ICC-ES Evaluation Report

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Section: 03 16 00—Concrete Anchors

Division: 05 00 00—METALS
Section: 05 05 19—Post-Installed Concrete Anchors

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EVALUATION SUBJECT:

ITW BUILDEX TAPCON® SCREW ANCHORS AND SAMMYS® SCREW ANCHORS FOR USE IN CRACKED AND UNCRACKED CONCRETE

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2012, 2009, and 2006 *International Building Code®* (IBC)
- 2012, 2009 and 2006 *International Residential Code®* (IRC)
- 1997 *Uniform Building Code™* (UBC)

Property evaluated:

Structural

2.0 USES

The $^{3}/_{16}$-inch- and $^{1}/_{4}$-inch-diameter (4.8 mm and 6.4 mm) Tapcon® Screw Anchors with Advanced Threadform Technology are used to resist static and wind, tension and shear loads in uncracked normal-weight and sand-lightweight concrete having a specified compressive strength f'_c = 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa).

The $^{5}/_{16}$-inch-, $^{3}/_{8}$-inch-, and $^{1}/_{2}$-inch-diameter (7.9 mm, 9.5 mm and 12.7 mm) Tapcon® Screw Anchors with Advanced Threadform Technology are used to resist static, wind, and seismic tension and shear loads in cracked and uncracked normal-weight and sand-lightweight concrete having a specified compressive strength f'_c = 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa).

The $^{1}/_{2}$-inch-diameter (12.7 mm) Tapcon® Screw Anchors with Advanced Threadform Technology are used to resist static, wind, and seismic tension and shear loads when installed in the soffit of cracked and uncracked normal-weight and sand-lightweight concrete over steel deck having a minimum specified compressive strength f'_c = 3,000 psi (20.7 MPa).

The $^{5}/_{16}$-inch-diameter (7.9 mm) SAMMYS® Screw Anchors for Threaded Rod are used to resist static and wind tension and shear loads and seismic tension loads only in cracked and uncracked normal-weight and sand-lightweight concrete having a specified compressive strength f'_c = 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa).

The anchoring system is an alternative to anchors described in Sections 1908 and 1909 of the 2012 IBC, Sections 1911 and 1912 of the 2009 and 2006 IBC and Sections 1923.1 and 1923.2 of the UBC. 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 Tapcon® Screw Anchors with Advanced Threadform Technology:

The Tapcon® Screw Anchors with Advanced Threadform Technology are manufactured from carbon steel with supplementary heat treatment. The anchors have an alternating high-low thread form on the shank and are available a variety of lengths with nominal diameters of $^{3}/_{16}$ inch, $^{1}/_{4}$ inch, $^{5}/_{16}$ inch, $^{3}/_{16}$ inch, and $^{1}/_{2}$ inch (4.8 mm, 6.4 mm, 7.9 mm, 9.5 mm and 12.7 mm). The $^{3}/_{16}$-inch- and $^{1}/_{4}$-inch-diameter (4.8 mm and 6.4 mm) Tapcon® Screw Anchors are available with a slotted hex washer head or Phillips flat head, and have a blue Climaseal® coating. The $^{5}/_{16}$-inch-, $^{3}/_{16}$-inch- and $^{1}/_{2}$-inch-diameter (7.9 mm, 9.5 mm and 12.7 mm) Tapcon® Screw Anchors are available with a hex washer head, and have a blue Climaseal® coating. Illustrations of anchors are provided in Figure 1.

3.2 SAMMYS® Screw Anchors for Threaded Rod:

The SAMMYS® Screw Anchor for Threaded Rod is a two-piece, carbon steel threaded anchor that is comprised of the $^{5}/_{16}$-inch-diameter (7.9 mm) Tapcon® Screw Anchor

with Advanced Threadform Technology and a $^3/_8$-inch-16 UNC internal thread hex shaped cap. The hex shaped cap is manufactured from carbon steel alloy complying with UNS G1010 heat treated steel and has an electrodeposited coating of zinc, minimum thickness of 0.0002 inch (5 µm), in accordance with ASTM B633, SC1, Type III. The SAMMYS® Screw Anchors for Threaded Rod are available with a $^5/_{16}$-inch (7.9 mm) diameter and a $2^1/_4$-inch (57.2 mm) length. Figure 3 illustrates a typical SAMMYS® Screw Anchor for Threaded Rod with its torque limiting installation tool. The installation tool is designed to prevent over torque conditions upon installation. The design also permits the nut driver to release from the head of the anchor once fully installed.

3.3 Concrete:

Normal-weight and sand-lightweight concrete must comply with Sections 1903 and 1905 of the IBC or UBC, as applicable.

3.4 Steel Deck Panels:

Steel deck panels must comply with the configurations in Figure 6 and have a minimum base steel thickness of 0.034 inch (0.864 mm). Steel must comply with ASTM A653 Grade 40, with a minimum yield strength of 40,000 psi (276 MPa).

4.0 DESIGN AND INSTALLATION

4.1 Strength Design:

4.1.1 General: Design strength of anchors complying with the 2012 IBC, the UBC and Section R301.1.3 of the 2012 IRC, must be determined in accordance with ACI 318-11 Appendix D and this report.

Design strength of anchors complying with the 2009 IBC and Section R301.1.3 of the 2009 IRC must be determined in accordance with ACI 318-08 Appendix D and this report.

Design strength of anchors complying with the 2006 IBC and Section R301.1.3 of the 2006 IRC must be determined in accordance with ACI 318-05 Appendix D and this report.

Design parameters and references to ACI 318 are based on the 2012 IBC (ACI 318-11) unless noted otherwise in Sections 4.1.2 through 4.1.12 of this report. The strength design must comply with ACI 318 D.4.1, except as required in ACI 318 D.3.3.

Strength reduction factors, ϕ, as given in ACI 318-11 Section D.4.3, and noted in Tables 2, 3, and 5 must be used for load combinations calculated in accordance with Section 1605.2.1 of the IBC, Section 9.2 of ACI 318, or Section 1612.2 of the UBC. Strength reduction factors as given in ACI 318-11 D.4.4 must be used for load combinations set forth in ACI 318 Appendix C or UBC Section 1909.2.

The value of f'_c used in the calculations must be limited to a maximum of 8,000 psi (55.2 MPa), in accordance with ACI 318-11 D.3.7. Design parameters are provided in Table 1.

4.1.2 Requirements for Static Steel Strength in Tension: The nominal static steel strength of a single anchor in tension is calculated in accordance with ACI 318 D.5.1.2. The N_{sa} values of a single anchor are given in Table 2 of this report. Strength reduction factors, ϕ, corresponding to brittle steel elements as defined in ACI 318 D.1, and provided in Table 2, must be used.

