WEAVER CONSTRUCTION MANAGEMENT, INC.
3679 S. Huron St., Suite 404
Englewood, CO 80110
Phone: (303) 789-4111 FAX: (303) 789-4310

SUBMITTAL TRANSMITAL

September 29, 2011
WCM Submittal No: 05501-001

PROJECT: **Harold Thompson Regional WRF**
Birdsall Rd.
Fountain, CO 80817
Job No. 2908

ENGINEER: **GMS, Inc.**
611 No. Weber St., #300
Colorado Springs, CO 80903
719-475-2935 Roger Sams

OWNER: **Lower Fountain Metropolitan Sewage Disposal District**
901 S. Santa Fe Ave.
Fountain, CO 80817
719-382-5303 James Heckman

CONTRACTOR: **Weaver Construction Management**

SUBJECT: Simpson Acrylic-Tie Anchoring Adhesive

SPEC SECTION: 05501 – Not in Spec – Anchoring Adhesive

PREVIOUS SUBMISSION DATES: n/a

DEVIATIONS FROM SPEC: ___ YES _X_ NO

CONTRACTOR'S STAMP: This submittal has been reviewed by WCM and approved with respect to the means, methods, techniques, & safety precautions & programs incidental thereto. Weaver General Construction also warrants that this submittal complies with contracted documents and comprises on deviations thereto:

Contractor's Stamp:	Engineer's Stamp:
Date: 9/27/11 Reviewed by: H.C. Myers (X) Reviewed Without Comments ( ) Reviewed With Comments ENGINEER'S COMMENTS:_____	

Submittal / Substitution Request

SUBMITTED TO:

To: _____

Firm: _____

Project: _____

Submitted Product: **SIMPSON STRONG-TIE ACRYLIC-TIE® ANCHORING ADHESIVE**

Specified Product: _____

Section: _____ Page: _____ Detail/Sheet No.: _____

Description of Application: _____

_____

_____

_____

_____

Attached information includes product description, installation instructions and pertinent technical data needed for evaluation of the submittal request.

SUBMITTED BY:

Name: _____ Signature: _____

Firm: _____

Address: _____

_____

Phone: _____ Fax: _____

E-Mail: _____

Date of Submittal: _____

FOR ARCHITECT/ENGINEER USE:

Approved: _____ Approved As Noted: _____ Not Approved: _____

(Please briefly explain why not approved)

_____

_____

_____

By: _____ Date: _____

Remarks: _____

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ACRYLIC-TIE®
Acrylic-Tie Adhesive

Acrylic-Tie is a two component, 10:1 ratio acrylic based adhesive for use as a high strength, anchor grouting material. Formulated for use in all types of weather, AT is designed to dispense easily and cure at temperatures down to 0°F. Resin and initiator are dispensed and mixed simultaneously through the mixing nozzle. AT meets the physical requirements of ASTM C881, Type I & IV, Grade 3, Classes A, B & C, except Acrylic-Tie is a non-epoxy product formulated for fast cure time.

USES:
- Threaded rod anchoring
- Rebar dowelling
- Pick proof sealant around doors, windows and fixtures

CODES: ICC-ES ER-5791; City of L.A. RR25459; Florida FL 2304.1; NSF/ANSI Standard 61 (10.03 in^2/5000 gal); Multiple DOT listings.

The Load Tables list values based upon results from the most recent testing and may not reflect those in current code reports. Where code jurisdictions apply, consult the current reports for applicable load values.

APPLICATION: Surfaces to receive adhesive must be clean and free of frost. The base material temperature must be 0° F or above at the time of installation. For information on installations below 0° F contact Simpson. Mixed material in nozzle can harden in 5–7 minutes. For installations in or through standing water, see page 11 for details.

SHELF LIFE: Twelve months from date of manufacture in unopened cartridge.

STORAGE CONDITIONS: For best results store between 32° F - 80° F. Partially used cartridges can be stored for a limited time by leaving nozzle in place. To re-use, attach new nozzle.

COLOR: Resin — white; Initiator — black. When properly mixed, adhesive will be a uniform gray color.

CLEAN UP: Uncured material — Wipe up with cotton cloths. If desired scrub area with abrasive, waterbased cleaner and flush with water. If approved, solvents such as ketones (MEK, acetone, etc.), laquer thinner, or adhesive remover can be used. DO NOT USE SOLVENTS TO CLEAN ADHESIVE FROM SKIN. Take appropriate precautions when handling flammable solvents. Solvents may damage surfaces to which they are applied. Cured Material: Chip or grind off surface.

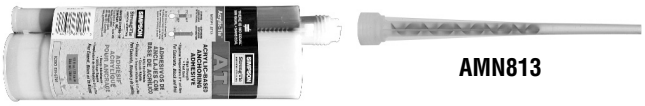
TEST CRITERIA: Anchors installed with Acrylic-Tie adhesive have been tested in accordance with ICC-ES's Acceptance Criteria for Adhesive Anchors in Concrete and Masonry Elements (AC58). in addition to static loads, ICC-ES report ER-5791 recognizes Acrylic-Tie adhesive for the following:
- Seismic/Wind Loading.
- Long Term Creep at Elevated Temperature.
- Static Loading at Elevated Temperature.
- Damp and Water-Filled Holes.
- Freeze-Thaw Conditions.
- Critical and Minimum Edge Distance and Spacing.

In addition, anchors installed with Acrylic-Tie adhesive have been tested in accordance with ICC-ES's Acceptance Criteria for Unreinforced Masonry Anchors (AC60) and NSF/ANSI Standard 61, Drinking Water System Components - Health Effects.

PROPERTY	TEST METHOD	RESULTS
Consistency (77° F)	ASTM C 881	Non-Sag/Thixotropic Paste
Heat Deflection	ASTM D 648	149°F (65° C)
Bond Strength	ASTM C 882	2,900 psi (2 days) 2,970 psi (14 days)
Water Absorption	ASTM D 570	0.23% (24 hours)
Compressive Yield Strength	ASTM D 695	10,210 psi (7 days)
Compressive Modulus	ASTM D 695	660,800 psi (7 days)
Gel Time (77° F)	ASTM C 881	9 min – Thin film

CHEMICAL RESISTANCE Very good to excellent against distilled water and inorganic acids. Fair to good against organic acids and alkalis, inorganic alkalis, and many organic solvents. Poor against Ketones. For more detailed information visit our website or contact Simpson and request Technical Bulletin T-SAS-CHEMRES03.

The performance of this product results from its unique formulation which is proprietary to Simpson Strong-Tie. The product may also be protected by one or more of U.S. Pats. 5,643,994; 5,965,635; 6,228,207, licensed from ITW.



AMN813

AT13
(AT08 similar)

ADT813B

FAST-PAC
(ATPAC05KT)
Includes 5 ounce coaxial cartridge, adaptor and mixing nozzle.

AT30
(The EMN22 is the required mixing nozzle for the AT30)

EMN22

SUGGESTED SPECIFICATIONS: Anchoring Adhesive shall be a two-component acrylic based system supplied in manufacturer's standard side-by-side or coaxial cartridge and dispensed through a static-mixing nozzle supplied by the manufacturer. Adhesive shall meet the physical requirements of ASTM C-881 for Type I and IV, Grade 3, Class A, B and C and must develop a minimum 10,210 psi compressive yield strength after 7 day cure. Adhesive must have a heat deflection temperature of a minimum 149°F (65°C). Adhesive shall be Acrylic-Tie from Simpson Strong-Tie, Dublin, CA. Anchors shall be installed per Simpson Strong-Tie's instructions for Acrylic-Tie.

When the concrete temperature is at or below freezing, ensure any holes drilled in advance are free of frost or ice.

ACRYLIC-TIE®
Preparation and Installation

Acrylic-Tie Cartridge Systems

Model No.	Capacity ounces (cubic inches)	Cartridge Type	Carton Quantity	Dispensing Tool(s)	Mixing Nozzle
ATPAC05KT	5 (9.0)	coaxial	12	Standard Caulking Tool	AMN813 (included)
AT08	8 (14.4)	side-by-side	10	ADT813	AMN813 (included)
AT13	13 (23.5)	side-by-side	10	ADT813	AMN813 (included)
AT30	30 (54.2)	side-by-side	5	ADT30 or ADT30P	EMN22 (sold separately)

1. Cartridge Estimation Guides are available on pages 17-20.

Cure Schedule

Base Material Temperature		Cure Time
°F	°C	
0	-18	24 hrs.
25	-4	8 hrs.
40	4	4 hrs.
60	16	1 hr.
70	21	30 min.
100	38	20 min.

In-Service Temperature Sensitivity

Base Material Temperature		Percent Allowable Load for T_{inst} = 0°F	Percent Allowable Load for $T_{inst} \geq$ 70°F
°F	°C		
0	-18	100%	100%
32	0	100%	100%
70	21	100%	100%
110	43	100%	100%
135	57	74%	100%
150	66	38%	88%
180	82	22%	60%

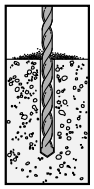
1. Refer to in-service temperature sensitivity chart for allowable bond strength reduction for in-service temperature. See page 11 for more information.
2. T_{inst} is the base material temperature during installation and curing of the adhesive.
3. Percent allowable load for T_{inst} = 0°F is to be used for T_{inst} between 0°F and 70°F.
4. Percent allowable load may be linearly interpolated for intermediate base material in-service temperatures.
5. °C = (°F - 32) / 1.8

CARTRIDGE PREPARATION (SIDE-BY-SIDE & FAST-PAC)

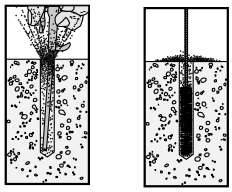
- Cut or pry tips from cartridge.
- Insert cartridge into dispensing tool.
- Attach a clean mixing nozzle (which is free of gelled or hardened material) to the cartridge.
- Tighten nozzle on cartridge. DO NOT OVER-TIGHTEN.
- **Dispense bead of adhesive off to the side to check for proper mixture (a uniform gray color) before using.**

- **Caution:** Adhesive will start to harden in the mixing nozzle after 5-7 minutes. Adhesive will harden faster in higher temperatures. Do not try to dispense after adhesive hardens in nozzle.
- **When using a pneumatic dispensing tool, air pressure must be regulated at 80-100 psi.**

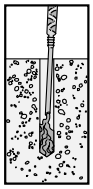
Installation into Concrete and Grout-Filled CMU



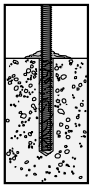
1. **Drill**–Drill hole to specified diameter and depth.



2. **Clean**–Remove dust from hole with oil-free compressed air. Clean with nylon brush and blow out remaining dust. **Note: Dust left in hole can reduce the adhesive's holding capacity.**

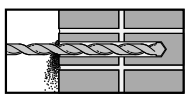


3. **Fill**–Fill hole ½ - ⅔ full, starting from bottom of hole to prevent air pockets. Withdraw nozzle as hole fills up.

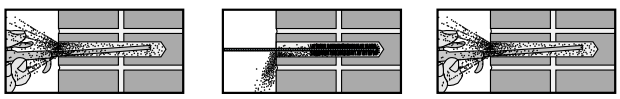


4. **Insert–Anchors must be clean and oil free.** Insert anchor, turning slowly until the anchor contacts the bottom of the hole. Do not disturb during cure time.

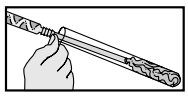
ATS or ATSP Screen Tube Installation into Brick and Ungrouted Masonry (Hollow CMU Similar)

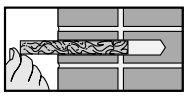


1. **Drill**–Drill hole to specified diameter and depth. **Drill should be set on rotation only.**

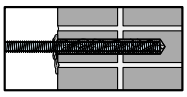


2. **Clean**–Remove dust from hole with oil-free compressed air. Clean with nylon brush and blow out remaining dust. **Note: Dust left in hole can reduce the adhesive's holding capacity.**





3. **Fill**–**Dispense bead of adhesive off to the side to check for proper mixture (a uniform gray color) before using**. Fill screen completely. Always start by filling from the bottom of the screen and withdrawing the nozzle as the screen fills to avoid air pockets. Insert adhesive filled screen into hole.



4. **Insert–Anchors must be clean and oil free**. Insert anchor, turning slowly until the anchor contacts the bottom of the screen. Do not disturb during cure time.

Tension Loads for Threaded Rod Anchors in Normal-Weight Concrete

Rod Dia. in. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Critical Edge Dist. in. (mm)	Critical Spacing Dist. in. (mm)	Tension Load Based on Bond Strength			Tension Load Based on Steel Strength		
					f'c >= 2000 psi (13.8 MPa) Concrete			A307 (SAE 1018)	A193 GR B7 (SAE 4140)	F593 (A304SS)
					Ultimate lbs. (kN)	Std. Dev. lbs. (kN)	Allowable lbs. (kN)	Allowable lbs. (kN)	Allowable lbs. (kN)	Allowable lbs. (kN)
3/8 (9.5)	7/16	1 3/4 (44)	2 5/8 (67)	7 (178)	3,362 (15.0)	99 (0.4)	840 (3.7)	2,105 (9.4)	4,535 (20.2)	3,630 (16.1)
		3 1/2 (89)	5 1/4 (133)	6 1/8 (156)	8,937 (39.8)	314 (1.4)	2,235 (9.9)			
		4 1/2 (114)	6 3/4 (171)	18 (457)	10,411 (46.3)	525 (2.3)	2,605 (11.6)			
1/2 (12.7)	9/16	2 1/8 (54)	3 3/16 (81)	8 1/2 (216)	5,252 (23.4)	501 (2.2)	1,315 (5.8)	3,750 (16.7)	8,080 (35.9)	6,470 (28.8)
		4 1/4 (108)	6 3/8 (162)	7 1/2 (191)	16,668 (74.1)	822 (3.7)	4,165 (18.5)			
		6 (152)	9 (229)	24 (610)	19,182 (85.3)	331 (1.5)	4,795 (21.3)			
5/8 (15.9)	11/16	2 1/2 (64)	3 3/4 (95)	10 (254)	8,495 (37.8)	561 (2.5)	2,125 (9.5)	5,875 (26.1)	12,660 (56.3)	10,120 (45.0)
		4 (102)	5 5/8 (143)	16 (406)	•	•	4,315 (19.2)			
		5 1/2 (140)	7 1/2 (191)	9 5/8 (244)	26,025 (115.8)	1,866 (8.3)	6,505 (28.9)			
		7 7/16 (189)	10 7/8 (276)	29 3/4 (756)	•	•	7,215 (32.1)			
		9 3/8 (238)	14 1/8 (359)	37 1/2 (953)	31,683 (140.9)	1,571 (7.0)	7,920 (35.2)			
3/4 (19.1)	13/16	3 3/8 (86)	5 1/16 (129)	13 1/2 (343)	12,991 (57.8)	725 (3.2)	3,250 (14.5)	8,460 (37.6)	18,230 (81.1)	12,400 (55.2)
		5 1/16 (129)	7 5/8 (194)	20 1/4 (514)	•	•	6,330 (28.2)			
		6 3/4 (171)	10 1/8 (257)	11 7/8 (302)	37,616 (167.3)	1,817 (8.1)	9,405 (41.8)			
		9 (229)	13 1/2 (343)	36 (914)	•	•	10,000 (44.5)			
		11 1/4 (286)	16 7/8 (429)	45 (1143)	42,381 (188.5)	683 (3.0)	10,595 (47.1)			
7/8 (22.2)	1	3 7/8 (98)	5 13/16 (148)	15 1/2 (394)	14,206 (63.2)	457 (2.0)	3,550 (15.8)	11,500 (51.2)	24,785 (110.2)	16,860 (75.0)
		5 13/16 (148)	8 3/4 (222)	23 1/4 (591)	•	•	7,130 (31.7)			
		7 3/4 (197)	11 5/8 (295)	13 5/8 (346)	42,848 (190.6)	3,155 (14.0)	10,710 (47.6)			
		10 7/16 (265)	15 5/8 (397)	41 3/4 (1060)	•	•	12,250 (54.5)			
		13 1/8 (333)	19 5/8 (498)	52 1/2 (1334)	55,148 (245.3)	5,673 (25.2)	13,785 (61.3)			
1 (25.4)	1 1/16	4 1/2 (114)	6 3/4 (171)	18 (457)	20,797 (92.5)	1,763 (7.8)	5,200 (23.1)	15,025 (66.8)	32,380 (144.0)	22,020 (97.9)
		6 3/4 (171)	10 1/8 (257)	27 (686)	•	•	10,165 (45.2)			
		9 (229)	13 1/2 (343)	15 3/4 (400)	60,504 (269.1)	2,065 (9.2)	15,125 (67.3)			
		12 (305)	18 (457)	48 (1219)	•	•	17,880 (79.5)			
		15 (381)	22 1/2 (572)	60 (1524)	82,529 (367.1)	5,146 (22.9)	20,630 (91.8)			
1 1/4 (31.8)	1 5/16	5 5/8 (143)	8 7/16 (214)	22 1/2 (572)	32,368 (144.0)	2,054 (9.1)	8,090 (36.0)	23,490 (104.5)	50,620 (225.2)	34,420 (153.1)
		8 7/16 (214)	12 3/4 (324)	33 3/4 (857)	•	•	13,090 (58.2)			
		11 1/4 (286)	16 7/8 (429)	19 3/4 (502)	72,363 (321.9)	7,457 (33.2)	18,090 (80.5)			
		15 (381)	22 1/2 (572)	60 (1524)	•	•	24,860 (110.6)			
		18 3/4 (476)	28 1/8 (714)	75 (1905)	126,500 (562.7)	15,813 (70.3)	31,625 (140.7)			

1. Reference page 11 for oversize holes.
2. Allowable load must be the lesser of the bond or steel strength.
3. The allowable loads listed under allowable bond are based on a safety factor of 4.0.
4. Allowable loads may be increased by 33⅓ percent for short-term loading due to wind or seismic forces where permitted by code.
5. Refer to allowable load adjustment factors for spacing and edge distance on pages 12, 14 & 15.
6. Refer to In-Service Temperature Sensitivity chart for allowable load adjustment for temperature.
7. Anchors are permitted to be used within fire-resistive construction, provided the anchors resist wind or seismic loads only. For use in fire-resistive construction, the anchors can also be permitted to be used to resist gravity loads, provided special consideration has been given to fire exposure conditions.
8. Anchors are not permitted to resist tension forces in overhead or wall installations unless proper consideration is given to fire-exposure and elevated temperature conditions.

Shear Loads for Threaded Rod Anchors in Normal-Weight Concrete

Rod Dia. in. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Critical Edge Dist. in. (mm)	Critical Spacing Dist. in. (mm)	Shear Load Based on Concrete Edge Distance			Shear Load Based on Steel Strength		
					f'c >= 2000 psi (13.8 MPa) Concrete			A307 (SAE 1018)	A193 GR B7 (SAE 4140)	F593 (A304SS)
					Ultimate lbs. (kN)	Std. Dev. lbs. (kN)	Allowable lbs. (kN)	Allowable lbs. (kN)	Allowable lbs. (kN)	Allowable lbs. (kN)
3/8 (9.5)	7/16	1 3/4 (44)	5 1/4 (133)	2 5/8 (67)	4,869 (21.7)	369 (1.6)	1,215 (5.4)	1,085 (4.8)	2,340 (10.4)	1,870 (8.3)
		3 1/2 (89)		5 1/4 (133)	5,540 (24.6)	620 (2.8)	1,385 (6.2)			
		4 1/2 (114)		5 1/4 (133)	•	•	1,385 (6.2)			
1/2 (12.7)	9/16	2 1/8 (54)	6 3/8 (162)	3 1/4 (83)	8,318 (37.0)	643 (2.9)	2,080 (9.3)	1,930 (8.6)	4,160 (18.5)	3,330 (14.8)
		4 1/4 (108)		6 3/8 (162)	9,998 (44.5)	522 (2.3)	2,500 (11.1)			
		6 (152)		6 3/8 (162)	•	•	2,500 (11.1)			
5/8 (15.9)	11/16	2 1/2 (64)	7 1/2 (191)	3 3/4 (95)	14,806 (65.9)	728 (3.2)	3,700 (16.5)	3,025 (13.5)	6,520 (29.0)	5,220 (23.2)
		5 1/2 (140)		8 1/4 (210)	15,692 (69.8)	305 (1.4)	3,925 (17.5)			
		9 3/8 (238)		8 1/4 (210)	•	•	3,925 (17.5)			
3/4 (19.1)	13/16	3 3/8 (86)	10 1/8 (257)	5 1/8 (130)	20,350 (90.5)	•	5,090 (22.6)	4,360 (19.4)	9,390 (41.8)	6,385 (28.4)
		6 3/4 (171)		10 1/8 (257)	20,350 (90.5)	1,521 (6.8)	5,090 (22.6)			
		11 1/4 (286)		10 1/8 (257)	•	•	5,090 (22.6)			
7/8 (22.2)	1	3 7/8 (98)	11 5/8 (295)	5 7/8 (149)	27,475 (122.2)	1,655 (7.4)	6,870 (30.6)	5,925 (26.4)	12,770 (56.8)	8,685 (38.6)
		7 3/4 (197)		11 5/8 (295)	30,876 (137.3)	1,714 (7.6)	7,720 (34.3)			
		13 1/8 (333)		11 5/8 (295)	•	•	7,720 (34.3)			
1 (25.4)	1 1/16	4 1/2 (114)	13 1/2 (343)	6 3/4 (171)	32,687 (145.4)	2,287 (10.2)	8,170 (36.3)	7,740 (34.4)	16,680 (74.2)	11,345 (50.5)
		9 (229)		13 1/2 (343)	33,858 (150.6)	2,035 (9.1)	8,465 (37.7)			
		15 (381)		13 1/2 (343)	•	•	8,465 (37.7)			
1 1/4 (31.8)	1 5/16	5 5/8 (143)	16 7/8 (429)	8 1/2 (216)	50,385 (224.1)	1,090 (4.8)	12,595 (56.0)	12,100 (53.8)	26,075 (116.0)	17,730 (78.9)
		11 1/4 (286)		16 7/8 (429)	65,765 (292.5)	4,636 (20.6)	16,440 (73.1)			
		18 3/4 (476)		16 7/8 (429)	•	•	16,440 (73.1)			

1. Allowable load must be the lesser of the load based on concrete edge distance or steel strength.
2. The allowable loads based on concrete edge distance are based on a safety factor of 4.0.
3. Allowable loads may be increased by 33⅓ percent for short-term loading due to wind or seismic forces where permitted by code.
4. Refer to allowable load adjustment factors for spacing and edge distance on pages 13 & 15.
5. Refer to In-Service Temperature Sensitivity chart for allowable load adjustment for temperature.
6. Anchors are permitted to be used within fire-resistive construction, provided the anchors resist wind or seismic loads only. For use in fire-resistive construction, the anchors can also be permitted to be used to resist gravity loads, provided special consideration has been given to fire exposure conditions.

