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TITEN TURBO™ SCREW ANCHORS FOR USE IN MASONRY

CSI Division:
04 00 00—MASONRY
CSI Section:
04 05 19.16—Masonry 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)
- 2020 City of Los Angeles Building Code (LABC) - attached supplement
- 2020 City of Los Angeles Residential Code (LARC) - attached supplement

1.2 Evaluated in accordance with:

- ICC-ES Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry (AC106)

1.3 Properties assessed:

- Structural

2.0 PRODUCT USE

Simpson Strong-Tie® Titen Turbo™ Screw Anchors are used to resist static, wind, or earthquake (Seismic Design Categories A and B only) tension and shear loads in grouted or ungrouted concrete masonry construction. The anchoring system is an alternative to cast-in-place anchors described in Section 2107.1 of the IBC and Section 8.1.3 of the 2016 TMS 402 or Section 8.1.3 of the 2013 TMS 402/ACI 530/ASCE 5 or Section 2.1.4 of the 2011, 2008 and 2005 TMS 402/ACI 530/ASCE 5, as applicable. 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 Titen Turbo™ Screw Anchors

The Titen Turbo™ 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 masonry 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) diameters and in a variety of lengths.

The Titen Turbo™ Screw Anchors are available with either a slotted hex head or a Philips flat head as shown in Figure 1 of this report. All Titen Turbo™ Screw Anchors are provided with zinc plating and baked ceramic coating.

3.2 Materials

3.2.1 Concrete Masonry Units (CMU's): CMU's shall be medium-weight or normal-weight conforming to ASTM C90. Minimum allowable nominal size of the CMU shall be 8 inches (203 mm) wide by 8 inches (203 mm) high by 16 inches (406 mm) long (i.e. 8x8x16).

3.2.2 Grout: Grout shall comply with 2018 and 2015 IBC Section 2103.3, 2012 IBC Section 2103.13, 2009 and 2006 IBC Section 2103.12 or 2018 and 2015 IRC Section R606, or 2012, 2009 and 2006 IRC Section R609.1.1, as applicable. Alternatively, the grout shall have a minimum compressive strength when tested in accordance with ASTM C1019 equal to its specified strength, f'_g, but not less than 2,000 psi (13.8 MPa).

3.2.3 Mortar: Mortar shall be minimum Type N in compliance with IBC Section 2103 or 2018 and 2015 IRC Sections R606.2.8 and R606.2.7, respectively, or R607 (2012, 2009 and 2006 IRC), as applicable.

4.0 DESIGN AND INSTALLATION

4.1 Design

4.1.1 General: Titen Turbo™ Screw Anchor capacities in this report are allowable load values for use in allowable stress design as set forth in Section 2107 of the IBC. For use under the IRC, an engineered design in accordance with Section R301.1.3 of the IRC shall be submitted to the building official for approval.

4.1.2 Design of Titen Turbo™ Screw Anchors Installed in Concrete Masonry: Titen Turbo™ Screw Anchors are limited to installation in the face shell of the grouted or ungrouted concrete masonry units. Allowable tension and shear values, embedment depths, spacing requirements, end and edge distances for screw anchors installed in fully-grouted concrete masonry unit construction are noted in Tables 3 and 4 of this report. Allowable tension and shear values, embedment depths, spacing requirements, end and edge distances for screw anchors installed in ungrouted

concrete masonry unit construction are noted in Tables 5 and 6 of this report.

Allowable loads for the Titen Turbo™ Screw Anchors installed in the face shell of the grouted or ungrouted concrete masonry units subjected to combined tension and shear forces shall be determined by Equation 1:

$$(P_s/P_t) + (V_s/V_t) \leq 1.0 \quad (1)$$

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.

4.2 Installation

Installation parameters are provided in Table 2 and Figure 2 of this report. The Titen Turbo™ 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, or completely through the face shell in the case of ungrouted masonry. Dust and debris in the hole is not required to be removed prior to screw anchor installation. The screw anchor shall be driven into the predrilled hole using a cordless impact driver or cordless drill with a Titen Turbo™ Drive Adaptor.

