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October 08, 2025

REPORT:

26 Heron Street,
West Roxbury, MA

Beam to Column Shear & Moment Connections

Job: 250164; Drawings: Structural Drawings-S-001 thru S610
(GSE Job No.25729)

Prepared for:

D. Cronin's Welding Service, Inc.,
70 State Street,
Lawrence, MA 01843.

Prepared by:

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Scope of Project

Design of Beam to Column Shear & Moment Connections at 26 Heron Street, West Roxbury, MA

**26 HERON ST,
WEST ROXBURY, MA
STRUCTURAL PLANS**



Job 25729

October 17, 2025

Design Criteria

Refer to Structural Notes on structural drawings dated 12/12/2024

For Connection design, ASCE 7-10, AISC 360-10 edition, IBC 2018 as amended by the Massachusetts State Building Code 9th edition, and the AISC 15th Edition Manual have been used.

All Steel Connections have been designed for the LRFD Loads given on Sheet S004

Materials

Structural steel shall be designed per the 'Specification for structural steel buildings' & American Welding Society (AWS D1.1) "Structural Welding Code - Steel" (E70XX Grade). AISC 15th edition. All Bars, Steel plates, Channels, MC Sections, and angles of grade ASTM A36 Grade 36 shall be used. All W sections ASTM A572 or 992-50 ksi shall be used. All HSS sections of grade ASTM A 500 – Grade B shall be used. The high-strength bolts of A325N or A490N shall be used for Shear & Moment Connections.

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B) Beam to Column Shear, Moment & Beam to Wall Bearing Connections Summary

- 6) **Shear Connection** – W12x_ Beam connecting to HSS6x6x5/16", HSS8x8x3/8" & HSS10x10x1/2" Column using 1/2" Thick Shear Plate with (2) - 3/4" ϕ A325N Bolts & 5/16" thick weld - For 22 kip Shear
- 7) **Shear Connection** – W18x_ Beam connecting to HSS6x6x5/16", HSS8x8x3/8" & HSS10x10x1/2" Column using 1/2" Thick Shear Plate with (5)- 3/4" ϕ A325N Bolts & 5/16" thick weld - For 80 to 108 kip Shear - **NO GOOD**
- 7.1) **Shear Connection** – W18x_ Beam connecting to HSS6x6x5/16", HSS8x8x3/8" & HSS10x10x1/2" Column using 1/2" Thick Shear Plate with (5)- 1" ϕ A490N Bolts & 5/16" thick weld - For 108 kip Shear - **REVISED**
- 8) **Shear Connection** – W18x35 To W18x65 Beam connecting to HSS6x6x5/16", HSS8x8x3/8" & HSS10x10x1/2" Column using 1/2" Thick Shear Plate with (5)- 3/4" ϕ A325N Bolts & 5/16" thick weld - For up to 80 kip Shear
- 9) **Shear Connection** – W24x176 & W24x192 Beam connecting to HSS10x10x1/2" Column using 1/2" Thick Shear Plate with (7) - 3/4" ϕ A325N Bolts & 5/16" thick weld - For 235 kip Shear - **NO GOOD**
- 9.1) **Shear Connection** – W24x176 & W24x192 Beam connecting to HSS10x10x1/2" Column using 3/4" Thick Shear Plate with (7) - 1" ϕ A490N Bolts & 1/2" thick weld - For 235 kip Shear - **REVISED**
- 10) **Moment Connection** – Up to W18x76 Beam connecting to HSS10x10x1/2" Column using 1/2" Thick Internal Diaphragm with 3/8" thick weld & Flanges directly welded to column by CJP - For 80 kip-ft Moment
- 11) **Moment Connection** – W18x143 Beam connecting to HSS10x10x1/2" Column using 1/2" Thick Internal Diaphragm with 3/8" thick weld & Flanges directly welded to column by CJP - For 120 kip-ft Moment
- 12) **Moment Connection** – W24x192 Beam connecting to HSS10x10x1/2" Column using 1/2" Thick Internal Diaphragm with 1/4" thick weld & Flanges directly welded to column by CJP - For 85 kip-ft Moment
- 13) **Bearing Connection** – W12x22 Steel Beam to 10" thick wall using 1/2" thick steel bearing plate with (2) 1/2" dia. HIT-HY 200 + HIT Z 6" Embedded Anchors - For – 5 kips
- 14) **Bearing Connection** – W18x35 & W18x40 Steel Beam to 10" thick wall using 1/2" thick steel bearing plate with (2) 1/2" dia. HIT-HY 200 + HIT Z 6" Embedded Anchors - For – 27 kips **NO GOOD, USE a 3/4" Thick Plate**



Job 25729
October 17, 2025

NOTE:
OWNER/CONTRACTOR TO SEND STEEL
SHOP DRAWINGS TO STRUCTURAL ENGINEER
FOR REVIEW BEFORE ANY
STEEL WORK BEING CARRIED OUT.

* SHEAR VALUES FOR
SIMPLE CONNECTIONS IN
LRFD
 $V = X.X$ KIP
(ENGINEER TO BE
NOTIFIED IF MORE
INFORMATION IS
REQUIRED)

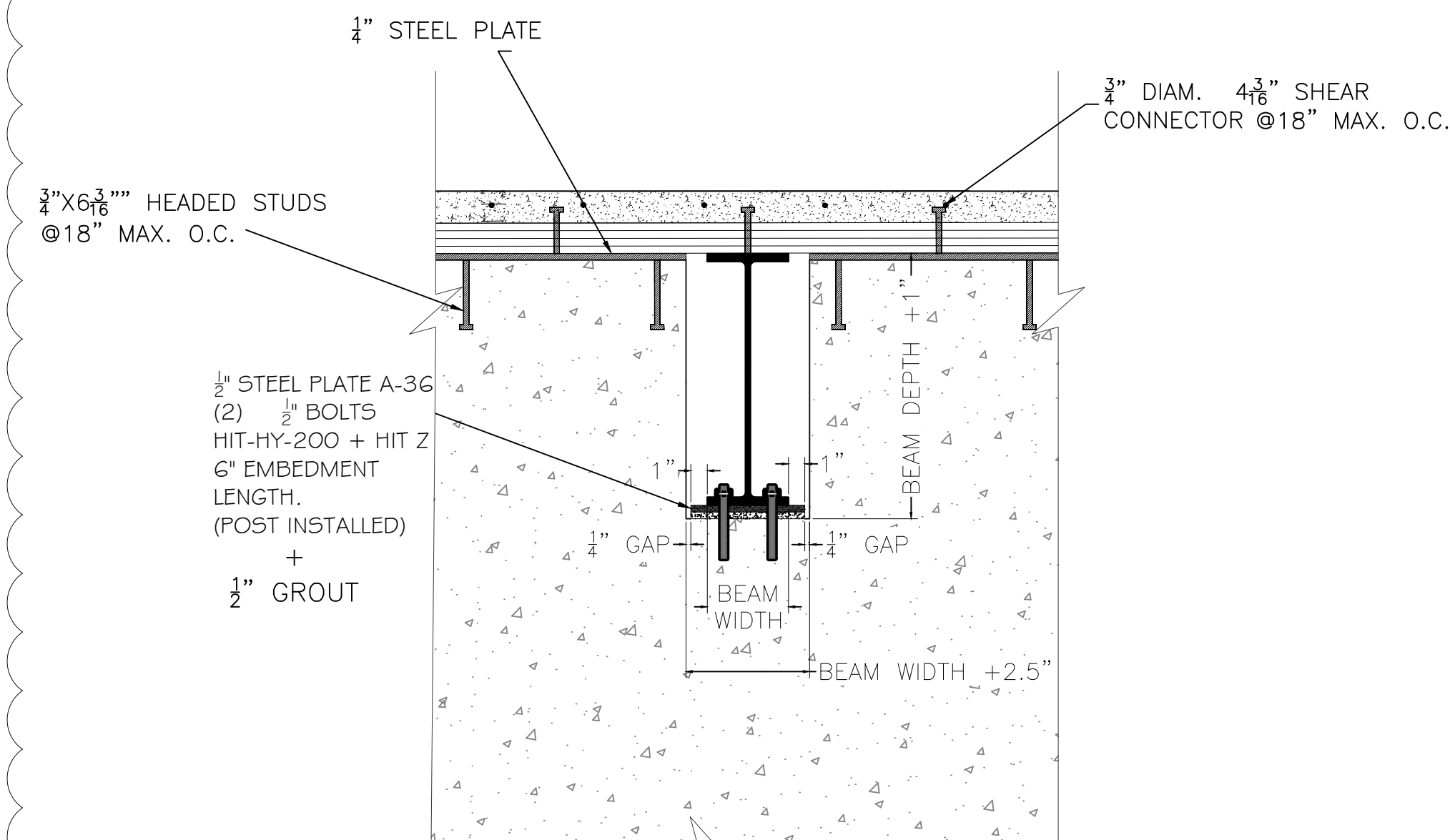
** SHEAR STUDS QUANTITY
SHOWN NEXT TO PROFILE
SECTION W12X14[X]

○ HOLD DOWN DEVICE HDU

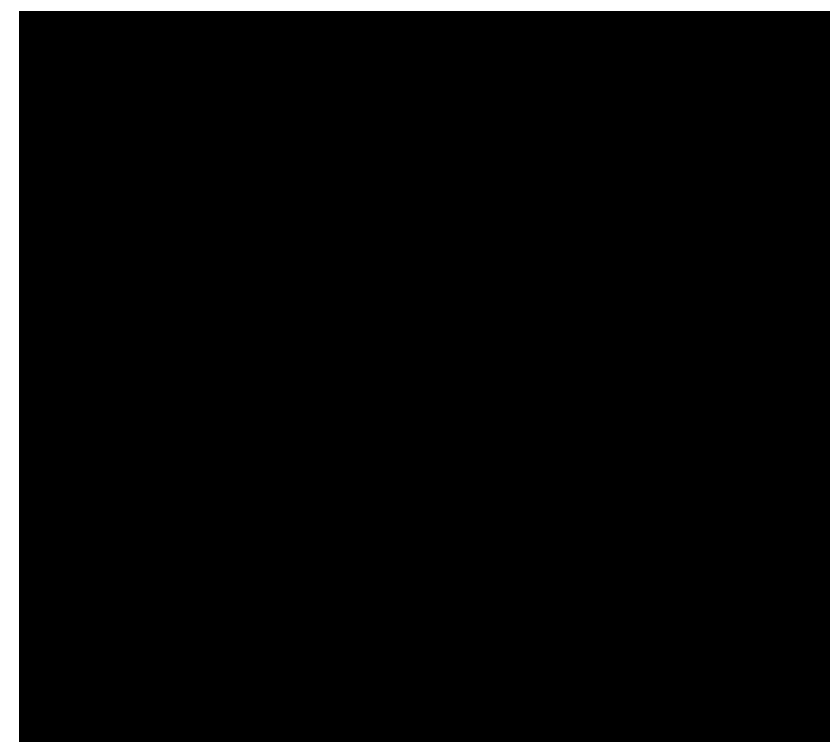
FOUNDATION WALL DN
LOAD BEARING WALL UP
8" CMU WALL
TYPE B UP: 1½"X5½" VERSA-STUD 1.7
2650 @ 16" O.C. (BLOCKED) MINIMUM
SHEARWALL UP

* MOMENT VALUES FOR
MOMENT CONNECTIONS
IN LRFD
 $M = X.X$ KIP. FT
(ENGINEER TO BE
NOTIFIED IF MORE
INFORMATION IS
REQUIRED)

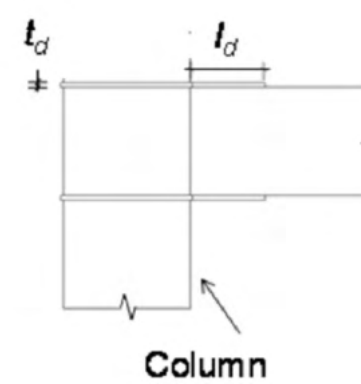
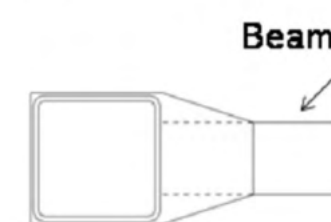
NOTE:
THE CONTRACTOR MUST REFER TO
THE SHOP DRAWINGS FOR THE SIZE
OF EACH BEAM POCKET BEFORE
CARRYING OUT ANY WORK.



