Titen HD® *Heavy Duty Screw Anchor for Cracked and Uncracked Concrete*

Cracked & Uncracked CONCRETE · IBC® 2009 · ICC-ES ESR-2713

SIMPSON Strong-Tie®

The Titen HD® anchor is a patented, high-strength screw anchor for concrete and masonry. It is designed for optimum performance in both cracked and uncracked concrete; a requirement that the 2009 IBC places on post-installed anchors. The high strength, easy to install Titen HD anchor has been tested and shown to provide outstanding performance in cracked and uncracked concrete under both static and seismic loading conditions. The self-undercutting, non-expansion characteristics of the Titen HD anchor make it ideal for structural applications, even at reduced edge distances and spacings. Recommended for permanent dry, interior non-corrosive environments or temporary outdoor applications.

PERFORMANCE FEATURES:

- Tested per AC193 to ensure outstanding performance in both cracked and uncracked concrete
- Higher load capacity and vibration resistance: Threads along the length of the anchor undercut the concrete and efficiently transfer the load to the base material.
- Vibration and shock resistance: The mechanical interlock of the threads and the ratchet teeth on the underside of the head help prevent the anchor from loosening in vibratory conditions. The Titen HD anchor has been tested to 12.6 million vibratory cycles with no performance reductions.
- Specialized heat treating process: Creates superior surface hardness at the tip to facilitate cutting, while at the same time not compromising ductility within the anchor body.
- Less spacing and edge distance required: The anchor does not exert expansion forces on the base material.
- Easy post-installation inspection: The head is stamped with the Simpson Strong-Tie® "≠" sign and the anchor length in inches.

INSTALLATION FEATURES:

- No special drill bit needed: Designed to install using standard sized ANSI tolerance drill bits
- Installs with 50% less torque: Testing shows that when compared to competitors, the Titen HD requires 50% less torque to be installed in concrete.
- Hex-washer head: Requires no separate washer and provides a clean installed appearance.*
- Removable: Ideal for temporary anchoring (e.g. formwork, bracing) or applications where fixtures may need to be moved. Re-use of the anchor to achieve listed load values is not recommended. See reinstallation note on next page.

MATERIAL: Carbon steel, heat treated

FINISH: Zinc plated or mechanically galvanized

CODES: ICC-ES ESR-2713 (concrete); ICC-ES ESR-1056 (CMU); City of L.A. RR25741(concrete)City of L.A. RR25560(CMU); Florida FL 11506.7; Factory Mutual 3017082, 3035761 and 3043442.

⚠ The load tables list values based upon results from the most recent testing and may not reflect those in current code reports. Where code jurisdictions apply, consult the current reports for applicable load values.

TEST CRITERIA: The Titen HD® anchor has been tested in accordance with ICC-ES AC193, ACI 355.2 and ICC-ES AC106 for the following:

- Static tension and shear loading in cracked and uncracked concrete
- Seismic and wind loading in cracked and uncracked concrete
- Performance in uncracked masonry

Anchor Fatigue Testing: Tested in accordance with ASTM E 488 for the effects of fatigue. 25% of the average ultimate load was applied to the anchor for 2 million cycles at a frequency of 15 Hz. Subsequent load tests showed no reduction in ultimate tension capacity.

Vibratory Load Testing: A 150 lb. concrete block was suspended from a ⅜" diameter anchor embedded at 1½" and vibrated for 12.6 million cycles at a frequency of 30 Hz and an amplitude of 0.0325 inches. Subsequent load test showed no reduction in ultimate tension capacity.

Field Testing: For guidance on field testing see technical bulletin T-SAS-THDINSP.

INSTALLATION: Holes in metal fixtures to be mounted should match the diameter specified in the table on the next page.

⚠ Caution: Oversized holes in the base material will reduce or eliminate the mechanical interlock of the threads with the base material and will reduce the anchor's load capacity. Use a Titen HD screw anchor one time only. Installing the anchor multiple times may result in excessive thread wear and reduce load capacity.

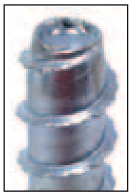
- Drill a hole in the base material using a carbide drill bit the same diameter as the nominal diameter of the anchor to be installed. Drill the hole to the specified embedment depth plus ½" minimum to allow the thread tapping dust to settle and blow it clean using compressed air. Overhead installations need not be blown clean. Alternatively, drill the hole deep enough to accommodate embedment depth and dust from drilling and tapping.
- Insert the anchor through the fixture and into the hole.
- Tighten the anchor into the base material until the hex washer head contacts the fixture.
- Do not use impact wrenches to install into hollow CMU.

SUGGESTED SPECIFICATIONS: Screw anchors shall have 360-degree contact with the base material and shall not require oversized holes for installation. Fasteners shall be manufactured from carbon steel, and are heat-treated. Anchors shall be zinc plated in accordance with ASTM B633 or mechanically galvanized in accordance with ASTM B695. Anchors are not to be reused after initial installation. Screw anchors shall be Titen HD® anchors from Simpson Strong-Tie, Pleasanton, CA. Anchors shall be installed per the Simpson Strong-Tie instructions for the Titen HD anchor.

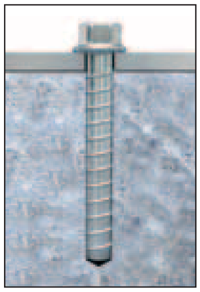
*Some jurisdictions require an additional square plate washer for sill plate applications.

Titen HD® Screw Anchor

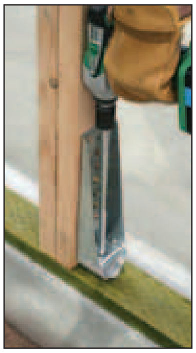
U.S. Patent 5,674,035 & 6,623,228



Serrated teeth on the tip of the Titen HD® screw anchor facilitate cutting and reduce installation torque.

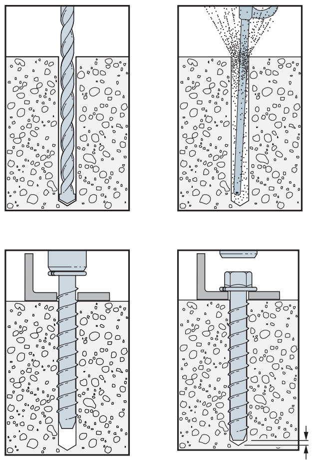


Suitable for use in place of code anchor bolts.



Longer ½" diameter Titen HD anchors achieve sufficient embedment depth to develop tension loads equal to many Simpson Strong-Tie holdowns that specify a ⅝" diameter anchor. Testing has been conducted to assure compatibility of these holdowns' anchor holes with the ½" Titen HD screw anchor.

