



The following excerpt are pages from the North American Masonry Anchor Strength Design Guide 2024.

Please refer to the publication in its entirety for complete details on this product including data development, product specifications, general suitability, installation, and spacing and edge distance guidelines.

US&CA: [Hilti North American Product Technical Guides](#)

To consult directly with a team member regarding our anchor fastening products, contact Hilti's team of technical support specialists between the hours of 7:00am – 5:00pm CST.


US: 877-749-6337 or HNATechnicalServices@hilti.com

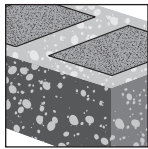
CA: 1-800-363-4458 or CATechnicalServices@hilti.com

7.7 KB1 EXPANSION ANCHOR

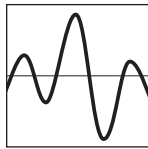
PRODUCT DESCRIPTION

KB1 Expansion Anchor

Anchor System	Features and Benefits
<p>Carbon Steel KB1</p> 	<ul style="list-style-type: none"> • Instructions For Use (IFU) provides multiple installation methods including Hilti Hollow Drill bit, or no hole cleaning with hammer drill and Hilti Dust Removal System (DRS) for virtually dustless installation (OSHA 1926.1153 Table 1 compliant). • Product and length identification marks facilitate quality control after installation. • Maximized thread lengths and multiple embedment depths to accommodate various base plate thicknesses. • Functional coatings and profiled expansion wedges provide increased reliability. • Mechanical expansion allows immediate load application. • Raised impact section (dog point) prevents thread damage during installation.



Grout-filled concrete masonry



Seismic Design Categories A-F



Profis Engineering design software



Hollow Drill Bit

Approvals/ Listings

<p>IAPMO Uniform ES</p> <ul style="list-style-type: none"> • 2021 International Building Code / International Residential Code (IBC/IRC) 	<p>ER-677 in grout-filled CMU per AC01</p>
<p>City of Los Angeles</p>	<p>2023 LABC Supplement (within ER-677)</p>
<p>Florida Building Code</p>	<p>2023 FBC Supplement with HVHZ (within ER-677)</p>



MATERIAL SPECIFICATIONS

Carbon steel with electroplated zinc

- Hilti KB1 anchor bodies manufactured from carbon steel with Fe/Zn plating per ASTM F1941 to a minimum thickness of 5 μm .
- Nuts conform to the requirements of ASTM A563, Grade A, Hex.
- Washers conform to the requirements of ASTM F844.
- Expansion sleeves (wedges) are manufactured from carbon steel.

INSTALLATION PARAMETERS

Table 1 – KB1 Installation Information – Fully Grouted CMU Construction – Face of Wall

Setting information	Symbol	Units	Nominal anchor diameter (in)						
			3/8	1/2		5/8		3/4	
Nominal drill bit diameter	d_o	in.	3/8	1/2		5/8		3/4	
Effective minimum embedment	h_{ef}	in. (mm)	2 (51)	2 (51)	3 1/4 (83)	2 3/4 (70)	4 (102)	3 1/4 (83)	4 3/4 (121)
Nominal embedment	h_{nom}	in. (mm)	2 3/8 (60)	2 3/8 (60)	3 5/8 (92)	3 1/4 (83)	4 1/2 (114)	4 (102)	5 1/2 (140)
Minimum hole depth	h_o	in. (mm)	2 3/4 (70)	2 3/4 (70)	4 1/4 (108)	3 3/4 (95)	4 3/4 (121)	4 1/4 (108)	5 3/4 (146)
Fixture hole diameter	d_h	in. (mm)	7/16 (11.1)	9/16 (14.3)		11/16 (17.5)		13/16 (20.6)	
Installation torque	T_{inst}	ft-lb (Nm)	15 (20.3)	25 (33.9)		35 (47.5)		50 (67.8)	
Minimum Masonry Thickness	h_{min}	in. (mm)	7 5/8 (194)						
Minimum Distance to Hollow Head Joint ¹	$c_{min,HJ}$	in. (mm)	2 1/2 (64)	2 1/2 (64)		2 1/2 (64)		2 1/2 (64)	
Minimum Edge Distance	c_{min}	in. (mm)	4 (102)	4 (102)		4 (102)		4 (102)	
Minimum Anchor Spacing	s_{min}	in. (mm)	6 (152)	5 (127)		5 (127)		6 (152)	

