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ESR-3638

Reissued 02/2017

This report is subject to renewal 02/2018.

DIVISION: 04 00 00—MASONRY
SECTION: 04 05 19.16—MASONRY ANCHORS

REPORT HOLDER:

SIMPSON STRONG-TIE COMPANY, INC.

**5956 WEST LAS POSITAS BOULEVARD
PLEASANTON, CALIFORNIA 94588**

EVALUATION SUBJECT:

ET-HP® ADHESIVE ANCHOR SYSTEMS



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Section: 04 05 19.16—Masonry Anchors

REPORT HOLDER:

SIMPSON STRONG-TIE COMPANY INC.
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(800) 925-5099
www.strongtie.com

EVALUATION SUBJECT:

ET-HP® ADHESIVE ANCHOR SYSTEMS

1.0 EVALUATION SCOPE:

Compliance with the following codes:

- 2015, 2012, 2009 and 2006 *International Building Code*® (IBC)
- 2015, 2012, 2009 and 2006 *International Residential Code*® (IRC)
- 2015, 2012, 2009 and 2006 *International Existing Building Code*® (IEBC)

Properties evaluated:

Structural

2.0 USES

The ET-HP® adhesive anchor system (ET-HP22 and ET-HP56) is used for anchoring threaded steel rods in unreinforced brick masonry. Anchors installed in unreinforced masonry with the ET-HP adhesive are designed to resist short-term earthquake and wind loads as noted in Section 4.0 of this evaluation report. The anchor system is an alternative to anchors described in Section 8.1.3 of [ACI 530](#) as referenced in Section 2107 of the 2015 IBC, and Section 2.1.4 of ACI 530 as referenced in Section [2107](#) of the 2012, 2009 and 2006 IBC. The anchors are alternatives to bolts described in Section [A107.4](#) and Section [A113.1](#) of the IEBC. The anchor system may also be used where an engineered design is submitted in accordance with Section [R301.1.3](#) of the IRC.

3.0 DESCRIPTION

3.1 General:

The ET-HP™ adhesive anchor system consists of a two-part epoxy adhesive available in different cartridge systems. Threaded rods, plastic-mesh or steel-mesh screen tubes, adhesive dispensers, hole cleaning

equipment, and steel sleeve and steel plate washers are used for anchor installation in unreinforced brick masonry walls, as applicable.

3.2 Materials:

3.2.1 ET-HP Adhesive: The ET-HP adhesive is a two-component, high-solids, high-viscosity, epoxy-based adhesive mixed at a 1-to-1 volume ratio of hardener-to-resin. The ET-HP adhesive is packaged in different cartridge systems, each bearing a different model designation: ET-HP22 and ET-HP56. Resin and hardener are mixed while being dispensed through a Simpson Strong-Tie mixing nozzle. Simpson Strong-Tie ET-HP adhesive has a shelf life of two years from date of manufacture when stored in unopened, side-by-side ET-HP22 and ET-HP56 cartridges in a dry environment at storage temperatures between 45°F (7°C) and 90°F (32°C). Gel and cure times for the ET-HP adhesive at the corresponding masonry temperature are shown in [Table 1](#).

3.2.1.1 ET-HP22 and ET-HP56 Cartridges: The ET-HP22 and ET-HP56 cartridges consist of the ET-HP epoxy adhesive as described in Section 3.2. The ET-HP22 and ET-HP56 are packaged in dual side-by-side, 22-ounce and 56-ounce (0.65 and 1.66 L) cartridges, respectively.

3.2.2 Screen Tubes:

3.2.2.1 Simpson Strong-Tie Opti-Mesh™ Plastic Screen Tube: The Opti-Mesh screen tubes are plastic and consist of an integral cap, flanges, an open mesh collar, and a black plastic mesh tube. The Opti-Mesh plastic screen tubes are used in unreinforced brick masonry walls, as described in Sections 4.1.1 and 4.1.2 of this report. In unreinforced brick masonry walls, the Opti-Mesh plastic screen tubes may be used in configurations A and B only ([Figure 1](#)).

