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AT-XP® ADHESIVE ANCHORS FOR MASONRY

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:

- 2021, 2018, 2015, 2012, and 2009 International Building Code® (IBC)
- 2021, 2018, 2015, 2012, and 2009 International Residential Code® (IRC)
- 2021, 2018, 2015, 2012, and 2009 International Existing Building Code® (IEBC)
- 2021, 2018, 2015, and 2012 Uniform Plumbing Code® (UPC)
- 2021, 2018, 2015, and 2012 International Plumbing Code® (IPC)
- 2023 City of Los Angeles Building Code (LABC) – attached supplement
- 2023 City of Los Angeles Residential Code (LARC) – attached supplement

1.2 Evaluated in accordance with:

- ICC-ES Acceptance Criteria for Adhesive Anchors in Masonry Elements (AC58)

1.3 Properties assessed:

- Structural
- Compliance with NSF/ANSI Standard 61

2.0 PRODUCT USE

Simpson Strong-Tie AT-XP® adhesive anchors are post-installed, adhesive anchors used for anchoring building components to fully-grouted and hollow (ungrouted) concrete masonry. Threaded steel rods or deformed steel reinforcing bars installed with AT-XP adhesive resist dead, live, seismic, 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 2016 and 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 UPC and Section 605 of the 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
- Plastic-mesh screen tubes used for anchor installations in hollow (ungrouted) concrete masonry construction.

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. The 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 Opti-Mesh™ Plastic Screen Tube: The Opti-Mesh plastic screen tubes are used in hollow (ungrouted) concrete masonry walls described in Section 4.2.3 of this report. The plastic tubes consist of an integral cap, flanges, an open mesh collar, and a white plastic mesh tube.

3.2.5 Anchor Materials

3.2.5.1 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.

3.2.5.2 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.

3.2.6 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:

3.2.6.1 Concrete Masonry Units (CMU): CMU shall be closed-end minimum lightweight, medium-weight, or normal-weight concrete masonry conforming to ASTM C90. The 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., 8×8×16) for threaded rod and rebar installed with AT-XP adhesive in the face of the masonry wall construction.

3.2.6.2 Grout: Grout shall comply with IBC Section 2103.3 or IRC Section R606.2.12 (2021 and 2018 IRC), R606.11 (2015 IRC), or R609 (2012 and 2009 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.

3.2.6.3 Mortar: Mortar shall comply with IBC Section 2103.2, or IRC Section R606.2.8 (2021 and 2018 IRC) R606.2.7 (2015 IRC), or R607.1 (2012 and 2009 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 building 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 allowable stress design load combinations in 2021 IBC Section 1605.1 (Section 2.4 of ASCE/SEI 7-16), or the basic allowable stress design load combinations in accordance with the 2018, 2015, 2012, or 2009 IBC Section 1605.3.1, allowable loads are not permitted to be increased for earthquake or wind loading. When using the alternative basic allowable stress design load combinations in 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 allowable stress design load combinations in 2021 IBC Section 1605.2 or 2018, 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. The

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.

4.1.3 Design of Anchors in Hollow CMU Walls

4.1.3.1 General: For installations of threaded rods with Opti-Mesh™ plastic screen tubes through the face shell of hollow concrete masonry walls, the anchors are permitted to resist dead load, live load, and wind load applications. The use of the anchors to resist earthquake loads is outside the scope of this report. Minimum edge and end distances, and allowable tension and shear values are noted in Tables 6 and 7 and Figure 4 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. The 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 the 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. The 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), the 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.

4.2.3 Installation in Hollow Concrete Masonry: Anchor holes shall be drilled into and through the face shell of hollow concrete masonry walls using a rotary hammer drill set on rotation-only mode, with a carbide-tipped drill bit complying with ANSI B212.15-1994. The hole shall be cleaned with a properly sized nylon brush (2 complete strokes). Allowable anchor location relative to the edge and end of the masonry wall and to mortared joints shall comply with Table 6 and Figure 4 of this report. The AT-XP® adhesive shall be injected into a Simpson Strong-Tie Opti-Mesh plastic screen tube, as described in Section 3.2.4 of this report, starting at the bottom, until the tube is completely full. The Opti-Mesh plastic screen tube completely filled with adhesive shall be inserted into the predrilled hole until it is fully seated at the required embedment. A threaded rod, which shall be free of dirt, grease, oil, or other foreign material, shall then be pushed into the screen, while being turned slightly, to the bottom of the epoxy-filled screen tube to ensure complete coating of the rod.