4.1.3 Requirements for Static Concrete Breakout Strength in Tension: The nominal static concrete breakout strength for a single anchor or group of anchors in tension, N_{cb} or N_{cbg}, must be calculated in accordance with ACI 318 D.5.2, with modifications as described in this section. The basic concrete breakout strength in tension, N_b, must be calculated in accordance with ACI 318 D.5.2.2, using the values of h_{ef} and k_{cr} as given in Table 2. The nominal concrete breakout strength in tension in regions of concrete where analysis indicates no cracking at service loads in accordance with ACI 318 D.5.2.6 must be calculated using the values of k_{uncr} as given in Table 2 of this report with $\psi_{c,N} = 1.0$.

For $^1/_2$-inch-diameter (12.7 mm) Tapcon® Screw Anchors installed in the soffit of sand-lightweight or normal-weight concrete on steel deck floor and roof assemblies, as shown in Figure 6, calculation of the concrete breakout strength is not required.

4.1.4 Requirements for Static Pullout Strength in Tension: The nominal pullout strength of a single anchor in tension in accordance with ACI 318 D.5.3 in cracked and uncracked concrete, $N_{p,cr}$ and $N_{p,uncr}$, respectively, is given in Table 2 of this report. For all design cases $\Psi_{c,P} = 1.0$. In accordance with ACI 318 D.5.3, the nominal pullout strength in cracked concrete may be adjusted for concrete strengths according to Eq-1:

$$N_{p,f'_c} = N_{p,cr}\left(\frac{f'_c}{2{,}500}\right)^n \quad \text{(lb,psi)} \qquad \text{(Eq-1)}$$

$$N_{p,f'_c} = N_{p,cr}\left(\frac{f'_c}{17.2}\right)^n \quad \text{(N, MPa)}$$

where f'_c is the specified compressive strength and n is the factor defining the influence of concrete strength on the pullout strength. For the $^3/_8$-inch-diameter anchor in cracked concrete, n is 0.12. For all other diameters, n is 0.5.

In regions where analysis indicates no cracking in accordance with ACI 318 D.5.3.6, the nominal pullout strength in tension may be adjusted for concrete strengths according to Eq-2:

$$N_{p,f'_c} = N_{p,uncr}\left(\frac{f'_c}{2{,}500}\right)^n \quad \text{(lb,psi)} \qquad \text{(Eq-2)}$$

$$N_{p,f'_c} = N_{p,uncr}\left(\frac{f'_c}{17.2}\right)^n \quad \text{(N, MPa)}$$

where f'_c is the specified compressive strength and n is the factor defining the influence of concrete strength on the pullout strength. For all diameters, n is 0.5.

Where values for $N_{p,cr}$ or $N_{p,uncr}$ are not provided in Table 2, the pullout strength in tension need not be evaluated.

The nominal pullout strength in cracked concrete of the $^1/_2$-inch-diameter (12.7 mm) Tapcon® Screw Anchor installed in the soffit of sand-lightweight or normal-weight concrete on steel deck floor and roof assemblies, as shown in Figure 6, is given in Table 5. In accordance with ACI 318 D.5.3.2, the nominal pullout strength in cracked concrete must be calculated in accordance with Eq-1, whereby the value of $N_{p,deck,cr}$ must be substituted for $N_{p,cr}$ and the value of 3,000 psi (20.7 MPa) must be substituted for the value of 2,500 psi (17.2 MPa) in the denominator. In regions where analysis indicates no cracking in accordance with ACI 318 D.5.3.6, the nominal strength in uncracked concrete must be calculated according to Eq-2, whereby the value of $N_{p,deck,uncr}$ must be substituted for $N_{p,uncr}$ and the value of 3,000 psi (20.7 MPa) must be

substituted for the value of 2,500 psi (17.2 MPa) in the denominator.

4.1.5 Requirements for Static Steel Strength in Shear: The nominal steel strength in shear, V_{sa}, of a single anchor in accordance with ACI 318 D.6.1.2 is given in Table 3 of this report and must be used in lieu of the values derived by calculation from ACI 318-11, Eq. D-29. Strength reduction factors, ϕ, corresponding to brittle steel elements as defined in ACI 318 D.1, and provided in Table 3, must be used.

The nominal shear strength $V_{sa,deck}$, of anchors installed in the soffit of sand-lightweight of normal-weight concrete filled steel deck floor and roof assemblies, as shown in Figure 6, is given in Table 5.

4.1.6 Requirements for Static Concrete Breakout Strength of Anchor in Shear: The nominal static concrete breakout strength of a single anchor or group of anchors in shear, V_{cb} or V_{cbg}, must be calculated in accordance with ACI 318 D.6.2, with modifications as described in this section. The basic concrete breakout strength of a single anchor in shear, V_b, must be calculated in accordance with ACI 318 D.6.2.2 based on the values provided in Table 2. The value of l_e used in ACI 318-11 Eq. D-33 must be taken as no greater than the lesser of h_{ef} or $8d_a$.

For $^1/_2$-inch-diameter (12.7 mm) Tapcon® Screw Anchors installed in the soffit of sand-lightweight or normal-weight concrete on steel deck floor and roof assemblies, as shown in Figure 6, calculation of the concrete breakout strength in shear is not required.

4.1.7 Requirements for Static Concrete Pryout Strength in Shear: The nominal static concrete pryout strength of a single anchor or group of anchors in shear, V_{cp} or V_{cpg}, must be calculated in accordance with ACI 318 D.6.3, using the value of k_{cp} described in Table 3, and the values of N_{cb} or N_{cbg} as calculated in Section 4.1.3 of this report.

For $^1/_2$ inch (12.7 mm) diameter Tapcon® Screw Anchors installed in the soffit of sand-lightweight or normal-weight concrete on steel deck floor and roof assemblies, as shown in Figure 6, calculation of the concrete pryout strength in shear is not required.

4.1.8 Requirements for Seismic Design:

4.1.8.1 General: For load combinations including seismic, the design must be performed according to ACI 318 D.3.3. For the 2012 IBC, Section 1905.1.9 must be omitted. Modifications to ACI 318 D.3.3 must be applied under Section 1908.1.9 of the 2009 IBC or Section 1908.1.16 of the 2006 IBC. The nominal steel strength and the nominal concrete breakout strength for anchors in tension, and the nominal concrete breakout strength and pryout strength for anchors in shear, must be calculated according to ACI 318 D.5 and D.6, respectively, taking into account the corresponding values given in Tables 1, 2, 3 and 5 of this report. The anchors comply with ACI 318 D.1 as brittle steel elements and must be designed in accordance with ACI 318-11 D.3.3.4, D.3.3.5 or D.3.3.6; or ACI 318-08 D.3.3.4, D.3.3.5 or D.3.3.6; or ACI 318-05 D.3.3.4 or D.3.3.5, as applicable.

