EVALUATION SUBJECT:
TITEN®2 SCREW ANCHORS FOR USE IN UNCRACKED CONCRETE

REPORT HOLDER:
Simpson Strong-Tie Company Inc.
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CSI Section:
03 15 19 Cast-in Concrete Anchors
05 05 19 Post-Installed Concrete Anchors

1.0 SCOPE OF EVALUATION

1.1 Compliance to the following codes & regulations:
- 2018, 2015, 2012, 2009 and 2006 International Building Code® (IBC)
- 2018, 2015, 2012, 2009 and 2006 International Residential Code® (IRC)

1.2 Evaluated in accordance with:
- ICC-ES Acceptance Criteria for Mechanical Anchors in Concrete Elements (AC193)

1.3 Properties assessed:
- Structural

2.0 PRODUCT USE

Simpson Strong-Tie® Titen®2 Screw Anchors are used to resist static and wind tension and shear loads in uncracked normal-weight and lightweight concrete having a specified compressive strength, f'_c, of 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa). The anchoring system is an alternative to anchors described in Section 1901.3 of the 2018, 2015 IBC, Sections 1908 and 1909 of the 2012 IBC, and Sections 1911 and 1912 of the 2009 and 2006 IBC. The anchors may also be used where an engineered design is submitted in accordance with Section R301.1.3 of the IRC.

3.0 PRODUCT DESCRIPTION

3.1 Titen2 Screw Anchors: The Titen®2 Screw Anchors are post-installed anchors that derive their holding strength from the mechanical interlock of the screw anchor threads with the grooves cut into the concrete by the screw anchor during installation. The screw anchors are manufactured from carbon steel that is given a supplementary hardening process. The screw anchors are available in nominal sizes of $^3/_{16}$ inch and ¼ inch (4.8 mm and 6.4 mm) and in a variety of lengths. The Titen®2 Screw Anchors are available with either a slotted hex head or a Philips flat head as shown in Figure 1. All Titen®2 Screw Anchors are provided with a Ruspert coating.

3.2 Concrete

Normal-weight and lightweight concrete shall conform to Sections 1901 and 1903 of the 2018, 2015 and 2012 IBC or Section 1903 and 1905 of the 2009 and 2006 IBC. The specified compressive strength of the concrete, f'_c, shall be from 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa).

4.0 DESIGN AND INSTALLATION

4.1 Strength Design

4.1.1 General: The design strength of anchors under the 2018 and 2015 IBC and Section R301.1.3 of the 2018 and 2015 IRC shall be determined in accordance with ACI 318-14 as amended in IBC Section 1905 and this report. The design strength of anchors under the 2012, 2009 and 2006 IBC and Section R301.1.3 of the 2012, 2009 and 2006 IRC shall be determined in accordance with ACI 318-11 Appendix D and this report.

Design parameters are based on ACI 318-14 for use with the 2018 and 2015 IBC and ACI 318-11 for use with the 2012, 2009 and 2006 IBC unless noted otherwise in Sections 4.1.1 through 4.1.11 of this report.

The strength design of anchors shall conform to the requirements of ACI 318-14 Section 17.3.1 except as required for earthquake loading in ACI 318-14 Section 17.2.3; or ACI 318-11 Section D.4.1, except as required for earthquake loading in ACI 318-11 Section D.3.3.

Strength reduction factors, ϕ, described in ACI 318-14 Section 17.3.3 or ACI 318-11 Section D.4.3, and noted in Tables 3 and 4 of this report, shall be used for load combinations calculated in accordance with Section 1605.2 of the 2018, 2015, 2012, 2009 or 2006 IBC, ACI 318-14 Section 5.3, and ACI 318-11 Section 9.2. Strength reduction factors, ϕ, described in ACI 318-11 Section D.4.4 shall be used for load combinations calculated in accordance with Appendix C of ACI 318-11. Construction documents shall include information specified in ACI 318-14 Sections 17.7.7 and 26.7, or ACI 318-11 Sections 1.2 and D.8.7.

