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DIVISION: 04 00 00—MASONRY
SECTION: 04 05 19.16—MASONRY ANCHORS

REPORT HOLDER:

ITW RED HEAD

700 HIGH GROVE BOULEVARD
GLENDALE HEIGHTS, ILLINOIS 60139

EVALUATION SUBJECT:

ITW RED HEAD A7+ ADHESIVE ANCHORING SYSTEM IN MASONRY

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ICC-ES Evaluation Report

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DIVISION: 04 00 00—MASONRY
Section: 04 05 19.16—Masonry Anchors

REPORT HOLDER:

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EVALUATION SUBJECT:

ITW RED HEAD A7+ ADHESIVE ANCHORING SYSTEM IN MASONRY

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2015, 2012, 2009 and 2006 *International Building Code®* (IBC)
- 2015, 2012, 2009 and 2006 *International Residential Code®* (IRC)

Property evaluated:

Structural

2.0 USES

The Red Head A7+ Adhesive Anchoring System is used to anchor building components to fully grouted concrete masonry walls to resist static, wind or seismic forces, as noted in Section 4.0 of this report.

The anchoring system is an alternative to Section 2.1.4 of TMS 402/ACI 530/ASCE 5 as referenced in Section 2107 of the IBC. The anchoring system may also be used where an engineered design is submitted in accordance with Section R301.1.3 of the IRC.

3.0 DESCRIPTION

3.1 General:

The Red Head A7+ Adhesive Anchoring System is available in dual-component cartridges, used with continuously threaded rods and deformed reinforcing bar. The primary components of the ITW Red Head A7+ Adhesive Anchoring System are shown in Figure 3 of this report.

The manufacturer's printed installation instructions (MPII) are included with the adhesive packaging and are replicated in Figure 4 of this report.

3.2 Materials:

3.2.1 Red Head A7+ Adhesive: The Red Head A7+ Anchoring System is a two-part vinylester packaged in a dual-chamber cartridge at a volumetric ratio of 10:1. The cartridge is available in either 28-ounce (side-by-side), 9.5-ounce (coaxial), and 5-ounce (coaxial) sizes as shown in Figure 3. The components are dispensed through a static mixing nozzle which attaches to the cartridge. The original, unopened cartridge has a shelf life of 18 months, as indicated by the "best used by" date stamped onto the cartridge, when stored in a cool, dry, ventilated area.

3.2.2 Hole Cleaning Equipment: Hole cleaning equipment consists of wire brushes, as shown in Figures 3 and 4, and a compressed air nozzle with extension.

3.2.3 Dispensing Tools: Red Head A7+ Adhesive must be dispensed with manual or pneumatic dispensing tools provided by ITW Red Head, as shown in Figure 3.

3.2.4 Anchor Elements:

3.2.4.1 Threaded Rods: The continuously threaded rods range from $^3/_8$ inch through $^3/_4$ inches (9.5 mm through 19 mm) in diameter. Carbon steel threaded rods must comply with either ASTM A36 [minimum f_{uta} = 58,000 psi (400 MPa)] or ASTM A193, Grade B7 [minimum f_{uta} = 125,000 psi (860 MPa)]. Stainless steel threaded rods must comply with ASTM F593 (Alloy Type 300, CW1 and CW2) [minimum f_{uta} = 95,000 psi (655 MPa) for CW1, and f_{uta} =80,000 psi (552 MPa) for CW2]. Table 2 notes steel design information for the threaded rods. Carbon steel threaded rods must be furnished with a minimum 0.0002-inch-thick (5 μm) zinc electroplated coating complying with ASTM B633 SC1 or must be hot-dipped galvanized complying with ASTM A153, Class C or D. Threaded steel rods must be straight and free from indentations or other defects along their length.

3.2.4.2 Steel Reinforcing Bars: Steel reinforcing bars are deformed reinforcing bars as described in Table 5 of this report. The embedded portions of reinforcing bars must be straight, and free of mill scale, rust, mud, oil, and other coatings that may impair the bond with the adhesive.

3.3 Grouted-filled Concrete Masonry: The masonry shall be fully grouted complying with Chapter 21 of the IBC. The compressive strength of masonry, f'_m, at 28 days must be a minimum of 1,500 psi (10.3 MPa). Fully grouted masonry walls must be constructed from the following:

3.3.1 Concrete Masonry Units (CMUs): Concrete masonry walls must be constructed from minimum nominal 8-inch-wide (203 mm) by 8-inches-high (203 mm) by 16-inches-long (406 mm), lightweight, medium-weight and

normal-weight concrete masonry units (CMUs) conforming to ASTM C90.

3.3.2 Grout: Grout-filled concrete masonry units must be fully grouted with grout complying with Section 2103.3 of the 2015 IBC, Section 2103.13 of the 2012 IBC, Section 2103.12 of the 2009 and 2006 IBC, Section R606.2.11 of the 2015 IRC, or Section R609.1.1 of the 2012, 2009 and 2006 IRC, as applicable. Alternatively, the grout must have a minimum compressive strength, when tested in accordance with ASTM C1019, equal to its specified strength, but not less than 2,000 psi (13.8 MPa).

