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ICC-ES Evaluation Report
ESR-5359

Issued September 2023

This report is subject to renewal September 2024.

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

REPORT HOLDER:

MKT FASTENING LLC

EVALUATION SUBJECT:

SUP-R BOLT AND SUP-R BOLT WITH SUP-R COAT SCREW ANCHORS FOR USE IN CRACKED AND UNCRACKED MASONRY

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2021, 2018 and 2015 International Building Code® (IBC)
- 2021, 2018 and 2015 International Residential Code® (IRC)

For evaluation for compliance with codes adopted by the Los Angeles Department of Building and Safety (LADBS), see ESR-5359 LABC and LARC Supplement.

Property evaluated:

Structural

2.0 USES

The Sup-R Bolt and Sup-R Bolt with Sup-R Coat screw anchors are used as anchorage to resist static, wind and seismic tension and shear loads. The 1/4-inch (3.4 mm) screw anchor is for use in uncracked fully grouted concrete masonry unit (CMU) construction (Seismic Design Categories A and B only); the 3/8-inch (9.5 mm) through 3/4-inch (19.05 mm) screw anchors are for use in uncracked and cracked fully grouted concrete masonry unit (CMU) construction (Seismic Design Categories A and B only). The anchor system is an alternative to cast-in-place anchors described in Section 8.1.3 (2016 and 2013 edition) of TMS 402/ACI 530/ASCE 5, as applicable, as referenced in Section 2107.1 of the IBC. The anchors 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 SUP-R BOLT WITH SUP-R COAT:

Sup-R Bolt with Sup-R Coat screw anchors are comprised of a body with hex washer head. The anchor is manufactured from carbon steel and is heat treated. The anchoring system is available in a variety of lengths, with nominal diameters of ¼ inch, 3/8 inch, ½ inch, 5/8 inch and ¾ inch. It has an Atlantic epoxy coating in gray or blue colors. The anchors have been tested for corrosion resistance in accordance with ASTM G85-11 Annex 5 for handling purposes (e.g. storage). A typical Sup-R Bolt with Sup-R Coat screw anchor is illustrated in Figure 3.

The hex head diameter is larger than the diameter of the anchor and is formed with serrations on the underside. The anchor body is formed with threads running most of the length of the anchor body. The anchor is installed in a predrilled hole with a powered impact wrench or torque wrench. The anchor threads cut into the masonry on the sides of the hole and interlock with the base material during the installation.

3.2 SUP-R BOLT:

Sup-R Bolt screw anchors are comprised of a body with hex washer head. The anchor is manufactured from carbon steel and is heat-treated. The anchoring system is available in a variety of lengths, with nominal diameters of ¼-inch (3.4 mm), 3/8-inch (9.5 mm), ½-inch (12.7 mm), 5/8-inch (15.88 mm) and ¾-inch (19.05 mm). It has a minimum of 0.0002-inch-thick (5 μm) zinc coating according to ASTM B633 type SC1, Class III. A typical Sup-R Bolt screw anchor is illustrated in Figure 3.

The hex head diameter is larger than the diameter of the anchor and is formed with serrations on the underside. The anchor body is formed with threads running most of the length of the anchor body. The anchor is installed in a predrilled hole with a powered impact wrench or torque wrench. The anchor threads cut into the masonry on the sides of the hole and interlock with the base material during the installation.

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

3.3.1 Concrete Masonry Units (CMUs): Grouted concrete masonry walls must be constructed from lightweight, medium-weight or normal-weight, closed-end or open-end, concrete masonry units (CMUs) conforming to ASTM C90. The minimum allowable nominal size of the CMU is 8 inches (203 mm) wide by 8 inches (203 mm) high by 16 inches (406 mm) long.

3.3.2 Grout: Grout must comply with IBC Section 2103.3, 2021 and 2018 IRC Section R606.2.12 or 2015 IRC Section R606.2.11, 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 Type N, S or M, prepared in accordance with IBC Section 2103.2.1, 2021 and 2018 IRC Section R606.2.8 or 2015 IRC Section R606.2.7, as applicable.

4.0 DESIGN AND INSTALLATION

4.1 Strength Design of Anchors in Grouted Concrete Masonry Unit Construction:

4.1.1 General: Sections 4.1 and 4.2 provide strength design requirements used in fully grouted concrete masonry unit construction, where anchors are used to transmit structural loads by means of tension, shear or a combination of tension and shear.

Strength design of screw anchors in grouted concrete masonry unit construction shall be conducted in accordance with the provisions for the design of screw anchors in concrete in ACI 318 (-19 or -14) Chapter 17, and TMS 402-16 as modified by the sections that follow. Design in accordance with this report cannot be conducted without reference to ACI 318 (-19 or -14) with the deletions and modifications summarized in Table 4.1 and TMS 402-16 Eq. 9-7.

This report references sections, tables, and figures in both this report and ACI 318, with the following method used to distinguish between the two document references:

- References to sections, tables, and figures originating from ACI 318 are *italicized*, with the leading reference corresponding to 318-19 and the parenthetical reference corresponding to 318-14. For example, Section 2.2 of ACI 318-19, which is analogous to Section 2.2 of ACI 318-14, will be displayed as *ACI 318-19 Section 2.2 (ACI 318-14 Section 2.2)*.
- References to sections, tables, and figures originating from this report do not have any special font treatment, for example Section 4.2.1.

Where language from ACI 318 is directly referenced, the following modifications generally apply:

- The term "masonry" shall be substituted for the term "concrete" wherever it occurs.
- The modification factor to reflect the reduced mechanical properties for mixtures with lightweight aggregate and lightweight units, λ_a , shall be taken as 1.0.

The following terms shall be replaced wherever they occur:

ACI 318-14/19 term	Replacement term
f'_c	f'_m
N_{cb} , N_{cbg}	N_{mb} , N_{mbg}
V_{cb}, V_{cbg}	V_{mb} , V_{mbg}
V_{cp}, V_{cpg}	V_{mp} , V_{mpg}

4.1.2 Restrictions for anchor placement are noted in Table 1 and Figure 2. For CMU construction with closed end blocks and hollow head joints, in addition to the ends and edges of walls, the nearest head joint on a horizontal projection from the anchor shall be treated as an edge for design purposes. The minimum distance from the nearest adjacent head joint shall be 2 inches (50.8 mm) as measured from the centerline of the head joint in CMU construction with hollow head joints. For anchor groups installed in CMU construction with solid head joints, the nearest head joint outside of the group on a horizontal projection to the group shall be treated as an edge. If open-ended units are employed, only the ends and edges of walls shall be considered for edge distance determination. For horizontal ledgers in fully-grouted CMU walls with hollow head joint applications, see Section 4.2.23.

4.2 ACI Modifications Required for Design: Table 4.1 provides a summary of all applicable *ACI 318-19* and *ACI 318-14* sections for the design of screw anchors in fully grouted masonry. Where applicable, modifying sections contained within this report are also provided.

4.2.1 *ACI 318-19 Section 17.1.1 and 17.1.5 (ACI 318-14 Section 17.1.1-17.1.2)* apply with the general changes prescribed in Section 4.1.1.

4.2.2 In lieu of *ACI 318-19 Section 17.1.2 (ACI 318-14 Section 17.1.3):* Design provisions are included for screw anchors that meet the assessment criteria of ICC-ES AC01.

4.2.3 *ACI 318-19 Section 17.1.4, 17.2.1 and 17.4.1 (ACI 318-14 Section 17.1.4-17.2.2)* apply with the general changes prescribed in Section 4.1.1.

4.2.4 *ACI 318-19 Section 17.3.1 (ACI 318-14 Section 17.2.7)* applies with the general changes prescribed in Section 4.1.1.

