ICC-ES Evaluation Report

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DIVISION: 03—CONCRETE
Section: 03151—Concrete Anchoring

REPORT HOLDER:

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EVALUATION SUBJECT

POWERS T308+ EPOXY ADHESIVE ANCHORING SYSTEM IN UNCRACKED CONCRETE

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2009 *International Building Code*® (2009 IBC)
- 2009 *International Residential Code*® (2009 IRC)
- 2009 *International Plumbing Code*® (IPC)
- 2006 *International Building Code*® (2006 IBC)
- 2006 *International Residential Code*® (2006 IRC)
- 2003 *International Building Code*® (2003 IBC)
- 2003 *International Residential Code*® (2003 IRC)
- 1997 *Uniform Building Code*™ (UBC)

Property evaluated:

Structural

2.0 USES

Powers T308+ Epoxy Adhesive Anchors are used to resist static tension and shear loads, including wind loads, in uncracked, normal-weight concrete having a specified compressive strength, f'_c, of 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa). The anchors are alternatives to cast-in-place anchors described in Sections 1911 and 1912 of the 2009 and 2006 IBC, Sections 1912 and 1913 of the 2003 IBC, and Sections 1923.1 and 1923.2 of the UBC. The anchors may also be used where an engineering design is submitted in accordance with Section R301.1.3 of the 2009, 2006 and 2003 IRC.

3.0 DESCRIPTION

3.1 General:

The Powers T308+ Epoxy Adhesive Anchoring System is comprised of the following components:

- T308+ epoxy adhesive
- Adhesive mixing and dispensing equipment
- Hole cleaning equipment

Powers T308+ epoxy adhesive is used with continuously threaded carbon steel rods. Installation instructions and parameters, included with each adhesive unit package, are replicated in Figure 3 of this report.

The primary components of the Powers T308+ epoxy adhesive anchoring system, including the side-by-side cartridge, static mixing nozzle, nozzle extension tube and steel anchor elements, are shown in Figure 2.

3.1.1 Powers T308+ Epoxy Adhesive: Powers T308+ is a two-component (resin and hardener) epoxy-based adhesive, supplied in dual-chamber, plastic cartridges separating the chemical components, which are combined in a 1:1 ratio by volume when dispensed through the system static mixing nozzle supplied by Powers Fasteners, Inc. Powers T308+ is available in 8.5-ounce (250 mL), 14-ounce (410 mL), 21.5-ounce (630 mL) and 51-ounce (1508 mL) cartridges. Each cartridge label is marked with the adhesive expiration date, reflecting a shelf life of two years when the adhesive is stored in the manufacturer's unopened containers at temperatures between 40°F (4.4°C) and 95°F (35°C).

3.1.2 Dispensing Equipment: Powers T308+ epoxy adhesive must be dispensed using a powered or manually actuated extrusion tool, supplied by Powers Fasteners, Inc. intended for the cartridge size.

3.2 Hole Preparation:

The holes must be drilled with carbide drills placed in a percussion electric drill (e.g., hammer drill or equivalent). The holes must be cleaned in accordance with the installation instructions using the corresponding-size nylon-cleaning brush supplied by Powers Fasteners, Inc.

3.3 Anchor Element Materials:

3.3.1 Threaded Rod: Continuously threaded anchor rods, $^3/_8$ inch- to $^7/_8$ inch in diameter (9.5 mm to 22.2 mm) must be formed from carbon steel and comply with ASTM

F 1554 Grade 36 (supersedes ASTM A 307, Grade C) or ASTM A 193, Grade B7, and must be dry and free of dirt, mud, scale, rust, oil, or other foreign materials that could decrease bond. Threaded rods must be straight and free of indentations or other defects along their length. Nuts must comply with ASTM A 563 Grade A for use with rods complying with ASTM F 1554 Grade 36; or ASTM A 194 in a grade and type developing specified proof load stresses equal to or greater than the minimum tensile strength of the rods complying with ASTM A 193 Grade B7. Carbon steel rods must be furnished with a minimum 0.0002-inch-thick (0.005 mm) zinc-electroplated coating complying with ASTM B 633, SC1, or a minimum 0.0021-inch-thick (0.053 mm) mechanically deposited zinc coating complying with ASTM F 695, Class 55. Table 1 of this report contains further details regarding material strength properties of threaded rod steel elements.

3.3.2 Ductility: In accordance with ACI 318-08 (2009 IBC) and ACI 318-05 (2006 IBC), for the steel element to be considered as ductile, the threaded rod elongation must be not less than 14 percent and have a reduction of area not less than 30 percent. Steel elements that have an elongation of less than 14 percent or a reduction of area less than 30 percent must be considered brittle.

Rods complying with both ASTM F 1554, Grade 36, or ASTM A 193, Grade B7, may be designed as ductile steel elements based on the minimum specified elongation and reduction of area properties required by these standards.

3.4 Concrete:

Normal-weight concrete with a minimum compressive strength as indicated in this report, at the time of anchor installation, of 2,500 psi (17.2 MPa) but not less than that required by the applicable code, nor more than 8,500 psi (58.6 MPa), must comply with Sections 1903 and 1905 of the IBC or UBC, as applicable.

4.0 DESIGN AND INSTALLATION

4.1 Strength Design:

4.1.1 General: Anchor design strengths, ϕN_n and ϕV_n, must be determined in accordance with ACI 318-08 (2009 IBC and IRC) or ACI 318-05 (2006 IBC and IRC), as applicable, using the design parameters provided in Table 1 of this report. An example set of calculations is presented in Figure 1. Design strengths must be determined in accordance with ACI 318-08 as an alternative to the 2003 IBC. 2003 IRC design parameters are based on the 2009 IBC (ACI 318-08) unless noted otherwise in Sections 4.1.1 through 4.1.2 of this report. The anchor design must satisfy the requirements in ACI 318 D.4.1.1 and D.4.1.2 of this report. Strength reduction factors, ϕ, described in ACI 318 D.4.4, and noted in Table 1 of this report, must be used for the load combinations calculated in accordance with Section 1605.2.1 of the IBC, ACI 318 Section 9.2, or UBC Section 1612.2.1. Strength reduction factors, ϕ, described in ACI 318 D.4.5 must be used for load combinations calculated in accordance with Appendix C of ACI 318 or Section 1909.2 of the UBC.

This section provides amendments to ACI 318 Appendix D as required for the strength design of post-installed adhesive anchors in hardened concrete. In conformance with ACI 318, all equations are expressed in inch-pound units.

