



### EVALUATION SUBJECT: AT-XP® ADHESIVE ANCHORS FOR MASONRY

#### REPORT HOLDER:

Simpson Strong-Tie Company Inc.  
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CSI Division: 04 00 00—MASONRY

CSI Section: 04 05 19.16—Masonry Anchors

### 1.0 SCOPE OF EVALUATION

#### 1.1 Compliance to the following codes & regulations:

- 2015, 2012, 2009, 2006 and 2003 International Building Code® (IBC)
- 2015, 2012, 2009, 2006 and 2003 International Residential Code® (IRC)
- 2015, 2012 and 2009 International Existing Building Code® (IEBC)
- 2015 and 2012 Uniform Plumbing Code® (UPC)
- 2015 and 2012 International Plumbing Code® (IPC)

#### 1.2 Evaluated in accordance with:

- ICC-ES Acceptance Criteria for Adhesive Anchors in Masonry Elements (AC58), Approved November 2015

#### 1.3 Properties assessed:

- Structural
- Compliance with NSF/ANSI Standard 61

### 2.0 PRODUCT USE

Simpson Strong-Tie® AT-XP® adhesive anchors are used for anchoring building components to fully-grouted concrete masonry. Threaded steel rods or deformed steel reinforcing bars installed with AT-XP adhesive resist dead, live, earthquake, and wind loads, as noted in Section 4.0 of this evaluation report. Post-installed anchors are alternatives to anchor bolts specified in Section 2107 of the IBC and Chapters 6 and 8 of 2013 [TMS 402/ACI 530/ASCE 5](#) and Chapters 1 and 2 of 2011, 2008, 2005 and 2002 [TMS 402/ACI 530/ASCE 5](#), as applicable.

Anchors may also be used where an engineered design is submitted in accordance with Section [R301.1.3](#) of the IRC. AT-XP adhesives are certified to [NSF/ANSI Standard 61](#), as referenced in Section [604](#) of the 2015 and 2012 UPC and Section [605](#) of the 2015 and 2012 IPC for products used in water distribution systems.

### 3.0 PRODUCT DESCRIPTION

**3.1 Product information:** AT-XP® Adhesive Anchor System is comprised of the following components:

- AT-XP adhesive packaged in cartridges
  - Adhesive mixing and dispensing equipment
  - Equipment for hole cleaning and adhesive injection
- AT-XP adhesive is used with either continuously threaded steel rods or deformed steel reinforcing bars. Installation information and parameters are included with each adhesive unit package.

#### 3.2 Material information

**3.2.1 AT-XP® Adhesive:** AT-XP adhesive is an injectable, two component, acrylic-based adhesive that is mixed in a 10 to 1 ratio of resin to initiator by volume. These two components combine and react when dispensed through a static mixing nozzle attached to the cartridge. Shelf life of AT-XP in unopened cartridges is nine months from the date of manufacture when stored at temperatures between 32°F and 80°F (0°C and 27°C). AT-XP is available in 9.4 ounce (280 mL), 12.5 ounce (370 mL) and 30 ounce (885 mL) cartridges.

**3.2.2 Dispensing Equipment:** AT-XP adhesive shall be dispensed using Simpson Strong-Tie® manual dispensing tools, battery-powered dispensing tools or pneumatic dispensing tools.

**3.2.3 Equipment for Hole Preparation:** Hole cleaning equipment consists of hole-cleaning brushes and air nozzles. Brushes shall be Simpson Strong-Tie hole cleaning brushes, identified by Simpson Strong-Tie catalog number series ETB. Air nozzles shall be equipped with an extension capable of reaching the bottom of the drilled hole.

#### 3.2.4 Anchor Materials

**3.2.4.1 Threaded Steel Rods:** Threaded anchor rods, having diameters from 3/8 inch to 3/4 inch (9.5 mm to 19.1 mm), shall be carbon steel conforming to [ASTM F1554](#), Grade 36, or [ASTM A193](#), Grade B7; or stainless steel conforming to ASTM A193, Grade B6, B8, or B8M. Threaded rods shall be clean, straight and free of indentations or other defects along their lengths.

**3.2.4.2 Deformed Reinforcing Bar (Rebar):** Deformed steel rebar, in sizes No. 3 to No. 5, shall conform to [ASTM A615](#) Grade 40 minimum. Embedded portions of reinforcing bars shall be straight, and free of mill scale, rust, mud, oil, and other coatings that may impair the bond with adhesive.

