Power-Stud+™ SD4 & SD6

Stainless Steel Wedge Expansion Anchors

- **Consistent performance in high & low strength concrete**
- **Nominal bit size matches anchor diameter; anchor can be installed through standard fixture holes**
- **Allows follow-up expansion after setting under tensile loading**

NEW!

Powers is a proud member of:

Powers

FASTENING INNOVATIONS

A domestic company headquartered in Brewster, NY

Power-Stud+™ SD4 & SD6

Stainless Steel Wedge Expansion Anchor

THREAD VERSION
UNC Threaded stud

ANCHOR MATERIALS
Stainless steel body and expansion clip, nut and washer

ANCHOR SIZE RANGE (TYP.)
1/4" diameter through 5/8" diameter

SUITABLE BASE MATERIALS
Normal-weight concrete
Sand-lightweight concrete

This Product Available In

PDA®

Powers Design Assist
Real Time Anchor Design Software
www.powersdesignassist.com

PRODUCT DESCRIPTION

The Power-Stud+ SD4 and Power-Stud+ SD6 anchors are fully threaded, torque-controlled, wedge expansion anchors which are designed for consistent performance in cracked and uncracked concrete. Suitable base material is normal-weight and sand-lightweight concrete. The anchor is manufactured with a stainless 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 and exterior applications
- Tension zone applications, i.e., cable trays and strut, pipe supports, fire sprinklers

FEATURES AND BENEFITS

- Knurled mandrel design provides consistent performance and helps prevent galling during service live.
- Nominal drill bit size is the same as the anchor diameter
- Anchor can be installed through standard fixture holes
- Length ID code and identifying marking stamped on head of each anchor
- Anchor design allows for follow-up expansion after setting under tensile loading
- Category 1 corrosion resistant stainless steel anchors

APPROVALS AND LISTINGS

International Code Council Evaluation Service (ICC-ES), Evaluation Service Report Pending
Tested in accordance with ACI 355.2 and ICC-ES AC193 for use in structural concrete under the design provisions of ACI 318 (Strength Design method using Appendix D

GUIDE SPECIFICATIONS

CSI Divisions: 03151- *Concrete Anchoring, 05090 - Metal Fastenings, and 050519 Post-installed concrete anchors.* Expansion anchors shall be Power-Stud+ SD4 and Power-Stud+ SD6 as supplied by Powers Fasteners, Inc., Brewster, NY. Anchors shall be installed in accordance with published instructions and requirements of the Authority Having Jurisdiction.

MATERIAL SPECIFICATIONS

Anchor component	Specification	
	SD4[1,2]	SD6
Anchor body	Type 304 Stainless Steel	Type 316 Stainless Steel
Washer	300 Series Stainless Steel	Type 316 Stainless Steel
Hex Nut	Type 316 Stainless Steel	
Expansion wedge (clip)	Type 316 Stainless Steel	

1. Anchors manufactured with Type 303 Stainless Steel are available upon request (see ordering information for Power-Stud+ SD3) , and are equivalent to Type 304 Stainless Steel anchors.
2. Domestically manufactured anchors (as produced in the USA) are available upon request in Type 303 Stainless Steel (see ordering information for Power-Stud+ SD3).

Power-Stud+™ SD4 & SD6

ASD INSTALLATION SPECIFICATIONS

Installation Table for Power-Stud+ SD4 & Power-Stud+ SD6

Anchor Property/Setting Information	Notation	Units	Nominal Anchor Diameter (inch)			
			1/4	3/8	1/2	5/8
Anchor outside diameter	d_a	in. (mm)	0.25 (6.4)	0.375 (9.5)	0.500 (12.7)	0.625 (15.9)
Nominal drill bit diameter	d_{bit}	in.	1/4 ANSI	3/8 ANSI	1/2 ANSI	5/8 ANSI
Minimum diameter of hole clearance in fixture	d_h	in. (mm)	5/16 (7.9)	7/16 (11.1)	9/16 (14.3)	11/16 (17.5)
Minimum embedment depth	h_v	in. (mm)	1-3/4 (44)	1-7/8 (48)	2-1/2 (64)	3-1/4 (83)
Minimum hole depth	h_o	in. (mm)	1-7/8 (48)	2 (51)	2-5/8 (67)	3-1/2 (89)
Installation torque	T_{inst}	ft.-lbf. (N-m)	6 (8)	25 (34)	40 (54)	60 (81)
Torque wrench/socket size	-	in.	7/16	9/16	3/4	15/16
Nut height	-	in.	7/32	21/64	7/16	35/64

