
CODE LISTED
ICC-ES ESR-2818
ICC-ES ESR-2966
CATEGORY 1
CRACKED &
UNCRACKED CONCRETE
PowerStud+ SD1
Strength Design Anchoring System
Powers is a proud member of:
Spiracon
PREFERRED SUPPLIER
STAFDA
Evergreen
MARKETING GROUP
Powers
FASTENERS
A domestic company headquartered in Brewster, NY

Power-Stud™+ SD1

Wedge Expansion Anchor

THREAD VERSION

UNC Threaded Stud

ANCHOR MATERIALS

Zinc plated carbon steel body and expansion clip, nut and washer

ANCHOR SIZE RANGE (TYP.)

1/4" diameter (uncracked concrete)

3/8" through 1-1/4" diameter

SUITABLE BASE MATERIALS

Normal-weight concrete

Structural sand-lightweight concrete

Concrete over steel deck

Grouted concrete masonry

PRODUCT DESCRIPTION

The Power-Stud+ SD1 anchor is a fully threaded, torque-controlled, wedge expansion anchor which is designed for consistent performance in cracked and uncracked concrete. Suitable base materials include normal-weight concrete, structural sand-lightweight concrete, concrete over metal deck and grouted concrete masonry. The anchor is manufactured with a zinc plated carbon steel body and expansion clip. Nut and washer are included.

GENERAL APPLICATIONS AND USES

- Structural connections, i.e., beam and column anchorage
- Safety-related attachments
- Interior applications / low level corrosion environment
- Tension zone applications, i.e., cable trays and strut, pipe supports, fire sprinklers
- Seismic and wind loading applications

FEATURES AND BENEFITS

- Consistent performance in high and low strength concrete
- Nominal drill bit size is the same as the anchor diameter
- Length ID code and identifying marking stamped on head of each anchor
- Anchor can be installed through standard fixture holes
- Anchor design allows for follow-up expansion after setting under tensile loading

APPROVALS AND LISTINGS

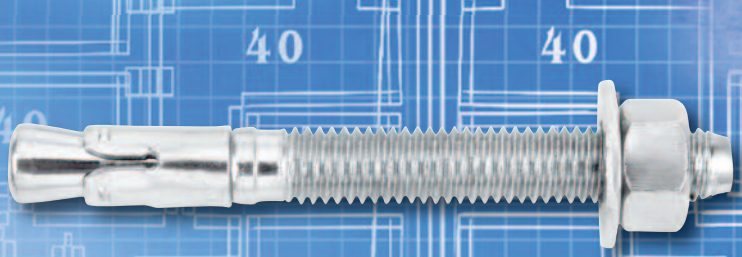
- International Code Council, Evaluation Service (ICC-ES), ESR-2818 & ESR2966
- Tested in accordance with ACI 355.2 and ICC-ES AC193 for use in concrete under the design provisions of ACI 318 (Strength Design method using Appendix D)
- Evaluated and qualified by an accredited independent testing laboratory for use in cracked and uncracked concrete including seismic and wind loading (Category 1 anchors)
- Factory Mutual Approval for 3/8" and 1/2" diameters, File number 3033795
- Underwriters Laboratory (UL Listed) File No. EX1289

GUIDE SPECIFICATIONS

CSI Divisions: *03151-Concrete Anchoring and 05090-Metal Fastenings.*
Expansion anchors shall be Power-Stud+ SD1 anchors as supplied by Powers Fasteners, Inc., Brewster, NY. Anchors shall be installed in accordance with published instructions and the Authority Having Jurisdiction.

MATERIAL SPECIFICATIONS

Anchor component	Specification
Anchor body	Medium carbon steel
Hex nut	Carbon steel, ASTM A 563, Grade A
Washer	Carbon steel, ASTM F 844; meets dimensional requirements of ANSI B18.22.2, Type A Plain
Expansion wedge (clip)	Carbon Steel
Plating	Zinc plating according to ASTM B 633, SC1, Type III (Fe/Zn 5) Minimum plating requirement for Mild Service Condition



INSTALLATION SPECIFICATIONS

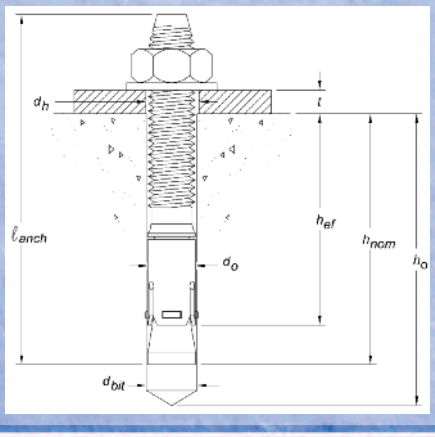
Installation Table for Power-Stud™+ SD1[1, 2, 3]

Anchor Property/Setting Information	Notation	Units	Nominal Anchor Diameter									
			1/4	3/8	1/2		5/8		3/4	7/8	1	1-1/4
Anchor diameter	do	in. (mm)	0.25 (6.4)	0.375 (9.5)	0.500 (12.7)		0.625 (15.9)		0.75 (19.1)	0.875 (22.2)	1 (25.4)	1.25 (31.8)
Minimum diameter of hole clearance in fixture	dh	in. (mm)	5/16 (7.5)	7/16 (11.1)	9/16 (14.3)		11/16 (17.5)		13/16 (20.6)	15/16 (23.8)	1-1/8 (28.6)	1-3/8 (34.9)
Nominal drill bit diameter	dbit	in. (mm)	1/4" ANSI	3/8" ANSI	1/2" ANSI		5/8" ANSI		3/4" ANSI	7/8" ANSI	1" ANSI	1-1/4" ANSI
Minimum nominal embedment depth	hnom	in. (mm)	1-3/4 (44)	2-3/8 (60)	2-1/2 (64)	3-3/4 (95)	3-3/8 (86)	4-5/8 (117)	4 (102)	4-1/2 (114)	5-1/2 (140)	6-1/2 (165)
Effective embedment	hef	in. (mm)	1.5 (38)	2 (51)	2 (51)	3.25 (83)	2.75 (70)	4 (102)	3.125 (79)	3.5 (89)	4.375 (111)	5.375 (137)
Minimum hole depth2	ho	in. (mm)	2 (51)	2-5/8 (67)	2-3/4 (70)	4 (102)	3-3/4 (95)	5 (127)	4-1/4 (108)	4-13/16 (122)	4-7/8 (124)	7-1/4 (184)
Minimum member thickness2	hmin	in. (mm)	4 (102)	4 (102)	5 (127)	6 (152)	6 (152)	7 (178)	6 (152)	10 (254)	10 (254)	12 (305)
Minimum overall anchor length	ℓanch	in. (mm)	2-1/4 (57)	3 (76)	3-3/4 (95)	5-1/2 (140)	4-1/2 (114)	6 (152)	5-1/2 (140)	6 (152)	9 (229)	9 (229)
Minimum edge distance2	cmin	in. (mm)	1-3/4 (44)	2-1/4 (57)	5-1/4 (133)	4 (102)	5-1/2 (140)	4-1/4 (108)	5 (127)	7 (178)	8 (203)	8 (203)
Minimum spacing distance2	smin	in. (mm)	2-1/4 (57)	3-3/4 (95)	7-1/4 (184)	5 (127)	11 (279)	4-1/4 (108)	6 (152)	6-1/2 (165)	8 (203)	8 (203)
Critical edge distance2	cac	in. (mm)	3-1/2 (89)	6-1/2 (165)	8-1/2 (216)	8 (203)	6 (152)	10 (254)	11 (279)	12 (305)	12 (305)	15 (381)
Installation torque3	Tinst	ft.-lbf. (N-m)	4 (5)	20 (27)	40 (54)		80 (108)		110 (149)	175 (237)	225 (305)	375 (508)
Torque wrench/socket size	-	in.	7/16	9/16	3/4		15/16		1-1/8	1-5/16	1-1/2	1-7/8
Nut height	-	In.	7/32	21/64	7/16		35/64		41/64	3/4	55/64	1-1/16

