

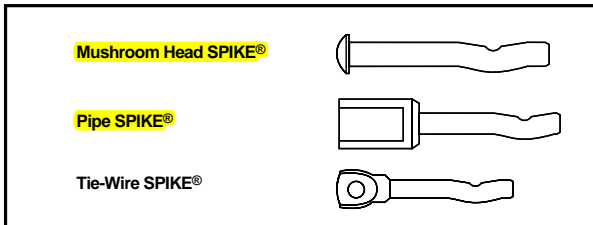
## 13.0 SPIKE®

### 13.1 Introduction

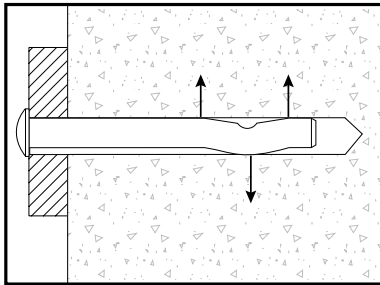
The Powers SPIKE is a patented, one-piece, vibration resistant anchor for use in concrete, block, brick, or stone. Several head styles and anchor materials are available.

### 13.2 Product Description

Using a special manufacturing process, the SPIKE anchor is formed with an "s" shaped configuration at the working end of the anchor to create an expansion mechanism. The pre-expanded mechanism is activated as the anchor is driven into the drilled hole and creates a spring type compression force against the walls of the hole. To develop the spring action of the expansion mechanism, manufacturing processes such as heat treatment, cold working, die-casting, or injection molding are used depending upon the SPIKE style.



The basic working principle is the same for all versions. As the anchor is driven into the hole, the expansion mechanism is compressed and flexes to accommodate the size of the hole. Once seated at the required embedment, residual spring force developed in the expansion mechanism provides three compression forces at three different levels, at the bottom of the anchor hole. The first level is near the bottom of the anchor hole, with the second and third levels of compression force spaced equidistant above it. When a vibratory load is applied to some anchors, the area of the base material around the expansion mechanism may experience localized pulverization at the point of contact. The Powers SPIKE has been designed to overcome this problem. When subjected to vibratory loads, the SPIKE will expand due to the residual spring action of the expansion mechanism if localized pulverization occurs.



Use of the SPIKE anchor reduces installation time. Since the anchor is pre-expanded, there is no secondary tightening operation required which greatly reduces the overall cost of an anchor installation. The simple installation procedure helps to insure a quality application each time the SPIKE anchor is used.

## 13.2.1 Material Specifications

### Mushroom Head, Carbon Steel SPIKE® Pipe and Tie-Wire SPIKE®

Anchor Component	Component Material
Anchor Body	Grade 8.2 Carbon Steel
Zinc Plating	ASTM B 633, SCl, Type III (Fe / Zn)

### Threaded Carbon Steel SPIKE®

Anchor Component	Component Material
Anchor Body	Grade 8.2 Carbon Steel
Nut	Carbon Steel, ASTM A563, Grade A
Washer	Carbon Steel
Zinc Plating	ASTM B 633, SCl, Type III (Fe / Zn)

### Mushroom Head Stainless Steel SPIKE®

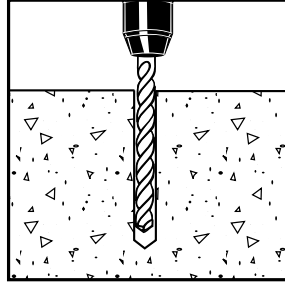
Anchor Component	Component Material
Anchor Body	Type 316 Stainless Steel

### Threaded Stainless Steel SPIKE®

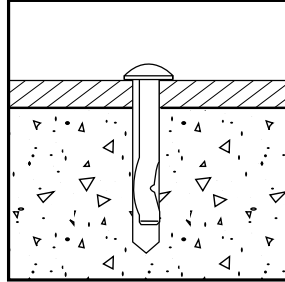
Anchor Component	Component Material
Anchor Body	Type 316 Stainless Steel
Nut	Type 316 Stainless Steel
Washer	Type 316 Stainless Steel

### 13.3 Installation Procedures

Drill a hole into the base material to a depth of at least 13mm deeper than the embedment required. The tolerances of the drill bit used should meet the requirements of ISO/DIN Standard 8035. Blow the hole clean of dust and other material.