Modify ACI 318 D.4.1.2 as follows:

D.4.1.2 — In Eq. (D-1) and (D-2), ϕN_n and ϕV_n are the lowest design strengths determined from all appropriate failure modes. ϕN_n is the lowest design strength in tension of an anchor or group of anchors as determined from consideration of ϕN_{sa}, either ϕN_a or ϕN_{ag}, and either ϕN_{cb} or ϕN_{cbg}. ϕV_n is the lowest design strength in tension of an anchor or group of anchors as determined from consideration of ϕV_{sa}, either ϕV_{cp} or ϕV_{cpg}, and either ϕV_{cb} or ϕV_{cbg}. For adhesive anchors subjected to tension resulting from sustained loading, refer to D.4.1.4 in this report for additional requirements.

Add ACI 318 D.4.1.4 as follows:

D.4.1.4 — For adhesive anchors subjected to tension resulting from sustained loading, a supplementary check shall be performed using Eq. (D-1), whereby N_{ua} is determined from the sustained load alone, e.g., the dead load and that portion of the live load acting that may be considered as sustained and ϕN_n is determined as follows:

D.4.1.4.1 — For single anchors, $\phi N_n = 0.75\phi N_{ao}$

D.4.1.4.2 — For anchor groups, Eq. (D-1) shall be satisfied by taking $\phi N_n = 0.75\phi N_{ao}$ for that anchor in an anchor group that resists the highest tension load.

D.4.1.4.3 — Where shear loads act concurrently with the sustained tension load, the interaction of tension and shear shall be analyzed in accordance with D.4.1.3.

4.1.2 Static Steel Strength in Tension: The nominal steel strength of a single anchor in tension, N_{sa} , shall be calculated in accordance with ACI 318 D.5.1.2. N_{sa} and the strength reduction factor, ϕ, in accordance with ACI 318 D.4.4 are given in Table 1 of this report.

4.1.3 Static Concrete Breakout Strength in Tension: The nominal concrete breakout strength in tension of a single anchor or group of anchors, N_{cb} and N_{cbg}, must be calculated in accordance with ACI 318 D.5.2, with the following modifications as described in this section.

D.5.2.910 (2009 IBC) or D.5.2.9 (2006 IBC) — The limiting concrete strength of adhesive anchors in tension shall be calculated in accordance with ACI 318-08 D.5.2.1 to D.5.2.9 under the 2009 IBC or ACI 318-05 D.5.2.1 to D.5.2.8 under the 2006 IBC where the value of k_c to be used in Eq. (D-7) shall be:

$k_{c,uncr}$ = 24 (SI units) or 10 (Imperial units)

where analysis indicates no cracking ($f_t < f_r$) at service load levels in anchor vicinity (uncracked concrete).

The basic concrete breakout strength of a single anchor in tension, N_b, must be calculated in accordance with ACI 318 D.5.2.2 using the values of h_{ef} and $k_{c,uncr}$ as given in Table 1 of this report.

The value of f'_c used in the design must be limited to a maximum of 8,000 psi (55.1 MPa) in accordance with D.3.5.

4.1.4 Static Pullout Strength in Tension: In lieu of determining the nominal pullout strength in accordance with ACI 318 D.5.3, the nominal bond strength in tension must be calculated using values noted in Table 1 of this report and in accordance with the following sections added to ACI 318:

D.5.3.7 — The nominal strength of an adhesive anchor, N_a, or group of adhesive anchors, N_{ag}, in tension must not exceed:

(a) for a single anchor

$$N_a = \frac{A_{Na}}{A_{Nao}}\psi_{ed,Na}\psi_{p,Na}N_{a0} \qquad \text{(D-16a)}$$

(*b*) *for a group of anchors*

$$N_{ag} = \frac{A_{Na}}{A_{Nao}} \psi_{g,na} \psi_{ec,Na} \psi_{ed,Na} \psi_{p,Na} N_{a0} \qquad (D\text{-}16b)$$

where:

A_{na} is the projected area of the failure surface for the anchor or group of anchors that shall be approximated as the base of the rectilinear geometrical figure that results from projecting the failure surface outward a distance $c_{cr,Na}$ from the centerline of the anchor, or in the case of a group of anchors, from a line through a row of adjacent anchors. A_{Na} must not exceed nA_{Na0} where n is the number of anchors loaded in tension in the group. In Figures RD.5.2.1a and RD.5.2.1b, the terms $1.5h_{ef}$ and $3.0h_{ef}$ are replaced with $c_{cr,Na}$ and $s_{cr,Na}$ respectively.

A_{Na0} is the projected area of the failure surface of a single anchor without the influence of proximate edges in accordance with Eq. (D-16c):

$$A_{Na0} = (s_{cr,Na})^2 \qquad (D\text{-}16c)$$

with:

$$s_{cr,Na} = 20d \cdot (\tau_{k,uncr}/1{,}450)^{1/2} \leq 3 \cdot h_{ef} \qquad (D\text{-}16d)$$

D.5.3.8 — The critical spacing $s_{cr,Na}$ and critical edge distance $c_{cr,Na}$ shall be calculated as follows:

$s_{cr,Na}$ = *as given by Eq. D-16d*

$$c_{cr,Na} = s_{cr,Na}/2 \qquad (D\text{-}16e)$$

D.5.3.9 — The basic strength of a single adhesive anchor in tension in uncracked concrete shall not exceed:

$$N_{a0} = \tau_{k,uncr} \cdot \pi \cdot d \cdot h_{ef} \qquad (D\text{-}16f)$$

where:

$\tau_{k,uncr}$ = *characteristic bond resistance in uncracked concrete.*

Table 1 in this report provides the values for each anchor diameter.

D.5.3.10 — The modification factor for the influence of the failure surface of a group of adhesive anchors is:

$$\psi_{g,Na} = \psi_{g,Na0} + [(s/s_{cr,Na})^{0.5} \cdot (1 - \psi_{g,Na0})] \qquad (D\text{-}16g)$$

where:

s = *actual spacing of the anchors.*

$$\psi_{g,Na0} = \sqrt{n} - [(\sqrt{n} - 1) \cdot (\tau_{k,uncr}/\tau_{k,max,uncr})^{1.5}] \geq 1.0 \qquad (D\text{-}16h)$$

N = *the number of tension loaded adhesive anchors in a group.*

$$\tau_{k,max,uncr} = \tau_{k,max,uncr} = \frac{k_{c,uncr}}{\pi \cdot d} \cdot \sqrt{h_{ef} \cdot f'_c} \qquad (D\text{-}16i)$$

The value of f'_c shall be limited to 8,000 psi (55 MPa), maximum, in accordance with ACI 318 D.3.5

D.5.3.11 — The modification factor for eccentrically loaded adhesive anchor groups is:

$$\psi_{ec,Na} = \psi_{ec,Na} = \frac{1}{1 + \frac{2e'_N}{s_{cr,Na}}} \leq 1.0 \qquad (D\text{-}16j)$$

Eq. (D-16j) is valid for $e'_N \leq s/2$

If the loading on an anchor group is such that only some anchors are in tension, only those anchors that are in tension shall be considered when determining the eccentricity e'_N for use in Eq. (D-16j).

