

Set-Bolt™ Displacement-Controlled Expansion Anchor

PRODUCT DESCRIPTION

The Set-Bolt is a one piece, stud style anchor with an external bottom-bearing expansion plug. It is available in carbon steel for use in concrete, stone and solid masonry units.

The design of the Set-Bolt provides an anchor which is ideal for applications in which it is desirable to minimize the clamping force on a fixture. The nut may be placed on finger tight if required to prevent damage to light duty fixtures such as aluminum extrusions or stone facades. Jacking or leveling equipment can easily be accomplished with the Set-Bolt.

GENERAL APPLICATIONS AND USES

- Structural Anchorage
- Mechanical Equipment
- Column Base Plates
- Fire Sprinkler
- Cable Trays and Strut
- Suspended Lighting

FEATURES AND BENEFITS

- Fast installation with force-controlled setting mechanism
- No torque wrench required

APPROVALS AND LISTINGS

Factory Mutual Research Corporation (FM Approvals) – J.I OK4A9.AH
 Federal GSA Specification – Meets the proof load requirements of FF-S-325C, Group VIII, Type 2, (superseded) and CID A-A-55614, Type 2.
 Various North American Departments of Transportation (DOT) – See www.powers.com, including CalTrans listing for “Stud Mechanical Expansion Anchors”

GUIDE SPECIFICATIONS

CSI Divisions: 03151-Concrete Anchoring and 05090-Metal Fastenings.
 Expansion Anchors shall be Set-Bolt as supplied by Powers Fasteners, Inc., Brewster, NY.

SECTION CONTENTS Page No.

General Information..... 64
Installation and Material Specifications..... 64
Performance Data..... 65
Design Criteria..... 65
Ordering Information..... 66



Set-Bolt

ANCHOR MATERIALS

Carbon Steel

ANCHOR SIZE RANGE (TYP.)

1/4" diameter x 1-3/4" length to
 1/2" diameter x 5-1/4" length

SUITABLE BASE MATERIALS

Normal-Weight Concrete

INSTALLATION AND MATERIAL SPECIFICATIONS

Installation Specification

Dimension	Anchor Size, <i>d</i>		
	1/4"	3/8"	1/2"
ANSI Drill Bit Size, <i>d_{bit}</i> (in.)	1/4	3/8	1/2
Max. Tightening Torque, <i>T_{max}</i> (ft.-lbs)	5-7	15-20	22-30
Fixture Clearance Hole, <i>d_h</i> (in.)	5/16	7/16	9/16
Thread Size (UNC)	1/4-20	3/8-16	1/2-13

Material Specification

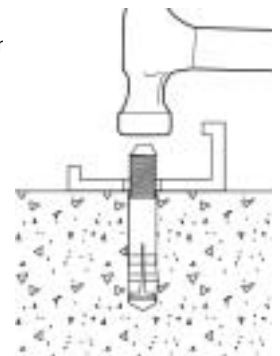
Anchor Component	Component Material
Anchor Body	AISI 12L14
Cone	AISI 12L14
Zinc Plating	ASTM B633, SC1, Type III (Fe/Zn 5)

Installation Guidelines

Drill a hole into the base material to a depth that equals the embedment required. The tolerances of the drill bit used should meet the requirements of ANSI Standard B212.15. Do not over drill the hole. Blow the hole clean of dust and other material.



Insert the anchor through the fixture into the hole. Set the anchor by driving the anchor body over the plug. Be sure the anchor is driven to the required embedment depth. A nut and washer (supplied separately) is applied to secure the fixture.



