

Quality People. Building Solutions.

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Date: 10/10/2023

Return Request: 10/16/2023

Project: ASU Mid-South RC & UC Chiller Replacement

Supplier: Comfort Systems USA (Arkansas), Inc.

Manufacturer: Various

Submittal: Hangers & Supports

Submittal Number: 23 05 29-01

Drawing # and Installation: Mechanical Drawings

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ENGINEER

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Notes:

CSUSA PROJECT NO.

23-1024

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Adjustable Clevis Hanger Fig. 260 (Formerly Afcon Fig. 371)

Size Range: ½" through 30"

Material: Carbon Steel

Finish: Plain, 8" & Smaller: Zinc Plated (Hot-Dip Galvanized optional), 10" & Larger: Hot-Dip Galvanized with Zinc Plated Bolts & Nuts, or Primed, also available in Plastic or Epoxy Coated.

Service: Recommended for the suspension of stationary pipe lines.

Maximum Temperature: Plain 650° F, Galvanized and Epoxy 450° F

Approvals: Complies with Federal Specification A-A-1192A (Type 1), WW-H-171-E (Type 1), ANSI/MSS SP-69 and MSS SP-58 (Type 1). FM Approved (Sizes ¾" through 8"), UL and ULC Listed (Sizes ½" through 8").

Installation: Hanger load nut above clevis must be tightened securely to assure proper hanger performance.

Adjustment: Vertical adjustment without removing pipe may be made from ¾" through 5/8", varying with the size of clevis. Tighten upper nut after adjustment.

Features:

- Design has yoke on outside of lower U-strap so yoke cannot slide toward center of bolt, thus bending of bolt is minimized.
- Sizes 5" and up have rod and two nuts instead of bolt and nut; thread length on clevis rod is such that the thread locks the nuts in place, and threads are not in shear plane.

Ordering:

Specify pipe size, figure number, name and finish.

Notes:

- Punched forming holes may be present on certain sizes of this clevis hanger. These holes are solely for the purpose of manufacturing, and do not effect the structural integrity or load carrying capacities of these hangers.
- For insulated line options without shields, see Figures 260 ISS and Figure 300. For insulated line options with shields, see Figures 167 and 168. For ductile iron pipe sizes, see Figure 590.
- Fig. 260F (Felt lined) – available for use for suspension of copper (or other material) so as to prevent electrolysis between the dissimilar metals of the hanger and the pipe, tube or conduit.

Caution:

When an oversize clevis is used, a pipe spacer or multispaceer should be placed over clevis bolt to ensure that the lower U-strap will not move in on the bolt.



PROJECT INFORMATION	APPROVAL STAMP
Project:	Approved
Address:	Approved as noted
Contractor:	Not approved
Engineer:	Remarks:
Submittal Date:	
Notes 1:	
Notes 2:	

Adjustable Clevis Hanger (Cont.) Fig. 260 (Formerly Afcon Fig. 371)

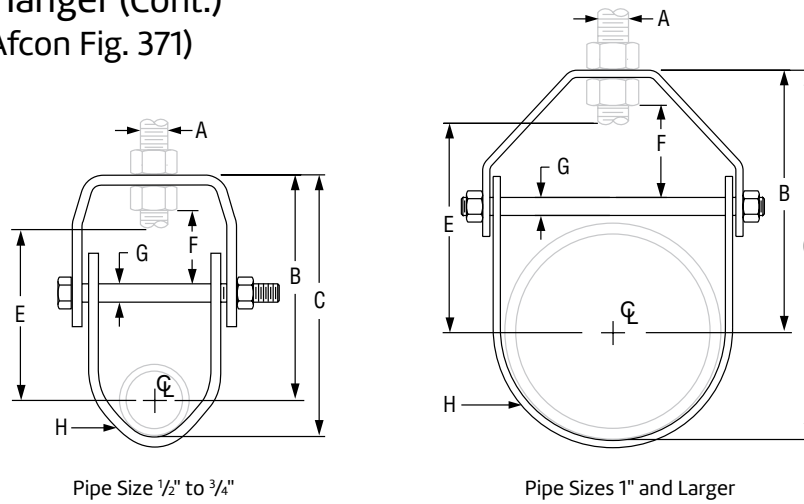


Fig. 260: Dimensions (in) • Loads (lbs) • Weight (lbs)

Pipe Size	Max Load	Span Ft.	Weight	Rod Size A	B	C	Rod Take Out E	Adjust. F	G	H Width Lower			
1/2	610	7*	0.34	3/8	2 ³ / ₁₆	2 ¹¹ / ₁₆	1 ¹ / ₂	5/8	1/4	1			
3/4			0.34		2						1 ⁵ / ₁₆		
1			0.35		2 ⁵ / ₁₆						3	1 ⁵ / ₈	
1 1/4	730	9*	0.40	1/2	2 ³ / ₈	3 ¹³ / ₁₆	2 ¹ / ₈	7/8	3/8	1 1/4			
1 1/2			0.45		2 ¹³ / ₁₆						3 ¹³ / ₁₆	2 ¹ / ₈	1 ¹ / ₈
2			0.50		3 ⁵ / ₁₆						4 ¹ / ₂	2 ⁵ / ₈	1 ⁵ / ₁₆
2 1/2	1,350	11*	0.65	5/8	4 ¹ / ₁₆	5 ¹ / ₂	3 ³ / ₁₆	1 ⁵ / ₈	3/8	1 1/4			
3			0.85		4 ³ / ₄						6 ¹ / ₂	4 ¹ / ₁₆	1 ⁵ / ₈
3 1/2			1.10		5 ¹ / ₁₆						7 ¹ / ₁₆	4 ³ / ₁₆	1 ¹³ / ₁₆
4	1,430	13*	1.51	3/4	5 ⁹ / ₁₆	7 ¹³ / ₁₆	4 ¹ / ₂	1 ¹¹ / ₁₆	3/8	1 3/16			
5			1.70		6 ⁹ / ₁₆						8 ¹⁵ / ₁₆	5 ¹ / ₂	1 ¹⁵ / ₁₆
6			3.10		6 ¹⁵ / ₁₆						10 ¹ / ₄	5 ³ / ₄	1 ¹¹ / ₁₆
8	2,000	16*	4.75	7/8	8 ³ / ₈	12 ¹¹ / ₁₆	7 ³ / ₁₆	2	1/2	1 7/16			
10			8.60		9 ⁷ / ₈						15 ¹ / ₄	8 ⁷ / ₁₆	2 ¹ / ₈
12			11.20		11 ⁹ / ₁₆						17 ¹⁵ / ₁₆	10 ¹ / ₈	2 ¹³ / ₁₆
14	3,600	19*	12.50	1	12 ⁹ / ₁₆	19 ⁹ / ₁₆	10 ¹¹ / ₁₆	2 ¹¹ / ₁₆	3/4	2			
16			19.85		14						22	12	2 ³ / ₄
18			22.25		15 ¹⁵ / ₁₆						24 ¹⁵ / ₁₆	13 ¹⁵ / ₁₆	3 ¹³ / ₁₆
20	4,800	22*	40.33	3/4	17 ⁹ / ₁₆	27 ⁹ / ₁₆	15 ³ / ₁₆	3 ⁷ / ₈	1/4	3			
24**			49.83		19 ¹³ / ₁₆						31 ¹³ / ₁₆	17 ⁵ / ₁₆	7 ⁵ / ₈ *
30***			70.18		24 ³ / ₁₆						39 ³ / ₁₆	21 ⁹ / ₁₆	5 ¹ / ₈

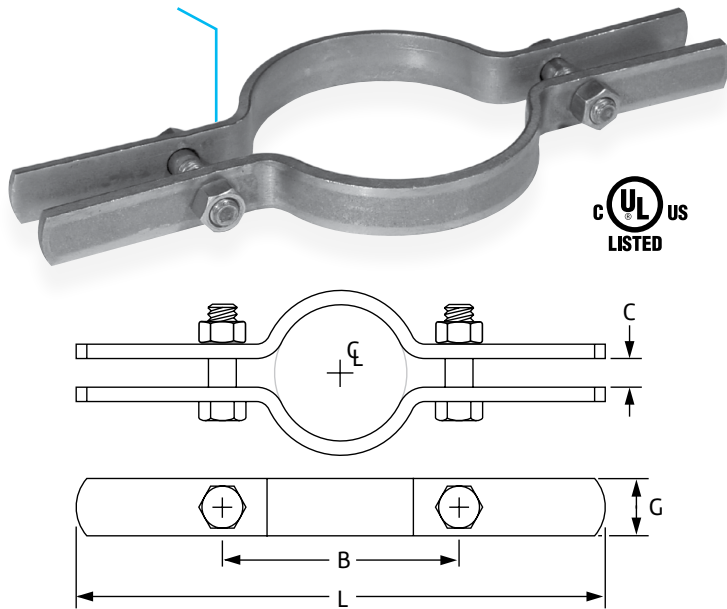
"Span" represents the maximum recommended distance between hangers on a continuous and straight run of horizontal standard weight steel pipe filled with water. In all cases, verify that chosen location of hangers does not subject hangers to a load greater than the maximum recommended load shown above.