Installation Sequence



Mechanical Anchors

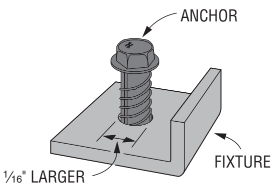
Titen HD® Anchor Product Data - Zinc Plated

Size (in.)	Model No.	Drill Bit Dia. (in.)	Wrench Size (in.)	Quantity	
				Box	Carton
⅜ x 3	THD37300H	⅜	9/16	50	200
⅜ x 4	THD37400H			50	200
⅜ x 5	THD37500H			50	100
⅜ x 6	THD37600H			50	100
½ x 3	THD50300H	½	¾	25	100
½ x 4	THD50400H			20	80
½ x 5	THD50500H			20	80
½ x 6	THD50600H			20	80
½ x 6½	THD50612H			20	40
½ x 8	THD50800H			20	40
½ x 12	THD501200H			20	40
½ x 13	THD501300H			20	40
½ x 14	THD501400H			20	40
½ x 15	THD501500H			20	40
⅝ x 4	THD62400H	⅝	15/16	10	40
⅝ x 5	THD62500H			10	40
⅝ x 6	THD62600H			10	40
⅝ x 6½	THD62612H			10	40
⅝ x 8	THD62800H			10	20
⅝ x 4	THDB62400H	⅝	15/16	10	40
⅝ x 5	THDB62500H			10	40
⅝ x 6	THDB62600H			10	40
⅝ x 6½	THDB62612H			10	40
⅝ x 8	THDB62800H			10	20
¾ x 4	THD75400H	¾	1⅛	10	40
¾ x 5	THD75500H			5	20
¾ x 6	THDT75600H			5	20
¾ x 7	THD75700H			5	10
¾ x 8½	THD75812H			5	10
¾ x 10	THD75100H			5	10

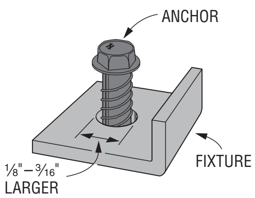
1. Zinc plating meets ASTM B633, SC1.
2. Length is measured from the underside of the head to the tip of the anchor.

FIXTURE HOLE DIAMETER:
Due to the full shank diameter and larger threads of the Titen HD® screw anchor, consideration needs to be given to specifying the appropriate diameter Titen HD anchor based on the fixture hole type to be used. The American Institute of Steel Construction (AISC) has established the following guidelines with regards to fixture hole sizing depending on the hole type:

- "Standard" fixture holes are 1/16" larger than the nominal anchor diameter.
- "Oversized" fixture holes are ⅛ -3/16" larger than the nominal anchor diameter, depending upon the specific anchor diameter.



Standard fixture hole



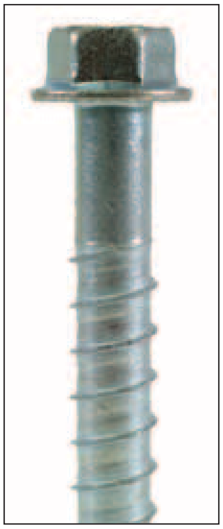
Oversized fixture hole

Use the following table to identify which diameter Titen HD® screw anchor to use based on the fixture hole type and diameter. In most cases where a smaller diameter Titen HD anchor is called out in comparison to the competitor's larger diameter anchor, the Titen HD anchor still generally provides allowable tension and shear load values comparable to or greater than those of the competitor's anchor.

Titen HD Anchor Product Data - Mechanically Galvanized

Size (in.)	Model No.	Drill Bit Dia. (in.)	Wrench Size (in.)	Quantity	
				Box	Carton
⅜ x 5	THD37500HMG	⅜	9/16	50	100
⅜ x 6	THD37600HMG			50	100
½ x 5	THD50500HMG	½	¾	20	80
½ x 6	THD50600HMG			20	80
½ x 6½	THD50612HMG			20	40
½ x 8	THD50800HMG			20	40
⅝ x 5	THD62500HMG	⅝	15/16	10	40
⅝ x 6	THD62600HMG			10	40
⅝ x 6½	THD62612HMG			10	40
⅝ x 8	THD62800HMG			10	20
⅝ x 5	THDB62500HMG	⅝	15/16	10	40
⅝ x 6	THDB62600HMG			10	40
⅝ x 6½	THDB62612HMG			10	40
⅝ x 8	THDB62800HMG			10	20
¾ x 8½	THD75812HMG	¾	1⅛	5	10
¾ x 10	THD75100HMG			5	10

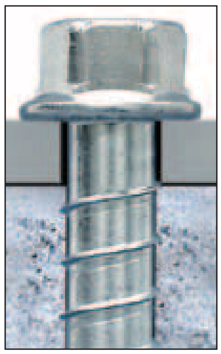
1. Mechanical galvanizing meets ASTM B695, Class 65, Type 1. Intended for some pressure-treated wood sill plate applications. Not for use in other corrosive or outdoor environments. See page 11 or visit www.strongtie.com/info for more corrosion information.



The Titen HD® screw anchor ¾" x 6" and ¾" x 7" (models THDT75600H and THD75700H) have a 1" section under the head that is unthreaded to allow installation into tilt-up wall braces.

Hole Dimensions

Titen HD Diameter (in.)	Wrench Size (in.)	Recommended Fixture Hole Size (in.)
⅜	9/16	½ to 9/16
½	¾	⅝ to 11/16
⅝	15/16	¾ to 13/16
¾	1⅛	⅞ to 15/16



Mechanical Anchors

SIMPSON Strong-Tie®

Titen HD® Anchor Installation Information and Additional Data[1]

Characteristic	Symbol	Units	Nominal Anchor Diameter (in.)							
			⅜		½		⅝[4]		¾	
Installation Information										
Drill Bit Diameter	d_{bit}	in.	⅜		½		⅝		¾	
Baseplate Clearance Hole Diameter	d_c	in.	½		⅝		¾		⅞	
Maximum Installation Torque	$T_{inst,max}$	ft-lb	50[2]		65[2]		100[2]		150[2]	
Maximum Impact Wrench Torque Rating	$T_{impact,max}$	ft-lb	150[3]		340[3]		340[3]		385[3]	
Embedment Depth	h_{nom}	in.	2½	3¼	3¼	4	4	5½	5½	6¼
Critical Edge Distance	c_{ac}	in.	2 11/16	3⅝	3 9/16	4½	4½	6⅜	6⅜	7 5/16
Minimum Edge Distance	c_{min}	in.	1¾							
Minimum Spacing	s_{min}	in.	3							
Minimum Concrete Thickness	h_{min}	in.	3¾	5	5	6¼	6	8½	8¾	10
Additional Data										
Anchor Category	category	—	1							
Yield Strength	f_{ya}	psi	97,000							
Tensile Strength	f_{uta}	psi	110,000							
Minimum Tensile & Shear Stress Area	A_{se}	in^2	0.099		0.183		0.276		0.414	
Axial Stiffness in Service Load Range - Uncracked Concrete	β_{uncr}	lb/in.	715,000							
Axial Stiffness in Service Load Range - Cracked Concrete	β_{cr}	lb/in.	345,000							

1. The information presented in this table is to be used in conjunction with the design criteria of ACI 318 Appendix D.
2. $T_{inst,max}$ is the maximum permitted installation torque for the embedment depth range covered by this table for installations using a torque wrench. This is not applicable to other embedment depths published elsewhere in this catalog.
3. $T_{impact,max}$ is the maximum permitted torque rating for impact wrenches for the embedment depth range covered by this table. This is not applicable to other embedment depths published elsewhere in this catalog.
4. Data for ⅝" anchor is only valid for THDB62 series.