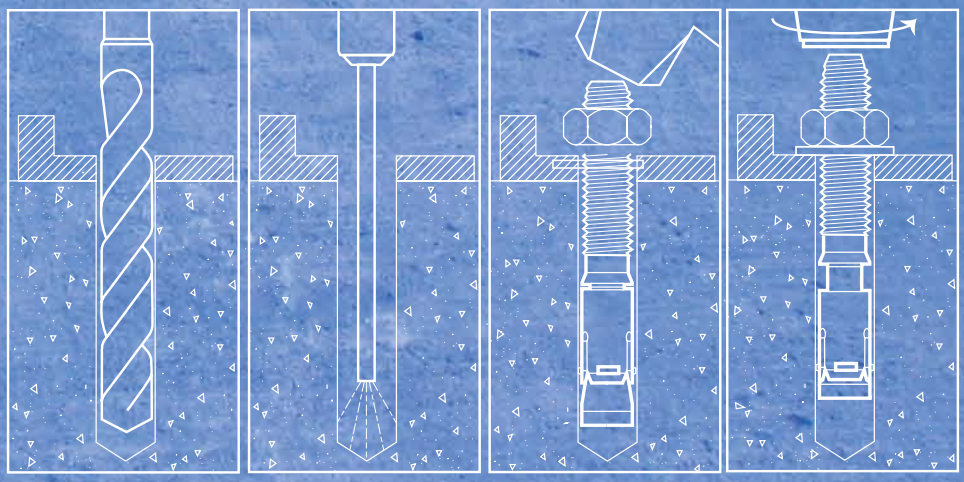
For SI: 1 inch = 25.4 mm, 1 ft-lbf = 1.356 N-m.

Length Identification

Mark	From	Up to but not including
A	1-1/2"	2"
B	2"	2-1/2"
C	2-1/2"	3"
D	3"	3-1/2"
E	3-1/2"	4"
F	4"	4-1/2"
G	4-1/2"	5"
H	5"	5-1/2"
I	5-1/2"	6"
J	6"	6-1/2"
K	6-1/2"	7"
L	7"	7-1/2"
M	7-1/2"	8"
N	8"	8-1/2"
O	8-1/2"	9"
P	9"	9-1/2"
Q	9-1/2"	10"
R	10"	10-1/2"

Length identification mark indicates overall length of anchor.

Installation Instructions



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 using a hand pump, compressed air or a vacuum to remove loose particles left from drilling.

3.) Position the supplied washer on the anchor and thread on the supplied 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 embedment depth,

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

Head Marking

Legend

Letter Code =
Length Identification Mark

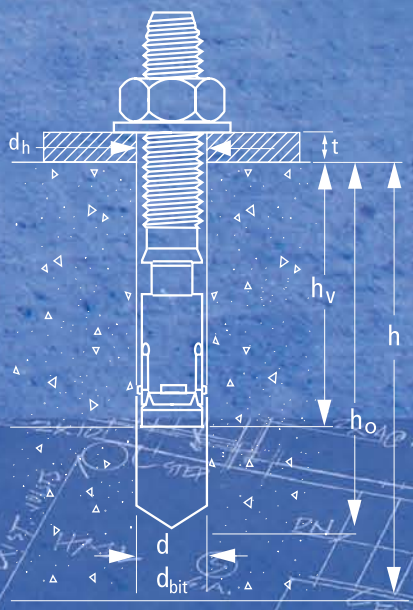
'+' Symbol =
Strength Design Compliant Anchor
(see ordering information, symbol not on 1/4" diameter anchors)

Number Code =
Stainless Steel Body Type (3, 4, or 6)

ASD Installation Detail

Nomenclature

d = Diameter of anchor
d_{bit} = Diameter of drill bit
d_h = Diameter of fixture clearance hole
h = Base material thickness
The minimum value of h should be $1.5h_v$ or 3" whichever is greater
h_v = Minimum embedment depth
t = Fixture thickness



Power-Stud+™ SD4 & SD6

REFERENCE PERFORMANCE DATA

Ultimate Load Capacities for Power-Stud+ SD4 and Power-Stud+ SD6 in Normal-Weight Concrete[1,2]

Nominal Anchor Diameter (in.)	Minimum Embedment Depth (in.)	Minimum Concrete Compressive Strength - f'c (psi)									
		2,500 psi		3,000 psi		4,000 psi		6,000 psi		8,000 psi	
		Ultimate Tension Load Capacity (lbs.)	Ultimate Shear Load Capacity (lbs.)	Ultimate Tension Load Capacity (lbs.)	Ultimate Shear Load Capacity (lbs.)	Ultimate Tension Load Capacity (lbs.)	Ultimate Shear Load Capacity (lbs.)	Ultimate Tension Load Capacity (lbs.)	Ultimate Shear Load Capacity (lbs.)	Ultimate Tension Load Capacity (lbs.)	Ultimate Shear Load Capacity (lbs.)
1/4	1-3/4	2,395	2,585	2,500	2,585	2,500	2,585	2,500	2,585	2,500	2,585
3/8	1-7/8	2,790	3,355	3,060	3,355	3,530	3,355	4,195	3,355	4,840	3,355
1/2	2-1/2	5,370	5,485	5,880	5,485	6,185	5,485	6,790	5,485	7,845	5,485
5/8	3-1/4	6,760	10,360	7,405	10,360	8,550	10,360	9,615	10,360	11,105	10,360

