ICC-ES Evaluation Report

ESR-5134

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This report also contains:

- CBC Supplement

- FBC Supplement

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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:** **MIDWEST FASTENER CORP**	**EVALUATION SUBJECT:** **TORQUEMASTER CONCRETE SCREWS FOR USE IN UNCRACKED CONCRETE**	

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2021 *International Building Code®* (IBC)
- 2021 *International Residential Code®* (IRC)

Property evaluated:

- Structural

2.0 USES

The TorqueMaster Concrete Screws are used as an anchorage to resist static, wind and seismic (Seismic Design Categories A and B only), tension and shear loads in uncracked normal-weight or lightweight concrete having a specified compressive strength f'_c, of 2,500 psi to 8,500 psi (17.2MPa to 56.8 MPa).

The TorqueMaster Concrete Screws $^3/_{16}$ and $^1/_4$ inch (4.8 and 6.4 mm) diameters with effective embedment according to Table 1 are to be used in single anchor applications or in group anchorages when designed according to ACI 318-19 Chapter 17.

The TorqueMaster Concrete Screws are an alternative to cast-in-place anchors described in Section 1901.3 of the 2021 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 DESCRIPTION

3.1 TorqueMaster Concrete Screws:

The TorqueMaster Concrete Screws are manufactured from carbon steel that is heat treated. Anchors have a proprietary coating consisting of multiple layers of protective materials, designated as DuraPro, which is either blue or black in color, with nominal diameters of 3/16 and 1/4 inch (4.8 and 6.4 mm) with various lengths. The anchor bodies have a high-low alternating thread form and are available with a star recess in a hex washer head, flat head or pan head.

The TorqueMaster Concrete Screws with different head styles are illustrated in Figure 1 and Figure 2.

3.2 Concrete:

The concrete must be normal-weight concrete or lightweight concrete conforming to Sections 1903 and 1905 of the IBC.

4.0 DESIGN AND INSTALLATION

4.1 Strength Design:

4.1.1 General: Design strength of anchors complying with the 2021 IBC, as well as Section R301.1.3 of the 2021 IRC, must be determined in accordance with ACI 318-19 Chapter 17 and this report.

Design parameters and references are based on the 2021 IBC (ACI 318-19), unless noted otherwise in Sections 4.1.1 through 4.1.11 of this report.

The strength design of anchors must comply with ACI 318-19 17.5.1.2, except as required in ACI 318-19 17.10.

Strength reduction factors, ϕ, as given in ACI 318-19 17.5.3, and noted in Tables 3 and 4 of this report, must be used for load combinations calculated in accordance with Section 1605.1 of the 2021 IBC and Section 5.3 of ACI 318-19.

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 318-19 17.3.1.

4.1.2 Requirements for Static Steel Strength in Tension, N_{sa}: The nominal static steel strength of a single anchor in tension is calculated in accordance with ACI 318-19 17.6.1.2. The N_{sa} values of a single anchor are given in Table 3 of this report. Strength reduction factors, ϕ, corresponding to brittle steel elements as defined in ACI 318-19 and provided in Table 3, must be used.

4.1.3 Requirements for Static Concrete Breakout Strength in Tension, N_{cb} and N_{cbg}: The nominal static concrete breakout strength of a single anchor or a group of anchors in tension, N_{cb} and N_{cbg}, respectively, must be calculated in accordance with ACI 318-19 17.6.2, with modifications as described in this section. The nominal concrete breakout strength in tension in regions of concrete where analysis indicates no cracking at service loads in accordance with ACI 318-19 17.6.2.5.1, must be calculated using the values of k_{uncr} as given in Table 3 of this report with $\psi_{c,N}$ = 1.0.

4.1.4 Requirements for Static Pullout Strength in Tension, N_{pn}: The nominal static pullout strength of a single anchor in accordance with ACI 318-19 17.6.3.1 and 17.6.3.2.1 in uncracked concrete, $N_{p,uncr}$, is given in Table 3 of this report. In lieu of ACI 318-19 17.6.3.3, $\psi_{c,P}$ = 1.0 for all design cases. The nominal pullout strength can be adjusted by calculation according to Eq-1:

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

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

where f'_c is the specified compressive strength and n is the factor defining the influence of concrete strength on the pullout strength. The value of the n coefficient is 0.22 for the $^3/_{16}$ inch diameter and 0.42 for the $^1/_4$ inch diameter.