4.3 Special Inspection

Periodic special inspection is required in accordance with 2018 and 2015 IBC Section 1705.4, 2012 IBC Section 1705.3, 2009 IBC Section 1704.15 or 2006 IBC Section 1704.13, provided the masonry construction has quality assurance requirements as specified in Tables 3 and 4 of TMS 602-16 Section 1.6 (2018 IBC), Section 3.1 of TMS 402-13 (2015 IBC) or Section 1.19 of TMS 402-11 (2012 IBC, Level 1 or Level 2 under Section 1704.5 of the 2009 IBC or Section 1704.5 of the 2006 IBC. The special inspector shall be present as often as required in accordance with the "statement of inspection." The special inspector shall make periodic inspections during anchor installation to verify anchor type, anchor dimensions, masonry unit type and compliance with ASTM C90, grout and mortar compressive strengths, hole dimensions, drill bit size, anchor spacing, edge and end distances, anchor embedment and adherence to the installation instructions contained in this report. Additional requirements as set forth in Section 1704, 1705, 1706 and 1707 of the IBC shall be observed, where applicable.

5.0 LIMITATIONS

The Simpson Strong-Tie Titen Turbo™ 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 limitations:

5.1 Titen Turbo™ 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 Screw anchors shall be installed 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.

5.4 Titen Turbo™ Screw Anchors may be used to resist short-term loading due to wind or seismic forces in structures assigned to Seismic Design Categories A and B only under the IBC. The allowable loads or load combinations for the screw anchors shall not be adjusted for screw anchors subjected to wind or seismic loads.

5.5 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 statutes of the jurisdiction in which the project is to be constructed.

5.6 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.

5.7 Where not otherwise prohibited in the IBC or IRC, Titen Turbo™ Screw Anchors are permitted for installation in fire-resistive construction provided at least one of the following conditions is met.

- 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.

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

5.9 Since acceptance criteria for evaluating the performance of screw anchors in cracked masonry are not available at this time, the use of screw anchors is limited to installation in uncracked masonry. Cracking occurs when $f_t > f_r$ due to service loads or deformations.

5.10 Special inspection shall be provided in accordance with Section 4.3 of this report.

5.11 Titen Turbo™ Screw Anchors are manufactured under an approved 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 Predrilled Fasteners (Screw Anchors) in Masonry (AC106), approved March 2018. Test reports are from laboratories in compliance with ISO/IEC 17025.

7.0 IDENTIFICATION

Titen Turbo™ Screw Anchors are identified in the field by labels on the packaging, bearing the company name (Simpson Strong-Tie Company, Inc.), product name (Titen Turbo™), the anchor diameter and length, catalog number, either IAPMO ES Mark of Conformity as shown below, and the evaluation report number (ER-716). In addition, the ≠ symbol and a length identification code letter are stamped on the head of each screw anchor.

Either Mark of Conformity may be used as shown below:

or

IAPMO ER-716

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 TITEN TURBO™ 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
TITEN TURBO™ SCREW ANCHOR INSTALLATION INFORMATION[1]

CHARACTERISTIC	NOMINAL SCREW ANCHOR DIAMETER (inch)	
	3/16	1/4
Nominal Outside Diameter (shank)	0.129	0.164
Drill Bit Diameter	5/32	3/16
Minimum Embedment depth - Grouted CMU	2	2
Minimum Hole Depth - Grouted CMU	2 1/2	2 1/2
Embedment depth - Ungrouted CMU	1 1/4	1 1/4

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

[1] Embedment is measured form the masonry surface to the embedded end of the screw anchor.

TABLE 3
ALLOWABLE TENSION LOADS FOR TITEN TURBO™ SCREW ANCHORS INSTALLED IN GROUTED CMU WALL FACES[1,2,3]

Anchor Diameter (in.)	Embedment Depth (in.)	Minimum Dimensions			Allowable Load (lbf.)
		Spacing (in.)	Edge (in.)	End (in.)	
3/16	2	3	3 7/8	3 7/8	267
3/16	2	3	1 1/2	3 7/8	267
1/4	2	4	3 7/8	3 7/8	393
1/4	2	4	1 1/2	3 7/8	343

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

[1] The tabulated values are for screw anchors installed in minimum 8-inch wide grouted concrete masonry walls having reached a minimum f'_m of 1,500 psi at time of installation.