*Indicates that span represents the maximum span for water filled pipe.

**The 24" pipe size assembly includes a 1 1/4" SCH 40 pipe spacer over the 7/8" threaded rod.

***The 30" pipe size assembly includes a 1 1/4" SCH 40 pipe spacer over the 1 1/4" threaded rod. When assembled, the U-strap sits outside of the yoke.

Extension Pipe or Riser Clamp Fig. 261 (Formerly Afcon Fig. 400)



Size Range: ¾" through 24"

Material: Carbon steel

Finish: Plain, Hot-Dip Galvanized with Zinc Plated
Bolts & Nuts, Epoxy Coated or Painted.

Service: For support of stationary steel pipe risers, cast iron pipe or conduit. This product is not intended for use with hanger rods. For this application refer to Fig. 40 Riser Clamp.

Maximum Temperature: Plain 650° F, Galvanized and Epoxy 450° F

Approvals: Complies with Federal Specification A-A-1192A (Type 8) WW-H-171-E (Type 8), ANSI/MSS SP-69 and MSS SP-58 (Type 8). UL, ULC Listed (Sizes 1½" – 8").

Installation: Clamp is fitted and bolted preferably below a coupling, hub or welded lugs on steel pipe. Bolt torques should be per industry standards (see page 248). Clamp is designed for standard steel pipe O.D. and this must be considered in sizing the riser for other types of piping.

Ordering: Specify pipe size, figure number, name and finish.

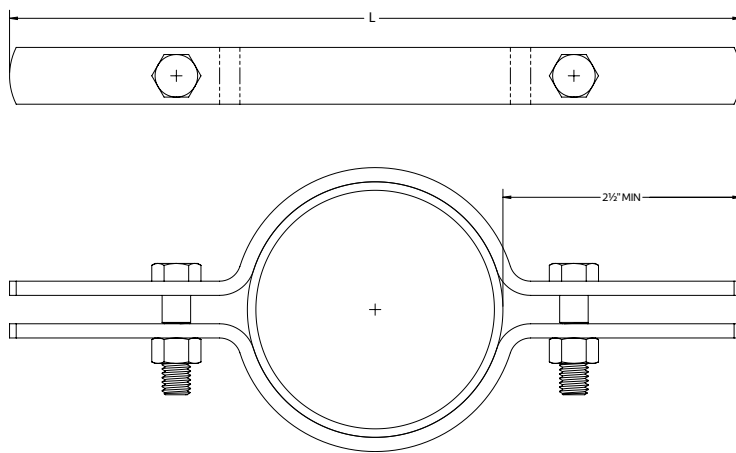
Note: Refer to Technical Data Section of the Pipe Hanger Catalog for cast iron soil pipe data.

Fig. 261: Dimensions (in) • Loads (lbs) • Torque (ft-lbs) • Weight (lbs)

Pipe Size	Max Load	Weight	L	G Width	B	C	Bolt Diameter	Torque Values
½ & ¾	220	1.1	8⅞	1	2⅞	¾	¾	21
1		1.1			3⅞			
1¼	250	1.6	10	1	3½	½	⅞	32
1½		1.6			3⅞			
2	300	1.7	10¼	1½	4¼	½	½	46
2½	400	1.9	11¼		4¾			
3	500	1.9	11⅜	2	5½	⅝	⅝	100
3½	600	2.3	12⅞		6½			
4	750	2.4	13¾	2½	7	¾	¾	150
5	1,500	3.6			8			
6	1,600	4.0	14¾	3	9	1	⅞	190
8	2,500	7.6	18½		12			
10		11.1	20¼	2	13¾	⅝	⅝	100
12	16.5	22¾	15¾					
14	2,700	17.7	24	2½	17¼	¾	¾	150
16	2,900	30.4	26		19¾			
18		33.8	28	3	21¾	1	⅞	190
20	35.0	30	23¾					
24	3,200	82.0	36¾	30	1	⅞	190	

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Light Duty Copper Tubing Riser Clamp Fig. 008CTG



Size Range: ½" through 6" CTS

Material: Carbon Steel

Finish: Epoxy coated

Service: Recommended for the suspension of stationary copper tube.

Maximum Temperature: 450° F

Approvals: MSS SP-58 (Type-8)

Installation: Clamp is to be fitted and bolted below a coupling or hub. Bolt torques should be per industry standards. Clamp is designed for standard copper tube O.D. and this must be considered in sizing the riser for other types of piping.

Ordering: Nominal pipe size and figure number.

Notes:

- For U.S. domestic product see Figure CT-121 copper tubing riser clamp.

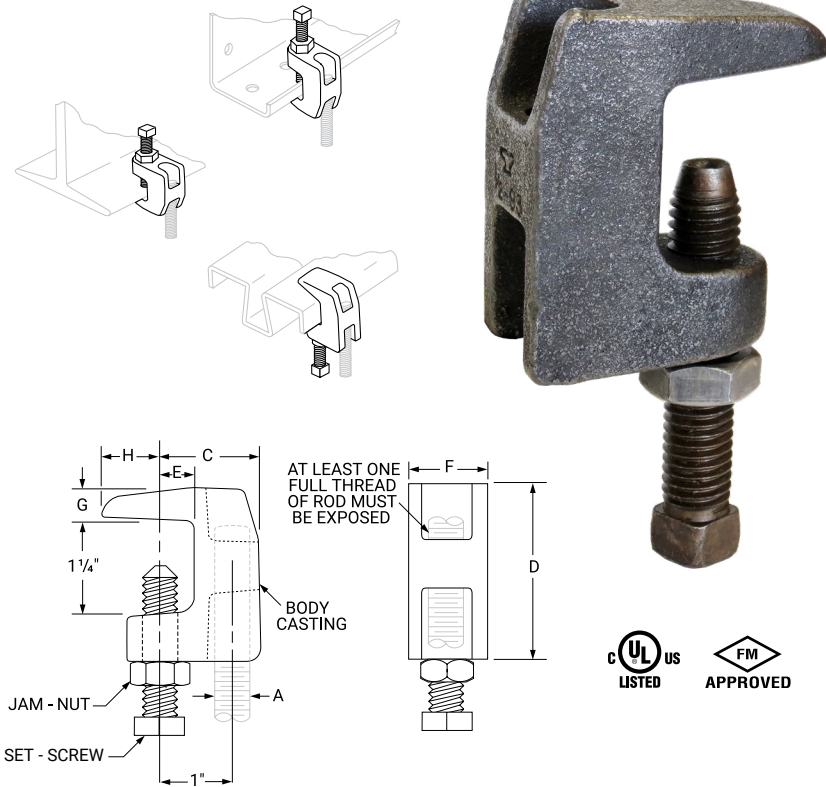
Fig. 008CTG: Dimensions (in) Loads (lbs)

Pipe Size	Max Load	Length
½	150	8½
¾	150	9¼
1	150	9 ⁵ / ₁₆
1¼	150	9½
1½	150	9 ⁵ / ₈
2	150	10 ⁷ / ₁₆
2½	150	11 ³ / ₁₆
3	200	11 ¹⁵ / ₁₆
4	250	12½
6	480	15 ³ / ₁₆



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Universal C-type Clamp (Wide Throat) Fig. 93 (Formerly Afcon Fig. 105)



Material Specifications

Size Range
3/8" and 1/2"

Material
Ductile iron, hardened steel cup point set screw and locknut.

Finish
Plain
Zinc Plated (Hot-Dip Galvanized optional)

Service
Recommended for use under roof installations with bar joist type construction, or for attachment to the top or bottom flange of structural shapes where the vertical hanger rod is required to be offset from the edge of the flange and where the thickness of joist or flange does not exceed 1/4".