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 1705.4 of the 2021, 2018, and 2015 IBC or Section 1705.3 of the 2012 IBC or Section 1705 of the 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, cleanliness condition, and 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 (2021, 2018, and 2015 IEBC) or Section A107.4 (2012 and 2009 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 the 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 2021, 2018, 2015, and 2012 UPC and Section 605 of the 2021, 2018, 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 limitations:

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 Sections 4.1.2 and 4.1.3 of this report.

5.3 Anchors shall be installed in fully-grouted or hollow (ungrouted) 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 Threaded rods, nuts, washers, and deformed reinforcing bars are standard elements and shall be identified according to the applicable national or international specifications.

5.10 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).

5.11 Anchors installed in masonry shall be installed in dry holes.

5.12 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.

5.13 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 $f_t > f_r$ due to service loads or deformations.

5.14 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. The 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.

5.15 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.

5.16 AT-XP® adhesive is manufactured and packaged into cartridges by Simpson Strong-Tie Company, Inc., in West Chicago, Illinois, with quality control inspections under the supervision of IAPMO UES.

6.0 SUBSTANTIATING DATA

6.1 Data in accordance with the ICC-ES Acceptance Criteria for Adhesive Anchors in Masonry Elements (AC58), approved March 2018, (editorially revised May 2021).

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

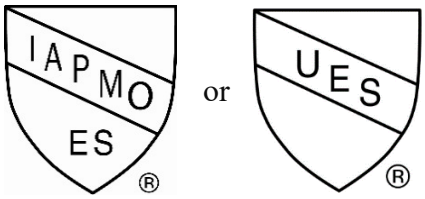
6.3 Test reports are from laboratories in compliance with ISO/IEC 17025.

6.4 A quality control manual.

7.0 IDENTIFICATION

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, and the evaluation report number (ER-281).

Either IAPMO UES Mark of Conformity below may also be used.



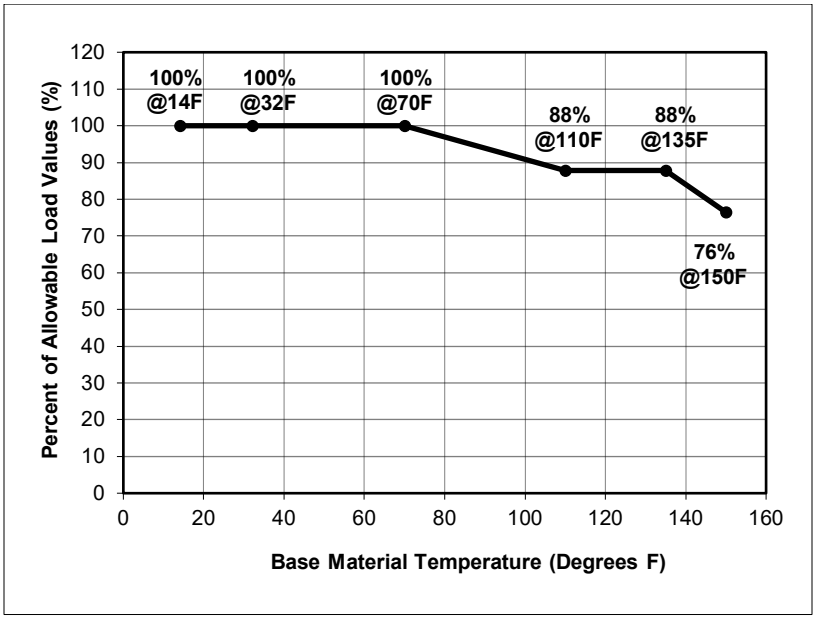
IAPMO UES ER-281

For additional information about this evaluation report please visit www.uniform-es.org or email at info@uniform-es.org

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[7]

