

# ICC-ES Evaluation Report

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

## REPORT HOLDER:

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## EVALUATION SUBJECT:

**HILTI HIT-HY 70 ADHESIVE ANCHOR SYSTEM**

## 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)
- \* ■ ~~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.~~

### Property evaluated:

Structural

## 2.0 USES

The Hilti HIT-HY 70 Adhesive Anchor System is used to anchor building components to hollow (ungrouted) and fully grouted concrete masonry walls, and hollow (ungrouted) brick masonry walls. Threaded rods, steel reinforcing bars, and internally threaded inserts installed with Hilti HIT-HY 70 can resist static, wind, and earthquake loads, as noted in Section 4.0 of this evaluation report. The anchor system is an alternative to Section 8.1.3 (2015 IBC) or Section 2.1.4 (2012, 2009 and 2006 IBC) of TMS 402/ ACI 530/ ASCE 5 as referenced in Section 2107 of the IBC. 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 70 Adhesive Anchor System is comprised of the following components:

- Hilti HIT-HY 70 adhesive

- All-threaded steel rods, ~~steel reinforcing bars~~, or Hilti HIS steel internally threaded inserts (grout-filled concrete masonry) \*
- All-threaded rods, bolts, cap screws, studs, Hilti HIT-IC internally threaded inserts, and Hilti HIT-SC plastic-mesh screen tubes (hollow concrete masonry and hollow brick masonry)

### 3.2 Materials:

**3.2.1 Hilti HIT-HY 70 Adhesive:** The Hilti HIT-HY 70 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 their proper mixing. The injection nozzle may be replaced to permit interruptions in the use of the cartridges. Available cartridge 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 70 adhesive, and the respective masonry temperature during installation and cure, are shown in Table 1.

**3.2.2 Hole Cleaning Equipment:** Hole cleaning equipment consists of steel wire brushes and air nozzles supplied by Hilti, as illustrated in Figure 4 of this report.

**3.2.3 Threaded Steel Rods (For Use in Fully Grouted Concrete Masonry and with Plastic Mesh Screen Tubes in Hollow Masonry):** Threaded rods, having diameters described in Tables 3A through 8 of this report, must be clean, continuously threaded rods (all-thread). Carbon steel threaded rods must be in accordance with ASTM A36, ASTM A307, ASTM A193 Grade B7, ISO 898 Class 5.8. Stainless steel threaded rods must conform to ASTM F593 (AISI 304 or 316), Condition CW. Threaded steel rods must be straight and free of indentations or other defects along their lengths. The ends may be stamped with identifying marks and the embedded end may be blunt cut or cut on the bias (chisel point).

~~**3.2.4 Steel Reinforcing Bars (For Use in Fully Grouted Concrete Masonry):** Steel reinforcing bars are deformed reinforcing bars (rebar) having diameters described in Tables 3A, 3B, and 5B of this report, and must comply with~~ \*

\* ~~ASTM A615, Grade 60. The embedded portions of reinforcing bars must be straight, and free of mill scale, rust, mud, oil, and other coatings that impair the bond with the adhesive~~

**3.2.5 HIT-SC Screen Tubes:** The Hilti HIT-SC plastic-mesh screen tubes are used in hollow masonry as described in Sections 3.4, 3.5, 4.2.3, 4.2.4, and 5.6 of this report. The screens consist of a removable cap, a collar, and a plastic mesh tube.

**3.2.6 HIT-IC Inserts (For Use With Plastic Mesh Screens in Hollow Masonry):** Hilti HIT-IC are steel internally threaded inserts conforming to DIN 10277-3 and are available in  $\frac{5}{16}$ -,  $\frac{3}{8}$ -, and  $\frac{1}{2}$ -inch (7.9, 9.5, and 12.7 mm) internal thread diameters. Common threaded rods as per Section 3.2.3, or bolts, cap screws, and studs conforming to SAE J995, ASTM A563 C, C3, D, DH, DH3 Heavy Hex, and ASTM F594, can be used with internally threaded inserts.

**3.2.7 HIS-N and HIS-RN Inserts (For Use in Fully Grouted Concrete Masonry):** Hilti HIS-(R)N steel inserts have a profile on the external surface and are internally threaded. Inserts are available in  $\frac{3}{8}$ - and  $\frac{1}{2}$ -inch (9.5 and 12.7 mm) internal thread diameters. HIS-(R)N inserts are produced from carbon steel and furnished either with a 0.005-millimeter-thick (5 mm) zinc electroplated coating complying with ASTM B633 SC 1 or a hot-dipped galvanized coating complying with ASTM A153, Class C or D. The stainless steel HIS-RN inserts conform to DIN 10088-3. Common threaded rods as per Section 3.2.3, or bolts, cap screws, and studs conforming to SAE J995, ASTM A563 C, C3, D, DH, DH3 Heavy Hex, and ASTM F594 can be used with internally threaded inserts.

**3.3 Fully Grouted Concrete Masonry:** Fully grouted concrete masonry must comply with Chapter 21 of the IBC. The compressive strength of masonry,  $f_m$ , at 28 days must be a minimum of 1,500 psi (10.3 MPa). Fully grouted masonry systems must be constructed from the following materials:

**3.3.1 Concrete Masonry Units (CMUs):** CMUs must be minimum Grade N, Type 1, light-, medium-, or normal-weight conforming to ASTM C90. The minimum nominal size of the CMUs must be 8 inches wide by 8 inches high by 16 inches long.

**3.3.2 Grout:** Grout must comply with 2015 IBC Section 2103.3, 2012 IBC Section 2103.13, 2009 and 2006 IBC Section 2103.12, or 2015 IRC Section R606.2.11, 2012, 2009 ~~and 2006~~ IRC Section R609.1.1, as applicable. Alternatively, the grout must have a minimum compressive strength, when tested in accordance with ASTM C1019, equal to its specified strength, but not less than 2,000 psi (13.8 MPa).

**3.3.3 Mortar:** Mortar must be Type N (minimum) in accordance with IBC Section 2103, or 2015 IRC Section R606.2.7, or 2012, 2009 ~~and 2006~~ IRC Section R607, as applicable.

**3.4 Hollow (UngROUTED) Concrete Masonry:** Hollow concrete masonry must comply with Chapter 21 of the IBC. The compressive strength of masonry,  $f_m$ , at 28 days must be a minimum of 1,500 psi (10.3 MPa). Hollow concrete masonry walls must be constructed from the following materials:

**3.4.1 Concrete Masonry Units (CMUs):** CMUs must be minimum Grade N, Type 1, light-, medium-, or normal-weight conforming to ASTM C90. The minimum nominal size of the CMUs must be 8 inches wide by 8 inches high by 16 inches long.

**3.4.2 Mortar:** Mortar must be Type N (minimum) in accordance with IBC Section 2103, or 2015 IRC Section R606.2.7 or 2012, 2009 and 2006 IRC Section R607, as applicable.

**3.5 Hollow Brick Masonry:** Hollow brick masonry must comply with Chapter 21 of the IBC. The compressive strength of masonry,  $f_m$ , at 28 days must be a minimum of 3,000 psi (20.7 MPa). Hollow brick masonry walls must be a minimum of two-wythes in thickness, and constructed from the following materials:

**3.5.1 Brick Masonry Units:** Hollow brick masonry must be constructed using hollow bricks conforming to ASTM C652, Grade SW. The minimum nominal size of the brick masonry units must be  $3\frac{5}{8}$  inches (92 mm) wide by  $2\frac{1}{4}$  inches (57 mm) high by  $7\frac{5}{8}$  inches (194 mm) long.

**3.5.2 Mortar:** Mortar must be Type N (minimum) in accordance with IBC Section 2103, or 2015 Section R606.2.7 or 2012, 2009 ~~and 2006~~ IRC Section R607, as applicable.

## 4.0 DESIGN AND INSTALLATION

### 4.1 Design:

**4.1.1 General:** Anchors described in this report are assigned allowable tension and shear load values based on allowable stress design (ASD), as an alternative to TMS 402/ ACI 530/ ASCE 5 Section 2.1.4. For use under the IRC, an engineered design in accordance with Section R301.1.3 must be submitted to the code official. The allowable tension and shear values reported herein must be adjusted in accordance with Figure 1 for in-service base-material temperatures in excess of 70°F (21°C). Anchors installed or cured at temperatures below 23°F (-5°C) are outside the scope of this report. Allowable tension and shear loads based on steel strength for threaded rods are described in Table 10, ~~and for reinforcing bars are described in Table 11.~~

Allowable stress design tension and shear load values in Tables 3A, 3B, 5A and 5B may be used for resistance to short-term loads such as wind and seismic, in accordance with Section 5.5 and Table 2 of this report. Use of the values in the remaining tables for seismic loads is beyond the scope of this report. Use of the values in the remaining tables may be used for short-term loading due to wind forces; however, the allowable loads must not be increased.

**4.1.2 Combined Loading:** Allowable loads for anchors installed in masonry and subjected to combined tension and shear forces must be determined by the following formula:

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

where:

$P_s$  = Applied service tension load (lbf or kN).

$P_t$  = Allowable service tension load (lbf or kN).

$V_s$  = Applied service shear load (lbf or kN).

$V_t$  = Allowable service shear load (lbf or kN).

$n = \frac{5}{3}$  for the  $\frac{3}{8}$ - and  $\frac{1}{2}$ -inch-diameter steel threaded rods, No. 3 and No. 4 reinforcing bars, and  $\frac{3}{8}$ - and  $\frac{1}{2}$ -inch-diameter Hilti HIS steel internally threaded inserts installed in the face of grout filled concrete masonry.

$n = 1$  for the  $\frac{5}{8}$ - and  $\frac{3}{4}$ -inch-diameter steel threaded rods and No. 5 and No. 6 reinforcing bars installed

in the face of grout filled concrete masonry, and all diameters of threaded rod and reinforcing bar installed in the top of grout filled concrete masonry, and all threaded rods and inserts in hollow (ungrouted) concrete masonry, and brick masonry.