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

1. The information presented in this table is to be used in conjunction with the design criteria of ACI 318 Appendix D.
2. For installations through the soffit of steel into concrete, see the installation detail. Anchors in the lower flute may be installed with a maximum 1-inch offset in either direction from the center of the flute. In addition, anchors must have an axial spacing along the flute equal to the greater of $3h_{ef}$ or 1.5 times the flute width.
3. For installation of 5/8-inch diameter anchor through the soffit of the steel deck into structural sand-lightweight concrete, installation torque is 50 ft.-lbf. For installation of 3/4-inch diameter anchor through the soffit of the steel deck into structural sand-lightweight concrete, installation torque is 80 ft.-lbf.

Power-Stud+ SD1 Anchor Detail



Length Indentification

Length identification mark indicates overall length of anchor.

Mark	A	B	C	D	E	F	G	H	I	J
From	1-1/2"	2"	2-1/2"	3"	3-1/2"	4"	4-1/2"	5"	5-1/2"	6"
Up to but not including	2"	2-1/2"	3"	3-1/2"	4"	4-1/2"	5"	5-1/2"	6"	6-1/2"

Mark	K	L	M	N	O	P	Q	R	S	T
From	6-1/2"	7"	7-1/2"	8"	8-1/2"	9"	9-1/2"	10"	11"	12"
Up to but not including	7"	7-1/2"	8"	8-1/2"	9"	9-1/2"	10"	11"	12"	13"

Head Marking

Legend

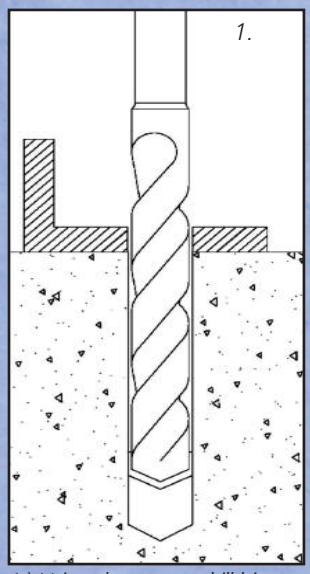
Letter Code = Length Identification Mark
'+' Symbol = Strength Design Compliant Anchor
Number Code = Carbon Steel Body and Expansion Clip (not on 1/4" diameter anchors)

Power-Stud™+ SD1

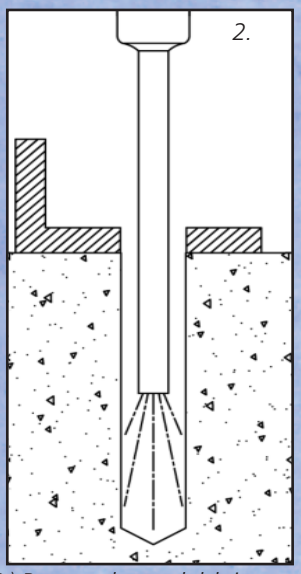
Wedge Expansion Anchor

INSTALLATION SPECIFICATIONS

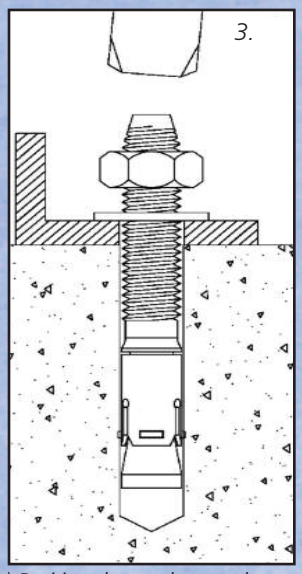
Installation Instructions for Power-Stud+ SD1



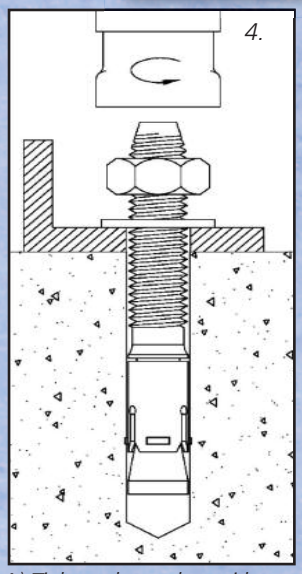
1.) Using the proper drill bit size, drill a hole into the base material to the required depth. The tolerances of the drill bit used should meet the requirements of ANSI Standard B212.15.



2.) Remove dust and debris from the hole.

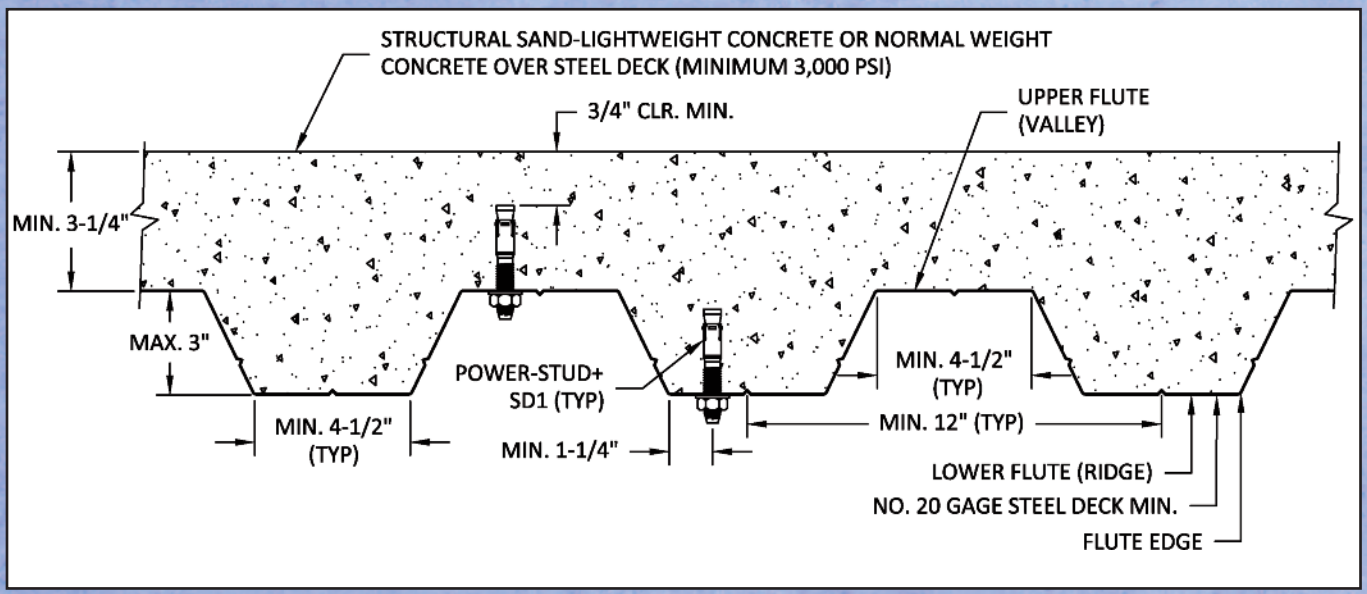


3.) Position the washer on the anchor and thread on the nut. If installing through a fixture, drive the anchor through the fixture into the hole. Be sure the anchor is driven to the minimum required nominal embedment depth, h_{nom}.