[2] Embedment is measured from the masonry surface to the embedded end of the screw anchor.

[3] Screw anchors shall be installed in grouted cell. The minimum edge and end distances shall be maintained.

TABLE 4
ALLOWABLE SHEAR LOADS FOR TITEN TURBO™ SCREW ANCHORS INSTALLED IN GROUTED CMU WALL FACES[1,2,3]

Anchor Diameter (in.)	Embedment Depth (in.)	Minimum Dimensions			Direction of Loading	Allowable Load (lb.)
		Spacing (in.)	Edge (in.)	End (in.)		
3/16	2	3	$3^{7}/_{8}$	$3^{7}/_{8}$	Toward edge, parallel to wall end	218
3/16	2	3	$1^{1}/_{2}$	$3^{7}/_{8}$	Toward wall end, parallel to wall edge	218
1/4	2	4	$3^{7}/_{8}$	$3^{7}/_{8}$	Toward edge, parallel to wall end	342
1/4	2	4	$1^{1}/_{2}$	$3^{7}/_{8}$	Toward wall end, parallel to wall edge	283

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

[1] The tabulated values are for screw anchors installed in minimum 8-inch wide grouted concrete masonry walls having reached a minimum f'_m of 1,500 psi at time of installation.

[2] Embedment is measured from the masonry surface to the embedded end of the screw anchor.

[3] Screw anchors shall be installed in grouted cell. The minimum edge and end distances shall be maintained.

TABLE 5
ALLOWABLE TENSION LOADS FOR TITEN TURBO™ SCREW ANCHORS INSTALLED IN UNGROUTED CMU WALL FACES[1,2,3]

Anchor Diameter (in.)	Embedment Depth (in.)	Minimum Dimensions			Allowable Load (lb.)
		Spacing (in.)	Edge (in.)	End (in.)	
3/16	$1^{1}/_{4}$	3	$3^{7}/_{8}$	$3^{7}/_{8}$	117
1/4	$1^{1}/_{4}$	4	$3^{7}/_{8}$	$3^{7}/_{8}$	117

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

[1] The tabulated values are for screw anchors installed in minimum 8-inch wide ungrouted concrete masonry walls having reached a minimum f'_m of 1,500 psi at time of installation.

[2] Embedment is measured from the masonry surface to the embedded end of the screw anchor.

[3] Screw anchors may be installed at any location in the wall face provided the minimum edge and end distances are maintained.

TABLE 6
ALLOWABLE SHEAR LOADS FOR TITEN TURBO™ SCREW ANCHORS INSTALLED IN UNGROUTED CMU WALL FACES[1,2,3]

Anchor Diameter (in.)	Embedment Depth (in.)	Minimum Dimensions			Direction of Loading	Allowable Load (lb.)
		Spacing (in.)	Edge (in.)	End (in.)		
3/16	$1^1/_4$	3	$3^7/_8$	$3^7/_8$	Toward edge, parallel to wall end	164
1/4	$1^1/_4$	4	$3^7/_8$	$3^7/_8$	Toward edge, parallel to wall end	190

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

[1] The tabulated values are for screw anchors installed in minimum 8-inch wide ungrouted concrete masonry walls having reached a minimum f'_m of 1,500 psi at time of installation.

[2] Embedment is measured from the masonry surface to the embedded end of the screw anchor.

[3] Screw anchors may be installed at any location in the wall face provided the minimum edge and end distances are maintained.

