AT-3G™ High-Strength Hybrid Acrylic Adhesive

Easy prep. Fast cure. Code listed.

AT-3G is a hybrid, acrylic-based adhesive for anchoring threaded rod and rebar into cracked and uncracked concrete. Ideal for cold weather and wet concrete applications, AT-3G dispenses easily and offers a fast curing time for same-day bolt up. It can be specified for a wide range of in-service temperatures, and maintains its strong bond strength in extreme environments for ultimate design and jobsite flexibility. Tested and code compliant with the IBC and IRC, AT-3G hybrid adhesive is easy to install with the conventional blow-brush-blow hole cleaning method.

Features

- Excellent for use in cold weather conditions or applications where fast cure is required
- Recognized per ICC-ES AC308 for threaded rod and rebar anchoring, along with post-installed rebar development and splice length design provisions
- Conventional blow-brush-blow hole cleaning technique using a wire brush — no power brushing required
- Additional special application testing has been conducted to address:
  - » Base material installation temperatures down to 0°F (-18°C)
  - » Use in grout-filled CMU construction
  - » Use of a vacuum in lieu of compressed air for hole cleaning
  - » Installation into oversized holes
  - » Installation in holes drilled with diamond core bits

  Note: Please see the website for access to engineering letters for detailed information on special applications.

Test Criteria

AT-3G has been tested in accordance with ICC-ES 308, ACI 355.4 and applicable ASTM test methods.

Code Reports, Standards and Compliance

Concrete — ICC-ES ESR 5026 (including post-installed rebar, City of LA and Florida Building Code)

ASTM C881 and AASHTO M235 — Type I/IV, Grade 3, Classes A, B and C, except AT-3G is not an epoxy

UL Certification — CDPH Standard Method v1.2

NSF/ANSI/CAN 61 — Certified for use in potable water

Chemical Resistance

Contact Simpson Strong-Tie for information.

Installation Instructions

- For full installation instructions, see product packaging or visit **strongtie.com/at3g**.
- To warm cold cartridge, store cartridges in a warm, uniformly heated area or storage container.

Product Information

Mix Ratio/Type	10:1 hybrid-acrylic
Mixed Color	Gray
Base Materials	Concrete — Cracked and Uncracked
Base Material Conditions	Dry, Water-Saturated, Water-Filled Holes
Anchor Type	Threaded Rod or Rebar
Substrate Installation Temperature	23°F (-5°C) to 104°F (40°C)
In-Service Temperature Range	-40°F (-40°C) to 320°F (160°C)
Storage Temperature	41°F (5°C) to 77°F (25°C)
Shelf Life	18 months
Volatile Organic Compound (VOC)	41 g/l

AT-3G Usage and Applications

AT-3G dispenses easily and offers a fast curing time. It can be specified for a wide range of in-service temperatures, and sustains strong bond strengths in extreme environments for ultimate design and jobsite flexibility.

Key Applications

- Post base
- Stairs and rails
- Seismic retrofit
- Rebar and doweling
- Conveyors
- Parking bollards
- Gates
- Highway barriers
- Heavy equipment
- Holdowns
- Racking
- Structural steel — beams and columns
- Dock doors and bumpers

Cartridge System Table

Model No.	Capacity (oz.)	Cartridge Type	Carton Qty.	Dispensing Tool(s)	Mixing Nozzle
AT3G10[1]	9.4	Coaxial	6	CDT10S	AMN19Q
AT3G30[1]	28	Side-by-Side	5	ADT30S, ADTA30P or ADTA30CKT	

1. One AMN19Q mixing nozzle with integrated extension is supplied with each cartridge.
2. Use only Simpson Strong-Tie® mixing nozzles in accordance with Simpson Strong-Tie instructions. Modifications or improper use of mixing nozzle may impair AT-3G adhesive performance.
3. Use of rodless pneumatic tools to dispense single-tube, coaxial cartridges is prohibited.
4. Detailed information on dispensing tools, mixing nozzles and other adhesive accessories is available at **strongtie.com**.
5. Cartridge estimation guidelines are available at **strongtie.com/apps**.

