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RESEARCH REPORT: RR 25029
(CSI #04050)

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GENERAL APPROVAL – Renewal/Clerical Modification - CIA-Gel Anchors for use in unreinforced solid brick walls.

DETAILS

The Covert Injection Adhesive-Gel (CIA-Gel) anchors are approved for use in resisting short duration lateral loading conditions, such as seismic and wind loads. The system shall not be used for sustained gravity loading conditions.

DESCRIPTION

The CIA-Gel is a structural epoxy packaged in equal volume side-by-side plastic cartridges. The cartridges are sealed individually with D-shaped plugs and a plastic screw on cap. The plugs may be replaced after partial usage. The epoxy is mixed when dispensed through a spiral motionless mixer attached to the cartridge. CIA-Gel may be dispensed with a hand-powered, caulking-type tool, however, it is more readily dispensed with a pneumatic dispensing tool.

There are three types of stud assemblies approved for use in unreinforced masonry walls within this approval; a through-bolted anchor which resists both shear and/or tension forces, an 8" embedded anchor which resists only shear forces, and an anchor installed at 22½ degrees which resists both shear and/or tension forces. Reinforcing bars or other dowels may not be substituted for the threaded rods specified in this approval. The threaded rods are supplied in various lengths and are stamped at the end to identify Covert Operations as the manufacturer and to provide the rod's length. Specific details of the anchorage systems may be found within this report.

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The CIA-Gel Anchors are approved for installation in existing unreinforced brick masonry walls subject to the following conditions:

1. Each anchor rod shall bear a permanent identification indicating the manufacturer's name or symbol.
2. Use of the CIA-Gel Anchors shall be approved by the engineer of record for each job.
3. Anchors shall not be installed in overhead applications such as in the soffit of a beam, arch, lintel or in a ceiling.
4. Installation of the anchors shall be in accordance with the manufacturer's instructions stated in the "Discussion" portion of this report.
5. Weld connections to the zinc plated threaded rods are allowed only if all of the zinc coating is removed from the weld area prior to welding. Welded connections shall comply with Section 91.2204.1 of the 2008 Los Angeles City Building Code. Welds shall be made prior to installation of anchor in wall. An approved equivalent corrosion resistant coating (such as hot-dip zinc coating or red oxide paint) must be reapplied after welding.
6. Wall thickness shall be a minimum of 3 wythes and 13". (Footnote 4 of Table 88-I is not applicable)
7. The minimum mortar quality in 80% of the in-place shear tests specified in Section 91.8809.5.3 of the 2008 Los Angeles City Building Code shall not be less than the total of 30 psi plus the axial stress in the wall at the point of the test.
8. The anchors may be installed above the intersection of the roof sheathing with the wall, only where:
 - a. Additional in-place shear tests have been performed above the roof intersection at representative locations. One test per each wall direction must be performed.
 - b. The minimum quality mortar in each of the tests shall not be less than 50 psi.
9. Inspection by a registered deputy inspector is required for the installation of anchors. Inspection shall also include but not be limited to the following:
 - a. Installer qualification and component identification.
 - b. Drilling holes for anchor installation shall be done with a non-impact electric rotary drill. Impact tools shall not be used for drilling holes or for tightening anchor rod nuts.

10. The installed anchors shall not be disturbed until the adhesive has cured sufficiently. Anchors shall not be bolted up, torqued, or otherwise load tested prior to the torque times listed in Table No. 1.

TABLE NO. 1

Recommended Curing Times for CIA-Gel Anchors

Masonry Temperature (°F)	Working Life (min.)	Torque Time (hours)	Cure Time (hours)
40-50	60	24	96
51-60	45	18	72
61-70	30	12	48
71-80	20	9	36
80+	10	6	24

11. No gaps shall appear between the anchoring device and the masonry. No adjustments shall be made during the "working life" of the epoxy. See Table No. 1 for working life.
12. The excess adhesive shall be removed before the working life time period has expended. See Table No. 1 for working life.
13. For use of the wall anchor in tension and/or shear:
 - a. Design tension loads shall not exceed 1200 pounds. Design shear loads shall not exceed 1000 pounds for $\frac{3}{4}$ " diameter shear anchors and $\frac{3}{4}$ " diameter - 22.5 degree combination anchors, and 1000 pounds for $\frac{5}{8}$ " diameter through bolted combination anchors. No increase for lateral loading is allowed.
 - b. The stud assembly used for tension and/or shear applications where the outside of the wall is accessible consists of a length of zinc-plated $\frac{5}{8}$ "- diameter threaded rod which meets ASTM A307 specifications. It is used in conjunction with $\frac{13}{16}$ "- O.D. by $\frac{11}{16}$ "-I.D. steel sleeve 8" in length, and a $\frac{15}{16}$ "-diameter screen tube made of steel wire cloth. The $\frac{5}{8}$ "-diameter rod anchor shall be installed through the steel sleeve on the interior side of the wall and bolted with a $\frac{3}{8}$ " x 6" x 6" steel gusset plate on the exterior side of the wall.

- c. The stud assembly used to resist tension and/or shear loads where the outside of the wall is not accessible consists of a length of zinc-plated $\frac{3}{4}$ "-diameter threaded rod, which meets ASTM A307 specifications, prebent to a 22.5 degree angle. It is used in conjunction with a $\frac{15}{16}$ "-diameter screen tube made of electrogalvanized steel wire cloth. The $\frac{3}{4}$ "-diameter rod shall be installed at an angle of 22.5

degrees in the vertical plane only. The anchor shall be embedded to within one inch of the exterior wall surface without penetrating the exterior wall surface.