Min. Embed. Depth (inches)	Edge or End Distance[1,8]						Spacing[2,9]				
	Critical (Full Anchor Capacity)[3]		Minimum (Reduced Anchor Capacity)[4]				Critical (Full Anchor Capacity)[5]		Minimum (Reduced Anchor Capacity)[6]		
	Critical Edge or End Distance, c_{cr} (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[10]		Tension or Shear	Tension or Shear	Tension or Shear	Tension	Shear
					Perp.	Para.					
3-3/8	12	1.00	4	1.00	0.76	0.94	8	1.00	4	1.00	1.00
4-1/2	12	1.00	4	0.90	0.57	0.94	8	1.00	4	1.00	1.00
5-5/8	12	1.00	4	0.72	0.47	0.94	8	1.00	4	1.00	1.00
6-3/4	12	1.00	4	0.72	0.47	0.94	8	1.00	4	1.00	1.00
3-3/8	12	1.00	4	1.00	0.62	0.95	8	1.00	4	1.00	1.00
4-1/2	12	1.00	4	1.00	0.37	0.82	8	1.00	4	1.00	0.89
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.

1. Edge distance (c_{cr} or c_{min}) is the distance measured from the anchor centerline to the edge or end of the CMU masonry wall. Figure 2 of this report illustrates critical and minimum edge and end distances.
2. Anchor spacing (s_{cr} or s_{min}) is the distance measured from the centerline to the centerline of two anchors.
3. Critical edge distance, c_{cr}, is the least edge distance at which the tabulated allowable load of an anchor is achieved where a load reduction factor equals 1.0 (no load reduction).
4. Minimum edge distance, c_{min}, is the least edge distance where an anchor has an allowable load capacity, which shall be determined by multiplying the allowable loads assigned to anchors installed at critical edge distance, c_{cr}, in Table 3 of this report by the load reduction factors shown above.
5. Critical spacing, s_{cr}, is the least anchor spacing at which the tabulated allowable load of an anchor is achieved such that anchor performance is not influenced by adjacent anchors.
6. Minimum spacing, s_{min}, is the least spacing where an anchor has an allowable load capacity, which shall be determined by multiplying the allowable loads assigned to anchors installed at the critical spacing distance, s_{cr}, in Table 3 of this report by the load reduction factors shown in the table.
7. Reduction factors are cumulative. Multiple reduction factors for more than one spacing or edge or end distance shall be calculated separately and multiplied.
8. Load reduction factor for anchors loaded in tension or shear with edge distances between critical and minimum shall be obtained by linear interpolation.
9. The load reduction factor for anchors loaded in tension with spacing between critical and minimum shall be obtained by linear interpolation.
10. Perpendicular shear loads act towards the edge or end. Parallel shear loads act parallel to the edge or end (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[1,3,4,5,6,8,9,10,11]

Diameter (inch) or Rebar Size No.	Drill Bit Diameter (inch)	Minimum Embedment[2] (inches)	Allowable Load based on Bond Strength[7] (pounds)	
			Tension	Shear
Threaded Rod Installed in the Face of CMU Wall				
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
Rebar Installed in the Face of CMU Wall				
#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. The 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 the 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. The minimum allowable nominal width of the 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 1½ 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 rods and rebars 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. The 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 5.10 of this report shall be used.

TABLE 4 - ALLOWABLE TENSION AND SHEAR VALUES FOR THREADED ROD BASED ON STEEL STRENGTH[1, 7]

THREADED ROD DIAMETER (inch)	TENSILE STRESS AREA (inch^2)	TENSION LOAD BASED ON STEEL STRENGTH[2] (pounds)				SHEAR LOAD BASED ON STEEL STRENGTH[3] (pounds)			
				STAINLESS STEEL				STAINLESS STEEL	
		ASTM F1554 GRADE 36[4]	ASTM A193 GRADE B7[6]	ASTM A193 GRADE B6[5]	ASTM A193 GRADES B8 AND B8M[7]	ASTM F1554, GRADE 36[4]	ASTM A193, GRADE B7[6]	ASTM A193, GRADE B6[5]	ASTM A193, GRADES B8 AND B8M[7]
3/8	0.078	1,495	3,220	2,830	1,930	770	1,660	1,460	995
½	0.142	2,720	5,860	5,155	3,515	1,400	3,020	2,655	1,810
5/8	0.226	4,325	9,325	8,205	5,595	2,230	4,805	4,225	2,880
¾	0.334	6,395	13,780	12,125	8,265	3,295	7,100	6,245	4,260