4.2.5 *In lieu of ACI 318-19 Section 17.5.2 (ACI 318-14 Section 17.3.1.1)*: The design of anchors shall be in accordance with Table 4.2.

4.2.6 *ACI 318-19 Section 17.5.2.3 (ACI 318-14 Section 17.3.1.3)* applies with the general changes prescribed in Section 4.1.1.

4.2.7 *ACI 318-19 Section 17.5.1.2 excluding Section 17.5.2.1 (ACI 318-14 Section 17.3.2 excluding Section 17.3.2.1*) applies with the general changes prescribed in Section 4.1.1**.**

4.2.8 In lieu of *ACI 318-19 Section 17.5.3 (ACI 318-14 Section 17.3.3)*: Strength reduction factor ϕ for anchors in masonry shall be as follows when the LFRD load combinations of ASCE 7 are used:

a) For steel capacity of ductile steel elements as defined in *ACI 318-19 Section 2.3 (ACI 318-14 Section 2.3)*, ϕ shall be taken as 0.75 in tension and 0.65 in shear.

b) For shear crushing capacity ϕ shall be taken as 0.50.

c) For cases where the nominal strength of anchors in masonry is controlled by masonry breakout or pullout strength in tension, ϕ shall be taken as 0.65 for anchors qualifying for Category 1 and 0.55 for anchors qualifying for Category 2 as indicated Tables 2 and 3 of this report.

d) For cases where the nominal strength of anchors in masonry is controlled by masonry failure modes in shear, ϕ shall be taken as 0.70.

4.2.9 *ACI 318-19 Section 17.6.1 (ACI 318-14 Section 17.4.1)* applies with the general changes prescribed in Section 4.1.1.

4.2.10 In lieu *of ACI 318-19 Section 17.6.2.1 (ACI 318-14 Section 17.4.2.1):* The nominal breakout strength in tension, N_{mb} of a single anchor or N_{mbg} of a group of anchors, shall not exceed:

a) For a single anchor

$$N_{mb} = \frac{A_{Nm}}{A_{Nmo}} \psi_{ed,N,m} \cdot \psi_{c,N,m} \cdot N_{b,m} \quad (17.6.2.1a)$$

b) For a group of anchors

$$N_{mbg} = \frac{A_{Nm}}{A_{Nmo}} \psi_{ec,N,m} \cdot \psi_{ed,N,m} \cdot \psi_{c,N,m} \cdot N_{b,m} \quad (17.6.2.1b)$$

Factors $\psi_{ec,N,m}$, $\psi_{ed,N,m}$, $\psi_{c,N,m}$ are defined in *ACI 318-19 Sections 17.6.2.3.1, 17.6.2.4 (ACI 318-14 Sections 17.4.2.4, 17.4.2.5)*, and Section 4.2.13, respectively. A_{Nm} is the projected masonry failure area of a single 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 1.5 h_{ef} from the centerlines of the anchor, or, in the case of a group of anchors, from a line through a row of adjacent anchors. A_{Nm} shall not exceed $n \cdot A_{Nmo}$, where n is the number of anchors in the group that resist tension. A_{Nmo} is the projected masonry failure area of a single anchor with an edge distance equal to or greater than 1.5 h_{ef}.

$$A_{Nmo} = 9h_{ef}^2 \quad (17.6.2.1.4)$$

4.2.11 In lieu of *ACI 318-19 Section 17.6.2.2.1 (ACI 318-14 Section 17.4.2.2:* The basic masonry breakout strength of a single anchor in tension in cracked masonry, $N_{b,m}$ shall not exceed

$$N_{b,m(cr,uncr)} = k_{m(cr,uncr)} \sqrt{f'_m}\ h_{ef}^{1.5} \quad (17.6.2.2.1)$$

Where

$k_{m,cr}$ = effectiveness factor for breakout strength in cracked masonry

= $\alpha_{masonry} \cdot k_{c,cr}$

$k_{c,cr}$ = effectiveness factor for breakout strength in concrete

= 17; and

$\alpha_{masonry}$ = reduction factor for the inhomogeneity of masonry materials in breakout strength determination.

= 0.7

4.2.12 ACI 318-19 Section 17.6.2.1.2, 17.6.2.3.1 and *17.6.2.4 (ACI 318-14 Section 17.4.2.3-17.4.2.5)* apply with the general changes prescribed in Section 4.1.1**.**

4.2.13 In lieu of *ACI 318-19 Section 17.6.2.5.1(a) (ACI 318-14 Section 17.4.2.6):* For anchors located in a region of a masonry member where analysis indicates no cracking at service load levels, the following modification factor shall be permitted:

$\psi_{c,N,m} = 1.4$ for post-installed anchors, where the value of k_m is 11.9.

4.2.14 *ACI 318-19 Section 17.6.2.6 (ACI 318-14 Section 17.4.2.7)* need not be considered since the modification factor for post installed anchors, ψ_{cp}, is not included in Eq. 17.6.2.1a & b.(Eq. 17.4.2.7 a&b)

4.2.15 The following apply with the general changes prescribed in Section 4.1.1**:**

- *ACI 318-19 Section 17.6.2.1.3 (ACI 318-14 Section 17.4.2.8)*
- *ACI 318-19 Section 17.5.2.1 (ACI 318-14 Section 17.4.2.9)*

4.2.16 In lieu of *ACI 318-19 Section 17.6.3.1 (ACI 318-14 Section 17.4.3.1 or Section D.5.3.1):* The nominal pullout strength of a single screw anchor in tension shall not exceed

$$N_{pn} = \psi_{m,P} N_p \quad (17.6.3.1)$$

where $\psi_{m,P}$ = 1.0.

4.2.17 In lieu of *ACI 318-19 Section 17.6.3.2.1 (ACI 318-14 Section 17.4.3.2):* The nominal pullout strength of a single anchor in cracked and uncracked masonry, $N_{p,cr}$ and $N_{p,uncr}$, respectively, is given in Tables 2 and 3 of this report.

4.2.18 *The* following apply with the general changes prescribed in Section 4.1.1**:**

- *ACI 318-19 Section 17.6.3.3 (ACI 318-14 Section 17.4.3.6)*
- *ACI 318-19 Section 17.7.1.1-17.7.2.2 (ACI 318-14 Section 17.5.1.1-17.5.2.2)*
- *ACI 318-19 Section 17.7.2.1.2, 17.7.2.3 and 17.7.2.4 (ACI 318-14 Section 17.5.2.4-17.5.2.6)*
- *ACI 318-19 Section 17.7.2.6 (ACI 318-14 Section 17.5.2.8)*
- *ACI 318-19 Section 17.7.3 (ACI 318-14 Section 17.5.3)*
- *ACI 318-19 Section 17.8 (ACI 318-14 Section 17.6)*
- *ACI 318-19 Section 17.9 (ACI 318-14 Section 17.7)*
- *ACI 318-19 Section 26.13.1.5 and 26.13.2.5 (ACI 318-14 Section 17.8.1)*

4.2.19 In lieu of *ACI 318-19 Section 17.7.2.5 (ACI 318-14 Section 17.5.2.7)*: For anchors located in a region of masonry construction where *cracking* is anticipated, $\psi_{m,V}$ shall be taken as 1.0. For cases where analysis indicates no cracking at service load levels, it shall be permitted to take $\psi_{m,V}$ as 1.4.

4.2.20 In lieu of *ACI 318-19 Section 17.9 (ACI 318-14 Section 17.7)*: Minimum edge distances and spacings shall be as indicated in Table 1 of this report.

4.2.21 *[In addition to the ACI 318 provisions]* For screw anchors with embedment depths $5d_a \leq h_{ef} \leq 10d_a$ and $h_{ef} \geq$ 1.5 in, masonry breakout strength requirements shall be considered satisfied by the design procedures of *ACI*

318-19 Sections 17.6.2 and 17.7.2 (ACI 318-14 Section 17.4.2 and 17.5.2).