¹ The minimum distance to hollow head joint is measured from the center of an anchor to the centerline of a hollow head joint (vertical mortar joint).

Figure 1 – Hilti KB1 Installation Parameters

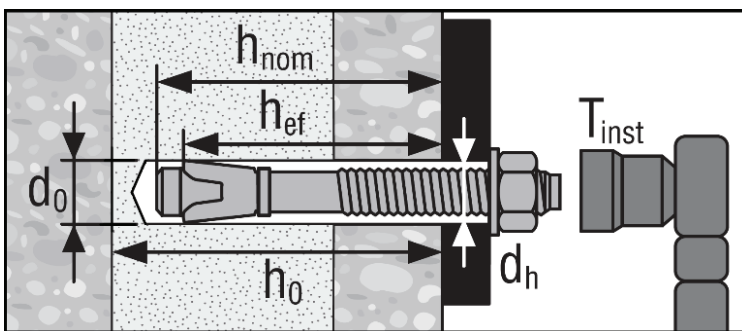


Table 2 — Hilti KB1 design strength with masonry failure modes in the face of uncracked fully grouted CMU walls ^{1,2,3,4}

Nominal anchor diameter in.	Effective embedment in. (mm)	Tension (lesser of breakout / pullout) - ΦN_n				Shear (lesser of prying or crushing) - ΦV_n			
		$f'_m = 1500$ psi (10.3 MPa) lb (kN)	$f'_m = 2000$ psi (13.8 MPa) lb (kN)	$f'_m = 2500$ psi (17.2 MPa) lb (kN)	$f'_m = 3000$ psi (20.7 MPa) lb (kN)	$f'_m = 1500$ psi (10.3 MPa) lb (kN)	$f'_m = 2000$ psi (13.8 MPa) lb (kN)	$f'_m = 2500$ psi (17.2 MPa) lb (kN)	$f'_m = 3000$ psi (20.7 MPa) lb (kN)
3/8	2 (51)	760 (3.4)	760 (3.4)	760 (3.4)	760 (3.4)	1,305 (5.8)	1,505 (6.7)	1,685 (7.5)	1,845 (8.2)
	3-1/4 (83)	1,965 (8.7)	1,965 (8.7)	1,965 (8.7)	1,965 (8.7)	3,085 (13.7)	3,315 (14.7)	3,505 (15.6)	3,670 (16.3)
1/2	2 (51)	1,025 (4.6)	1,185 (5.3)	1,320 (5.9)	1,350 (6.0)	1,305 (5.8)	1,505 (6.7)	1,685 (7.5)	1,845 (8.2)
	3-1/4 (83)	1,965 (8.7)	1,965 (8.7)	1,965 (8.7)	1,965 (8.7)	3,085 (13.7)	3,315 (14.7)	3,505 (15.6)	3,670 (16.3)
5/8	2-3/4 (70)	1,950 (8.7)	2,000 (8.9)	2,000 (8.9)	2,000 (8.9)	3,465 (15.4)	3,725 (16.6)	3,935 (17.5)	4,120 (18.3)
	4 (102)	2,945 (13.1)	2,945 (13.1)	2,945 (13.1)	2,945 (13.1)	3,465 (15.4)	3,725 (16.6)	3,935 (17.5)	4,120 (18.3)
3/4	3-1/4 (83)	2,300 (10.2)	2,300 (10.2)	2,300 (10.2)	2,300 (10.2)	3,805 (16.9)	4,090 (18.2)	4,325 (19.2)	4,530 (20.2)
	4-3/4 (121)	3,245 (14.4)	3,245 (14.4)	3,245 (14.4)	3,245 (14.4)	3,805 (16.9)	4,090 (18.2)	4,325 (19.2)	4,530 (20.2)