Titen HD® Anchor Tension Strength Design Data[1]

*See page 13 for an explanation of the load table icons

Characteristic	Symbol	Units	Nominal Anchor Diameter (in.)							
			3/8		1/2		5/8[9]		3/4	
Embedment Depth	h_{nom}	in.	2½	3¼	3¼	4	4	5½	5½	6¼
Steel Strength in Tension										
Tension Resistance of Steel	N_{sa}	lb.	10,890		20,130		30,360		45,540	
Strength Reduction Factor - Steel Failure	ϕ	—	0.65[2]							
Concrete Breakout Strength in Tension[6, 8]										
Effective Embedment Depth	h_{ef}	in.	1.77	2.40	2.35	2.99	2.97	4.24	4.22	4.86
Critical Edge Distance[6]	c_{ac}	in.	2 11/16	3 5/8	3 9/16	4 1/2	4 1/2	6 3/8	6 3/8	7 5/16
Effectiveness Factor - Uncracked Concrete	k_{uncr}	—	24							
Effectiveness Factor - Cracked Concrete	k_{cr}	—	17							
Modification Factor	$\psi_{c,N}$	—	1.0							
Strength Reduction Factor - Concrete Breakout Failure	ϕ	—	0.65[7]							
Pullout Strength in Tension[8]										
Pullout Resistance, Uncracked Concrete (f'_c=2,500 psi)	$N_{p,uncr}$	lb.	2,700[4]	—[3]	—[3]	—[3]	—[3]	9810	—[3]	—[3]
Pullout Resistance, Cracked Concrete (f'_c=2,500 psi)	$N_{p,cr}$	lb.	1,235[4]	2,700[4]	—[3]	—[3]	3260[4]	5570[4]	6,070[4]	7,195[4]
Strength Reduction Factor - Pullout Failure	ϕ	—	0.65[5]							
Breakout or Pullout Strength in Tension for Seismic Applications[8]										
Nominal Pullout Strength for Seismic Loads (f'_c=2,500 psi)	$N_{p,eq}$	lb.	1,235[4]	2,700[4]	—[3]	—[3]	3260[4]	5570[4]	6,070[4]	7,195[4]
Strength Reduction Factor - Breakout or Pullout Failure	ϕ	—	0.65[5]							

1. The information presented in this table is to be used in conjunction with the design criteria of ACI 318 Appendix D, except as modified below.
2. The value of ϕ applies when the load combinations of ACI 318 Section 9.2 are used. If the load combinations of ACI 318 Appendix C are used, refer to Section D4.5 to determine the appropriate value of ϕ. Anchors are considered brittle steel elements.
3. Pullout strength is not reported since concrete breakout controls.
4. Adjust the characteristic pullout resistance for other concrete compressive strengths by multiplying the tabular value by $(f'_{c,specified} / 2{,}500)^{0.5}$.
5. The value of ϕ applies when both the load combinations of ACI 318 Section 9.2 are used and the requirements of Section D4.4(c) for Condition B are met. If the load combinations of ACI 318 Appendix C are used, refer to Section D4.5 to determine the appropriate value of ϕ.
6. The modification factor $\psi_{cp,N}$ = 1.0 for cracked concrete. Otherwise, the modification factor for uncracked concrete without supplementary reinforcement to control splitting is either: (1) $\psi_{cp,N} = 1.0$ if $c_{a,min} \geq c_{ac}$ or (2) $\psi_{cp,N} = \frac{c_{a,min}}{c_{ac}} \geq \frac{1.5h_{ef}}{c_{ac}}$ if $c_{a,min} < c_{ac}$. The modification factor, $\psi_{cp,N}$ is applied to the nominal concrete breakout strength, N_{cb} or N_{cbg}.
7. The value of ϕ applies when both the load combinations of ACI 318 Section 9.2 are used and the requirements of Section D4.4(c) for Condition B are met. If the load combinations of ACI 318 Section 9.2 are used and the requirements of Section D4.4(c) for Condition A are met, refer to Section D4.4 to determine the appropriate value of ϕ. If the load combinations of ACI 318 Appendix C are used, refer to Section D4.5 to determine the appropriate value of ϕ.
8. For sand-lightweight concrete, in lieu of ACI 318 Section D.3.4, modify the value of concrete breakout strength, $N_{p,cr}$, $N_{p,uncr}$ and N_{eq} by 0.6. All-lightweight concrete is beyond the scope of this table..
9. Data for ⅝" anchor is only valid for THDB62 series.

* See page 13 for an explanation of the load table icons

Titen HD® Anchor Shear Strength Design Data[1]

Characteristic	Symbol	Units	Nominal Anchor Diameter (in.)							
			⅜		½		⅝[5]		¾	
Embedment Depth	h_{nom}	in.	2½	3¼	3¼	4	4	5½	5½	6¼
Steel Strength in Shear										
Shear Resistance of Steel	V_{sa}	lb.	4,460		7,455		10,000		16,840	
Strength Reduction Factor - Steel Failure	ϕ	—	0.60[2]							
Concrete Breakout Strength in Shear[6]										
Outside Diameter	d_o	in.	0.375		0.500		0.625		0.750	
Load Bearing Length of Anchor in Shear	ℓ_e	in.	1.77	2.40	2.35	2.99	2.97	4.24	4.22	4.86
Strength Reduction Factor - Concrete Breakout Failure	ϕ	—	0.70[3]							
Concrete Pryout Strength in Shear										
Coefficient for Pryout Strength	k_{cp}	—	1.0			2.0				
Strength Reduction Factor - Concrete Pryout Failure	ϕ	—	0.70[4]							
Steel Strength in Shear for Seismic Applications										
Shear Resistance of Single Anchor for Seismic Loads	V_{eq}	lb.	2,855		4,790		8,000		9,350	
Strength Reduction Factor - Steel Failure	ϕ	—	0.60[2]							

1. The information presented in this table is to be used in conjunction with the design criteria of ACI 318 Appendix D, except as modified below.
2. The value of ϕ applies when the load combinations of ACI 318 Section 9.2 are used. If the load combinations of ACI 318 Appendix C are used, refer to Section D4.5 to determine the appropriate value of ϕ. Anchors are considered brittle steel elements
3. The value of ϕ applies when both the load combinations of ACI 318 Section 9.2 are used and the requirements of Section D4.4(c) for Condition B are met. If the load combinations of ACI 318 Section 9.2 are used and the requirements of Section D4.4(c) for Condition A are met, refer to Section D4.4 to determine the appropriate value of ϕ. If the load combinations of ACI 318 Appendix C are used, refer to Section D4.5 to determine the appropriate value of ϕ.
4. The value of ϕ applies when both the load combinations of ACI 318 Section 9.2 are used and the requirements of Section D4.4(c) for Condition B are met. If the load combinations of ACI 318 Appendix C are used, refer to Section D4.5 to determine the appropriate value of ϕ.
5. Data for ⅝" anchor is only valid for THDB62 series.
6. For sand-lightweight concrete, in lieu of ACI 318 Section D.3.4, modify the value of concrete breakout strength by 0.6. All-lightweight concrete is beyond the scope of this table.

