ICC-ES Evaluation Report

ESR-4144

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

REPORT HOLDER:

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PLANO, TEXAS 75024

EVALUATION SUBJECT:

HILTI HIT-HY 270 ADHESIVE ANCHOR SYSTEM IN UNREINFORCED MASONRY

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DIVISION: 04 00 00—MASONRY
Section: 04 05 19.16—Masonry Anchors

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EVALUATION SUBJECT:
HILTI HIT-HY 270 ADHESIVE ANCHOR SYSTEM IN UNREINFORCED MASONRY

1.0 EVALUATION SCOPE

Compliance with the following codes:
- 2013 Abu Dhabi International Building Code (ADIBC)†

†The ADIBC is based on the 2009 IBC. 2009 IBC code sections referenced in this report are the same sections in the ADIBC.

For evaluation for compliance with codes adopted by the Los Angeles Department of Building Safety (LADBS), see ESR-4144 LABC, LARC and LAEBC supplement.

Property evaluated:
Structural

2.0 USES

The Hilti HIT-HY 270 Adhesive Anchor System is used to anchor threaded steel rods or deformed steel reinforcement bars in unreinforced brick masonry. Anchors installed in unreinforced masonry with the HIT-HY 270 adhesive system are designed to resist short-term loads imposed by earthquake or wind, as noted in Section 4.0 of this report. The anchor system is an alternative to anchors described in Section 8.1.3 of ACI 530-13, as referenced in Section 2107 of the 2015 IBC and Section 2.1.4 of ACI 530-11, -08, -05 as referenced in Section 2107 of the 2012, 2009 and 2006 IBC, respectively. The anchors are an alternative 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 Hilti HIT-HY 270 Adhesive Anchor System consists of steel threaded rods or reinforcing bars, plastic mesh screen tube(s), the adhesive, and installation equipment as described in this report.

3.2 Materials:

3.2.1 Hilti HIT-HY 270 Adhesive: The Hilti HIT-HY 270 adhesive is an injectable hybrid adhesive mortar consisting of urethane methacrylate resin, hardener, cement and water. The resin and cement are separated from the hardener and water by means of a dual-cylinder foil pack attached to a manifold. An injection nozzle with an internal mixing element is attached to the manifold, and the adhesive components are dispensed through the injection nozzle to ensure proper mixing of the separate adhesive components. The injection nozzle may be replaced to permit multiple uses of the foil packs. Available foil pack sizes include total mixed volumes of 11.1 ounces (330 mL) and 16.9 ounces (500 mL).

The adhesive expiration date is printed on the manifold of each foil pack (month/year). The shelf life, as indicated by the expiration date, is for an unopened foil pack stored in a cool, dry, dark environment at temperatures between 41°F and 77°F (5°C and 25°C). Gel and curing times for the Hilti HIT-HY 270 adhesive and the respective masonry temperature during installation and cure are shown in Table 1.

3.2.2 Threaded Steel Rods and Reinforcing Bars: The threaded steel rods are 3/4 inch (19.1 mm) in diameter, and must comply with the minimum mechanical properties of ASTM A307. Alternatively, the 3/4-inch threaded rods may be used in a prebent 22 1/2-degree configuration. Threaded rods are supplied with nuts conforming to ASTM A563, Grade A, hex style, and with washers conforming to ANSI B 18.22.1, type A, Plain. The steel reinforcing bars are No. 4, No. 5, or No. 6 deformed bars complying with ASTM A615, A706, A767, or A996, Grade 60.

3.2.3 Plastic Mesh Screen Tubes: The mesh screen tubes are plastic with a black driving collar at the open end. They are available in diameters and lengths as described in Section 4.1. Different lengths can be achieved by assembling multiple screen tubes together, as depicted in Figure 3.

3.3 Unreinforced 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:
Two types of anchor assemblies are available: Configuration A (shear anchor or rebar dowel) and Configuration B (22°-degree combination anchor).

4.1.1 Configuration A, Threaded Rods or Steel Reinforcing Bars in Shear (Shear Anchor or Rebar Dowel):
Configuration A is the anchor assembly resisting shear loads only. Configuration A consists of a 3/4-inch-diameter (19.1 mm), ASTM A307 threaded rod or a No. 4, No. 5 or No. 6 reinforcing bar and a 1-inch-diameter-by-8-inch-long (26 mm by 200 mm) plastic-mesh screen tube (HIT-SC 26x200). Figure 1 shows details of an installed shear-resisting assembly.

