

HDI and HDI-L Drop-in Anchor 3.3.9

3.3.9.1 Product Description

The Hilti HDI/HDI-L Drop-in anchor is an internally threaded, flush mounted expansion anchor for use in concrete.

Product Features

HDI

- Anchor, setting tool and Hilti drill bit form a matched tolerance system to provide reliable fastenings
- Allows shallow embedment without sacrificing performance
- Lip provides flush installation, consistent anchor depth, and easy rod alignment (HDI-L)
- Lip allows accurate flush surface setting, independent of hole depth (HDI-L)
- Ideal for repetitive fastenings with threaded rods of equal length

- Intelligent expansion section adapts to the base material and reduces number of hammer blows up to 50% (HDI-L)

Guide Specifications

Expansion Anchor Expansion anchors shall be flush or shell type and zinc plated in accordance with ASTM B633, SC 1, Type III. Anchors shall be Hilti HDI/HDI-L anchors as supplied by Hilti.

Installation Install shell or flush type anchors in holes drilled with Hilti carbide tipped drill bits. Install anchors as per manufacturer's recommendations.

3.3.9.1 Product Description

3.3.9.2 Material Specifications

3.3.9.3 Technical Data

3.3.9.4 Installation Instructions

3.3.9.5 Ordering Information



3.3.9.2 Material Specifications

HDI/HDI-L, 1/4", 3/8", 1/2", and HDI 5/8" and 3/4" are manufactured from mild carbon steel which is plated with a zinc finish for corrosion protection in accordance with ASTM B633, SC 1, Type III

HDI Stainless Steel material meets the requirements of AISI 303

Listings/Approvals

FM (Factory Mutual)

Pipe Hanger Components for Automatic Sprinkler Systems (3/8" - 3/4") (HDI and HDI-L)

UL (Underwriters Laboratories)

UL 203 Pipe Hanger Equipment for Fire Protection Services (3/8" - 3/4")

3.3.9.3 Technical Data

Table 1 - HDI/HDI-L Specification Table

Details	Anchor Size	in. (mm)	HDI/HDI-L			HDI	
			1/4 (6.4)	3/8 (9.5)	1/2 (12.7)	5/8 (15.9)	3/4 (19.1)
d_{bit} nominal bit diameter		in.	3/8	1/2	5/8	27/32	1
h_{nom} std. depth of embedment		in.	1	1-9/16	2	2-9/16	3-3/16
l anchor length		(mm)	(25)	(40)	(51)	(65)	(81)
h_1 hole depth							
l_{th} useable thread length		in.	7/16	5/8	11/16	7/8	1-3/8
		(mm)	(11)	(15)	(17)	(22)	(34)
threads per inch			20	16	13	11	10
h min. base material thickness		in.	3	3-1/8	4	5-1/8	6-3/8
		(mm)	(76)	(79)	(102)	(130)	(162)
T_{inst} installation torque		ft-lb	4	11	22	37	80
		(Nm)	(5.4)	(14.9)	(29.8)	(50.2)	(108.5)



Combined Shear and Tension Loading

$$\left(\frac{N_d}{N_{rec}} \right)^{5/3} + \left(\frac{V_d}{V_{rec}} \right)^{5/3} \leq 1.0 \quad (\text{Ref. Section 4.1.8.3})$$

3.3.9 HDI and HDI-L Drop-in Anchor

Table 2 - Carbon Steel HDI Allowable Loads in Concrete¹

Anchor size in. (mm)	2000 psi (13.8 MPa)				4000 psi (27.6 MPa)				6000 psi (41.4 MPa)			
	Tension		Shear		Tension		Shear		Tension		Shear	
	HDI	HDI-L	HDI	HDI-L	HDI	HDI-L	HDI	HDI-L	HDI	HDI-L	HDI	HDI-L
1/4 (6.4)	500 (2.2)	500 (2.2)	450 (8.0)	450 (8.0)	570 (2.5)	570 (2.5)	625 (2.8)	625 (2.8)	790 (3.5)	790 (3.5)	700 (3.1)	700 (3.1)
3/8 (9.5)	890 (4.0)	890 (4.0)	965 (4.3)	965 (4.3)	1115 (5.0)	1115 (5.0)	1250 (5.6)	1250 (5.6)	1360 (6.0)	1360 (6.0)	1500 (6.7)	1500 (6.7)
1/2 (12.7) ²	1120 (5.0)	1120 (5.0)	1500 (6.7)	1500 (6.7)	1785 (7.9)	1785 (7.9)	2125 (9.5)	1940 (8.6)	2345 (10.4)	2345 (10.4)	2500 (11.1)	2500 (11.1)
5/8 (15.9)	1875 (8.3)	-	2500 (11.1)	-	2920 (13.0)	-	3250 (14.5)	-	3715 (16.5)	-	3750 (16.7)	-
3/4 (19.1)	2500 (11.1)	-	3875 (17.2)	-	4065 (18.1)	-	5000 (22.2)	-	5565 (24.8)	-	5500 (24.5)	-

1 The ultimate shear and allowable shear values are based on the use of SAE Grade 5 bolts, ($f_y = 85$ ksi, $f_{ult} = 120$ ksi) with the exception of the 1/4" HDI/HDI-L in $f'_c = 6000$ psi concrete which is based upon the use of a SAE Grade 8 bolt ($f_y = 120$ ksi, $f_{ult} = 150$ ksi).