4.2.22 *[In addition to the ACI 318 provisions] Masonry crushing strength for anchors in shear*—The nominal strength of an anchor in shear as governed by masonry crushing, V_{mc}, shall be calculated using Eq. (4-1).

$$V_{mc} = 1750 \sqrt[4]{f'_{m} A_{se,v}} \quad (4\text{-}1)$$

4.2.23 *[In addition to the ACI 318 provisions]* Determination of shear capacity for bolts in horizontal ledgers in fully-grouted CMU walls with hollow head joint applications with an assumed masonry unit length of 16 inches, standard:

Where six or more anchor bolts are placed at uniform horizontal spacing in continuous wood or steel ledgers connecting floor and roof diaphragms to fully grouted CMU walls constructed with hollow head joints (using closed-end block), the horizontal and vertical shear capacity of the bolts shall be permitted to be calculated in accordance with Eq. (4-2) and Eq. (4-3), respectively, in lieu of Section 4.1.2.

$$v_{mb,horiz} = 0.75 \cdot V_{gov,horiz} \cdot \frac{12}{s_{horiz}} \text{ (plf or N/m)} \quad (4\text{-}2)$$

$$v_{mb,vert} = 0.75 \cdot V_{gov,vert} \cdot \frac{12}{s_{horiz}} \text{ (plf or N/m)} \quad (4\text{-}3)$$

where

s_{horiz} = horizontal anchor spacing in the ledger, (in). For anchor spacings that are multiples of 8 inches, locate the first anchor in the ledger at least 2 inches from the head joint and the center of the block. For other anchor spacings, minimum edge distance as specified in the evaluation report shall apply.

$V_{gov,horiz}$	=	$\min(V_{sa}, V_{mb,4}, V_{mc}, V_{mp,4})$ (lb or N)
$V_{gov,vert}$	=	$\min(V_{sa}, 2 \cdot V_{mb,4}, V_{mc}, V_{mp,4})$ (lb or N)
V_{sa}	=	shear capacity for a single bolt as given in Tables 2 and 3 of this report (lb or N)
$V_{mb,4}$	=	breakout capacity for a single bolt with edge distance of 4 in. (lb or N)
V_{mc}	=	crushing capacity for a single bolt calculated in accordance with Eq. (4-1) (lb or N)
$V_{mp,4}$	=	pryout capacity for a single bolt with edge distance of 4 in. (lb or N)

4.2.24 Interaction shall be calculated in compliance *with ACI 318-19 Section 17.8 (ACI 318-14 Section 17.6)* as follows:

- For shear loads $V \leq 0.2V_{allowable,ASD}$, the full allowable load in tension shall be permitted.
- For tensile loads $T \leq 0.2T_{allowable,ASD}$, the full allowable load in shear shall be permitted.
- For all other cases:

$$\frac{T}{T_{allowable}} + \frac{V}{V_{allowable}} \leq 1.2$$

4.3 Conversion of strength design to allowable stress design (ASD):

4.3.1 For post-installed anchors designed using Allowable Stress Design load combinations from the legally adopted building code shall be established using the equations below:

$$T_{allowable,ASD} = \frac{\phi N_n}{\alpha} \quad (3\text{-}4)$$

and

$$V_{allowable,ASD} = \frac{\phi V_n}{\alpha} \quad (3\text{-}5)$$

where

$T_{allowable,ASD}$	=	Allowable tensile load (lb. or N);
$V_{allowable,ASD}$	=	Allowable shear load (lb. or N);
N_n	=	Lowest design strength of an anchor or anchor group in tension as determined in accordance with this report, as applicable, and IBC Section 1905.1.8;
V_n	=	Lowest design strength of an anchor or anchor group in shear as determined in accordance with this report, as applicable, and IBC Section 1905.1.8;
α	=	Conversion factor calculated as a weighted average of the load factors for the controlling load combination. In addition, α shall include all applicable factors to account for non-ductile failure modes and required overstrength; and
ϕ	=	relevant strength reduction factor for load case and Anchor Category.

The requirements for member thickness, edge distance and spacing, described in this report, must apply. An example of allowable stress design calculations is shown in Table 5.

4.4 Installation:

Installation parameters are provided in Table 1 and in Figures 1, 2 and 3 of this report. Anchors must be installed per the manufacturer's published instructions and this report. In case of conflict, this report governs. Anchor locations must comply with this report and the plans and specifications approved by the code official. Anchors must be installed in holes drilled into masonry using carbide-tipped drill bits complying with ANSI B212.15-1994. The nominal drill diameter must be equal to the nominal diameter of the anchor. Prior to anchor installation, the hole must be cleaned in accordance with the manufacturer's published installation instructions. The minimum drilled hole depth h_{hole} is given in Table 1. The anchor must be installed into the predrilled hole using a powered impact wrench or installed with a torque wrench until the proper nominal embedment depth is obtained. The maximum impact installation wrench torque, $T_{impact,max}$, and maximum installation torque, $T_{inst.max}$ for the manual torque wrench must be in accordance with Table 1.

Sup-R Bolt and Sup-R Bolt with Sup-R Coatscrew anchors are permitted to be loosened by a maximum of one full turn and retightened with a torque wrench or a powered impact wrench to facilitate fixture attachment or realignment. Complete removal and reinstallation of the anchor is not allowed.

4.5 Special Inspection:

At a minimum, periodic special inspections shall be provided for all anchors in accordance with IBC, and is also applicable for installations under the IRC. Installation in head joints shall only be permitted in fully grouted walls constructed with open-ended units. The special inspector must make periodic inspections during anchor installation to verify anchor type, anchor dimensions, masonry type, masonry compressive strength, hole dimensions, hole cleaning, installation outside of hollow head joints, anchor spacing, edge distances, masonry thickness, anchor embedment, installation torque, maximum impact wrench torque rating and adherence to the manufacturer's published installation instructions. The special inspector must be present as often as required in accordance with the "statement of special inspection". Under the IBC, additional requirements as set forth in Sections 1705, 1706 and 1707 must be observed, where applicable.

Subsequent installations of the same anchor type and size by the same construction personnel shall be 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 shall require an initial inspection in accordance with the list provided in this section. For ongoing installations over an extended period, the special inspector shall make regular inspections to confirm correct handling and installation of the product.

5.0 CONDITIONS OF USE

The Sup-R Bolt and Sup-R Bolt with Sup-R Coatscrew anchors described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 Anchor sizes, dimensions and minimum embedment depths are as set forth in the tables of this report.

5.2 The anchors have been evaluated for use in cracked and uncracked grouted concrete masonry unit (CMU) construction with a minimum compressive strength of 1,500 psi (10.3 MPa) at the time of anchor installation.

5.3 Strength design values are established in accordance with Section 4.1 and 4.2 of this report.

5.4 Allowable stress design values are established in accordance with Section 4.3 of this report.

5.5 Design of anchors in fully grouted CMU construction must avoid location of anchors in hollow head joints.

5.6 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, signed and sealed by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

5.7 The use of anchors to resist fatigue or shock loading is beyond the scope of this report.

5.8 For screw anchors described in Table 2, the design of anchors may be in accordance with the provisions for uncracked masonry where analysis indicates that cracking will not occur ($f_t < f_r$) in the vicinity of the anchor due to service loads or deformations over the anchor service life.

5.9 For screw anchors described in Table 3, the design of anchors shall be in accordance with the provisions for uncracked or cracked masonry where analysis indicates that cracking could occur ($f_t \geq f_r$) in the vicinity of the anchor due to service loads or deformations over the anchor service life.

5.10 Use of the anchors to resist seismic loads in Seismic Design Categories C through F is beyond the scope of this report. The allowable loads or load combinations for the anchors shall not be adjusted for anchors subjected to wind loads.