4.) Tighten the anchor with a torque wrench by applying the required installation torque, T_{inst}.

Installation Detail for Power-Stud+ SD1 Installed Through Soffit of Steel Deck Into Concrete



STRENGTH DESIGN INFORMATION

Tension Design Information for Power-Stud+ SD1 Anchor in Concrete

(For use with load combinations taken from ACI 318, Section 9.2)[1,2,3]

Design Characteristic	Notation	Units	Nominal Anchor Diameter									
			1/4	3/8	1/2		5/8		3/4	7/8	1	1-1/4
Anchor category	1,2 or 3	-	1	1	1		1		1	1	1	1
Nominal embedment depth	h_{nom}	in.	1-3/4	2-3/8	2-1/2	3-3/4	3-3/8	4-5/8	4	4-1/2	5-1/2	6-1/2
STEEL STRENGTH IN TENSION[4]												
Minimum specified yield strength	f_y	ksi (N/mm^2)	88 (606)	88 (606)	80 (551)		80 (551)		58 (400)	58 (400)	58 (400)	58 (400)
Minimum specified ultimate tensile strength (neck)	f_{uta}[11]	ksi (N/mm^2)	110 (758)	110 (758)	100 (689)		100 (689)		75 (517)	75 (517)	75 (517)	75 (517)
Effective tensile stress area (neck)	A_{se}	in^2 (mm^2)	0.022 (14.2)	0.0531 (34.3)	0.1018 (65.7)		0.1626 (104.9)		0.2376 (150.9)	0.327 (207.5)	0.43 (273.1)	0.762 (484)
Steel strength in tension	N_{sa}[11]	lb (kN)	2,255 (10)	5,455 (24.3)	9,080 (40.4)		14,465 (64.3)		17,820 (79.3)	24,503 (109.0)	32,250 (143.5)	56,202 (250)
Reduction factor for steel strength[3]	ϕ	-	0.75									
CONCRETE BREAKOUT STRENGTH IN TENSION[8]												
Effective embedment	h_{ef}	in. (mm)	1.5 (38)	2 (51)	2 (51)	3.25 (83)	2.75 (70)	4 (102)	3.125 (79)	3.5 (89)	4.375 (111)	5.375 (137)
Effectiveness factor for uncracked concrete	k_{uncr}	-	24	24	24		24		24	24	24	24
Effectiveness factor for cracked concrete	k_{cr}	-	N/A	17	17		17		24	17	24	24
Modification factor for cracked and uncracked concrete[5]	$\Psi_{c,N}$[11]	-	1 See note 5	1 See note 5	1 See note 5		1 See note 5		1 See note 5	1 See note 5	1 See note 5	1 See note 5
Critical edge distance	c_{ac}	in. (mm)	4 (102)	6-1/2 (165)	8-1/2 (216)	8 (203)	11 (280)	12 (305)	11 (280)	12 (305)	12 (305)	15 (381)
Reduction factor for concrete breakout strength[3]	ϕ	-	0.65 (Condition B)									
PULLOUT STRENGTH IN TENSION (NON-SEISMIC APPLICATIONS)[8]												
Characteristic pullout strength, uncracked concrete (2,500 psi)[6]	$N_{p,uncr}$	lb (kN)	See note 7	2,865 (12.8)	3,220 (14.3)	5,530 (24.6)	See note 7	See note 7	See note 7	See note 7	See note 7	See note 7
Characteristic pullout strength, crackedconcrete (2,500 psi)[6]	$N_{p,cr}$	lb (kN)	N/A	2,035 (9.1)	See note 7	2,505 (11.2)	See note 7	4,450 (19.8)	See note 7	See note 7	See note 7	See note 7
Reduction factor for pullout strength[3]	ϕ	-	0.65 (Condition B)									
PULLOUT STRENGTH IN TENSION FOR SEISMIC APPLICATIONS[8]												
Characteristic pullout strength, seismic (2,500 psi)[6,9]	N_{eq}[11]	lb (kN)	N/A	2,035 (9.1)	See note 7	2,505 (11.1)	See note 7	4,450 (19.8)	5,965 (26.5)	See note 7	See note 7	See note 7
Reduction factor for pullout strength[3]	ϕ	-	0.65 (Condition B)									
PULLOUT STRENGTH IN TENSION FOR STRUCTURAL SAND-LIGHTWEIGHT AND NORMAL-WEIGHT CONCRETE OVER STEEL DECK												
Characteristic pullout strength,uncracked concrete over steel deck, according to Installation Detail [6,10]	$N_{p,deck,uncr}$	lb (kN)	N/A	1,940 (8.6)	3,205 (14.2		2,795 (12.4)		3,230 (14.4)	N/A	N/A	N/A
Characteristic pullout strength, cracked concrete over steel deck, according toInstallation Detail [6,10]	$N_{p,deck,cr}$	lb (kN)	N/A	1375 (6.1)	2,390 (10.6)		1,980 (8.8)		3,230 (14.4)	N/A	N/A	N/A
Reduction factor for pullout strength[3]	ϕ	-	0.65 (Condition B)									

