕ_{dry}	—	0.65 ⁶						
Anchor Category	Water-Saturated Concrete	—	—	2						
Strength Reduction Factor	Water-Saturated Concrete	ϕ_{ws}	—	0.55 ⁶						
Anchor Category	Water-Filled Hole	—	—	3						
Strength Reduction Factor	Water-Filled Hole	ϕ_{wf}	—	0.45 ⁶						
Reduction Factor for Seismic Tension	$\alpha_{N,seis}$ ¹⁰	—	0.95	0.95	1.00	1.00	1.00	1.00	1.00	

- The information presented in this table is to be used in conjunction with the design criteria of ACI 318-19, ACI 318-14 and ACI 318-11.
- Temperature Range A: Maximum short-term temperature = 176°F, Maximum long-term temperature = 122°F.
- Temperature Range B: Maximum short-term temperature = 248°F, Maximum long-term temperature = 161°F.
- Temperature Range C: Maximum short-term temperature = 320°F, Maximum long-term temperature = 212°F.
- Short-term concrete temperatures are those that occur over short intervals (diurnal cycling). Long-term temperatures are roughly constant over significant periods of time.
- The tabulated value of ϕ applies when the load combinations from the IBC or ACI 318 are used and the requirements of ACI 318-19 17.5.3, ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable, are met. If the load combinations of ACI 318-11 Appendix C are used, refer to ACI 318-11 D.4.4 to determine the appropriate value of ϕ .
- Bond strength values shown are for normal-weight concrete having a compressive strength of f'_c = 2,500 psi. For higher compressive strengths up to 8,000 psi, the tabulated characteristic bond strength may be increased by a factor of (f'_c/2,500)^{0.10}.
- For lightweight concrete, the modification factor for bond strength shall be as given in ACI 318-19 17.2.4, ACI 318-14 17.2.6 or ACI 318-11 D.3.6, as applicable, where applicable.
- Characteristic bond strength values are for sustained loads, including dead and live loads. For load combinations consisting of short-term loads only such as wind, bond strengths may be increased by 23% for Temperature Range C.
- For anchors installed in regions assigned to Seismic Design Category C, D, E or F, the bond strength values must be multiplied by $\alpha_{N,seis}$.

*See p. 14 for an explanation of the load table icons.

AT-3G™ Design Information — Concrete

AT-3G Shear Strength Design Data for Threaded Rod¹



Characteristic	Symbol	Units	Nominal Rod Diameter (in.)						
			3/8	1/2	5/8	3/4	7/8	1	1 1/4
Steel Strength in Shear									
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.	2,695	4,940	7,860	11,640	16,070	21,080	33,725
Shear Resistance of Steel — ASTM F1554, Grade 55			3,490	6,385	10,170	15,055	20,780	27,260	43,610
Shear Resistance of Steel — ASTM A193, Grade B7 and ASTM F1554, Grade 105			5,810	10,640	16,950	25,085	34,625	45,425	72,680
Shear Resistance of Steel — ASTM A449			5,580	10,220	16,270	24,085	33,240	43,610	61,055
Shear Resistance of Steel — ASTM F593 CW (Types 304 and 316 Stainless Steel)			4,650	8,515	13,560	17,060	23,545	30,890	49,425
Shear Resistance of Steel — ASTM A193, Grade B8/B8M, Class 2B (Types 304 and 316 Stainless Steel)			4,420	8,090	12,880	19,070	26,320	34,525	55,240
Reduction Factor for Seismic Shear			$\alpha_{V,seis}$ ³	—	0.65				
Strength Reduction Factor for Shear — Steel Failure	ϕ	—	0.65 ²						
Concrete Breakout Strength in Shear									
Outside 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.	Minimum of h_{ef} and 8x anchor diameter						
Strength Reduction Factor for Shear — Breakout Failure	ϕ	—	0.70 ²						
Concrete Pryout Strength in Shear									
Load-Bearing Length of Anchor in Shear	k_{cp}	in.	1.0 for $h_{ef} < 2.50"$; 2.0 for $h_{ef} \geq 2.50"$						
Strength Reduction Factor for Shear — Breakout Failure	ϕ	—	0.70 ²						

- The information presented in this table is to be used in conjunction with the design criteria of ACI 318-19, ACI 318-14 and ACI 318-11.
- The tabulated value of ϕ applies when the load combinations from the IBC or ACI 318 are used and the requirements of ACI 318-19 17.5.3, ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable, are met. If the load combinations of ACI 318-11 Appendix C are used, refer to ACI 318-11 D.4.4 to determine the appropriate value of ϕ .
- 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/at3g.