PERFORMANCE DATA

Ultimate Load Capacities for Set-Bolt Installed in Normal-Weight Concrete^{1,2}

Anchor Diameter <i>d</i> in. (mm)	Minimum Embedment Depth <i>h_v</i> in. (mm)	Minimum Concrete Compressive Strength (<i>f'_c</i>)					
		2,000 psi (13.8 MPa)		4,000 psi (27.6 MPa)		6,000 psi (41.4 MPa)	
		Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)
1/4 (6.4)	1 3/8 (34.9)	1,150 (5.2)	1,780 (8.0)	1,935 (8.7)	2,070 (9.3)	2,320 (10.4)	2,070 (9.3)
3/8 (9.5)	1 5/8 (41.3)	2,605 (11.7)	3,705 (16.7)	3,600 (16.2)	4,185 (18.8)	3,850 (17.3)	4,185 (18.8)
1/2 (12.7)	1 7/8 (47.6)	3,595 (16.2)	5,140 (23.1)	5,000 (22.5)	6,000 (27.0)	5,265 (23.7)	6,000 (27.0)

1. The values listed above are ultimate load capacities which should be reduced by a minimum safety factor of 4.0 or greater to determine the allowable working load.
2. Linear interpolation may be used to determine ultimate loads for intermediate compressive strengths.

Allowable Load Capacities for Set-Bolt Installed in Normal-Weight Concrete^{1,2}

Anchor Diameter <i>d</i> in. (mm)	Minimum Embedment Depth <i>h_v</i> in. (mm)	Minimum Concrete Compressive Strength (<i>f'_c</i>)					
		2,000 psi (13.8 MPa)		4,000 psi (27.6 MPa)		6,000 psi (41.4 MPa)	
		Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)
1/4 (6.4)	1 3/8 (34.9)	290 (1.3)	445 (2.0)	485 (2.2)	520 (2.3)	580 (2.6)	520 (2.3)
3/8 (9.5)	1 5/8 (41.3)	650 (2.9)	925 (4.2)	900 (4.0)	1,045 (4.7)	965 (4.3)	1,045 (4.7)
1/2 (12.7)	1 7/8 (47.6)	900 (4.0)	1,285 (5.8)	1,250 (5.6)	1,500 (6.8)	1,315 (5.9)	1,500 (6.8)

1. Allowable load capacities listed are calculated using an applied safety factor of 4.0.
2. Linear interpolation may be used to determine allowable loads for intermediate compressive strengths.

DESIGN CRITERIA

Combined Loading

For anchors loaded in both shear and tension, the combination of loads should be proportioned as follows:

$$\left(\frac{N_u}{N_n}\right) + \left(\frac{V_u}{V_n}\right) \leq 1$$

- Where: *N_u* = Applied Service Tension Load
N_n = Allowable Tension Load
V_u = Applied Service Shear Load
V_n = Allowable Shear Load

Load Adjustment Factors for Spacing and Edge Distances

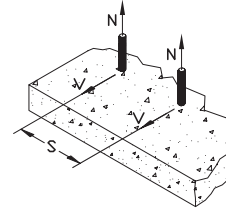
Anchor Installed in Normal-Weight Concrete					
Anchor Dimension	Load Type	Critical Distance (Full Anchor Capacity)	Critical Load Factor	Minimum Distance (Reduced Capacity)	Minimum Load Factor
Spacing (<i>s</i>)	Tension and Shear	<i>s_{cr}</i> = 10 <i>d</i>	<i>F_N</i> = <i>F_V</i> = 1.0	<i>s_{min}</i> = 5 <i>d</i>	<i>F_N</i> = <i>F_V</i> = 0.50
Edge Distance (<i>c</i>)	Tension	<i>c_{cr}</i> = 12 <i>d</i>	<i>F_N</i> = 1.0	<i>c_{min}</i> = 5 <i>d</i>	<i>F_N</i> = 0.80
	Shear	<i>c_{cr}</i> = 12 <i>d</i>	<i>F_V</i> = 1.0	<i>c_{min}</i> = 5 <i>d</i>	<i>F_V</i> = 0.50