3.2.2.2 Steel Wire Screen Tube: The steel screen tubes, consisting of 60 mesh carbon steel wire screen, are open at one end and closed at the other. The outside diameter of the steel screen tubes used with the threaded rods specified in Section 3.3 of this report is $3\frac{1}{32}$ inch (24.6 mm). The steel screen tubes are used in unreinforced brick masonry walls, as described in Sections 4.1.1, 4.1.2, and 4.1.3 of this report. In unreinforced brick masonry walls, the steel screen tubes are permitted for use in configurations A, B, and C ([Figure 1](#)).

3.3 Threaded Rods:

Threaded anchor rods, having diameters of $\frac{5}{8}$ inch or $\frac{3}{4}$ inch (15.9 or 19.1 mm), must be carbon steel

conforming to a minimum of [ASTM F1554](#) Grade 36. The $\frac{3}{4}$ -inch (19.1 mm) threaded rods may also be used in a prebent $22\frac{1}{2}$ -degree configuration as described in Section 4.1.2 of this report.

3.4 Steel Sleeve:

The steel sleeve for use in unreinforced brick masonry walls, Simpson Strong-Tie part No. AST800, is an 8-inch-long (203 mm) sleeve, formed from [AISI 1010](#) steel, closed at one end with a plastic cap and open on the other, having outside and inside diameters of $\frac{13}{16}$ inch (20.6 mm) and $\frac{11}{16}$ inch (17.5 mm), respectively. The steel sleeves are used in unreinforced brick masonry walls as described in Section 4.1.3. In unreinforced brick masonry walls, the steel sleeve is used in configuration C only ([Figure 1](#)).

3.5 Steel Plate Washer:

The steel plate is for use in unreinforced brick masonry walls as described in Section 4.1.3. The steel plate must be [ASTM A36](#) steel, measuring 6 inches by 6 inches by $\frac{3}{8}$ -inch thick (152 mm by 152 mm by 9.5 mm). The steel sleeve is used in unreinforced brick masonry for configuration C only ([Figure 1](#)).

3.6 Hole Cleaning Equipment:

Hole cleaning equipment consists of hole cleaning brushes and air nozzles. Brushes must be Simpson Strong-Tie 1-inch-diameter hole cleaning brushes, identified by Simpson Strong-Tie catalog number ETB10. Air nozzles and brushes must reach the bottom of the drilled hole.

3.7 Unreinforced Brick Masonry:

The existing unreinforced masonry walls must have a minimum nominal thickness of 13 inches (330 mm) (three wythes of brick). The average in-place mortar shear strength of the building's unreinforced masonry, determined in accordance with IEBC Section [A106.3.3](#), must be no less than 50 psi (345 kPa) net.

4.0 DESIGN AND INSTALLATION

4.1 General:

Three types of anchor assembly are available: Configuration A (shear anchor), Configuration B ($22\frac{1}{2}$ -degree combination anchor), and Configuration C (through-bolt combination anchor):

4.1.1 Configuration A, Threaded Rods in Shear (Shear Anchor): Configuration A consists of a $\frac{3}{4}$ -inch-diameter (19.1 mm) straight threaded rod and a $\frac{31}{32}$ -inch-outer-diameter-by-8-inch-long (24.6 mm by 203 mm) steel wire (ETS758) or plastic mesh (ETS758P) screen tube. This anchor must be embedded a minimum of 8 inches (203 mm) into the wall and is used when the outside wall is inaccessible. This anchor configuration resists shear loads only. [Figure 1](#) shows details of an installed shear-resisting assembly.

