Lag Shield™ *Shell Expansion Anchor*

PRODUCT DESCRIPTION

The Lag Shield is a screw style anchor designed for use with lag bolts. It is suitable for use in concrete and the mortar joints of block or brick walls. In harder masonry materials, short style Lag Shields are used to reduce drilling time. The long style version is used in soft or weak masonry to better develop strength.

GENERAL APPLICATIONS AND USES

- Hard and Soft Base Materials
- Mortar Joints
- Shallow Attachments
- Masonry Anchorage

FEATURES AND BENEFITS

- Ideal for use in masonry materials
- Internally threaded anchor for easy removability and service work

APPROVALS AND LISTINGS

Federal GSA Specification – Meets the proof load requirements of FF-S-325C-Group 2, Type 1, Class 1 (Long) or Class 2C (Short) (superseded) and CID A-A 1923A, Type 1

GUIDE SPECIFICATIONS

CSI Divisions: *03151-Concrete Anchoring, 04081-Masonry Anchorage* and *05090-Metal Fastenings.* Shell Expansion Anchors shall be Lag Shield anchors as supplied by Powers Fasteners, Inc., Brewster, NY.

SECTION CONTENTS Page No.

General Information **133**
Installation and Material Specifications **133**
Performance Data **134**
Design Criteria **135**
Ordering Information **136**



Lag Shield

THREAD VERSION

UNC Thread

ANCHOR MATERIALS

Zamac Alloy

ROD/ANCHOR SIZE RANGE (TYP.)

1/4" to 3/4" diameter

SUITABLE BASE MATERIALS

Normal-Weight Concrete
Hollow Concrete Masonry
Brick Masonry

INSTALLATION AND MATERIAL SPECIFICATIONS

Installation Specifications

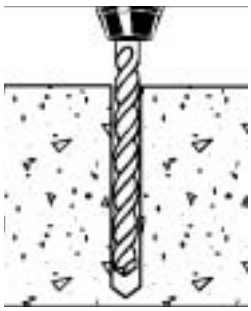
Dimension	Rod/Anchor Diameter, *d*					
	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"
ANSI Drill Bit Size, d_{bit} (in.)	1/2	1/2	5/8	3/4	7/8	1
Max. Tightening Torque, T_{max} (ft.-lbs.)	5	7	10	20	30	60
Thread Size (UNC)	1/4-10	5/16-9	3/8-7	1/2-6	5/8-5	3/4-4 1/2

Material Specifications

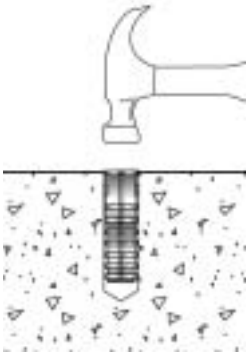
Anchor Component	Component Material
Anchor Body	Zamac Alloy

Installation Guidelines

Drill a hole into the base material to the depth of at least 1/2" or one anchor diameter deeper than the embedment required. The tolerances of the drill bit used should meet the requirements of ANSI Standard B212.15. Do not over dill the hole unless the application calls for a subset anchor.



Blow the hole clean of dust and other material. Insert the anchor into the hole until it is flush with the surface. If installing in a mortar joint, position the anchor to expand against the block or brick.



Position fixture, insert the lag bolt, and tighten. The lag bolt length selected should fully engage the entire anchor body.



PERFORMANCE DATA

Ultimate Load Capacities for Lag Shield in Normal-Weight Concrete[1,2]

