Stainless-Steel Titen HD® Design Information — Concrete

SIMPSON Strong-Tie

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 318-19 Chapter 17, 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. 14 for an explanation of the load table icons.

SIMPSON Strong-Tie

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 318-19 17.6.1, 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 318-19 17.6.2, 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 318-19 17.6.3, 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 318-19 17.10.3, 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 318-19 Chapter 17, 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 1605.1 of the 2021 IBC, Section 1605.2 of the 2018, 2015, 2012, and 2009 IBC, ACI 318-19 and 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 1605.1 of the 2021 IBC, Section 1605.2 of the 2018, 2015, 2012, and 2009 IBC, ACI 318-19 and ACI 318-14 Section 5.3, or ACI 318-11 Section 9.2 are used, as applicable, are used and the requirements of ACI 318-19 Section 17.5.3 and Table 17.5.3(b), 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 318-19 Table 17.5.3(b), 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 318-11 Appendix C are used, the appropriate value of ϕ must be determined in accordance with ACI 318-11 D.4.4(c) for Condition B.
4. 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 318-19 Section 5.3, ACI 318-14 Section 5.3 or ACI 318-11 Section 9.2, as applicable, are used and the requirements of ACI 318-19 Section 17.5.3 and Table 17.5.3(b), 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, the appropriate value of ϕ must be determined in accordance with ACI 318-11 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. 14 for an explanation of the load table icons.

Stainless-Steel Titen HD® Design Information — Concrete

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 318-19 17.7.1, 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 318-19 17.7.2, 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 318-19 17.7.3, 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[3]	ϕ_{cp}	—	0.70									
Shear Strength for Seismic Applications (ACI 318-19 17.10.3, 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 318-19 Chapter 17, 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 1605.1 of the 2021 IBC, Section 1605.2 of the 2018, 2015, 2012, and 2009 IBC, ACI 318-19 or ACI 318-14 Section 5.3, or ACI 318-11 Section 9.2, as applicable, are used. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ_{sa} and ϕ_{eq} must be determined in accordance with ACI 318-11 D.4.4(b).
3. The tabulated values of ϕ_{cb} and ϕ_{cp} apply when both the load combinations of Section 1605.1 of the 2021 IBC, Section 1605.2 of the 2018, 2015, 2012, and 2009 IBC, ACI 318-19 or ACI 318-14 Section 5.3 or ACI 318-11 Section 9.2 are used and the requirements of ACI 318-19 Section 17.5.3 and Table 17.5.3(b), ACI 318-14 Section 1703.3, or ACI 318-11 D.4.3(c) for Supplementary reinforcement are not present (Condition B) are met. Condition B applies where supplementary reinforcement is not provided in concrete. For installations where complying reinforcement is verified, the ϕ_{cb} and ϕ_{cp} factors described in ACI 318-19 Table 17.5.3(b), 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 318-11 Appendix C are used, the appropriate value of ϕ_{cb} shall be determined in accordance with ACI 318-11 D.4.5(c) for Condition B.

*See p. 14 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 318-19 Section 17.7.2, 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. 84–85.
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).