- 1 Linear interpolation between embedment depths and masonry compressive strengths is not permitted.
- 2 Tabular values are for a single anchor with no influence from nearby edges, hollow head joints, or additional anchors. For designs with the influence of nearby edges, hollow head joints, or additional anchors, use Hilti PROFIS Engineering Design software or perform anchor calculation using design equations from AC01.
- 3 Compare masonry tabular values to the steel values in Table 6. The lesser of the values is to be used for the design.
- 4 Tabular values are for static loads only. Seismic design is not permitted for uncracked masonry.

Table 3 — Hilti KB1 design strength with masonry failure modes in the face of cracked fully grouted CMU walls ^{1,2,3,4}

Nominal anchor diameter in.	Effective embedment in. (mm)	Tension (lesser of breakout / pullout) - ΦN_n				Shear (lesser of prying or crushing) - ΦV_n			
		$f'_m = 1500$ psi (10.3 MPa) lb (kN)	$f'_m = 2000$ psi (13.8 MPa) lb (kN)	$f'_m = 2500$ psi (17.2 MPa) lb (kN)	$f'_m = 3000$ psi (20.7 MPa) lb (kN)	$f'_m = 1500$ psi (10.3 MPa) lb (kN)	$f'_m = 2000$ psi (13.8 MPa) lb (kN)	$f'_m = 2500$ psi (17.2 MPa) lb (kN)	$f'_m = 3000$ psi (20.7 MPa) lb (kN)
3/8	2 (51)	570 (2.5)	570 (2.5)	570 (2.5)	570 (2.5)	920 (4.1)	1,065 (4.7)	1,190 (5.3)	1,300 (5.8)
	3-1/4 (83)	980 (4.4)	980 (4.4)	980 (4.4)	980 (4.4)	3,085 (13.7)	3,315 (14.7)	3,505 (15.6)	3,670 (16.3)
1/2	2 (51)	675 (3.0)	675 (3.0)	675 (3.0)	675 (3.0)	920 (4.1)	1,065 (4.7)	1,190 (5.3)	1,300 (5.8)
	3-1/4 (83)	980 (4.4)	980 (4.4)	980 (4.4)	980 (4.4)	3,085 (13.7)	3,315 (14.7)	3,505 (15.6)	3,670 (16.3)
5/8	2-3/4 (70)	1,380 (6.1)	1,590 (7.1)	1,600 (7.1)	1,600 (7.1)	2,965 (13.2)	3,425 (15.2)	3,830 (17.0)	4,120 (18.3)
	4 (102)	2,355 (10.5)	2,355 (10.5)	2,355 (10.5)	2,355 (10.5)	3,465 (15.4)	3,725 (16.6)	3,935 (17.5)	4,120 (18.3)
3/4	3-1/4 (83)	1,335 (5.9)	1,335 (5.9)	1,335 (5.9)	1,335 (5.9)	3,805 (16.9)	4,090 (18.2)	4,325 (19.2)	4,530 (20.2)
	4-3/4 (121)	1,880 (8.4)	1,880 (8.4)	1,880 (8.4)	1,880 (8.4)	3,805 (16.9)	4,090 (18.2)	4,325 (19.2)	4,530 (20.2)

- 1 Linear interpolation between embedment depths and masonry compressive strengths is not permitted.
- 2 Tabular values are for a single anchor with no influence from nearby edges, hollow head joints, or additional anchors. For designs with the influence of nearby edges, hollow head joints, or additional anchors, use Hilti PROFIS Engineering Design software or perform anchor calculation using design equations from AC01.
- 3 Compare masonry tabular values to the steel values in Table 6. The lesser of the values is to be used for the design.
- 4 Tabular values are for static loads only. For seismic loads, multiply design strength values in tension and shear by 0.75.