2 Allowable and Ultimate tension loads for the HDI 1/2 are applicable to the HDI-S 1/2.

Table 3 - Carbon Steel HDI Ultimate Loads in Concrete¹

Anchor size in. (mm)	2000 psi (13.8 MPa)				4000 psi (27.6 MPa)				6000 psi (41.4 MPa)			
	Tension		Shear		Tension		Shear		Tension		Shear	
	HDI	HDI-L	HDI	HDI-L	HDI	HDI-L	HDI	HDI-L	HDI	HDI-L	HDI	HDI-L
1/4 (6.4)	1995 (8.9)	1995 (8.9)	1800 (8.0)	1800 (8.0)	2270 (10.1)	2270 (10.1)	2500 (11.1)	2500 (11.1)	3150 (14.0)	3150 (14.0)	2800 (12.5)	2800 (12.5)
3/8 (9.5)	3555 (15.8)	3555 (15.8)	3850 (17.1)	3850 (17.1)	4460 (19.8)	4460 (19.8)	5000 (22.2)	5000 (22.2)	5430 (24.2)	5430 (24.2)	6000 (26.7)	6000 (26.7)
1/2 (12.7) ²	4470 (19.9)	4470 (19.9)	6000 (26.7)	6000 (26.7)	7140 (31.8)	7140 (31.8)	8500 (37.8)	7750 (34.4)	9375 (41.7)	9375 (41.7)	10000 (44.5)	10000 (44.5)
5/8 (15.9)	7500 (33.4)	-	10000 (44.5)	-	11685 (52.0)	-	13000 (57.8)	-	14865 (66.1)	-	15000 (66.7)	-
3/4 (19.1)	10000 (44.5)	-	15500 (69.0)	-	16260 (72.3)	-	20000 (89.0)	-	22250 (99.0)	-	22000 (97.9)	-

1 The ultimate shear and allowable shear values are based on the use of SAE Grade 5 bolts, ($f_y = 85$ ksi, $f_{ult} = 120$ ksi) with the exception of the 1/4" HDI/HDI-L in $f'_c = 6000$ psi concrete which is based upon the use of a SAE Grade 8 bolt ($f_y = 120$ ksi, $f_{ult} = 150$ ksi).

2 Allowable and Ultimate tension loads for the HDI 1/2 are applicable to the HDI-S 1/2.

Table 4 - Carbon Steel HDI Allowable Loads in Lightweight Concrete and Lightweight Concrete over Metal Deck^{1,2}

Anchor size in. (mm)	Anchor Installed in 3000 psi (20.7 MPa)		Anchor Installed Through Steel Deck Upper Flute		Anchor Installed Through Steel Deck Lower Flute	
	Lt. Wt. Concrete ³		Into 3000 psi (20.7 MPa) Lt. Wt. Concrete ⁴		Into 3000 psi (20.7 MPa) Lt. Wt. Concrete ⁴	
	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)
1/4 (6.4)	465 (2.1)	340 (1.5)	530 (2.4)	335 (1.5)	375 (1.7)	250 (1.1)
3/8 (9.5)	755 (3.4)	940 (4.2)	880 (3.9)	1010 (4.5)	500 (2.2)	500 (2.2)
1/2 (12.7)	1135 (5.0)	1700 (7.6)	1105 (4.9)	1755 (7.8)	625 (2.8)	750 (3.3)
5/8 (15.9)	1465 (6.5)	2835 (12.6)	-	-	875 (3.9)	875 (3.9)
3/4 (19.1)	2075 (9.2)	3680 (16.4)	-	-	1250 (5.5)	1000 (4.4)

1 The allowable values are based on the use of SAE Grade 2 bolts installed in the anchors.

2 Based on using a safety factor of 4.0.

3 The tabulated shear and tensile values are for anchors installed in structural lightweight concrete having the designated ultimate compressive strength at the time of installation. The concrete must comply with ASTM C 330-05.

4 The tabulated shear and tensile values are for anchors installed through 20 gauge intermediate decking into structural lightweight concrete having the designated ultimate strength at the time of installation. The concrete must comply with ASTM C 330-05.