\* **4.1.3 Design of Threaded Rods and Reinforcing Bars Installed in the Face of Fully Grouted CMU Walls:**

Allowable tension and shear load values for  $\frac{3}{8}$ -,  $\frac{1}{2}$ -,  $\frac{1}{2}$ -, and  $\frac{3}{4}$ -inch-diameter (9.5, 12.7, 15.9, and 19.1 mm) steel threaded rods and No. 3, 4, 5, and 6 reinforcing bars installed in the face of grout-filled CMU walls are reported in Tables 3A and 3B. The allowable tension and shear loads are for anchors installed in any location in the face of the grout-filled CMU walls (cell, web, joints), and resisting static, wind, or earthquake loads. Critical and minimum spacing and edge distances, with appropriate reduction factors, are given in Tables 3A and 3B and shown in Figure 2.

\* **4.1.4 Design of Threaded Rods and Reinforcing Bars Installed in the Top of Fully Grouted CMU Walls:**

Allowable tension and shear load values for  $\frac{1}{2}$ - and  $\frac{5}{8}$ -inch-diameter (12.7 mm and 15.9 mm) steel threaded rods and No. 4 and No. 5 reinforcing bars installed in the top of grout-filled CMU walls and resisting static, wind, or earthquake loads are reported in Table 5A and Table 5B, respectively. Minimum edge and end distances are noted in Table 5A and Table 5B and shown in Figure 3.

**4.1.5 Design of HIS-N and HIS-RN Inserts Installed in the Face of Fully Grouted CMU Walls:** Allowable tension and shear load values for  $\frac{3}{8}$ -inch and  $\frac{5}{8}$ -inch (9.5 and 12.7 mm) HIS-N and HIS-RN internally threaded inserts installed in the face of fully grouted CMU walls are reported in Tables 4A and 4B. The allowable tension and shear loads are for HIS-(R)N inserts installed in any location in the face of the fully grouted CMU walls (cell, web, joints), and resisting static and wind load applications only. Use of these anchors to resist earthquake loads is outside the scope of this report. Critical and minimum spacing and edge distances, with appropriate reduction factors, are also given in Tables 4A and 4B.

**4.1.6 Design of Anchors in Hollow Concrete Masonry Walls:** Allowable tension and shear load values for  $\frac{1}{4}$ -,  $\frac{5}{16}$ -,  $\frac{3}{8}$ -,  $\frac{1}{2}$ -inch-diameter (6.4, 7.9, 9.5, 12.7 mm) steel threaded rods and  $\frac{5}{16}$ -inch,  $\frac{3}{8}$ -inch, and  $\frac{1}{2}$ -inch (7.9, 9.5, 12.7 mm) HIT-IC internally threaded inserts installed with Hilti HIT-SC plastic screens through the face of hollow concrete masonry walls are reported in Tables 6 and 7. The allowable tension and shear loads are for anchors resisting static and wind load applications only. Use of these anchors to resist earthquake loads is outside the scope of this report. Critical and minimum spacing and edge distances are also given in Tables 6 and 7.

**4.1.7 Design of Anchors in Hollow Brick Masonry Walls:** Allowable tension and shear load values for  $\frac{1}{4}$ -,  $\frac{5}{16}$ -,  $\frac{3}{8}$ -,  $\frac{1}{2}$ -inch-diameter (6.4, 7.9, 9.5, 12.7 mm) steel threaded rods and  $\frac{5}{16}$ -inch,  $\frac{3}{8}$ -inch, and  $\frac{1}{2}$ -inch (7.9, 9.5, 12.7 mm) HIT-IC internally threaded inserts installed with Hilti HIT-SC plastic screens through the face of hollow brick masonry walls are reported in Tables 8 and 9. The allowable tension and shear loads are for anchors resisting static and wind load applications only. Use of these anchors to resist earthquake loads is outside the scope of this report. Critical and minimum spacing and edge distances are also given in Tables 8 and 9.

## 4.2 Installation:

**4.2.1 General:** Installation of the Hilti HIT-HY 70 Adhesive Anchor System must conform to the

manufacturer's printed installation instructions (MPII) included in each unit package, and depicted in Figure 4 of this report. In case of conflict, this report governs. The adhesive must be allowed to cure for the full curing time listed in Table 1 before anchors are loaded. Anchors must not be disturbed after the gel time has elapsed until the full curing time has been reached. Design loads may not be applied until the full curing time has transpired. Installations in masonry at temperatures below 23°F (-5°C) are outside the scope of this report. Anchors must not be installed until the base material has reached its minimum specified compressive strength. Base material type and strength, drill hole diameter, embedment depth, spacing, and edge distance must comply with the requirements of this report.

**4.2.2 Installation in Fully Grouted CMU Walls:** Anchor locations must comply with this report and the plans and specifications approved by the code official. Holes for installation of the threaded rod, reinforcing bars, or the HIS insert into grouted concrete masonry must be drilled using an electro-pneumatic hammer drill set in "rotation plus hammer" mode and a carbide-tipped drill bit complying with ANSI B212.15-1994. Holes must be cleaned of dust and debris by blowing with oil-free compressed air, brushing with a wire brush two times, and again blowing with compressed air to achieve a relatively dust-free wall surface. Holes may be dry or damp but must not contain any water at the time of anchor installation. The dual cartridge is self-opening, and the adhesive is dispensed through an injection nozzle equipped with an internal mixing element that is attached to the cartridge manifold to ensure proper mixing of the components; material from the first two (330 mL foil pack) or the first three (500 mL foil pack) "trigger pulls" must be discarded to ensure that only properly mixed products are used. The injection nozzle may be replaced to permit interruptions in the use of the cartridge. The injection nozzle must always be equipped with the internal mixing element. The injection nozzle must be as manufactured by Hilti for the HIT-HY 70 Adhesive Anchor System. Holes must be filled approximately two-thirds full with the mixed adhesive, with injection from the bottom of the hole toward the top. The threaded rod or the HIS insert must be twisted in a clockwise motion as it is inserted into the hole to the required embedment depth. After insertion of the anchor element, the hole must be completely full with no gaps present between the anchor element and the wall of the hole. The anchor position may be adjusted only during the gel time shown in Table 1. Anchors are permitted to be loaded to the design load only after the cure time shown in Table 1 has elapsed. Section 5.12 provides additional information regarding base material temperature. The manufacturer's printed installation instructions (MPII) is provided in Figure 4 of this report.

**4.2.3 Installation in Hollow Concrete Masonry:** Anchor locations must comply with this report and the plans and specifications approved by the code official. Holes for installation of the threaded rod or the HIT-IC insert into hollow concrete masonry must be drilled using an electro-pneumatic hammer drill set in "rotation only" mode and a carbide-tipped drill bit complying with ANSI B212.15-1994. Holes must be cleaned of dust and debris by blowing with a manual pump or compressed air, brushing with a wire brush two times, and again blowing with a manual pump or compressed air. The dual cartridge is self-opening, and the adhesive is dispensed through an injection nozzle equipped with an internal mixing element that is attached to the cartridge manifold to ensure proper mixing of the components; material from the first two (330 mL foil pack) or the first three (500 mL foil pack) "trigger pulls" must be discarded to ensure that only properly mixed products are



used. The injection nozzle may be replaced to permit interruptions in the use of the cartridge. The injection nozzle must always be equipped with the internal mixing element. The injection nozzle must be as manufactured by Hilti for the HIT-HY 70 Adhesive Anchor System. The HIT-HY 70 adhesive must be injected into a Hilti HIT-SC plastic screen tube placed inside the drilled hole. The injection must start from the internal side of the driving cap until the tube is completely full. Steel mesh screen tubes for use with anchors installed in hollow masonry are outside the scope of this report. A threaded rod (or a HIT-IC insert), which is free of dirt, grease, oil, or other foreign material, must be pushed into the screen, while being turned slightly, to the required embedment depth (or until the HIT-IC insert is flush with the external surface) to ensure complete coating of the anchor. After insertion of the anchor element, the hole must be completely full with no gaps present between the anchor element and the wall of the hole. The anchor position may be adjusted only during the gel time shown in Table 1. Anchors are permitted to be loaded to the design load only after the cure time shown in Table 1 has elapsed. Section 5.12 provides additional information regarding base-material temperature. The manufacturer's printed installation instructions (MPII) are provided in Figure 4 of this report.

**4.2.4 Installation in Hollow Brick Masonry:** Anchor locations must comply with this report and the plans and specifications approved by the code official. Holes for installation of the threaded rod or the HIT-IC insert into hollow brick masonry must be drilled using an electro-pneumatic hammer drill set in "rotation plus hammer" mode and a carbide-tipped drill bit complying with ANSI B212.15-1994. Holes must be cleaned of dust and debris by blowing with a manual pump or compressed air, brushing with a wire brush two times, and again blowing with a manual pump or compressed air. The dual cartridge is self-opening, and the adhesive is dispensed through an injection nozzle equipped with an internal mixing element that is attached to the cartridge manifold to ensure proper mixing of the components; material from the first two (330 mL foil pack) or the first three (500 mL foil pack) "trigger pulls" must be discarded to ensure that only properly mixed products are used. The injection nozzle may be replaced to permit interruptions in the use of the cartridge. The injection nozzle must always be equipped with the internal mixing element. The injection nozzle must be as manufactured by Hilti for the HIT-HY 70 Adhesive Anchor System. The HIT-HY 70 adhesive must be injected into a Hilti HIT-SC plastic screen tube placed inside the drilled hole. The injection must start from the internal side of the driving cap until the tube is completely full. Steel mesh screen tubes for use with anchors installed in hollow brick masonry are outside the scope of this report. A threaded rod (or an HIT-IC insert), which is free of dirt, grease, oil, or other foreign material, must be pushed into the screen, while being turned slightly, to the required embedment depth (or until the HIT-IC insert is flush with the external surface) to ensure complete coating of the anchor. After insertion of the anchor element, the hole must be completely full with no gaps present between the anchor element and the wall of the hole. The anchor position may be adjusted only during the gel time shown in Table 1. Anchors are permitted to be loaded to the design load only after the cure time shown in Table 1 has elapsed. Section 5.12 provides additional information regarding base material temperature. The manufacturer's printed installation instructions (MPII) are provided in Figure 4 of this report.

### 4.3 Special Inspection

Periodic special inspections are required in accordance with IBC Sections 1704 and 1705, and are also applicable for installations under the IRC.

The approved special inspector must be on the jobsite initially during anchor installation to verify anchor type, anchor dimensions, adhesive identification and expiration date, masonry type, masonry compressive strength, hole dimensions, hole cleaning procedures, anchor spacing, edge distances, masonry wall thickness, anchor embedment, tightening torque, base-material temperature, and adherence to the manufacturer's printed installation instructions (MPII).