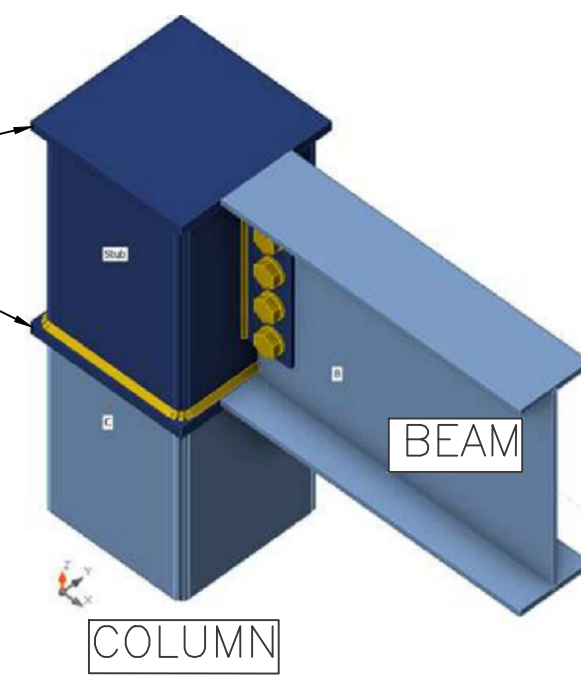
BEAM POCKET DETAIL



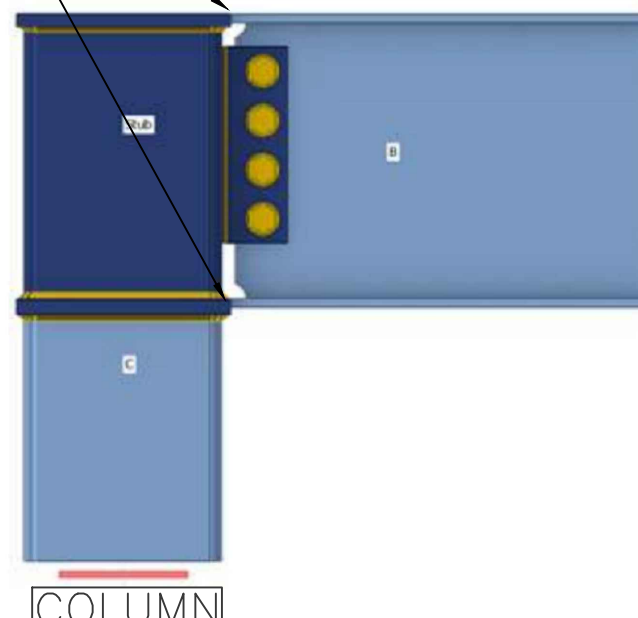
Internal Diaphragm



INTERNAL
DIAPHRAGM



FULL PENETRATION
WELDED MOMENT
CONNECTION



TYP. MOMENT CONNECTION

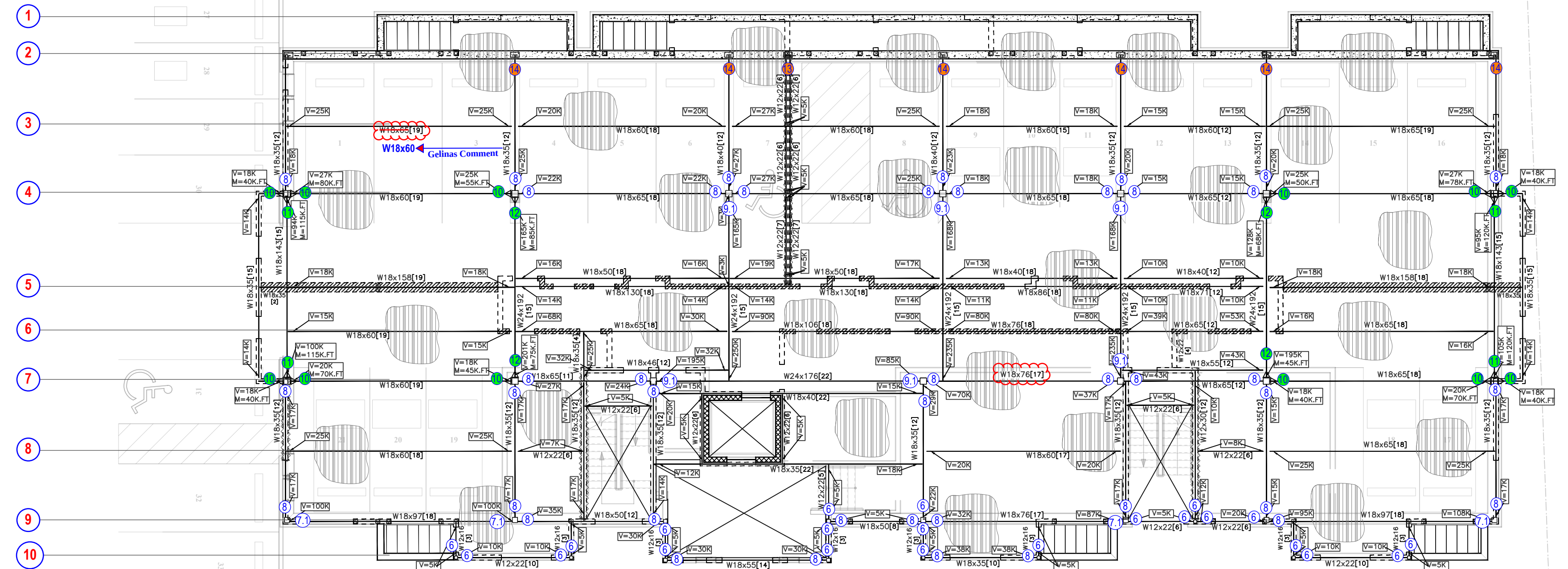
Gelinas Comment

LEGENDS

SYMBOL	DESCRIPTION
(X)	BEAM TO BEAM SHEAR CONNECTION
(X)	BEAM TO COLUMN SHEAR CONNECTION
(X)	BEAM TO BEAM MOMENT CONNECTION
(X)	BEAM TO COLUMN MOMENT CONNECTION
(X)	BEAM TO COLUMN & WALL BEARING CONN.

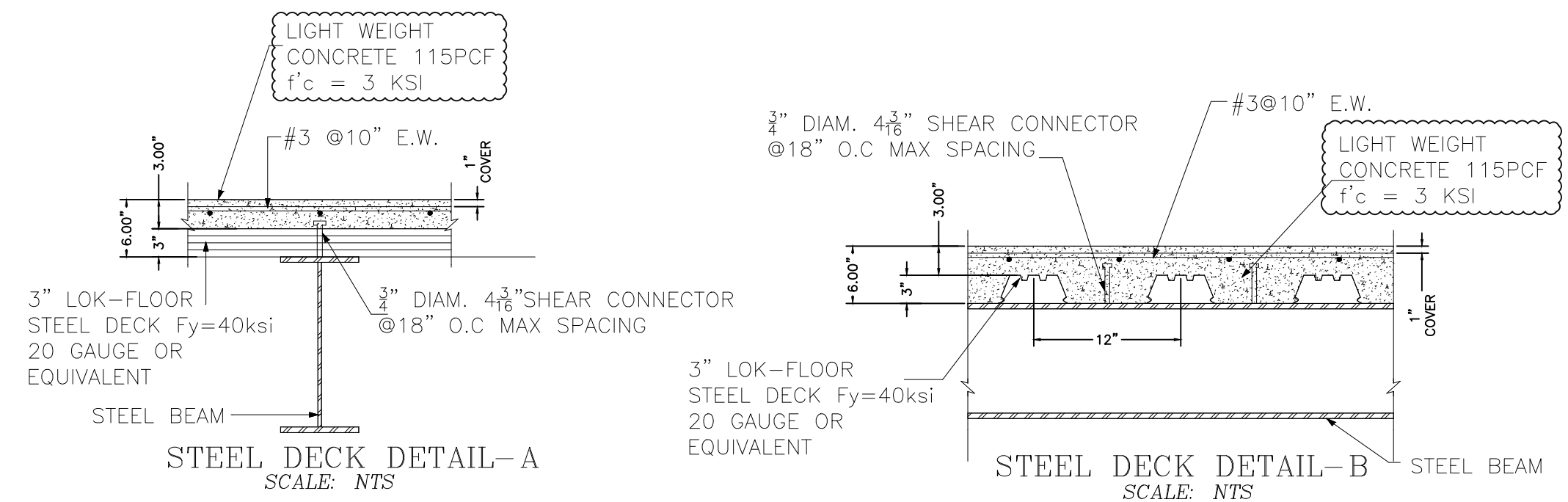
JOB NO : 25729
10-08-2025 GELINAS COMMENTS

THE STEEL BEAM AND METAL DECKING MUST
BE TEMPORARILY SUPPORTED WITH PROPS
AS REQUIRED BY THE CONTRACTOR.



FIRST FLOOR MOMENT, SHEAR FORCE LRFD
AND SHEAR STUDS

NOTE:
LIGHTWEIGHT CONCRETE MUST BE USED FOR THE STEEL DECK.
LIGHTWEIGHT CONCRETE CERTIFICATE MUST BE SEND TO STRUCTURAL ENGINEER.



COMPOSITE STEEL DECK DETAIL

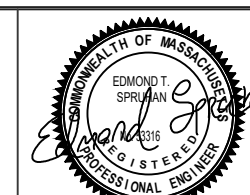
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26 HERON ST.
WEST ROXBURY, MA
STRUCTURAL PLANS

REVISION BLOCK	
DESCRIPTION	DATE



Spruhan
Engineering, P.C.
20 JEWETT ST., SUITE 2
NEWTON, MA 02459
Tel: 617-816-0722
Email: ledmond@spruhaneng.com



TITLE

1ST FLOOR FRAMING

DRAWN BY CL
CHKD BY HM
DATE 12/12/2024
SCALE 3/32 "1'-0"
PROJECT NO 24)SE0234

S004

B) BEAM TO COLUMN - SHEAR, MOMENT & WALL BEARING CONNECTIONS SUMMARY

NOTES:

- 1) DL IN THE RAM CONNECT OUTPUT DENOTES "DESIGN LOADS".
- 2) ALL STRUCTURAL STEEL GRADE A572 OR A992 (GR50 KSI) FOR ALL WIDE FLANGE SHAPES EXCEPT SECTIONS SMALLER THAN W8, A36 (36 KSI) FOR WIDE FLANGE SECTIONS SMALLER THAN W8, ASTM A53 GR B FOR PIPE SECTIONS, A500 GRADE-C (Fy=50 KSI) FOR RECTANGULAR HSS AND A500 GRADE-B (Fy=46 KSI) FOR ROUND HSS SECTIONS.
- 3) CONNECTION MATERIAL GRADE : ANGLES AND PLATE (A36-36 KSI). U.N.O.
- 4) ALL BOLTS ARE ¾" Ø A325N & 1" Ø A490N BOLTS (U.N.O)
- 5) WELDING ELECTRODES SHALL CONFORM TO ASTM SPECIFICATION E-70XX.
- 6) **DESIGN METHOD - LRFD PER AISC 15TH EDITION (AISC 360 - 10).**
- 7) **ALL THE CONNECTIONS HAVE BEEN DESIGNED FOR THE LOADS GIVEN ON SHEETS S004.**