4.1.2 Configuration B, Bent Threaded Rods in Tension and Shear ($22\frac{1}{2}$ -degree Combination Anchor): Configuration B consists of a $\frac{3}{4}$ -inch-diameter (19.1 mm) threaded rod prebent at a $22\frac{1}{2}$ -degree angle and installed a minimum of 13 inches (330 mm) into the wall at a downward angle of 22.5 degrees, to within a maximum of 1 inch (25.4 mm) of the exterior wall surface. The prebent threaded rod is used with a $\frac{31}{32}$ -inch-outer-diameter-by-13-inch-long (26.4 mm by 330 mm) steel wire (ETS7513) or plastic mesh (ETS7513P) screen tube. This anchor configuration resists tension and shear loads, and is used where the outside of the wall is inaccessible.

4.1.3 Configuration C, Through-bolts in Tension and Shear: Configuration C consists of a $\frac{5}{8}$ -inch-diameter (15.9 mm) threaded rod; an 8-inch-long (203 mm) steel sleeve (AST800), formed from AISI 1010 steel, having outside and inside diameters of $\frac{13}{16}$ inch (20.6 mm) and $\frac{11}{16}$ inch (17.5 mm), respectively; and a $\frac{31}{32}$ -inch-outer-diameter-by-8-inch-long (26.4 mm by 203 mm) steel screen tube (ETS758). A 6-inch-by-6-inch-by- $\frac{3}{8}$ -inch-thick (152 mm by 152 mm by 9.5 mm) ASTM A36 steel plate must be located on the back face of the wall at the end of the threaded rod of the through-bolted connection. This anchor configuration resists tension and shear loads, and is used when the outside surface of the wall is accessible.

4.2 Design:

The ET-HP™ adhesive anchors are intended to resist only short-term loads imposed by wind or earthquake. The anchors must be approved by a registered design professional and installed under special inspection in accordance with Section 4.5 of this report. The edge distance and vertical and horizontal spacing for the three configurations of anchor assemblies described in Section 4.1 must comply with [Table 2](#).

Conditions of acceptance for threaded rods in unreinforced brick masonry are as follows:

4.2.1 Configuration A, Threaded Rods in Shear (Shear Anchor):

- Installation of Configuration A threaded rods intended to resist shear loads only must comply with Sections 4.1.1 and 4.3, and [Figure 1](#).
- The allowable shear load for the $\frac{3}{4}$ -inch-diameter (19.1 mm) threaded rod is 1,000 pounds (4450 N) as shown in [Table 3](#). No adjustment for wind or earthquake loading is permitted with the above-noted loads.
- Allowable shear value is applicable only to anchors installed in walls where in-place shear tests indicate a minimum mortar strength of 50 psi (345 kPa) net, in accordance with IEBC Section A106.3.3.

4.2.2 Configuration B, Bent Threaded Rods, and Configuration C, Through-bolts:

- Installation of threaded rods and through-bolts must comply with Sections 4.1.2, 4.1.3 and 4.3, and [Figure 1](#).
- Maximum allowable tension load for the $\frac{3}{4}$ -inch-diameter (19.1 mm) prebent threaded rod (Configuration B) or the $\frac{5}{8}$ -inch-diameter (15.9 mm) through-bolt (Configuration C) is 1,200 pounds (5340 N), as shown in [Table 3](#). No adjustment for wind or earthquake loading is permitted with the above-noted loads.
- The maximum allowable shear load for the $\frac{3}{4}$ -inch-diameter (19.1 mm) prebent threaded rod is 1,000 pounds (4450 N), and for the $\frac{5}{8}$ -inch (15.9 mm) through-bolt it is 750 pounds (3335 N), as shown in [Table 3](#). No adjustment for wind or earthquake loading is permitted with the above-noted loads.
- For the $\frac{3}{4}$ -inch-diameter (19.1 mm) prebent threaded rod or the $\frac{5}{8}$ -inch-diameter (15.9 mm) through-bolt subjected to combined tension and shear, the allowable combined load must be determined using the following equation:

$$(P_s/P_t) + (V_s/V_t) \leq 1$$

where:

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

The allowable tension and shear is applicable only to anchors installed in walls where in-place shear tests indicate minimum mortar strength of 50 psi (345 kPa) net in accordance with IEBC Section A106.3.3.

