

# ICC-ES Evaluation Report

ESR-4420

Reissued June 2024


This report also contains:

Subject to renewal June 2025

- CBC Supplement
- FBC Supplement
- LABC Supplement

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<p><b>DIVISION: 04 00 00— MASONRY</b></p> <p><b>Section: 04 05 19.16— Masonry Anchors</b></p>	<p><b>REPORT HOLDER: ROBERTSON, INC.</b></p>	<p><b>EVALUATION SUBJECT: DRILLCRETE CONCRETE SCREWS INSTALLED IN CONCRETE MASONRY</b></p>	
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## 1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2021, 2018, 2015, 2012 and 2009 [International Building Code® \(IBC\)](#)
- 2021, 2018, 2015, 2012 and 2009 [International Residential Code® \(IRC\)](#)

For evaluation for compliance with codes adopted by the [Los Angeles Department of Building and Safety \(LADBS\)](#), see [ESR-4420 LABC and LARC Supplement](#).

For evaluation for compliance with codes adopted by the California Office of Statewide Health Planning and Development (OSHPD) and Division of the State Architects (DSA), see [ESR-4420 CBC and CRC supplement](#).

Property evaluated:

- Structural

## 2.0 USES

The Drillcrete concrete screws installed in concrete masonry are used as anchorage to resist static, tension and shear loads in uncracked, grouted or ungrouted concrete masonry construction.

Drillcrete concrete screws installed in concrete masonry are alternatives to cast-in-place anchors described in Section 8.1.3 (2016 or 2013 edition), or Section 2.1.4 (2011 or 2008 editions) of TMS 402 as referenced in Section 2107.1 of the IBC.

The Drillcrete concrete screws installed in concrete masonry are permitted to be used where an engineered design is submitted in accordance with Section R301.1.3 of the IRC.

## 3.0 DESCRIPTION

### 3.1 Drillcrete Concrete Screws :

The Drillcrete Concrete Screws installed in concrete masonry are manufactured from carbon steel that is heat treated. The anchors are available with a blue coating and nominal diameters of <sup>3</sup>/<sub>16</sub>- and <sup>1</sup>/<sub>4</sub>-inch (4.8 and 6.4 mm) with various lengths. The anchor bodies have a high-low alternating thread form and are available with a hex washer head or a flat countersunk head with a cross recess.

The Drillcrete Concrete Screws with different head styles are illustrated in [Figure 1](#).

### 3.2 Grout-filled Concrete Masonry:

The specified 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 materials:

**3.2.1 Concrete Masonry Units (CMUs):** Concrete masonry units, conforming to ASTM C90, are lightweight or medium-weight units. As a minimum, CMU nominal size must be 8 inches (203.2 mm) wide by 8 inches (203.2 mm) high by 16 inches (406.4 mm) long.

**3.2.2 Grout:** Grout must comply with IBC Section 2103.3 (2021, 2018 and 2015 IBC), 2013.13 (2012 IBC), Section 2103.12 (2009 IBC) or IRC Section R606 (2021, 2018 and 2015 IRC), R609.1.1 (2012 and 2009), as applicable. The grout must have a minimum compressive strength of 2,000 psi (13.8 MPa) at 28 days.

**3.2.3 Mortar:** Mortar must be Type M, S or N in compliance with IBC Section 2103 or IRC Section R606 (2021, 2018 and 2015) or R607 (2012 and 2009), as applicable.

### 3.3 Hollow (UngROUTED) Concrete Masonry:

The specified compressive strength of masonry,  $f_m$ , at 28 days must be a minimum of 1,500 psi (10.3 MPa). Hollow masonry walls must comply with Chapter 21 of the IBC and must be constructed from the following materials:

**3.3.1 Concrete Masonry Units (CMUs):** Concrete masonry units, conforming to ASTM C90, are lightweight or medium weight units. As a minimum, CMU nominal size must be 8 inches (203.2 mm) wide by 8 inches (203.2 mm) high by 16 inches (406.4 mm) long.

**3.3.2 Mortar:** Mortar must be Type M, S or N in compliance with IBC Section 2103 or IRC Section R606 (2021, 2018 and 2015) or R607 (2012 and 2009), as applicable.