BEAM TO COLUMN SHEAR, MOMENT & WALL BEARING CONNECTIONS SUMMARY							
CONN. ID	BEAM SIZE	BEAM OR COLUMN SIZE	TYPE OF CONNECTION	BOLT DESCRIPTION	SHEAR PLATE & WELD THICKNESS	REACTIONS PER SHEET - S004	REMARKS
6	W12x16, W12x22, W12x 30	HSS6"x6"x5/16" HSS8"x8"x5/16" COL	SHEAR CONNECTION	(3) - 3/4" Ø A325N	1/2" THICK SHEAR PLATE WITH 5/16" THICK WELD	22 KIPS SHEAR	
7	W18x76 & W18x97	HSS6"x6"x5/16", HSS8"x8"x5/16" HSS10"x10"x1/2" COL	SHEAR CONNECTION	(5) - 3/4" Ø A325N	1/2" THICK SHEAR PLATE WITH 5/16" THICK WELD	108 KIPS SHEAR	• 3/4" Ø A325N BOLTS FAIL IN SHEAR. • (5) - 3/4" Ø A325N CAN CARRY UPTO 80 KIPS ONLY
7.1	W18x76 & W18x97	HSS6"x6"x5/16", HSS8"x8"x5/16" HSS10"x10"x1/2" COL	SHEAR CONNECTION	(5) - 1" Ø A490N	1/2" THICK SHEAR PLATE WITH 5/16" THICK WELD	108 KIPS SHEAR	REVISED CONNECTION WITH (5) - 1" Ø A490N BOLTS
8	W18x35 TO W18x65	HSS6"x6"x5/16", HSS8"x8"x5/16" HSS10"x10"x1/2" COL	SHEAR CONNECTION	(5) - 3/4" Ø A325N	1/2" THICK SHEAR PLATE WITH 5/16" THICK WELD	70 KIPS SHEAR	
9	W24x176 & W24x192	HSS10"x10"x1/2" COL	SHEAR CONNECTION	(7) - 3/4" Ø A325N	1/2" THICK SHEAR PLATE WITH 5/16" THICK WELD	235 KIPS SHEAR	• 3/4" Ø A325N BOLTS FAIL IN SHEAR • 1/2" THICK PLATE FAILS • (5) - 3/4" Ø A325N CAN CARRY UPTO 80 KIPS ONLY
9.1	W24x176 & W24x192	HSS10"x10"x1/2" COL	SHEAR CONNECTION	(7) - 1" Ø A490N	3/4" THICK SHEAR PLATE WITH 1/2" THICK WELD	235 KIPS SHEAR	• REVISED CONNECTION WITH • (7) 1" DIA. A490N BOLTS & • A 3/4" THICK PLATE & 1/2" WELD
10	W18x60,65, 76	HSS10"x10"x1/2" COL	MOMENT CONNECTION	(5) - 3/4" Ø A325N	1/2" THICK INTERNAL DIAPHRAGM WITH 3/8" THICK WELD & FLANGES DIRECTLY CJP WELDED TO COLUMN	27 KIPS SHEAR & 80 KIP-FT MOMENT	REFER TO <u>CONNECTION ID-8</u> FOR SHEAR CONNECTION DETAILS
11	W18x143	HSS10"x10"x1/2" COL	MOMENT CONNECTION	(5) - 1" Ø A490N	1/2" THICK INTERNAL DIAPHRAGM WITH 3/8" THICK WELD & FLANGES DIRECTLY CJP WELDED TO COLUMN	105 KIPS SHEAR & 120 KIP-FT MOMENT	REFER TO <u>CONNECTION ID-7.1</u> FOR SHEAR CONNECTION DETAILS
12	W24x192	HSS10"x10"x1/2" COL	MOMENT CONNECTION	(7) - 1" Ø A490N	1/2" THICK INTERNAL DIAPHRAGM WITH 1/4" THICK WELD & FLANGES DIRECTLY CJP WELDED TO COLUMN	201 KIPS SHEAR & 85 KIP-FT MOMENT	REFER TO <u>CONNECTION ID-9.1</u> FOR SHEAR CONNECTION DETAILS
13	W12x22	FOUNDATION WALL	BEARING CONNECTION		1/2" THICK BEARING PLATE	5 KIPS	
14	W18x35, 40	FOUNDATION WALL	BEARING CONNECTION		3/4" THICK BEARING PLATE	27 KIPS	1/2" THICK BEARING PLATE NOT ADEQUATE FOR 27 KIPS
NOTE: - ALL THE CONNECTIONS HAVE BEEN DESIGNED FOR THE LOADS GIVEN ON SHEETS S004							

NOTE: -

RED TEXT CONNECTIONS ARE NO GOOD.

BLUE TEXT CONNECTIONS ARE REVISION FOR RESPECTIVE CONNECTIONS.

6) Shear Connection – W12x_ Beam connecting to HSS6x6x5/16", HSS8x8x3/8" & HSS10x10x1/2" Column using 1/2" Thick Shear Plate with (3) - 3/4" ϕ A325N Bolts & 5/16" thick weld - For 22 kip Shear



RAM Connection

Units system: English

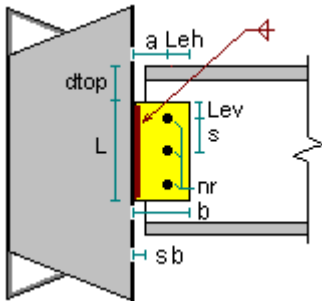
Steel Connections
Data

Connection: 6 - SP_BCF_1/2PL_3B3/4

Family:	Beam - Column flange (BCF)
Type:	Single plate
Description:	CONN. ID - 6 - W12x_ BEAM TO HSS6x6_ & HSS8x8x5/16" COLUMN

General information

Connector



Members

Beam

General	
Beam section	: W 12X22
Beam material	: A992 Gr50
sb: Beam setback	: 0.5 in
Horizontal angle (deg)	: 0
Vertical angle (deg)	: 0
Horizontal eccentricity	: 0 in
Braced	: No

Coped

dct: Top cope depth	: 0 in
ct: Top cope length	: 0 in
dcb: Bottom cope depth	: 0 in
cb: Bottom cope length	: 0 in

Column

General	
Support section	: HSS_SQR 6X6X5_16
Support material	: A500 GrB rectangular
Is column end	: Yes

Single plate

Connector

Section	:	PL 1/2x4x8 1/2
b: Width	:	4 in
L: Length	:	8.5 in
tp: Plate thickness	:	0.5 in
Material	:	A36
Plate position on beam	:	Top
dtop: Distance to beam top	:	1.75 in
Bolts	:	3/4" A325 N
nr: Rows of Bolts	:	3
nc: Bolt columns	:	1
s: Pitch - longitudinal center-to-center spacing	:	3 in
Lev: Vertical edge distance	:	1.25 in
Leh: Horizontal edge distance	:	1.5 in
a: Distance between weld and bolts	:	2.5 in
Hole type on plate	:	Short Slotted (SSL)
Slot direction on plate	:	Horizontal
Hole type on beam	:	Standard (STD)
Welding electrode to support	:	E70XX
D: Weld size to support (1/16 in)	:	5
Wo: Obtuse side weld size (AWS) (1/16 in)	:	5
Wa: Acute side weld size (AWS) (1/16 in)	:	5
Wo: Obtuse side weld size (AISC) (1/16 in)	:	5
Wa: Acute side weld size (AISC) (1/16 in)	:	5



Units system: English

Steel Connections Results

Connection: 6 - SP_BCF_1/2PL_3B3/4

Family: Beam - Column flange (BCF)
Type: Single plate
Description: CONN. ID - 6 - W12x_ BEAM TO HSS6x6_ & HSS8x8x5/16" COLUMN

Design code: AISC 360-16 LRFD

Demands

Description	Beam		Left beam		Column			Load type
	Ru [kip]	Pu [kip]	Ru [kip]	Pu [kip]	Pu [kip]	Mu22 [kip*ft]	Mu33 [kip*ft]	
DL	22.00	0.00	0.00	0.00	0.00	0.00	0.00	Design

Geometric Considerations

Dimensions	Unit	Value	Min.	Max.	Sta.	References
Shear plate						
Number of bolts		3	2	12	✓	p. 10-88
Distance from the bolt line to the weld line	[in]	2.50	--	3.50	✓	p. 10-88
Length	[in]	8.50	5.42	9.82	✓	p. 10-7
Thickness, precludes a punching failure of the HSS...	[in]	0.50	--	--	✓	
Vertical edge distance	[in]	1.25	1.00	--	✓	Tables J3.4, J3.5
Horizontal edge distance	[in]	1.50	1.50	--	✓	p. 10-88
Vertical center-to-center spacing (pitch)	[in]	3.00	2.00	6.24	✓	Sec. J3.5
Clear distance between holes (longitudinal)	[in]	2.19	0.75	--	✓	Sec. J3.3
Beam						
Vertical edge distance	[in]	3.00	1.00	--	✓	Tables J3.4, J3.5
Horizontal edge distance	[in]	2.00	1.50	--	✓	p. 10-88
Support						
Maximum value of the specified yield stress	[Kip/in ²]	46.00	--	--	✓	Table K2.1
Yield stress to tensile stress ratio		0.79	--	0.80	✓	
Weld size	[1/16in]	5	5	--	✓	p. 10-87
Weld length	[in]	8.50	1.25	--	✓	Sec. J2.2b

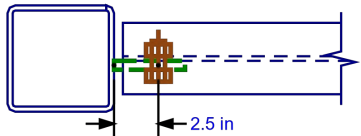
Design Check

Verification	Unit	Capacity	Demand	Ctrl EQ	Ratio	References
Shear plate						
Bolts shear	[Kip]	46.60	22.00	DL	0.47	Tables (7-1..14)
Bolt bearing under shear load	[Kip]	101.92	22.00	DL	0.22	Tables (7-1..14)
Bolt tearout under shear load	[Kip]	126.02	22.00	DL	0.17	Sec. J3.6
Shear yielding	[Kip]	91.80	22.00	DL	0.24	Eq. J4-3
Shear rupture	[Kip]	76.67	22.00	DL	0.29	Eq. J4-4
Block shear	[Kip]	79.80	22.00	DL	0.28	Eq. J4-5
Flexural rupture	[Kip]	128.83	22.00	DL	0.17	p. 9-6
Flexural yielding	[Kip*ft]	24.38	4.58	DL	0.19	p. 10-90
Lateral torsional buckling	[Kip*ft]	24.24	4.58	DL	0.19	Sec. F1
Compression	[Kip]	137.70	0.00	DL	0.00	Sec. J4.4
Plate (support side)						
Weld capacity	[Kip]	118.33	22.00	DL	0.19	Tables 8-4 .. 8-11
Interaction of flexure and shear yielding		1.00	0.09	DL	0.09	Eq. 10-5
Beam						
Bolt bearing under shear load	[Kip]	59.39	22.00	DL	0.37	Tables (7-1..14)
Shear yielding	[Kip]	95.94	22.00	DL	0.23	Eq. J4-3
Bolt group						
Bolt effective strength	[Kip]	46.60	22.00	DL	0.47	Sec. J3.6
Support						
Shear rupture of base metal at fillet weld	[in]	0.29	0.27	DL	0.92	Eq. 9-2
Shear strength at welds	[Kip]	129.12	22.00	DL	0.17	Eq. J4-4
Punching shear (shear rupture)	[Kip]	73.17	22.00	DL	0.30	p. 10-153
Global critical strength ratio						
		0.92				

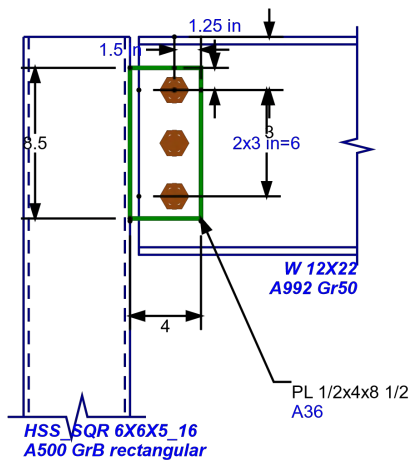
Notes

The plate is designed with the conventional configuration criteria.

