Stainless-Steel Titen HD® Heavy-Duty Screw Anchor

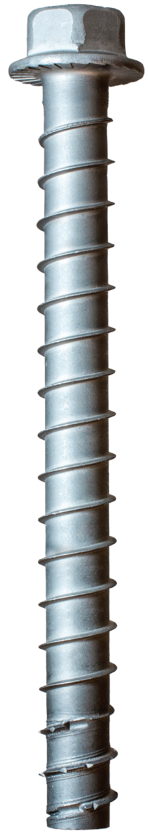
Cracked Concrete CODE LISTED

The Next Era of Stainless-Steel Screw Anchor for Concrete and Masonry

Titen HD screw anchors are a trusted anchor solution because they offer the performance that specifiers need and the ease of installation that contractors demand. Until now, however, they were not for use in permanent exterior or corrosive environments. The Titen HD stainless-steel screw anchor for concrete and masonry sets the new standard for when the job calls for installation in multiple types of environments. It is the ultimate choice to provide fast and efficient installation, combined with long-lasting corrosion resistance for an unsurpassed peace-of-mind.

Innovative — The serrated carbon-steel threads on the tip of the stainless-steel Titen HD are vital because they undercut the concrete as the anchor is driven into the hole, making way for the rest of the threads to interlock with the concrete. In order for these threads to be durable enough to cut into the concrete, they are formed from carbon steel that is then hardened and brazed onto the tip of the anchor.

Corrosion Resistant — For dry, interior applications, carbon-steel corrosion is not a risk, but in any kind of exterior, coastal or chemical environment the anchor would be susceptible to corrosion. With the introduction of the THDSS, there is finally a state-of-the-art anchor solution that combines the corrosion resistance of Type 300 Series stainless steel with the undercutting ability of sacrificial heat-treated carbon-steel cutting threads.

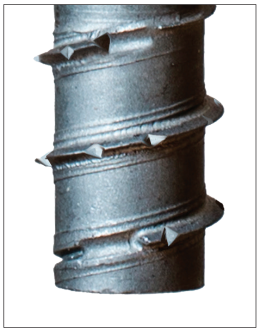


Stainless-Steel Titen HD Hex-Washer Head Style Screw Anchor

US Patents 8,747,042 B2 and 9,517,519

Features:

- Ideal for exterior or corrosive environments
- Anchor contains minimal carbon steel resulting in less expansion forces in the concrete due to corrosion
- Installs with an impact wrench or with a hand tool
- Tested per ACI355.2, AC193 and AC106



Innovative Carbon-Steel Lead Threads

Codes: IAPMO UES ER-493 (concrete);
ICC-ES ESR-1056 (masonry);
City of LA Supplement within ER-493 (concrete);
City of LA Supplement within ESR-1056 (masonry);
Florida FL15730 (masonry); FL16230 (concrete)

Material: Type 316 and Type 304 stainless steel with carbon-steel lead threads

Installation

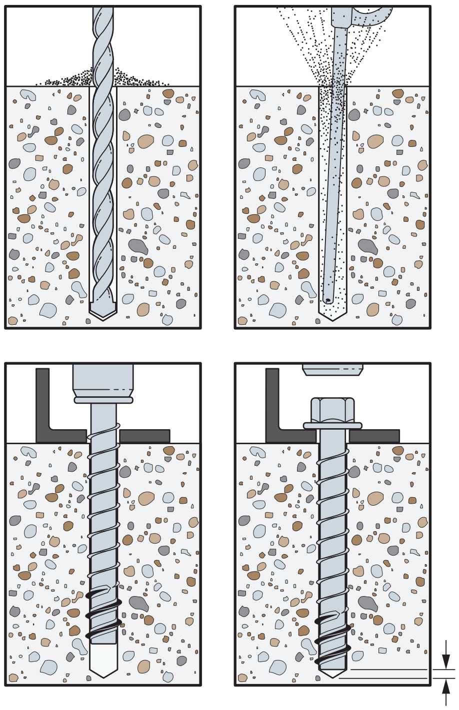
Caution: Holes in steel fixtures to be mounted should match the diameter specified in the table below if steel is thicker than 12 gauge.

Caution: Use a Titen HD screw anchor one time only — installing the anchor multiple times may result in excessive thread wear and reduce load capacity. Do not use impact wrenches to install into hollow CMU.

Caution: Oversized holes in base material will reduce or eliminate the mechanical interlock of the threads with the base material and reduce the anchor's load capacity.

1. Drill a hole in the base material using a carbide drill bit (complying with ANSI B212.15) with the same diameter as the nominal diameter of the anchor to be installed. Drill the hole to the specified minimum hole depth overdrill (see table below) to allow the thread tapping dust to settle, and blow it clean using compressed air. (Overhead installations need not be blown clean.) Alternatively, drill the hole deep enough to accommodate embedment depth and the dust from drilling and tapping.
2. Insert the anchor through the fixture and into the hole.
3. Tighten the anchor into the base material until the hex-washer head or the countersunk head contacts the fixture.

Installation Sequence



Minimum overdrill. See table.

Additional Installation Information

Titen HD® Diameter (in.)	Wrench Size (in.)	Recommended Steel Fixture Hole Size (in.)	Minimum Hole Depth Overdrill (in.)
¼	⅜	⅜ to 7/16	⅛
⅜	9/16	½ to 9/16	¼
½	¾	⅝ to 11/16	½
⅝	15/16	¾ to 13/16	½
¾	1⅛	⅞ to 15/16	½

Suggested fixture hole sizes are for structural steel thicker than 12 gauge only. Larger holes are not required for wood or thinner cold-formed steel members.

Stainless-Steel **Countersunk** Head Style

The countersunk head style is for applications that require a flush-mount profile. Countersinking also leaves a cleaner surface appearance for exposed through-set applications. The anchor head's 6-lobe drive eases installation and is less prone to stripping than traditional recessed anchor heads.