AT-3G Cure Schedule

Base Material Temperature		Gel Time	Cure Time
(°F)	(°C)	(min.)	(hr.)
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.

1. Cartridge temperature must be between 41° (5°C) and 104°F (40°C) at the time of installation.

Hole Cleaning Accessories: Wire Brush Heads / T-Handle Extensions

Designed for use with AT-3G to permit proper hole cleaning at embedments up to 20 times the anchor diameter.

Model No.	Hole Diameter (in.)	Anchor Diameter (in.)	Rebar Size	Usable Length (in.)	Carton Quantity
ETB43S	7/16	3/8	—	5	25
ETB50S	1/2	—	#3	5	25
ETB56S	9/16	1/2	—	5	25
ETB62S	5/8	—	#4	5	25
ETB68S	11/16	5/8	—	5	25
ETB75S	3/4	—	#5	5	25
ETB87S	7/8	3/4	#6	5	25
ETB100S	1	7/8	#7	5	25
ETB112S	1 1/8	1	#8	5	25
ETB137S	1 3/8	1 1/4	#9	5	25
ETBS-TH	T-handle			8½	25
ETBS-EXT	Extension			11½	25

1. T-handle is required for use with all sizes of standard wire brush.
2. To obtain total usable length, add the usable length for each part used.

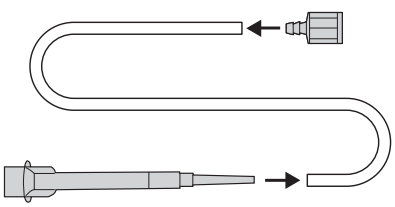
Adhesive Piston Plug Delivery System

For consistent dispensing of anchoring adhesives in any installation orientation, the Simpson Strong-Tie Adhesive Piston Plug Delivery System offers you an easy-to-use, more reliable and less time-consuming means to dispense adhesive into drilled holes for threaded rod and rebar dowel installations at overhead, upwardly inclined and horizontal orientations.

The matched tolerance design between the piston plug and drilled hole virtually eliminates the formation of voids and air pockets during adhesive dispensing.

Adhesive Piston Plug Family

Piston Plug Delivery System



Mixing Nozzle with Delivery System

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	
	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 Concrete[1]

IBC

Characteristic	Symbol	Units	Nominal Rod Diameter (in.) / Rebar Size						
			⅜ / #3	½ / #4	⅝ / #5	¾ / #6	⅞ / #7	1 / #8	1¼ / #9
Drill Bit Diameter for Threaded Rod	d_{hole}	in.	7/16	9/16	11/16	⅞	1	1⅛	1⅜
Drill Bit Diameter for Rebar	d_{hole}	in.	½	⅝	¾	⅞	1	1⅛	1⅜
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.	2⅜	2¾	3⅛	3½	3½	4	5
Maximum Embedment Depth for Threaded Rod	$h_{ef,\,max}$	in.	7½	10	12½	15	17½	20	25
Maximum Embedment Depth for Rebar	$h_{ef,\,max}$	in.	7½	10	12½	15	17½	20	22½
Minimum Concrete Thickness	h_{min}	in.	h_{ef} + 1¼		$h_{ef} + 2d_{hole}$				
Critical Edge Distance	c_{ac}	in.	See footnote 2						
Minimum Edge Distance	c_{min}	in.	1⅝	1¾	2	2⅜	2½	2¾	3¼
Minimum Anchor Spacing	s_{min}	in.	1⅞	2½	3	3¾	4¼	4¾	5⅞

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. $c_{ac} = h_{ef}(\tau_{k,uncr}/1{,}160)^{0.4}$ x [3.1 – 0.7(h/h_{ef})], where:
   [h/h_{ef}] ≤ 2.4
   $\tau_{k,uncr}$ = the characteristic bond strength in uncracked concrete, given in the tables that follow ≤ k_{uncr} ((h_{ef} x f'_c)$^{0.5}$/(π x d_a))
   h = the member thickness (inches)
   h_{ef} = the embedment depth (inches)

