

## Drop-In (DIA) Design Information — Concrete

Allowable Tension Loads for Drop-In (Stainless Steel) and Coil-Thread Drop-In (Carbon Steel) Anchors in Normal-Weight Concrete



Rod Size in. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Critical Edge Dist. in. (mm)	Critical Spacing in. (mm)	Tension Load						
					$f'_c \geq 2,000$ psi (13.8 MPa) Concrete			$f'_c \geq 3,000$ psi (20.7 MPa) Concrete		$f'_c \geq 4,000$ psi (27.6 MPa) Concrete	
					Ultimate lb. (kN)	Std. Dev. lb. (kN)	Allowable lb. (kN)	Allowable lb. (kN)	Ultimate lb. (kN)	Std. Dev. lb. (kN)	Allowable lb. (kN)
¼ (6.4)	⅜	1 (25)	3 (76)	4 (102)	1,400 (6.2)	201 (0.9)	350 (1.6)	405 (1.8)	1,840 (8.2)	451 (2.0)	460 (2.0)
⅜ (9.5)	½	1⅞ (40)	4½ (114)	6 (152)	2,400 (10.7)	251 (1.1)	600 (2.7)	795 (3.5)	3,960 (17.6)	367 (1.6)	990 (4.4)
½ (12.7)	⅝	2 (51)	6 (152)	8 (203)	3,320 (14.8)	372 (1.7)	830 (3.7)	1,178 (5.2)	6,100 (27.1)	422 (1.9)	1,525 (6.8)
⅝ (15.9)	⅞	2½ (64)	7½ (191)	10 (254)	5,040 (22.4)	689 (3.1)	1,260 (5.6)	1,715 (7.6)	8,680 (38.6)	971 (4.3)	2,170 (9.7)
¾ (19.1)	1	3⅞ (79)	9 (229)	12½ (318)	8,160 (36.3)	961 (4.3)	2,040 (9.1)	2,365 (10.5)	10,760 (47.9)	1,696 (7.5)	2,690 (12.0)

1. The allowable loads listed are based on a safety factor of 4.0.
2. Refer to allowable load-adjustment factors for edge distance and spacing on page 234.
3. Allowable loads may be linearly interpolated between concrete strengths listed.
4. The minimum concrete thickness is 1½ times the embedment depth.

Allowable Shear Loads for Drop-In (Stainless Steel) and Coil-Thread Drop-In (Carbon Steel) Anchors in Normal-Weight Concrete



Rod Size in. (mm)	Drill Bit Dia. in.	Embed. Depth in. (mm)	Critical Edge Dist. in. (mm)	Critical Spacing in. (mm)	Shear Load					
					$f'_c \geq 2,000$ psi (13.8 MPa) Concrete			$f'_c \geq 3,000$ psi (20.7 MPa) Concrete		$f'_c \geq 4,000$ psi (27.6 MPa) Concrete
					Ultimate lb. (kN)	Std. Dev. lb. (kN)	Allowable lb. (kN)	Allowable lb. (kN)	Allowable lb. (kN)	
¼ (6.4)	⅜	1 (25)	3½ (89)	4 (102)	1,960 (8.7)	178 (0.8)	490 (2.2)	490 (2.2)	490 (2.2)	
⅜ (9.5)	½	1⅞ (40)	5¼ (133)	6 (152)	3,240 (14.4)	351 (1.6)	810 (3.6)	925 (4.1)	1,040 (4.6)	
½ (12.7)	⅝	2 (51)	7 (178)	8 (203)	7,000 (31.1)	562 (2.5)	1,750 (7.8)	1,750 (7.8)	1,750 (7.8)	
⅝ (15.9)	⅞	2½ (64)	8¾ (222)	10 (254)	11,080 (49.3)	923 (4.1)	2,770 (12.3)	2,770 (12.3)	2,770 (12.3)	
¾ (19.1)	1	3⅞ (79)	10½ (267)	12½ (318)	13,800 (61.4)	1,781 (7.9)	3,450 (15.3)	3,725 (16.6)	4,000 (17.8)	

1. The allowable loads listed are based on a safety factor of 4.0.
2. Refer to allowable load-adjustment factors for edge distance and spacing on page 234.
3. Allowable loads may be linearly interpolated between concrete strengths listed.
4. The minimum concrete thickness is 1½ times the embedment depth.