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

1. The 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. The allowable Tension Steel Strength is based on the following equation $F_t = 0.33 \times F_u$ x Tensile Stress Area.
3. The allowable Shear Steel Strength is based on the following equation: $F_v = 0.17 \times F_u$ x 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 (Fu = 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[1]

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

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

1. The 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. The allowable tension steel strength is based on AC58 Section 3.3.3 (20,000 psi × tensile stress area) for Grade 40 rebar.
3. The allowable tension steel strength is based on AC58 Section 3.3.3 (24,000 psi × tensile stress area) for Grade 60 rebar.
4. The allowable shear steel strength is based on AC58 Section 3.3.3 (F_v = 0.17 x F_u x tensile stress area).
5. F_u = 70,000 psi for Grade 40 rebar.
6. F_u = 90,000 psi for Grade 60 rebar.

TABLE 6 - EDGE, END, AND SPACING DISTANCE REQUIREMENTS AND ALLOWABLE LOAD REDUCTION FACTORS FOR THREADED ROD WITH AT-XP® EPOXY ADHESIVE IN THE FACE OF HOLLOW CMU WALL CONSTRUCTION[7]

Rod Dia. (in)	Edge or End Distance[1,8]					Spacing[2,9]				
	Critical (Full Anchor Capacity)[3]		Minimum (Reduced Anchor Capacity)[4]			Critical (Full Anchor Capacity)[5]		Minimum (Reduced Anchor Capacity)[6]		
	Critical Edge or End Distance, c_{cr} (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	Tension or Shear	Tension or Shear	Tension or Shear	Tension	Shear
3/8	12	1.00	4	1.00	1.00	8	1.00	4	0.74	1.00
1/2	12	1.00	4	1.00	1.00	8	1.00	4	0.76	0.89
5/8	12	1.00	4	1.00	0.89	8	1.00	4	0.78	0.77

For SI: 1 inch = 25.4 mm.

1. Edge and end distances (c_{cr} or c_{min}) are the distances measured from the anchor centerline to the edge or end of the CMU masonry wall. Figure 4 of this report shows critical and minimum edge and end distances.
2. Anchor spacing (s_{cr} or s_{min}) is the distance measured from the centerline to the centerline of two anchors.
3. Critical edge and end distances, c_{cr}, are the least edge distances at which the tabulated allowable load of an anchor is achieved where a load reduction factor equals 1.0 (no load reduction).
4. Minimum edge and end distances, c_{min}, are the least edge distances where an anchor has an allowable load capacity, which shall be determined by multiplying the allowable loads assigned to anchors installed at critical edge distance, c_{cr}, in Table 7 of this report by the load reduction factors shown above.
5. Critical spacing, s_{cr}, is the least anchor spacing at which the tabulated allowable load of an anchor is achieved such that anchor performance is not influenced by adjacent anchors.
6. Minimum spacing, s_{min}, is the least spacing where an anchor has an allowable load capacity, which shall be determined by multiplying the allowable loads assigned to anchors installed at the critical spacing distance, s_{cr}, in Table 7 of this report by the load reduction factors shown above.
7. Reduction factors are cumulative. Multiple reduction factors for more than one spacing or edge or end distance shall be calculated separately and multiplied.
8. Load reduction factor for anchors loaded in tension or shear with edge and end distances between critical and minimum shall be obtained by linear interpolation.
9. Load reduction factor for anchors loaded in tension with spacing between critical and minimum shall be obtained by linear interpolation.