1. Tabulated load values are for anchors installed in uncracked concrete with no edge or spacing considerations. Concrete compressive strength must be at the specified minimum at the time of installation.
2. Ultimate load capacities must be reduced by a minimum safety factor of 4.0 or greater to determine allowable working loads.

Allowable Load Capacities for Power-Stud+ SD4 and Power-Stud+ SD6 in Normal-Weight Concrete[1,2,3]

Nominal Anchor Diameter (in.)	Minimum Embedment Depth (in.)	Minimum Concrete Compressive Strength - f'c (psi)									
		2,500 psi		3,000 psi		4,000 psi		6,000 psi		8,000 psi	
		Allowable Tension Load Capacity (lbs.)	Allowable Shear Load Capacity (lbs.)	Allowable Tension Load Capacity (lbs.)	Allowable Shear Load Capacity (lbs.)	Allowable Tension Load Capacity (lbs.)	Allowable Shear Load Capacity (lbs.)	Allowable Tension Load Capacity (lbs.)	Allowable Shear Load Capacity (lbs.)	Allowable Tension Load Capacity (lbs.)	Allowable Shear Load Capacity (lbs.)
1/4	1-3/4	600	645	625	645	625	645	625	645	625	645
3/8	1-7/8	700	840	765	840	885	840	1,050	840	1,210	840
1/2	2-1/2	1,345	1,370	1,470	1,370	1,545	1,370	1,700	1,370	1,960	1,370
5/8	3-1/4	1,690	2,590	1,850	2,590	2,140	2,590	2,405	2,590	2,775	2,590

1. Tabulated load values are for anchors installed in uncracked concrete. Concrete compressive strength must be at the specified minimum at the time of installation.
2. Allowable load capacities listed are calculated using and applied safety factor of 4.0.
3. Allowable load capacities are multiplied by reduction factors when anchor spacing or edge distances are less than critical distances.

ALLOWABLE STRESS DESIGN (ASD) DESIGN CRITERIA

Spacing Distance and Edge Distance Adjustment Factors for Normal Weight Concrete - Tension (F_{NS}, F_{NC})

Spacing Reduction Factors - Tension (F_{NS})					
Diameter d (in)		1/4	3/8	1/2	5/8
Critical Spacing s_{cr} (in)		4-1/2	5-1/2	6	8-1/4
Minimum Spacing s_{min} (in) (Reduced Anchor Capacity)		2	5-1/2	4-1/2	5
Min. Slab Thickness h_{min} (in)		3-1/4	3-1/4	4	5
Minimum Embedment h_v (in)		1-3/4	1-7/8	2-1/2	3-1/4
Spacing Distance (inches)	1-3/4	-	-	-	-
	2	0.79	-	-	-
	2-1/4	0.81	-	-	-
	2-1/2	0.83	-	-	-
	2-3/4	0.85	-	-	-
	3	0.87	-	-	-
	3-1/2	0.91	-	-	-
	4	0.96	-	-	-
	4-1/2	1.00	-	0.91	-
	5	1.00	-	0.94	0.85
	5-1/2	1.00	1.00	0.97	0.87
	6	1.00	1.00	1.00	0.90
	6-1/2	1.00	1.00	1.00	0.92
	7	1.00	1.00	1.00	0.94
	7-1/2	1.00	1.00	1.00	0.97
	8	1.00	1.00	1.00	0.99
	8-1/4	1.00	1.00	1.00	1.00

Edge Distance Reduction Factors - Tension (F_{NC})					
Diameter d (in)		1/4	3/8	1/2	5/8
Critical Distance c_{cr} (in)		5	5	7 1/2	9 1/2
Minimum Edge Distance c_{min} (in) (Reduced Anchor Capacity)		1-3/4	3	6	8-1/2
Min. Slab Thickness h_{min} (in)		3-1/4	3-1/4	4	5
Minimum Embedment h_v (in)		1-3/4	1-7/8	2-1/2	3-1/4
Edge Distance (inches)	1-1/2	-	-	-	-
	1-3/4	0.37	-	-	-
	2	0.41	-	-	-
	2-1/4	0.45	-	-	-
	2-1/2	0.50	-	-	-
	2-3/4	0.55	-	-	-
	3	0.60	0.60	-	-
	3-1/2	0.70	0.70	-	-
	4	0.80	0.80	-	-
	4-1/2	0.90	0.90	-	-
	5	1.00	1.00	-	-
	5-1/2	1.00	1.00	-	-
	6	1.00	1.00	0.80	-
	6-1/2	1.00	1.00	0.87	-
	7	1.00	1.00	0.93	-
	7-1/2	1.00	1.00	1.00	-
	8	1.00	1.00	1.00	-
	8-1/2	1.00	1.00	1.00	0.89
	9	1.00	1.00	1.00	0.95
	9-1/2	1.00	1.00	1.00	1.00