4.1.2 Static Steel Strength in Tension: The nominal steel strength of a single anchor in tension, N_{sa}, in accordance with ACI 318-14 Section 17.4.1.2 or ACI 318-11 Section D5.1.2, and the corresponding strength reduction factors, ϕ, corresponding to a brittle steel element in accordance with

ACI 318-14 Section 17.3.3, or ACI 318-11 Section D.4.3, are provided in Table 3 of this report for each anchor size referenced in this report.

4.1.3 Static Concrete Breakout Strength in Tension: The nominal static concrete breakout strength of a single anchor or group of anchors in tension, N_{cb} or N_{cbg}, shall be calculated in accordance with ACI 318-14 Section 17.4.2 or ACI 318-11 Section D.5.2. The nominal concrete breakout strength in tension in regions of the concrete where analysis indicates no cracking in accordance with ACI 318-14 Section 17.4.2.6 or ACI 318-11 Section D.5.2.6, shall be calculated using k_{uncr} given in Table 3 and where $\Psi_{c,N} = 1.0$. The value of f'_c used for calculation purposes shall be limited to 8,000 psi (55.1 MPa) maximum in accordance with ACI 318-14 Section 17.2.7 or ACI 318-11 Section D.3.7.

4.1.4 Static Pullout Strength in Tension: The nominal pullout strength of a single anchor in tension in accordance with ACI 318-14 Sections 17.4.3.1 and 17.4.3.2 or ACI 318-11 Sections D.5.3.1 and D.5.3.2 in uncracked concrete, $N_{p,uncr}$, is given in Table 3 of this report. For all design cases, $\Psi_{c,P} = 1.0$. The nominal pullout strength may be adjusted for concrete strengths as follows:

$$N_{p,f'c} = N_{p,uncr}(f'_c/2500)^{0.5}$$

For SI: $N_{p,f'c} = N_{p,uncr}(f'_c/17.2)^{0.5}$

Where f'_c is the specified concrete compression strength.

4.1.5 Static Steel Strength in Shear: The nominal static steel strength of a single anchor in shear as governed by the steel, V_{sa}, and the corresponding strength reduction factor for a brittle steel element, ϕ, complying with ACI 318-14 Sections 17.5.1.2 and 17.3.3 or ACI 318-11 Sections D.6.1.2 and D.4.3 respectively, are given in Table 4 of this report and shall be used in lieu of the values derived by calculation from ACI 318-14 Eq. 17.5.1.2b or ACI 318-11 Eq. D-29.

4.1.6 Static Concrete Breakout Strength in Shear: The nominal static concrete breakout strength of a single anchor or group of anchors in shear, V_{cb} or V_{cbg}, shall be calculated in accordance with ACI 318-14 Section 17.5.2 or ACI 318-11 Section D.6.2, based on information given in Table 4 of this report. The basic concrete breakout strength of a single anchor in shear, V_b, shall be calculated in accordance with ACI 318-14 Section 17.5.2.2 or ACI 318-11 Section D.6.2.2 using the values given in Table 4 of this report. In addition, h_{ef} shall replace l_e in ACI 318-14 Eq. 17.5.2.2a or ACI 318-11 Eq. D-33 and in no case shall h_{ef} exceed $8d_a$. The value of f'_c used for calculation purposes shall be limited to 8,000 psi (55.1 MPa) maximum in accordance with ACI 318-14 Section 17.2.7 or ACI 318-11 Section D.3.7.

4.1.7 Static Concrete Pryout Strength in Shear: The nominal static pryout strength of a single anchor or group of anchors in shear, V_{cp} or V_{cpg}, shall be calculated in accordance with ACI 318-14 Section 17.5.3 or ACI 318-11 Section D.6.3, using the value of k_{cp}, described in Table 4, and the values of N_{cb} or N_{cbg}, as calculated in Section 4.1.3 of this report.

4.1.8 Interaction of Tensile and Shear Forces: For designs that include combined tension and shear, the interaction of tension and shear loads shall be calculated in accordance with ACI 318-14 Section 17.6 or ACI 318-11 Section D.7.

