CASTCONNEX®

innovative components for inspired designs

PRODUCT DATASHEETS

For Use With **AISC 360** and **341.**

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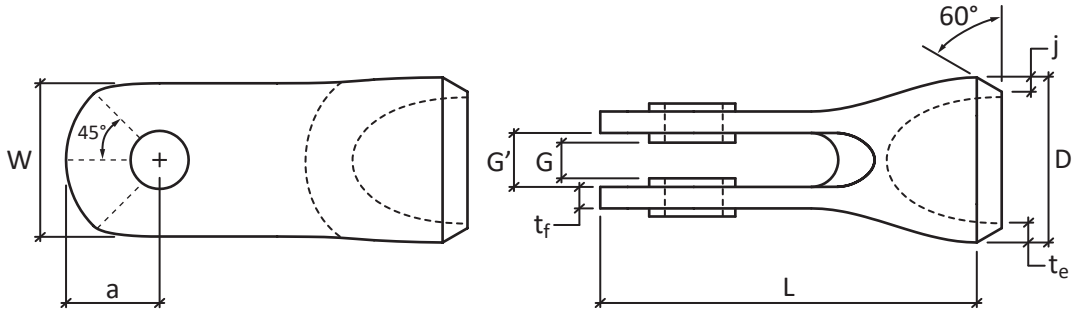
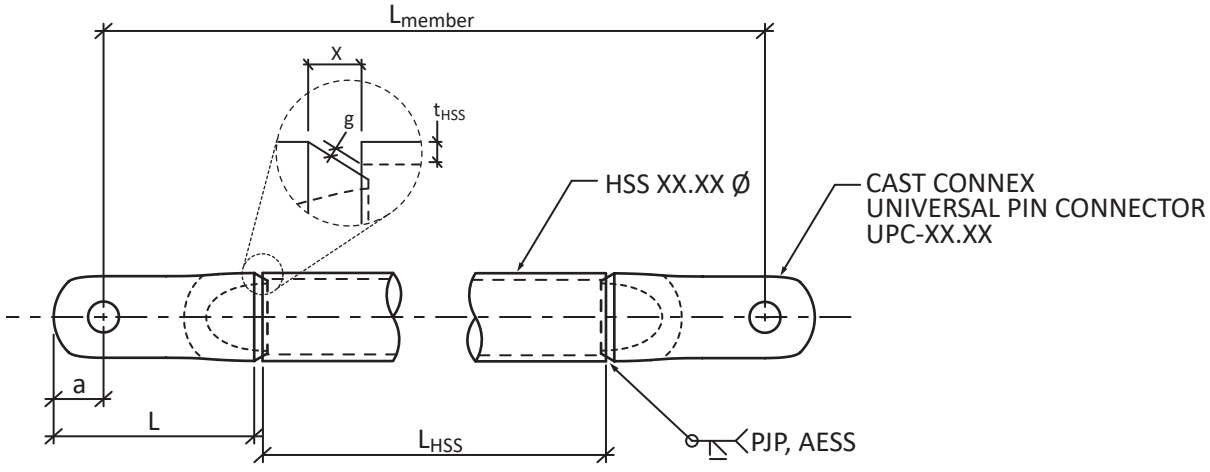
Nominal Connector Dimensions



	D [in]	W [in]	a [in]	G [in]	G' [in]	t_f [in]	t_e [in]	L [in]	j [in]	D_{pin} [in]
UPC-3.500	3 1/2	3	2	N/A	15/16	1/2	5/8	8 1/4	7/16	1 1/2
UPC-4.000L	4	3 1/2	2 1/4	N/A	15/16	1/2	5/8	9 1/8	7/16	1 1/2
UPC-4.000	4	3 3/4	2 1/4	1 1/16	1 7/16	3/4	7/8	9 7/8	5/8	1 3/4
UPC-5.563	5 9/16	5 1/4	3 3/16	1 9/16	1 15/16	7/8	7/8	12 15/16	3/4	2
UPC-6.625	6 5/8	6 1/4	3 3/4	1 13/16	2 3/16	1 1/8	1	15 3/4	3/4	2 3/4
UPC-8.625	8 5/8	8	4 7/8	2 1/16	2 13/16	1 1/8	1	19 5/8	3/4	3
UPC-10.75	10 3/4	9 1/2	5 3/4	2 1/16	2 13/16	1 1/4	1	23 7/8	3/4	3 3/4
UPC-12.75	12 3/4	11	6 5/8	2 1/16	2 13/16	1 1/4	1	28 1/4	3/4	4 1/2
UPC-14.00	14	12	7 1/4	2 1/16	2 13/16	1 3/8	1	31 3/4	3/4	5
UPC-16.00	16	13 1/4	7 7/8	2 1/16	2 13/16	1 3/8	1	34 5/8	3/4	6
UPC-24.00	24	21	12 3/4	6 1/16	N/A	2 15/16	1 1/2	52 3/4	1 3/8	8 1/2

Typical Assembly



Estimating required length of HSS:

$L_{HSS} = L_{member} - 2(L - a + X)$

$X = 2g + \sqrt{3}(t_{HSS})$

When using these equations to estimate the length of the HSS required (L_{HSS}) for a given element, note that the actual HSS thickness (t_{HSS}) can be significantly thinner than the nominal value. Refer to the relevant HSS or Pipe specification.

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Available Axial Strength of Connectors

Load and Resistance Factor Design (LRFD)

Tensile Strength

The pin connection detail shown offers a factored tensile strength equal to the lesser of:

a) ϕP_n in the table below,
b) the factored strength of the weld between the HSS member and the connector, and
c) the factored tensile yield strength of the connecting HSS member

Compressive Strength

The pin connection detail shown offers a factored compressive strength equal to the lesser of:

a) ϕP_n in the table below,
b) the factored strength of the weld between the HSS member and the connector,
c) the factored overall compressive strength of the pin-ended HSS member, and
d) the factored buckling strength of the gusset plate

Allowable Stress Design (ASD)