- d. Tension tests shall be performed on anchors installed at an angle of 22.5 degrees. The testing shall be performed by a testing laboratory approved by the City of Los Angeles for in-place anchor testing. A minimum of 5% 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. All tension tests must be performed without blocking, ledgers or hardware in place. The tests shall show that the anchors can maintain a tensile load of 3000 pounds for a period of 5 minutes, with allowable load dissipation of no more than 10% deviation from the initially applied load. The allowable displacement of the anchor from the face of the wall is no more than $\frac{1}{8}$ ". The tests shall be performed using the equipment and procedures as follows.

Acceptable test equipment include any suitable testing or loading system which permit the following conditions to be met. Test equipment must not bear against the epoxy. The testing device shall be of sufficient capacity to prevent yielding of its various components and shall ensure that the applied tension load remains parallel to the axis of the anchor during testing. Forces applied to the test rod must be perpendicular to the surface of the brick wall. A continuous increase in load must be applied to the test anchor until the final test load is reached. Any suitable measurement device accurate to at least 0.001" shall be used to measure horizontal displacement of the anchor relative to the face of the wall. The loading system must be calibrated and be capable of measuring forces to an accuracy within $\pm 2\%$ of the applied load.

Test procedures are as follows:

1. Measure projection of rod from face of wall to verify anchor embedment.
2. Attach test system and measuring device to anchor. The measuring device should be positioned on the anchor as close to the wall as possible.
3. Measure and record the initial displacement between a marked point on the wall and reference point on the anchor.
4. Apply 3000 pound test load.

5. After 5 minutes, record the remaining test load and record the final displacement between the marked point on the wall and reference point on the anchor.

The test report shall include:

1. Test locations.
2. Brick/mortar condition.
3. Wall thickness.
4. Embedment of anchor.
5. Applied load.
6. Remaining tensile load after 5 minutes.
7. Anchor displacement.
8. Calibration of the tension load test system.

Should any of the anchors fail the above criteria, all of the anchors shall be tested and replaced or substituted as necessary. The test results shall be submitted directly to the Department for all jobs tested.

- e. One-fifth (20%) of the steel sleeves of the through- bolted combination anchors shall be tested by a registered deputy building inspector using a calibrated torque wrench to a minimum torque of 60 foot-lbs. All requirements of Earthquake Safety Division, Guideline No. 3, " Torque Testing Grouted Bolts and Anchors" shall be met.
14. For use of the wall anchor in shear:
- a. Design shear shall not exceed 1000 pounds for $\frac{3}{4}$ " diameter shear only anchors and $\frac{3}{4}$ " diameter - 22.5 degree combination anchors, and 1000 pounds for $\frac{5}{8}$ " diameter through bolted combination anchors. No increase for lateral loading is allowed.
 - b. The stud assembly used to resist only shear loads consists of a length of zinc-plated $\frac{3}{4}$ "-diameter threaded rod which meets ASTM A307 specifications. It is used in conjunction with a $\frac{15}{16}$ "-diameter by 8" long screen tube made of electrogalvanized steel wire cloth. The straight anchor rod shall be embedded a minimum of 8" into a 1"-diameter hole drilled into the wall.
 - c. One-fourth (25%) of the anchors described in (b.) shall be tested by a Registered Deputy Building Inspector using a calibrated torque wrench to a minimum torque of 60 foot-lbs. All requirements of Earthquake Safety Division, Guide No. 3, "Torque Testing Grouted Bolts and Anchors" shall be met.

15. Anchors shall be placed no closer to an edge than 24" (3 brick lengths) to attain full capacity. They may be spaced as close to an edge as 12" (½ brick lengths) provided the load on the anchor is also reduced to 33% of full capacity. Anchors may be spaced no closer than 24 inches on center to attain full capacity. Use 50% of full capacity at 12" spacing.

Anchors shall be stored in a cool location and shall not be exposed to a heat source prior to installation.

DISCUSSION

The Clerical Modification is to change the code basis of this report to 2008 Los Angeles City Building Code

The manufacturer's recommended cure times are listed in Table No. 1 (Page 3). Working life is the time after mixing during which the epoxy retains sufficient workability for proper use. Torque time is the minimum time required before the anchors can be torqued, proof loaded, bolted-up, or otherwise disturbed. Cure time is the time required for the epoxy to reach ultimate strength. The anchors are not recommended for installation in a substrate with temperature lower than 40°F.

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

One-inch diameter holes are drilled for all three types of anchors. The drill bits used must meet ANSI specification B94.12-77. Impact tools may not be used. The holes are cleaned of dust and debris using a nylon brush and compressed air. Epoxy is injected into the screen tubes until the tubes are completely full and then placed into the drilled holes. Threaded rod or steel sleeves (depending upon application) are then slowly pushed into the screen tube while continuously rotating.

After the sleeve has been installed for the 5/8"-diameter through-bolted anchor in an 8" deep hole, and the epoxy has been given time to cure, a 5/8"-diameter drill bit is used to drill through the plastic plugs in the steel sleeves and completely through the remaining thickness of the wall. A 5/8"-diameter threaded rod is then pushed through to the other side. A metal plate and nut are attached to the end of the rod on the exterior side of the wall.

Holes for the combination anchors installed at 22.5 degrees are drilled using 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 are drilled a minimum of 13" 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"-diameter anchors resisting only shear loads are drilled to a depth of 8" and are installed with a screen as described above.

United Steel Products Company

RE: CIA-Gel Anchors for use in unreinforced solid brick walls

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 2008 Los Angeles Building 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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