2.0 DESCRIPTION

1.0 SUBJECT

WOOD DALE, ILLINOIS 60191
1300 NORTH MICHAEL DRIVE
ITW RAMSET/RED HEAD

Section: 04081—Masonry Anchorage
DIVISION: 04—MASONRY

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Legacy report on the 1997 Uniform Building Code™

DIVISION: 04—MASONRY
Section: 04081—Masonry Anchorage

EPCON ACRYLIC 7 ADHESIVE ANCHORING SYSTEMS

ITW RAMSET/RED HEAD
1300 NORTH MICHAEL DRIVE
WOOD DALE, ILLINOIS 60191

1.0 SUBJECT
Epcon A7 Adhesive Anchors and Maxima 7 Capsule Anchors.

2.0 DESCRIPTION

2.1 Epcon A7 Adhesive:

2.1.1 General: Epcon A7 is a stud-type adhesive designed for anchoring and doweling in concrete masonry units with threaded rod and reinforcing bar.

2.1.2 Materials:

2.1.2.1 Epcon A7: Epcon A7 is a methyl methacrylate adhesive packaged in either a 5-ounce (150 mL), 8-ounce (235 mL) or a 28-ounce (825 mL) cartridge. The dual-component cartridges, assembled with a 10:1 ratio of adhesive to activator, are used with manual or pneumatic dispensing tools and plastic mixing nozzles to ensure proper mixing of the two components. Epcon A7 cartridges have an 18-month shelf life when stored at temperatures of –40°F to 80°F (–40°C to 26.7°C). The adhesive may be used with threaded steel rods that are 3/8, 1/2, 5/8, 3/4, 7/8, 1 or 1 1/4 inches (9.5, 12.7, 15.9, 19.1, 25.4 or 31.7 mm) in diameter. Steel rods must conform to either ASTM A 615, A 616, A 617 or A 706 (Grade B7 [minimum Grade 60], 5/3 5/3

2.1.2.2 Umbrella Inserts: The plastic Umbrella Inserts consist of a white spring assembly positioned inside of an orange, slotted conical body. The spring assembly allows the insert to adapt to the wall thickness of the concrete masonry; the body, which is placed in the void behind the wall, holds the adhesive in place. The length of the umbrella body is 2 inches (51 mm). The total length of rod required for each anchor is equal to the length of rod in the umbrella body [2 inches (51 mm)] plus the wall thickness plus the length of rod projecting from the wall. The plated, carbon steel Umbrella Sleeve, used in conjunction with the plastic Umbrella Insert, is internally threaded to accept a 3/8-inch-diameter (9.5 mm) threaded rod. The total length of the sleeve is 3 inches (76 mm). The 1 1/2-inch (31.7 mm) length at the open end of the sleeve is vertically grooved on the outside surface, and has an enlarged outside diameter that is positioned inside the wall face shell during installation. The remaining 1 1/2 inches (44.5 mm) of exterior length is horizontally threaded. The total length of rod required for each anchor is equal to the length of rod in the umbrella sleeve [approximately 1 inch (25.4 mm)] plus the length of rod projecting from the wall.

2.1.2.3 Stubby Screens: The Stubby Screens consist of stainless steel screen tubing that is open at one end and closed at the other end. The 1 1/2-inch (31.7 mm) lengths at the open ends of the screens are enlarged and positioned inside the wall face shell during installation. The 1 1/2-inch-diameter (12.7 mm) Stubby Screen has a total length of 3 1/2 inches (89 mm) and the 1 1/2-inch-diameter (15.9 mm) Stubby Screen has a total length of 4 1/2 inches (114 mm).

2.1.3 Design: Allowable static loads for anchors installed in accordance with this report are shown in Tables 4 and 5. These values must be adjusted for in-service temperatures in accordance with Figure 1, and for spacing and edge distance effects in accordance with the footnotes to the tables. Allowable loads for anchors subject to combined shear and tension forces are determined by the following equation:

Concrete:

$P_s = \frac{P_t}{V_s} + \frac{V_t}{V_s}$

Masonry:

$P_s = \frac{P_t}{V_s} + \frac{V_t}{V_s}$

where:

$P_s$ = Applied service tension load.

$P_t$ = Service tension load.

$V_s$ = Applied service shear load.

