Strong-Bolt® 2 Wedge Anchor

Code listed for cracked and uncracked concrete, and masonry applications, the Strong-Bolt 2 wedge-type expansion anchor is an optimal choice for high-performance even in seismic and high-wind conditions. Dual undercutting embossments on each clip segment enable secondary expansion should a crack form and intersect the anchor location; this feature significantly increases the ability of Strong-Bolt 2 to carry load if the hole expands.

Features

- Chamfered top designed to prevent mushrooming during installation
- Qualified for static and seismic loading conditions (seismic design categories A through F)
- Suitable for horizontal, vertical and overhead applications
- Qualified for minimum concrete thickness of 3¼", and lightweight concrete-over-steel deck thickness of 2½" and 3¼"
- Standard (ANSI) fractional sizes: fits standard fixtures and installs with common drill bit and tool sizes
- Tested per ACI355.2 and AC193

Material: Zinc-plated carbon steel or stainless steel (Type 304; Type 316)

Codes: ICC-ES ESR-3037 (concrete);
IAPMO UES ER-240 (carbon steel in CMU);
City of LA Supplement within ESR-3037 (concrete);
City of LA Supplement within ER-240 (carbon steel in CMU);
Florida FL15730 (concrete); FL16230 (masonry);
UL File Ex3605;
FM 3043342 and 3047639;
Mulitiple DOT listings; meets the requirements of
Federal Specifications A-A-1923A, Type 4

Installation

Do not use an impact wrench to set or tighten the Strong-Bolt 2 anchor.

Caution: Oversized holes in the base material will make it difficult to set the anchor and will reduce the anchor's load capacity.

1. 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 minimum hole depth, 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.
2. Assemble the anchor with nut and washer so the top of the nut is flush with the top of the anchor. Place the anchor in the fixture, and drive it into the hole until the washer and nut are tight against the fixture.
3. Tighten to the required installation torque.

Strong-Bolt 2 Wedge Anchor

Cracked Concrete CODE LISTED

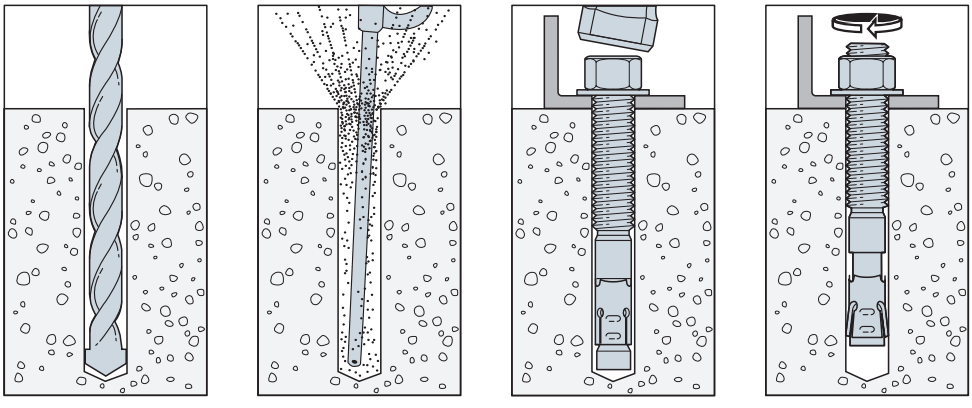
Head Stamp
The head is stamped with the length identification letter, bracketed top and bottom by horizontal lines.

3/8" diameter anchor data for CIP and CMU is bubbled for convenience

*CIP See Pages 108-110,112,114,116

*CMU See Pages 121,122

Installation Sequence



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Strong-Bolt® 2 Wedge Anchor

Material Specifications

Anchor Body	Nut	Washer	Clip
Carbon Steel (Zinc Plated)	Carbon Steel, ASTM A 563, Grade A	Carbon Steel ASTM F844	Carbon Steel, ASTM A 568
Type 304 Stainless Steel	Type 304 Stainless Steel	Type 304 Stainless Steel	Type 304 or 316 Stainless Steel
Type 316 Stainless Steel	Type 316 Stainless Steel	Type 316 Stainless Steel	Type 316 Stainless Steel

Strong-Bolt 2 Anchor Installation Data

Strong-Bolt 2 Diameter (in.)	¼	⅜	½	⅝	¾	1
Drill Bit Size (in.)	¼	⅜	½	⅝	¾	1
Min. Fixture Hole (in.)	5⁄16	7⁄16	9⁄16	11⁄16	⅞	1⅛
Wrench Size (in.)	7⁄16	9⁄16	¾	15⁄16	1⅛	1½
Concrete Installation Torque (ft.-lbf.) Carbon Steel	4	30	60	90	150	230
Concrete Installation Torque (ft.-lbf.) Stainless Steel	4	30	65	80	150	—

Length Identification Head Marks on Strong-Bolt® 2 Wedge Anchors (corresponds to length of anchor – inches)

Mark	Units	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
From	in.	1½	2	2½	3	3½	4	4½	5	5½	6	6½	7	7½	8	8½	9	9½	10	11	12	13	14	15	16	17	18
Up To But Not Including	in.	2	2½	3	3½	4	4½	5	5½	6	6½	7	7½	8	8½	9	9½	10	11	12	13	14	15	16	17	18	19

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Strong-Bolt® 2 Wedge Anchor

Strong-Bolt 2 Anchor Product Data

Size (in.)	Zinc-Plated Carbon Steel Model No.	Type 304 Stainless Steel Model No.	Type 316 Stainless Steel Model No.	Drill Bit Diameter (in.)	Thread Length (in.)	Quantity	
						Box	Carton
¼ x 1¾	STB2-25134	STB2-251344SS	STB2-251346SS	¼	1 5/16	100	500
¼ x 2¼	STB2-25214	STB2-252144SS	STB2-252146SS	¼	1 7/16	100	500
¼ x 3¼	STB2-25314	STB2-253144SS	STB2-253146SS	¼	2 7/16	100	500
⅜ x 2¾	STB2-37234	STB2-372344SS	STB2-372346SS	⅜	1 5/16	50	250
⅜ x 3	STB2-37300	STB2-373004SS	STB2-373006SS	⅜	1 9/16	50	250
⅜ x 3½	STB2-37312	STB2-373124SS	STB2-373126SS	⅜	2 1/16	50	250
⅜ x 3¾	STB2-37334	STB2-373344SS	STB2-373346SS	⅜	2 5/16	50	250
⅜ x 5	STB2-37500	STB2-375004SS	STB2-375006SS	⅜	3 9/16	50	200
⅜ x 7	STB2-37700	STB2-377004SS	STB2-377006SS	⅜	5 9/16	50	200
½ x 3¾	STB2-50334	STB2-503344SS	STB2-503346SS	½	2 1/16	25	125
½ x 4¼	STB2-50414	STB2-504144SS	STB2-504146SS	½	2 9/16	25	100
½ x 4¾	STB2-50434	STB2-504344SS	STB2-504346SS	½	3 1/16	25	100
½ x 5½	STB2-50512	STB2-505124SS	STB2-505126SS	½	3 13/16	25	100
½ x 7	STB2-50700	STB2-507004SS	STB2-507006SS	½	5 5/16	25	100
½ x 8½	STB2-50812	STB2-508124SS	STB2-508126SS	½	6	25	50
½ x 10	STB2-50100	STB2-501004SS	STB2-501006SS	½	6	25	50
⅝ x 4½	STB2-62412	STB2-624124SS	STB2-624126SS	⅝	2 7/16	20	80
⅝ x 5	STB2-62500	STB2-625004SS	STB2-625006SS	⅝	2 15/16	20	80
⅝ x 6	STB2-62600	STB2-626004SS	STB2-626006SS	⅝	3 15/16	20	80
⅝ x 7	STB2-62700	STB2-627004SS	STB2-627006SS	⅝	4 15/16	20	80
⅝ x 8½	STB2-62812	STB2-628124SS	STB2-628126SS	⅝	6	20	40
⅝ x 10	STB2-62100	STB2-621004SS	STB2-621006SS	⅝	6	10	20
¾ x 5½	STB2-75512	STB2-755124SS	STB2-755126SS	¾	3 3/16	10	40
¾ x 6¼	STB2-75614	STB2-756144SS	STB2-756146SS	¾	3 15/16	10	40
¾ x 7	STB2-75700	STB2-757004SS	STB2-757006SS	¾	4 11/16	10	40
¾ x 8½	STB2-75812	STB2-758124SS	STB2-758126SS	¾	6	10	20
¾ x 10	STB2-75100	—	—	¾	6	10	20
1 x 7	STB2-100700	—	—	1	3½	5	20
1 x 10	STB2-1001000	—	—	1	3½	5	10
1 x 13	STB2-1001300	—	—	1	3½	5	10