4.3 Installation:

4.3.1 General: The anchors must be 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 standard carbide-tipped masonry drill bits complying with [ANSI B212.15-1994](#). Impact tools are not permitted. The holes must be cleaned with oil-free compressed air and a nylon brush. Installation must be in accordance with Sections 4.3.2, 4.3.3, and 4.3.4, and [Figure 1](#), of this report, and the manufacturer's printed installation instructions (MPII) as shown in [Figure 2](#). The adhesive must be installed and cured at temperatures above 50°F (10°C), and for the time period as noted in [Table 1](#), before load application is permitted for Configuration A or B anchors, and before continuing installation of the Configuration C anchor. The ET-HP adhesive anchors are intended to resist only short-term loads imposed by wind or earthquake. The anchors must be approved by a registered design professional and the anchors installed under special inspection in accordance with Section 4.5 of this report. The edge distance and vertical and horizontal spacing for the three types of anchor assemblies described in Section 4.1 must comply with [Table 2](#).

4.3.2 Configuration A: The holes for threaded rods intended to resist shear only must be drilled perpendicular to the wall face, to a depth of 8 inches (203 mm). The holes must be cleaned with oil-free compressed air and a nylon brush. The ET-HP adhesive must be injected through the mixing nozzle into the screen tube until the tube is completely full, and then placed immediately into the drilled hole. The screen is filled from the bottom and the nozzle is withdrawn as the screen fills, to prevent air pockets. The threaded rod must be inserted while being turned slowly until the anchor contacts the bottom of the screen, forcing the adhesive through the screen and into the hole. [Figure 1](#) includes an illustration of an anchor installed in Configuration A.

4.3.3 Configuration B: The holes for the prebent threaded rods intended to resist shear and tension for the Configuration B anchor, must be drilled at a downward angle of 22.5 degrees to within 1 inch (25.4 mm) of the opposing surface. This is achieved by using a guide that is handheld or attached to the drill. The holes must be cleaned with oil-free compressed air and a nylon brush. The ET-HP adhesive must be injected through the mixing nozzle into the screen tube until the tube is completely full, and then placed immediately into the drilled hole. The screen is filled from the bottom and the nozzle is withdrawn as the screen fills, to prevent air pockets. The prebent threaded rod must be inserted while being turned slowly until the anchor contacts the bottom of the screen, forcing the adhesive through the screen and into the hole. [Figure 1](#) includes an illustration of an anchor installed in Configuration B.

4.3.4 Configuration C: The holes for the through-bolted threaded rods intended to resist shear and tension for the

Configuration C anchor must be drilled perpendicular to the wall face, to a depth of 8 inches (203 mm). The holes must be cleaned with oil-free compressed air and a nylon brush. The ET-HP adhesive must be injected through the mixing nozzle into the screen tube until the tube is completely full, and then placed immediately into the drilled hole. The screen is filled from the bottom and the nozzle is withdrawn as the screen fills to prevent air pockets. The steel sleeve must then be inserted, plastic plug end first, while being turned slowly until the sleeve contacts the bottom of the screen, forcing the adhesive through the screen and into the hole. The adhesive is allowed to cure in accordance with [Table 1](#) before proceeding. After the adhesive has cured, a ⁵/₈-inch-diameter carbide-tipped masonry drill bit is used to drill through the plastic plug at the bottom of the steel sleeve and completely through the remainder of the wall, using rotation mode only. The ⁵/₈-inch threaded rod is inserted through the wall, and the steel plate and nut on the opposite end of the rod are attached. [Figure 1](#) includes an illustration of an anchor installed in Configuration C.