4.1.9 Minimum Member Thickness h_{min}, Minimum Anchor Spacing, s_{min}, and Minimum Edge Distance, c_{min}: In lieu of ACI 318-14 Sections 17.7.1 and 17.7.3 or ACI 318-11 Sections D.8.1 and D.8.3, values of c_{min} and s_{min} used for anchor design and installation shall conform to the values provided in Table 2 of this report. In lieu of ACI 318-14 Section 17.7.5 or ACI 318-11 Section D.8.5, the minimum member thicknesses, h_{min}, shall be in accordance with Table 2 of this report.

4.1.10 Critical Edge Distance, c_{ac}: 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 318-14 Section 17.4.2 or ACI 318-11 Section D.5.2 shall be further multiplied by the factor $\Psi_{cp,N}$ as follows:

$$\Psi_{cp,N} = c/c_{ac}$$

whereby the factor $\Psi_{cp,N}$ need not be taken as less than $1.5h_{ef}/c_{ac}$. For all other cases, $\Psi_{cp,N} = 1.0$. In lieu of ACI 318-14 Section 17.7.6 or ACI 318-11 Section D.8.6, the values for critical edge distance, c_{ac}, shall be taken from Table 2 of this report.

4.1.11 Lightweight Concrete: For the use of anchors in lightweight concrete, the modification factor $\boldsymbol{\lambda_a}$ equal to 0.8 $\boldsymbol{\lambda}$ is applied to all values of $\sqrt{\boldsymbol{f'c}}$ affecting $\boldsymbol{N_n}$ and $\boldsymbol{V_n}$ where $\boldsymbol{\lambda}$ is determined in accordance with ACI 318- 08 (2009 IBC/IRC), ACI 318-11 (2012 IBC/IRC), and ACI 318-14 (2018, 2015 IBC/IRC). For ACI 318-05 (2006 IBC/IRC), $\boldsymbol{\lambda}$ shall be taken as 0.75 for all lightweight concrete and 0.85 for sand-lightweight concrete. Linear interpolation shall be permitted if partial sand replacement is used. In addition, the pullout strength $\mathbf{N_{p,uncr}}$ shall be multiplied by the modification factor, $\boldsymbol{\lambda_a}$, as applicable.

4.2 Allowable Stress Design

4.2.1 General: For anchors designed using load combinations in accordance with IBC Section 1605.3, allowable loads shall be established using Eq. (4-1) or Eq.

(4-2), as follows:

$$T_{allowable,\ ASD} = \phi N_n/\alpha \qquad \text{Eq. (4-1)}$$

$$V_{allowable,\ ASD} = \phi V_n/\alpha \qquad \text{Eq. (4-2)}$$

Where:

$T_{allowable,\ ASD}$ = Allowable tension load (lb or kN)
$V_{allowable,\ ASD}$ = Allowable shear load (lb or kN)
ϕN_n = The lowest design strength of an anchor or anchor group in tension as determined in accordance with ACI 318-14 Chapter 17 or ACI 318-11 Appendix D as amended in Section 4.1 of this report.
ϕV_n = The lowest design strength of an anchor or group in shear as determined in accordance with ACI 318-14 Chapter 17 or ACI 318-11 Appendix D as amended in Section 4.1 of this report.
α = Conversion factor calculated as a weighted average of the load factors for the controlling load combination. In addition, **α** shall include all applicable factors to account for non-ductile failure modes and required over-strength.

The requirement for member thickness, edge distance and spacing, described in Table 2 of this report, shall apply.

4.2.2 Interaction of Tensile and Shear Forces: In lieu of ACI 318-14 Sections 17.6.1, 17.6.2 and 17.6.3 or ACI 318-11 Sections D.7.1, D.7.2 and D.7.3, interaction of tension and shear loads shall be calculated as follows:

17.6.1 (D.7.1): If $V_{applied} \leq 0.2\ V_{allowable,\ ASD}$ for the governing strength in shear, then the full allowable strength in tension, $T_{allowable,\ ASD}$, shall be permitted.

17.6.2 (D.7.2): If $T_{applied} \leq 0.2\ T_{allowable,\ ASD}$ for the governing strength in tension, then the full allowable strength in shear, $V_{allowable,\ ASD}$, shall be permitted.