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Strong-Bolt® 2 Design Information — Concrete

Carbon-Steel Strong-Bolt 2 Installation Information and Additional Data[1]

Characteristic	Symbol	Units	Nominal Anchor Diameter, d_a (in.)											
			¼[4]	⅜[5]		½[5]			⅝[5]			¾[5]		1[5]
Installation Information														
Nominal Diameter	d_a	in.	¼	⅜		½			⅝			¾		1
Drill Bit Diameter	d	in.	¼	⅜		½			⅝			¾		1
Baseplate Clearance Hole Diameter[2]	d_c	in.	5⁄16	7⁄16		9⁄16			11⁄16			7⁄8		1⅛
Installation Torque	T_{inst}	ft-lbf	4	30		60			90			150		230
Nominal Embedment Depth	h_{nom}	in.	1¾	1⅞	2⅞	2¾		3⅞	3⅜		5⅛	4⅛	5¾	5¼	9¾
Effective Embedment Depth	h_{ef}	in.	1½	1½	2½	2¼		3⅜	2¾		4½	3⅜	5	4½	9
Minimum Hole Depth	h_{hole}	in.	1⅞	2	3	3		4⅛	3⅝		5⅜	4⅜	6	5½	10
Minimum Overall Anchor Length	ℓ_{anch}	in.	2¼	2¾	3½	3¾		5½	4½		6	5½	7	7	13
Critical Edge Distance	c_{ac}	in.	2½	6½	6	6	6	7½	7½		9	9	8	18	13½
Minimum Edge Distance	c_{min}	in.	1¾	6		6	4	4	6½	6½	6½	6½		8	
	for $s \geq$	in.	—	—		6	4	4	—	5	5	8		—	
Minimum Spacing	s_{min}	in.	2¼	3		2¾	2¾	2¾	5	2¾	2¾	7		8	
	for $c \geq$	in.	—	—		12	12	12	—	8	8	8		—	
Minimum Concrete Thickness	h_{min}	in	3¼	3¼	4½	4	5½	6	5½	6	7⅞	6¾	8¾	9	13½
Additional Data															
Yield Strength	f_{ya}	psi	56,000	92,000		85,000						70,000		60,000	
Tensile Strength	f_{uta}	psi	70,000	115,000								110,000		78,000	
Minimum Tensile and Shear Stress Area	A_{se}	in.^{2}	0.0318	0.0514		0.105			0.166			0.270		0.472	
Axial Stiffness in Service Load Range — Cracked and Uncracked Concrete	β	lb./in.	73,700[3]	34,820		63,570			91,370			118,840		299,600	

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.
2. The clearance must comply with applicable code requirements for the connected element.
3. The tabulated value of β for ¼"-diameter carbon steel Strong-Bolt 2 anchor is for installations in uncracked concrete only.
4. The ¼"-diameter (6.4 mm) anchor may be installed in top of uncracked normal-weight and sand-lightweight concrete over profile steel deck, where concrete thickness above upper flute meets the minimum thickness specified in this table.
5. The ⅜"- through 1"-diameter (9.5 mm through 25.4 mm) anchors may be installed in top of cracked and uncracked normal-weight and sand-lightweight concrete over profile steel deck, where concrete thickness above upper flute meets the minimum thickness specified in this table for ⅝"- through 1"-diameter anchors and in the table on p. 117 for ⅜"- and ½"- diameter anchors.

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

Strong-Bolt® 2 Design Information — Concrete

Stainless-Steel Strong-Bolt 2 Installation Information and Additional Data[1]

Characteristic	Symbol	Units	Nominal Anchor Diameter, d_a (in.)									
			¼[4]	⅜[5]		½[5]		⅝[5]		¾[5]		
Installation Information												
Nominal Diameter	d_a	in.	¼	⅜		½		⅝		¾		
Drill Bit Diameter	d	in.	¼	⅜		½		⅝		¾		
Baseplate Clearance Hole Diameter[2]	d_c	in.	5⁄16	7⁄16		9⁄16		11⁄16		⅞		
Installation Torque	T_{inst}	ft-lbf	4	30		65		80		150		
Nominal Embedment Depth	h_{nom}	in.	1¾	1⅞	2⅞	2¾	3⅞	3⅜	5⅛	4⅛	5¾	
Effective Embedment Depth	h_{ef}	in.	1½	1½	2½	2¼	3⅜	2¾	4½	3⅜	5	
Minimum Hole Depth	h_{hole}	in.	1⅞	2	3	3	4⅛	3⅝	5⅜	4⅜	6	
Minimum Overall Anchor Length	ℓ_{anch}	in.	2¼	2¾	3½	3¾	5½	4½	6	5½	7	
Critical Edge Distance	c_{ac}	in.	2½	6½	8½	4½	7	7½	9	8	8	
Minimum Edge Distance	c_{min}	in.	1¾	6		6½	5	4	4		6	
	for $s \geq$	in.	—	10		—	—	8	8		—	
Minimum Spacing	s_{min}	in.	2¼	3		8	5½	4	6¼		6½	
	for $c \geq$	in.	—	10		—	—	8	5½		—	
Minimum Concrete Thickness	h_{min}	in.	3¼	3¼	4½	4½	6		5½	7⅞	6¾	8¾
Additional Data												
Yield Strength	f_{ya}	psi	96,000	80,000		92,000		82,000		68,000		
Tensile Strength	f_{uta}	psi	120,000	100,000		115,000		108,000		95,000		
Minimum Tensile and Shear Stress Area	A_{se}	in.^{2}	0.0255	0.0514		0.105		0.166		0.270		
Axial Stiffness in Service Load Range — Cracked and Uncracked Concrete	β	lb./in.	54,430[3]	29,150		54,900		61,270		154,290		

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.
2. The clearance must comply with applicable code requirements for the connected element.
3. The tabulated value of β for ¼"-diameter stainless-steel Strong-Bolt 2 anchor is for installtions in uncracked concrete only.
4. The ¼"-diameter (6.4 mm) anchor may be installed in top of uncracked normal-weight and sand-lightweight concrete over profile steel deck, where concrete thickness above upper flute meets the minimum thickness specified in this table.
5. The ⅜"- through ¾"-diameter (9.5 mm through 19.1 mm) anchors may be installed in top of cracked and uncracked normal-weight and sand-lightweight concrete over profile steel deck, where concrete thickness above upper flute meets the minimum thickness specified in this table and in the table on p. 117 for the ⅜"- and ½"-diameter anchors.