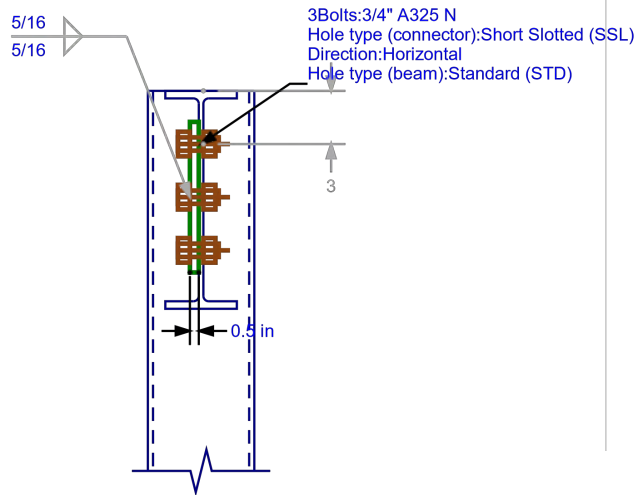
Top view



Lateral view



Front view



7) **Shear Connection** – W18x_ Beam connecting to HSS6x6x5/16", HSS8x8x3/8" & HSS10x10x1/2" Column using ½" Thick Shear Plate with (5)- ¾" ϕ A325N Bolts & 5/16" thick weld - For 80 to108 kip Shear - **NO GOOD**



RAM Connection

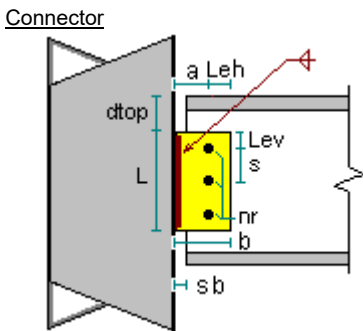
Units system: English

Steel Connections Data

Connection: 7 - SP_BCF_1/2PL_5B3/4

Family: Beam - Column flange (BCF)
Type: Single plate
Description: CONN. ID - 7 - W18x_ BEAM TO HSS6x6_ & HSS8x8x5/16" COLUMN

General information



Members

Beam

General
Beam section : W 18X35
Beam material : A992 Gr50
sb: Beam setback : 0.5 in
Horizontal angle (deg) : 0
Vertical angle (deg) : 0
Horizontal eccentricity : 0 in
Braced : No

Coped
dct: Top cope depth : 0 in
ct: Top cope length : 0 in
dcb: Bottom cope depth : 0 in
cb: Bottom cope length : 0 in

Column

General
Support section : HSS_SQR 6X6X5_16
Support material : A500 GrB rectangular
Is column end : Yes

Single plate

Connector

Section	:	PL 1/2x4x14 1/2
b: Width	:	4 in
L: Length	:	14.5 in
tp: Plate thickness	:	0.5 in
Material	:	A36
Plate position on beam	:	Top
dtop: Distance to beam top	:	1.75 in
Bolts	:	3/4" A325 N
nr: Rows of Bolts	:	5
nc: Bolt columns	:	1
s: Pitch - longitudinal center-to-center spacing	:	3 in
Lev: Vertical edge distance	:	1.25 in
Leh: Horizontal edge distance	:	1.5 in
a: Distance between weld and bolts	:	2.5 in
Hole type on plate	:	Short Slotted (SSL)
Slot direction on plate	:	Horizontal
Hole type on beam	:	Standard (STD)
Welding electrode to support	:	E70XX
D: Weld size to support (1/16 in)	:	5
Wo: Obtuse side weld size (AWS) (1/16 in)	:	5
Wa: Acute side weld size (AWS) (1/16 in)	:	5
Wo: Obtuse side weld size (AISC) (1/16 in)	:	5
Wa: Acute side weld size (AISC) (1/16 in)	:	5



Units system: English

Steel Connections Results

Connection: 7 - SP_BCF_1/2PL_5B3/4

Family: Beam - Column flange (BCF)
Type: Single plate
Description: CONN. ID - 7 - W18x_ BEAM TO HSS6x6_ & HSS8x8x5/16" COLUMN

Design code: AISC 360-16 LRFD

Demands

Description	Beam		Left beam		Column			Load type
	Ru [kip]	Pu [kip]	Ru [kip]	Pu [kip]	Pu [kip]	Mu22 [kip*ft]	Mu33 [kip*ft]	
DL	108.00	0.00	0.00	0.00	0.00	0.00	0.00	Design

Geometric Considerations

Dimensions	Unit	Value	Min.	Max.	Sta.	References
Shear plate						
Number of bolts		5	2	12	✓	p. 10-88
Distance from the bolt line to the weld line	[in]	2.50	--	3.50	✓	p. 10-88
Length	[in]	14.50	8.02	15.12	✓	p. 10-7
Thickness, precludes a punching failure of the HSS...	[in]	0.50	--	--	✓	
Vertical edge distance	[in]	1.25	1.00	--	✓	Tables J3.4, J3.5
Horizontal edge distance	[in]	1.50	1.50	--	✓	p. 10-88
Vertical center-to-center spacing (pitch)	[in]	3.00	2.00	7.20	✓	Sec. J3.5
Clear distance between holes (longitudinal)	[in]	2.19	0.75	--	✓	Sec. J3.3
Beam						
Vertical edge distance	[in]	3.00	1.00	--	✓	Tables J3.4, J3.5
Horizontal edge distance	[in]	2.00	1.50	--	✓	p. 10-88
Support						
Maximum value of the specified yield stress	[Kip/in2]	46.00	--	--	✓	
Yield stress to tensile stress ratio		0.79	--	0.80	✓	Table K2.1
Weld size	[1/16in]	5	5	--	✓	p. 10-87
Weld length	[in]	14.50	1.25	--	✓	Sec. J2.2b

Design Check

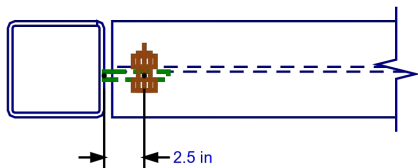
Verification	Unit	Capacity	Demand	Ctrl EQ	Ratio	References
Shear plate						
Bolts shear	[Kip]	83.98	108.00	DL	1.29	Tables (7-1..14)
Bolt bearing under shear load	[Kip]	183.67	108.00	DL	0.59	Tables (7-1..14)
Bolt tearout under shear load	[Kip]	421.58	108.00	DL	0.26	Sec. J3.6
Shear yielding	[Kip]	156.60	108.00	DL	0.69	Eq. J4-3
Shear rupture	[Kip]	132.13	108.00	DL	0.82	Eq. J4-4
Block shear	[Kip]	128.40	108.00	DL	0.84	Eq. J4-5
Flexural rupture	[Kip]	350.68	108.00	DL	0.31	p. 9-6
Flexural yielding	[Kip*ft]	70.96	22.50	DL	0.32	p. 10-90
Lateral torsional buckling	[Kip*ft]	69.57	22.50	DL	0.32	Sec. F1
Compression	[Kip]	234.90	0.00	DL	0.00	Sec. J4.4
Plate (support side)						
Weld capacity	[Kip]	201.86	108.00	DL	0.54	Tables 8-4 .. 8-11
Interaction of flexure and shear yielding		1.00	0.58	DL	0.58	Eq. 10-5
Beam						
Bolt bearing under shear load	[Kip]	123.50	108.00	DL	0.87	Tables (7-1..14)
Shear yielding	[Kip]	159.30	108.00	DL	0.68	Eq. J4-3
Bolt group						
Bolt effective strength	[Kip]	83.98	108.00	DL	1.29	Sec. J3.6
Support						
Shear rupture of base metal at fillet weld	[in]	0.29	0.27	DL	0.92	Eq. 9-2
Shear strength at welds	[Kip]	220.26	108.00	DL	0.49	Eq. J4-4
Punching shear (shear rupture)	[Kip]	212.92	108.00	DL	0.51	p. 10-153
Global critical strength ratio						
		1.29				

Notes

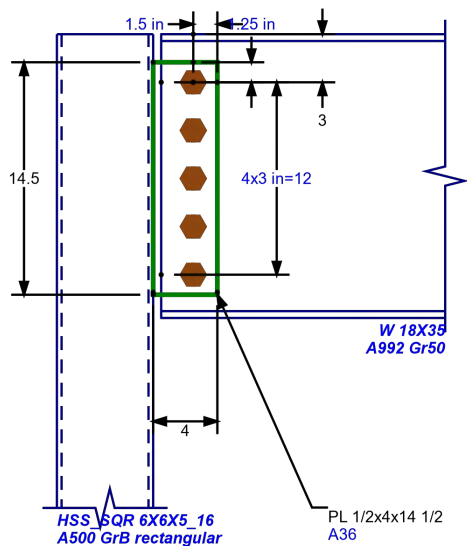
The plate is designed with the conventional configuration criteria.

REFER TO REVISED
CONNECTION 7.1 BELOW

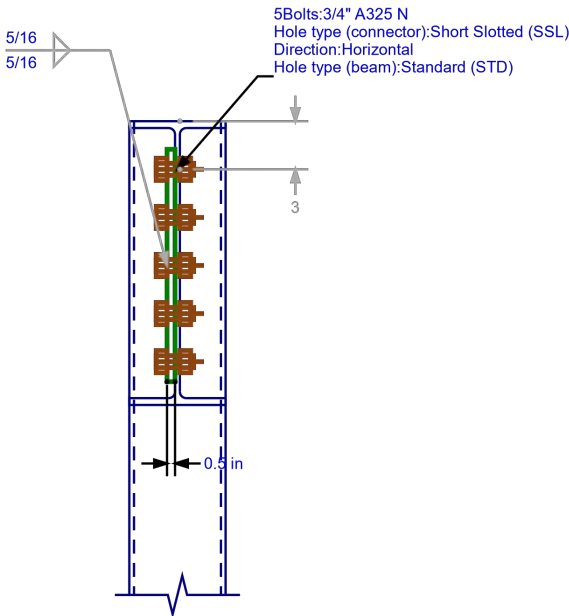
Top view



Lateral view



Front view



7.1) Shear Connection – W18x_ Beam connecting to HSS6x6x5/16", HSS8x8x3/8" & HSS10x10x1/2" Column using ½" Thick Shear Plate with (5)- 1" ϕ A490N Bolts & 5/16" thick weld - For 108 kip Shear - **REVISED**



RAM Connection

Units system: English

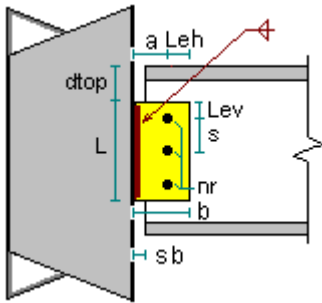
Steel Connections
Data

Connection: 7.1 - SP_BCF_1/2PL_5B1

Family:	Beam - Column flange (BCF)
Type:	Single plate
Description:	REV. CONN. ID - 7.1 - W18x_ BEAM TO HSS6x6_ & HSS8x8x5/16" COLUMN

General information

Connector



Members

Beam

General	
Beam section	: W 18X35
Beam material	: A992 Gr50
sb: Beam setback	: 0.5 in
Horizontal angle (deg)	: 0
Vertical angle (deg)	: 0
Horizontal eccentricity	: 0 in
Braced	: No

Coped

dct: Top cope depth	: 0 in
ct: Top cope length	: 0 in
dcb: Bottom cope depth	: 0 in
cb: Bottom cope length	: 0 in

Column

General	
Support section	: HSS_SQR 6X6X5_16
Support material	: A500 GrB rectangular
Is column end	: Yes

Single plate

Connector

Section	:	PL 1/2x4x14 1/2
b: Width	:	4 in
L: Length	:	14.5 in
tp: Plate thickness	:	0.5 in
Material	:	A36
Plate position on beam	:	Top
dtop: Distance to beam top	:	1.75 in
Bolts	:	1" A490 N
nr: Rows of Bolts	:	5
nc: Bolt columns	:	1
s: Pitch - longitudinal center-to-center spacing	:	3 in
Lev: Vertical edge distance	:	1.25 in
Leh: Horizontal edge distance	:	2.0 in
a: Distance between weld and bolts	:	2.5 in
Hole type on plate	:	Short Slotted (SSL)
Slot direction on plate	:	Horizontal
Hole type on beam	:	Standard (STD)
Welding electrode to support	:	E70XX
D: Weld size to support (1/16 in)	:	5
Wo: Obtuse side weld size (AWS) (1/16 in)	:	5
Wa: Acute side weld size (AWS) (1/16 in)	:	5
Wo: Obtuse side weld size (AISC) (1/16 in)	:	5
Wa: Acute side weld size (AISC) (1/16 in)	:	5



Units system: English

Steel Connections Results

Connection: 7.1 - SP_BCF_1/2PL_5B1

Family: Beam - Column flange (BCF)
 Type: Single plate
 Description: REV. CONN. ID - 7.1 - W18x_ BEAM TO HSS6x6_ & HSS8x8x5/16" COLUMN

Design code: AISC 360-16 LRFD

Demands

Description	Beam		Left beam		Column			Load type
	Ru [kip]	Pu [kip]	Ru [kip]	Pu [kip]	Pu [kip]	Mu22 [kip*ft]	Mu33 [kip*ft]	
DL	108.00	0.00	0.00	0.00	0.00	0.00	0.00	Design