## Material Specifications

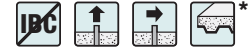
Anchor Component	Component Material		
	Zinc Plated Carbon Steel	Type 303/304 Stainless Steel	Type 316 Stainless Steel
Anchor Body	Meets minimum 70,000 psi tensile	AISI 303. Meets chemical requirements of ASTM A582	Type 316
Expander Plug	Meets minimum 50,000 psi tensile	AISI 303	Type 316
Thread	UNC/Coil-thread	UNC	UNC

Note: DIA37S, DIA50C and DIA75C are not available in stainless steel.

\* See page 12 for an explanation of the load table icons.

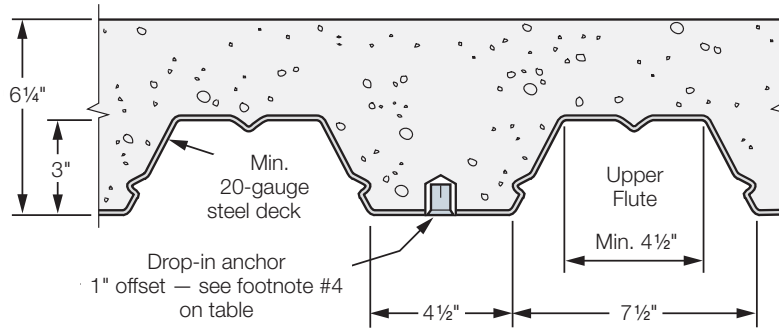
# Drop-In (DIA) Design Information — Concrete

Allowable Tension and Shear Loads for 3/8" and 1/2" Short Drop-In Anchor in Sand-Lightweight Concrete Fill over Metal Deck



Model No.	Rod Size (in.)	Drill Bit Dia. (in.)	Emb. Depth (in.)	Tension Critical End Distance (in.)	Shear Critical End Distance (in.)	Critical Spacing (in.)	Install through the Lower Flute or Upper Flute of Metal Deck, $f'_c \geq 3,000$ psi Concrete (20.7 MPa)			
							Tension Load		Shear Load	
							Ultimate (lb.)	Allowable (lb.)	Ultimate (lb.)	Allowable (lb.)
DIA37S	3/8	1/2	3/4	6	7	8	1,344	335	1,649	410
DIA50S	1/2	5/8	1	8	9 3/8	10 3/8	1,711	430	2,070	515

1. The allowable loads listed are based on a safety factor of 4.0.
2. Allowable loads may not be increased for short-term loading due to wind or seismic forces.
3. Refer to allowable load-adjustment factors for edge distances and spacing on page 235.
4. Anchors were installed with a 1" offset from the centerline of the flute.



**Lightweight Concrete over Metal Deck**

\* See page 12 for an explanation of the load table icons.

# Drop-In (DIA) Design Information — Concrete

Allowable Tension and Shear Loads for 3/8" and 1/2" Short Drop-In Anchor in Normal-Weight Concrete



Model No.	Rod Size (in.)	Drill Bit Dia. (in.)	Emb. Depth (in.)	Tension Critical Edge Distance (in.)	Shear Critical Edge Distance (in.)	Critical Spacing (in.)	Normal-Weight Concrete, $f'_c \geq 2500$ psi				Normal-Weight Concrete, $f'_c \geq 4,000$ psi			
							Tension Load		Shear Load		Tension Load		Shear Load	
							Ultimate (lb.)	Allowable (lb.)	Ultimate (lb.)	Allowable (lb.)	Ultimate (lb.)	Allowable (lb.)	Ultimate (lb.)	Allowable (lb.)
DIA37S	3/8	1/2	3/4	4 1/2	5 1/4	3	1,500	375	2,274	570	2,170	540	3,482	870
DIA50S	1/2	5/8	1	6	7	4	2,039	510	3,224	805	3,420	855	5,173	1,295