Tension Loads for Rebar Dowels in Normal-Weight Concrete

Rebar Size No. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Critical Edge Dist. in. (mm)	Critical Spacing Dist. in. (mm)	Tension Load Based on Bond Strength						Tension Load Based on Steel Strength
					f'c >= 2000 psi (13.8 MPa) Concrete			f'c >= 4000 psi (27.6 MPa) Concrete			ASTM A615 Grade 60 Rebar
					Ultimate lbs. (kN)	Std. Dev. lbs. (kN)	Allow. lbs. (kN)	Ultimate lbs. (kN)	Std. Dev. lbs. (kN)	Allow. lbs. (kN)	Allowable lbs. (kN)
#3 (9.5)	1/2	3 1/2 (89)	5 1/4 (133)	6 1/8 (156)	8,245 (36.7)	849 (3.8)	2,060 (9.2)	•	•	2,060 (9.2)	2,640 (11.7)
		4 1/2 (114)	5 1/4 (133)	6 1/8 (156)	•	•	2,060 (9.2)	•	•	2,060 (9.2)	
#4 (12.7)	9/16	4 1/4 (108)	6 3/8 (162)	7 1/2 (191)	12,743 (56.7)	1,760 (7.8)	3,185 (14.2)	•	•	3,185 (14.2)	4,800 (21.4)
		5 7/8 (149)	8 7/8 (225)	23 1/2 (597)	•	•	3,185 (14.2)	•	•	3,985 (17.7)	
		7 1/2 (191)	11 1/4 (286)	30 (762)	•	•	3,185 (14.2)	19,124 (85.1)	854 (3.8)	4,780 (21.3)	
#5 (15.9)	3/4	5 1/2 (140)	7 1/2 (191)	9 5/8 (244)	20,396 (90.7)	1,412 (6.3)	5,100 (22.7)	•	•	5,100 (22.7)	7,440 (33.1)
		7 1/4 (184)	10 7/8 (276)	29 (737)	•	•	5,100 (22.7)	•	•	6,095 (27.1)	
		9 3/8 (191)	14 1/8 (359)	37 1/2 (953)	•	•	5,100 (22.7)	28,115 (125.1)	1,496 (6.7)	7,030 (31.3)	
#6 (19.1)	7/8	6 3/4 (171)	10 1/8 (257)	11 7/8 (302)	31,839 (141.6)	1,454 (6.5)	7,960 (35.4)	•	•	7,960 (35.4)	10,560 (47.0)
		9 (229)	13 1/2 (343)	36 (914)	•	•	7,960 (35.4)	•	•	8,730 (38.8)	
		11 1/4 (286)	16 7/8 (429)	45 (1,143)	•	•	7,960 (35.4)	37,992 (169.0)	1,999 (8.9)	9,500 (42.3)	
#7 (22.2)	1	7 3/4 (197)	11 5/8 (295)	13 5/8 (346)	35,250 (156.8)	2,693 (12.0)	8,815 (39.2)	•	•	8,815 (39.2)	14,400 (64.1)
		10 1/2 (267)	15 3/4 (400)	42 (1,067)	•	•	8,815 (39.2)	•	•	10,815 (48.1)	
		13 1/8 (333)	19 5/8 (498)	52 1/2 (1,334)	•	•	8,815 (39.2)	50,889 (226.4)	3,717 (16.5)	12,720 (56.6)	
#8 (25.4)	1 1/8	9 (229)	13 1/2 (343)	15 3/4 (400)	49,973 (222.3)	5,023 (22.3)	12,495 (55.6)	•	•	12,495 (55.6)	18,960 (84.3)
		12 (305)	18 (457)	48 (1,219)	•	•	12,495 (55.6)	•	•	16,325 (72.6)	
		15 (381)	22 1/2 (572)	60 (1,524)	•	•	12,495 (55.6)	80,598 (358.5)	2,195 (9.8)	20,150 (89.6)	
#9 (28.6)	1 1/4	16 7/8 (429)	25 3/8 (645)	67 1/2 (1,715)	•	•	•	96,096 (427.5)	489 (2.2)	24,025 (106.9)	24,000 (106.8)
#10 (31.8)	1 3/8	18 3/4 (476)	28 1/8 (714)	75 (1,905)	•	•	•	124,031 (551.7)	2,447 (10.9)	31,010 (137.9)	30,480 (135.6)
#11 (34.9)	1 5/8	20 5/8 (524)	31 (787)	82 1/2 (2,096)	•	•	•	166,059 (738.7)	4,222 (18.8)	41,515 (184.7)	37,440 (166.5)

1. Oversize holes may reduce load capacity.
2. Allowable load must be the lesser of the bond or steel strength.
3. The allowable loads listed under allowable bond are based on a safety factor of 4.0.
4. Allowable loads may be increased by 33⅓ percent for short-term loading due to wind or seismic forces where permitted by code.
5. Refer to allowable load adjustment factors for spacing and edge distance on pages 12, 14 & 15.
6. Refer to In-Service Temperature Sensitivity chart for allowable load adjustment for temperature.
7. Anchors are permitted to be used within fire-resistive construction, provided the anchors resist wind or seismic loads only. For use in fire-resistive construction, the anchors can also be permitted to be used to resist gravity loads, provided special consideration has been given to fire exposure conditions.
8. Anchors are not permitted to resist tension forces in overhead or wall installations unless proper consideration is given to fire-exposure and elevated temperature conditions.

Shear Loads for Rebar Dowels in Normal-Weight Concrete

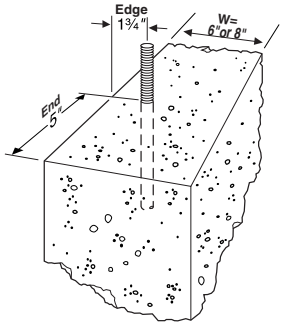
Rebar Size No. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Critical Edge Dist. in. (mm)	Critical Spacing Dist. in. (mm)	Shear Load Based on Concrete Edge Distance			Shear Load Based on Steel Strength
					f'c >= 2000 psi (13.8 MPa) Concrete			ASTM A615 Grade 60 Rebar
					Ultimate lbs. (kN)	Std. Dev. lbs. (kN)	Allowable lbs. (kN)	Allowable lbs.(kN)
#3 (9.5)	1/2	3 1/2 (89)	6 (152)	5 1/4 (133)	8,294 (36.9)	515 (2.3)	2,075 (9.2)	1,680 (7.5)
		4 1/2 (114)			•	•	2,075 (9.2)	
#4 (12.7)	9/16	4 1/4 (108)	8 (203)	6 3/8 (162)	11,012 (49.0)	383 (1.7)	2,755 (12.3)	3,060 (13.6)
		7 1/2 (191)			•	•	2,755 (12.3)	
#5 (15.9)	3/4	5 1/2 (140)	10 (254)	8 1/4 (210)	15,758 (70.1)	1,154 (5.1)	3,940 (17.5)	4,740 (21.1)
		9 3/8 (238)			•	•	3,940 (17.5)	
#6 (19.1)	7/8	6 3/4 (171)	12 (305)	10 1/8 (257)	23,314 (103.7)	1,494 (6.6)	5,830 (25.9)	6,730 (29.9)
		11 1/4 (286)			•	•	5,830 (25.9)	
#7 (22.2)	1	7 3/4 (197)	14 (356)	11 5/8 (295)	32,662 (145.3)	5,588 (24.9)	8,165 (36.3)	9,180 (40.8)
		13 1/8 (333)			•	•	8,165 (36.3)	
#8 (25.4)	1 1/8	9 (229)	16 (406)	13 1/2 (343)	33,428 (148.7)	2,319 (10.3)	8,360 (37.2)	12,085 (53.8)
		15 (381)			•	•	8,360 (37.2)	

1. Allowable load must be the lesser of the load based on concrete edge distance or steel strength.
2. The allowable loads based on concrete edge distance are based on a safety factor of 4.0.
3. Allowable loads may be increased by 33⅓ percent for short-term loading due to wind or seismic forces where permitted by code.
4. Refer to allowable load adjustment factors for spacing and edge distance on pages 13 & 15.
5. Refer to In-Service Temperature Sensitivity chart for allowable load adjustment for temperature.
6. Anchors are permitted to be used within fire-resistive construction, provided the anchors resist wind or seismic loads only. For use in fire-resistive construction, the anchors can also be permitted to be used to resist gravity loads, provided special consideration has been given to fire exposure conditions.

Tension Loads for Threaded Rod Anchors in Normal-Weight Concrete Stemwall

Rod Dia. in. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Stemwall Width in. (mm)	Min. Edge Dist. in. (mm)	Min. End Dist. in. (mm)	Tension Load Based on Bond Strength		Tension Load Based on Steel Strength
						f'c >= 2500 psi (17.2 MPa) Concrete		A307 (SAE 1018)
						Ultimate lbs. (kN)	Allowable lbs. (kN)	Allowable lbs. (kN)
5/8 (15.9)	11/16	10 (254.0)	6 (152.4)	1 3/4 (44.5)	5 (127.0)	12,913 (57.4)	3,230 (14.4)	5,875 (26.1)
7/8 (22.2)	1	15 (381.0)	8 (203.2)	1 3/4 (44.5)	5 (127.0)	21,838 (97.1)	5,460 (24.3)	11,500 (51.2)

1. Allowable load must be the lesser of the bond or steel strength.
2. The allowable loads listed under allowable bond are based on a safety factor of 4.0.
3. Allowable loads may be increased by 33⅓ percent for short-term loading due to wind or seismic forces where permitted by code.
4. Refer to In-Service Temperature Sensitivity chart for allowable load adjustment for temperature.
5. Anchors are permitted to be used within fire-resistive construction, provided the anchors resist wind or seismic loads only. For use in fire-resistive construction, the anchors can also be permitted to be used to resist gravity loads, provided special consideration has been given to fire exposure conditions.



Edge and end distances for threaded rod in concrete foundation stemwall corner installation

Tension Loads for Threaded Rod Anchors in Lightweight Concrete

Rod Dia. in. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Critical Edge Dist. in. (mm)	Critical Spacing Dist. in. (mm)	Tension Load Based on Bond Strength			Tension Load Based on Steel Strength		
					f'c >= 3000 psi (20.7 MPa) Lightweight Concrete			A307 (SAE 1018)	A193 GR B7 (SAE 4140)	F593 (A304SS)
					Ultimate lbs. (kN)	Std. Dev. lbs. (kN)	Allowable lbs. (kN)	Allowable lbs. (kN)	Allowable lbs. (kN)	Allowable lbs. (kN)
3/8 (9.5)	7/16	1 3/4 (44)	2 5/8 (67)	3 1/2 (89)	2,842 (12.6)	226 (1.0)	710 (3.2)	2,105 (9.4)	4,535 (20.2)	3,630 (16.1)
		3 1/2 (89)	5 1/4 (133)	7 (178)	5,132 (22.8)	762 (3.4)	1,280 (5.7)			
1/2 (12.7)	9/16	2 1/8 (54)	3 1/8 (79)	4 1/4 (108)	4,415 (19.6)	454 (2.0)	1,100 (4.9)	3,750 (16.7)	8,080 (35.9)	6,470 (28.8)
		4 1/4 (108)	6 3/8 (162)	8 1/2 (216)	6,709 (29.8)	1,002 (4.5)	1,675 (7.5)			
5/8 (15.9)	11/16	2 1/2 (64)	3 3/4 (95)	5 (127)	5,568 (24.8)	498 (2.2)	1,390 (6.2)	5,875 (26.1)	12,660 (56.3)	10,120 (45.0)
		5 (127)	7 1/2 (191)	10 (254)	6,298 (28.0)	1,155 (5.1)	1,575 (7.0)			

1. Oversize holes may reduce load capacity.
2. Allowable load must be the lesser of the bond or steel strength.
3. The allowable loads listed under allowable bond are based on a safety factor of 4.0.
4. Allowable loads must be decreased by 8 percent for short-term loading due to wind or seismic forces.
5. 100% of the allowable load is permitted at critical spacing. No reduction in spacing is allowed.
6. Refer to allowable load adjustment factors edge distance on page 16.
7. Refer to In-Service Temperature Sensitivity chart for allowable load adjustment for temperature.
8. Anchors are permitted to be used within fire-resistive construction, provided the anchors resist wind or seismic loads only. For use in fire-resistive construction, the anchors can also be permitted to be used to resist gravity loads, provided special consideration has been given to fire exposure conditions.
9. Anchors are not permitted to resist tension forces in overhead or wall installations unless proper consideration is given to fire-exposure and elevated temperature conditions.

Shear Loads for Threaded Rod Anchors in Lightweight Concrete

Rod Dia. in. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Critical Edge Dist. in. (mm)	Critical Spacing Dist. in. (mm)	Shear Load Based on Concrete Edge Distance			Shear Load Based on Steel Strength		
					f'c >= 3000 psi (20.7 MPa) Lightweight Concrete			A307 (SAE 1018)	A193 GR B7 (SAE 4140)	F593 (A304SS)
					Ultimate lbs. (kN)	Std. Dev. lbs. (kN)	Allowable lbs. (kN)	Allowable lbs. (kN)	Allowable lbs. (kN)	Allowable lbs. (kN)
3/8 (9.5)	7/16	1 3/4 (44)	2 5/8 (67)	3 1/2 (89)	3,042 (13.5)	249 (1.1)	760 (3.4)	1,085 (4.8)	2,340 (10.4)	1,870 (8.3)
		3 1/2 (89)	5 1/4 (133)	7 (178)	5,320 (23.7)	187 (0.8)	1,330 (5.9)			
1/2 (12.7)	9/16	2 1/8 (54)	3 1/8 (79)	4 1/4 (108)	4,076 (18.1)	458 (2.0)	1,020 (4.5)	1,930 (8.6)	4,160 (18.5)	3,330 (14.8)
		4 1/4 (108)	6 3/8 (162)	8 1/2 (216)	9,838 (43.8)	625 (2.8)	2,460 (10.9)			
5/8 (15.9)	11/16	2 1/2 (64)	3 3/4 (95)	5 (127)	5,360 (23.8)	351 (1.6)	1,340 (6.0)	3,025 (13.5)	6,520 (29.0)	5,220 (23.2)
		5 (127)	7 1/2 (191)	10 (254)	12,430 (55.3)	518 (2.3)	3,105 (13.8)			

1. Allowable load must be the lesser of the load based on concrete edge distance or steel strength.
2. The allowable loads based on concrete edge distance are based on a safety factor of 4.0.
3. Allowable loads may be increased by 29 percent for short-term loading due to wind or seismic forces where permitted by code.
4. 100% of the allowable load is permitted at critical spacing. No reduction in spacing is allowed.
5. Refer to allowable load adjustment factors for edge distance on page 16.
6. Refer to In-Service Temperature Sensitivity chart for allowable load adjustment for temperature.
7. Anchors are permitted to be used within fire-resistive construction, provided the anchors resist wind or seismic loads only. For use in fire-resistive construction, the anchors can also be permitted to be used to resist gravity loads, provided special consideration has been given to fire exposure conditions.

Tension and Shear Loads for Threaded Rod Anchors in 6 and 8-Inch Normal-Weight Grout-Filled CMU

Rod Dia. in. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Min. Edge Dist. in. (mm)	Min. End Dist. in. (mm)	Min. Spacing Dist. in. (mm)	6-Inch Grout-Filled CMU Allowable Loads Based on CMU Strength		8-Inch Grout-Filled CMU Allowable Loads Based on CMU Strength	
						Tension	Shear	Tension	Shear
						Allowable lbs. (kN)	Allowable lbs. (kN)	Allowable lbs. (kN)	Allowable lbs. (kN)
Anchor Installed in Face Shell (See Figure 1)									
1/2 (12.7)	9/16	4 1/4 (108)	12 (305)	12 (305)	17 (432)	965 (4.3)	1,655 (7.4)	955 (4.3)	1,655 (7.4)
3/4 (19.1)	13/16	6 3/4 (171)	12 (305)	4 (102)	27 (686)	•	•	1,720 (7.7)	•
				12 (305)	27 (686)	•	•	•	3,340 (14.9)
Anchor Installed in Mortar "T" Joint (See Figure 2)									
3/4 (19.1)	13/16	6 3/4 (171)	16 (406)	8 (203)	27 (686)	•	•	•	1,285 (5.7)

See Notes 1-7 Below

Tension and Shear Loads for Threaded Rod Anchors in 6 and 8-Inch Normal-Weight Grout-Filled CMU

Rod Dia. in. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Min. Edge Dist. in. (mm)	Min. End Dist. in. (mm)	Min. Spacing Dist. in. (mm)	6 and 8-Inch Grout-Filled CMU Allowable Loads Based on CMU Strength		
						Tension	Shear Perpendicular[8]	Shear Parallel[9]
						Allowable lbs. (kN)	Allowable lbs. (kN)	Allowable lbs. (kN)
Anchor Installed in Cell Opening (Top of Wall) (See Figure 3)								
1/2 (12.7)	9/16	4 1/4 (108)	1 3/4 (44)	11 (279)	17 (432)	815 (3.6)	355 (1.6)	880 (3.9)
5/8 (15.9)	11/16	5 (127)	1 3/4 (44)	11 (279)	20 (508)	1,020 (4.5)	410 (1.8)	945 (4.2)
		12 (305)	1 3/4 (44)	11 (279)	48 (1219)	1,400 (6.2)	510 (2.3)	1,020 (4.5)
7/8 (22.2)	1	12 (305)	1 3/4 (44)	11 (279)	48 (1219)	1,730 (7.7)	365 (1.6)	1,290 (5.7)

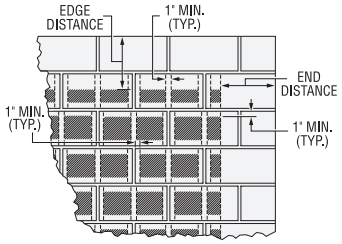
1. Threaded rods must comply with ASTM A 307 minimum.
2. Values for 6 and 8-inch wide CMU Grade N, Type II concrete masonry units conforming to UBC Standard 21-4 or ASTM C90. The masonry units, when grouted, must be fully grouted with grout complying with UBC Section 2103.4. Mortar is prepared in accordance with Section 2103.3 of the UBC and UBC Standard 21-15. The minimum specified compressive strength of masonry, f'_m, at 28 days is 1,500 psi.
3. Embedment depth is measured from the outside face of the concrete masonry unit for installations through a face shell.
4. Allowable loads may not be increased for short-term loading due to wind or seismic forces.
5. Refer to In-Service Temperature Sensitivity chart for allowable load adjustment for temperature.
6. The tabulated allowable loads are based on a safety factor of 4.0 for installations under the UBC. For installations under the IBC and IRC, use a safety factor of 5.0 (multiply the tabulated allowable loads by 0.80).
7. Anchors must be spaced a minimum distance of four times the anchor embedment.
8. Shear load applied perpendicular to edge of CMU wall.
9. Shear load applied parallel to edge of CMU wall.

Tension and Shear Loads for Threaded Rod Anchors in Light-Weight, Medium-Weight and Normal-Weight Hollow CMU

Rod Dia. in. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Min. Edge Dist. in. (mm)	Min. End Dist. in. (mm)	6 and 8-inch Hollow CMU Allowable Loads Based on CMU Strength			
					Tension		Shear	
					Ultimate lbs. (kN)	Allow. lbs. (kN)	Ultimate lbs. (kN)	Allow. lbs. (kN)
Anchor Installed in Face Shell w/Simpson ATS (Stainless Steel) Screen Tube (See Figure 4)								
3/8 (9.5)	9/16	3 (76.2)	4 (101.6)	4 5/8 (117.5)	1,400 (6.2)	350 (1.6)	1,326 (5.9)	330 (1.5)
1/2 (12.7)	11/16	3 (76.2)	4 (101.6)	4 5/8 (117.5)	•	350 (1.6)	•	330 (1.5)
5/8 (15.9)	7/8	3 (76.2)	4 (101.6)	4 5/8 (117.5)	•	350 (1.6)	•	330 (1.5)

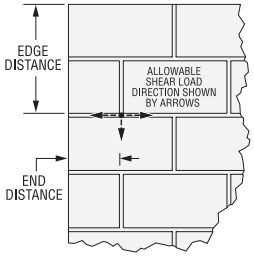
See Notes 1-7 Above

Figure 1



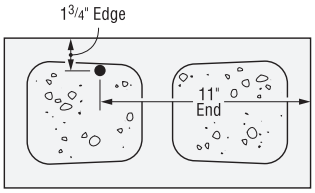
Allowable anchor placement in grouted CMU face shell

Figure 2



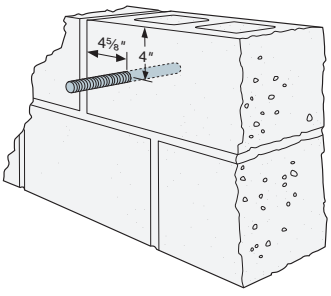
Anchor placement in grouted CMU mortar "T" joint

Figure 3



Anchor installed in cell opening (top of wall)

Figure 4



Anchor installed in face shell w/screen tube in hollow cell

Tension and Shear Loads for Installations in Unreinforced Brick Masonry Walls Minimum URM Wall Thickness is 13" (3 wythes thick)

Rod/Rebar Dia./Size in. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Min. Edge/End Dist. in. (mm)	Min. Vertical Spacing Dist. in. (mm)	Min. Horiz. Spacing Dist. in. (mm)	Tension Load Based on URM Strength	Shear Load Based on URM Strength
						Minimum Net Mortar Strength = 50 psi	Minimum Net Mortar Strength = 50 psi
						Allowable lbs. (kN)	Allowable lbs. (kN)
Configuration A (Simpson ATS or ATSP Screen Tube Required)							
3/4 (19.1)	**1**	**8** (203)	**24** (610)	**18** (457)	**18** (457)	•	**1,000** (4.4)
#5 (15.9)	**1**	**8** (203)	**24** (610)	**18** (457)	**18** (457)	•	**750** (3.3)
#6 (19.1)	**1**	**8** (203)	**24** (610)	**18** (457)	**18** (457)	•	**1,000** (4.4)
Configuration B (Simpson ATS or ATSP Screen Tube Required)							
3/4 (19.1)	**1**	**13** (330)	**16** (406)	**18** (457)	**24** (610)	**1,200** (5.3)	**1,000** (4.4)
Configuration C (Simpson ATS Screen Tube and AST Steel Sleeve Required)							
5/8 (15.9)	**1**	**	**24** (610)	**18** (457)	**18** (457)	**1,200** (5.3)	**750** (3.3)

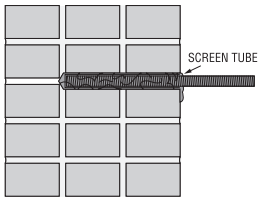
1. Threaded rods must comply with ASTM A 307 minimum.
2. All holes are drilled with a 1" diameter carbide-tipped drill bit with the drill set in the rotation-only mode.
3. The unreinforced brick walls must have a minimum thickness of 13 inches (three wythes of brick).
4. The allowable load is applicable only where in-place shear tests indicate minimum net mortar strength of 50 psi.
5. The allowable load for Configuration B and C anchors subjected to a combined tension and shear load is determined by assuming a straight-line relationship between allowable tension and shear.
6. The anchors installed in unreinforced brick walls are limited to resisting seismic or wind forces only.
7. **Configuration A** has a straight threaded rod or rebar embedded 8 inches into the wall with a 31/32" diameter by 8-inch long screen tube (part # ATS758 or ATS758P). This configuration is designed to resist shear loads only.
8. **Configuration B** has a ¾" threaded rod bent and installed at a 22.5-degree angle and installed 13 inches into the wall, to within 1-inch (maximum) of the exterior wall surface. This configuration is designed to resist tension and shear loads. The pre-bent threaded rod is installed with a 31/32" diameter by 13-inch long screen tube (part # ATS7513 or ATS7513P).
9. **Configuration C** is designed to resist tension and shear forces. It consists of a 5/8" diameter, ASTM A 307 threaded rod and an 8" long steel sleeve (part # AST800) and a 31/32" diameter by 8-inch long screen tube (part # ATS758). The steel sleeve has a plastic plug in one end. A 6" by 6" by 3/8" thick ASTM A 36 steel plate is located on the back face of the wall.
10. Special inspection requirements are determined by local jurisdiction and must be confirmed by the local building official.
11. Refer to In-Service Temperature Sensitivity chart for allowable load adjustment for temperature.