5.11 Anchors are not permitted to support fire-resistance-rated construction. Where not otherwise prohibited by the code, anchors are permitted for installation in fire-resistance-rated construction provided that at least one of the following conditions is fulfilled:

- Anchors are used to resist wind or seismic forces in Seismic Design Categories A and B only.
- Anchors that support gravity load-bearing structural elements are within a fire-resistance-rated envelope or a fire-resistance-rated membrane, are protected by approved fire-resistance-rated materials, or have been evaluated for resistance to fire exposure in accordance with recognized standards.
- Anchors are used to support nonstructural elements.

5.12 Use of anchors is limited to dry, interior locations.

5.13 Anchors have been evaluated for reliability against brittle fracture and found not to be significantly sensitive to stress-induced hydrogen embrittlement.

5.14 Special inspection must be provided in accordance with Section 4.5 of this report.

5.15 Anchors are manufactured under an approved quality control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

6.1 Data in accordance with the ICC-ES Acceptance Criteria for Mechanical Anchors in Cracked and Uncracked Masonry Elements (AC01), dated February 2021 (Editorially revised February 2023), which incorporates requirements in ACI 355.2-19, for use in cracked and uncracked masonry.

6.2 Data in accordance with ASTM G85-11 Annex 5 for corrosion resistance.

6.3 Quality control documentation.

7.0 IDENTIFICATION

7.1 The ICC-ES mark of conformity, electronic labeling, or the evaluation report number (ICC-ES ESR-5359) along with the name, registered trademark, or registered logo of the report holder must be included in the product label.

7.2 In addition, the screw anchors are identified by packaging labeled with the evaluation report holder's name (MKT Fastening LLC.) and address, anchor name and anchor size., The screw anchors also have the size (diameter x length, in inches) and company logo stamped on the head of each screw anchor.

7.3 The report holder's contact information is the following:

MKT FASTENING LLC
1 GUNNEBO DRIVE
LONOKE, ARKANSAS 72086
(501) 676-2222
www.mktfastening.com
louis.peyron@mktfastening.com

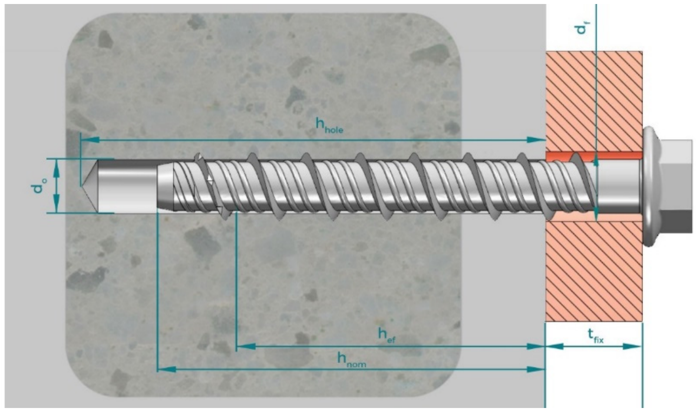


FIGURE 1—ANCHOR DIMENSIONS

TABLE 1—ANCHOR INSTALLATION PARAMETERS[1]

Characteristic	Symbol	Unit	Nominal Anchor Diameter									
			1/4"		3/8"		1/2"		5/8"		3/4"	
Drill Bit Diameter	d_o	in (mm)	1/4 (6.4)	1/4 (6.4)	3/8 (9.5)	3/8 (9.5)	1/2 (12.7)	1/2 (12.7)	5/8 (15.9)	5/8 (15.9)	3/4 (19.1)	3/4 (19.1)
Nominal Embedment Depth	h_{nom}	in (mm)	1 5/8 (41)	2 ½ (64)	2 (51)	3 ¼ (83)	2 ½ (64)	4 ¼ (108)	3 ¼ (83)	5 (127)	4 (102)	6 ¼ (159)
Effective Embedment Depth	h_{ef}	in (mm)	1.23 (31)	1.98 (50)	1.42 (36)	2.49 (63)	1.78 (45)	3.27 (83)	2.36 (60)	3.85 (98)	2.97 (75)	4.89 (124)
Minimum Hole Depth	h_{hole}	in (mm)	2 (51)	2 7/8 (73)	2 3/8 (60)	3 5/8 (92)	2 7/8 (73)	4 5/8 (117)	3 5/8 (92)	5 3/8 (137)	4 3/8 (111)	6 5/8 (168)
Fixture Hole Diameter	d_f	in (mm)	3/8 (9.5)		½ (12.7)		5/8 (15.9)		¾ (19.1)		7/8 (22.2)	
Maximum Installation Torque	$T_{inst,max}$	ft.lb (Nm)	5 (7)	5 (7)	15 (20)	15 (20)	30 (41)	30 (41)	40 (54)	40 (54)	40 (54)	40 (54)
Maximum impact wrench torque rating	$T_{impact.max}$	ft lb (Nm)	150 (203)	150 (203)	380 (515)	380 (515)	380 (515)	380 (515)	380 (515)	380 (515)	380 (515)	380 (515)
Minimum Distance to Head Joint[2]	$C_{min,HJ}$	in (mm)	2 (51)									
Critical Edge Distance	C_{cr}	in (mm)	1.85 (47)	2.97 (75)	2.14 (54)	3.73 (95)	2.67 (68)	4.91 (125)	3.54 (90)	5.78 (147)	4.46 (113)	7.34 (186)
Minimum Edge Distance and spacing, field of wall	c_{min}	in (mm)	4 (102)	3 (76)	4 (102)							
	s_{min}	in (mm)	4 (102)	4 (102)	4½ (114)	4 (102)	4 (102)	4 (102)	4 (102)	4 (102)	4 (102)	4 (102)
Minimum Edge Distance and spacing, top of wall	$c_{min,top}$	in (mm)	1 ¾ (44)									
	$s_{min,top}$	in (mm)	4½ (114)	4½ (114)	4½ (114)	4½ (114)	5½ (140)	5½ (140)	6½ (165)	6½ (165)	8½ (216)	8½ (216)
Minimum Overall Anchor Length	l_{anch}	in (mm)	1 ¾ (44)	2 5/8 (67)	2 ¾ (70)	3 ½ (89)	2 ¾ (70)	4 ½ (114)	3 ½ (89)	5 ¼ (133)	4 ¼ (108)	6 ½ (165)
Torque Wrench Socket Size	-	in	7/16		9/16		3/4		15/16		1 1/8	
Maximum Fixture Thickness[2]	t_{fix}	in (mm)	L – 1.6 (L - 41)	L – 2.5 (L - 64)	L – 2 (L - 51)	L – 3.25 (L - 83)	L - 2.5 (L - 64)	L - 4.25 (L - 108)	L - 3.25 (L - 83)	L - 5 (L - 127)	L - 4 (L - 102)	L - 6.25 (L - 159)

1. The tabulated data is to be used in conjunction with the design criteria given in ACI 318-19 and ACI 318-14 Chapter 17, as applicable.
2. Minimum distance to head joint applies to solid head joints as shown in Figure 2 of this report. For hollow head joints, the minim distance to head joint must be 2 inches as shown in Figure 2 of this report.
3. L = total anchor length.