In the case where eccentric loading exists about two orthogonal axes, the modification factor $\psi_{ec,Na}$ shall be computed for each axis individually and the product of these factors used as $\psi_{ec,Na}$ in Eq. (D-16b).

D.5.3.12 — The modification factor for edge effects for single adhesive anchors or anchor groups loaded in tension is:

$$\Psi_{ed,Na} = 1.0 \qquad (D\text{-}16l)$$

when $c_{a,min} \geq c_{cr,Na}$

or

$$\psi_{ed,Na} = [0.7 + 0.3 \cdot (c_{a,min}/c_{cr,Na})] \leq 1.0 \qquad (D\text{-}16m)$$

when $c_{a,min} < c_{cr,Na}$

D.5.3.13 — Since the anchor is limited to use in uncracked concrete, the modification factor $\psi_{p,Na}$ shall be taken as:

$$\psi_{p,Na} = 1.0 \text{ when } c_{a,min} \geq c_{cr,Na} \qquad (D\text{-}16o)$$

or

$$\psi_{p,Na} = \frac{max\,|c_{a,min}; c_{cr,Na}|}{c_{ac}} \text{ when } c_{a,min} < c_{ac} \qquad (D\text{-}16p)$$

Values of c_{ac} and $c_{a,min}$ shall be as noted in Table 1 of this report. The value of $c_{cr,Na}$ shall be determined using Eq. (D-16e).

Additional information for the determination of nominal bond strength in tension is given in Section 4.1.8 of this report.

4.1.5 Static Steel Strength in Shear V_{sa}: The nominal static steel strength of a single anchor in tension as governed by the steel, V_{sa}, in accordance with ACI 318 D.6.1.2 and strength reduction factor, ϕ, in accordance with ACI 318 D.4.4, are given in Table 1.

4.1.6 Static Concrete Breakout Strength in Shear V_{cb} or V_{cbg}: The nominal static concrete breakout strength of a single anchor or group of anchors in shear, V_{cb} or V_{cbg}, respectively, must be calculated in accordance with ACI 318 D.6.2 based on information given in Table 1 for the corresponding anchor steel. The basic concrete breakout strength in shear, V_b, must be calculated in accordance with ACI 318 D.6.2.2 using the values of d and h_{ef} given in Table 1 of this report in lieu of d_o and ℓ_e respectively. The value of f'_c must be limited to 8,000 psi (55.1 MPa), maximum, in accordance with ACI 318 D.3.5.

4.1.7 Static Concrete Pryout Strength in Shear V_{cp} or V_{cpg}: In lieu of determining the nominal pryout strength in accordance with ACI 318 D.6.3.1, nominal pryout strength in shear must be calculated in accordance with the following sections added to ACI 318:

D.6.3.2 — The nominal pryout strength of an adhesive anchor or group of adhesive anchors shall not exceed:

(a) for a single adhesive anchor

$$V_{cp} = min\,/k_{cp} \cdot N_a\,;\,k_{cp} \cdot N_{cb}\,/ \qquad (D\text{-}30a)$$

(b) for a group of adhesive anchors

$$V_{cpg} = min\,/k_{cp} \cdot N_{ag}\,;\,k_{cp} \cdot N_{cbg}\,/ \qquad (D\text{-}30b)$$

where:

k_{cp} *=1.0 for* $h_{ef} < 2.5$ *in. (64 mm)*

k_{cp} *= 2.0 for* $h_{ef} \geq 2.5$ *inches (64 mm)*

N_a *is calculated in accordance with Eq. (D-16a)*

N_{ag} *is calculated in accordance with Eq. (D-16b)*

N_{cb} *and* N_{cbg} *are determined in accordance with D.5.2.1.*

4.1.8 Bond Strength Determination: Bond strength values are a function of concrete compressive strength, concrete state (uncracked), drilling method (hammer drilled), and installation conditions (dry concrete). Bond strength values must be modified with the factor k_d as follows:

CONCRETE	HOLE DRILLING METHOD	PERMISSIBLE INSTALLATION CONDITIONS	BOND STRENGTH	ASSOCIATED STRENGTH REDUCTION FACTOR
Uncracked	Hammer drilled	Dry concrete	$\tau_{k,uncr} \cdot \kappa_d$	$\phi_{d,pi}$ or $\phi_{d,ci}$

The characteristic bond strength must be multiplied with the associated strength reduction factors $\phi_{d,pi}$ (periodic inspection) or $\phi_{d,ci}$ (continuous inspection) as indicated in Table 1 of this report.

The bond strength values in Table 1 of this report correspond to a concrete compressive strength, f'_c, equal to 2,500 psi (17.2 MPa). For concrete compressive strength, f'_c, between 2,500 psi and 8.000 psi (17.2 MPa and 55 MPa), the tabulated characteristic bond strength may not be increased.

4.1.9 Requirements for Minimum Member Thickness h_{min}**, Anchor Spacing** s_{min} **and Edge Distance** c_{min}**:** In lieu of ACI 318 D.8.3, values of c_{min} and s_{min} described in Table 1 of this report must be observed for anchor design and installation. Likewise, in lieu of ACI 318 D.8.5, the minimum member thickness, h_{min}, described in Table 1 of this report must be observed for anchor design and installation. In determining minimum edge distances, c_{min}, the following section must be added to ACI 318, Appendix D:

D.8.8 — For adhesive anchors that will remain untorqued, the minimum edge distances shall be based on minimum cover requirements for reinforcement in 7.7. For adhesive anchors that will be torqued, the minimum edge distance and spacing shall be taken as described in Table 1 of this report.

4.1.10 Critical Edge Distance c_{ac}**:** In lieu of using ACI 318 Section D.8.6, values of c_{ac} must be in accordance with Table 1 of this report.