1. The data in this table is intended to be used with the design provisions of ACI 318 Appendix D; for anchors resisting seismic load combinations the additional requirements of ACI 318 D.3.3 must apply.
2. Installation must comply with published instructions and details.
3. All values of ϕ apply to the load combinations of IBC Section 1605.2.1, UBC Section 1612.2.1, or ACI 318 Section 9.2. If the load combinations of UBC Section 1902.2 or ACI 318 Appendix C are used, the appropriate value of ϕ must be determined in accordance with ACI 318 D.4.5. For reinforcement that complies with ACI 318 Appendix D requirements for Condition A, the appropriate ϕ factor must be determined in accordance with ACI 318 D.4.4.
4. The Power-Stud+ SD1 is considered a ductile steel element as defined by ACI 318 D.1. Tabulated values for steel strength in tension must be used for design.
5. For all design cases use $\Psi_{c,N} = 1.0$. The appropriate effectiveness factor for cracked concrete (k_{cr}) or uncracked concrete (k_{uncr}) must be used.
6. For all design cases use $\Psi_{c,P} = 1.0$. For concrete compressive strength greater than 2,500 psi, N_{pn} = (pullout strength value from table)*(specified concrete compressive strength/2500)$^{0.5}$. For concrete over steel deck the value of 2500 must be replaced with the value of 3000.
7. Pullout strength will not control design of indicated anchors. Do not calculate pullout strength for indicated anchor size and embedment.
8. Anchors are permitted to be used in structural sand-lightweight concrete provided that N_b, N_{eq} and N_{pn} are multiplied by a factor of 0.60.
9. Tabulated values for characteristic pullout strength in tension are for seismic applications and based on test results in accordance with ACI 355.2, Section 9.5.
10. Values for $N_{p,\ deck}$ are for structural sand-lightweight concrete ($f'_{c,min}$ = 3,000 psi) and additional lightweight concrete reduction factors need not be applied. In addition, evaluation for the concrete breakout capacity in accordance with ACI 318 D.5.2 is not required for anchors installed in the deck soffit (flute).
11. For 2003 IBC, f_{uta} replaces f_{ut}; N_{sa} replaces N_s; $\Psi_{c,N}$ replaces Ψ_3, and N_{eq} replaces $N_{p,seis}$.

Power-Stud™+ SD1

STRENGTH DESIGN INFORMATION

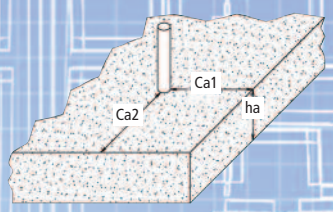
Shear Design Information for Power-Stud+ SD1 Anchor in Concrete
(For use with load combinations taken from ACI 318, Section 9.2)[1,2]

Design Characteristic	Notation	Units	Nominal Anchor Diameter									
			1/4	3/8	1/2		5/8		3/4	7/8	1	1-1/4
Anchor category	1, 2 or 3	-	1	1	1		1		1	1	1	1
Nominal embedment depth	hnom	in.	1-3/4	2-3/8	2-1/2	3-3/4	3-3/8	4-5/8	4	4-1/2	5-1/2	6-1/2
STEEL STRENGTH IN SHEAR[4]												
Minimum specified yield strength (threads)	fy	ksi (N/mm2)	70 (482)	70 (482)	64 (441)		64 (441)		58 (400)	58 (400)	58 (400)	58 (400)
Minimum specified ultimate strength (threads)	futa10	ksi (N/mm2)	88 (606)	88 (606)	80 (503)		80 (503)		75 (517)	75 (517)	75 (517)	75 (517)
Effective tensile stress area (threads)	Ase	in2 (mm2)	0.0318 (20.5)	0.0775 (50)	0.1419 (91.5)		0.226 (145.8)		0.3345 (212.4)	0.462 (293.4)	0.606 (384.8)	0.969 (615)
Steel strength in shear5	Vsa10	lb (kN)	915 (4.1)	2,120 (9.4)	3,520 (15.6)		4,900 (21.8)		6,860 (30.5)	8,819 (39.2)	10,935 (48.6)	17,750 (79)
Reduction factor for steel strength3	ϕ	-	0.65									
CONCRETE BREAKOUT STRENGTH IN SHEAR[6]												
Load bearing length of anchor (h_{ef} or 8_{do}, whichever is less)	ℓ10	in. (mm)	1.5 (38)	2 (51)	2 (51)	3.25 (83)	2.75 (70)	4 (102)	3.125 (79)	3.5 (88.9)	4.375 (111)	5.375 (137)
Nominal anchor diameter	do	in. (mm)	0.25 (6.4)	0.375 (9.5)	0.5 (12.7)		0.625 (15.9)		0.75 (19.1)	0.875 (22.2)	1 (25.4)	1.25 (31.8)
Reduction factor for concrete breakout[3]	ϕ	-	0.70 (Condition B)									
CONCRETE PRYOUT STRENGTH IN SHEAR[6]												
Coefficient for pryout strength (1.0 for $h_{ef} < 2.5$ in., 2.0 for $h_{ef} \geq 2.5$ in.)	kcp	-	1	1	1	2	2	2	2	2	2	2
Effective embedment	hef	in. (mm)	1.5 (38)	2 (51)	2 (51)	3.25 (83)	2.75 (70)	4 (102)	3.125 (79)	3.5 (88.9)	4.375 (111)	5.375 (137)
Reduction factor for pryout strength[3]	ϕ	-	0.70 (Condition B)									
STEEL STRENGTH IN SHEAR FOR SEISMIC APPLICATIONS												
Steel strength in shear, seismic[7]	Veq10	lb (kN)	N/A	2,120 (9.4)	3,520 (15.6)		4,900 (21.8)		5,695 (25.3)	8,819 (39.2)	9,845 (43.8)	17,750 (79)
Reduction factor for steel strength in shear for seismic[3]	ϕ	-	0.65									
STEEL STRENGTH IN SHEAR FOR STRUCTURAL SAND-LIGHTWEIGHT AND NORMAL-WEIGHT CONCRETE OVER STEEL DECK[9]												
Steel strength in shear, concrete over steel deck, according to Installation Detail 8,9	Vsa,deck	lb (kN)	N/A	2,120 (9.4)	2,290 (10.2)		3,710 (15.6)		5,505 (24.5)	N/A	N/A	N/A
Reduction factor for steel strength in shear for concrete over steel deck3	ϕ	-	0.65									

1. The data in this table is intended to be used with the design provisions of ACI 318 Appendix D; for anchors resisting seismic load combinations the additional requirements of ACI 318 D.3.3 must apply.
2. Installation must comply with published instructions and details.
3. All values of ϕ apply to the load combinations of IBC Section 1605.2.1, UBC Section 1612.2.1, or ACI 318 Section 9.2. If the load combinations of UBC Section 1902.2 or ACI 318 Appendix C are used, the appropriate value of ϕ must be determined in accordance with ACI 318 D.4.5. For reinforcement that complies with ACI 318 Appendix D requirements for Condition A, the appropriate ϕ factor must be determined in accordance with ACI 318 D.4.4.
4. The Power-Stud+ SD1 is considered a ductile steel element as defined by ACI 318 D.1.
5. Tabulated values for steel strength in shear must be used for design. These tabulated values are lower than calculated results using equation D-20 in ACI 318-05, ACI 318 D.6.1.2 and D-18 in ACI 318-02, D.6.1.2.
6. Anchors are permitted to be used in structural sand-lightweight concrete provided that V_b, and V_{cp} and V_{cpg} are multiplied by a factor of 0.60.
7. Tabulated values for steel strength in shear are for seismic applications and based on test results in accordance with ACI 355.2, Section 9.6.
8. Tabulated values for $V_{sa,\,deck}$ are for structural sand-lightweight concrete ($f'_{c,\,min}$ = 3,000 psi) and additional lightweight concrete reduction factors need not be applied. In addition, evaluation for the concrete breakout capacity in accordance with ACI 318 D.6.2 and the pryout capacity in accordance with Section D.6.3 are not required for anchors installed in the deck soffit (flute).
9. Shear loads for anchors installed through steel deck into concrete may be applied in any direction.
10. For the 2003 IBC f_{uta} replaces f_{ut}; V_{sa} replaces V_s; ℓ_e replaces ℓ; and V_{eq} replaces $V_{sa,seis}$.---