Features

- Available in many standard lengths in ¼" and ⅜" diameters
- Countersunk head allows screw anchor applications incompatible with a hex head
- Countersunk version includes driver bit in each box

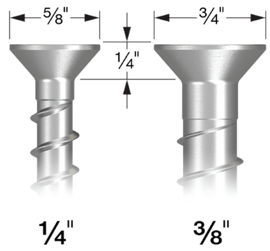
Codes: IAPMO UES ER-493 (concrete);
ICC-ES ESR-1056 (masonry);
City of LA Supplement within ER-493 (concrete);
City of LA Supplement within ESR-1056 (masonry);
Florida FL15730 (masonry); FL16230 (concrete)

Material: Type 316 stainless steel with carbon-steel lead threads

Stainless-Steel Titen HD Countersunk Head Style Screw Anchor

Cracked Concrete CODE LISTED

6-lobe drive

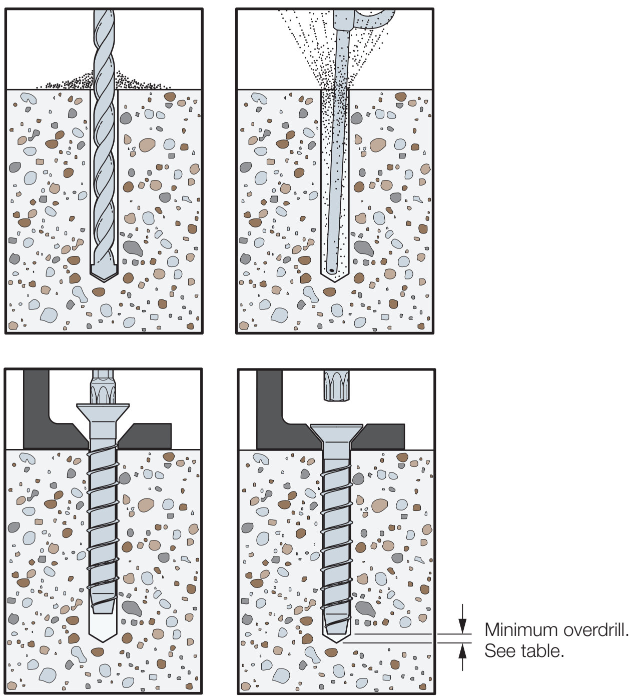


Additional Installation Information

Titen HD Diameter (in.)	Bit Size	Recommended Steel Fixture Hole Size (in.)	Minimum Hole Depth Overdrill (in.)
¼	T30	⅜ to 7⁄16	⅛
⅜	T50	½ to 9⁄16	¼

Suggested fixture hole sizes are for structural steel thicker than 12 gauge only. Larger holes are not required for wood or thinner cold-formed steel members.

Installation Sequence



Titen HD Countersunk Installation

Stainless-Steel Titen HD® Heavy-Duty Screw Anchor

Stainless-Steel Titen HD Anchor Product Data — Hex Washer Head

Size (in.)	Model No. (Type 316)	Model No. (Type 304)	Thread Length (in.)	Drill Bit Diameter (in.)	Wrench Size (in.)	Quantity	
						Box	Carton
¼ x 2	THDC25200H6SS†	—	1⅞	¼	⅜	50	250
¼ x 2⅜	THDC25238H6SS	—	2¼	¼	⅜	50	250
¼ x 3	THDC25300H6SS	—	2⅞	¼	⅜	50	250
¼ x 4	THDC25400H6SS	—	3⅞	¼	⅜	50	250
⅜ x 3	THD37300H6SS	THD37300H4SS	2½	⅜	9⁄16	50	200
⅜ x 4	THD37400H6SS	THD37400H4SS	3½	⅜	9⁄16	50	200
⅜ x 5	THD37500H6SS	THD37500H4SS	4½	⅜	9⁄16	50	100
⅜ x 6	THD37600H6SS	THD37600H4SS	5½	⅜	9⁄16	50	100
½ x 3	THD50300H6SS	THD50300H4SS	2½	½	¾	25	100
½ x 4	THD50400H6SS	THD50400H4SS	3½	½	¾	20	80
½ x 5	THD50500H6SS	THD50500H4SS	4½	½	¾	20	80
½ x 6	THD50600H6SS	THD50600H4SS	5½	½	¾	20	80
½ x 6½	THD50612H6SS	THD50612H4SS	6	½	¾	20	40
½ x 8	THD50800H6SS	THD50800H4SS	6⅞	½	¾	20	40
⅝ x 4	THDB62400H6SS	THDB62400H4SS	3½	⅝	15⁄16	10	40
⅝ x 5	THDB62500H6SS	THDB62500H4SS	4½	⅝	15⁄16	10	40
⅝ x 6	THDB62600H6SS	THDB62600H4SS	5½	⅝	15⁄16	10	40
⅝ x 6½	THDB62612H6SS	THDB62612H4SS	6	⅝	15⁄16	10	40
⅝ x 8	THDB62800H6SS	THDB62800H4SS	7 1⁄16	⅝	15⁄16	10	20
¾ x 4	THD75400H6SS	THD75400H4SS	3½	¾	1⅛	10	40
¾ x 5	THD75500H6SS	THD75500H4SS	4½	¾	1⅛	5	20
¾ x 6	THD75600H6SS	THD75600H4SS	5½	¾	1⅛	5	20
¾ x 7	THD75700H6SS	THD75700H4SS	6½	¾	1⅛	5	10
¾ x 8½	THD75812H6SS	THD75812H4SS	7 3⁄16	¾	1⅛	5	10

† Does not meet minimum embedment in code report.