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

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Strong-Bolt® 2 Design Information — Concrete

Carbon-Steel Strong-Bolt 2 Tension Strength Design Data[1]

Characteristic	Symbol	Units	Nominal Anchor Diameter, d_a (in.)									
			¼[8]	⅜[9]		½[9]		⅝[9]		¾[9]		1[9]	
Anchor Category	1, 2 or 3	—	1									2	
Nominal Embedment Depth	h_{nom}	in.	1¾	1⅞	2⅞	2¾	3⅞	3⅜	5⅛	4⅛	5¾	5¼	9¾
Steel Strength in Tension (ACI 318-14 Section 17.4.1 or ACI 318-11 Section D.5.1)													
Steel Strength in Tension	N_{sa}	lb.	2,225	5,600		12,100		19,070		29,700		36,815	
Strength Reduction Factor — Steel Failure[2]	ϕ_{sa}	—	0.75									0.65	
Concrete Breakout Strength in Tension (ACI 318-14 Section 17.4.2 or ACI 318-11 Section D.5.2)													
Effective Embedment Depth	h_{ef}	in.	1½	1½	2½	2¼	3⅜	2¾	4½	3⅜	5	4½	9
Critical Edge Distance	c_{ac}	in.	2½	6½	6	6½	7½	7½	9	9	8	18	13½
Effectiveness Factor — Uncracked Concrete	k_{uncr}	—	24										
Effectiveness Factor — Cracked Concrete	k_{cr}	—	—[7]	17									
Modification Factor	$\psi_{c,N}$	—	—[7]	1.00									
Strength Reduction Factor — Concrete Breakout Failure[3]	ϕ_{cb}	—	0.65									0.55	
Pullout Strength in Tension (ACI 318-14 17.4.3.1 or ACI 318-11 Section D.5.3)													
Pullout Strength, Cracked Concrete (f'_c = 2,500 psi)	$N_{p,cr}$	lb.	—[7]	1,300[5]	2,775[5]	N/A[4]	4,985[5]	N/A[4]	6,895[5]	N/A[4]	8,500[5]	7,700[5]	11,185[5]
Pullout Strength, Uncracked Concrete (f'_c = 2,500 psi)	$N_{p,uncr}$	lb.	N/A[4]	N/A[4]	3,340[5]	3,615[5]	5,255[5]	N/A[4]	9,025[5]	7,115[5]	8,870[5]	8,360[5]	9,690[5]
Strength Reduction Factor — Pullout Failure[6]	ϕ_p	—	0.65									0.55	
Tensile Strength for Seismic Applications (ACI 318-14 Section 17.2.3.3 or ACI 318-11 Section D3.3.3)													
Nominal Pullout Strength for Seismic Loads (f'_c = 2,500 psi)	$N_{p.eq}$	lb.	—[7]	1,300[5]	2,775[5]	N/A[4]	4,985[5]	N/A[4]	6,895[5]	N/A[4]	8,500[5]	7,700[5]	11,185[5]
Strength Reduction Factor — Pullout Failure[6]	ϕ_{eq}	—	0.65									0.55	

1. The information presented in this table must be used in conjunction with the design criteria of ACI 318-14 Chapter 17 or ACI 318-11 Appendix D, as applicable, except as modified below.
2. The tabulated value of ϕ_{sa} applies when 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. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ_{sa} must be determined in accordance with ACI 318-11 D.4.4.
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. N/A (not applicable) denotes that pullout resistance does not need to be considered.
5. The characteristic pullout strength for greater concrete compressive strengths shall be increased by multiplying the tabular value by $(f'_c/2{,}500\ \text{psi})^{0.5}$.
6. The tabulated value of ϕ_p or ϕ_{eq} applies when 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. If the load combinations of ACI 318-11 Appendix C are used, appropriate value of ϕ must be determined in accordance with ACI 318-11 Section D.4.4(c).
7. The ¼"-diameter carbon steel Strong-Bolt 2 anchor installation in cracked concrete is beyond the scope of this table.
8. The ¼"-diameter (6.4 mm) anchor may be installed in top of uncracked normal-weight and sand-lightweight concrete over profile steel deck, where concrete thickness above upper flute meets the minimum thickness specified in the table on p. 111.
9. The ⅜"- through 1"-diameter (9.5 mm through 25.4 mm) anchors may be installed in top of cracked and uncracked normal-weight and sand-lightweight concrete over profile steel deck, where concrete thickness above upper flute meets the minimum thickness specified in the table on p. 111 and in the table on p. 117 for the ⅜"- and ½"-diameter anchors.

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

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Strong-Bolt® 2 Design Information — Concrete

Stainless-Steel Strong-Bolt 2 Tension Strength Design Data[1]

Characteristic	Symbol	Units	Nominal Anchor Diameter, d_a (in.)									
			¼[10]	⅜[11]		½[11]		⅝[11]		¾[11]		
Anchor Category	1, 2 or 3	—	1									
Nominal Embedment Depth	h_{nom}	in.	1¾	1⅞	2⅞	2¾	3⅞	3⅜	5⅛	4⅛	5¾
Steel Strength in Tension (ACI 318-14 Section 17.4.1 or ACI 318-11 Section D5.1)												
Steel Strength in Tension	N_{sa}	lb.	3,060	5,140		12,075		17,930		25,650	
Strength Reduction Factor — Steel Failure[2]	ϕ_{sa}	—	0.75									
Concrete Breakout Strength in Tension (ACI 318-14 Section 17.4.2 or ACI 318-11 Section D5.2)												
Effective Embedment Depth	h_{ef}	in.	1½	1½	2½	2¼	3⅜	2¾	4½	3⅜	5
Critical Edge Distance	c_{ac}	in.	2½	6½	8½	4½	7	7½	9	8	8
Effectiveness Factor — Uncracked Concrete	k_{uncr}	—	24									
Effectiveness Factor — Cracked Concrete	k_{cr}	—	—[9]	17								
Modification Factor	$\Psi_{c,N}$	—	—[9]	1.00								
Strength Reduction Factor — Concrete Breakout Failure[3]	ϕ_{cb}	—	0.65									
Pullout Strength in Tension (ACI 318-14 Section 17.4.3 or ACI 318-11 Section D5.3)												
Pullout Strength, Cracked Concrete (f'_c = 2,500 psi)	$N_{p,cr}$	lb.	—[9]	1,720[6]	3,145[6]	2,560[5]	4,305[5]	N/A[4]	6,545[7]	N/A[4]	8,230[5]
Pullout Strength, Uncracked Concrete (f'_c = 2,500 psi)	$N_{p,uncr}$	lb.	1,925[7]	N/A[4]	4,770[6]	3,230[5]	4,495[5]	N/A[4]	7,615[5]	7,725[7]	9,625[7]
Strength Reduction Factor — Pullout Failure[8]	ϕ_p	—	0.65									
Tensile Strength for Seismic Applications (ACI 318-14 Section 17.2.3.3 or ACI 318-11 Section D.3.3.3)												
Nominal Pullout Strength for Seismic Loads (f'_c = 2,500 psi)	$N_{p,eq}$	lb.	—[9]	1,720[6]	2,830[6]	2,560[5]	4,305[5]	N/A[4]	6,545[7]	N/A[4]	8,230[5]
Strength Reduction Factor — Pullout Failure[8]	ϕ_{eq}	—	0.65									

