

# ICC-ES Evaluation Report

**ESR-1671**

Reissued September 2019

Revised December 2019

This report is subject to renewal September 2021.

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

## REPORT HOLDER:

ITW BUILDDEX

## EVALUATION SUBJECT:

**TAPCON® ANCHORS WITH ADVANCED  
 THREADFORM TECHNOLOGY**

## ADDITIONAL LISTEE:

ITW RESIDENTIAL & RENOVATION

## 1.0 EVALUATION SCOPE

### Compliance with the following codes:

- ½ 2018, 2015, 2012 and 2009 *International Building Code®* (IBC)
- ½ 2018, 2015, 2012 and 2009 *International Residential Code®* (IRC)

### Property evaluated:

Structural

## 2.0 USES

The Tapcon Anchors with Advanced Threadform Technology are used as anchorage to resist static, tension and shear loads in uncracked, grouted or ungrouted concrete masonry construction, unless otherwise noted in this report.

The Tapcon anchors 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 edition) of TMS 402 as referenced in Section 2107.1 of the IBC.

The anchors are permitted to be used in structures regulated by the IRC, provided an engineered design is submitted in accordance with Section R301.1.3 of the IRC.

## 3.0 DESCRIPTION

### 3.1 Tapcon Anchors with Advanced Threadform Technology:

The Tapcon Anchors with Advanced Threadform Technology are manufactured from carbon steel with supplementary heat treatment. They have an alternating high-low thread form and are available in 3/16- and 1/4-inch (4.8 and 6.4 mm) diameters with various lengths. Tapcon

carbon steel anchors are available with a slotted hex washer head, slotted hex washer head with under head ribs, Phillips flat head, Maxi-set head or Scots® stainless steel head, and have a white, silver or blue coating. Different head styles and types of coatings for Tapcon Anchors with Advanced Threadform Technology are noted in Table 4, Figure 1 and Figure 2.

### 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 are closed-end units, minimum Grade N, Type II, lightweight, medium-weight, or normal-weight conforming to ASTM C90. The minimum allowable nominal size of the CMU 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 (2018 and 2015 IBC), 2013.13 (2012 IBC), Section 2103.12 (2009 IBC) or IRC Section R606 (2018 and 2015 IRC), R609.1.1 (2012 and 2009), 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).

**3.2.3 Mortar:** Mortar must be Type M or S in compliance with IBC Section 2103 or IRC Section R606.2.8 (2018), R606.2.7 (2015), R607.1 (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:** Anchors are limited to installation into the face shell of grouted or ungrouted, uncracked concrete masonry units at locations indicated by the non-shaded areas in Figure 5. Masonry wall construction must be fully mortared. Allowable tension and shear loads for installation in concrete masonry under the IBC and IRC are noted in Tables 1 and 2.

Allowable load reduction factors noted in Table 3 are applicable to the allowable loads shown in Tables 1 and 2. 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 must be as set forth in Table 3. For anchors installed between the critical edge distance,  $c_{cr}$ , and minimum edge distance,  $c_{min}$ , load reduction factors must be used in accordance with Table 3. For anchors installed between the critical spacing distance,  $s_{cr}$ , and minimum spacing distance,  $s_{min}$ , load reduction factors must be used in accordance with Table 3. Edge distances less than the critical edge distance,  $c_{cr}$ , are not permitted for anchors installed in medium- or normal- weight CMUs.

## 4.2 Installation:

The Tapcon® Screw Anchors must be installed in accordance with the manufacturer's published instructions (MPII) included in each unit package as described in Figure 4 of 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. Holes must be predrilled in masonry with a Tapcon® carbide-tipped drill bit supplied by ITW. The hole must be drilled to the specified nominal embedment depth plus a minimum of 1/4 inch (6.4 mm). Before anchor installation, dust and other debris must be removed using a vacuum or compressed air. The anchors must then be installed through the attachment into the hole, in accordance with ITW's instructions, to the specified nominal embedment depth using a hammer drill in a rotary-only mode with an ITW Buildex Condrive® Tool and drive socket. 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 Section 1704 of the IBC, must be provided during anchor installation as set forth in Tables 1 or 2 of this report. The code official must receive a report, from an approved special inspector, that includes the following details:

1. Anchor description, including the anchor product name, nominal anchor diameter, and anchor length.
2. Hole description, including verification of drill bit compliance with ITW Buildex's instructions, hole depth, concrete masonry wall thickness and hole cleanliness.
3. Installation description, including hole location (spacing and edge distance), anchor embedment, and verification of anchor installation in accordance with the manufacturer's published installation instructions and this report.
4. Concrete masonry unit size and compressive strength, mortar compressive strength and, when required, masonry prism compressive strength.

## 5.0 CONDITIONS OF USE

The Tapcon Anchors with Advanced Threadform Technology, 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 Since an ICC-ES acceptance criteria for evaluating the performance of screw anchors in cracked masonry is unavailable at this time, 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 Use of anchors in contact with preservative-treated and fire-retardant-treated wood is beyond the scope of this report.
- 5.10 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.

## 7.0 IDENTIFICATION

- 7.1 The Tapcon® Screw Anchors are identified by packaging labeled with the manufacturer's name (ITW Buildex or ITW Residential & Renovation), contact information, anchor name, anchor size and evaluation report number (ESR-1671). The letters "BX" or "TAPCON" and a length identification code letter are stamped on the head of each anchor. See the length identification system illustrated in Figure 3 of this report.

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

**ITW BUILDEX**  
**155 HARLEM AVENUE, N4E**  
**GLENVIEW, ILLINOIS 60025**  
**(800) 848-5611**  
[www.itwbuildex.com](http://www.itwbuildex.com)  
[techsupport@itwccna.com](mailto:techsupport@itwccna.com)

7.3 The Additional Listee's contact information is the following:

**ITW RESIDENTIAL & RENOVATION**  
**155 HARLEM AVENUE, N3E**  
**GLENVIEW, ILLINOIS 60025**  
**(877) 489-2726**  
[www.tapcon.com](http://www.tapcon.com)

**TABLE 1—ALLOWABLE TENSION VALUES FOR TAPCON SCREW ANCHORS WITH ADVANCED THREADFORM TECHNOLOGY INSTALLED IN CONCRETE MASONRY UNITS<sup>1,2</sup>**

ANCHOR DIAMETER (inch)	DRILL BIT DIAMETER (inch)	MINIMUM EMBEDMENT DEPTH (inch) <sup>3</sup>	IBC/IRC <sup>4</sup>	
			ASTM C90 CMU Type	
			Lightweight (lb)	Medium/Normal (lb)
$\frac{3}{16}$	0.173	1	40	60
$\frac{1}{4}$	0.204	1	45	105

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

<sup>1</sup>The tabulated tension loads are for anchors installed in the face shell of lightweight, medium-weight and normal-weight concrete masonry units in compliance with ASTM C90.

<sup>2</sup>The tabulated tension values are for anchors installed at the specified critical spacing,  $s_{cr}$ , and critical edge distance,  $c_{cr}$ , as noted in Table 3.

<sup>3</sup>The embedment depth is the distance from the concrete masonry unit surface to the bottom of the fastener.

<sup>4</sup>Special inspection shall be provided in accordance with Section 4.3 of this report.

**TABLE 2—ALLOWABLE SHEAR VALUES FOR TAPCON SCREW ANCHORS WITH ADVANCED THREADFORM TECHNOLOGY INSTALLED IN CONCRETE MASONRY UNITS<sup>1,2,3</sup>**

ANCHOR DIAMETER (inch)	DRILL BIT DIAMETER (inch)	MINIMUM EMBEDMENT DEPTH (inch)	IBC/IRC <sup>4</sup>	
			ASTM C90 CMU Type	
			Lightweight (lb)	Medium/Normal (lb)
$\frac{3}{16}$	0.173	1	85	130
$\frac{1}{4}$	0.204	1	110	180

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

<sup>1</sup>The tabulated shear loads are for anchors installed in lightweight, medium-weight and normal-weight concrete masonry units complying with ASTM C90.