AT-3G Tension Strength Design Data for Threaded Rod in Normal-Weight Concrete[1, 9]

IBC

Characteristic		Symbol	Units	Nominal Rod Diameter (in.)						
				⅜	½	⅝	¾	⅞	1	1¼
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[7]						
Bond Strength in Tension (2,500 psi ≤ f'$_c$ ≤ 8,000 psi)[8]										
Minimum Embedment		$h_{ef,min}$	in.	2⅜	2¾	3⅛	3½	3½	4	5
Maximum Embedment		$h_{ef,max}$	in.	7½	10	12½	15	17½	20	25
Temperature Range A[2,5]	Characteristic Bond Strength in Uncracked Concrete[10]	$\tau_{k,uncr}$	psi	2,600	2,415	2,260	2,140	2,055	2,000	1,990
	Characteristic Bond Strength in Cracked Concrete[10]	$\tau_{k,cr}$	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[10]	$\tau_{k,uncr}$	psi	2,265	2,100	1,970	1,865	1,785	1,740	1,730
	Characteristic Bond Strength in Cracked Concrete[10]	$\tau_{k,cr}$	psi	905	905	965	1,060	1,055	1,050	995
Temperature Range C[4,5]	Characteristic Bond Strength in Uncracked Concrete[10]	$\tau_{k,uncr}$	psi	1,630	1,515	1,420	1,345	1,290	1,255	1,250
	Characteristic Bond Strength in Cracked Concrete[10]	$\tau_{k,cr}$	psi	650	655	695	765	760	755	720
Anchor Category	Dry Concrete			1						
Strength Reduction Factor	Dry Concrete	ϕ_{dry}		0.65[11]						
Anchor Category	Water-Saturated Concrete			2						
Strength Reduction Factor	Water-Saturated Concrete	ϕ_{ws}		0.55[11]						
Anchor Category	Water-Filled Hole			3						
Strength Reduction Factor	Water-Filled Hole	ϕ_{wf}		0.45[11]						
Reduction Factor for Seismic Tension		$\alpha_{N,seis}$[12]		0.95						

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. Temperature Range A: Maximum short-term temperature = 176°F, Maximum long-term temperature = 122°F.
3. Temperature Range B: Maximum short-term temperature = 248°F, Maximum long-term temperature = 161°F.
4. Temperature Range C: Maximum short-term temperature = 320°F, Maximum long-term temperature = 212°F.
5. Short-term concrete temperatures are those that occur over short intervals (diurnal cycling). Long-term temperatures are roughly constant over significant periods of time.
6. The tabulated value of ϕ applies when the load combinations of ACI 318-19 14.5.3, ACI 318-14 5.3 or ACI 318-11 9.2 are used. 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.
7. The tabulated value of ϕ applies when both the load combinations of ACI 318-19 14.5.3, ACI 318-14 5.3 or ACI 318-11 9.2 are used and the requirements of ACI 318-19 Table 17.5.3 (b) or (c), ACI 318-14 17.3.3 (c) or ACI 318-11 D.4.3 (c), as applicable, for Condition B are met. If the load combinations of ACI 318-11 Appendix C are used, refer to ACI 318 D.4.4 (c) for Condition B to determine the appropriate value of ϕ.
8. 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)$^{0.10}$.
9. 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.
10. Characteristic bond strength values are for sustained loads, including dead and live loads.
11. The tabulated value of ϕ applies when both the load combinations of ACI 318-19 14.5.3, ACI 318-14 5.3 or ACI 318-11 9.2 are used and the requirements of ACI 318-19 Table 17.5.3 (b) or (c), ACI 318-14 17.3.3 (c) or ACI 318-11 D.4.3 (c), as applicable, for Condition B are met. If the load combinations of ACI 318-11 Appendix C are used, refer to ACI 318 D.4.4 (c) for Condition B to determine the appropriate value of ϕ.
12. For anchors installed in regions assigned to Seismic Design Category C, D, E or F, the bond strength values must be multiplied by $\alpha_{N,seis}$.