1. The information presented in this table must be used in conjunction with the design criteria of ACI 318-14 Chapter 17 or ACI 318-11 Appendix D, as applicable, except as modified below.
2. The tabulated value of ϕ_{sa} applies when 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. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ_{sa} must be determined in accordance with ACI 318-11 D.4.4.
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. N/A (not applicable) denotes that pullout resistance does not need to be considered.
5. The characteristic pullout strength for greater concrete compressive strengths shall be increased by multiplying the tabular value by $(f'_c/2{,}500\text{ psi})^{0.5}$.
6. The characteristic pullout strength for greater concrete compressive strengths shall be increased by multiplying the tabular value by $(f'_c/2{,}500\text{ psi})^{0.3}$.
7. The characteristic pullout strength for greater concrete compressive strengths shall be increased by multiplying the tabular value by $(f'_c/2{,}500\text{ psi})^{0.4}$.
8. The tabulated value of ϕ_p or ϕ_{eq} applies when 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. If the load combinations of ACI 318-11 Appendix C are used, appropriate value of ϕ must be determined in accordance with ACI 318-11 Section D.4.4(c).
9. The ¼"-diameter stainless-steel Strong-Bolt 2 anchor installation in cracked concrete is beyond the scope of this table.
10. The ¼"-diameter (6.4 mm) anchor may be installed in top of uncracked normal-weight and sand-lightweight concrete over profile steel deck, where concrete thickness above upper flute meets the minimum thickness specified in the table on p. 112.
11. The ⅜"- through ¾"-diameter (9.5 mm through 19.1 mm) anchors may be installed in top of cracked and uncracked normal-weight and sand-lightweight concrete over profile steel deck, where concrete thickness above upper flute meets the minimum thickness specified in the table on p. 112 and in the table on p. 117 for the ⅜"- and ½"-diameter anchors.

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

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Strong-Bolt® 2 Design Information — Concrete

Carbon-Steel Strong-Bolt 2 Shear Strength Design Data[1]

Characteristic	Symbol	Units	Nominal Anchor Diameter, d_a (in.)									
			¼[6]	⅜[7]		½[7]		⅝[7]		¾[7]		1[7]
Anchor Category	1, 2 or 3	—	1									2
Nominal Embedment Depth	h_{nom}	in.	1¾	1⅞	2⅞	2¾	3⅞	3⅜	5⅛	4⅛	5¾	5¼	9¾
Steel Strength in Shear (ACI 318-14 Section 17.5.1.1 or ACI 318-11 Section D.6.1)												
Steel Strength in Shear	V_{sa}	lb.	965	1,800		7,235		11,035		14,480		15,020
Strength Reduction Factor — Steel Failure[2]	ϕ_{sa}	—	0.65									0.60
Concrete Breakout Strength in Shear (ACI 318-14 Section 17.5.2 or ACI 318-11 Section D.6.2)												
Outside Diameter	d_a	in.	0.25	0.375		0.500		0.625		0.750		1.00
Load-Bearing Length of Anchor in Shear	ℓ_e	in.	1.500	1.500	2.500	2.250	3.375	2.750	4.500	3.375	5.000	4.500	8.000
Strength Reduction Factor — Concrete Breakout Failure[2]	ϕ_{cb}	—	0.70									
Concrete Pryout Strength in Shear (ACI 318-14 Section 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						
Effective Embedment Depth	h_{ef}	in.	1½	1½	2½	2¼	3⅜	2¾	4½	3⅜	5	4½	9
Strength Reduction Factor — Concrete Pryout Failure[4]	ϕ_{cp}	—	0.70									
Steel Strength in Shear for Seismic Applications (ACI 315-14 Section 17.2.3.3 or ACI 318-11 Section D.3.3.3)												
Shear Strength of Single Anchor for Seismic Loads (f'_c = 2,500 psi)	$V_{sa.eq}$	lb.	—[5]	1,800		6,510		9,930		11,775		15,020
Strength Reduction Factor — Steel Failure[2]	ϕ_{eq}	—	0.65									0.60

1. The information presented in this table must be used in conjunction with the design criteria of ACI 318-14 Chapter 17 or ACI 318-11 Appendix D, except as modified below.
2. The tabulated value of ϕ_{sa} or ϕ_{eq} applies when 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. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ_{sa} or ϕ_{eq} must be determined in accordance with ACI 318 D.4.4.
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).
5. The ¼"-diameter carbon steel Strong-Bolt 2 anchor installation in cracked concrete is beyond the scope of this table.
6. The ¼"-diameter (6.4 mm) anchor may be installed in top of uncracked normal-weight and sand-lightweight concrete over profile steel deck, where concrete thickness above upper flute meets the minimum thickness specified in the table on p. 111.
7. The ⅜"- through 1"-diameter (9.5 mm through 25.4 mm) anchors may be installed in top of cracked and uncracked normal-weight and sand-lightweight concrete over profile steel deck, where concrete thickness above upper flute meets the minimum thickness specified in the table on p. 117.

SD

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

Stainless-Steel Strong-Bolt 2 Shear Strength Design Data[1]

Characteristic	Symbol	Units	Nominal Anchor Diameter, d_a (in.)									
			¼[6]	⅜[7]		½[7]		⅝[7]		¾[7]		
Anchor Category	1, 2 or 3	—	1									
Nominal Embedment Depth	h_{nom}	in.	1¾	1⅞	2⅞	2¾	3⅞	3⅜	5⅛	4⅛	5¾	
Steel Strength in Shear (ACI 318-14 Section 17.5.1 or ACI 318-11 Section D.6.1)												
Steel Strength in Shear	V_{sa}	lb.	1,605	3,085		7,245		6,745	10,760	15,045		
Strength Reduction Factor — Steel Failure[2]	ϕ_{sa}	—	0.65									
Concrete Breakout Strength in Shear (ACI 318-14 Section 17.5.2 or ACI 318-11 Section D.6.2)												
Outside Diameter	d_a	in.	0.250	0.375		0.500		0.625		0.750		
Load Bearing Length of Anchor in Shear	ℓ_e	in.	1.500	1.500	2.500	2.250	3.375	2.750	4.500	3.375	5.000	
Strength Reduction Factor — Concrete Breakout Failure[3]	ϕ_{cb}	—	0.70									
Concrete Pryout Strength in Shear (ACI 318-14 Section 17.5.2 or ACI 318-11 Section D.6.3)												
Coefficient for Pryout Strength	k_{cp}	—	1.0		2.0	1.0	2.0					
Effective Embedment Depth	h_{ef}	in.	1½	1½	2½	2¼	3⅜	2¾	4½	3⅜	5	
Strength Reduction Factor — Concrete Pryout Failure[4]	ϕ_{cp}	—	0.70									
Steel Strength in Shear for Seismic Applications (ACI 318-14 Section 17.2.3.3 or ACI 318-11 Section D.3.3.3)												
Shear Strength of Single Anchor for Seismic Loads (f'_c = 2,500 psi)	$V_{sa,eq}$	lb.	—[5]	3,085		6,100		6,745	10,760	13,620		
Strength Reduction Factor — Steel Failure[2]	ϕ_{sa}	—	0.65									