4.1.2 Configuration B, Bent Threaded Rods in Shear and Tension (22°-degree Combination Anchor): Configuration B is the anchor assembly resisting a combination of tension and shear loads. Configuration B consists of a 3/4-inch-diameter (19.1 mm), ASTM A307 threaded rod prebent at an angle of 22° degrees and a 1-inch-diameter-by-13-inch-long (26 mm by 325 mm) plastic-mesh screen tube obtained by combining 1-inch-diameter-by-8-inch-long (26 mm by 200 mm) and 1-inch-diameter-by-5-inch-long (26 mm by 125 mm) plastic-mesh screen tubes (HIT-SC 26x200 and HIT-SC 26x125). The anchor must be embedded a minimum of 13 inches (330 mm) at a downward angle of 22° degrees to the horizontal. Figure 2 shows details of an installed shear- and tension-resisting assembly.

4.2 Design:
The Hilti HIT-HY 270 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 two types of anchor assemblies described in Section 4.1 must comply with Table 2.

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

4.2.1 Configuration A, Threaded Rods or Steel Reinforcing Bars in Shear (Shear Anchor or Rebar Dowel):

a. Installation of assemblies using threaded rods or reinforcing bars intended to resist shear loads only must comply with Sections 4.1 and 4.3, and Figure 3 of this report.

b. The allowable shear load for the 3/4-inch-diameter (19.1 mm) threaded rod is 1,000 pounds (4450 N), as shown in Table 3. The allowable shear loads for the Nos. 4, 5, and 6 reinforcing bars are 500, 750, and 1,000 pounds (2225, 3338, and 4450 N), respectively, as shown in Table 3. No adjustment for wind or earthquake loading is permitted.

c. The allowable shear loads noted above are 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 in Shear and Tension (22°-degree Combination Anchor):

a. Installation of assemblies using prebent threaded rods intended to resist a combination of tension and shear loads must comply with Sections 4.1 and 4.3, and Figure 3 of this report.

b. The maximum allowable tension load for the 3/4-inch-diameter (19.1 mm) prebent threaded rod (Configuration B) is 1,200 pounds (5340 N), as shown in Table 3. No adjustment for wind or earthquake loading is permitted.

c. The maximum allowable shear load for the 3/4-inch-diameter (19.1 mm) prebent threaded rod (Configuration B) is 1,200 pounds (5340 N), as shown in Table 3. No adjustment for wind or earthquake loading is permitted.

d. The maximum allowable load for the bent rod anchors subjected to combined tension and shear loads is determined by the following equation:

\[
\frac{P_t}{P_s} + \frac{V_s}{V_t} \leq 1.0
\]

where:

- \( P_t \) = Applied tension load
- \( P_s \) = Allowable tension load
- \( V_s \) = Applied shear load
- \( V_t \) = Allowable shear load

e. The allowable tension and shear values as determined above are 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: 1-inch-diameter (25.4 mm) holes must be drilled using standard carbide-tipped masonry drill bits complying with ANSI Specification B212.15-1994. Holes must be drilled using a rotary drill or a rotary hammer drill set on “rotation only”. Impact tools are not permitted. Assembly installation must be in accordance with Section 4.3.2 or 4.3.3, and Figure 3 of this report. The adhesive must be allowed to cure for the full curing time listed in Table 1 before anchors are loaded. Cure time refers to that period of cure after which hardware may be placed and nuts tightened. Design loads may not be applied until the full curing time has transpired. Installation must not occur when masonry temperatures are below 41 °F (5 °C). The Hilti HIT HY 270 Adhesive Anchor System is intended to resist only short-term loads imposed by wind or earthquake. The anchors must be approved by the registered professional and installed under special inspection in accordance with Section 4.5 of this report. The edge distance, and vertical and horizontal spacing for all anchor configurations described in Sections 4.3.2 and 4.3.3 of this report, must comply with Table 2.

4.3.2 Configuration A: Holes for threaded rods or reinforcing bars intended to resist shear only must be drilled perpendicular to the wall to a minimum embedment depth of 8 inches (203 mm). The holes must be cleaned with a wire brush and compressed air to remove debris. The Hilti HIT-HY 270 adhesive must be injected into the supplied plastic mesh screen tube that is then inserted into the predrilled hole. The threaded rod or reinforcing bar must be inserted and pushed into the screen tube in a rotating manner to force the adhesive into the hole. Figure 1 illustrates an anchor installed in this configuration. Figure
3 illustrates the Manufacturer’s Published Installation Instructions (MPII), also referred to as Instruction for Use (IFU).

4.3.3 Configuration B: Holes for installation of assemblies using prebent threaded rods intended to resist shear and tension must be drilled at a 22 1/2-degree angle to within 1 inch (25.4 mm) of the opposing surface. The holes must be cleaned with a wire brush and compressed air to remove debris. The Hilti HIT-HY 270 adhesive must be injected into the supplied plastic mesh screen tube that is then inserted into the predrilled hole. The prebent threaded rod must be inserted and pushed into the screen tube in a rotating manner to force the adhesive into the hole. Figure 2 illustrates an anchor installed in this configuration. Figure 3 illustrates the MPII, also referred to as IFU.