<sup>2</sup>The tabulated tension values are for anchors installed at the specified critical spacing,  $s_{cr}$ , and critical edge distance,  $c_{cr}$ , as noted in Table 3.

<sup>3</sup>The embedment depth is the distance from the concrete masonry unit surface to the bottom of the fastener.

<sup>4</sup>Special inspection shall be provided in accordance with Section 4.3 of this report.

<sup>5</sup>When required, special inspection shall be provided in accordance with Section 4.3 of this report.

**TABLE 3—ALLOWABLE SPACING AND EDGE DISTANCES FOR TAPCON ANCHORS WITH ADVANCED THREADFORM TECHNOLOGY INSTALLED IN CONCRETE MASONRY UNITS (inches)<sup>1,2,3,4,5</sup>**

CHARACTERISTIC	SYMBOL	UNITS	NOMINAL ANCHOR DIAMETER (inches)	
			$\frac{3}{16}$	$\frac{1}{4}$
Minimum spacing distance	$s_{min}$	inches	$1\frac{1}{2}$	2
Critical spacing distance	$s_{cr}$	inches	3	4
Spacing load reduction factor - Tension	-	-	1.00	0.84
Spacing load reduction factor - Shear	-	-	1.00	0.81
Minimum edge distance	$c_{min}$	inches	2	2
Critical edge distance	$c_{cr}$	inches	4	4
Edge load reduction factor - Tension	-	-	0.91 <sup>6</sup>	0.88 <sup>6</sup>
Edge load reduction factor - Shear	-	-	0.93	0.80

For SI: 1 inch = 25.4 mm.

<sup>1</sup>The critical edge and spacing distances are for full anchor capacity, and the minimum edge and spacing distances are for reduced anchor capacity.

<sup>2</sup>The load reduction factors in this table are applicable only to the allowable loads shown in Tables 1 and 2 of this report.

<sup>3</sup>Reduction factors are cumulative. Multiple reduction factors for more than one spacing or edge distance are calculated separately and multiplied.

<sup>4</sup>Load reduction factors for anchors loaded in tension or shear with spacing between critical and minimum are obtained by linear interpolation.

<sup>5</sup>Load reduction factors for anchors loaded in tension or shear with edge distances between critical and minimum are obtained by linear interpolation.

<sup>6</sup>Reduction applies to anchors installed in lightweight CMU only.

TABLE 4—TAPCON SCREW ANCHORS WITH ADVANCED THREADFORM TECHNOLOGY HEAD TYPES AND COATINGS

HEAD TYPE	ANCHOR COATING			
	Blue Climaseal <sup>1</sup>	Silver Climaseal <sup>®2</sup>	Ultrashield <sup>™3</sup>	White Ultrashield <sup>4</sup>
Slotted hex washer head (with or without under head ribs)	X			
Flat head (Phillips)	X			
Maxi-set head			X	X
Scots head		X		

<sup>1</sup>Blue Climaseal is a water-based polymer type coating (blue in color) that has been cured at elevated temperature.  
<sup>2</sup>Silver Climaseal is a water-based polymer type coating (silver in color) that has been cured at elevated temperature.  
<sup>3</sup>Ultrashield is a water-based polymer type coating (silver in color) that consists generally of multiple coats which are cured at elevated temperature.  
<sup>4</sup>White Ultrashield is a water-based polymer type coating (white in color) that consists generally of multiple coats which are cured at elevated temperature.