The $^3/_{16}$-inch and $^1/_4$-inch (4.8 and 6.4 mm) Tapcon® Screw Anchors must be limited to installation in regions designated as IBC Seismic Design Categories A and B only, or UBC Seismic Zones 0, 1, and 2A. The $^5/_{16}$-inch-, $^3/_8$-inch-, and $^1/_2$-inch-diameter (7.9 mm, 9.5 mm and 12.7 mm) Tapcon® Screw Anchors may be installed in regions designated as IBC Seismic Design Categories A through F or UBC Seismic Zones 0, 1, 2A, 2B, 3 and 4.

The $^5/_{16}$-inch (7.9 mm) SAMMYS® Screw Anchors for Threaded Rod are limited to seismic tension loads only. Seismic shear loads are beyond the scope of this report. The SAMMYS® Screw Anchors for Threaded Rod may be installed in regions designated as IBC Seismic Design Categories A through F or UBC Seismic Zones 0, 1, 2A, 2B, 3 and 4.

4.1.8.2 Seismic Tension: The nominal steel strength and nominal concrete breakout strength for anchors in tension must be calculated according to ACI 318 D.5.1 and D.5.2, as described in Sections 4.1.2 and 4.1.3 of this report. In accordance with ACI 318 D.5.3.2, the value for nominal pullout strength in tension for seismic loads, $N_{p,eq}$ or $N_{p,deck,cr}$, given in Table 2 and Table 5 of this report, must be used in lieu of N_p. The values of $N_{p,eq}$ or $N_{p,deck,cr}$ must be adjusted for the concrete strength in accordance with Eq-2 and Section 4.1.4 whereby the value of $N_{p,deck,cr}$ must be substituted for $N_{p,cr}$ and the value of 3,000 psi (20.7MPa) must be substituted for the value of 2,500 psi (17.2 MPa) in the denominator. If no values for $N_{p,eq}$ are given in Table 2 or Table 5, the static design strength values govern.

4.1.8.3 Seismic Shear: The nominal concrete breakout strength and pryout strength for anchors in shear must be calculated according to ACI 318 D.6.2 and D.6.3, as described in Sections 4.1.6 and 4.1.7 of this report. In accordance with ACI 318 D.6.1.2, the value for nominal steel strength in shear for seismic loads, $V_{sa,eq}$, or $V_{sa,deck}$, given in Tables 3 or 5 of this report, must be used in lieu of $V_{sa,}$ as applicable.

4.1.9 Requirements for Interaction of Tensile and Shear Forces: For designs that include combined tension and shear, the interaction of tension and shear loads must be calculated in accordance with ACI 318 D.7.

4.1.10 Requirements for Critical Edge Distance: In applications where $c < c_{ac}$ and supplemental reinforcement to control splitting of the concrete is not present, the concrete breakout strength in tension for uncracked concrete, calculated in accordance with ACI 318 D.5.2, must be further multiplied by the factor $\psi_{cp,N}$ given by Eq-3:

$$\Psi_{cp,N} = \frac{c}{c_{ac}} \qquad \text{(Eq-3)}$$

whereby the factor $\Psi_{cp,N}$ need not be taken as less than $\frac{1.5h_{ef}}{c_{ac}}$. For all other cases, $\Psi_{cp,N} = 1.0$. In lieu of ACI 318 D.8.6, the values for the critical edge distance, c_{ac}, must be taken from Table 1.

4.1.11 Requirements for Minimum Member Thickness, Minimum Anchor Spacing and Minimum Edge Distance: In lieu of ACI 318 D.8.1 and D.8.3, values of s_{min} and c_{min} as given in Table 1 of this report must be used. In lieu of ACI 318 D.8.5, minimum concrete thickness h_{min} as given in Table 1 of this report must be used.

For $^1/_2$-inch-diameter (12.7 mm) Tapcon® Screw Anchors installed in the soffit of sand-lightweight or normal-weight concrete on steel deck floor and roof assemblies, the anchors must be installed in accordance with Figure 6 and must have an axial spacing along the flute equal to the greater of $3h_{ef}$ or 1.5 times the flute width.

4.1.12 Sand-lightweight Concrete: For ACI 318-11 and ACI 318-08, when anchors are used in sand-lightweight concrete, the modification factor, λ_a or λ, respectively, for

concrete breakout strength must be taken as 0.6 in lieu of ACI 318-11 D.3.6 (2012 IBC) or ACI 318-08 D.3.4 (2009 IBC). In addition, the pullout strength $N_{p,cr}$, $N_{p,uncr}$ and $N_{p,eq}$ must be multiplied by 0.6, as applicable.

For ACI 318-05, the values N_b, $N_{p,cr}$, $N_{p,uncr}$, $N_{p,eq}$ and V_b determined in accordance with this report must be multiplied by 0.6, in lieu of ACI 318 D.3.4.

For $^1/_2$-inch-diameter (12.7 mm) Tapcon® Screw Anchors installed in the soffit of sand-lightweight or normal-weight concrete on steel deck floor and roof assemblies, this reduction is not required. Values are presented in Table 5 and installation details are shown in Figure 6.

4.2 Allowable Stress Design:

4.2.1 General: Design values for use with allowable stress design (working stress design) load combinations calculated in accordance with Section 1605.3 of the IBC, must be established as follows**:**

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

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

where:

$T_{allowable,\ ASD}$ = Allowable tension load (lbf or kN).

$V_{allowable,\ ASD}$ = Allowable tension load (lbf or kN).

ϕN_n = Lowest design strength of an anchor or anchor group in tension as determined in accordance with ACI 318 Appendix D, Section 4.1 of this report and 2009 IBC Section 1908.1.9 or 2006 IBC Section 1908.1.16, as applicable (lbf or kN).

ϕV_n = Lowest design strength of an anchor or anchor group in shear as determined in accordance with ACI 318 Appendix D Section 4.1 of this report and 2009 IBC Section 1908.1.9 or 2006 IBC Section 1908.1.16, as applicable (lbf or kN).

α = Conversion factor calculated as a weighted average of the load factors for the controlling load combination. In addition, α must include all applicable factors to account for nonductile failure modes and required over-strength.

Limits on edge distance, anchor spacing and member thickness as given in Section 4.1.11 of this report must apply. An illustrative example of allowable stress design values is shown in Table 4.

4.2.2 Interaction of Tensile and Shear Forces: The interaction must be calculated and consistent with ACI 318 D.7 as follows:

If $T_{applied} \le 0.2\ T_{allowable,ASD}$, the full allowable load in shear $V_{allowable,ASD}$ shall be permitted.

If $V_{applied} \le 0.2\ V_{allowable,ASD}$, the full allowable load in tension $T_{allowable,ASD}$ shall be permitted.

For all other cases:

$$\frac{T_{applied}}{T_{allowable,ASD}} + \frac{V_{applied}}{V_{allowable,ASD}} \le 1.2 \quad \text{(Eq-6)}$$

4.3 Installation:

Installation parameters are provided in Table 1 and Figures 4 and 6 of this report. The Tapcon® Screw Anchors and SAMMYS® Screw Anchors for Threaded Rod must be installed in accordance with 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.