The special inspector must verify the initial installations of each type and size of adhesive anchor by construction personnel on the site.

Subsequent installations of the same anchor type and size by the same construction personnel are permitted to be performed in the absence of the special inspector. Any change in the anchor product being installed or the personnel performing the installation requires an initial inspection. For ongoing installations over an extended period, the special inspector must make regular inspections to confirm correct handling and installation of the product.

### 5.0 CONDITIONS OF USE

The Hilti HIT-HY 70 Adhesive Anchor System 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** The Hilti HIT-HY 70 Adhesive Anchor System must be installed in accordance with the manufacturer's printed installation instructions (MPII) and this report. In case of conflict, this report governs.
- 5.2** Anchor sizes, dimensions, and minimum embedment depths must be as set forth in this report.
- 5.3** Prior to installation, calculations and details demonstrating compliance with this report must be submitted to the code official for approval. The calculations must be prepared by a registered design professional when required by the statutes of the jurisdiction in which the project is to be constructed.
- 5.4** Anchors resisting static, seismic or wind loads in masonry must be designed in accordance with Section 4.0 of this report.
- 5.5** Grout-filled concrete masonry under the IBC or the IRC (Tables 3A, 3B, 5A, and ~~5B~~): The adhesive anchors described in Sections 4.1.3 and 4.1.4 of this evaluation report are capable of resisting seismic and wind loads. When using the basic load combinations in accordance with IBC Section 1605.3.1, allowable loads must not be increased for seismic or wind loading. When using the alternative basic load combinations in 2009 and 2006 IBC Section 1605.3.2 that include seismic or wind loads, the allowable loads may be increased in accordance with Table 2, or the alternative basic load combinations may be decreased by the factors in Table 2, as applicable. For the 2015 and 2012 IBC, the allowable loads or load combinations must not be adjusted. \*
- 5.6** HIS-N and HIS-RN inserts (Tables 4A and 4B), hollow concrete masonry (tables 6 and 7), and hollow brick

masonry (Tables 8 and 9) under the IBC or the IRC: Use of the adhesive anchors described in Sections 4.1.5, 4.1.6, and 4.1.7 for resistance to seismic loads is beyond the scope of this report. The allowable loads or load combinations for these anchors must not be adjusted for applications subjected to wind loads.

- 5.7 Since an ICC-ES acceptance criteria for evaluating data to determine the performance of adhesive anchors subjected to fatigue or shock loading is unavailable at this time, the use of these anchors under these conditions is beyond the scope of this report.
- 5.8 The Hilti HIT-HY 70 Adhesive Anchor Systems 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 describes load reduction factors for elevated temperatures.
- 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 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.
- 5.10 Since an ICC-ES acceptance criteria for evaluating the performance of adhesive anchors in cracked masonry is unavailable at this time, the use of anchors is limited to installation in uncracked masonry. Cracking occurs when  $f_t > f_r$  due to service loads or deformations.
- 5.11 Use of Hilti HIT-HY 70 Adhesive Anchor System in conjunction with uncoated or zinc electroplated carbon steel threaded rods or steel reinforcing bars must be limited to interior exposure. Use of stainless steel (AISI 304 or 316) anchors or hot dipped galvanized anchors with a zinc coating conforming to ASTM A153, Class C or D, is permitted for exterior or damp environments.
- 5.12 The Hilti HIT-HY 70 Adhesive Anchor System may be installed in base materials having interior temperatures between 23°F (-5°C) and 104°F (40°C) at the time of installation. Installation of HIT-HY 70 adhesive in base materials having temperatures beyond this range is outside the scope of this report.
- 5.13 When anchors are located where the base-material temperature may exceed 70°F (21°C), allowable tension and shear loads indicated in this report must be adjusted for in-service temperatures in accordance with Figure 1. The use of HIT-HY 70 adhesive in base materials having interior temperatures exceeding 180°F (82°C) during their service life is outside the scope of this report.
- 5.14 Steel anchoring materials in contact with preservative-treated wood or fire-retardant-treated wood must be

stainless steel or hot-dipped galvanized in accordance with ASTM A153 Class C or D.

- 5.15 Special inspection in accordance with Section 4.3 of this report must be provided for all anchor installations.
- 5.16 The Hilti HIT-HY 70 Adhesive Anchor Systems must be installed in holes created using a carbide-tipped masonry drill bit manufactured within the range of the maximum and minimum dimensions of ANSI B212.15-1994.
- 5.17 The Hilti HIT-HY 70 adhesive is manufactured by Hilti GmbH at their facilities in Kaufering, Germany, under a quality control program with inspections by ICC-ES.
- 5.18 The Hilti HIT-SC plastic screens are manufactured by Hilti Kunststofftechnik GmbH, Nersingen, Germany, with quality control inspections by ICC-ES.
- 5.19 The Hilti HIT-IC inserts are manufactured by Hilti (China) Ltd., Guangdong, China, with quality control inspections by ICC-ES.
- 5.20 The Hilti HIS-N and HIS-RN inserts are manufactured by Hilti (China) Ltd., Guangdong, China, with quality control inspections by ICC-ES.

## 6.0 EVIDENCE SUBMITTED

- 6.1 Data in accordance with the ICC-ES Acceptance Criteria for Adhesive Anchors in Masonry Elements (AC58), dated November 2015, including tests on the effects of edge distance on tension performance (Test Series 4 and 5); the effects of spacing on tension performance (Test Series 8 and 9), the effects of spacing on shear performance; the effects of edge distance on shear performance (Test Series 13 and 14) for installations in grout-filled CMU, hollow concrete, and hollow brick masonry walls; the effects of oblique tension loading (Test Series 15); and suitability tests (Test Series 17 through 21) for installations in grout-filled CMU walls.
- 6.2 A quality-control manual.

## 7.0 IDENTIFICATION

- 7.1 The Hilti HIT-HY 70 adhesive cartridges are identified by a label displaying the product name, name of the manufacturer (Hilti, Inc.), lot number, expiration date, description of the product, evaluation report number (ICC-ES ESR-2682)..
- 7.2 The Hilti HIT-SC plastic screens are identified by a packaging label displaying the product name, name of the manufacturer (Hilti Inc.), description of the product, evaluation report number (ICC-ES ESR-2682).
- 7.3 The Hilti HIS-N and HIS-RN inserts are identified by a packaging label displaying the product name, name of the manufacturer (Hilti Inc.), description of the product, evaluation report number (ICC-ES ESR-2682).
- 7.4 The Hilti HIT-IC inserts are identified by a packaging label displaying the product name, name of the manufacturer (Hilti Inc.), description of the product, evaluation report number (ICC-ES ESR-2682).
- 7.5 Threaded rods, ~~reinforcing bars~~, nuts, washers, bolts, cap screws, and studs are standard elements and must conform to applicable national or international specifications and this report. \*

TABLE 1—HILTI, INC., GEL AND CURE TIMES FOR HIT-HY 70 ADHESIVE

| Base-Material Temperature |         | Approximate Gel Time <sup>1</sup> | Approximate Curing Time <sup>1</sup> |
|---------------------------|---------|-----------------------------------|--------------------------------------|
| °F                        | °C      |                                   |                                      |
| 23 – 32                   | -5 – 0  | 10 Minutes                        | 6 hours                              |
| 33 – 41                   | 1 – 5   | 10 Minutes                        | 4 hours                              |
| 42 – 50                   | 6 – 10  | 7 Minutes                         | 2.5 hours                            |
| 51 – 68                   | 11 – 20 | 4 Minutes                         | 1.5 hours                            |
| 69 – 86                   | 21 – 30 | 2 Minutes                         | 30 minutes                           |
| 87 – 104                  | 31 – 40 | 1 Minutes                         | 20 minutes                           |

For SI:  $t^{\circ}\text{C} = 5/9 \cdot (t^{\circ}\text{F} - 32^{\circ}\text{F})$

<sup>1</sup> Sections 4.2.1 of this report describes the significance of gel time and curing time in anchor installations.

TABLE 2—ALTERNATIVE BASIC LOAD COMBINATION ADJUSTMENT FACTORS<sup>1,2,3</sup>

| Steel Type                         | Modification Factors                             |                 |   |                 |
|------------------------------------|--|-----------------|---|-----------------|
|                                    | Reductions for Alternate Basic Load Combinations |                 | Increase Factor for Allowable Loads for Short-term Loading Conditions |                 |
|                                    | Tension  | Shear           | Tension   | Shear           |
| Standard threaded rods and inserts | 0.75   | 0.75            | 1.33  | 1.33            |
| High-strength rods                 | 0.75   | 1               | 1.33  | 1               |
| Stainless rods and inserts         | 0.75   | 0.87            | 1.33  | 1.14            |
| <del>Steel reinforcing bars</del>  | <del>0.75</del>                                  | <del>0.75</del> | <del>1.33</del>   | <del>1.33</del> |

<sup>1</sup> When using the basic load combinations in accordance with IBC Section 1605.3.1, allowable loads must not be increased for wind or seismic loading.

<sup>2</sup> When using the alternative basic load combinations in the 2009 or 2006 IBC Section 1605.3.2 that include wind or seismic loads, the allowable loads for anchors may be increased by the tabulated factors found in the right half of the table. Alternatively, the alternate basic load combinations may be reduced by multiplying them by the reduction factors found in the left half of the table. For example, for stainless steel rods in shear, the alternate basic loads for wind or seismic may be multiplied by 0.87 for shear loading or divided by 1.14 ( $1/1.14 = 0.87$ ), as applicable. For the 2015, 2012 IBC, the allowable loads or load combinations must not be adjusted.

\* <sup>3</sup> The above modification factors are applicable under the 2009 or 2006 IBC only, for Tables 3A, 3B, 5A and 5B of this report for seismic loads, and Tables 3A, 3B, 4A, 4B, 5, 6, 7, 8, 9, 10, and 11 of this report for wind loads.