1. Anchor length is measured from under head to bottom of anchor.

Stainless-Steel Titen HD Anchor Product Data — Countersunk

Size (in.)	Model No. (Type 316)	Thread Length (in.)	Drill Bit Diameter (in.)	Wrench Size (in.)	Quantity	
					Box	Carton
¼ x 2⅜	THDC25238CS6SS†	2	¼	T30	25	250
¼ x 3	THDC25300CS6SS	2⅝	¼	T30	25	250
¼ x 4	THDC25400CS6SS	3⅝	¼	T30	25	250
⅜ x 2½	THD37212CS6SS†	2	⅜	T50	25	125
⅜ x 3	THD37300CS6SS	2½	⅜	T50	25	125
⅜ x 4	THD37400CS6SS	3½	⅜	T50	25	125

† These models do not meet minimum embedment depth requirements for strength design and require maximum installation torque of 25 ft. – lb. using a torque wrench, driver drill or cordless ¼" impact driver with a maximum permitted torque rating of 100 ft. – lb.

1. Anchor length is measured from top of head to bottom of anchor.

Stainless-Steel Titen HD® Design Information — Concrete

IBC *

Stainless-Steel Titen HD Installation Information[1]

Characteristic	Symbol	Units	Nominal Anchor Diameter (in.)										
			¼		⅜		½			⅝		¾	
Installation Information													
Nominal Diameter	d_a	in.	¼		⅜		½			⅝		¾	
Drill Bit Diameter	d_{bit}	in.	¼		⅜		½			⅝		¾	
Minimum Baseplate Clearance Hole Diameter[2]	d_c	in.	⅜		½		⅝			¾		⅞	
Maximum Installation Torque[3]	$T_{inst,max}$	ft.-lbf.	N/A		40		70			85		150	
Maximum Impact Wrench Torque Rating	$T_{impact,max}$	ft.-lbf.	125		150		345			345		380	
Minimum Hole Depth	h_{hole}	in.	2¼	3⅛	2¾	3½	3¾		4½	4½	6	6	6¾
Nominal Embedment Depth	h_{nom}	in.	2⅛	3	2½	3¼	3¼		4	4	5½	5½	6¼
Effective Embedment Depth	h_{ef}	in.	1.27	2.01	1.40	2.04	1.86		2.50	2.31	3.59	3.49	4.13
Critical Edge Distance	c_{ac}	in.	3	3	4½	5½	6		5¾	6	6⅜	6¾	7⅜
Minimum Edge Distance	c_{min}	in.	1½	1½	1¾	1¾	1¾	2¼	1¾	1¾	1¾	1¾	1¾
Minimum Spacing	s_{min}	in.	1½	1½	3	3	4	3	3	3	3	3	3
Minimum Concrete Thickness	h_{min}	in.	3½	4⅜	4	5	5		6¼	6	8½	8¾	10
Anchor Data													
Yield Strength	f_{ya}	psi	88,000		98,400		91,200			83,200		92,000	
Tensile Strength	f_{uta}	psi	110,000		123,000		114,000			104,000		115,000	
Minimum Tensile and Shear Stress Area	A_{se}	in.^{2}	0.0430		0.099		0.1832			0.276		0.414	
Axial Stiffness in Service Load Range — Uncracked Concrete	β_{uncr}	lb./in.	139,300		807,700		269,085			111,040		102,035	
Axial Stiffness in Service Load Range — Cracked Concrete	β_{cr}	lb./in.	103,500		113,540		93,675			94,400		70,910	

For **SI**: 1 in. = 25.4 mm, 1 ft.-lbf. = 1.356 N-m, 1 psi = 6.89 kPa, 1 in.^{2} = 645 mm^2, 1 lb./in. = 0.175 N/mm.

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 minimum hole size must comply with applicable code requirements for the connected element.
3. $T_{inst,max}$ applies to installations using a calibrated torque wrench.

* *See p. 12 for an explanation of the load table icons.*

Stainless-Steel Titen HD® Design Information — Concrete

Stainless-Steel Titen HD Tension Strength Design Data[1,5]

Characteristic	Symbol	Units	Nominal Anchor Diameter (in.)									
			¼		⅜		½		⅝		¾	
Anchor Category	1, 2 or 3	—	3		1							
Nominal Embedment Depth	h_{nom}	in.	2⅛	3	2½	3¼	3¼	4	4	5½	5½	6¼
Steel Strength in Tension (ACI 318-14 17.4.1 or ACI 318-11 Section D.5.1)												
Tension Resistance of Steel	N_{sa}	lbf.	4,730		12,177		20,885		28,723		47,606	
Strength Reduction Factor — Steel Failure[2]	ϕ_{sa}	—	0.75									
Concrete Breakout Strength in Tension (ACI 318-14 17.4.2 or ACI 318 Section D.5.2)												
Effective Embedment Depth	h_{ef}	in.	1.27	2.01	1.40	2.04	1.86	2.50	2.31	3.59	3.49	4.13
Critical Edge Distance	c_{ac}	in.	3	3	4½	5½	6	5¾	6	6⅜	6¾	7⅜
Effectiveness Factor — Uncracked Concrete	k_{uncr}	—	24	24	27	24	27	24	24	24	27	27
Effectiveness Factor — Cracked Concrete	k_{cr}	—	17	17	21	17	17	17	17	17	17	21
Modification Factor	$\Psi_{c,N}$	—	1									
Strength Reduction Factor — Concrete Breakout Failure[3]	ϕ_{cb}	—	0.45		0.65							
Pullout Strength in Tension (ACI 318-14 17.4.3 or ACI 318-11 Section D.5.3)												
Pullout Resistance Uncracked Concrete (f'_c = 2,500 psi)	$N_{p,uncr}$	lbf.	1,725[5]	3,550[8]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	3,820[5]	9,080[7]	N/A[4]	N/A[4]
Pullout Resistance Cracked Concrete (f'_c = 2,500 psi)	$N_{p,cr}$	lbf.	695[5]	1,225[5]	1,675[5]	2,415[5]	1,995[5]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]
Strength Reduction Factor — Pullout Failure[6]	ϕ_p	—	0.45		0.65							
Tension Strength for Seismic Applications (ACI 318-14 17.2.3.3 or ACI 318-11 Section D.3.3.3)												
Nominal Pullout Strength for Seismic Loads (f'_c = 2,500 psi)	$N_{p,eq}$	lbf.	695[5]	1,225[5]	1,675[5]	2,415[5]	1,995[5]	N/A[4]	N/A[4]	N/A[4]	N/A[4]	N/A[4]
Strength Reduction Factor for Pullout Failure[6]	ϕ_{eq}	—	0.45		0.65							

