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**DIVISION: 04—MASONRY**  
**Section: 04081—Masonry Anchorage**

**REPORT HOLDER:**

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**EVALUATION SUBJECT:**

**CIA-GEL 7000 EPOXY AND EPOXY ACRYLATE**

### 1.0 EVALUATION SCOPE

**Compliance with the following codes:**

- 2006 *International Building Code*® (2006 IBC)
- \* ■ ~~2006 *International Residential Code*® (2006 IRC)~~
- ~~2003 *International Building Code*® (2003 IBC)~~
- ~~2003 *International Residential Code*® (2003 IRC)~~
- ~~2000 *International Building Code*® (2000 IBC)~~
- ~~2000 *International Residential Code*® (2000 IRC)~~
- ~~1997 *Uniform Building Code*™ (UBC)~~

**Properties evaluated:**

Structural

### 2.0 USES

- The anchoring systems are alternatives to the solidly grouted anchors described in Section 2.1.4 of ACI 530, referenced in the IBC and Section 2107 of the UBC. ~~The anchors are permitted to be used where an engineered design is submitted in accordance with Section R301.1.2 of the IRC.~~

### 3.0 DESCRIPTION

#### 3.1 Covert Injection Adhesive:

**3.1.1 General:** The Covert Injection Adhesive (CIA) is a two-component structural epoxy adhesive for anchoring stud-type, threaded steel anchor bolts or deformed steel reinforcing bars into unreinforced brick. The adhesive formulation is designated as CIA-Gel 7000. The CIA-Gel adhesive anchors consist of CIA-Gel 7000 epoxy and a threaded steel rod, with a nut and washer, or deformed steel reinforcing bars. The installation in unreinforced brick masonry and reinforced brick masonry, is described in Sections 4.1.2 through 4.1.5 in this report.

#### 3.1.2 Materials:

**3.1.2.1 Adhesive:** The CIA-Gel 7000 epoxy two-component adhesive is packaged in equal-volume, side-by-side plastic cartridges. The cartridges are sealed individually with D-shaped plugs and/or a screw-on cap, which may be reused after partial use of contents. The epoxy is mixed when dispensed through a spiral motionless mixer attached to the cartridge. The epoxy shall be dispensed with either a manual or a pneumatically activated tool. The CIA-Gel 7000 epoxy adhesive components have a shelf life of one year when stored in a dry environment at a temperature of 70°F (21°C). The hardening times are noted in Table 3.

**3.1.2.2 Threaded Rods:** All threaded rods are manufactured from steel complying with ASTM A 307, Grade C [ $F_u = 60,000$  psi (400 MPa), minimum]; ASTM A 193, Grade B7; [ $F_u = 125,000$  psi (860 MPa), minimum]; or ASTM F 593, Grade F 593A [ $F_u = 115,000$  psi (795 MPa), minimum], SS304. Specifications and installation details for threaded rods are noted in Table 1.

**3.1.2.3 Reinforcing Bars:** Deformed reinforcement bars are manufactured from steel complying with ASTM A 615, Grade 60. Specifications and installation details for reinforcing bars are noted in Table 2 in this report.

### 4.0 DESIGN AND INSTALLATION

#### 4.1 Covert Injection Adhesive:

- \* **4.1.1 Design:** Design applies to ~~both the UBC and the IBC.~~ Allowable tension and shear values for threaded rod or reinforcing bar are described in Tables 4, 5 and 6 in this report. The allowable tension load values noted in Tables 4 and 5 shall be adjusted for in-service temperatures in accordance with Figure 1 in this report, when anchors are installed in locations where the masonry temperatures may exceed 105°F (41°C). Allowable loads for anchors subjected to combined shear and tension forces shall be determined by the following equation:

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

where:

- $P_s$  = Applied service tensile load.
- $P_t$  = Allowable service tensile load.
- $V_a$  = Applied service shear load.
- $V_t$  = Allowable service shear load.
- $n$  = 1 for unreinforced brick masonry.
- $n$  =  $5/3$  for concrete masonry.