Table 4 — Hilti KB1 design strength with masonry failure modes in the face of uncracked fully grouted CMU walls and installed at minimum distance from centerline of hollow head joint^{1,2,3,4}

Nominal anchor diameter in.	Effective embedment in. (mm)	Tension (lesser of breakout or pullout) - ΦN_n				Shear (lesser of breakout, pryout, or crushing) - ΦV_n			
		$f'_m = 1500$ psi (10.3 MPa) lb (kN)	$f'_m = 2000$ psi (13.8 MPa) lb (kN)	$f'_m = 2500$ psi (17.2 MPa) lb (kN)	$f'_m = 3000$ psi (20.7 MPa) lb (kN)	$f'_m = 1500$ psi (10.3 MPa) lb (kN)	$f'_m = 2000$ psi (13.8 MPa) lb (kN)	$f'_m = 2500$ psi (17.2 MPa) lb (kN)	$f'_m = 3000$ psi (20.7 MPa) lb (kN)
3/8	2 (51)	760 (3.4)	760 (3.4)	760 (3.4)	760 (3.4)	1,075 (4.8)	1,240 (5.5)	1,390 (6.2)	1,520 (6.8)
	2 (51)	845 (3.8)	975 (4.3)	1,090 (4.8)	1,195 (5.3)	1,075 (4.8)	1,240 (5.5)	1,390 (6.2)	1,520 (6.8)
1/2	3-1/4 (83)	1,315 (5.8)	1,520 (6.8)	1,700 (7.6)	1,865 (8.3)	1,920 (8.5)	2,220 (9.9)	2,480 (11.0)	2,715 (12.1)
	2-3/4 (70)	1,320 (5.9)	1,525 (6.8)	1,705 (7.6)	1,870 (8.3)	1,985 (8.8)	2,295 (10.2)	2,565 (11.4)	2,810 (12.5)
5/8	4 (102)	1,935 (8.6)	2,235 (9.9)	2,495 (11.1)	2,735 (12.2)	2,140 (9.5)	2,475 (11.0)	2,765 (12.3)	3,030 (13.5)
	3-1/4 (83)	1,555 (6.9)	1,800 (8.0)	2,010 (8.9)	2,200 (9.8)	2,170 (9.7)	2,505 (11.1)	2,800 (12.5)	3,070 (13.7)
3/4	4-3/4 (121)	2,340 (10.4)	2,700 (12.0)	3,020 (13.4)	3,245 (14.4)	2,340 (10.4)	2,705 (12.0)	3,020 (13.4)	3,310 (14.7)

- 1 Linear interpolation between embedment depths and masonry compressive strengths is not permitted.
- 2 Tabular values are for a single anchor located 2.5-in from centerline of a hollow head joint with no additional influence from nearby edges or additional anchors. For designs with the influence of nearby edges, different distances to a hollow head joint, or additional anchors, use Hilti PROFIS Engineering Design software or perform anchor calculation using design equations from AC01.
- 3 Compare masonry tabular values to the steel values in Table 6. The lesser of the values is to be used for the design.
- 4 Tabular values are for static loads only. Seismic design is not permitted for uncracked masonry.

Table 5 — Hilti KB1 design strength with masonry failure modes in the face of cracked fully grouted CMU walls and installed at minimum distance from centerline of hollow head joint^{1,2,3,4}