4.1.11 Requirements for Seismic Design: Load combinations including earthquake loads are not permitted, except for structures assigned to Seismic Design Categories A or B under the IBC and IRC and Seismic Zones 0, 1, and 2A under the UBC.

4.1.12 Interaction of Tensile and Shear Forces: For loadings that include combined tension and shear, the design must be performed in accordance with ACI 318 D.7.

4.2 Allowable Stress Design (ASD):

4.2.1 General: Design values for use with allowable stress design load combinations calculated in accordance with Section 1605.3 of the IBC and Section 1612.3 of the UBC, must be established using Eq-4 and Eq-5:

$$T_{allowable,ASD} = \frac{\phi N_n}{\alpha} \quad \text{(Eq-4)}$$

$$V_{allowable,ASD} = \frac{\phi V_n}{\alpha} \quad \text{(Eq-5)}$$

where:

$T_{allowable,ASD}$ = Allowable tension load (lbf or kN)

$V_{allowable,ASD}$ = Allowable shear load (lbf or kN)

ϕN_n = Lowest design strength of an anchor or anchor group in tension as determined in accordance with ACI 318 Appendix D, Section 4.1 of this report, and 2009 IBC Section 1908.1.9 or 2006 IBC Section 1908.1.16, as applicable (lbf or N).

ϕV_n = Lowest design strength of an anchor or anchor group in shear as determined in accordance with ACI 318 Appendix D, Section 4.1 of this report, and 2009 IBC Section 1908.1.9 or 2006 IBC Section 1908.1.16, as applicable (lbf or N).

α = Conversion factor calculated as a weighted average of the load factors for the controlling load combination. In addition, α must include all applicable factors to account for nonductile failure modes and required over-strength.

The requirements for member thickness, edge distance and spacing, described in this report, must apply. An example of allowable stress design values for illustrative purposes in shown in Table 2.

4.2.2 Interaction of Tensile and Shear Forces: The interaction must be calculated and consistent with ACI 318 D.7 as follows:

For shear loads $V \leq 0.2V_{allowable,ASD}$, the full allowable load in tension must be permitted.

For tension loads $T \leq 0.2T_{allowable,ASD}$, the full allowable load in shear must be permitted.

For all other cases Eq-6 applies:

$$\frac{T}{T_{allowable,ASD}} + \frac{V}{V_{allowable,ASD}} \leq 1.2 \quad \text{(Eq-6)}$$

4.3 Installation:

Installation parameters are provided in Table 1 and Figure 3. Anchor locations must comply with this report and the plans and specifications approved by the code official. Installation of the Powers T308+ Epoxy Adhesive Anchoring System must conform to the published installation instructions included in each unit package and reproduced in Figure 3.

4.4 Special Inspection:

Installations may be made under continuous special inspection or periodic special inspection, subject to the requirements of the registered design professional.

Installations made under continuous special inspection with an on-site proof loading program must be performed in accordance with Sections 1704.4 and 1704.13 of the IBC or Section 1701.5.2 of the UBC. The special inspector must be on the jobsite continuously during anchor installation to verify the following requirements in accordance with published instructions: hole location, hole drilling method, hole diameter and depth, hole cleaning, anchor type, anchor diameter and length, adhesive identification and expiration date, adhesive, edge distances, anchor spacing, concrete type, concrete compressive strength, concrete thickness and maximum tightening torque. The proof loading program must be established by the registered design professional. As a minimum, the following requirements are to be addressed in the proof loading program:

1. Frequency of proof loading based on anchor type, diameter, and embedment
2. Proof loads by anchor type, diameter, embedment and location
3. Acceptable displacements at proof load
4. Remedial action in the event of failure to achieve proof load or excessive displacement

Unless otherwise directed by the registered design professional, proof loads must be applied as confined tension tests. Proof load levels must not exceed the lesser of 50 percent of expected peak load based on adhesive bond strength or 80 percent of the anchor yield strength. The proof load shall be maintained at the required load level for a minimum of 10 seconds.

Installations made under periodic special inspection must be performed where required in accordance with Section 1704.13 of the IBC or Section 1701.5 of the UBC. Periodic special inspection is defined in this report and Section 1701.6.2 of the UBC and Section 1702.1 of the IBC. The special inspector must be on the jobsite initially during anchor installation to verify anchor type, anchor dimensions, concrete type, concrete compressive strength, hole dimensions, hole cleaning procedures, anchor spacing, edge distances, concrete thickness, anchor embedment, and maximum tightening torque. The special inspector must verify the initial installation of each type and size of adhesive anchor by personnel on the site. Subsequent installations for the same anchor type and size by the same construction personnel is permitted to be performed in the absence of the special inspector in accordance with the statement of special inspection. Any change in the anchor product being installed or in the personnel performing the installation will require an additional, initial inspection. For ongoing installations over an extended period of time, the special inspector must make regular inspections to confirm continuing correct use and installation of the product.

Under the IBC, additional requirements as set forth in Sections 1705 or 1706 must be observed, where applicable.

4.5 Compliance with NSF/ANSI Standard 61:

The Powers T308+ Epoxy Adhesive complies with the requirements of NSF/ANSI 61, as referenced in Section 605 of the IPC for products used in water distribution systems. The focus of NSF/ANSI 61 as it pertains to adhesive anchors is to ensure that the contaminants or impurities imparted from the adhesive products to potable water do not exceed acceptable levels.

5.0 CONDITIONS OF USE

The Powers T308+ Epoxy Adhesive Anchoring 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 Powers T308+ epoxy adhesive anchors must be installed in accordance with the manufacturer's published installation instructions as included in the adhesive packaging and reproduced in Figure 3 of this report.

5.2 The anchors described in this report must be installed in uncracked normal-weight concrete having a specified compressive strength, f'_c, of 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa). Uncracked concrete is determined by there being no cracks present during installation and where analysis indicates no cracking $f_t < f_r$, subject to the conditions of this report.

5.3 Anchors must be installed in concrete base materials in holes predrilled with carbide-tipped drill bits complying with ANSI B212.15-1994 in accordance with Section 4.3 and the instructions provided in Figure 3 of this report.

5.4 Powers T308+ epoxy adhesive anchors are recognized for use to resist short- and long-term loads, including wind, subject to the conditions of this report. Use of anchors in structures assigned to seismic design category C, D, E, or F under the IBC, or Seismic Zone 2, 3, or 4 under the UBC, is beyond the scope of this report.

5.5 Powers T308+ epoxy adhesive anchors in structures are limited to structures assigned to Seismic Design Categories A and B under the IBC, or Seismic Zones 0, 1 and 2a under the UBC.