4.3.1 Tapcon® Screw Anchors with Advanced Threadform Technology: The $^3/_{16}$-inch- and $^1/_4$-inch-diameter (4.8 and 6.4 mm) Tapcon® Screw Anchors must be installed according to ITW's published instructions and this report. Holes must be predrilled in concrete 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 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.

The $^5/_{16}$-inch-, $^3/_8$-inch-, and $^1/_2$-inch-diameter (7.9 mm, 9.5 mm and 12.7 mm) Tapcon® Screw Anchors must be installed according to ITW's published instructions and this report. For the $^5/_{16}$-inch-diameter (7.9 mm) anchor, the holes must be predrilled in concrete with a carbide-tipped drill bit complying with ANSI B212.15-1994 or a Tapcon® carbide-tipped drill bit, supplied by ITW. For the $^3/_8$-inch- and $^1/_2$-inch-diameter (9.5 mm and 12.7 mm) anchors, the holes must be predrilled in concrete with a carbide-tipped drill bit complying with ANSI B212.15-1994. The hole must be drilled to the specified minimum hole depth, h_{hole}, in accordance with Table 1. Before anchor installation, dust and other debris must be removed by use of 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 powered impact wrench or manual torque wrench until the proper embedment depth is obtained. The maximum impact wrench torque and maximum installation torque for the manual torque wrench must be in accordance with Table 1. The Tapcon® Screw Anchors may be loosened by a maximum of one turn and retightened with a manual torque wrench or powered impact wrench to facilitate fixture attachment or realignment. Complete removal and reinstallation of the anchor is not allowed.

For installation of the $^1/_2$-inch-diameter (12.7 mm) Tapcon® Screw Anchor in the soffit of concrete on steel deck assemblies, the hole diameter in the steel deck must not exceed the diameter of the hole in the concrete by more than $^1/_8$ inch (3.2 mm). For member thickness and edge distance restrictions for installations into the soffit of concrete on steel deck assemblies, see Figure 6.

4.3.2 SAMMYS® Anchors with Advanced Threadform Technology: The Sammys® Screw Anchors for Threaded Rod must be installed according to ITW's published instructions and this report. Holes must be predrilled in concrete with a Tapcon® carbide-tipped drill bit complying with ANSI B212.15-1994, 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 by use of compressed air. The anchors must then be installed into the hole, in accordance with ITW's instructions, to the

specified nominal embedment depth using a powered impact wrench in conjunction with the ITW torque limiting nut driver until the proper embedment depth is obtained. Removal and reinstallation of the anchor is not allowed.

4.4 Special Inspection:

Periodic special inspection is required in accordance with Section 1705.1.1 and Table 1705.3 of the 2012 IBC, or Section 1704.15 and Table 1704.4 of the 2009 IBC, or Section 1704.13 of the 2006 IBC and Section 1701.5.2 of the UBC, as applicable. The special inspector must make periodic inspections during anchor installation to verify anchor type, anchor dimensions, concrete type, concrete compressive strength, hole dimensions, anchor spacing, edge distances, concrete thickness, anchor embedment, drill bit type and size, hole cleaning procedures, installation torque, and adherence to the manufacturer's published installation instructions and the conditions of this report (in case of conflict, this report governs). The special inspector must be present as often as required in accordance with the "statement of special inspection."

5.0 CONDITIONS OF USE

The Tapcon® Screw Anchors and SAMMYS® Screw Anchors for Threaded Rod 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, embedment, and installation are as set forth in this report.

5.2 The anchors must be installed in accordance with the manufacturer's published installation instructions and this report. In case of conflict, this report governs.

5.3 The $^3/_{16}$- and $^1/_4$-inch-diameter (4.8 mm and 6.4 mm) anchors must be limited to use in uncracked normal-weight concrete and sand-lightweight concrete having a specified compressive strength, f'_c, of 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa).

5.4 The $^5/_{16}$-inch-, $^3/_8$-inch-, and $^1/_2$-inch-diameter (7.9 mm, 9.5 mm and 12.7 mm) anchors must be used in cracked and uncracked normal-weight concrete and sand-lightweight concrete having a specified compressive strength, f'_c, of 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa).

5.5 The $^1/_2$-inch-diameter (12.7 mm) anchor may be used in cracked and uncracked normal-weight or sand-lightweight concrete over metal deck having a minimum specified compressive strength, f'_c, of 3,000 psi (20.7 MPa).

5.6 The values of f'_c used for calculation purposes must not exceed 8,000 psi (55.1 MPa).

5.7 Strength design values must be established in accordance with Section 4.1 of this report.

5.8 Allowable stress design values must be established in accordance with Section 4.2 of this report.

5.9 Anchor spacing, edge distance, and minimum concrete thickness must comply with Section 4.1.11, Table 1, and Figure 6 of this report.

5.10 Reported values for the SAMMYS® Screw Anchors for Threaded Rod do not consider the steel element threaded into the anchor, which must be verified by the design professional.

5.11 Prior to installation, calculations and details demonstrating compliance with this report must be submitted to the code official for approval. The calculations and details must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

5.12 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.

5.13 The $^3/_{16}$-inch- and $^1/_4$-inch-diameter (4.8 and 6.4 mm) Tapcon® Screw Anchors may be used to resist short-term loading due to wind forces and for seismic load combinations in locations designated as Seismic Design Categories A and B under the IBC and Seismic Zones 0, 1 and 2A under the UBC, subject to the conditions of this report.

5.14 The $^5/_{16}$-inch-, $^3/_8$-inch-, and $^1/_2$-inch-diameter (7.9 mm, 9.5 mm, and 12.7 mm) Tapcon® Screw Anchors may be used to resist short-term loading due to wind forces and for seismic load combinations in locations designated as Seismic Design Categories A through F under the IBC and Seismic Zones 0, 1 2A, 2B, 3 and 4 under the UBC, subject to the conditions of this report.

5.15 The $^5/_{16}$-inch-diameter (7.9 mm) SAMMYS® Screw Anchors for Threaded Rod may be used to resist short-term loading due to wind forces and seismic tension loads only in locations designated as Seismic Design Categories A through F under the IBC, and Seismic Zones 0, 1 2A, 2B, 3 and 4 under the UBC, subject to the conditions of this report.

5.16 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 only.
- Anchors that support 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.

5.17 The anchors have been evaluated for reliability against brittle failure and found to be not significantly sensitive to stress-induced hydrogen-embrittlement.

5.18 The design of anchor groups in accordance with ACI 318 Appendix D is valid for screw anchors with a thread length of at least 80 percent of the nominal embedment depth. Anchors with a thread length less than 80 percent of the nominal embedment depth shall be designed as single anchors.