Nominal anchor diameter in.	Effective embedment in. (mm)	Tension (lesser of breakout or pullout) - ΦN_n				Shear (lesser of breakout, pryout, or crushing) - ΦV_n			
		$f'_m = 1500$ psi (10.3 MPa) lb (kN)	$f'_m = 2000$ psi (13.8 MPa) lb (kN)	$f'_m = 2500$ psi (17.2 MPa) lb (kN)	$f'_m = 3000$ psi (20.7 MPa) lb (kN)	$f'_m = 1500$ psi (10.3 MPa) lb (kN)	$f'_m = 2000$ psi (13.8 MPa) lb (kN)	$f'_m = 2500$ psi (17.2 MPa) lb (kN)	$f'_m = 3000$ psi (20.7 MPa) lb (kN)
3/8	2 (51)	570 (2.5)	570 (2.5)	570 (2.5)	570 (2.5)	760 (3.4)	875 (3.9)	980 (4.4)	1,075 (4.8)
	2 (51)	595 (2.6)	675 (3.0)	675 (3.0)	675 (3.0)	760 (3.4)	875 (3.9)	980 (4.4)	1,075 (4.8)
1/2	3-1/4 (83)	930 (4.1)	980 (4.4)	980 (4.4)	980 (4.4)	1,370 (6.1)	1,585 (7.1)	1,770 (7.9)	1,940 (8.6)
	2-3/4 (70)	935 (4.2)	1,080 (4.8)	1,205 (5.4)	1,320 (5.9)	1,420 (6.3)	1,640 (7.3)	1,830 (8.1)	2,005 (8.9)
5/8	4 (102)	1,365 (6.1)	1,575 (7.0)	1,765 (7.9)	1,930 (8.6)	1,530 (6.8)	1,765 (7.9)	1,975 (8.8)	2,165 (9.6)
	3-1/4 (83)	1,100 (4.9)	1,270 (5.6)	1,335 (5.9)	1,335 (5.9)	1,550 (6.9)	1,790 (8.0)	2,000 (8.9)	2,190 (9.7)
3/4	4-3/4 (121)	1,650 (7.3)	1,880 (8.4)	1,880 (8.4)	1,880 (8.4)	1,670 (7.4)	1,930 (8.6)	2,160 (9.6)	2,365 (10.5)

- 1 Linear interpolation between embedment depths and masonry compressive strengths is not permitted.
- 2 Tabular values are for a single anchor located 2.5-in from centerline of a hollow head joint with no additional influence from nearby edges or additional anchors. For designs with the influence of nearby edges, different distances to a hollow head joint, or additional anchors, use Hilti PROFIS Engineering Design software or perform anchor calculation using design equations from AC01.
- 3 Compare masonry tabular values to the steel values in Table 6. The lesser of the values is to be used for the design.
- 4 Tabular values are for static loads only. For seismic loads, multiply design strength values in tension and shear by 0.75.

Table 6 — Hilti KB1 design strength based on steel failure per ACI 318 Ch. 17 ¹

Nominal anchor diameter in.	Tensile ³ ΦN_{sa} lb (kN)	Shear ⁴ ΦV_{sa} lb (kN)	Seismic Shear ⁵ ΦV_{sa} lb (kN)
3/8	4,760 (21.2)	1,170 (5.2)	1,170 (5.2)
1/2	8,145 (36.2)	1,970 (8.8)	1,970 (8.8)
5/8	12,875 (57.3)	3,460 (15.4)	3,460 (15.4)
3/4	18,220 (81.0)	4,985 (22.2)	4,985 (22.2)
3/4x12 ¹	15,790 (70.2)	4,600 (20.5)	4,600 (20.5)

1 Hilti KB1 anchors are to be considered ductile steel elements with the exception of the 3/4 x 12 KB1, which is a brittle steel element.

2 Tensile $\Phi N_{sa} = \Phi A_{se,N} f_{uta}$ as noted in ACI 318 Ch. 17.

3 Shear values determined by static shear tests with $\Phi V_{sa} < \Phi 0.60 A_{se,V} f_{uta}$ as noted in ACI 318 Ch. 17.

4 Seismic shear values determined by seismic shear tests with $\Phi V_{sa} \leq \Phi 0.60 A_{se,V} f_{uta}$ as noted in ACI 318 Ch. 17. See Section 3.1.8 for additional information on seismic applications.