**3.2.5 Grout-filled Concrete Masonry:** Compressive strength of masonry,  $f'_m$ , at 28 days shall be a minimum of



1,500 psi (10.3 MPa). Fully grouted masonry walls shall be constructed from the following materials:

**3.2.5.1 Concrete Masonry Units (CMU):** CMU shall be closed-end minimum lightweight, medium-weight, or normal-weight concrete masonry conforming to [ASTM C90](#). Minimum allowable nominal size of CMU shall be 8 inches (203 mm) wide by 8 inches (203 mm) high by 16 inches (406 mm) long (i.e., 8x8x16) for threaded rod and rebar installed with AT-XP adhesive in the face of the masonry wall construction. [Tables 2](#) and [3](#) and [Figure 2](#) of this report provide more details.

**3.2.5.2 Grout:** Grout shall comply with IBC Section [2103](#) or IRC Section [R606](#) (2015 IRC) or [R609](#) (2012, 2009, 2006 and 2003 IRC), as applicable. Alternatively, the grout shall have a minimum compressive strength equal to its specified strength, but not less than 2,000 psi (13.8 MPa) when tested in accordance with [ASTM C1019](#).

**3.2.5.3 Mortar:** Mortar shall comply with IBC Section [2103](#) or IRC Section [R606](#) (2015 IRC) or [R607](#) (2012, 2009, 2006 or 2003 IRC), as applicable. Mortar shall have a minimum compressive strength of 1,500 psi (10.3 MPa).

## 4.0 DESIGN AND INSTALLATION

### 4.1 Design

**4.1.1 General:** Anchor capacities in this report are allowable load values for use in allowable stress design as set forth in Section 2107 of the IBC. For use under the IRC, an engineered design in accordance with IRC Section R301.1.3 shall be submitted to the code official for approval.

Allowable tension and shear loads noted in this report shall be adjusted for in-service base-material temperatures in accordance with [Figure 1](#) of this report for anchors installed and cured in base materials having a temperature of 14°F (-10°C) and above. Anchors installed or cured at temperatures below 14°F (-10°C) or above 110°F (43°C) are outside the scope of this report.

Allowable loads for anchors subjected to combined tension and shear forces shall be determined by the following equation:

$$\left(\frac{P_s}{P_t}\right) + \left(\frac{V_s}{V_t}\right) \leq 1.0$$

where:

- $P_s$  = Applied tension load.
- $P_t$  = Allowable tension load.
- $V_s$  = Applied shear load.
- $V_t$  = Allowable shear load.

### 4.1.2 Design of Anchors in Grout-filled CMU Walls

**4.1.2.1 General:** For installations in fully grouted concrete masonry construction, anchors are permitted to resist dead, live, wind, and earthquake load applications. When using the basic load combinations in accordance with IBC Section [1605.3.1](#), allowable loads are not permitted to be increased for earthquake or wind loading. When using the alternative basic load combinations in 2003, 2006 and 2009 IBC Section [1605.3.2](#) that include earthquake or wind loads, the allowable tension and shear loads for anchors are permitted to be increased by 33-1/3 percent, or the alternative basic load combinations may be reduced by a factor of 0.75. When using the alternative basic load combinations in 2015 and 2012 IBC Section [1605.3.2](#) that include earthquake or wind loads, no adjustments are permitted.

**4.1.2.2 Threaded Steel Rod Installed in the Vertical Face of Fully Grouted CMU Walls (Resisting Dead, Live, Wind, and Earthquake Load Applications):** [Tables 3](#) and [4](#) specify allowable tension and shear values for 3/8-, 1/2-, 5/8-, and 3/4-inch-diameter (9.5, 12.7, 15.9 and 19.1 mm) threaded rod installed in the face of the fully grouted CMU masonry wall construction (face shell, web and bed joint, see [Figure 2](#)), for anchors designed to resist dead, live, wind, and earthquake load applications. Edge and end distances, spacing requirements and allowable load reduction factors are noted in [Table 2](#) of this report. The allowable load shall be the lesser of bond values given in [Table 3](#) and steel rod values given in [Table 4](#) of this report.

**4.1.2.3 Deformed Steel Rebar Installed in the Vertical Face of Fully Grouted CMU Walls (Resisting Dead, Live, Wind, and Earthquake Load Applications):** [Tables 3](#) and [5](#) of this report specify allowable tension and shear values for No. 3, No. 4 and No. 5 deformed steel rebar installed in the face of the fully grouted CMU masonry wall construction (face shell, web and bed joint locations are shown in [Figure 2](#) of this report), for anchors designed to resist dead, live, wind, and earthquake load applications. Edge and end distances, spacing requirements and allowable load reduction factors are noted in [Table 2](#) of this report. Allowable load shall be the lesser of bond values given in [Table 3](#) of this report and steel rebar values given in [Table 5](#) of this report.