Tension and Shear Loads for Threaded Rod Anchors in Light-Weight, Medium-Weight and Normal-Weight Hollow CMU

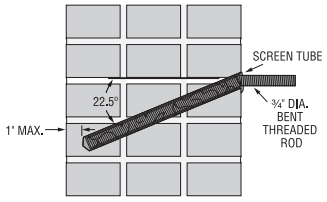
Rod Dia. in. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Critical Edge Dist. in. (mm)	Critical Spacing Dist. in. (mm)	8-inch Hollow CMU Allowable Loads Based on CMU Strength			
					Tension		Shear	
					Ultimate lbs. (kN)	Allowable lbs. (kN)	Ultimate lbs. (kN)	Allowable lbs. (kN)
Anchor Installed in Face Shell w/Simpson ATSP (Plastic) Screen Tube								
3/8 (9.5)	**9/16**	**3** (76.2)	**12** (305)	**8** (203)	**1,545** (6.9)	**385** (1.7)	**1,385** (6.2)	**340** (1.5)
1/2 (12.7)	**3/4**	**3** (76.2)	**12** (305)	**8** (203)	**1,510** (6.7)	**380** (1.7)	**1,305** (5.8)	**325** (1.4)
5/8 (15.9)	**7/8**	**3** (76.2)	**12** (305)	**8** (203)	**1,590** (7.1)	**395** (1.8)	**1,345** (6.0)	**335** (1.5)

1. Threaded rods must comply with ASTM A 307 minimum.
2. The tabulated allowable loads are based on a safety factor of 4.0 for installations under the UBC. For installations under the IBC and IRC, use a safety factor of 5.0 (multiply the tabulated allowable loads by 0.80).
3. Edge distances may be reduced to 4" with a corresponding 37% reduction in tension capacity. Shear capacity is unaffected.
4. Values for 8-inch wide CMU Grade N, Type II, lightweight, medium-weight and normal weight concrete masonry units conforming to UBC Standard 21-4 or ASTM C90 with min compressive strength of 1,900 psi and 1 1/4" thick face shell.
5. Mortar is prepared in accordance with UBC Section 2103.3 and UBC Standard 21-15, or IBC Section 2103.7.
6. Embedment depth is measured from the outside face of the concrete masonry unit.
7. Refer to in-service temperature sensitivity chart for allowable load adjustment for temperature.
8. Allowable loads may not be increased for short-term loading due to wind or seismic forces. Wall design must satisfy applicable design standards and be capable of withstanding applied loads.

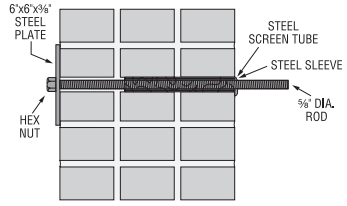
Configuration A (Shear)



Configuration B (Tension & Shear)



Configuration C (Tension & Shear)



Installation Instructions for Configuration C:

1. Drill hole perpendicular to the wall to a depth of 8" with a 1" diameter carbide-tipped drill bit (rotation only mode).
2. Clean hole with oil-free compressed air and a nylon brush.
3. Fill 8" steel screen tube with mixed adhesive and insert into hole.
4. Insert steel sleeve slowly into screen tube (adhesive will displace).
5. Allow adhesive to cure (see cure schedule).
6. Drill through plastic plug in (inside) end of steel sleeve with ⅝" bit.
7. Drill completely through the wall with 5/8" carbide tipped concrete drill bit (rotation mode only).
8. Insert ⅝" rod through hole and attach metal plate and nut.

Load Adjustment Factors for AT Adhesive in Normal-Weight Concrete: Edge Distance, Tension Load

Load adjustment factors for critical and minimum edge distance have been determined by testing. The following tables have been created using linear interpolation.

How to use these charts:

1. The following tables are for reduced Edge Distance.
2. Locate the anchor size to be used for either a tension and/or shear load application.
3. Locate the embedment (E) at which the anchor is to be installed.
4. Locate the edge distance (C_{act}) at which the anchor is to be installed.
5. The load adjustment factor (f_c) is the intersection of the row and column.
6. Multiply the allowable load by the applicable load adjustment factor.
7. Reduction factors for multiple edges are multiplied together.
8. Adjustment factors do not apply to allowable steel strength values.
9. Adjustment factors are to be applied to allowable **Tension Load Based on Bond Strength** values only.

Edge Distance Tension (f_c)

Edge Dist. C_{act} (in)	Dia.	3/8			1/2				5/8			3/4		
	Rebar		#3			#4		#4		#5			#6	
	E	1 3/4	3 1/2	4 1/2	2 1/8	4 1/4	6	7 1/2	2 1/2	5 1/2	9 3/8	3 3/8	6 3/4	11 1/4
	C_{cr}	2 5/8	5 1/4	6 3/4	3 3/16	6 3/8	9	11 1/4	3 3/4	7 1/2	14 1/8	5 1/16	10 1/8	16 7/8
	C_{min}	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
	f_{cmin}	0.59	0.59	0.65	0.50	0.50	0.65	0.65	0.50	0.50	0.61	0.50	0.50	0.56
1 3/4		0.59	0.59	0.65	0.50	0.50	0.65	0.65	0.50	0.50	0.61	0.50	0.50	0.56
2		0.71	0.62	0.67	0.59	0.53	0.66	0.66	0.56	0.52	0.62	0.54	0.51	0.57
3		1.00	0.74	0.74	0.93	0.64	0.71	0.70	0.81	0.61	0.65	0.69	0.57	0.60
4			0.85	0.81	1.00	0.74	0.76	0.73	1.00	0.70	0.68	0.84	0.63	0.63
5			0.97	0.88		0.85	0.81	0.77		0.78	0.71	0.99	0.69	0.65
6			1.00	0.95		0.96	0.86	0.81		0.87	0.74	1.00	0.75	0.68
7				1.00		1.00	0.90	0.84		0.96	0.78		0.81	0.71
8							0.95	0.88		1.00	0.81		0.87	0.74
9							1.00	0.92			0.84		0.93	0.77
10								0.95			0.87		0.99	0.80
11								0.99			0.90		1.00	0.83
12								1.00			0.93			0.86
13											0.96			0.89
14											1.00			0.92
15														0.95
16														0.97
17														1.00

See Notes Below

Edge Distance Tension (f_c) (cont'd)

Edge Dist. C_{act} (in)	Dia.	7/8			1			1 1/4					
	Rebar		#7			#8					#9	#10	#11
	E	3 7/8	7 3/4	13 1/8	4 1/2	9	15	5 5/8	11 1/4	18 3/4	16 7/8	18 3/4	20 5/8
	C_{cr}	5 13/16	11 5/8	19 5/8	6 3/4	13 1/2	22 1/2	8 7/16	16 7/8	28 1/8	25 3/8	28 1/8	31
	C_{min}	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4
	f_{cmin}	0.49	0.49	0.52	0.44	0.44	0.39	0.47	0.47	0.43	0.43	0.43	0.43
1 3/4		0.49	0.49	0.52	0.44	0.44	0.39						
2 3/4		0.62	0.54	0.55	0.55	0.49	0.42	0.47	0.47	0.43	0.43	0.43	0.43
4		0.77	0.61	0.58	0.69	0.55	0.46	0.59	0.52	0.46	0.46	0.46	0.46
6		1.00	0.71	0.63	0.92	0.64	0.51	0.77	0.59	0.50	0.51	0.50	0.50
8			0.81	0.69	1.00	0.74	0.57	0.96	0.67	0.55	0.56	0.55	0.54
10			0.92	0.74		0.83	0.63	1.00	0.74	0.59	0.61	0.59	0.58
12			1.00	0.80		0.93	0.69		0.82	0.64	0.66	0.64	0.62
14				0.85		1.00	0.75		0.89	0.68	0.71	0.68	0.66
16				0.90			0.81		0.97	0.73	0.76	0.73	0.70
18				0.96			0.87		1.00	0.77	0.81	0.77	0.74
20				1.00			0.93			0.82	0.86	0.82	0.78
22							0.99			0.86	0.91	0.86	0.82
24							1.00			0.91	0.97	0.91	0.86
26										0.95	1.00	0.95	0.90
28										1.00		1.00	0.94
30													0.98
32													1.00

1. E = Embedment depth (inches).
2. C_{act} = actual edge distance at which anchor is installed (inches).
3. C_{cr} = critical edge distance for 100% load (inches).
4. C_{min} = minimum edge distance for reduced load (inches).
5. f_c = adjustment factor for allowable load at actual edge distance.
6. f_{ccr} = adjustment factor for allowable load at critical edge distance. f_{ccr} is always = 1.00.
7. f_{cmin} = adjustment factor for allowable load at minimum edge distance.
8. $f_c = f_{cmin} + [(1 - f_{cmin}) (C_{act} - C_{min}) / (C_{cr} - C_{min})]$.

The edge distance tension load adjustment factors shown in red in these tables have been revised as a result of further testing by Simpson. These values are different from and should be used instead of those values shown in ICC-ES ER-5791. Simpson has determined that adjustment factors for allowable load at minimum edge distance (f_{cmin}) are correlated to concrete aggregate performance. Other factors may also influence load values. The values set forth in this table are consistent with the use of aggregates yielding lower performance results and have been adjusted from previous published values accordingly. Installations built in accordance with prior published and tested load values will still achieve the prior published allowable load due to the factor of safety used in the original load values. Please see the SPECIAL NOTE on page 8.

Load Adjustment Factors for AT Adhesive in Normal-Weight Concrete: Edge Distance, Shear Load

Load adjustment factors for critical and minimum edge distance have been determined by testing. The following tables have been created using linear interpolation.

How to use these charts:

1. The following tables are for reduced Edge Distance.
2. Locate the anchor size to be used for either a tension and/or shear load application.
3. Locate the embedment (E) at which the anchor is to be installed.
4. Locate the edge distance (C_{act}) at which the anchor is to be installed.
5. The load adjustment factor (f_c) is the intersection of the row and column.
6. Multiply the allowable load by the applicable load adjustment factor.
7. Reduction factors for multiple edges are multiplied together.
8. Adjustment factors do not apply to allowable steel strength values.
9. Adjustment factors are to be applied to allowable **Shear Load Based on Concrete Edge Distance** values only.

Edge Distance Shear (f_c)

Edge Dist. C_{act} (in)	Dia.	3/8					1/2					5/8					3/4				
	Rebar				#3					#4					#5					#6	
	E	1 3/4	3 1/2	4 1/2	3 1/2	4 1/2	2 1/8	4 1/4	6	4 1/4	7 1/2	2 1/2	5 1/2	9 3/8	5 1/2	9 3/8	3 3/8	6 3/4	11 1/4	6 3/4	11 1/4
	C_{cr}	5 1/4	5 1/4	5 1/4	6	6	6 3/8	6 3/8	6 3/8	8	8	7 1/2	7 1/2	7 1/2	10	10	10 1/8	10 1/8	10 1/8	12	12
	C_{min}	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
	f_{cmin}	0.40	0.35	0.39	0.19	0.39	0.18	0.15	0.25	0.16	0.25	0.12	0.11	0.14	0.10	0.14	0.10	0.11	0.14	0.10	0.14
1 3/4		0.40	0.35	0.39	0.19	0.39	0.18	0.15	0.25	0.16	0.25	0.12	0.11	0.14	0.10	0.14	0.10	0.11	0.14	0.10	0.14
2 3/4		0.57	0.54	0.56	0.38	0.53	0.36	0.33	0.41	0.29	0.37	0.27	0.26	0.29	0.21	0.24	0.21	0.22	0.24	0.19	0.22
3		0.61	0.58	0.61	0.43	0.57	0.40	0.38	0.45	0.33	0.40	0.31	0.30	0.33	0.24	0.27	0.23	0.24	0.27	0.21	0.24
3 1/2		0.70	0.68	0.70	0.52	0.64	0.49	0.47	0.53	0.40	0.46	0.39	0.38	0.40	0.29	0.32	0.29	0.30	0.32	0.25	0.29
4		0.79	0.77	0.78	0.62	0.71	0.58	0.56	0.61	0.46	0.52	0.46	0.46	0.48	0.35	0.37	0.34	0.35	0.37	0.30	0.33
4 1/2		0.87	0.86	0.87	0.71	0.78	0.67	0.66	0.70	0.53	0.58	0.54	0.54	0.55	0.40	0.43	0.40	0.40	0.42	0.34	0.37
5		0.96	0.95	0.96	0.81	0.86	0.76	0.75	0.78	0.60	0.64	0.62	0.61	0.63	0.45	0.48	0.45	0.46	0.47	0.39	0.41
5 1/2		1.00	1.00	1.00	0.90	0.93	0.84	0.84	0.86	0.66	0.70	0.69	0.69	0.70	0.51	0.53	0.50	0.51	0.53	0.43	0.45
6					1.00	1.00	0.93	0.93	0.94	0.73	0.76	0.77	0.77	0.78	0.56	0.58	0.56	0.56	0.58	0.47	0.50
6 1/2							1.00	1.00	1.00	0.80	0.82	0.85	0.85	0.85	0.62	0.64	0.61	0.61	0.63	0.52	0.54
7										0.87	0.88	0.92	0.92	0.93	0.67	0.69	0.66	0.67	0.68	0.56	0.58
7 1/2										0.93	0.94	1.00	1.00	1.00	0.73	0.74	0.72	0.72	0.73	0.60	0.62
8										1.00	1.00				0.78	0.79	0.77	0.77	0.78	0.65	0.66
8 1/2															0.84	0.84	0.83	0.83	0.83	0.69	0.71
9															0.89	0.90	0.88	0.88	0.88	0.74	0.75
9 1/2															0.95	0.95	0.93	0.93	0.94	0.78	0.79
10															1.00	1.00	0.99	0.99	0.99	0.82	0.83
10 1/2																	1.00	1.00	1.00	0.87	0.87
11																				0.91	0.92
11 1/2																				0.96	0.96
12																				1.00	1.00

See Notes Below

Edge Distance Shear (f_c) (cont'd)

Edge Dist. C_{act} (in)	Dia.	7/8					1					1 1/4		
	Rebar				#7					#8				
	E	3 7/8	7 3/4	13 1/8	7 3/4	13 1/8	4 1/2	9	15	9	15	5 5/8	11 1/4	18 3/4
	C_{cr}	11 5/8	11 5/8	11 5/8	14	14	13 1/2	13 1/2	13 1/2	16	16	16 7/8	16 7/8	16 7/8
	C_{min}	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	2 3/4	2 3/4	2 3/4
	f_{cmin}	0.09	0.08	0.09	0.09	0.09	0.08	0.08	0.09	0.08	0.09	0.14	0.12	0.12
1 3/4		0.09	0.08	0.09	0.09	0.09	0.08	0.08	0.09	0.08	0.09			
2 3/4		0.18	0.17	0.18	0.16	0.16	0.16	0.16	0.17	0.14	0.15	0.14	0.12	0.12
3		0.21	0.20	0.21	0.18	0.18	0.18	0.18	0.19	0.16	0.17	0.16	0.14	0.14
4		0.30	0.29	0.30	0.26	0.26	0.26	0.26	0.26	0.23	0.23	0.22	0.20	0.20
5		0.39	0.38	0.39	0.33	0.33	0.33	0.33	0.34	0.29	0.30	0.28	0.26	0.26
6		0.48	0.48	0.48	0.41	0.41	0.41	0.41	0.42	0.35	0.36	0.34	0.32	0.32
7		0.57	0.57	0.57	0.48	0.48	0.49	0.49	0.50	0.42	0.43	0.40	0.38	0.38
8		0.67	0.66	0.67	0.55	0.55	0.57	0.57	0.57	0.48	0.49	0.46	0.45	0.45
9		0.76	0.76	0.76	0.63	0.63	0.65	0.65	0.65	0.55	0.55	0.52	0.51	0.51
10		0.85	0.85	0.85	0.70	0.70	0.73	0.73	0.73	0.61	0.62	0.58	0.57	0.57
11		0.94	0.94	0.94	0.78	0.78	0.80	0.80	0.81	0.68	0.68	0.64	0.63	0.63
12		1.00	1.00	1.00	0.85	0.85	0.88	0.88	0.88	0.74	0.74	0.70	0.70	0.70
13					0.93	0.93	0.96	0.96	0.96	0.81	0.81	0.76	0.76	0.76
14					1.00	1.00	1.00	1.00	1.00	0.87	0.87	0.82	0.82	0.82
15										0.94	0.94	0.89	0.88	0.88
16										1.00	1.00	0.95	0.95	0.95
17												1.00	1.00	1.00

1. E = Embedment depth (inches).
2. C_{act} = actual edge distance at which anchor is installed (inches).
3. C_{cr} = critical edge distance for 100% load (inches).
4. C_{min} = minimum edge distance for reduced load (inches).
5. f_c = adjustment factor for allowable load at actual edge distance.
6. f_{ccr} = adjustment factor for allowable load at critical edge distance. f_{ccr} is always = 1.00.
7. f_{cmin} = adjustment factor for allowable load at minimum edge distance.
8. $f_c = f_{cmin} + [(1 - f_{cmin}) (C_{act} - C_{min}) / (C_{cr} - C_{min})]$.

Load Adjustment Factors for AT Adhesive in Normal-Weight Concrete: Spacing, Tension Load

Load adjustment factors for critical and minimum spacing have been determined by testing. The following tables have been created using linear interpolation.

How to use these charts:

1. The following tables are for reduced Spacing.
2. Locate the anchor size to be used for either a tension and/or shear load application.
3. Locate the embedment (E) at which the anchor is to be installed.
4. Locate the spacing (S_{act}) at which the anchor is to be installed.
5. The load adjustment factor (f_s) is the intersection of the row and column.
6. Multiply the allowable load by the applicable load adjustment factor.
7. Reduction factors for multiple spacings are multiplied together.
8. Adjustment factors do not apply to allowable steel strength values.
9. Adjustment factors are to be applied to allowable **Tension Load Based on Bond Strength** values only.

Spacing Tension (f_s)

S_{act} (in)	Dia.	3/8			1/2				5/8			3/4		
	Rebar		#3		#4		#4			#5			#6	
	E	1 3/4	3 1/2	4 1/2	2 1/8	4 1/4	6	7 1/2	2 1/2	5 1/2	9 3/8	3 3/8	6 3/4	11 1/4
	S_{cr}	7	6 1/8	18	8 1/2	7 1/2	24	30	10	9 5/8	37 1/2	13 1/2	11 7/8	45
	S_{min}	7/8	1 3/4	2 1/4	1 1/8	2 1/8	3	3 3/4	1 1/4	2 3/4	4 3/4	1 3/4	3 3/8	5 5/8
	f_{smin}	0.57	0.58	0.80	0.57	0.58	0.80	0.80	0.57	0.58	0.80	0.57	0.58	0.80
7/8		0.57												
1		0.58												
1 1/2		0.61			0.59				0.58					
2		0.65	0.60		0.62				0.61			0.58		
2 1/2		0.68	0.64	0.80	0.65	0.61			0.63			0.60		
3		0.72	0.68	0.81	0.67	0.64	0.80		0.66	0.59		0.61		
3 1/2		0.75	0.72	0.82	0.70	0.68	0.80		0.68	0.62		0.63	0.59	
4		0.79	0.76	0.82	0.73	0.71	0.81	0.80	0.71	0.65		0.65	0.61	
5		0.86	0.84	0.83	0.78	0.79	0.82	0.81	0.75	0.71	0.80	0.68	0.66	
6		0.93	0.92	0.85	0.84	0.86	0.83	0.82	0.80	0.77	0.81	0.72	0.71	0.80
7		1.00	1.00	0.86	0.89	0.93	0.84	0.82	0.85	0.83	0.81	0.75	0.76	0.81
8				0.87	0.95	1.00	0.85	0.83	0.90	0.88	0.82	0.79	0.81	0.81
9				0.89	1.00		0.86	0.84	0.95	0.94	0.82	0.82	0.85	0.82
10				0.90			0.87	0.84	1.00	1.00	0.83	0.86	0.90	0.82
12				0.92			0.89	0.86			0.84	0.93	1.00	0.83
14				0.95			0.90	0.87			0.85	1.00		0.84
16				0.97			0.92	0.89			0.86			0.85
18				1.00			0.94	0.90			0.88			0.86
20							0.96	0.92			0.89			0.87
24							1.00	0.94			0.91			0.89
28								0.97			0.93			0.91
32								1.00			0.95			0.93
36											0.98			0.95
40											1.00			0.97
45														1.00

⅞" – 1¼" Diameters on next page →

1. E = Embedment depth (inches).
2. S_{act} = actual spacing distance at which anchors are installed (inches).
3. S_{cr} = critical spacing distance for 100% load (inches).
4. S_{min} = minimum spacing distance for reduced load (inches).
5. f_s = adjustment factor for allowable load at actual spacing distance.
6. f_{scr} = adjustment factor for allowable load at critical spacing distance. f_{scr} is always = 1.00.
7. f_{smin} = adjustment factor for allowable load at minimum spacing distance.
8. $f_s = f_{smin} + [(1 - f_{smin}) (S_{act} - S_{min}) / (S_{cr} - S_{min})]$.