For **SI**: 1 in. = 25.4 mm, 1 ft.-lbf. = 1.356 N-m, 1 psi = 6.89 kPa, 1 in.^{2} = 645 mm^2, 1 lb./in. = 0.175 N/mm.

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, as applicable. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ must be determined in accordance with ACI 318 D.4.4(b), as applicable.
3. The tabulated values 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, as applicable, are used and the requirements of ACI 318-14 17.3.3(c) or ACI 318-11 D.4.3(c) for Condition B are met. Condition B applies where supplementary reinforcement is not provided in concrete. For installations where complying reinforcement can be verified, the ϕ_{cb} factors described in ACI 318-14 17.3.3(c) or ACI 318-11 D.4.3(c), as applicable, may be used for Condition A. If the load combinations of ACI 318 Appendix C are used, the appropriate value of ϕ must be determined in accordance with ACI 318 D.4.4(c) for Condition B.
4. N/A denotes that pullout resistance does not govern and does not need to be considered.
5. The characteristic pullout resistance for greater compressive strengths may be increased by multiplying the tabular value by $(f'_c/2{,}500)^{0.5}$.
6. The tabulated values of ϕ_p or ϕ_{eq} applies when both the load combinations of ACI 318-14 Section 5.3 or ACI 318-11 Section 9.2, as applicable, are used and the requirements of ACI 318-14 17.3.3(c) or 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 D.4.4(c) for Condition B.
7. The characteristic pullout resistance for greater compressive strengths may be increased by multiplying the tabular value by $(f'_c/2{,}500)^{0.4}$.
8. The characteristic pullout resistance for greater compressive strengths may be increased by multiplying the tabular value by $(f'_c/2{,}500)^{0.3}$.

* See p. 12 for an explanation of the load table icons.

Stainless-Steel Titen HD Shear Strength Design Data[1]

*

Characteristic	Symbol	Units	Nominal Anchor Diameter (in.)									
			¼		⅜		½		⅝		¾	
Anchor Category	1, 2 or 3	—	3		1							
Nominal Embedment Depth	h_{nom}	in.	2⅛	3	2½	3¼	3¼	4	4	5½	5½	6¼
Steel Strength in Shear (ACI 318-14 17.5.1 or ACI 318-11 Section D.6.1)												
Shear Resistance of Steel	V_{sa}	lbf.	2,285		3,790	4,780	6,024	7,633	10,422	10,649	13,710	19,161
Strength Reduction Factor — Steel Failure[2]	ϕ_{sa}	—	0.65									
Concrete Breakout Strength in Shear (ACI 318-14 17.5.2 or ACI 318-11 Section D.6.2)												
Nominal Diameter	d_a	in.	0.250		0.375		0.500		0.625		0.750	
Load Bearing Length of Anchor in Shear	l_e	in.	1.27	2.01	1.40	2.04	1.86	2.50	2.31	3.59	3.49	4.13
Strength Reduction Factor — Concrete Breakout Failure[3]	ϕ_{cb}	—	0.70									
Concrete Pryout Strength in Shear (ACI 318-14 17.5.3 or ACI 318-11 Section D.6.3)												
Coefficient for Pryout Strength	k_{cp}	—	1.0					2.0	1.0	2.0		
Strength Reduction Factor — Concrete Pryout Failure[4]	ϕ_{cp}	—	0.70									
Shear Strength for Seismic Applications (ACI 318-14 17.2.3.3 or ACI 318-11 Section D.3.3.3)												
Shear Resistance — Single Anchor for Seismic Loads (f'_C = 2,500 psi)	$V_{sa,eq}$	lbf.	1,370	1,600	3,790	4,780	5,345	6,773	9,367	9,367	10,969	10,969
Strength Reduction Factor — Steel Failure[2]	ϕ_{eq}	—	0.65									

For **SI**: 1 in. = 25.4mm, 1 lbf. = 4.45N.

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} and ϕ_{eq} 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, as applicable, are used. If the load combinations of ACI 318 Appendix C are used, the appropriate value of ϕ_{sa} and ϕ_{eq} must be determined in accordance with ACI 318 D.4.4(b).
3. The tabulated value of ϕ_{cb} applies when both the load combinations of Section 1605.2.1 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 17.3.3(c) or ACI 318-11 D.4.3(c) for Condition B are met. Condition B applies where supplementary reinforcement is not provided. For installations where complying supplementary reinforcement can be verified, the ϕ_{cb} factors described in ACI 318-14 17.3.3(c) or ACI 318-11 D.4.3(c) for Condition A are allowed. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ_{cb} must be determined in accordance with ACI 318-11 D.4.4(c).
4. The tabulated value of ϕ_{cp} applies when both the load combinations of IBC Section 1605.2, ACI 318-14 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI 318-14 17.3.3(c) or ACI 318-11 D.4.3(c) for Condition B are met. If the load combinations of ACI 318-11 Appendix C are used, appropriate value of ϕ_{cp} must be determined in accordance with ACI 318-11 Section D.4.4(c).