Tensile Capacity

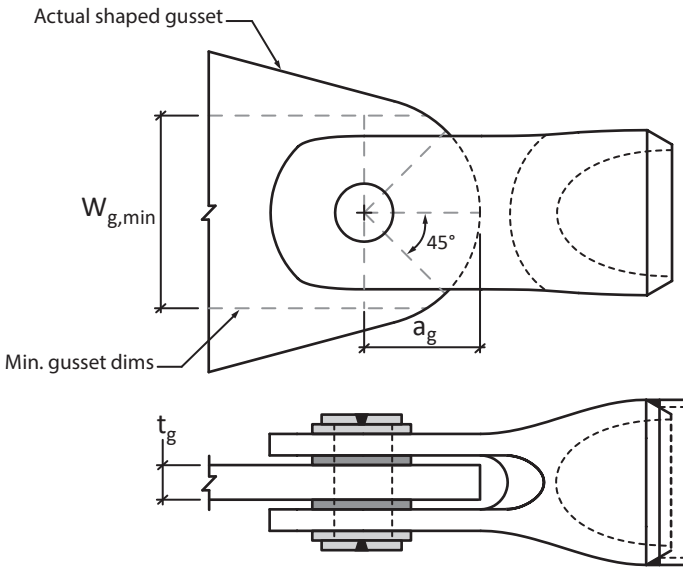
The pin connection detail shown offers an allowable tensile capacity equal to the lesser of:

a) P_n/Ω in the table below,
b) the allowable capacity of the weld between the HSS member and the connector, and
c) the allowable tensile yield capacity of the connecting HSS member

Compressive Capacity

The pin connection detail shown offers a allowable compressive capacity equal to the lesser of:

a) P_n/Ω in the table below,
b) the allowable capacity of the weld between the HSS member and the connector,
c) the allowable overall compressive capacity of the pin-ended HSS member, and
d) the allowable buckling capacity of the gusset plate



SOLID PIN:

D_{pin} : Diameter of pin; diameter of pin hole not more than 1/32" larger than pin

GUSSET PLATE:

t_g : thickness of gusset plate
$a_{g,min}$: min gusset plate end distance for max design load
$a_{g,max}$: max gusset plate end distance to fit within connector
$W_{g,min}$: min gusset plate width at pin for max design load

CONNECTOR:

Specified minimum yield strength F_y = 50 ksi
Specified minimum tensile strength F_u = 80 ksi

						A36 gusset		A572 Gr. 42 gusset		A572 Gr. 50 gusset	
	$W_{g,min}$ [in]	$a_{g,min}$ [in]	$a_{g,max}$ [in]	D_{pin} [in]	t_g [in]	ϕP_n [kips]	P_n/Ω [kips]	ϕP_n [kips]	P_n/Ω [kips]	ϕP_n [kips]	P_n/Ω [kips]
UPC-3.500	3 1/2	2 1/4	2 3/4	1 1/2	7/8	64	43	74	50	84	56
UPC-4.000L	4	2 1/2	2 3/4	1 1/2	7/8	64	43	74	50	89	59
UPC-4.000	5 1/4	3 1/4	3 5/8	1 3/4	1	85	57	99	66	118	79
UPC-5.563	5 7/8	3 5/8	4 3/16	2	1 1/2	146	97	170	113	184	123
UPC-6.625	7 7/8	4 7/8	5 3/8	2 3/4	1 3/4	234	156	273	182	325	217
UPC-8.625	9	5 1/2	6 1/8	3	2	292	194	340	227	405	270
UPC-10.75	11 1/4	6 7/8	7 3/8	3 3/4	2	365	243	425	284	506	338
UPC-12.75	13 5/8	8 3/8	8 7/8	4 1/2	2	437	292	510	340	608	405
UPC-14.00	14 1/2	9	10	5	2	486	324	567	378	675	450
UPC-16.00	17 1/2	9 7/8	10 3/4	6	2	583	389	680	454	810	540
UPC-24.00	21	13	15 3/4	8 1/2	6	2478	1652	2860	1906	2860	1906

Nominal strengths have been determined using AISC 360-10.

P_n: Nominal strength

Equal to minimum strength of the connector, min. sized gusset, and pin using Sections D5.1, D2a, E3, J4.2 and J7a.

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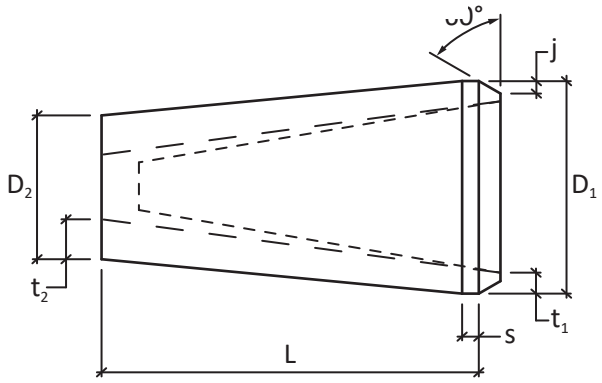
Nominal Connector Dimensions

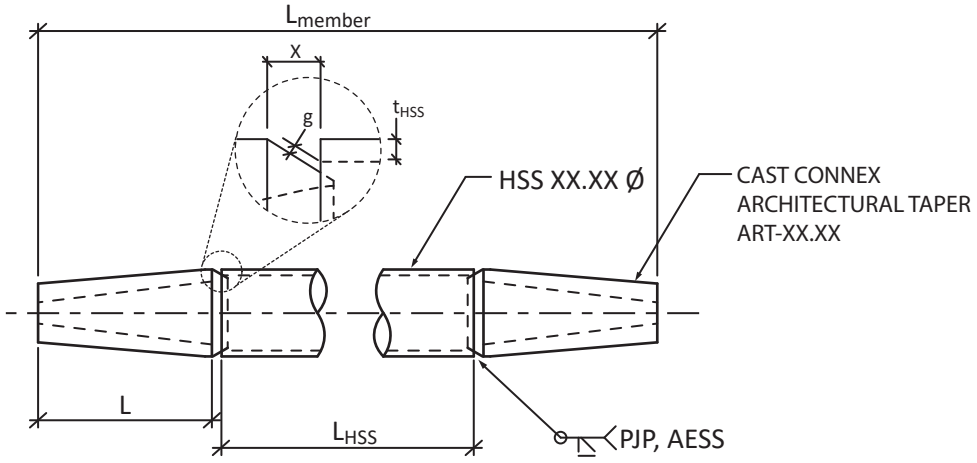


- - - - ART-6.625

— — ART-8.625, 10.75, 12.75, 16.00, 18.00

	D_1 [in]	$t_{1,min}$ [in]	D_2 [in]	$t_{2,min}$ [in]	L [in]	s [in]	j [in]
ART-6.625	6 5/8	3/4	4 1/4	N/A	14	3/4	5/8
ART-8.625	8 5/8	7/8	5 13/16	2 1/16	18	3/4	3/4
ART-10.75	10 3/4	7/8	6 7/8	2 11/32	22 1/2	1	3/4
ART-12.75	12 3/4	7/8	8 13/16	2 17/32	26 1/2	1	3/4
ART-16.00	16	7/8	10 15/16	2 15/16	33 1/2	1 1/2	3/4
ART-18.00	18	13/16	12 15/16	2 15/16	33 1/2	1 1/2	3/4