Where a fixture is used, drive the anchor through the fixture into the anchor hole until the head is firmly seated against the fixture. Be sure the anchor is driven to the required embedment depth. The Tie-Wire and Pipe SPIKE versions should be driven in until the head is seated against the surface of the base material.



### 13.4 Anchor Sizes and Styles

The following tables list the many sizes and styles of SPIKE anchors. To select the proper length, determine the embedment depth required to obtain the desired load capacity. Then add the thickness of the fixture, including any spacers or shims, to the embedment depth. This will be the minimum anchor length required. On the Tie-Wire and Pipe Spike versions, no fixture is used. These anchors should be driven in until the head is seated against the surface of the base material.

### Mushroom Head Carbon Steel SPIKE®

Cat. No.	Part No.	Anchor Size (mm)	Drill Dia.	Min. Embed.	Std. Box	Std. Ctn.	Wt./100 (kg)
1013	MH53MM	5 x 25	5mm	22mm	100	1000	0.6
1016	MH510MM	5 x 32	5mm	22mm	100	1000	0.7
1017	MH56MM	5 x 38	5mm	32mm	100	1000	0.8
1018	MH519MM	5 x 50	5mm	32mm	100	1000	0.9
1019	MH653MM	6.5 x 25	6.5mm	22mm	100	1000	0.7
1197	MH657MM	6.5 x 32	6.5mm	25mm	100	1000	1
1021	MH656MM	6.5 x 38	6.5mm	32mm	100	1000	1.1
1023	MH6519MM	6.5 x 50	6.5mm	32mm	100	1000	1.4
1006	MH6532MM	6.5 x 64	6.5mm	32mm	100	1000	1.8
1024	MH6544MM	6.5 x 75	6.5mm	32mm	100	1000	2
1145	MH6556MM	6.5 x 89	6.5mm	32mm	100	1000	2.3
1026	MH6568MM	6.5 x 100	6.5mm	32mm	100	500	2.7
1236	SMH1050MM	10 x 50	10mm	40mm	25	250	3.6
1237	SMH1075MM	10 x 75	10mm	40mm	25	250	4.5
1238	SMH1095MM	10 x 100	10mm	40mm	25	250	5
1239	SMH1260MM	12 x 60	13mm	50mm	50	200	7
1240	SMH1275MM	12 x 75	13mm	50mm	50	200	9.5
1241	SMH12100MM	12 x 100	13mm	50mm	25	150	12

The published length is measured from below the head to the end of the anchor.

### Mushroom Head Type 316 Stainless Steel SPIKE®

Cat. No.	Part No.	Anchor Size (mm)	Drill Dia.	Min. Embed.	Std. Box	Std. Ctn.	Wt./100 (kg)
1027	MH53MMSS	5 x 25	5mm	22mm	100	1000	0.6
1038	MH510MMSS	5 x 32	5mm	22mm	100	1000	0.7
1028	MH56MMSS	5 x 38	5mm	32mm	100	1000	0.8
1144	MH519MMSS	5 x 50	5mm	32mm	100	1000	0.9
1171	MH653MMSS	6.5 x 25	6.5mm	22mm	100	1000	0.7
1175	MH657MMSS	6.5 x 32	6.5mm	26mm	100	1000	1
1029	MH656MMSS	6.5 x 38	6.5mm	32mm	100	1000	1.1
1037	MH6519MMSS	6.5 x 50	6.5mm	32mm	100	1000	1.4
1176	MH6532MMSS	6.5 x 64	6.5mm	32mm	100	1000	1.8

The published length is measured from below the head to the end of the anchor.