4.1.5 Requirements for Static Steel Strength in Shear, V_{sa}: The nominal static steel strength in shear, V_{sa}, of a single anchor in accordance with ACI 318-19 17.7.1.2 is given in Table 4 of this report and must be used in lieu of the values derived by calculation from ACI 318-19 Eq. 17.7.1.2b. The strength reduction factor, ϕ, corresponding to brittle steel elements as defined in ACI 318-19 2.3 must be used.

4.1.6 Requirements for Static Concrete Breakout Strength in Shear, V_{cb} and V_{cbg}: The nominal static concrete breakout strength in shear of a single anchor or group of anchors, V_{cb} and V_{cbg}, respectively, must be calculated in accordance with ACI 318-19 17.7.2, with modifications as provided in this section. The basic concrete breakout strength in shear, V_b, must be calculated in accordance with ACI 318-19 17.7.2.2.1, using the values of l_e and d_a described in Table 4 of this report. In no case shall l_e be taken as greater than $8d_a$ in the calculation of V_{cb} or V_{cbg}. The value of l_e used in ACI 318-19 Eq. 17.7.2.2.1a, must be taken as no greater than the lesser of h_{ef} or $8d_a$.

4.1.7 Requirements for Static Concrete Pryout Strength in Shear, V_{cp} or V_{cpg}: Static nominal concrete pryout strength of a single anchor or a group of anchors, V_{cp} and V_{cpg}, respectively, must be calculated in accordance with ACI 318-19 17.7.3, modified by using the value of k_{cp} provided in Table 4 and the value of N_{cb} or N_{cbg} as calculated in Section 4.1.3 of this report.

4.1.8 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 318-19 17.8.

4.1.9 Requirements for 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 according to ACI 318-19 17.6.2 must be further multiplied by the factor $\psi_{cp,N}$ given by Eq-2:

$$\psi_{cp,N} = \frac{c}{c_{ac}} \qquad \text{(Eq-2)}$$

where 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 318-19 17.9.5, the values for the critical edge distance, c_{ac}, must be taken from Table 3.

4.1.10 Requirements for Minimum Member Thickness, Minimum Anchor Spacing, and Minimum Edge Distance: In lieu of ACI 318-19 17.9.2, values of s_{min} and c_{min} must comply with Tables 3 and 4 of this report. In lieu of ACI 318-19 17.9.4, minimum member thicknesses, h_{min}, must comply with Table 2 of this report.

4.1.11 Lightweight Concrete: For the use of anchors in lightweight concrete, the modification factor λ_a equal to 0.8λ is applied to all values of $\sqrt{f'_c}$ affecting N_n and V_n.

The value of λ shall be determined in accordance with ACI 318-19.

4.2 Allowable Stress Design (ASD, Structural):

4.2.1 General: Design values for use with allowable stress design (working stress design) load combinations in accordance with Section 1605.1 of the 2021 IBC are required. These are calculated using Eq-3 and Eq-4 as follows:

$$T_{allowable,\,ASD} = \phi N_n \,/\, \alpha \qquad \text{(Eq-3)}$$

and

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

where:

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

$V_{allowable,ASD}$ = Allowable shear load (lbf or N).

ϕN_n = Lowest design strength of an anchor or anchor group in tension as determined in accordance with ACI 318-19 Chapter and Section 4.1 of this report, as applicable (lbf or kN).

ϕV_n = Lowest design strength of an anchor or anchor group in shear as determined in accordance with ACI 318-19 Chapter 17 and Section 4.1 of this report (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 overstrength.

Limits on edge distance, anchor spacing and member thickness as given in Section 4.1.10 of this report must apply. An example of allowable stress design tension values for illustrative purposes is shown on Figure 4 of this report.

4.2.2 Interaction of Tensile and Shear Forces: The interaction must be calculated and consistent with ACI 318-19 17.8 as follows:

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

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

For all other cases:

$$\frac{T_{applied}}{T_{allowable,ASD}} + \frac{V_{applied}}{V_{allowable,ASD}} \le 1.2 \qquad \text{(Eq-5)}$$

4.3 Installation:

Installation parameters are provided in Table 1 and Table 2. The manufacturer's printed installation instructions (MPII) are reproduced in Figure 3. Anchor locations must comply with this report and the plans and specifications approved by the code official. The TorqueMaster Concrete Screws must be installed in accordance with the manufacturer's published installation instructions and this report. In case of conflict, this report governs. Holes must be predrilled in concrete with the provided Midwest Fasteners carbide drill bit conforming to ANSI B212.15-1994 and a hammer drill. The hole must be drilled 1/4 inch (6.4 mm) deeper than the embedment depth and cleaned out of any dust or debris using a vacuum or compressed air. The anchors must then be installed into the pre-drilled hole until firmly seated to the specified nominal embedment depth with a Midwest Screw Anchor installation tool.