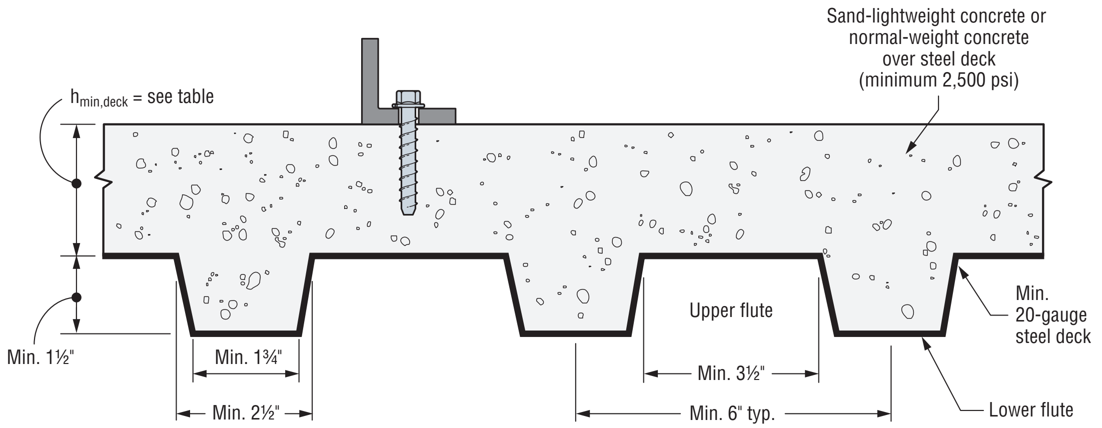

Figure 1. Installation of ¼"-, ⅜"- and ½"-Diameter Anchors in the Topside of Concrete over Steel Deck

*See p. 14 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. 89–90.
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.

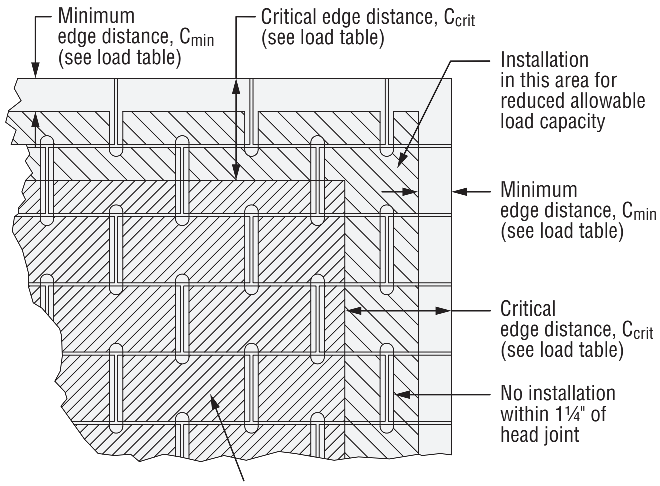

Figure 1. Shaded Area = Placement for Full and Reduced Allowable Load Capacity in Grout-Filled CMU

*See p. 14 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. 91.
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.

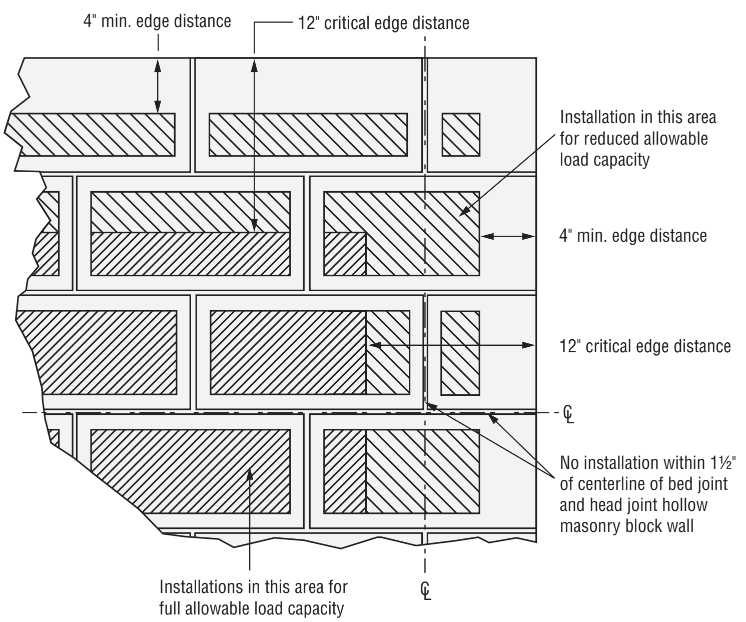

Figure 2. Stainless-Steel Titen HD Screw Anchor Installed in the Face of Hollow CMU Wall Construction

**See p. 14 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

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. 14 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. 14 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. 14 for an explanation of the load table icons.*