## 4.0 DESIGN AND INSTALLATION

### 4.1 Allowable Stress Design (ASD):

**4.1.1 General:** Anchors described in this report are assigned allowable tension and shear loads for design based on allowable stress design (ASD) under the codes described in Section 1.0 of this report.

**4.1.2 Design of Anchors in Concrete Masonry:** Allowable tension and shear loads for installation in concrete masonry under the IBC and IRC are noted in [Table 1](#). Installation is limited to the face shell of grouted or ungrouted, uncracked concrete masonry members. Masonry wall construction must be fully mortared.

Allowable loads for anchors installed in concrete masonry subjected to combined shear and tension forces must be determined by the following equation:

$$\left(\frac{P_s}{P_t}\right) + \left(\frac{V_s}{V_t}\right) \leq 1 \quad (\text{Eq-1})$$

where:

$P_s$  = Applied service tension load.

$P_t$  = Allowable service tension load.

$V_s$  = Applied service shear load.

$V_t$  = Allowable service shear load.

**4.1.3 Minimum Spacing and Minimum Edge Requirements:** The minimum spacing between anchors and the minimum edge distance between the anchor and the edge of the concrete masonry wall and joints must be as set forth in [Table 1](#) and [Figure 3](#).

### 4.2 Installation:

The Drillcrete Concrete Screws installed in concrete masonry must be installed in accordance with this report as described in [Figures 2](#) and [3](#) and the manufacturer's printed installation instructions (MPII). Anchor locations must comply with this report and the approved plans and specifications by the code official. Holes must be predrilled in masonry with carbide-tipped drill bit conforming to ANSI B212.15-1994 and a rotary-hammer drill. The hole must be drilled  $\frac{1}{4}$  inch (6.4 mm) deeper than the embedment depth and cleaned out of any dust or debris. The anchors must then be installed through the attachment into the hole, to the specified nominal embedment depth, with the Robertson installation tool kit. Anchors must not be installed until the masonry has fully cured to its specified strength.

### 4.3 Special Inspection:

Continuous special inspection under the IBC and IRC, in accordance with Sections 1704 and 1705 of the IBC, must be provided during anchor installation as set forth in [Table 1](#) of this report. The special inspector must verify that anchor installation is in compliance with this report and in accordance with the manufacturer's printed installation instructions. The code official must receive a report, from an approved special inspector, that

includes the following details: fastener type, fastener dimensions, masonry dimensions and compressive strength, grout and mortar compliance with Section 3.2 of this report, drill bit size, edge and end distances, fastener spacing and embedment (as applicable).

## 5.0 CONDITIONS OF USE:

The Drillcrete Concrete Screws installed in concrete masonry, as described in this report, 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 installation must comply with this report and the manufacturer's published installation instructions. In the event of a conflict between this report and the manufacturer's published installation instructions, this report governs.
- 5.2 Under the IBC or IRC, use of the anchors to resist wind or seismic loads is beyond the scope of this report. The allowable loads or load combinations for the anchors must not be adjusted for anchors subjected to wind or seismic loads.
- 5.3 Since an ICC-ES acceptance criteria for evaluating data to determine the performance of anchors subjected to fatigue or shock loading is unavailable at this time, the use of these anchors under these conditions is beyond the scope of this report.
- 5.4 Where not otherwise prohibited by the applicable code, anchors are permitted for use with fire-resistance-rated construction provided that at least one of the following conditions is fulfilled:
  - Anchors that support fire-resistance-rated construction or gravity load-bearing structural elements are within a fire-resistance-rated envelope or a fire-resistance-rated membrane, are protected by approved fire-resistance-rated materials, or have been evaluated for resistance to fire exposure in accordance with recognized standards.
  - Anchors are used to support nonstructural elements.
- 5.5 The use of anchors is limited to installation in uncracked masonry. Cracking occurs when  $f_t > f_r$  due to service loads or deformations.
- 5.6 Calculations demonstrating that the applied loads are less than the allowable loads described in this report, must be submitted to the code official. The calculations must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.
- 5.7 Special inspection must be provided in accordance with Section 4.3 of this report.
- 5.8 Anchors are limited to dry, interior use.
- 5.9 Anchors are manufactured under an approved quality control program with inspections by ICC-ES.