Typical Assembly



Estimating required length of HSS:

$L_{HSS} = L_{member} - 2(L + X)$

$X = 2g + \sqrt{3}(t_{HSS})$

When using these equations to estimate the length of the HSS or Pipe required (L_{HSS}) for a given element, note that the actual HSS or Pipe thickness (t_{HSS}) can be significantly thinner than the nominal value. Refer to the relevant HSS or Pipe specification.

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Available Strength of Connectors

Load and Resistance Factor Design (LRFD)

The taper shown offers a factored strength equal to the lesser of:
a) LRFD values in the table below,
b) the factored strengths of the joints between the connector and other steel attachments (HSS, base plate, etc.), and
c) the factored strength of the overall member.

Allowable Stress Design (ASD)

The taper shown offers an available capacity equal to the lesser of:
a) ASD values in the table below,
b) allowable capacity of the joints between the connector and other steel attachments (HSS, base plate, etc.), and
c) the available capacity of the overall member.

	LRFD			ASD		
	$\phi P_n{}^*$ [kips]	$\phi M_n{}^{**}$ [k.ft]	$\phi V_n{}^+$ [kips]	${}^*P_n/\Omega$ [kips]	${}^{**}M_n/\Omega$ [k.ft]	${}^+V_n/\Omega$ [kips]
ART-6.625	615	48.0	186.9	409	31.9	124.3
ART-8.625	949	119.7	288	631	79.7	191.4
ART-10.75	1208	196.6	367	804	130.8	244
ART-12.75	1456	395	441	969	263	293
ART-16.00	1854	737	561	1234	491	373
ART-18.00	1962	901	592	1306	599	394

Specified minimum yield strength
F_y = 50 ksi

Specified minimum tensile strength
F_u = 80 ksi

The values reported are factored strengths or allowable capacities for single-action loading (axial, flexural, or shear). The engineer shall consider the combined action of axial forces, bending and shear forces. Refer to AISC Chapter H.

Nominal strengths have been determined using AISC 360-10

* P_n : Nominal axial compressive or tensile strength:
Equal to the squash load: the minimum value determined from equation D2-1.
The governing gross-section of the taper is $A_g = \pi \cdot t_1(D_1 - t_1)$

**M_n : Nominal flexural strength:
Equal to minimum value determined from equation F8-1.
The governing plastic section modulus of the taper is $Z = (D_2{}^3 - (D_2 - 2t_2)^3) / 6$; or $Z = D_2{}^3/ 6$ for ART-6.625

+ V_n : Nominal shear strength
Equal to minimum value determined from equation G6-1.
The governing shear area of the taper is $A_v = A_g / 2 = \pi \cdot t_1(D_1 - t_1) / 2$;
The critical shear stress was taken as $F_{cr} = 0.6F_y$

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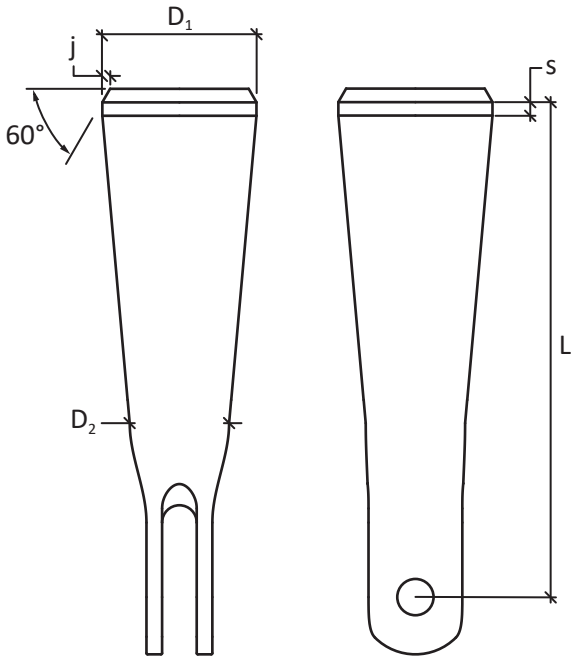
CASTCONNEX®

ARCHITECTURAL TAPER™ + UNIVERSAL PIN CONNECTOR™

Nominal Connector Dimensions



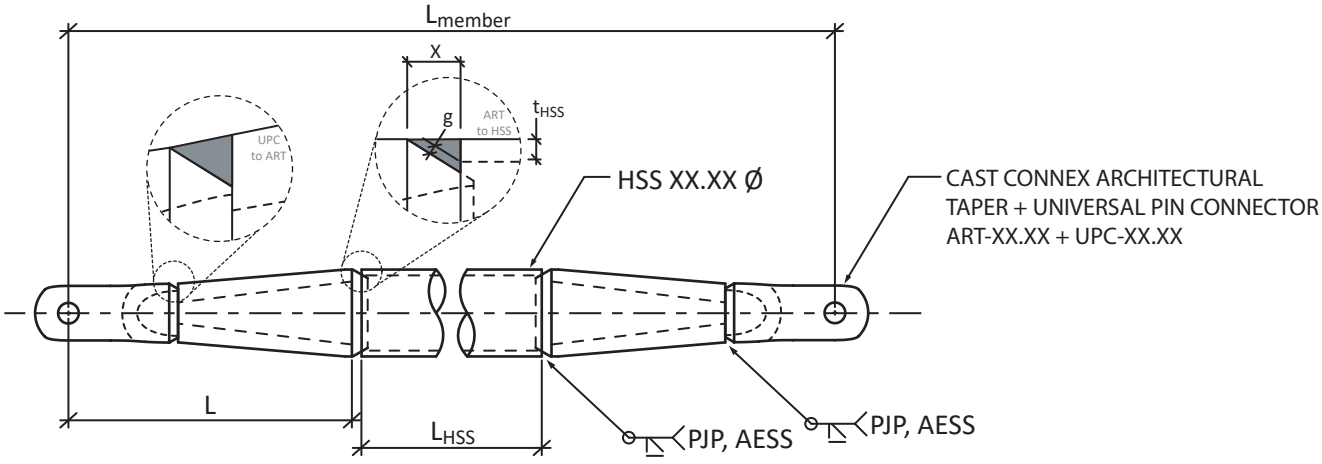
	D_1 [in]	D_2 [in]	L [in]	s [in]	j [in]
ART-6.625 + UPC-4.000L	6 5/8	4	21 5/8	3/4	5/8
ART-6.625 + UPC-4.000	6 5/8	4	22 23/32	3/4	5/8
ART-8.625 + UPC-5.563	8 5/8	5 9/16	29 1/32	3/4	3/4
ART-10.75 + UPC-6.625	10 3/4	6 5/8	35 13/16	1	3/4
ART-12.75 + UPC-8.625	12 3/4	8 5/8	42 9/16	1	3/4
ART-16.00 + UPC-10.75	16	10 3/4	52 15/16	1 1/2	3/4