Titen HD® Tension and Shear Strength Design Data for Normal-Weight or Sand-Lightweight Concrete over Metal Deck[1,2,6]

* See page 13 for an explanation of the load table icons

Characteristic	Symbol	Units	Lower Flute				Upper Flute	
			Nominal Anchor Diameter (inch)				Nom. Anch. Diameter (inch)	
			⅜		½		⅜	½
Embedment Depth	h_{nom}	in.	1⅞	2½	2	3½	1⅞	2
Effective Embedment Depth	h_{ef}	in.	1.23	1.77	1.29	2.56	1.23	1.29
Pullout Resistance, concrete on metal deck (cracked)[3,4]	$N_{p,deck,cr}$	lbs.	375	870	905	2,040	500	1,700
Pullout Resistance, concrete on metal deck (uncracked)[3,4]	$N_{p,deck,uncr}$	lbs.	825	1,905	1,295	2,910	1,095	2,430
Steel Strength in Shear, concrete on metal deck[5]	$V_{sa,deck}$	lbs.	2,240	2,395	2,435	4,430	4,180	7,145
Steel Strength in Shear, Seismic	$V_{sa,\ deck,\ eq}$	lbs.	1,434	1,533	1,556	2,846	2,676	4,591

1. The information presented in this table is to be used in conjunction with the design criteria of ACI 318 Appendix D, except as modified below.
2. Concrete compressive strength shall be 3,000 psi minimum. The characteristic pullout resistance for greater compressive strengths shall be increased by multiplying the tabular value by $(f'_{c,specified} / 3{,}000\ psi)^{1/2}$.
3. For anchors installed in the soffit of sand-lightweight or normal-weight concrete over metal deck floor and roof assemblies, as shown in Figure A, calculation of the concrete breakout strength may be omitted.
4. In accordance with ACI 318 Section D.5.3.2, the nominal pullout strength in cracked concrete for anchors installed in the soffit of sand-lightweight or normal-weight-concrete-over-metal-deck floor and roof assemblies $N_{pn,deck,cr}$ shall be substituted for $N_{pn,cr}$. Where analysis indicates no cracking at service loads, the normal pullout strength in uncracked concrete $N_{pn,deck,uncr}$ shall be substituted for $N_{pn,uncr}$.
5. In accordance with ACI 318 Section D.6.1.2 (c), the shear strength for anchors installed in the soffit of sand-lightweight or normal-weight concrete over metal deck floor and roof assemblies $V_{sa,deck}$ and $V_{sa,\ deck,eq}$ shall be substituted for V_{sa}.
6. Minimum distance to edge of panel is $2h_{ef}$.
7. The minimum anchor spacing along the flute must be the greater of $3h_{ef}$ or 1.5 times the flute width.

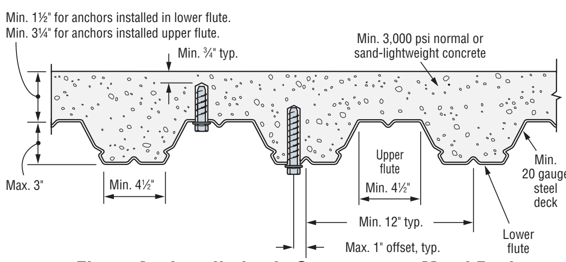


Figure A – Installation in Concrete over Metal Deck

Mechanical Anchors

Tension Loads in Normal-Weight Concrete

*

Size in. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Critical Edge Dist. in. (mm)	Critical Spacing Dist. in. (mm)	Tension Load						
					$f'_c \geq$ 2000 psi (13.8 MPa) Concrete			$f'_c \geq$ 3000 psi (20.7 MPa) Concrete	$f'_c \geq$ 4000 psi (27.6 MPa) Concrete		
					Ultimate lbs. (kN)	Std. Dev. lbs. (kN)	Allowable lbs. (kN)	Allowable lbs. (kN)	Ultimate lbs. (kN)	Std. Dev. lbs. (kN)	Allowable lbs. (kN)
⅜ (9.5)	⅜	2¾ (70)	3 (76)	6 (152)	4,297 (19.1)	—	1,075 (4.8)	1,315 (5.8)	6,204 (27.6)	—	1,550 (6.9)
		3¾ (95)			7,087 (31.5)	347 (1.5)	1,770 (7.9)	2,115 (9.4)	9,820 (43.7)	1,434 (6.4)	2,455 (10.9)
½ (12.7)	½	2¾ (70)	4 (102)	8 (203)	4,610 (20.5)	—	1,155 (5.1)	1,400 (6.2)	6,580 (29.3)	—	1,645 (7.3)
		3⅝ (92)			7,413 (33.0)	412 (1.8)	1,855 (8.3)	2,270 (10.1)	10,742 (47.8)	600 (2.7)	2,685 (11.9)
		5¾ (146)			10,278 (45.7)	297 (1.3)	2,570 (11.4)	3,240 (14.4)	15,640 (69.6)	2,341 (10.4)	3,910 (17.4)
⅝ (15.9)	⅝	2¾ (70)	5 (127)	10 (254)	4,610 (20.5)	—	1,155 (5.1)	1,400 (6.2)	6,580 (29.3)	—	1,645 (7.3)
		4⅛ (105)			8,742 (38.9)	615 (2.7)	2,185 (9.7)	2,630 (11.7)	12,286 (54.7)	1,604 (7.1)	3,070 (13.7)
		5¾ (146)			12,953 (57.6)	1,764 (7.8)	3,240 (14.4)	3,955 (17.6)	18,680 (83.1)	—	4,670 (20.8)
¾ (19.1)	¾	2¾ (70)	6 (152)	12 (305)	4,674 (20.8)	—	1,170 (5.2)	1,405 (6.3)	6,580 (29.3)	—	1,645 (7.3)
		4⅝ (117)			10,340 (46.0)	1,096 (4.9)	2,585 (11.5)	3,470 (15.4)	17,426 (77.5)	1,591 (7.1)	4,355 (19.4)
		5¾ (146)			13,765 (61.2)	1,016 (4.5)	3,440 (15.3)	4,055 (18.0)	18,680 (83.1)	1,743 (7.8)	4,670 (20.8)