### 4.2 Installation

**4.2.1 General:** Anchors shall be installed in accordance with the manufacturer's published installation instructions and the requirements of this report. Where conflicts between this report and the published instructions occur, the more restrictive shall prevail. Anchors shall not be installed until the base material has reached its minimum specified compressive strength set forth in Section 3.2.5 of this report. Hole diameter, embedment depth, spacing, edge distance and base material shall comply with the requirements in this report. Anchor locations shall comply with approved construction documents.



Anchors installed or cured in masonry at temperatures below 14°F (-10°C) or above 110°F (43°C) are outside the scope of this report. Manufacturer's recommended gel and cure times are shown in [Table 1](#) of this report. After installation into the hole, the anchor shall be undisturbed during the gel time and shall be allowed to fully cure before building components are attached.

#### 4.2.2 Installation in Grout-filled Concrete Masonry:

Anchor holes shall be drilled into the concrete masonry to a predetermined depth, using an electro-pneumatic rotary hammer drill, in either a rotation-and-hammering or rotation-only mode, having a carbide-tipped drill bit conforming to [ANSI B212.15-1994](#). Anchor holes shall be cleaned of dust and debris using oil-free compressed air and a nylon brush. During installation, the holes shall be dry.

A clean, static-mixing nozzle shall be attached to the AT-XP® adhesive cartridge. Prior to injection of the adhesive into the anchor hole, an initial amount of adhesive shall be dispensed through the nozzle until the two adhesive components are uniformly blended. An initial amount of adhesive shall be discarded. Adhesive shall be injected into the hole, starting at the bottom, until the hole is approximately one-half full. Anchor rods or bars, which shall be free of oil, scale, and rust, shall be inserted into the hole with a slow twisting motion to the required embedment depth. As a minimum, the adhesive shall be flush with the concrete masonry surface after insertion of the anchor.

For installations of anchors in the face of the fully grouted masonry wall construction (face shell, web and bed joint), anchor location shall comply with the critical and minimum edge and end distances and the critical and minimum spacing noted in [Table 2](#) of this report and shown in [Figure 2](#) of this report.

Threaded rods and reinforcing bars shall not be bent after installation except as set forth in Section 26.6.3.1 of [ACI 318-14](#) and Section 7.3.2 of [ACI 318-11](#), [-08](#), [-05](#) and [-02](#), with the additional condition that the rods and bars shall be bent cold, and heating of threaded rods and reinforcing bars to facilitate field bending is not permitted.

#### 4.3 Special Inspection

**4.3.1 IBC and IRC:** For the IBC and IRC, adhesive anchors shall be installed with special inspection in accordance with Sections [1704](#) and [1705](#) of the IBC. A statement of special inspections complying with Section [1704.3](#) of the 2015 or 2012 IBC or Section [1705](#) of the 2003, 2006 and 2009 IBC shall be prepared and submitted. An approved special inspector shall furnish the building official and the registered design professional in responsible charge with an inspection report that includes the following:

1. Anchor description, including the adhesive product name and expiration date, anchor steel type, grade, and cleanliness condition, nominal anchor diameter and length.

2. Drilled hole description, including verification of drill bit compliance with ANSI B212.15-1994, hole diameter, location, depth and cleanliness.

3. Installation description including verification of masonry compressive strength, verification of anchor installation location (spacing and edge distance), installation temperature, gel time and cure time, and general installation requirements in accordance with the manufacturer's published installation instructions and this report.

**4.3.2 IEBC:** Adhesive anchors shall be installed with periodic inspection, and direct-tension tests and torque tests shall be done in accordance with Sections [A107.4](#) and [A107.5](#) (2015 IEBC) or Section [A107.4](#) (2012, 2009, 2006 and 2003 IEBC), as applicable. A statement of special inspections complying with Section 1704.3 of the IBC indicating the schedule for the periodic inspections shall be prepared and submitted. The inspection report shall contain the information specified in Section 4.3.1 of this report. In lieu of testing and periodic special inspection, the IEBC permits continuous special inspection during installation of bolts resisting shear forces only.

**4.4 Compliance with NSF/ANSI Standard 61:** AT-XP® Adhesive Anchor Systems comply with the requirements of [NSF/ANSI Standard 61](#), as referenced in Section 604 of the 2015 and 2012 UPC and Section [605](#) of the [2015](#) and [2012](#) IPC for products used in water distribution systems. AT-XP Adhesive Anchor Systems may have a maximum exposed surface area to volume ratio of 43.2 square inches per 1,000 gallons (0.028 square meters per 3,785 liters) of potable water and/or drinking water treatment chemicals. Compliance with NSF/ANSI 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.