5.19 Use of anchors must be limited to dry, interior locations.

5.20 Special inspection must be provided in accordance with Section 4.4 of the report.

5.21 Anchors are manufactured in the U.S.A. under an approved quality control program with inspections by CEL Consulting (AA-639) and PFS Corporation (AA-652).

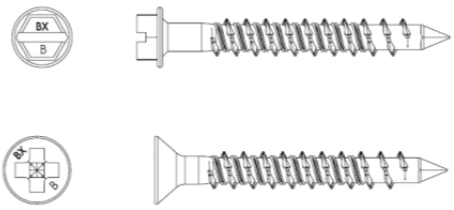
6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Mechanical Anchors in Concrete Elements (AC193), dated June 2012; and quality control documentation.

7.0 IDENTIFICATION

The Tapcon® Screw Anchors and SAMMYS® Screw Anchors for Threaded Rod are identified by packaging labeled with the manufacturer's name (ITW Buildex or ITW Brands) and contact information, anchor name, anchor size, evaluation report number (ICC-ES ESR-2202), and the logo of the inspection agency (CEL Consulting or PFS Corporation). The letters "BX" and a length identification code letter are stamped on the head of each anchor. See the length identification system illustrated in Figure 2 of this report.

FIGURE 1—TAPCON® SCREW ANCHOR WITH ADVANCED THREADFORM TECHNOLOGY



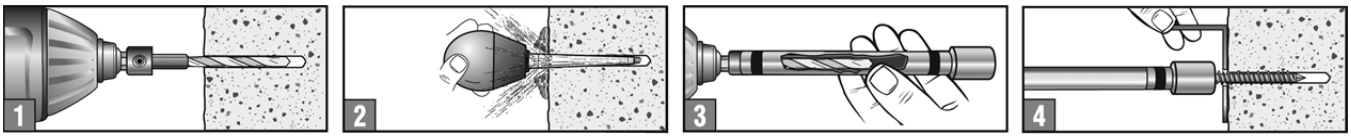
LENGTH MARKING ON ANCHOR HEAD			A	B	C	D	E	F	G	H	I	J
Length of anchor (inches)	From	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6
	Up to, but not including	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2

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

FIGURE 2—LENGTH IDENTIFICATION SYSTEM

FIGURE 3—SAMMYS® SCREW ANCHOR FOR THREADED ROD

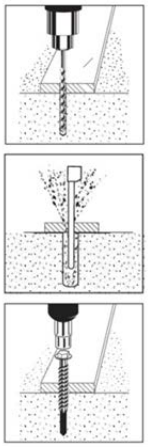
Installation Instructions for $^{3}/_{16}$" and $^{1}/_{4}$" diameter Tapcon® Screw Anchors



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) Drive anchor thru fixture and into hole until nut driver spins free from head of anchor.

Installation Instructions for $^{5}/_{16}$", $^{3}/_{8}$" and $^{1}/_{2}$" diameter Tapcon® Screw Anchors

Installation Steps for Concrete, Lightweight Concrete and Metal Deck



1. Using a carbide drill bit, drill a hole at least 1/4" deeper than anchor embedment.
2. Clean hole with pressurized air or vacuum to remove any excess dust/debris.
3. Using an impact or manual wrench, insert anchor into hole and tighten anchor until fully seated.

ANCHOR DIA	DRILL BIT DIAMETER[1]	ANCHOR HEAD (SOCKET SIZE) DIAMETER	WASHER DIAMETER	MANUAL WRENCH MAX TORQUE[2]	IMPACT WRENCH MAX TORQUE RATING
5/16"	1/4"*	3/8"	1/2"	20 FT LBS	115 FT LBS
3/8"	3/8"	9/16"	13/16"	50 FT LBS	200 FT LBS
1/2"	1/2"	3/4"	1"	70 FT LBS	345 FT LBS

1 A 1/4" Tapcon drill bit may also be used for installation of the 5/16" anchor.
2 For manual installation, use a torque wrench to verify that the maximum installation torque has not been exceeded.

Installation Steps for Concrete

1. Using a $^{1}/_{4}$" Tapcon drill bit, drill a hole at least $^{1}/_{4}$" deeper than anchor embedment.
2. Clean hole with compressed air to remove any excess dust/debris.
3. Insert torque-limiting black nut driver marked SAMMYS #14 into the drill.
4. Insert the anchor into the nut driver, position the anchor into hole and tighten anchor until nut driver spins free on cap of anchor.

Anchor Model	Torque-Limiting Nut Driver (Color)	Installation Orientation	Rod Size
CST 516	#14 (Black)	Vertical	3/8"

FIGURE 4—INSTALLATION INSTRUCTIONS FOR TAPCON® SCREW ANCHOR AND SAMMYS® SCREW ANCHOR FOR THREADED ROD

TABLE 1—INSTALLATION INFORMATION FOR TAPCON® SCREW ANCHOR AND SAMMYS® SCREW ANCHOR FOR THREADED ROD[1,6]

CHARACTERISTIC	SYMBOL	UNITS	NOMINAL ANCHOR DIAMETER (inch)								
			3/16	1/4	5/16			3/8	1/2		
Head Style	—	—	Hex Head/Phillips Head	Hex Head/Phillips Head	Hex Head		Sammys® (internally threaded)	Hex Head	Hex Head		
Nominal Outside diameter	d_a (d_o)[3]	in.	0.14	0.18	0.24		0.24	0.37	0.50		
Drill bit specification	d_{bit}	in.	5/32 Tapcon® Bit	3/16 Tapcon® Bit	1/4 Tapcon® Bit	1/4 ANSI Bit	1/4 Tapcon® Bit	3/8 ANSI Bit	1/2 ANSI Bit		
Minimum base plate clearance hole diameter	d_h	in.	3/16	1/4	5/16		Not applicable	3/8	1/2		
Maximum installation torque[5]	$T_{inst,\ max}$	ft-lbf	Not applicable[4]	Not applicable[4]	20		Not applicable[4]	50	70		
Maximum Impact Wrench Torque Rating	$T_{impact,\ max}$	ft-lbf	Not applicable[4]	Not applicable[4]	115		Not applicable[4]	200	345		
Minimum effective embedment depth	h_{ef}	in.	1.50	1.50	1.45		1.67	1.78	1.32	2.17	3.02
Minimum nominal embedment depth[6]	h_{nom}	in.	2.00	2.10	2.00		2.25	2.50	2.00	3.00	4.00
Minimum hole depth	h_{hole}	in.	2.25	2.35	2.25		2.50	2.75	2.25	3.25	4.25
Minimum concrete member thickness	h_{min}	in.	4	4	4			4	4	6	
Critical edge distance	c_{ac}	in.	4	4	$2^1/_2$			$4^1/_2$	3	4	5
Minimum edge distance	c_{min}	in.	2	$2^1/_2$	$1^1/_2$			$1^1/_2$	$2^1/_2$	$1^3/_4$	$2^1/_2$
Minimum spacing	s_{min}	in.	3	4	3			3	3	$3^1/_2$	3

For **SI:** 1 inch = 25.4 mm, 1 ft-lbf = 1.356 N-m.