## Special Application SPIKE® Anchors

### Rod Hanging

#### Pipe SPIKE®

Cat. No.	Part No.	Thread Size	Shank Dia.	Min. Embed.	Std. Box	Std. Ctn.	Wt./100 (kg)
1036	PS514	1/4"	5mm	32mm	100	1000	1.8
1293	PS656MM	6mm	5mm	32mm	100	1000	1.8
1215	PS658MM	8mm	6.5mm	44mm	50	500	1.8
1139	PS6538	3/8"	6.5mm	44mm	50	500	2.7
1074	PS6510MM	10mm	6.5mm	44mm	50	500	2.7

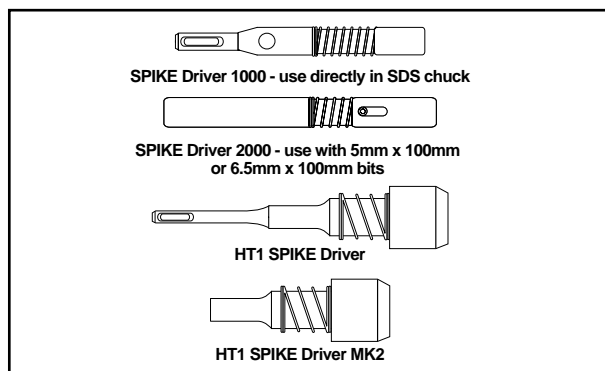
### Suspended Ceilings

#### Tie-Wire SPIKE®

Cat. No.	Part No.	Drill Size	Min. Dia.	Tie-Wire Embed.	Eyelet Hole Size	Std. Box	Std. Ctn.	Wt./100 (kg)
1290	TW3700	5mm	5mm	32mm	5.5mm	100	500	0.9
1033	TW3759	6.5mm	6.5mm	32mm	7mm	100	500	1.1

#### SPIKE® Installation Tools

While the SPIKE anchor can easily be installed using a hammer, a specially designed series of drivers and manual tools provide a fast, easy to use method for installing SPIKE anchors into concrete and masonry materials. The tools allow the SPIKE anchor to be installed in confined areas and prevent damage to the fixture from stray hammer blows. Some drivers have a nylon tip to further protect the fixture.



Cat. No.	Description	Guide I.D.	Std. Box	Wt./ Each
3790	SPIKE Driver 1000	13mm	1	0.1
3791	SPIKE Driver 2000	13mm	1	0.1
N/A	HT1 SPIKE Driver	25mm	1	0.2
N/A	HT1 SPIKE Driver MK2	25mm	1	0.3

## 13.5 Performance Data

The Following load capacities are based on testing conducted according to ASTM Standard E 488.

#### Load Capacities for Carbon Steel SPIKE®

Anchor Size (mm)	Drill Dia. (mm)	Embed. Depth (mm)	20 MPa Concrete		28 MPa Concrete		35 MPa Concrete	
			Tension (kN)	Shear (kN)	Tension (kN)	Shear (kN)	Tension (kN)	Shear (kN)
5	5	22	3.4	5.6	3.8	5.8	4.0	6.0
5	5	25	3.6	7.7	4.4	8.3	4.4	8.3
5	5	32	4.3	10.0	5.2	10.8	6.4	11.6
6.5	6.5	22	3.6	9.1	4.2	9.9	4.5	10.5
6.5	6.5	25	4.3	10.3	5.0	10.9	5.3	11.7
6.5	6.5	32	4.9	11.1	6.9	12.2	7.6	14.2
10 (3/8)	10	45	11.1	28.0	12.9	31.1	15.6	32.0
12 (1/2)	13	65	15.1	40.0	21.3	48.9	24.0	53.4

#### Load Capacities in Block - Carbon Steel SPIKE®

Anchor Size (mm)	Drill Dia. (mm)	Embed. Depth (mm)	C-90 Hollow Block	
			Tension (kN)	Shear (kN)
5	5	22	1.2	2.4
5	5	25	1.8	2.6
5	5	32	3.3	9.3
6.5	6.5	22	2.0	7.3
6.5	6.5	25	3.0	8.2
6.5	6.5	32	3.6	9.3