4.4 Field Tests:

- Tests for in-place mortar shear strength of the building must be done in accordance with Section A106.3.3 of the IEBC. In-place mortar shear strengths must indicate minimum mortar strength of 50 psi (345 kPa).
- Anchors resisting tension forces or a combination of tension and shear forces must be tested in accordance with Section A107.4 of the IEBC. The test report must include:
 - Test location(s)
 - Brick/mortar condition
 - Bolt movement/elongation
 - Embedment depth and masonry wall thickness
 - Applied load, loading procedure, load increments and rate of loading

4.5 Special Inspection Requirements Based on Applicable Code:

4.5.1 IBC and IRC: Continuous special inspection must be provided in accordance with Sections [1704](#) and [1705](#) of the IBC.

4.5.2 IEBC: Periodic inspection, direct-tension tests, and calibrated torque wrench tests must be performed in accordance with Section A107.4 of the IEBC. In lieu of testing and periodic inspection, the IEBC permits continuous special inspection during installation of bolts resisting shear forces only.

5.0 CONDITIONS OF USE

The ET-HP™ adhesive anchor systems for unreinforced masonry, described in this report are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

- Use and installation must be as set forth in this evaluation report and the manufacturer's printed installation instructions (MPII) shown in [Figure 2](#). In case of conflict, this report governs.
- Calculations and details must be submitted to the code official for approval.
- Special inspection must be in accordance with Section 4.5 of this evaluation report.
- Use of the anchor system must be approved by the registered design professional.

- 5.5 Anchors must be limited to resisting transient wind or seismic loads only.
- 5.6 Anchors are installed in holes predrilled with a carbide-tipped masonry drill bit complying with ANSI B212.15-1994, using rotation mode only. Impact tools are not permitted
- 5.7 The adhesive must not be used after the expiration date stamped on the cartridge.
- 5.8 The ET-HP adhesive is manufactured and packaged into the cartridges described in this report by Simpson Strong-Tie Company, Inc., under a quality-control program with inspections by ICC-ES.
- 5.9 Anchors are not permitted to support fire-resistive construction. Where not otherwise prohibited by the code, anchors are permitted for installation in fire-resistive construction provided that at least one of the following conditions is fulfilled
 - Anchors are used to resist wind or seismic forces only.
 - Anchors are used to support nonstructural elements.

6.0 EVIDENCE SUBMITTED

- 6.1 Data in accordance with the ICC-ES Acceptance Criteria for Anchors in Unreinforced Masonry Elements (AC60), dated December 2009 (editorially revised March 2015).
- 6.2 A quality control manual.

7.0 IDENTIFICATION

Simpson Strong-Tie ET-HP™ adhesive anchoring systems are identified in the field by labels on the cartridges or packaging, bearing the company name (Simpson Strong-Tie Company, Inc.), the product name (ET-HP22, ET-HP56), the batch number, the expiration date, and the evaluation report number (ESR-3638). Screen tubes are identified by a label on the packaging, bearing the Simpson Strong-Tie name and the tube type (plastic or metal) and size.

TABLE 1—MANUFACTURER’S GEL TIMES AND CURING TIMES FOR ET-HP™ ADHESIVES¹

MASONRY TEMPERATURE		GEL TIME ² (minutes)	CURE TIME ² (hours)
(°F)	(°C)		
50	10	45	72
60	16	30	24
80	27	20	24
100	38	15	24

For SI: 1°C = 5/9 (°F-32).

¹Anchors installed or cured at temperatures below 50°F (10°C) are outside the scope of this report.

²Anchors must be not be disturbed after the gel time until the cure time has elapsed, and must be allowed to reach cure time before attachment of building components.

TABLE 2—SPACING AND EDGE DISTANCE REQUIREMENTS FOR ET-HP™ ADHESIVE ANCHOR SYSTEMS INSTALLED IN UNREINFORCED MASONRY

ANCHOR ASSEMBLY	MINIMUM VERTICAL SPACING (inches)	MINIMUM HORIZONTAL SPACING (inches)	MINIMUM EDGE DISTANCE (inches)
Shear anchor Configuration A	16	16	16
22 ¹ / ₂ ° combination anchor Configuration B	16	16	16
Through-bolt anchor Configuration C	16	16	16

For SI: 1 inch = 25.4 mm.

