Drop-In (DIAB) Design Information — Concrete

DIAB Allowable Tension and Shear Loads in Normal-Weight Concrete

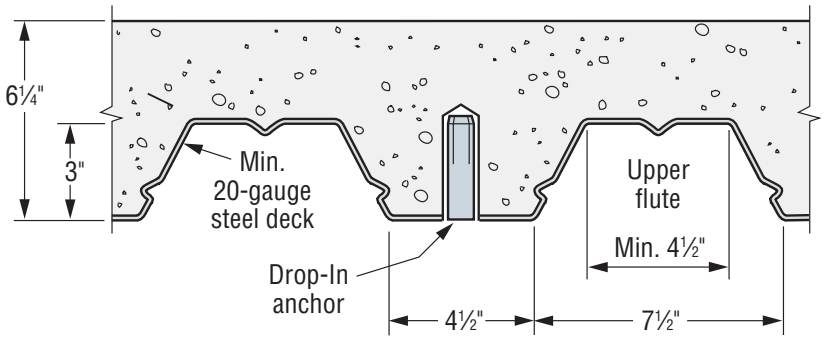
Model No.	Rod Size in. (mm)	Drill Bit Dia. In.	Embed Depth In. (mm)	Critical Edge Dist. In. (mm)	Critical Spacing In. (mm)	$f'_c \geq 2{,}500$ psi (17.2 MPa)				$f'_c \geq 4{,}000$ psi (27.6 MPa)			
						Tension Load		Shear Load		Tension Load		Shear Load	
						Ultimate lb. (kN)	Allowable lb. (kN)	Ultimate lb. (kN)	Allowable lb. (kN)	Ultimate lb. (kN)	Allowable lb. (kN)	Ultimate lb. (kN)	Allowable lb. (kN)
DIAB25 DIABL25	¼ (6.4)	⅜	1 (25)	3 (76)	4 (102)	1,565 (7.0)	390 (1.7)	1,840 (8.2)	460 (2.0)	1,965 (8.7)	490 (2.2)	1,840 (8.2)	460 (2.0)
DIAB37 DIABL37	⅜ (9.5)	½	1 9⁄16 (40)	4½ (114)	6 (152)	2,950 (13.1)	740 (3.3)	4,775 (21.2)	1,195 (5.3)	3,910 (17.4)	980 (4.4)	4,775 (21.2)	1,195 (5.3)
DIAB50 DIABL50 DIAB50C	½ (12.7)	⅝	2 (51)	6 (152)	8 (203)	5,190 (23.1)	1,300 (5.8)	6,760 (30.1)	1,690 (7.5)	6,515 (29.0)	1,630 (7.3)	6,760 (30.1)	1,690 (7.5)
DIAB62	⅝ (15.9)	⅞	2½ (64)	7½ (191)	10 (254)	7,010 (31.2)	1,755 (7.8)	12,190 (54.2)	3,050 (13.6)	9,060 (40.3)	2,265 (10.1)	12,190 (54.2)	3,050 (13.6)
DIAB75 DIAB75C	¾ (19.1)	1	3⅛ (79)	9 (229)	12½ (318)	9,485 (42.2)	2,370 (10.5)	15,960 (71.0)	3,990 (17.7)	11,660 (51.9)	2,915 (13.0)	15,960 (71.0)	3,990 (17.7)

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 p. 186.
3. Allowable loads may be linearly interpolated between concrete strength listed.
4. The minimum concrete thickness is 1½ times the embedment depth.
5. Allowable loads may not be increased for short-term loading due to wind or seismic forces.

DIAB Allowable Tension and Shear Loads in Soffit of Sand-Lightweight Concrete over Metal Deck

Model No.	Rod Size in. (mm)	Drill Bit Dia. In.	Embed Depth In. (mm)	Critical End Dist.[6] In. (mm)	Critical Spacing In. (mm)	$f'_c \geq 3{,}000.$ psi (20.7 MPa)			
						Tension Load		Shear Load	
						Ultimate lb. (kN)	Allowable lb. (kN)	Ultimate lb. (kN)	Allowable lb. (kN)
DIAB37 DIABL37	⅜ (9.5)	½	1 9⁄16 (40)	4½ (114)	6 (152)	2,895 (12.9)	725 (3.2)	3,530 (15.7)	885 (3.9)
DIAB50 DIABL50 DIAB50C	½ (12.7)	⅝	2 (51)	6 (152)	8 (203)	4,100 (18.2)	1,025 (4.6)	4,685 (20.8)	1,170 (5.2)

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 distance and spacing on p. 186.
4. Anchors were installed in the center of the bottom flute of the steel deck.
5. Metal deck must be minimum 20-gauge thick with minimum yield strength of 33 ksi.
6. Critical end distance is defined as the distance from end of the slab in the direction of the flute.



Lightweight Concrete over Metal Deck

* See p. 13 for an explanation of the load table icons.