#### 5.0 LIMITATIONS

Simpson Strong-Tie AT-XP® Adhesive Anchor System described in this report is a suitable alternative to what is specified in the codes listed in Section 1.0 of this report, subject to the following conditions:

**5.1** AT-XP adhesive anchors shall be installed in accordance with the manufacturer's published installation instructions and this report. Where conflicts between this report and the published instructions occur, the more restrictive shall prevail.

**5.2** AT-XP adhesive anchors are recognized for use to resist short-term and long-term loads, including wind and earthquake loads in accordance with Section 4.1.2 of this report.

**5.3** Anchors shall be installed in fully-grouted concrete masonry in holes predrilled with carbide-tipped drill bits complying with ANSI B212.15-1994.



**5.4** Special inspection in accordance with Section 4.3 of this report shall be provided for all anchor installations.

**5.5** Prior to installation, calculations and details demonstrating compliance with this report shall be submitted to the building official. Calculations and details shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

**5.6** Since an IAPMO Evaluation 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 outside the scope of this report.

**5.7** AT-XP adhesive anchors may be used to resist tension and shear forces in wall installations only if consideration is given to the effects of elevated temperature conditions on anchor performance. [Figure 1](#) of this report describes load reduction factors for elevated temperatures.

**5.8** Anchors are not permitted to support fire-resistive construction. Where not otherwise prohibited in the code, AT-XP adhesive anchors are permitted for installation in fire-resistive construction provided at least one of the following conditions is fulfilled:

- Anchors are used to resist wind or earthquake forces only.
- Anchors that support gravity load-bearing structural elements are within a fire-resistive envelope or a fire resistive membrane, are protected by approved fire-resistive materials, or have been evaluated for resistance to fire exposure in accordance with recognized standards.
- Anchors are used to support nonstructural elements.

**5.9** Use of zinc-plated carbon steel threaded rods or steel reinforcing bars is limited to interior locations. Installations exposed to severe, moderate or negligible exterior weathering conditions, as defined in [Figure 1](#) of [ASTM C62](#) (IBC or IRC), are permitted where stainless steel or zinc-coated anchors are used. Zinc coating shall be either hot-dipped in accordance with [ASTM A153](#) with a Class C or D coating weight or mechanically deposited in accordance with [ASTM B695](#) with a Class 65 coating having a minimum thickness of 2.1 mils (0.533 mm).

**5.10** Anchors installed in masonry shall be installed in dry holes.

**5.11** AT-XP adhesive anchors shall be installed in masonry having internal base material temperatures between 14°F (-10°C) and 110°F (43°C) at the time of anchor installation. Installation of anchors in base material having internal temperatures outside of this range is outside the scope of this report.

**5.12** Since an IAPMO Evaluation Criteria for evaluating the performance of adhesive anchors in cracked masonry is unavailable at this time, the use of the anchors is limited to installation in uncracked masonry. Cracking occurs when  $f_i > f_r$  due to service loads or deformations.

**5.13** When anchors are located where the internal masonry temperature may exceed 70°F (21°C) in service, allowable loads in this report shall be adjusted for in-service temperatures in accordance with [Figure 1](#) of this report. Use of AT-XP adhesive anchors in base materials having interior temperatures exceeding 150°F (65°C) in service is outside the scope of this report.

**5.14** Steel anchoring materials in contact with preservative-treated and fire-retardant-treated wood shall be zinc-coated steel or stainless steel. Coating weights for zinc-coated steel shall be in accordance with ASTM A153 Class C or D.

**5.15** AT-XP adhesive is manufactured and packaged into cartridges by Simpson Strong-Tie Company, Inc., in Addison, Illinois, with quality control inspections by CEL Consulting (AA-639).

## 6.0 SUBSTANTIATING DATA

**6.1** Data in accordance with the ICC-ES Acceptance Criteria for Adhesive Anchors in Masonry Elements (AC58), approved November 2015 including the following test series: 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 testing of anchors installed and cured at 50°F (Test Series 18); freeze/thaw (Test Series 20); and earthquake investigations in fully-grouted concrete masonry construction (Test Series 21).

**6.3** Data in accordance with NSF/ANSI Standard 61, Drinking Water System Components—Health Effects, for the AT-XP® adhesive.