* *See p. 12 for an explanation of the load table icons.*

Stainless-Steel Titen HD® Design Information — Concrete

Stainless-Steel Titen HD Screw Anchor Setting Information for Installation on the Top of Concrete-Filled Profile Steel Deck Floor and Roof Assemblies[1,2,3,4]

IBC *

Design Information	Symbol	Units	Nominal Anchor Diameter (in.)		
			¼	⅜	½
Nominal Embedment Depth	h_{nom}	in.	2⅛	2½	3¼
Effective Embedment Depth	h_{ef}	in.	1.27	1.40	1.86
Minimum Concrete Thickness[5]	$h_{min,deck}$	in.	2½	3¼	3¾
Critical Edge Distance	$c_{ac,deck,top}$	in.	3	4½	7½
Minimum Edge Distance	$c_{min,deck,top}$	in.	1½	1¾	1¾
Minimum Spacing	$s_{min,deck,top}$	in.	1½	3	3

For **SI**: 1 in. = 25.4 mm, 1 lbf = 4.45 N.

1. For anchors installed in the topside of concrete-filled deck assemblies, as shown in Figure 1, the nominal concrete breakout strength of a single anchor or group of anchors in shear, V_{cb} or V_{cbg}, respectively, must be calculated in accordance with ACI 318-14 Section 17.5.2 or ACI 318-11 Section D.6.2, using the actual member thickness, $h_{min,deck}$, in the determination of A_{vc}.
2. Design capacity shall be based on calculations according to values in the tables featured on pp. 96–97.
3. Minimum flute depth (distance from top of flute to bottom of flute) is 1½" (see Figure 1).
4. Steel deck thickness shall be minimum 20 gauge.
5. Minimum concrete thickness ($h_{min,deck}$) refers to concrete thickness above upper flute (see Figure 1).

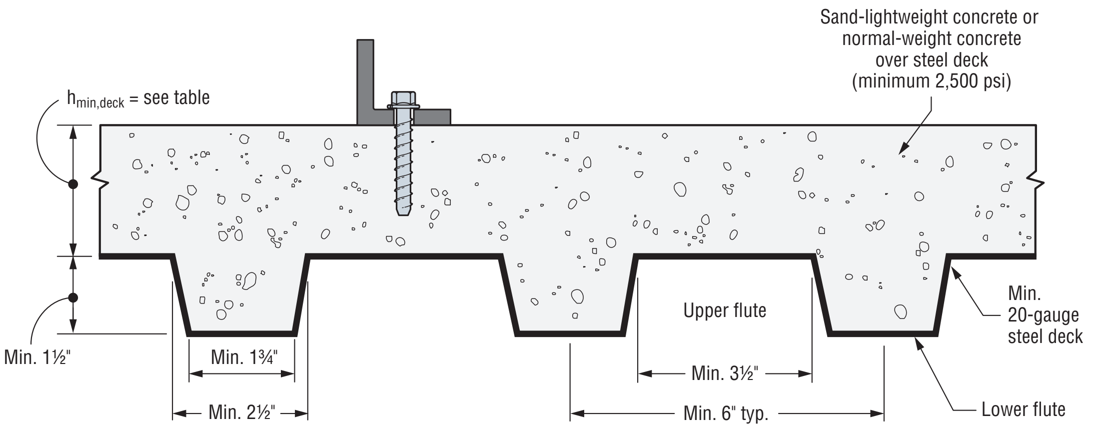


Figure 1. Installation of ¼"-, ⅜"- and ½"-Diameter Anchors in the Topside of Concrete over Steel Deck

* See p. 12 for an explanation of the load table icons.

Stainless-Steel Titen HD Allowable Tension and Shear Loads in 8" Medium-Weight and Normal-Weight Grout-Filled CMU

IBC *

Size in. (mm)	Drill Bit Diameter in.	Minimum Embedment Depth in. (mm)	Critical Edge Distance c_{crit} in. (mm)	Minimum Edge Distance c_{min} in. (mm)	Critical Spacing Distance in. (mm)	Values for 8" Medium-Weight or Normal-Weight Grout-Filled CMU			
						Tension Load		Shear Load	
						Ultimate lb. (kN)	Allowable lb. (kN)	Ultimate lb. (kN)	Allowable lb. (kN)
Anchor Installed in the Face of the CMU Wall (See Figure 1)									
¼ (6.4)	¼	2½ (64)	4 (102)	1¼ (32)	4 (102)	1,325 (5.9)	265 (1.2)	1,400 (6.2)	280 (1.3)
⅜ (9.5)	⅜	2¾ (70)	12 (305)	4 (102)	8 (203)	2,125 (9.5)	425 (1.9)	2,850 (12.7)	570 (2.5)
½ (12.7)	½	3½ (89)	12 (305)	4 (102)	8 (203)	3,325 (14.8)	665 (3.0)	4,950 (22.0)	990 (4.4)
⅝ (15.9)	⅝	4½ (114)	12 (305)	4 (102)	8 (203)	3,850 (17.1)	770 (3.4)	4,925 (21.9)	985 (4.4)
¾ (19.1)	¾	5½ (140)	12 (305)	4 (102)	8 (203)	5,200 (23.1)	1,040 (4.6)	4,450 (19.8)	890 (4.0)

1. The tabulated allowable loads are based on a safety factor of 5.0 for installations under the IBC and IRC.
2. Values for 8"-wide, medium-weight and normal-weight concrete masonry units. For ⅜"- to ¾"-diameter anchors, anchors may be installed in lightweight masonry units.
3. The masonry units must be fully grouted.
4. The minimum specified compressive strength of masonry, f'_m, at 28 days is 2,000 psi.
5. Embedment depth is measured from the outside face of the concrete masonry unit.
6. Grout-filled CMU wall design must satisfy applicable design standards and be capable of withstanding applied loads.
7. Refer to allowable load-adjustment factors for spacing and edge distance on pp. 101–102.
8. Although the ¼" stainless steel Titen HD is not part of the evaluation report, we still tested the ¼" screw per the appropriate AC.