\* **TABLE 3A—ALLOWABLE ADHESIVE BOND TENSION LOADS FOR THREADED RODS AND REINFORCING BARS IN THE FACE OF GROUT-FILLED CONCRETE MASONRY UNITS (POUNDS)**<sup>1,2,7,8,9,11,12,13</sup>

| Anchor Diameter (inches), or Rebar Size        | Embedment (inches) <sup>3</sup> | Load @ $c_{cr}$ and $s_{cr}$ | Spacing <sup>4</sup>        |                             |   | Edge Distance <sup>5</sup>  |                             |   |
|--|---------------------------------|------------------------------|-----------------------------|-----------------------------|---|-----------------------------|-----------------------------|---|
|  |                                 |                              | Critical, $s_{cr}$ (inches) | Minimum, $s_{min}$ (inches) | Load Reduction Factor at $s_{min}$ <sup>6</sup> | Critical, $c_{cr}$ (inches) | Minimum, $c_{min}$ (inches) | Load Reduction Factor at $c_{min}$ <sup>6</sup> |
| * <del><math>\frac{3}{8}</math> or No. 3</del> | $3\frac{3}{8}$                  | 1240                         | 13.5                        | 4                           | 0.70  | 12                          | 4                           | 0.80  |
| * <del><math>\frac{1}{2}</math> or No. 4</del> | $4\frac{1}{2}$                  | 2035                         | 18                          | 4                           | 0.70  | 20                          | 4                           | 0.76  |
| * <del><math>\frac{5}{8}</math> or No. 5</del> | $5\frac{5}{8}$                  | 2840                         | 22.5                        | 4                           | 0.50  | 20                          | 4                           | 0.71  |
| * <del><math>\frac{3}{4}</math> or No. 6</del> | $6\frac{3}{4}$                  | 3810                         | 27                          | 4                           | 0.50  | 20                          | 4                           | 0.66  |

\* **TABLE 3B—ALLOWABLE ADHESIVE BOND SHEAR LOADS FOR THREADED RODS AND REINFORCING BARS IN THE FACE OF GROUT-FILLED CONCRETE MASONRY UNITS (POUNDS)**<sup>1,2,7,8,9,10,11,12,13</sup>

| Anchor Diameter (inches)                       | Embedment (inches) <sup>3</sup> | Load @ $c_{cr}$ and $s_{cr}$ | Spacing <sup>4</sup>        |                             |   | Edge Distance <sup>5</sup>  |                             |   |                       |
|--|---------------------------------|------------------------------|-----------------------------|-----------------------------|---|-----------------------------|-----------------------------|---|-----------------------|
|  |                                 |                              | Critical, $s_{cr}$ (inches) | Minimum, $s_{min}$ (inches) | Load Reduction Factor at $s_{min}$ <sup>6</sup> | Critical, $c_{cr}$ (inches) | Minimum, $c_{min}$ (inches) | Load Reduction Factor at $c_{min}$ <sup>6</sup> |                       |
|  |                                 |                              |                             |                             |   |                             |                             | Load Perpendicular to Edge                      | Load Parallel to Edge |
| * <del><math>\frac{3}{8}</math> or No. 3</del> | $3\frac{3}{8}$                  | 850                          | 13.5                        | 4                           | 1.00  | 12                          | 4                           | 0.88  | 1.00                  |
| * <del><math>\frac{1}{2}</math> or No. 4</del> | $4\frac{1}{2}$                  | 1495                         | 18                          | 4                           | 1.00  | 12                          | 4                           | 0.49  | 1.00                  |
| * <del><math>\frac{5}{8}</math> or No. 5</del> | $5\frac{5}{8}$                  | 2615                         | 22.5                        | 4                           | 0.50  | 20                          | 4                           | 0.40  | 0.78                  |
| * <del><math>\frac{3}{4}</math> or No. 6</del> | $6\frac{3}{4}$                  | 4090                         | 27                          | 4                           | 0.50  | 20                          | 4                           | 0.26  | 0.60                  |

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

The following footnotes apply to both Tables 3A and 3B:

- <sup>1</sup> All values are for anchors installed in fully grouted concrete masonry with minimum masonry strength of 1500 psi. Concrete masonry units must be light-, medium-, or normal-weight conforming to ASTM C90. Allowable loads have been calculated using a safety factor of 5.
- <sup>2</sup> Anchors may be installed in any location in the face of the masonry wall (cell, web, joints). Anchors are limited to one per masonry cell.
- <sup>3</sup> Embedment depth is measured from the outside face of the concrete masonry unit.
- <sup>4</sup> The critical spacing,  $s_{cr}$ , is the anchor spacing where full load values in the table may be used. The minimum spacing,  $s_{min}$ , is the minimum anchor spacing for which values are available and installation is recommended. Spacing is measured from the center of one anchor to the center of an adjacent anchor.
- <sup>5</sup> The critical edge distance,  $c_{cr}$ , is the edge distance where full load values in the table may be used. The minimum edge distance,  $c_{min}$ , is the minimum edge distance for which values are available and installation is permitted. Edge distance is measured from the center of the anchor to the closest edge (See Figure 2).
- <sup>6</sup> Load reduction factors are multiplicative; both spacing and edge distance load reduction factors must be considered.
- <sup>7</sup> Load values for anchors installed at less than  $s_{cr}$  and  $c_{cr}$  must be multiplied by the appropriate load reduction factor based on actual edge distance ( $c$ ) or spacing ( $s$ ).
- <sup>8</sup> Linear interpolation of load values between minimum spacing ( $s_{min}$ ) and critical spacing ( $s_{cr}$ ) and between minimum edge distance ( $c_{min}$ ) and critical edge distance ( $c_{cr}$ ) is permitted.
- <sup>9</sup> Concrete masonry thickness must be equal to or greater than 1.5 times the anchor embedment depth. EXCEPTION: the  $\frac{5}{8}$ -inch- and the  $\frac{3}{4}$ -inch-diameter anchors and No.5 and No. 6 reinforcing bars may be installed in minimum nominally 8-inch-thick concrete masonry.
- <sup>10</sup> When using the basic load combinations in accordance with IBC Section 1605.3.1, tabulated allowable loads must not be increased for seismic or wind loading. When using the alternative basic load combinations in the 2009 or 2006 IBC Section 1605.3.2 that include seismic or wind loads, tabulated allowable loads may be increased, or the alternative basic load combinations may be reduced according to Table 2. For the 2015 and 2012 IBC, the allowable loads or load combinations must not be adjusted.
- <sup>11</sup> Allowable loads must be the lesser of the adjusted masonry or bond values tabulated above and the steel values given in Table 10.
- <sup>12</sup> Tabulated allowable bond loads must be adjusted for increased base material temperatures in accordance with Figure 1, as applicable.
- <sup>13</sup> For combined loading, see Section 4.1.2.

**TABLE 4A—ALLOWABLE ADHESIVE BOND TENSION LOADS FOR HIS-N AND HIS-RN INSERTS IN THE FACE OF GROUT-FILLED CONCRETE MASONRY UNITS (POUNDS)**<sup>1,2,7,8,9,10,11,12, 13</sup>

| Anchor Diameter (inches)    | Embedment (inches) <sup>3</sup> | Load @ c <sub>cr</sub> and s <sub>cr</sub> | Spacing <sup>4</sup>               |                                    |   | Edge Distance <sup>5</sup>         |                                    |   |
|-----------------------------|---------------------------------|--|------------------------------------|------------------------------------|---|------------------------------------|------------------------------------|---|
|                             |                                 |  | Critical, s <sub>cr</sub> (inches) | Minimum, s <sub>min</sub> (inches) | Load Reduction Factor @ s <sub>min</sub> <sup>6</sup> | Critical, c <sub>cr</sub> (inches) | Minimum, c <sub>min</sub> (inches) | Load Reduction Factor @ c <sub>min</sub> <sup>6</sup> |
| <sup>3</sup> / <sub>8</sub> | 4 <sup>1</sup> / <sub>4</sub>   | 2075                                       | 17                                 | 4                                  | 0.55  | 12                                 | 4                                  | 0.82  |
| <sup>1</sup> / <sub>2</sub> | 5                               | 2710                                       | 20                                 | 4                                  | 0.55  | 20                                 | 4                                  | 0.63  |

**TABLE 4B—ALLOWABLE ADHESIVE BOND SHEAR LOADS FOR HIS-N AND HIS-RN INSERTS IN THE FACE OF GROUT-FILLED CONCRETE MASONRY UNITS (POUNDS)**<sup>1,2,7,8,9,10,11,12, 13</sup>

| Anchor Diameter (inches)    | Embedment (inches) <sup>3</sup> | Load @ c <sub>cr</sub> and s <sub>cr</sub> | Spacing <sup>4</sup>               |                                    |   | Edge Distance <sup>5</sup>         |                                    |   |                       |
|-----------------------------|---------------------------------|--|------------------------------------|------------------------------------|---|------------------------------------|------------------------------------|---|-----------------------|
|                             |                                 |  | Critical, s <sub>cr</sub> (inches) | Minimum, s <sub>min</sub> (inches) | Load Reduction Factor @ s <sub>min</sub> <sup>6</sup> | Critical, c <sub>cr</sub> (inches) | Minimum, c <sub>min</sub> (inches) | Load Reduction Factor @ c <sub>min</sub> <sup>6</sup> |                       |
|                             |                                 |  |                                    |                                    |   |                                    |                                    | Load Perpendicular to Edge                            | Load Parallel to Edge |
| <sup>3</sup> / <sub>8</sub> | 4 <sup>1</sup> / <sub>4</sub>   | 1100                                       | 17                                 | 4                                  | 0.74  | 12                                 | 4                                  | 0.72  | 1.00                  |
| <sup>1</sup> / <sub>2</sub> | 5                               | 2065                                       | 20                                 | 4                                  | 0.71  | 20                                 | 4                                  | 0.40  | 0.87                  |

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

The following footnotes apply to both Tables 4A and 4B:

- <sup>1</sup> All values are for anchors installed in fully grouted concrete masonry walls with minimum masonry strength of 1500 psi. Concrete masonry units must be light-, medium-, or normal-weight conforming to ASTM C90. Allowable loads have been calculated using a safety factor of 5.
- <sup>2</sup> Anchors may be installed in any location in the face of the masonry wall (cell, web, joints). Anchors are limited to one per masonry cell.
- <sup>3</sup> Embedment depth is measured from the outside face of the concrete masonry unit.
- <sup>4</sup> The critical spacing, s<sub>cr</sub>, is the anchor spacing where full load values in the table may be used. The minimum spacing, s<sub>min</sub>, is the minimum anchor spacing for which values are available and installation is recommended. Spacing is measured from the center of one anchor to the center of an adjacent anchor.
- <sup>5</sup> The critical edge distance, c<sub>cr</sub>, is the edge distance where full load values in the table may be used. The minimum edge distance, c<sub>min</sub>, is the minimum edge distance for which values are available and installation is permitted. Edge distance is measured from the center of the anchor to the closest edge (See Figure 2).
- <sup>6</sup> Load reduction factors are multiplicative; both spacing and edge distance load reduction factors must be considered.
- <sup>7</sup> Load values for anchors installed at less than s<sub>cr</sub> and c<sub>cr</sub> must be multiplied by the appropriate load reduction factor based on actual edge distance (c) or spacing (s).
- <sup>8</sup> Linear interpolation of load values between minimum spacing (s<sub>min</sub>) and critical spacing (s<sub>cr</sub>) and between minimum edge distance (c<sub>min</sub>) and critical edge distance (c<sub>cr</sub>) is permitted.
- <sup>9</sup> Concrete masonry thickness must be equal to or greater than 1.5 times the anchor embedment depth.
- <sup>10</sup> Anchors are not recognized for resisting earthquake forces. When using the basic load combinations in accordance with IBC Section 1605.3.1, or the alternative basic load combinations in IBC Section 1605.3.2, tabulated allowable loads must not be increased for wind loading.
- <sup>11</sup> Allowable loads must be the lesser of the adjusted masonry or bond values tabulated above and the steel values given in Table 10.
- <sup>12</sup> Tabulated allowable bond loads must be adjusted for increased base material temperatures in accordance with Figure 1, as applicable.
- <sup>13</sup> For combined loading, see Section 4.1.2.