Universal Pin Connector and Architectural Taper are supplied separately. Fabricator must weld the two pieces together to form the connection assembly.

Available Axial Strength of Connectors

Strengths governed by associated Universal Pin Connector. Refer to the appropriate Universal Pin Connector data sheet.

Typical Assembly



Estimating required length of HSS:

$L_{HSS} = L_{member} - 2(L + X)$

$X = 2g + \sqrt{3}(t_{HSS})$

When using these equations to estimate the length of the HSS or Pipe required (L_{HSS}) for a given element, note that the actual HSS or Pipe thickness (t_{HSS}) can be significantly thinner than the nominal value. Refer to the relevant HSS or Pipe specification.

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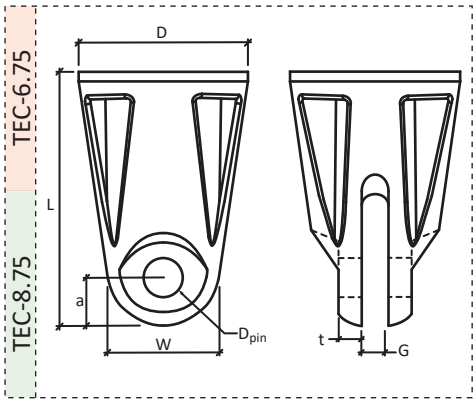
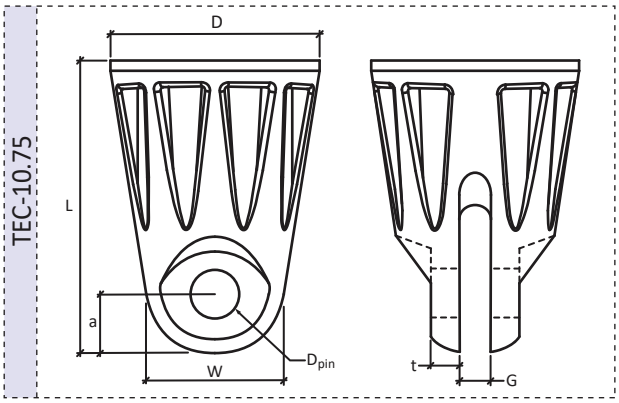
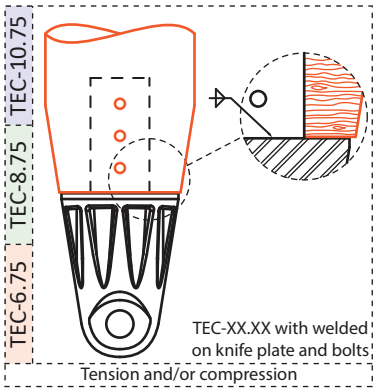
Nominal Connector Dimensions

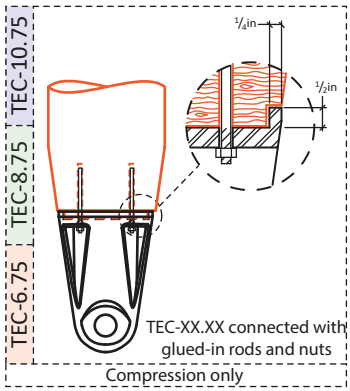


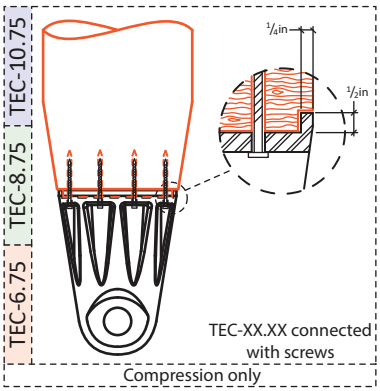


	D [in]	W [in]	L [in]	a [in]	G [in]	t [in]	D_{pin} [in]
TEC-6.75	6 3/4	4 1/8	9 5/16	2 1/4	1 1/8	1	1 1/2
TEC-8.75	8 3/4	5 1/8	13 1/8	2 1/2	1 3/8	1 1/4	2
TEC-10.75	10 3/4	7 1/8	15 1/8	3 1/8	1 5/8	1 1/2	2 1/2