3.3.3 Mortar: Mortar must be Types M, S or N prepared in accordance with Section 2103.2.1 of the 2015 IBC, 2103.9 of the 2012 IBC, Section 2103.8 of the 2009 and 2006 IBC, Section R606.2.7 of the 2015 IRC, or Section R607.1 of the 2012, 2009 and 2006 IRC, as applicable.

4.0 DESIGN AND INSTALLATION

4.1 Strength Design:

4.1.1 General: The design load values for anchors described in this report are based on allowable stress design (ASD), as an alternative to TMS 402/ACI 530/ASCE 5 Section 8.1.3 (2013 edition) or Section 2.1.4 (2011 or 2008 editions) as referenced in Section 2107.1 of the IBC. For use under the IRC, an engineered design in accordance with R301.1.3 must be submitted to the code official. Allowable tension and shear loads for installation in grout-filled masonry walls are noted in Tables 3, 4, 6 and 7 of this report. The allowable tension and shear values in this report must be adjusted in accordance with Figure 1 for in-service base material temperatures in excess of 70°F (21°C). Allowable tension and shear loads based on steel strength for threaded rods are described in Table 2. Allowable tension and shear loads based on steel strength for reinforcing bar are described in Table 5.

Allowable stress design tension and shear load values given in Tables 3, 4, 6 and 7 may be used to resist short-term loads such as wind as seismic, in accordance with Section 5.5 and Table 1 of this report. The allowable tension and shear loads are for anchors installed the area of the face of the grout-filled CMU wall (cell, web, joints) and resisting static, wind or earthquake loads.

Critical and minimum spacing and edge distance values, with appropriate reduction values, where applicable, are given in Tables 3, 4, 6 and 7.

4.1.2 Combined Loading: The allowable loads for anchors installed in masonry and subjected to combined tension and shear forces must be determined by the following equation:

$$\left(\frac{P_s}{P_t}\right)+\left(\frac{V_s}{V_t}\right)\le 1$$

where:

P_s = Applied service tension load (lbf or kN)

P_t = Allowable service tension load (lbf or kN)

V_s = Applied service shear load (lbf or kN)

V_t = Allowable service shear load (lbf or kN)

4.2 Installation:

4.2.1 General: Anchor must be installed in accordance with this report and the manufacturer's published installation instructions (MPII) represented in Figure 4. The anchors must not be installed until the base material has reached its minimum designated compressive strength. The drill bit size, hole diameter, embedment depth, spacing, edge distance and base material must comply with the requirements of this report. Installation procedures and locations must be in accordance with Tables 3, 4, 6 and 7 as well as Figure 2 of this report, as applicable.

4.2.2 Installation in Grout-filled Concrete Masonry Wall: Anchors are installed in grout-filled concrete masonry walls as specified in Tables 3, 4, 6 and 7. Installation requirements are tabulated for various threaded rod and rebar diameters in Figure 4. The minimum installation temperature is 14°F (-10°C) for the adhesive and the masonry. Holes are drilled to predetermined depths using rotary hammer drills and carbide-tipped drill bits that comply with ANSI B212.15-1994. Holes may be drilled in the face of masonry units or the mortar joints. Holes must be cleaned from the back with compressed air. A wire brush is used to remove dust and debris from the hole, and this is followed by another cleaning with compressed air. A mixing nozzle is attached to the Red Head 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. Holes may be dry or damp but must not contain any water at the time of installations. Holes are filled approximately 60% full with the mixed adhesive, and the threaded rods or reinforcement bars are inserted, with a rotating motion, to the back of the hole. The adhesive shall cure in accordance with Figure 4 before the placement of attachments.

4.3 Special Inspection:

Periodic special inspections are required in accordance with IBC Section 1704, and are also applicable for installations under the IRC.

The special inspector must be on the jobsite initially during anchor installation to verify anchor type, anchor dimensions, masonry type, masonry dimensions and compressive strength, drill bit size, anchor spacing, edge distances, embedment, and adherence to the manufacturer's printed installation instructions (MPII).

The special inspector must verify that the initial anchor installations of each type and size are in compliance with this evaluation report and in accordance with the MPII.

Subsequent installations of the same anchor type and size by the same construction personnel are permitted to be performed in the absence of the special inspector. Any change in the anchor product being installed or the personnel performing the installation requires an initial inspection. For ongoing installations over an extended period, the special inspector must make regular inspections to confirm correct handling and installation of the product.

5.0 CONDITIONS OF USE

The Red Head A7+ 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 The Red Head A7+ Adhesive must be identified and installed in accordance with this report and the manufacturer's printed installation instructions (MPII), as included with the adhesive packaging and reproduced in Figure 3 of this report.

5.2 Anchor sizes, dimensions, and minimum embedment depths are as set forth in this report.

5.3 Red Head A7+ Adhesive Anchors described in Section 4.1.1 of this evaluation report are capable of

resisting seismic and wind loads. When using the basic load combinations in accordance with IBC Section 1605.3.1, allowable loads must not be increased for wind or seismic loading. When using the alternative basic load combinations in 2009 and 2006 IBC Section 1605.3.2 that include seismic or wind loads, the allowable loads may be increased in accordance with Table 1, or the alternative basic load combinations may be decreased by the factors in Table 1, as applicable. For the 2015 and 2012 IBC, the allowable loads or load combinations must not be adjusted.