$V_t$ = Service shear load.

*Revised January 2007 and January 2008

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2.1.4 Installation:

2.1.4.1 Installation in Grout-filled Concrete Masonry Walls: Anchors are installed in grout-filled concrete masonry walls as specified in Table 5. Installation requirements are tabulated for various threaded rod sizes in Table 2. The minimum installation temperature is 0°F (–18°C); the adhesives may be placed without warming. Holes are drilled to predetermined depths using rotary hammer drills and carbide-tipped drill bits that comply with ANSI B212.15-1994. For installations in grouted concrete masonry, holes must be into the face of masonry units only and are not permitted in mortar joints. Holes must be cleaned from the bottom with forced air. A wire brush is used to remove dust and slurry from the hole, and this is followed by another cleaning with forced air. A mixing nozzle is attached to the Eponent A7 cartridge to ensure proper mixing of the adhesive from the dual-component system. Before application, the adhesive is pumped out of the nozzle until the material achieves a uniform dark-gray color. Approximately 1 1/2 inches (38 mm) from solid webs of masonry units. Stubby Screens may be installed in either the hollow or the solid portions of the masonry units. Holes are drilled to predetermined depths using rotary hammer drills and carbide-tipped drill bits that comply with ANSI B212.15-1994. Holes must be into the face of masonry units only and are not permitted in mortar joints. Holes must be cleaned from the bottom with forced air. A wire brush is used to remove dust and slurry from the hole, and this is followed by another cleaning with forced air.

For the installation of the Umbrella Insert, the umbrella is placed on the insertion tool and is then fully expanded over the hold pin. The assembly is inserted into the hole and the tool is disengaged from the umbrella. A mixing nozzle, with a 3/8-inch (9.5 mm) from the nozzle tip, is attached to the Eponent A7 cartridge. Before application, the adhesive is pumped out of the nozzle until the material achieves a uniform dark-gray color. Approximately 1/2 ounces (44 mL) of adhesive is then injected into the umbrella. The threaded rod, with a centering ring or the internally threaded sleeve, is inserted into the hole with a slow, twisting motion. The adhesive shall cure in accordance with Table 1 before the placement of attachments.

For the installation of the Stubby Screens, a mixing nozzle is attached to the Eponent A7 cartridge to ensure proper mixing of the adhesive from the dual-component system. Before application, the adhesive is pumped out of the nozzle until the material achieves a uniform dark-gray color. The nozzle is then inserted to the bottom of the screen, and the screen is filled completely with adhesive. The filled screen is inserted into the hole until it is below the wall surface. While the tab of the screen is held against the surface of the wall, the threaded rod is inserted into the screen with a rotating motion. The screen is pulled flush to the wall surface and the adhesive is allowed to cure in accordance with Table 1 before the placement of attachments.

2.1.5 Special Considerations: The anchors may be used within fire-resistive construction, provided the anchors only resist wind and/or seismic forces. The anchors can be satisfactorily installed in walls and ceilings, provided proper consideration is given to fire-exposure conditions.

2.2 Special Inspection:

Adhesive anchor installations require special inspection in accordance with Section 1701 of the code. The special inspector records compliance of the drill bit with ANSI B212.15-1994; hole depth and cleanliness; product description, including product name, rod diameter and length; adhesive expiration date; and verification of anchor installation in accordance with the manufacturer’s published instructions and this report.

2.3 Identification:

The Eponent A7 Adhesive Anchors are identified by labels on the packaging indicating the manufacturer’s name (ITW Ramset/Red Head), product name, material type, serial number traceable to production date, and evaluation report number (ER-5560). The Umbrella Inserts and Sleeves are identified by labels on the packaging indicating the manufacturer’s name (ITW Ramset/Red Head), product name (Eponent Umbrella Inserts, or Eponent Umbrella Flush Sleeves) and product part number [HBU-38 (for inserts), HBU-FS (for sleeves)]. The Stubby Screens are identified by labels on the packaging indicating the manufacturer’s name (ITW Ramset/Red Head), product name (Eponent System Screens) and product part number (HB12-312, or HB58-412).

3.0 EVIDENCE SUBMITTED

Data in accordance with the Acceptance Criteria for Adhesive Anchors in Concrete and Masonry Elements (AC58), dated January 1999, including reports of creep, seismic, freeze-thaw, in-service temperature, and damp/wet hole tests.