#### Load Capacities for Stainless Steel SPIKE®

Anchor Size (mm)	Drill Dia. (mm)	Embed. Depth (mm)	20 MPa Concrete		28 MPa Concrete		35 MPa Concrete	
			Tension (kN)	Shear (kN)	Tension (kN)	Shear (kN)	Tension (kN)	Shear (kN)
5	5	22	3.2	5.1	3.8	5.5	3.9	5.7
5	5	25	3.6	7.3	4.3	7.9	4.7	8.1
5	5	32	4.3	9.5	5.2	10.4	6.3	10.9
6.5	6.5	22	3.5	8.8	3.9	9.5	4.4	10.1
6.5	6.5	25	4.3	10.2	4.6	10.4	5.0	11.2
6.5	6.5	32	4.8	10.8	6.5	11.6	7.4	12.6
10 (3/8)	10	45	9.0	25.2	10.9	28.1	11.6	29.3
12 (1/2)	13	65	21.9	34.8	24.6	35.5	25.3	36.9

#### Load Capacities in Block - Stainless Steel SPIKE®

Anchor Size (mm)	Drill Dia. (mm)	Embed. Depth (mm)	C-90 Hollow Block	
			Tension (kN)	Shear (kN)
5	5	22	1.2	2.4
5	5	25	1.4	2.6
5	5	32	3.2	8.8
6.5	6.5	22	1.9	6.0
6.5	6.5	25	2.9	7.2
6.5	6.5	32	3.4	8.4

**NOTE:** The load capacities listed above for the Carbon and Stainless Steel SPIKE are ultimate or failure loads which should be reduced by a minimum safety factor of four to determine the allowable working loads.

#### Load Capacities for Pipe SPIKE®

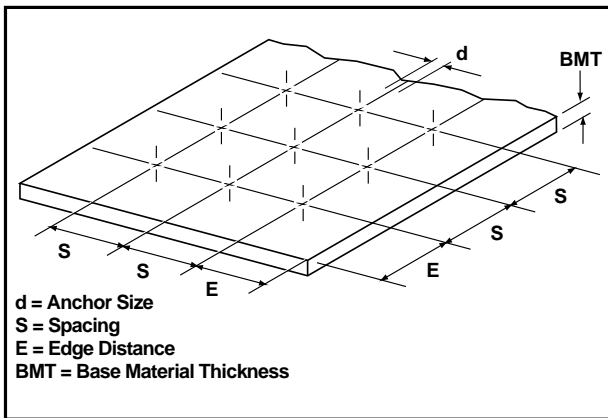
Anchor Size (mm)	Drill Dia. (mm)	Embed. Depth (mm)	20 MPa Concrete		28 MPa Concrete		35 MPa Concrete	
			Tension (kN)	Shear (kN)	Tension (kN)	Shear (kN)	Tension (kN)	Shear (kN)
1/4"	5	32	5.4	4.2	6.3	4.2	7.0	4.2
6mm	5	32	5.4	4.2	6.3	4.2	7.0	4.2
8mm	6.5	44	8.2	9.7	9.7	9.7	11.2	9.7
3/8"	6.5	44	8.2	9.7	9.7	9.7	11.2	9.7
10mm	6.5	44	8.2	9.7	9.7	9.7	11.2	9.7
8mm	7	44	6.9	9.7	8.5	9.7	10.1	9.7
3/8"	7	44	6.9	9.7	8.5	9.7	10.1	9.7
10mm	7	44	6.9	9.7	8.5	9.7	10.1	9.7

**NOTE:** The values listed above are ultimate load capacities which should be reduced by minimum safety factor of 4 or greater to determine the allowable working load. For installations in hard aggregate concrete, a special application 7mm SDS drill bit (Cat. No. 0390) is available for the 8mm, 3/8", and 10mm Pipe SPIKE. The tension load capacities listed for installations made with a 7mm drill bit should be used as a guide. Job site tests are required when using this bit.

### Load Capacities for Tie-Wire SPIKE®

Anchor Size (mm)	Drill Dia. (mm)	Embed. Depth (mm)	20 MPa Concrete		28 MPa Concrete		35 MPa Concrete	
			Tension (kN)	Shear (kN)	Tension (kN)	Shear (kN)	Tension (kN)	Shear (kN)
5	5	32	4.3	4.2	4.7	4.2	5.0	4.2
6.5	6.5	32	4.8	5.8	5.1	5.8	5.5	5.8

NOTE: The values listed above are ultimate load capacities which should be reduced by minimum safety factor of 4 or greater to determine the allowable working load. Refer to the section on Product Selection Guidelines for details.