AT-3G Tension Strength Design Data for Rebar in Normal-Weight Concrete[1,9]

IBC

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[7]						
Bond Strength in Tension (2,500 psi ≤ f'$_c$ ≤ 8,000 psi)[8]										
Minimum Embedment		$h_{ef,min}$	in.	2⅜	2¾	3⅛	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[10]	$\tau_{k,uncr}$	psi	2,200	2,100	2,030	1,970	1,920	1,880	1,845
	Characteristic Bond Strength in Cracked Concrete[10]	$\tau_{k,cr}$	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[10]	$\tau_{k,uncr}$	psi	1,915	1,830	1,765	1,715	1,670	1,635	1,615
	Characteristic Bond Strength in Cracked Concrete[10]	$\tau_{k,cr}$	psi	945	915	980	1,015	1,020	1,005	995
Temperature Range C[4,5]	Characteristic Bond Strength in Uncracked Concrete[10]	$\tau_{k,uncr}$	psi	1,380	1,315	1,270	1,235	1205	1,180	1,155
	Characteristic Bond Strength in Cracked Concrete[10]	$\tau_{k,cr}$	psi	680	660	705	735	735	725	715
Anchor Category	Dry Concrete			1						
Strength Reduction Factor	Dry Concrete	ϕ_{dry}		0.65[11]						
Anchor Category	Water-Saturated Concrete			2						
Strength Reduction Factor	Water-Saturated Concrete	ϕ_{ws}		0.55[11]						
Anchor Category	Water-Filled Hole			3						
Strength Reduction Factor	Water-Filled Hole	ϕ_{wf}		0.45[11]						
Reduction Factor for Seismic Tension		$\alpha_{N,seis}$[12]		0.95	0.95	1.00	1.00	1.00	1.00	1.00

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. Temperature Range A: Maximum short-term temperature = 176°F, Maximum long-term temperature = 122°F.
3. Temperature Range B: Maximum short-term temperature = 248°F, Maximum long-term temperature = 161°F.
4. Temperature Range C: Maximum short-term temperature = 320°F, Maximum long-term temperature = 212°F.
5. Short-term concrete temperatures are those that occur over short intervals (diurnal cycling). Long-term temperatures are roughly constant over significant periods of time.
6. The tabulated value of ϕ applies when the load combinations of ACI 318-19 14.5.3, ACI 318-14 5.3 or ACI 318-11 9.2 are used. 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.
7. The tabulated value of ϕ applies when both the load combinations of ACI 318-19 14.5.3, ACI 318-14 5.3 or ACI 318-11 9.2 are used and the requirements of ACI 318-19 Table 17.5.3 (b) or (c), ACI 318-14 17.3.3 (c) or ACI 318-11 D.4.3 (c), as applicable, for Condition B are met. If the load combinations of ACI 318-11 Appendix C are used, refer to ACI 318 D.4.4 (c) for Condition B to determine the appropriate value of ϕ.
8. 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)$^{0.10}$.
9. 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.
10. Characteristic bond strength values are for sustained loads, including dead and live loads.
11. The tabulated value of ϕ applies when both the load combinations of ACI 318-19 14.5.3, ACI 318-14 5.3 or ACI 318-11 9.2 are used and the requirements of ACI 318-19 Table 17.5.3 (b) or (c), ACI 318-14 17.3.3 (c) or ACI 318-11 D.4.3 (c), as applicable, for Condition B are met. If the load combinations of ACI 318-11 Appendix C are used, refer to ACI 318 D.4.4 (c) for Condition B to determine the appropriate value of ϕ.
12. For anchors installed in regions assigned to Seismic Design Category C, D, E or F, the bond strength values must be multiplied by $\alpha_{N,seis}$.