5.4 Since an ICC-ES acceptance criteria for evaluating data to determine the performance of adhesive anchors subjected to fatigue and shock loading is unavailable at this time, the use of these anchors under these conditions is beyond the scope of this report.

5.5 Prior to anchor 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.

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

5.7 Since an ICC-ES acceptance criteria for evaluating data to determine the performance of adhesive anchors in cracked masonry is unavailable at this time, the use of adhesive anchors is limited to installation in uncracked masonry. Cracking occurs when $f_t > f_r$ due to service loads or deformations.

5.8 The anchors may be installed in base materials having internal temperatures between 14°F (-10°C) and 110°F (43°C) at the time of installation. Installation of Red Head A7+ adhesive in base materials having temperatures beyond this range is outside the scope of the report.

5.9 When anchors are located where the internal base material temperature may exceed 70°F (21°C), allowable tension and shear loads indicated in this report must be adjusted for in-service temperatures in accordance with Figure 1. The use of Red Head A7+ adhesive in base materials having internal temperatures exceeding 176°F (80°C) during service life is beyond the scope of this report.

5.10 Use of Red Head A7+ in conjunction with uncoated, or zinc electroplated carbon steel threaded rods must be limited to interior exposure. Use of stainless steel (AISI 304 or Type 316) anchors or hot-dipped galvanized anchors with zinc coating conforming to ASTM A153, Class C or D is permitted for exterior or damp environments.

5.11 Special inspection in accordance with Section 4.3 of this report must be provided for all anchor installations.

5.12 Red Head A7+ Adhesive is manufactured under a quality-control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

6.1 Data in accordance with the ICC-ES Acceptance Criteria for Adhesive Anchors in Masonry Elements (AC58), dated November 2015.

6.2 A quality control manual.

7.0 IDENTIFICATION

Red Head A7+ Adhesive Anchors are identified by labels on the packaging indicating the manufacturer's name (ITW Commercial Construction North America) product name, material type, lot number traceable to production date, and the evaluation report number (ESR-3951).

TABLE 1—ALTERNATIVE BASIC LOAD COMBINATION ADJUSTMENT FACTORS[1,2,3]

Steel Type	Modification Factors			
	Reductions for Alternate Basic Load Combinations		Increase Factor for Allowable Loads for Short-term Loading Conditions	
	Tension	Shear	Tension	Shear
Standard threaded rods	0.75	0.75	1.33	1.33
High-strength rods	0.75	1	1.33	1
Stainless steel rods	0.75	0.87	1.33	1.14
Steel reinforcing bars	0.75	0.75	1.33	1.33

[1]When using the basic load combinations in accordance with IBC Section 1605.3.1, allowable loads must not be increased for wind or seismic loading.
[2]The above modification factors are applicable under the 2009 or 2006 IBC only.
[3]When using the alternative basic load combinations in the 2009 or 2006 IBC Section 1605.3.2 that include wind or seismic loads, the allowable loads for anchors may be increased by the tabulated factors found in the right half of the table. Alternatively, the alternate basic load combinations may be reduced by multiplying them by the reduction factors found in the left half of the table. For example, for stainless steel rods in shear the alternate basic loads for wind or seismic may be multiplied by 0.87 for shear loading or divided by 1.14 (1/1/14 = 0.87), as applicable. For the 2015 and 2012 IBC, the allowable loads or load combination must not be adjusted.

TABLE 2—ALLOWABLE TENSION AND SHEAR LOADS BASED ON STEEL DESIGN INFORMATION FOR U.S. CUSTOMARY UNIT THREADED ROD[1,2,3]

Anchor Diameter (inches)	Tension (lb)			Shear (lb)		
	ASTM A307 F_u = 60 ksi	ASTM A193 Grade B7 F_u = 125 ksi	ASTM F593 SS 304 F_u = 100 ksi	ASTM A307 F_u = 60 ksi	ASTM A193 Grade B7 F_u = 125 ksi	ASTM F593 SS 304 F_u = 100 ksi
3/8	2,185	4,555	3,645	1,125	2,345	1,875
1/2	3,885	8,100	6,480	2,000	4,170	3,335
5/8	6,075	12,655	10,125	3,130	6,520	5,215
3/4	8,750	18,225	12,390	4,505	9,390	6,385

For **SI:** 1 inch = 25.4mm, 1 lbf = 4.45N, 1ft-lbf = 1.356 N-M, 1 psi = 0.006895 MPa.

[1]Allowable load used in the design must be the lesser of bond values and tabulated steel element values.
[2]Allowable tension and shear loads for threaded rods to resist short term loads, such as wind or seismic, must be calculated in accordance with Section 4.1 as applicable.
[3]Allowable steel loads are based on allowable tension and shear stresses equal to 0.33X F_u and 0.17xF_u, respectively.