TABLE 2—ANCHOR DESIGN INFORMATION (UNCRACKED FULLY GROUTED CMU CONSTRUCTION)[1,2]

Characteristic	Symbol	Unit	Nominal Anchor Diameter	
			$^{1}/_{4}$"	
Nominal Embedment Depth	h_{nom}	in (mm)	1 $^{5}/_{8}$ (41)	2 ½ (64)
Anchor Category	1, 2 or 3	-	1	
Steel Strength in Tension and Shear				
Minimum specified ultimate strength	f_{uta}	psi (N/mm^2)	110,000 (758)	
Minimum specified yield strength	f_y	psi (N/mm^2)	88,000 (607)	
Effective stress area (screw anchor body)	A_{se}	in^2 (mm^2)	0.0438 (28.3)	
Steel Strength in Tension	N_{sa}	lb (kN)	4,820 (21.4)	
Strength Reduction Factor for Steel Failure in Tension	ϕ_{sa}	-	0.75	
Steel Strength in Shear, field of wall	V_{sa}	lb (kN)	1,959 (8.71 kN)	
Steel Strength in Shear, top of wall	$V_{sa,top}$	lb (kN)	553 (2.37 kN)	
Strength Reduction Factor for Steel Failure in Shear	ϕ_{sa}	-	0.65	
Masonry Pullout Strength in Tension				
Pullout Strength in Uncracked Masonry, field of wall	$N_{p,uncr}$	lb (kN)	917 (4.08)	1,353 (6.02)
Pullout Strength in Uncracked Masonry, top of wall	$N_{p,top,uncr}$	lb (kN)	917 (4.08)	1,353 (6.02)
Strength Reduction Factor for Pullout Strength in Tension	ϕ_p	-	0.65	
Masonry Breakout Strength in Tension				
Effective Embedment	h_{ef}	in. (mm)	1.23 (31)	1.98 (50)
Effectiveness Factor for Uncracked Masonry	k_{uncr}	-	16.7	
Strength Reduction Factor for Masonry Breakout Strength in Tension	ϕ_{mb}	-	0.65	
Axial stiffness in service load range in uncracked masonry	β_{uncr}	lb/inch (N/mm)	105,553 (18,485)	121,349 (21,252)
Coefficient of variation for axial stiffness in service load range in uncracked masonry	v_{uncr}	%	65	33
Axial stiffness in service load range in uncracked masonry, top of wall	$\beta_{uncr,top}$	lb/inch (N/mm)	92,150 (16,138)	7,993 (1,400)
Coefficient of variation for axial stiffness in service load range in uncracked masonry	$V_{uncr,top}$	%	37	55
Masonry Breakout Strength in Shear				
Nominal Diameter	d_o	in (mm)	¼ (6.4)	
Load Bearing Length of Anchor	l_e	in (mm)	1.23 (31)	1.98 (50)
Reduction Factor for Masonry Breakout Strength in Shear	ϕ_{mb}	-	0.70	
Masonry Pryout and Crushing Strength in Shear				
Coefficient for Pryout Strength	k_{mp}	-	1.0	
Reduction Factor for Pryout Strength in Shear	ϕ_{mp}	-	0.70	
Reduction Factor for Crushing Strength in Shear	ϕ_{mc}	-	0.50	

1. The tabulated data is to be used in conjunction with the design criteria given in ACI 318-19 and ACI 318-14 Chapter 17, as applicable.
2. Screw anchors meet the ductile requirements of ACI 318.

TABLE 3—ANCHOR DESIGN INFORMATION (CRACKED AND UNCRACKED FULLY GROUTED CMU CONSTRUCTION)[1,2]

Characteristic	Symbol	Unit	Nominal Anchor Diameter							
			3/8"		1/2"		5/8"		3/4"	
Nominal Embedment Depth	h_{nom}	in (mm)	2 (51)	3 ¼ (83)	2 1/2 (64)	4 ¼ (108)	3 ¼ (83)	5 (127)	4 (102)	6 ¼ (159)
Anchor Category	1, 2 or 3	-	1						2	
Steel Strength in Tension and Shear										
Minimum specified ultimate strength	f_{uta}	psi (N/mm^2)	111,000 (765)		107,000 (738)		102,000 (703)		99,000 (683)	
Minimum specified yield strength	f_y	psi (N/mm^2)	88,800 (612)		85,600 (590)		81,600 (563)		79,200 (546)	
Effective stress area (screw anchor body)	A_{se}	in^2 (mm^2)	0.0943 (60.8)		0.1768 (114.1)		0.2703 (174.4)		0.3988 (257.3)	
Steel Strength in Tension	N_{sa}	lb (kN)	10,465 (46.6)		18,920 (84.1)		27,570 (122.6)		39,480 (175.6)	
Strength Reduction Factor for Steel Failure in Tension	ϕ_{sa}	-	0.75							
Steel Strength in shear, field of wall	V_{sa}	lb (kN)	3,220 (14.33)		3,837 (17.07)	5,524 (24.57)	6,463 (28.75)	7,700 (34.25)	8,973 (39.91)	9,427 (41.93)
Steel Strength in shear, top of wall	$V_{sa,top}$	lb (kN)	1,335 (5.94)		1,991 (8.86)		2,175 (9.67)		4,203 (18.70)	
Strength Reduction Factor for Steel Failure in Shear	ϕ_{sa}	-	0.65							
Masonry Pullout Strength in Tension										
Pullout Strength in Uncracked Masonry, field of wall	$N_{p,uncr}$	lb (kN)	824 (3.66)	3,953 (17.58)	1,633 (7.26)	1,619 (7.20)	2,706 (12.04)	4,513 (20.08)	3,367 (14.98)	5,744 (25.55)
Pullout Strength in Cracked Masonry, field of wall	$N_{p,cr}$	lb (kN)	437 (1.94)	2,097 (9.33)	873 (3.88)	866 (3.85)	2,591 (11.53)	4,321 (19.22)	2,894 (12.87)	3,791 (16.86)
Pullout Strength in uncracked masonry, top of wall	$N_{p,uncr,top}$	lb (kN)	824 (3.66)	1,175 (5.23)	1,485 (6.61)	1,619 (7.20)	1,747 (7.77)	3,306 (14.70)	3,303 (14.69)	4,082 (18.16)
Masonry Pullout Cracking Factor	$\psi_{m,P}$	-	1.0							
Strength Reduction Factor for Pullout Strength in Tension	ϕ_p	-	0.65						0.55	
Masonry Breakout Strength in Tension										
Effective Embedment	h_{ef}	in. (mm)	1.42 (36)	2.49 (63)	1.78 (45)	3.27 (83)	2.36 (60)	3.85 (98)	2.97 (75)	4.89 (124)
Effectiveness Factor for Uncracked Masonry	k_{muncr}	-	16.7							
Effectiveness Factor for Cracked Masonry	k_{mcr}	-	11.9							
Strength Reduction Factor for Masonry Breakout Strength in Tension	ϕ_{mb}	-	0.65						0.55	
Axial stiffness in service load range in uncracked masonry	β_{uncr}	lb/inch (N/mm)	122,681 (21,485)	121,349 (21,252)	170,136 (29,795)	87,954 (15,403)	119,675 (20,958)	124,779 (21,852)	110,495 (19,351)	226,287 (39,629)
Coefficient of variation for axial stiffness in service load range in uncracked masonry	v_{uncr}	%	66	33	55	30	43	57	29	37
Axial stiffness in service load range in cracked masonry	β_{cr}	lb/inch (N/mm)	144,644 (25,331)	76,812 (13,452)	78,069 (13,672)	113,586 (19,892)	82,924 (14,522)	74,917 (13,120)	101,211 (17,725)	47,422 (8,305)
Coefficient of variation for axial stiffness in service load range in cracked masonry	v_{cr}	%	62	43	72	47	49	35	45	18
Axial stiffness in service load range in masonry, top of wall	$\beta_{cr,top}$	lb/inch (N/mm)	93,455 (16,367)	47,984 (8,403)	100,955 (17,680)	27,476 (4,812)	41,307 (7,234)	54,810 (9,599)	31,215 (5,467)	70,483 (12,344)
Coefficient of variation for axial stiffness in service load range in masonry, top of wall	$v_{cr,top}$	%	77	22	45	34	44	25	42	51
Masonry Breakout Strength in Shear										
Nominal Diameter	d_o	in (mm)	3/8		1/2		5/8		3/4	
Load Bearing Length of Anchor	l_e	in (mm)	1.42 (36)	2.49 (63)	1.78 (45)	3.27 (83)	2.36 (60)	3.85 (98)	2.97 (75)	4.89 (124)
Reduction Factor for Masonry Breakout Strength in Shear	ϕ_{mb}	-	0.70							
Masonry Pryout and Crushing Strength in Shear										
Coefficient for Pryout Strength	k_{mp}	-	1.0	1.0	1.0	2.0	1.0	2.0	2.0	2.0
Reduction Factor for Pryout Strength in Shear	ϕ_{mp}	-	0.70							
Reduction Factor for Crushing Strength in Shear	ϕ_{mc}	-	0.50							

1. The tabulated data is to be used in conjunction with the design criteria given in ACI 318-19 and ACI 318-14 Chapter 17, as applicable.
2. Screw anchors meet the ductile requirements of ACI 318.