Table 5 - Stainless Steel HDI Allowable Loads in Concrete

Anchor size in. (mm)	4000 psi (27.6 MPa)		6000 psi (41.4 MPa)	
	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)
SS HDI - 1/4 (6.4)	480 (2.1)	600 (2.7)	740 (3.3)	600 (2.7)
SS HDI - 3/8 (9.5)	1040 (4.6)	1230 (5.5)	1460 (6.5)	1230 (5.5)
SS HDI - 1/2 (12.7)	1840 (8.2)	2760 (12.4)	2410 (10.7)	2760 (12.3)
SS HDI - 5/8 (15.9)	2630 (11.7)	4510 (20.1)	3770 (16.8)	4510 (20.1)
SS HDI - 3/4 (19.1)	3830 (17.0)	5580 (24.8)	5030 (22.4)	5580 (24.8)

Note: The ultimate and allowable shear values are based on the use of Type 18-8 bolts.

Table 6 - Stainless Steel HDI Ultimate Loads in Concrete

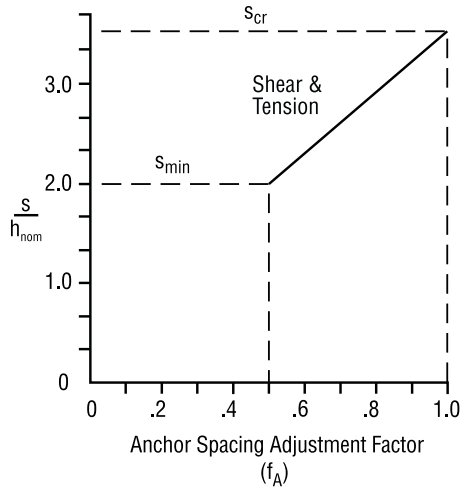
Anchor Size in. (mm)	4000 psi (27.6 MPa)		6000 psi (41.4 MPa)	
	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)
SS HDI - 1/4 (6.4)	1930 (8.6)	2400 (10.7)	2950 (13.1)	2400 (10.7)
SS HDI - 3/8 (9.5)	4170 (18.5)	4920 (21.9)	5850 (26.0)	4920 (21.9)
SS HDI - 1/2 (12.7)	7350 (32.7)	11040 (49.1)	9630 (42.8)	11040 (49.1)
SS HDI - 5/8 (15.9)	10540 (46.9)	18040 (80.2)	15100 (67.2)	18040 (80.2)
SS HDI - 3/4 (19.1)	15340 (68.2)	22320 (99.3)	20130 (89.5)	22320 (99.3)

HDI and HDI-L Drop-in Anchor 3.3.9

Anchor Spacing and Edge Distance Guidelines (See Anchoring Technology Section 4.1.8.2)

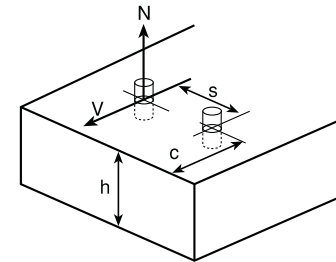
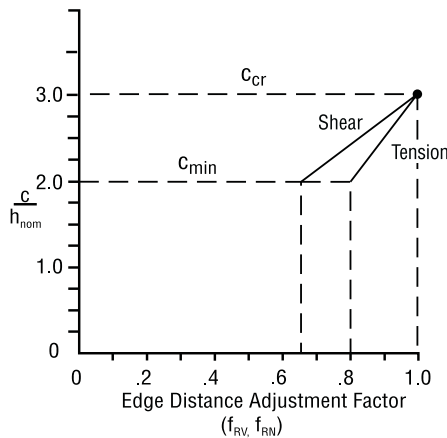
Anchor Spacing Adjustment Factors

- s = Actual Spacing
- s_{min} = 2.0 h_{nom}
- s_{cr} = 3.5 h_{nom}



Edge Distance Adjustment Factors

- c = Actual edge distance
- c_{min} = 2.0 h_{nom}
- c_{cr} = 3.0 h_{nom}



Influence of Anchor Spacing and Edge Distance f_A, f_R

Anchor Size		h _{nom}	
in.	(mm)	in.	(mm)
1/4	(6.4)	1	(25)
3/8	(9.5)	1-9/16	(40)
1/2	(12.7)	2	(51)
5/8	(15.8)	2-9/16	(65)
3/4	(19.1)	3-3/16	(81)