Spacing Distance and Edge Distance Adjustment Factors for Normal Weight Concrete -Shear (F_{VS}, F_{VC})

Spacing Reduction Factors -Shear (F_{VS})					
Diameter d (in)		1/4	3/8	1/2	5/8
Critical Spacing s_{cr} (in)		4-1/2	5-1/2	6	8-1/4
Minimum Spacing s_{min} (in)(Reduced Anchor Capacity)		2	5-1/2	4-1/2	5
Min. Slab Thickness h_{min} (in)		3-1/4	3-1/4	4	5
Minimum Embedment h_v (in)		1-3/4	1-7/8	2-1/2	3-1/4
Spacing Distance (inches)	1-3/4	-	-	-	-
	2	0.87	-	-	-
	2-1/4	0.88	-	-	-
	2-1/2	0.90	-	-	-
	2-3/4	0.91	-	-	-
	3	0.92	-	-	-
	3-1/2	0.95	-	-	-
	4	0.97	-	-	-
	4-1/2	1.00	-	0.95	-
	5	1.00	-	0.96	0.91
	5-1/2	1.00	1.00	0.98	0.93
	6	1.00	1.00	1.00	0.94
	6-1/2	1.00	1.00	1.00	0.95
	7	1.00	1.00	1.00	0.97
	7-1/2	1.00	1.00	1.00	0.98
	8	1.00	1.00	1.00	0.99
	8-1/4	1.00	1.00	1.00	1.00

Edge Distance Reduction Factors -Shear (F_{VC})					
Diameter d (in)		1/4	3/8	1/2	5/8
Critical Distance c_{cr} (in)		4-1/2	4-1/2	6	8-1/4
Minimum Distance c_{min} (in)(Reduced Anchor Capacity)		1-3/4	3	6	4-1/2
Min. Slab Thickness h_{min} (in)		3-1/4	3-1/4	4	5
Minimum Embedment h_v (in)		1-3/4	1-7/8	2-1/2	3-1/4
Edge Distance (inches)	1-1/2	-	-	-	-
	1-3/4	0.39	-	-	-
	2	0.44	-	-	-
	2-1/4	0.50	-	-	-
	2-1/2	0.56	-	-	-
	2-3/4	0.61	-	-	-
	3	0.67	0.67	-	-
	3-1/2	0.78	0.78	-	-
	4	0.89	0.89	-	-
	4-1/2	1.00	1.00	-	0.55
	5	1.00	1.00	-	0.61
	5-1/2	1.00	1.00	-	0.67
	6	1.00	1.00	1.00	0.73
	6-1/2	1.00	1.00	1.00	0.79
	7	1.00	1.00	1.00	0.85
	7-1/2	1.00	1.00	1.00	0.91
	8	1.00	1.00	1.00	0.97
	8-1/4	1.00	1.00	1.00	1.00

Power-Stud+™ SD4 & SD6

INSTALLATION SPECIFICATIONS

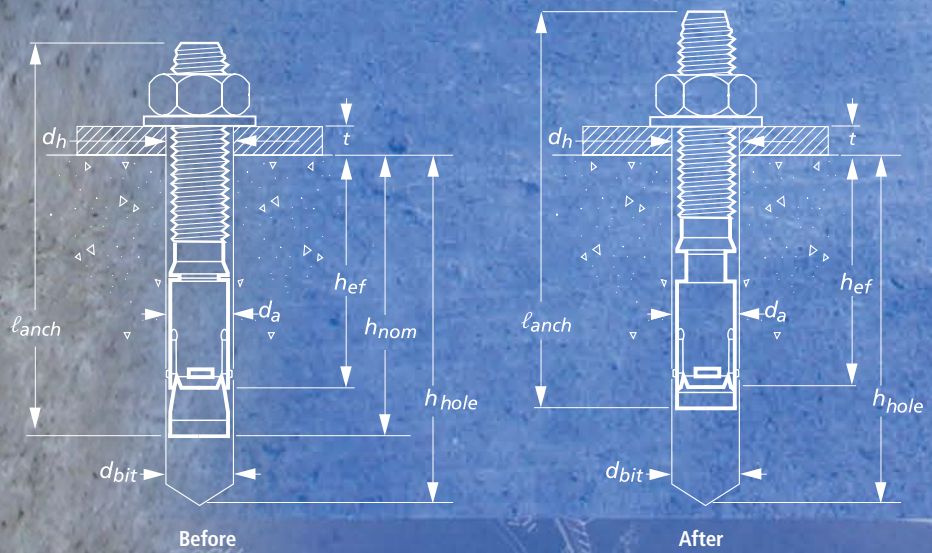
Strength Design Installation Table for Power-Stud+ SD4 and Power-Stud+ SD6[1]