Load Adjustment Factors for AT Adhesive in Normal-Weight Concrete: Spacing, Tension Load (cont'd)

Spacing Tension (f_s) (cont'd)

S_{act} (in)	Dia.	7/8			1			1 1/4					
	Rebar		#7			#8					#9	#10	#11
	E	3 7/8	7 3/4	13 1/8	4 1/2	9	15	5 5/8	11 1/4	18 3/4	16 7/8	18 3/4	20 5/8
	S_{cr}	15 1/2	13 5/8	52 1/2	18	15 3/4	60	22 1/2	19 3/4	75	67 1/2	75	82 1/2
	S_{min}	2	3 7/8	6 5/8	2 1/4	4 1/2	7 1/2	2 7/8	5 5/8	9 3/8	8 1/2	9 3/8	10 3/8
	f_{smin}	0.57	0.58	0.80	0.57	0.58	0.80	0.57	0.58	0.80	0.80	0.80	0.80
2		0.57											
3		0.60			0.59			0.57					
4		0.63	0.59		0.61			0.59					
5		0.66	0.63		0.64	0.60		0.61					
6		0.69	0.67		0.66	0.63		0.63	0.59				
8		0.75	0.75	0.81	0.71	0.71	0.80	0.67	0.65				
10		0.82	0.83	0.81	0.76	0.78	0.81	0.72	0.71	0.80	0.80	0.80	
12		0.88	0.92	0.82	0.81	0.85	0.82	0.76	0.77	0.81	0.81	0.81	0.80
14		0.94	1.00	0.83	0.85	0.93	0.82	0.80	0.82	0.81	0.82	0.81	0.81
16		1.00		0.84	0.90	1.00	0.83	0.84	0.88	0.82	0.82	0.82	0.82
20				0.85	1.00		0.85	0.92	1.00	0.83	0.84	0.83	0.83
24				0.87			0.86	1.00		0.84	0.85	0.84	0.84
28				0.88			0.88			0.85	0.86	0.85	0.85
32				0.90			0.89			0.86	0.88	0.86	0.86
36				0.91			0.91			0.88	0.89	0.88	0.87
40				0.93			0.92			0.89	0.90	0.89	0.88
50				0.96			0.96			0.92	0.93	0.92	0.91
60				1.00			1.00			0.94	0.97	0.94	0.94
70										0.97	1.00	0.97	0.96
80										1.00		1.00	0.99
83													1.00

See Notes on Previous Page

Load Adjustment Factors for AT Adhesive in Normal-Weight Concrete: Spacing, Shear Load

Load adjustment factors for critical and minimum spacing have been determined by testing and/or design calculations. The following tables have been created using linear interpolation.

How to use these charts:

1. The following tables are for reduced Spacing.
2. Locate the anchor size to be used for either a tension and/or shear load application.
3. Locate the embedment (E) at which the anchor is to be installed.
4. Locate the spacing (S_{act}) at which the anchor is to be installed.
5. The load adjustment factor (f_s) is the intersection of the row and column.
6. Multiply the allowable load by the applicable load adjustment factor.
7. Reduction factors for multiple spacings are multiplied together.
8. Adjustment factors do not apply to allowable steel strength values.
9. Adjustment factors are to be applied to allowable **Shear Load Based on Concrete Edge Distance** values only.

Spacing Shear (f_s)

S_{act} (in)	Dia.	3/8		1/2		5/8		3/4		7/8		1		1 1/4	
	Rebar		#3		#4		#5		#6		#7		#8		
	E	1 3/4	3 1/2	2 1/8	4 1/4	2 1/2	5 1/2	3 3/8	6 3/4	3 7/8	7 3/4	4 1/2	9	5 5/8	11 1/4
	S_{cr}	2 5/8	5 1/4	3 1/4	6 3/8	3 3/4	8 1/4	5 1/8	10 1/8	5 7/8	11 5/8	6 3/4	13 1/2	8 1/2	16 7/8
	S_{min}	7/8	1 3/4	1 1/8	2 1/8	1 1/4	2 3/4	1 3/4	3 3/8	2	3 7/8	2 1/4	4 1/2	2 7/8	5 5/8
	f_{cmin}	0.90	0.83	0.90	0.83	0.90	0.83	0.90	0.83	0.90	0.83	0.90	0.83	0.90	0.83
7/8		0.90													
1		0.91													
1 1/2		0.94		0.92		0.91									
2		0.96	0.84	0.94		0.93		0.91		0.90					
2 1/2		0.99	0.87	0.96	0.85	0.95		0.92		0.91		0.91			
3		1.00	0.89	0.99	0.87	0.97	0.84	0.94		0.93		0.92		0.90	
3 1/2			0.92	1.00	0.89	0.99	0.85	0.95	0.83	0.94		0.93		0.91	
4			0.94		0.91	1.00	0.87	0.97	0.85	0.95	0.83	0.94		0.92	
5			0.99		0.95		0.90	1.00	0.87	0.98	0.85	0.96	0.84	0.94	
6			1.00		0.99		0.93		0.90	1.00	0.88	0.98	0.86	0.96	0.84
7					1.00		0.96		0.92		0.90	1.00	0.88	0.97	0.85
8							0.99		0.95		0.92		0.90	0.99	0.87
9							1.00		0.97		0.94		0.92	1.00	0.88
10									1.00		0.96		0.93		0.90
12											1.00		0.97		0.93
14													1.00		0.96
16															0.99
17															1.00

1. E = Embedment depth (inches).
2. S_{act} = actual spacing distance at which anchors are installed (inches).
3. S_{cr} = critical spacing distance for 100% load (inches).
4. S_{min} = minimum spacing distance for reduced load (inches).
5. f_s = adjustment factor for allowable load at actual spacing distance.
6. f_{scr} = adjustment factor for allowable load at critical spacing distance. f_{scr} is always = 1.00.
7. f_{smin} = adjustment factor for allowable load at minimum spacing distance.
8. $f_s = f_{smin} + [(1 - f_{smin}) (S_{act} - S_{min}) / (S_{cr} - S_{min})]$.

Load Adjustment Factors for AT Adhesive in Lightweight Concrete: Edge Distance, Tension and Shear Loads

Load adjustment factors for critical and minimum edge distances have been determined by testing. The following tables have been created using linear interpolation.

How to use these charts:

1. The following tables are for reduced Edge Distance only.
2. Locate the anchor size to be used for either a tension and/or shear load application.
3. Locate the embedment (E) at which the anchor is to be installed.
4. Locate the edge distance (C_{act}) at which the anchor is to be installed.
5. The load adjustment factor (f_c) is the intersection of the row and column.
6. Multiply the allowable load by the applicable load adjustment factor.
7. Reduction factors for multiple edges are multiplied together.
8. Adjustment factors do not apply to allowable steel strength values.
9. Adjustment factors are to be applied to allowable **Tension Load Based on Bond Strength** values or allowable **Shear Load Based on Concrete Edge Distance** values only.

Edge Distance Tension (f_c)

Edge Dist. C_{act} (in)	Dia.	3/8		1/2		5/8	
	E	1 3/4	3 1/2	2 1/8	4 1/4	2 1/2	5
	C_{cr}	2 5/8	5 1/4	3 1/8	6 3/8	3 3/4	7 1/2
	C_{min}	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
	f_{cmin}	0.59	0.59	0.50	0.50	0.50	0.50
1 3/4		0.59	0.59	0.50	0.50	0.50	0.50
2		0.71	0.62	0.59	0.53	0.56	0.52
2 1/4		0.82	0.65	0.68	0.55	0.63	0.54
2 1/2		0.94	0.68	0.77	0.58	0.69	0.57
2 3/4		1.00	0.71	0.86	0.61	0.75	0.59
3			0.74	0.95	0.64	0.81	0.61
3 1/4			0.77	1.00	0.66	0.88	0.63
3 1/2			0.80		0.69	0.94	0.65
3 3/4			0.82		0.72	1.00	0.67
4			0.85		0.74		0.70
4 1/4			0.88		0.77		0.72
4 1/2			0.91		0.80		0.74
4 3/4			0.94		0.82		0.76
5			0.97		0.85		0.78
5 1/4			1.00		0.88		0.80
5 1/2					0.91		0.83
5 3/4					0.93		0.85
6					0.96		0.87
6 1/4					0.99		0.89
6 1/2					1.00		0.91
6 3/4							0.93
7							0.96
7 1/4							0.98
7 1/2							1.00

Edge Distance Shear (f_c)

Edge Dist. C_{act} (in)	Dia.	3/8		1/2		5/8	
	E	1 3/4	3 1/2	2 1/8	4 1/4	2 1/2	5
	C_{cr}	2 5/8	5 1/4	3 1/8	6 3/8	3 3/4	7 1/2
	C_{min}	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
	f_{cmin}	0.40	0.35	0.18	0.15	0.12	0.11
1 3/4		0.40	0.35	0.18	0.15	0.12	0.11
2		0.57	0.40	0.33	0.20	0.23	0.15
2 1/4		0.74	0.44	0.48	0.24	0.34	0.19
2 1/2		0.91	0.49	0.63	0.29	0.45	0.23
2 3/4		1.00	0.54	0.78	0.33	0.56	0.26
3			0.58	0.93	0.38	0.67	0.30
3 1/4			0.63	1.00	0.43	0.78	0.34
3 1/2			0.68		0.47	0.89	0.38
3 3/4			0.72		0.52	1.00	0.42
4			0.77		0.56		0.46
4 1/4			0.81		0.61		0.50
4 1/2			0.86		0.66		0.54
4 3/4			0.91		0.70		0.57
5			0.95		0.75		0.61
5 1/4			1.00		0.79		0.65
5 1/2					0.84		0.69
5 3/4					0.89		0.73
6					0.93		0.77
6 1/4					0.98		0.81
6 1/2					1.00		0.85
6 3/4							0.88
7							0.92
7 1/4							0.96
7 1/2							1.00

1. E = Embedment depth (inches).
2. C_{act} = actual edge distance at which anchor is installed (inches).
3. C_{cr} = critical edge distance for 100% load (inches).
4. C_{min} = minimum edge distance for reduced load (inches).
5. f_c = adjustment factor for allowable load at actual edge distance.
6. f_{ccr} = adjustment factor for allowable load at critical edge distance. f_{ccr} is always = 1.00.
7. f_{cmin} = adjustment factor for allowable load at minimum edge distance.
8. $f_c = f_{cmin} + [(1 - f_{cmin}) (C_{act} - C_{min}) / (C_{cr} - C_{min})]$.

Estimating Guide for 5 oz. Cartridge using Threaded Rod – Installations per Cartridge

Rod Dia. (in.)	Drill Bit Dia. (in.)	THREADED ROD IN SOLID BASE MATERIAL HOLE DEPTH (inches)																		
		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
3/8	7/16	39	26	20	16	13	11	10	9	8	7	7	6	6	5	5	5	4	4	4
3/8	1/2	25	17	12	10	8	7	6	6	5	5	4	4	4	3	3	3	3	3	2
1/2	9/16	29	19	14	11	10	8	7	6	6	5	5	4	4	4	4	3	3	3	3
1/2	5/8	18	12	9	7	6	5	5	4	4	3	3	3	3	2	2	2	2	2	2
5/8	11/16	21	14	11	8	7	6	5	5	4	4	4	3	3	3	3	2	2	2	2
5/8	3/4	14	9	7	6	5	4	4	3	3	3	2	2	2	2	2	2	2	1	1
3/4	13/16	17	11	8	7	6	5	4	4	3	3	3	3	2	2	2	2	2	2	2
3/4	7/8	11	8	6	5	4	3	3	3	2	2	2	2	2	2	1	1	1	1	1
7/8	15/16	13	9	7	5	4	4	3	3	3	2	2	2	2	2	2	2	1	1	1
7/8	1	10	6	5	4	3	3	2	2	2	2	2	1	1	1	1	1	1	1	1
1	1 1/16	11	7	6	4	4	3	3	2	2	2	2	2	2	1	1	1	1	1	1
1	1 1/8	8	5	4	3	3	2	2	2	2	1	1	1	1	1	1	1	1	1	1
1 1/8	1 3/16	9	6	5	4	3	3	2	2	2	2	2	1	1	1	1	1	1	1	1
1 1/8	1 1/4	7	5	3	3	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1
1 1/4	1 5/16	8	5	4	3	3	2	2	2	2	1	1	1	1	1	1	1	1	1	1
1 1/4	1 3/8	6	4	3	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1

Estimating Guide for 5 oz. Cartridge using Rebar – Installations per Cartridge

Rebar Size (no.)	Drill Bit Dia. (in.)	REBAR IN SOLID BASE MATERIAL HOLE DEPTH (inches)																		
		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
3	1/2	30	20	15	12	10	8	7	7	6	5	5	5	4	4	4	3	3	3	3
4	9/16	43	29	22	17	14	12	11	10	9	8	7	7	6	6	5	5	5	5	4
4	5/8	23	15	12	9	8	7	6	5	5	4	4	4	3	3	3	3	3	2	2
5	3/4	19	12	9	7	6	5	5	4	4	3	3	3	3	2	2	2	2	2	2
6	7/8	15	10	7	6	5	4	4	3	3	3	2	2	2	2	2	2	2	2	1
7	1	13	9	6	5	4	4	3	3	3	2	2	2	2	2	2	2	1	1	1
8	1 1/8	11	7	6	4	4	3	3	2	2	2	2	2	2	1	1	1	1	1	1
9	1 1/4	10	7	5	4	3	3	2	2	2	2	2	2	1	1	1	1	1	1	1
10	1 3/8	10	7	5	4	3	3	3	2	2	2	2	2	1	1	1	1	1	1	1
11	1 5/8	5	3	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Estimating Guide for 5 oz. Cartridge and Steel Screen Tubes – Installations per Cartridge

Rod Dia. (in.)	Drill Bit Dia. (in.)	THREADED ROD INSERTED IN SCREEN TUBE HOLE DEPTH (inches)																		
		3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7	7 1/2	8	9	10	11	12	13	14	15	16	17
3/8	9/16	11	10	9	8	7	6	6	6	5	5	4	4							
1/2	11/16	7	6	5	5	4	4	4	4	3	3	3	2							
5/8	7/8	4	3	3	3	3	2	2	2	2	2	2	1	1	1	1				
3/4	1	3	3	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1

Tables are estimations. Actual usage may vary depending on waste.

Estimating Guide for 5 oz. Cartridge and Plastic Screen Tubes – Installations per Cartridge

Rod Dia. (in.)	Drill Bit Dia. (in.)	THREADED ROD INSERTED IN SCREEN TUBE HOLE DEPTH (inches)																						
		3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7	7 1/2	8	9	10	11	12	13	14	15	16	17	18	19	20	21
3/8	9/16	13	11	10	9	8	8	7	7	6	6	5	5											
1/2	11/16	7	6	5	5	4	4	4	3	3	3	3	2											
5/8	7/8	5	4	4	3	3	3	2	2	2	2	2	2	1	1	1								
3/4	1	3	3	3	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Tables are estimations. Actual usage may vary depending on waste.

Estimating Guide for 8 oz. Cartridge using Threaded Rod – Installations per Cartridge

Rod Dia. (in.)	Drill Bit Dia. (in.)	THREADED ROD IN SOLID BASE MATERIAL HOLE DEPTH (inches)																		
		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
3/8	7/16	63	42	32	25	21	18	16	14	13	11	11	10	9	8	8	7	7	7	6
3/8	1/2	40	27	20	16	13	11	10	9	8	7	7	6	6	5	5	5	4	4	4
1/2	9/16	46	31	23	18	15	13	11	10	9	8	8	7	7	6	6	5	5	5	5
1/2	5/8	29	19	14	12	10	8	7	6	6	5	5	4	4	4	4	3	3	3	3
5/8	11/16	34	22	17	13	11	10	8	7	7	6	6	5	5	4	4	4	4	4	3
5/8	3/4	23	15	11	9	8	6	6	5	5	4	4	3	3	3	3	3	3	2	2
3/4	13/16	27	18	13	11	9	8	7	6	5	5	4	4	4	4	3	3	3	3	3
3/4	7/8	18	12	9	7	6	5	5	4	4	3	3	3	3	2	2	2	2	2	2
7/8	15/16	21	14	11	9	7	6	5	5	4	4	4	3	3	3	3	3	2	2	2
7/8	1	15	10	8	6	5	4	4	3	3	3	3	2	2	2	2	2	2	2	2
1	1 1/16	18	12	9	7	6	5	4	4	4	3	3	3	3	2	2	2	2	2	2
1	1 1/8	13	8	6	5	4	4	3	3	3	2	2	2	2	2	2	1	1	1	1
1 1/8	1 3/16	15	10	7	6	5	4	4	3	3	3	2	2	2	2	2	2	2	2	1
1 1/8	1 1/4	11	7	5	4	4	3	3	2	2	2	2	2	2	1	1	1	1	1	1
1 1/4	1 5/16	13	9	6	5	4	4	3	3	3	2	2	2	2	2	2	2	1	1	1
1 1/4	1 3/8	10	7	5	4	3	3	2	2	2	2	2	2	1	1	1	1	1	1	1

Estimating Guide for 8 oz. Cartridge using Rebar – Installations per Cartridge

Rebar Size (no.)	Drill Bit Dia. (in.)	REBAR IN SOLID BASE MATERIAL HOLE DEPTH (inches)																		
		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
3	1/2	47	32	24	19	16	14	12	11	9	9	8	7	7	6	6	6	5	5	5
4	9/16	70	46	35	28	23	20	17	15	14	13	12	11	10	9	9	8	8	7	7
4	5/8	37	25	18	15	12	11	9	8	7	7	6	6	5	5	5	4	4	4	4
5	3/4	30	20	15	12	10	8	7	7	6	5	5	5	4	4	4	3	3	3	3
6	7/8	24	16	12	10	8	7	6	5	5	4	4	4	3	3	3	3	3	3	2
7	1	21	14	10	8	7	6	5	5	4	4	3	3	3	3	3	2	2	2	2
8	1 1/8	18	12	9	7	6	5	4	4	4	3	3	3	3	2	2	2	2	2	2
9	1 1/4	16	11	8	6	5	5	4	4	3	3	3	2	2	2	2	2	2	2	2
10	1 3/8	16	11	8	6	5	5	4	4	3	3	3	2	2	2	2	2	2	2	2
11	1 5/8	8	5	4	3	3	2	2	2	2	1	1	1	1	1	1	1	1	1	1

Estimating Guide for 8 oz. Cartridge and Steel Screen Tubes – Installations per Cartridge

Rod Dia. (in.)	Drill Bit Dia. (in.)	THREADED ROD INSERTED IN SCREEN TUBE HOLE DEPTH (inches)																		
		3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7	7 1/2	8	9	10	11	12	13	14	15	16	17
3/8	9/16	18	16	14	12	11	10	10	9	8	8	7	6							
1/2	11/16	11	10	9	8	7	7	6	6	5	5	4	4							
5/8	7/8	6	6	5	4	4	4	3	3	3	3	2	2	2	2	2				
3/4	1	5	4	4	3	3	3	3	2	2	2	2	2	2	1	1	1	1	1	1

Tables are estimations. Actual usage may vary depending on waste.

Estimating Guide for 8 oz. Cartridge and Plastic Screen Tubes – Installations per Cartridge

Rod Dia. (in.)	Drill Bit Dia. (in.)	THREADED ROD INSERTED IN SCREEN TUBE HOLE DEPTH (inches)																					
		3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7	7 1/2	8	9	10	11	12	13	14	15	16	17	18	19	20	21
3/8	9/16	18	16	14	12	11	10	10	9	8	8	7	6											
1/2	11/16	11	10	9	8	7	7	6	6	5	5	4	4											
5/8	7/8	6	6	5	4	4	4	3	3	3	3	2	2	2	2	2								
3/4	1	5	4	4	3	3	3	3	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1

Tables are estimations. Actual usage may vary depending on waste.

Estimating Guide for 13 oz. Cartridge using Threaded Rod – Installations per Cartridge

Rod Dia. (in.)	Drill Bit Dia. (in.)	THREADED ROD IN SOLID BASE MATERIAL HOLE DEPTH (inches)																		
		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
3/8	7/16	103	69	51	41	34	29	26	23	21	19	17	16	15	14	13	12	11	11	10
3/8	1/2	65	43	32	26	22	19	16	14	13	12	11	10	9	9	8	8	7	7	6
1/2	9/16	75	50	37	30	25	21	19	17	15	14	12	12	11	10	9	9	8	8	7
1/2	5/8	47	31	24	19	16	13	12	10	9	9	8	7	7	6	6	6	5	5	5
5/8	11/16	55	37	27	22	18	16	14	12	11	10	9	8	8	7	7	6	6	6	5
5/8	3/4	37	25	18	15	12	11	9	8	7	7	6	6	5	5	5	4	4	4	4
3/4	13/16	44	29	22	18	15	13	11	10	9	8	7	7	6	6	6	5	5	5	4
3/4	7/8	30	20	15	12	10	8	7	7	6	5	5	5	4	4	4	3	3	3	3
7/8	15/16	35	23	17	14	12	10	9	8	7	6	6	5	5	5	4	4	4	4	3
7/8	1	25	17	12	10	8	7	6	6	5	5	4	4	4	3	3	3	3	3	2
1	1 1/16	29	19	14	12	10	8	7	6	6	5	5	4	4	4	4	3	3	3	3
1	1 1/8	21	14	10	8	7	6	5	5	4	4	3	3	3	3	3	2	2	2	2
1 1/8	1 3/16	24	16	12	10	8	7	6	5	5	4	4	4	3	3	3	3	3	3	2
1 1/8	1 1/4	18	12	9	7	6	5	4	4	4	3	3	3	3	2	2	2	2	2	2
1 1/4	1 5/16	21	14	10	8	7	6	5	5	4	4	3	3	3	3	3	2	2	2	2
1 1/4	1 3/8	16	11	8	6	5	5	4	4	3	3	3	2	2	2	2	2	2	2	2

Estimating Guide for 13 oz. Cartridge using Rebar – Installations per Cartridge

Rebar Size (no.)	Drill Bit Dia. (in.)	REBAR IN SOLID BASE MATERIAL HOLE DEPTH (inches)																		
		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
3	1/2	77	52	39	31	26	22	19	17	15	14	13	12	11	10	10	9	9	8	8
4	9/16	114	76	57	45	38	32	28	25	23	21	19	17	16	15	14	13	13	12	11
4	5/8	60	40	30	24	20	17	15	13	12	11	10	9	9	8	8	7	7	6	6
5	3/4	48	32	24	19	16	14	12	11	10	9	8	7	7	6	6	6	5	5	5
6	7/8	39	26	19	16	13	11	10	9	8	7	6	6	6	5	5	5	4	4	4
7	1	34	23	17	14	11	10	8	8	7	6	6	5	5	5	4	4	4	4	3
8	1 1/8	29	19	15	12	10	8	7	6	6	5	5	4	4	4	4	3	3	3	3
9	1 1/4	26	17	13	10	9	7	7	6	5	5	4	4	4	3	3	3	3	3	3
10	1 3/8	26	18	13	11	9	8	7	6	5	5	4	4	4	4	3	3	3	3	3
11	1 5/8	13	9	7	5	4	4	3	3	3	2	2	2	2	2	2	2	1	1	1

Estimating Guide for 13 oz. Cartridge and Steel Screen Tubes – Installations per Cartridge

Rod Dia. (in.)	Drill Bit Dia. (in.)	THREADED ROD INSERTED IN SCREEN TUBE HOLE DEPTH (inches)																		
		3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7	7 1/2	8	9	10	11	12	13	14	15	16	17
3/8	9/16	29	25	23	20	18	17	16	15	14	13	11	10							
1/2	11/16	18	16	14	13	12	11	10	9	9	8	7	6							
5/8	7/8	10	9	8	7	7	6	6	5	5	5	4	4	3	3	3				
3/4	1	8	7	6	5	5	4	4	4	4	3	3	3	2	2	2	2	2	2	2

Tables are estimations. Actual usage may vary depending on waste.