FACTORED DESIGN STRENGTH ($øN_n$ AND $øV_n$) CALCULATED IN ACCORDANCE WITH ACI 318 APPENDIX D:

1. Tabular values are provided for illustration and are applicable for single anchors installed in normal-weight-concrete with minimum slab thickness, $h_a = h_{min}$, and with the following conditions:
   - c_{a1} is greater than or equal to the critical edge distance, c_{ac} (table values based on $c_{a1} = c_{ac}$).
   - c_{a2} is greater than or equal to 1.5 c_{a1}.
2. Calculations were performed according to ACI 318-05 Appendix D. The load level corresponding to the controlling failure mode is listed. (e.g. For *tension:* steel, concrete breakout and pullout; For *shear:* steel, concrete breakout and pryout). Furthermore, the capacities for concrete breakout strength in tension and pryout strength in shear are calculated using the effective embedment values, h_{ef}, for the selected anchors as noted in the design information tables. Please also reference the installation specifications for more information.
3. Strength reduction factors (**ø**) were based on ACI 318 Section 9.2 for load combinations. Condition B is assumed.
4. Tabular values are permitted for static loads only, seismic loading is not considered with these tables.
5. For designs that include combined tension and shear, the interaction of tension and shear loads must be calculated in accordance with ACI 318 Appendix D.
6. Interpolation is not permitted to be used with the tabular values. For intermediate base material compressive strengths please see ACI 318 Appendix D. For other design conditions including seismic considerations please see ACI 318 Appendix D.



Tension and Shear Design Strengths for Power-Stud+ SD1 in Cracked Concrete[1,6]

Nominal Anchor Diameter (in.)	Nominal Embed. h_{nom} (in.)	Minimum Concrete Compressive Strength, f'c (psi)									
		2,500		3,000		4,000		6,000		8,000	
		$øN_n$ Tension (lbs.)	$øV_n$ Shear (lbs.)	$øN_n$ Tension (lbs.)	$øV_n$ Shear (lbs.)	$øN_n$ Tension (lbs.)	$øV_n$ Shear (lbs.)	$øN_n$ Tension (lbs.)	$øV_n$ Shear (lbs.)	$øN_n$ Tension (lbs.)	$øV_n$ Shear (lbs.)
1/4	1-3/4	-	-	-	-	-	-	-	-	-	-
3/8	2-3/8	1,325	1,380	1,450	1,380	1,675	1,380	2,050	1,380	2,365	1,380
1/2	2-1/4	1,565	1,685	1,710	1,845	1,975	2,130	2,420	2,290	2,795	2,290
1/2	3-3/4	1,630	2,290	1,785	2,290	2,060	2,290	2,520	2,290	2,915	2,290
5/8	3-3/8	2,520	3,185	2,760	3,185	3,185	3,185	3,905	3,185	4,505	3,185
5/8	4-5/8	2,895	3,185	3,170	3,185	3,660	3,185	4,480	3,185	5,175	3,185
3/4	4	4,135	4,460	4530	4,460	5230	4,460	6405	4,460	7395	4,460
7/8	4-1/2	3,620	5,730	3,965	5,730	4,575	5,730	5,605	5,730	6,470	5,730
1	5-1/2	7,140	7,110	7,820	7,110	9,030	7,110	11,060	7,110	12,770	7,110
1 1/4	6-1/2	9,720	11,540	10,650	11,540	12,295	11,540	15,060	11,540	17,390	11,540

Tension and Shear Design Strengths for Power-Stud+ SD1 in Uncracked Concrete[1,6]

Nominal Anchor Diameter (in.)	Nominal Embed. h_{nom} (in.)	Minimum Concrete Compressive Strength, f'c (psi)									
		2,500		3,000		4,000		6,000		8,000	
		$øN_n$ Tension (lbs.)	$øV_n$ Shear (lbs.)	$øN_n$ Tension (lbs.)	$øV_n$ Shear (lbs.)	$øN_n$ Tension (lbs.)	$øV_n$ Shear (lbs.)	$øN_n$ Tension (lbs.)	$øV_n$ Shear (lbs.)	$øN_n$ Tension (lbs.)	$øV_n$ Shear (lbs.)
1/4	1-3/4	1,435	595	1,570	595	1,765	595	1,765	595	1,765	595
3/8	2-3/8	1,860	1,380	2,040	1,380	2,355	1,380	2,885	1,380	3,330	1,380
1/2	2-1/4	2,095	2,290	2,295	2,290	2,645	2,290	3,240	2,290	3,745	2,290
1/2	3-3/4	3,590	2,290	3,935	2,290	4,545	2,290	5,565	2,290	6,425	2,290
5/8	3-3/8	3,555	3,185	3,895	3,185	4,500	3,185	5,510	3,185	6,365	3,185
5/8	4-5/8	6,240	3,185	6,835	3,185	7,895	3,185	9,665	3,185	10,850	3,185
3/4	4	4,310	4,460	4,720	4,460	5,450	4,460	6,675	4,460	7,710	4,460
7/8	4-1/2	5,105	5,730	5,595	5,730	6,460	5,730	7,910	5,730	9,135	5,730
1	5-1/2	7,140	7,110	7,820	7,110	9,030	7,110	11,060	7,110	12,770	7,110
1 1/4	6-1/2	9,720	11,540	10,650	11,540	12,295	11,540	15,060	11,540	17,390	11,540

Legend

Anchor Pullout/Pryout Strength Controls | Concrete Breakout Strength Controls | Steel Strength Controls

Power-Stud™+ SD1

REFERENCE PEFORMANCE DATA

Ultimate Load Capacities for Power-Stud+ SD1 in Normal-Weight Concrete[1]