**6.4** A quality control manual.

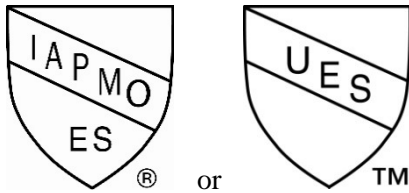


## 7.0 IDENTIFICATION

7.1 Simpson Strong-Tie AT-XP® Adhesive is identified in the field by labels on the cartridge or packaging, bearing the company name (Simpson Strong-Tie Company, Inc.), product name (AT-XP), the batch number, the expiration date, the name of the inspection agency (CEL Consulting) and the evaluation report number (ER-281).

7.2 Threaded rods, nuts, washers and deformed reinforcing bars are standard elements and shall be identified according to the applicable national or international specifications.

This evaluation report is subject to re-examination in one year.



**IAPMO ER #281**

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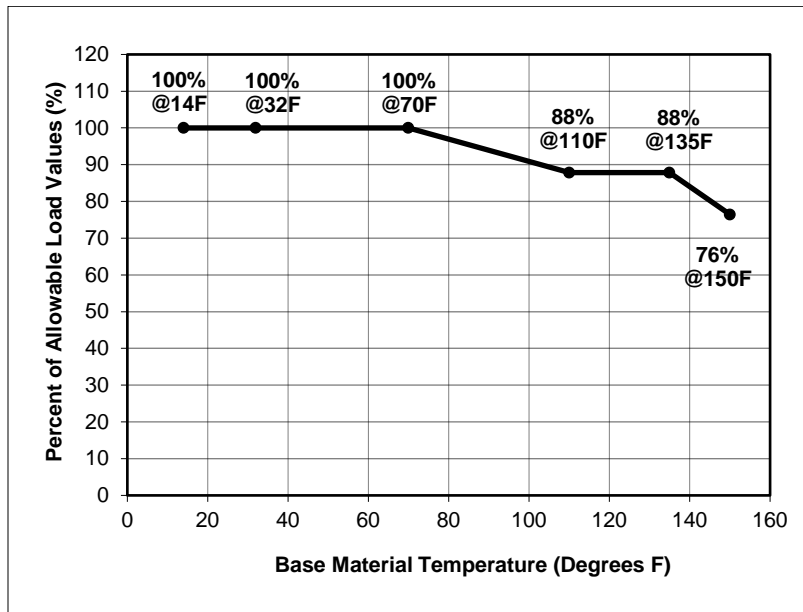


**TABLE 1—MANUFACTURER’S RECOMMENDED CURING TIMES FOR AT-XP® ADHESIVE**

Concrete Temperature		Gel Time (minutes)	Cure Time
(°F)	(°C)		
14	-10	30	24 hours
32	0	15	8 hours
50	10	7	3 hours
68	20	4	60 minutes
85	30	1.5	30 minutes
100	38	1.0	20 minutes

For SI: 1°C = 5/9 (t°F-32).

1. Anchors installed or cured, or both, at temperatures below 14°F (-10°C) or above 110°F (43°C) are outside the scope of this report.
2. Anchors shall be undisturbed during the gel time and shall be allowed to fully cure before attaching building components.



For SI: 1°C = 5/9 (t°F-32).

**FIGURE 1—LOAD CAPACITY BASED ON IN-SERVICE TEMPERATURE FOR AT-XP® ADHESIVE**



**TABLE 2—EDGE DISTANCE AND SPACING REQUIREMENTS AND ALLOWABLE LOAD REDUCTION FACTORS FOR THREADED ROD AND REBAR WITH AT-XP® ADHESIVE IN THE FACE OF FULLY GROUTED CMU WALL CONSTRUCTION<sup>7</sup>**

Rod Dia. (inch) or Rebar Size No.	Min. Embed. Depth (inches)	Edge or End Distance <sup>1,8</sup>						Spacing <sup>2,9</sup>				
		Critical (Full Anchor Capacity) <sup>3</sup>		Minimum (Reduced Anchor Capacity) <sup>4</sup>				Critical (Full Anchor Capacity) <sup>5</sup>		Minimum (Reduced Anchor Capacity) <sup>6</sup>		
		Critical Edge or End Distance, $c_{cr}$ (inches)	Allowable Load Reduction Factor	Minimum Edge or End Distance, $c_{min}$ (inches)	Allowable Load Reduction Factor			Critical Spacing, $s_{cr}$ (inches)	Allowable Load Reduction Factor	Minimum Spacing, $s_{min}$ (inches)	Allowable Load Reduction Factor	
		Load Direction		Load Direction				Load Direction		Load Direction		
		Tension or Shear	Tension or Shear	Tension or Shear	Tension	Shear <sup>10</sup>		Tension or Shear	Tension or Shear	Tension or Shear	Tension	Shear
				Perp.	Para.							
3/8	3-3/8	12	1.00	4	1.00	0.76	0.94	8	1.00	4	1.00	1.00
1/2	4-1/2	12	1.00	4	0.90	0.57	0.94	8	1.00	4	1.00	1.00
5/8	5-5/8	12	1.00	4	0.72	0.47	0.94	8	1.00	4	1.00	1.00
3/4	6-3/4	12	1.00	4	0.72	0.47	0.94	8	1.00	4	1.00	1.00
#3	3-3/8	12	1.00	4	1.00	0.62	0.95	8	1.00	4	1.00	1.00
#4	4-1/2	12	1.00	4	1.00	0.37	0.82	8	1.00	4	1.00	0.89
#5	5-5/8	12	1.00	4	1.00	0.37	0.82	8	1.00	4	1.00	0.89