4.4 Special Inspection:

Special inspection is required in accordance with Section 1705.1.1 and Table 1705.3 of the 2021 IBC. 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." Under the IBC, additional requirements as set forth in Sections 1705, 1706 and 1707 must be observed, where applicable.

5.0 CONDITIONS OF USE:

The TorqueMaster Concrete Screws For Use In Uncracked Concrete described in this report comply with, or is a suitable alternative to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 Anchor sizes, dimensions, and other installation parameters 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 cases of a conflict, this report governs.

5.3 The anchors must be installed in uncracked normal-weight concrete or 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 values of f'c used for calculation purposes must not exceed 8,000 psi (55.2 MPa).

5.5 The concrete must have attained its minimum design strength prior to the installation of anchors.

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

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

5.8 Anchor spacing, edge distance, and minimum member thickness must comply with Tables 2, 3 and 4 of this report.

5.9 Prior to installation, calculations and details justifying that the applied loads demonstrate 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.

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

5.11 Use of TorqueMaster Concrete Screws to resist seismic forces in structures assigned to Seismic Design Category C, D, E or F is beyond the scope of this report. Anchors may be used to resist short-term loading due to wind or seismic forces (Seismic Design Category A and B), subject to the conditions of this report.

5.12 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 gravity load-bearing structural elements are within a fire-resistance-rated envelope or a fire-resistance-rated membrane, are protected by approved fire-resistance-rated materials, or have been evaluated for resistance to fire exposure in accordance with recognized standards.

- Anchors are used to support nonstructural elements.

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

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

5.15 Special inspections are provided in accordance with Section 4.4 of this report.

5.16 Anchor design in accordance with ACI 318-19 Chapter 17 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.

5.17 Anchors are manufactured under an approved quality-control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Mechanical Anchors in Concrete Elements (AC193), dated October 2017, editorially revised December 2020, which incorporates requirements in ACI 355.2 (-19 and -07) and quality control documentation.

7.0 IDENTIFICATION

7.1 The ICC-ES mark of conformity, electronic labeling, or the evaluation report number (ICC-ES ESR-5134) along with the name, registered trademark, or registered logo of the report holder must be included in the product label.

7.2 In addition, the TorqueMaster Concrete Screws are packaged in chipboard cartons, plastic tubs, or blister packs, with graphics on the packaging or labels that provides the manufacturer name and the name of the product (TorqueMaster Concrete Screws), screw description (type, length, screw diameter), a picture of the product, and the part number and lot number of the particular item. The length identification code letter is stamped on the head of the anchor. See the length identification system indicated in Table 1 of this report.

7.3 The report holder's contact information is the following:

MIDWEST FASTENER CORP
9031 SHAVER ROAD
PORTAGE, MICHIGAN 49024
(269) 327-6917
www.fastenerconnection.com

TABLE 1—LENGTH IDENTIFICATION SYSTEM

LENGTH ID MARKING ON ANCHOR HEAD		+	A	B	C	D	E	F
Length of anchor (inches)	From	1	1 1/2	2	2 1/2	3	3 1/2	4
	Up to, but not including	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2

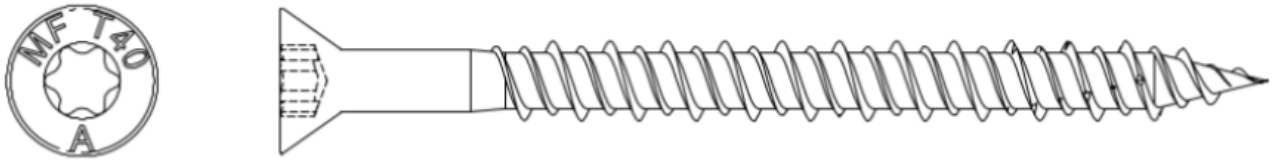
For **SI:** 1 inch = 25.4 mm.