**TABLE 5A—ALLOWABLE ADHESIVE BOND TENSION AND SHEAR LOADS FOR THREADED RODS IN THE TOP OF GROUT-FILLED MASONRY UNITS (POUNDS)**<sup>1,2,3,4,8</sup>

| Anchor Diameter (inches) | Embedment (inches) | Edge Distance <sup>5,6</sup> (inches) | Minimum End Distance (inches) | Tension Load <sup>7</sup> | Shear Load <sup>7</sup>               |  |
|--------------------------|--------------------|---------------------------------------|-------------------------------|---------------------------|---------------------------------------|--|
|                          |                    |                                       |                               |                           | Load Parallel to Edge of Masonry Wall | Load Perpendicular to Edge of Masonry Wall |
| 1/2                      | 4 1/2              | 1 3/4                                 | 8                             | 1165                      | 815                                   | 345  |
|                          |                    | 4                                     |                               | 1625                      | 1445                                  | 505  |
| 5/8                      | 5 5/8              | 1 3/4                                 |                               | 1165                      | 1190                                  | 385  |
|                          |                    | 4                                     |                               | 1590                      | 1825                                  | 655  |

**TABLE 5B—ALLOWABLE ADHESIVE BOND TENSION AND SHEAR LOADS FOR REINFORCING BARS IN THE TOP OF GROUT-FILLED MASONRY UNITS (POUNDS)**<sup>1,2,3,4,8</sup>

| Reinforcing Bar Size | Embedment (inches) | Edge Distance <sup>5,6</sup> (inches) | Minimum End Distance (inches) | Tension Load <sup>7</sup> | Shear Load <sup>7</sup>               |  |
|----------------------|--------------------|---------------------------------------|-------------------------------|---------------------------|---------------------------------------|--|
|                      |                    |                                       |                               |                           | Load Parallel to Edge of Masonry Wall | Load Perpendicular to Edge of Masonry Wall |
| No. 4                | 4 1/2              | 1 3/4                                 | 8                             | 865                       | 635                                   | 245  |
| No. 5                | 5 5/8              | 1 3/4                                 |                               | 980                       | 755                                   | 295  |

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

\* The following footnotes apply to both Tables 5A and 5B:

- <sup>1</sup> All values are for anchors installed in fully grouted concrete masonry with minimum masonry strength of 1500 psi. Concrete masonry units must be light-, medium-, or normal-weight conforming to ASTM C90. Allowable loads have been calculated using a safety factor of 5.
- <sup>2</sup> When using the basic load combinations in accordance with IBC Section 1605.3.1, tabulated allowable loads must not be increased for seismic or wind loading. When using the alternative basic load combinations in the 2009 or 2006 IBC Section 1605.3.2 that include seismic or wind loads, tabulated allowable loads may be increased, or the alternative basic load combinations may be reduced according to Table 2. For the 2015 and 2012 IBC, the allowable loads or load combinations must not be adjusted.
- <sup>3</sup> One anchor must be permitted to be installed in each CMU block. Refer to Figure 3 for an illustration of the anchor location for which the tabulated values are applicable.
- <sup>4</sup> The tabulated edge distance is measured from the anchor centerline to the edge of the CMU block as depicted in Figure 3.
- <sup>5</sup> Anchors must be installed into the grouted cell. Anchors are not permitted to be installed in a head joint, flange or web of the concrete masonry unit.
- <sup>6</sup> Linear interpolation of load values between the two tabulated edge distances is permitted, as applicable.
- <sup>7</sup> Allowable loads must be the lesser of the adjusted masonry or bond values tabulated above and the steel values given in Table 10.
- <sup>8</sup> Tabulated allowable bond loads must be adjusted for increased base material temperatures in accordance with Figure 1, as applicable.

**TABLE 6—ALLOWABLE ADHESIVE BOND TENSION AND SHEAR LOADS FOR THREADED RODS IN THE FACE OF HOLLOW CONCRETE MASONRY UNITS (POUNDS)**<sup>1,3,7,9</sup>

| Anchor Diameter (inches) | Embedment (inches) <sup>2</sup> | Tension Load <sup>4,5,8</sup> | Critical and Minimum Edge Distance for Tension, $c_{cr}$ and $c_{min}$ (inches) | Shear Load at $c_{cr}$ <sup>4,5,8</sup> | Edge Distances for Shear <sup>6</sup> |                             |                       |
|--------------------------|---------------------------------|-------------------------------|---|---|---------------------------------------|-----------------------------|-----------------------|
|                          |                                 |                               |   |   | Critical, $c_{cr}$ (inches)           | Minimum, $c_{min}$ (inches) | Load Reduction Factor |
| $\frac{1}{4}$            | 2                               | 220                           | 4   | 355                                     | 4                                     | 4                           | 1.00                  |
| $\frac{5}{16}$           | 2                               | 390                           | 4   | 630                                     | 12                                    | 4                           | 0.73                  |
| $\frac{3}{8}$            | 2                               | 390                           | 4   | 645                                     | 12                                    | 4                           | 0.73                  |
| $\frac{1}{2}$            | 2                               | 390                           | 4   | 670                                     | 12                                    | 4                           | 0.73                  |

**TABLE 7—ALLOWABLE ADHESIVE BOND TENSION AND SHEAR LOADS FOR HIT-IC INSERTS IN THE FACE OF HOLLOW CONCRETE MASONRY UNITS (POUNDS)**<sup>1,3,7,9</sup>

| Anchor Diameter (inches) | Embedment (inches) <sup>2</sup> | Tension Load <sup>4,5,8</sup> | Critical and Minimum Edge Distance for Tension, $c_{cr}$ and $c_{min}$ (inches) | Shear Load at $c_{cr}$ <sup>4,5,8</sup> | Edge Distances for Shear <sup>6</sup> |                             |                       |
|--------------------------|---------------------------------|-------------------------------|---|---|---------------------------------------|-----------------------------|-----------------------|
|                          |                                 |                               |   |   | Critical, $c_{cr}$ (inches)           | Minimum, $c_{min}$ (inches) | Load Reduction Factor |
| $\frac{5}{16}$           | 2                               | 415                           | 4   | 605                                     | 12                                    | 4                           | 0.80                  |
| $\frac{3}{8}$            | 2                               | 480 <sup>5</sup>              | 4   | 620                                     | 12                                    | 4                           | 0.78                  |
| $\frac{1}{2}$            | 2                               | 495 <sup>5</sup>              | 4   | 620                                     | 12                                    | 4                           | 0.75                  |

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

The following footnotes apply to both Tables 6 and 7:

- <sup>1</sup> All values are for anchors installed in hollow concrete masonry with minimum masonry strength of 1500 psi. Concrete masonry units must be light-, medium, normal-weight conforming to ASTM C90. Allowable loads have been calculated using a safety factor of 5.
  - <sup>2</sup> Tabulated embedment depth is limited by the length of the plastic HIT-SC screens. ~~threaded rods~~
  - ~~\*\*~~ <sup>3</sup> Anchors must be installed in the face of the hollow CMU masonry wall. A maximum of two ~~anchors~~ may be installed in a single cell of the hollow CMU block. ~~For HIT-IC inserts, installation is limited to one anchor installed in the center of the hollow CMU block.~~
  - <sup>4</sup> Tabulated values are for one anchor installed in the cell of the hollow CMU. Installation in other locations of the hollow CMU (mortar joints, flange, or cell web) is not permitted. ~~threaded rods~~
  - ~~\*\*~~ <sup>5</sup> The minimum spacing,  $s_{min}$ , for which values are available and installation is permitted is 4 inches. Two ~~anchors~~ installed in adjacent cells may be spaced as close as 4 inches apart with no reduction in tension or shear capacity. Two ~~anchors~~ installed in the same cell can be spaced as close as 4 inches apart with no reduction in shear capacity. ~~For two anchors installed in the same cell spaced as close as 4 inches apart, the  $\frac{3}{8}$ -inch and  $\frac{1}{2}$ -inch diameter HIT-IC inserts require a 20% reduction in the tension capacity, and the  $\frac{5}{16}$ -inch diameter HIT-IC insert requires no reduction in tension capacity. (see below for the continuation of footnote # 5)~~
  - ~~\*\*~~ <sup>6</sup> The critical edge distance,  $c_{cr}$ , is the edge distance where full load values in the table may be used. The minimum edge distance,  $c_{min}$ , is the minimum edge distance for which values are available and installation is permitted. Edge distance is measured from the center of the anchor to the closest edge.
  - <sup>7</sup> Anchors are not recognized for resisting earthquake forces. When using the basic load combinations in accordance with IBC Section 1605.3.1, or the alternative basic load combinations in IBC Section 1605.3.2, tabulated allowable loads must not be increased for wind loading.
  - <sup>8</sup> Allowable loads must be the lesser of the adjusted masonry or bond values tabulated above and the steel values given in Table 10.
  - <sup>9</sup> Tabulated allowable bond loads must be adjusted for increased base material temperatures in accordance with Figure 1, as applicable.
- ~~\*\*~~ 5. (continued) - For HIT-IC inserts, the minimum spacing for which values are available and for which installation is permitted is 8 inches. Two HIT-IC inserts installed in adjacent cells may be spaced as close as 8 inches apart with no reduction in tension or shear capacity.