See Notes Below

*See page 13 for an explanation of the load table icons

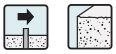
Shear Loads in Normal-Weight Concrete

*

Size in. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Critical Edge Dist. in. (mm)	Critical Spacing Dist. in. (mm)	Shear Load						
					$f'_c \geq$ 2000 psi (13.8 MPa) Concrete			$f'_c \geq$ 3000 psi (20.7 MPa) Concrete	$f'_c \geq$ 4000 psi (27.6 MPa) Concrete		
					Ultimate lbs. (kN)	Std. Dev. lbs. (kN)	Allowable lbs. (kN)	Allowable lbs. (kN)	Ultimate lbs. (kN)	Std. Dev. lbs. (kN)	Allowable lbs. (kN)
⅜ (9.5)	⅜	2¾ (70)	4½ (114)	6 (152)	6,353 (28.3)	—	1,585 (7.1)	1,665 (7.4)	—	—	1,740 (7.7)
		3¾ (95)			6,377 (28.4)	1,006 (4.5)	1,595 (7.1)	1,670 (7.4)	—	—	1,740 (7.7)
½ (12.7)	½	2¾ (70)	6 (152)	8 (203)	6,435 (28.6)	—	1,605 (7.1)	2,050 (9.1)	9,987 (44.4)	—	2,495 (7.8)
		3⅝ (92)			9,324 (41.5)	1,285 (5.7)	2,330 (10.4)	2,795 (12.4)	13,027 (57.9)	597 (2.7)	3,255 (14.5)
		5¾ (146)			11,319 (50.3)	1,245 (5.5)	2,830 (12.6)	3,045 (13.5)	—	—	3,255 (14.5)
⅝ (15.9)	⅝	2¾ (70)	7½ (191)	10 (254)	7,745 (34.5)	—	1,940 (8.6)	2,220 (9.9)	9,987 (44.4)	—	2,495 (11.1)
		4⅛ (105)			8,706 (38.7)	1,830 (8.1)	2,175 (9.7)	3,415 (15.2)	18,607 (82.8)	1,650 (7.3)	4,650 (20.7)
		5¾ (146)			12,498 (55.6)	2,227 (9.9)	3,125 (13.9)	3,890 (17.3)	—	—	4,650 (20.7)
¾ (19.1)	¾	2¾ (70)	9 (229)	12 (305)	7,832 (34.8)	—	1,960 (8.7)	2,415 (10.7)	11,460 (51.0)	—	2,865 (12.7)
		4⅝ (117)			11,222 (49.9)	2,900 (12.9)	2,805 (12.5)	4,490 (20.0)	24,680 (109.8)	2,368 (10.5)	6,170 (27.4)
		5¾ (146)			19,793 (88.0)	3,547 (15.8)	4,950 (22.0)	5,560 (24.7)	24,680 (109.8)	795 (3.5)	6,170 (27.4)

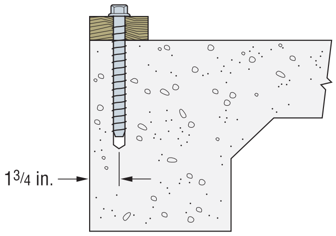
1. The allowable loads listed are based on a safety factor of 4.0.
2. Refer to allowable load-adjustment factors for spacing and edge distance on pages 119–120.
3. The minimum concrete thickness is 1½ times the embedment depth.
4. Tension and Shear loads for the Titen HD anchor may be combined using the elliptical interaction equation (n=⁵⁄₃). Allowable load may be interpolated for concrete compressive strengths between 2000 psi and 4000 psi.

Shear Loads in Normal-Weight Concrete, Load Applied Parallel to Concrete Edge


*

Size in. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Minimum Edge Dist. in. (mm)	Minimum End Dist. in. (mm)	Minimum Spacing Dist. in. (mm)	Shear Load Based on Concrete Edge Distance		
						$f'_c \geq 2500$ psi (17.2 MPa) Concrete		
						Ultimate lbs. (kN)	Std. Dev. lbs. (kN)	Allowable lbs. (kN)
½ (12.7)	½	2¾ (70)	1¾ (45)	8 (203)	8 (203)	4,660 (20.7)	575 (2.6)	1,165 (5.2)
		3¼ (83)				—	—	1,530 (6.8)
		3½ (89)				6,840 (30.4)	860 (3.8)	1,710 (7.6)
		4½ (114)				7,800 (34.7)	300 (1.3)	1,950 (8.7)
⅝ (15.9)	⅝	2¾ (70)	1¾ (45)	10 (254)	10 (254)	4,820 (21.4)	585 (2.6)	1,205 (5.3)
		3¼ (83)				—	—	1,580 (7.0)
		3½ (89)				7,060 (31.4)	1,284 (5.7)	1,765 (7.9)

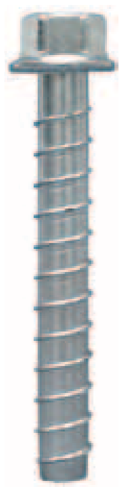
*See page 13 for an explanation of the load table icons



Note: Rebar not shown for clarity.

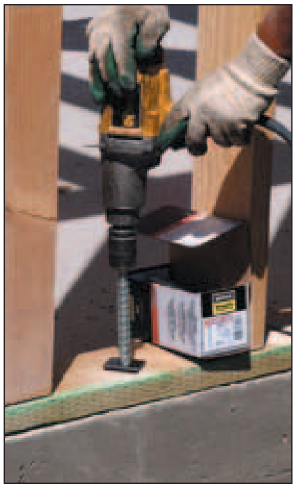
1. The allowable loads listed are based on a safety factor of 4.0.
2. The minimum concrete thickness is 1½ times the embedment depth.

The Titen HD® screw anchor may be used for sill plate applications. Use bearing plates as required by code. Refer to the appropriate code report or use Simpson Strong-Tie ACI 318 Anchor Selector™ software for anchor design information.



Titen HD Screw Anchor

U.S. Patent 5,674,035 & 6,623,228



Tension Loads in Normal-Weight Concrete Stemwall *

Size in. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Stemwall Width in. (mm)	Min. Edge Dist. in. (mm)	Min. End Dist. in. (mm)	Tension Load f'c ≥ 2500 psi (17.2 MPa) Concrete Ultimate lbs. (kN)	Tension Load f'c ≥ 2500 psi (17.2 MPa) Concrete Allow. lbs. (kN)	Tension Load f'c ≥ 4500 psi (31.0 MPa) Concrete Ultimate lbs. (kN)	Tension Load f'c ≥ 4500 psi (31.0 MPa) Concrete Allow. lbs. (kN)
½ (12.7)	½	10 (254)	6 (152)	1¾ (44)	8 (203)	15,420 (68.6)	3,855 (17.1)	20,300 (90.3)	5,075 (22.6)
					4⅜ (111)	14,280 (63.5)	3,570 (15.9)	19,040 (84.7)	4,760 (21.2)

1. The allowable loads are based on a safety factor of 4.0.
2. The minimum anchor spacing is 15 inches.
3. The minimum concrete thickness (depth) is 12 inches.
4. Allowable loads may be interpolated for compressive strengths between 2,500 and 4,500 psi.

Tension Loads in Normal-Weight Concrete, Load Applied at 60° Angle to Horizontal for Tilt-Up Wall Braces *

Size in. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Tension Applied at 60-degrees to Horizontal f'c ≥ 2500 psi (17.2 MPa) Concrete Ultimate lbs. (kN)	Std. Dev. lbs. (kN)	Allow. lbs. (kN)
⅝ (15.9)	⅝	5 (127)	13,420 (59.7)	1,273 (5.7)	3,355 (14.9)
¾ (19.1)	¾	5 (127)	15,180 (67.5)	968 (4.3)	3,795 (16.9)

1. The allowable loads are based on a safety factor of 4.0.
2. Anchor must be installed into a concrete floor slab, footing, or deadman with sufficient area, weight, and strength to resist the anchorage load.
3. Titen HD® has been qualified for temporary outdoor use of up to 90 days through testing for this application.