TABLE 4.1—ACI 318-19 AND -14 SECTIONS APPLICABLE OR MODIFIED BY THIS REPORT

318-19 section	*318-14 section*	**Modified by**
2.2	*2.2*	unchanged*
2.3	*2.3*	
17.1.1 and 17.1.5	*17.1.1 – 17.1.2*	
17.1.2	*17.1.3*	4.2.2
17.1.4, 17.2.1 and 17.4.1	*17.1.4 – 17.2.2*	unchanged*
17.3.1	*17.2.7*	unchanged*
17.5.2	*17.3.1.1*	4.2.5
17.5.2.3	*17.3.1.3*	unchanged*
17.5.1.2 excluding 17.5.2.1	*17.3.2 excluding 17.3.2.1*	
17.5.3	*17.3.3*	4.2.8
17.6.1	*17.4.1*	unchanged*
17.6.2.1	*17.4.2.1*	4.2.10
17.6.2.2.1	*17.4.2.2*	4.2.11
17.6.2.1.2, 17.6.2.3.1 and 17.6.2.4	*17.4.2.3 – 17.4.2.5*	unchanged*
17.6.2.5.1(a)	*17.4.2.6*	4.2.13
17.6.2.6, 17.6.2.1.3 and 17.5.2.1	*17.4.2.7 – 17.4.2.9*	unchanged*
17.6.3.1	*17.4.3.1*	4.2.16
17.6.3.2.1	*17.4.3.2*	4.2.17
17.7.1.1-17.7.2.2	*17.5.1.1 – 17.5.2.2*	unchanged*
17.7.2.1.2,17.7.2.3 and 17.7.2.4	*17.5.2.4 – 17.5.2.6*	
17.7.2.5	*17.5.2.7*	4.2.19
17.7.2.6	*17.5.2.8*	unchanged*
17.7.3	*17.5.3*	
17.8	*17.6*	
17.9	*17.7*	4.2.20
26.13.1.5 and 26.13.2.5	*17.8.1*	unchanged*
Additional provisions		4.2.21-4.2.24

*Sections marked as unchanged adopt the general changes prescribed in Section 4.1.1.

TABLE 4.2—REQUIRED STRENGTH OF ANCHORS

Failure mode	**Single anchor**	**Anchor group[(1)]**	
		Individual anchor in a group	**Anchors as a group**
Steel strength in tension	$\phi N_{sa} \geq N_{ua}$	$\phi N_{sa} \geq N_{ua,i}$	
Masonry breakout strength in tension	$\phi N_{mb} \geq N_{ua}$		$\phi N_{mbg} \geq N_{ua,g}$
Pullout strength in tension	$\phi N_{pn} \geq N_{ua}$	$\phi N_{pn} \geq N_{ua,i}$	
Steel strength in shear	$\phi V_{sa} \geq V_{ua}$	$\phi V_{sa} \geq V_{ua,i}$	
Masonry breakout strength in shear	$\phi V_{mb} \geq V_{ua}$		$\phi V_{mbg} \geq V_{ua,g}$
Masonry crushing strength in shear	$\phi V_{mc} \geq V_{ua}$	$\phi V_{mc} \geq V_{ua,i}$	
Masonry pryout strength in shear	$\phi V_{mp} \geq V_{ua}$		$\phi V_{mpg} \geq V_{ua,g}$

[(1)]Required strengths for steel failure modes shall be calculated for the most highly stressed anchor in the group.

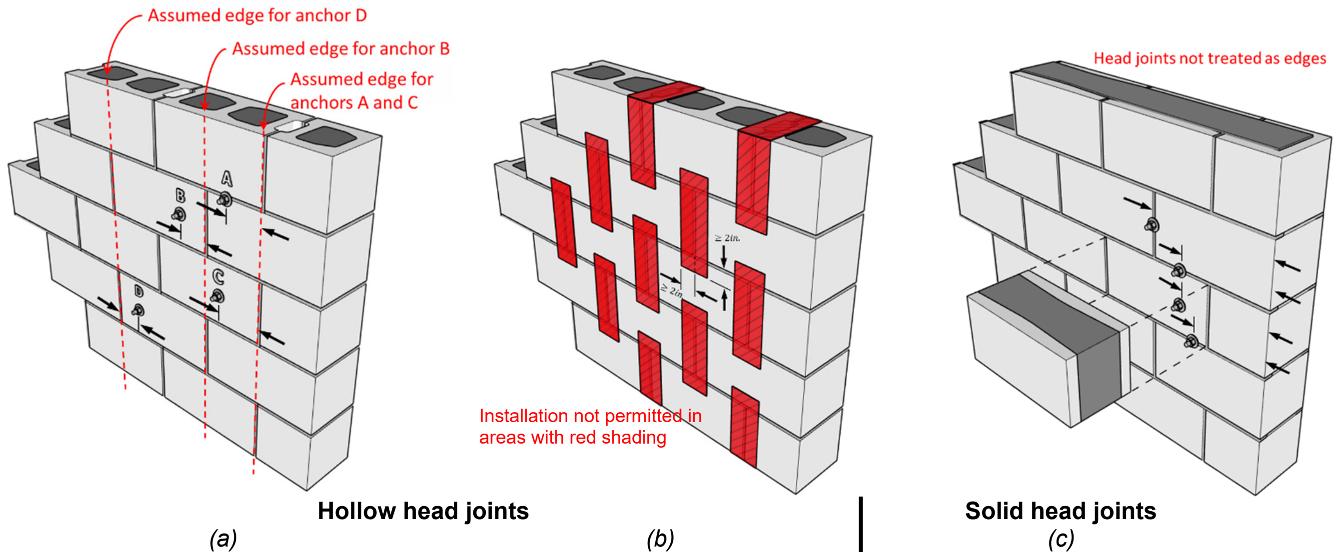
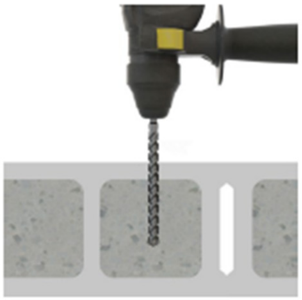


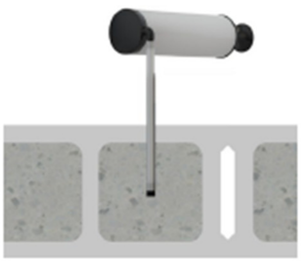
FIGURE 2—(a) Edge distance considerations in fully grouted CMU construction with hollow head joints, (b) exclusion zones in fully grouted construction with closed head joints, and (c) edge distance considerations in fully grouted CMU construction with solid head joints . (Note: dimensions to upper and lower edges omitted for clarity.)