17.6.3 (D.7.3): If $V_{applied} > 0.2\ V_{allowable,\ ASD}$ for the governing strength in shear and $T_{applied} > 0.2\ T_{allowable,\ ASD}$ for the governing strength in tension, then:

$$T_{applied}/\ T_{allowable,\ ASD} + V_{applied}/\ V_{allowable,\ ASD} \leq 1.2 \qquad \text{Eq. (4-3)}$$

4.3 Installation

Installation parameters are provided in Table 2 of this report. The Titen®2 Screw Anchors shall be installed in accordance with the manufacturer's published instructions and this report. Screw anchor locations shall comply with this report and the plans and specifications approved by the building official. Screw anchors shall be installed in holes drilled using carbide-tipped drill bits conforming to ANSI B212.15-1994 and Table 2 of this report. The hole shall be drilled to the minimum depth noted in Table 2 of this report. Dust and debris in the hole shall be removed by using oil-free compressed air or a vacuum. The screw anchor shall be driven into the predrilled hole using a hammer drill set in the hammer and rotation mode with a Titen Screw Installation Tool and drive socket.

4.4 Special Inspection

Special inspection is required in accordance with 2018, 2015 and 2012 IBC Sections 1705.1 and 1705.3, 2009 IBC Sections 1704.4 and 1704.15 or 2006 IBC Sections 1704.4 and 1704.13 and this report. The special inspector shall make periodic inspections during anchor installation to verify anchor type, anchor dimensions, concrete compressive strength, hole dimensions, hole cleaning procedures, drill bit size, anchor spacing, edge distances, concrete thickness, anchor embedment and adherence to the manufacturer's published installation instructions. The special inspector shall be present as often as required in accordance with the "statement of inspection."

5.0 LIMITATIONS

The Simpson Strong-Tie® Titen®2 Screw Anchors described in this report are suitable alternatives to what is specified in the codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 Titen®2 Screw Anchors shall be installed in accordance with the manufacturer's published installation instructions and this report as shown in Figure 2 of this report. Where conflicts between this report and the published instructions occur, the more restrictive shall prevail.

5.2 Screw anchor sizes, dimensions and minimum embedment depths are as set forth in this report.

5.3 The screw anchors shall be installed in uncracked normal-weight concrete and structural sand lightweight concrete having a specified compressive strength of f'_c = 2,500 psi to 8,500 psi (17.2 MPA to 58.6 MPa).

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

5.5 Screw anchors shall be installed in concrete base materials in holes predrilled with carbide-tipped drill bits complying with ANSI B212.15-1994 in accordance with the installation details shown in Table 2 of this report.

5.6 Strength design values shall be established in accordance with Section 4.1 of this report.

5.7 Allowable design values shall be established in accordance with Section 4.2 of this report.

5.8 Minimum anchor spacing, minimum edge distance, minimum member thickness, critical spacing, and minimum critical edge distance shall comply with the values described in this report.

5.9 Prior to installation, calculations and details demonstrating compliance with this report shall be submitted to the building official. The calculations and details shall be prepared by a registered design professional where required by the statures of the jurisdiction in which the project is to be constructed.

5.10 Since an evaluation 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 such conditions is beyond the scope of this report.

5.11 Screw anchors shall not be installed in regions of concrete where cracking has occurred or where analysis indicates cracking may occur ($f_t > f_r$), subject to the conditions of this report.

5.12 Screw anchors may be used to resist short-term loads due to wind and to seismic load combinations limited to locations designated as Seismic Design Categories A and B under the IBC, subject to the conditions of this report.

5.13 Screw anchors shall not be used to support fire-resistive construction. Where not otherwise prohibited in the IBC or IRC, Titen®2 Screw Anchors are permitted for installation in fire-resistive construction provided at least one of the following conditions are met.

- Anchors are used to resist wind or seismic forces only.
- Anchors that support gravity load-bearing structural elements are within a fire-resistive envelope or a fire-resistive membrane, are protected by approved fire-resistive materials, or have been evaluated for resistance to fire exposure in accordance with recognized standards.
- Anchors are used to support nonstructural elements.