**4.1.2 Installation in Masonry:** A hole is drilled to the specified depth with a handheld electro-pneumatic rotary hammer drill using carbide-tipped drill bits conforming to ANSI Specification B212.15-1994. The holes shall be cleaned of dust and debris with a nylon brush and a jet of compressed air. The hole diameter, anchor embedment, spacing and edge distances shall comply with Tables 4 or 5 in this report. A mixing nozzle shall be attached to the adhesive cartridge and the assembly placed into the hand or pneumatic injection tool. Before placement into the hole, a small amount of epoxy shall be pumped out of the nozzle until a uniform gray material is achieved. Holes shall be approximately half-filled with the mixed epoxy. The threaded rods or deformed reinforcement bars shall be inserted with a rotating motion until the anchor contacts the bottom of the hole. The adhesive shall be level with the masonry surface after insertion of the rod or bar. Oil, scale, and rust shall be removed from the threaded rod or reinforcing bar prior to installation. During anchor installation, the hole and surrounding location may be wet, and any standing water need not be removed from the hole. Anchors shall not be loaded until cure time has passed.

#### 4.1.3 Installation in Unreinforced Brick Masonry Walls:

**4.1.3.1 General:** Anchors installed in unreinforced masonry using the CIA-Gel 7000 adhesive shall be designed to resist wind or seismic loads. The existing unreinforced brick walls shall have a minimum thickness of 13 inches [330 mm (3 wythes of brick)].

Three types of anchor assemblies can be used for retrofitting. The anchor assembly resisting tension and shear loads where the outside of the wall is not accessible is the “combination” anchor. The anchor shall be installed in the wall at an angle of  $22\frac{1}{2}$  degrees to the horizontal. The anchor consists of a  $\frac{3}{4}$ -inch-diameter (19.1 mm) ASTM A 307 prebent threaded rod used with a  $\frac{15}{16}$ -inch-outer-diameter (23.8 mm) screen tube, 13 inches (330 mm) long and made of steel wire cloth. The threaded rod shall be embedded a minimum of 13 inches (330 mm) at the  $22\frac{1}{2}$ -degree angle. Figure 2 in this report provides details of an installed “combination” anchor.

The anchor assembly for tension and shear applications where the outside of the wall is accessible is the “through-bolt” anchor. The assembly consists of  $\frac{5}{8}$ -inch-diameter (15.9 mm) ASTM A 307 threaded rod; a  $\frac{13}{16}$ -inch (20.6 mm) O.D. by  $\frac{11}{16}$ -inch (17.5 mm) I.D. AISI 1010 steel sleeve 8 inches (203 mm) in length; a  $\frac{15}{16}$ -inch-diameter-by-8-inch-long (23.8 mm by 203 mm) wire mesh screen tube; and an ASTM A 36 steel plate measuring 6 inches by 6 inches by  $\frac{3}{8}$  inch (152 mm by 152 mm by 9.5 mm). The plate shall be bolted to the opposite side of the wall. The steel sleeve has a plastic plug at one end to prevent leakage of adhesive during installation. Figure 3 provides details of an installed “through-bolt” anchor.

The anchor assembly resisting shear load where the outside wall is inaccessible is the “shear” anchor. The assembly consists of a  $\frac{3}{4}$ -,  $\frac{5}{8}$ - or  $\frac{1}{2}$ -inch-diameter (19.1, 15.9, or 12.7 mm) ASTM A 307 threaded rod or a No. 6, No. 5 or No. 4 reinforcing bar and a  $\frac{15}{16}$ -inch-diameter-by-8-inch-long (23.8 mm by 203 mm) wire mesh screen tube. Figure 4 provides details of an installed “shear” anchor.

**4.1.3.2 Installation:** One-inch-diameter (25.4 mm) holes shall be drilled using standard carbide-tipped masonry drill bits which meet ANSI Specification B212.15-1994. A rotary drill, or rotary hammer drill set on “rotation only,” shall be used to drill the holes.