Geometric Considerations

Dimensions	Unit	Value	Min.	Max.	Sta.	References
Length	[in]	14.50	8.02	15.12	✓	p. 10-7
Thickness, precludes a punching failure of the HSS...	[in]	0.50	--	--	✓	
Vertical edge distance	[in]	1.25	1.25	--	✓	Tables J3.4, J3.5
Horizontal edge distance	[in]	1.50	1.38	--	✓	Tables J3.4, J3.5
Vertical center-to-center spacing (pitch)	[in]	3.00	2.67	7.20	✓	Sec. J3.5
Clear distance between holes (longitudinal)	[in]	1.88	1.00	--	✓	Sec. J3.3
Beam						
Vertical edge distance	[in]	3.00	1.25	--	✓	Tables J3.4, J3.5
Horizontal edge distance	[in]	2.00	2.00	--	✓	Tables J3.4, J3.5
Support						
Maximum value of the specified yield stress	[Kip/in ²]	46.00	--	--	✓	
Yield stress to tensile stress ratio		0.79	--	0.80	✓	Table K2.1
Weld size	[1/16in]	5	5	--	✓	p. 10-87
Weld length	[in]	14.50	1.25	--	✓	Sec. J2.2b

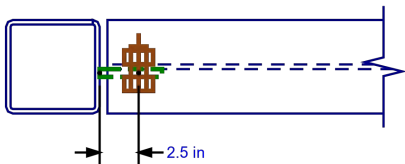
Design Check

Verification	Unit	Capacity	Demand	Ctrl EQ	Ratio	References
Shear plate						
Bolts shear	[Kip]	165.04	108.00	DL	0.65	Tables (7-1..14)
Bolt bearing under shear load	[Kip]	216.78	108.00	DL	0.50	Tables (7-1..14)
Bolt tearout under shear load	[Kip]	255.06	108.00	DL	0.42	Sec. J3.6
Shear yielding	[Kip]	156.60	108.00	DL	0.69	Eq. J4-3
Shear rupture	[Kip]	111.74	108.00	DL	0.97	Eq. J4-4
Block shear	[Kip]	120.85	108.00	DL	0.89	Eq. J4-5
Flexural rupture	[Kip]	300.35	108.00	DL	0.36	p. 9-6
Flexural yielding	[Kip*ft]	70.96	22.50	DL	0.32	p. 10-90
Lateral torsional buckling	[Kip*ft]	69.57	22.50	DL	0.32	Sec. F1
Compression	[Kip]	234.90	0.00	DL	0.00	Sec. J4.4
Plate (support side)						
Weld capacity	[Kip]	201.86	108.00	DL	0.54	Tables 8-4 .. 8-11
Interaction of flexure and shear yielding		1.00	0.58	DL	0.58	Eq. 10-5
Beam						
Bolt bearing under shear load	[Kip]	145.77	108.00	DL	0.74	Tables (7-1..14)
Shear yielding	[Kip]	159.30	108.00	DL	0.68	Eq. J4-3
Bolt group						
Bolt effective strength	[Kip]	138.76	108.00	DL	0.78	Sec. J3.6
Support						
Shear rupture of base metal at fillet weld	[in]	0.29	0.27	DL	0.92	Eq. 9-2
Shear strength at welds	[Kip]	220.26	108.00	DL	0.49	Eq. J4-4
Punching shear (shear rupture)	[Kip]	212.92	108.00	DL	0.51	p. 10-153
Global critical strength ratio		0.97				

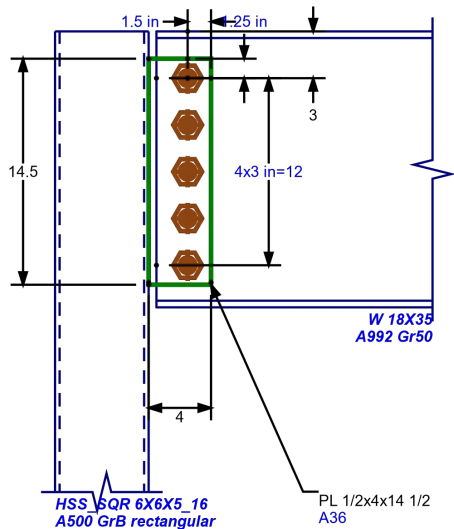
Notes

The plate is designed with the extended configuration criteria.

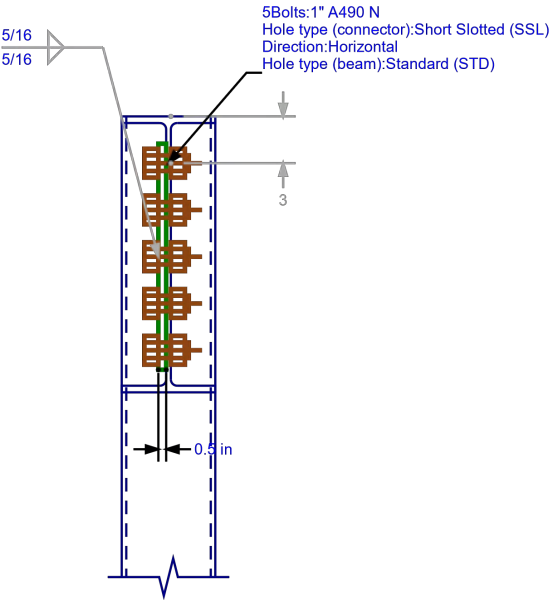
Top view



Lateral view



Front view



8) Shear Connection – W18x35 To W18x65 Beam connecting to HSS6x6x5/16", HSS8x8x3/8" & HSS10x10x1/2" Column using 1/2" Thick Shear Plate with (5)- 3/4" φ A325N Bolts & 5/16" thick weld - For up to 80 kip Shear



RAM Connection

Units system: English

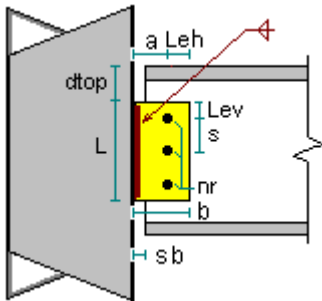
Steel Connections Data

Connection: 8 - SP_BCF_1/2PL_5B3/4

Family:	Beam - Column flange (BCF)
Type:	Single plate
Description:	CONN. ID - 8 - W18x60, 65 BEAM TO HSS10x10x1/2" COLUMN

General information

Connector



Members

Beam

General

Beam section	:	W 18X60
Beam material	:	A992 Gr50
sb: Beam setback	:	0.5 in
Horizontal angle (deg)	:	0
Vertical angle (deg)	:	0
Horizontal eccentricity	:	0 in
Braced	:	No

Coped

dct: Top cope depth	:	0 in
ct: Top cope length	:	0 in
dcb: Bottom cope depth	:	0 in
cb: Bottom cope length	:	0 in

Column

General

Support section	:	HSS_SQR 10X10X1_2
Support material	:	A500 GrB rectangular
Is column end	:	Yes

Single plate

Connector

Section	:	PL 1/2x4x14 1/2
b: Width	:	4 in
L: Length	:	14.5 in
tp: Plate thickness	:	0.5 in
Material	:	A36
Plate position on beam	:	Top
dtop: Distance to beam top	:	1.75 in
Bolts	:	3/4" A325 N
nr: Rows of Bolts	:	5
nc: Bolt columns	:	1
s: Pitch - longitudinal center-to-center spacing	:	3 in
Lev: Vertical edge distance	:	1.25 in
Leh: Horizontal edge distance	:	1.5 in
a: Distance between weld and bolts	:	2.5 in
Hole type on plate	:	Standard (STD)
Hole type on beam	:	Standard (STD)
Welding electrode to support	:	E70XX
D: Weld size to support (1/16 in)	:	5
Wo: Obtuse side weld size (AWS) (1/16 in)	:	5
Wa: Acute side weld size (AWS) (1/16 in)	:	5
Wo: Obtuse side weld size (AISC) (1/16 in)	:	5
Wa: Acute side weld size (AISC) (1/16 in)	:	5



Units system: English

Steel Connections Results

Connection: 8 - SP_BCF_1/2PL_5B3/4

Family: Beam - Column flange (BCF)
 Type: Single plate
 Description: CONN. ID - 8 - W18x60, 65 BEAM TO HSS10x10x1/2" COLUMN

Design code: AISC 360-16 LRFD

Demands

Description	Beam		Left beam		Column			Load type
	Ru [kip]	Pu [kip]	Ru [kip]	Pu [kip]	Pu [kip]	Mu22 [kip*ft]	Mu33 [kip*ft]	
DL	70.00	0.00	0.00	0.00	0.00	0.00	0.00	Design

Geometric Considerations

Dimensions	Unit	Value	Min.	Max.	Sta.	References
Length	[in]	14.50	8.00	15.35	✓	p. 10-7
Thickness, precludes a punching failure of the HSS...	[in]	0.50	--	--	✓	
Vertical edge distance	[in]	1.25	1.00	--	✓	Tables J3.4, J3.5
Horizontal edge distance	[in]	1.50	1.00	--	✓	Tables J3.4, J3.5
Vertical center-to-center spacing (pitch)	[in]	3.00	2.00	9.96	✓	Sec. J3.5
Clear distance between holes (longitudinal)	[in]	2.19	0.75	--	✓	Sec. J3.3
Beam						
Vertical edge distance	[in]	3.00	1.00	--	✓	Tables J3.4, J3.5
Horizontal edge distance	[in]	2.00	1.00	--	✓	Tables J3.4, J3.5
Support						
Maximum value of the specified yield stress	[Kip/in ²]	46.00	--	--	✓	
Yield stress to tensile stress ratio		0.79	--	0.80	✓	Table K2.1
Weld size	[1/16in]	5	5	--	✓	p. 10-87
Weld length	[in]	14.50	1.25	--	✓	Sec. J2.2b

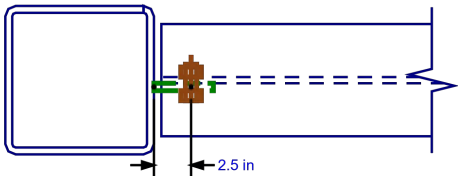
Design Check

Verification	Unit	Capacity	Demand	Ctrl EQ	Ratio	References
Shear plate						
Bolts shear	[Kip]	74.34	70.00	DL	0.94	Tables (7-1..14)
Bolt bearing under shear load	[Kip]	162.59	70.00	DL	0.43	Tables (7-1..14)
Bolt tearout under shear load	[Kip]	277.98	70.00	DL	0.25	Sec. J3.6
Shear yielding	[Kip]	156.60	70.00	DL	0.45	Eq. J4-3
Shear rupture	[Kip]	132.13	70.00	DL	0.53	Eq. J4-4
Block shear	[Kip]	130.43	70.00	DL	0.54	Eq. J4-5
Flexural rupture	[Kip]	350.68	70.00	DL	0.20	p. 9-6
Flexural yielding	[Kip*ft]	70.96	14.58	DL	0.21	p. 10-90
Lateral torsional buckling	[Kip*ft]	69.57	14.58	DL	0.21	Sec. F1
Compression	[Kip]	234.90	0.00	DL	0.00	Sec. J4.4
Plate (support side)						
Weld capacity	[Kip]	201.86	70.00	DL	0.35	Tables 8-4 .. 8-11
Interaction of flexure and shear yielding		1.00	0.24	DL	0.24	Eq. 10-5
Beam						
Bolt bearing under shear load	[Kip]	151.23	70.00	DL	0.46	Tables (7-1..14)
Shear yielding	[Kip]	226.59	70.00	DL	0.31	Eq. J4-3
Bolt group						
Bolt effective strength	[Kip]	74.34	70.00	DL	0.94	Sec. J3.6
Support						
Shear rupture of base metal at fillet weld	[in]	0.47	0.27	DL	0.57	Eq. 9-2
Shear strength at welds	[Kip]	351.96	70.00	DL	0.20	Eq. J4-4
Punching shear (shear rupture)	[Kip]	340.23	70.00	DL	0.21	p. 10-153
Global critical strength ratio		0.94				

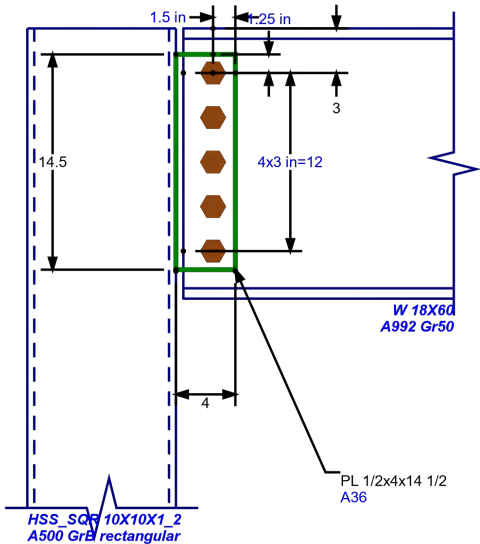
Notes

The plate is designed with the extended configuration criteria.

