



The following pages are an excerpt from the North American Product Technical Guide, Volume 1: Direct Fastening Technical Guide, Edition 21.

Please refer to the publication in its entirety for complete details on this product including data development, base materials, general suitability, installation, corrosion, and product specifications.

[Direct Fastening Technical Guide, Edition 21](#)

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

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## 3.5.7 X-HVB SHEAR CONNECTOR

### 3.5.7.1 PRODUCT DESCRIPTION

The Hilti X-HVB Shear Connector is a shear transfer device mechanically attached with Hilti X-ENP-21 HVB powder-actuated fasteners (Note: Do not use Hilti X-ENP-19 L15 fasteners) for use in composite beam construction with steel beams and concrete slabs as an alternate to welded studs.

#### Product features

- Ductile connections
- Minimal damage to coatings
- Faster and simpler installation
- Install in virtually any weather
- No electrical power source required

3.5.7.1 Product description

3.5.7.2 Material specifications

3.5.7.3 Technical data

3.5.7.4 Connector positioning

3.5.7.5 Ordering information

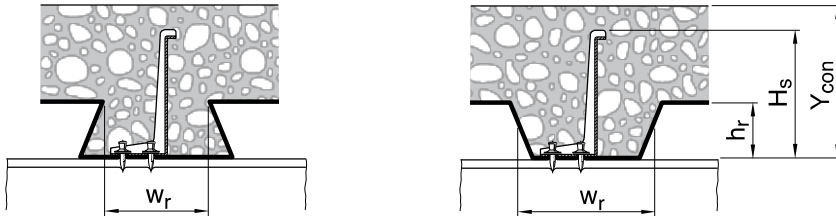


### 3.5.7.2 MATERIAL SPECIFICATION

X-HVB: Carbon Steel with  $F_u = 39,000$  psi

Zinc plated for corrosion resistance in accordance with ASTM B633, SC 1, Type III. Reference Section 2.3.3.1 of Hilti North American Product Technical Guide Volume 1: Direct Fastening for more information.

### 3.5.7.3 TECHNICAL DATA



#### Product selection and performance in concrete over metal deck composite floor slabs<sup>3,4</sup>

X-HVB connector	Connector height, $H_s$ in. (mm)	Minimum slab thickness, $Y_{con}$ in. (mm)	Maximum rib height, $h_r$ in. (mm)		Nominal shear strength <sup>1</sup> , $Q_n$ lb (kN)	Allowable shear strength <sup>2</sup> , $q$ lb (kN)
			$w_r/h_r \geq 1.8$	$w_r/h_r < 1.8$		
X-HVB80	<b>3-1/8</b> (80)	<b>3-11/16</b> (93)	<b>1-3/4</b> (45)	<b>1-3/4</b> (45)	7308 (32.5)	3654 (16.3)
X-HVB95	<b>3-3/4</b> (95)	<b>4-1/4</b> (108)	<b>2-3/8</b> (60)	<b>2-1/4</b> (57)	7868 (35.0)	3934 (17.5)
X-HVB110	<b>4-5/16</b> (110)	<b>4-13/16</b> (123)	<b>2-15/16</b> (75)	<b>2-5/8</b> (66)	7868 (35.0)	3934 (17.5)
X-HVB125	<b>4-15/16</b> (125)	<b>5-7/16</b> (138)	<b>3-1/8</b> (80)	<b>2-15/16</b> (75)	8430 (37.5)	4215 (18.7)
X-HVB140	<b>5-1/2</b> <b>(140)</b>	<b>6</b> (152)	<b>3-1/8</b> (80)	<b>3-1/8</b> (80)	8430 (37.5)	4215 (18.7)

<sup>1</sup> Nominal shear strength to be used for designs per AISC-LRFD and unfactored shear resistance per AISC design formulas.

<sup>2</sup> Allowable shear strength to be used for designs per AISC-ASD.

<sup>3</sup> Nominal and allowable shear strength values may need to be reduced in certain cases, where the geometry of the connection and the shear demand dictate multiple shear connectors in a single deck rib. Please contact Hilti for additional information.

<sup>4</sup> Tabulated load values based upon installation in base steel greater than or equal to 5/16".

### Connector placement along the beams

The ductile performance of the Hilti X-HVB Shear Connector allows distribution of the calculated required number of X-HVB's uniformly between the points of zero and maximum moment.

### Point loads

Application of large point loads causes abrupt changes in shear. To avoid excessive slip, additional X-HVB connectors may be necessary between the point load and the support.

### Partial shear connection

AISC-LRFD and AISC-ASD both require that the capacity of the installed shear connectors must be no less than 25 to 50% of the calculated shear load for full composite design. This requirement is applicable, independent of whether welded studs or X-HVB's are used for the shear connection.