TABLE 3—ALLOWABLE RED HEAD A7+ ADHESIVE BOND TENSION LOADS FOR THREADED RODS INSTALLED INTO GROUT-FILLED CONCRETE MASONRY UNITS[1,2,3,4,7,9,10,11,12]

Threaded Rod Size	Minimum Embedment (inches)	Load at s_{cr} and c_{cr} (lb)	Spacing[5]			Edge Distance[6]		
			Critical, s_{cr} (inches)	Minimum, s_{min} (inches)	Load reduction factor for s_{min}[8]	Critical, c_{cr} (inches)	Minimum, c_{min} (inches)	Load reduction factor for c_{min}[8]
3/8	3 3/8	1,125	13.5	4	1.00	12	4	1.00
1/2	4 1/2	1,695	18	4	0.60	20	4	0.90
5/8	5 5/8	2,015	22.5	4	0.60	20	4	0.90
3/4	6 3/4	3,145	27	4	0.60	20	4	0.63

For **SI:** 1 inch = 25.4 mm; 1 lbf = 0.0044 kN, 1 ksi = 6.894 MPa. **(Refer to Table 4 for footnotes)**

TABLE 4—ALLOWABLE RED HEAD A7+ ADHESIVE BOND SHEAR LOADS FOR THREADED RODS INSTALLED INTO GROUT-FILLED CONCRETE MASONRY UNITS[1,2,3,4,7,9,10,11,12]

Threaded Rod Size	Minimum Embedment (inches)	Load at s_{cr} and c_{cr} ⊥ to edge (lb)	Spacing[5]			Edge Distance[6]		
			Critical, s_{cr} (inches)	Minimum, s_{min} (inches)	Load reduction factor for s_{min}[8]	Critical, c_{cr} (inches)	Minimum, c_{min} (inches)	Load reduction factor for c_{min}[8]
3/8	3 3/8	750	13.5	4	0.50	12	4	0.95
1/2	4 1/2	1,520	18	4	0.50	12	4	0.44
5/8	5 5/8	2,285	22.5	4	0.50	20	4	0.26
3/4	6 3/4	2,345	27	4	0.50	20	4	0.26

For **SI:** 1 inch = 25.4 mm; 1 lbf = 0.0044 kN, 1 ksi = 6.894 MPa.

(The following footnotes apply to both Tables 3 and 4)

[1]All values are for anchors installed in fully grouted concrete masonry with minimum masonry strength of 1500 psi (10.3 MPa). Concrete masonry units must be light-, medium, or normal-weight conforming to ASTM C 90. Allowable loads have been calculated using a safety factor of 5.0.
[3]Anchors may be installed in any location in the face of the masonry wall (cell, web, bed joint) as shown in Figure 2.
[4]A maximum of two anchors may be installed in a single masonry cell in accordance with the spacing and edge or end distance requirements. Embedment is measured from the outside surface of the concrete masonry unit to the embedded end of the anchor. See Figure 2 of this report.
[5]The critical spacing distance, s_{cr}, is the anchor spacing where full load values in the table may be used. The minimum spacing distance, s_{min}, is the minimum anchor spacing for which values are available and installation is permitted. Spacing distance is measured from the centerline to centerline between two anchors.
[6]The critical edge or end distance, c_{cr}, is the distance where full load values in the table may be used. The minimum edge or end distance, c_{min}, is the minimum distance for which values are available and installation is permitted. Edge or end distance is measured from anchor centerline to the closest unrestrained edge.
[7]The tabulated values are applicable for anchors in the ends of grout-filled concrete masonry units where minimum edge distances are maintained.
[8]Load values for anchors installed less than s_{cr} and c_{cr} must be multiplied by the appropriate load reduction factor based on actual spacing (s) or edge distance (c). Load factors are multiplicative; both spacing and edge reduction factors must be considered.
[9]Linear interpolation of load values between minimum spacing (s_{min}) and critical spacing (s_{cr}) and between minimum edge or end distance (c_{min}) and critical edge or end distance (c_{cr}) is permitted.
[10]Concrete masonry width (wall thickness) must be equal to or greater than 1.5 times the anchor embedment depth (e.g. 3/8-inch- and 1/2-inch-diameter anchors are permitted in minimum nominally 6-inch-thick concrete masonry). The 5/8- and 3/4-inch-diameter anchors must be installed in minimum nominally 8-inch-thick concrete masonry.
[11]Allowable loads must be the lesser of the adjusted masonry or bond values tabulated above and the steel strength values given in Table 2.
[12]Tabulated allowable bond loads must be adjusted for increased in-service base material temperatures in accordance with Figure 1, as applicable.

TABLE 5—ALLOWABLE TENSION AND SHEAR LOADS BASED ON STEEL STRENGTH FOR REINFORCING BARS[1,2,3]

Rebar Size	Tension (lb)	Shear (lb)
	ASTM A615, Grade 60	ASTM A615, Grade 60
No. 3	3,270	1,685
No. 4	5,940	3,060
No. 5	9,205	4,745
No. 6	13,070	6,730

For **SI:** 1 inch = 25.4mm, 1 lbf = 4.45N, 1ft-lbf = 1.356 N-M, 1 psi = 0.006895 MPa.

