



Attached are page(s) from the 2014 Hilti North American Product Tech Guide. For complete details on this product, including data development, product specifications, general suitability, installation, corrosion, and spacing and edge distance guidelines, please refer to the Technical Guide, or contact Hilti.

HDI, HDI-L, HDI+ and HDI-L+ Drop-in Anchor 3.3.11

3.3.11.1 Product description

HDI+, HDI-L+ and HDI drop-in anchors are internally threaded, flush mounted expansion anchors for use in concrete.

Product features

HDI+, HDI-L+ and HDI

- Anchor, setting tool and Hilti drill bit form a matched tolerance system to provide reliable fastenings
- Allows shallow embedment without sacrificing performance
- Lip allows accurate flush surface setting, independent of hole depth for the HDI-L+
- Ideal for repetitive fastenings with threaded rods of equal length
- HDI+ and HDI-L+ have an innovative stepped plug that reduces number of hammer blows by up to 50%

- HDI+ and HDI-L+ can be installed with the new HDI+ Setting Tool system (stop drill bit and machine setting tool) for improved productivity

Guide specifications

Expansion anchor shall be drop-in, shell or flush type. Carbon steel anchors are zinc plated in accordance with ASTM B633, SC 1, Type III. Stainless steel anchors are manufactured from AISI Type 303 stainless steel. Anchors shall be Hilti HDI+ (HDI-L+) (HDI) anchors as supplied by Hilti.

3.3.11.1 Product description

3.3.11.2 Material specifications

3.3.11.3 Technical data

3.3.11.4 Installation instructions

3.3.11.5 Ordering information



3.3.11.2 Material specifications

HDI+, HDI-L+ and HDI anchors are manufactured from mild carbon steel. Anchor bodies are zinc plated in accordance with ASTM B633, SC 1, Type III.

HDI stainless steel anchors are manufactured from AISI Type 303 stainless steel.

Listings/Approvals

FM (Factory Mutual)

Pipe Hanger Components for Automatic Sprinkler Systems HDI+ 3/8, HDI-L+ 3/8, HDI+1/2, HDI-L+ 1/2, HDI 5/8 and HDI 3/4

UL LLC

UL 203 Pipe Hanger Equipment for Fire Protection Services HDI+ 3/8, HDI-L+ 3/8, HDI+1/2, HDI-L+ 1/2, HDI 5/8 and HDI 3/4

3.3.11

3.3.11.3 Technical data

Table 1 - HDI+, HDI-L+ and HDI specifications¹

Setting Information	Symbol	Units	HDI+ and HDI-L+			HDI	
			1/4	3/8	1/2	5/8	3/4
Insert thread	d	UNC	1/4-20	3/8-16	1/2-13	5/8-11	3/4-10
Nominal bit diameter	d _{bit}	in.	3/8	1/2	5/8	27/32	1
Nominal embedment Anchor length	h _{nom} ℓ	in.	1	1-9/16	2	2-9/16	3-3/16
Hole depth	h _o	(mm)	(25)	(40)	(51)	(65)	(81)
Useable thread length	ℓ _{th}	in. (mm)	7/16 (11)	5/8 (15)	11/16 (17)	7/8 (22)	1-3/8 (34)
Installation torque	T _{inst}	ft-lb (Nm)	4 (5)	11 (15)	22 (30)	37 (50)	80 (109)
Minimum slab thickness	h	in. (mm)	3 (76)	3-1/8 (79)	4 (102)	5-1/8 (130)	6-3/8 (162)

¹ HDI+ and HDI-L+ are available in 1/4-, 3/8- and 1/2-in. The HDI is available in 5/8- and 3/4-in.

Combined shear and tension loading

$$\left(\frac{N_d}{N_{rec}} \right)^{5/3} + \left(\frac{V_d}{V_{rec}} \right)^{5/3} \leq 1.0$$



3.3.11 HDI, HDI-L, HDI+ and HDI-L+ Drop-in Anchor

Table 2 - HDI+, HDI-L+ and HDI carbon steel allowable loads in concrete (lb)^{1,2}

Nominal anchor diameter in.	$f'_c = 2,000$		$f'_c = 4,000$		$f'_c = 6,000$	
	Tension	Shear	Tension	Shear	Tension	Shear
1/4	500	450	570	625	790	700
3/8	635	965	920	1,250	1,260	1,500
1/2	945	1,500	1,605	1,940	1,950	2,500
5/8	1,875	2,500	2,920	3,250	3,715	3,750
3/4	2,500	3,875	4,065	5,000	5,565	5,500