5.6 Strength design values must be established in accordance with Section 4.1 of this report.

5.7 Allowable stress design values are established in accordance with Section 4.2 of this report.

5.8 Minimum anchor spacing and edge distance, as well as minimum member thickness, must comply with the values provided in this report.

5.9 Installations with the anchor element oriented horizontally or vertically downward are permitted. Overhead (vertically upward) installations are beyond the scope of this report. Installations are permitted in dry holes for interior use only.

5.10 Prior to installation, calculations and details demonstrating compliance with this report must be submitted to the code official. The calculations and details must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

5.11 Where not otherwise prohibited in the code, Powers T308+ epoxy adhesive anchors are permitted for use with fire-resistance-rated construction provided that at least one of the following conditions is fulfilled:

- Anchors are used to resist wind only.
- Anchors that support fire-resistance-rated construction or 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.

5.12 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 such conditions is beyond the scope of this report.

5.13 Use of threaded rods made of carbon steel with zinc electroplated coating as specified in Section 3.3.1 of this report must be limited to dry, interior locations.

5.14 Steel anchor materials in contact with preservative-treated wood or fire-retardant-treated wood shall be zinc-coated carbon steel with coating weights in accordance with ASTM A 153 or equivalent.

5.15 Continuous or periodic special inspection must be provided in accordance with Section 4.4 of this report.

5.16 Powers T308+ epoxy adhesive is manufactured and packaged into cartridges in Kansas City, Missouri, with quality control inspections by CEL Consulting (AA-639).

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Post-installed Adhesive Anchors in Concrete (AC308), dated November 2009.

7.0 IDENTIFICATION

7.1 Powers T308+ Epoxy Adhesive is identified in the field by labels on the cartridge or packaging bearing the company name (Powers Fasteners, Inc.), product name (T308+), the batch number, the expiration date, the name of the inspection agency (CEL Consulting), and the evaluation report number (ESR-3066).

7.2 Threaded rods, nuts, and washers are standard elements, and must conform to applicable specifications as set forth in Section 3.3.1 of this report.

TABLE 1—DESIGN INFORMATION[1,2]

T308+ Adhesive Anchor System for Use in Uncracked Concrete														
Suppler	**Product Name**	**ICC-ES Criteria**	**Symbol**	**Units**	**Nominal Anchor Diameters (inch)**									
Powers Fasteners, Inc.	**T308+ Epoxy**	**AC308 T4.1**			**3/8**		**1/2**		**5/8**		**3/4**		**7/8**	
Threaded Rod O.D.			*d*	in.	0.375		0.500		0.625		0.750		0.875	
ANSI Drill Bit Diameter			d_{bit}	in.	7/16		9/16		3/4		7/8		1	
Nominal Hole Diameter			d_o	in.	7/16		9/16		3/4		7/8		1	
Maximum Installation Torque			T_{max}	ft·lb	14		25		73		119		144	
Effective Embedment Depth			h_{ef}	in.	2	3 3/8	2 1/2	4	3 1/4	5 5/8	3 3/8	6 3/4	4	7 7/8
Minimum Member Thickness			h_{min}	in.	4	5	5	6	6	9	7	10 1/8	8	12
Critical Edge Distance			c_{ac}	in.	4	6 3/4	5	9 1/2	6 1/2	12	6 3/4	14 1/2	8	15 3/4
Minimum Anchor Spacing			s_{min}	in.	3		3 3/4		4 7/8		5		8	
Minimum Edge Distance			c_{min}	in.	3		3 3/4		4 7/8		5		6	
Effective Tensile Stress Area of Anchor Steel			$A_{se,N}$ [A_{se}]	in²	0.0775		0.1419		0.2260		0.3345		0.4617	
Anchor Steel Yield Strength[3]		F1554Grade 36	f_y	psi	36,000									
		A 193 Grade B7			105,000									
Anchor Steel Ultimate Strength[3]		F1554 Grade 36	f_{uta}	psi	58,000									
		A 193 Grade B7			125,000									
Nominal Steel Strength of Single Anchor, Tension		F1554 Grade 36	N_{sa}	lbf	4,495		8,230		13,110		19,400		26,780	
		A 193 Grade B7			9,685		17,735		28,250		41,810		57,710	
Strength Reduction Factor for Steel Strength in Tension			ϕ^4	-	0.75									
Nominal Steel Strength of Single Anchor, Shear		F1554 Grade 36	V_{sa}	lbf	2,695		4,940		7,860		11,640		16,070	
		A 193 Grade B7			4,845		10,640		16,950		25,085		34,625	
Strength Reduction Factor for Steel Strength in Shear			ϕ^4	-	0.65									
Effectiveness Factor for Uncracked Concrete			$k_{c,uncr}$	-	24									
Strength Reduction Factor for Tension, Concrete Failure Modes, Condition B[5]			ϕ	-	0.65									
Strength Reduction Factor for Shear, Concrete Failure Modes, Condition B[5]			ϕ	-	0.70									
Anchor Category, with Periodic Inspection			1, 2 or 3	-	2	2	2	2	3	3	3	3	3	3
Strength reduction factor for bond strength, with periodic special inspection			$\phi_{d,pi}$	-	0.55	0.55	0.55	0.55	0.45	0.45	0.45	0.45	0.45	0.45
			K_d	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.7	0.7
Anchor Category, with Continuous Inspection			1, 2 or 3	-	1	1	1	1	2	2	2	2	3	3
Strength Reduction Factor for Bond Strength, with Continuous Special Inspection			$\phi_{d,ci}$	-	0.65	0.65	0.65	0.65	0.55	0.55	0.55	0.55	0.45	0.45
			K_d	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.9
Characteristic Bond Strength in Uncracked Concrete, Temperature Range A[5,6]			$\tau_{k,uncr}$	psi	676		681		418		523		645	
Characteristic Bond Strength in Uncracked Concrete, Temperature Range B[5,6]			$\tau_{k,uncr}$	psi	406		409		251		314		288	

For **SI:** 1 inch = 25.4 mm, 1 lbf = 4.45 N, 1-ft·lb = 1.356 N·m, 1 in² = 645 mm², 1 psi = 0.006895 MPa, °C = 5/9 · (°F - 32).