[1]Allowable load used in the design must be the lesser of bond values and tabulated steel element values.
[2]Allowable tension and shear loads for threaded rods to resist short term loads, such as wind or seismic, must be calculated in accordance with Section 4.1 as applicable.
[3]Allowable steel loads are based on allowable tension and shear stresses equal to 0.33X F_u and 0.17xF_u, respectively.

TABLE 6—ALLOWABLE RED HEAD A7+ ADHESIVE BOND TENSION LOADS FOR REINFORCING BARS INSTALLED INTO GROUT-FILLED CONCRETE MASONRY UNITS[1,2,3,4,7,9,10,11,12]

Rebar Size	Minimum Embedment (inches)	Load at s_{cr} and c_{cr} (lb)	Spacing[5]			Edge Distance[6]		
			Critical, s_{cr} (inches)	Minimum, s_{min} (inches)	Load reduction factor for s_{min}[8]	Critical, c_{cr} (inches)	Minimum, c_{min} (inches)	Load reduction factor for c_{min}[8]
No. 3	$3^3/_8$	1,530	13.5	4	1.00	12	4	1.00
No. 4	$4^1/_2$	1,845	18	4	0.60	20	4	0.90
No. 5	$5^5/_8$	2,465	22.5	4	0.60	20	4	0.90
No. 6	$6^3/_4$	2,380	27	4	0.60	20	4	0.63

For **SI:** 1 inch = 25.4 mm; 1 lbf = 0.0044 kN, 1 ksi = 6.894 MPa. **(Refer to Table 7 for footnotes)**

TABLE 7—ALLOWABLE RED HEAD A7+ ADHESIVE BOND SHEAR LOADS FOR REINFORCING BARS INSTALLED INTO GROUT-FILLED CONCRETE MASONRY UNITS[1,2,3,4,7,9,10,11,12]

Rebar Size	Minimum Embedment (inches)	Load at s_{cr} and c_{cr} ⊥ to edge (lb)	Spacing[5]			Edge Distance[6]		
			Critical, s_{cr} (inches)	Minimum, s_{min} (inches)	Load reduction factor for s_{min}[8]	Critical, c_{cr} (inches)	Minimum, c_{min} (inches)	Load reduction factor for c_{min}[8]
No. 3	$3^3/_8$	1,410	13.5	4	0.50	12	4	0.95
No. 4	$4^1/_2$	1,680	18	4	0.50	12	4	0.44
No. 5	$5^5/_8$	3,245	22.5	4	0.50	20	4	0.44
No. 6	$6^3/_4$	4,000	27	4	0.50	20	4	0.26

For **SI:** 1 inch = 25.4 mm; 1 lbf = 0.0044 kN, 1 ksi = 6.894 MPa.

(The following footnotes apply to both Tables 6 and 7)

[1]All values are for anchors installed in fully grouted concrete masonry with minimum masonry strength of 1500 psi (10.3 MPa). Concrete masonry units must be light-, medium, or normal-weight conforming to ASTM C 90. Allowable loads have been calculated using a safety factor of 5.0.
[3]Anchors may be installed in any location in the face of the masonry wall (cell, web, bed joint) as shown in figure 2.
[4]A maximum of two anchors may be installed in a single masonry cell in accordance with the spacing and edge or end distance requirements. Embedment is measured from the outside surface of the concrete masonry unit to the embedded end of the anchor. See Figure 2 of this report.
[5]The critical spacing distance, s_{cr}, is the anchor spacing where full load values in the table may be used. The minimum spacing distance, s_{min}, is the minimum anchor spacing for which values are available and installation is permitted. Spacing distance is measured from the centerline to centerline between two anchors.
[6]The critical edge or end distance, c_{cr}, is the distance where full load values in the table may be used. The minimum edge or end distance, c_{min}, is the minimum distance for which values are available and installation is permitted. Edge or end distance is measured from anchor centerline to the closest unrestrained edge.
[7]The tabulated values are applicable for anchors in the ends of grout-filled concrete masonry units where minimum edge distances are maintained.
[8]Load values for anchors installed less than s_{cr} and c_{cr} must be multiplied by the appropriate load reduction factor based on actual spacing (s) or edge distance (c). Load factors are multiplicative; both spacing and edge reduction factors must be considered.
[9]Linear interpolation of load values between minimum spacing (s_{min}) and critical spacing (s_{cr}) and between minimum edge or end distance (c_{min}) and critical edge or end distance (c_{cr}) is permitted.
[10]Concrete masonry width (wall thickness) must be equal to or greater than 1.5 times the anchor embedment depth (e.g. No. 3 and No. 4 reinforcing bars are permitted in minimum nominally 6-inch-thick concrete masonry). No. 5 and No. 6 reinforcing bars must be installed in minimum nominally 8-inch-thick concrete masonry.
[11]Allowable loads must be the lesser of the adjusted masonry or bond values tabulated above and the steel strength values given in Table 4.
[12]Tabulated allowable bond loads must be adjusted for increased in-service base material temperatures in accordance with Figure 1, as applicable.