TABLE 7 - ALLOWABLE TENSION AND SHEAR VALUES FOR THREADED ROD WITH AT-XP ADHESIVE IN THE FACE OF HOLLOW CMU WALL CONSTRUCTION[1,3,4,5,6,8,9,10,11]

Diameter (inch)	Drill Bit Diameter (inch)	Minimum Embedment Depth[2] (inches)	Allowable Load based on Bond Strength[7] (pounds)	
			Tension	Shear
3/8	9/16	1-1/4	225	275
1/2	3/4	1-1/4	220	315
5/8	7/8	1-1/4	215	355

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

1. The allowable load shall be the lesser of bond values given in Table 7 of this report and steel values given in Table 4 of this report as applicable.
2. Embedment depth is considered the minimum wall thickness of 8 inch x 8 inch x 16 inch ASTM C90 concrete masonry blocks and is measured from the outside to the inside face of the block wall. The minimum length Opti-Mesh™ plastic screen tube for use in hollow CMU is 3½ inches.
3. Critical and minimum edge distance and spacing shall comply with Table 7 of this report. Figure 4 of this report shows critical and minimum edge and end distances.
4. Anchors are permitted to be installed in the face shell of hollow masonry wall construction as shown in Figure 4 of this report.
5. Anchors are limited to one or two anchors per masonry cell and shall comply with the spacing and edge distance requirements of Table 7 of this report.
6. Tabulated load values are for anchors installed in hollow masonry walls constructed from materials per Sections 3.2.6.1 and 3.2.6.3 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 rods installed in hollow masonry walls with AT-XP adhesive are permitted to resist dead load, live load, and wind load applications. Section 4.1 of this report provides additional design requirement details.
10. Threaded rods shall meet or exceed the tensile strength of ASTM F1554, Grade 36, which is 58,000 psi.
11. For installations exposed to severe, moderate, or negligible exterior weathering conditions, as defined in Figure 1 of ASTM C62 (IBC or IRC), allowable tension loads shall be multiplied by 0.80, and stainless steel or zinc-coated anchors per Section 5.10 of this report shall be used.