Holes for the “combination” anchors (Figure 2 in this report) shall be drilled 13 inches (330 mm) deep at a  $22\frac{1}{2}$ -degree angle. Holes for the “through-bolt” anchors (Figure 3) and the “shear” anchors (Figure 4) shall be drilled perpendicular to the wall. For the “through-bolt” application, the holes shall be

drilled completely through the wall. For shear anchors, the holes shall be drilled 8 inches (203 mm) deep. The holes shall be cleaned using a nylon brush and a jet of compressed air. An extension nozzle shall be used to reach the back of the hole with compressed air.

Screen tubes shall be completely filled with CIA-Gel 7000 epoxy and placed into the drilled holes. A  $\frac{3}{4}$ -inch-diameter (19.1 mm) threaded rod for the “combination” anchors and “shear” anchors, and  $\frac{7}{8}$ -inch-diameter (22 mm) steel sleeves for the “through-bolt” anchors, shall be slowly pushed into the screen tube, while being rotated continuously. The anchors or steel sleeves shall be allowed to cure for the times listed in Table 3 before anchors are loaded. Bolt-up time refers to that period of cure after which hardware may be placed and nuts tightened. Care shall be taken not to overtighten nuts nor induce tension in the bolts. Design loads may not be applied until minimum cure time has been reached.

For the through-bolted anchor, a 1-inch-diameter (25.4 mm), 8-inch-deep (203 mm) hole shall be drilled and cleaned as noted above. A  $\frac{7}{8}$ -inch-outer-diameter (22 mm) steel sleeve shall be pushed into an adhesive-filled screen in a manner similar to the rod. After curing, a hole shall be drilled through the sleeve and through the remainder of the masonry wall. Drilling shall be continued until the entire wall is penetrated. The  $\frac{5}{8}$ -inch-diameter (15.9 mm) rod shall be inserted and fitted with a plate and nut to complete the through-bolted anchor connection. See Figure 3 for additional details.

**4.1.3.3 Conditions of Acceptance:** Conditions of acceptance for threaded rods and reinforcing bars in unreinforced brick masonry shall be as follows:

##### 4.1.3.3.1 Threaded Rods and Through-bolts in Tension and Shear:

- Installation of threaded rods and through-bolts shall comply with Sections 4.1.3.1 and 4.1.3.2 in this report.
- Maximum allowable tension load for the  $\frac{3}{4}$ -inch-diameter (19.1 mm) bent threaded rod or the  $\frac{5}{8}$ -inch-diameter (15.9 mm) through-bolt shall be 1,200 pounds (5340 N), with no increase for lateral loading.
- The maximum allowable shear load for the  $\frac{3}{4}$ -inch-diameter (19.1 mm) bent threaded rod shall be 1,000 pounds (4450 N) and for the  $\frac{5}{8}$ -inch (15.9 mm) through-bolt shall be 750 pounds (3338 N), with no increase for lateral loading permitted.
- For the  $\frac{3}{4}$ -inch-diameter (19.1 mm) bent threaded rod or the  $\frac{5}{8}$ -inch-diameter (15.9 mm) through-bolt subjected to tension and shear, the allowable combined load shall be determined using the equation in Section 4.1.1 in this report.
- Minimum wall thickness shall be 13 inches [330 mm (three wythes of brick)].
- The allowable tension and shear shall be applicable only to anchors installed in walls where in-place shear tests indicate a minimum mortar strength of 50 psi (345 kPa), net in accordance with Section A 106.3.3.5 of the 2003 *International Existing Building Code*® (IEBC) or Section A 106.3.3.5 of the 1991 *Uniform Code for Building Conservation*™ (UCBC). Testing must be conducted in accordance with Section A106.3.31 of the IEBC.

##### 4.1.3.3.2 Threaded Rods or Reinforcing Bars in Shear:

- Installation of threaded rods and reinforcing bars intended to resist shear only shall comply with Section 4.1.3.
- The allowable shear load for the  $\frac{3}{4}$ -inch-diameter (19.1 mm) rod shall be 1,000 pounds (4450 N), and for the No. 6, No. 5 and No. 4 reinforcing bars the allowable shear loads shall be 1,000, 750 and 500 pounds (4450, 3338

and 2225 N), respectively. No increase for lateral loading shall be permitted with the above-noted loads.