Table 3 - HDI+, HDI-L+ and HDI carbon steel ultimate loads in concrete (lb)¹

Nominal anchor diameter in.	$f'_c = 2,000$		$f'_c = 4,000$		$f'_c = 6,000$	
	Tension	Shear	Tension	Shear	Tension	Shear
1/4	1,995	1,800	2,270	2,500	3,150	2,800
3/8	2,540	3,850	3,685	5,000	5,035	6,000
1/2	3,780	6,000	6,425	8,500	7,810	10,000
5/8	7,500	1,000	11,685	13,000	14,865	15,000
3/4	10,000	15,500	16,260	20,000	22,250	22,000

1 The shear tests were conducted with SAE Grade 5 bolts with minimum yield strength of 85 ksi and minimum tension strength of 120 ksi. Shear testing for the 1/4-in. models were conducted with SAE Grade 8 bolts with minimum yield strength of 120 ksi and minimum tension strength of 150 ksi in 6,000 psi concrete. High-strength bolts were used to force concrete failure modes. When using steel bolts with a lower tensile strength, steel failure must be considered.

2 Allowable loads calculated with a factor of safety of 4.

Table 4 - HDI+, HDI-L+ and HDI carbon steel allowable loads in lightweight concrete and lightweight concrete poured over metal deck (lb)^{1,2,3,4}

Nominal anchor diameter in.	Lightweight concrete		Lightweight concrete poured over metal deck			
			Upper flute		Lower flute	
	Tension	Shear	Tension	Shear	Tension	Shear
1/4	465	340	530	335	375	250
3/8	720	940	810	1,010	500	500
1/2	1,035	1,700	1,035	1,755	625	750
5/8	1,465	2,835			875	875
3/4	2,075	3,680			1,250	1,000

1 The shear tests were conducted with SAE Grade 5 bolts with minimum yield strength of 85 ksi and minimum tension strength of 120 ksi. Shear testing for the 1/4-in. models were conducted with SAE Grade 8 bolts with minimum yield strength of 120 ksi and minimum tension strength of 150 ksi in 6,000 psi concrete. High-strength bolts were used to force concrete failure modes. When using steel bolts with a lower tensile strength, steel failure must be considered.

2 Minimum compressive strength of structural lightweight concrete is 3,000 psi.

3 See figure 1 for typical details.

4 Allowable loads calculated with a factor of safety of 4.

Table 5 - HDI stainless steel allowable loads in concrete (lb)^{1,2,3}

Nominal anchor diameter in.	$f'_c = 4,000$		$f'_c = 6,000$	
	Tension	Shear	Tension	Shear
1/4	480	600	740	600
3/8	1,040	1,230	1,460	1,230
1/2	1,840	2,760	2,410	2,760
5/8	2,630	4,510	3,770	4,510
3/4	3,830	5,580	5,030	5,580

Table 6 - HDI stainless steel ultimate loads in concrete (lb)^{1,2}

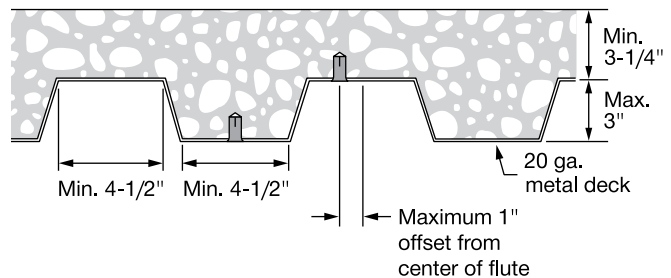
Nominal anchor diameter in.	$f'_c = 4,000$		$f'_c = 6,000$	
	Tension	Shear	Tension	Shear
1/4	1,930	2,400	2,950	2,400
3/8	4,170	4,920	5,850	4,920
1/2	7,350	11,040	9,630	11,040
5/8	10,540	18,040	15,100	18,040
3/4	15,340	22,320	20,130	22,320

1 Stainless steel models available in HDI version only.

2 Shear testing conducted with 18-8 stainless steel bolts.

3 Allowable loads calculated with a factor of safety of 4.

Figure 1 - Installation of HDI drop-in anchor in the soffit of concrete over metal deck floor and roof assemblies W – deck