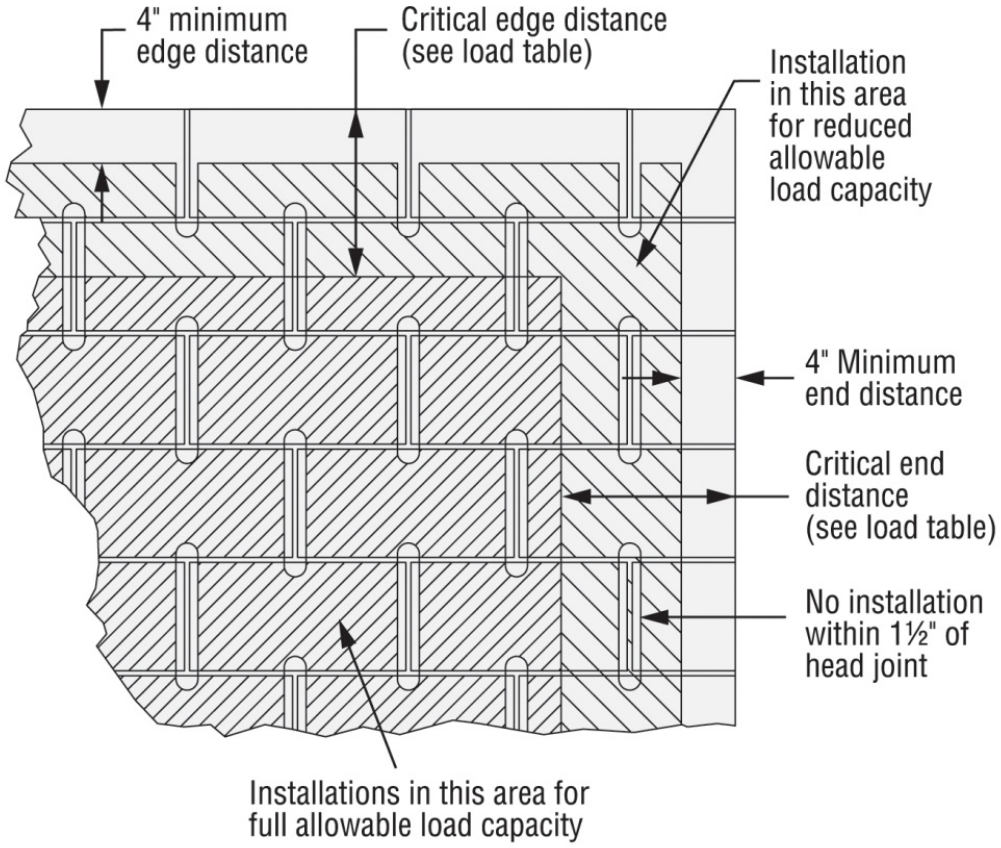
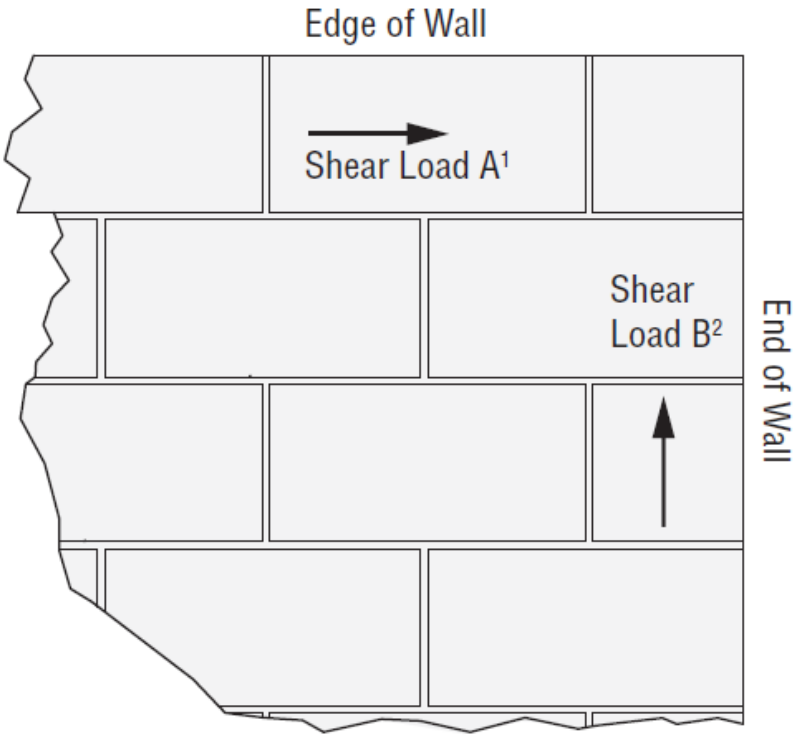


FIGURE 2—ALLOWABLE ANCHOR LOCATIONS FOR FULL AND REDUCED LOAD CAPACITY WHEN INSTALLATION IS IN THE FACE OF FULLY GROUTED CMU MASONRY WALL CONSTRUCTION