- c. Minimum wall thickness shall be 13 inches [339 mm (three wythes of brick)].
- d. Allowable shear value shall be applicable only to anchors installed in walls where in-place shear tests indicate a minimum mortar strength of 50 psi (345 kPa) net in accordance with Section A 106.3.3.5 of the IEBC or Section 106.3.3.5 of the UCBC. Testing must be conducted in accordance with Section A 106.3.31 of the IEBC.

**4.1.3.4 Miscellaneous:** The Covert Injection Adhesive Anchors are intended for resisting short-term lateral loads only, such as wind or seismic loads. The anchors must be approved by the registered design professional and installed under special inspection in accordance with Section 4.4 in this report.

The anchor edge distances and vertical and horizontal spacings for the three types of anchor assemblies described in Section 4.1.3.1, shall comply with Table 7.

**4.1.4 Installation in Unreinforced, Grouted, Concrete Masonry Walls:** CIA-Gel 7000 adhesive may be installed in unreinforced, grouted concrete masonry walls, utilizing  $\frac{3}{8}$ -inch-,  $\frac{1}{2}$ -inch-,  $\frac{5}{8}$ -inch- and  $\frac{3}{4}$ -inch-diameter (9.5 mm, 12.7 mm, 15.9 mm and 19.1 mm) anchors designed to resist tension and shear loads. The anchors are threaded rods as described in Section 3.1.2.2. The anchors shall be installed in minimum 2,300 psi (15.9 MPa) grouted concrete masonry. The existing unreinforced concrete masonry walls shall have a minimum thickness of 8 inches (203 mm). The installation is described in Section 4.1.2. Allowable loads, embedment depths, and end and edge distances are noted in Table 4.

**4.1.5 Installation in Reinforced Brick Masonry Walls:** CIA-Gel 7000 adhesive may be installed in brick masonry walls, utilizing  $\frac{1}{2}$ -inch- and  $\frac{3}{4}$ -inch-diameter (12.7 mm and 19.1 mm) anchors. The anchors are threaded rods complying with ASTM A 193, Grade B7. The existing reinforced brick wall shall have a minimum thickness of 9 inches (229 mm). The anchors shall be installed in masonry units having a minimum 1,300 psi (8.9 MPa) strength. Installation is described in Section 4.1.2. Allowable loads are noted in Table 5.

## 4.2 Special Inspection:

\* Adhesive anchor installations require continuous special inspection in accordance with ~~Section 1701 of the UBC and~~ Section 1704 of the IBC. The special inspector shall record product description (including product name), adhesive expiration date, concrete type and strength, anchor diameter and steel grade, compliance of drill bit with this report, hole diameter and location, cleanliness of hole and anchor, adhesive application, anchor embedment, and verification that anchor installation is in accordance with the manufacturer's published installation instructions and this report. The manufacturer's instructions shall be included in each package.

## 5.0 CONDITIONS OF USE

The anchoring systems described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1 The anchors are installed in accordance with this report and the manufacturer's installation instructions. The anchor size, minimum embedment depths, spacing and edge distances shall conform to applicable tables in this report.

- 5.2 Calculations and construction drawings verifying compliance with the applicable code and this report shall be submitted to the building official. The calculations and construction drawings shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

- 5.3 Since an ICC-ES acceptance criteria for adhesive and undercut 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.

- 5.4 **Fire-resistance-rated Construction:** Anchors are not permitted to support fire-resistance-rated construction. Where not otherwise prohibited by the code, anchors are permitted for installation in fire-resistance-rated 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-resistance-rated envelope or a fire-resistance-rated membrane, are protected by approved fire-resistance-rated materials, or have been evaluated for resistance to fire exposure in accordance with recognized standards.
  - Anchors are used to support nonstructural elements.