1. The information presented in this table must be used in conjunction with the design criteria of ACI 318-14 Chapter 17 or ACI 318-11 Appendix D, except as modified below.
2. The tabulated value of ϕ_{sa} applies when 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. If the load combinations of ACI 318-11 Appendix C are used, the appropriate value of ϕ_{sa} must be determined in accordance with ACI 318 D.4.4.
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).
5. The ¼"-diameter stainless-steel Strong-Bolt 2 anchor installation in cracked concrete is beyond the scope of this table.
6. The ¼"-diameter (6.4 mm) anchor may be installed in top of uncracked normal-weight and sand-lightweight concrete over profile steel deck, where concrete thickness above upper flute meets the minimum thickness specified in the table on p. 112.
7. The ⅜"- through ¾"-diameter (9.5 mm through 19.1 mm) anchors may be installed in top of cracked and uncracked normal-weight and sand-lightweight concrete over profile steel deck, where concrete thickness above upper flute meets the minimum thickness specified in the table on p. 117.

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

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Strong-Bolt® 2 Design Information — Concrete

Carbon-Steel Strong-Bolt 2 Information for Installation in the Topside of Concrete-Filled Profile Steel Deck Floor and Roof Assemblies[1,2,3,4]

IBC *

Design Information	Symbol	Units	Nominal Anchor Diameter (in.)		
			⅜		½
Nominal Embedment Depth	h_{nom}	in.	1⅞		2¾
Effective Embedment Depth	h_{ef}	in.	1½		2¼
Minimum Concrete Thickness[5]	$h_{min,deck}$	in.	2½	3¼	3¼
Critical Edge Distance	$c_{ac,deck,top}$	in.	4¾	4	4
Minimum Edge Distance	$c_{min,deck,top}$	in.	4¾	4½	4¾
Minimum Spacing	$s_{min,deck,top}$	in.	7	6½	8

For **SI**: 1 inch = 25.4 mm; 1 lbf = 4.45N

1. Installation must comply with the table on p. 111 and Figure 1 below.
2. Design capacity shall be based on calculations according to values in the tables on pp. 113 and 115.
3. Minimum flute depth (distance from top of flute to bottom of flute) is 1½".
4. Steel deck thickness shall be a minimum 20 gauge.
5. Minimum concrete thickness ($h_{min,deck}$) refers to concrete thickness above upper flute.

Stainless-Steel Strong-Bolt 2 Information for Installation in the Topside of Concrete-Filled Profile Steel Deck Floor and Roof Assemblies[1,2,3,4]

IBC *

Design Information	Symbol	Units	Nominal Anchor Diameter (in.)		
			⅜		½
Nominal Embedment Depth	h_{nom}	in.	1⅞		2¾
Effective Embedment Depth	h_{ef}	in.	1½		2¼
Minimum Concrete Thickness[5]	$h_{min,deck}$	in.	2½	3¼	3¼
Critical Edge Distance	$c_{ac,deck,top}$	in.	4¾	4	4
Minimum Edge Distance	$c_{min,deck,top}$	in.	4¾		6
Minimum Spacing	$s_{min,deck,top}$	in.	6½		8

For **SI**: 1 inch = 25.4 mm; 1 lbf = 4.45N

1. Installation must comply with the table on p. 112 and Figure 1 below.
2. Design capacity shall be based on calculations according to values in the tables on pp. 114 and 116.
3. Minimum flute depth (distance from top of flute to bottom of flute) is 1½".
4. Steel deck thickness shall be a minimum 20 gauge.
5. Minimum concrete thickness ($h_{min,deck}$) refers to concrete thickness above upper flute.

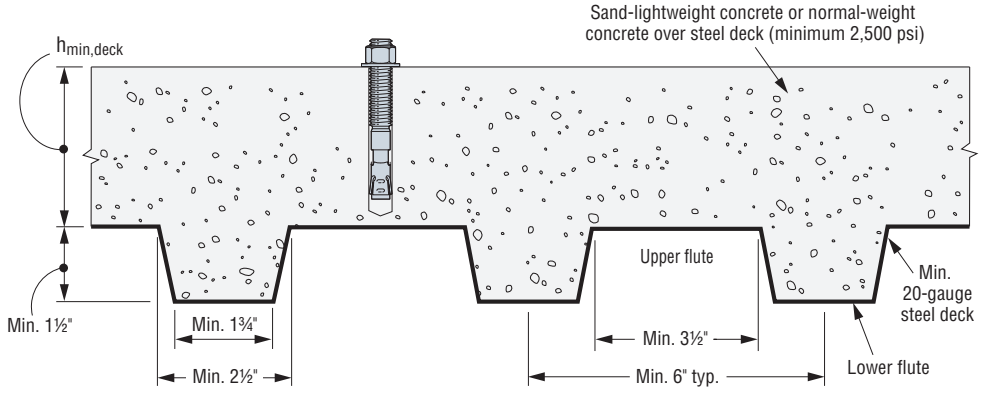

Figure 1

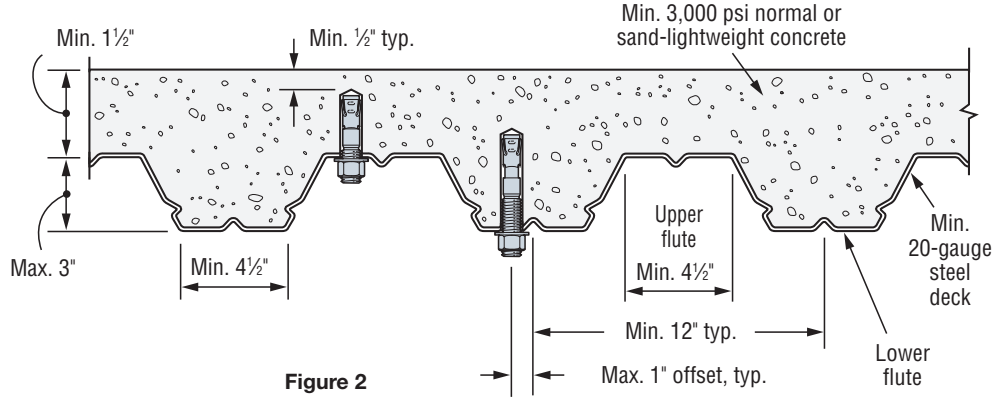

Figure 2

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

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Carbon-Steel Strong-Bolt 2 Tension and Shear Strength Design Data for the Soffit of Concrete over Steel Deck Floor and Roof Assemblies[1,2,6,8,9]