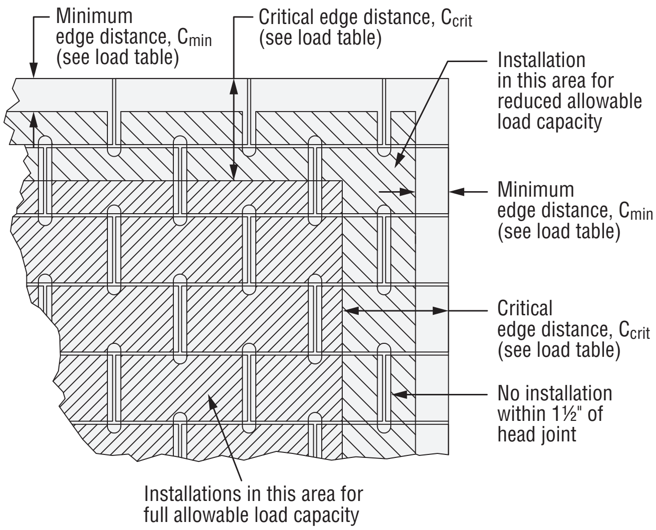


Figure 1. Shaded Area = Placement for Full and Reduced Allowable Load Capacity in Grout-Filled CMU

* *See p. 12 for an explanation of the load table icons.*

Stainless-Steel Titen HD® Design Information — Masonry

Stainless-Steel Titen HD Allowable Tension and Shear Loads in 8" Lightweight, Medium-Weight and Normal-Weight Hollow CMU

IBC *

Size in. (mm)	Drill Bit Diameter in.	Minimum Embedment Depth[4] in. (mm)	Critial Edge Distance in. (mm)	Critical Spacing Distance in. (mm)	8" Hollow CMU Loads Based on CMU Strength			
					Tension Load		Shear Load	
					Ultimate lb. (kN)	Allowable lb. (kN)	Ultimate lb. (kN)	Allowable lb. (kN)
Anchor Installed in Face Shell (See Figure 2)								
3/8 (9.5)	3/8	2½ (64)	12 (305)	8 (203)	925 (4.1)	185 (0.8)	2,250 (10.0)	450 (2.0)
½ (12.7)	½	2½ (64)	12 (305)	8 (203)	1,025 (4.6)	205 (0.9)	2,325 (10.3)	465 (2.1)
5/8 (15.9)	5/8	2½ (64)	12 (305)	8 (203)	550 (2.4)	110 (0.5)	2,025 (9.0)	405 (1.8)
¾ (19.1)	¾	2½ (64)	12 (305)	8 (203)	775 (3.4)	155 (0.7)	1,975 (8.8)	395 (1.8)

1. The tabulated allowable loads are based on a safety factor of 5.0 for installations under the IBC and IRC.
2. Values for 8"-wide, lightweight, medium-weight and normal-weight concrete masonry units.
3. The minimum specified compressive strength of masonry, f'_m, at 28 days is 2,000 psi.
4. Embedment depth is measured from the outside face of the concrete masonry unit and is based on the anchor being embedded an additional 1¼" through 1¼"-thick face shell.
5. Allowable loads may not be increased for short-term loading due to wind or seismic forces. CMU wall design must satisfy applicable design standards and be capable of withstanding applied loads.
6. Do not use impact wrenches to install in hollow CMU.
7. Set drill to rotation-only mode when drilling into hollow CMU.
8. Refer to allowable load-adjustment factors for spacing and edge distance on p. 103.
9. Anchors must be installed a minimum of 1½" from vertical head joints and T-joints. Refer to Figure 2 for permitted and prohibited anchor installation locations.

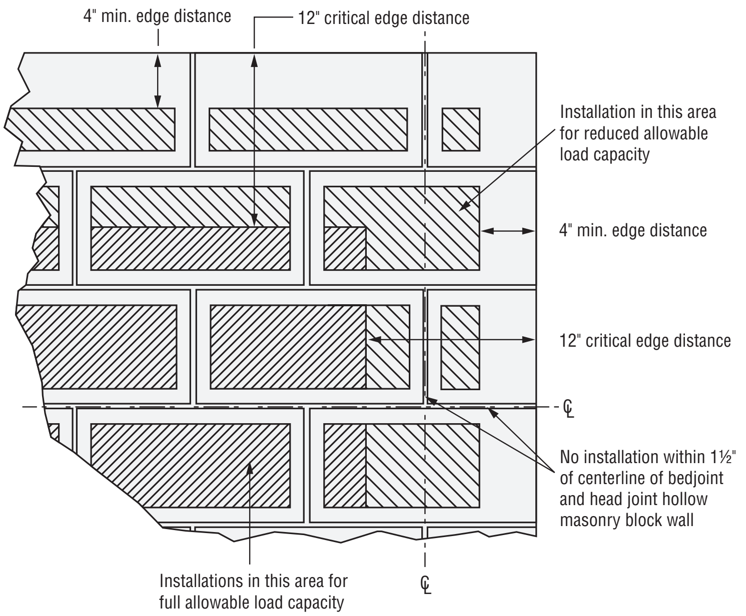


Figure 2. Stainless-Steel Titen HD Screw Anchor Installed in the Face of Hollow CMU Wall Construction

* See p. 12 for an explanation of the load table icons.