4.0 FINDINGS

That the ITW Ramset/Red Head Eponent A7 Adhesive Anchors described in this report comply with the 1997 Uniform Building Code™, subject to the following conditions:

4.1 The anchors are installed in accordance with the manufacturer’s instructions and this report.

4.2 Anchors used to resist seismic loads in masonry are outside the scope of this report.

4.3 The anchors may be installed in damp or water-filled holes.

4.4 The anchors may be installed in severe, moderate or negligible exterior weathering locations, in accordance with Figure 21-1-1 of UBC Standard 21-1, when stainless steel rods are utilized.

4.5 Anchors are installed in holes and substrates predrilled with a carbide-tipped masonry drill bit manufactured within the range of the maximum and minimum drill-tip dimensions of ANSI B212.15-1994 for the values set forth in this evaluation report.

4.6 Special inspection in accordance with Section 2.2 is provided for all anchor installations.

4.7 Calculations and details showing compliance with this report must be submitted to the local building official for approval.
4.8 Anchors are not used in conjunction with fire-resistive construction, except as noted in Section 2.1.5.

4.9 Anchors are not used to resist tension forces in wall installations unless special consideration is given to fire-exposure conditions.

4.10 Anchors are not subjected to vibratory or shock loads, such as those encountered by supports for reciprocating engines or crane rails.

4.11 Anchors are limited to installation in uncracked masonry. Cracking occurs when $f_y > f_{cm}$ due to service loads or deformations.

4.12 Epcon A7 Adhesive is manufactured at a plant in Danvers, Massachusetts. Quality control inspections are done by PFS Corporation (AA-652).

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

TABLE 1—MANUFACTURER’S RECOMMENDED CURE TIMES FOR EPCON A7 ADHESIVE ANCHORS

<table>
<thead>
<tr>
<th>MINIMUM CONCRETE TEMPERATURE</th>
<th>INITIAL SET TIME</th>
<th>CURE TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>4 hours</td>
<td>24 hours</td>
</tr>
<tr>
<td>20</td>
<td>35 minutes</td>
<td>6 hours</td>
</tr>
<tr>
<td>40</td>
<td>15 minutes</td>
<td>75 minutes</td>
</tr>
<tr>
<td>60</td>
<td>7 minutes</td>
<td>35 minutes</td>
</tr>
<tr>
<td>80</td>
<td>5.5 minutes</td>
<td>30 minutes</td>
</tr>
<tr>
<td>100</td>
<td>5 minutes</td>
<td>25 minutes</td>
</tr>
<tr>
<td>120</td>
<td>4 minutes</td>
<td>20 minutes</td>
</tr>
</tbody>
</table>

For SI: $t\degree C = \frac{t\degree F - 32}{1.8}$.

1Anchors must be undisturbed during the initial set time.

2Cure time is the time required for the anchor to reach allowable tensile and shear load capacities.

TABLE 2—SPECIFICATIONS FOR INSTALLATION OF THREADED RODS IN NORMAL-WEIGHT CONCRETE WITH EPCON A7 ADHESIVE AND EPCON MAXIMA 7 CAPSULES

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>THREADED ROD DIAMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3/16 inch</td>
</tr>
<tr>
<td>$A_s$ = Tensile stress area of rod (inch$^2$)</td>
<td>0.0775</td>
</tr>
<tr>
<td>$A_n$ = Nominal area of rod (inch$^2$)</td>
<td>0.1042</td>
</tr>
<tr>
<td>Epcon A7 Adhesive BD = Nominal bit diameter (inch)</td>
<td>7/32</td>
</tr>
<tr>
<td>Epcon Maxima 7 Capsules BD = Nominal bit diameter (inch)</td>
<td>7/32</td>
</tr>
<tr>
<td>$T$ = Maximum tightening torque (ft.-lbf.)</td>
<td>18</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm, 1 ft.-lbf = 1.36 N-m, 1 inch$^2$ = 645.16 mm$^2$.

1Rod threads must conform to ANSI B1.1-74.