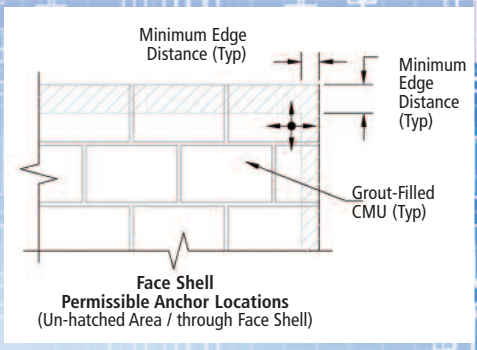
Nominal Anchor Diameter in. (mm)	Minimum Embedment Depth in. (mm)	Minimum Concrete Compressive Strength							
		f'_c = 2,500 psi (17.3 MPa)		f'_c = 3,000 psi (20.7 MPa)		f'_c = 4,000 psi (27.6 MPa)		f'_c = 6,000 psi (41.4 MPa)	
		Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)
1/4 (6.3)	1-1/8 (28)	-	-	1,435 (6.4)	1,255 (5.6)	1,660 (7.4)	1,255 (5.6)	-	-
	1-3/4 (44)	2,775 (12.4)	1,255 (5.6)	2,775 (12.4)	1,255 (5.6)	2,775 (12.4)	1,255 (5.6)	2,775 (12.4)	1,255 (5.6)
3/8 (9.5)	1-5/8 (48)	-	-	2,685 (12)	2,540 (11.3)	3,100 (13.8)	2,540 (11.3)	-	-
	2-3/8 (60)	3,485 (15.5)	2,540 (11.3)	3,815 (17)	2,540 (11.3)	4,410 (19.6)	2,540 (11.3)	5,400 (24)	2,540 (11.3)
1/2 (12.7)	2-1/4 (57)	-	-	4,155 (18.5)	4,195 (18.7)	4,800 (21.4)	4,195 (18.7)	-	-
	2-1/2 (64)	3,910 (17.4)	4,195 (18.7)	4,285 (19.1)	4,195 (18.7)	4,950 (22)	4,195 (18.7)	6,060 (27)	4,195 (18.7)
	3-3/4 (95)	7,955 (35.4)	4,195 (18.7)	8,715 (38.8)	4,195 (18.7)	10,065 (44.8)	4,195 (18.7)	12,325 (54.8)	4,195 (18.7)
5/8 (15.9)	2-3/4 (70)	-	-	5,440 (24.3)	6,815 (30.3)	6,285 (28)	6,815 (30.3)	-	
	3-3/8 (86)	6,625 (29.5)	6,815 (30.3)	7,260 (32.3)	6,815 (30.3)	8,380 (37.3)	6,815 (30.3)	10,265 (45.7)	6,815 (30.3)
	4-5/8 (117)	11,260 (50.1)	6,815 (30.3)	12,335 (54.9)	6,815 (30.3)	14,245 (63.4)	6,815 (30.3)	14,465 (65.7)	6,815 (30.3)
3/4 (19.1)	3-3/8 (86)	-	-	7,860 (32.2)	12,685 (56.4)	9,075 (40.5)	12,685 (56.4)	-	-
	4 (102)	9,530 (42.4)	12,685 (56.4)	10,440 (46.5)	12,685 (56.4)	12,060 (53.6)	12,685 (56.4)	14,770 (65.7)	12,685 (56.4)
7/8 (22.2)	3-1/2 (89)	11,320 (50.4)	11,690 (52.0)	12,405 (55.2)	11,690 (52.0)	15,125 (67.3)	11,690 (52.0)	19,470 (86.6)	11,690 (52.0)
1 (25.4)	4-1/2 (114)	-	-	13,850 (61.8)	21,155 (94.1)	20,915 (93.4)	21,155 (94.1)	-	-
	5-1/2 (140)	16,535 (73.6)	21,155 (94.1)	18,115 (80.6)	21,155 (94.1)	20,915 (93)	21,155 (94.1)	25,615 (114)	21,155 (94.1)
1 1/4 (31.8)	5-3/8 (137)	22,485 (100.0)	29,105 (129.4)	24,630 (109.6)	29,105 (129.4)	28,440 (126.5)	29,105 (129.4)	37,360 (166.2)	29,105 (129.4)

1. The tabulated load values are applicable to single anchors installed in uncracked concrete with no edge or spacing considerations.

ALLOWABLE STRESS DESIGN (AS)D PEFORMANCE DATA

Ultimate and Allowable Load Capacities in Tension for Power-Stud+ SD1 in Grout Filled Concrete Masonry Wall Faces[1,2,3,4,5]

Anchor Diameter in. (mm)	Minimum Embedment Depth in. (mm)	Min. Edge Distance in. (mm)	Min. End Distance in. (mm)	Grout-Filled Concrete Masonry			
				f'm = 1,500 psi		f'm = 2,000 psi	
				Ultimate Load Shear lbs. (kN)	Allowable Load Shear lbs. (kN)	Ultimate Load Shear lbs. (kN)	Allowable Load Shear lbs. (kN)
3/8 (9.5)	2 3/8 (60.3)	4 (101.6)	4 (101.6)	2,225 (10.0)	445 (2.0)	2,600 (11.6)	520 (2.3)
1/2 (12.7)	2 1/2 (63.5)			2,650 (11.8)	530 (2.4)	3,075 (13.7)	615 (2.7)
5/8 (15.9)	3 3/8 (85.7)			3,525 (15.7)	705 (3.2)	4,100 (18.3)	820 (3.7)



1. Tabulated load values are for anchors installed in minimum 6" wide, Type II, Grade N, normal-weight concrete masonry units conforming to ASTM C90.
2. The values listed above are allowable and ultimate load capacities. Allowable load capacities listed are calculated using a safety factor of 5.0. Consideration of safety factors of 10 or higher may be necessary depending on the application, such as life safety.
3. The tabulated values are applicable for anchors installed in grouted masonry wall faces at a critical spacing distance, s_{cr}, between anchors of 16 times the anchor diameter. The spacing distance between two anchors may be reduced to a minimum distance, s_{min}, of 8 times the anchor diameter provided the allowable tension loads are multiplied by a reduction factor of 0.80 and allowable shear loads are multiplied by a reduction factor of 0.90. Linear interpolation for calculation of allowable loads may be used for intermediate anchor spacing distances.
4. Anchors may be installed in the grouted cells and in cell webs and bed joints not closer than 1-3/8" from head joints. The minimum edge and end distances must also be maintained.
5. Allowable tension values for anchors installed into bed joints of grouted masonry wall faces with a minimum of 12" edge distance and end distance may be increased by 20 percent for the 1/2-inch diameter and 10 percent for the 5/8-inch diameter.

Ultimate and Allowable Load Capacities in Shear for Power-Stud+ SD1 in Grout Filled Concrete Masonry Wall Faces[1,2,3,4,5]

Anchor Diameter in. (mm)	Minimum Embedment Depth in. (mm)	Min. Edge Distance in. (mm)	Min. End Distance in. (mm)	Direction of Loading	Grout-Filled Concrete Masonry			
					f'm = 1,500 psi		f'm = 2,000 psi	
					Ultimate Load Shear lbs. (kN)	Allowable Load Shear lbs. (kN)	Ultimate Load Shear lbs. (kN)	Allowable Load Shear lbs. (kN)
3/8 (9.5)	2 3/8 (60.3)	4 (101.6)	4 (101.6)	Perpendicular or parallel to wall edge or end	2,875 (12.8)	575 (2.6)	3,490 (15.6)	665 (3.0)
1/2 (12.7)	2 1/2 (63.5)	4 (101.6)	12 (304.8)	Perpendicular or parallel to wall edge or end	2,875 (12.8)	565 (2.7)	4,940 (22.1)	655 (2.9)
		12 (304.8)	4 (101.6)	Parallel to wall edge	4,050 (18.1)	810 (3.6)	3,435 (15.3)	940 (4.2)
		4 (101.6)	12 (304.8)	Parallel to wall end				
5/8 (15.9)	3 3/8 (85.7)	4 (101.6)	4 (101.6)	Perpendicular or parallel to wall edge or end	3,425 (15.3)	685 (3.1)	4,300 (19.2)	795 (3.5
		12 (304.8)	4 (101.6)	Parallel to wall edge	5,350 (23.9)	1,070 (4.85)	6,530 (29.2)	1,240 (5.5)
		4 (101.6)	12 (304.8)	Parallel to wall end				