TABLE 1—DESIGN INFORMATION[1,2] (Continued)

TABLE 1 NOTES:

[1]The data presented is applicable to use with uncracked, normal weight, structural concrete having a compressive strength between 2,500 and 8,500 psi.
[2]The T308+ anchoring system is recognized for applications in dry concrete, internal exposure only, non-sulfurous exposure environment, minimum base material temperature of not less than 50°F and in holes drilled with a carbide drill bit used with a hammer drill.
[3]Values provided for common threaded rod material types based on specified strengths and calculated in accordance with ACI 318 Eq. (D-3) and Eq. (D-20). Nuts must be appropriate for the rod, as listed in Section 3.3.1 of this report.
[4]The tabulated value of ϕ applies when the load combinations of Section 1605.2.1 of the IBC, Section 1612.2.1 of the UBC, or ACI 318 Section 9.2 are used. If the load combinations of ACI 318 Appendix C or Section 1909.2 of the UBC are used, the appropriate value of ϕ must be determined in accordance with ACI 318 D.4.5.
[5]Condition A requires supplemental reinforcement, while Condition B applies where supplemental reinforcement is not provided or where pullout or pryout governs, as set forth in ACI 318 D.4.4. The tabulated value of ϕ applies when the load combinations of Section 1605.2.1 of the IBC, Section 1612.2.1 of the UBC, or ACI 318 Section 9.2 are used. If the load combinations of ACI 318 Appendix C or Section 1909.2 of the UBC are used, the appropriate value of ϕ must be determined in accordance with ACI 318 D.4.5.
[5]Characteristic bond strength is dependent on temperature:
Temperature Range A: Maximum long term temperature = 75°F and maximum short term temperature = 110°F.
Temperature Range B: Maximum long term temperature = 110°F and maximum short term temperature = 162°F.
Long term concrete temperatures are roughly constant over significant periods of time and short term elevated concrete temperatures are those that occur over brief intervals, e.g. such as due to diurnal cycling.
[6]Characteristic bond strengths are for normal-weight concrete with a minimum compressive strength, f'_c,of 2,500 psi and are for sustained loads including dead and live loads. For load combinations consisting of short-term loads such as due to wind, the listed bond strength may be increased 40 percent for Temperature Range B only.

TABLE 2—EXAMPLE OF T308+ EPOXY ADHESIVE ANCHOR ALLOWABLE STRESS DESIGN VALUES FOR ILLUSTRATIVE PURPOSES[1,2,3,4,5,6,7,8,9,10,11,12]

TEMPERATURE RANGE A Maximum long-term temperature = 75°F; Maximum short-term temperature = 110°F					
Periodic Inspection Regimen			**Continuous Inspection Regimen**		
Threaded Rod Diameter (inch)	**Effective Embedment (inches)**	**Allowable Tension Load (pounds)**	**Threaded Rod Diameter (inch)**	**Effective Embedment (inches)**	**Allowable Tension Load (pounds)**
$^3/_8$	2	590	$^3/_8$	2	700
	$3^3/_8$	1,000		$3^3/_8$	1,180
$^1/_2$	$2^1/_2$	990	$^1/_2$	$2^1/_2$	1,175
	4	1,590		4	1,875
$^5/_8$	$3^1/_4$	810	$^5/_8$	$3^1/_4$	990
	$5^5/_8$	1,405		$5^5/_8$	1,715
$^3/_4$	$3^3/_8$	1,265	$^3/_4$	$3^3/_8$	1,545
	$6^3/_4$	2,530		$6^3/_4$	3,090
$^7/_8$	4	1,510	$^7/_8$	4	1,940
	$7^7/_8$	2,970		$7^7/_8$	3,820

TEMPERATURE RANGE B Maximum long-term temperature = 110°F; Maximum short-term temperature = 162°F					
Periodic Inspection Regimen			**Continuous Inspection Regimen**		
Threaded Rod Diameter (inch)	**Effective Embedment (inches)**	**Allowable Tension Load (pounds)**	**Threaded Rod Diameter (inch)**	**Effective Embedment (inches)**	**Allowable Tension Load (pounds)**
$^3/_8$	2	355	$^3/_8$	2	420
	$3^3/_8$	600		$3^3/_8$	710
$^1/_2$	$2^1/_2$	595	$^1/_2$	$2^1/_2$	705
	4	955		4	1,125
$^5/_8$	$3^1/_4$	485	$^5/_8$	$3^1/_4$	595
	$5^5/_8$	840		$5^5/_8$	1,030
$^3/_4$	$3^3/_8$	760	$^3/_4$	$3^3/_8$	930
	$6^3/_4$	1,515		$6^3/_4$	1,855
$^7/_8$	4	910	$^7/_8$	4	1,170
	$7^7/_8$	1,785		$7^7/_8$	2,295

For **SI:** 1 inch = 25.4 mm, 1 lbf = 4.448 N, 1 psi = 0.006897 MPa.

[1] Single anchor with static tension load only; ASTM A193 Grade B7 threaded rod.
[2] Vertical downward installation direction.
[3] Installation temperature = 50°F (10°C) to 104°F (40°C).
[4] Dry hole condition; carbide drilled hole.
[5] Values are for Condition B where supplementary reinforcement in accordance with ACI 318 D4.4 is not provided.
[6] Concrete determined to remain uncracked for the life of the anchorage.
[7] Load combinations are based on ACI 318 Section 9.2 with no seismic loading.
[8] Thirty percent dead load and seventy percent live load, controlling load combination $1.2D + 1.6L$.
[9] Calculation of weighted average for $\alpha = 1.2(0.3) + 1.6(0.7) = 1.48$.
[10] f'_c = 2,500 psi (normal-weight concrete)
[11] $c_{a1} = c_{a2} \geq c_{ac}$
[12] $h \geq h_{min}$.