TABLE 2—INSTALLATION INFORMATION FOR TORQUEMASTER CONCRETE SCREWS [1]

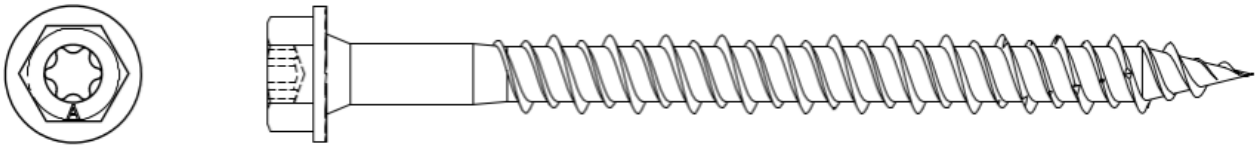
ANCHOR INFORMATION	SYMBOL	UNITS	NOMINAL ANCHOR DIAMETER (inch)	
			3/16	1/4
Nominal Outside Anchor Diameter	d_a	in. (mm)	0.207 (5.3)	0.246 (6.2)
Drill Bit Diameter	d_{bit}	in. (mm)	5/32 (4.0)	3/16 (4.8)
Maximum Installation Torque	$T_{inst,max}$	ft-lbf (N-m)	Not applicable[2]	
Nominal Embedment Depth	h_{nom}	in. (mm)	1 3/4 (44.5)	2 (50.8)
Effective Embedment Depth	h_{ef}	in. (mm)	1.107 (28.1)	1.295 (32.9)
Minimum Hole Depth	h_{hole}	in. (mm)	2 (50.8)	2 1/4 (57.2)
Minimum Concrete Thickness	h_{min}	in. (mm)	4 (101.6)	

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

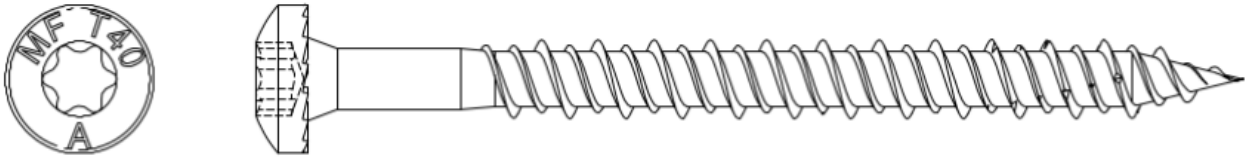
[1]The information presented in this table must be used in conjunction with the design requirements of ACI 318-19 Chapter 17.
[2]Installation must be performed with TorqueMaster tool kit. See Figure 3 for additional information.