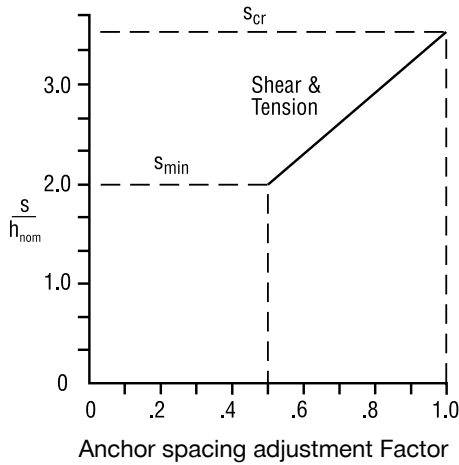


HDI, HDI-L, HDI+ and HDI-L+ Drop-in Anchor 3.3.11

Anchor spacing and edge distance guidelines

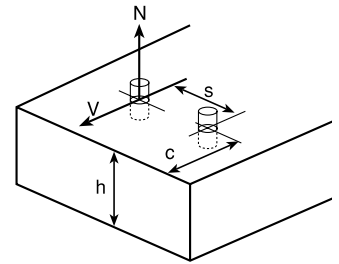
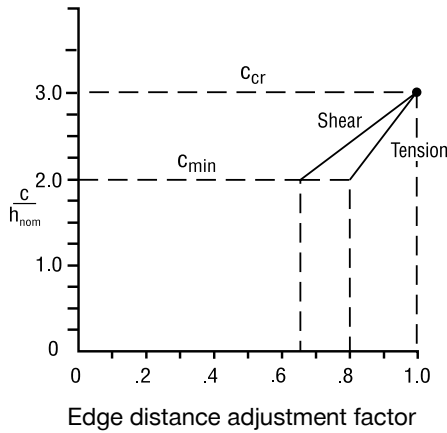
Anchor spacing adjustment factors

- 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 and 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} = nominal embedment depth

Table 7 - Load adjustment factors for HDI drop-in anchors in concrete

Load adjustment factors for anchor spacing f_A							Load adjustment factors for 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												

$s_{min} = 2.0 h_{nom}$ $s_{cr} = 3.5 h_{nom}$ $f_A = 0.33 \frac{s}{h_{nom}} - 0.17$ 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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3.3.11

3.3.11 HDI, HDI-L, HDI+ and HDI-L+ Drop-in Anchor

3.3.11.4 Installation instructions

Manufacturer's Printed Installation Instructions (MPII) are included with each product package. They can also be viewed or downloaded at www.us.hilti.com (U.S.) and www.hilti.ca (Canada). Because of the possibility of changes, always verify that downloaded MPII are current when used. Proper installation is critical to achieve full performance. Training is available on request. Contact Hilti Technical Services for applications and conditions not addressed in the MPII.

3.3.11.5 Ordering information¹

HDI+, HDI-L+ and HDI

Carbon steel

Description	Description	Anchor thread size	Qty / box
HDI+ 1/4	HDI-L+ 1/4	1/4	100
HDI+ 3/8	HDI-L+ 3/8	3/8	50
HDI+ 1/2	HDI-L+ 1/2	1/2	50
HDI 5/8	-	5/8	25
HDI 3/4	-	3/4	25

HDI-SS anchors

Stainless steel

Description	Anchor thread size	Qty / box
HDI 1/4 SS303	1/4	100
HDI 3/8 SS303	3/8	50
HDI 1/2 SS303	1/2	50
HDI 5/8 SS303	5/8	25
HDI 3/4 SS303	3/4	25

Setting tools for HDI and HDI-SS anchors

Description	Anchor thread size
HST 5/8 Setting Tool	5/8
HST 3/4 Setting Tool	3/4



Setting Tools for HDI+ and HDI-L+

Anchor thread size	Description
1/4	HST 1/4 Setting tool
	HSD-MM 1/4 (TE-C-24D6 1/4 Setting tool)
	HDI+ Setting Tool includes a TE-CX 3/8x1 carbide bit
3/8	HST 3/8 Setting tool
	HSD-MM 3/8 (TE-C-24SD10 3/8 Setting tool)
	HDI+ Setting Tool includes a TE-CX 1/2x1-9/16 carbide bit
1/2	HST 1/2 Setting tool
	HSD-MM 1/2 (TE-C-24SD12 1/2 Setting tool)
	HDI+ Setting Tool includes a TE-CX 5/8x2 carbide bit



¹ All dimensions in inches