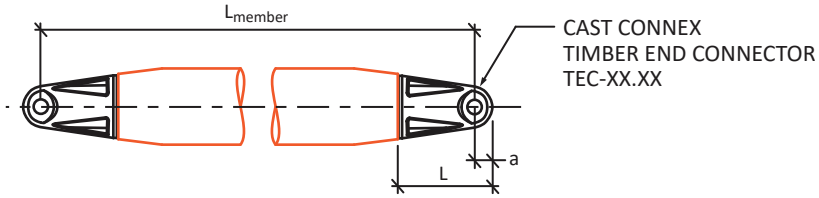
Typical Assembly







Timber supplier to coordinate with casting supplier



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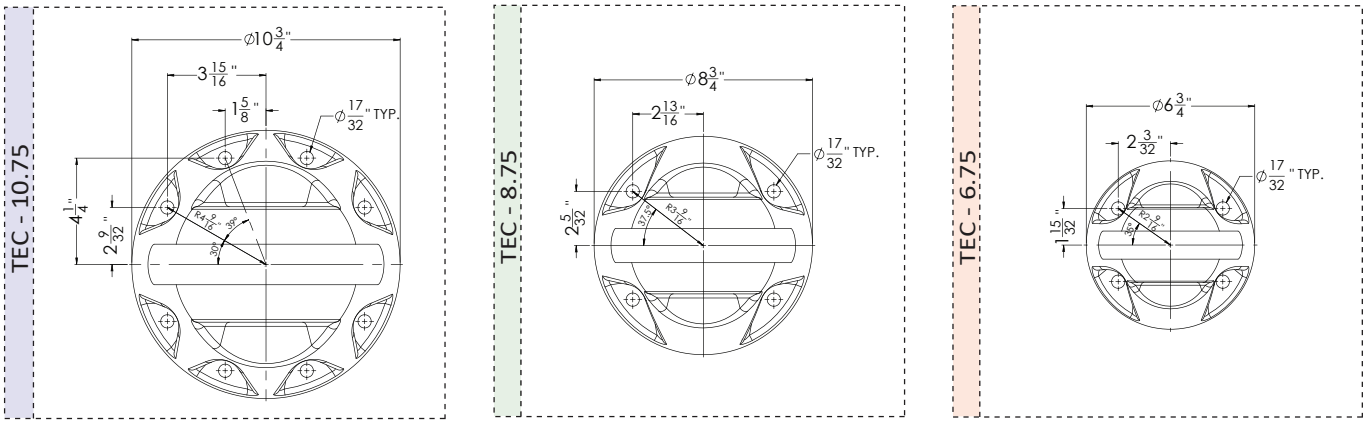
Hole Patterns for Compression Only Connectors



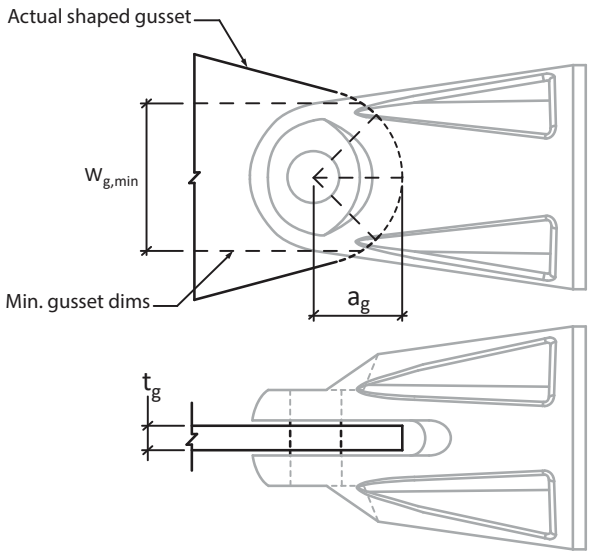
Available Axial Strength of Connectors

Load and Resistance Factor Design (LRFD)

The pin connection detail shown offers a factored axial strength equal to the lesser of:
a) ϕP_n in the table below,
b) the factored strength of the timber member-to-connector connection
c) the factored strength of the connecting timber member, and
d) the factored buckling strength of the gusset plate

Allowable Stress Design (ASD)

The pin connection detail shown offers an allowable tensile capacity equal to the lesser of:
a) P_n/Ω in the table below,
b) the allowable capacity of the timber member-to-connector connection
c) the allowable tensile capacity of the connecting timber member, and
d) the allowable buckling capacity of the gusset plate



SOLID PIN:
D_{pin} : Diameter of pin; diameter of pin hole not more than 1/32" larger than pin

GUSSET PLATE:
t_g : thickness of gusset plate
$a_{g,min}$: min gusset plate end distance for max design load
$a_{g,max}$: max gusset plate end distance to fit within connector
$W_{g,min}$: min gusset plate width at pin for max design load

CONNECTOR:
Specified minimum yield strength F_y = 40 ksi
Specified minimum tensile strength F_u = 70 ksi

						A36 gusset		A572 Gr. 42 gusset		A572 Gr. 50 gusset	
	$W_{g,min}$ [in]	$a_{g,min}$ [in]	$a_{g,max}$ [in]	D_{pin} [in]	t_g [in]	ϕP_n [kips]	P_n/Ω [kips]	ϕP_n [kips]	P_n/Ω [kips]	ϕP_n [kips]	P_n/Ω [kips]
TEC-6.75	4 1/8	2 3/4	3	1 1/2	1	72.9	48.6	85.1	56.7	101	67.5
TEC-8.75	4 7/8	3	3 1/2	2	1 1/4	121	81.0	142	94.5	169	112
TEC-10.75	6	3 5/8	4 1/2	2 1/2	1 1/2	182	121	213	142	253	169

Nominal strengths have been determined using AISC 360-16.

P_n: Nominal Compressive or Tensile strength: Equal to min. strength of the connector, min. sized gusset, and pin using Sections D2a, D5.1, E3, J4.2 and J7a.

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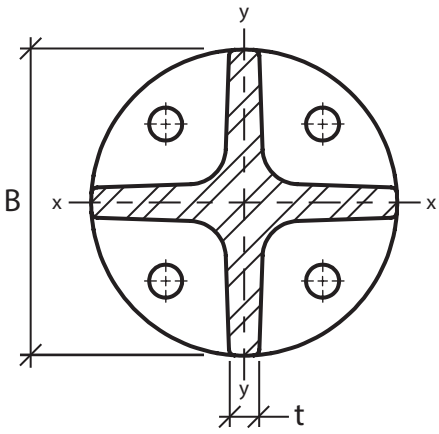
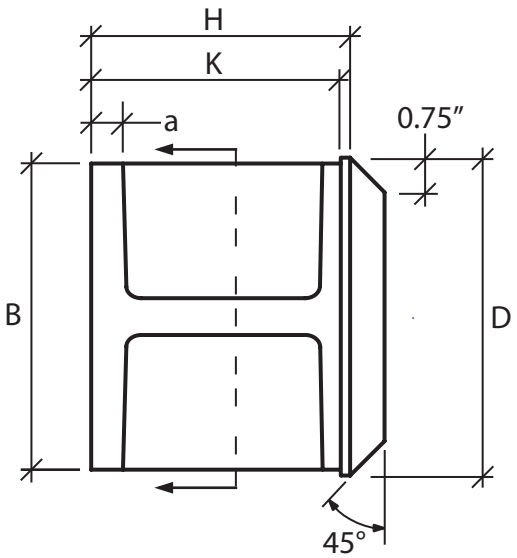
Nominal Connector Dimensions

