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RESEARCH REPORT: RR 24564  
(CSI 03150)

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**GENERAL APPROVAL** - Renewal - HIT Adhesive Anchor for use in un-reinforced brick walls.

## DETAILS

HIT Adhesive Anchor is designed to be installed in predrilled holes in existing un-reinforced brick walls for use in resisting short duration lateral loading, such as from seismic or wind forces, not for sustained gravity loading. The anchor system consists a two-component adhesive mortar (HIT HY-20) contained in two separate cartridges, a 3/4-inch diameter threaded rod or No.5 and No. 6 grade 60 Rebar dowels, and a screen tube (as provided by Hilti).

The HIT Adhesive Anchor system consists of a 3/4-inch diameter rod with 3/4-inch UNC threads and a 15/16-inch diameter Hilti screen tube. The anchor shall be limited to those locations where access to the exterior face of the masonry wall is prevented by proximity of an existing building. The anchor rod shall be embedded to within one inch of the exterior wall surface in a one inch diameter hole drilled at an angle of 22.5 degrees upward or downward from the horizontal. The minimum wall thickness shall be 13", and the hole shall not go through the wall. The HIT Adhesive Anchor is used to resist both shear and tension forces.

A Shear Anchor System consisting of a 3/4-inch diameter threaded rod with 3/4-inch UNC threads and a 15/16-inch diameter Hilti screen tube embedded a minimum of 8 inches at a right angle with the wall is used to resist shear forces only. Similar to the 3/4" diameter threaded rod, no. 5 and no. 6 grade 60 Rebar dowels may be used with the Hilti HIT HY-20 adhesive mortar and Hilti 15/16" x 8" Screen Tube to resist shear forces only.

RR 24564  
Page 1 of 5

Hilti, Incorporated

RE: HIT Adhesive Anchor for use in un-reinforced brick walls

**HIT Anchors are approved for installations in un-reinforced brick walls subject to the following conditions:**

1. Each anchor rod shall bear a permanent identification indicating the manufacturer's name or symbol and product designation.
2. Use of the HIT Anchors shall be approved by the engineer of record for each job.
3. Installations of the anchor shall be in accordance with the manufacturer's instructions except as otherwise stated in this report. Anchors shall be stored in a cool location and shall not be exposed to a heat source prior to installation.
4. The anchors shall not be used to resist gravity loads.
5. The minimum mortar strength of the masonry wall as determined by the in-place shear tests required by Section 91.8809.5.3 of the 2011 Los Angeles City Building Code shall not be less than 30 psi plus the axial overburden stress in the wall at the point of the tests.
6. A called building inspection shall be requested prior to the installation of bolts to verify:
  - a. Installer qualification.
  - b. Component identification.
7. The anchors may be installed above the intersection of the roof sheathing with the wall, **ONLY WHERE:**
  - a. Additional in-plane shear tests are performed above the intersection of the roof sheathing with the wall at representative locations where the mortar and masonry conditions are similar to that at which the anchors are installed. A minimum of one test per each wall direction shall be performed.
  - b. The minimum quality mortar in each of the shear tests shall not be less than 50 psi.
8. Drilling for bolt holes shall be done with an electric rotary drill. Impact tools shall not be used for drilling holes or for tightening anchors and shear bolt nuts.
9. Minimum horizontal edge distance for all bolts shall be 24". Minimum bolt spacing shall be as follows:

Adhesive Anchor

( $\frac{3}{4}$ " Rod installed at 22.5)

Shear Anchor ( $\frac{3}{4}$ " Rod Embedded 8")

24" o.c. each way

16" o.c. each way

Hilti, Incorporated

RE: HIT Adhesive Anchor for use in un-reinforced brick walls

10. The installed anchors shall not be disturbed until the cure time for the adhesive has elapsed. Manufacturer's recommended open (gel) and minimum curing times with temperature indicated in degrees Fahrenheit are as follows:

Temperature of Masonry (F°)	Open Time*	Min. Curing Time**
41	20 min.	2-3 hours
68	6 min.	1 hour
86	3 min.	45 minutes
104	1 min.	30 minutes

\*Open time is the time available for anchor installation once the two components of the adhesive are mixed.

\*\*Curing time is the time required for the adhesive to cure before load application.