IBC *

Characteristic	Symbol	Units	Nominal Anchor Diameter (in.)								
			Carbon Steel								
			Lower Flute							Upper Flute	
			⅜		½		⅝		¾	⅜	½
Nominal Embedment Depth	h_{nom}	in.	2	3⅜	2¾	4½	3⅜	5⅝	4⅛	2	2¾
Effective Embedment Depth	h_{ef}	in.	1⅝	3	2¼	4	2¾	5	3⅜	1⅝	2¼
Installation Torque	T_{inst}	ft.-lbf.	30		60		90		150	30	60
Pullout Strength, concrete on steel deck (cracked)[3,4]	$N_{p,deck,cr}$	lb.	1,040[7]	2,615[7]	2,040[7]	3,645[7]	2,615[7]	4,990[7]	2,815[7]	1,340[7]	3,785[7]
Pullout Strength, concrete on steel deck (uncracked)[3,4]	$N_{p,deck,uncr}$	lb.	1,765[7]	3,150[7]	2,580[7]	3,840[7]	3,685[7]	6,565[7]	3,800[7]	2,275[7]	4,795[7]
Pullout Strength, concrete on steel deck (seismic)[3,4]	$N_{p,deck,eq}$	lb.	1,040[7]	2,615[7]	2,040[7]	3,645[7]	2,615[7]	4,990[7]	2,815[7]	1,340[7]	3,785[7]
Steel Strength in Shear, concrete on steel deck[5]	$V_{sa,deck}$	lb.	1,595	3,490	2,135	4,580	2,640	7,000	4,535	3,545	5,920
Steel Strength in Shear, concrete on steel deck (seismic)[5]	$V_{sa,deck,eq}$	lb.	1,595	3,490	1,920	4,120	2,375	6,300	3,690	3,545	5,330

1. The information presented in this table must be used in conjunction with the design criteria of ACI 318-14 Chapter 17 or ACI 318-11 Appendix D, except as modified below.
2. The steel deck profile must comply with the configuration in Figure 2 on the previous page, and have a minimum base-steel thickness of 0.035 inch (20 gauge). Steel must comply with ASTM A 653/A 653M SS Grade 33 with minimum yield strength of 33,000 psi. Concrete compressive strength shall be 3,000 psi minimum.
3. For anchors installed in the soffit of sand-lightweight or normal-weight concrete over steel deck floor and roof assemblies, calculation of the concrete breakout strength may be omitted.
4. In accordance with ACI 318-14 Section 17.4.3.2 or ACI 318-11 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 steel deck floor and roof assemblies $N_{p,deck,cr}$ shall be substituted for $N_{p,cr}$. Where analysis indicates no cracking at service loads, the normal pullout strength in uncracked concrete $N_{p,deck,uncr}$ shall be substituted for $N_{p,uncr}$. For seismic loads, $N_{p,deck,eq}$ shall be substituted for N_p.
5. In accordance with ACI 318-14 Section 17.5.1.2(C) or ACI 318-11 Section D.6.1.2(c), the shear strength for anchors installed in the soffit of sand-lightweight or normal-weight concrete over steel deck floor and roof assemblies V_{sa},deck shall be substituted for V_{sa}. For seismic loads, $V_{sa,deck,eq}$ shall be substituted for V_{sa}.
6. The minimum anchor spacing along the flute must be the greater of $3.0h_{ef}$ or 1.5 times the flute width.
7. The characteristic pull-out strength for greater concrete compressive strengths shall be increased by multiplying the tabular value by $(f'_c / 3{,}000\ psi)^{0.5}$.
8. Concrete shall be normal-weight or structural sand-lightweight concrete having a minimum specified compressive strength, f'_c, of 3,000 psi.
9. Minimum distance to edge of panel is $2h_{ef}$.

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

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Stainless-Steel Strong-Bolt 2 Tension and Shear Strength Design Data for the Soffit of Concrete over Steel Deck Floor and Roof Assemblies[1,2,6,10,11]

Characteristic	Symbol	Units	Stainless Steel								
			Lower Flute							Upper Flute	
			⅜		½		⅝		¾	⅜	½
Nominal Embedment Depth	h_{nom}	in.	2	3⅜	2¾	4½	3⅜	5⅝	4⅛	2	2¾
Effective Embedment Depth	h_{ef}	in.	1⅝	3	2¼	4	2¾	5	3⅜	1⅝	2¼
Installation Torque	T_{inst}	ft.-lbf.	30		65		80		150	30	65
Pullout Strength, concrete on steel deck (cracked)[3]	$N_{p,deck,cr}$	lb.	1,230[8]	2,605[8]	1,990[7]	2,550[7]	1,750[9]	4,020[9]	3,030[7]	1,550[8]	2,055[7]
Pullout Strength, concrete on steel deck (uncracked)[3]	$N_{p,deck,uncr}$	lb.	1,580[8]	3,950[8]	2,475[7]	2,660[7]	2,470[7]	5,000[7]	4,275[9]	1,990[8]	2,560[7]
Pullout Strength, concrete on steel deck (seismic)[5]	$N_{p,deck,eq}$	lb.	1,230[8]	2,345[8]	1,990[7]	2,550[7]	1,750[9]	4,020[9]	3,030[7]	1,550[8]	2,055[7]
Steel Strength in Shear, concrete on steel deck[4]	$V_{sa,deck}$	lb.	2,285	3,085	3,430	4,680	3,235	5,430	6,135	3,085	5,955
Steel Strength in Shear, concrete on steel deck (seismic)[5]	$V_{sa,deck,eq}$	lb.	2,285	3,085	2,400	3,275	3,235	5,430	5,520	3,085	4,170

1. The information presented in this table must be used in conjunction with the design criteria of ACI 318-14 Chapter 17 or ACI 318-11 Appendix D, except as modified below.
2. The steel deck profile must comply with the configuration in Figure 2 on the previous page, and have a minimum base-steel thickness of 0.035 inch (20 gauge). Steel must comply with ASTM A 653/A 653M SS Grade 33 with minimum yield strength of 33,000 psi. Concrete compressive strength shall be 3,000 psi minimum.
3. For anchors installed in the soffit of sand-lightweight or normal-weight concrete over steel deck floor and roof assemblies, calculation of the concrete breakout strength may be omitted.
4. In accordance with ACI 318-14 Section 17.4.3.2 or ACI 318-11 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 steel deck floor and roof assemblies $N_{p,deck,cr}$ shall be substituted for $N_{p,cr}$. Where analysis indicates no cracking at service loads, the normal pullout strength in uncracked concrete $N_{p,deck,uncr}$ shall be substituted for $N_{p,uncr}$. For seismic loads, $N_{p,deck,eq}$ shall be substituted for N_p.
5. In accordance with ACI 318-14 Section 17.5.1.2(C) or ACI 318-11 Section D.6.1.2(c), the shear strength for anchors installed in the soffit of sand-lightweight or normal-weight concrete over steel deck floor and roof assemblies V_{sa},deck shall be substituted for V_{sa}. For seismic loads, $V_{sa,\ deck,eq}$ shall be substituted for V_{sa}.
6. The minimum anchor spacing along the flute must be the greater of $3.0h_{ef}$ or 1.5 times the flute width.
7. The characteristic pull-out strength for greater concrete compressive strengths shall be increased by multiplying the tabular value by $(f'_c / 3{,}000\ psi)^{0.5}$.
8. The characteristic pull-out strength for greater concrete compressive strengths shall be increased by multiplying the tabular value by $(f'_c / 3{,}000\ psi)^{0.3}$.
9. The characteristic pull-out strength for greater concrete compressive strengths shall be increased by multiplying the tabular value by $(f'_c / 3{,}000\ psi)^{0.4}$.
10. Concrete shall be normal-weight or structural sand-lightweight concrete having a minimum specified compressive strength, f'_c, of 3,000 psi.
11. Minimum distance to edge of panel is $2h_{ef}$.