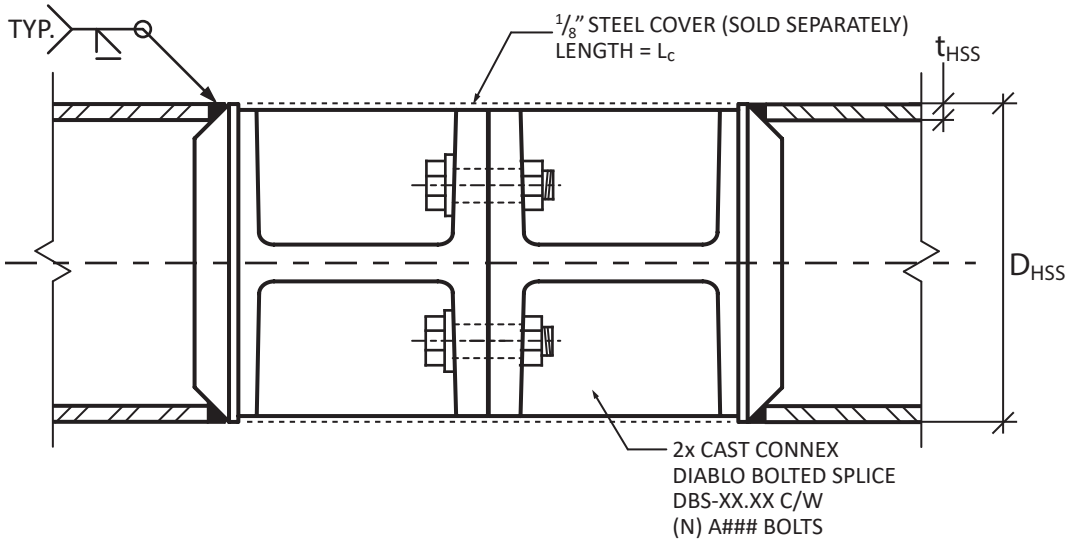




	D (in)	B (in)	t (in)	a (in)	H (in)	K (in)	A* (in²)	Z* (in³)	SOLD SEPARATELY L_c (in)
DBS-5.563	5 9/16	5 1/5	4/7	3/4	5 1/2	5 1/3	6.77	4.93	10 3/8
DBS-6.625	6 5/8	6 1/4	5/8	3/4	5 3/4	5 9/16	8.92	7.76	10 7/8
DBS-8.625	8 5/8	8 1/4	1	1	7 1/8	7	18.2	21.6	13 5/8
DBS-10.75	10 3/4	10 3/8	1 1/4	1 3/16	8 1/8	7 13/16	28.3	42.1	15 1/4
DBS-12.75	12 3/4	12 3/8	1 1/4	1 1/4	8 5/16	8	34.7	60.0	15 5/8

*A = Area at Cruciform Section
*Z = Plastic Section Modulus at Cruciform Section about x or y axis

Typical Assembly



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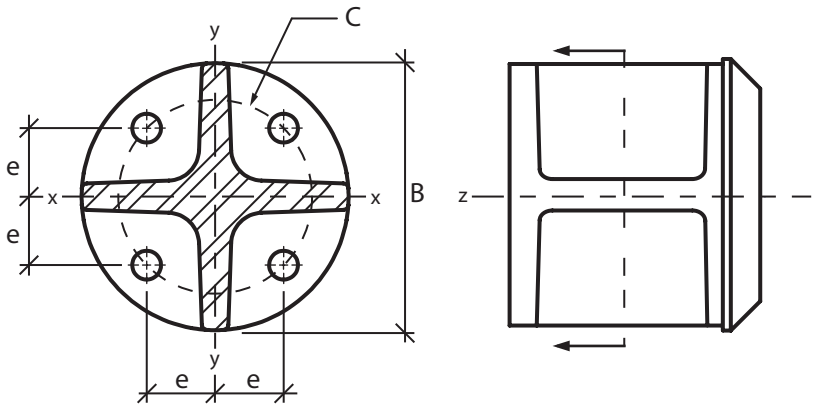
Available Strength of Connectors (4 Bolts)

Load and Resistance Factor Design (LRFD)

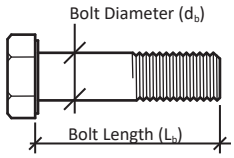
The joint detail shown offers a factored strength equal to the lesser of:
a) ϕT_n, ϕP_n, ϕM_n, and ϕV_n in the table below with the qualifications indicated,
b) the factored strength of the HSS-to-connector welded connection, and
c) the factored strength of the connecting HSS member

Allowable Stress Design (ASD)

The joint detail shown offers an allowable capacity equal to the lesser of:
a) T_n/Ω, P_n/Ω, M_n/Ω and V_n/Ω, in the table below with the qualifications indicated,
b) the allowable capacity of the HSS-to-connector welded connection, and
c) the allowable capacity of the connecting HSS member



Connector	d_b [in]	L_b [in]	C [in]	e [in]
DBS-5.563	5/8	2 3/4	3 3/5	1 2/7
DBS-6.625	5/8	2 3/4	4 5/8	1 5/8
DBS-8.625	1	3 3/4	5 7/8	2 1/16
DBS-10.75	1 1/4	4 1/2	7 1/4	2 9/16
DBS-12.75	1 1/4	4 1/2	9 1/4	3 9/32



For any bolt size (d_b), standard diameter holes are provided.