For SI: 1 inch = 25.4 mm.

- Edge distance ( $c_{cr}$  or  $c_{min}$ ) is the distance measured from anchor centerline to edge or end of CMU masonry wall. [Figure 2](#) of this report illustrates critical and minimum edge and end distances.
- Anchor spacing ( $s_{cr}$  or  $s_{min}$ ) is the distance measured from centerline to centerline of two anchors.
- Critical edge distance,  $c_{cr}$ , is the least edge distance at which tabulated allowable load of an anchor is achieved where a load reduction factor equals 1.0 (no load reduction).
- Minimum edge distance,  $c_{min}$ , is the least edge distance where an anchor has an allowable load capacity, which shall be determined by multiplying the allowable loads assigned to anchors installed at critical edge distance,  $c_{cr}$ , in [Table 3](#) of this report by the load reduction factors shown above.
- Critical spacing,  $s_{cr}$ , is the least anchor spacing at which tabulated allowable load of an anchor is achieved such that anchor performance is not influenced by adjacent anchors.
- Minimum spacing,  $s_{min}$ , is the least spacing where an anchor has an allowable load capacity, which shall be determined by multiplying the allowable loads assigned to anchors installed at critical spacing distance,  $s_{cr}$ , in [Table 3](#) of this report by the load reduction factors shown in the table.
- Reduction factors are cumulative. Multiple reduction factors for more than one spacing or edge or end distance shall be calculated separately and multiplied.
- Load reduction factor for anchors loaded in tension or shear with edge distances between critical and minimum shall be obtained by linear interpolation.
- Load reduction factor for anchors loaded in tension with spacing between critical and minimum shall be obtained by linear interpolation.
- Perpendicular shear loads act towards the edge or end. Parallel shear loads act parallel to the edge or end (as shown in [Figure 3](#) of this report). Perpendicular and parallel shear load reduction factors are cumulative when the anchor is located between the critical and minimum edge and end distance.



**TABLE 3—ALLOWABLE TENSION AND SHEAR VALUES FOR THREADED ROD AND REBAR WITH AT-XP® ADHESIVE IN THE FACE OF FULLY GROUTED CMU WALL CONSTRUCTION<sup>1,3,4,5,6,8,9,10,11</sup>**

Diameter (inch) or Rebar Size No.	Drill Bit Diameter (inch)	Minimum Embedment <sup>2</sup> (inches)	Allowable Load based on Bond Strength <sup>7</sup> (pounds)	
			Tension	Shear
<b>Threaded Rod Installed in the Face of CMU Wall</b>				
3/8	1/2	3-3/8	1,265	1,135
1/2	5/8	4-1/2	1,910	1,660
5/8	3/4	5-5/8	2,215	1,810
3/4	7/8	6-3/4	2,260	1,810
<b>Rebar Installed in the Face of CMU Wall</b>				
#3	1/2	3-3/8	1,180	1,315
#4	5/8	4-1/2	1,720	1,565
#5	3/4	5-5/8	1,835	1,565

For SI: 1 inch = 25.4 mm, 1 psi = 6.89 kPa, 1 lbf = 4.48 N.