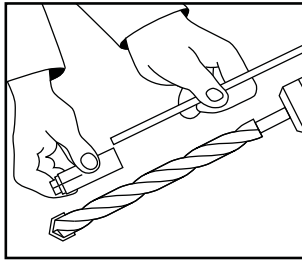
h_{nom} = standard embedment depth

Load Adjustment Factors (Anchor Spacing) f _A							Load Adjustment Factors (Edge Distance) f _R											
Tension/Shear Loads							Tension f _{RN}					Shear f _{RV}						
Spacing s		Anchor Diameter					Edge Distance c		Anchor Diameter					Anchor Diameter				
in.	(mm)	1/4	3/8	1/2	5/8	3/4	in.	(mm)	1/4	3/8	1/2	5/8	3/4	1/4	3/8	1/2	5/8	3/4
2	(51)	.50					2	(51)	.80					.65				
2-1/2	(64)	.67					2-1/2	(64)	.90					.83				
3	(76)	.83	.50				3	(76)	1.0	.80				1.0	.65			
3-1/2	(89)	1.0	.58				3-1/2	(89)		.85					.73			
4	(102)		.69	.50			4	(102)		.91	.80				.85	.65		
4-1/2	(114)		.79	.58			4-1/2	(114)		.98	.85				.96	.74		
5	(127)		.90	.67	.50		5	(127)		1.0	.90	.80			1.0	.83	.65	
5-1/2	(140)		1.0	.75	.55		5-1/2	(140)			.95	.83				.91	.70	
6	(152)			.83	.61	.50	6	(152)			1.0	.87			1.0	.77		
7	(178)			1.0	.74	.57	6-1/2	(165)				.91	.80			.84	.65	
8	(203)				.87	.67	7	(178)				.95	.84			.91	.72	
9	(229)				1.0	.77	8	(203)				1.0	.90			1.0	.83	
10	(254)					.88	9	(229)					.96				.94	
11	(279)					.98	10	(254)					1.0				1.0	
12	(305)					1.0												1.0

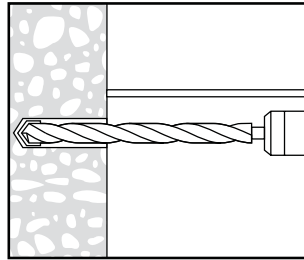
$s_{min} = 2.0 h_{nom}$ $s_{cr} = 3.5 h_{nom}$ $f_A = 0.33 \frac{s}{h_{nom}} - 0.17$ for $s_{cr} > s > s_{min}$	$c_{min} = 2.0 h_{nom}$ $c_{cr} = 3.0 h_{nom}$ $f_{RN} = 0.2 \frac{c}{h_{nom}} + 0.4$ for $c_{cr} > c > c_{min}$	$c_{min} = 2.0 h_{nom}$ $c_{cr} = 3.0 h_{nom}$ $f_{RV} = 0.35 \frac{c}{h_{nom}} - 0.05$ for $c_{cr} > c > c_{min}$
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3.3.9 HDI and HDI-L Drop-in Anchor

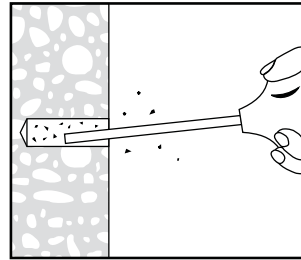
3.3.9.4 Installation Instructions



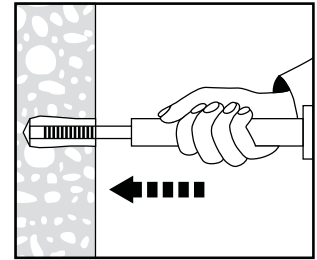
1. Adjust depth gauge so that anchor will be flush with the concrete surface when installed.



2. Hammer drill hole.



3. Clean hole.



4. Install anchor using proper setting tool. Setting tool to be driven into anchor until setting tool shoulder meets top of anchor.

3.3.9.5 Ordering Information

HDI Anchors

Carbon Steel

Anchor Thread Size	Description	Description	Description	Box Qty.
1/4"	HDI 1/4	HDI-L 1/4		100
3/8"	HDI 3/8	HDI-L 3/8		50
1/2"	HDI 1/2	HDI-L 1/2	HDI-S 1/2	50
5/8"	HDI 5/8	-		25
3/4"	HDI 3/4	-		25

HDI Anchors

Stainless Steel

Anchor Thread Size	Description	Box Qty.
1/4"	HDI 1/4 (SS 303)	100
3/8"	HDI 3/8 (SS 303)	50
1/2"	HDI 1/2 (SS 303)	50
5/8"	HDI 5/8 (SS 303)	25
3/4"	HDI 3/4 (SS 303)	25

Setting Tools for HDI, HDI-L and HDI-S

Anchor Thread Size	Description
1/4"	HST 1/4 Setting Tool
3/8"	HST 3/8 Setting Tool
1/2"	HST 1/2 Setting Tool
5/8"	HST 5/8 Setting Tool
3/4"	HST 3/4 Setting Tool



Anchor Thread Size	Description
3/8"	HSD-MM 3/8" (TE-C-24SD10 3/8" Setting tool)
1/2"	HSD-MM 1/2" (TE-C-24SD12 1/2" Setting tool)



1 Use automatic setting tools with TE-C style (SDS plus) hammer drills.