## 6.0 EVIDENCE SUBMITTED

Data in accordance with the [ICC-ES Acceptance Criteria for Predrilled Fasteners \(Screw Anchors\) in Masonry \(AC106\)](#), dated March 2018 (editorially revised December 2020).

## 7.0 IDENTIFICATION

- 7.1 The Drillcrete Concrete Screws installed in concrete masonry, are identified in cartons bearing labels that provide the manufacturer name and the name of the product (Drillcrete Concrete Screws); screw description (type, length, and shank diameter) and the evaluation report number (ESR-4420). The length identification code letter is stamped on the head of the anchor. See the length identification system indicated in [Table 2](#) of this report.
- 7.2 The report holder's contact information is the following:

**ROBERTSON, INC**  
**1185 CORPORATE DR. #1**  
**BURLINGTON, ONTARIO L7L 5V5**  
**CANADA**  
**(905) 332-7666**  
[www.robertsonscREW.com](http://www.robertsonscREW.com)  
[info@robertsonscREW.com](mailto:info@robertsonscREW.com)

**TABLE 1—ALLOWABLE TENSION AND SHEAR VALUES FOR DRILLCRETE CONCRETE SCREWS INSTALLED IN GROUTED AND UNGROUTED CONCRETE MASONRY UNITS<sup>1,2,6,7</sup>**

ANCHOR DIAMETER (inch)	DRILL BIT DIAMETER (inch)	CRITICAL DISTANCES <sup>3</sup> (inch)				IBC/IRC <sup>5</sup>	
		NOMINAL EMBEDMENT <sup>4</sup>	EDGE	END	SPACING	TENSION (lb.)	SHEAR (lb.)
3/16	5/32	1	3	3	3	73	133
1/4	3/16	1	4	4	4	107	174

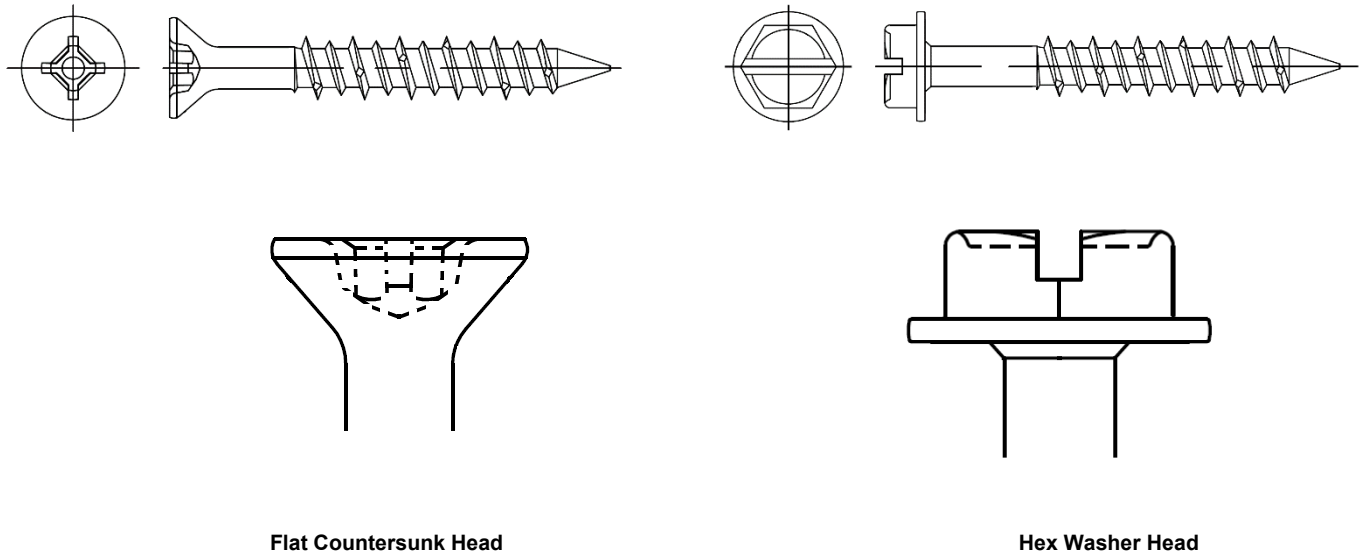
For SI: 1 inch = 25.4 mm; 1 lb = 4.45 N.