**TABLE 8—ALLOWABLE ADHESIVE BOND TENSION AND SHEAR LOADS FOR THREADED RODS IN THE FACE OF HOLLOW BRICK MASONRY (POUNDS)**<sup>1,3,4,7,9</sup>

| Anchor Diameter (inches) | Embedment (inches) <sup>2</sup> | Tension Load <sup>5,8</sup> | Critical and Minimum Edge Distance for Tension, $c_{cr}$ and $c_{min}$ (inches) | Shear Load @ $c_{cr}$ <sup>5,8</sup> | Edge Distance for Shear <sup>6</sup> |                             |                       |
|--------------------------|---------------------------------|-----------------------------|---|--------------------------------------|--------------------------------------|-----------------------------|-----------------------|
|                          |                                 |                             |   |                                      | Critical, $c_{cr}$ (inches)          | Minimum, $c_{min}$ (inches) | Load Reduction Factor |
| $\frac{1}{4}$            | $3\frac{1}{8}$                  | 530                         | $6\frac{3}{8}$  | 370                                  | 8                                    | 8                           | 1.00                  |
| $\frac{5}{16}$           | $3\frac{1}{8}$                  | 735                         | $6\frac{3}{8}$  | 595                                  | 8                                    | 8                           | 1.00                  |
| $\frac{3}{8}$            | $3\frac{1}{8}$                  | 905                         | $6\frac{3}{8}$  | 1045                                 | 12                                   | 8                           | 0.76                  |
| $\frac{1}{2}$            | $3\frac{1}{8}$                  | 905                         | $6\frac{3}{8}$  | 1685                                 | 12                                   | 8                           | 0.52                  |

**TABLE 9—ALLOWABLE ADHESIVE BOND TENSION AND SHEAR LOADS FOR HIT-IC INSERTS IN THE FACE OF HOLLOW BRICK MASONRY (POUNDS)**<sup>1,3,4,7,9</sup>

| Anchor Diameter (inches) | Embedment (inches) <sup>2</sup> | Tension Load <sup>5,8</sup> | Critical and Minimum Edge Distance for Tension, $c_{cr}$ and $c_{min}$ (inches) | Shear Load @ $c_{cr}$ <sup>5,8</sup> | Edge Distance for Shear <sup>6</sup> |                             |                       |
|--------------------------|---------------------------------|-----------------------------|---|--------------------------------------|--------------------------------------|-----------------------------|-----------------------|
|                          |                                 |                             |   |                                      | Critical, $c_{cr}$ (inches)          | Minimum, $c_{min}$ (inches) | Load Reduction Factor |
| $\frac{5}{16}$           | $3\frac{1}{8}$                  | 880                         | $6\frac{3}{8}$  | 655                                  | 8                                    | 8                           | 1.00                  |
| $\frac{3}{8}$            | $3\frac{1}{8}$                  | 880                         | $6\frac{3}{8}$  | 1235                                 | 12                                   | 8                           | 0.66                  |
| $\frac{1}{2}$            | $3\frac{1}{8}$                  | 990                         | $6\frac{3}{8}$  | <del>1895</del> 1840                 | 12                                   | 8                           | 0.44                  |

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

(The following footnotes apply to both Tables 8 and 9)

- <sup>1</sup> All values are for anchors installed in hollow brick masonry with minimum masonry strength of 3000 psi. Hollow brick units must be in conformance with ASTM C652. Allowable loads have been calculated using a safety factor of 5.
- <sup>2</sup> Tabulated embedment depth is limited by the length of the plastic HIT-SC screens.
- <sup>3</sup> Anchors must be installed in the face of the hollow brick masonry wall.
- <sup>4</sup> Tabulated values are for one anchor installed in the center of the hollow brick, mortar joints, flanges, or cell web (all wall face locations permitted).
- <sup>5</sup> One anchor must be permitted to be installed in each brick. Two anchors installed in adjacent bricks may be spaced as close as 8 inches apart with no load reduction.
- <sup>6</sup> The critical edge distance,  $c_{cr}$ , is the edge distance where full load values in the table may be used. The minimum edge distance,  $c_{min}$ , is the minimum edge distance for which values are available and installation is permitted. Edge distance is measured from the center of the anchor to the closest edge.
- <sup>7</sup> Anchors are not recognized for resisting earthquake forces. When using the basic load combinations in accordance with IBC Section 1605.3.1, or the alternative basic load combinations in IBC Section 1605.3.2, tabulated allowable loads must not be increased for wind loading.
- <sup>8</sup> Allowable loads must be the lesser of the adjusted masonry or bond values tabulated above and the steel values given in Table 10.
- <sup>9</sup> Tabulated allowable bond loads must be adjusted for increased base material temperatures in accordance with Figure 1, as applicable.

**TABLE 10—ALLOWABLE TENSION AND SHEAR LOADS BASED ON STEEL STRENGTH FOR THREADED RODS (pounds)**<sup>1,2,3</sup>

| Anchor Diameter (inches) | Tension           |          |           |              |                        | Shear             |          |           |              |                        |
|--------------------------|-------------------|----------|-----------|--------------|------------------------|-------------------|----------|-----------|--------------|------------------------|
|                          | ISO 898 Class 5.8 | ASTM A36 | ASTM A307 | ASTM A193 B7 | ASTM F593 CW (316/304) | ISO 898 Class 5.8 | ASTM A36 | ASTM A307 | ASTM A193 B7 | ASTM F593 CW (316/304) |
| $\frac{1}{4}$            | 1,175             | 940      | 970       | 2,025        | 1,620                  | 605               | 485      | 500       | 1,040        | 835                    |
| $\frac{5}{16}$           | 1,835             | 1,470    | 1,520     | 3,160        | 2,530                  | 945               | 755      | 780       | 1,630        | 1,300                  |
| $\frac{3}{8}$            | 2,640             | 2,115    | 2,185     | 4,555        | 3,645                  | 1,360             | 1,090    | 1,125     | 2,345        | 1,875                  |
| $\frac{1}{2}$            | 4,700             | 3,755    | 3,885     | 8,100        | 6,480                  | 2,420             | 1,935    | 2,000     | 4,170        | 3,335                  |
| $\frac{5}{8}$            | 7,340             | 5,870    | 6,075     | 12,655       | 10,125                 | 3,780             | 3,025    | 3,130     | 6,520        | 5,215                  |
| $\frac{3}{4}$            | 10,570            | 8,455    | 8,750     | 18,225       | 12,390                 | 5,445             | 4,355    | 4,505     | 9,390        | 6,385                  |

**TABLE 11—ALLOWABLE TENSION AND SHEAR LOADS BASED ON STEEL STRENGTH FOR REINFORCING BARS (pounds)**<sup>1,2,3</sup>

| Rebar Size | Tension             | Shear               |
|------------|---------------------|---------------------|
|            | ASTM A615, Grade 60 | ASTM A615, Grade 60 |
| No. 3      | 3,270               | 1,685               |
| No. 4      | 5,940               | 3,060               |
| No. 5      | 9,205               | 4,745               |
| No. 6      | 13,070              | 6,730               |

(The following footnotes apply to both Tables 10 and 11)

- <sup>1</sup> Allowable load used in the design must be the lesser of bond values and tabulated steel values
- <sup>2</sup> Allowable tension and shear loads for threaded rods to resist short term loads, such as wind or seismic, must be calculated in accordance with Section 4.1 as applicable.
- <sup>3</sup> Allowable steel loads are based on allowable tension and shear stresses equal to  $0.33 \times F_u$  and  $0.17 \times F_u$ , respectively.

\* Deleted/ \*\* Modified by City of Los Angeles

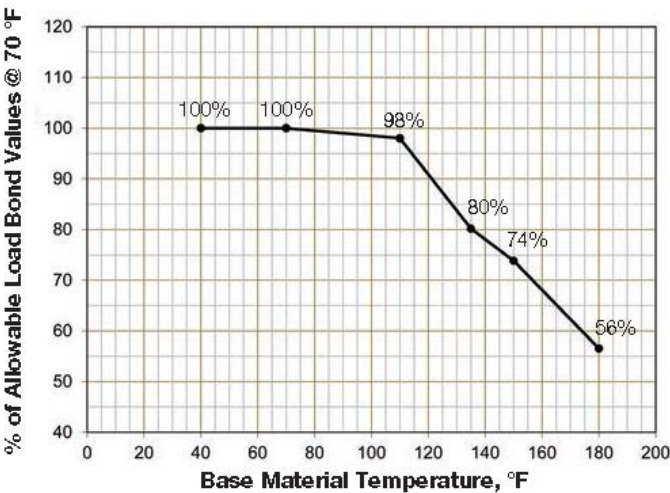


FIGURE 1—INFLUENCE OF BASE MATERIAL TEMPERATURE ON ALLOWABLE TENSION AND SHEAR LOADS FOR HILTI HIT-HY 70 ADHESIVE

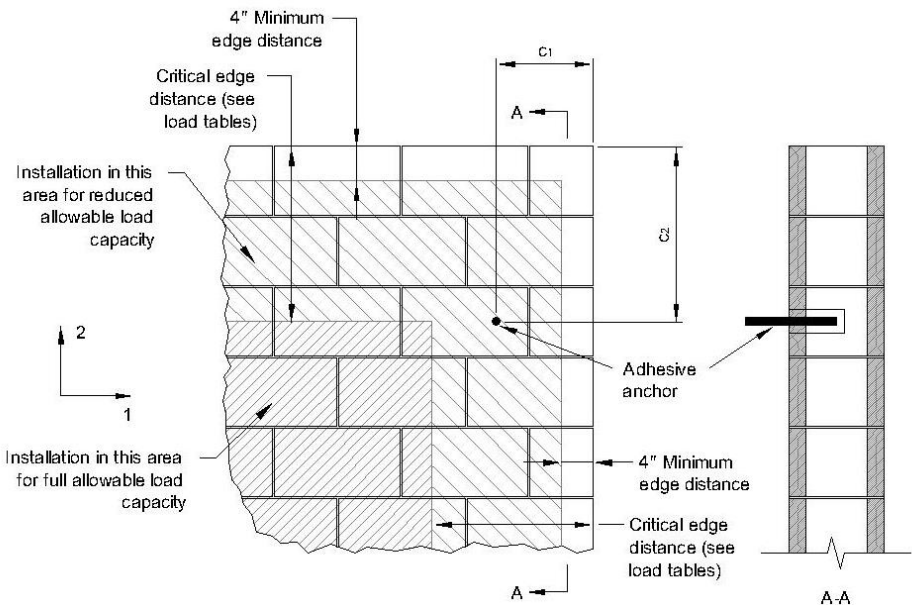


FIGURE 2—ALLOWABLE ANCHOR INSTALLATION LOCATIONS IN THE FACE OF GROUT-FILLED CONCRETE MASONRY (ASTM C90)