Estimating Guide for 13 oz. Cartridge and Plastic Screen Tubes – Installations per Cartridge

Rod Dia. (in.)	Drill Bit Dia. (in.)	THREADED ROD INSERTED IN SCREEN TUBE HOLE DEPTH (inches)																						
		3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7	7 1/2	8	9	10	11	12	13	14	15	16	17	18	19	20	21
3/8	9/16	34	30	26	24	22	20	18	17	16	15	13	12											
1/2	11/16	18	15	14	12	11	10	9	9	8	8	7	6											
5/8	7/8	12	11	9	8	8	7	6	6	6	5	5	4	4	4	3								
3/4	1	9	8	7	6	6	5	5	4	4	4	3	3	3	3	2	2	2	2	2	2	2	2	2

Tables are estimations. Actual usage may vary depending on waste.

Estimating Guide for 30 oz. Cartridge using Threaded Rod – Installations per Cartridge

Rod Dia. (in.)	Drill Bit Dia. (in.)	THREADED ROD IN SOLID BASE MATERIAL HOLE DEPTH (inches)																		
		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
3/8	7/16	237	158	119	95	79	68	59	53	47	43	40	37	34	32	30	28	26	25	24
3/8	1/2	150	100	75	60	50	43	37	33	30	27	25	23	21	20	19	18	17	16	15
1/2	9/16	173	115	86	69	58	49	43	38	35	31	29	27	25	23	22	20	19	18	17
1/2	5/8	109	73	54	44	36	31	27	24	22	20	18	17	16	15	14	13	12	11	11
5/8	11/16	127	84	63	51	42	36	32	28	25	23	21	19	18	17	16	15	14	13	13
5/8	3/4	85	57	43	34	28	24	21	19	17	15	14	13	12	11	11	10	9	9	9
3/4	13/16	102	68	51	41	34	29	25	23	20	18	17	16	15	14	13	12	11	11	10
3/4	7/8	68	46	34	27	23	20	17	15	14	12	11	11	10	9	9	8	8	7	7
7/8	15/16	81	54	40	32	27	23	20	18	16	15	13	12	12	11	10	9	9	8	8
7/8	1	58	38	29	23	19	16	14	13	12	10	10	9	8	8	7	7	6	6	6
1	1 1/16	66	44	33	27	22	19	17	15	13	12	11	10	9	9	8	8	7	7	7
1	1 1/8	47	32	24	19	16	14	12	11	9	9	8	7	7	6	6	6	5	5	5
1 1/8	1 3/16	55	37	27	22	18	16	14	12	11	10	9	8	8	7	7	6	6	6	5
1 1/8	1 1/4	41	27	20	16	14	12	10	9	8	7	7	6	6	5	5	5	5	4	4
1 1/4	1 5/16	48	32	24	19	16	14	12	11	10	9	8	7	7	6	6	6	5	5	5
1 1/4	1 3/8	37	25	18	15	12	11	9	8	7	7	6	6	5	5	5	4	4	4	4

Estimating Guide for 30 oz. Cartridge using Rebar – Installations per Cartridge

Rebar Size (no.)	Drill Bit Dia. (in.)	REBAR IN SOLID BASE MATERIAL HOLE DEPTH (inches)																		
		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
3	1/2	178	119	89	71	59	51	45	40	36	32	30	27	25	24	22	21	20	19	18
4	9/16	262	175	131	105	87	75	65	58	52	48	44	40	37	35	33	31	29	28	26
4	5/8	139	92	69	55	46	40	35	31	28	25	23	21	20	18	17	16	15	15	14
5	3/4	112	74	56	45	37	32	28	25	22	20	19	17	16	15	14	13	12	12	11
6	7/8	89	60	45	36	30	26	22	20	18	16	15	14	13	12	11	11	10	9	9
7	1	78	52	39	31	26	22	19	17	16	14	13	12	11	10	10	9	9	8	8
8	1 1/8	67	45	33	27	22	19	17	15	13	12	11	10	10	9	8	8	7	7	7
9	1 1/4	60	40	30	24	20	17	15	13	12	11	10	9	9	8	8	7	7	6	6
10	1 3/8	61	40	30	24	20	17	15	13	12	11	10	9	9	8	8	7	7	6	6
11	1 5/8	31	20	15	12	10	9	8	7	6	6	5	5	4	4	4	4	3	3	3

Estimating Guide for 30 oz. Cartridge and Steel Screen Tubes – Installations per Cartridge

Rod Dia. (in.)	Drill Bit Dia. (in.)	THREADED ROD INSERTED IN SCREEN TUBE HOLE DEPTH (inches)																		
		3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7	7 1/2	8	9	10	11	12	13	14	15	16	17
3/8	9/16	67	59	52	47	43	39	36	33	31	29	26	23							
1/2	11/16	42	37	33	30	27	25	23	21	20	19	16	15							
5/8	7/8	24	21	19	17	15	14	13	12	11	10	9	8	8	7	6				
3/4	1	18	16	14	12	11	10	10	9	8	8	7	6	6	5	5	4	4	4	4

Tables are estimations. Actual usage may vary depending on waste.

Estimating Guide for 30 oz. Cartridge and Plastic Screen Tubes – Installations per Cartridge

Rod Dia. (in.)	Drill Bit Dia. (in.)	THREADED ROD INSERTED IN SCREEN TUBE HOLE DEPTH (inches)																					
		3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7	7 1/2	8	9	10	11	12	13	14	15	16	17	18	19	20	21
3/8	9/16	78	69	61	55	50	46	42	39	37	34	31	27											
1/2	11/16	41	36	32	28	26	24	22	20	19	18	16	14											
5/8	7/8	28	24	22	19	18	16	15	14	13	12	11	10	9	8	7								
3/4	1	20	18	16	14	13	12	11	10	9	9	8	7	6	6	5	5	5	4	4	4	4	4	3

Tables are estimations. Actual usage may vary depending on waste.

LEGACY REPORT

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Legacy report on the 1997 *Uniform Building Code*™, the 2000 *International Building Code*®, the 2000 *International Residential Code*® and the 2000 *International Plumbing Code*®

DIVISION: 03—CONCRETE
Section: 03151—Concrete Anchoring

ACRYLIC-TIE AND ACRYLIC-TIE FAST-PAC

SIMPSON STRONG-TIE COMPANY, INC.
4120 DUBLIN BOULEVARD, SUITE 400
DUBLIN, CALIFORNIA 94568

1.0 SUBJECT

Acrylic-Tie and Acrylic-Tie FAST-PAC Adhesive Anchor Systems.

2.0 DESCRIPTION

2.1 General:

Simpson Strong-Tie Acrylic-Tie series adhesive anchoring systems are post-installed, stud-type adhesive anchors for use in normal-weight concrete, structural lightweight concrete, grout-filled concrete masonry units, and unreinforced brick walls under the 1997 *Uniform Building Code*™ (UBC) and the 2000 *International Building Code*® (IBC). The anchor systems may also be used where an engineered design is submitted in accordance with Section R301.1.2 of the 2000 *International Residential Code*® (IRC).

The anchor systems consist of two-part acrylic adhesives used with a threaded steel rod or deformed steel reinforcement dowel. For installation in unreinforced brick walls, a screen tube (stainless steel or plastic), steel sleeve and steel plate are also used, as applicable.

2.2 Materials:

2.2.1 Acrylic-Tie Adhesive: Acrylic-Tie is a two-component (resin and initiator) acrylic adhesive, packaged in 8-, 13-, and 30-ounce (237, 385, and 887 ml) dual side-by-side cartridges in a 10:1 volume ratio of resin to initiator. The cartridges are dispensed with a manual or pneumatically activated tool. The adhesive is mixed by a static mixing nozzle, supplied by Simpson Strong-Tie, as it is dispensed from the dual cartridges. See Figure 1A. The Acrylic-Tie adhesive has a shelf life of one year from date of manufacture when stored in an unopened cartridge in a dry environment at storage temperatures ranging from 32°F (0°C) to 80°F (27°C). The gel and cure times recommended by Simpson Strong-Tie Company, Inc., are noted in Table 1.

2.2.2 Acrylic-Tie FAST-PAC Adhesive: Acrylic-Tie FAST-PAC is a two-component (resin and initiator) acrylic adhesive, coaxial cartridge system packaged in 5-ounce (148 ml) dual-component cartridges in a 10:1 volume ratio of resin to initiator. The cartridges are dispensed with a standard caulking gun. The adhesive is mixed by a static mixing nozzle, supplied by Simpson Strong-Tie, as it is dispensed from the coaxial cartridge system. See Figure 1B. The Acrylic-Tie FAST-PAC adhesive has a shelf life of one year from date of manufacture in an unopened cartridge when stored in a dry environment at storage temperatures ranging from 32°F (0°C) to 80°F (27°C). The gel and cure times recommended by Simpson Strong-Tie Company, Inc., are noted in Table 1.

2.2.3 All-thread Steel Rods: The threaded steel rods, ranging from $^3/_8$ inch through $1^1/_4$ inch (9.5 mm through 31.8 mm) in diameter, are manufactured either from carbon steel conforming to ASTM A 307 or ASTM A 193, Grade B7; or from stainless steel conforming to ASTM F 593, Alloy Group 1, Type 304, Condition CW. Alternate ASTM standard steel specifications not specifically prescribed in this report may be approved by the building official provided the proposed anchor design compiles with this report, and that the steel material is at least the equivalent of that prescribed in this report in quality, strength, ductility, effectiveness, and durability.

2.2.4 Rebar: Deformed steel reinforcement dowels are No. 3 through No. 11, and conform to ASTM A 615, A 616, A 617, A 706, A 767 or A 775.

2.2.5 Concrete: Concrete must be normal-weight or lightweight, stone-aggregate concrete having a minimum compressive strength as noted in the tables in this evaluation report at the time of anchor installation.

2.2.6 Grout-filled Concrete Masonry: Grout-filled, concrete-masonry walls must be constructed from Grade N, Type II, normal-weight concrete-masonry units conforming to UBC Standard 21-4 or ASTM C 90. The masonry units must be fully grouted with grout complying with UBC Section 2103.4 or IBC Section 2103.10. Mortar must be Type M or S prepared in accordance with Section 2103.3 of the UBC and UBC Standard 21-15, or IBC Section 2103.7, or Section R607 of the IRC. The specified compressive strength of masonry, f'_m, at 28 days must be a minimum of 1,500 psi (10 340 kPa).

2.2.7 Unreinforced Brick Masonry: Refer to Section 2.6 for details.

2.3 Design:

2.3.1 General: The anchor capacities in this report are allowable load values for use in allowable stress design. When in-service base material temperatures exceed 110°F

(43°C), the allowable load values in Tables 7, 8, 9, 10, 11, 12, and 14 must be adjusted in accordance with Figure 3. For anchors installed in base materials with temperatures at 70°F (21°C) and above, the top curve of Figure 3 must be used. For anchors installed in base materials with temperatures between 0°F (–18°C) and 70°F (21°C), the bottom curve of Figure 3 must be used.

Allowable loads for anchors subjected to combined shear and tension loads are determined using the following equation:

$$\frac{P_s}{P_t} + \frac{V_s}{V_t} \le 1$$

where:

P_s = Applied service tension load.

P_t = Allowable service tension load.

V_s = Applied service shear load.

V_t = Allowable service shear load.

2.3.2 Design of Anchors in Normal-weight Concrete: For installations in normal-weight concrete, anchors are permitted for live load, dead load, wind load and earthquake load applications. Allowable tension and shear values for threaded rods installed in normal-weight concrete are noted in Tables 7 and 8. Allowable tension and shear values for deformed steel reinforcing dowels in normal-weight concrete are noted in Tables 9 and 10. Spacing and edge distance requirements are noted in Table 2 for threaded rods and Table 3 for deformed rebar.

The allowable tension and shear loads with threaded rod (Tables 7 and 8) and with rebar (Tables 9 and 10) are permitted to be increased by $33^1/_3$ percent in accordance with Section 1612.3.2 of the UBC or Section 1605.3.2 of the IBC, for wind or earthquake loading conditions. When using the basic load combinations in accordance with Section 1612.3.1 of the UBC or Section 1605.3.1.1 of the IBC, allowable loads are not permitted to be increased for wind or earthquake loading.

2.3.3 Design of Anchors in Structural Lightweight Concrete: For installations in structural lightweight concrete, anchors are permitted for live load, dead load and wind load applications. Use of the anchors to resist earthquake loads is beyond the scope of this report. For short-term loading due to wind forces, the allowable loads are not permitted to be increased. Allowable tension and shear values for threaded rods installed in structural lightweight concrete are noted in Tables 11 and 12. Spacing and edge distance requirements are noted in Table 4.

2.3.4 Design of Anchors in Grout-filled Concrete Masonry: For installations in grout-filled concrete masonry, anchors are permitted for live load, dead load and wind load applications. Use of the anchors to resist earthquake loads is beyond the scope of this report. For short-term loading due to wind forces, the allowable loads are not permitted to be increased. Allowable tension and shear values for threaded rods installed in grout-filled concrete masonry units, and spacing and edge distance requirements, are noted in Table 14.

2.3.5 Design of Anchors in Unreinforced Brick Masonry: For installations in existing unreinforced brick walls, anchors are permitted for short-term wind load and earthquake load applications only. For short-term loading due to wind forces and earthquake forces, the allowable loads may not be increased. Allowable loads are noted in Sections 2.6.3.1 and 2.6.3.2 of this report. Spacing and edge distance requirements are noted in Table 13.

2.4 Installation in Concrete:

A hole is drilled into the concrete using a hand-held electro-pneumatic rotary hammer drill, in either a rotation-and-hammering or rotation-only mode, using carbide-tipped drill bits conforming to ANSI B212.15-1994. The hole is cleaned with oil-free compressed air, brushed with a nylon brush, and cleaned again with oil-free compressed air. If the hole is water-filled and contains sludge and/or debris, the hole must be cleaned with pressurized water and a nylon brush. Anchors are permitted to be installed in dry, damp, or clean water-filled holes. The hole diameter, anchor embedment, spacing and edge distances must comply with the allowable load tables. A clean nozzle is attached to the cartridge. Before injecting into holes, an initial amount of adhesive is dispensed until the adhesive color is uniform, and then the initial amount of adhesive is discarded. The nozzle is inserted to the bottom of the hole and the mixed adhesive is injected into the hole to fill it approximately one-half full. Threaded rods or deformed steel reinforcement dowels, free of oil, scale and rust, are pushed to the bottom of the hole with a slow, twisting motion, to ensure coverage of the threads or bar surface with adhesive. As a minimum, the adhesive must be level with the concrete surface after insertion of the rod or bar. Anchors must not be disturbed during the gel time. Anchors must not be loaded until the cure time has passed in accordance with Table 1.

2.5 Installation in Grout-filled Concrete Masonry:

Procedures for installing Acrylic-Tie and Acrylic-Tie FAST-PAC adhesive anchoring systems into grout-filled concrete masonry are the same as those for installation in concrete, described in Section 2.4.

2.6 Installation in Unreinforced Brick Masonry Walls:

2.6.1 General: The unreinforced brick walls must have a minimum thickness of 13 inches (330 mm) (three wythes of brick). The anchor can be installed in three configurations, as shown in Figure 2 and described in Sections 2.6.1.1 through 2.6.1.3. The anchors must be approved by the design engineer, and installed under special inspection in accordance with UBC Section 1701 or IBC Section 1704.

2.6.1.1 Configuration A: Configuration A has a straight threaded rod embedded 8 inches (203 mm) into the wall. This "shear" anchor is designed for use when the outside wall is inaccessible. This anchor assembly consists of a $^3/_4$-inch-diameter (19.1 mm) ASTM A 307 threaded rod or a No. 5 or No. 6 deformed reinforcing dowel bar, and a $^{31}/_{32}$-inch-diameter-by-8-inch-long (24.6 mm by 203 mm) stainless steel wire mesh screen tube or a 0.980-inch-diameter-by-8-inch-long (24.9 mm by 203 mm) plastic screen tube supplied by Simpson Strong-Tie Company.

2.6.1.2 Configuration B: Configuration B consists of a $^3/_4$-inch-diameter (19.1 mm), ASTM A 307 threaded rod bent and installed at a 22.5-degree angle and installed 13 inches (330 mm) into the wall, to within 1 inch (25.4 mm) maximum of the exterior wall surface. This configuration is designed to resist tension and shear loads, and is used where the outside of the wall is inaccessible. The pre-bent threaded rod is used with a $^{31}/_{32}$-inch-diameter-by-13-inch-long (24.6 mm by 330 mm) stainless steel wire mesh screen tube or a 0.980-inch-diameter-by-13-inch-long (24.9 mm by 330 mm) plastic screen tube supplied by Simpson Strong-Tie Company.

2.6.1.3 Configuration C: Configuration C is designed to resist tension and shear forces, and is used when the outside surface of the wall is accessible. It consists of a $^5/_8$-inch-diameter (15.9 mm), ASTM A 307 threaded rod; and an 8-inch-long (203 mm) sleeve, formed from AISI 1010 steel, having an outside and inside diameter of $^{13}/_{16}$ inch (20.6 mm)

and $^{11}/_{16}$ inch (17.5 mm), respectively, and a $^{31}/_{32}$-inch-diameter-by-8-inch-long (24.6 mm by 203 mm) stainless steel wire mesh screen tube or a 0.980-inch-diameter-by-8-inch-long (24.9 mm by 203 mm) plastic screen tube supplied by Simpson Strong-Tie Company. The steel sleeve has a plastic plug in one end. A 6-inch-by-6-inch-by-$^{3}/_{8}$-inch-thick (152 mm by 152 mm by 9.5 mm) ASTM A 36 steel plate is located on the back face of the wall at the end of the threaded rod of the through-bolted connection.

2.6.2 Installation: The anchors are installed in 1-inch-diameter (25.4 mm) holes drilled with a rotary drill or rotary hammer drill used in the rotation-only mode using carbide-tipped standard rotary drill bits conforming to ANSI B212.15-1994 designed for use in concrete or masonry. The hole is drilled perpendicular to the wall face, to a depth of 8 inches (203 mm) for Configurations A and C. The hole for the Configuration B anchor is at the angle and embedment described in Section 2.6.1.2, and is achieved by using a guide that is hand-held or attached to the drill. The hole is cleaned with oil-free compressed air, brushed with a nylon brush, and cleaned again with oil-free compressed air.

The mixed adhesive is injected into the screen tube until the tube is completely full. The tube is then placed into the drilled hole. The threaded rod of Configurations A and B, or the steel sleeve of Configuration C, is slowly pushed into the screen tube, forcing the adhesive through the screen and into the hole. The adhesive must be cured at the temperatures, and for the time period noted in Table 1 before load application is permitted to Configuration A or B anchors, and before continuing installation of the Configuration C anchor. After the adhesive of the Configuration C anchor has cured, standard carbide-tipped rotary drill bits conforming to ANSI B212.15-1994 are used to drill a $^{5}/_{8}$-inch-diameter (15.9 mm) hole through the plastic plug in the end of the steel sleeve and completely through the wall. The $^{5}/_{8}$-inch (15.9 mm) threaded rod is inserted through the hole and secured to the other side of the wall using the metal plate and nut.

2.6.3 Conditions of Acceptance: Conditions of acceptance for threaded rods and reinforcing dowel bars in unreinforced brick masonry are as noted with Sections 2.6.3.1 and 2.6.3.2, as applicable.

2.6.3.1 Configurations B and C Anchors in Tension and Shear:

1. The maximum allowable tension load for the 22.5-degree bent threaded rod or the $^{5}/_{8}$-inch-diameter (15.9 mm) through-bolt is 1,200 pounds (5338 N).
2. The maximum allowable shear load for the 22.5-degree bent threaded rod and for the $^{5}/_{8}$-inch-diameter (15.9 mm) through-bolt are 1,000 pounds (4448 N) and 750 pounds (3336 N), respectively.
3. The allowable load for Configuration B and C anchors subjected to a combined tension and shear load is determined by assuming a straight-line relationship between allowable tension and shear using the equation in Section 2.3.1.
4. The allowable load is applicable only where in-place shear tests indicate minimum net mortar strength of 50 psi (345 kPa).
5. Five percent of the anchors resisting tension loads must be tested, with a minimum of two tests required. Where the wall thickness varies, at least one test must be performed on an anchor that has the least embedment. Tests must indicate that bolts can sustain a tensile load of 3,000 pounds (13,345 N) (10 percent deviation) for a five-minute period. At a minimum, the test report must include:
   a. Test location(s).
   b. Brick/mortar condition.
   c. Bolt movement/elongation.
   d. Embedment depth.
   e. Applied load.
6. One-fourth (25 percent) of the anchors must be tested by a special inspector using a calibrated torque wrench set to a minimum torque of 60 foot-pounds (81 N×m). At a minimum, the test report must include:
   a. Test location(s).
   b. Brick/mortar condition.
   c. Embedment depth.

2.6.3.2 Configuration A Anchors in Shear:

1. The allowable shear load for the $^{3}/_{4}$-inch-diameter (19.1 mm) threaded rod is 1,000 pounds (4,448 N). The allowable shear loads for the No. 5 and No. 6 reinforcing dowel bars are 750 pounds (3,336 N) and 1,000 pounds (4,448 N), respectively.
2. The allowable load is applicable only where in-place shear tests indicate minimum net mortar strength of 50 psi (345 kPa).
3. One-fourth (25 percent) of the anchors must be tested by a special inspector using a calibrated torque wrench. The torque for the $^{3}/_{4}$-inch-diameter (19.1 mm) threaded rod and the No. 6 reinforcing dowel bar is 60 foot-pounds (81 N×m); the torque for the No. 5 reinforcing dowel bar is 50 foot-pounds (68 N×m).