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

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

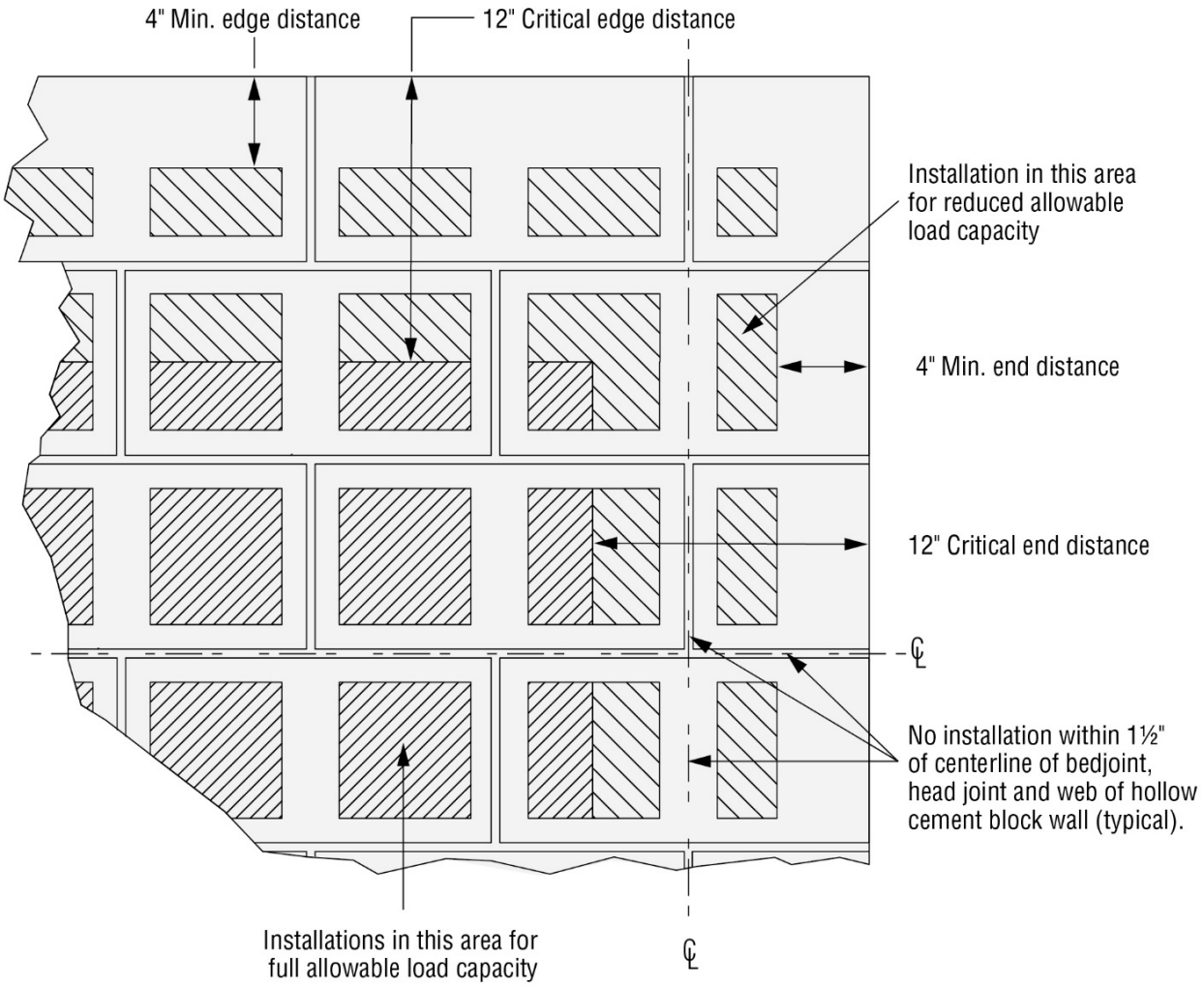


FIGURE 4 – ALLOWABLE ANCHOR LOCATIONS FOR FULL AND REDUCED LOAD CAPACITY WHEN INSTALLATION IS IN THE FACE OF HOLLOW CMU MASONRY WALL CONSTRUCTION

CITY OF LOS ANGELES SUPPLEMENT

SIMPSON STRONG-TIE COMPANY INC.
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AT-XP® ADHESIVE ANCHORS FOR MASONRY

CSI Division: 04 00 00 MASONRY
CSI Section: 04 05 19.16 Masonry Anchors

1.0 RECOGNITION

The Simpson Strong-Tie® AT-XP® adhesive anchors recognized in ER-281 have been evaluated for use to resist dead, live, seismic, and wind tension and shear loads. The structural performance properties of the Simpson Strong-Tie® AT-XP® adhesive anchors were evaluated for compliance with the following codes:

- 2023 City of Los Angeles Building Code (LABC)
- 2023 City of Los Angeles Residential Code (LARC)

2.0 LIMITATIONS

The Simpson Strong-Tie® AT-XP® adhesive anchors described in IAPMO UES ER-281 comply with the 2023 LABC Chapter 21 and 2023 LARC, subject to the following limitations:

2.1 The design, installation, conditions of use, and identification of the Simpson Strong-Tie® AT-XP® adhesive anchors shall be in accordance with the 2021 International Building Code and the 2021 International Residential Code as noted in ER-281.

2.2 Prior to installation, calculations and details demonstrating compliance with this approval report and the Los Angeles Building Code or Los Angeles Residential Code shall be submitted to the structural plan check section for review and approval. The calculations and details shall be prepared, stamped, and signed by a California registered design professional.