## 13.6 Design Criteria

### Base Material Thickness

The minimum recommended thickness of base material, BMT, when using the SPIKE anchor is 125% of the embedment to be used. For example, when installing an anchor to a depth of 100mm, the base material thickness should be 125mm.

### Spacing Between Anchors

To obtain the maximum load in tension or shear, a spacing, S, of 10 anchor diameters (10d) should be used. The minimum recommended anchor spacing, S, is 5 anchor diameters (5d) at which point the load should be reduced by 50%. The following table lists the load reduction factor; Rs, for each anchor diameter, d, based on the center to center anchor spacing.

Anchor Size (mm)	Anchor Spacing, S (mm)					
	10d	9d	8d	7d	6d	5d
5	50	45	40	35	30	25
6.5	65	59	52	46	39	33
10	100	90	80	70	60	50
12	120	108	96	84	72	60
<b>Rs</b>	<b>1.00</b>	<b>0.90</b>	<b>0.80</b>	<b>0.70</b>	<b>0.60</b>	<b>0.50</b>

### Edge Distance -Tension

An edge distance, E, of 12 anchor diameters (12d) should be used to obtain the maximum tension load. The minimum recommended edge distance is 5 anchor diameters (5d) at which point the tension load should be reduced by 20%. The following table lists the load reduction factor, Re, for each anchor diameter, d, based on the anchor center to edge distance.

Anchor Size (mm)	Edge Distance, E (mm)							
	12d	11d	10d	9d	8d	7d	6d	5d
5	60	55	50	45	40	35	30	25
6.5	78	72	65	59	52	46	39	33
10	120	110	100	90	80	70	60	50
12	144	132	120	108	96	84	72	60
<b>Re</b>	<b>1.00</b>	<b>0.97</b>	<b>0.94</b>	<b>0.91</b>	<b>0.89</b>	<b>0.86</b>	<b>0.83</b>	<b>0.80</b>

### Edge Distance - Shear

For shear loads, an edge distance, E, of 12 anchor diameters (12d) should be used to obtain the maximum load. The minimum recommended edge distance, E, is 5 anchor diameters (5d) at which point the shear load should be reduced by 50%. The following table lists the load reduction factor, Re, for each anchor diameter, d, based on the anchor center to edge distance.

Anchor Size (mm)	Edge Distance, E (mm)							
	12d	11d	10d	9d	8d	7d	6d	5d
5	60	55	50	45	40	35	30	25
6.5	78	72	65	59	52	46	39	33
10	120	110	100	90	80	70	60	50
12	144	132	120	108	96	84	72	60
<b>Re</b>	<b>1.00</b>	<b>0.93</b>	<b>0.86</b>	<b>0.79</b>	<b>0.71</b>	<b>0.64</b>	<b>0.57</b>	<b>0.50</b>

## 13.7 Approvals and Listings

The following approvals and listings are for reference purposes. They should be reviewed by the design professional responsible for the product installation to verify approved sizes, base materials, and compliance with local codes.

ICBO Research Report No. 4514

Factory Mutual

Pipe SPIKE J.I. ON5A1.AH

BHP Fire Rating Report

REF: BHPR/SM/S/002

## 13.8 Suggested Specification

### Carbon Steel SPIKE

Expansion anchors shall be a one piece unit with a mushroom style head. The expansion mechanism shall be pre-expanded and shall develop three compression forces at three different levels in the bottom of the anchor hole. The anchors shall be formed from heat treated carbon steel equivalent to Grade 8.2 and shall be plated zinc. Anchors shall be as dimensioned and supplied by Powers Fasteners Australasia.

### Stainless Steel SPIKE

Expansion anchors shall be a one piece unit with a \_\_\_\_\_ style head. The expansion mechanism shall be pre-expanded and shall develop three compression forces at three different levels in the bottom of the anchor hole. The anchors shall be formed from Type 316 stainless steel. Anchors shall be as dimensioned and supplied by Powers Fasteners Australasia.