Approvals
Complies with Federal Specification A-A-1192A (Type 19 & 23), WW-H-171-E (Type 23), ANSI/MSS SP-69 and MSS SP-58 (Type 19 & 23).
UL, ULC Listed and FM Approved.

How to size
Size of clamp is determined by size of rod to be used.

Installation
Follow recommended set screw torque values per MSS-SP-69.

- Features**
- They may be attached to horizontal flanges of structural members in either the top beam or bottom beam positions.
 - Secured in place by a cup-pointed Set Screw tightened against the flange. A Jam Nut is provided for tightening the Set Screw against the Body Casting.
 - Thru tapping of the body casting permits extended adjustment of the threaded rod.
 - Wider throat for attaching to flange with up to 1/4" thickness.

Ordering
Specify rod size, figure number, name of clamp and finish.

Available with oversized tapped rod hole for Hot Dip Galvanized finish.

Dimensions (In) - Load (Lbs) - Torque (In-Lbs) - Weight (Lbs)

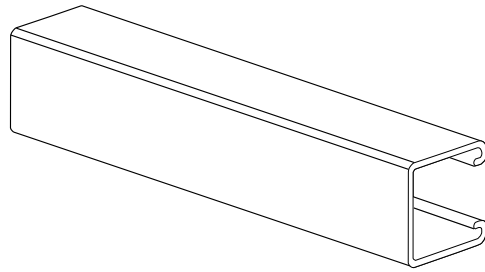
Rod Size A	Set Screw Size	Torque Value	Max Loads ■		Weight	C	D	E	F	G	H
			Top	Bottom							
3/8	3/8	60	500	250	0.41	1 5/16	2 5/32	9/16	13/16	3/8	5/8
1/2	1/2	125	950	760	0.75	1 3/8	2 11/32	1/2	1 1/16	7/16	13/16

Note:
■ Maximum temperature of 450° F



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Channel Fig. AS 200

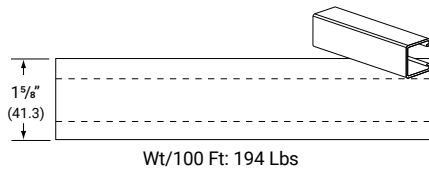


Description

Anvil-Strut channels are manufactured by a series of forming dies, or rolls, which progressively cold work the strip steel into the desired channel configuration. This method produces a cross section of uniform dimensions within a tolerance of plus or minus 0.015", on outside dimensions.

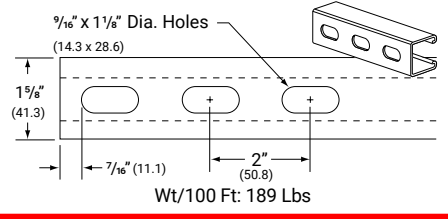
Solid AS 200

PL, GR, PG, SS, ZTC, HG



With Elongated Holes AS 200EH

PL, GR, PG, SS, ZTC, HG



Specifications

Size:

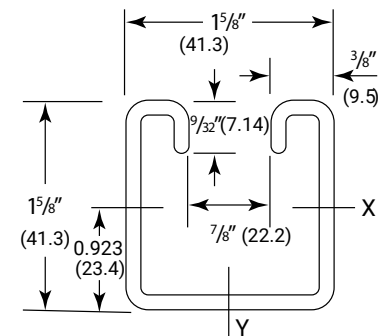
1 5/8" X 1 5/8" (41.3 x 41.3mm)
12 Gauge Channel • wt./100 ft. - 194 lbs.

Materials:

Carbon Steel
Stainless Steel
Aluminum

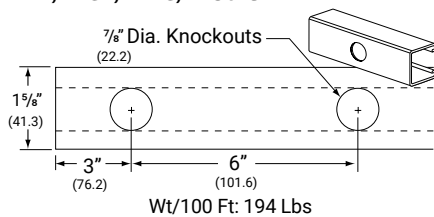
Finishes

Pre-Galvanized
Hot Dip Galvanized - Post Fabrication
Supr-Green Powder Coated
Zinc Trivalent Chromium
PVC



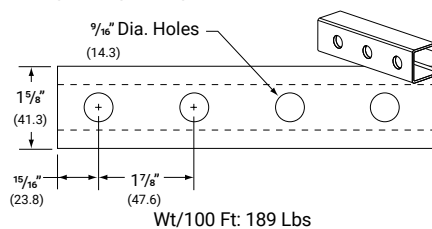
With Knock Out AS 200KO

PL, GR, PG, Other



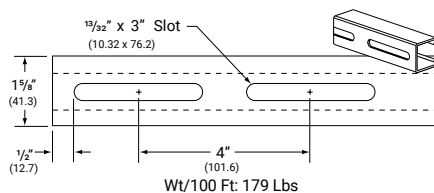
With Holes AS 200H

PL, GR, PG, Other



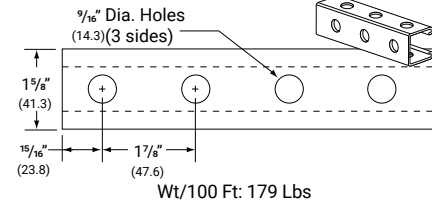
With Long Slots AS 200S

PL, GR, PG, Other



With Holes on 3 Sides AS 200H3

PL, GR, PG, Other



LEGEND:

GR: Powder Coated Supr-Green
EG: Electro-Galvanized
PG: Pre-Galvanized
AL: Aluminum
HG: Hot Dipped Galvanized
PL: Plain
SS: Stainless Steel
ZTC: Zinc Trivalent Chromium Stainless Steel (SS), Zinc Trivalent Chromium (ZTC) and Hot Dipped Galvanized (HG) are specialty finishes. Pricing is located in the Specialty Strut Section of the Anvil-Strut price book.



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Channel Fig. AS 200

1⁵/₈" X 1⁵/₈" (41.3 x 41.3mm)
 12 Gauge Channel • wt./100 ft. – 194 lbs
 Stocked in pre-galvanized, plain, powder coated
 Supr-Green, zinc trivalent chromium, and hot dipped
 galvanized, in 10 & 20 ft. lengths. Note: Also available in
 Stainless Steel 304 & 316 Alloys. Other materials, finishes
 & lengths are available upon request.

Properties of Section

Catalog Number	Wt./Ft.		Area of Selection		X-X Axis						Y-Y Axis					
	Lbs.	Kg.	Sq. In.	Sq. CM	I in ⁴	I cm ⁴	S in ³	S cm ³	r in	r cm	I in ⁴	I cm ⁴	S in ³	S cm ³	r in	r cm
AS 200	1.94	2.9	0.552	3.561	0.188	7.825	0.208	3.409	0.584	1.483	0.236	9.823	0.290	4.752	0.654	1.661

I = Moment of Inertia S = Section Modulus r = Radius of Gyration

Beam and Column Loads

Span or Unbraced Height	Static Beam Load (X-X Axis)							Column Loading Data			
	Max Allowable Uniform Load	Deflection at Uniform Load	Uniform Load at Deflection				Max. Allowable Load at Slot Face	Max. Column Load Applied at C.G.			
			Span/180 Deflection	Span/240 Deflection	Span/360 Deflection	Weight of Channel		k=.65	k=.80	k=1.0	k=1.2
In	Lbs	In	Lbs	Lbs	Lbs	Lbs	Lbs	Lbs	Lbs	Lbs	Lbs
12	3,480	0.01	3,480	3,480	3,480	1.9	3,850	12,240	11,940	11,480	10,960
18	2,320	0.03	2,320	2,320	2,320	2.9	3,710	11,540	10,960	10,130	9,290
24	1,740	0.06	1,740	1,740	1,740	3.9	3,530	10,690	9,850	8,740	7,710
30	1,390	0.09	1,390	1,390	1,310	4.9	3,330	9,780	8,740	7,470	6,380
36	1,160	0.13	1,160	1,160	910	5.8	3,120	8,880	7,710	6,380	5,310
42	990	0.17	990	990	670	6.8	2,910	8,020	6,800	5,470	4,430
48	870	0.23	870	770	510	7.8	2,710	7,240	6,000	4,690	3,810
60	700	0.35	660	490	330	9.7	2,340	5,910	4,690	3,630	2,960
72	580	0.51	460	340	230	11.6	2,040	4,840	3,810	2,960	2,400
84	500	0.69	340	250	170	13.6	1,800	4,040	3,200	2,480	1,980
96	430	0.90	260	190	130	15.5	1,600	3,480	2,750	2,110	1,670
108	390	1.14	200	150	100	17.5	1,440	3,050	2,400	1,820	**
120	350	1.41	160	120	80	19.4	1,290	2,700	2,110	**	**
144	290	2.03	110	90	60	23.3	1,060	2,180	1,670	**	**
168	250	2.77	80	60	40	27.2	**	1,790	**	**	**
180	230	3.18	70	50	40	29.1	**	**	**	**	**
192	220	3.61	60	50	NR	31.6	**	**	**	**	**
216	190	4.57	50	40	NR	34.9	**	**	**	**	**
240	170	5.65	40	NR	NR	38.8	**	**	**	**	**