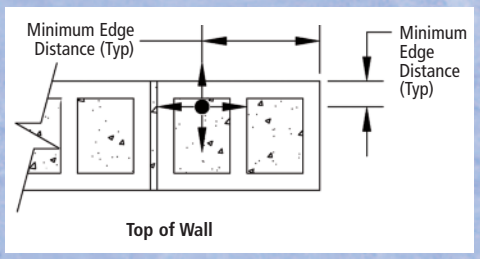
1. Tabulated load values are for anchors installed in minimum 6" wide, Type II, Grade N, normal-weight concrete masonry units conforming to ASTM C90.
2. The values listed above are allowable and ultimate load capacities. Allowable load capacities listed are calculated using a safety factor of 5.0. Consideration of safety factors of 10 or higher may be necessary depending on the application, such as life safety.
3. The tabulated values are applicable for anchor installed in grouted masonry wall faces at a critical spacing distance, s_{cr}, between anchors of 16 times the anchor diameter. The spacing distance between two anchors may be reduced to a minimum distance, s_{min}, of 8 times the anchor diameter provided the allowable tension loads are multiplied by a reduction factor of 0.80 and allowable shear loads are multiplied by a reduction factor of 0.90. Linear interpolation for calculation of allowable loads may be used for intermediate anchor spacing distances.
4. Anchors may be installed in the grouted cells and in cell webs and bed joints not closer than 1-3/8" from head joints. The minimum edge and end distances must also be maintained.
5. Allowable sheer loads for anchors installed into grouted masonry wall faces may be applied in any direction

Power-Stud™+ SD1

ASD PEFORMANCE DATA

Ultimate and Allowable Load Capacities in Tension for Power-Stud+ SD1 in Grout Filled Concrete Masonry Wall Tops[1,2,3,4]

Anchor Diameter in. (mm)	Minimum Embed. Depth in. (mm)	Min. Edge Distance in. (mm)	Min. End Distance in. (mm)	Grout-Filled Concrete Masonry			
				f'm = 1,500 psi		f'm = 2,000 psi	
				Ultimate Load Tension lbs. (kN)	Allowable Load Tension lbs. (kN)	Ultimate Load Tension lbs. (kN)	Allowable Load Tension lbs. (kN)
3/8 (9.5)	2 3/8 (60.3)	1 3/4 (44.5)	12 (304.8)	1,500 (6.7)	300 (1.3)	1,725 (7.7)	345 (1.5)
1/2 (12.7)	2 1/2 (63.5)	2 /14 (57.1)		2,225 (9.9)	445 (2.0)	2,575 (11.5)	515 (2.3)
	5 (127)			3,400 (15.1)	680 (3.0)	3,925 (17.5)	785 (3.5)
5/8 (15.9)	3 3/8 (85.7)			3,825 (17.1)	765 (3.4)	4,425 (19.7)	885 (3.9)

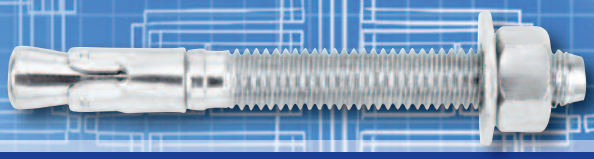


1. Tabulated load values are for anchors installed in minimum 8" wide, Type II, Grade N, normal-weight concrete masonry units conforming to ASTM C90.
2. The values listed above are allowable and ultimate load capacities. Allowable load capacities listed are calculated using a safety factor of 5.0. Consideration of safety factors of 10 or higher may be necessary depending on the application, such as life safety.
3. Anchors must be installed in the grouted cells and the minimum edge and end distances must be maintained.
4. The tabulated values are applicable for anchors installed in top of grouted masonry walls at a critical spacing distance, s_{cr}, between anchors of 16 times the anchor diameter.

Ultimate and Allowable Load Capacities in Shear for Power-Stud+ SD1 in Grout Filled Concrete Masonry Wall Tops[1,2,3,4]

Anchor Diameter in. (mm)	Minimum Embed. Depth in. (mm)	Minimum Edge Distance in. (mm)	Minimum End Distance in. (mm)	Direction of Loading	Grout-Filled Concrete Masonry			
					f'm = 1,500 psi		f'm = 2,000 psi	
					Ultimate Load Shear lbs. (kN)	Allowable Load Shear lbs. (kN)	Ultimate Load Shear lbs. (kN)	Allowable Load Shear lbs. (kN)
3/8 (9.5)	2 3/8 (60.3)	1 3/4 (44.5)	12 (304.8)	Perpendicular to wall toward minimum edge	1,075 (4.8)	215 (1.0)	1,250 (5.6)	250 (1.3)
				Parallel to wall edge	2,300 (10.3)	460 (2.0)	2,650 (11.8)	530 (2.4)
1/2 (12.7)	2 1/2 (63.5)	2 1/4 (57.1)	12 (304.8)	Any	1,075 (4.8)	215 (1.0)	1,250 (5.6)	250 (1.3)
	5 (127)			Perpendicular to wall toward minimum edge	1,400 (6.2)	280 (1.2)	1,625 (7.2)	325 (1.4)
				Parallel to wall edge	2,800 12.5	560 (2.5)	3,250 (14.5)	650 (2.9)
5/8 (15.9)	3 3/8 (85.7)	2 1/4 (57.1)	12 (304.8)	Any	1,075 (4.8)	215 (1.0)	1,250 (5.6)	250 (1.3)
	6 1/4 (158.8)			Perpendicular to wall toward minimum edge	2,350 (10.5)	470 (2.1)	2,725 (12.1)	545 (2.4)
				Parallel to wall edge	3,500 (15.6)	700 (3.1)	4,075 (18.2)	815 (3.6)

1. Tabulated load values are for anchors installed in minimum 8" wide, Type II, Grade N, normal-weight concrete masonry units conforming to ASTM C90.
2. The values listed above are allowable and ultimate load capacities. Allowable load capacities listed are calculated using a safety factor of 5.0. Consideration of safety factors of 10 or higher may be necessary depending on the application, such as life safety.
3. Anchors must be installed in the grouted cells and the minimum edge and end distances must be maintained.
4. The tabulated values are applicable for anchors installed in top of grouted masonry walls at a critical spacing distance, s_{cr}, between anchors of 16 times the anchor diameter.