Anchor Property/Setting Information	Notation	Units	Nominal Anchor Diameter				
			1/4	3/8	1/2	5/8	
Anchor outside diameter	d_a	in. (mm)	0.250 (6.4)	0.375 (9.5)	0.500 (12.7)	0.625 (15.9)	
Minimum diameter of hole clearance in fixture	d_h	in. (mm)	5/16 (7.9)	7/16 (11.1)	9/16 (14.3)	11/16 (17.5)	
Nominal drill bit diameter	d_{bit}	in.	1/4 ANSI	3/8 ANSI	1/2 ANSI	5/8 ANSI	
Minimum nominal embedment depth	h_{nom}	in. (mm)	1-3/4 (44)	1-7/8 (48)	2-1/2 (64)	3-1/4 (83)	
Effective embedment	h_{ef}	in. (mm)	1.50 (38)	1.50 (38)	2.00 (51)	2.75 (70)	
Minimum hole depth	h_{hole}	in. (mm)	1-7/8 (48)	2 (51)	2-5/8 (67)	3-1/2 (89)	
Minimum member thickness	h_{min}	in. (mm)	3-1/4 (83)	3-1/4 (83)	4 (102)	5 (127)	
Minimum overall anchor length	ℓ_{anch}	in. (mm)	2-1/4 (57)	2-3/4 (70)	3-3/4 (95)	4-1/2 (114)	
Minimum edge distance	c_{min}	in. (mm)	1-3/4 (44)	3 (76)	6 (152)	4-1/2 (114)	8-1/2 (21 6)
Minimum spacing distance	s_{min}	in. (mm)	2 (51)	6 (152)	4-1/2 (114)	8-1/2 (216)	5 (127)
Critical edge distance	c_{ac}	in. (mm)	5 (127)	5 (127)	7-1/2 (191)	9-1/2 (241)	
Installation torque	T_{inst}	ft.-lbf. (N-m)	6 (8)	25 (34)	40 (54)	60 (81)	
Torque wrench/socket size	-	in.	7/16	9/16	3/4	15/16	
Nut height	-	In.	7/32	21/64	7/16	35/64	

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.

Power-Stud+ SD4 & Power-Stud+ SD6 Anchor Detail



STRENGTH DESIGN INFORMATION

Tension Design Information for Power-Stud+ SD4 and Power-Stud+ SD6 Anchors in Concrete (For use with load combinations taken from ACI 318, Section 9.2)[1-4]

Design Characteristic	Notation	Units	Nominal Anchor Diameter			
			1/4	3/8	1/2	5/8
Anchor category	1,2 or 3	-	1	1	1	1
Nominal embedment depth	h_{nom}	in.	1-3/4	1-7/8	2-1/2	3-1/4
STEEL STRENGTH IN TENSION[4]						
Minimum specified yield strength	f_y	ksi (N/mm^2)	60 (414)	60 (414)	60 (414)	60 (414)
Minimum specified ultimate tensile strength (neck)	f_{uta} [10]	ksi (N/mm^2)	90 (621)	90 (621)	90 (621)	90 (621)
Effective tensile stress area (neck)	A_{se}	in^2 (mm^2)	0.0249 (16.1)	0.053 (34.2)	0.102 (65.8)	0.163 (105.2)
Steel strength in tension	N_{sa} [10]	lb (kN)	2,240 (10)	4,770 (22)	9,160 (41)	14,635 (65)
Reduction factor for steel strength[3]	ϕ	-	0.75			
CONCRETE BREAKOUT STRENGTH IN TENSION[8]						
Effective embedment	h_{ef}	in. (mm)	1-1/2 (38)	1-1/2 (38)	2 (51)	2-3/4 (70)
Effectiveness factor for uncracked concrete	k_{uncr}	-	24	24	30	24
Effectiveness factor for cracked concrete	k_{cr}	-	N/A	21	21	21
Modification factor for cracked and uncracked concrete[5]	$\psi_{c,N}$ [10]	-	N/A	1	1	1
Critical edge distance (uncracked concrete only)	c_{ac}	in. (mm)	5 (127)	5 (127)	7-1/2 (191)	9-1/2 (241)
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)	1,735 (7.8)	See Note[7]	See Note[7]	See Note[7]
Characteristic pullout strength, cracked concrete (2,500 psi)[6]	$N_{p,cr}$	lb (kN)	N/A	1,645 (7.4)	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} [10]	lb (kN)	N/A	1,645 (7.4)	See Note[7]	See Note[7]
Reduction factor for pullout strength[3]	ϕ	-	0.65 (Condition B)			

For SI: 1 inch = 25.4 mm;
1 ksi = 6.894 N/mm^2; 1 lb = 0.0044 kN.