Tension and Shear Loads in Sand-Lightweight Concrete over Metal Deck *

Size in. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Critical Edge Dist. in. (mm)	Critical Spacing Dist. in. (mm)	Install in Concrete (see Figure A)				Install through Metal Deck (see Figure A)			
					Tension Load f'c ≥ 3000 psi (20.7 MPa) Lightweight Concrete		Shear Load f'c ≥ 3000 psi (20.7 MPa) Lightweight Concrete		Tension Load f'c ≥ 3000 psi (20.7 MPa) Lightweight Concrete		Shear Load f'c ≥ 3000 psi (20.7 MPa) Lightweight Concrete	
					Ultimate lbs. (kN)	Allowable lbs. (kN)	Ultimate lbs. (kN)	Allowable lbs. (kN)	Ultimate lbs. (kN)	Allowable lbs. (kN)	Ultimate lbs. (kN)	Allowable lbs. (kN)
⅜ (9.5)	⅜	2¾ (70)	6 (152)	6 (152)	2,560 (11.4)	640 (2.8)	4,240 (18.9)	1,060 (4.7)	—	—	—	—
		3 (76)			—	—	—	—	5,420 (24.1)	1,355 (6.0)	4,100 (18.2)	1,025 (4.6)
½ (12.7)	½	2¾ (70)	8 (203)	8 (203)	3,040 (13.5)	760 (3.4)	6,380 (28.4)	1,595 (7.1)	—	—	—	—
		4 (102)			—	—	—	—	7,020 (31.2)	1,755 (7.8)	6,840 (30.4)	1,710 (7.6)
⅝ (15.9)	⅝	2¾ (70)	10 (254)	10 (254)	3,100 (13.8)	775 (3.4)	6,380 (28.4)	1,595 (7.1)	—	—	—	—
		5 (127)			—	—	—	—	8,940 (39.8)	2,235 (9.9)	10,700 (47.6)	2,675 (11.9)

1. The allowable loads listed are based on a safety factor of 4.0.
2. Allowable loads for anchors installed in the lower flute of the steel deck are for flutes with a trapezoidal profile with a depth of 3 inches, and a width varying from 4½ inches at the bottom to 7½ inches at the top. The spacing of the flutes is 12 inches. The metal deck must be minimum 20-gauge with a minimum yield strength of 38 ksi and minimum ultimate strength of 45 ksi.
3. Anchors may be installed off-center in the lower flute (up to 1½" from the edge of the lower flute) without a load reduction.
4. 100% of the allowable load is permitted at critical edge distance and critical spacing. Testing at smaller edge distances and spacings has not been performed.

*See page 13 for an explanation of the load table icons

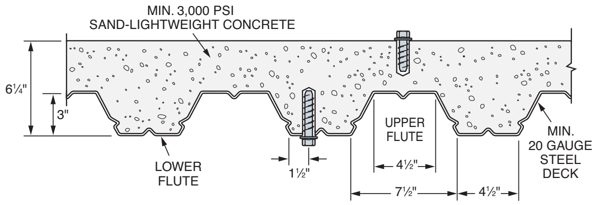


Figure A – Titen HD® screw anchor installed in the top and bottom of a structural sand-lightweight-concrete and metal-deck assembly

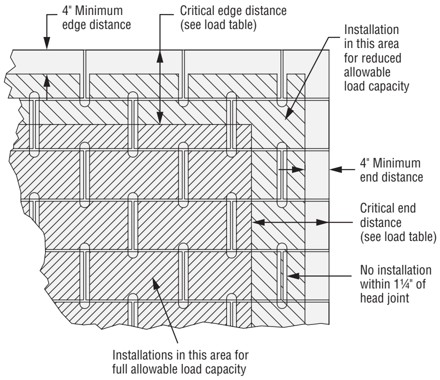
Tension and Shear Loads in 8-inch Lightweight, Medium-Weight and Normal-Weight Grout-Filled CMU

*See page 13 for an explanation of the load table icons

Size in. (mm)	Drill Bit Dia. in.	Min. Embed. Depth in. (mm)	Critical Edge Dist. in. (mm)	Critical End Dist. in. (mm)	Critical Spacing Dist. in. (mm)	Values for 8-inch Lightweight, Medium-Weight or Normal-Weight Grout-Filled CMU			
						Tension Load		Shear Load	
						Ultimate lbs. (kN)	Allowable lbs. (kN)	Ultimate lbs. (kN)	Allowable lbs. (kN)
Anchor Installed in the Face of the CMU Wall (See Figure 1)									
⅜ (9.5)	⅜	2¾ (70)	12 (305)	12 (305)	6 (152)	2,390 (10.6)	480 (2.1)	4,340 (19.3)	870 (3.9)
½ (12.7)	½	3½ (89)	12 (305)	12 (305)	8 (203)	3,440 (15.3)	690 (3.1)	6,920 (30.8)	1,385 (6.2)
⅝ (15.9)	⅝	4½ (114)	12 (305)	12 (305)	10 (254)	5,300 (23.6)	1,060 (4.7)	10,420 (46.4)	2,085 (9.3)
¾ (19.1)	¾	5½ (140)	12 (305)	12 (305)	12 (305)	7,990 (35.5)	1,600 (7.1)	15,000 (66.7)	3,000 (13.3)

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-inch wide, lightweight, medium-weight and normal-weight concrete masonry units.
3. The masonry units must be fully grouted.
4. The minimum specified compressive strength of masonry, f'_m, at 28 days is 1,500 psi.
5. Embedment depth is measured from the outside face of the concrete masonry unit.
6. Allowable loads may be increased 33⅓% for short-term loading due to wind or seismic forces where permitted by code.
7. Grout-filled CMU wall design must satisfy applicable design standards and be capable of withstanding applied loads.
8. Refer to allowable load-adjustment factors for spacing and edge distance on page 121.

Figure 1



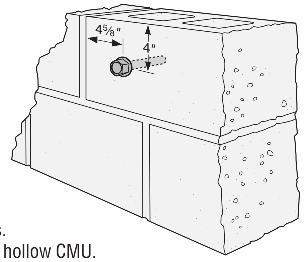
Shaded Area = Placement for Full and Reduced Allowable Load Capacity in Grout-Filled CMU

Tension and Shear Loads in 8-inch Lightweight, Medium-Weight and Normal-Weight Hollow CMU

Size in. (mm)	Drill Bit Dia. in.	Embed. Depth[4] in. (mm)	Min. Edge Dist. in. (mm)	Min. End Dist. in. (mm)	8-inch Hollow CMU Loads Based on CMU Strength			
					Tension Load		Shear Load	
					Ultimate lbs. (kN)	Allowable lbs. (kN)	Ultimate lbs. (kN)	Allowable lbs. (kN)
Anchor Installed in Face Shell (See Figure 2)								
⅜ (9.5)	⅜	1¾ (44)	4 (102)	4⅝ (117)	720 (3.2)	145 (0.6)	1,240 (5.5)	250 (1.1)
½ (12.7)	½	1¾ (44)	4 (102)	4⅝ (117)	760 (3.4)	150 (0.7)	1,240 (5.5)	250 (1.1)
⅝ (15.9)	⅝	1¾ (44)	4 (102)	4⅝ (117)	800 (3.6)	160 (0.7)	1,240 (5.5)	250 (1.1)
¾ (19.1)	¾	1¾ (44)	4 (102)	4⅝ (117)	880 (3.9)	175 (0.8)	1,240 (5.5)	250 (1.1)

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-inch wide, lightweight, medium-weight and normal-weight concrete masonry units.
3. The minimum specified compressive strength of masonry, f'_m, at 28 days is 1,500 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 ½" 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.