TABLE 3—ALLOWABLE LOAD CAPACITIES FOR THREADED RODS FOR ET-HP™ ADHESIVE ANCHOR SYSTEMS INSTALLED IN UNREINFORCED BRICK MASONRY^{1,2}

CONFIGURATION A - SHEAR ANCHOR				
Anchor Rod Diameter(inch)	Minimum Embedment (inches)	Minimum Wall Thickness (inches)	Allowable Tension Load (lbs)	Allowable Shear Load (lbs)
3/4	8	13	-	1,000
CONFIGURATION B - 22 ¹ / ₂ ° COMBINATION ANCHOR				
Anchor Rod Diameter (inch)	Minimum Embedment	Minimum Wall Thickness (inches)	Allowable Tension Load ³ (lbs)	Allowable Shear Load (lbs)
3/4	Within 1 inch of opposite wall surface	13	1,200	1,000
CONFIGURATION C - THROUGH-BOLT ANCHOR				
Anchor Rod Dia. (inch)	Minimum Steel Sleeve Embedment	Minimum Wall Thickness (inches)	Allowable Tension Load (lbs)	Allowable Shear Load (lbs)
5/8	8 inches from interior wall surface	13	1,200	750

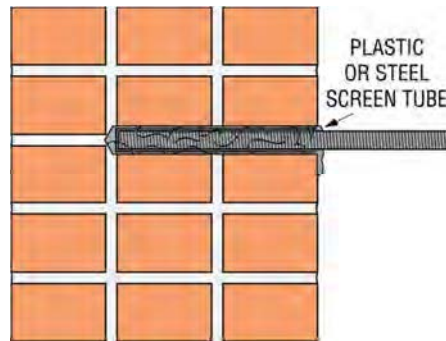
For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N, 1 foot-pound = 1.356 N-m, 1 psi = 6.89 Pa.

¹Allowable load values are applicable only to anchors where in-place shear tests indicate minimum mortar strength of 50 psi, net.

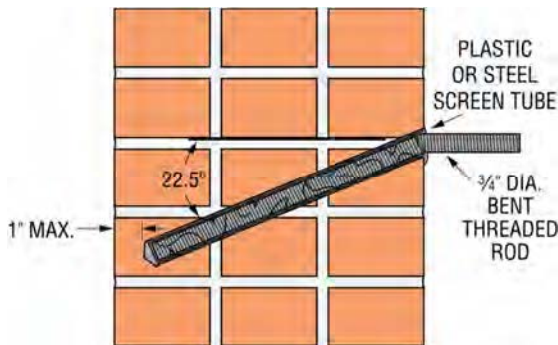
²No increase for lateral loading, such as loading induced by wind or earthquake, is permitted.

³Anchors must be tested in accordance with Section 4.4 for use with the IEBC.

**Configuration A
(Shear)**



**Configuration B
(Tension & Shear)**



**Configuration C
(Tension & Shear)**

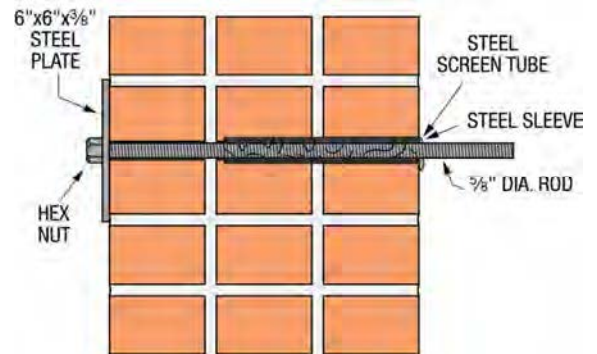
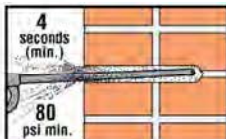


FIGURE 1—ANCHOR INSTALLATIONS FOR UNREINFORCED BRICK MASONRY
(Refer to Sections 4.1 through 4.3 for details concerning design and installation of anchors in unreinforced brick masonry)

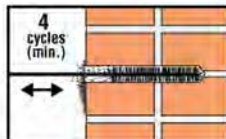
1 HOLE PREPARATION: For Configurations A and C (Horizontal) and B (22½ - Degree Downward) Installations.