FLAT HEAD SCREW



HEX WASHER HEAD SCREW



PAN HEAD SCREW

FIGURE 1- TORQUEMASTER CONCRETE SCREWS AND HEAD STYLES

FIGURE 2- TORQUEMASTER CONCRETE SCREWS

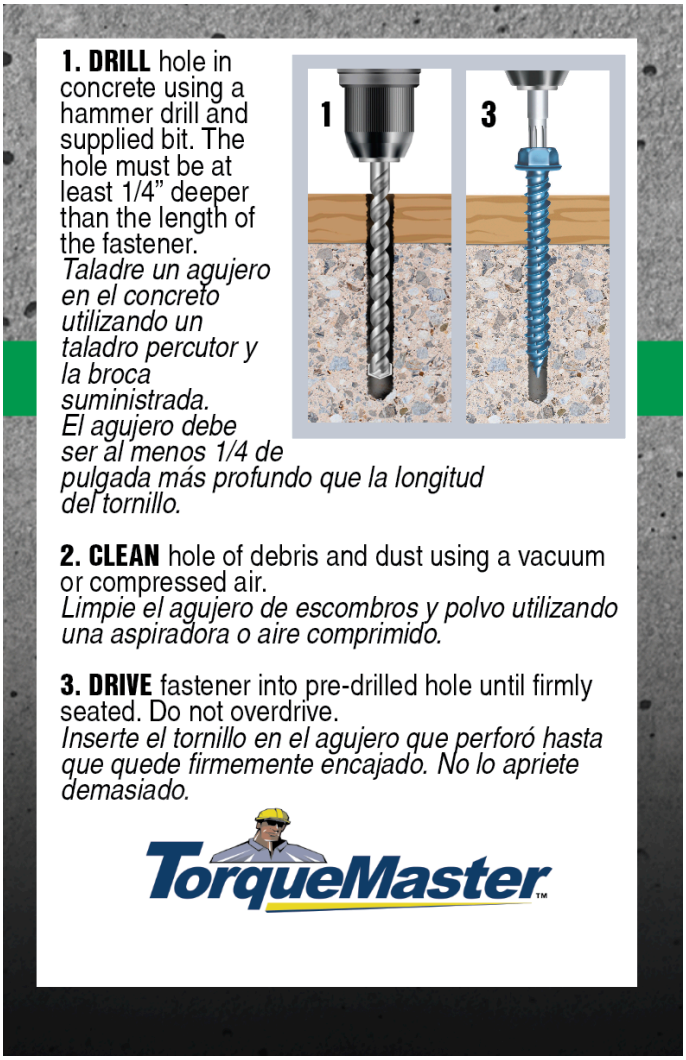


FIGURE 3- INSTALLATION INSTRUCTIONS (MPII)

TABLE 3—TENSION STRENGTH DESIGN INFORMATION FOR TORQUEMASTER CONCRETE SCREWS [1]

CHARACTERISTIC	SYMBOL	UNITS	NOMINAL ANCHOR DIAMETER (inch)	
			$^3/_{16}$	$^1/_4$
Anchor Category	1, 2 or 3	-	1	1
Nominal Embedment Depth	h_{nom}	in. (mm)	1 3/4 (44.5)	2 (50.8)
Critical Edge Distance	c_{ac}	in. (mm)	4 (101.6)	4 (101.6)
Minimum Edge Distance	c_{min}	in. (mm)	2 (50.8)	2 (50.8)
Minimum Spacing	s_{min}	in. (mm)	1 $^1/_2$ (38.1)	2 (50.8)
Steel Strength in Tension (ACI 318-19 17.6.1)				
Minimum Specified Yield Strength	f_{ya}	psi (N/mm²)	100,000 (689)	100,000 (689)
Minimum Specified Tensile Strength	f_{uta}	psi (N/mm²)	125,000 (862)	125,000 (862)
Effective Tensile Stress Area	A_{se}	in² (mm²)	0.0143 (9.2)	0.0232 (15)
Steel Strength in Tension	N_{sa}	lbf (kN)	1,788 (7.95)	2,900 (12.9)
Strength Reduction Factor-Steel Failure[2]	ϕ_{sa}	-	0.65	
Concrete Breakout Strength in Tension (ACI 318-19 17.6.2)				
Effective Embedment Depth	h_{ef}	in. (mm)	1.107 (28.1)	1.295 (32.9)
Effectiveness Factor-Uncracked Concrete	k_{uncr}	-	24	24
Strength Reduction Factor-Concrete Breakout Failure[2]	ϕ_{cb}	-	0.65	
Modification Factor for Concrete[3]	$\Psi_{c,N}$	-	1.0	
Pull-Out Strength in Tension (ACI 318-19 17.6.3)				
Pull-Out Resistance Uncracked Concrete (f'_c = 2,500 psi)[4]	$N_{p,uncr}$	lbf (kN)	1,090 (4.85)	1,155 (5.14)
Strength Reduction Factor-Pullout Failure[2]	ϕ_p	-	0.65	
Axial stiffness				
Axial stiffness in service load range in uncracked concrete	β	lb/in (N/mm)	55,800 (9,765)	45,850 (8,024)

For **SI:** 1 inch = 25.4mm, 1lbf = 4.45N, 1 lb/in = 0.175 N/mm, 1 psi = 0.00689 MPa = 0.00689 N/mm², 1 in² = 645 mm²

[1]The information presented in this table must be used in conjunction with the design requirements of ACI 318-19 Chapter 17.
[2]The strength reduction factor applies when the load combinations from the IBC or ACI 318 are used and the requirements of ACI 318-19 17.5.3 are met.
[3]For all design cases use $\Psi_{c,N}$ = 1.0. The effectiveness factor for uncracked concrete (k_{uncr}) must be used.
4 For all design cases use $\Psi_{c,P}$ = 1.0. Tabular value for pullout strength is for concrete compressive strength of 2,500 psi (17.2 MPa). Pullout strength for concrete compressive strength greater that 2,500 psi (17.2 MPa) may be increased by multiplying the tabular pullout strength by $(f'_c / 2500)^n$ for psi and $(f'_c / 17.2)^n$ for MPa, where n is defined in section 4.1.4 of this report.