- <sup>1</sup>The tabulated values are for anchors installed in the face shell of concrete masonry units in compliance with ASTM C90.
- <sup>2</sup>The tabulated values are for anchors installed in a minimum 8-inch wide grouted or hollow CMU wall having reached a minimum  $f_m = 1,500$  psi at the time of installation.
- <sup>3</sup>The tabulated values are for anchors installed at the listed critical joint or wall edge and end distance, and anchor spacing in the wall face.
- <sup>4</sup>The nominal embedment depth is the distance from the concrete masonry unit surface to the end of the screw anchor.
- <sup>5</sup>Special inspection shall be provided in accordance with Section 4.3 of this report.
- <sup>6</sup>Values are based on a factor of safety of 5.
- <sup>7</sup>Refer to [Figure 3](#) for permitted and prohibited anchor installation locations.

**TABLE 2—LENGTH IDENTIFICATION SYSTEM**

LENGTH ID MARKING ON ANCHOR HEAD		#	A	B	C	D	E	F	G	H	I	J
Length of anchor (inches)	From	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6
	Up to, but not including	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2

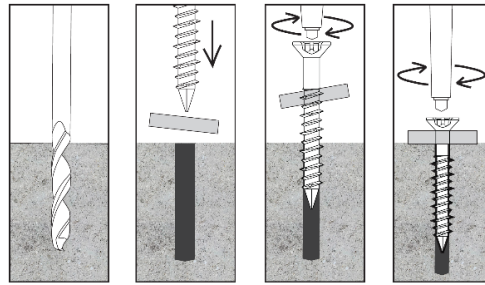
For SI: 1 inch = 25.4 mm.



**FIGURE 1— DRILLCRETE CONCRETE SCREWS AND HEAD STYLES**



# DRILLCRETE® INSTALLATION INSTRUCTIONS



### INSTALLATION INSTRUCTIONS

**TO DRILL HOLE:**

Place drill bit into drill adapter and insert adapter into drill chuck - drill hole 1/4" deeper than fastener's engagement.

**TO INSTALL ANCHOR:**

Insert proper nutsetter or bit holder into 1/4" end of drive tube. Slide 5/16" end of drive tube over drill bit and lock on drill adapter. Insert head of screw/anchor into appropriate nutsetter/bit holder and drive it into your pre-drilled hole.

**CAUTION:**

Always wear safety glasses when operating power tools.



# DRILLCRETE® TOOL KIT

### ROBERTSON® INSTALLATION MASONRY DRILL & DRIVE TOOL KIT

- Drive Tube
- Drill Adapter
- 1/4" Drive Nutsetter
- 5/16" Drive Nutsetter
- Holder for Phillips Bits