[1]The data presented in this table is to be used in conjunction with the design criteria of ACI 318 Appendix D.
[2]The Sammys® Anchor is installed without a base plate, directly into the concrete.
[3]For the 2006 IBC, d_o replaced d_a.
[4]Installation must be performed with an ITW Buildex Condrive® Tool and drive socket, or ITW torque limiting nut driver, as applicable. See Section 4.3 for additional information.
[5]$T_{inst,max}$ applies to installations using a calibrated torque wrench.
[6]For the 3/8-inch-, and 1/2-inch-diameter Tapcon® anchors, the design of anchor groups in accordance with ACI 318 Appendix D is only valid for screw anchors with a thread length of at least 80 percent of the nominal embedment depth. Anchors with a thread length less than 80 percent of the nominal embedment depth shall be designed as single anchors.

TABLE 2—TENSION STRENGTH DESIGN INFORMATION FOR TAPCON® SCREW ANCHOR AND SAMMYS® SCREW ANCHOR FOR THREADED ROD[1]

CHARACTERISTIC	SYMBOL[5]	UNITS	NOMINAL ANCHOR DIAMETER (inch)[4]										
			$^3/_{16}$	$^1/_4$	$^5/_{16}$			$^3/_8$	$^1/_2$				
Head Style	—	—	Hex Head/ Phillips Head	Hex Head/ Phillips Head	Hex Head		Sammys® (internally threaded)	Hex Head	Hex Head				
Drill bit specification		in.	$^5/_{32}$ Tapcon® Bit	$^3/_{16}$ Tapcon® Bit	$^1/_4$ Tapcon® Bit	$^1/_4$ ANSI Bit	$^1/_4$ Tapcon® Bit	$^3/_8$ ANSI Bit	$^1/_2$ ANSI Bit				
Anchor category	1, 2 or 3	—	1	1	1	2	1	1	1				
Minimum effective embedment depth	h_{ef}	in.	1.50	1.50	1.45		1.45	1.78	1.32	2.17	3.02		
Minimum concrete member thickness	h_{min}	in.	4	4	4		4	4	4	6			
Critical edge distance	c_{ac}	in.	4	4	2 $^1/_2$		2 $^1/_2$	4 $^1/_2$	3	4	5		
Data for Steel Strength in Tension													
Minimum specified yield strength	f_y	psi	100,000	100,000	100,000		Not applicable	100,000	100,000				
Minimum specified ultimate strength	f_{uta} (f_{ut})[5]	psi	125,000	125,000	125,000		Not applicable	125,000	125,000				
Effective tensile stress area	A_{se}	in^2	0.0147	0.0241	0.0470		Not applicable	0.098	0.1850				
Steel strength in tension	N_{sa}	lbf	2,025	3,800	5,900		1,822	12,250	23,125				
Strength reduction factor ϕ for tension, steel failure modes[2]	ϕ_{sa}	—	0.65	0.65	0.65		0.65	0.65	0.65				
Data for Concrete Breakout Strength in Tension													
Effectiveness factor - uncracked concrete	k_{uncr}	—	24	24	24		24	27	30				
Effectiveness factor - cracked concrete	k_{cr}	—	Not applicable	Not applicable	17		17	17	17				
Modification factor for cracked and uncracked concrete[3]	$\Psi_{c,N}$ (Ψ_3)[5]	—	1.0	1.0	1.0		1.0	1.0	1.0				
Strength reduction factor ϕ for tension, concrete failure modes, Condition B[3]	ϕ_{cb}	—	0.65	0.65	0.65	0.55	0.65	0.65	0.65				
Data for Pullout Strength in Tension													
Pullout strength, uncracked concrete	$N_{p,uncr}$	lbf	590	795	2,107		2,107	See Footnote 4	See Footnote 4				
Pullout strength, cracked concrete	$N_{p,cr}$	lbf	Not applicable	Not applicable	857		857	1,837	See Footnote 4				
Pullout strength for seismic loads	$N_{p,eq}$	lbf	Not applicable	Not applicable	857		857	1,677	See Footnote 4				
Strength reduction factor ϕ for tension, pullout failure modes, Condition B[3]	ϕ_p	—	0.65	0.65	0.65	0.55	0.65	0.65	See Footnote 4				
Additional Anchor Data													
Axial stiffness in service load range in uncracked concrete	β_{uncr}	lbf /in	317,000	467,000	385,000		385,000	800,000	800,000				
Axial stiffness in service load range in cracked concrete	β_{cr}	lbf /in	n/a	n/a	225,000		225,000	365,000	365,000				

For **SI:** 1 inch = 25.4 mm, 1 ft-lbf = 1.356 N-m.

[1]The data presented in this table is to be used in conjunction with the design criteria of ACI 318 Appendix D.
[2]The tabulated value of ϕ_{sa} applies when the load combinations of Section 1605.2.1 of the IBC or ACI 318 Section 9.2 are used. If the load combinations of ACI 318 Appendix C are used, the appropriate value of ϕ must be determined in accordance with ACI 318-11 D.4.4(b).
[3]The tabulated value of ϕ_{cb} and ϕ_{cp} applies when the load combinations of Section 1605.2.1 of the IBC or ACI 318 Section 9.2 are used and the requirements of ACi 318-11 D.4.3(c) for Condition B are met. If the load combinations of ACI 318 Appendix C are used, the appropriate value of ϕ must be determined in accordance with ACI 318-11 D.4.4(c) for Condition B.
[4]Pullout resistance does not govern design and does not need to be considered.
[5]The notation in parentheses is for the 2006 IBC.