1. DRILL

Drill a hole into the base material of the correct diameter and depth using a drill bit that meets the requirements of ANSI B212.15

Caution: oversized holes in base material will reduce or eliminate the mechanical interlock of the threads with the base material and reduce the anchor's load capacity



2. BLOW AND CLEAN

Remove dust and debris from hole using a hand pump, compressed air or a vacuum to remove loose particles left from drilling.

3. INSTALL

Select a powered impact wrench or a torque wrench that does not exceed the maximum torque $T_{impact,max}$ or $T_{ins,max}$ respectively. Attach an appropriately sized hex socket to the wrench. Mount the screw anchor head in the socket.

4. APPLY TORQUE

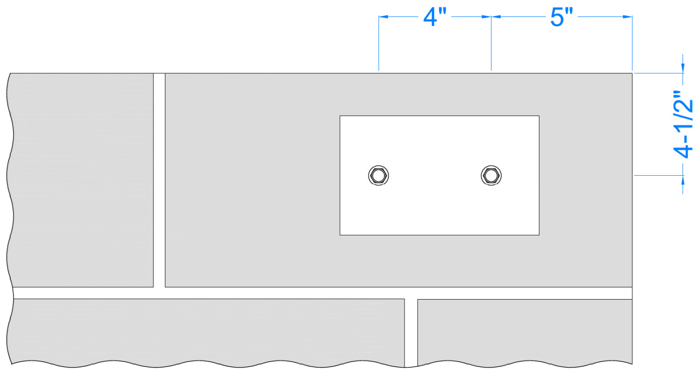
Drive the anchor with an impact driver or a torque wrench through the fixture and into the hole until the anchor head washer comes in contact with the fixture. The anchor must be snug after installation. Do not spin the hex socket off the anchor to disengage.

The screw anchor is permitted to be loosened by a maximum of one full turn and retightened with a torque wrench or a powered impact wrench to facilitate fixture attachment or realignment

FIGURE 3—MANUFACTURER'S PUBLISHED INSTALLATION INSTRUCTIONS

FIGURE 4—SUP-R BOLT AND SUP-R BOLT WITH SUP-R COAT SCREW ANCHOR

TABLE 5- SAMPLE CALCULATION FOR ALLOWABLE STRESS DESIGN

Illustrative procedure of Allowable Stress Design calculation.	
Given data: 2 anchors Sup-R Bolt with Sup-R Coat 1/2"x 5", deep embedment depth 8-inch Concrete masonry unit CMU 90 having minimum net area compressive strength of 4,500 psi with Type M or S mortar, cracked (not to scale). Anchors must be embedded in grouted cells. Fully-grouted concrete masonry wall must be constructed in accordance with TMS 402. Grout strength: 3,000 psi, cracked h_{ef} = 3.27 in Anchor Layout: as per sketch Installation: field of wall Static or quasi-static loads Load: tension + shear towards upper edge	

Step	AC 01 calculation section 3.3	ESR
1	Verify spacing / edge distance / member thickness s = 4 in ≥ 4 in → verified c_{a1} = 4-1/2 in ≥ 4 in → verified c_{a2} = 5 in ≥ 4 in → verified	4.1.2; Table 1
2	Calculation of steel capacity on a single fastener loaded in tension ϕN_{sa}= (0.75) (18,917) = 14,187 lbf Group of fasteners ϕN_s= n ϕN_{sa}= (2) (14,187) = **28,374** lbf	4.2.9; Table 3
3	Calculation of concrete strength capacity of the group of fasteners loaded in tension $\phi N_{mbg} = \phi \frac{A_{Nm}}{A_{Nmo}} \psi_{ec,N,m}\, \psi_{ed,N,m}\, \psi_{c,N,m}\, N_{b,m}$	4.2.10
3.1	A_{Nmo} = 9 $(h_{ef})^2$ = 9 $(3.27)^2$ = 96.23 A_{Nm} = (c_{a1}+1,5 h_{ef}) (c_{a2}+s+1,5 h_{ef}) = (4.5+4.90) (5+4+4.90) = 130.66	4.2.10; Table 1
3.2	No load eccentricity → e_N = 0 → $\psi_{ec,N,m} = 1.00$	
3.3	$C_{a,min}$ < 1.5 h_{ef} → $\psi_{ed,N,m} = 0.7 + 0.3\, \frac{c_{a,min}}{1.5\, h_{ef}} = 0.7 + 0.3\, \frac{4.5}{4.9} = 0.98$	4.2.10; Table 1
3.4	Cracked masonry → $\psi_{c,N,m} = 1.00$	4.2.10;
3.5	$N_{b.m,cr} = k_{m,cr} \sqrt{f'_m}\, h_{ef}^{1,5} = \alpha_{masonry}\, k_{c,cr} \sqrt{f'_m}\, h_{ef}^{1,5} = (0.7)\,(17)\sqrt{3000}\,(3.27)^{1.5} = 3{,}854 \text{ lbf}$	4.2.11; Table 1
3.6	thus $\phi N_{mbg} = (0.65)\, \frac{130.66}{96.23}\, (1.0)(0.98)(1.0)(3{,}854) = \mathbf{3{,}333} \text{ lbf}$	4.2.10
4	Calculation of pull out strength on single fastener loaded in tension $\phi N_{pm} = \phi\, \psi_{m,P} N_p = (0{,}65)(1.00)\,(866) = 562 \text{ lbf}$ Group of fasteners ϕN_{pm}= n ϕN_{pm} = (2) (562) = **1,125** lbf	4.2.16; Table 3
5	Governing tension strength: Minimum value of steel, concrete breakout, pull out: $\phi N_{n,m}$= min [ϕN_{sa}; ϕN_{mbg}; ϕN_{pm}] = **1,125** lbf	
6	Calculation of conversion factor α α = (1.2) D +(1.6) L = (1.2) (0.30) + (1,6) (0.6) = **1.48**	4.3.1
7	Calculation of allowable stress design in tension $T_{allowable,ASD} = \frac{\phi N_{n,m}}{\alpha} = \frac{1{,}125}{1.48} = \mathbf{803} \text{ lbf}$	4.3.1
8	Calculation of steel capacity on a single fastener loaded in shear ϕV_{sa}= (0.65) (5,524) = 3,590 lbf Group of fasteners ϕV_m= n ϕV_m= (2) (3,866) = **7,181** lbf	Table 3

TABLE 5- SAMPLE CALCULATION FOR ALLOWABLE STRESS DESIGN (CONTINUED)