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

Carbon-Steel Strong-Bolt 2 Anchor Tension and Shear Strength Design Data for the Soffit of Concrete over Steel Deck, Floor and Roof Assemblies[1,2,6,8,9]

IBC *

Characteristic	Symbol	Units	Carbon Steel Nominal Anchor Diameter (in.)					
			Installed in Lower Flute					
			⅜		½		⅝	
Nominal Embedment Depth	h_{nom}	in.	2	3⅜	2¾	4½	3⅜	5⅝
Effective Embedment Depth	h_{ef}	in.	1⅝	3	2¼	4	2¾	5
Minimum Hole Depth	h_{hole}	in.	2⅛	3½	3	4¾	3⅝	5⅝
Minimum Concrete Thickness	$h_{min,deck}$	in.	2	2	2	3¼	2	3¼
Installation Torque	T_{inst}	ft.-lbf.	30		60		90	
Pullout Strength, concrete on steel deck (cracked)[3,4,7]	$N_{p,deck,cr}$	lb.	1,295	2,705	2,585	5,850	3,015	5,120
Pullout Strength, concrete on steel deck (uncracked)[3,4,7]	$N_{p,deck,uncr}$	lb.	2,195	3,260	3,270	6,165	4,250	6,735
Pullout Strength, concrete on steel deck (seismic)[3,4,7]	$N_{p,deck,eq}$	lb.	1,295	2,705	2,585	5,850	3,015	5,120
Steel Strength in Shear, concrete on steel deck[5]	$V_{sa,deck}$	lb.	1,535	3,420	2,785	5,950	3,395	6,745
Steel Strength in Shear, concrete on steel deck (seismic)[5]	$V_{sa,deck,eq}$	lb.	1,535	3,420	2,505	5,350	3,055	6,070

1. The information presented in this table must be used in conjunction with the design criteria of ACI 318-14 Chapter 17 or ACI 318-11 Appendix D, except as modified below.
2. The steel deck profile must comply with the configuration in Figure 3 below, and have a minimum base-steel thickness of 0.035 inch (20 gauge). Steel must comply with ASTM A 653/A 653M SS Grade 50 with minimum yield strength of 50,000 psi. Concrete compressive strength shall be 3,000 psi minimum.
3. For anchors installed in the soffit of sand-lightweight or normal-weight concrete over steel deck floor and roof assemblies, calculation of the concrete breakout strength may be omitted.
4. In accordance with ACI 318-14 Section 17.4.3.2 or ACI 318-11 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 steel deck floor and roof assemblies $N_{p,deck,cr}$ shall be substituted for $N_{p,cr}$. Where analysis indicates no cracking at service loads, the normal pullout strength in uncracked concrete $N_{p,deck,uncr}$ shall be substituted for $N_{p,uncr}$. For seismic loads, $N_{p,deck,eq}$ shall be substituted for N_p.
5. In accordance with ACI 318-14 Section 17.5.1.2(c) or ACI 318-11, the shear strength for anchors installed in the soffit of sand-lightweight or normal-weight concrete over steel deck floor and roof assemblies V_{sa},deck shall be substituted for V_{sa}. For seismic loads, $V_{sa,deck,eq}$ shall be substituted for V_{sa}.
6. The minimum anchor spacing along the flute must be the greater of $3.0h_{ef}$ or 1.5 times the flute width.
7. The characteristic pull-out strength for greater concrete compressive strengths shall be increased by multiplying the tabular value by $(f'_c / 3{,}000\ psi)^{0.5}$.
8. Concrete shall be normal-weight or structural sand-lightweight concrete having a minimum specified compressive strength, f'_c, of 3,000 psi.
9. Minimum distance to edge of panel is $2h_{ef}$.

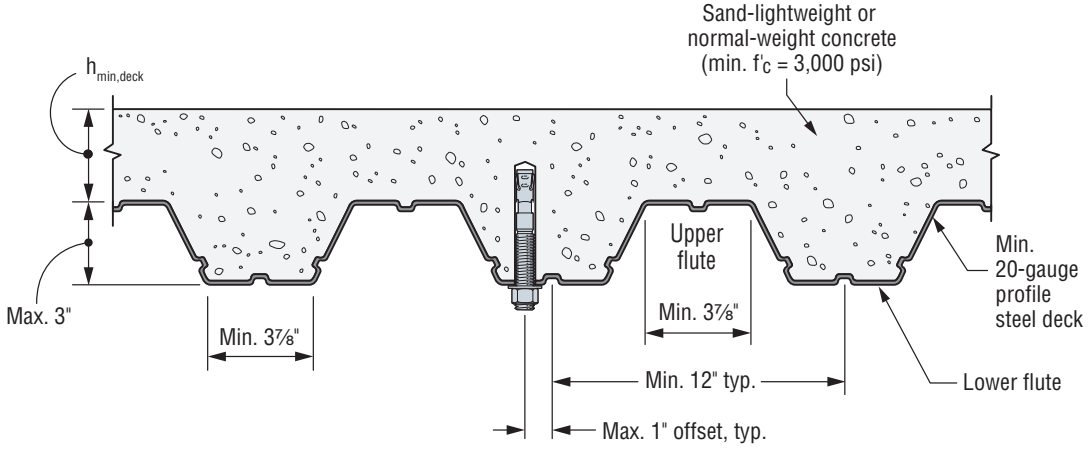

Figure 3

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

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Strong-Bolt® 2 Design Information — Masonry

Carbon-Steel Strong-Bolt 2 Tension and Shear Loads in 8" Lightweight, Medium-Weight and Normal-Weight Grout-Filled CMU

IBC *

Size in. (mm)	Drill Bit Diameter (in.)	Min. Embed. Depth in. (mm)	Install. Torque ft.-lb. (N-m)	Critical Edge Dist. in. (mm)	Critical End Dist. in. (mm)	Critical Spacing in. (mm)	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	1¾ (45)	4 (5.4)	12 (305)	12 (305)	8 (203)	1,150 (5.1)	230 (1.0)	1,500 (6.7)	300 (1.3)
⅜ (9.5)	⅜	2⅝ (67)	20 (27.1)	12 (305)	12 (305)	8 (203)	2,185 (9.7)	435 (1.9)	3,875 (17.2)	775 (3.4)
½ (12.7)	½	3½ (89)	35 (47.5)	12 (305)	12 (305)	8 (203)	2,645 (11.8)	530 (2.4)	5,035 (22.5)	1,010 (4.5)
⅝ (15.9)	⅝	4⅜ (111)	55 (74.6)	20 (508)	20 (508)	8 (203)	4,460 (19.8)	890 (4.0)	8,815 (39.2)	1,765 (7.9)
¾ (19.1)	¾	5¼ (133)	100 (135.6)	20 (508)	20 (508)	8 (203)	5,240 (23.3)	1,050 (4.7)	12,450 (55.4)	2,490 (11.1)

1. The tabulated allowable loads are based on a safety factor of 5.0 for installation under the IBC and IRC.
2. Listed loads may be applied to installations on the face of the CMU wall at least 1¼" away from headjoints.
3. Values for 8"-wide concrete masonry units (CMU) with a 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.
5. Tension and shear loads may be combined using the parabolic interaction equation (n = ⅝).
6. Refer to allowable load adjustment factors for edge distance and spacing on p. 122.