1. Allowable load shall be the lesser of bond values given in **Table 3** of this report and steel values given in [Tables 4](#) or [5](#) of this report as applicable.
2. Embedment depth shall be measured from the outside face of masonry wall.
3. Critical and minimum edge distance and spacing shall comply with [Table 2](#) of this report. [Figure 2](#) of this report illustrates critical and minimum edge and end distances.
4. Minimum allowable nominal width of CMU wall shall be 8 inches. No more than one anchor shall be permitted per masonry cell.
5. Anchors shall be permitted to be installed at any location in the face of the fully grouted masonry wall construction (cell, web, bed joint), except anchors shall not be installed within 1 1/2 inches of the head joint as shown in [Figure 2](#) of this report.
6. Tabulated allowable load values are for anchors installed in fully grouted masonry walls constructed from materials complying with Section 3.2.5 of this report.
7. Tabulated allowable loads are based on a safety factor of 5.0 for installations under the IBC and the IRC.
8. Tabulated allowable load values shall be adjusted for increased base material temperatures in accordance with [Figure 1](#) of this report, as applicable.
9. Threaded rod and rebar installed in fully grouted masonry walls with AT-XP adhesive are permitted to resist dead, live, seismic and wind loads. Section 4.1 of this report describes design requirement details.
10. Threaded rod shall meet or exceed the tensile strength of [ASTM F1554](#), Grade 36 steel, which is 58,000 psi.
11. For installations exposed to severe, moderate or negligible exterior weathering conditions, as defined in [Figure 1](#) of [ASTM C62](#) (IBC or IRC), allowable tension loads shall be multiplied by 0.80 and stainless steel or zinc coated anchors per Section 5.9 of this report shall be used.





**TABLE 4 - ALLOWABLE TENSION AND SHEAR VALUES FOR THREADED ROD BASED ON STEEL STRENGTH<sup>1,7</sup>**

THREADED ROD DIAMETER (inch)	TENSILE STRESS AREA (inch <sup>2</sup> )	TENSION LOAD BASED ON STEEL STRENGTH <sup>2</sup> (pounds)				SHEAR LOAD BASED ON STEEL STRENGTH <sup>3</sup> (pounds)			
		ASTM F1554 GRAD E 36 <sup>4</sup>	ASTM A193 GRADE B7 <sup>6</sup>	STAINLESS STEEL		ASTM F1554, GRADE 36 <sup>4</sup>	ASTM A193, GRADE B7 <sup>6</sup>	STAINLESS STEEL	
				ASTM A193 GRADE B6 <sup>5</sup>	ASTM A193 GRADES B8 AND B8M <sup>7</sup>			ASTM A193, GRADE B6 <sup>5</sup>	ASTM A193, GRADES B8 AND B8M <sup>7</sup>
3/8	0.078	1,495	3,220	2,830	1,930	770	1,660	1,460	995
1/2	0.142	2,720	5,860	5,155	3,515	1,400	3,020	2,655	1,810
5/8	0.226	4,325	9,325	8,205	5,595	2,230	4,805	4,225	2,880
3/4	0.334	6,395	13,780	12,125	8,265	3,295	7,100	6,245	4,260

For SI: 1 inch = 25.4 mm, 1 psi = 6.89 kPa, 1 lbf = 4.48 N.

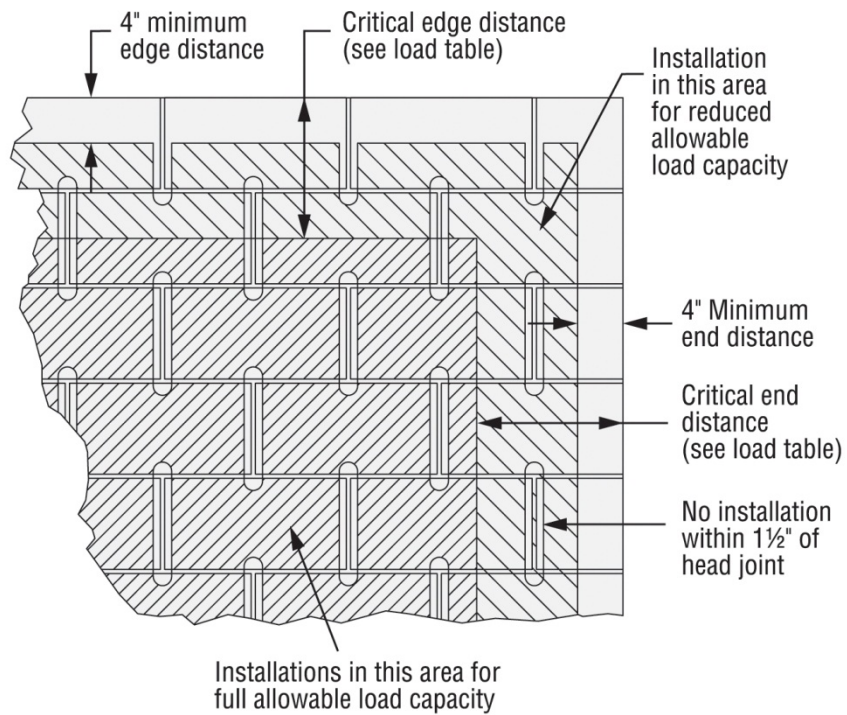
1. Allowable load shall be the lesser of bond values given in [Table 3](#) of this report and steel values given in [Table 4](#) of this report.
2. Allowable Tension Steel Strength is based on the following equation  $F_t = 0.33 \times F_u \times \text{Tensile Stress Area}$ .
3. Allowable Shear Steel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