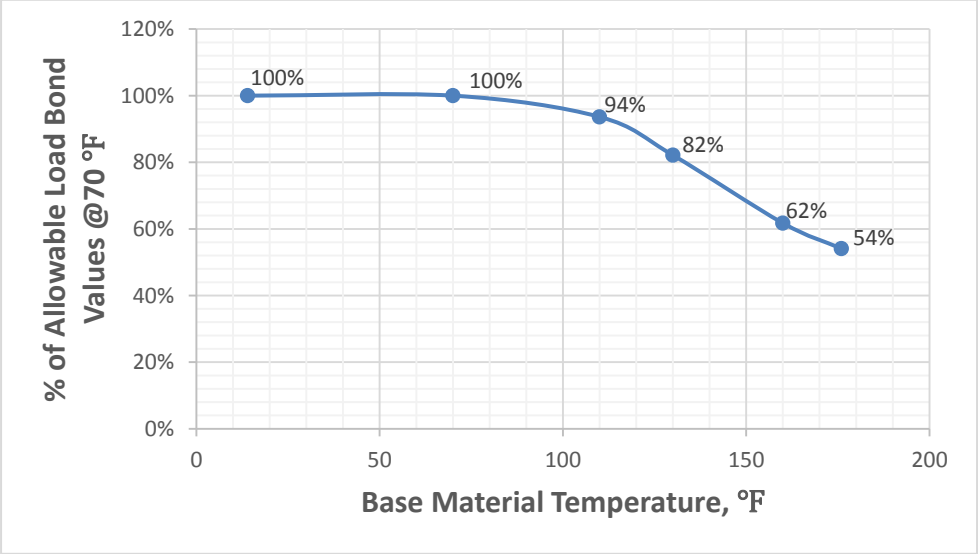


FIGURE 1—INFLUENCE OF BASE MATERIAL TEMPERATURE ON ALLOWABLE ADHESIVE BOND TENSION AND SHEAR LOADS FOR RED HEAD A7+ ADHESIVE ANCHORS INSTALLED INTO THE FACE OF CONCRETE MASONRY UNIT WALLS