Step	AC -01 calculation section 3.3	ESR
9	Calculation of concrete edge capacity on the group of fasteners loaded in shear	Table 3
9.1	$\phi V_{mbg} = \phi \frac{A_{Vm}}{A_{Vm0}} \psi_{ec,V,m} \psi_{ed,V,m} \psi_{c,V,m} \psi_{h,V,m} V_{b,m}$	
9.2	$A_{Nmo} = 4.5 (c_{a1})^2 = 4.5 (4.5)^2 = 91.12$	
9.3	$A_{Vm} = (1.5\ c_{a1}) (c_{a2}+s+1.5\ c_{a1}) = (1.5)(4.5) (5+4+1.5 \cdot 4.5) = 106.31$	
9.4	No load eccentricity → $e_V = 0$ → $\psi_{ec,V,m} = 1.00$	
9.5	$C_{a2} < 1.5\ c_{a1}$ → $\psi_{ed,V,m} = 0.7 + 0.3 \frac{c_{a2}}{1.5\ c_{a1}} = 0.7 + 0.3 \frac{5}{6.75} = 0.92$	
9.6	Cracked masonry → $\psi_{c,V,m} = 1.00$	
9.7	$\psi_{h,V,m} = \sqrt{\frac{1.5\ c_a}{h_a}} = \sqrt{\frac{1.5 \cdot 4.5}{8}} = 0.92$ → 1.00	
	$= \min\left[7 \left(\frac{l_c}{d_a}\right)^{0.2} \sqrt{d_a} \sqrt{f'_m}\, c_{a1}^{1.5} ; 9 \sqrt{f'_m}\, c_{a1}^{1.5}\right] =$ $= \min\left[7 \left(\frac{3.27}{0.5}\right)^{0.2} \sqrt{0.5} \sqrt{3000}\, 4.5^{1.5} ; 9 \sqrt{3000}\, 4.5^{1.5}\right]$ $= \min[3{,}767; 4{,}705] = 3{,}767\ lbf$	
9.9	thus $\phi V_{mbg} = (0.70) \frac{106.31}{91.12} (0.92)(1.00)(1.00) = \mathbf{2,830}$ lbf	
10	Calculation of shear pryout capacity $\phi V_{cp,m} = \phi\ k_{cp}\ N_{cp,m} = (0.70)\ (2.0)\ (5{,}127) =$ **7,536** lbf	Table 3
11	Calculation of masonry crushing strength on a single fastener loaded in shear $\phi V_{mc} = \phi\ 1750 \sqrt[4]{f'_m A_{se,V}} = (0.50)(1750) \sqrt[4]{(3000)(0.1768)} =$ 4,199 lbf Group of fasteners $\phi V_m = n\ \phi V_m = (2)\ (4{,}199) =$ **8,397** lbf	Table 3
12	Calculation of shear capacity for bolts in horizontal ledgers It does not apply, since there are less than 6 anchors	4.2.23
13	Governing shear strength: Minimum value of steel, masonry breakout, masonry, masonry pryout, masonry crushing: $\phi V_{n,m} = \min [\phi V_{sa}; \phi V_{mbg}; \phi V_{pcp,m}, \phi V_{mc}] =$ **2,830** lbf	
14	Calculation of allowable stress design in shear $V_{allowable,ASD} = \frac{\phi V_{n,m}}{\alpha} = \frac{2{,}830}{1.48} = \mathbf{1,912}$ lbf	4.3.1

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

REPORT HOLDER:

MKT FASTENING LLC

EVALUATION SUBJECT:

SUP-R BOLT AND SUP-R BOLT WITH SUP-R COAT SCREW ANCHORS FOR USE IN CRACKED AND UNCRACKED MASONRY

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Sup-R Bolt and Sup-R Bolt with Sup-R Coat screw anchors, described in ICC-ES evaluation report ESR-5359, have also been evaluated for compliance with the codes noted below as adopted by the Los Angeles Department of Building and Safety (LADBS).

Applicable code editions:

- 2023 *City of Los Angeles Building Code* (LABC)
- 2023 *City of Los Angeles Residential Code* (LARC)

2.0 CONCLUSIONS

The Sup-R Bolt and Sup-R Bolt with Sup-R Coat screw anchors, described in Sections 2.0 through 7.0 of the evaluation report ESR-5359, comply with the LABC Chapter 21, and the LARC, and are subject to the conditions of use described in this supplement.

3.0 CONDITIONS OF USE

The Sup-R Bolt and Sup-R Bolt with Sup-R Coat screw anchors described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report ESR-5359.
- The design, installation, conditions of use and identification of the Sup-R Bolt and Sup-R Bolt with Sup-R Coat screw anchors are in accordance with the 2021 *International Building Code®* (IBC) provisions noted in the evaluation report ESR-5359.
- The design, installation and inspection are in accordance with additional requirements of LABC Chapters 16 and 17, as applicable.
- Under the LARC, an engineered design in accordance with LARC Section R301.1.3 must be submitted.
- The connection between the anchors and the connected masonry members shall be checked for capacity (which may govern).
- For use in wall anchorage assemblies to flexible diaphragm applications, anchors shall be designed per the requirements of City of Los Angeles Information Bulletin P/BC 2020-071.

This supplement expires concurrently with the evaluation report, issued September 2023.

ICC-ES Evaluation Report

ESR-5359 CBC and Supplement

Issued September 2023

This report is subject to renewal September 2024.

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

REPORT HOLDER:

MKT FASTENING LLC

EVALUATION SUBJECT:

SUP-R BOLT AND SUP-R BOLT WITH SUP-R COAT SCREW ANCHORS FOR USE IN CRACKED AND UNCRACKED MASONRY

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that Sup-R Bolt and Sup-R Bolt with Sup-R Coat screw anchors, described in ICC-ES evaluation report ESR-5359, have also been evaluated for compliance with the codes noted below.

Applicable code edition*(s)*:

- *2022 California Building Code* (CBC)

For evaluation of applicable Chapters adopted by the California Office of Statewide Health Planning and Development (OSHPD) AKA: California Department of Health Care Access and Information (HCAI) and the Division of State Architect (DSA), see Sections 2.1.1 and 2.1.2 below.

- *2022 California Residential Code* (CRC)

2.0 CONCLUSIONS

2.1 CBC:

The Sup-R Bolt and Sup-R Bolt with Sup-R Coat screw anchors, described in Sections 2.0 through 7.0 of the evaluation report ESR-5216, comply with CBC Chapter 21, provided the design and installation are in accordance with the 2021 *International Building Code®* (IBC) provisions noted in the evaluation report and the additional requirements of CBC Chapters 16, 17 and 21, as applicable.

2.1.1 OSHPD: The applicable OSHPD Sections and Chapters of the CBC are beyond the scope of this supplement.

2.1.2 DSA: The applicable DSA Sections and Chapters of the CBC are beyond the scope of this supplement.

2.2 CRC:

The Sup-R Bolt and Sup-R Bolt with Sup-R Coat screw anchors, described in Sections 2.0 through 7.0 of the evaluation report ESR-5216, complies with CRC Chapter 3, provided the design and installation are in accordance with the 2021 *International Residential Code®* (IRC) provisions noted in the evaluation report and the additional requirements of CRC Chapter 3.

This supplement expires concurrently with the evaluation report, issued September 2023.

ICC-ES Evaluation Report

ESR-5359 FBC Supplement

Issued September 2023

This report is subject to renewal September 2024.

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

REPORT HOLDER:

MKT FASTENING LLC

EVALUATION SUBJECT:

SUP-R BOLT AND SUP-R BOLT WITH SUP-R COAT SCREW ANCHORS FOR USE IN CRACKED AND UNCRACKED MASONRY

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that Sup-R Bolt and Sup-R Bolt with Sup-R Coat screw anchors, recognized in ICC-ES evaluation report ESR-5359, has also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2023 and 2020 *Florida Building Code—Building*
- 2023 and 2020 *Florida Building Code—Residential*

2.0 CONCLUSIONS

The Sup-R Bolt and Sup-R Bolt with Sup-R Coat screw anchors, described in Sections 2.0 through 7.0 of ICC-ES evaluation report ESR-5359, comply with the *Florida Building Code—Building* and the *Florida Building Code—Residential*. The design requirements must be determined in accordance with the *Florida Building Code—Building* and the *Florida Building Code—Residential*, as applicable. The installation requirements noted in ICC-ES evaluation report ESR-5359 for the 2021 and 2018 *International Building Code®* meet the requirements of the *Florida Building Code—Building* and the *Florida Building Code—Residential*, as applicable.

Use of the Sup-R Bolt and Sup-R Bolt with Sup-R Coat screw anchors have also been found to be in compliance with the High-Velocity Hurricane Zone provisions of the *Florida Building Code—Building* and the *Florida Building Code—Residential*, with the following conditions:

a) Design and installation must meet the requirements of Section 2122.7 of the *Florida Building Code-Building*.

b) For anchorage to wood members, the connection subject to uplift, must be designed for no less than 700 pounds (3114 N).

For products falling under Florida Rule 61G20-3, 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 evaluation report, issued September 2023.