Rod/Anchor Diameter d in. (mm)	Minimum Embedment Depth h_v in. (mm)	Minimum Concrete Compressive Strength (f'_c)					
		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 Short (6.4)	1 (25.4)	220 (1.0)	880 (4.0)	315 (1.4)	1,025 (4.6)	415 (1.9)	1,025 (4.6)
1/4 Long (6.4)	1 1/2 (38.1)	435 (2.0)	880 (4.0)	635 (2.9)	1,025 (4.6)	750 (3.4)	1,025 (4.6)
5/16 Short (7.9)	1 1/4 (31.8)	370 (1.7)	1,105 (5.0)	600 (2.7)	1,485 (6.7)	780 (3.5)	1,485 (6.7)
5/16 Long (7.9)	1 3/4 (44.5)	535 (2.4)	1,105 (5.0)	785 (3.5)	1,485 (6.7)	820 (3.7)	1,485 (6.7)
3/8 Short (9.5)	1 3/4 (44.5)	845 (3.8)	1,305 (5.9)	1,225 (5.5)	1,620 (7.3)	1,345 (6.1)	1,620 (7.3)
3/8 Long (9.5)	2 1/2 (63.5)	1,060 (4.8)	1,305 (5.9)	1,545 (7.0)	1,620 (7.3)	1,840 (8.3)	1,620 (7.3)
1/2 Short (12.7)	2 (50.8)	1,145 (5.2)	1,780 (8.0)	1,700 (7.7)	2,140 (9.6)	1,810 (8.1)	2,140 (9.6)
1/2 Long (12.7)	3 (76.2)	2,085 (9.4)	1,780 (8.0)	3,015 (13.6)	2,140 (9.6)	3,390 (15.3)	2,140 (9.6)
5/8 Short (15.9)	2 (50.8)	1,220 (5.5)	2,220 (10.0)	1,760 (7.9)	2,520 (11.3)	1,935 (8.7)	2,520 (11.3)
5/8 Long (15.9)	3 1/2 (88.9)	2,470 (11.1)	2,220 (10.0)	3,800 (17.1)	2,520 (11.3)	4,265 (19.2)	2,520 (11.3)
3/4 Short (19.1)	2 (50.8)	1,325 (6.0)	2,355 (10.6)	2,200 (9.9)	2,680 (12.1)	2,345 (10.6)	2,680 (12.1)
3/4 Long (19.1)	3 1/2 (88.9)	2,925 (13.2)	2,355 (10.6)	4,000 (18.0)	2,680 (12.1)	4,195 (18.9)	2,680 (12.1)

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 Lag Shield in Normal-Weight Concrete[1,2,3]

Rod/Anchor Diameter d in. (mm)	Minimum Embedment Depth h_v in. (mm)	Minimum Concrete Compressive Strength (f'_c)					
		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 Short (6.4)	1 (25.4)	55 (0.2)	220 (1.0)	80 (0.4)	255 (1.1)	105 (0.5)	255 (1.1)
1/4 Long (6.4)	1 1/2 (38.1)	110 (0.5)	220 (1.0)	160 (0.7)	255 (1.1)	190 (0.9)	255 (1.1)
5/16 Short (7.9)	1 1/4 (31.8)	95 (0.4)	275 (1.2)	150 (0.7)	370 (1.7)	195 (0.9)	370 (1.7)
5/16 Long (7.9)	1 3/4 (44.5)	135 (0.6)	275 (1.2)	195 (0.9)	370 (1.7)	205 (0.9)	370 (1.7)
3/8 Short (9.5)	1 3/4 (44.5)	210 (0.9)	325 (1.5)	305 (1.4)	405 (1.8)	335 (1.5)	405 (1.8)
3/8 Long (9.5)	2 1/2 (63.5)	265 (1.2)	325 (1.5)	385 (1.7)	405 (1.8)	460 (2.1)	405 (1.8)
1/2 Short (12.7)	2 (50.8)	285 (1.3)	445 (2.0)	425 (1.9)	535 (2.4)	455 (2.0)	535 (2.4)
1/2 Long (12.7)	3 (76.2)	520 (2.3)	445 (2.0)	755 (3.4)	535 (2.4)	850 (3.8)	535 (2.4)
5/8 Short (15.9)	2 (50.8)	305 (1.4)	555 (2.5)	440 (2.0)	630 (2.8)	485 (2.2)	630 (2.8)
5/8 Long (15.9)	3 1/2 (88.9)	620 (2.8)	555 (2.5)	950 (4.3)	630 (2.8)	1,065 (4.8)	630 (2.8)
3/4 Short (19.1)	2 (50.8)	330 (1.5)	590 (2.7)	550 (2.5)	670 (3.0)	585 (2.6)	670 (3.0)
3/4 Long (19.1)	3 1/2 (88.9)	730 (3.3)	590 (2.7)	1,000 (4.5)	670 (3.0)	1,050 (4.7)	670 (3.0)

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.
3. Critical and minimum spacing and edge distances as well as reduction factors for intermediate spacing and edge distances are listed in the Design Criteria section.