Calculate the factored resistance strength, ϕN_n, and the allowable stress design value, $T_{allowable,ASD}$, for a 1/2-inch diameter, ASTM A193 Grade B7 threaded rod with a 4-inch embedment installed with T308+ epoxy adhesive under Temperature Range A and with periodic special inspection assuming the given conditions in Table 2.	Code Ref.	Report Ref.
Step 1. Calculate steel strength of a single anchor in tension: N_{sa} = 17,735 lbs. Calculate steel capacity: ϕN_{sa} = 0.75 • 17,735 lbs. = **13,300 lbs**.	ACI 318 § D.5.1.2 and § D.4.4 a) i)	§ 4.1.2 Table 1
Step 3. Calculate concrete breakout strength of a single anchor in tension: $N_{cb} = \frac{A_{Nc}}{A_{Nco}}\psi_{ed,N}\psi_{c,N}\psi_{cp,N}N_b$	ACI 318 § D.5.2.1(a) and Eq. (D-5)	§ 4.1.3
Step 3a. Calculate A_{Nco} and A_{Nc} $A_{Nco} = 9h_{ef}^2 = 9 \bullet (4.0)^2$ = **144 in.²** $A_{Nc} = (3.0\ h_{ef}) \bullet (3.0\ h_{ef}) = (3.0 \bullet 4.0) \bullet (3.0 \bullet 4.0)$ = **144 in.²**	ACI 318 § D.5.2.1 and Eq. (D-6)	-
Step 3b. Calculate $\psi_{ed,N}$ = 1.0 if $c_{a,min} \geq 1.5h_{ef}$; $\psi_{ed,N} = 0.7 + 0.3\frac{c_{a,min}}{1.5h_{ef}}$ if $c_{a,min} < 1.5h_{ef}$ $c_{a,min} \geq 1.5h_{ef}$. $\therefore \psi_{ed,N}$ = **1.0**	ACI 318 § D.5.2.5 and Eq. (D-10) or (D-11)	-
Step 3c. Calculate $\psi_{c,N}$ = **1.0** (uncracked concrete)	ACI 318 §D.5.2.6	-
Step 3d. Calculate $\psi_{cp,N}$ = 1.0 if $c_{a,min} \geq c_{ac}$; $\psi_{cp,N} = \frac{c_{a,min}}{c_{ac}} \geq \frac{1.5h_{ef}}{c_{ac}}$ if $c_{a,min} < c_{ac}$ $c_{a,min} \geq c_{ac} \therefore \psi_{cp,N}$ = **1.0**	ACI 318 § D.5.2.7 and Eq. (D-12) or (D-13)	Table 1
Step 3e. Calculate $N_b = k_{uncr}\sqrt{f'_c}\,h_{ef}^{1.5} = 24\sqrt{2{,}500} \bullet 4.0^{1.5}$ = **9,600 lbs.**	ACI 318 §D.5.2.2 and Eq. (D-7)	§ 4.1.3
Step 3f. Calculate concrete breakout strength of a single anchor in tension: N_{cb} = (144/144) •1.0 • 1.0 • 1.0 • 9,600 = 9,600 lbs Calculate concrete breakout capacity = ϕN_{cbg} = 0.65 • 9,600 = **6,240 lbs**	ACI 318 § D.5.2.1(a) § D.4.4 c) ii)	§ 4.1.3 Table 1
Step 4. Calculate nominal strength of a single adhesive anchor in tension: $N_a = \frac{A_{Na}}{A_{Na0}}\psi_{ed,Na}\psi_{p,Na}N_{a0}$	AC308 § D.5.3.7 and Eq. (D-16a)	§ 4.1.4
Step 4a. Calculate $s_{cr,Na}$ and $c_{cr,Na}$ $s_{cr,Na} = 20(d)\sqrt{\frac{\tau_{k,uncr}}{1450}} = 20(0.5)\sqrt{\frac{681}{1450}} = 6.8 \leq 3h_{ef}$ = 3 • 2.75 = 8.25 ∴ 6.8 in. $c_{cr,Na} = \frac{s_{cr,Na}}{2}$ = 3.4 in.	AC308 § D.5.3.8 and Eq. (D-16d) Eq. (D-16e)	§ 4.1.4 Table 1
Step 4b. Calculate A_{Na} and A_{Na0} $A_{Nao} = (s_{cr,Na})^2 = (6.8)^2$ = **46 in.²** $A_{nc} = (2.0\ c_{cr,Na}) \bullet (2.0\ c_{cr,Na}) = (2.0 \bullet 3.4) \bullet (2.0 \bullet 3.4)$ = 46 in.²	AC308 § D.5.3.7 and Eq. (D-16c)	§ 4.1.4
Step 4c. Calculate $\psi_{ed,Na}$ = 1.0 if $c_{a,min} \geq c_{cr,Na}$; $\psi_{ed,Na} = \left(0.7 + 0.3\frac{c_{a,min}}{c_{cr,Na}}\right)$ if $c_{a,min} < c_{cr,Na}$ $c_{a,min} \geq c_{cr,Na} \therefore \psi_{ed,Na}$ = **1.0**	AC308 § D.5.3.12 and Eq. (D-16l) or (16m)	§ 4.1.4
Step 4d. Calculate $\psi_{p,Na}$ = 1.0 if $c_{a,min} \geq c_{ac}$; $\psi_{p,Na} = \frac{max\lvert c_{a,min}\,;\,c_{cr,Na}\rvert}{c_{ac}}$ if $c_{a,min} < c_{ac}$ $c_{a,min} \geq c_{ac} \therefore \psi_{p,na}$ = 1.0	AC308 § D.5.3.14 and Eq. (D-16o) & (16p)	§ 4.1.4
Step 4e. Calculate $N_{ao} = \tau_{k,uncr}(\pi)(d)(h_{ef}) = 681(\pi)(0.5)(4.0)$ = **4,275 lbs**	AC308 § D.5.3.9 and Eq. (D-16f)	§ 4.1.4 Table 1
Step 4f. Calculate nominal strength of a single adhesive anchor in tension: $N_a = \frac{46}{46} \bullet 1.0 \bullet 1.0 \bullet 4{,}275$ = 4,275 lbs. Calculate strength capacity = ϕN_a = 0.55 • 4,275 = **2,350 lbs**	AC308 § D.5.3.7 and Eq. (D-16a) ACI 318 § D.4.4 c) ii)	§ 4.1.4 Table 1
Step 5. Determine controlling resistance strength for the single anchor in tension: $\phi N_n = \min\lvert\phi N_{sa}, \phi N_{cb}, \phi N_a\rvert = N_a$ = **2,350 lbs**	ACI 318 § D.4.1.1	§ 4.1.1
Step 6. Calculate allowable stress design conversion factor for loading condition: Controlling load combination: 1.2D + 1.6L ; 30% Dead Load, 70% Live Load α = 1.2(30%) + 1.6(70%) = **1.48**	AC308 § D.3.2.1.1	
Step 6a. Calculate allowable stress design value for the single anchor in Tension: $T_{allowable,ASD} = \frac{\phi N_a}{\alpha} = \frac{2{,}350}{1.48}$ = **1,585 lbs.**	AC308 § D.3.2.1.1 and Eq. 3.1	

FIGURE 1—EXAMPLE STRENGTH DESIGN CALCULATION INCLUDING ASD CONVERSION FOR ILLUSTRATIVE PURPOSES

TABLE 3—GEL TIMES AND CURING TIMES

Temperature of Base Material (°F)	Gel Time (minutes)	Curing Time (hours)
50	35	48
60	20	36
70	10	24
80	7	24
90	5	24
100	3	12