TABLE 3—ALLOWABLE TENSION AND SHEAR LOADS FOR THREADED ROD BASED ON STEEL STRENGTH

<table>
<thead>
<tr>
<th>THREADED ROD DIAMETER (inches)</th>
<th>TENSION (lbf)</th>
<th>SHEAR (lbf)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A 307</td>
<td>A 193 Grade B 7</td>
</tr>
<tr>
<td>3/8</td>
<td>2,080</td>
<td>4,340</td>
</tr>
<tr>
<td>1/2</td>
<td>3,730</td>
<td>7,780</td>
</tr>
<tr>
<td>5/8</td>
<td>5,870</td>
<td>12,230</td>
</tr>
<tr>
<td>3/4</td>
<td>8,490</td>
<td>17,690</td>
</tr>
<tr>
<td>7/8</td>
<td>11,600</td>
<td>24,170</td>
</tr>
<tr>
<td>1</td>
<td>15,180</td>
<td>31,620</td>
</tr>
<tr>
<td>1 1/2</td>
<td>23,800</td>
<td>49,580</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm, 1 lbf = 4.48 N.

1Tabulated allowable loads are based on the strength of the steel. These values must be compared to the allowable loads for the anchors, based on the Epcon A7 Adhesive bond strengths. The lesser of the value shown above and in Tables 4 and 5 in this evaluation report for the bond strength of the anchors must be used for the allowable value of the threaded bar installed with Epcon A7 Adhesive.
The specified compressive strength of masonry, $f'_{cm}$, at 28 days must be a minimum of 1,500 psi.

Umbrella Inserts are installed through the face shell of the masonry unit and into the hollow cell portion of the unit only. Anchor installations are not permitted in mortar joints. See Figure 2 for anchor installation.

The allowable tension load must be the lesser of the tabulated bond strength and the allowable steel strength shown in Table 3. The allowable load capacities may be increased for duration of load in accordance with Section 1612.3.3 of the code. Resistance to earthquake loads is beyond the scope of this report.

The tabulated values are for anchors installed at the critical edge distances ($c_{cr}$) and critical spacings ($s_{cr}$). Critical edge distance is the least edge distance at which the tabulated allowable load capacity of an anchor is applicable without applying a load-reduction factor. Critical spacing is the least anchor spacing distance at which the tabulated allowable load capacity of an anchor is applicable such that the anchor is not influenced by neighboring anchors.

### Table 4—Allowable Tension and Shear Loads for Threaded Rods Installed

<table>
<thead>
<tr>
<th>ANCHOR DIAMETER (inch)</th>
<th>INSTALLATION DEVICE</th>
<th>BIT DIAMETER (inch)</th>
<th>ANCHOR LENGTH/EMBEDMENT DEPTH (inches)</th>
<th>CRITICAL EDGE DISTANCE, $c_{cr}$ (inches)</th>
<th>CRITICAL SPACING, $s_{cr}$ (inches)</th>
<th>TENSILE LOAD BASED ON MASONRY AND BOND STRENGTH (lbf)</th>
<th>SHEAR LOAD BASED ON MASONRY AND BOND STRENGTH (lbf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/8</td>
<td>Umbrella Insert¹</td>
<td>3/4</td>
<td>12</td>
<td>8</td>
<td>900</td>
<td>800</td>
<td></td>
</tr>
<tr>
<td>1/2</td>
<td>Stubby Screen²</td>
<td>5/8</td>
<td>12</td>
<td>8</td>
<td>615</td>
<td>1,115</td>
<td></td>
</tr>
<tr>
<td>3/8</td>
<td>Stubby Screen³</td>
<td>1/2</td>
<td>12</td>
<td>8</td>
<td>620</td>
<td>1,260</td>
<td></td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm, 1 lbf = 4.48 N, 1 psi = 6.89 kPa.

¹Allowable load values are based on masonry construction consisting of 8-inch-wide, Grade N, lightweight, medium-weight, or normal-weight masonry units conforming to ASTM C 90 and UBC Standard 21-4. Mortar must be Type M or S prepared in accordance with Section 2103 of the code and UBC Standard 21-15. The specified compressive strength of masonry, $f'_{cm}$, at 28 days must be a minimum of 1,500 psi.

²Umbrella Inserts are installed through the face shell of the masonry unit and into both hollow and solid portions of the unit. Anchor installations are not permitted in mortar joints. See Figure 2 for anchor installation.