PERFORMANCE DATA

Ultimate and Allowable Load Capacities for Lag Shield in Hollow Concrete Masonry[1,2,3,4]

Rod/Anchor Diameter d in. (mm)	Minimum Embedment Depth h_v in. (mm)	$f'_m \geq$ 1,500 psi (10.4 MPa)			
		Ultimate Load		Allowable Load	
		Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)
1/4 Short (6.4)	1 (25.4)	230 (1.0)	720 (3.2)	45 (0.2)	145 (0.7)
5/16 Short (7.9)	1 1/4 (31.8)	360 (1.6)	1,025 (4.6)	70 (0.3)	205 (0.9)
3/8 Short (9.5)	1 1/2 (38.1)	795 (3.6)	1,125 (5.1)	160 (0.7)	225 (1.0)
1/2 Short (12.7)	1 1/2 (38.1)	1,025 (4.6)	1,600 (7.2)	205 (0.9)	320 (1.4)

1. Tabulated load values are for anchors installed in minimum 6-inch wide, Grade N, Type II, medium and normal-weight concrete masonry units. Mortar must be minimum Type N. Masonry compressive strength must be 1,500 psi minimum at the time of installation.
2. Allowable loads are based on average ultimate values using a safety factor of 5.0.
3. Anchors with diameters of 1/2" and larger installed in hollow concrete masonry units are limited to one anchor per unit cell.
4. Anchors installed flush with face shell surface.

Ultimate and Allowable Load Capacities for Lag Shield in Clay Brick Masonry[1,2]

Rod/Anchor Diameter d in. (mm)	Minimum Embedment Depth h_v in. (mm)	$f'_m \geq$ 1,500 psi (10.4 MPa)			
		Ultimate Load		Allowable Load	
		Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)
1/4 Short (6.4)	1 (25.4)	240 (1.1)	1,025 (4.6)	50 (0.2)	205 (0.9)
5/16 Short (7.9)	1 1/4 (31.8)	425 (1.9)	1,485 (6.7)	85 (0.4)	295 (1.3)
3/8 Short (9.5)	1 3/4 (44.5)	1,190 (5.4)	1,620 (7.3)	240 (1.1)	325 (1.5)
1/2 Short (12.7)	2 (50.8)	1,230 (5.5)	2,140 (9.6)	245 (1.1)	430 (1.9)

1. Tabulated load values are for anchors installed in Grade SW multiple wythe, solid brick masonry conforming to ASTM C62.
2. Allowable loads are calculated using an applied safety factor of 5.0.

DESIGN CRITERIA

Combined Loading

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

$$\left(\frac{N_u}{N_n}\right)^{\frac{5}{3}} + \left(\frac{V_u}{V_n}\right)^{\frac{5}{3}} \leq 1 \quad \text{OR} \quad \left(\frac{N_u}{N_n}\right) + \left(\frac{V_u}{V_n}\right) \leq 1$$

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

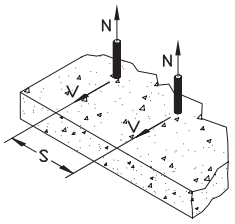
Anchor Installed in Normal-Weight Concrete					
Anchor Dimension	Load Type	Critical Distance (Full Anchor Capacity)	Critical Load Factor	Minimum Distance (Reduced Capacity)	Minimum Load Factor
Spacing (s)	Tension and Shear	$s_{cr} = 10d$	$F_N = F_V = 1.0$	$s_{min} = 5d$	$F_N = F_V = 0.50$
Edge Distance (c)	Tension	$c_{cr} = 12d$	$F_N = 1.0$	$c_{min} = 8d$	$F_N = 0.80$
	Shear	$c_{cr} = 12d$	$F_V = 1.0$	$c_{min} = 8d$	$F_V = 0.50$