- 5.5 Since an ICC-ES acceptance criteria for 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.

- 5.6 **Grouted Masonry under the IBC or the IRC:** The adhesive anchors described in the evaluation report are capable of resisting seismic and wind loads. When using the basic load combinations in accordance with 2003 IBC Section 1605.3.1, allowable loads are not permitted to be increased for seismic or wind loading. When using the alternative basic load combinations in 2003 IBC Section 1605.3.2 that include seismic or wind loads, the allowable shear and tension loads for anchors are permitted to be increased by  $33\frac{1}{3}$  percent, or the alternative basic load combinations may be reduced by a factor of 0.75.

- 5.7 ~~**Grouted Masonry under the 1997 UBC:** When using the basic load combinations in accordance with UBC Section 1612.3.1, allowable loads are not permitted to be increased for wind or seismic loading. When using the alternative basic load combinations in UBC Section 1612.3.2 that include wind or seismic loads, the allowable shear and tension loads for anchors are permitted to be increased by  $33\frac{1}{3}$  percent. The values in Table 8, 9, 10, 11, 13 and 14, however, must not be adjusted for wind.~~

- 5.8 Adhesive anchors 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 reductions for elevated temperatures.

- 5.9 The use of the CIA-Gel 7000 adhesive anchors in conjunction with carbon steel threaded rods and/or reinforcing bars is limited to interior exposure. Installations exposed to severe, moderate or negligible exterior weathering conditions, as defined in Figure 21-1-1 of UBC Standard 21-1 or Figure 1 of ASTM C 62-97a (IBC or IRC), are permitted where SS304 stainless steel anchors are used.

- 5.10** Special inspection in accordance with Section 4.3 shall be provided for all adhesive anchor installations.
- 5.11** For CIA-GEL 7000 adhesive anchors, during anchor installation, the hole and surrounding location are permitted to be dry, damp, or wet, including the presence of standing water.
- 5.12** The CIA-Gel 7000 adhesive anchors are manufactured in Rancho Cucamonga, California, under a quality control program with inspections by CEL Consulting (AA-639).

## 6.0 EVIDENCE SUBMITTED

In addition to a quality control manual, the following evidence was submitted:

- 6.1 CIA-GEL 7000 Anchors:** Data in accordance with the ICC-ES Acceptance Criteria for Adhesive Anchors in Masonry Elements (AC58), dated June 2006, including reports of seismic tests, freezing and thawing tests, creep tests, and damp and water-filled hole tests.

- 6.2 CIA-GEL 7000 Anchors in Unreinforced Masonry:** Data in accordance with the ICC-ES Acceptance Criteria for Unreinforced Masonry Anchors (AC60), dated April 2005.

## 7.0 IDENTIFICATION

The CIA-Gel 7000 shall be identified by a label on the cartridge displaying the name and address of the manufacturer (USP Structural Connectors), the words "CIA-Gel 7000," general installation instructions, the expiration date, the weight and the evaluation report number (ESR-1702). Steel sleeves and screen tubes are identified by a label on boxes displaying the name and address of the manufacturer (USP Structural Connectors) and size and quantity of the contents. Threaded rods and bars shall be identified by material certification.

**TABLE 1—SPECIFICATION AND INSTALLATION DETAILS FOR  
THREADED ROD INSTALLED WITH COVERT INJECTION ADHESIVES**

PARAMETER	ROD DIAMETER, <i>d</i> (inches)						
	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1	$1\frac{1}{4}$
$d_{o1}$ Nominal bit diameter (in.)/CIA-GEL	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$
$d_{o2}$ Nominal bit diameter (in.)/CIA-EA	$\frac{7}{16}$	$\frac{9}{16}$	$\frac{11}{16}$	$\frac{13}{16}$	$\frac{15}{16}$	$1\frac{1}{8}$	$1\frac{3}{8}$
$A_s$ Tensile stress area (in. <sup>2</sup> )	0.0775	0.142	0.226	0.334	0.462	0.606	0.969
$A_b$ Nominal area of rod (in. <sup>2</sup> )	0.1042	0.1867	0.2935	0.4246	0.6013	0.7854	1.227
$T_{max}$ Maximum tightening torque (ft.-lbs.)	0	0	0	0	0	0	0

For SI: 1 inch = 25.4 mm, 1 in.<sup>2</sup> = 645 mm<sup>2</sup>, 1 ft.-lbf = 1356 N-mm.