AT-3G Shear Strength Design Data for Threaded Rod in Normal-Weight Concrete[1]

Characteristic	Symbol	Units	Nominal Rod Diameter (in.)						
			⅜	½	⅝	¾	⅞	1	1¼
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	$\alpha_{V,seis}$[4]		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[3]						
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[3]						

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. The tabulated value of ϕ applies when the load combinations of ACI 318-19 14.5.3, ACI 318-14 5.3 or ACI 318-11 9.2 are used. 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.
3. The tabulated value of ϕ applies when both the load combinations of ACI 318-19 14.5.3, ACI 318-14 5.3 or ACI 318-11 9.2 are used and the requirements of ACI 318-19 Table 17.5.3 (b) or (c), ACI 318-14 17.3.3 (c) or ACI 318-11 D.4.3 (c), as applicable, for Condition B are met. If the load combinations of ACI 318-11 Appendix C are used, refer to ACI 318 D.4.4 (c) for Condition B to determine the appropriate value of ϕ.
4. 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 α_{Vseis} for the corresponding anchor steel type.

AT-3G Shear Strength Design Data for Rebar in Normal-Weight Concrete[1]

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	$\alpha_{V,seis}$[4]		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[3]						
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[3]						

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. The tabulated value of ϕ applies when the load combinations of ACI 318-19 14.5.3, ACI 318-14 5.3 or ACI 318-11 9.2 are used. 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.
3. The tabulated value of ϕ applies when both the load combinations of ACI 318-19 14.5.3, ACI 318-14 5.3 or ACI 318-11 9.2 are used and the requirements of ACI 318-19 Table 17.5.3 (b) or (c), ACI 318-14 17.3.3 (c) or ACI 318-11 D.4.3 (c), as applicable, for Condition B are met. If the load combinations of ACI 318-11 Appendix C are used, refer to ACI 318 D.4.4 (c) for Condition B to determine the appropriate value of ϕ.
4. 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 α_{Vseis} for the corresponding anchor steel type.

AT-3G™ High-Strength Hybrid-Acrylic Adhesive

AT-3G Development Length for Rebar Dowels in Normal-Weight Concrete

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	½	1⅜6	12	12	12	12	12
#4	⅝	1⅜6	14.4	14	12	12	12
#5	¾	1⅜6	18	17	14.2	12	12
#6	⅞	1⅜6	21.6	20	17.1	14	13
#7	1	1⅝6	31.5	29	25	21	18
#8	1⅛	1⅝6	36	33	28.5	24	21
#9	1⅜	1⅝6	40.5	38	32	27	23

1. 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 318-14 Chapter 18 or ACI 318-11 Chapter 21, as applicable.
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. Tabulated values assume bottom cover less that 12" cast below rebars (Ψ_1 = 1.0).
4. Uncoated rebar must be used.
5. The value of K_{tr} is assumed to be 0. Refer to ACI 318-14 Section 25.4.2.3 or ACI 318-11 Section 12.2.3.

Software and Web Application Technology

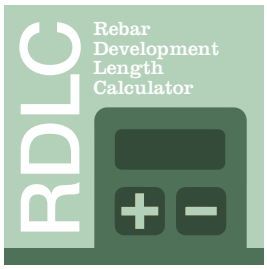
Please visit the Sofware and Web Applications page of our website for innovative, cost-effective product and design recommendations for any project at **strongtie.com/softwareandwebapplications/category**.

Anchor Designer™ (AD)

Perform anchorage design in accordance with the strength design provision of ACI 318 or CSA A23.3 for cracked and uncracked concrete conditions.

Adhesive Cartridge Estimator (ACE)

Easily estimate how much adhesive you will need for your project, including threaded rod and rebar doweling and crack injection.



Rebar Development Length Calulator (RDLC)

Calculate ACI 318 tension and compression development lengths for desiging post-installed rebar in concrete conditions.

(800) 999-5099
strongtie.com