2.3 The design, installation, and inspection of the Simpson Strong-Tie® AT-XP® adhesive anchors shall be in accordance with LABC Chapters 16 and 17, as applicable, due to local amendments to these chapters; or LABC Section 2114, as applicable.

2.4 The design information listed in the report and tables of ER-281 is valid for the anchorage to masonry only. Connected members also shall be analyzed for structural capacities in accordance with the applicable requirements in the LABC and LARC.

2.5 Periodic special inspection shall be provided by the Registered Deputy Inspector in accordance with Section 1705 of the LABC during installations of the Simpson Strong-Tie® AT-XP® adhesive anchors.

2.6 Under the LARC, a design in accordance with Section R301.1.3 shall be submitted.

2.7 The AT-XP® adhesive anchors are not approved for unreinforced masonry walls.

2.8 This supplement expires concurrently with ER-281.

FLORIDA SUPPLEMENT

AT-XP® ADHESIVE ANCHORS FOR MASONRY

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1.0 RECOGNITION

Simpson Strong-Tie® AT-XP® adhesive anchors recognized in ER-281 have been evaluated for use to resist dead, live, seismic, and wind tension and shear loads. The structural performance properties of the Simpson Strong-Tie® AT-XP® adhesive anchors were evaluated for compliance with the following codes:

- 2023 Florida Building Code, Building, 8th Edition (FBC--Building)
- 2023 Florida Building Code, Residential, 8th Edition (FBC--Residential)

2.0 LIMITATIONS

Simpson Strong-Tie® AT-XP™ adhesive anchors described in IAPMO UES ER-281 comply with the 2023 FBC--Building and the 2023 FBC--Residential, subject to the following limitations:

2.1 The design and installation of the Simpson Strong-Tie® AT-XP™ adhesive anchors shall be in accordance with the 2021 International Building Code and the 2021 International Residential Code as noted in ER-281.

2.2 Load combinations shall be in accordance with Section 1605.2 of the FBC--Building, as applicable.

2.3 Design wind loads shall be in accordance with Section 1609.1.1 of the FBC--Building or Section R301.2.1.1 of the FBC--Residential, as applicable, and Section 1620 of the FBC–Building where used in High-velocity Hurricane Zones (HVHZ).

2.4 Use of Simpson Strong-Tie® ET-HP™ adhesive anchors in High-velocity Hurricane Zones (HVHZ) as set forth in Section 2321.5.2 of the FBC--Building and Section R4409 of the FBC--Residential to resist wind uplift is permitted. The anchors shall be designed to resist the uplift forces as required in Section 1620 (HVHZ) of the FBC--Building or 700 pounds (3114 N), whichever is greater, per FBC--Building Section 2321.7.

2.5 Use of Simpson Strong-Tie® AT-XP™ adhesive anchors in High-velocity Hurricane Zones (HVHZ) as set forth in Section 2122.7 of the FBC--Building and Section R4407 of the FBC--Residential to resist wind forces is permitted. The anchors shall be designed to resist the horizontal forces as required in Section 1620 (HVHZ) of the FBC--Building or 200 pounds per lineal foot (2919 N/m) of wall, whichever is greater, per FBC--Building Section 2122.7.3.

2.6 Use of Simpson Strong-Tie® AT-XP™ adhesive anchors with stainless steel or galvanized carbon steel threaded rod complies with the High-Velocity Hurricane Zone (HVHZ) provisions set forth in Sections 2324.2 of the FBC--Building.

2.7 Use of Simpson Strong-Tie® AT-XP™ adhesive anchors with carbon steel threaded rods or reinforcing bars in applications exposed to the weather within High-velocity Hurricane Zones (HVHZ) set forth in the FBC--Building and the FBC--Residential is beyond the scope of this supplemental report.

2.8 For products falling under Section (5)(d) of Florida Rule 61G20-3.008, verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission (or the building official when the report holder does not possess an approval by the Commission) is required to provide oversight and determine that the products are being manufactured as described in this evaluation report to establish continual product performance.

2.9 This supplement expires concurrently with ER-281.