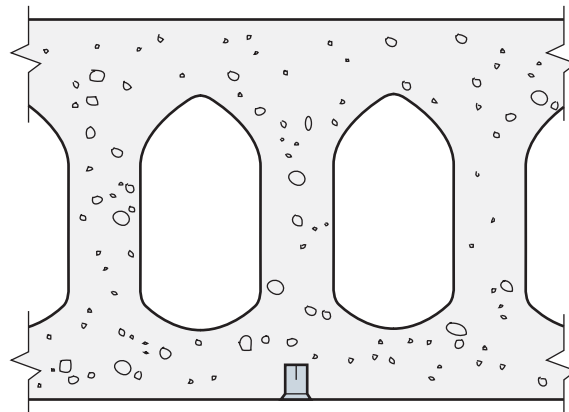
1. The allowable loads listed are based on a safety factor of 4.0.
2. Allowable loads may not be increased for short-term loading due to wind or seismic forces.
3. Refer to allowable load-adjustment factors for edge distances and spacing on page 234.
4. Allowable loads may be linearly interpolated between concrete strengths.
5. The minimum concrete thickness is 1 1/2 times the embedment depth.

Allowable Tension and Shear Loads for 3/8" and 1/2" Short Drop-In Anchor in Hollow-Core Concrete Panel



Model No.	Rod Size (in.)	Drill Bit Dia. (in.)	Emb. Depth (in.)	Tension Critical Edge Distance (in.)	Shear Critical Edge Distance (in.)	Critical Spacing (in.)	Hollow Core Concrete Panel, $f'_c \geq 4,000$ psi			
							Tension Load		Shear Load	
							Ultimate (lb.)	Allowable (lb.)	Ultimate (lb.)	Allowable (lb.)
DIA37S	3/8	1/2	3/4	4 1/2	5 1/4	3	1,860	465	3,308	825
DIA50S	1/2	5/8	1	6	7	4	2,650	660	4,950	1,235

1. The allowable loads listed are based on a safety factor of 4.0.
2. Allowable loads may not be increased for short-term loading due to wind or seismic forces.
3. Refer to allowable load-adjustment factors for edge distances and spacing on page 234.
4. Allowable loads may be linearly interpolated between concrete strengths.



**Hollow-Core Concrete Panel**  
(Anchor can be installed below web or hollow core)

\* See page 12 for an explanation of the load table icons.

# Drop-In (DIA) Design Information — Concrete

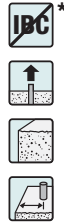
Allowable Load-Adjustment Factors for Drop-In (Stainless Steel), Coil Thread (Carbon Steel) and Short Drop-In Anchors in Normal-Weight Concrete: Edge Distance and Spacing, Tension and Shear Loads

### How to use these charts:

- The following tables are for reduced edge distance and spacing.
- Locate the anchor size to be used for either a tension and/or shear load application.
- Locate the edge distance ( $c_{act}$ ) or spacing ( $s_{act}$ ) at which the anchor is to be installed.
- The load adjustment factor ( $f_c$  or  $f_s$ ) is the intersection of the row and column.
- Multiply the allowable load by the applicable load adjustment factor.
- Reduction factors for multiple edges or spacing are multiplied together.

### Edge Distance Tension ( $f_c$ )

Edge Dist. $c_{act}$ (in.)	Size	1/4	3/8	1/2	5/8	3/4
	$c_{cr}$	3	4 1/2	6	7 1/2	9
	$c_{min}$	1 3/4	2 5/8	3 1/2	4 3/8	5 1/4
	$f_{cmin}$	0.65	0.65	0.65	0.65	0.65
1 3/4		0.65				
2		0.72				
2 1/2		0.86				
2 5/8		0.90	0.65			
3		1.00	0.72			
3 1/2			0.81	0.65		
4			0.91	0.72		
4 3/8			0.98	0.77	0.65	
4 1/2			1.00	0.79	0.66	
5				0.86	0.72	
5 1/4				0.90	0.75	0.65
5 1/2				0.93	0.78	0.67
6				1.00	0.83	0.72
6 1/2					0.89	0.77
7					0.94	0.81
7 1/2					1.00	0.86
8						0.91
8 1/2						0.95
9						1.00