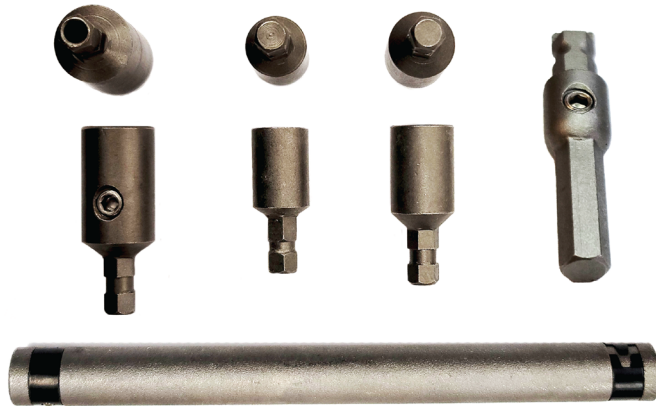


FIGURE 2—INSTALLATION KIT AND INSTRUCTIONS FOR DRILLCRETE CONCRETE SCREWS



# DRILLCRETE<sup>®</sup> MASONRY UNITS

## INSTALLATION LOCATIONS FOR DRILLCRETE<sup>®</sup> CONCRETE SCREWS IN MASONRY UNITS

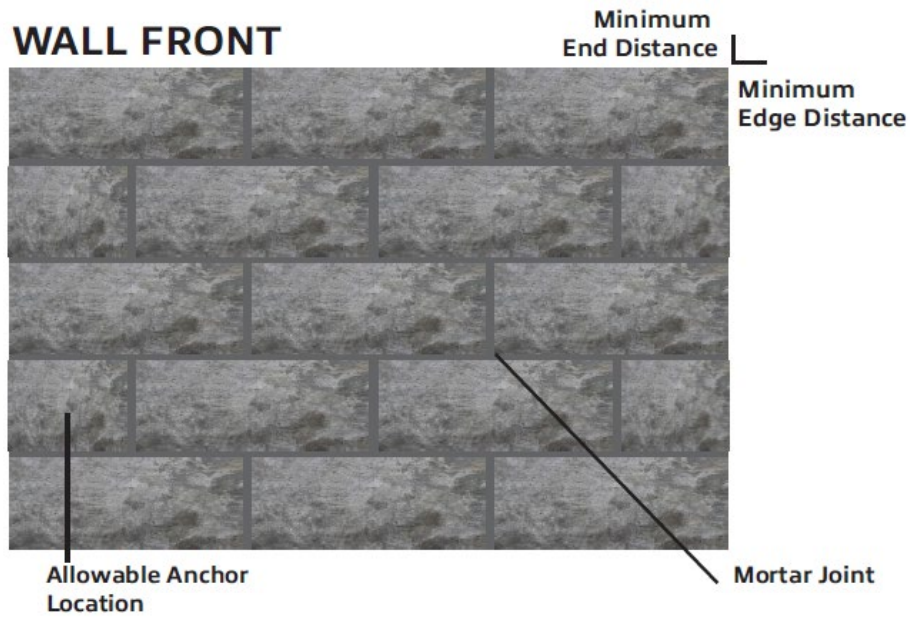


FIGURE 3—INSTALLATION LOCATIONS FOR DRILLCRETE CONCRETE SCREWS  
IN MASONRY UNITS

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

**REPORT HOLDER:**

ROBERTSON, INC.

**EVALUATION SUBJECT:****DRILLCRETE CONCRETE SCREWS INSTALLED IN CONCRETE MASONRY****1.0 REPORT PURPOSE AND SCOPE****Purpose:**

The purpose of this evaluation report supplement is to indicate that Drillcrete concrete screws installed in concrete masonry, described in ICC-ES evaluation report [ESR-4420](#), have also been evaluated for compliance with the codes noted below as adopted by Los Angeles Department of Building and Safety (LADBS).

**Applicable code editions:**

- 2020 *City of Los Angeles Building Code* (LABC)
- 2020 *City of Los Angeles Residential Code* (LARC)

**2.0 CONCLUSIONS**

The Drillcrete concrete screws installed in concrete masonry, described in Sections 2.0 through 7.0 of the evaluation report [ESR-4420](#), comply with LABC Chapter 21, and LARC, and are subjected to the conditions of use described in this supplement.

**3.0 CONDITIONS OF USE**

The Drillcrete concrete screws installed in concrete masonry described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report [ESR-4420](#).
- The design, installation, conditions of use and labeling of the anchors are in accordance with the 2018 *International Building Code*® (IBC) provisions noted in the evaluation report [ESR-4420](#).
- 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 allowable design values listed in the evaluation report and tables are for the connection of the anchors to masonry substrate. The connection between the anchors and the connected 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, reissued June 2024.

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

**REPORT HOLDER:**

ROBERTSON, INC.

**EVALUATION SUBJECT:**

**DRILLCRETE CONCRETE SCREWS INSTALLED IN CONCRETE MASONRY**

**1.0 REPORT PURPOSE AND SCOPE**

**Purpose:**

The purpose of this evaluation report supplement is to indicate that the Drillcrete concrete screws installed in concrete masonry, described in ICC-ES evaluation report [ESR-4420](#), have also been evaluated for compliance with the codes noted below.