TABLE 3—SHEAR STRENGTH DESIGN INFORMATION FOR TAPCON® SCREW ANCHOR AND SAMMYS® SCREW ANCHOR FOR THREADED ROD [1]

CHARACTERISTIC	SYMBOL[5]	UNITS	NOMINAL ANCHOR DIAMETER (inch)[4]								
			3/16	1/4	5/16			3/8	1/2		
Head Style	—	—	Hex Head/Phillips Head	Hex Head/Phillips Head	Hex Head		Sammys® (internally threaded)	Hex Head	Hex Head		
Drill bit specification		in.	5/32 Tapcon® Bit	3/16 Tapcon® Bit	1/4 Tapcon® Bit	1/4 ANSI Bit	1/4 Tapcon® Bit	3/8 ANSI Bit	1/2 ANSI Bit		
Anchor category	1, 2 or 3	—	1	1	1	2	1	1	1		
Minimum effective embedment depth	h_{ef}	in.	1.50	1.50	1.45		1.45	1.78	1.32	2.17	3.02
Minimum concrete member thickness	h_{min}	in.	4	4	4		4	4	4	6	
Critical edge distance	c_{ac}	in.	4	4	2 1/2		2 1/2	4 1/2	3	4	5
Data for Steel Strengths in Shear											
Minimum specified yield strength	f_y	psi	100,000	100,000	100,000		Not applicable	100,000	100,000		
Minimum specified ultimate strength	f_{uta} (f_{ut})[4]	psi	125,000	125,000	125,000		Not applicable	125,000	125,000		
Effective shear stress area	A_{se}	in^2	0.0147	0.0241	0.047		Not applicable	0.098	0.185		
Steel strength in shear - static	V_{sa}	lbf	715	1,300	2,045		905	3,621	12,610		
Steel strength in shear - seismic	$V_{sa,eq}$		Not applicable	Not applicable	1,350		Not applicable[5]	2,920	9,300		
Strength reduction factor ϕ for shear, steel failure modes[2]	ϕ_{sa}	—	0.60	0.60	0.60		0.60	0.60	0.60		
Data for Concrete Breakout and Concrete Pryout Strengths in Shear											
Nominal Outside diameter	d_a (d_o)[4]	in.	0.145	0.188	0.244		0.244	0.375	0.500		
Load bearing length of anchor	ℓ_e	—	1.50	1.50	1.45		1.67	1.78	1.32	2.17	3.02
Coefficient for Pryout Strength	κ_{cp}	—	1.0	1.0	1.0		1.0	1.0	1.0		2.0
Strength reduction factor for shear, concrete breakout[3]	ϕ_{cb}	—	0.70	0.70	0.70		0.70	0.70	0.70		
Strength reduction factor for shear, pryout[3]	ϕ_{cp}	—	0.70	0.70	0.70		0.70	0.70	0.70		

For **SI:** 1 inch = 25.4 mm, 1 ft-lbf = 1.356 N-m.

[1]The data presented in this table is to be used in conjunction with the design criteria of ACI 318 Appendix D.
[2]The tabulated value of ϕ_{sa} applies when the load combinations of Section 1605.2.1 of the IBC or ACI 318 Section 9.2 are used. If the load combinations of ACI 318 Appendix C are used, the appropriate value of ϕ must be determined in accordance with ACI 318-11 D.4.4(b).
[3]The tabulated value of ϕ_{cb} and ϕ_{cp} applies when the load combinations of Section 1605.2.1 of the IBC or ACI 318 Section 9.2 are used and the requirements of ACI 318-11 D.4.3(c) for Condition B are met. If the load combinations of ACI 318 Appendix C are used, the appropriate value of ϕ must be determined in accordance with ACI 318-11 D.4.4(c) for Condition B.
[4]The notation in parentheses is for the 2006 IBC.
[5]The Sammys® anchors have not been evaluated for seismic shear design under this report.

TABLE 4—EXAMPLE ALLOWABLE STRESS DESIGN TENSION VALUES FOR ILLUSTRATIVE PURPOSES FOR TAPCON® SCREW ANCHOR AND SAMMYS® SCREW ANCHOR FOR THREADED ROD [1,2,3,4,5,6,7,8]

NOMINAL ANCHOR DIAMETER (inch)	NOMINAL EMBEDMENT DEPTH (inches)	EFFECTIVE EMBEDMENT DEPTH (inches)	ALLOWABLE TENSION LOAD (pounds)
$^3/_{16}$	2.00	1.50	260
$^1/_4$	2.10	1.50	350
$^5/_{16}$	2.00	1.45	920
$^5/_{16}$ SAMMYS	2.25	1.45	800
$^3/_8$	2.50	1.78	1,335
$^1/_2$	2.00	1.32	800
	3.00	2.17	1,685
	4.00	3.02	2,765

For **SI:** 1 inch = 25.4 mm, 1 lbf = 4.45 N, 1 psi = 0.006895 MPa.

[1]Single anchor with static tension load only.
[2]Concrete determined to remain uncracked for the life of the anchorage.
[3]Load combination 9-2 from ACI 318 Section 9.2 (no seismic loading).
[4]Thirty percent dead load and 70 percent live load, controlling load combination 1.2D + 1.6L.
[5]Calculation of weighted average for α = 0.3* 1.2 + 0.7* 1.6 = 1.48.
[6]Normal weight concrete, f'_c = 2,500 psi
[7]$c_{a1} = c_{a2} > c_{ac}$.
[8]$h \geq h_{min}$.
[9]Condition B where supplementary reinforcement in accordance with ACI 318 Section D.4.4 is not provided.

Illustrative Procedure to Calculate Allowable Stress Design Tension Value:
Tapcon Screw Anchor $^1/_2$-inch diameter, using an embedment of 4-inches, assuming the conditions given in Table 4.

	PROCEDURE		CALCULATION
Step 1	Calculate steel strength of a single anchor in tension per ACI 318 D 5.1.2, Table 2 of this report:	ϕN_{sa}	$= \phi N_{sa}$ =0.70*23,125 **=15,031 lbs steel strength**
Step 2	Calculate concrete breakout strength of a single anchor in tension per ACI 318 D 5.2.2, Table 2 of this report:	N_b	$= k_{uncr} \sqrt{f`_c}\ h_{ef}^{1.5}$ $= 24 * \sqrt{2,500} * 3.02^{1.5}$ = 6,298 lbs
		ϕN_{cb}	$= \phi A_{NC}/A_{NC0}\ \psi_{ed,N}\ \psi_{c,N}\ \psi_{cp,N}\ N_b$ = 0.65*1.0*1.0*1.0*1.0*6,298 = 0.65*6,298 **= 4,093 lbs concrete breakout strength**
Step 3	Calculate pullout strength per Table 2 of this report:	ϕN_{pn}	$= \phi N_{p,uncr}\ \psi_{c,P}$ **n/a – pullout strength does not control** (see Table 2, footnote 4)
Step 4	Determine controlling resistance strength in tension per ACI 318 D 4.1.1 and D 4.1.2:		**= 4,093 lbs controlling resistance (concrete)**
Step 5	Calculate allowable stress design conversion factor for loading condition per ACI 318 Section 9.2:	α	=1.2*D* + 1.6*L* =1.2(0.3) + 1.6(0.7) **=1.48**
Step 6	Calculate allowable stress design value per Section 4.2 of this report:	$T_{allowable,ASD}$	$= \phi N_n / \alpha$ = 4,093/ 1.48 **= 2,765 lbs allowable stress design**