Bearing Load may limit load

** Not recommended - KL/r exceeds 200

Notes

- The beam capacities shown above include the weight of the strut beam. The beam weight must be subtracted from these capacities to arrive at the net beam capacity.
- Allowable beam loads are based on a uniformly loaded, simply supported beam. For capacities of a beam loaded at midspan at a single point, multiply the beam capacity by 50% and deflection by 80%.
- The above chart shows beam capacities for strut without holes. For strut with holes, multiply by the following:
 EH by 88%, S by 90%,
 H (3/16 holes) by 88%, KO by 82%.
- Refer to the Anvil-Strut Catalog for reduction factors for unbraced lengths.



Channel Fig. AS 200

Beam and Column Loads – Metric

Span or Unbraced Height	Static Beam Load (X-X Axis)							Column Loading Data			
	Max Allowable Uniform Load	Deflection at Uniform Load	Uniform Load at Deflection				Max. Allowable Load at Slot Face	Max. Column Load Applied at C.G.			
			Span/180 Deflection	Span/240 Deflection	Span/360 Deflection	Weight of Channel		k=.65	k=.80	k=1.0	k=1.2
mm	Kn	mm	Kn	Kn	Kn	Kg	Kn	Kn	Kn	Kn	Kn
305	15.5	0.3	15.5	15.5	15.5	0.9	17.1	54.4	53.1	51.1	48.8
457	10.3	0.8	10.3	10.3	10.3	1.3	16.5	51.3	48.8	45.1	41.3
610	7.7	1.5	7.7	7.7	7.7	1.8	15.7	47.6	43.8	38.9	34.3
762	6.2	2.3	6.2	6.2	5.8	2.2	14.8	43.5	38.9	33.2	28.4
914	5.2	3.3	5.2	5.2	4.0	2.6	13.9	39.5	34.3	28.4	23.6
1,067	4.4	4.3	4.4	4.4	3.0	3.1	12.9	35.7	30.2	24.3	19.7
1,219	3.9	5.8	3.9	3.4	2.3	3.5	12.1	32.2	26.7	20.9	16.9
1,524	3.1	8.9	2.9	2.2	1.5	4.4	10.4	26.3	20.9	16.1	13.2
1,829	2.6	13.0	2.0	1.5	1.0	5.3	9.1	21.5	16.9	13.2	10.7
2,134	2.2	17.5	1.5	1.1	0.8	6.2	8.0	18.0	14.2	11.0	8.8
2,438	1.9	22.9	1.2	0.8	0.6	7.0	7.1	15.5	12.2	9.4	7.4
2,743	1.7	29.0	0.9	0.7	0.4	7.9	6.4	13.6	10.7	8.1	**
3,048	1.6	35.8	0.7	0.5	0.4	8.8	5.7	12.0	9.4	**	**
3,658	1.3	51.6	0.5	0.4	0.3	10.6	4.7	9.7	7.4	**	**
4,267	1.1	70.4	0.4	0.3	0.2	12.3	**	8.0	**	**	**
4,572	1.0	80.8	0.3	0.2	0.2	13.2	**	**	**	**	**
4,877	1.0	91.7	0.3	0.2	**	14.1	**	**	**	**	**
5,486	0.8	116.1	0.2	0.2	**	15.8	**	**	**	**	**
6,096	0.8	143.5	0.2	**	**	17.6	**	**	**	**	**

Channel Fig. AS 200

Materials

Carbon Steel: Channels are formed from high-quality, structural grade carbon steel which has been manufactured in accordance with ASTM A-1011-04- SS Grade 33 (hot rolled), or ASTM 366 (cold rolled), with mechanical properties of 33 ksi minimum yield and 52 ksi minimum tensile strength. The precision roll-forming process by which the channels are formed “cold works” the steel, thereby increasing its mechanical properties.

Stainless Steel: Channels are formed from chromium-nickel stainless steel sheet manufactured in accordance with ASTM A-240 specification, offered in both AISI Type 304 and 316 material to provide protection in varying corrosive conditions.

Aluminum: Extruded aluminum channel is produced from 6063-T6 alloy, and fittings are produced from 5052-H32 alloy, both in accordance with ASTM B-221 specifications. Aluminum is suitable for use in various corrosive environments.

Finishes

Pre-Galvanized: Hot dip, mill galvanized coating produced through a process of continuously passing the steel through a bath of molten zinc. This process is performed in accordance with ASTM A-653. The thickness of the zinc coating conforms with ASTM G-90 which represents a coating thickness of .90 ounces of zinc per square foot. This coating is applied to the steel master coils prior to slitting and fabrication.

Hot Dip Galvanized - Post Fabrication: The finished channel is completely immersed in a bath of molten zinc, resulting in the complete coating of all surfaces of the product, including edges and welds. Strut channels that are hot dip galvanized, have a total coating weight of 3.0 ounces of zinc per square foot in accordance with ASTM A-123 specification. This coating provides superior results in applications calling for prolonged outdoor exposure.

Supr-Green Powder Coating: Strut channels are coated after fabrication with polyester powder finish. This coating is applied using an electrostatic spray process, beginning with cleaning and phosphating, through a bonderite pretreatment process, and ending with oven curing. The resulting finish provides a high quality appearance and durability. Powder Coating is in accordance with ASTM B-117 (standard practice for operating salt spray (fog) apparatus) to 500 hours with less than 1/8” scribe creep.

Zinc Trivalent Chromium: The finished channel undergoes a multi-step process consisting of electrogalvanizing, in accordance with ASTM B-633-85, followed by an application of zinc trivalent chromium, which provides the distinctive gold coloration of the finish. All surfaces are coated because the process is performed after fabrication.

PVC: A corrosive resistant PVC (polyvinyl chloride) coating is applied over the completed strut channel. The coating process consists of surface pretreatment, followed by preheating of the part, which is then passed through a fluidized bed of vinyl plastic powder. The powder melts onto the heated channel forming a smooth coating which undergoes a final heat curing.

Cushion Clamp Assembly Figs. AS 0040D through AS 106P



Specifications

Materials:

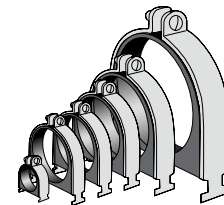
Clamp: 1008-1018 Carbon Steel
Cushion: High Strength TPE
Locknut: Nylon Insert

Service Temperature:

-65°F to 275°F

Approvals:

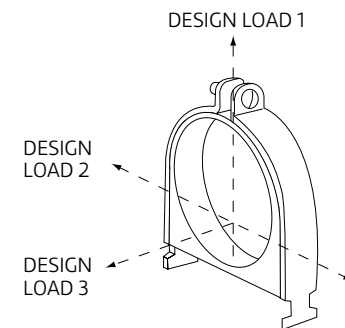
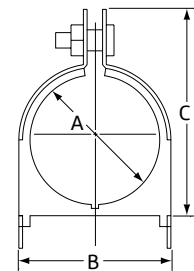
UL 2043 Fire Test for Heat and Visible Smoke Release
25/50 Flame Spread/Smoke Development Index



Description

Anvil-Strut Pipe Clamps are all manufactured to fit into the standard openings of 1⁵/₈" channel to support runs of piping where desired, to secure the pipe in place.

AS 0040D Thru AS 106P EG, 304SS, 316SS, ZTC



LEGEND:

GR: Powder Coated Supr-Green **EG:** Electro-Galvanized **PG:** Pre-Galvanized **AL:** Aluminum
HG: Hot Dipped Galvanized **PL:** Plain SS: Stainless Steel
ZTC: Zinc Trivalent Chromium Stainless Steel (**SS**), Zinc Trivalent Chromium (**ZTC**) and Hot Dipped Galvanized (**HG**) are specialty finishes. Pricing is located in the Specialty Strut Section of the Anvil-Strut price book.