**Applicable code editions:**

- 2019 *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 and Information (HCAI) and the Division of State Architect (DSA), see Sections 2.1.1 and 2.1.2 below.

- 2019 *California Residential Code* (CRC)

**2.0 CONCLUSIONS**

**2.1 CBC:**

The Drillcrete concrete screws installed in concrete masonry, described in Sections 2.0 through 7.0 of the evaluation report ESR-4420, comply with CBC Chapter 21, provided the design and installation are in accordance with the 2018 *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 Drillcrete concrete screws installed in concrete masonry, described in Sections 2.0 through 7.0 of the evaluation report ESR-4420, comply with CBC amended Chapters 16, 17 and 21, and Chapters 16A, 17A and 21A, provided the design and installation are in accordance with the 2018 *International Building Code*® (IBC) provisions noted in the evaluation report and the additional requirements in Sections 2.1.1.1 and 2.1.1.2 of this supplement:

**2.1.1.1 Conditions of Use**

In accordance with Section 1617A.1.19, use of anchors shall be limited to dry interior conditions and shall not be used in building enclosures. Re-use of screw anchor or screw anchor holes shall not be permitted [OSHPD 1 and 4].

**2.1.1.2 Special Inspection Requirements**

In accordance with Section 1705.4 [OSHPD 1R, 2 and 5] and Section 1705A.4 [OSHPD 1 and 4], special inspection and testing of post-installed anchors in masonry shall be required in accordance with the requirements for concrete in Chapters 17 and 19 [OSHPD 1R, 2 and 5] or Chapters 17A and 19A [OSHPD 1 and 4].

**2.1.2 DSA:**

The Drillcrete concrete screws installed in concrete masonry, described in Sections 2.0 through 7.0 of the evaluation report ESR-4721, comply with CBC amended Chapters 16 and 21, and Chapters 16A, 17A and 21A, provided the design and



installation are in accordance with the 2018 *International Building Code*® (IBC) provisions noted in the evaluation report and the additional requirements in Sections 2.1.2.1 and 2.1.2.2 of this supplement:

**2.1.2.1 Conditions of Use**

In accordance with Section 1617A.1.19, use of anchors shall be limited to dry interior conditions. Re-use of screw anchor or screw anchor holes shall not be permitted [DSA-SS].

**2.1.2.2 Special Inspection Requirements**

In accordance with Section 1705.4 [DSA-SS and DSA SS/CC5] special inspection and testing of post-installed anchors in masonry shall be required in accordance with the requirements for concrete in Chapters 17A and 19A.

**2.2 CRC:**

The Drillcrete concrete screws installed in concrete masonry, described in Sections 2.0 through 7.0 of the evaluation report ESR-4420, comply with CRC Chapter 3, provided the design and installation are in accordance with the 2018 *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, reissued June 2024.

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

**REPORT HOLDER:**

ROBERTSON, INC.

**EVALUATION SUBJECT:****DRILLCRETE CONCRETE SCREWS INSTALLED IN CONCRETE MASONRY****1.0 REPORT PURPOSE AND SCOPE****Purpose:**

The purpose of this evaluation report supplement is to indicate that Drillcrete concrete screws installed in concrete masonry, described in ICC-ES evaluation report ESR-4420, have also been evaluated for compliance with the codes noted below.

**Applicable code editions:**

- 2020 Florida Building Code—Building
- 2020 Florida Building Code—Residential

**2.0 CONCLUSIONS**

The Drillcrete concrete screws installed in concrete masonry, described in Sections 2.0 through 7.0 of ICC-ES evaluation report ESR-4420, comply with the *Florida Building Code—Building* and the *Florida Building Code—Residential*, provided the design requirements are determined in accordance with the *Florida Building Code—Building* or the *Florida Building Code—Residential*, as applicable. The installation requirements noted in ICC-ES evaluation report ESR-4420 for the 2018 *International Building Code*® meet the requirements of the *Florida Building Code—Building* or the *Florida Building Code—Residential*, as applicable.

Use of the Drillcrete concrete screws installed in concrete masonry has 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 condition:

- 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, reissued June 2024.