Figure 2

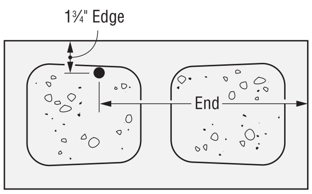


Tension and Shear Loads in 8-inch Lightweight, Medium-Weight and Normal-Weight Grout-Filled CMU Stemwall

Size in. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Min. Edge Dist. in. (mm)	Min. End Dist. in. (mm)	Critical Spacing Dist. in. (mm)	8-inch Grout-Filled CMU Allowable Loads Based on CMU Strength					
						Tension		Shear Perp. to Edge		Shear Parallel to Edge	
						Ultimate lbs. (kN)	Allowable lbs. (kN)	Ultimate lbs. (kN)	Allowable lbs. (kN)	Ultimate lbs. (kN)	Allowable lbs. (kN)
Anchor Installed in Cell Opening or Web (Top of Wall) (See Figure 3)											
½ (12.7)	½	4½ (114)	1¾ (44.5)	8 (203)	8 (203)	2,860 (12.7)	570 (2.5)	800 (3.6)	160 (0.7)	2,920 (13.0)	585 (2.6)
⅝ (15.9)	⅝	4½ (114)	1¾ (44.5)	10 (254)	10 (254)	2,860 (12.7)	570 (2.5)	800 (3.6)	160 (0.7)	3,380 (15.0)	675 (3.0)

1. The tabulated allowable loads are based on a safety factor of 5.0 for installations under the IBC and IRC.
2. Values are for 8-inch wide, lightweight, medium-weight and normal-weight concrete masonry units.
3. The masonry units must be fully grouted.
4. The minimum specified compressive strength of masonry, f'_m, at 28 days is 1,500 psi.
5. Allowable loads may be increased 33⅓% for short-term loading due to wind or seismic forces where permitted by code.
6. Grout-filled CMU wall design must satisfy applicable design standards and be capable of withstanding applied design loads.
7. Loads are based on anchor installed in either the web or grout-filled cell opening in the top of wall.

Figure 3



Anchor installed in top of wall

SIMPSON Strong-Tie®

Load-Adjustment Factors for Titen HD® Anchors in Normal-Weight Concrete: Edge Distance, Tension and Shear Loads

These tables are not for use with SD design methods

How to use these charts:

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

Edge Distance Tension (f_c)

Edge Dist. C_{act} (in.)	Dia.	⅜		½			⅝			¾		
	E	2¾	3¾	2¾	3⅝	5¾	2¾	4⅛	5¾	2¾	4⅝	5¾
	C_{cr}	3	3	4	4	4	5	5	5	6	6	6
	C_{min}	1¾	1¾	1¾	1¾	1¾	1¾	1¾	1¾	1¾	1¾	1¾
	f_{cmin}	**0.83**	**0.73**	**0.67**	**0.57**	**0.73**	**0.67**	**0.57**	**0.59**	**0.67**	**0.48**	**0.58**
1¾		0.83	0.73	0.67	0.57	0.73	0.67	0.57	0.59	0.67	0.48	0.58
2		0.86	0.78	0.71	0.62	0.76	0.70	0.60	0.62	0.69	0.51	0.60
2¼		0.90	0.84	0.74	0.67	0.79	0.72	0.64	0.65	0.71	0.54	0.63
2½		0.93	0.89	0.78	0.71	0.82	0.75	0.67	0.68	0.73	0.57	0.65
2¾		0.97	0.95	0.82	0.76	0.85	0.77	0.70	0.72	0.75	0.60	0.68
3		1.00	1.00	0.85	0.81	0.88	0.80	0.74	0.75	0.77	0.63	0.70
3¼				0.89	0.86	0.91	0.82	0.77	0.78	0.79	0.66	0.73
3½				0.93	0.90	0.94	0.85	0.80	0.81	0.81	0.69	0.75
3¾				0.96	0.95	0.97	0.87	0.83	0.84	0.83	0.72	0.78
4				1.00	1.00	1.00	0.90	0.87	0.87	0.84	0.76	0.80
4¼							0.92	0.90	0.91	0.86	0.79	0.83
4½							0.95	0.93	0.94	0.88	0.82	0.85
4¾							0.97	0.97	0.97	0.90	0.85	0.88
5							1.00	1.00	1.00	0.92	0.88	0.90
5¼										0.94	0.91	0.93
5½										0.96	0.94	0.95
5¾										0.98	0.97	0.98
6										1.00	1.00	1.00

*See page 13 for an explanation of the load table icons

See Notes Below

Edge Distance Shear (f_c)

Edge Dist. C_{act} (in.)	Dia.	⅜		½			⅝			¾		
	E	2¾	3¾	2¾	3⅝	5¾	2¾	4⅛	5¾	2¾	4⅝	5¾
	C_{cr}	4½	4½	6	6	6	7½	7½	7½	9	9	9
	C_{min}	1¾	1¾	1¾	1¾	1¾	1¾	1¾	1¾	1¾	1¾	1¾
	f_{cmin}	**0.25**	**0.24**	**0.25**	**0.20**	**0.17**	**0.19**	**0.16**	**0.19**	**0.19**	**0.14**	**0.13**
1¾		0.25	0.24	0.25	0.20	0.17	0.19	0.16	0.19	0.19	0.14	0.13
2		0.32	0.31	0.29	0.25	0.22	0.23	0.20	0.23	0.22	0.17	0.16
2½		0.45	0.45	0.38	0.34	0.32	0.30	0.27	0.30	0.27	0.23	0.22
3		0.59	0.59	0.47	0.44	0.41	0.37	0.34	0.37	0.33	0.29	0.28
3½		0.73	0.72	0.56	0.53	0.51	0.44	0.42	0.44	0.39	0.35	0.34
4		0.86	0.86	0.65	0.62	0.61	0.51	0.49	0.51	0.44	0.41	0.40
4½		1.00	1.00	0.74	0.72	0.71	0.58	0.56	0.58	0.50	0.47	0.46
5				0.82	0.81	0.80	0.65	0.63	0.65	0.55	0.53	0.52
5½				0.91	0.91	0.90	0.72	0.71	0.72	0.61	0.58	0.58
6				1.00	1.00	1.00	0.79	0.78	0.79	0.66	0.64	0.64
6½							0.86	0.85	0.86	0.72	0.70	0.70
7							0.93	0.93	0.93	0.78	0.76	0.76
7½							1.00	1.00	1.00	0.83	0.82	0.82
8										0.89	0.88	0.88
8½										0.94	0.94	0.94
9										1.00	1.00	1.00

