ICC Evaluation Service, Inc.
www.icc-es.org

Business/Regional Office ■ 5360 Workman Mill Road, Whittier, California 90601 ■ (562) 699-0543
Regional Office ■ 900 Montclair Road, Suite A, Birmingham, Alabama 35213 ■ (205) 599-9800
Regional Office ■ 4051 West Flossmoor Road, Country Club Hills, Illinois 60478 ■ (708) 799-2305

DIVISION: 04—MASONRY
Section: 04081—MASONRY Anchorage

REPORT HOLDER:

ILLINOIS TOOL WORKS, INC., BUILDEX DIVISION
1349 WEST BRYN MAWR AVENUE
ITASCA, ILLINOIS 60143
(800) 323-0720
www.itwbuildex.com

EVALUATION SUBJECT:

TAPCON® WITH ADVANCED THREADFORM TECHNOLOGY ANCHORS

ADDITIONAL LISTEES:

ILLINOIS TOOL WORKS, INC., BRANDS DIVISION
955 NATIONAL PARKWAY, SUITE 95500
SCHAUMBURG, ILLINOIS 60173
(877) 489-2726
www.itwbrands.com

ILLINOIS TOOL WORKS, INC., REDHEAD DIVISION
2171 EXECUTIVE DRIVE, SUITE 100
ADDISON, ILLINOIS 60101
(800) 899-7890
www.itw-redhead.com

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2006 *International Building Code*® (IBC)
- 2006 *International Residential Code*® (IRC)
- 1997 *Uniform Building Code*™ (UBC)

Properties evaluated:

Structural

2.0 USES

The Tapcon with Advanced Threadform Technology anchors are used to resist dead, live, wind and earthquake loads in concrete masonry, unless otherwise noted in this report. The Tapcon with Advanced Threadform Technology anchors are alternatives to cast-in-place anchors described in IBC Section 2107.1 and UBC Section 2107.1. 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 with Advanced Threadform Technology Anchors:

The Tapcon with Advanced Threadform Technology anchors are manufactured from UNS G 10220 heat-treated steel. They have an alternating high-low thread form and are available in $^{3}/_{16}$- and $^{1}/_{4}$-inch-diameter (4.8 and 6.4 mm) sizes with various lengths. Tapcon carbon steel anchors are available with a slotted hex washer head, phillips flat head, maxi-set head and Scots® stainless steel head, and have a white, silver or blue coating. The different head styles and types of coatings for Tapcon with Advanced Threadform Technology anchors are noted in Table 5.

3.2 Concrete Masonry:

Concrete masonry units shall be closed-end units, minimum Grade N, Type II, lightweight, medium-weight, or normal-weight conforming to ASTM C 90 or UBC Standard 21-4. The minimum allowable nominal size of CMU shall be 8 inches (203 mm) wide by 8 inches (203 mm) high by 16 inches (406 mm) long. When walls are fully grouted, the grout shall comply with IBC Section 2103.12, IRC Section R609.1.1, or UBC Section 2103.4, as applicable. Alternatively, the grout shall have a minimum compressive strength when tested in accordance with ASTM C 1019 equal to its specified strength, but not less than 2000 psi (13.8 MPa). Mortar shall comply with IBC Section 2103.8, IRC Section R607, or UBC Standard 21-5, as applicable. The mortar shall have a minimum compressive strength of 1,500 psi (10.3 MPa).

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 General: Anchors described in this report are assigned allowable tension and shear loads for design based on allowable stress design (working stress design).

4.1.2 Design of Anchors in Concrete Masonry: Anchors are limited to installation into the face shell of ungrouted or grouted concrete masonry units at locations indicated by the non-shaded areas in Figure 2. Allowable tension and shear loads for installation in concrete masonry are noted in Tables 1 and 2. Spacing and edge distance requirements are noted in Table 3. 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 shall be determined by the following equation:

$$\left(\frac{P_s}{P_t}\right) + \left(\frac{V_s}{V_t}\right) \leq 1.0$$

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.

The spacing between anchors and the distance between the anchor and the edge of the concrete masonry wall shall be as set forth in Table 3.

4.2 Installation:

4.2.1 General: Tapcon with Advanced Threadform Technology anchors shall not be installed until the masonry has fully cured. Tapcon with Advanced Threadform Technology anchors shall be installed by drilling a pilot hole into the substrate using a rotary hammer drill with a carbide-tipped drill bit supplied by ITW Buildex. The hole shall be drilled to the specified embedment depth plus a minimum of $^1/_4$ inch (6.35 mm). Dust and other deleterious matter shall be removed by the use of compressed air, before anchor installation. The Tapcon with Advanced Threadform Technology anchors shall then be installed into the hole in accordance with ITW Buildex's instructions to the specified embedment depth using a hammer drill in a rotary-only mode with an ITW Buildex Condrive Tool and drive socket.