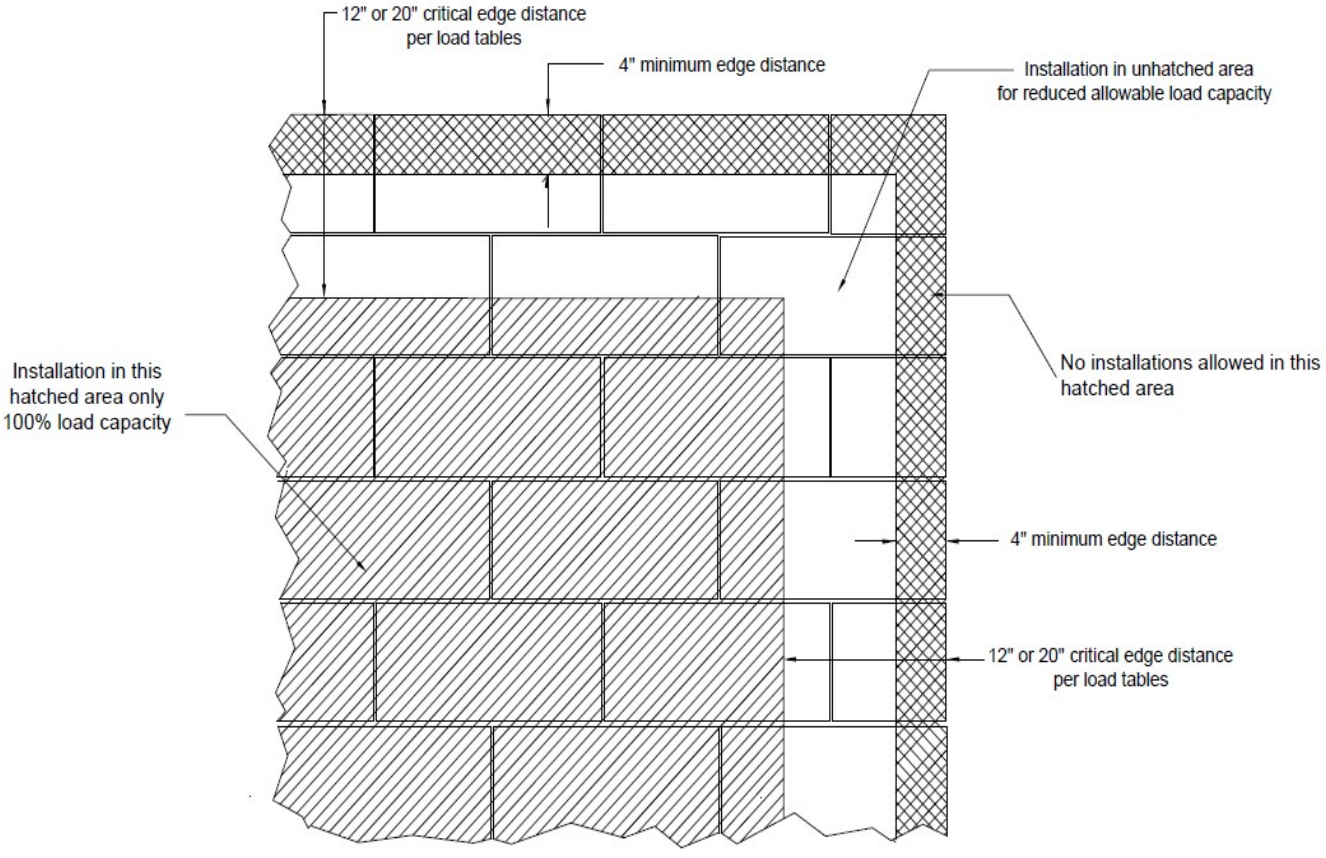


FIGURE 2—ILLUSTRATION OF PERMISSABLE LOCATIONS FOR RED HEAD A7+ ADHESIVE ANCHORS INSTALLED INTO THE FACE OF GROUTED CONCRETE MASONRY WALL (ELEVATION VIEW)

FIGURE 3—RED HEAD EPCON A7+ ADHESIVE CARTRIDGES, DISPENSING TOOLS, MIXING NOZZLES, HOLE CLEANING BRUSHES AND HOLE PLUGS

SPECIFICATIONS FOR INSTALLATION OF RED HEAD A7+ ADHESIVE ANCHORS

BRUSH AND CARBIDE DRILL BIT SPECIFICATIONS

Anchor diameter (in)	Carbide drill bit diameter (in)	Brush Part No.	Minimum brush diameter (in)
3/8 No. 3	7/16	WB-038	0.563
1/2 No. 4	9/16 for threaded rod 5/8 for rebar	WB-012	0.675
5/8 No. 5	3/4	WB-058	0.900
3/4 No. 6	7/8	WB-034	1.125

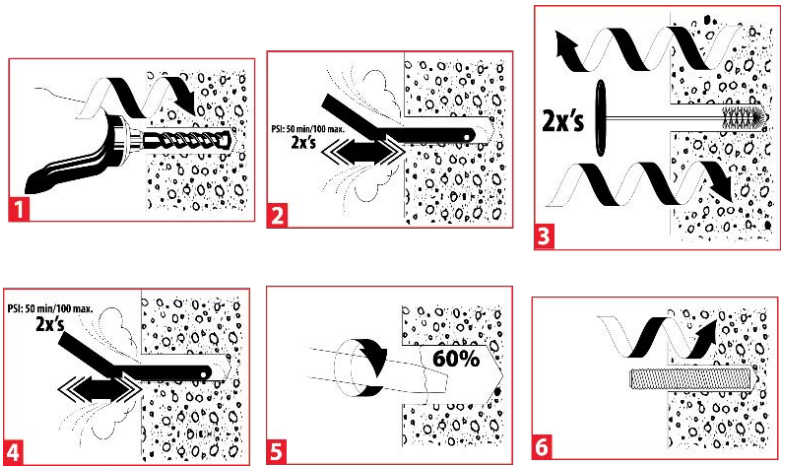
CURE TIMES AND GEL TIMES FOR RED HEAD EPCON A7+ ADHESIVE

Concrete Temperature (°F)[1,2]	Gel Time[3]	Cure Time[4]
110	1.5 minutes	45 minutes
90	5 minutes	45 minutes
70	10 minutes	45 minutes
50	16 minutes	90 minutes
32	35 minutes	4 hours
14	35 minutes	24 hours

For **SI:** t° (°F-32) X .555 = °C.

[1]Adhesive must be installed in concrete temperatures within the noted range or artificially maintained at the noted temperature.
[2]For concrete temperatures between 14°F and 32°F, adhesive must be maintained at a minimum of 32°F during installation.
[3]Gel time is the maximum time from the end of mixing to when the insertion of the anchor into the adhesive shall be completed and is based upon the adhesive and concrete temperatures noted.
[4]Cure time is the minimum time from the end of gel time to when the anchor maybe torque or loaded. Anchors are to be undisturbed during the cure time.

FIGURE 4—RED HEAD A7+ ADHESIVE INSTALLATION INSTRUCTIONS



*Damp installations require 4x's air, 4x's brushing and 4x's air

1) ▪ Use a rotary hammer drill or pneumatic air drill with a carbide drill bit complying to ANSI B212.15-1994 tolerance requirements. Drill hole to the required embedment depth. See attached table for drill bit specifications and embedment depths.
▪ Installations may be used with maximum 3/4" diameter rods/rebar for masonry wall applications.
▪ Per construction specification, adhere to minimum spacing, minimum edge distance, and minimum wall thickness.

2) ▪ For dry holes, oscillate a clean air nozzle in and out of the dry hole two times, for a total of two seconds, starting at the bottom of the hole with contaminant-free compressed air, exhausting hole until visually clean (i.e., no dust, debris, etc.)
▪ For water-saturated applications, oscillate a clean air nozzle in and out of the damp hole four times, for a total of four seconds, starting at the bottom of the hole with contaminant-free compressed air, exhausting hole until visually clean (i.e., no dust, debris, etc.)
▪ If required, use an extension on the end of the air nozzle to reach the back of the hole.