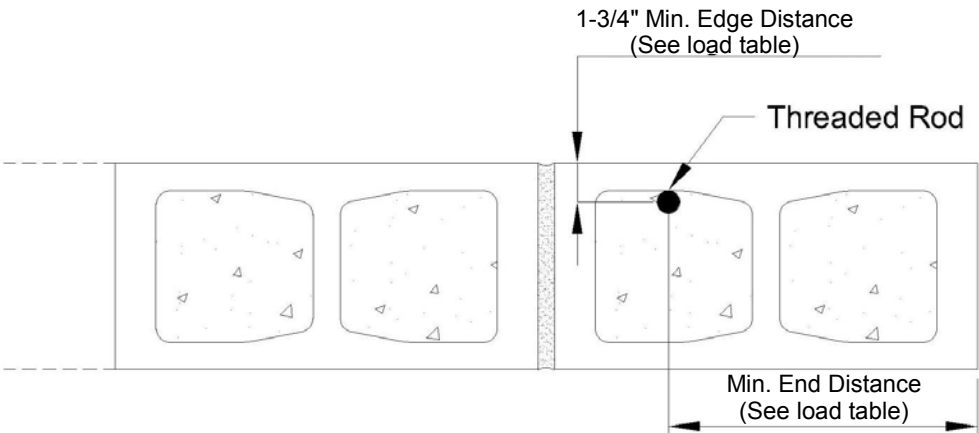


FIGURE 3—EDGE AND END DISTANCES FOR THREADED RODS INSTALLED IN THE TOP OF GROUT-FILLED CONCRETE MASONRY



# HILTI

**Hilti HIT-HY 70**  
For industrial use only. Keep out of the reach of children.  
See the Material Safety Data Sheet for this product before handling.  
**Caution:** Irritating to eyes and skin. May cause sensitization in susceptible individuals.  
**Content:** bisoxazolone peroxide, hydroxypropylmethacrylate  
**Precautions:** Avoid contact with skin/eyes. Always wear impermeable gloves and eye protection when using product. Store in a cool, dry area. Keep from freezing. Do not store in direct sunlight.  
**First Aid: Eyes:** Immediately flush with water for 15 minutes, contact a physician.  
**Skin:** Wash with soap and water. Launder contaminated clothing before reuse. If irritation occurs, contact a physician. **Ingestion:** Do not induce vomiting unless directed by a physician. Contact a physician immediately. **Inhalation:** Move to fresh air, give oxygen if breathing is difficult. Contact a physician if symptoms persist.  
**Hilti HIT-HY 70**  
**Usage:** Industrial independent. À conserver hors de la portée des enfants.  
**Lire la fiche de données de sécurité sur le matériel relative à ce produit avant toute manipulation.**  
**Avvertimento:** Irritante per gli occhi e la pelle. Può causare sensibilizzazione in alcuni individui a rischio.  
**Contenuto:** Perossido di bisossazolo, metacrilato di idrossipropil  
**Precauzioni:** Evitare il contatto con la pelle e gli occhi. Utilizzare sempre guanti impermeabili e protezione per gli occhi quando si utilizza questo prodotto. Conservare in un luogo fresco e asciutto. Evitare che il prodotto si congeli. Non lo esporre alla luce diretta del sole. **Primo soccorso:** **Occhi:** Enjuague inmediatamente con agua durante 15 minutos, busque ayuda médica. **Piel:** Lave con agua y jabón. Lave bien la ropa contaminada antes de volver a utilizarla. En caso de ingestión, busque ayuda médica. **Ingestión:** No induzca al vómito a menos que así lo indique un médico. Busque ayuda médica de inmediato. **Inhalación:** Lleve a la persona al aire libre. Déle oxígeno si tiene dificultades para respirar. Si los síntomas persisten, busque ayuda médica.  
**Hilti Inc. Tulsa, OK 74148 / Hilti Canada Corp.**

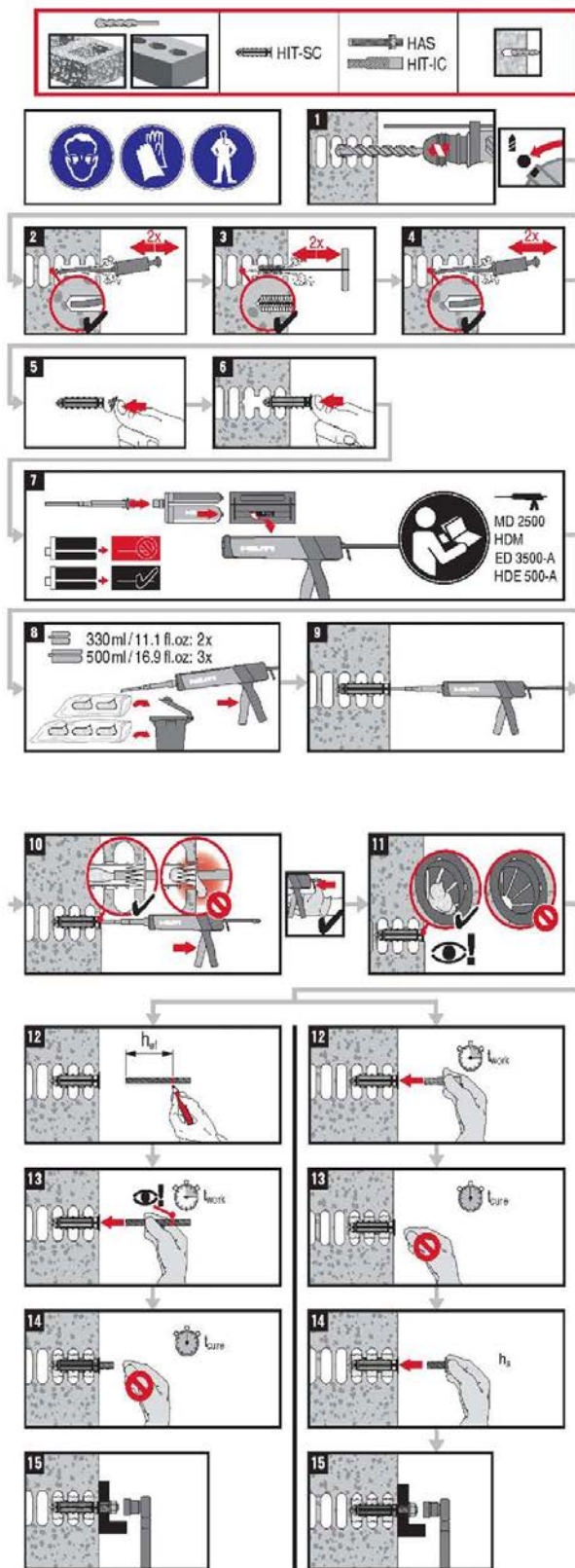
**Hilti HIT-HY 70**

Instruction for use

en

ICC ESR - 2682

Inspected by UL LLC



| [F]    | [C]     |  | t <sub>work</sub> | t <sub>cure</sub> |
|--------|---------|--|-------------------|-------------------|
| 23-32  | -5...0  |  | 10 min            | 6 h               |
| 33-41  | 1...5   |  | 10 min            | 4 h               |
| 42-50  | 6...10  |  | 7 min             | 2.5 h             |
| 51-68  | 11...20 |  | 4 min             | 1.5 h             |
| 69-86  | 21...30 |  | 2 min             | 30 min            |
| 87-104 | 31...40 |  | 1 min             | 20 min            |

| [F]    | [C]     |  | t <sub>work</sub> | t <sub>cure</sub> |
|--------|---------|--|-------------------|-------------------|
| 41     | 5       |  | 10 min            | 4 h               |
| 42-50  | 6...10  |  | 7 min             | 2.5 h             |
| 51-68  | 11...20 |  | 4 min             | 1.5 h             |
| 69-86  | 21...30 |  | 2 min             | 30 min            |
| 87-104 | 31...40 |  | 1 min             | 20 min            |