Stainless-Steel Titen HD® Design Information — Masonry

Load-Adjustment Factors for Stainless-Steel Titen HD Anchors in Face-of-Wall Installation in 8" Grout-Filled CMU: Edge Distance and Spacing, Tension and Shear Loads

How to use these charts:

1. The following tables are for reduced edge distance and spacing.
2. Locate the anchor size to be used for either a tension and/or shear load application.
3. Locate the embedment (E) at which the anchor is to be installed.
4. Locate the edge distance (c_{act}) or spacing (s_{act}) at which the anchor is to be installed.
5. The load adjustment factor (f_c or f_s) is the intersection of the row and column.
6. Multiply the allowable load by the applicable load adjustment factor.
7. Reduction factors for multiple edges or spacings are multiplied together.

Edge Distance Tension (f_c)

c_{act} (in.)	Dia.	¼	⅜	½	⅝	¾
	E	2½	2¾	3½	4½	5½
	c_{cr}	4	12	12	12	12
	c_{min}	1.25	4	4	4	4
	f_{cmin}	0.84	0.80	0.81	1.00	1.00
1.25		0.84				
2		0.88				
3		0.94				
4		1.00	0.80	0.81	1.00	1.00
6		1.00	0.85	0.86	1.00	1.00
8		1.00	0.90	0.91	1.00	1.00
10		1.00	0.95	0.95	1.00	1.00
12		1.00	1.00	1.00	1.00	1.00

See footnotes below.

Edge Distance Shear (f_c)
Shear Load Parallel to Edge or End

c_{act} (in.)	Dia.	¼	⅜	½	⅝	¾
	E	2½	2¾	3½	4½	5½
	c_{cr}	4	12	12	12	12
	c_{min}	1.25	4	4	4	4
	f_{cmin}	0.89	0.88	0.56	0.65	0.84
1.25		0.89				
2		0.92				
3		0.96				
4		1.00	0.88	0.56	0.65	0.84
6		1.00	0.91	0.67	0.74	0.88
8		1.00	0.94	0.78	0.83	0.92
10		1.00	0.97	0.89	0.91	0.96
12		1.00	1.00	1.00	1.00	1.00

See footnotes below.

Edge Distance Shear (f_c)
Shear Load Perpendicular to Edge or End (Directed Towards Edge or End)

c_{act} (in.)	Dia.	¼	⅜	½	⅝	¾
	E	2½	2¾	3½	4½	5½
	c_{cr}	4	12	12	12	12
	c_{min}	1.25	4	4	4	4
	f_{cmin}	0.33	0.93	0.48	0.66	0.69
1.25		0.33				
2		0.51				
3		0.76				
4		1.00	0.93	0.48	0.66	0.69
6		1.00	0.95	0.61	0.75	0.77
8		1.00	0.97	0.74	0.83	0.85
10		1.00	0.98	0.87	0.92	0.92
12		1.00	1.00	1.00	1.00	1.00

1. E = embedment depth (inches).
2. c_{act} = actual end or edge distance at which anchor is installed (inches).
3. c_{cr} = critical end or edge distance for 100% load (inches).
4. c_{min} = minimum end or edge distance for reduced load (inches).
5. f_c = adjustment factor for allowable load at actual end or edge distance.
6. f_{ccr} = adjustment factor for allowable load at critical end or edge distance. f_{ccr} is always = 1.00.
7. f_{cmin} = adjustment factor for allowable load at minimum end or edge distance.
8. $f_c = f_{cmin} + [(1 - f_{cmin}) (c_{act} - c_{min}) / (c_{cr} - c_{min})]$.

* See p. 12 for an explanation of the load table icons.

Load-Adjustment Factors for Stainless-Steel Titen HD Anchors in Face-of-Wall Installation in 8" Grout-Filled CMU: Edge Distance and Spacing, Tension and Shear Loads (cont.)

How to use these charts:

1. The following tables are for reduced edge distance and spacing.
2. Locate the anchor size to be used for either a tension and/or shear load application.
3. Locate the embedment (E) at which the anchor is to be installed.
4. Locate the edge distance (c_{act}) or spacing (s_{act}) at which the anchor is to be installed.
5. The load adjustment factor (f_c or f_s) is the intersection of the row and column.
6. Multiply the allowable load by the applicable load adjustment factor.
7. Reduction factors for multiple edges or spacings are multiplied together.

Edge Distance Shear (f_c)
Shear Load Perpendicular to Edge or End (Directed Away From Edge or End)

IBC *

c_{act} (in.)	Dia.	¼	⅜	½	⅝	¾
	E	2½	2¾	3½	4½	5½
	c_{cr}	4	12	12	12	12
	c_{min}	1.25	4	4	4	4
	f_{cmin}	0.33	0.93	0.48	0.66	0.69
1.25		0.33				
2		0.51				
3		0.76				
4		1.00	0.93	0.48	0.66	0.69
6		1.00	0.95	0.61	0.75	0.77
8		1.00	0.97	0.74	0.83	0.85
10		1.00	0.98	0.87	0.92	0.92
12		1.00	1.00	1.00	1.00	1.00

Spacing Tension (f_s)

IBC *

s_{act} (in.)	Dia.	¼	⅜	½	⅝	¾
	E	2½	2¾	3½	4½	5½
	s_{cr}	4	8	8	8	8
	s_{min}	2	4	4	4	4
	f_{smin}	0.79	0.81	0.79	0.87	0.78
2		0.79				
3		0.90				
4		1.00	0.81	0.79	0.87	0.78
6			0.91	0.90	0.94	0.89
8			1.00	1.00	1.00	1.00

Spacing Shear (f_s)

IBC *

s_{act} (in.)	Dia.	¼	⅜	½	⅝	¾
	E	2½	2¾	3½	4½	5½
	s_{cr}	4	6	8	10	12
	s_{min}	2	3	4	5	6
	f_{smin}	0.78	1.00	0.86	0.90	0.94
2		0.78				
3		0.89				
4		1.00	1.00	0.86	0.90	0.94
6			1.00	0.93	0.95	0.97
8			1.00	1.00	1.00	1.00

1. E = embedment depth (inches).
2. s_{act} = actual spacing distance at which anchors are installed (inches).
3. s_{cr} = critical spacing distance for 100% load (inches).
4. s_{min} = minimum spacing distance for reduced load (inches).
5. f_s = adjustment factor for allowable load at actual spacing distance.
6. f_{scr} = adjustment factor for allowable load at critical spacing distance. f_{scr} is always = 1.00.
7. f_{smin} = adjustment factor for allowable load at minimum spacing distance.
8. $f_s = f_{smin} + [(1 - f_{smin}) (s_{act} - s_{min}) / (s_{cr} - s_{min})]$.