**TABLE 2—SPECIFICATION AND INSTALLATION DETAILS FOR  
REINFORCING BAR (REBAR) INSTALLED WITH COVERT INJECTION ADHESIVE CIA-GEL 7000**

PARAMETER	REBAR SIZE, <i>d<sub>r</sub></i>							
	#3	#4	#5	#6	#7	#8	#9	#10
$A_{br}$ Nominal area of rebar (in. <sup>2</sup> )	0.11	0.20	0.31	0.44	0.60	0.79	1.0	1.27
$d_o$ Nominal bit diameter hole size (in.)	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	1	$1\frac{1}{8}$	$1\frac{1}{4}$	$1\frac{3}{8}$	$1\frac{1}{2}$

For SI: 1 inch = 25.4 mm.

**TABLE 3—RECOMMENDED HARDENING TIMES FOR  
COVERT INJECTION ADHESIVE CIA-GEL 7000**

TEMPERATURE (°F) <sup>1</sup>	BOLT-UP TIME (hours) <sup>2</sup>	CURE TIME (hours) <sup>3</sup>
40-50	12	72
51-60	8	48
61-70	6	36
71-80	4	24
>80	4	24

For SI: 1°C = 0.555(°F - 32).

<sup>1</sup>Installation in substrates colder than 40°F is beyond the scope of this report since data has not been submitted for such applications.

<sup>2</sup>Section 4.1.3.2, third paragraph, explains bolt-up time.

<sup>3</sup>Minimum cure time is the time required for the adhesive to achieve full strength.

**TABLE 4—ALLOWABLE TENSION AND SHEAR LOADS FOR THREADED ROD INSTALLED IN GROUT-FILLED NORMAL-WEIGHT CONCRETE MASONRY UNITS USING CIA-GEL 7000 (pounds)<sup>1,2,3,4,5,6</sup>**

STUD DIAMETER (inch)	DRILL DIAMETER (inch)	EMBEDMENT, $h_{ef}$ (inches)	SPACING, $s$ (inches)	EDGE DISTANCE, $c$ (inches)	TENSION		SHEAR CELL (pounds)
					Cell (pounds)	Joint (pounds)	
$\frac{3}{8}$	$\frac{1}{2}$	$3\frac{1}{2}$	$6\frac{3}{4}$	$3\frac{3}{8}$	1255	790	1170
$\frac{1}{2}$	$\frac{5}{8}$	$4\frac{1}{4}$	9	$4\frac{1}{2}$	1610	1060	1880
$\frac{5}{8}$	$\frac{3}{4}$	$4\frac{7}{8}$	$11\frac{1}{4}$	$5\frac{5}{8}$	1980	1360	2270
$\frac{3}{4}$	$\frac{7}{8}$	$6\frac{1}{2}$	$13\frac{1}{2}$	$6\frac{3}{4}$	1910	2495	2975

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N, 1°C = 0.555(°F - 32).

<sup>1</sup>Values are for 6- and 8-inch-wide, Grade N type, lightweight, medium-weight, or normal-weight concrete masonry units conforming to UBC Standard 21-4 or ASTM C 90-99 (IBC or IRC), with a minimum compressive strength of 2,300 psi. Grout shall meet the proportions of Table 21-B of the UBC, Table 2103.10 of the IBC, or Table R609.1.1 of the IRC.

<sup>2</sup>Allowable load must be the lesser of bond or steel strength. See Table 6 for steel strength values.

<sup>3</sup>The tabulated values are for anchors installed at the specified spacing ( $s$ ) and edge ( $c$ ) distances. Linear interpolation may be used for intermediate spacings.