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+ SD4 and Power-Stud+ SD6 are considered ductile steel elements 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 $\psi_{c,N}$ = 1.0. For concrete compressive strength greater than 2,500 psi, N_{p2} = (pullout strength value from table)*(specified concrete strength/2500)$^{0.5}$
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_p, 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. For 2003 IBC, ϕ_{uta} replaces ϕ_{ut}; N_{sa} replaces N_s; $\psi_{c,N}$ replaces ψ_3; and N_{eq} replaces $N_{p,seis}$.

Power-Stud+™ SD4 & SD6

STRENGTH DESIGN INFORMATION

Shear Design Information for Power-Stud+ SD4 and Power-Stud+ SD6 Anchors 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
Anchor category	1, 2 or 3	-	1	1	1	1
Nominal embedment depth	h_{nom}	in.	1-3/4	1-7/8	2-1/2	3-1/4
STEEL STRENGTH IN SHEAR[4]						
Minimum specified yield strength (threads)	f_y	ksi (N/mm²)	60 (414)	60 (414)	60 (414)	60 (414)
Minimum specified ultimate strength (threads)	f_{uta} [8]	ksi (N/mm²)	90 (621)	90 (621)	90 (621)	90 (621)
Effective tensile stress area (threads)	A_{se}	in² (mm²)	0.0318 (20.5)	0.078 (50.3)	0.142 (91.6)	0.226 (145.8)
Steel strength in shear[5]	V_{sa} [8]	lb (kN)	1,115 (5.0)	1,470 (6.6)	3,170 (14.3)	7,455 (33.6)
Reduction factor for steel strength[3]	ϕ	-	0.65			
CONCRETE BREAKOUT STRENGTH IN SHEAR[6]						
Load bearing length of anchor (hef or 8do, whichever is less)	ℓ_e [8]	in. (mm)	1.50 (38.1)	1.50 (38.1)	2.00 (50.8)	2.75 (69.9)
Nominal anchor diameter	d_a	in. (mm)	0.250 (6.4)	0.375 (9.5)	0.500 (12.7)	0.625 (15.9)
Reduction factor for concrete breakout[3]	ϕ	-	0.70 (Condition B)			
CONCRETE PRYOUT STRENGTH IN SHEAR[6]						
Coefficient for pryout strength (1.0 for hef < 2.5 in., 2.0 for hef ≥ 2.5 in.)	k_{cp}	-	1	1	1	2
Effective embedment	h_{ef}	in. (mm)	1.50 (38.1)	1.50 (38.1)	2.00 (50.8)	2.75 (69.9)
Reduction factor for pryout strength[3]	ϕ	-	0.70 (Condition B)			
STEEL STRENGTH IN SHEAR FOR SEISMIC APPLICATIONS						
Steel strength in shear, seismic[7]	$V_{sa,seis}$	lb (kN)	N/A	1,305 (5.9)	2,765 (12.4)	5,240 (23.6)
Reduction factor for steel strength in shear for seismic[3]	ϕ	-	0.65			

For SI: 1 inch = 25.4 mm; 1 ksi = 6.894 N/mm²; 1 lb = 0.0044 kN.

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+ SD4 & Power-Stud+ SD6 are considered ductile steel elements 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_{sp} 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. For the 2003 IBC f_{uta} replaces f_{ut}; V_{sa} replaces V_s; ℓ_e replaces ℓ.

STRENGTH DESIGN PERFORMANCE DATA

Factored design strength ϕN_n and ϕV_n
Calculated in accordance with ACI 318 Appendix D
Compliant with the International Building Code

Tension and Shear Design Strengths for Power-Stud+ SD4 and Power-Stud+ SD6 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	
		ϕN_n Tension (lbs.)	ϕV_n Shear (lbs.)	ϕN_n Tension (lbs.)	ϕV_n Shear (lbs.)	ϕN_n Tension (lbs.)	ϕV_n Shear (lbs.)	ϕN_n Tension (lbs.)	ϕV_n Shear (lbs.)	ϕN_n Tension (lbs.)	ϕV_n Shear (lbs.)
1/4	1-3/4	-	-	-	-	-	-	-	-	-	-
3/8	1-7/8	1,070	955	1,170	955	1,355	955	1,655	955	1,915	955
1/2	2-1/2	1,930	2,060	2,115	2,060	2,440	2,060	2,990	2,060	3,455	2,060
5/8	3-1/4	3,110	4,520	3,410	4,845	3,935	4,845	4,820	4,485	5,570	4,845