5.14 Use of screw anchors is limited to dry, interior locations.

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

5.16 Special inspection shall be provided in accordance with Section 4.4 of this report.

5.17 Titen®2 Screw Anchors are manufactured under an approve quality control program with quality control inspections by CEL Consulting (AA-639).

6.0 SUBSTANTIATING DATA

Data in accordance with the ICC-ES Acceptance Criteria for Mechanical Anchors in Concrete Elements (AC193), approved October 2017, editorially revised April 2018. Test reports are from laboratories in compliance with ISO/IEC 17025.

7.0 IDENTIFICATION

7.1 Titen®2 Screw Anchors are identified in the field by labels on the packaging, bearing the company name (Simpson Strong-Tie Company, Inc.), product name (Titen®2), the anchor diameter and length, catalog number, either IAPMO ES Mark of Conformity as shown below, and the evaluation report number (ER-449).

This evaluation report is subject to re-examination in one year.

or

IAPMO ER-449

Brian Gerber, P.E., S.E.
Vice President, Technical Operations
Uniform Evaluation Service

Richard Beck, PE, CBO, MCP
Vice President, Uniform Evaluation Service

GP Russ Chaney
CEO, The IAPMO Group

For additional information about this evaluation report please visit www.uniform-es.org or email us at info@uniform-es.org

TABLE 1
LENGTH IDENTIFICATION HEAD MARKS ON TITEN2 SCREW ANCHORS
(CORRESPONDS TO ANCHOR LENGTH IN INCHES)

Length ID marking on head		-	A	B	C	D	E	F	G	H	I	J
Length of anchor (inch)	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

TABLE 2
TITEN2 SCREW ANCHOR INSTALLATION INFORMATION[1]

CHARACTERISTIC	SYMBOL	UNITS	NOMINAL SCREW ANCHOR DIAMETER (inch)	
			3/16	1/4
Nominal Outside Diameter (shank)	$d_a(d_o)^2$	In	0.149	0.180
Drill Bit Diameter	d_{bit}	In	5/32	3/16
Nominal Embedment depth	h_{nom}	In	1 3/4	1 3/4
Effective Embedment depth	h_{ef}	In	1.30	1.30
Minimum Concrete Thickness	h_{min}	In	3 1/4	3 1/4
Critical Edge Distance	c_{ac}	In	3	3
Minimum Edge Distance	c_{min}	In	1 3/4	1 3/4
Minimum Spacing Distance	s_{min}	In	1	2
Minimum Hole Depth	h_{hole}	In	2 1/4	2 1/4
Maximum Installation Torque	$T_{inst,max}$	ft-lb	Not applicable[3]	Not applicable[3]
Maximum Impact Wrench Torque Rating	$T_{impact,max}$	ft-lb	Not applicable[3]	Not applicable[3]

For SI: 1 inch = 25.4 mm, 1 ft-lb = 1.36 N-m

[1]The information presented in this table is to be used in conjunction with the design criteria of ACI 318-14 Chapter 17 or ACI 318-11 Appendix D, as applicable.

[2]For the 2006 IBC, d_o replaces d_a.

[3]Installation shall be performed with a Simpson Titen Screw Installation Tool. Section 4.3 of this report provides additional information.

TABLE 3
TITEN2 SCREW ANCHOR CHARACTERISTIC TENSION STRENGTH DESIGN VALUES[1]