2.7 Compliance with ANSI/NSF Standard 61, Drinking Water System Components—Health Effects:

Acrylic-Tie and Acrylic-tie FAST-PAC adhesives comply with the requirements of ANSI/NSF Standard 61, as referenced in Section 605 of the 2000 *International Plumbing Code*® (IPC) for products used in water distribution systems. Acrylic-Tie and Acrylic-Tie FAST-PAC adhesives are certified for a maximum surface area to volume ratio of 0.00053 sq. in./L (10.03 sq. in./5000 gallons) as an anchoring compound for threaded rods or steel bars. ANSI/NSF Standard 61 is intended to cover specific materials or products that come into contact with potable water. The focus of ANSI/NSF Standard 61 as it pertains to adhesive anchors is to ensure that the contaminants or impurities imparted from the adhesive product to the potable water do not exceed acceptable levels.

2.8 Special Inspection:

Adhesive anchor installations require special inspection in accordance with Section 1701 of the UBC and Section 1704 of the IBC. The special inspector must record strength and age of base material; drill bit compliance with ANSI B212.15-1994; hole diameter, depth and cleanliness; hole location; hole edge distance and spacing; installation temperature; adhesive product description, including product name; adhesive expiration date; use of proper mixing nozzles; verification of properly mixed adhesive prior to injection of adhesive in anchor hole; anchors undisturbed during gel time; rod type, grade, diameter, length and cleanliness; and verification of anchor installation in accordance with the manufacturer's published instructions and this report.

2.9 Identification:

Simpson Strong-Tie Acrylic-Tie and Acrylic-tie FAST-PAC adhesives are identified in the field by labels on the packaging, bearing the Simpson Strong-Tie name and

address, the product name, the batch number, the expiration date, and the evaluation report number (ER-5791). Stainless steel wire mesh screen tubes or plastic screen tubes are identified by a label on the packaging, bearing the Simpson Strong-Tie name and address, and the size.

3.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Interim Criteria for Adhesive Anchors in Concrete and Masonry Elements (AC58), dated November 2001, including effects of edge distance on tension performance (Test Series 4 and 5), effects of spacing on tension performance (Test Series 8 and 9), effects of edge distance on shear performance (Test Series 13 and 14), creep (Test Series 17), in-service temperature (Test Series 18), damp and water-filled hole (Test Series 19), freeze/thaw (Test Series 20), and seismic investigations (Test Series 21); data in accordance with the ICC-ES Interim Criteria for Unreinforced Masonry Anchors (AC60), dated January 1995; data in accordance with ANSI/NSF Standard 61, Drinking Water System Components—Health Effects; and a quality control manual.

4.0 FINDINGS

That the Simpson Strong-Tie Acrylic-Tie and Acrylic-Tie FAST-PAC adhesive anchor systems described in this report comply with the 1997 *Uniform Building Code*™ (UBC), the 2000 *International Building Code*® (IBC), the 2000 *International Residential Code*® (IRC), and the 2000 *International Plumbing Code*® (IPC), subject to the following conditions:

4.1 The anchors are installed in accordance with the manufacturer's instructions and this report.

4.2 The anchors installed in normal-weight concrete are used for dead, live, wind and earthquake load applications as permitted by Section 2.3.2 of this report. When anchors are used to resist short-term loads, such as wind or seismic, allowable loads must be calculated in accordance with Section 2.3.2 of this report.

4.3 The anchors installed in lightweight aggregate concrete are used for dead, live and wind load applications as permitted by Section 2.3.3. Use of the anchors to resist earthquake loads is beyond the scope of this report.

4.4 The anchors installed in grout-filled concrete masonry are used for dead, live and wind load applications as permitted by Section 2.3.4. Use of the anchors to resist earthquake loads is beyond the scope of this report.

4.5 The anchors installed in unreinforced brick walls are limited to resisting seismic or wind forces only as noted in Section 2.3.5.

4.6 Anchors are installed in substrates in holes predrilled with carbide-tipped masonry drill bits complying with ANSI B212.15-1994.

4.7 Special inspection in accordance with Sections 2.6 and 2.8 is provided for all anchor installations.

4.8 Calculations and details including the location of anchors in concrete masonry construction, where applicable, showing compliance with this report, are submitted to the local building official for approval.

4.9 Since an ICC-ES acceptance criteria for evaluating data to determine the performance of adhesive anchors subjected to fatigue or shock loading is unavailable at this time, the use of these anchors under these conditions is beyond the scope of this report.

4.10 The adhesive anchoring systems may be used to resist tension and shear forces in overhead or wall installations only if consideration is given to the effects of elevated temperature conditions on anchor performance. Figure 3 indicates load reduction factors for elevated temperatures.

4.11 The Acrylic-Tie adhesive and Acrylic-Tie FAST-PAC adhesive anchor systems are not permitted for use in conjunction with fire-resistive construction. Exceptions would be:

- **Anchors resist wind or seismic loading only.**
- **For other than wind or seismic loading, special consideration is given to fire exposure conditions.**

4.12 Since an ICC-ES acceptance criteria for evaluating the performance of adhesive anchors in cracked concrete or masonry is unavailable at this time, the use of anchors is limited to installation in uncracked concrete or masonry. Cracking occurs when $f_t > f_r$ due to service loads or deformations.

4.13 Use of the Acrylic-Tie and Acrylic-Tie FAST-PAC Adhesive Anchor Systems in conjunction with carbon steel threaded rods shall be limited to interior exposure. Installations exposed to severe, moderate or negligible exterior weathering conditions, as defined in Figure 21-1-1 of UBC Standard 21-1 or Figure 1 of ASTM C 62, are permitted where stainless steel or zinc coated anchors are used. Zinc coating on threaded rod must be either hot-dipped in accordance with ASTM A 153 with a Class C or D coating weight, or mechanically deposited in accordance with ASTM B 695 with a Class 65 coating having a minimum thickness of 2.1 mils (0.533 mm).

4.14 The anchors are permitted to be installed in dry, damp, or water-filled holes.

4.15 Where this evaluation report does not include the edition of any referenced standard, the applicable edition of the referenced standard is as specified in the code (UBC, IBC or IRC) that is applicable to the specific building project.

4.16 The adhesives are produced at the Simpson Strong-Tie Company, Inc., facility in Addison, Illinois, under a quality control program with inspections by CEL Consulting (AA-639).

This report is subject to re-examination in two years.

TABLE 1— ACRYLIC-TIE ADHESIVES (ACRYLIC-TIE AND ACRYLIC-TIE FAST-PAC) MANUFACTURER'S RECOMMENDED CURING TIMES[1]

TEMPERATURE (°F)	GEL TIME[2]	INITIAL CURE[3]
0	88 minutes	24 hours
25	22 minutes	8 hours
40	12 minutes	4 hours
60	6 minutes	1 hour
70	4 minutes	30 minutes
100	2.5 minutes	20 minutes

For **SI:** 1°C = $^5/_9$ (t°F - 32).

[1]Anchors installed and cured at temperatures colder than 0°F are beyond the scope of this report.
[2]Anchors must be undisturbed during the gel time.
[3]Allowable (design) tensile or shear loads must not be applied until after the initial cure time.

TABLE 2—THREADED ROD ACRYLIC-TIE ADHESIVES (ACRYLIC-TIE AND ACRYLIC-TIE FAST-PAC) NORMAL-WEIGHT AGGREGATE CONCRETE SPACING AND EDGE DISTANCE REQUIREMENTS[1,2]

THREADED ROD DIAMETER (inches)	MINIMUM EMBEDMENT DEPTH, h_v (inches)	EDGE DISTANCE (inches)			SPACING (inches)			
		Tension	Shear	Tension or Shear	Tension		Shear	
		Critical Edge Distance, C_{cr}	Critical Edge Distance, C_{cr}	Minimum Edge Distance, C_{min}	Critical Spacing, S_{cr}	Minimum Spacing, S_{min}	Critical Spacing, S_{cr}	Minimum Spacing, S_{min}
$^3/_8$	$1^3/_4$	$2^5/_8$	$5^1/_4$	$1^3/_4$	7	$^7/_8$	$2^5/_8$	$^7/_8$
	$3^1/_2$	$5^1/_4$			$6^1/_8$	$1^3/_4$	$5^1/_4$	$1^3/_4$
	$4^1/_2$	$6^3/_4$			18	$2^1/_4$	$5^1/_4$	$1^3/_4$
$^1/_2$	$2^1/_8$	$3^1/_4$	$6^3/_8$	$1^3/_4$	$8^1/_2$	$1^1/_8$	$3^1/_4$	$1^1/_8$
	$4^1/_4$	$6^3/_8$			$7^1/_2$	$2^1/_8$	$6^3/_8$	$2^1/_8$
	6	9			24	3	$6^3/_8$	$2^1/_8$
$^5/_8$	$2^1/_2$	$3^3/_4$	$7^1/_2$	$1^3/_4$	10	$1^1/_4$	$3^3/_4$	$1^1/_4$
	$5^1/_2$	$7^1/_2$			$9^5/_8$	$2^3/_4$	$8^1/_4$	$2^3/_4$
	$9^3/_8$	$14^1/_8$			$37^1/_2$	$4^3/_4$	$8^1/_4$	$2^3/_4$
$^3/_4$	$3^3/_8$	$5^1/_8$	$10^1/_8$	$1^3/_4$	$13^1/_2$	$1^3/_4$	$5^1/_8$	$1^3/_4$
	$6^3/_4$	$10^1/_8$			$11^7/_8$	$3^3/_8$	$10^1/_8$	$3^3/_8$
	$11^1/_4$	$16^7/_8$			45	$5^5/_8$	$10^1/_8$	$3^3/_8$
$^7/_8$	$3^7/_8$	$5^7/_8$	$11^5/_8$	$1^3/_4$	$15^1/_2$	2	$5^7/_8$	2
	$7^3/_4$	$11^5/_8$			$13^5/_8$	$3^7/_8$	$11^5/_8$	$3^7/_8$
	$13^1/_8$	$19^5/_8$			$52^1/_2$	$6^5/_8$	$11^5/_8$	$3^7/_8$
1	$4^1/_2$	$6^3/_4$	$13^1/_2$	$1^3/_4$	18	$2^1/_4$	$6^3/_4$	$2^1/_4$
	9	$13^1/_2$			$15^3/_4$	$4^1/_2$	$13^1/_2$	$4^1/_2$
	15	$22^1/_2$			60	$7^1/_2$	$13^1/_2$	$4^1/_2$
$1^1/_4$	$5^5/_8$	$8^1/_2$	$16^7/_8$	$2^3/_4$	$22^1/_2$	$2^7/_8$	$8^1/_2$	$2^7/_8$
	$11^1/_4$	$16^7/_8$			$19^3/_4$	$5^5/_8$	$16^7/_8$	$5^5/_8$
	$18^3/_4$	$28^1/_8$			75	$9^3/_8$	$16^7/_8$	$5^5/_8$

For **SI:** 1 inch = 25.4 mm.

[1]The spacing and edge distance requirements in this table are applicable to Tables 7 and 8.
[2]The critical edge and spacing distances are for full anchor capacity, and the minimum edge and spacing distances are for reduced anchor capacity. See Table 5 for applicable load reduction factors for anchors installed at distances less than the critical distance and less than critical spacing.

TABLE 3—REBAR ACRYLIC-TIE ADHESIVES (ACRYLIC-TIE AND ACRYLIC-TIE FAST-PAC) NORMAL-WEIGHT AGGREGATE CONCRETE SPACING AND EDGE DISTANCE REQUIREMENTS[1,2]

REBAR SIZE	MINIMUM EMBEDMENT DEPTH, h_v (inches)	EDGE DISTANCE (inches)			SPACING (inches)			
		Tension	Shear	Tension or Shear	Tension		Shear	
		Critical Edge Distance, C_{cr}	Critical Edge Distance, C_{cr}	Minimum Edge Distance, C_{min}	Critical Spacing, S_{cr}	Minimum Spacing, S_{min}	Critical Spacing, S_{cr}	Minimum Spacing, S_{min}
No. 3	3 1/2	5 1/4	6	1 3/4	6 1/8	1 3/4	5 1/4	1 3/4
No. 4	4 1/4	6 3/8	8	1 3/4	7 1/2	2 1/8	6 3/8	2 1/8
	7 1/2	11 1/4			30	3 3/4	—	—
No. 5	5 1/2	7 1/2	10	1 3/4	9 5/8	2 3/4	8 1/4	2 3/4
	9 3/8	14 1/8			37 1/2	4 3/4	—	—
No. 6	6 3/4	10 1/8	12	1 3/4	11 7/8	3 3/8	10 1/8	3 3/8
	11 1/4	16 7/8			45	5 5/8	—	—
No. 7	7 3/4	11 5/8	14	1 3/4	13 5/8	3 7/8	11 5/8	3 7/8
	13 1/8	19 5/8			52 1/2	6 5/8	—	—
No. 8	9	13 1/2	16	1 3/4	15 3/4	4 1/2	13 1/2	4 1/2
	15	22 1/2			60	7 1/2	—	—
No. 9	16 7/8	25 3/8	25 3/8	2 3/4	67 1/2	8 1/2	—	—
No. 10	18 3/4	28 1/8	28 1/8	2 3/4	75	9 3/8	—	—
No. 11	20 5/8	31	31	2 3/4	82 1/2	10 3/8	—	—

For **SI:** 1 inch = 25.4 mm.

[1]The spacing and edge distance requirements in this table are applicable to Tables 9 and 10.
[2]The critical edge and spacing distances are for full anchor capacity, and the minimum edge and spacing distances are for reduced anchor capacity. See Table 6 for applicable load reduction factors for anchors installed at distances less than the critical distance and less than critical spacing.
[3]A dash, —, indicates that testing was not performed.

TABLE 4—THREADED ROD ACRYLIC-TIE ADHESIVES (ACRYLIC-TIE AND ACRYLIC-TIE FAST-PAC) STRUCTURAL LIGHTWEIGHT CONCRETE SPACING AND EDGE DISTANCE REQUIREMENTS[1,2]

THREADED ROD DIAMETER (inch)	MINIMUM EMBEDMENT DEPTH, h_v (inches)	EDGE DISTANCE (inches)		SPACING (inches)
		Critical Edge Distance, C_{cr}	Minimum Edge Distance, C_{min}	Critical Spacing, S_{cr}
		Tension and Shear	Tension and Shear	Tension and Shear
3/8	1 3/4	2 5/8	1 3/4	3 1/2
	3 1/2	5 1/4	1 3/4	7
1/2	2 1/8	3 1/8	1 3/4	4 1/4
	4 1/4	6 3/8	1 3/4	8 1/2
5/8	2 1/2	3 3/4	1 3/4	5
	5	7 1/2	1 3/4	10

For **SI:** 1 inch = 25.4 mm.

[1]The spacing and edge distance requirements in this table are applicable to Tables 11 and 12.
[2]The critical edge and spacing distances for full anchor capacity, and the minimum edge distance, are for reduced anchor capacity. See Table 5 for applicable load reduction factors for anchors installed at distances less than the critical distance.

TABLE 5—ALLOWABLE LOAD REDUCTION FACTORS FOR THREADED ROD AND ACRYLIC-TIE ADHESIVES (ACRYLIC-TIE AND ACRYLIC-TIE FAST-PAC) INSTALLED IN NORMAL-WEIGHT AND STRUCTURAL LIGHTWEIGHT CONCRETE[1,2,3,4,5]

THREADED ROD DIAMETER (inches)	MINIMUM EMBEDMENT DEPTH, h_v (inches)	EDGE DISTANCE (inches)			SPACING (inches)		
		Tension or Shear	Tension	Shear	Tension or Shear	Tension	Shear
		Critical Edge Distance, C_{cr}	Minimum Edge Distance, C_{min}	Minimum Edge Distance, C_{min}	Critical Spacing, S_{cr}	Minimum Spacing, S_{min}	Minimum Spacing, S_{min}
	$1^3/_4$		0.59	0.40		0.57	0.90
$^3/_8$	$3^1/_2$	1.00	0.59	0.35	1.00	0.58	0.83
	$4^1/_2$		0.65	0.39		0.80	0.83
	$2^1/_8$		0.50	0.18		0.57	0.90
$^1/_2$	$4^1/_4$	1.00	0.50	0.15	1.00	0.58	0.83
	6		0.65	0.25		0.80	0.83
	$2^1/_2$		0.50	0.12		0.57	0.90
$^5/_8$	$5^1/_2$	1.00	0.50	0.11	1.00	0.58	0.83
	$9^3/_8$		0.65	0.14		0.80	0.83
	$3^3/_8$		0.50	0.10		0.57	0.90
$^3/_4$	$6^3/_4$	1.00	0.50	0.11	1.00	0.58	0.83
	$11^1/_4$		0.65	0.14		0.80	0.83
	$3^7/_8$		0.49	0.09		0.57	0.90
$^7/_8$	$7^3/_4$	1.00	0.49	0.08	1.00	0.58	0.83
	$13^1/_8$		0.64	0.09		0.80	0.83
	$4^1/_2$		0.44	0.08		0.57	0.90
1	9	1.00	0.44	0.08	1.00	0.58	0.83
	15		0.64	0.09		0.80	0.83
	$5^5/_8$		0.47	0.14		0.57	0.90
$1^1/_4$	$11^1/_4$	1.00	0.47	0.12	1.00	0.58	0.83
	$18^3/_4$		0.62	0.12		0.80	0.83

For **SI:** 1 inch = 25.4 mm.

[1]The load reduction factors in this table are applicable to the allowable loads based on bond strength shown in Tables 7, 8, 11, and 12.
[2]Reduction factors are cumulative. Multiple reduction factors for more than one spacing or edge distance are calculated separately and multiplied.
[3]Load reduction factors for anchors loaded in tension or shear with spacing between critical and minimum are obtained by linear interpolation.
[4]Load reduction factors for anchors loaded in tension or shear with edge distances between critical and minimum are obtained by linear interpolation.
[5]Applies to shear loads directed either toward or away from an edge.

TABLE 6—ALLOWABLE LOAD REDUCTION FACTORS FOR REBAR AND ACRYLIC-TIE ADHESIVES (ACRYLIC-TIE AND ACRYLIC-TIE FAST-PAC) INSTALLED IN NORMAL-WEIGHT AND STRUCTURAL LIGHTWEIGHT CONCRETE[1,2,3,4,5,6]

REBAR SIZE	MINIMUM EMBEDMENT DEPTH, h_v (inches)	EDGE DISTANCE (inches)			SPACING (inches)		
		Tension or Shear	Tension	Shear	Tension or Shear	Tension	Shear
		Critical Edge Distance, C_{cr}	Minimum Edge Distance, C_{min}	Minimum Edge Distance, C_{min}	Critical Spacing, S_{cr}	Minimum Spacing, S_{min}	Minimum Spacing, S_{min}
No. 3	$3^1/_2$	1.00	0.59	0.19	1.00	0.58	0.85
No. 4	$4^1/_4$	1.00	0.50	0.16	1.00	0.58	0.85
	$7^1/_2$		0.65	—		0.80	—
No. 5	$5^1/_2$	1.00	0.50	0.10	1.00	0.58	0.85
	$9^3/_8$		0.65	—		0.80	—
No. 6	$6^3/_4$	1.00	0.50	0.10	1.00	0.58	0.85
	$11^1/_4$		0.65	—		0.80	—
No. 7	$7^3/_4$	1.00	0.49	0.09	1.00	0.58	0.85
	$13^1/_8$		0.64	—		0.80	—
No. 8	9	1.00	0.44	0.08	1.00	0.58	0.85
	15		0.64	—		0.8	—
No. 9	$16^7/_8$	1.00	0.62	—	1.00	0.8	—
No. 10	$18^3/_4$	1.00	0.62	—	1.00	0.8	—
No. 11	$20^5/_8$	1.00	0.62	—	1.00	0.8	—

For **SI:** 1 inch = 25.4 mm.

[1]The load reduction factors in this table are applicable to the allowable loads based on bond strength shown in Tables 9 and 10.
[2]A dash, —, indicates that testing was not performed.
[3]Reduction factors are cumulative. Multiple reduction factors for more than one spacing or edge distance are calculated separately and multiplied.
[4]Load reduction factors for anchors loaded in tension or shear with spacing between critical and minimum are obtained by linear interpolation.
[5]Load reduction factors for anchors loaded in tension or shear with edge distances between critical and minimum are obtained by linear interpolation.
[6]Applies to shear loads directed either toward or away from an edge.

TABLE 7—ACRYLIC-TIE ADHESIVES (ACRYLIC-TIE AND ACRYLIC-TIE FAST-PAC) ALLOWABLE TENSION LOADS FOR THREADED ROD INSTALLED IN NORMAL-WEIGHT AGGREGATE CONCRETE, $f'_c \geq$ 2,000 psi [1,2,3,4,5]

THREADED ROD DIAMETER (inches)	DRILL BIT DIAMETER (inches)	MINIMUM EMBEDMENT DEPTH, h_v (inches)	BASED ON BOND STRENGTH[6,7]		BASED ON STEEL STRENGTH[8]		
			Allowable Load of Anchors Installed at C_{cr} (pounds)	Allowable Load of Anchors Installed at C_{min} (pounds)	Allowable Capacity of Threaded Steel Rods (pounds)		
					A 307 Grade C	A 193 Grade B7	F 593 (A 304 SS)
$^3/_8$	$^7/_{16}$	$1^3/_4$	840	495	2,105	4,535	3,630
		$3^1/_2$	2,235	1,320			
		$4^1/_2$	2,605	1,695			
$^1/_2$	$^9/_{16}$	$2^1/_8$	1,315	660	3,750	8,080	6,470
		$4^1/_4$	4,165	2,085			
		6	4,795	3,115			
$^5/_8$	$^{11}/_{16}$	$2^1/_2$	2,125	1,065	5,875	12,660	10,120
		$5^1/_2$	6,505	3,255			
		$9^3/_8$	7,920	5,150			
$^3/_4$	$^{13}/_{16}$	$3^3/_8$	3,250	1,625	8,460	18,230	12,400
		$6^3/_4$	9,405	4,705			
		$11^1/_4$	10,595	6,885			
$^7/_8$	1	$3^7/_8$	3,550	1,740	11,500	24,785	16,860
		$7^3/_4$	10,710	5,250			
		$13^1/_8$	13,785	8,820			
1	$1^1/_{16}$	$4^1/_2$	5,200	2,290	15,025	32,380	22,020
		9	15,125	6,655			
		15	20,630	13,205			
$1^1/_4$	$1^5/_{16}$	$5^5/_8$	8,090	3,800	23,490	50,620	34,420
		$11^1/_4$	18,090	8,500			
		$18^3/_4$	31,625	19,610			

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

[1]Allowable load must be the lesser of the allowable load based on bond strength and the allowable load based on steel strength.
[2]Allowable tension loads based on bond strength must be reduced for the effects of elevated temperatures as shown in Figure 3.
[3]Allowable tension loads are permitted to be increased by $33^1/_3$ percent in accordance with Section 1612.3.2 of the UBC or Section 1605.3.2 of the IBC, for wind or earthquake loading conditions. When using the basic load combinations in accordance with Section 1612.3.1 of the UBC or Section 1605.3.1.1 of the IBC, allowable loads are not permitted to be increased for wind or earthquake loading.
[4]Minimum concrete thickness is 1.5 h_v.
[5]Critical and minimum anchor spacing and edge distances must comply with Table 2. Linear interpolation for allowable loads for anchors loaded in tension may be used for spacings between s_{cr} and s_{min} and edge distances between c_{cr} and c_{min} as well as intermediate embedment depths.
[6]Bond strength values are based on a safety factor of 4.0.
[7]The tabulated values are for anchors installed in concrete having a minimum 2000 psi compressive strength at the time of anchor installation.
[8]Steel strength values are based on the equation:

$$T = 0.33\ F_u\ A$$

where:

T = Allowable tension load (pounds).
F_u = Minimum specified ultimate tensile strength of threaded rod (psi).
A = Nominal cross-sectional area of threaded rod (square inches).