Drop-In (DIAB) Design Information — Concrete

Allowable Load-Adjustment Factors for Drop-In Anchor (DIAB) in Normal-Weight Concrete and 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 a 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	¼	⅜	½	⅝	¾
	c_{cr}	3	4½	6	7½	9
	c_{min}	1¾	2⅝	3½	4⅜	5¼
	f_{cmin}	0.77	0.77	0.77	0.77	0.77
1¾		0.77				
2		0.82				
2½		0.91				
2⅝		0.93	0.77			
3		1.00	0.82			
3½			0.88	0.77		
4			0.94	0.82		
4⅜			0.98	0.85	0.77	
4½			1.00	0.86	0.78	
5				0.91	0.82	
5¼				0.93	0.83	0.77
5½				0.95	0.85	0.79
6				1.00	0.89	0.82
6½					0.93	0.85
7					0.96	0.88
7½					1.00	0.91
8						0.94
8½						0.97
9						1.00

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_{ccr} = adjustment factor for allowable load at critical edge distance. f_{ccr} is always = 1.00.
6. f_{cmin} = adjustment factor for allowable load at minimum edge distance.
7. $f_c = f_{cmin} + [(1 - f_{cmin})\ (c_{act} - c_{min})\ /\ (c_{cr} - c_{min})]$.

Edge Distance Shear (f_c)

Edge Dist. c_{act} (in.)	Size	¼	⅜	½	⅝	¾
	c_{cr}	3	4½	6	7½	9
	c_{min}	1¾	2⅝	3½	4⅜	5¼
	f_{cmin}	0.54	0.54	0.64	0.64	0.64
1¾		0.54				
2		0.63				
2½		0.82				
2⅝		0.86	0.54			
3		1.00	0.63			
3½			0.75	0.64		
4			0.88	0.71		
4⅜			0.97	0.77	0.64	
4½			1.00	0.78	0.65	
5				0.86	0.71	
5¼				0.89	0.74	0.64
5½				0.93	0.77	0.66
6				1.00	0.83	0.71
6½					0.88	0.76
7					0.94	0.81
7½					1.00	0.86
8						0.90
8½						0.95
9						1.00

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_{ccr} = adjustment factor for allowable load at critical edge distance. f_{ccr} is always = 1.00.
6. f_{cmin} = adjustment factor for allowable load at minimum edge distance.
7. $f_c = f_{cmin} + [(1 - f_{cmin})\ (c_{act} - c_{min})\ /\ (c_{cr} - c_{min})]$.

Spacing Tension (f_s)

Spacing s_{act} (in.)	Size	¼	⅜	½	⅝	¾
	s_{cr}	4	6	8	10	12½
	s_{min}	1½	2¼	3	3¾	4¾
	f_{smin}	0.72	0.72	0.80	0.80	0.80
1½		0.72				
2		0.78				
2¼		0.80	0.72			
2½		0.83	0.74			
3		0.89	0.78	0.80		
3½		0.94	0.81	0.82		
3¾		0.97	0.83	0.83	0.80	
4		1.00	0.85	0.84	0.81	
4½			0.89	0.86	0.82	
4¾			0.91	0.87	0.83	0.80
5			0.93	0.88	0.84	0.81
5½			0.96	0.90	0.86	0.82
6			1.00	0.92	0.87	0.83
6½				0.94	0.89	0.85
7				0.96	0.90	0.86
7½				0.98	0.92	0.87
8				1.00	0.94	0.88
8½					0.95	0.90
9					0.97	0.91
9½					0.98	0.92
10					1.00	0.94
10½						0.95
11						0.96
11½						0.97
12						0.99
12½						1.00

1. s_{act} = actual spacing distance at which anchor is 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_{scr} = adjustment factor for allowable load at critical spacing distance. f_{scr} is always = 1.00.
6. f_{smin} = adjustment factor for allowable load at minimum spacing distance.
7. $f_s = f_{smin} + [(1 - f_{smin})\ (s_{act} - s_{min})\ /\ (s_{cr} - s_{min})]$.

Spacing Shear (f_s)

Spacing s_{act} (in.)	Size	¼	⅜	½	⅝	¾
	s_{cr}	4	6	8	10	12½
	s_{min}	1½	2¼	3	3¾	4¾
	f_{smin}	1.00	1.00	1.00	1.00	1.00
1½		1.00				
2		1.00				
2¼		1.00	1.00			
2½		1.00	1.00			
3		1.00	1.00	1.00		
3½		1.00	1.00	1.00		
3¾		1.00	1.00	1.00	1.00	
4		1.00	1.00	1.00	1.00	
4½			1.00	1.00	1.00	
4¾			1.00	1.00	1.00	1.00
5			1.00	1.00	1.00	1.00
5½			1.00	1.00	1.00	1.00
6			1.00	1.00	1.00	1.00
6½				1.00	1.00	1.00
7				1.00	1.00	1.00
7½				1.00	1.00	1.00
8				1.00	1.00	1.00
8½					1.00	1.00
9					1.00	1.00
9½					1.00	1.00
10					1.00	1.00
10½						1.00
11						1.00
11½						1.00
12						1.00
12½						1.00

1. s_{act} = actual spacing distance at which anchor is 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_{scr} = adjustment factor for allowable load at critical spacing distance. f_{scr} is always = 1.00.
6. f_{smin} = adjustment factor for allowable load at minimum spacing distance.
7. $f_s = f_{smin} + [(1 - f_{smin})\ (s_{act} - s_{min})\ /\ (s_{cr} - s_{min})]$.

* See p. xx for an explanation of the load table icons.