### Deflections

Beam deflections are computed by conventional elastic formulas. For beams with partial shear connection, deflections may be estimated by using the following formula for the effective moment of inertia:

$$I_{\text{eff}} = I_s + \sqrt{n} \times (I_{\text{tr}} - I_s)$$

$I_s$  = moment of inertia of steel section

$n$  = connection fraction

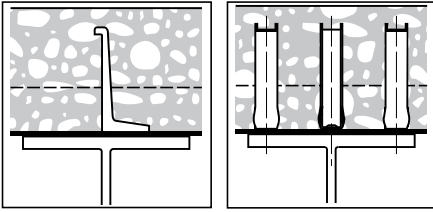
$I_{\text{tr}}$  = moment of inertia with 100% connection

### Continuous beams

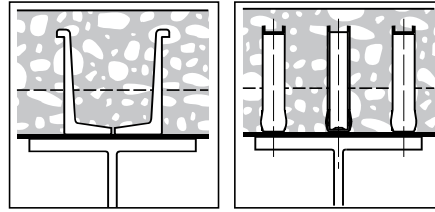
Hilti X-HVB Shear Connectors are also suitable for use in continuous composite beams. The connectors are distributed uniformly between the point of zero moment and the point of maximum moment.

### 3.5.7.4 CONNECTOR POSITIONING\*

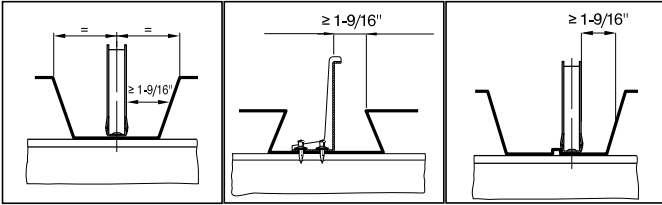
#### Connector positioning (metal decking ribs transverse to beam)



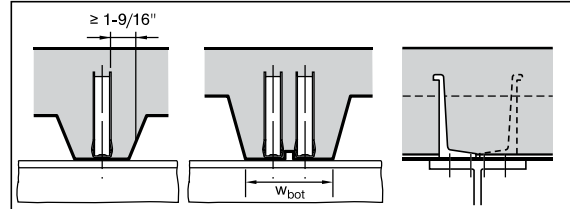
1. One to three X-HVB's per rib.



2. X-HVB's transverse or parallel to beam.

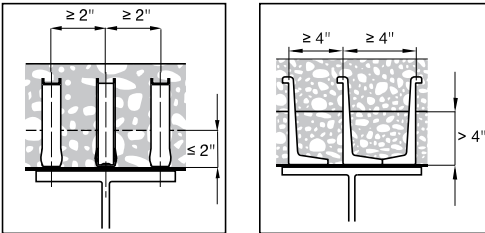


3. With one X-HVB per rib, the leg may be either centered in the rib or positioned to give a 1-9/16" (40 mm) clearance to the side of the rib.



$w_{bot} = 5"$  for 2" U.S. composite floor deck (X-HVB 95, 110, 125, 140)  
 $w_{bot} = 4.5"$  for 3" U.S. composite floor deck (X-HVB 125, 140)

4. With two or three X-HVB's per rib, the legs may be either centered in the rib or alternated about the center. If the decking has a stiffener in the bottom rib (as in case of 2" or 3" U.S. composite floor deck) position the X-HVB against the stiffener.

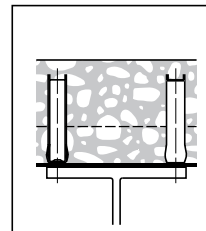
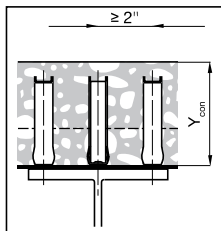
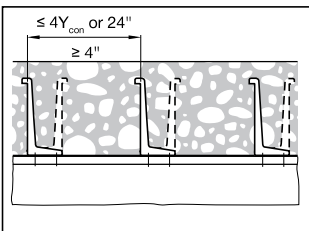


5a. Spacing along the ribs (2" and 3" U.S. composite floor deck profiles)

#### 5b. Spacings along the ribs (other decking profiles)

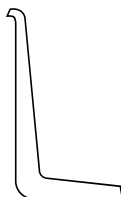
Minimum spacing  $\geq 2"$  (50 mm), however for decking profiles with:  $w_r/h_r < 1.8$ , the minimum spacing is increased from 2" to 4" (50 to 100 mm).

#### Connector positioning (ribs parallel to beam and solid slabs)



X-HVB's may be placed with zero clearance to edge of flange.

### 3.5.7.5 Ordering information



#### X-HVB Shear Connectors\*

Description	Qty/Pkg
X-HVB80	250
X-HVB95	250
X-HVB110	250
X-HVB125	200
X-HVB140	120

#### Setting Equipment for X-HVB Shear Connectors

Description
DX-76
X-76-F-HVB Baseplate
X-76-P-HVB Piston
X-76-PS Stop Ring

\* X-HVB shear connectors must be fastened with the X-76-F-HVB fastener guide, the X-76-P-HVB piston and the X-ENP-21 HVB fastener.