TABLE 8—ACRYLIC-TIE ADHESIVES (ACRYLIC-TIE AND ACRYLIC-TIE FAST-PAC) ALLOWABLE SHEAR LOADS FOR THREADED ROD INSTALLED IN NORMAL-WEIGHT AGGREGATE CONCRETE, $f'_c \geq$ 2,000 psi[1,2,3,4]

THREADED ROD DIAMETER (inches)	DRILL BIT DIAMETER (inches)	MINIMUM EMBEDMENT DEPTH (h_v) (inches)	BASED ON CONCRETE EDGE DISTANCE[5,6,7]		BASED ON STEEL STRENGTH[8]		
			Allowable Load of Anchor Installed at C_{cr} (pounds)	Allowable Load of Anchor Installed at C_{min} (pounds)	Allowable Capacity of the Threaded Steel Rod (pounds)		
					A 307, Grade C	A 193, Grade B7	F 593 (A 304 SS)
$^3/_8$	$^7/_{16}$	$1^3/_4$	1,215	485	1,085	2,340	1,870
		$3^1/_2$	1,385	485			
		$4^1/_2$	1,385	540			
$^1/_2$	$^9/_{16}$	$2^1/_8$	2,080	375	1,930	4,160	3,330
		$4^1/_4$	2,500	375			
		6	2,500	625			
$^5/_8$	$^{11}/_{16}$	$2^1/_2$	3,700	430	3,025	6,520	5,220
		$5^1/_2$	3,925	430			
		$9^3/_8$	3,925	550			
$^3/_4$	$^{13}/_{16}$	$3^3/_8$	5,090	510	4,360	9,390	6,385
		$6^3/_4$	5,090	560			
		$11^1/_4$	5,090	715			
$^7/_8$	1	$3^7/_8$	6,870	620	5,925	12,770	8,685
		$7^3/_4$	7,720	620			
		$13^1/_8$	7,720	695			
1	$1^1/_{16}$	$4^1/_2$	8,170	675	7,740	16,680	11,345
		9	8,465	675			
		15	8,465	760			
$1^1/_4$	$1^5/_{16}$	$5^5/_8$	12,595	1,765	12,100	26,075	17,730
		$11^1/_4$	16,440	1,975			
		$18^3/_4$	16,440	1,975			

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

[1]Allowable load must be the lesser of the allowable load based on concrete edge distance and the allowable load based on steel strength.
[2] Allowable shear loads are permitted to be increased by $33^1/_3$ percent in accordance with Section 1612.3.2 of the UBC or Section 1605.3.2 of the IBC, for wind or earthquake loading conditions. When using the basic load combinations in accordance with Section 1612.3.1 of the UBC or Section 1605.3.1.1 of the IBC, allowable loads are not permitted to be increased for wind or earthquake loading.
[3]Critical and minimum anchor spacing and edge distances must comply with Table 2.
[4]Minimum concrete thickness is 1.5 h_v.
[5]Linear interpolation for allowable loads for anchors loaded in shear may be used for spacings between s_{cr} and s_{min} and edge distances between c_{cr} and c_{min} as well as intermediate embedment depths.
[6]The tabulated values are for anchors installed in concrete having a minimum 2000 psi compressive strength at the time of anchor installation.
[7]The allowable loads based on concrete edge distance are based on a safety factor of 4.0.
[8]Steel strength values are based on the equation:

$$V = 0.17\ F_u\ A$$

where:

V = Allowable shear load (pounds).
F_u = Minimum specified ultimate tension strength of threaded rod (psi).
A = Nominal cross-sectional area of threaded rod (square inches).

TABLE 9—ACRYLIC-TIE ADHESIVES (ACRYLIC-TIE AND ACRYLIC-TIE FAST-PAC) ALLOWABLE TENSION LOADS FOR REINFORCING DOWELS INSTALLED IN NORMAL-WEIGHT AGGREGATE CONCRETE[1,2,3,4,5]

REBAR SIZE	DRILL BIT DIAMETER (inches)	MINIMUM EMBEDMENT DEPTH, h_v (inches)	BASED ON BOND STRENGTH[6,7,8]				BASED ON STEEL STRENGTH[9]	
			$f'_c \geq$ 2,000 psi		$f'_c \geq$ 4,000 psi		Allowable Capacity of Deformed Rebar[10] (pounds)	
			Allowable Load of Anchors Installed at C_{cr} (pounds)	Allowable Load of Anchors Installed at C_{min} (pounds)	Allowable Load of Anchors Installed at C_{cr} (pounds)	Allowable Load of Anchors Installed at C_{min} (pounds)	Grade 40	Grade 60
No. 3	$^1/_2$	$3^1/_2$	2,060	1,215	2,060	1,215	2,200	2,640
No. 4	$^9/_{16}$	$4^1/_4$	3,185	1,595	3,185	1,595	4,000	4,800
		$7^1/_2$	—	—	4,780	3,105		
No. 5	$^3/_4$	$5^1/_2$	5,100	2,550	5,100	2,550	6,200	7,440
		$9^3/_8$	—	—	7,030	4,570		
No. 6	$^7/_8$	$6^3/_4$	7,960	3,980	7,960	3,980	8,800	10,560
		$11^1/_4$	—	—	9,500	6,175		
No. 7	1	$7^3/_4$	8,815	4,320	8,815	4,320	12,000	14,400
		$13^1/_8$	—	—	12,720	8,140		
No. 8	$1^1/_8$	9	12,495	5,500	12,495	5,500	15,800	18,960
		15	—	—	20,150	12,895		
No. 9	$1^1/_4$	$16^7/_8$	—	—	24,025	14,895	20,000	24,000
No. 10	$1^3/_8$	$18^3/_4$	—	—	31,010	19,225	25,400	30,480
No. 11	$1^5/_8$	$20^5/_8$	—	—	41,515	25,740	31,200	37,440

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

[1]Allowable load must be the lesser of the allowable load based on bond strength and the allowable load based on steel strength.
[2]Allowable tension loads based on bond strength must be reduced for the effects of elevated temperatures as shown in Figure 3.
[3]Allowable tension loads are permitted to be increased by $33^1/_3$ percent in accordance with Section 1612.3.2 of the UBC or Section 1605.3.2 of the IBC, for wind or earthquake loading conditions. When using the basic load combinations in accordance with Section 1612.3.1 of the UBC or Section 1605.3.1.1 of the IBC, allowable loads are not permitted to be increased for wind or earthquake loading.
[4]Minimum concrete thickness is 1.5 h_v.
[5]Critical and minimum anchor spacing and edge distances must comply with Table 3. Linear interpolation for allowable loads for anchors loaded in tension may be used for spacings between s_{cr} and s_{min} and edge distances between c_{cr} and c_{min}.
[6]Bond strength values are based on a safety factor of 4.0.
[7]A dash, —, indicates that testing was not performed.
[8]The tabulated values are for anchors installed in concrete having the designated compressive strength at the time of anchor installation.
[9]The steel strength values are based on multiplying the allowable tensile stress specified in UBC Section 1926.3.2 (Appendix A, Section A.3.2, of ACI 318-99) by the cross-sectional area of the rebar.
[10]Deformed rebar must conform to either ASTM A 615, A 616, A 617, A 706, A 767 or A 775.

TABLE 10—ACRYLIC-TIE ADHESIVES (ACRYLIC-TIE AND ACRYLIC-TIE FAST-PAC) ALLOWABLE SHEAR LOADS FOR ASTM A 615, GRADE 60, REINFORCING DOWELS INSTALLED IN NORMAL-WEIGHT AGGREGATE CONCRETE, $f'_c \geq$ 2,000 psi [1,2,3,4]

REBAR SIZE	DRILL BIT DIAMETER (inches)	MINIMUM EMBEDMENT DEPTH (h_v) (inches)	BASED ON CONCRETE EDGE DISTANCE[5,6,7]		BASED ON STEEL STRENGTH[8]	
			Allowable Load of Anchors Installed at C_{cr} (pounds)	Allowable Load of Anchors Installed at C_{min} (pounds)	Allowable Capacity of Deformed Rebar[9] (pounds)	
					Grade 40	Grade 60
No. 3	$^1/_2$	$3^1/_2$	2,075	395	1,120	1,680
No. 4	$^9/_{16}$	$4^1/_4$	2,755	440	2,040	3,060
No. 5	$^3/_4$	$5^1/_2$	3,940	395	3,160	4,740
No. 6	$^7/_8$	$6^3/_4$	5,830	585	4,490	6,730
No. 7	1	$7^3/_4$	8,165	735	6,120	9,180
No. 8	$1^1/_8$	9	8,360	670	8,060	12,085

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

[1]Allowable load must be the lesser of the allowable load based on concrete edge distance and the allowable load based on steel strength.
[2]Allowable shear loads are permitted to be increased by $33^1/_3$ percent in accordance with Section 1612.3.2 of the UBC or Section 1605.3.2 of the IBC, for wind or earthquake loading conditions. When using the basic load combinations in accordance with Section 1612.3.1 of the UBC or Section 1605.3.1.1 of the IBC, allowable loads are not permitted to be increased for wind or earthquake loading.
[3]Critical and minimum anchor spacing and edge distances must comply with Table 3.
[4]Minimum concrete thickness is 1.5 h_v.
[5]Linear interpolation for allowable loads for anchors loaded in shear may be used for spacings between s_{cr} and s_{min} and edge distances between c_{cr} and c_{min}.
[6]The tabulated values are for anchors installed in concrete having a minimum 2,000 psi compressive strength at the time of anchor installation.
[7]The allowable loads are based on a safety factor of 4.0.
[8]Steel strength values are based on the equation:

$$V = 0.17\ F_u\ A$$

where:

V = Allowable shear load (pounds).
F_u = Minimum specified ultimate tension strength of rebar (psi).
A = Nominal cross-sectional area of rebar (square inches).
[9]Deformed rebar must conform to either ASTM A 615, A 616, A 617, A 706, A 767 or A 775.

TABLE 11 — ACRYLIC-TIE ADHESIVES (ACRYLIC-TIE AND ACRYLIC-TIE FAST-PAC) ALLOWABLE TENSION LOADS FOR THREADED ROD INSTALLED IN STRUCTURAL LIGHTWEIGHT CONCRETE, $f'_c \geq$ 3,000 psi [1,2,3,4,5]

THREADED ROD DIAMETER (inch)	DRILL BIT DIAMETER (inch)	MINIMUM EMBEDMENT DEPTH, h_v (inches)	BASED ON BOND STRENGTH[6,7] (pounds)		BASED ON STEEL STRENGTH[8] (pounds)		
			Allowable Load of Anchors installed at C_{cr} (pounds)	Allowable Load of Anchors installed at C_{min} (pounds)	Allowable Capacity of Threaded Steel Rods (pounds)		
					A 307, Grade C	A 193, Grade B7	F 593 (A 304 SS)
3/8	7/16	1 3/4	710	420	2,105	4,535	3,630
		3 1/2	1280	755			
1/2	9/16	2 1/8	1100	550	3,750	8,080	6,470
		4 1/4	1675	840			
5/8	11/16	2 1/2	1390	695	5,875	12,660	10,120
		5	1575	790			

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

[1]Allowable load must be the lesser of the allowable load based on bond strength and the allowable load based on steel strength.
[2]Allowable tension loads based on bond strength must be reduced for the effects of elevated temperatures as shown in Figure 3.
[3]Anchors are not recognized for resisting seismic forces. For short-term loading due to wind forces, the allowable loads may not be increased.
[4]Minimum concrete thickness is 1.5 h_v.
[5]Anchor spacing and edge distance must comply with Table 4. Allowable loads for anchors loaded in tension with edge distances between critical and minimum must be obtained by linear interpolation.
[6]Bond strength values are based on a safety factor of 4.0.
[7]The tabulated values are for anchors installed in concrete having a minimum 3,000 psi compressive strength at the time of anchor installation.
[8]Steel strength values are based on the equation:

$$T = 0.33\ F_u\ A$$

where:

T = Allowable tension load (pounds).
F_u = Minimum specified ultimate tensile strength of threaded rod (psi).
A = Nominal cross-sectional area of threaded rod (square inches).

TABLE 12 — ACRYLIC-TIE ADHESIVES (ACRYLIC-TIE AND ACRYLIC-TIE FAST-PAC) ALLOWABLE SHEAR LOADS FOR THREADED ROD INSTALLED IN STRUCTURAL LIGHTWEIGHT CONCRETE, $f'_c \geq$ 3,000 psi[1,2,3,4]

THREADED ROD DIAMETER (inch)	DRILL BIT DIAMETER (inch)	MINIMUM EMBEDMENT DEPTH, h_v (inches)	BASED ON CONCRETE EDGE DISTANCE[5,6,7] (pounds)		BASED ON STEEL STRENGTH[8]		
			Allowable Load of Anchors installed at C_{cr} (pounds)	Allowable Load of Anchors installed at C_{min} (pounds)	Allowable Capacity of the Threaded Steel Rod (pounds)		
					A 307, Grade C	A 193, Grade B7	F 593 (A 304 SS)
$^3/_8$	$^7/_{16}$	$1^3/_4$	760	265	1,085	2,340	1,870
		$3^1/_2$	1,330	465			
$^1/_2$	$^9/_{16}$	$2^1/_8$	1,020	155	1,930	4,160	3,330
		$4^1/_4$	2,460	370			
$^5/_8$	$^{11}/_{16}$	$2^1/_2$	1,340	150	3,025	6,520	5,220
		5	3,105	340			

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

[1]Allowable load must be the lesser of the allowable load based on concrete edge distance and the allowable load based on steel strength.
[2]Anchors are not recognized for resisting seismic forces. For short-term loading due to wind forces, the allowable loads are not permitted to be increased.
[3]Anchor spacing and edge distance must comply with Table 4.
[4]Minimum concrete thickness is 1.5 h_v.
[5]Allowable loads for anchors loaded in shear with edge distances between critical and minimum must be obtained by linear interpolation.
[6]The tabulated values are for anchors installed in concrete having a minimum 3000 psi compressive strength at the time of anchor installation.
[7]The allowable loads based on concrete edge distance are based on a safety factor of 4.0.
[8]Steel strength values are based on the equation:

$$V = 0.17 \ F_u \ A$$

where:

V = Allowable shear load (pounds).
F_u = Minimum specified ultimate tension strength of threaded rod (psi).
A = Nominal cross-sectional area of threaded rod (square inches).

TABLE 13 — ACRYLIC-TIE ADHESIVES (ACRYLIC-TIE AND ACRYLIC-TIE FAST-PAC) MINIMUM SPACING AND EDGE DISTANCES FOR ANCHORS INSTALLED IN UNREINFORCED BRICK MASONRY

ANCHOR CONFIGURATION	MINIMUM VERTICAL SPACING (inches)	MINIMUM HORIZONTAL SPACING (inches)	MINIMUM EDGE DISTANCE (inches)
A	18	18	24
B	18	24	16
C	18	18	24

For **SI:** 1 inch = 25.4 mm.

TABLE 14 — ACRYLIC-TIE ADHESIVES (ACRYLIC-TIE AND ACRYLIC-TIE FAST-PAC) ALLOWABLE TENSION AND SHEAR VALUES FOR THREADED ROD INSTALLED IN 6-INCH AND 8-INCH GROUT-FILLED CONCRETE MASONRY UNITS (CMU)[1,2,3,4,5,6,7,8]

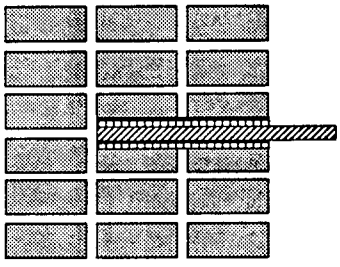
ANCHOR INSTALLED THROUGH FACE SHELL (see Figure 4)								
THREADED ROD DIAMETER (inch)	DRILL BIT DIAMETER (inch)	MINIMUM EMBEDMENT DEPTH (inches)	EDGE DISTANCE (inches)	END DISTANCE (inches)	6-INCH GROUT-FILLED CMU		8-INCH GROUT-FILLED CMU	
					Allowable Tension Load (pounds)	Allowable Shear Load (pounds)	Allowable Tension Load (pounds)	Allowable Shear Load (pounds)
1/2	9/16	4 1/4	12	12	770	1,320	770	1,320
3/4	13/16	6 3/4	12	4	—	—	1,375	—
				12	—	—	—	2,670
ANCHOR INSTALLED AT INTERSECTION OF HEAD AND BED JOINT (see Figure 5)								
THREADED ROD DIAMETER (inch)	DRILL BIT DIAMETER (inch)	MINIMUM EMBEDMENT DEPTH (inches)	EDGE DISTANCE (inches)	END DISTANCE (inches)	6-INCH GROUT-FILLED CMU		8-INCH GROUT-FILLED CMU	
					Allowable Tension Load (pounds)	Allowable Shear Load (pounds)	Allowable Tension Load (pounds)	Allowable Shear Load (pounds)
3/4	13/16	6 3/4	16	8	—	—	—	1,025
ANCHOR INSTALLED IN CELL OPENING (TOP OF WALL) (see Figures 6 and 7)								
THREADED ROD DIAMETER (inch)	DRILL BIT DIAMETER (inch)	MINIMUM EMBEDMENT DEPTH (inches)	EDGE DISTANCE (inches)	END DISTANCE (inches)	6-INCH AND 8-INCH GROUT-FILLED CMU			
					Allowable Tension Load (pounds)	Allowable Shear Load Applied Perpendicular to CMU Wall Edge[9] (pounds)	Allowable Shear Load Applied Parallel to CMU Wall Edge (pounds)[10]	
1/2	9/16	4 1/4	1 3/4	11	655	285	705	
5/8	11/16	5	1 3/4	11	815	325	755	
		12	1 3/4	11	1,120	405	815	
7/8	1	12	1 3/4	11	1,385	295	1,030	

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

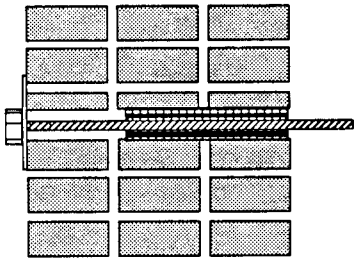
[1]Threaded rods must comply with ASTM A 307 minimum.
[2]The 6- and 8-inch-wide CMU must be Grade N, Type II, normal-weight concrete masonry units conforming to UBC Standard 21-4 or ASTM C 90. The masonry units must be fully grouted with grout complying with UBC Section 2103.4 or IBC Section 2103.10. Mortar must be Type M or S prepared in accordance with Section 2103.3 of the UBC and UBC Standard 21-15, or IBC Section 2103.7. The specified compressive strength of masonry, f'_m, at 28 days must be a minimum of 1,500 psi.
[3]Embedment depth is measured from the outside face of the concrete masonry unit for installations through a face shell.
[4]Anchors are not permitted to be used to resist seismic forces. Allowable loads are not permitted to be increased for short-term loads due to wind forces.
[5]Allowable tension loads must be reduced for the effects of elevated temperatures as shown in Figure 3.
[6]Allowable loads are based on a safety factor of 5.0. The tabulated allowable loads are permitted to be increased 25 percent for installations under the UBC.
[7]Anchors must be spaced a minimum distance of four times the anchor tabulated minimum embedment depth.
[8]A dash, — , indicates that testing was not performed.
[9]Shear load applied perpendicular to edge of CMU Wall.
[10]Shear load applied parallel to edge of CMU Wall.

**FIGURE 1A—ACRYLIC-TIE
(FOR USE WITH DISPENSING TOOL SUPPLIED BY
SIMPSON STRONG-TIE COMPANY)**

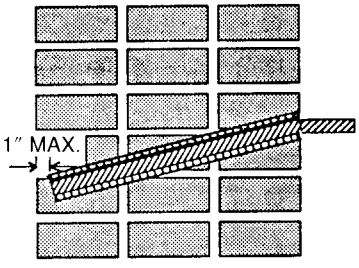
**FIGURE 1B—ACRYLIC-TIE FAST-PAC
(FOR USE WITH A GENERIC STANDARD CAULKING GUN)**



CONFIGURATION A



CONFIGURATION C



CONFIGURATION B

For **SI:** 1 inch = 25.4 mm.