TABLE 4—SHEAR STRENGTH DESIGN INFORMATION FOR TORQUEMASTER CONCRETE SCREWS [1]

CHARACTERISTIC	SYMBOL	UNITS	NOMINAL ANCHOR DIAMETER (inch)	
			$^3/_{16}$	$^1/_4$
Anchor Category	1, 2 or 3	-	1	1
Nominal Embedment Depth	h_{nom}	in. (mm)	1 3/4 (44.5)	2 (50.8)
Critical Edge Distance	c_{ac}	in. (mm)	4 (101.6)	4 (101.6)
Minimum Edge Distance	c_{min}	in. (mm)	2 (50.8)	2 (50.8)
Minimum Spacing	s_{min}	in. (mm)	1 $^1/_2$ (38.1)	2 (50.8)
Effective Embedment Depth	h_{ef}	in. (mm)	1.107 (28.1)	1.295 (32.9)
Steel Strength in Shear (ACI 318-19 17.7.1)				
Minimum Specified Yield Strength	f_{ya}	psi (N/mm²)	100,000 (689)	100,000 (689)
Minimum Specified Tensile Strength	f_{uta}	psi (N/mm²)	125,000 (862)	125,000 (862)
Effective Shear Stress Area	A_{se}	in² (mm²)	0.0143 (9.2)	0.0232 (15)
Steel strength in shear - static	V_{sa}	lbf (kN)	647 (2.9)	1,635 (7.3)
Strength Reduction Factor-Steel Failure[2]	ϕ_{sa}	-	0.60	
Concrete Breakout Strength in Shear (ACI 318-19 17.7.2)				
Nominal Diameter	d_a	in. (mm)	$^3/_{16}$ (4.8)	$^1/_4$ (6.4)
Load Bearing Length of Anchor in Shear (h_{ef} or $8d_o$, whichever is less)	l_e	in. (mm)	1.107 (28.1)	1.295 (32.9)
Strength Reduction Factor-Concrete Breakout Failure[2]	ϕ_{cb}	-	0.70	
Concrete Pryout Strength in Shear (ACI 318-19 17.7.3)				
Coefficient for Pryout Strength	k_{cp}	-	1.0	
Strength Reduction Factor-Concrete Pryout Failure[2]	ϕ_{cp}	-	0.7	

For **SI:** 1 inch = 25.4mm, 1 lbf = 4.45 N, 1 psi = 0.00689 MPa = 0.00689 N/mm², 1 in² = 645 mm².

[1]The information presented in this table must be used in conjunction with the design requirements of ACI 318-19 Chapter 17.
[2]The strength reduction factor applies when the load combinations from the IBC or ACI 318 are used and the requirements of ACI 318-19 17.5.3 are met.

Design Example to Calculate Allowable Stress Design Tension Capacity for Illustrative Purposes[1,2,3,4,5,6,7,8,9]:

TorqueMaster Concrete Screws $^{3}/_{16}$-inch diameter, with an effective embedment (h_{ef}) of 1.107 inch, assuming the conditions given in Table 3

	PROCEDURE		CALCULATION
Step 1	Determine steel strength of a single anchor in tension per ACI 318-19 17.6.1.2 and Table 3 of this report:	ϕN_{sa}	$= \phi N_{sa}$ =0.65*1,788 **=1,162 lbs steel strength**
Step 2	Determine concrete breakout strength of a single anchor in tension per ACI 318-19 17.6.2.2 and Table 3 of this report:	N_b	$= k_{uncr} \sqrt{f`_c}\ h_{ef}^{1.5}$ $= 24 * \sqrt{2,500} * 1.107^{1.5}$ = 1,398 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*1,398 = 0.65*1,398 **= 909 lbs concrete breakout strength**
Step 3	Determine pullout strength per Table 3 of this report:	$\phi N_{p,uncr}$	$=\phi N_{p,uncr}\ \psi_{c,P}$ = 0.65 * 1090 * 1.0 = **709 lbs pullout strength**
Step 4	Determine controlling resistance strength in tension per ACI 318-19 17.5.2:		**= 709 lbs controlling resistance (pullout)**
Step 5	Determine allowable stress design conversion factor for loading condition per ACI 318-19 Section 5.3:	α	=1.2*D* + 1.6*L* =1.2(0.3) + 1.6(0.7) **=1.48**
Step 6	Determine allowable stress design value per Section 4.2 of this report:	$T_{allowable,ASD}$	$= \phi N_n / \alpha$ = 709 / 1.48 **= 479 lbs allowable stress design**