CHARACTERISTIC	SYMBOL	UNITS	NOMINAL SCREW ANCHOR DIAMETER (inch)	
			3/16	1/4
Anchor Category	1, 2, or 3	-	1	1
Nominal Embedment Depth	h_{nom}	In	$1^3/_4$	$1^3/_4$
Steel Strength in Tension				
Minimum Specified Yield Strength	f_{ya}	psi	100,000	100,000
Minimum Specified Ultimate Strength	f_{uta}	psi	125,000	125,000
Effective Tensile Stress Area	A_{se}	in^2	0.0174	0.0254
Steel Strength in Tension	N_{sa}	lbf	2175	3175
Strength Reduction Factor – Steel Failure[2]	ϕ_{sa}	-	0.65	0.65
Concrete Breakout in Tension				
Effective Embedment	h_{ef}	In	1.30	1.30
Critical Edge Distance	c_{ac}	In	3	3
Effectiveness Factor for Uncracked Concrete	k_{uncr}	-	24	24
Modification Factor	$\Psi_{c,N}$	-	1	1
Strength Reduction Factor-Concrete Breakout Failure[3]	ϕ_{cb}	-	0.65	0.65
Pullout Strength in Tension				
Pullout Resistance in Uncracked Concrete (f'_c=2500 psi)[5]	$N_{p,uncr}$	lbf	1900	1900
Strength Reduction Factor – Pullout Failure[4]	ϕ_p	-	0.65	0.65

For SI: 1 inch = 25.4 mm, 1 lbf = 4.448 N, 1 psi = 6.895 kPa

[1]The information presented in this table is to be used in conjunction with the design criteria of ACI 318-14 Chapter 17 or ACI 318-11 Appendix D, as applicable.

[2] The tabulated value of ϕ_{sa} applies when the load combinations of Section 1605.2 of the IBC, ACI 318-14 Section 5.3 or ACI 318-11 Section 9.2 are used. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ shall be determined in accordance with ACI 318-11 Section D.4.4.

[3] The tabulated value of ϕ_{cb} applies when both the load combinations of Section 1605.2 of the IBC, ACI 318-14 Section 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI 318-14 Section 17.3.3 (c) or ACI 318-11 Section D.4.3, as applicable, for Condition B are met. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of Φ shall be determined in accordance with ACI 318-11 Section D.4.4 for Condition B.

[4] The tabulated value of ϕ_p applies when both the load combinations of ACI 318-11 Section 9.2 are used and the requirement of ACI 318 Section D.4.4(c) for Condition B are met. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ shall be determined in accordance with ACI 318-11 Section D.4.5(c) for Condition B.

[5] The value of $N_{p,uncr}$ may be increased in accordance with Section 4.1.4 of this report.

TABLE 4
TITEN2 SCREW ANCHOR CHARACTERISTIC SHEAR STRENGTH DESIGN VALUES[1]

CHARACTERISTIC	SYMBOL	UNITS	NOMINAL SCREW ANCHOR DIAMTER (inch)	
			3/16	1/4
Anchor Category	1, 2 or 3	-	1	1
Nominal Embedment Depth	h_{nom}	in	$1^3/_4$	$1^3/_4$
Steel Strength in Shear				
Steel Strength in Shear	V_{sa}	lbf	990	1510
Strength Reduction Factor – Steel Failure[3]	ϕ_{sa}	-	0.6	0.6
Concrete Breakout in Shear				
Load Bearing Length of Anchor in Shear	l_e	in	1.30	1.30
Nominal Outside Diameter (shank)	$d_a(d_o)^2$	in	0.149	0.180
Strength Reduction Factor – Concrete Breakout Failure[4]	ϕ_{cb}	-	0.7	0.7
Concrete Pryout Strength in Shear				
Coefficient for Pryout Strength	K_{cp}	-	1.0	1.0
Strength Reduction Factor – Concrete Pryout Failure[4]	ϕ_{cp}	-	0.7	0.7

For SI: 1 inch = 25.4 mm, 1 lbf = 4.448 N

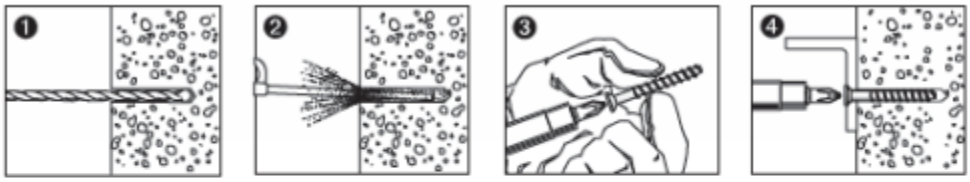
[1] The information presented in this table is to be used in conjunction with the design criteria of ACI 318-14 Chapter 17 or ACI 318-11 Appendix D, as applicable.

