

ICC-ES Evaluation Report

ESR-1671

Reissued September 2024

This report also contains:

- CBC Supplement

Subject to renewal September 2025

- FBC Supplement

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<p>DIVISION: 04 00 00— MASONRY</p> <p>Section: 04 05 19.16— Masonry Anchors</p>	<p>REPORT HOLDER: ITW BUILDEX</p>	<p>EVALUATION SUBJECT: TAPCON® ANCHORS WITH ADVANCED THREADFORM TECHNOLOGY</p>	
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1.0 EVALUATION SCOPE

Compliance with the following codes:

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

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) 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, Star flat head, Maxi-set head or Scots® stainless steel head. Different head styles for Tapcon Anchors with Advanced Threadform Technology are illustrated in [Figure 1](#) and [Figure 2](#).

The Tapcon Anchors are available in Black Climaseal, Blue Climaseal, Silver Climaseal, Ultrashield and White Ultrashield coating. Black Climaseal is a water-based polymer type coating (black in color) that has been cured at elevated temperature. Blue Climaseal is a water-based polymer type coating (blue in color) that has been cured at elevated temperature. Silver Climaseal is a water-based polymer type coating (silver in color) that has been cured at elevated temperature. Ultrashield is a water-based polymer type coating (silver in color) that consists generally of multiple coats which are cured at elevated temperature. White Ultrashield is a water-based polymer type coating (white in color) that consists generally of multiple coats which are cured at elevated temperature.

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 or IRC Section R606, 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, 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 Distance 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 installation instructions 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 Condri[®] 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 Sections 1704 and 1705 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 referenced 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 (editorially revised December 2020).

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
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

TABLE 1—ALLOWABLE TENSION VALUES FOR TAPCON SCREW ANCHORS WITH ADVANCED THREADFORM TECHNOLOGY INSTALLED IN CONCRETE MASONRY UNITS^{1,2}

ANCHOR DIAMETER (inch)	DRILL BIT DIAMETER (inch)	MINIMUM EMBEDMENT DEPTH (inch) ³	IBC/IRC ⁴	
			ASTM C90 CMU Type	
			Lightweight (lb)	Medium/Normal (lb)
³ / ₁₆	0.173	1	40	60
¹ / ₄	0.204	1	45	105

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

¹The 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.

²The 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](#).

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

⁴Special 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^{1,2,3}

ANCHOR DIAMETER (inch)	DRILL BIT DIAMETER (inch)	MINIMUM EMBEDMENT DEPTH (inch)	IBC/IRC ⁴	
			ASTM C90 CMU Type	
			Lightweight (lb)	Medium/Normal (lb)
³ / ₁₆	0.173	1	85	130
¹ / ₄	0.204	1	110	180

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

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

²The 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](#).

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

⁴Special 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)^{1,2,3,4,5}

CHARACTERISTIC	SYMBOL	UNITS	NOMINAL ANCHOR DIAMETER (inches)	
			³ / ₁₆	¹ / ₄
Minimum spacing distance	S_{min}	inches	1 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 ⁶	0.88 ⁶
Edge load reduction factor - Shear	-	-	0.93	0.80

For SI: 1 inch = 25.4 mm.

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

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

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

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

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

⁶Reduction applies to anchors installed in lightweight CMU only.