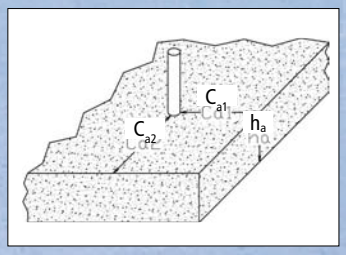
Tension and Shear Design Strengths for Power-Stud+ SD4 and Power-Stud+ SD6 in Uncracked Concrete[1-6]

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	
		ϕN_n Tension (lbs.)	ϕV_n Shear (lbs.)	ϕN_n Tension (lbs.)	ϕV_n Shear (lbs.)	ϕN_n Tension (lbs.)	ϕV_n Shear (lbs.)	ϕN_n Tension (lbs.)	ϕV_n Shear (lbs.)	ϕN_n Tension (lbs.)	ϕV_n Shear (lbs.)
1/4	1-3/4	1,125	725	1,235	725	1,425	725	1,680	725	1,680	725
3/8	1-7/8	1,435	955	2,570	955	1,815	955	2,220	955	2,565	955
1/2	2-1/2	2,760	2,060	3,020	2,060	3,490	2,060	4,270	2,060	4,935	2,060
5/8	3-1/4	3,555	4,845	3,895	4,845	4,500	4,845	5,510	4,845	6,365	4,845

Legend

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

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 318-08 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 (ϕ) 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.



Power-Stud+™ SD4 & SD6

ORDERING INFORMATION

Power-Stud+ SD4

Type 304 Stainless Steel Body & Type 316 Expansion Clip

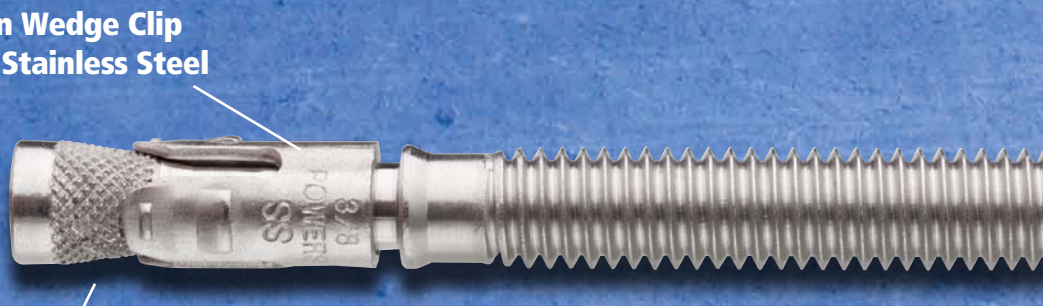
Cat. No.	Anchor Size	Thread Length	Box Qty.	Carton Qty.
7300SD4	1/4" x 1-3/4"	3/4"	100	600
7302SD4	1/4" x 2-1/4"	1-1/4"	100	600
7304SD4	1/4" x 3-1/4"	2-1/4"	100	600
7310SD4	3/8" x 2-1/4"	7/8"	50	300
7312SD4	3/8" x 2-3/4"	1-3/8"	50	300
7313SD4	3/8" x 3"	1-5/8"	50	300
7314SD4	3/8" x 3-1/2"	2-1/8"	50	300
7315SD4	3/8" x 3-3/4"	2-3/8"	50	300
7316SD4	3/8" x 5"	3-5/8"	50	300
7317SD4	3/8" x 7"	5-5/8"	50	300
7320SD4	1/2" x 2-3/4"	1"	50	300
7322SD4	1/2" x 3-3/4"	2"	50	300
7323SD4	1/2" x 4-1/2"	2-3/4"	50	300
7324SD4	1/2" x 5-1/2"	3-3/4"	50	300
7326SD4	1/2" x 7"	5-1/4"	25	100
7330SD4	5/8" x 3-1/2"	1-1/2"	25	100
7332SD4	5/8" x 4-1/2"	2-1/2"	25	100
7333SD4	5/8" x 5"	3"	25	100
7334SD4	5/8" x 6"	4"	25	75
7336SD4	5/8" x 7"	5"	25	75
7338SD4	5/8" x 8-1/2"	6-1/2"	25	50