[2] For the 2006 IBC, d_o replaces d_a.

[3] The tabulated value of ϕ_{sa} applies when the load combinations of Section 1605.2 of the IBC, ACI 318-14 Section 5.3 or ACI 318-11 Section 9.2 are used. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ shall be determined in accordance with ACI 318-11 Section D.4.4.

[4] The tabulated values of ϕ_{cb} and ϕ_{cp} apply when both the load combinations of Section 1605.2 of the IBC, ACI 318-14 Section 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI 318-14 Section 17.3.3(c) or ACI 318-11 Section D.4.3, as applicable, for Condition B are met. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ shall be determined in accordance with ACI 318-11 Section D.4.4 for Condition B.

Figure 1 - Titen HD®2 Screw Anchors



Step 1 – Drill a hole in the base material using the proper diameter carbide drill bit to a depth that is 1/2" deeper than the specified embedment depth.

Step 2 – Clean the hole of excess drill fines with compressed air.

Step 3 – Assemble the Titen Installation Tool sleeve and drive socket over the drill bit, and position the anchor in the drive socket.

Step 4 – Drive the anchor through the fixture and into the predrilled hole. The drive socket will automatically disengage from the anchor when the anchor is flush with the fixture.

Figure 2 – Installation Instructions for Titen HD®2 Screw Anchors

FLORIDA SUPPLEMENT

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TITEN®2 SCREW ANCHORS FOR USE IN UNCRACKED CONCRETE

CSI Division:
03 00 00—CONCRETE
05 00 00—METALS

CSI Section:
03 16 00—Concrete Anchors
05 05 19—Post-installed Concrete Anchors

1.0 RECOGNITION

Simpson Strong-Tie® Titen®2 Screw Anchors for use in uncracked concrete recognized in ER-449 have been evaluated for use to resist dead, live, wind, and seismic tension and shear loads limited to locations designated as Seismic Design Categories A and B under the IBC. The structural performance properties of the Simpson Strong-Tie® Titen®2 Screw Anchors were evaluated for compliance with the following codes:

- 2020 and 2017 Florida Building Code, Building (FBC--Building)
- 2020 and 2017 Florida Building Code, Residential (FBC--Residential)

2.0 LIMITATIONS

Simpson Strong-Tie® Titen®2 Screw Anchors described in ER-449 complies with the 2020 and 2017 FBC--Building and the 2020 and 2017 FBC--Residential, subject to the following limitations:

1. The design and installation of the Simpson Strong-Tie® Titen®2 Screw Anchors shall be in accordance with the 2018 or 2015 International Building Code and the 2018 or 2015 International Residential Code as noted in ER-449.

2. Load combinations shall be in accordance with Sections 1605.2 or 1605.3 of the FBC--Building, as applicable.

3. Design wind loads shall be in accordance with Section 1609.5 of the FBC--Building or Section R301.2.1.1 of the FBC--Residential, as applicable, and Section 1620 of the FBC–Building where used in High-velocity Hurricane Zones (HVHZ).

4. Use of Simpson Strong-Tie® Titen®2 Screw Anchors in applications exposed to the weather within High-velocity Hurricane Zones (HVHZ) as set forth in the FBC--Building and the FBC--Residential is beyond the scope of this supplemental report.

5. Use of Simpson Strong-Tie® Titen®2 Screw Anchors in High-velocity Hurricane Zones (HVHZ) as set forth in Section 2321.5.2 of the FBC--Building and Section 4409 of the FBC--Residential to resist wind uplift is permitted. The anchors shall be designed to resist the uplift forces as required in Section 1620 (HVHZ) of the FBC--Building or 700 pounds (3114 N), whichever is greater, per FBC--Building Section 2321.7.

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 (or the building official when the report holder does not possess an approval by the Commission) is required to provide oversight and determine that the products are being manufactured as described in this evaluation report to establish continual product performance.

This supplement expires concurrently with ER-449.