**TABLE 5 - ALLOWABLE TENSION AND SHEAR VALUES FOR DEFORMED REINFORCING BAR BASED ON STEEL STRENGTH<sup>1</sup>**

REBAR SIZE NUMBER	TENSILE STRESS AREA (inch <sup>2</sup> )	TENSION LOAD (pounds)		SHEAR LOAD (pounds)	
		BASED ON STEEL STRENGTH		BASED ON STEEL STRENGTH	
		ASTM A615 GRADE 40 <sup>2</sup>	ASTM A615 GRADE 60 <sup>3</sup>	ASTM A615 GRADE 40 <sup>4,5</sup>	ASTM A615 GRADE 60 <sup>4,6</sup>
#3	0.11	2,200	2,640	1,310	1,685
#4	0.20	4,000	4,800	2,380	3,060
#5	0.31	6,200	7,440	3,690	4,745

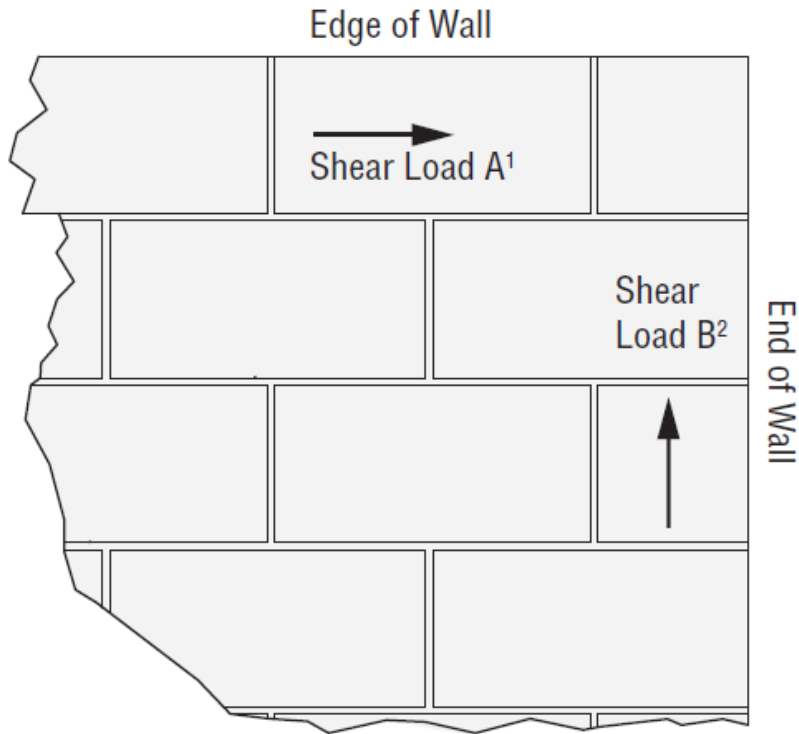
For SI: 1 inch = 25.4 mm, 1 psi = 6.89 kPa, 1 lbf = 4.48 N.

1. Allowable load shall be the lesser of bond values given in [Table 3](#) of this report and steel values given in [Table 5](#) of this report.
2. Allowable tension steel strength based on AC58 Section 3.3.3 (20,000 psi  $\times$  tensile stress area) for Grade 40 rebar.
3. Allowable tension steel strength based on AC58 Section 3.3.3 (24,000 psi  $\times$  tensile stress area) for Grade 60 rebar.
4. Allowable shear steel strength based on AC58 Section 3.3.3 ( $F_v = 0.17 \times F_u \times \text{tensile stress area}$ ).
5.  $F_u = 70,000$  psi for Grade 40 rebar.
6.  $F_u = 90,000$  psi for Grade 60 rebar.



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

**FIGURE 2—ALLOWABLE ANCHOR LOCATIONS FOR FULL AND REDUCED LOAD CAPACITY WHEN INSTALLATION IS IN THE FACE OF FULLY GROUTED CMU MASONRY WALL CONSTRUCTION**



1. Direction of Shear Load A is parallel to Edge of Wall AND perpendicular to End of Wall.
2. Direction of Shear Load B is parallel to End of Wall AND perpendicular to Edge of Wall.

**FIGURE 3—DIRECTION OF SHEAR LOAD IN RELATION TO EDGE AND END OF WALL**