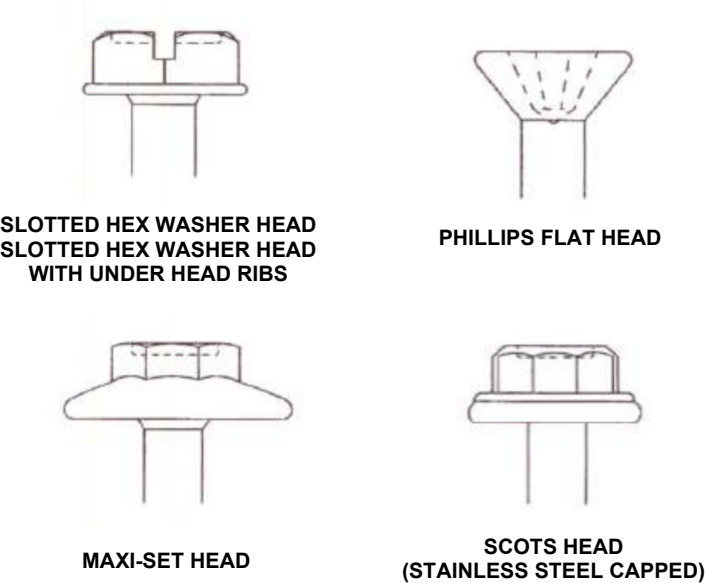


FIGURE 1—TAPCON ANCHORS WITH ADVANCED THREADFORM TECHNOLOGY HEAD STYLES

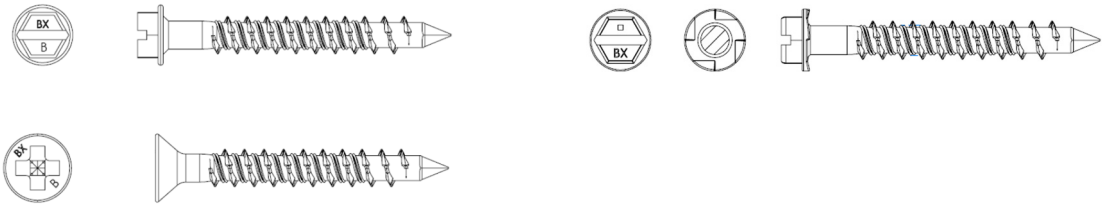


FIGURE 2—TAPCON ANCHORS WITH ADVANCED THREADFORM TECHNOLOGY ANCHORS

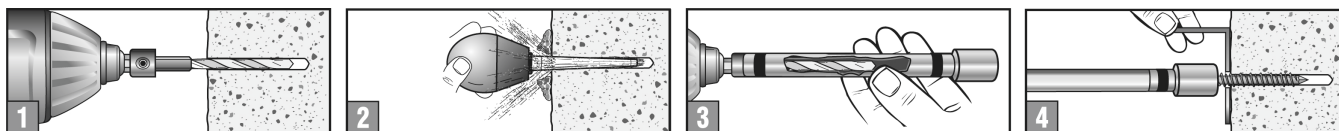
LENGTH MARKING ON ANCHOR HEAD			A	B	C	D	E	F	G	H	I	J
Length of anchor (inches)	From	1	1½	2	2½	3	3½	4	4½	5	5½	6
	Up to, but not including	1½	2	2½	3	3½	4	4½	5	5½	6	6½

For SI: 1 inch = 25.4 mm.

FIGURE 3—LENGTH IDENTIFICATION SYSTEM



### Installation Instructions for $\frac{3}{16}$ " and $\frac{1}{4}$ " diameter Tapcon® Screw Anchors



- 1) Using a Tapcon® drill bit, drill the hole  $\frac{1}{4}$ " deeper than anchor embedment.
- 2) Clean hole with compressed air or vacuum to remove any excess dust/debris.
- 3) Place Condrive® tool with drive socket over drill bit.
- 4) Using drill, hammer mode disabled, drive anchor thru fixture and into hole until nut driver spins free from head of anchor.