PROJECT INFORMATION	APPROVAL STAMP
Project:	Approved
Address:	Approved as noted
Contractor:	Not approved
Engineer:	Remarks:
Submittal Date:	
Notes 1:	
Notes 2:	

Cushion Clamp Assembly Figs. AS 004OD through AS 106P

Tube Series

Part Number	O.D. Size	A	B	C	Std Pkg	Wt/100 pcs
AS 004OD	1/4"	0.25	0.62	0.98	25	10
AS 006ODN	3/8"	0.37	0.82	1.13	25	11
AS 008ODN	1/2"	0.50	0.94	1.34	25	13
AS 010ODN	5/8"	0.62	1.06	1.54	25	14
AS 012ODN	3/4"	0.75	1.20	1.68	25	14
AS 014ODN	7/8"	0.87	1.31	1.82	25	15
AS 016OD	1"	1.00	1.44	1.95	25	17
AS 018ODN	1 1/8"	1.12	1.57	2.08	20	18
AS 020OD	1 1/4"	1.25	1.70	2.21	20	18
AS 022ODN	1 3/8"	1.37	1.82	2.34	20	20
AS 024OD	1 1/2"	1.50	1.95	2.47	20	33
AS 026ODN	1 5/8"	1.62	2.07	2.60	20	35
AS 028OD	1 3/4"	1.75	2.20	2.73	20	37
AS 032OD	2"	2.00	2.45	3.04	10	41
AS 034OD	2 1/8"	2.12	2.57	3.23	10	46
AS 040OD	2 1/2"	2.50	2.94	3.79	10	49
AS 042OD	2 5/8"	2.62	3.07	3.92	5	51
AS 048OD	3"	3.00	3.57	4.42	5	57
AS 050OD	3 1/8"	3.12	3.57	4.42	5	60
AS 058OD	3 5/8"	3.62	4.20	5.11	5	70
AS 066OD	4 1/8"	4.12	4.57	5.54	5	94
AS 082OD	5 1/8"	5.12	5.57	6.54	5	125
AS 098OD	6 1/8"	6.12	6.57	7.54	5	130

Std Pkg & Wt/100 pcs: See charts above.

Specifications

Materials:

Clamp: 1008-1018 Carbon Steel

Cushion: High Strength TPE

Locknut: Nylon Insert

Service Temperature:

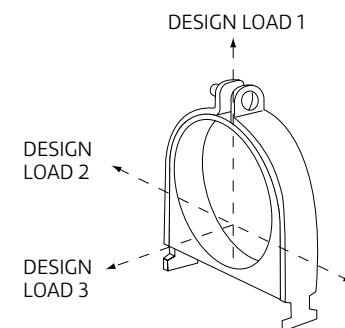
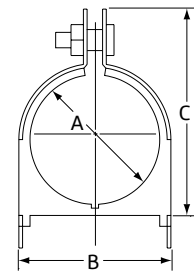
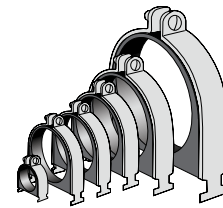
-65°F to 275°F

Approvals:

UL 2043 Fire Test for Heat and

Visible Smoke Release

25/50 Flame Spread/Smoke Development Index



Cushion Clamp Assembly Figs. AS 0040D through AS 106P

Tube Series

Copper & Steel Tube O.D. Size	Design Load 1 (lbs)	Design Load 2 (lbs)	Design Load 3 (lbs)
1/4"	400	50	50
3/8"	400	50	50
1/2"	400	50	50
5/8"	400	50	50
3/4"	600	75	75
7/8"	600	75	75
1"	600	75	75
1 1/8"	600	75	75
1 1/4"	600	75	75
1 3/8"	600	75	75
1 1/2"	600	75	75
1 5/8"	600	75	75
1 3/4"	800	125	125
1 7/8"	800	125	125
2"	800	125	125
2 1/8"	800	125	125
2 1/4"	800	125	125
2 3/8"	800	125	125
2 1/2"	800	125	125
2 5/8"	800	125	125
3"	800	125	125
3 1/8"	800	125	125
3 5/8"	1000	200	150
4 1/8"	1000	200	150
6 1/8"	1000	200	150

Std Pkg & Wt/100 pcs: See charts above.

Specifications

Materials:

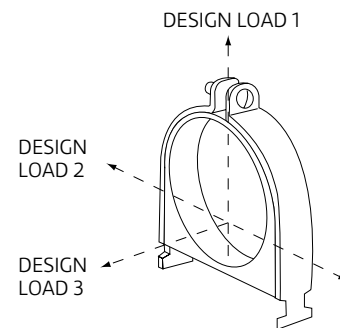
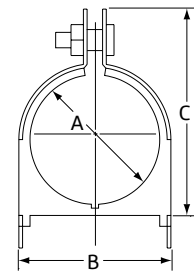
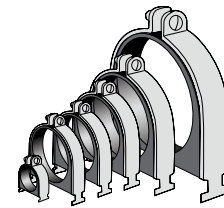
Clamp: 1008-1018 Carbon Steel
Cushion: High Strength TPE
Locknut: Nylon Insert

Service Temperature:

-65°F to 275°F

Approvals:

UL 2043 Fire Test for Heat and Visible Smoke Release
25/50 Flame Spread/Smoke Development Index



Cushion Clamp Assembly Figs. AS 004OD through AS 106P

Pipe Series

Part Number	O.D. Size	A	B	C	Std Pkg	Wt/100 pcs
AS 009P	1/4" Pipe	0.54	0.98	1.34	25	13
AS 011P	3/8" Pipe	0.67	1.13	1.54	25	14
AS 014P	1/2" Pipe	0.84	1.29	1.82	25	15
AS 017P	3/4" Pipe	1.05	1.50	2.08	20	17
AS 021P	1" Pipe	1.31	1.76	2.34	20	19
AS 027P	1 1/4" Pipe	1.66	2.17	2.73	20	35
AS 030ODP	1 1/2" Pipe	1.90	2.35	2.86	20	39
AS 038ODP	2" Pipe	2.37	2.82	3.67	10	47
AS 046ODP	2 1/2" Pipe	2.87	3.32	4.17	5	55
AS 056ODP	3" Pipe	3.50	3.95	4.79	5	55
AS 064ODP	3 1/2" Pipe	4.00	4.45	5.42	5	88
AS 072ODP	4" Pipe	4.50	4.95	5.92	5	110
AS 089P	5" Pipe	5.56	6.01	6.92	5	130
AS 106P	6" Pipe	6.62	7.07	8.23	5	140

Pipe Series

Pipe Sizes (Nominal)	Design Load 1 (lbs)	Design Load 2 (lbs)	Design Load 3 (lbs)
1/4"	400	50	50
3/8"	600	75	75
1/2"	600	75	75
3/4"	600	75	75
1"	600	75	75
1 1/4"	800	125	125
1 1/2"	800	125	125
2"	800	125	125
2 1/2"	800	125	125
3"	1000	200	150
3 1/2"	1000	200	150
4"	1000	200	150
5"	1000	200	150
6"	1000	200	150

Std Pkg & Wt/100 pcs: See charts above.