### Spacing Tension and Shear ( $f_s$ )

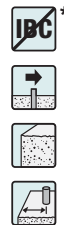
$s_{act}$ (in.)	Size	1/4	3/8 <sup>9</sup>	3/8	1/2 <sup>10</sup>	1/2	5/8	3/4
	$E$	1	3/4	1 1/2	1	2	2 1/2	3 1/8
	$s_{cr}$	4	3	6	4	8	10	12 1/2
	$s_{min}$	2	1 1/2	3	2	4	5	6 1/4
	$f_{smin}$	0.50	0.50	0.50	0.50	0.50	0.50	0.50
1 1/2			0.50					
2		0.50	0.67		0.50			
2 1/2		0.63	0.83		0.63			
3		0.75	1.00	0.50	0.75			
3 1/2		0.88		0.58	0.88			
4		1.00		0.67	1.00	0.50		
4 1/2				0.75		0.56		
5				0.83		0.63	0.50	
5 1/2				0.92		0.69	0.55	
6				1.00		0.75	0.60	
6 1/4						0.78	0.63	0.50
7						0.88	0.70	0.56
8						1.00	0.80	0.64
9							0.90	0.72
10							1.00	0.80
11								0.88
12								0.96
12 1/2								1.00



See notes below.

### Edge Distance Shear ( $f_c$ )

Edge Dist. $c_{act}$ (in.)	Size	1/4	3/8	1/2	5/8	3/4
	$c_{cr}$	3 1/2	5 1/4	7	8 3/4	10 1/2
	$c_{min}$	1 3/4	2 5/8	3 1/2	4 3/8	5 1/4
	$f_{cmin}$	0.45	0.45	0.45	0.45	0.45
1 3/4		0.45				
2		0.53				
2 1/2		0.69				
2 5/8		0.73	0.45			
3		0.84	0.53			
3 1/2		1.00	0.63	0.45		
4			0.74	0.53		
4 3/8			0.82	0.59	0.45	
4 1/2			0.84	0.61	0.47	
5			0.95	0.69	0.53	
5 1/4			1.00	0.73	0.56	0.45
5 1/2				0.76	0.59	0.48
6				0.84	0.65	0.53
6 1/2				0.92	0.72	0.58
7				1.00	0.78	0.63
7 1/2					0.84	0.69
8					0.91	0.74
8 1/2					0.97	0.79
8 3/4					1.00	0.82
9						0.84
9 1/2						0.90
10						0.95
10 1/2						1.00



- $E$  = Embedment depth (inches).
- $s_{act}$  = actual spacing distance at which anchors are installed (inches).
- $s_{cr}$  = critical spacing distance for 100% load (inches).
- $s_{min}$  = minimum spacing distance for reduced load (inches).
- $f_s$  = adjustment factor for allowable load at actual spacing distance.
- $f_{scr}$  = adjustment factor for allowable load at critical spacing distance.  $f_{scr}$  is always = 1.00.
- $f_{smin}$  = adjustment factor for allowable load at minimum spacing distance.
- $f_s = f_{smin} + [(1 - f_{smin})(s_{act} - s_{min}) / (s_{cr} - s_{min})]$ .
- 3/8" short drop-in (DIA37S).
- 1/2" short Drop-in (DIA50S).

- $c_{act}$  = actual edge distance at which anchor is installed (inches).
- $c_{cr}$  = critical edge distance for 100% load (inches).
- $c_{min}$  = minimum edge distance for reduced load (inches).
- $f_c$  = adjustment factor for allowable load at actual edge distance.
- $f_{ccr}$  = adjustment factor for allowable load at critical edge distance.  $f_{ccr}$  is always = 1.00.
- $f_{cmin}$  = adjustment factor for allowable load at minimum edge distance.
- $f_c = f_{cmin} + [(1 - f_{cmin})(c_{act} - c_{min}) / (c_{cr} - c_{min})]$ .