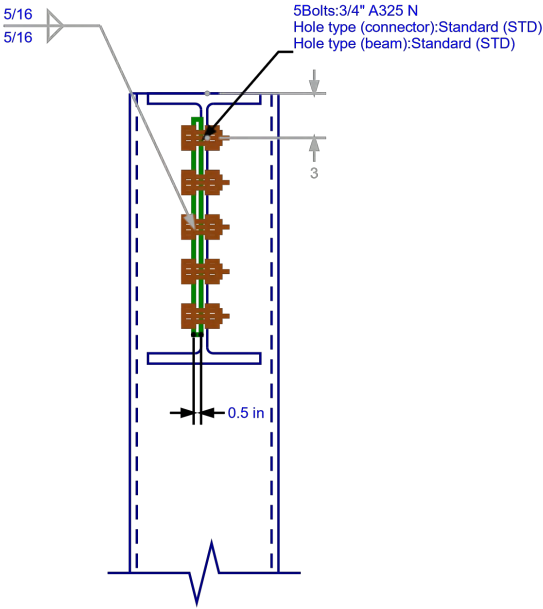
Top view



Lateral view



Front view



9) **Shear Connection** – W24x176 & W24x192 Beam connecting to HSS10x10x1/2" Column using 1/2" Thick Shear Plate with (7) - 3/4" ϕ A325N Bolts & 5/16" thick weld - For 235 kip Shear - **NO GOOD**



RAM Connection

Units system: English

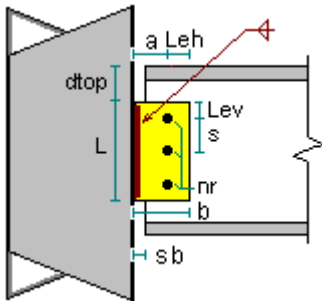
Steel Connections Data

Connection: 9 - SP_BCF_1/2PL_7B3/4

Family:	Beam - Column flange (BCF)
Type:	Single plate
Description:	CONN. ID - 9 - W24x_ BEAM TO HSS10x10x1/2" COLUMN

General information

Connector



Members

Beam

General

Beam section	:	W 24X176
Beam material	:	A992 Gr50
sb: Beam setback	:	0.5 in
Horizontal angle (deg)	:	0
Vertical angle (deg)	:	0
Horizontal eccentricity	:	0 in
Braced	:	No

Coped

dct: Top cope depth	:	0 in
ct: Top cope length	:	0 in
dcb: Bottom cope depth	:	0 in
cb: Bottom cope length	:	0 in

Column

General

Support section	:	HSS_SQR 10X10X1_2
Support material	:	A500 GrB rectangular
Is column end	:	Yes

Single plate

Connector

Section	:	PL 1/2x4x20 1/2
b: Width	:	4 in
L: Length	:	20.5 in
tp: Plate thickness	:	0.5 in
Material	:	A36
Plate position on beam	:	Top
dtop: Distance to beam top	:	1.75 in
Bolts	:	3/4" A325 N
nr: Rows of Bolts	:	7
nc: Bolt columns	:	1
s: Pitch - longitudinal center-to-center spacing	:	3 in
Lev: Vertical edge distance	:	1.25 in
Leh: Horizontal edge distance	:	1.5 in
a: Distance between weld and bolts	:	2.5 in
Hole type on plate	:	Short Slotted (SSL)
Slot direction on plate	:	Horizontal
Hole type on beam	:	Standard (STD)
Welding electrode to support	:	E70XX
D: Weld size to support (1/16 in)	:	5
Wo: Obtuse side weld size (AWS) (1/16 in)	:	5
Wa: Acute side weld size (AWS) (1/16 in)	:	5
Wo: Obtuse side weld size (AISC) (1/16 in)	:	5
Wa: Acute side weld size (AISC) (1/16 in)	:	5



Units system: English

Steel Connections Results

Connection: 9 - SP_BCF_1/2PL_7B3/4

Family: Beam - Column flange (BCF)
 Type: Single plate
 Description: CONN. ID - 9 - W24x_ BEAM TO HSS10x10x1/2" COLUMN

Design code: AISC 360-16 LRFD

Demands

Description	Beam		Left beam		Column			Load type
	Ru [kip]	Pu [kip]	Ru [kip]	Pu [kip]	Pu [kip]	Mu22 [kip*ft]	Mu33 [kip*ft]	
DL	235.00	0.00	0.00	0.00	0.00	0.00	0.00	Design

Geometric Considerations

Dimensions	Unit	Value	Min.	Max.	Sta.	References
Shear plate						
Thickness	[in]	0.50	--	0.36	✗	p. 10-89
Length	[in]	20.50	10.76	21.52	✓	p. 10-7
Thickness, precludes a punching failure of the HSS...	[in]	0.50	--	--	✓	
Vertical edge distance	[in]	1.25	1.00	--	✓	Tables J3.4, J3.5
Horizontal edge distance	[in]	1.50	1.13	--	✓	Tables J3.4, J3.5
Vertical center-to-center spacing (pitch)	[in]	3.00	2.00	12.00	✓	Sec. J3.5
Clear distance between holes (longitudinal)	[in]	2.19	0.75	--	✓	Sec. J3.3
Beam						
Vertical edge distance	[in]	3.09	1.00	--	✓	Tables J3.4, J3.5
Horizontal edge distance	[in]	2.00	1.00	--	✓	Tables J3.4, J3.5
Support						
Maximum value of the specified yield stress	[Kip/in ²]	46.00	--	--	✓	
Yield stress to tensile stress ratio		0.79	--	0.80	✓	Table K2.1
Weld size	[1/16in]	5	5	--	✓	p. 10-87
Weld length	[in]	20.50	1.25	--	✓	Sec. J2.2b

Design Check

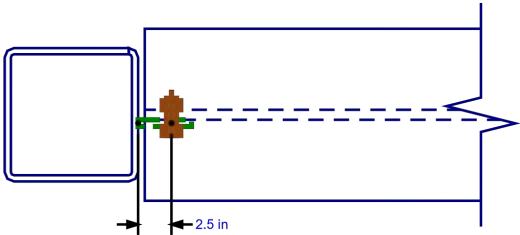
Verification	Unit	Capacity	Demand	Ctrl EQ	Ratio	References
Shear plate						
Bolts shear	[Kip]	112.47	235.00	DL	2.09	Tables (7-1..14)
Bolt bearing under shear load	[Kip]	245.98	235.00	DL	0.96	Tables (7-1..14)
Bolt tearout under shear load	[Kip]	624.94	235.00	DL	0.38	Sec. J3.6
Shear yielding	[Kip]	221.40	235.00	DL	1.06	Eq. J4-3
Shear rupture	[Kip]	187.59	235.00	DL	1.25	Eq. J4-4
Block shear	[Kip]	177.00	235.00	DL	1.33	Eq. J4-5
Flexural rupture	[Kip]	683.46	235.00	DL	0.34	p. 9-6
Flexural yielding	[Kip*ft]	141.83	48.96	DL	0.35	p. 10-90
Lateral torsional buckling	[Kip*ft]	137.13	48.96	DL	0.36	Sec. F1
Compression	[Kip]	332.10	0.00	DL	0.00	Sec. J4.4
Plate (support side)						
Weld capacity	[Kip]	285.38	235.00	DL	0.82	Tables 8-4 .. 8-11
Interaction of flexure and shear yielding		1.00	1.25	DL	1.25	Eq. 10-5
Beam						
Bolt bearing under shear load	[Kip]	413.51	235.00	DL	0.57	Tables (7-1..14)
Shear yielding	[Kip]	567.00	235.00	DL	0.41	Eq. J4-3
Bolt group						
Bolt effective strength	[Kip]	112.47	235.00	DL	2.09	Sec. J3.6
Support						
Shear rupture of base metal at fillet weld	[in]	0.47	0.27	DL	0.57	Eq. 9-2
Shear strength at welds	[Kip]	497.60	235.00	DL	0.47	Eq. J4-4
Punching shear (shear rupture)	[Kip]	680.05	235.00	DL	0.35	p. 10-153
Global critical strength ratio	2.09					

Notes

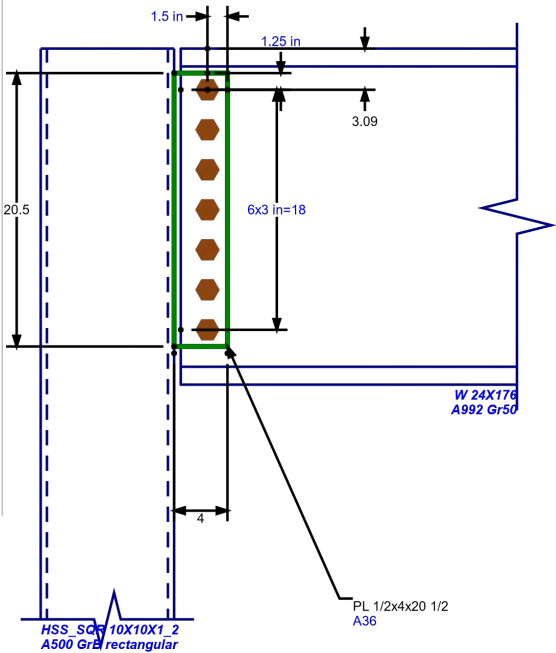
The plate is designed with the extended configuration criteria.

**REFER TO REVISED
CONNECTION 9.1 BELOW**

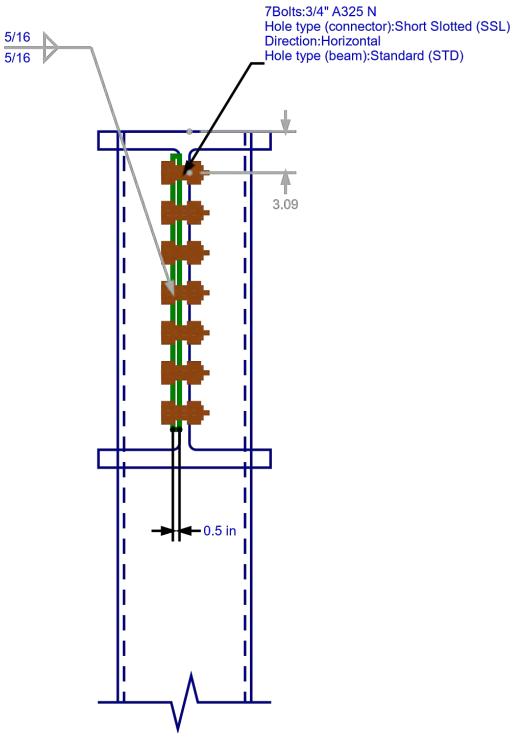
Top view



Lateral view



Front view



9.1) Shear Connection – W24x176 & W24x192 Beam connecting to HSS10x10x1/2" Column using 3/4" Thick Shear Plate with (7) - 1" ϕ A490N Bolts & 1/2" thick weld - For 235 kip Shear - **REVISED**



RAM Connection

Units system: English

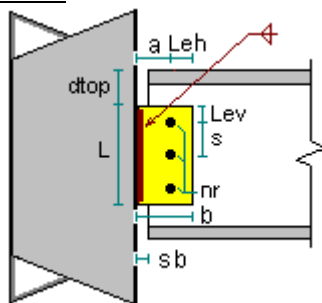
Steel Connections Data

Connection: 9.1 - SP_BCF_3/4PL_7B1

Family: Beam - Column flange (BCF)
Type: Single plate
Description: REV. CONN. ID - 9.1 - W24x_ BEAM TO HSS10x10x1/2" COLUMN