4.2.2 Installation with Special Inspection (When Required): Continuous special inspection in accordance with Section 1704 of the IBC or Section 1701 of the UBC, shall be provided when design loads are based on special inspection being provided during anchor installation as set forth in Tables 1 or 2 of this report. The code official shall receive a report, from an approved special inspector, that includes the following details:

a. Anchor description, including the anchor product name, nominal anchor diameter, and anchor length.

b. Hole description, including verification of drill bit compliance with ITW Buildex's instructions, hole depth, concrete thickness and cleanliness.

c. Installation description, including verification of concrete compressive strength by ASTM C 42 methods, hole location (spacing and edge distance), fastener embedment, and verification of anchor installation in accordance with the manufacturer's published installation instructions and this report.

d. Concrete masonry unit size and compressive strength, mortar compressive strength and, when required, masonry prism compressive strength.

5.0 CONDITIONS OF USE

The Tapcon with Advanced Threadform Technology 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 installation shall 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 shall govern.

5.2 Under the IBC or IRC, use of the anchors in concrete masonry units to resist wind or seismic loads is beyond the scope of this report.

5.3 Under the UBC, use of the anchors in concrete masonry units to resist wind or seismic loads is beyond the scope of this report.

5.4 Fatigue and Shock Loading: 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.

5.5 Fire-resistance Rated Construction: 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.

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

5.7 Calculations demonstrating that the applied loads are less than the allowable loads described in this report, shall be submitted to the code official. The calculations shall be prepared by a registered design professional where required by the statues of the jurisdiction in which the project is to be constructed.

5.8 Special inspection, when required, shall be provided in accordance with Section 4.2.2 of this report.

5.9 Anchors shall be limited to dry, interior use.

5.10 Use of anchors in contact with preservative-treated and fire-retardant-treated wood is beyond the scope of this report.

5.11 The Tapcon with Advanced Threadform Technology anchors are manufactured by ITW Buildex at facilities in Itasca, Illinois, and Roselle, Illinois, under a quality control program with inspections by CEL Consulting (AA-639).

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Concrete and Masonry (AC106), dated December 2007.

7.0 IDENTIFICATION

Tapcon with Advanced Threadform Technology anchors packaging is marked with the ITW Buildex company name, or the name of one of the additional listees noted in this report; product name (Tapcon with Advanced Threadform Technology); anchor diameter and length; the name of the inspection agency (CEL Consulting); and the evaluation report number (ESR-1671). A length identification code letter is stamped on the head of each anchor. See the length identification system in Table 4 of this report.

TABLE 1—ALLOWABLE TENSION VALUES FOR TAPCON WITH ADVANCED THREADFORM TECHNOLOGY ANCHORS INSTALLED IN CONCRETE MASONRY UNITS (pounds)[1,2]

ANCHOR DIAMETER (inch)	DRILL BIT DIAMETER (inch)	MINIMUM EMBEDMENT (inch)[3]	UBC - WITH SPECIAL INSPECTION[4]		UBC - WITHOUT SPECIAL INSPECTION		IBC/IRC[4]	
			UBC 21-4 CMU Type		UBC 21-4 CMU Type		ASTM C 90 CMU Type	
			Lightweight	Medium/Normal	Lightweight	Medium/Normal	Lightweight	Medium/Normal
$^3/_{16}$	0.173	1	50	75	25	35	40	60
$^1/_4$	0.204	1	55	130	25	65	45	105

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

[1]The tabulated tension loads are for anchors installed in the face shell of lightweight and medium-weight concrete masonry units compliance with ASTM C 90, as shown in figure 2 of this report.
[2]The tabulated tension values are for anchors installed at the specified spacing and edge distance as noted in Table 3.
[3]The embedment depth is the distance from the concrete masonry unit surface to the bottom of the fastener.
[4]Special inspection shall be provided in accordance with Section 4.2.2 of this report.