INSTALLATION INSTRUCTIONS

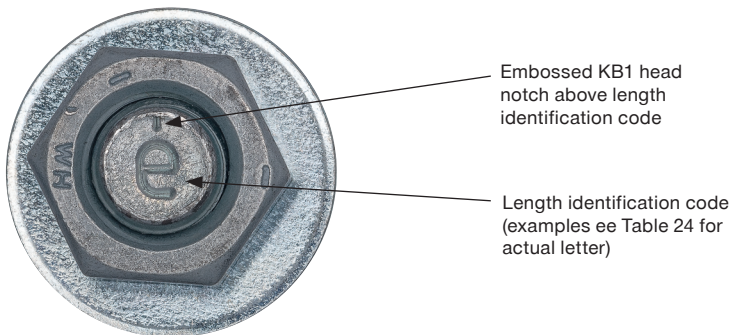
Installation Instructions For Use (IFU) are included with each product package. They can also be viewed or downloaded online at www.hilti.com. Because of the possibility of changes, always verify that downloaded IFU are current when used. Proper installation is critical to achieve full performance. Training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

ORDERING INFORMATION

Table 7 — Hilti KB1 product portfolio

Description	Length (in)	Length ident. letter	Thread length (in)	Nominal embed. 1 (in)	Min. fixture thickness 1 (in)	Max. fixture thickness 1 (in)	Nominal embed. 2 (in)	Min. fixture thickness 2 (in)	Max. fixture thickness 2 (in)	Packaging quantity
KB1 3/8x2 1/2	2-1/2	c	1	1-7/8	0	1/4	-	-	-	50
KB1 3/8x3	3	d	1-5/8	1-7/8	0	3/4	2-3/8	0	1/4	50
KB1 3/8x3 3/4	3-3/4	e	2-3/8	1-7/8	0	1-1/2	2-3/8	0	1	50
KB1 3/8x5	5	h	3-5/8	1-7/8	0	2-3/4	2-3/8	0	2-1/4	50
KB1 1/2x3	3	d	1-1/8	2-3/8	0	1/16	-	-	-	20
KB1 1/2x3 3/4	3-3/4	e	2	2-3/8	0	3/4	-	-	-	20
KB1 1/2x4 1/2	4-1/2	g	2-5/8	2-3/8	0	1-1/2	3-5/8	0	1/4	20
KB1 1/2x5 1/2	5-1/2	i	3-5/8	2-3/8	0	2-1/2	3-5/8	0	1-1/4	20
KB1 1/2x7	7	l	4-1/2	2-3/8	1/2	4	3-5/8	0	2-3/4	20
KB1 5/8x4 1/4	4-1/4	f	2-1/4	3-1/4	0	3/8	-	-	-	15
KB1 5/8x4 3/4	4-3/4	g	2-3/4	3-1/4	0	7/8	-	-	-	15
KB1 5/8x6	6	j	4	3-1/4	0	2-1/8	4-1/2	0	7/8	15
KB1 5/8x7	7	l	5	3-1/4	0	3-1/8	4-1/2	0	1-7/8	15
KB1 5/8x8 1/2	8-1/2	o	6-1/2	3-1/4	0	4-5/8	4-1/2	0	3-3/8	15
KB1 3/4x4 3/4	4-3/4	g	2-1/2	4	0	1/8	-	-	-	10
KB1 3/4x5 1/2	5-1/2	i	3-1/4	4	0	7/8	-	-	-	10
KB1 3/4x7	7	l	4	4	0	2-3/8	5-1/2	0	7/8	10
KB1 3/4x8	8	n	5	4	0	3-3/8	5-1/2	0	1-7/8	10
KB1 3/4x10	10	r	7	4	0	5-3/8	5-1/2	0	3-7/8	10
KB1 3/4x12	12	t	6	4	2-5/8	7-3/8	5-1/2	1-1/8	5-7/8	10

Figure 2 — Bolt head with length identification mark and KB1 head notch embossment





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