General information

Connector



Members

Beam

General

Beam section	:	W 24X176
Beam material	:	A992 Gr50
sb: Beam setback	:	0.5 in
Horizontal angle (deg)	:	0
Vertical angle (deg)	:	0
Horizontal eccentricity	:	0 in
Braced	:	No

Coped

dct: Top cope depth	:	0 in
ct: Top cope length	:	0 in
dcb: Bottom cope depth	:	0 in
cb: Bottom cope length	:	0 in

Column

General

Support section	:	HSS_SQR 10X10X1_2
Support material	:	A500 GrB rectangular
Is column end	:	Yes

Single plate

Connector

Section	:	PL 3/4x4x20 1/2
b: Width	:	4 in
L: Length	:	20.5 in
tp: Plate thickness	:	0.75 in
Material	:	A36
Plate position on beam	:	Top
dtop: Distance to beam top	:	1.75 in
Bolts	:	1" A490 N
nr: Rows of Bolts	:	7
nc: Bolt columns	:	1
s: Pitch - longitudinal center-to-center spacing	:	3 in
Lev: Vertical edge distance	:	1.25 in
Leh: Horizontal edge distance	:	2.0 in
a: Distance between weld and bolts	:	2.5 in
Hole type on plate	:	Short Slotted (SSL)
Slot direction on plate	:	Horizontal
Hole type on beam	:	Standard (STD)
Welding electrode to support	:	E70XX
D: Weld size to support (1/16 in)	:	8
Wo: Obtuse side weld size (AWS) (1/16 in)	:	8
Wa: Acute side weld size (AWS) (1/16 in)	:	8
Wo: Obtuse side weld size (AISC) (1/16 in)	:	8
Wa: Acute side weld size (AISC) (1/16 in)	:	8



Units system: English

Steel Connections Results

Connection: 9.1 - SP_BCF_3/4PL_7B1

Family: Beam - Column flange (BCF)
 Type: Single plate
 Description: REV. CONN. ID - 9.1 - W24x_ BEAM TO HSS10x10x1/2" COLUMN

Design code: AISC 360-16 LRFD

Demands

Description	Beam		Left beam		Column			Load type
	Ru [kip]	Pu [kip]	Ru [kip]	Pu [kip]	Pu [kip]	Mu22 [kip*ft]	Mu33 [kip*ft]	
DL	235.00	0.00	0.00	0.00	0.00	0.00	0.00	Design

Geometric Considerations

Dimensions	Unit	Value	Min.	Max.	Sta.	References
Shear plate						
Thickness	[in]	0.75	--	0.79	✓	p. 10-89
Length	[in]	20.50	10.76	21.52	✓	p. 10-7
Thickness, precludes a punching failure of the HSS...	[in]	0.75	--	--	✓	
Vertical edge distance	[in]	1.25	1.25	--	✓	Tables J3.4, J3.5
Horizontal edge distance	[in]	1.50	1.38	--	✓	Tables J3.4, J3.5
Vertical center-to-center spacing (pitch)	[in]	3.00	2.67	12.00	✓	Sec. J3.5
Clear distance between holes (longitudinal)	[in]	1.88	1.00	--	✓	Sec. J3.3
Beam						
Vertical edge distance	[in]	3.09	1.25	--	✓	Tables J3.4, J3.5
Horizontal edge distance	[in]	2.00	2.00	--	✓	Tables J3.4, J3.5
Support						
Maximum value of the specified yield stress	[Kip/in ²]	46.00	--	--	✓	
Yield stress to tensile stress ratio		0.79	--	0.80	✓	Table K2.1
Weld size	[1/16in]	8	8	--	✓	p. 10-87
Weld length	[in]	20.50	2.00	--	✓	Sec. J2.2b

Design Check

Verification	Unit	Capacity	Demand	Ctrl EQ	Ratio	References
Shear plate						
Bolts shear	[Kip]	249.69	235.00	DL	0.94	Tables (7-1..14)
Bolt bearing under shear load	[Kip]	491.97	235.00	DL	0.48	Tables (7-1..14)
Bolt tearout under shear load	[Kip]	895.53	235.00	DL	0.26	Sec. J3.6
Shear yielding	[Kip]	332.10	235.00	DL	0.71	Eq. J4-3
Shear rupture	[Kip]	238.57	235.00	DL	0.99	Eq. J4-4
Block shear	[Kip]	252.23	235.00	DL	0.93	Eq. J4-5
Flexural rupture	[Kip]	876.27	235.00	DL	0.27	p. 9-6
Flexural yielding	[Kip*ft]	212.75	48.96	DL	0.23	p. 10-90
Lateral torsional buckling	[Kip*ft]	211.19	48.96	DL	0.23	Sec. F1
Compression	[Kip]	498.15	0.00	DL	0.00	Sec. J4.4
Plate (support side)						
Weld capacity	[Kip]	456.61	235.00	DL	0.51	Tables 8-4 .. 8-11
Interaction of flexure and shear yielding		1.00	0.55	DL	0.55	Eq. 10-5
Beam						
Bolt bearing under shear load	[Kip]	551.34	235.00	DL	0.43	Tables (7-1..14)
Shear yielding	[Kip]	567.00	235.00	DL	0.41	Eq. J4-3
Bolt group						
Bolt effective strength	[Kip]	246.79	235.00	DL	0.95	Sec. J3.6
Support						
Shear rupture of base metal at fillet weld	[in]	0.47	0.43	DL	0.92	Eq. 9-2
Shear strength at welds	[Kip]	497.60	235.00	DL	0.47	Eq. J4-4
Punching shear (shear rupture)	[Kip]	680.05	235.00	DL	0.35	p. 10-153
Global critical strength ratio						
		0.99				

Notes

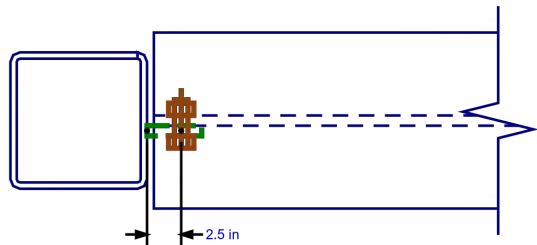
The plate is designed with the extended configuration criteria.

RAM Connection Standalone

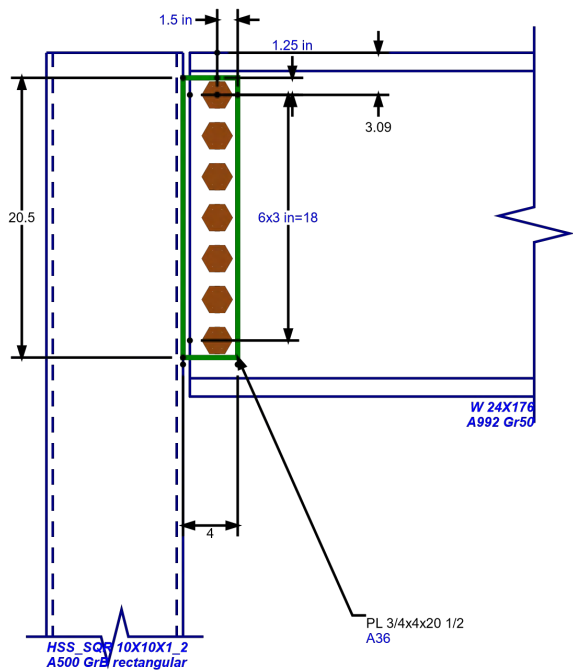
Units system: s

Current Date: s

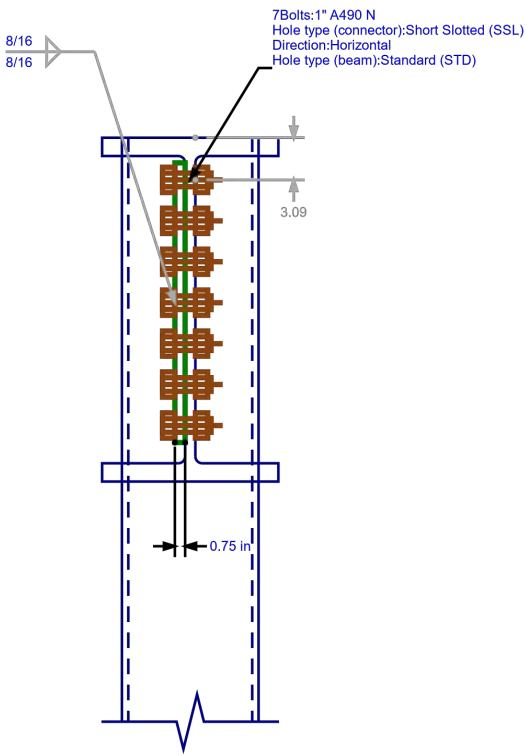
Top view



Lateral view



Front view



10) Moment Connection – Up to W18x76 Beam connecting to HSS10x10x1/2" Column using ½" Thick Internal Diaphragm with 3/8" thick weld & Flanges directly welded to column by CJP - For 80 kip-ft Moment

For Shear Connection calculations refer to Connection ID-8, on Page 20 of 51



Units system: English

Steel Connections

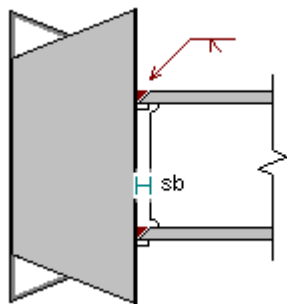
Data

Connection: 10M - DW BCF

Family:	Beam - Column flange (BCF)
Type:	Directly welded flanges
Description:	CONN. ID - 10 - W18x BEAM TO HSS10x10x1/2" COLUMN

General information

Connector

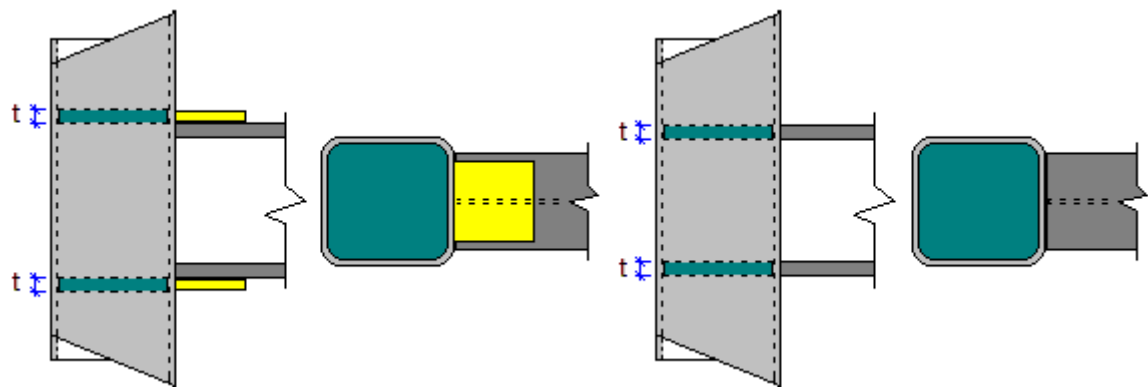


Members

<u>Configuration</u>	
Exists opposite connection	No
Beam	
<u>General</u>	
Beam section	W 18X60
Beam material	A992 Gr50
Horizontal angle (deg)	0
Vertical angle (deg)	0
Column	
<u>General</u>	
Support section	HSS_SQR 10X10X1_2
Support material	A500 GrB rectangular

Diaphragms

Diapraghms



Section	:	PL 1/2x9.07x9.07
Include diaphragms	:	Yes
Material	:	A36
Thickness	:	0.5 in
Welding electrode	:	E70XX
D: Weld size (1/16 in)	:	6



Units system: English

Steel Connections Results

Connection: 10M - DW BCF

Family: Beam - Column flange (BCF)
Type: Directly welded flanges
Description: CONN. ID - 10 - W18x BEAM TO HSS10x10x1/2" COLUMN

Design code: AISC 360-16 LRFD

Demands

Description	Beam			Right beam		Left beam		Column	Panel	Load type
	Ru [kip]	Pu [kip]	Mu [kip*ft]	PufTop [kip]	PufBot [kip]	PufTop [kip]	PufBot [kip]	Pu [kip]	Vu [kip]	
DL	27.00	18.00	80.00	-45.84	63.84	0.00	0.00	0.00	63.84	Design