<sup>4</sup>The CIA-Gel 7000 experiences a reduction in capacity with increased ambient temperatures. The temperature load factors noted in Figure 1 must be applied to the tension and shear values when anchors are installed in locations where the masonry temperatures may exceed 105°F.

<sup>5</sup>The allowable loads are based on a factor of safety of 5. ~~The tabulated allowable loads may be increased by 25 percent for installations under the UBC.~~

<sup>6</sup>Mortar must be Type N mortar complying with UBC Section 2103.3 and UBC Standard 21-15 for compliance under the UBC, IBC Section 2103.7 for compliance under the IBC, or Section R607.1 for compliance under the IRC.

**TABLE 5—ALLOWABLE TENSION AND SHEAR VALUES IN CLAY BRICK MASONRY FOR THREADED RODS USING CIA-GEL 7000 (pounds)<sup>1,2,3,4,5,6,7,8</sup>**

STUD DIAMETER (inch)	DRILL DIAMETER (inch)	EMBEDMENT, $h_{ef}$ (inches)	SPACING, $s$ (inches)	EDGE DISTANCE, $c$ (inches)	TENSION BASED ON BOND STRENGTH (pounds)	SHEAR BASED ON BOND STRENGTH (pounds)
$\frac{1}{2}$	$\frac{5}{8}$	6	12	6	3090	2385
$\frac{3}{4}$	$\frac{7}{8}$	$7\frac{3}{4}$	15	$7\frac{3}{4}$	4485	3790

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N, 1°C = 0.555(°F - 32).

<sup>1</sup>Allowable load must be the lesser of bond or steel strength. See Table 6 for allowable loads based on steel strength.

<sup>2</sup>The tabulated values are for anchors installed at the specified spacing ( $s$ ) and edge ( $c$ ) distances. Linear Interpolation may be used for intermediate dimensions.

<sup>3</sup>The tabulated values are for anchors installed in minimum 9-inch-thick reinforced clay brick masonry with a minimum  $f'_m = 1,300$  psi. The brick units shall conform to UBC Standard 21-1 or ASTM C 62-97a (IBC or IRC). Grout shall meet the proportions of Table 21-B of the UBC, Table 2103.10 of the IBC, or Table R609.1.1 of the IRC.

<sup>4</sup>The CIA-Gel 7000 experiences a reduction in capacity with increased ambient temperatures. The temperature load factors noted in Figure 1 must be applied to the values when anchors are installed in locations where the concrete temperatures may exceed 105°F.

<sup>5</sup>The anchors cannot be used to resist pullout forces in overhead and wall installations, unless proper consideration is given to fire conditions.

<sup>6</sup>Anchors may be installed in the brick face or the mortar joint.

<sup>7</sup>~~The allowable loads are based on a factor of safety of 5 and may be increased by 25 percent for applications under the UBC.~~

<sup>8</sup>Mortar must be Type N mortar complying with UBC Section 2103.3 and UBC Standard 21-15 for compliance under the UBC, IBC Section 2103.7 for compliance under the IBC, or Section R607.1 for compliance under the IRC.

**TABLE 6—ALLOWABLE TENSION AND SHEAR LOADS FOR THREADED ROD BASED ON STEEL STRENGTH**

ROD DIAMETER (inch)	STEEL STRENGTH IN TENSION (pounds)			STEEL STRENGTH IN SHEAR (pounds)		
	ASTM A 307	ASTM A 193 GR B7	ASTM SS 304	ASTM A 307	ASTM A 193 GR B7	ASTM SS 304
$\frac{3}{8}$	2185	4580	2732	1125	2350	1400
$\frac{1}{2}$	3885	8210	4860	2000	4170	2500
$\frac{5}{8}$	6070	12910	7590	3125	6520	2900
$\frac{3}{4}$	8740	18680	10925	4500	9390	5610
$\frac{7}{8}$	11900	25510	14875	6130	12775	8687
1	15540	33390	19428	8000	16700	10000