FIGURE 4—INSTALLATION INSTRUCTIONS FOR TAPCON® SCREW ANCHORS

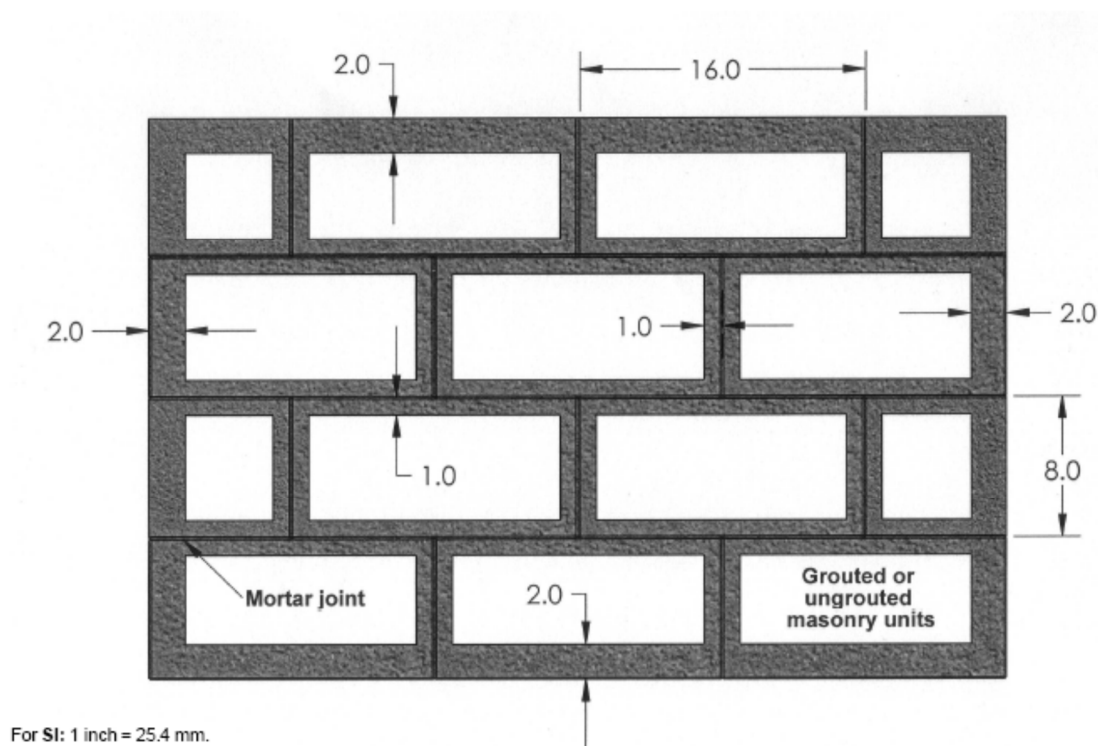


FIGURE 5—ANCHOR LOCATIONS (LIGHT COLOR AREAS) FOR INSTALLATION IN MASONRY UNITS  
(ALL DIMENSIONS IN INCHES)

# ICC-ES Evaluation Report

# ESR-1671 FBC Supplement

Reissued September 2019

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This report is subject to renewal September 2021.

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

## REPORT HOLDER:

ITW BUILDEX

## EVALUATION SUBJECT:

**TAPCON® ANCHORS WITH ADVANCED THREADFORM TECHNOLOGY**

## 1.0 REPORT PURPOSE AND SCOPE

### Purpose:

The purpose of this evaluation report supplement is to indicate that Tapcon® Anchors with Advanced Threadform Technology for masonry construction, recognized in ICC-ES master evaluation report ESR-1671, have also been evaluated for compliance with the codes noted below.

### Applicable code editions:

- 2017 *Florida Building Code—Building*
- 2017 *Florida Building Code—Residential*

## 2.0 CONCLUSIONS

The Tapcon® Anchors with Advanced Threadform Technology for masonry construction, described in Sections 2.0 through 7.0 of the master evaluation report ESR-1671, comply with the *Florida Building Code—Building* and the *Florida Building Code—Residential*, provided the design and installation are in accordance with the 2015 *International Building Code*® provisions noted in the master evaluation report.

Use of the Tapcon® Anchors with Advanced Threadform Technology for masonry construction for compliance with the High-Velocity Hurricane Zone provisions of the *Florida Building Code—Building* and the *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 evaluation report, reissued September 2019 and revised December 2019.