Specifications

Materials:

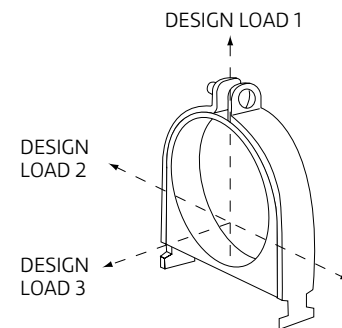
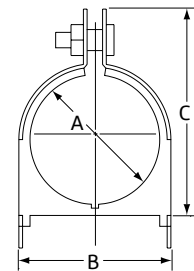
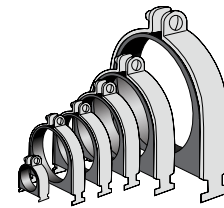
Clamp: 1008-1018 Carbon Steel
Cushion: High Strength TPE
Locknut: Nylon Insert

Service Temperature:

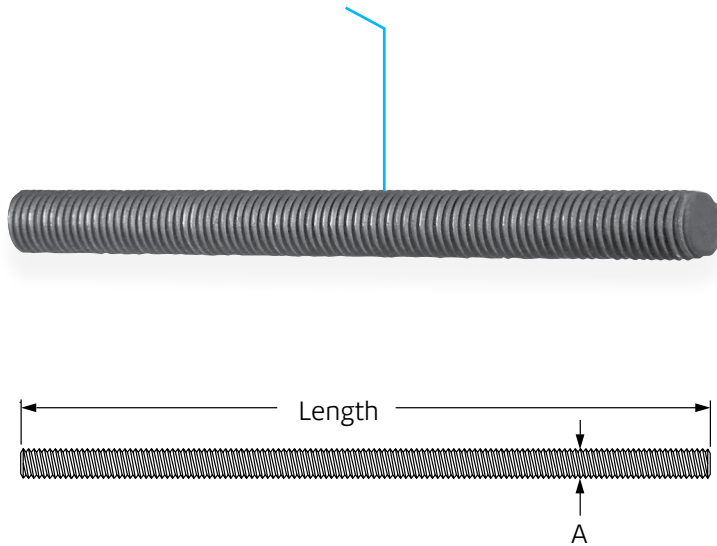
-65°F to 275°F

Approvals:

UL 2043 Fire Test for Heat and Visible Smoke Release
25/50 Flame Spread/Smoke Development Index



Continuous Threaded Rod Fig. 146 (Formerly Afcon Fig. 650)



Size Range: ¼" through 1½" stocked in six, ten, and twelve foot lengths. Other even foot lengths can be furnished to order.

Material: Carbon steel or Stainless Steel Gr 304

Threads: National Coarse (USS), rod threaded complete length.

Finish: Plain or Zinc Plated (Hot-Dip Galvanized optional)

Maximum Temperature: Zinc Plated 450°F, Stainless Steel 650°F

Approvals: Complies with MSS SP-58.

Ordering: Specify rod diameter and length, figure number, name and finish.

Note: The acceptability of galvanized coatings at temperatures above 450°F is at the discretion of the end user.

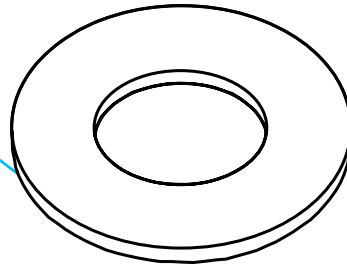


Fig. 146: Dimensions (in) • Loads (lbs) • Weight (lbs)

Rod Size A	Threads per Inch	Max Load		Weight per Ft.
		650° F		
¼	20	240		0.12
⅜	16	730		0.30
½	13	1,350		0.53
⅝	11	2,160		0.84
¾	10	3,230		1.20
⅞	9	4,480		1.70
1	8	5,900		2.30
1¼	7	9,500		3.60
1½	6	13,800		5.10

PROJECT INFORMATION	APPROVAL STAMP
Project:	Approved
Address:	Approved as noted
Contractor:	Not approved
Engineer:	Remarks:
Submittal Date:	
Notes 1:	
Notes 2:	

Flat Washer
Figs. AS 209, AS 3500,
AS 211, AS 83, AS 209,
AS 6108, AS 230

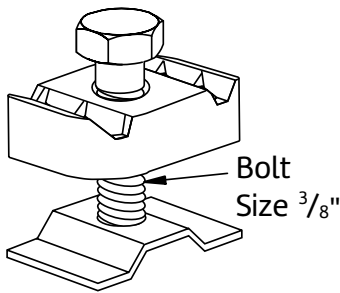


Description

Anvil-Strut Hardware, when used in conjunction with Anvil-Strut Channel and Nuts, provides a superior grip between channels and fittings.

Seismic Rod Stiffener

AS 3500 EG, ZTC

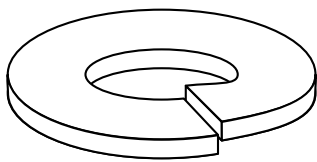


Size	Wt./100 Pcs.
3/8" - 5/8"	16

Std Pkg: 25 - Wt/100 pcs: See chart above.

Lock Washer

AS 211 EG



Size	Wt./100 Pcs.
1/4"	0.3
3/8"	0.7
1/2"	1.5

Std Pkg: 100 - Wt/100 pcs: See chart above.

LEGEND:

GR: Powder Coated Supr-Green **EG:** Electro-Galvanized **PG:** Pre-Galvanized **AL:** Aluminum
HG: Hot Dipped Galvanized **PL:** Plain **SS:** Stainless Steel
ZTC: Zinc Trivalent Chromium Stainless Steel (**SS**), Zinc Trivalent Chromium (**ZTC**) and Hot Dipped Galvanized (**HG**) are specialty finishes. Pricing is located in the Specialty Strut Section of the Anvil-Strut price book.



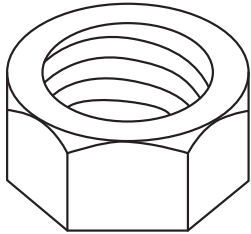
PROJECT INFORMATION	APPROVAL STAMP
Project:	Approved
Address:	Approved as noted
Contractor:	Not approved
Engineer:	Remarks:
Submittal Date:	
Notes 1:	
Notes 2:	

Flat Washer

Figs. AS 209, AS 3500, AS 211, AS 83, AS 209, AS 6108, AS 230

Hexagon Nut

AS 83 EG

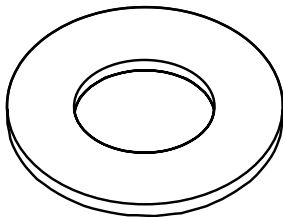


Size	Std. Pkg.	Wt./100 Pcs.
1/4"	500	0.6
3/8"	500	1.6
1/2"	100	4.8
5/8"	50	7.0
3/4"	50	12.0

Std Pkg & Wt/100 pcs: See chart above.

Flat Washer

AS 209 EG

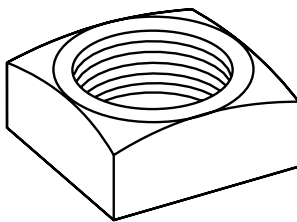


Size	Std. Pkg.	Wt./100 Pcs.
1/4"	200	0.7
3/8"	100	1.5
1/2"	100	3.5
5/8"	100	8.0
3/4"	100	11.0

Std Pkg & Wt/100 pcs: See chart above.

Square Nut

AS 6108 EG

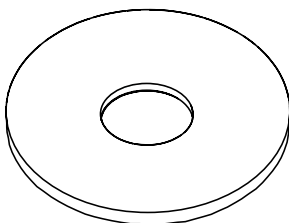


Size	Std. Pkg.	Wt./100 Pcs.
1/4"	100	0.9
5/16"	100	1.6
3/8"	100	2.7
1/2"	100	5.8

Std Pkg & Wt/100 pcs: See chart above.

Square Nut

AS 230 EG



Size	Std. Pkg.	Wt./100 Pcs.
1/4"	100	3.3
3/8"	100	3.0
1/2"	100	2.8

Std Pkg & Wt/100 pcs: See chart above.

LEGEND:

GR: Powder Coated Supr-Green **EG:** Electro-Galvanized **PG:** Pre-Galvanized **AL:** Aluminum
HG: Hot Dipped Galvanized **PL:** Plain **SS:** Stainless Steel
ZTC: Zinc Trivalent Chromium Stainless Steel (**SS**), Zinc Trivalent Chromium (**ZTC**) and Hot Dipped Galvanized (**HG**) are specialty finishes. Pricing is located in the Specialty Strut Section of the Anvil-Strut price book.

US Domestic Made Products



ASC Engineered Solutions™ offers many products that meet requirements and industry standards outlined by domestic preference programs, such as Buy America, Buy American, and AIS. Our domestic production capability allows us to give you – and your customers – the reliability and confidence of knowing we will always meet specification requirements with the highest quality offerings.

ASC Engineered Solutions is the only supplier of grooved products able to provide a domestically produced complete grooved steel system through 24 inches in size.

US domestic made product programs*:

- [Buy America](#)
- [Buy American](#)
- [American Iron and Steel Act \(AIS\)](#)
- [Steel Products Procurement Act](#)

* Due to ever changing compliance requirements, certification must be requested at placement of order.

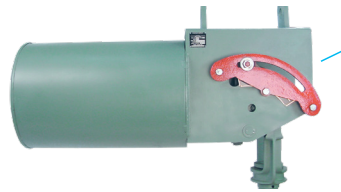


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Complete portfolio of grooved couplings, fittings & valves.