For **SI:** °C = 5/9 · (°F - 32)

TABLE 4—INSTALLATION EQUIPMENT

HOLE CLEANING EQUIPMENT			
Threaded Rod Diameter (inch)	**ANSI Drill Bit Diameter (inch)**	**Nylon Brush (Cat. #)**	**Compressed Air Nozzle (Cat. #)**
$^{3}/_{8}$	$^{7}/_{16}$	07931	08292
$^{1}/_{2}$	$^{9}/_{16}$	07932	
$^{5}/_{8}$	$^{3}/_{4}$	07933	
$^{3}/_{4}$	$^{7}/_{8}$	07933	
$^{7}/_{8}$	1	07934	

INJECTION EQUIPMENT		
Injection Tool	**Plastic Cartridge System**	**Extra Mixing Nozzles**
T308+ 10 fl. oz. heavy duty caulking gun – Cat. #08437 T308+ 10 fl. oz. high performance caulking gun – Cat. #08479	T308+ 8.5 fl. oz.Quik-Shot w/nozzle Cat. #8558SD	T308+ mixing nozzle Cat. #07908
T308+ 14 fl. oz. high performance manual dispensing tool Cat. #8415	T308+ 14 fl. oz. dual cart. w/nozzle Cat. #0503SD	T308+ mixing nozzle Cat. #07908
T308+ 21.5 fl. oz. high performance manual dispensing tool Cat. #08421	T308+ 21.5 fl. oz. dual cart. w/nozzle Cat. #8523SD	T308+ mixing nozzle Cat. #07908
T308+ 51 fl. oz. pneumatic dispensing tool Cat. #08438	T308+ 51 fl. oz dual cart. w/nozzle Cat. #8438SD	T308+ turbo mixing nozzle – Cat. #07921

FIGURE 2—COMPONENTS OF THE POWERS T308+ EPOXY ADHESIVE ANCHORING SYSTEM: DISPENSING TOOL, ADHESIVE CARTRIDGE, STATIC MIXING NOZZLE (EXTENSION NOT SHOWN) AND THREADED ROD ANCHOR STEEL

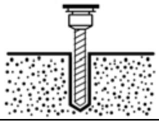
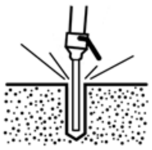
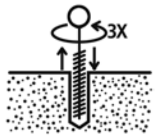
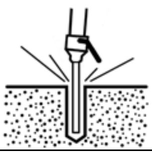
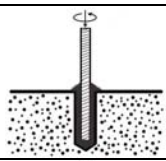
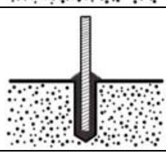
	**Step 1**: Drill hole into the concrete using a rotary-percussion power drill (hammer drill) and an ANSI (B212.151994) standard carbide drill bit. Drill bit size should be 1/16" larger than the anchor rod for sizes up to 1/2" diameter; and 1/8" larger for anchor rods 5/8" through 7/8" diameter.
	**Step 2**: Blow out hole using oil-free compressed air at a minimum of 70 psi with an air nozzle. While blowing air, insert the nozzle into the hole until in contact with the bottom, and then withdraw; whereby the blowing procedure takes at least one full second.
	**Step 3**: Insert an appropriate size nylon cleaning brush (see Table 4) into the hole with a thrusting, twisting motion. Once the brush is in contact with the bottom of the hole, turn the brush three full revolutions. Then quickly withdraw the brush with a vigorous, twisting pull. **Step 4**: Repeat brushing of the hole.
	**Step 5**: Repeat blow out of hole with air as per Step 2 above.
	**Step 6**: Check cartridge for expiration date to confirm the material is within the expiration date and for any physical defects. Concrete temperature must be 50 °F minimum. Condition cartridge and contents to a temperature of 65 °F to 95 °F for easier dispensing. Insert the cartridge into the extrusion tool, and attach the supplied mixing nozzle to the cartridge. Prior to injection, dispense some mixed epoxy through the mixing nozzle and discard until the color of the extruded material becomes uniform. After uniform color is achieved, insert the end of the mixing nozzle into the borehole until in contact with the bottom. Then, dispense the adhesive while slowly withdrawing the nozzle until borehole is approximately $^{2}/_{3}$ full, and then withdraw the mixing nozzle. Keep the nozzle attached on the partially used cartridges. A new mixing nozzle must be used if the gel time has been exceeded between injections.
	**Step 7**: Slowly insert a clean and oil-free anchor rod into the adhesive in the hole with a counter-thread, turning motion until it contacts the bottom of the hole. Make sure some adhesive has flowed from the top of the hole and completely surrounds the anchor at the surface of the concrete.
	**Step 8**: Immediately adjust the alignment of the anchor rod in the hole. Check that the anchor remains fully in the hole. An air bubble in the hole could cause the anchor rod to rise after insertion. If this occurs, immediately turn the anchor with downward pressure to work the air out. Do not disturb the anchorage after the adhesive gel time (see Table 3). Do not torque or load the anchorage until the adhesive is fully cured (see Table 3).

FIGURE 3—INSTALLATION INSTRUCTIONS

ICC-ES Evaluation Report

ESR-3066 Supplement

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This report is subject to re-examination in one year.

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DIVISION: 03—CONCRETE
Section: 03151—Concrete Anchoring

REPORT HOLDER:

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EVALUATION SUBJECT:

POWERS T308+ EPOXY ADHESIVE ANCHORING SYSTEM IN UNCRACKED CONCRETE

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2007 *Florida Building Code—Building*
- 2007 *Florida Building Code—Residential*

Property evaluated:

Structural

2.0 USES

This supplement is issued to indicate that the Powers T308+ Epoxy Adhesive Anchoring System in uncracked concrete as described in the master report complies with the 2007 *Florida Building Code—Building* and the 2007 *Florida Building Code—Residential*, when designed and installed in accordance with the master evaluation report.

Use of the Powers T308+ Epoxy Adhesive Anchoring System in uncracked concrete as described in the master evaluation report to comply with the High Velocity Hurricane Zone Provisions of the 2007 *Florida Building Code—Building* has not been evaluated, and is outside the scope of this supplement.

For products falling under Florida Rule 9B-72, verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission for the type of inspections being conducted is the responsibility of an approved validation entity (or the code official when the report holder does not possess an approval by the Commission).

This supplement expires concurrently with the master report issued March 1, 2010.