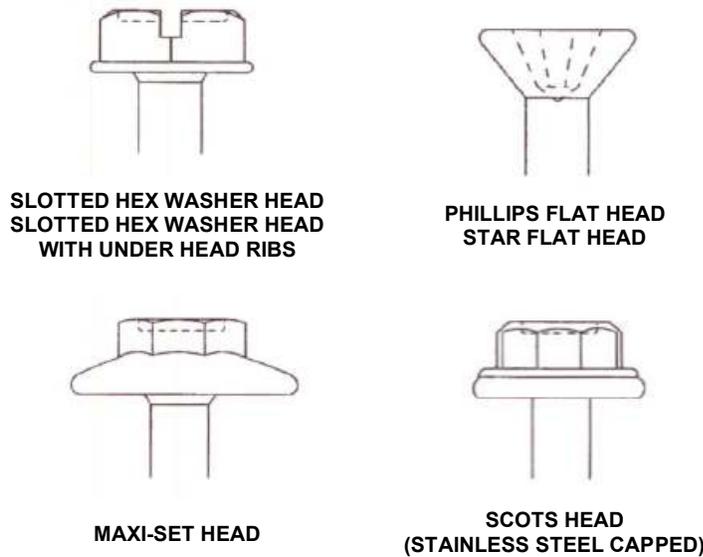


FIGURE 1—TAPCON ANCHORS WITH ADVANCED THREADFORM TECHNOLOGY HEAD STYLES

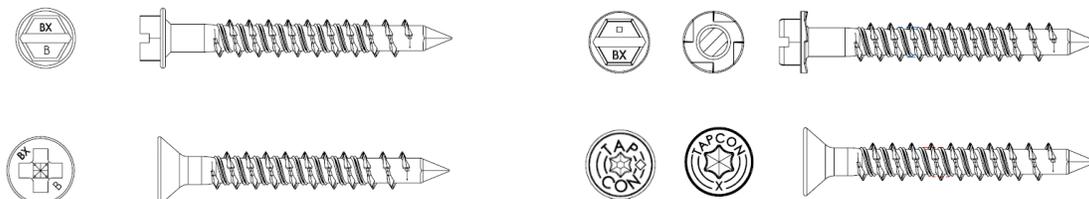


FIGURE 2—TAPCON ANCHORS WITH ADVANCED THREADFORM TECHNOLOGY ANCHORS

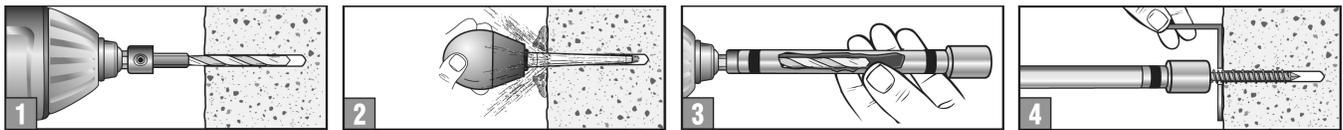
LENGTH MARKING ON ANCHOR HEAD			A	B	C	D	E	F	G	H	I	J
Length of anchor (inches)	From	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6
	Up to, but not including	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2

For SI: 1 inch = 25.4 mm.

FIGURE 3—LENGTH IDENTIFICATION SYSTEM

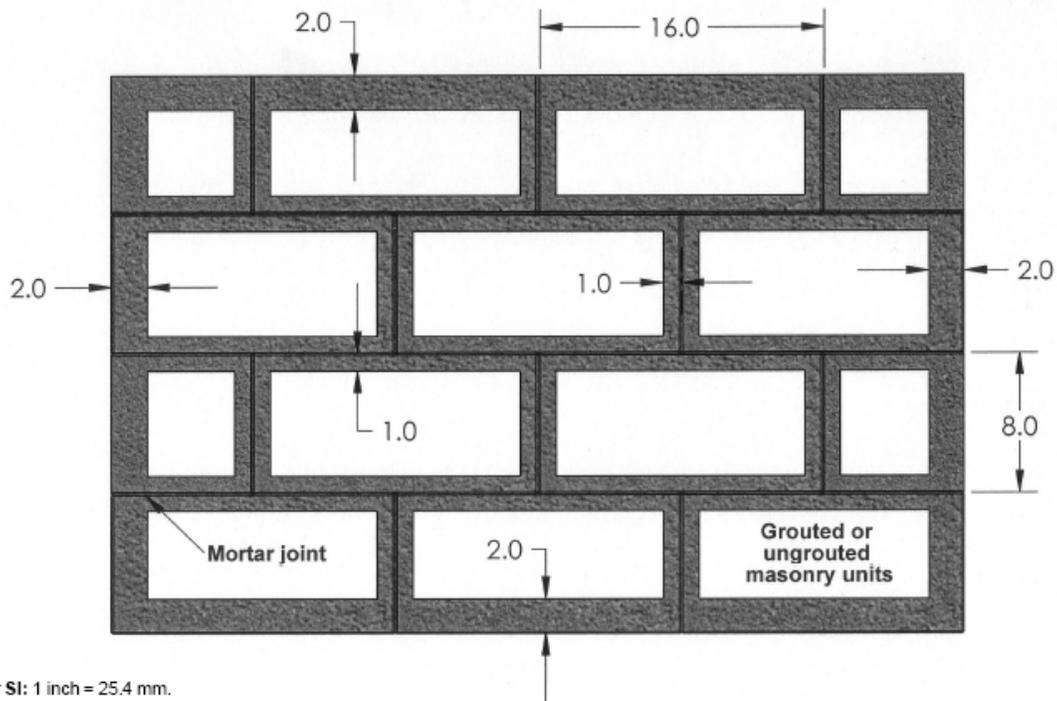


Installation Instructions for 3/16" and 1/4" diameter Tapcon[®] Screw Anchors



- 1) Using a Tapcon[®] drill bit, drill the hole 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



For SI: 1 inch = 25.4 mm.

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

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, described in ICC-ES evaluation report ESR-1671, 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 Tapcon® Anchors with Advanced Threadform Technology, described in Sections 2.0 through 7.0 of the evaluation report ESR-1671, 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 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 Tapcon® Anchors with Advanced Threadform Technology, described in Sections 2.0 through 7.0 of the evaluation report ESR-1671, 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, as applicable.

This supplement expires concurrently with the evaluation report, reissued September 2024.

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

REPORT HOLDER:

ITW BUILDDEX

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, described in ICC-ES evaluation report ESR-1671, 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 Tapcon® Anchors with Advanced Threadform Technology for masonry construction, described in Sections 2.0 through 7.0 of the evaluation report ESR-1671, 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* or the *Florida Building Code—Residential*, as applicable. The installation requirements noted in ICC-ES evaluation report ESR-1671 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 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 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 September 2024.