LRFD	Bolt Group Strength[1]						Connector Strength[1]		
	A325			A490					
Connector	ϕT_n [kips]	ϕM_n [k-ft]	ϕV_n[3] [kips]	ϕT_n [kips]	ϕM_n [k-ft]	ϕV_n[3] [kips]	ϕP_n[2] [kips]	ϕM_n [k-ft]	ϕV_n [kips]
DBS-5.563	82.8	8.80	62.6	104.0	11.1	77.1	292	16.0	78.8
DBS-6.625	82.8	11.3	62.6	104.0	14.2	77.3	382	25.1	100.0
DBS-8.625	212	36.7	160.2	266	46.1	197.9	791	74.8	214
DBS-10.75	331	70.8	250	416	88.9	309	1230	147.3	327
DBS-12.75	331	90.3	250	416	113.4	309	1486	197.7	387

ASD	Bolt Group Strength[1]						Connector Strength[1]		
	A325			A490					
Connector	T_n/Ω [kips]	M_n/Ω [k-ft]	V_n/Ω[3] [kips]	T_n/Ω [kips]	M_n/Ω [k-ft]	V_n/Ω[3] [kips]	P_n/Ω[2] [kips]	M_n/Ω [k-ft]	V_n/Ω [kips]
DBS-5.563	55.2	5.87	41.7	69.3	7.37	51.5	194.5	10.6	52.4
DBS-6.625	55.2	7.53	41.7	69.3	9.45	51.5	254	16.7	66.6
DBS-8.625	141.4	24.5	106.8	177.5	30.7	131.9	526	49.8	142.6
DBS-10.75	221	47.2	166.9	277	59.2	206	818	98.0	218
DBS-12.75	221	60.2	166.9	277	75.6	206	988	131.5	257

1. Strengths reported are for single-action loading conditions (i.e. pure axial force, single-direction pure flexure, or pure shear). Strength values are given with respect to the axes shown above (x-x and y-y). Engineer shall confirm adequacy of joint under combined axial forces, shear forces and moments using relevant code provisions. See AISC 360-16.

2. Depending on the thickness (t_{HSS}) and minimum yield strength (F_y) of the incoming HSS member, the tensile or compressive strength of the welded joint between the HSS and connector may be influenced by shear lag.

3. Shear strength assumes bolt threads are excluded.

Nominal strengths have been determined using AISC 360-16.
P_n: Nominal Compressive or Tensile strength (z-axis): Equal to min. strength of the connector.
T_n: Nominal Tensile strength (z-axis): Equal to min. strength of the bolt group.
M_n: Nominal Flexural strength (x or y axis): Equal to min. strength of the bolt group, or min. strength of the connector.
V_n: Nominal Shear strength (x or y axis): Equal to min. strength of the bolt group, or min. strength of the connector.

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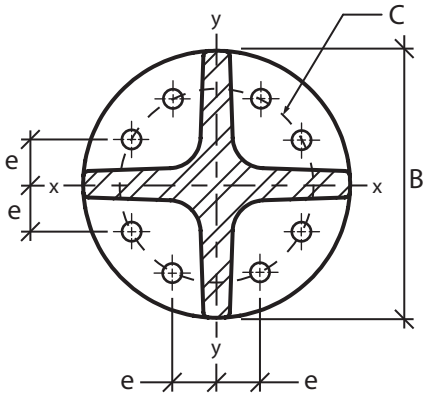
Available Strength of Connectors (8 Bolts)

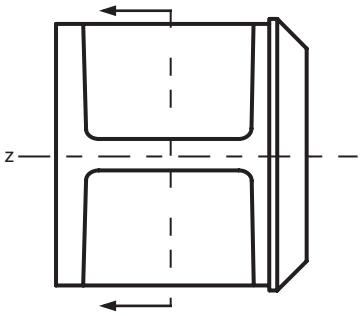
Load and Resistance Factor Design (LRFD)

The joint detail shown offers a factored strength equal to the lesser of:
a) ϕT_n, ϕP_n, ϕM_n, and ϕV_n in the table below with the qualifications indicated,
b) the factored strength of the HSS-to-connector welded connection, and
c) the factored strength of the connecting HSS member

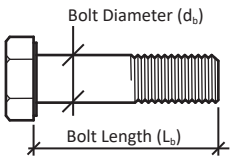
Allowable Stress Design (ASD)

The joint detail shown offers an allowable capacity equal to the lesser of:
a) T_n/Ω, P_n/Ω, M_n/Ω and V_n/Ω, in the table below with the qualifications indicated,
b) the allowable capacity of the HSS-to-connector welded connection, and
c) the allowable capacity of the connecting HSS member





Connector	d_b [in]	L_b [in]	C [in]	e [in]
DBS-12.75	1	4 1/2	10	2 1/4



For any bolt size (d_b), standard diameter holes are provided.

LRFD	Bolt Group Strength[1]						Connector Strength[1]		
	A325			A490					
Connector	ϕT_n [kips]	ϕM_n [k-ft]	$\phi V_n{}^3$ [kips]	ϕT_n [kips]	ϕM_n [k-ft]	$\phi V_n{}^3$ [kips]	$\phi P_n{}^2$ [kips]	ϕM_n [k-ft]	ϕV_n [kips]
DBS-12.75	424	118.7	320	532	149.0	396	1486	197.7	387

ASD	Bolt Group Strength[1]						Connector Strength[1]		
	A325			A490					
Connector	T_n/Ω [kips]	M_n/Ω [k-ft]	V_n/Ω^3 [kips]	T_n/Ω [kips]	M_n/Ω [k-ft]	V_n/Ω^3 [kips]	P_n/Ω^2 [kips]	M_n/Ω [k-ft]	V_n/Ω [kips]
DBS-12.75	283	79.1	214	355	99.3	264	988	131.5	257

1. Strengths reported are for single-action loading conditions (i.e. pure axial force, single-direction pure flexure, or pure shear). Strength values are given with respect to the axes shown above (x-x and y-y). Engineer shall confirm adequacy of joint under combined axial forces, shear forces and moments using relevant code provisions. See AISC 360-16.

2. Depending on the thickness (t_{HSS}) and minimum yield strength (F_y) of the incoming HSS member, the tensile or compressive strength of the welded joint between the HSS and connector may be influenced by shear lag.

3. Shear strength assumes bolt threads are excluded.

Nominal strengths have been determined using AISC 360-16.
P_n: Nominal Compressive or Tensile strength (z-axis): Equal to min. strength of the connector.
T_n: Nominal Tensile strength (z-axis): Equal to min. strength of the bolt group.
M_n: Nominal Flexural strength (x or y axis): Equal to min. strength of the bolt group, or min. strength of the connector.
V_n: Nominal Shear strength (x or y axis): Equal to min. strength of the bolt group, or min. strength of the connector.