\* See page 12 for an explanation of the load table icons.

# Drop-In (DIA) Design Information — Concrete

Allowable Load-Adjustment Factors for Short Drop-in Anchors in Sand-Lightweight Concrete over Metal Deck: Edge Distance and Spacing, Tension and Shear Loads

### How to use these charts:

1. The following tables are for reduced edge distance and spacing.
2. Locate the anchor size to be used for either a tension and/or shear load application.
3. Locate the edge distance ( $c_{act}$ ) or spacing ( $s_{act}$ ) at which the anchor is to be installed.
4. The load adjustment factor ( $f_c$  or  $f_s$ ) is the intersection of the row and column.
5. Multiply the allowable load by the applicable load adjustment factor.
6. Reduction factors for multiple edges or spacing are multiplied together.

### Edge Distance Tension ( $f_c$ )

Edge Dist. $c_{act}$ (in.)	Size	¾	½
	$c_{cr}$	6	8
	$c_{min}$	3½	4¾
	$f_{cmin}$	0.65	0.65
3½		0.65	
4		0.72	
4½		0.79	
4¾		0.83	0.65
5		0.86	0.68
5½		0.93	0.73
6		1.00	0.78
6½			0.84
7			0.89
7½			0.95
8			1.00



See notes below.

### Spacing Tension and Shear ( $f_s$ )

$s_{act}$ (in.)	Size	¾	½
	$s_{cr}$	8	10¾
	$s_{min}$	4	5¼
	$f_{smin}$	0.50	0.50
4		0.50	
4½		0.56	
5		0.63	
5¼		0.66	0.50
6		0.75	0.57
6½		0.81	0.62
7		0.88	0.66
7½		0.94	0.71
8		1.00	0.76
8½			0.80
9			0.85
9½			0.90
10			0.94
10¾			1.00



### Edge Distance Shear ( $f_c$ )

Edge Dist. $c_{act}$ (in.)	Size	¾	½
	$c_{cr}$	7	9¾
	$c_{min}$	3½	4¾
	$f_{cmin}$	0.45	0.45
3½		0.45	
4		0.53	
4½		0.61	
4¾		0.65	0.45
5		0.69	0.48
5½		0.76	0.54
6		0.84	0.60
6½		0.92	0.66
7		1.00	0.72
7½			0.78
8			0.84
8½			0.90
9			0.96
9¾			1.00



1.  $s_{act}$  = actual spacing distance at which anchors are installed (inches).
2.  $s_{cr}$  = critical spacing distance for 100% load (inches).
3.  $s_{min}$  = minimum spacing distance for reduced load (inches).
4.  $f_s$  = adjustment factor for allowable load at actual spacing distance.
5.  $f_{s_{cr}}$  = adjustment factor for allowable load at critical spacing distance.  $f_{s_{cr}}$  is always = 1.00.
6.  $f_{s_{min}}$  = adjustment factor for allowable load at minimum spacing distance.
7.  $f_s = f_{s_{min}} + [(1 - f_{s_{min}})(s_{act} - s_{min}) / (s_{cr} - s_{min})]$ .

1.  $c_{act}$  = actual edge distance at which anchor is installed (inches).
2.  $c_{cr}$  = critical edge distance for 100% load (inches).
3.  $c_{min}$  = minimum edge distance for reduced load (inches).
4.  $f_c$  = adjustment factor for allowable load at actual edge distance.
5.  $f_{c_{cr}}$  = adjustment factor for allowable load at critical edge distance.  $f_{c_{cr}}$  is always = 1.00.
6.  $f_{c_{min}}$  = adjustment factor for allowable load at minimum edge distance.
7.  $f_c = f_{c_{min}} + [(1 - f_{c_{min}})(c_{act} - c_{min}) / (c_{cr} - c_{min})]$ .

\* See page 12 for an explanation of the load table icons.