4.4 Field Tests:
   a. 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 strength testing must indicate a minimum mortar strength of 50 psi (345 kPa).
   b. 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:
      1. Test location(s)
      2. Brick/mortar condition
      3. Bolt movement/elongation
      4. Embedment depth and masonry wall thickness
      5. Applied load, loading procedure, load increments, and rate of loading.

4.5 Special Inspection:
   4.5.1 IBC and IRC: Continuous special inspection must be performed 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 Hilti HIT-HY 270 Adhesive Anchoring System for Unreinforced Masonry described in this report complies with, or is a suitable alternative to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 Use and installation must be as set forth in this evaluation report and the Manufacturer’s Published Installation Instructions (MPII) illustrated in Figure 3 of this report. In case of conflict, this report governs.
5.2 Calculations and details must be submitted to the code official for approval.
5.3 Special inspection must be in accordance with Section 4.5 of this evaluation report.
5.4 Use of the anchor system must be approved by the registered design professional.
5.5 The existing mortar shall have a minimum in-place shear strength of 50 psi (345 kPa) in accordance with Section 3.3 of this report prior to installation of the adhesive anchors.
5.6 Anchors must be limited to resisting transient wind or seismic loads only.
5.7 Anchors are installed in holes predrilled with a carbide-tipped masonry drill bit complying with ANSI B212.15-1994. Impact tools must not be used for drilling holes or for tightening steel anchors or nuts.
5.8 The adhesive is not used after the expiration date stamped on the cartridge.
5.9 The Hilti HIT-HY 270 adhesive is manufactured by Hilti GmbH in Kaufering, Germany, under a quality control program with inspections by ICC-ES.
5.10 The Hilti HIT-SC screens are manufactured by Herbert Kaut GmbH & Co. KG in Sigmaringen, Germany, under a quality-control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED
Data in accordance with the ICC-ES Acceptance Criteria for Adhesive Anchors in Unreinforced Masonry Elements (AC60), dated December 2009 (editorially revised March 2015); and quality-control documentation.

7.0 IDENTIFICATION
Hilti HIT-HY 270 adhesive cartridges are identified by a label displaying the product name, company name (Hilti, Inc.), lot number, expiration date, a description of the product, the ICC-ES evaluation report number (ESR-4144), and installation instructions. The Hilti HIT-SC screens are identified by a label displaying the product name, name of the manufacturer (Hilti, Inc.), lot number, a description of the product, and installation instructions. Threaded rods, nuts, washers, and deformed reinforcing bars are standard elements and must conform to applicable national or international specifications.
### TABLE 1—HILTI’S GEL AND CURING TIMES FOR HILTI HIT-HY 270 ADHESIVE

<table>
<thead>
<tr>
<th>MINIMUM BASE MATERIAL TEMPERATURE</th>
<th>GEL TIME</th>
<th>CURING TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>°F</strong></td>
<td><strong>°C</strong></td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>5</td>
<td>10 minutes</td>
</tr>
<tr>
<td>42-50</td>
<td>6-10</td>
<td>7 minutes</td>
</tr>
<tr>
<td>51-68</td>
<td>11-20</td>
<td>4 minutes</td>
</tr>
<tr>
<td>69-86</td>
<td>21-30</td>
<td>2 minutes</td>
</tr>
<tr>
<td>87-104</td>
<td>31-40</td>
<td>1 minute</td>
</tr>
</tbody>
</table>

For SI: °C = 5/9(°F – 32).

1The temperatures listed above refer to the base-material temperature, not ambient air temperature.
2The anchors may be adjusted during the gel time following installation.
3Anchors must not be disturbed between gel time and curing time. The anchors may be loaded after the full curing time has elapsed.

### TABLE 2—SPACING AND EDGE DISTANCE REQUIREMENTS FOR HILTI HIT-HY 270 ADHESIVE INSTALLED IN UNREINFORCED BRICK MASONRY

<table>
<thead>
<tr>
<th>ANCHOR ASSEMBLY</th>
<th>MINIMUM VERTICAL SPACING (inches)</th>
<th>MINIMUM HORIZONTAL SPACING (inches)</th>
<th>MINIMUM EDGE DISTANCE (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration A, Threaded Rods or Reinforcing Bars in Shear (see Figure 1)</td>
<td>16</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Configuration B, Bent Threaded Rods in Shear and Tension (22° Combination Anchor) (see Figure 2)</td>
<td>16</td>
<td>16</td>
<td>16</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm.