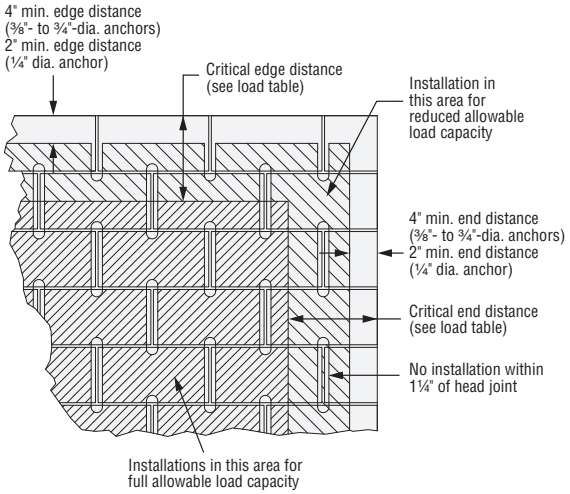

Figure 1

Carbon-Steel Strong-Bolt 2 Tension and Shear Loads in 8" Lightweight, Medium-weight and Normal-Weight Grout-Filled CMU

IBC *

Size in. (mm)	Drill Bit Diameter in.	Min. Embed. Depth. in. (mm)	Install. Torque ft.-lb. (N-m)	Min. Edge Dist. in. (mm)	Critical End Dist. in. (mm)	Critical Spacing in. (mm)	Tension Load		Shear Load Perpendicular to Edge		Shear Load Parallel to Edge	
							Ultimate lb. (kN)	Allowable lb. (kN)	Ultimate lb. (kN)	Allowable lb. (kN)	Ultimate lb. (kN)	Allowable lb. (kN)
Anchor Installed in Cell Opening or Web (Top of Wall) (See Figure 2)												
½ (12.7)	½	3½ (89)	35 (47.5)	1¾ (45)	12 (305)	8 (203)	2,080 (9.3)	415 (1.8)	1,165 (5.2)	235 (1.0)	3,360 (14.9)	670 (3.0)
⅝ (15.9)	⅝	4⅜ (111)	55 (74.6)	1¾ (45)	12 (305)	8 (203)	3,200 (14.2)	640 (2.8)	1,370 (6.1)	275 (1.2)	3,845 (17.1)	770 (3.4)

1. The tabulated allowable loads are based on a safety factor of 5.0 for installation under the IBC and IRC.
2. Values for 8"-wide concrete masonry units (CMU) with a minimum specified compressive strength of masonry, f'_m, at 28 days is 1,500 psi.
3. Tension and shear loads may be combined using the parabolic interaction equation (n = ⅝).
4. Refer to allowable load adjustment factors for edge distance and spacing on p. 122.

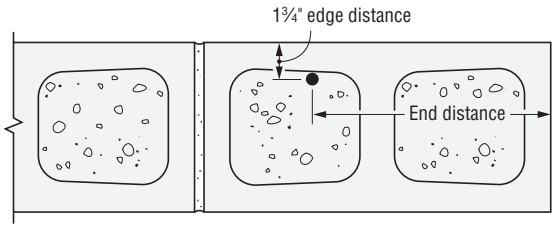

Figure 2

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

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Strong-Bolt® 2 Design Information — Masonry

Carbon-Steel Strong-Bolt 2 Allowable Load Adjustment Factors for 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 or End Distance Tension (f_c)

c_{act} (in.)	Dia.	¼	⅜	½	⅝	¾
	E	1¾	2⅝	3½	4⅜	5¼
	c_{cr}	12	12	12	20	20
	c_{min}	2	4	4	4	4
	f_{cmin}	**1.00**	**1.00**	**1.00**	**1.00**	**0.97**
2		1.00				
4		1.00	1.00	1.00	1.00	0.97
6		1.00	1.00	1.00	1.00	0.97
8		1.00	1.00	1.00	1.00	0.98
10		1.00	1.00	1.00	1.00	0.98
12		1.00	1.00	1.00	1.00	0.99
14					1.00	0.99
16					1.00	0.99
18					1.00	1.00
20					1.00	1.00

Edge or End Distance Shear (f_c)

c_{act} (in.)	Dia.	¼	⅜	½	⅝	¾
	E	1¾	2⅝	3½	4⅜	5¼
	c_{cr}	12	12	12	20	20
	c_{min}	2	4	4	4	4
	f_{cmin}	**0.88**	**0.71**	**0.60**	**0.36**	**0.28**
2		0.88				
4		0.90	0.71	0.60	0.36	0.28
6		0.93	0.78	0.70	0.44	0.37
8		0.95	0.86	0.80	0.52	0.46
10		0.98	0.93	0.90	0.60	0.55
12		1.00	1.00	1.00	0.68	0.64
14					0.76	0.73
16					0.84	0.82
18					0.92	0.91
20					1.00	1.00

Spacing Tension (f_s)

s_{act} (in.)	Dia.	¼	⅜	½	⅝	¾
	E	1¾	2⅝	3½	4⅜	5¼
	s_{cr}	8	8	8	8	8
	s_{min}	4	4	4	4	4
	f_{smin}	**1.00**	**1.00**	**0.93**	**0.86**	**0.80**
4		1.00	1.00	0.93	0.86	0.80
6		1.00	1.00	0.97	0.93	0.90
8		1.00	1.00	1.00	1.00	1.00

Spacing Shear (f_s)

s_{act} (in.)	Dia.	¼	⅜	½	⅝	¾
	E	1¾	2⅝	3½	4⅜	5¼
	s_{cr}	8	8	8	8	8
	s_{min}	4	4	4	4	4
	f_{smin}	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**
4		1.00	1.00	1.00	1.00	1.00
6		1.00	1.00	1.00	1.00	1.00
8		1.00	1.00	1.00	1.00	1.00

Load Adjustment Factors for Carbon-Steel Strong-Bolt 2 Wedge Anchors in Top-of-Wall Installation in 8" Grout-Filled CMU: Edge Distance and Spacing, Tension and Shear Loads

End Distance Tension (f_c)

s_{act} (in.)	Dia.	½	⅝
	E	3½	4⅜
	c_{cr}	12	12
	c_{min}	4	4
	f_{cmin}	**1.00**	**1.00**
4		1.00	1.00
6		1.00	1.00
8		1.00	1.00
10		1.00	1.00
12		1.00	1.00

End Distance Shear Perpendicular to Edge (f_c)

c_{act} (in.)	Dia.	½	⅝
	E	3½	4⅜
	c_{cr}	12	12
	c_{min}	4	4
	f_{cmin}	**0.90**	**0.83**
4		0.90	0.83
6		0.93	0.87
8		0.95	0.92
10		0.98	0.96
12		1.00	1.00

End Distance Shear Parallel to Edge (f_c)

c_{act} (in.)	Dia.	½	⅝
	E	3½	4⅜
	c_{cr}	12	12
	c_{min}	4	4
	f_{cmin}	**0.53**	**0.50**
4		0.53	0.50
6		0.65	0.63
8		0.77	0.75
10		0.88	0.88
12		1.00	1.00

Spacing Tension (f_s)

s_{act} (in.)	Dia.	½	⅝
	E	3½	4⅜
	s_{cr}	8	8
	s_{min}	4	4
	f_{cmin}	0.93	0.86
4		0.93	0.86
6		0.97	0.93
8		1.00	1.00

Spacing Shear Perpendicular or Parallel to Edge (f_s)

s_{act} (in.)	Dia.	½	⅝
	E	3½	4⅜
	s_{cr}	8	8
	s_{min}	4	4
	f_{cmin}	1.00	1.00
4		1.00	1.00
6		1.00	1.00
8		1.00	1.00

For footnotes, please see p. 121.

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