DESIGN CRITERIA

Load Adjustment Factors for Normal-Weight Concrete

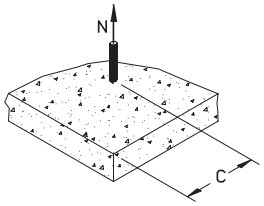
Spacing, Tension (F_N) & Shear (F_V)							
Dia. (in.)		1/4	5/16	3/8	1/2	5/8	3/4
s_{cr} (in.)		2 1/2	3 1/8	3 3/4	5	6 1/4	7 1/2
s_{min} (in.)		1 1/4	1 9/16	1 7/8	2 1/2	3 1/8	3 3/4
Spacing, s (inches)	1 1/4	0.50					
	1 9/16	0.63	0.50				
	1 7/8	0.75	0.60	0.50			
	2 1/2	1.00	0.80	0.67	0.50		
	3 1/8		1.00	0.83	0.63	0.50	
	3 3/4			1.00	0.75	0.60	0.50
	5				1.00	0.80	0.67
	6 1/4					1.00	0.83
	7 1/2						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.



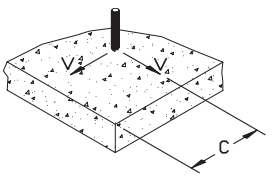
Edge Distance, Tension (F_N)							
Dia. (in.)		1/4	5/16	3/8	1/2	5/8	3/4
c_{cr} (in.)		3	3 3/4	4 1/2	6	7 1/2	9
c_{min} (in.)		2	2 1/2	3	4	5	6
Edge Distance, c (inches)	2	0.80					
	2 1/2	0.90	0.80				
	3	1.00	0.88	0.80			
	3 3/4		1.00	0.90			
	4			0.93	0.80		
	4 1/2			1.00	0.85		
	5				0.90	0.80	
	6				1.00	0.88	0.80
	7 1/2					1.00	0.90
	9						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 8 anchor diameters ($8d$) at which the anchor achieves 80% of load.



Edge Distance, Shear (F_V)							
Dia. (in.)		1/4	5/16	3/8	1/2	5/8	3/4
c_{cr} (in.)		3	3 3/4	4 1/2	6	7 1/2	9
c_{min} (in.)		2	2 1/2	3	4	5	6
Edge Distance, c (inches)	2	0.50					
	2 1/2	0.75	0.50				
	3	1.00	0.70	0.50			
	3 3/4		1.00	0.75			
	4			0.83	0.50		
	4 1/2			1.00	0.63		
	5				0.75	0.50	
	6				1.00	0.70	0.50
	7 1/2					1.00	0.75
	9						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 8 anchor diameters ($8d$) at which the anchor achieves 50% of load.



ORDERING INFORMATION

Lag Shield Anchor

Catalog Number	Size	Drill Diameter	Length	Thread Length	Standard Box	Standard Carton	Wt./ 100
1051	1/4" Short	1/2"	1/2"	1"	50	500	3
1055	1/4" Long	1/2"	1"	1 1/2"	50	500	4
1101	5/16" Short	1/2"	3/4"	1 1/4"	50	500	3
1105	5/16" Long	1/2"	1"	1 3/4"	50	500	4 1/4
1151	3/8" Short	5/8"	1"	1 3/4"	50	500	6 3/4
1155	3/8" Long	5/8"	1 1/2"	2 1/2"	50	250	9 1/2
1201	1/2" Short	3/4"	1 1/8"	2"	50	500	9 1/4
1205	1/2" Long	3/4"	1 7/8"	3"	50	200	14 1/4
1251	5/8" Short	7/8"	1"	2"	25	125	13
1255	5/8" Long	7/8"	2 1/4"	3 1/2"	25	125	22
1301	3/4" Short	1"	1 1/8"	2"	25	125	16
1305	3/4" Long	1"	2 1/4"	3 1/2"	25	100	24 1/2



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