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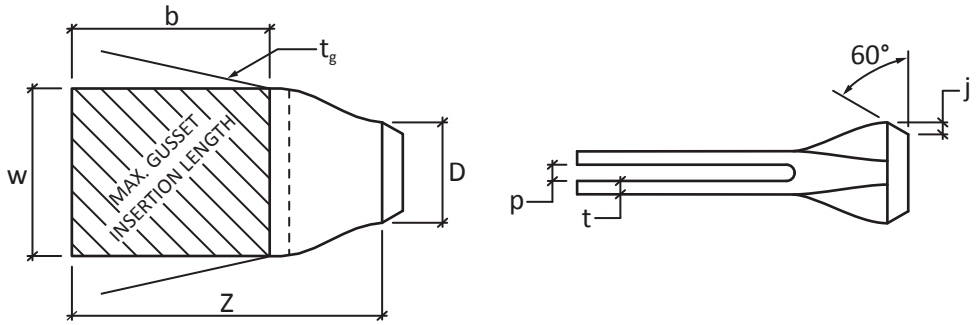
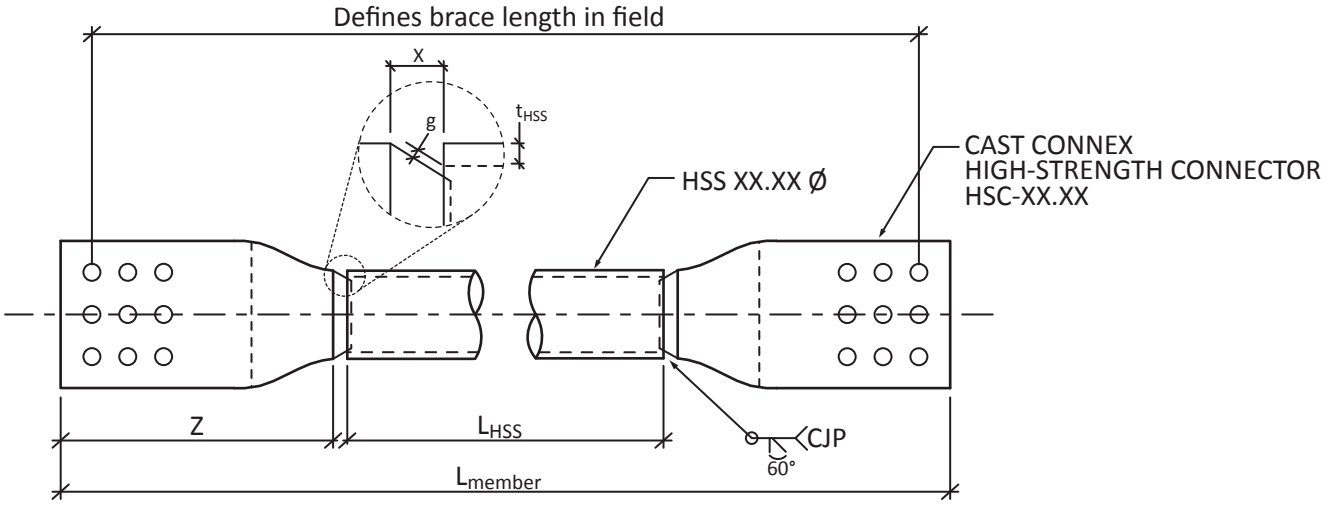
Nominal Connector Dimensions



	Z [in]	D [in]	b [in]	w [in]	t [in]	t_g [in]	p_{min} [in]	p_{max} [in]	j [in]
HSC-4.000	14 1/4	4	10	7	1/2	1/2	9/16	5/8	19/32
HSC-5.563	19 1/16	5 9/16	13	9	5/8	3/4	13/16	7/8	19/32
HSC-6.625	20 3/8	6 5/8	13	11	7/8	1	1 1/16	1 1/8	25/32
HSC-8.625	27 1/8	8 5/8	18	14	1	1 1/4	1 5/16	1 3/8	7/8
HSC-10.75	25 5/8	10 3/4	16	16	1 1/4	1 1/2	1 9/16	1 5/8	7/8
HSC-12.75	27 3/4	12 3/4	17	19	1 1/4	1 3/4	1 13/16	1 7/8	7/8
HSC-14.00*	29 3/4	14	17	19	1 1/2	1 3/4	1 13/16	1 7/8	7/8

*Limited availability, inquire about lead times

Typical Assembly



Estimating required length of HSS:

$L_{HSS} = L_{member} - 2(Z + X)$

$X = 2g + \sqrt{3}(t_{HSS})$

When using these equations to estimate the length of the HSS or Pipe required (L_{HSS}) for a given element, note that the actual HSS or Pipe thickness (t_{HSS}) can be significantly thinner than the nominal value. Refer to the relevant HSS or Pipe specification.

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Available Strength of Connectors

Load and Resistance Factor Design (LRFD)	Allowable Stress Design (ASD)
The connector shown offers a factored strength equal to the lesser of: a) LRFD values in the table below, b) factored strength of the bolted joint between the connector and the gusset plate (see Cast Connex HSC Design Manual for pre-designed bolt patterns), and c) the factored strength of gusset plate and its associated welded joints.	The connector shown offers an allowable capacity equal to the lesser of: a) ASD values in the table below, b) allowable capacity of the bolted joint between the connector and the gusset plate (see Cast Connex HSC Design Manual for pre-designed bolt patterns), and c) the allowable capacity of gusset plate and its associated welded joints.

	LRFD		ASD		
	ϕT_n* [kips]	$\phi M_{n,op}$** [k.ft]	T_n/Ω* [kips]	$M_{n,op}/\Omega$** [k.ft]	I_{op}+ [in^4]
HSC-4.000	315	167.3	210	111.3	2.12
HSC-5.563	506	364	337	242	6.18
HSC-6.625	866	839	576	558	19.29
HSC-8.625	1260	1457	838	969	39.8
HSC-10.75	1800	2530	1198	1684	84.3
HSC-12.75	2140	3270	1422	2180	117.6
HSC-14.00	2560	4250	1710	2830	167.0

Specified minimum yield strength
F_y = 50 ksi

Specified minimum tensile strength
F_u = 80 ksi

Nominal strengths have been determined using AISC 360-10.

* T_n: Nominal tensile yielding strength:
Equal to value determined from Chapter J4.
The governing gross-section of the connector is $A_g = 2w \cdot t$

**$M_{n,op}$: Nominal out-of-plane flexural strength:
Equal to value determined from Chapter F2.
The governing plastic section modulus is $Z = w \cdot t\ (t + p_{min})$

\+ I_{op}: Out-of-plane moment of inertia

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