ORDERING INFORMATION

Power-Stud+ SD1 (Carbon Steel Body and Expansion Clip)

Cat. No.	Anchor Size	Thread Length	Box Qty.	Carton Qty.	Wt./100 (lbs.)
7400SD1	1/4″ x 1-3/4″	3/4"	100	600	3
7402SD1	1/4″ x 2-1/4″	1-1/4"	100	600	4
7404SD1	1/4″ x 3-3/4″	2-1/4"	100	600	5
7410SD1	3/8″ x 2-1/4″	7/8"	50	300	8
7412SD1	3/8″ x 2-3/4″	1-3/8"	50	300	9
7413SD1	3/8″ x 3″	1-5/8"	50	300	10
7414SD1	3/8″ x 3-1/2″	2-1/8"	50	300	12
7415SD1	3/8″ x 3-3/4″	2-3/8"	50	300	13
7416SD1	3/8″ x 5″	3-5/8"	50	300	15
7417SD1	3/8″ x 7″	5-5/8"	50	200	21
7420SD1	1/2″ x 2-3/4″	1"	50	200	19
7422SD1	1/2″ x 3-3/4″	2"	50	200	23
7423SD1	1/2″ x 4-1/2″	2-3/4"	50	200	27
7424SD1	1/2″ x 5-1/2″	3-3/4"	50	200	30
7426SD1	1/2″ x 7″	5-1/4"	25	100	38
7427SD1	1/2″ x 8-1/2″	6-3/4"	25	100	44
7430SD1	5/8″ x 3-1/2″	1-1/2"	25	100	37
7432SD1	5/8″ x 4-1/2″	2-1/2"	25	100	43
7433SD1	5/8″ x 5″	3"	25	100	47
7434SD1	5/8″ x 6″	4"	25	75	53

Cat. No.	Anchor Size	Thread Length	Box Qty.	Carton Qty.	Wt./100 (lbs.)
7436SD1	5/8″ x 7″	5"	25	75	60
7438SD1	5/8″ x 8-1/2″	6-1/2"	25	50	70
7439SD1	5/8″ x 10″	8-1/2"	25	75	87
7440SD1	3/4″ x 4-1/4″	2-3/8"	20	60	63
7441SD1	3/4″ x 4-3/4″	2-7/8"	20	60	68
7442SD1	3/4″ x 5-1/2″	3-4/8"	20	10	76
7444SD1	3/4″ x 6-1/4″	3-3/8"	20	60	83
7446SD1	3/4″ x 7″	3-3/8"	20	60	91
7448SD1	3/4″ x 8-1/2″	3-3/8"	10	40	107
7449SD1	3/4″ x 10″	3-3/8"	10	30	123
7451SD1	3/4″ x 12″	3-3/8"	10	30	144
7450SD1	7/8″ x 6″	2-3/4"	10	20	128
7452SD1	7/8″ x 8″	4-3/4"	10	40	161
7454SD1	7/8″ x 10″	6-3/4"	10	30	187
7461SD1	1″ x 6″	4-1/2"	10	30	168
7463SD1	1″ x 9″	4-1/2"	10	30	234
7465SD1	1″ x 12″	4-1/2"	5	15	307
7473SD1	1-1/4″ x 9″	4-3/4"	5	15	374
7475SD1	1-1/4″ x 12″	7-3/4"	5	15	476

☐ These sizes not SD compliant.

The published size includes the diameter and the overall length of the anchor. All anchors are packaged with nuts and washers.

Installation Accessories

Cat. No.	Description	Wt./100 (lbs.)
08465	Adjustable torque wrench with 1/2" square drive (10 to 150 ft.-lbs.)	1
08280	Hand pump / dust blower	1

POWERS FASTENERS **BRANCH INFORMATION**

USA LOCATIONS

CITY	ADDRESS	CONTACT	PHONE	FAX
Alabama	5405 Buford Hwy Suite 410 Norcross, GA 30071-3984	Jeff Hatchett	205-520-6044	678-966-9242
Atlanta	5405 Buford Hwy Suite 410 Norcross, GA 30071-3984	Robert Brito	678-966-0000	678-966-9242
Boston	2 Powers Lane, Brewster, NY 10509	Jack Armour	800-524-3244	914-576-6483
Charlotte	349 L West Tremont Avenue, Charlotte, NC 28203	Bob Aurisy	704-375-5012	704-376-5517
Chicago	2472 Wisconsin Avenue, Downers Grove, IL 60515	Dan Gilligan	630-960-3156	630-960-3912
Dallas	10625 King Williams Drive, Dallas, TX 75220	Matt Henderson	972-506-9258	972-506-9290
Denver	2475 West Second Street #35, Denver, CO 80223	Jared Hemmert	303-922-9202	303-922-9228
Detroit	21600 Wyoming Avenue, Oak Park, MI 48237	Glen Gaskill	248-543-8600	248-543-8601
Florida	2412 Lynx Lane, Orlando, FL 32804	John Christy	813-626-4500	813-626-4545
Houston	13833 North Promenade, Suite 100, Stafford, TX 77477	Chris Salisbury	281-491-0351	281-491-0367
Indianapolis	15290 Stony Creek Way, Noblesville, IN 46060	Bill Trainor	317-773-1668	317-773-1690
Kansas City / St Louis	716 East 16th Avenue, North Kansas City, MO 64116	Don James, Jr.	816-472-5038	816-472-5040
Los Angeles	2761 Dow Avenue, Tustin, CA 92780	Jack Stewart	714-731-2500	714-731-2566
Maryland	3137-B Pennsy Drive, Landover, MD 20785	Chris Van Syckle	301-773-1722	301-341-5119
Milwaukee	12020 W. Feerick Street, Milwaukee, WI 53222	Donn Raduenz	414-466-2400	414-466-3993
Minneapolis	351 Wilson Street, NE Minneapolis, MN 55413	Josh Nelson	612-644-3047	612-331-3549
Nashville/Memphis	221 Blanton Avenue, Nashville, TN 37210	Ira Liss	615-248-2667	615-248-2676
New Orleans	102 Sampson Street, Houston, TX 77003	Cal Zenor	713-228-1524	713-228-1528
New York	2 Powers Lane, Brewster, NY 10509	John Partridge	914-235-6300	914-576-6483
Philadelphia	2 Powers Lane, Brewster, NY 10509	Greg Stephenson	800-524-3244	914-576-6483
Phoenix	3602 E. Southern Ave, Suite 5 Phoenix, AZ 85040	Craig Hering	602-431-8024	602-431-8027
Pittsburgh	1360 Island Avenue, Mckees Rocks, PA 15136	Bill Dugan	412-771-3010	412-771-9858
Portland	129 South Kenyon, Seattle, WA 98108	Jim Swink	360-608-6845	206-762-5817
Rochester	40 Harrison Street, Rochester, NY 14605	Mike Kolstad	585-288-2080	585-288-8732
Salt Lake City	2212 SW Temple #20, Salt Lake City, UT 84115	Don Manning	801-466-9428	801-466-3083
San Francisco	28970 Hopkins Street, Suite B+C, Hayward, CA 94545	Dan Mullan	510-293-1500	510-293-1505
Seattle	129 South Kenyon, Seattle, WA 98108	Darin Arnold	206-762-5812	206-762-5817

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China	TriF international, 4E, Building11, The City of Design, Tianmian Village, Futian, Shenzhen 518000	Tom Nie	86-755-82795378	86-755-82795379
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Guatemala	Tecnofijaciones, 6 Avenue 8-56 Zona 9, Zona 9, Guatemala	Oscar Lucas Penagos	502-233-4-3478	
Panama	Centro-Industrial, Via Cincuentenario, No. 7910, Ciudad Panama, Panama		(507) 302-8022	
Peru	Powers Peruana SAC, Av. Santa Catalina, 555 La Victoria, Lima 13, Peru (www.powersperuana.com)	Martin Vasquez	(011) 511 265 8500	(011) 511 330 0909
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