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Seismic Solutions

Seismic bracing & hanger solutions.



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Seis Brace® Software – Leader in Seismic Bracing Design Software

The most comprehensive seismic bracing calculation software in Fire Protection. Seis Brace ensures compliance to NFPA 13, with its intuitive and user friendly format. The end result is a complete submittal PDF package with all calculations and submittal sheets included. Features include:

- Detailed calculations in accordance with NFPA 13, 2016 / ASCE7-10 and 2019 / ASCE7-16

Design Services & Fabrication

Our design services team can provide a design analysis at no charge:

- Conceptual drawing(s) with BOM
- Documented potential savings capacity
- Prying factors of Anvil products to maximize swivel component
- Quotation for fabrication services

Typical design review results in reduction of fittings used by 10-15%.

- Three methods to calculate and optimize your Seismic Coefficient (C_p)
- Pipe selection by manufacturer for more accurate load calculation
- Anchor selection by manufacturer to maximize structural attachment capacity
- Prying factors of Anvil products to maximize swivel fitting load ratings
- UL or FM loads to comply with project specifications

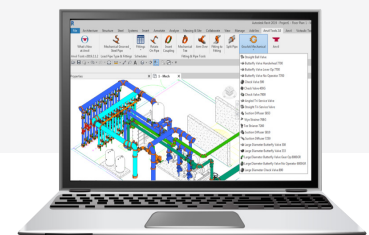
More savings can be generated with the availability to move equipment as needed for optimal design. Extended fee services are also available.

- Full fabrication drawing
- Fully dimensional and tagged BOM
- On site, field survey for retro fit projects
Dimensioned floor penetrations

At ASC, we offer tools and custom design services to help your team build better and smarter. All BIM and CAD content is available online in our BIM/CAD content library.

Designing with Anvil Tools™

- Anvil Tools plug-in for Autodesk's Revit software
- Easily load Anvil and Gruvlok products into a Revit Project
- Design with smart pipe routing and fitting families
- Save time by automating and enhancing mechanical workflows
- Simplified tagging, scheduling, and spool sheet creation



Please contact your local ASC Engineered Solutions sales representative.



asc-es.com

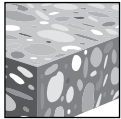
Building connections that last™

3.3.12 HDI+, HDI-L+, AND HDI DROP IN ANCHORS

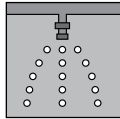
PRODUCT DESCRIPTION

HDI+, HDI-L+, and HDI Drop-in anchors

Anchor System	Features and Benefits
	<ul style="list-style-type: none"> 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
	<ul style="list-style-type: none"> 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



Uncracked concrete



Fire sprinkler listings

Approvals/Listings	
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 and cUL (Underwriters Laboratory)	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



INSTALLATION PARAMETERS

Table 1 - Hilti 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	h _{nom}	in.	1	1-9/16	2	2-9/16	3-3/16
Anchor length	ℓ	(mm)	(25)	(40)	(51)	(65)	(81)
Hole depth	h _o						
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.

MATERIAL SPECIFICATIONS

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

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

DESIGN DATA IN CONCRETE USING ALLOWABLE STRESS DESIGN

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

Anchor type	Nominal anchor diameter in.	$f'_c = 2,000$				$f'_c = 4,000$				$f'_c = 6,000$			
		Tension, lb (kN)		Shear, lb (kN)		Tension, lb (kN)		Shear, lb (kN)		Tension, lb (kN)		Shear, lb (kN)	
HDI+	1/4	385	(1.7)	450	(2.0)	510	(2.3)	625	(2.8)	640	(2.8)	700	(3.1)
	3/8	635	(2.8)	965	(4.3)	920	(4.1)	1,250	(5.6)	1,260	(5.6)	1,500	(6.7)
	1/2	945	(4.2)	1,500	(6.7)	1,605	(7.1)	2,125	(9.5)	1,950	(8.7)	2,500	(11.1)
HDI+	5/8	1,875	(8.3)	2,500	(11.1)	2,920	(13.0)	3,250	(14.5)	3,715	(16.5)	3,750	(16.7)
	3/4	2,500	(11.1)	3,875	(17.2)	4,065	(18.1)	5,000	(22.2)	5,565	(24.8)	5,500	(24.5)

Table 3 - Hilti HDI+, HDI-L+ and HDI carbon steel ultimate loads in concrete¹

Anchor type	Nominal anchor diameter in.	$f'_c = 2,000$				$f'_c = 4,000$				$f'_c = 6,000$			
		Tension, lb (kN)		Shear, lb (kN)		Tension, lb (kN)		Shear, lb (kN)		Tension, lb (kN)		Shear, lb (kN)	
HDI+	1/4	1,535	(6.8)	1,800	(8.0)	2,040	(9.1)	2,500	(11.1)	2,555	(11.4)	2,800	(12.5)
	3/8	2,540	(11.3)	3,850	(17.1)	3,685	(16.4)	5,000	(22.2)	5,035	(22.4)	6,000	(26.7)
	1/2	3,780	(16.8)	6,000	(26.7)	6,425	(28.6)	8,500	(37.8)	7,810	(34.7)	10,000	(44.5)
HDI+	5/8	7,500	(33.4)	10,000	(44.5)	11,685	(52.0)	13,000	(57.8)	14,865	(66.1)	15,000	(66.7)
	3/4	10,000	(44.5)	15,500	(68.9)	16,260	(72.3)	20,000	(89.0)	22,250	(99.0)	22,000	(97.9)

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

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

Anchor type	Nominal anchor diameter in.	3,000 psi lightweight concrete over metal deck											
		3,000 psi lightweight concrete				Upper flute				Lower flute			
		Tension, lb (kN)		Shear, lb (kN)		Tension, lb (kN)		Shear, lb (kN)		Tension, lb (kN)		Shear, lb (kN)	
HDI+	1/4	465	(2.1)	340	(1.5)	530	(2.4)	335	(1.5)	375	(1.7)	250	(1.1)
	3/8	720	(3.2)	940	(4.2)	810	(3.6)	1,010	(4.5)	500	(2.2)	500	(2.2)
	1/2	1,035	(4.6)	1,700	(7.6)	1,035	(4.6)	1,755	(7.8)	625	(2.8)	750	(3.3)
HDI+	5/8	1,465	(6.5)	2,835	(12.6)	-	-	-	-	875	(3.9)	875	(3.9)
	3/4	2,075	(9.2)	3,680	(16.4)	-	-	-	-	1,250	(5.6)	1,000	(4.4)

- 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.
- Minimum compressive strength of structural lightweight concrete is 3,000 psi.
- See figure 1 for typical details.
- Allowable loads calculated with a factor of safety of 4.

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

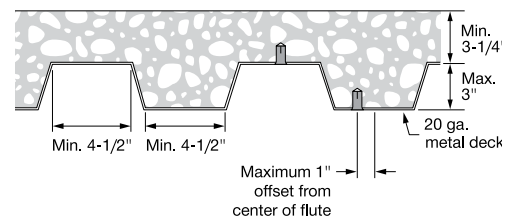
Nominal anchor diameter in.	Nominal anchor	$f'_c = 4,000$				$f'_c = 6,000$			
		Tension, lb (kN)		Shear, lb (kN)		Tension, lb (kN)		Shear, lb (kN)	
HDI+	1/4	480	(2.1)	600	(2.7)	740	(3.3)	600	(2.7)
	3/8	1,040	(4.6)	1,230	(5.5)	1,460	(6.5)	1,230	(5.5)
	1/2	1,840	(8.2)	2,760	(12.3)	2,410	(10.7)	2,760	(12.3)
HDI+	5/8	2,630	(11.7)	4,510	(20.1)	3,770	(16.8)	4,510	(20.1)
	3/4	3,830	(17.0)	5,580	(24.8)	5,030	(22.4)	5,580	(24.8)

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

Nominal anchor diameter in.	Nominal anchor	$f'_c = 4,000$				$f'_c = 6,000$			
		Tension, lb (kN)		Shear, lb (kN)		Tension, lb (kN)		Shear, lb (kN)	
HDI+	1/4	1,930	(8.6)	2,400	(10.7)	2,950	(13.1)	2,400	(10.7)
	3/8	4,170	(18.5)	4,920	(21.9)	5,850	(26.0)	4,920	(21.9)
	1/2	7,350	(32.7)	11,040	(49.1)	9,630	(42.8)	11,040	(49.1)
HDI+	5/8	10,540	(46.9)	18,040	(80.2)	15,100	(67.2)	18,040	(80.2)
	3/4	15,340	(68.2)	22,320	(99.3)	20,130	(89.5)	22,320	(99.3)

- Stainless steel models available in HDI version only.
- Shear testing conducted with 18-8 stainless steel bolts.
- Allowable loads calculated with a factor of safety of 4.