The tabled adjustment values (f_c) have been calculated using the following information:

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

SIMPSON Strong-Tie®

Load-Adjustment Factors for Titen HD® Anchors in Normal-Weight Concrete: Spacing, Tension and Shear Loads

These tables are not for use with SD design methods

How to use these charts:

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

Spacing Tension (f_s)

*

S_{act} (in.)	Dia.	⅜		½			⅝			¾		
	E	2¾	3¾	2¾	3⅝	5¾	2¾	4⅛	5¾	2¾	4⅝	5¾
	S_{cr}	6	6	8	8	8	10	10	10	12	12	12
	S_{min}	1½	1½	2	2	2	2½	2½	2½	3	3	3
	f_{smin}	0.66	0.56	0.72	0.63	0.76	0.79	0.69	0.73	0.80	0.70	0.72
1½		0.66	0.56									
2		0.70	0.61	0.72	0.63	0.76						
2½		0.74	0.66	0.74	0.66	0.78	0.79	0.69	0.73			
3		0.77	0.71	0.77	0.69	0.80	0.80	0.71	0.75	0.80	0.70	0.72
4		0.85	0.80	0.81	0.75	0.84	0.83	0.75	0.78	0.82	0.73	0.75
5		0.92	0.90	0.86	0.82	0.88	0.86	0.79	0.82	0.84	0.77	0.78
6		1.00	1.00	0.91	0.88	0.92	0.89	0.83	0.86	0.87	0.80	0.81
7				0.95	0.94	0.96	0.92	0.88	0.89	0.89	0.83	0.84
8				1.00	1.00	1.00	0.94	0.92	0.93	0.91	0.87	0.88
9							0.97	0.96	0.96	0.93	0.90	0.91
10							1.00	1.00	1.00	0.96	0.93	0.94
11										0.98	0.97	0.97
12										1.00	1.00	1.00

*See page 13 for an explanation of the load table icons

See Notes Below

Spacing Shear (f_s)

*

S_{act} (in.)	Dia.	⅜		½			⅝			¾		
	E	2¾	3¾	2¾	3⅝	5¾	2¾	4⅛	5¾	2¾	4⅝	5¾
	S_{cr}	6	6	8	8	8	10	10	10	12	12	12
	S_{min}	1½	1½	2	2	2	2½	2½	2½	3	3	3
	f_{smin}	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
1½		0.77	0.77									
2		0.80	0.80	0.77	0.77	0.77						
2½		0.82	0.82	0.79	0.79	0.79	0.77	0.77	0.77			
3		0.85	0.85	0.81	0.81	0.81	0.79	0.79	0.79	0.77	0.77	0.77
4		0.90	0.90	0.85	0.85	0.85	0.82	0.82	0.82	0.80	0.80	0.80
5		0.95	0.95	0.89	0.89	0.89	0.85	0.85	0.85	0.82	0.82	0.82
6		1.00	1.00	0.92	0.92	0.92	0.88	0.88	0.88	0.85	0.85	0.85
7				0.96	0.96	0.96	0.91	0.91	0.91	0.87	0.87	0.87
8				1.00	1.00	1.00	0.94	0.94	0.94	0.90	0.90	0.90
9							0.97	0.97	0.97	0.92	0.92	0.92
10							1.00	1.00	1.00	0.95	0.95	0.95
11										0.97	0.97	0.97
12										1.00	1.00	1.00

The tabled adjustment values (f_s) have been calculated using the following information:

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. $f_s = f_{smin} + [(1 - f_{smin}) (S_{act} - S_{min}) / (S_{cr} - S_{min})]$.

Mechanical Anchors

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

These tables are not for use with SD design methods

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 or End Distance Tension (f_c) *

C_{act} (in.)	Dia.	⅜	½	⅝	¾
	E	2¾	3½	4½	5½
	C_{cr}	12	12	12	12
	C_{min}	4	4	4	4
	f_{cmin}	**1.00**	**1.00**	**0.83**	**0.66**
4		1.00	1.00	0.83	0.66
6		1.00	1.00	0.87	0.75
8		1.00	1.00	0.92	0.83
10		1.00	1.00	0.96	0.92
12		1.00	1.00	1.00	1.00

See Notes Below

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

C_{act} (in.)	Dia.	⅜	½	⅝	¾
	E	2¾	3½	4½	5½
	C_{cr}	12	12	12	12
	C_{min}	4	4	4	4
	f_{cmin}	**0.77**	**0.48**	**0.46**	**0.44**
4		0.77	0.48	0.46	0.44
6		0.83	0.61	0.60	0.58
8		0.89	0.74	0.73	0.72
10		0.94	0.87	0.87	0.86
12		1.00	1.00	1.00	1.00

See Notes Below

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

C_{act} (in.)	Dia.	⅜	½	⅝	¾
	E	2¾	3½	4½	5½
	C_{cr}	12	12	12	12
	C_{min}	4	4	4	4
	f_{cmin}	**0.58**	**0.38**	**0.30**	**0.21**
4		0.58	0.38	0.30	0.21
6		0.69	0.54	0.48	0.41
8		0.79	0.69	0.65	0.61
10		0.90	0.85	0.83	0.80
12		1.00	1.00	1.00	1.00

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

C_{act} (in.)	Dia.	⅜	½	⅝	¾
	E	2¾	3½	4½	5½
	C_{cr}	12	12	12	12
	C_{min}	4	4	4	4
	f_{cmin}	**0.89**	**0.79**	**0.58**	**0.38**
4		0.89	0.79	0.58	0.38
6		0.92	0.84	0.69	0.54
8		0.95	0.90	0.79	0.69
10		0.97	0.95	0.90	0.85
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. $f_c = f_{cmin} + [(1 - f_{cmin}) (C_{act} - C_{min}) / (C_{cr} - C_{min})]$.

*See page 13 for an explanation of the load table icons

Spacing Tension (f_s) *

S_{act} (in.)	Dia.	⅜	½	⅝	¾
	E	2¾	3½	4½	5½
	S_{cr}	6	8	10	12
	S_{min}	3	4	5	6
	f_{smin}	**0.87**	**0.69**	**0.59**	**0.50**
3		0.87			
4		0.91	0.69		
5		0.96	0.77	0.59	
6		1.00	0.85	0.67	0.50
8			1.00	0.84	0.67
10				1.00	0.83
12					1.00

Spacing Shear (f_s) *

S_{act} (in.)	Dia.	⅜	½	⅝	¾
	E	2¾	3½	4½	5½
	S_{cr}	6	8	10	12
	S_{min}	3	4	5	6
	f_{smin}	**0.62**	**0.62**	**0.62**	**0.62**
3		0.62			
4		0.75	0.62		
5		0.87	0.72	0.62	
6		1.00	0.81	0.70	0.62
8			1.00	0.85	0.75
10				1.00	0.87
12					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. $f_s = f_{smin} + [(1 - f_{smin}) (S_{act} - S_{min}) / (S_{cr} - S_{min})]$.