3) ▪ Select an appropriately sized Red Head brush for the anchor diameter. Brush must be checked for wear before use. See attached table for brush specifications, including minimum diameter.
▪ Insert the brush into the hole with a clockwise motion. For every ½" forward advancement, complete one full turn until bottom of hole is reached. For faster and more suitable cleaning, attach the brush to a drill.
▪ Using a clockwise motion, for every full turn of the brush, pull the brush ½" out of the hole.
▪ For dry holes, twist/spin the brush two times in/out of the hole.
▪ For water-saturated applications, twist/spin the brush four times in/out of the hole.
▪ If required, use a wire brush extension (part nos. ESDS-38 or EHAN-38) to reach the bottom of the hole.
▪ Air clean the dust off the brush to prevent clogging of the brush.

4) ▪ For dry holes, oscillate a clean air nozzle in and out of the dry hole two times, for a total of two seconds, starting at the bottom of the hole with contaminant-free compressed air, exhausting hole until visually clean (i.e., no dust, debris, etc.)
▪ For water-saturated applications, oscillate a clean air nozzle in and out of the damp hole four times, for a total of four seconds, starting at the bottom of the hole with contaminant-free compressed air, exhausting hole until visually clean (i.e., no dust, debris, etc.)

5) ▪ Review the Safety Data Sheet (SDS) before use.
▪ Check the "Use By" date on the cartridge and that the cartridge has been stored in out of direct sunlight.
▪ Review the gel time/cure time chart, based on the temperature at time of installation, in order to determine tool, cartridge and nozzle requirements.
▪ Assemble the Red Head supplied cartridge and nozzle. Do not modify or remove mixing elements in nozzle.
▪Place the assembly into a hand injection tool or a pneumatic injection tool.
▪ Dispense mixed adhesive outside of hole until uniform color is achieved.
▪ During installations, masonry must be between 14 and 110 degrees F, or artificially maintained.
▪ Insert the nozzle to the bottom of the hole and inject the adhesive at an angle, leaving the nozzle tip always slightly below the fill level.
▪ In a slow circular direction, work the adhesive into the sides of the hole, filling slowly to ensure proper adhesive distribution, until the hole is approximately 60% filled.

6) ▪ Immediately insert the oil, rust and scale free rod/rebar assembly to the required embedment depth, using a counterclockwise motion to ensure proper adhesive distribution.
▪ The anchor rod/rebar must be marked with the required embedment depth.
▪ For installations with masonry or adhesive over 70 degrees F, the anchor rod/rebar must be marked with the required embedment depth and assembled with a Red Head hole plug positioned on the rod/rebar at the required embedment depth.
▪ After installing the anchor, the gap between the rod and the masonry must be completely filled with adhesive. The adhesive must fill voids, crevices and uniformly coat the rod and concrete.
▪ After installation, do not disturb the anchor until the full cure time has elapsed.
▪ Adhesive must be fully cured before applying any load or torque. Do not over torque the anchor as this could adversely affect its performance.

FIGURE 4—RED HEAD A7+ ADHESIVE INSTALLATION INSTRUCTIONS (Continued)

ICC-ES Evaluation Report

ESR-3951 FBC Supplement

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DIVISION: 04 00 00—MASONRY
Section: 04 05 19.16—Masonry Anchors

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EVALUATION SUBJECT:

ITW RED HEAD A7+ ADHESIVE ANCHORING SYSTEM IN MASONRY

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the RED HEAD A7+ Adhesive Anchor System in Masonry, recognized in ICC-ES master evaluation report ESR-3951, has also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2014 *Florida Building Code—Building*
- 2014 *Florida Building Code—Residential*

2.0 CONCLUSIONS

The RED HEAD A7+ Adhesive Anchor System in Masonry, described in Sections 2.0 through 7.0 of the master evaluation report ESR-3951, complies with the 2014 *Florida Building Code—Building* and the 2014 *Florida Building Code—Residential*, provided the design and installation are in accordance with the *International Building Code®* (IBC) provisions noted in the master report, and under the following conditions:

- Design wind loads must be based on Section 1609 of the 2014 *Florida Building Code—Building* or Section 301.2.1.1 of the 2014 *Florida Building Code—Residential*, as applicable.
- Load combinations must be in accordance with Section 1605.2 or Section 1605.3 of the 2014 *Florida Building Code—Building*, as applicable.

Use of the RED HEAD A7+ Adhesive Anchor System with stainless steel threaded rod materials has also been found to be in compliance with the High-Velocity Hurricane Zone provisions of the 2014 *Florida Building Code—Building* and the 2014 *Florida Building Code—Residential*, when the following conditions are met:

- The design wind loads for use of the anchors in a High-Velocity Hurricane Zone are based on Section 1620 of the *Florida Building Code—Building*.

Use of RED HEAD A7+ Adhesive Anchor System with carbon steel threaded rod materials for compliance with the High-velocity Hurricane Zone provisions of the 2014 *Florida Building Code—Building* and the 2014 *Florida Building Code—Residential* has not been evaluated, and is outside the scope of this supplemental report.

For products falling under Florida Rule 9N-3, 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 February 2017.