TABLE 2—ALLOWABLE SHEAR VALUES FOR TAPCON WITH ADVANCED THREADFORM TECHNOLOGY ANCHORS INSTALLED IN CONCRETE MASONRY UNITS (pounds)[1,2,3]

ANCHOR DIAMETER (inch)	DRILL BIT DIAMETER (inch)	MINIMUM EMBEDMENT (inch)	UBC		IBC/IRC[4]	
			UBC 21-4 CMU Type		ASTM C 90 CMU Type	
			Lightweight	Medium/Normal	Lightweight	Medium/Normal
$^3/_{16}$	0.173	1	110	160	85	130
$^1/_4$	0.204	1	135	220	110	180

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

[1]The tabulated shear loads are for anchors installed in lightweight and medium-weight concrete masonry units complying with ASTM C 90 or UBC 21-4.
[2]The tabulated tension values are for anchors installed at the specified spacing and edge distance as noted in Table 3.
[3]The embedment depth is the distance from the concrete masonry unit surface to the bottom of the fastener.
[4]Special inspection shall be provided in accordance with Section 4.2.2 of this report.
[5]Special inspection under UBC is optional. When required, special inspection shall be provided in accordance with Section 4.2.2 of this report.

TABLE 3—ALLOWABLE SPACING AND EDGE DISTANCES FOR TAPCON WITH ADVANCED THREADFORM TECHNOLOGY ANCHORS INSTALLED IN CONCRETE MASONRY UNITS (inches)[1,2,3,4,5,6]

PARAMETER	ANCHOR DIAMETER (inch)	DISTANCE FOR FULL ANCHOR CAPACITY (critical distance, inches)	DISTANCE FOR REDUCED ANCHOR CAPACITY (minimum distance, inches)	REDUCTION FACTOR
Spacing between anchors—tension	$^3/_{16}$	3	$1^1/_2$	1.00
	$^1/_4$	4	2	0.84
Spacing between anchors—shear	$^3/_{16}$	3	$1^1/_2$	1.00
	$^1/_4$	4	2	0.81
Edge distance—tension	$^3/_{16}$	4	2	0.91[7]
	$^1/_4$	4	2	0.88[7]
Edge distance—shear	$^3/_{16}$	4	2	0.93
	$^1/_4$	4	2	0.80

For **SI:** 1 inch = 25.4 mm.

[1]The spacing and edge distance requirements in this table are applicable only to Tables 1 and 2 of this report.
[2]The critical edge and spacing distances are for full anchor capacity, and the minimum edge and spacing distances are for reduced anchor capacity.
[3]The load reduction factors in this table are applicable only to the allowable loads shown in Tables 1 and 2 of this report.
[4]Reduction factors are cumulative. Multiple reduction factors for more than one spacing or edge distance are calculated separately and multiplied.
[5]Load reduction factors for anchors loaded in tension or shear with spacing between critical and minimum are obtained by linear interpolation.
[6]Load reduction factors for anchors loaded in tension or shear with edge distances between critical and minimum are obtained by linear interpolation.
[7]Reduction applies to anchors installed in lightweight CMU only. Reduction shall not be permitted for anchors installed in medium- or normal- weight CMU.

TABLE 4—LENGTH IDENTIFICATION SYSTEM

LENGTH OF ANCHOR (inch)		STAMP ON HEAD OF ANCHOR
From	**Up to But Not Including**	
1	$1^1/_2$	☐
$1^1/_2$	2	A
2	$2^1/_2$	B
$2^1/_2$	3	C
3	$3^1/_2$	D
$3^1/_2$	4	E
4	$4^1/_2$	F
5	$5^1/_2$	H
6	$6^1/_2$	J

For **SI:** 1 inch = 25.4 mm.

TABLE 5—TAPCON WITH ADVANCED THREADFORM TECHNOLOGY HEAD TYPES AND COATINGS

HEAD TYPE	FASTENER COATING			
	Blue Climaseal[1]	**Silver Climaseal®[2]**	**Ultrashield™[3]**	**White Ultrashield[4]**
Slotted hex washer head	X			
Phillips flat head	X			
Maxi-set head			X	X
Scots head		X		