Power-Stud+ SD3

Type 303 Stainless Steel Body & Type 316 Expansion Clip

Cat. No.	Anchor Size	Thread Length	Box Qty.	Carton Qty.
7310SD3	3/8" x 2-1/4"	7/8"	50	300
7312SD3	3/8" x 2-3/4"	1-3/8"	50	300
7313SD3	3/8" x 3"	1-5/8"	50	300
7314SD3	3/8" x 3-1/2"	2-1/8"	50	300
7315SD3	3/8" x 3-3/4"	2-3/8"	50	300
7316SD3	3/8" x 5"	3-5/8"	50	300
7317SD3	3/8" x 7"	5-5/8"	50	300
7320SD3	1/2" x 2-3/4"	1"	50	300
7322SD3	1/2" x 3-3/4"	2"	50	300
7323SD3	1/2"x 4-1/2"	2-3/4"	50	300
7324SD3	1/2" x 5-1/2"	3-3/4"	50	300
7326SD3	1/2" x 7"	5-1/4"	25	100
7330SD3	5/8" x 3-1/2"	1-1/2"	25	100
7332SD3	5/8" x 4-1/2"	2-1/2"	25	100
7333SD3	5/8" x 5"	3"	25	100
7334SD3	5/8" x 6"	4"	25	75
7336SD3	5/8" x 7"	5"	25	75
7338SD3	5/8" x 8-1/2"	6-1/2"	25	50

Power-Stud+ SD3 anchors are available on request and can be domestically manufactured (USA). Shaded catalog numbers denote sizes which are less than the minimum standard anchor length for strength design. The published size includes the diameter and the overall length of the anchor. All anchors are packaged with nuts and washers.



Power-Stud+™ SD4 & SD6

ORDERING INFORMATION

Power-Stud+ SD6

Type 316 Stainless Steel Body & Type 316 Expansion Clip

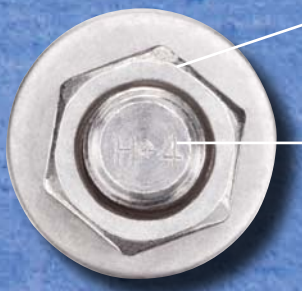
Cat. No.	Anchor Size	Thread Length	Box Qty.	Carton Qty.
7600SD6	1/4" x 1-3/4"	3/4"	100	600
7602SD6	1/4" x 2-1/4"	1-1/4"	100	600
7604SD6	1/4" x 3-1/4"	2-1/4"	100	600
7610SD6	3/8" x 2-1/4"	7/8"	50	300
7612SD6	3/8" x 2-3/4"	1-3/8"	50	300
7613SD6	3/8" x 3"	1-5/8"	50	300
7614SD6	3/8" x 3-1/2"	2-1/8"	50	300
7615SD6	3/8" x 3-3/4"	2-3/8"	50	300
7616SD6	3/8" x 5"	3-5/8"	50	300
7617SD6	3/8" x 7"	5-5/8"	50	300
7620SD6	1/2" x 2-3/4"	1"	50	300
7622SD6	1/2" x 3-3/4"	2"	50	300
7623SD6	1/2" x 4-1/2"	2-3/4"	50	300
7624SD6	1/2" x 5-1/2"	3-3/4"	50	300
7626SD6	1/2" x 7"	5-1/4"	25	100
7630SD6	5/8" x 3-1/2"	1-1/2"	25	100
7632SD6	5/8" x 4-1/2"	2-1/2"	25	100
7633SD6	5/8" x 5"	3"	25	100
7634SD6	5/8" x 6"	4"	25	75
7636SD6	5/8" x 7"	5"	25	75
7638SD6	5/8" x 8-1/2"	6-1/2"	25	50

Installation Accessories

Cat. No.	Description	Box Qty
08466	Adjustable torque wrench with 1/2" square drive (25 to 250 ft.-lbs.)	1
08280	Hand pump / dust blower	1

Washer
300 Series Stainless Steel
for SD3 & SD4

Type 316 for SD6



Hex Nut
Type 316 Stainless Steel

Length ID code and identifying marking stamped on head

UNC Threaded Stud
Nominal Drill Size Matches Anchor Diameter

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	Ryan Raica	678-966-0000	678-966-9242
Boston	2 Powers Lane, Brewster, NY 10509	Jack Armour	800-524-3244	914-576-6483
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Chicago	2472 Wisconsin Avenue, Downers Grove, IL 60515	Dan Gilligan	630-960-3156	630-960-3912
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Florida	2412 Lynx Lane, Orlando, FL 32804	John Christy	813-626-4500	813-626-4545
Houston	13833 North Promenade, Suite 100, Stafford, TX 77477	Vaughn Eshelman	281-491-0351	281-491-0367
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Seattle	18808 142nd Ave NE, Suite 4A, Woodinville, WA 98072	Darin Arnold	206-762-5812	206-762-5817

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