[1]Single anchor with static tension load only.
[2]Concrete determined to remain uncracked for the life of the anchorage.
[3]Load combinations are taken from ACI 318-19 Section 5.3 (no seismic loading considered).
[4]Assumes 30% dead load and 70% live load, controlling load combination 1.2*D* + 1.6*L*.
[5]Calculation of weighted average for conversion factor α = 1.2(0.3) + 1.6(0.7) = 1.48.
[6] f'_c = 2,500 psi (normal weight concrete).
[7] $c_{a1} = c_{a2} \geq c_{ac}$.
[8] $h \geq h_{min}$.
[9]Values are for Condition B (no supplementary reinforcement provided) in accordance with ACI 318-19 17.5.3.

FIGURE 4—EXAMPLE DESIGN CALCULATION

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:

MIDWEST FASTENER CORP

EVALUATION SUBJECT:

TORQUEMASTER CONCRETE SCREWS FOR USE IN UNCRACKED CONCRETE

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Torque Master Concrete Screws for use in Uncracked Concrete, described in ICC-ES evaluation report ESR-5134, have also been evaluated for compliance with the codes noted below.

Applicable code edition*(s)*:

- 2022 *California Building Code* (CBC)

For evaluation of applicable Chapters adopted by the California Office of Statewide Health Planning and Development (OSHPD) AKA: California Department of Health Care Access and Information (HCAI) and the Division of State Architect (DSA), see Sections 2.1.1 and 2.1.2 below.

- 2022 *California Residential Code* (CRC)

2.0 CONCLUSIONS

2.1 CBC:

The Torque Master Concrete Screws for use in Uncracked Concrete, described in Sections 2.0 through 7.0 of the evaluation report ESR-5134, comply with CBC Chapter 19, provided the design and installation are in accordance with the 2021 *International Building Code®* (IBC) provisions noted in the evaluation report and the additional requirements of CBC Chapter 16, 17 and 19, as applicable.

2.1.1.1 OSHPD:

The applicable OSHPD Sections and Chapters of the CBC are beyond the scope of this supplement.

2.1.1.2 DSA:

The applicable DSA Sections and Chapters of the CBC are beyond the scope of this supplement.

2.2 CRC:

The Torque Master Concrete Screws for use in Uncracked Concrete, described in Sections 2.0 through 7.0 of the evaluation report ESR-5134, comply with CRC Chapter 3, provided the design and installation are in accordance with the 2021 *International Residential Code®* (IRC) provisions noted in the evaluation report and the additional requirements of CRC Chapter 3, as applicable.

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

DIVISION: 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:

MIDWEST FASTENER CORP

EVALUATION SUBJECT:

TORQUEMASTER CONCRETE SCREWS FOR USE IN UNCRACKED CONCRETE

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that Torque Master Concrete Screws for use in Uncracked Concrete, described in ICC-ES evaluation report ESR-5134, have also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2023 *Florida Building Code—Building*
- 2023 *Florida Building Code—Residential*

2.0 CONCLUSIONS

The Torque Master Concrete Screws for use in Uncracked Concrete, described in Sections 2.0 through 7.0 of ICC-ES evaluation report ESR-5134, comply with the *Florida Building Code-Building and the Florida Building Code-Residential*. The design requirements must be determined in accordance with the *Florida Building Code-Building* or the *Florida Building Code-Residential,* as applicable. The installation requirements noted in ICC-ES evaluation report ESR-5134 for the 2021 *International Building Code®* meet the requirements of the *Florida Building Code-Building* or the *Florida Building Code-Residential,* as applicable.

Use of the Torque Master Concrete Screws for use in Uncracked Concrete has also been found to be in compliance with the High-Velocity Hurricane Zone provisions of the *Florida Building Code—Building* and *Florida Building Code—Residential* with the following condition:

a) For anchorage to wood members, the connection subject to uplift must be designed for no less than 700 pounds (3114 N).

For products falling under Florida Rule 61G20-3, verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission for the type of inspections being conducted is the responsibility of an approved validation entity (or the code official when the report holder does not possess an approval by the Commission).

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