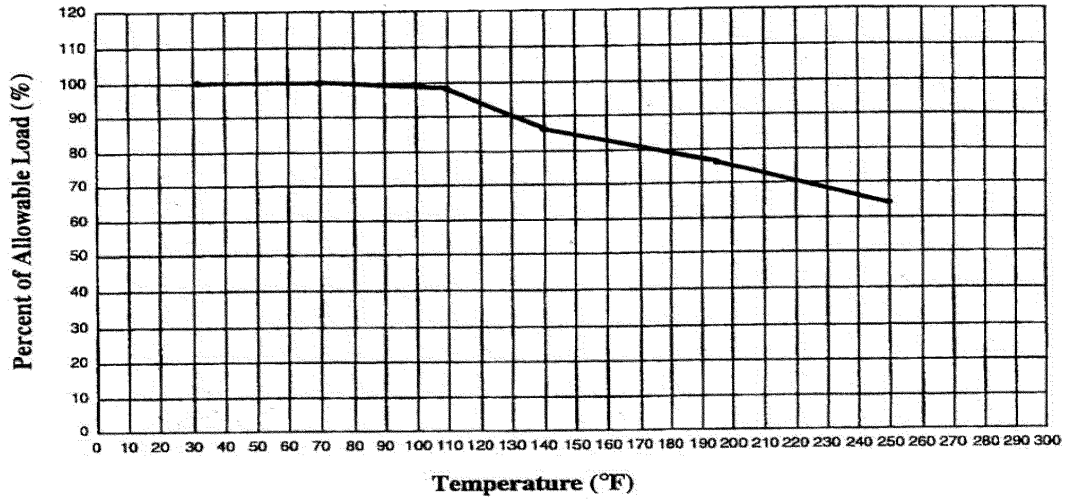
For SI: 1 inch = 25.4mm, 1psi = 6.89 kPa, 1 lbf = 4.45 N.

**TABLE 7—MINIMUM SPACING AND EDGE DISTANCE FOR COVERT INJECTION ADHESIVE ANCHORS IN UNREINFORCED MASONRY (inches)**

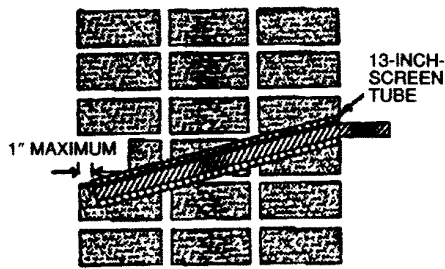
ANCHOR TYPE	MINIMUM VERTICAL SPACING	MINIMUM HORIZONTAL SPACING	MINIMUM EDGE DISTANCE
All types <sup>1</sup>	16	16	16

For SI: 1 inch = 25.4 mm.

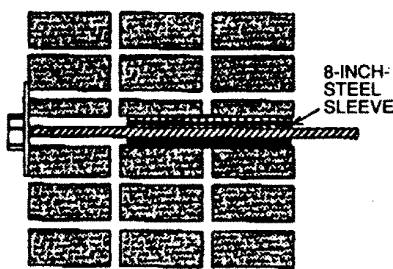
<sup>1</sup>"All types" refers to the three types of anchor assemblies described in Section 4.1.3.1 and Figures 3, 4 and 5 of this report.



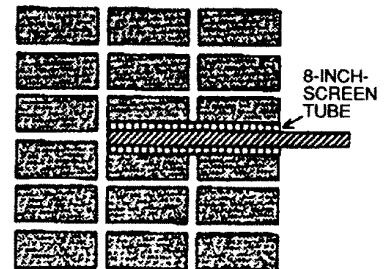
**FIGURE 1—CONCRETE TEMPERATURE SENSITIVITY TENSION AND SHEAR LOAD FACTOR FOR CIA ANCHORS**



**FIGURE 2  
THE COMBINATION ANCHOR**



**FIGURE 3  
THE THRU-BOLT ANCHOR**



**FIGURE 4  
THE SHEAR ANCHOR**