FIGURE 4—MANUFACTURERS PRINTED INSTALLATION INSTRUCTIONS

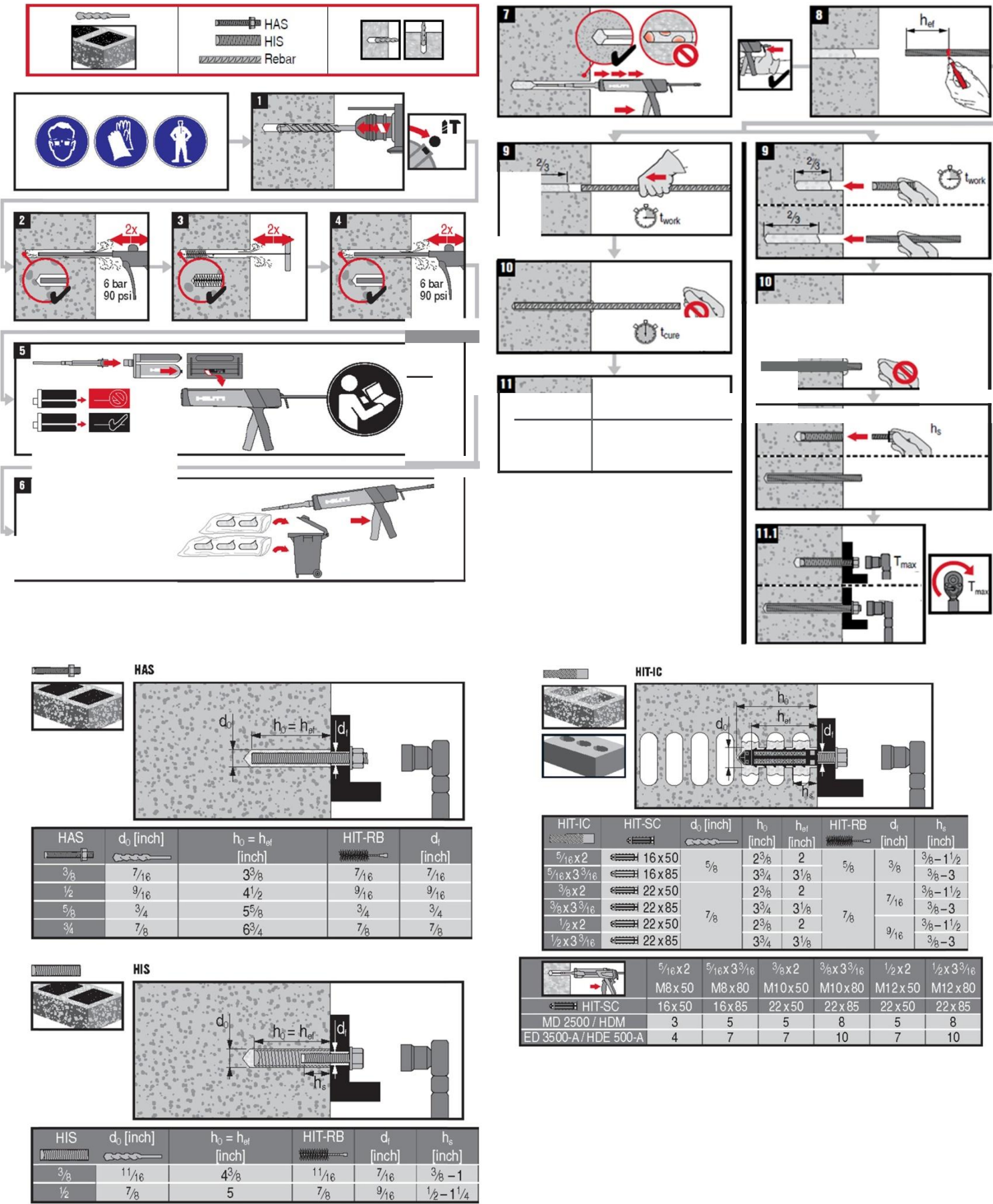
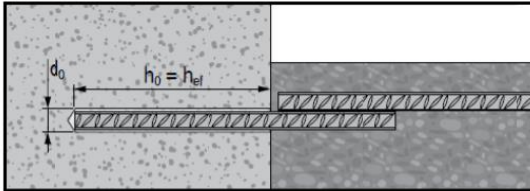


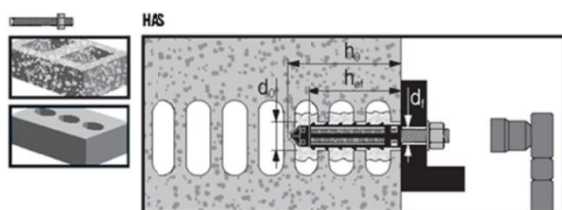
FIGURE 4—MANUFACTURERS PRINTED INSTALLATION INSTRUCTIONS (Continued)




**Rebar**



| Rebar | $d_0$ [inch] | $h_0 = h_{ef}$ [inch] | HIT-RB |
|-------|--------------|-----------------------|--------|
| #3    | 1/2          | 3 3/8                 | 1/2    |
| #4    | 5/8          | 4 1/2                 | 5/8    |
| #5    | 3/4          | 5 5/8                 | 3/4    |
| #6    | 7/8          | 6 3/4                 | 7/8    |



| HAS   | HIT-SC  | $d_0$ [inch] | $h_0$ [inch] | $h_{ef}$ [inch] | HIT-RB | $d_i$ [inch] |
|-------|---------|--------------|--------------|-----------------|--------|--------------|
| 1/4"  | 12 x 50 | 1/2          | 2 3/8        | 2               | 1/2    | 9/32         |
|       | 12 x 85 |              | 3 3/4        | 3 1/8           |        |              |
| 5/16" | 16 x 50 | 5/8          | 2 3/8        | 2               | 5/8    | 3/8          |
|       | 16 x 85 |              | 3 3/4        | 3 1/8           |        |              |
| 3/8"  | 16 x 50 | 1 1/16       | 2 3/8        | 2               | 1 1/16 | 9/16         |
|       | 16 x 85 |              | 3 3/4        | 3 1/8           |        |              |

|  | 1/4"  |       | 5/16" |       | 3/8"  |       | 1/2"  |       |
|---|-------|-------|-------|-------|-------|-------|-------|-------|
|   | M6    |       | M8    |       | M10   |       | M12   |       |
| HIT-SC  | 12x50 | 12x85 | 16x50 | 16x85 | 16x50 | 16x85 | 18x50 | 18x85 |
| MD 2500 / HDM   | 2     | 4     | 3     | 5     | 3     | 5     | 3     | 6     |
| ED 3500-A / HDE 500-A   | 3     | 6     | 4     | 7     | 4     | 7     | 4     | 9     |

**Hilti HIT-HY 70****Caution:** Irritating to eyes and skin.

May cause sensitization in susceptible individuals.

**Contains:** dibenzoyl peroxide, hydroxypropylmethacrylate**Precautions:** Avoid contact with skin/eyes. Always wear impermeable gloves and eye protection when using product. Store in a cool, dry area. Keep from freezing. Do not store in direct sunlight.**First Aid: Eyes** - Immediately flush with water for 15 minutes, contact a physician. **Skin** - Wash with soap and water. Launder contaminated clothing before reuse. If irritations occurs, contact physician.**Ingestion** - Do not induce vomiting unless directed by a physician. Contact a physician immediately. **Inhalation** - Move to fresh air, give oxygen if breathing is difficult. Contact a physician if symptoms persist.**Disposal considerations****Empty packs:**

- Leave the mixer attached and dispose of via the local Green Dot recovery system.

**Full or partially emptied packs:**

- Must be disposed of as special waste in accordance with official regulations.

| Ingredient                  | CAS Number        | Ingredient                  | CAS Number |
|-----------------------------|-------------------|-----------------------------|------------|
| <b>Part A: (Large side)</b> |                   | <b>Part B: (Small side)</b> |            |
| Quartz Sand                 | 14808-60-7        | Quartz Sand                 | 14808-60-7 |
| NJ Trade Secret Registry    | No. 19136100-5003 | Water                       | 07732-18-5 |
| NJ Trade Secret Registry    | No. 19136100-5020 | Dibenzoyl peroxide          | 00094-36-0 |
| NJ Trade Secret Registry    | No. 19136100-5004 | Amorphous silica            | 07631-86-9 |
| NJ Trade Secret Registry    | No. 19136100-5022 | Dipropylene glycol          | 25265-71-8 |
| NJ Trade Secret Registry    | No. 19136100-5021 |                             |            |
| NJ Trade Secret Registry    | No. 19136100-5002 |                             |            |
| NJ Trade Secret Registry    | No. 19136100-5017 |                             |            |
| Amorphous silica            | 67762-90-7        |                             |            |
| Boric acid                  | 10043-35-3        |                             |            |

► In Case of Emergency, call Chen-Trec: 1-800-424-9300 (USA, P.R., Virgin Islands, Canada)

**Warranty:** Refer to standard Hilti terms and conditions of sale for warranty information.

Failure to observe these installation instructions, use of non-Hilti anchors, poor or questionable base material conditions, or unique applications may affect the reliability or performance of the fastenings.

**Content:** 330 ml / 11.1 fl.oz. 500 ml / 16.9 fl. oz**Weight:** 590 g / 20.8 oz 890 g / 31.4 oz**Product Information**

- Always keep these instructions together with the product even when given to other persons.
- **Check expiration date:** See imprint on foil pack manifold (month/year). Do not use expired product.
- **Foil pack temperature during usage:** between 41 °F and 104 °F / +5 °C and 40 °C.
- **Base material temperature at time of installation:** between 23 °F and 104 °F / -5 °C and 40 °C.
- **Exception in solid clay brick:** between 41 °F and 104 °F / +5 °C and 40 °C.
- **Conditions for transport and storage:** Keep in a cool, dry and dark place between 41 °F and 77 °F / 5 °C and 25 °C.
- **For any application not covered by this document / beyond values specified, please contact HILTI.**
- Partly used foil packs must remain in the cassette and has to be used within 4 weeks. Leave the mixer attached on the foil pack manifold and store within the cassette under the recommended storage conditions. If reused, attach a new mixer and discard the initial quantity of anchor adhesive.

**! WARNING****! Improper handling may cause mortar splashes.**

- Always wear safety glasses, gloves and protective clothes during installation.
- Never start dispensing without a mixer properly screwed on.
- Attach a new mixer prior to dispensing a new foil pack (ensure snug fit).
- Use only the type of mixer (HIT-RE-M) supplied with the adhesive. Do not modify the mixer in any way.
- Never use damaged foil packs and/or damaged or unclean foil pack holders (cassettes).

**! Poor load values / potential failure of fastening points due to inadequate borehole cleaning.**

- The boreholes must be free of debris, dust, water, ice, oil, grease and other contaminants prior to adhesive injection.
- For blowing out the borehole - blow out with oil free air until return air stream is free of noticeable dust.
- For brushing the borehole - only use specified wire brush. The brush must resist insertion into the borehole - if not the brush is too small and must be replaced.
- Before inserting anchor into borehole, mark and set anchor to the required embedment depth.

**! Borehole filling in solid masonry:** Ensure that boreholes are filled from the back of the borehole without forming air voids. If necessary use the accessories / extensions to reach the back of the borehole.**! Borehole filling in hollow masonry:** Use a mesh sleeve. Fill the mesh sleeve with mortar from the centering cap until mortar escapes at the centering cap (filling control).**! Filling mesh sleeve combinations:** Push the mixer - if necessary use mixer extension- through the centering cap and through the bottom of the mesh sleeve to the next mesh sleeve(s), fill with mortar and retract the mixer to the centering cap and fill again until mortar escapes at the centering cap (filling control).**! Not adhering to these setting instructions can result in failure of fastening points!**

FIGURE 4—MANUFACTURERS PRINTED INSTALLATION INSTRUCTIONS (Continued)