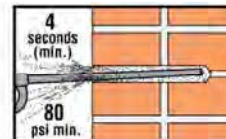
1. **Drill**—Drill 1-inch-diameter hole to specified depth with a carbide-tipped drill bit, using rotation only mode. For Configurations A and C, drill 8 inches deep. For Configuration B, drill to within 1 inch of the opposite side of wall (minimum 13 inches deep).



2. **Blow**—Remove dust from hole with oil-free compressed air for a minimum of 4 seconds. Compressed air nozzle **MUST** reach the bottom of the hole.



3. **Brush**—Clean with a 1-inch-diameter nylon brush for a minimum of 4 cycles. Brush **MUST** reach the bottom of the hole. Brush should provide resistance to insertion. If no resistance is felt, the brush is worn and must be replaced.



4. **Blow**—Remove dust from hole with oil-free compressed air for a minimum of 4 seconds. Compressed air nozzle **MUST** reach the bottom of the hole.

2 CARTRIDGE PREPARATION:

1. **Check**—Check cartridge expiration date. **Do not use expired product.** Product is usable until end of printed expiration month.

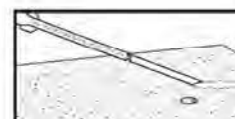
2. **Open**—Open cartridge per package instructions.



3. **Attach**—Attach proper Simpson Strong-Tie® nozzle and extension to cartridge. Do not modify nozzle.



4. **Insert**—Insert cartridge into dispensing tool.

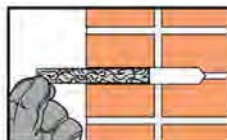


5. **Dispense**—Dispense adhesive to the side until properly mixed (uniform color).

3 FILLING THE HOLE: For Configurations A and C (Horizontal) and B (22½ - Degree Downward) Installations.



1. **Fill**—Fill screen completely. Fill from the bottom of the screen and withdraw the nozzle as the screen fills to prevent air pockets. (Opti-Mesh® screens: Close integral cap after filling).



2. **Insert**—Insert adhesive filled screen into hole.



3. **Insert**—Insert clean, oil-free anchor, turning slowly until the anchor contacts the bottom of the screen.



4. **Do not disturb**—Do not disturb anchor until fully cured. (See cure schedule for specific adhesive.)

Note: Opti-Mesh® plastic screens or steel wire mesh screens may be used for Configurations A and B.

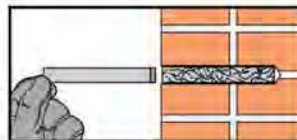
3 FILLING THE HOLE: For Configurations C (Horizontal Through-Bolt) Installation.



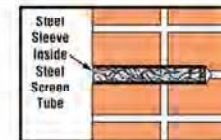
1. **Fill**—Fill screen completely. Fill from the bottom of the screen and withdraw the nozzle as the screen fills to prevent air pockets.



2. **Insert**—Insert adhesive filled screen into hole.

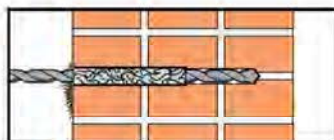


3. **Insert**—Insert steel sleeve (capped) anchor, turning slowly until the anchor contacts the bottom of the screen.



4. **Cure**—Allow adhesive to cure (see Cure Time Table 1).

5. **Drill**—Drill through plastic plug in (inside) end of steel sleeve and completely through the wall with 5/8" carbide tipped concrete drill bit (rotation mode only).



6. **Insert**—Insert 5/8" rod through hole and attach metal plate and nut.



Note: Steel wire mesh screens shall be used for Configuration C.

FIGURE 2—MANUFACTURER’S PRINTED INSTALLATION INSTRUCTIONS FOR UNREINFORCED BRICK MASONRY