Anchor Designer™ Software for ACI 318, ETAG and CSA

Simpson Strong-Tie® Anchor Designer software accurately analyzes existing design or suggests anchor solutions based on user-defined design elements in cracked and uncracked concrete conditions.

AT-3G™ Design Information — Concrete

AT-3G Shear Strength Design Data for Rebar¹



Characteristic	Symbol	Units	Nominal Rod Diameter (in.)						
			#3	#4	#5	#6	#7	#8	#9
Steel Strength in Shear									
Minimum Shear Stress Area	A_{se}	in. ²	0.11	0.20	0.31	0.44	0.60	0.79	1.00
Shear Resistance of Steel — ASTM A615 Grade 60	V_{sa}	lb.	5,940	10,800	16,740	23,760	32,400	42,660	54,000
Shear Resistance of Steel — ASTM A706 Grade 60			5,280	9,600	14,880	21,120	28,800	37,920	48,000
Shear Resistance of Steel — ASTM A615 Grade 40			3,960	7,200	11,160	15,840	Sizes not available		
Reduction Factor for Seismic Shear	$\alpha_{V_{seis}}$ ³	—							0.65
Strength Reduction Factor for Shear — Steel Failure — ASTM A615 Grades 40 and 60	ϕ	—							0.60 ²
Strength Reduction Factor for Shear — Steel Failure — ASTM A706	ϕ	—							0.65 ²
Concrete Breakout Strength in Shear									
Outside 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.	Minimum of h_{ef} and 8x anchor diameter						
Strength Reduction Factor for Shear — Breakout Failure	ϕ	—	0.70 ²						
Concrete Pryout Strength in Shear									
Load-Bearing Length of Anchor in Shear	k_{cp}	in.	1.0 for $h_{ef} < 2.50"$; 2.0 for $h_{ef} \geq 2.50"$						
Strength Reduction Factor for Shear — Breakout Failure	ϕ	—	0.70 ²						

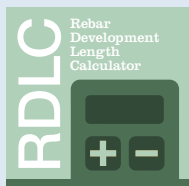
- The information presented in this table is to be used in conjunction with the design criteria of ACI 318-19, ACI 318-14 and ACI 318-11.
- The tabulated value of ϕ applies when the load combinations from the IBC or ACI 318 are used and the requirements of ACI 318-19 17.5.3, ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable, are met. If the load combinations of ACI 318-11 Appendix C are used, refer to ACI 318-11 D.4.4 to determine the appropriate value of ϕ .
- 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.

AT-3G Development Length for Rebar Dowels



Rebar Size	Drill Bit Diameter (in.)	Clear Cover (in.)	Development Length (in.)				
			$f'_c = 2,500$ psi Concrete	$f'_c = 3,000$ psi Concrete	$f'_c = 4,000$ psi Concrete	$f'_c = 6,000$ psi Concrete	$f'_c = 8,000$ psi Concrete
#3	1/2	1 3/16	12	12	12	12	12
#4	5/8	1 3/16	14.4	14	12	12	12
#5	3/4	1 3/16	18	17	14.2	12	12
#6	7/8	1 3/16	21.6	20	17.1	14	13
#7	1	1 3/16	31.5	29	25	21	18
#8	1 1/8	1 3/16	36	33	28.5	24	21
#9	1 3/8	1 3/16	40.5	38	32	27	23

- Tabulated development lengths are for static, wind and seismic load cases in Seismic Design Category A and B. Development lengths in Seismic Design Category C through F must comply with ACI 318-19 and ACI 318-14 Chapter 18 or ACI 318-11 Chapter 21, as applicable.
- 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.
- Concrete is assumed to be normal-weight concrete. For lightweight concrete, multiply tabulated values by 1.33. Tabulated values assume bottom cover less than 12" cast below rebars ($\Psi_1 = 1.0$).
- Uncoated rebar must be used.
- The value of K_{tr} is assumed to be 0. Refer to ACI 318-19 Section 25.4.2.4, ACI 318-14 Section 25.4.2.3 or ACI 318-11 Section 12.2.3.



Rebar Development Length Calculator

Rebar Development Length Calculator is a web application that supports the design of post-installed rebar in concrete applications by calculating the necessary tension and compression development lengths required in accordance with ACI 318-19 / ACI 318-14.

*See p. 14 for an explanation of the load table icons.