### TABLE 3—ALLOWABLE TENSION AND SHEAR LOADS FOR THREADED RODS AND REINFORCING BARS FOR HILTI HIT-HY 270 ADHESIVE INSTALLED IN UNREINFORCED BRICK MASONRY

#### CONFIGURATION A – SHEAR ANCHOR OR REBAR DOWEL (FIGURE 1)

<table>
<thead>
<tr>
<th>Threaded Rod Dia. (inch) or Rebar Size</th>
<th>Minimum Embedment (inches)</th>
<th>Minimum Wall Thickness (inches)</th>
<th>Allowable Tension Load (pounds)</th>
<th>Allowable Shear Load (pounds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4</td>
<td>8</td>
<td>13</td>
<td>-</td>
<td>1,000</td>
</tr>
<tr>
<td>No. 4</td>
<td>8</td>
<td>13</td>
<td>-</td>
<td>500</td>
</tr>
<tr>
<td>No. 5</td>
<td>8</td>
<td>13</td>
<td>-</td>
<td>750</td>
</tr>
<tr>
<td>No. 6</td>
<td>8</td>
<td>13</td>
<td>-</td>
<td>1,000</td>
</tr>
</tbody>
</table>

#### CONFIGURATION B – 22° COMBINATION ANCHOR (FIGURE 2)

<table>
<thead>
<tr>
<th>Threaded Rod Dia. (inch)</th>
<th>Minimum Embedment</th>
<th>Minimum Wall Thickness (inches)</th>
<th>Allowable Tension Load (pounds)</th>
<th>Allowable Shear Load (pounds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4</td>
<td>Within 1 inch of opposite wall surface</td>
<td>13</td>
<td>1,200</td>
<td>1,000</td>
</tr>
</tbody>
</table>

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 short-term loading is permitted, such as loading induced by wind or earthquake.
3Anchors must be tested in accordance with Section 4.4 for use with the IEBC.
FIGURE 1—HILTI HIT-HY 270 ADHESIVE SHEAR ANCHOR OR DOWEL (CONFIGURATION A)

FIGURE 2—HILTI HIT-HY 270 ADHESIVE 22\(\frac{1}{2}\)° COMBINATION ANCHOR (CONFIGURATION B)
FIGURE 3—HILTI HIT-HY 270 ADHESIVE MANUFACTURER’S PUBLISHED INSTALLATION INSTRUCTIONS (MPII)
FIGURE 3—HILTI HIT-HY 270 ADHESIVE MANUFACTURER’S PUBLISHED INSTALLATION INSTRUCTIONS (MPII) (Continued)
1.0 REPORT PURPOSE AND SCOPE

Purpose:
The purpose of this evaluation report supplement is to indicate that the Hilti HIT-HY 270 Adhesive Anchor System in unreinforced masonry, described in ICC-ES master evaluation report ESR-4144, has also been evaluated for compliance with the codes noted below as adopted by the Los Angeles Department of Building and Safety (LADBS).

Applicable code editions:
- 2017 City of Los Angeles Building Code (LABC)
- 2017 City of Los Angeles Residential Code (LARC)
- 2017 City of Los Angeles Existing Building Code (LAEBBC)

2.0 CONCLUSIONS

The Hilti HIT-HY 270 Adhesive Anchor System in unreinforced masonry, described in Sections 2.0 through 7.0 of the master evaluation report ESR-4144, complies with the LABC Chapters 21 and 88, LAEBBC Appendix A Chapter A1, and the LARC, and is subject to the conditions of use described in this supplement.

3.0 CONDITIONS OF USE

The Hilti HIT-HY 270 Adhesive Anchor System in unreinforced masonry described in this evaluation report must comply with all of the following conditions:

- All applicable sections in the master evaluation report ESR-4144.
- The design, installation, conditions of use and identification of the anchors are in accordance with the 2015 International Building Code® (2015 IBC) and the 2015 International Existing Building Code® (2015 IEBC) provisions noted in the master evaluation report ESR-4144.
- The design, installation, testing and inspection are in accordance with additional requirements of LABC Chapters 16, 17, 21, 88, and LAEBBC Appendix Chapter A1, as applicable, including LABC Sections 1704, 1705, 2107, and LAEBBC Sections A106, A107, and A108.
- Under the LARC, an engineered design in accordance with LARC Section R301.1.3 and additional requirements noted in this supplement must be submitted.
- The allowable strength and design strength values listed in the master evaluation report and tables are for the connection of the anchors to the masonry. The connection between the anchors and the connected members must be checked for capacity (which may govern).

This supplement expires concurrently with the master report, issued January 2018.