FIGURE 2—INSTALLATION CONFIGURATIONS

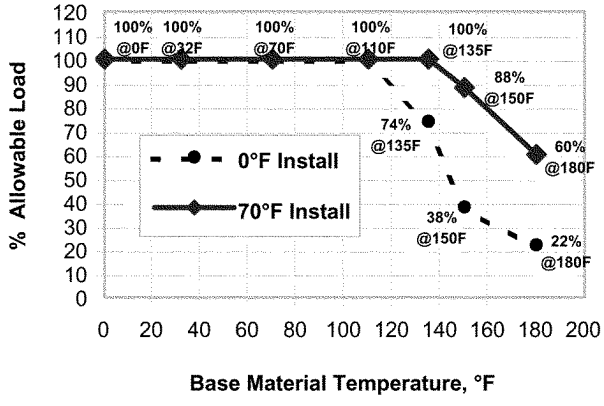


FIGURE 3—LOAD CAPACITY BASED ON IN-SERVICE TEMPERATURE

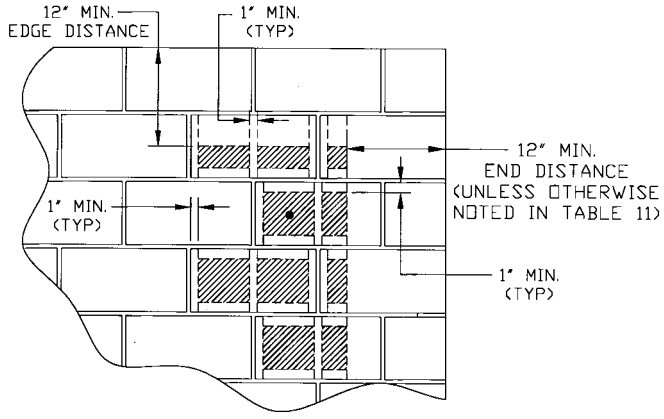


FIGURE 4—ANCHOR INSTALLED IN THE FACE SHELL (ALLOWABLE INSTALLATION LOCATION SHOWN BY SHADED AREA) (SHEAR LOAD MAY BE APPLIED IN ANY DIRECTION)

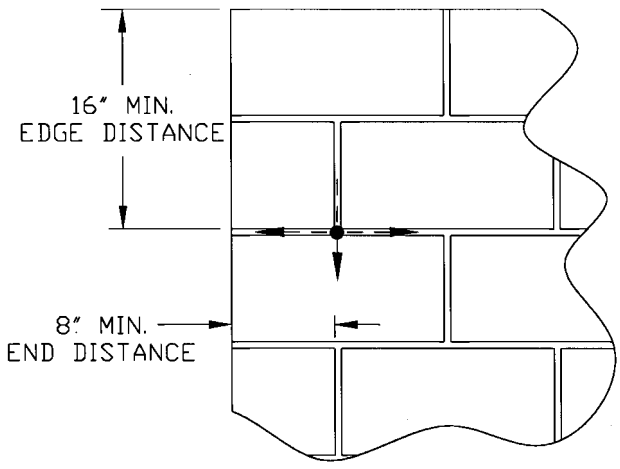


FIGURE 5—ANCHOR INSTALLED AT THE INTERSECTION OF A HEAD JOINT AND BED JOINT (ALLOWABLE SHEAR LOAD DIRECTION SHOWN BY ARROWS)

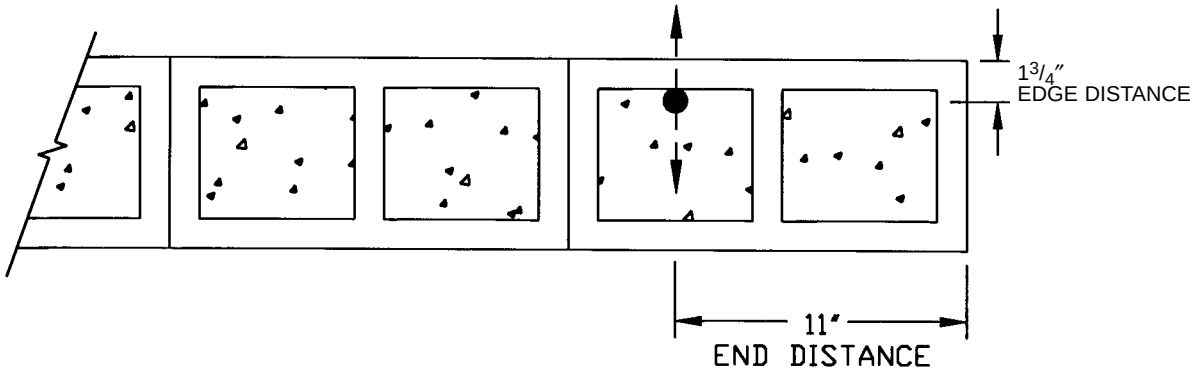


FIGURE 6—ANCHOR INSTALLED IN CELL OPENING (ALLOWABLE SHEAR LOAD DIRECTION SHOWN BY ARROWS)

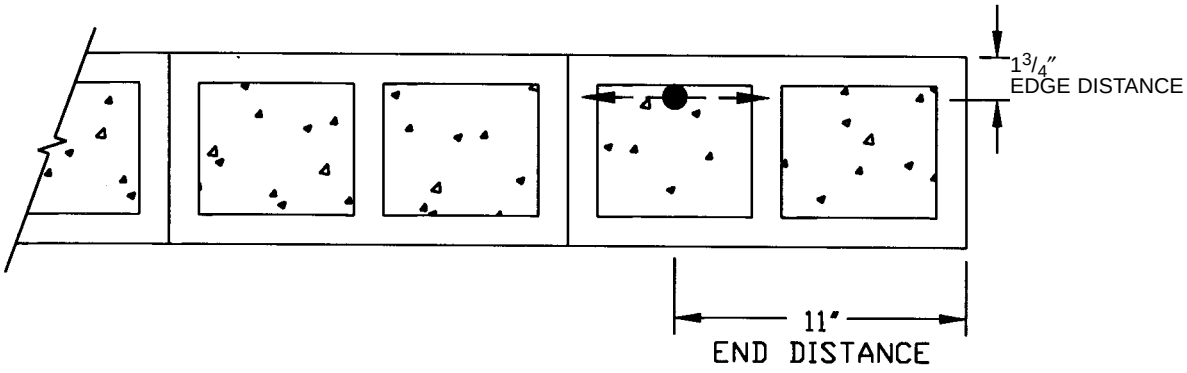


FIGURE 7—ANCHOR INSTALLED IN CELL OPENING (ALLOWABLE SHEAR LOAD DIRECTION SHOWN BY ARROWS)

NSF International

OFFICIAL LISTING

NSF International Certifies that the products appearing on this Listing conform to the requirements of NSF/ANSI Standard 61 - Drinking Water System Components - Health Effects

This is the Official Listing recorded on April 28, 2003.

SIMPSON STRONG-TIE COMPANY
4120 DUBLIN BOULEVARD
SUITE 400
DUBLIN, CA 94568
800-999-5099

Plant At: ADDISON, IL

Joining and Sealing Materials

Trade Designation	Size	Water Contact Temp	Water Contact Material
Adhesives			
Acrylic - Tie	[1]	CLD 30	JSM
ETI-LV Injection Epoxy	[3]	CLD 23	EPOXY
ETILV	[3]	CLD 23	EPOXY
ETILV22	[3]	CLD 23	EPOXY
SET High Strength Epoxy	[2]	CLD 23	EPOXY
SET-PAC	[2]	CLD 23	EPOXY
SET22	[2]	CLD 23	EPOXY
SET56	[2]	CLD 23	EPOXY

[1] Certified for a maximum of 0.00053 sq. in./L as an anchoring compound for threaded rods or steel bars.

[2] This product is certified as an adhesive and a sealant for a surface area to volume ratio of 193 square inches per 1000 gallons.

[3] Certified for a maximum surface area to volume ratio of: 2 sq. in. per 100 gallon tank.

789 N. Dixboro Road, Ann Arbor, Michigan 48105-9723 USA
1-800-NSF-MARK 734-769-8010
www.nsf.org

I. PRODUCT AND COMPANY IDENTIFICATION

Company: Simpson Strong-Tie Company, Inc.
Address: 4120 Dublin Blvd, Suite 400
Dublin, CA 94568
Product Name: **AT Resin** - ATPAC05, ATPAC05KT, AT08, AT13, AT30, BONDMAX10 AT050R

Product Description: Acrylic-Tie Adhesive - Resin

Emergency Contact No.: 1-800-535-5053 **USA**
1-352-323-3500 **International**

Date Prepared or Revised: January 2006

II. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Names	CAS Numbers
Methyl Methacrylate	80-62-6
Silica, amorphous (fumed)	67762-90-7
Crystalline Silica	14808-60-7

The remaining ingredients are designated as "trade secret".

III. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW

Non-corrosive.
Flammable.
May be irritating to the eyes and skin.
May cause skin sensitization

POTENTIAL HEALTH EFFECTS

ACUTE

Eye Contact: May cause eye irritation, swelling, tearing, redness or cornea damage.
Skin Contact: Moderate irritation. May cause skin sensitization, evidenced by rashes and hives.
Inhalation: Moderate irritation to the nose and respiratory tract. May cause Central Nervous System depression, evidenced by headache, dizziness, and nausea.
Ingestion: May cause irritation to the gastrointestinal tract. May cause Central Nervous System depression or other systemic effects.
Systemic Effects: Lungs, eyes, and skin.

IV. FIRST AID MEASURES

Eye Contact: Immediately flush eyes with plenty of cool water for at least 15 minutes while holding the eyes open. If redness, burning, blurred vision, or swelling persist, **CONSULT A PHYSICIAN**.
Skin Contact: Remove product and immediately wash affected area with soap and water. Do not apply greases or ointments. Remove contaminated clothing. Wash clothing with soap and water before reuse. If redness, burning, or swelling persist, **CONSULT A PHYSICIAN**.
Ingestion: **DO NOT INDUCE VOMITING**. Never administer anything by mouth to an unconscious person. Rinse out mouth with water, then drink sips of water to remove taste from mouth. **CONSULT A PHYSICIAN** if vomiting occurs spontaneously, keep head below hips to prevent aspiration.
Inhalation: Remove patient to fresh air. If patient continues to experience difficulty breathing, **CONSULT A PHYSICIAN**.

V. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media: Water fog, carbon dioxide or dry chemical, aqueous foam.
Fire And Explosion Hazard: Hazardous gases/vapors produced are methyl methacrylate, carbon monoxide, carbon dioxide, and smoke. Toxic and flammable vapors may be produced under combustion. Sealed containers exposed to elevated temperatures may rupture explosively due to polymerization. Vapors are heavier than air and may travel to ignition sources and flash back. Do not allow run-off from fire fighting to enter drains or water courses.

V. FIRE-FIGHTING MEASURES (CONT.)

Fire Fighting Equipment and Procedures: Wear full protective clothing and self-contained breathing apparatus for fire fighting. Isolate fuel supply from fire. Clear fire area of all non-emergency personnel. Use water spray to cool fire-exposed surfaces and containers.

VI. ACCIDENTAL RELEASE MEASURES

Personal Precautions: Use self-contained breathing apparatus and chemical protective clothing. Evacuate personnel to safe areas.

Environmental Precautions: Construct a dike to prevent spreading. Keep out of sewers, storm drains, surface waters, and soils.

Clean-up Methods: **Small spills**: Soak up with absorbent material such as clay, sand or other suitable non-reactive material. Place in leak-proof containers. Seal tightly for proper disposal. **Large spills**: Approach suspected leak areas with caution. Create a dike or trench to contain material. Soak up with absorbent material such as clay, sand or other suitable non-reactive material. Place in leak-proof containers. Seal tightly for proper disposal.

Additional Information: Notify authority if any exposures to the general public or environment occurs or is likely to occur. Dispose of in accordance with federal, state, and local regulations.

VII. STORAGE AND HANDLING

Storage: Keep away from: acids, oxidizers, heat, or flames. Keep in cool, dry, well-ventilated area in closed containers. Protect containers from physical damage.

Handling: To prevent skin and eyes contact under the foreseeable conditions of use, wear appropriate protective clothing and safety eyewear. When handling, do not eat, drink, or smoke. Wash thoroughly after handling. Avoid breathing fumes. Handle in a well-ventilated work area.

VIII. EXPOSURE CONTROLS / PERSONAL PROTECTION

Protective Measure: Wear appropriate personal protective equipment.

Eye Protection: Avoid contact with eyes. Wear chemical-resistant safety glasses.

Hand Protection: Wear chemical-resistant gloves such as: Nitrile, neoprene, butyl.

Skin and Body Protection: Wear chemical-resistant gloves and other clothing as required to minimizing contact.

Respirator Protection: Not required for properly ventilated areas.

Exposure Limits:

Chemical Names	ACGIH (TLV)	OSHA (PEL)
Methyl Methacrylate	50 ppm	100 ppm
Silica, amorphous (fumed)	2 mg/m^3*	20 mg/m^3**
Crystalline Silica	0.05mg/m^3 ***	0.2mg/m^3 ***

*ACGIH (TLV) for amorphous silica, fume, respirable fraction

**OSHA PEL for amorphous silica, total fraction is $\frac{80\ mg/m^3}{\%SiO_2}$

***OSHA PEL for crystalline silica, quartz, respirable is $\frac{10\ mg/m^3}{\%SiO_2+2}$

IX. PHYSICAL AND CHEMICAL PROPERTIES

Form: Paste

Color: White

Odor: Strong acrid odor

Vapor Pressure: N/E

Boiling Point, °F: N/E

Freezing Point: N/E

Flash Point: 73°F (23°C) Closed Cup

Specific Gravity: N/E

pH: 6.7

Solubility In Water: N/E

X. REACTIVITY DATA

Stability: Unstable with heat.
Conditions To Avoid: Incompatible chemicals, heat and open flame.
Materials To Avoid: Oxidizing and reducing agents
Hazardous Decomposition Products: Decomposes with heat. Combustion may produce carbon monoxide, carbon dioxide, aldehydes and smoke.
Hazardous Polymerization: Polymerization can occur when exposed to excessive heat.

XI. TOXICOLOGICAL PROPERTIES

Acute Oral (LD_{50}, Rat): Non toxic
Acute Dermal (LD_{50}, Rabbit): N/E
Acute Inhalation (LC_{50}, Rat): N/E

Chronic Health Hazard Prolonged and/or repeated exposure to methyl methacrylate may lead to kidney, lung, liver, and heart damage. Respirable crystalline silica (quartz) can cause silicosis (scarring) of the lungs. Exposure to silica dust is not likely from normal use of product.

XII. DISPOSAL CONSIDERATIONS

Waste From Residues / Unused Products: This material is a hazardous waste by RCRA criteria (40 CFR 261). Dispose of container and unused contents in accordance with federal, state, and local requirements.

XIII. TRANSPORTATION

US DOT (CFR): Resin Solution, 3, UN1866, PG III.
IATA: Resin Solution, 3, UN1866, PG III, Pkg Inst. 309.
IMDG: Resin Solution, 3, UN1866, PG III, (23°C).

IVX. REGULATORY INFORMATION

Country	Regulatory List
USA	TSCA

EPA SARA Title III Section 312 (40 CFR 370) Hazardous Classification:
Acute/Chronic Health Hazard.
EPA SARA Title III Section 313 (40 CFR 372) Component(s) above 'de minimus' level:
Methyl Methacrylate.
US. California "Safe Drinking Water and Toxic Enforcement Act" (Proposition 65):
This product contains small trace of the following chemicals that are known to the State of California to cause cancer and/or reproductive toxicity and other harm.

Component	Regulation	% In Blend (approx.)	Remarks
Silica Quartz	ACGIH	43	Carcinogenic

XV. OTHER INFORMATION

HMIS RATING

Health	Flammability	Physical Hazard
2	3	0

N/E – Not Established

This Material Safety Data Sheet (MSDS) is prepared by Simpson Strong-Tie Co. in compliance with the requirements of OSHA 29 CFR Part 1910.1200. The information it contains is offered in good faith as accurate as of the date of this MSDS. This MSDS is provided solely for the purpose of conveying health, safety, and environmental information. No warranty, expressed or implied, is given. Health and Safety precautions may not be adequate for all individuals and/or situations. It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations.

I. PRODUCT AND COMPANY IDENTIFICATION

Company: Simpson Strong-Tie Company, Inc.
Address: 4120 Dublin Blvd, Suite 400
Dublin, CA 94568
Product Name: **Initiator -** ATPAC05, ATPAC05KT, AT08, AT13, AT30, BONDMAX10
AT005I

Product Description: Acrylic-Tie Adhesive - Initiator

Emergency Contact No.: 1-800-535-5053 **USA**
1-352-323-3500 **International**

Date Prepared or Revised: January 2006

II. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Names	CAS Numbers
Dibenzoyl peroxide	94-36-0
Diisobutyl phthalate	84-69-5
Silica, amorphous (fumed)	67762-90-7
Crystalline Silica	14808-60-7

The remaining ingredients are designated as "trade secret".

III. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW

Non corrosive.
Moderate irritation to eyes and skin.
May cause skin sensitization.

POTENTIAL HEALTH EFFECTS

ACUTE

Eye Contact: May cause eye irritation, swelling, tearing, redness or cornea damage.
Skin Contact: Moderate irritation. May cause skin sensitization, evidenced by rashes and hives.
Inhalation: Moderate irritation to the nose and respiratory tract. May cause Central Nervous System depression, evidenced by headache, dizziness, and nausea.
Ingestion: May cause irritation to the gastrointestinal tract. May cause Central Nervous System depression or other systemic effects.
Systemic Effects: Lungs, eyes, and skin.

IV. FIRST AID MEASURES

Eye Contact: Immediately flush eyes with plenty of cool water for at least 15 minutes while holding the eyes open. If redness, burning, blurred vision, or swelling persist, **CONSULT A PHYSICIAN**.
Skin Contact: Remove product and immediately wash affected area with soap and water. Do not apply greases or ointments. Remove contaminated clothing. Wash clothing with soap and water before reuse. If redness, burning, or swelling persist, **CONSULT A PHYSICIAN**.
Ingestion: **DO NOT INDUCE VOMITING**. Never administer anything by mouth to an unconscious person. Rinse out mouth with water, then drink sips of water to remove taste from mouth. **CONSULT A PHYSICIAN** if vomiting occurs spontaneously, keep head below hips to prevent aspiration.
Inhalation: Remove patient to fresh air. If patient continues to experience difficulty breathing, **CONSULT A PHYSICIAN**.

V. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media: Carbon dioxide, dry chemical, alcohol-resistant foam, dry sand, limestone powder.
Fire And Explosion Hazard: Irritating and toxic fumes may be produced at high temperature. In a fire, may produce carbon monoxide**,** carbon dioxide, byphenyl, and smoke. Do not allow run-off from fire fighting to enter drains or water courses.

V. FIRE-FIGHTING MEASURES (CONT.)

Fire Fighting Equipment and Procedures: Wear full protective clothing and self-contained breathing apparatus for fire fighting. Isolate fuel supply from fire. Clear fire area of all non-emergency personnel. Use water spray to cool fire-exposed surfaces and containers.

VI. ACCIDENTAL RELEASE MEASURES

Personal Precautions: Use self-contained breathing apparatus and chemical protective clothing. Evacuate personnel to safe areas.

Environmental Precautions: Construct a dike to prevent spreading. Keep out of sewers, storm drains, surface waters, and soils.

Clean-up Methods: **Small spills**: Soak up with absorbent material such as clay, sand or other suitable non-reactive material. Place in leak-proof containers. Seal tightly for proper disposal. **Large spills**: Approach suspected leak areas with caution. Create a dike or trench to contain material. Soak up with absorbent material such as clay, sand or other suitable non-reactive material. Place in leak-proof containers. Seal tightly for proper disposal.

Additional Information: Notify authority if any exposures to the general public or environment occurs or is likely to occur. Dispose of in accordance with federal, state, and local regulations.

VII. STORAGE AND HANDLING

Storage: Keep away from: acids, oxidizers, heat, or flames. Keep in cool, dry, well-ventilated area in closed containers. Protect containers from physical damage.

Handling: To prevent skin and eyes contact under the foreseeable conditions of use, wear appropriate protective clothing and safety eyewear. When handling, do not eat, drink, or smoke. Wash thoroughly after handling. Avoid breathing fumes. Handle in a well ventilated work area.

VIII. EXPOSURE CONTROLS / PERSONAL PROTECTION

Protective Measure: Wear appropriate personal protective equipment.

Eye Protection: Avoid contact with eyes. Wear chemical-resistant safety glasses.

Hand Protection: Wear chemical-resistant gloves such as: Nitrile, neoprene, butyl.

Skin and Body Protection: Wear chemical-resistant gloves and other clothing as required to minimizing contact.

Respirator Protection: Not required for properly ventilated areas.

Exposure Limits:

Chemical Names	ACGIH (TLV)	OSHA (PEL)
Dibenzoyl peroxide	3 mg/m^3	100 ppm
Diisobutyl phthalate	N/E	N/E
Silica, amorphous (fumed)	2 mg/m^3*	32 mg/m^3**
Crystalline Silica	0.05mg/m^3 ***	0.2mg/m^3 ***

*ACGIH TLV for amorphous silica, fume, respirable fraction.

**OSHA PEL for amorphous silica, total fraction is $\frac{80\ mg/m^3}{\%SiO_2}$

***OSHA PEL for crystalline silica, quartz, respirable is $\frac{10\ mg/m^3}{\%SiO_2+2}$

IX. PHYSICAL PROPERTIES

Form: Paste

Color: Black

Odor: No significant odor

Boiling Point: N/E

Freezing Point: N/E

Vapor Pressure: N/E

Flash Point: 203ºF (95°C) Close cup

Specific Gravity: N/E

pH: 5.8

Solubility In Water: N/E

X. REACTIVITY DATA

Stability: According to the manufacturer, this material is stable at temperature up to 113˚F (45˚C).
Conditions To Avoid: Incompatible chemicals and temperature above 113˚F (45˚C).
Materials To Avoid: Strong oxidizing agents, acids, and bases. Metal salt, reducing agents, and accelerators.
Hazardous Decomposition Products: Combustion may produce carbon monoxide, carbon dioxide, byphenyl, and smoke. Other organic substances and flammable vapors may be produced.
Hazardous Polymerization: Will not occur under normal temperature and pressure.

XI. TOXICOLOGICAL PROPERTIES

Acute Oral (LD_{50}, Rat): N/E
Acute Dermal (LD_{50}, Rabbit): N/E
Acute Inhalation (LC_{50}, Rat): N/E
Chronic Health Hazard Systemic toxicity in humans has not been reported. Respirable crystalline silica (quartz) can cause silicosis (scarring) of the lungs. Exposure to silica dust is not likely from normal use of product. Components of this product are listed as carcinogens concentrations of 0.1% or greater. Repeated or prolonged exposure may cause allergic reaction and/or limited sensitization.

XII. DISPOSAL CONSIDERATIONS

Waste From Residues / Unused Products: This material is a hazardous waste by RCRA criteria (40 CFR 261). Dispose of container and unused contents in accordance with federal, state, and local requirements.

XIII. TRANSPORTATION

US DOT(CFR): Organic peroxide type E, liquid (Dibenzoyl Peroxide), 22%, 5.2, UN3107.
IATA: Organic peroxide type E, liquid (Dibenzoyl Peroxide), 22%, 5.2, UN3107, Pkg Inst. 500.
IMO: Organic peroxide type E, liquid (Dibenzoyl Peroxide), 22%, 5.2, UN3107.

XIV. REGULATORY INFORMATION

Country	Regulatory List
USA	TSCA

EPA SARA Title III Section 312 (40 CFR 370) Hazardous Classification:
Acute/Chronic Health Hazard.
EPA SARA Title III Section 313 (40 CFR 372) Component(s) above 'de minimus' level:
Dibenzoyl peroxide.
US. California "Safe Drinking Water and Toxic Enforcement Act" (Proposition 65):
This product contains small trace of the following chemicals that are known to the State of California to cause cancer and/or reproductive toxicity and other harm.

Component	Regulation	% In Blend (approx.)	Remarks
Carbon Black	ACGIH	0.07	Carcinogenic
Silica Quartz	ACGIH	41	Carcinogenic

XV. OTHER INFORMATION

HMIS RATING

Health	Flammability	Physical Hazard
2	1	0

N/E – Not Established

This Material Safety Data Sheet (MSDS) is prepared by Simpson Strong-Tie Co. in compliance with the requirements of OSHA 29 CFR Part 1910.1200. The information it contains is offered in good faith as accurate as of the date of this MSDS. This MSDS is provided solely for the purpose of conveying health, safety, and environmental information. No warranty, expressed or implied, is given. Health and Safety precautions may not be adequate for all individuals and/or situations. It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations.