FIGURE 5—EXAMPLE DESIGN CALCULATION

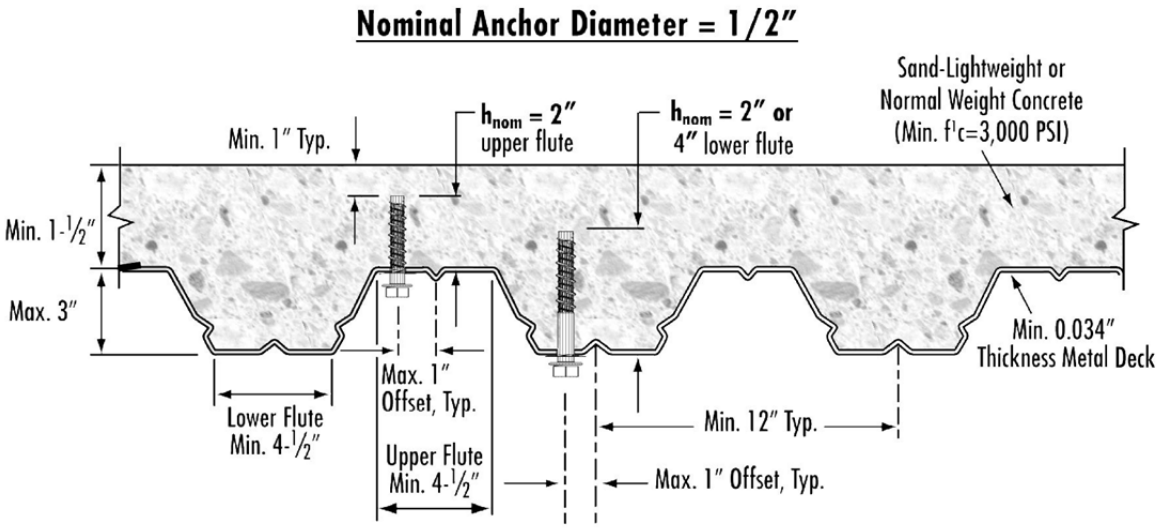


FIGURE 6—TAPCON® SCREW ANCHOR LOCATED IN THE SOFFIT OF CONCRETE OVER STEEL DECK FLOOR AND ROOF ASSEMBLIES
(1 inch = 25.4 mm)

TABLE 5—TAPCON® SCREW ANCHOR DESIGN INFORMATION FOR ANCHORS LOCATED IN THE SOFFIT OF CONCRETE OVER STEEL DECK FLOOR AND ROOF ASSEMBLIES[1,2,3,4,5]

CHARACTERISTIC	SYMBOL[5]	UNITS	NOMINAL ANCHOR DIAMETER (inch)		
			1/2		
Location of installation	—	—	Lower Flute		Upper Flute
Minimum hole depth	h_{hole}	in.	2 1/2	4 1/2	2 1/2
Nominal embedment depth	h_{nom}	in.	2	4	2
Minimum effective embedment depth	h_{ef}	in.	1.32	3.02	1.32
Characteristic pullout strength, uncracked concrete over metal deck	$N_{p,\ deck,uncr}$	lbf	1,720	4,950	2,405
Characteristic pullout strength, cracked concrete over metal deck	$N_{p,\ deck,cr}$	lbf	975	2,805	1,360
Characteristic shear strength, concrete over metal deck	$V_{sa,\ deck}$	lbf	3,825	6,130	3,825
Characteristic shear strength - seismic, concrete over metal deck	$V_{sa,\ deck,eq}$	lbf	2,820	4,520	2,820
Reduction factor for pullout strength in tension, Condition B	ϕ	—	0.65		
Reduction factor for steel strength in shear, Condition B	ϕ	—	0.60		

For **SI:** 1 inch = 25.4 mm, 1 ft-lbf = 1.356 N-m.

[1]Values for $N_{p,dec,uncr}$, $N_{p,dec,cr}$, $V_{sa,deck}$ and $V_{sa,deck,eq}$ apply to sand-lightweight concrete having a minimum concrete compressive strength, $f'c$, of 3,000 psi.
[2]The characteristic pull-out strength for greater concrete compressive strengths shall be increased by multiplying the tabular value by $(f'c/3{,}000\ psi)^{0.5}$.
[3]All values of ϕ apply to the load combinations of IBC Section 1605.2, ACI 318 Section 9.2 or UBC Section 1612.2. If the load combinations of Appendix C or UBC Section 1909.2 are used, the appropriate value of ϕ must be determined in accordance with ACI 318-11 D.4.4. For installations where reinforcement that complies with ACI 318 Appendix D requirements for Condition A is present, the appropriate ϕ factor must be determined in accordance with ACI 318-11 D.4.3.
[4]The minimum anchor spacing along the flute must be the greater of $3h_{ef}$ or 1.5 times the flute width in accordance with Section 4.1.11 of this report.
[5]Installation must comply with Figure 6 of this report.

ICC-ES Evaluation Report

ESR-2202 Supplement

Reissued October 1, 2013
This report is subject to renewal October 1, 2014.

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DIVISION: 03 00 00—CONCRETE
Section: 03 16 00—Concrete Anchors

DIVISION: 05 00 00—METALS
Section: 05 05 19—Post-Installed Concrete Anchors

REPORT HOLDER:

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EVALUATION SUBJECT:

ITW BUILDEX TAPCON® SCREW ANCHORS AND SAMMYS® SCREW ANCHORS FOR USE IN CRACKED AND UNCRACKED CONCRETE

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that ITW Buildex Tapcon® Screw Anchors And Sammys® Screw Anchors for use in cracked and uncracked concrete, recognized in ICC-ES master evaluation report ESR-2202, have also been evaluated for compliance with the codes noted below.

Compliance with the following codes:

- 2010 *Florida Building Code—Building*
- 2010 *Florida Building Code—Residential*

2.0 PURPOSE OF THIS SUPPLEMENT

The ITW Buildex Tapcon® Screw Anchors And Sammys® Screw Anchors for use in cracked and uncracked concrete, described in Sections 2.0 through 7.0 of the master evaluation report ESR-2202, comply with the 2010 *Florida Building Code—Building* and 2010 *Florida Building Code—Residential*, provided the design and installation are in accordance with the *International Building Code®* (IBC) provisions noted in the master report, and under the following conditions:

- Design wind loads must be based on Section 1609 of the 2010 *Florida Building Code—Building* or Section 301.2.1.1 of the 2010 *Florida Building Code—Residential*, as applicable.
- Load combinations must be in accordance with Section 1605.2 or Section 1605.3 of the 2010 *Florida Building Code—Building*, as applicable.
- The modifications to ACI 318 as shown in 2009 IBC Sections 1908.1.9 and 1908.1.10, as noted in 2009 IBC Section 1912.1, do not apply to the 2010 *Florida Building Code*.

Use of the ITW Buildex Tapcon® Screw Anchors and Sammys® Screw Anchors for use in cracked and uncracked concrete, for compliance with the High-Velocity Hurricane Zone provisions of the 2010 *Florida Building Code—Building* and 2010 *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 master report reissued on October 1, 2013.