FIGURE 1 – TITEN TURBO™ SCREW ANCHORS

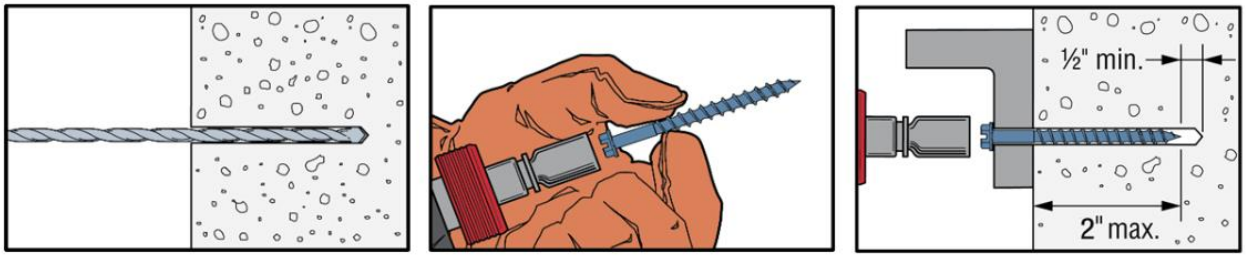

Figure 2 – Installation Instructions for Titen Turbo™ Screw Anchors

CITY OF LOS ANGELES SUPPLEMENT

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TITEN TURBO™ SCREW ANCHORS FOR USE IN MASONRY

CSI Division:
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04 05 19.16 —Masonry Anchors

1.0 RECOGNITION

The Simpson Strong-Tie Titen Turbo™ Screw Anchors for Use in Masonry as evaluated and represented in IAPMO UES Evaluation Report ER-716 and with changes as noted in this supplement is a satisfactory alternative for use in buildings built under the following codes (and regulations):

- 2020 City of Los Angeles Building Code (LABC)
- 2020 City of Los Angeles Residential Code (LARC)

2.0 LIMITATIONS

Use of the Simpson Strong-Tie Titen Turbo™ Screw Anchors for Use in Masonry recognized in this report is subject to the following limitations:

2.1 The design, installation, conditions of use and identification of the Titen Turbo™ Screw Anchors shall be in accordance with the 2018 International Building Code or the 2018 International Residential Code, as applicable, as noted in ER-716.

2.2 Prior to installation, calculations and details demonstrating compliance with this approval report and the 2020 Los Angeles Building Code or 2020 Los Angeles Residential Code shall be submitted to the structural plan check section for review and approval. The calculations and details shall be prepared by a registered engineer, licensed in the State of California.

2.3 The design and installation of the Titen Turbo™ Screw Anchors shall be in accordance with LABC Chapters 16 and 17.

2.4 The allowable and strength design values listed in ER-716 are for fasteners only. Connected members shall be checked for their capacity (which may govern).

2.5 Periodic special inspection shall be provided by the Registered Deputy Inspector in accordance with Section 1705 of the 2020 LABC during installations of the Titen Turbo™ Screw anchors.

2.6 Under the LARC a design in accordance with Section R301.1.3 shall be submitted.

2.7 The Simpson Strong-Tie Titen Turbo™ Screw Anchors for use in masonry have been evaluated for use to resist static, wind, or earthquake (Seismic Design Categories A and B only) tension and shear loads in grouted or ungrouted concrete masonry construction

This supplement expires concurrently with ER-716.

FLORIDA SUPPLEMENT

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CSI Division:
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1.0 RECOGNITION

The Simpson Strong-Tie Titen Turbo™ Screw Anchors for use in masonry recognized in ER-716 have been evaluated for use to resist static, wind, or earthquake (Seismic Design Categories A and B only) tension and shear loads in grouted or ungrouted concrete masonry construction. The structural performance properties of the Simpson Strong-Tie Titen Turbo™ 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

The Simpson Strong-Tie Titen Turbo™ Screw Anchors described in ER-716 comply 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 Turbo™ 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-716.

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 Turbo™ 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 the Simpson Strong-Tie Titen Turbo™ 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, in accordance with FBC–Building Section 2321.7.

6. Use of the Simpson Strong-Tie Titen Turbo™ Screw Anchors in High-velocity Hurricane Zones (HVHZ) as set forth in Section 2122.7 of the FBC--Building and Section 4407 of the FBC–Residential to resist wind forces is permitted. Loading shall comply with TMS402 Section 4.1. The anchors shall be designed to resist the horizontal forces as required in Section 1620 (HVHZ) of the FBC–Building or 200 pounds per lineal foot (2919 N/m) of wall, whichever is greater, in accordance with FBC–Building Section 2122.7.3. The Simpson Strong-Tie Titen Turbo™ Screw Anchors shall be embedded in reinforced grouted cells in accordance with Section 2122.7.4 of the FBC-Building.

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-716.