* See p. 12 for an explanation of the load table icons.

Load-Adjustment Factors for Stainless-Steel Titen HD Anchors in Face-of-Wall Installation in 8" Hollow CMU: Edge Distance and Spacing, Tension and Shear Loads

How to use these charts:

1. The following tables are for reduced edge distance and spacing.
2. Locate the anchor size to be used for either a tension and/or shear load application.
3. Locate the embedment (E) at which the anchor is to be installed.
4. Locate the edge distance (c_{act}) or spacing (s_{act}) at which the anchor is to be installed.
5. The load adjustment factor (f_c or f_s) is the intersection of the row and column.
6. Multiply the allowable load by the applicable load adjustment factor.
7. Reduction factors for multiple edges or spacings are multiplied together.

Edge Distance Tension (f_c)

c_{act} (in.)	Dia.	3/8	1/2	5/8	3/4
	E	2½	2½	2½	2½
	c_{cr}	12	12	12	12
	c_{min}	4	4	4	4
	f_{cmin}	1.00	1.00	1.00	1.00
4		1.00	1.00	1.00	1.00
6		1.00	1.00	1.00	1.00
8		1.00	1.00	1.00	1.00
10		1.00	1.00	1.00	1.00
12		1.00	1.00	1.00	1.00

Edge Distance Shear (f_c)

c_{act} (in.)	Dia.	3/8	1/2	5/8	3/4
	E	2½	2½	2½	2½
	c_{cr}	12	12	12	12
	c_{min}	4	4	4	4
	f_{cmin}	0.78	0.63	0.55	0.51
4		0.78	0.63	0.55	0.51
6		0.84	0.72	0.66	0.63
8		0.89	0.82	0.78	0.76
10		0.95	0.91	0.89	0.88
12		1.00	1.00	1.00	1.00

1. E = embedment depth (inches).
2. c_{act} = actual end or edge distance at which anchor is installed (inches).
3. c_{cr} = critical end or edge distance for 100% load (inches).
4. c_{min} = minimum end or edge distance for reduced load (inches).
5. f_c = adjustment factor for allowable load at actual end or edge distance.
6. f_{ccr} = adjustment factor for allowable load at critical end or edge distance. f_{ccr} is always = 1.00.
7. f_{cmin} = adjustment factor for allowable load at minimum end or edge distance.
8. $f_c = f_{cmin} + [(1 - f_{cmin}) (c_{act} - c_{min}) / (c_{cr} - c_{min})]$.

Spacing Tension (f_s) One Anchor per Cell

c_{act} (in.)	Dia.	3/8	1/2	5/8	3/4
	E	2½	2½	2½	2½
	c_{cr}	8	8	8	8
	c_{min}	4	4	4	4
	f_{cmin}	0.72	0.87	0.89	0.70
4		0.72	0.87	0.89	0.70
6		0.86	0.94	0.95	0.85
8		1.00	1.00	1.00	1.00

See notes below.

Spacing Tension (f_s) Two Anchors per Cell

c_{act} (in.)	Dia.	3/8	1/2	5/8	3/4
	E	2½	2½	2½	2½
	c_{cr}	8	8	8	8
	c_{min}	4	4	4	4
	f_{cmin}	1.00	1.00	1.00	0.78
4		1.00	1.00	1.00	0.78
6		1.00	1.00	1.00	0.89
8		1.00	1.00	1.00	1.00

See notes below.

Spacing Shear (f_s) One Anchor per Cell

s_{act} (in.)	Dia.	3/8	1/2	5/8	3/4
	E	2½	2½	2½	2½
	s_{cr}	8	8	8	8
	s_{min}	4	4	4	4
	f_{smin}	0.81	1.00	0.71	0.74
4		0.81	1.00	0.71	0.74
6		0.91	1.00	0.86	0.87
8		1.00	1.00	1.00	1.00

Spacing Shear (f_s) Two Anchors per Cell

s_{act} (in.)	Dia.	3/8	1/2	5/8	3/4
	E	2½	2½	2½	2½
	s_{cr}	8	8	8	8
	s_{min}	4	4	4	4
	f_{smin}	0.76	1.00	0.75	0.75
4		0.76	1.00	0.75	0.75
6		0.88	1.00	0.88	0.88
8		1.00	1.00	1.00	1.00

1. E = embedment depth (inches).
2. s_{act} = actual spacing distance at which anchors are installed (inches).
3. s_{cr} = critical spacing distance for 100% load (inches).
4. s_{min} = minimum spacing distance for reduced load (inches).
5. f_s = adjustment factor for allowable load at actual spacing distance.
6. f_{scr} = adjustment factor for allowable load at critical spacing distance. f_{scr} is always = 1.00.
7. f_{smin} = adjustment factor for allowable load at minimum spacing distance.
8. $f_s = f_{smin} + [(1 - f_{smin}) (s_{act} - s_{min}) / (s_{cr} - s_{min})]$.

* *See p. 12 for an explanation of the load table icons.*