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

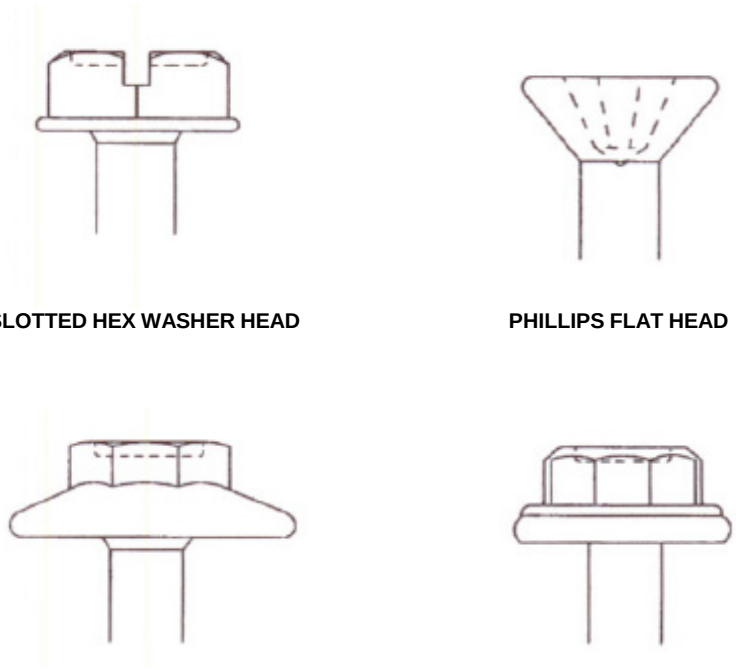
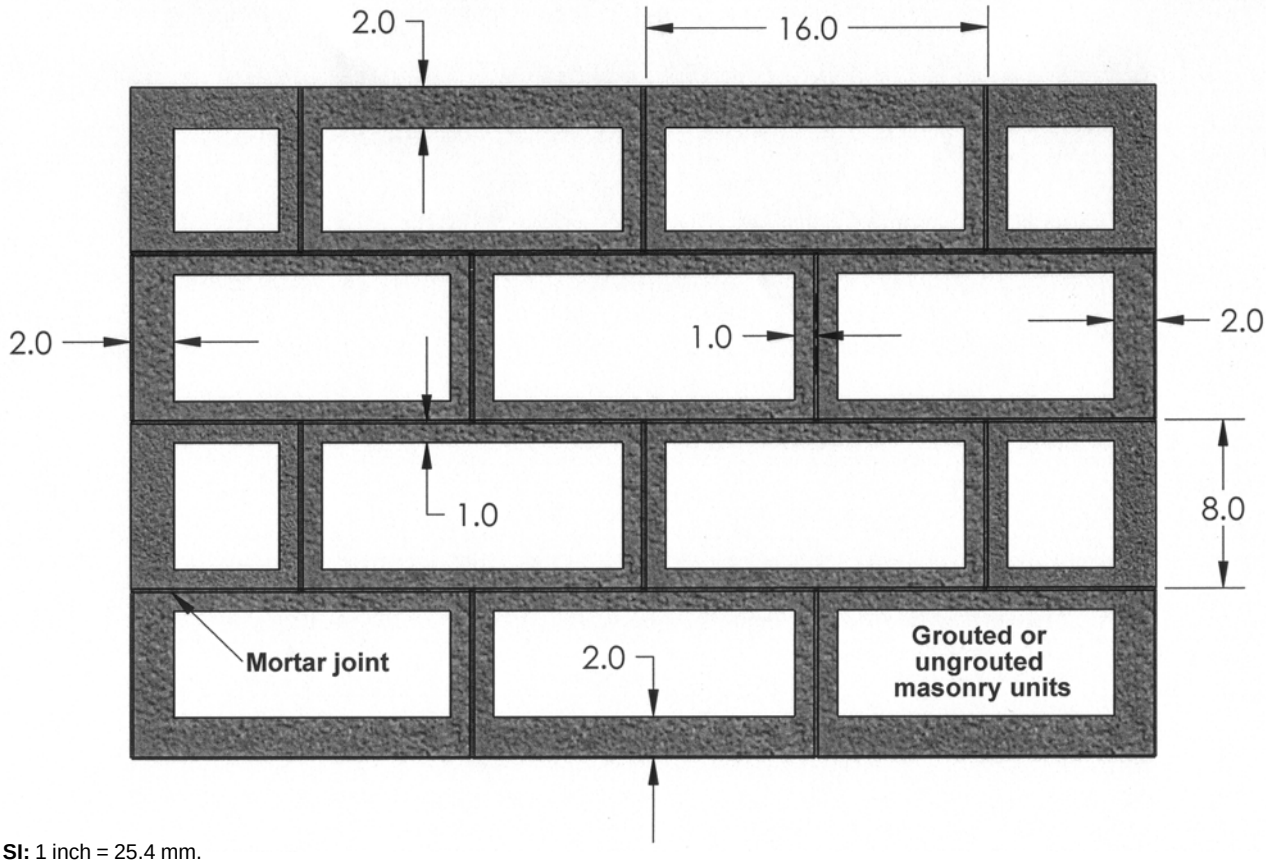


FIGURE 1—TAPCON WITH ADVANCED THREADFORM TECHNOLOGY ANCHOR HEAD STYLES



For **SI:** 1 inch = 25.4 mm.

FIGURE 2—ANCHOR LOCATIONS (LIGHT COLOR AREAS) FOR INSTALLING IN MASONRY UNITS (ALL DIMENSIONS IN INCHES)