DESIGN CRITERIA

Load Adjustment Factors for Normal-Weight and Lightweight Concrete

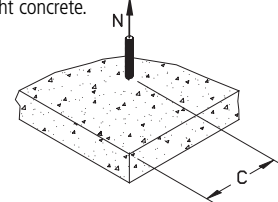
Spacing, Tension (F_N) & Shear (F_V)				
Dia. (in.)	1/4	3/8	1/2	
S_{cr} (in.)	2 1/2	3 3/4	5	
S_{min} (in.)	1 1/4	1 7/8	2 1/2	
Spacing, s (inches)	1 1/4	0.50		
	1 1/2	0.60		
	1 7/8	0.75	0.50	
	2	0.80	0.53	
	2 1/2	1.00	0.67	0.50
	3		0.80	0.60
	3 1/2		0.93	0.70
	3 3/4		1.00	0.75
	4			0.80
	5			1.00

Notes: For anchors loaded in tension and shear, the critical spacing (S_{cr}) is equal to 10 anchor diameters ($10d$) at which the anchor achieves 100% of load. Minimum spacing (S_{min}) is equal to 5 anchor diameters ($5d$) at which the anchor achieves 50% of load.



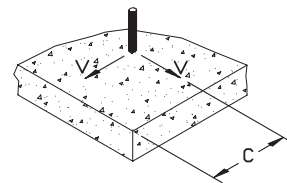
Edge Distance, Tension (F_N)				
Dia. (in.)	1/4	3/8	1/2	
C_{cr} (in.)	3	4 1/2	6	
C_{min} (in.)	1 1/4	1 7/8	2 1/2	
Edge Distance, c (inches)	1 1/4	0.80		
	1 7/8	0.87	0.80	
	2	0.89	0.81	
	2 1/2	0.94	0.85	0.80
	3	1.00	0.89	0.83
	3 3/4		0.94	0.87
	4		0.96	0.89
	4 1/2		1.00	0.91
	5			0.94
	6			1.00

Notes: For anchors loaded in tension, the critical edge distance (C_{cr}) is equal to 12 anchor diameters ($12d$) at which the anchor achieves 100% of load. Minimum edge distance (C_{min}) is equal to 5 anchor diameters ($5d$) at which the anchor achieves 80% of load for normal-weight concrete and 80% of load for lightweight concrete.



Edge Distance, Shear (F_V)				
Dia. (in.)	1/4	3/8	1/2	
C_{cr} (in.)	3	4 1/2	6	
C_{min} (in.)	1 1/4	1 7/8	2 1/2	
Edge Distance, c (inches)	1 1/4	0.50		
	1 7/8	0.68	0.50	
	2	0.71	0.52	
	2 1/2	0.86	0.62	0.50
	3	1.00	0.71	0.57
	3 3/4		0.86	0.68
	4		0.90	0.71
	4 1/2		1.00	0.79
	5			0.86
	6			1.00

Notes: For anchors loaded in shear, the critical edge distance (C_{cr}) is equal to 12 anchor diameters ($12d$) at which the anchor achieves 100% of load. Minimum edge distance (C_{min}) is equal to 5 anchor diameters ($5d$) at which the anchor achieves 50% of load.



ORDERING INFORMATION

Set-Bolt

Cat. No.	Size	Min. Embed.	Thread Length	Std. Box	Std. Carton	Wt./100
7101	1/4" x 1 3/4"	1 3/8"	5/8"	100	1,000	2 1/4
7103	1/4" x 2 1/4"	1 3/8"	7/8"	100	500	2 3/4
7107	1/4" x 3 1/4"	1 3/8"	1"	100	500	4 1/4
7123	3/8" x 2 1/4"	1 5/8"	5/8"	50	250	6 1/2
7126	3/8" x 3"	1 5/8"	1 3/8"	50	250	8 1/2
7129	3/8" x 3 3/4"	1 5/8"	1 3/8"	50	250	11
7134*	3/8" x 6"	1 5/8"	2 1/2"	50	50	16 1/2
7145	1/2" x 2 3/4"	1 7/8"	7/8"	50	250	14
7151	1/2" x 4 1/4"	1 7/8"	1 7/8"	25	125	24
7153	1/2" x 5 1/4"	1 7/8"	2"	25	25	28

*Discontinued item once current stock is depleted.