³Stubby Screens are installed through the face shell of the masonry unit and into both hollow and solid portions of the unit. Anchor installations are not permitted in mortar joints. See Figure 2 for anchor installation.

⁴The allowable tension load must be the lesser of the tabulated bond strength and the allowable steel strength shown in Table 3. Allowable load capacities may be increased for duration of load in accordance with Section 1612.3.3 of the code. Resistance to earthquake loads is beyond the scope of this report.

⁵Adhesive anchors experience a reduction in load capacity with increased ambient temperatures. See Figure 1 for load-reduction factor.

⁶Special inspection in accordance with Section 2.2 must be provided for all anchor installations.

⁷Sections 2.1.3 through 2.1.5 contain special considerations for anchor load conditions.

⁸Displacement under tabulated allowable loads is 1/8 inch or less.

⁹Bond strength loads are based on a safety factor of 4.0.

### Table 5—Allowable Tension and Shear Loads for Threaded Rods Installed

<table>
<thead>
<tr>
<th>ANCHOR DIAMETER (inch)</th>
<th>BIT DIAMETER (inch)</th>
<th>EMBEDMENT DEPTH, $h_v$ (inches)</th>
<th>CRITICAL EDGE DISTANCE, $c_{cr}$ (inches)</th>
<th>CRITICAL SPACING, $s_{cr}$ (inches)</th>
<th>TENSILE LOAD BASED ON MASONRY AND BOND STRENGTH (lbf)</th>
<th>SHEAR LOAD BASED ON MASONRY AND BOND STRENGTH (lbf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/8</td>
<td>3/4</td>
<td>4/8</td>
<td>12</td>
<td>8</td>
<td>1,290</td>
<td>2,125</td>
</tr>
<tr>
<td>1/2</td>
<td>5/8</td>
<td>5</td>
<td>12</td>
<td>8</td>
<td>1,580</td>
<td>2,710</td>
</tr>
<tr>
<td>3/8</td>
<td>1/2</td>
<td>6/8</td>
<td>12</td>
<td>8</td>
<td>2,725</td>
<td>4,265</td>
</tr>
</tbody>
</table>

For SI: 1 inch = 25.4 mm, 1 lbf = 4.48 N, 1 psi = 6.89 kPa.

¹Allowable load values are based on masonry construction consisting of 8-inch-wide, Grade N, lightweight, medium-weight, or normal-weight masonry units conforming to ASTM C 90 and UBC Standard 21-4. Mortar must be prepared in accordance with Section 2103 of the code and UBC Standard 21-15. Grout must have a minimum compressive strength of 2,000 psi and must meet the coarse grout proportion limits specified in Table 21-B of the code. Grout must be prepared in accordance with Section 2103 of the code and UBC Standard 21-19. The specified compressive strength of masonry, $f'_{cm}$, at 28 days must be a minimum of 1,500 psi.

²Anchor installations are not permitted in mortar joints. See Figure 2 for anchor installation.

³The allowable tension load must be the lesser of the tabulated bond strength and the allowable steel strength shown in Table 3. Allowable load capacities may be increased for duration of load in accordance with Section 1612.3.3 of the code. Resistance to earthquake loads is beyond the scope of this report.

⁴Adhesive anchors experience a reduction in load capacity with increased ambient temperatures. See Figure 1 for load-reduction factor.

⁵Special inspection in accordance with Section 2.2 must be provided for all anchor installations.

⁶Sections 2.1.3 through 2.1.5 contain special considerations for anchor load conditions.

⁷Bond strength loads are based on a safety factor of 4.0.

⁸The tabulated values are for anchors installed at the critical edge distances ($c_{cr}$) and critical spacings ($s_{cr}$). Critical edge distance is the least edge distance at which the tabulated allowable load capacity of an anchor is applicable without applying a load-reduction factor. Critical spacing is the least anchor spacing distance at which the tabulated allowable load capacity of an anchor is applicable such that the anchor is not influenced by neighboring anchors.
FIGURE 1—CHANGE IN LOAD CAPACITY OF EPCON A7 WITH TEMPERATURE VARIATION

FIGURE 2—HOLLOW BLOCK FASTENING WITH EPCON A7 ADHESIVE