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



Combined shear and tension loading

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

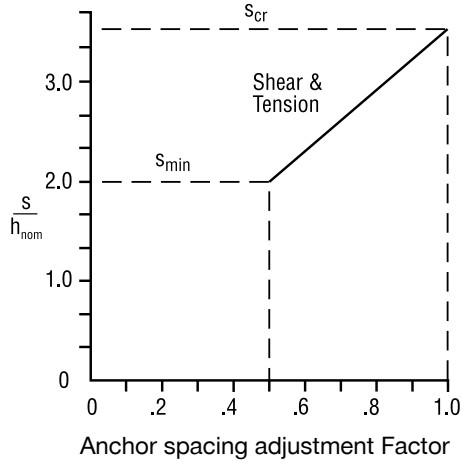
Anchor spacing and edge distance guidelines

Anchor spacing adjustment factors

$$s = \text{Actual Spacing}$$

$$s_{\min} = 2.0 h_{\text{nom}}$$

$$s_{\text{cr}} = 3.5 h_{\text{nom}}$$

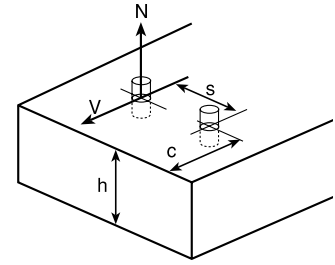
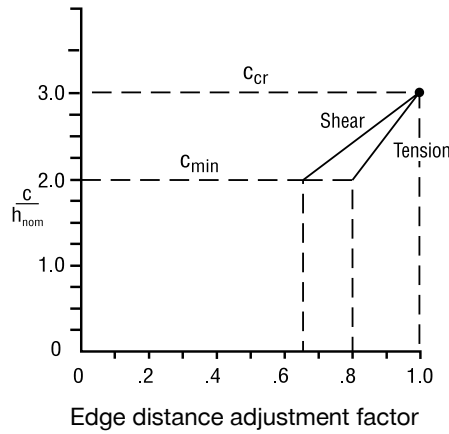


Edge distance adjustment factors

$$c = \text{Actual edge distance}$$

$$c_{\min} = 2.0 h_{\text{nom}}$$

$$c_{\text{cr}} = 3.0 h_{\text{nom}}$$



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 Hilti 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												

$s_{\min} = 2.0 h_{\text{nom}} \quad s_{\text{cr}} = 3.5 h_{\text{nom}}$ $f_A = 0.33 \frac{s}{h_{\text{nom}}} - 0.17$ for $s_{\text{cr}} > s > s_{\min}$	$c_{\min} = 2.0 h_{\text{nom}} \quad c_{\text{cr}} = 3.0 h_{\text{nom}}$ $f_{RN} = 0.2 \frac{c}{h_{\text{nom}}} + 0.4$ for $c_{\text{cr}} > c > c_{\min}$	$c_{\min} = 2.0 h_{\text{nom}} \quad c_{\text{cr}} = 3.0 h_{\text{nom}}$ $f_{RV} = 0.35 \frac{c}{h_{\text{nom}}} - 0.05$ for $c_{\text{cr}} > c > c_{\min}$
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INSTALLATION INSTRUCTIONS

Manufacturer's Printed Installation Instructions (MPII) are included with each product package. They can also be viewed or downloaded at www.hilti.com. 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.

ORDERING INFORMATION¹

HDI+, HDI-L+ and HDI

Carbon steel (Interior Use)

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 (Exterior Use)

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



3.3.12

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






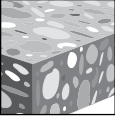
¹ All dimensions in inches

3.3.5 KWIK BOLT TZ EXPANSION ANCHOR

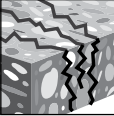
PRODUCT DESCRIPTION

KWIK Bolt TZ carbon steel and stainless steel anchors

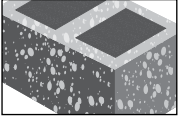
Anchor System	Features and Benefits
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>Carbon Steel KB-TZ</p> </div> <div style="text-align: center;">  <p>Stainless Steel KB-TZ</p> </div> </div>	<ul style="list-style-type: none"> • Used with Hilti Dust Removal System (DRS) for dustless drilling and installation (compliant with Table 1 of OSHA 1926.1153 regulations for silica dust exposure). • Accurate SafeSet™ installation when using the Hilti SIW-6AT-A22 impact wrench and the SI-AT-A22 Adaptive Torque Module • Product and length identification marks facilitate quality control after installation. • Through fixture installation and variable thread lengths improve productivity and accommodate various base plate thicknesses. • Type 316 stainless steel wedges provide superior performance in cracked concrete.
<div style="text-align: center;">  <p>Hilti SIW-6AT-A22 impact wrench and the SI-AT-A22 Adaptive Torque Module</p> </div>	<ul style="list-style-type: none"> • Ridges on expansion wedges provide increased reliability. • Mechanical expansion allows immediate load application. • Raised impact section (dog point) prevents thread damage during installation. • Bolt meets ductility requirements of ACI 318-14 Section 2.3. • ACI 349-01 Nuclear Design Guide is available. Call Hilti Technical Support.



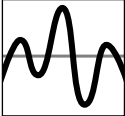
Uncracked concrete




Cracked concrete




Grout-filled concrete masonry



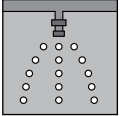
Seismic Design Categories A-F



Hollow Drill Bit with Adaptive Torque Tool (AT)



Profis Anchor design software



Fire sprinkler listings

Approvals/Listings	
ICC-ES (International Code Council) - 2018 International Building Code / International Residential Code (IBC/IRC) - 2015 National Building Code of Canada (NBC-C)	ESR-1917 in concrete per ACI 318-14 Ch. 17 / ACI 355.2/ ICC-ES AC193 ESR-3785 in grout-filled CMU per ICC-ES AC01 ELC-1917 in concrete per CSA A23.3-14 / ACI 355.2
City of Los Angeles	2017 LABC Supplement (within ESR-1917) RR 26057 grout-filled CMU
Florida Building Code	2010 FBC with HVHZ
FM (Factory Mutual)	Pipe hanger components for automatic sprinkler systems 3/8 through 3/4
UL and cUL (Underwriters Laboratory)	Pipe hanger equipment for fire protection services for 3/8 through 3/4



MATERIAL SPECIFICATIONS

Carbon steel with electroplated zinc

Carbon steel KB-TZ anchors have the following minimum bolt fracture loads.¹

Anchor diameter (in.)	Shear (lb)	Tension (lb)
3/8	NA	6,744
1/2	7,419	11,240
5/8	11,465	17,535
3/4	17,535	25,853

Carbon steel anchor components plated in accordance with ASTM B633 to a minimum thickness of 5 µm.

Nuts conform to the requirements of ASTM A563, Grade A, Hex.

Washers meet the requirements of ASTM F844.

Expansion sleeves (wedges) are manufactured from type 316 stainless steel

Stainless steel

Stainless steel KB-TZ anchors are made of type 304 or 316 material and have the following minimum bolt fracture loads.¹

Anchor diameter (in.)	Shear (lb)	Tension (lb)
3/8	5,058	6,519
1/2	8,543	12,364
5/8	13,938	19,109
3/4	22,481	24,729

All nuts and washers for type 304 anchors are made from type 304 stainless.

All nuts and washers for type 316 anchors are made from type 316 stainless.

Nuts meet the dimensional requirements of ASTM F594.

Washers meet the dimensional requirements of ANSI B18.22.1, Type A, plain.

Expansion sleeve (wedges) are made from type 316 stainless steel.

¹ Bolt fracture loads are determined by testing in a universal tensile machine for quality control at the manufacturing facility. These loads are not intended for design purposes. See tables 4 and 16 for the steel design strengths of carbon steel and stainless steel, respectively.

INSTALLATION PARAMETERS

Figure 1 - Hilti KWIK Bolt TZ specifications