11. No gaps shall appear between the anchoring device and the masonry. Any adjustment shall be made during the open time of the adhesive.
12. The excess adhesive shall be removed during the open time period.
13. For use of the wall anchor in tension:
- a. The design load shall not exceed 1200 pounds, with no increase for lateral loading.
  - b. Minimum wall thickness shall be 13 inches for the HIT Adhesive Anchor System.
  - c. Tension tests shall be performed by a Los Angeles City approved testing laboratory. Five percent of the anchors shall be tested with a minimum of two tests. Where the wall thickness varies, at least one test shall be performed on an anchor which has the least amount of embedment. The tests shall show that the bolts can maintain a tensile load of 3000 pounds for a period of 5 minutes with allowable dissipation of no more than 10% deviation from the initially applied load. The allowable displacement of the anchor from the face of the wall shall not be more than 1/8". The test report shall include:
    - 1) Test location(s).
    - 2) Brick/mortar condition.
    - 3) Embedment depth.
    - 4) Applied load.
    - 5) Remaining tensile load after 5 minutes.
    - 6) Anchor displacement.
    - 7) Calibration of the tension load test equipment.

The test results shall be submitted to the Earthquake Safety Inspection Section for each job. The tests shall be conducted in accordance with ASTM E-488 and

Hilti, Incorporated

RE: HIT Adhesive Anchor for use in un-reinforced brick walls

HILTI's quality control procedures. Should any of the bolts fail the above criteria, then all of the anchors shall be tested and replaced or substituted as necessary.

- d. One-fifth (20%) of the installed anchors shall be tested by a Registered Deputy Building Inspector using a torque calibrated wrench to a minimum torque of 60 foot-lbs. All requirements of Earthquake Safety Inspection Section, Guideline No. 3, "Torque Testing Grouted Bolts and Anchors" shall be met.
14. For use of the wall anchor in shear:
- a. The no. 5 rebar, no. 6 rebar, or 3/4-inch diameter anchor rod shall be embedded a minimum of 8-inches into a one-inch diameter hole drilled into the un-reinforced masonry wall. The rebar dowels shall be installed with the Hilti HIT HY-20 adhesive mortar only.
  - b. Design shear load shall not exceed 1000 pounds, with no increase for lateral loading, for the 3/4-inch diameter rod (Adhesive and Shear Anchor).
  - c. Design shear load shall not exceed 795 pounds and 905 pounds, with no increase for lateral loading, for no. 5 and no. 6 rebar dowels, respectively.
  - d. One-fourth of the anchors shall be tested by a Registered Deputy Inspector using a torque calibrated wrench to a minimum torque of 60 foot-lbs. All requirements of Earthquake Safety Inspection Section, Guideline No. 3, "Torque Testing Grouted Bolts and Anchors" shall be met.
  - e. Loads that will be imposed on the anchor shall be from lateral loading only.

## **DISCUSSION**

The report is in compliance with the 2011 City of Los Angeles Building Code.

The approval is based on load tests conducted in accordance with ASTM E-488. Allowable anchor loads were determined by guidelines established by the Earthquake Safety Section. The allowable tension load for the 5/8-inch diameter through-bolt (Combination Anchor) is given in Table No. 88-I of the 2008 Los Angeles City Building Code. The anchors may not be used to resist gravity loads.

### **The manufacturer's instructions for the anchor installations are as follows:**

The anchors are installed in one-inch diameter holes drilled by use of a rotary drill. The holes are cleaned with a jet of compressed air and nylon brush. The contents of the two cartridges are injected through the injection nozzle into the screen tube until completely filled. The screen tube is then placed by hand into the drilled hole. The anchor rod is pushed into the screen tube forcing the adhesive into the hole and voids in the vicinity of the hole.

Hilti, Incorporated

RE: HIT Adhesive Anchor for use in un-reinforced brick walls

Holes for the 3/4-inch diameter combination tension/shear anchors are drilled with a 22.5 degree guide to keep the drill bit at the correct angle. The angled hole is to be drilled in the vertical plane only. The holes shall be drilled a minimum of 13-inches deep and must extend to within one inch of the outer face without going all the way through the wall.

Holes for the 3/4-inch diameter anchors resisting only shear loads are drilled to a depth of 8-inches perpendicular to the plane of the wall and are installed with a screen as described above.

Addressee to whom this Research Report is issued is responsible for providing copies of it, complete with any attachments indicated, to architects, engineers and builders using items approved herein in design or construction which must be approved by Department of Building and Safety Engineers and Inspectors.

This general approval of an equivalent alternate to the Code is only valid where an engineer and/or inspector of this Department has determined that all conditions of this Approval have been met in the project in which it is to be used.

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