Geometric Considerations

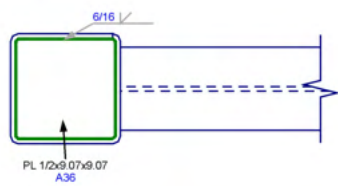
Dimensions	Unit	Value	Min.	Max.	Sta.	References
Support						
Flange wall slenderness		21.51	--	--	✓	
Web wall slenderness		21.51	--	--	✓	
Beam flange / support width ratio		0.76	--	--	✓	
Yield stress	[Kip/in2]	46.00	--	--	✓	
Yield stress to tensile stress ratio		0.79	--	0.80	✓	Table K2.1

Design Check

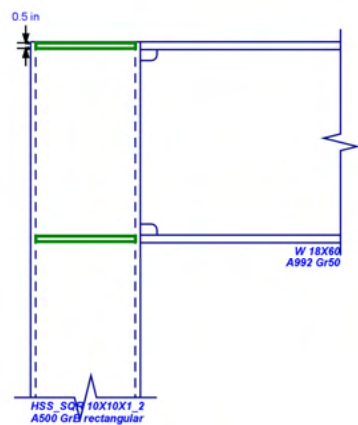
Verification	Unit	Capacity	Demand	Ctrl EQ	Ratio	References
Support						
Local yielding due to uneven load distribution	[Kip]	67.67	63.84	DL	0.94	Eq. J4-1
Diaphragm						
Plate weld capacity	[Kip]	70.91	63.84	DL	0.90	Eq. J2-4
Shear yielding	[Kip]	195.91	63.84	DL	0.33	Eq. J4-3
Shear rupture	[Kip]	236.73	63.84	DL	0.27	Eq. J4-4
Weld to HSS column	[Kip]	151.52	63.84	DL	0.42	Eq. J2-4
Sidewall shear at welds	[Kip]	220.16	63.84	DL	0.29	Eq. J4-4

Global critical strength ratio 0.94

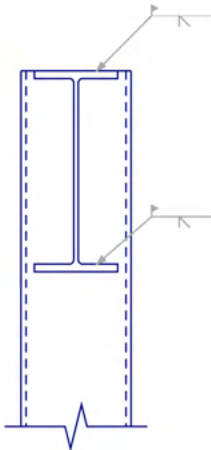
Top view



Lateral view



Front view



11) Moment Connection – W18x143 Beam connecting to HSS10x10x1/2" Column using 1/2" Thick Internal Diaphragm with 3/8" thick weld & Flanges directly welded to column by CJP - For 120 kip-ft Moment

For Shear Connection calculations refer to Connection ID-7.1, on Page 15 of 51



RAM Connection

Units system: English

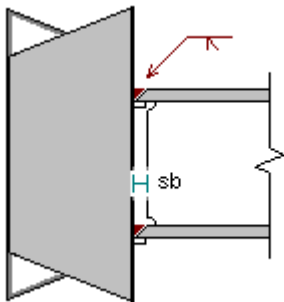
Steel Connections Data

Connection: 11M - DW BCF

Family:	Beam - Column flange (BCF)
Type:	Directly welded flanges
Description:	CONN. ID - 11 - W18x143 BEAM TO HSS10x10x1/2" COLUMN

General information

Connector



Members

Configuration

Exists opposite connection : No

Beam

General

Beam section : W 18X143
Beam material : A992 Gr50
Horizontal angle (deg) : 0
Vertical angle (deg) : 0

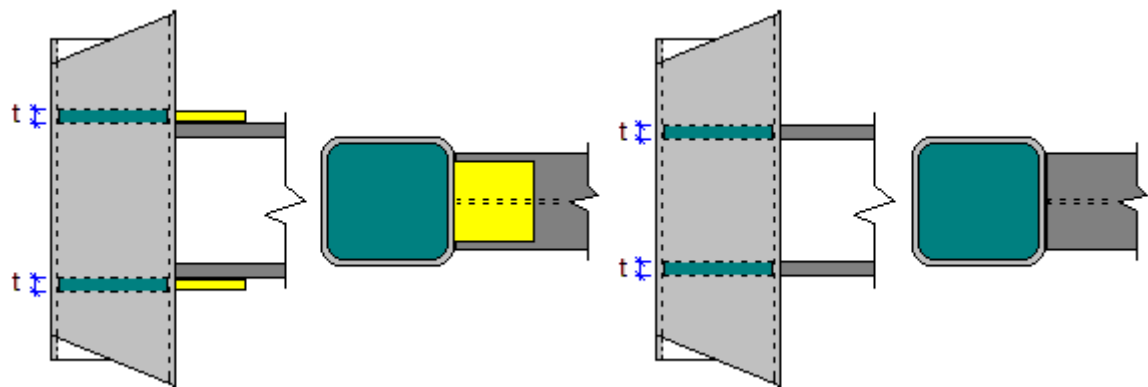
Column

General

Support section : HSS_SQR 10X10X1_2
Support material : A500 GrB rectangular

Diaphragms

Diapraghms



Section	:	PL 1/2x9.07x9.07
Include diaphragms	:	Yes
Material	:	A36
Thickness	:	0.5 in
Welding electrode	:	E70XX
D: Weld size (1/16 in)	:	6



Units system: English

Steel Connections Results

Connection: 11M - DW BCF

Family: Beam - Column flange (BCF)
Type: Directly welded flanges
Description: CONN. ID - 11 - W18x143 BEAM TO HSS10x10x1/2" COLUMN

Design code: AISC 360-16 LRFD

Demands

Description	Beam			Right beam		Left beam		Column	Panel	Load type
	Ru [kip]	Pu [kip]	Mu [kip*ft]	PufTop [kip]	PufBot [kip]	PufTop [kip]	PufBot [kip]	Pu [kip]	Vu [kip]	
DL	105.00	18.00	120.00	-70.21	88.21	0.00	0.00	0.00	88.21	Design

Geometric Considerations

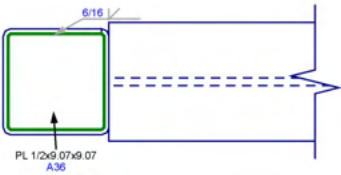
Dimensions	Unit	Value	Min.	Max.	Sta.	References
Support						
Flange wall slenderness		21.51	--	--	✓	
Web wall slenderness		21.51	--	--	✓	
Beam flange / support width ratio		1.12	--	--	✓	
Yield stress	[Kip/in2]	46.00	--	--	✓	
Yield stress to tensile stress ratio		0.79	--	0.80	✓	Table K2.1

Design Check

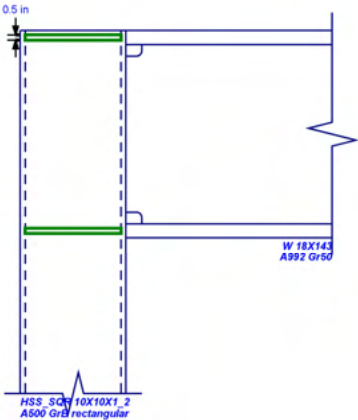
Verification	Unit	Capacity	Demand	Ctrl EQ	Ratio	References
Support						
Local yielding due to uneven load distribution	[Kip]	100.26	88.21	DL	0.88	Eq. J4-1
Diaphragm						
Plate weld capacity	[Kip]	101.32	88.21	DL	0.87	Eq. J2-4
Shear yielding	[Kip]	195.91	88.21	DL	0.45	Eq. J4-3
Shear rupture	[Kip]	236.73	88.21	DL	0.37	Eq. J4-4
Weld to HSS column	[Kip]	151.52	88.21	DL	0.58	Eq. J2-4
Sidewall shear at welds	[Kip]	220.16	88.21	DL	0.40	Eq. J4-4

Global critical strength ratio 0.88

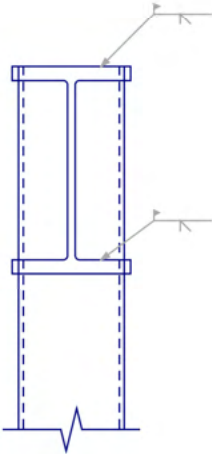
Top view



Lateral view



Front view



12) Moment Connection – W24x192 Beam connecting to HSS10x10x1/2" Column using ½" Thick Internal Diaphragm with 1/4" thick weld & Flanges directly welded to column by CJP - For 85 kip-ft Moment

For Shear Connection calculations refer to Connection ID-7.1, on Page 30 of 51



RAM Connection

Units system: English

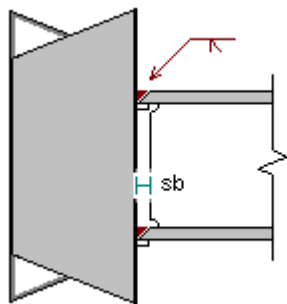
Steel Connections Data

Connection: 12M - DW BCF

Family:	Beam - Column flange (BCF)
Type:	Directly welded flanges
Description:	CONN. ID - 12 - W24x192 BEAM TO HSS10x10x1/2" COLUMN

General information

Connector



Members

Configuration

Exists opposite connection : No

Beam

General

Beam section : W 24X192
Beam material : A992 Gr50
Horizontal angle (deg) : 0
Vertical angle (deg) : 0

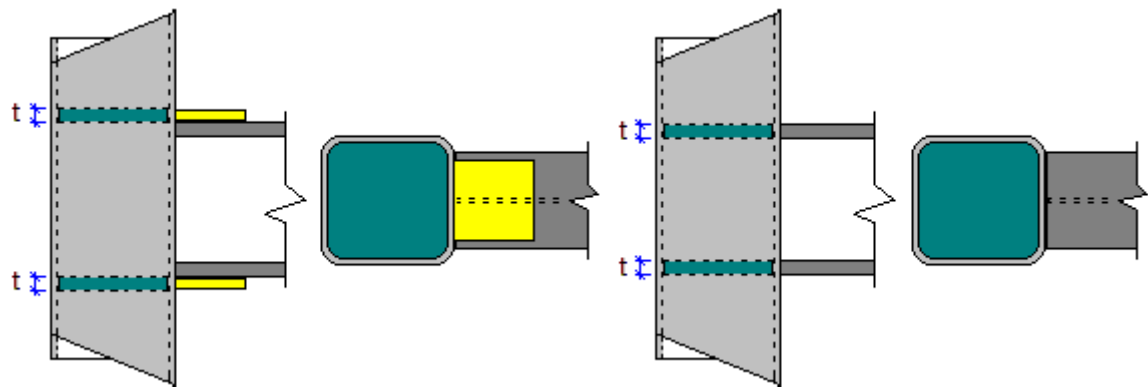
Column

General

Support section : HSS_SQR 10X10X1_2
Support material : A500 GrB rectangular

Diaphragms

Diaphraghms



Section	:	PL 1/2x9.07x9.07
Include diaphragms	:	Yes
Material	:	A36
Thickness	:	0.5 in
Welding electrode	:	E70XX
D: Weld size (1/16 in)	:	4



Units system: English

Steel Connections Results

Connection: 12M - DW BCF

Family: Beam - Column flange (BCF)
Type: Directly welded flanges
Description: CONN. ID - 12 - W24x192 BEAM TO HSS10x10x1/2" COLUMN

Design code: AISC 360-16 LRFD

Demands

Description	Beam			Right beam		Left beam		Column	Panel	Load type
	Ru [kip]	Pu [kip]	Mu [kip*ft]	PufTop [kip]	PufBot [kip]	PufTop [kip]	PufBot [kip]	Pu [kip]	Vu [kip]	
DL	201.00	18.00	85.00	-33.43	51.43	0.00	0.00	0.00	51.43	Design

Geometric Considerations

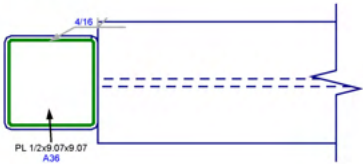
Dimensions	Unit	Value	Min.	Max.	Sta.	References
Support						
Flange wall slenderness		21.51	--	--	✓	
Web wall slenderness		21.51	--	--	✓	
Beam flange / support width ratio		1.30	--	--	✓	
Yield stress	[Kip/in2]	46.00	--	--	✓	
Yield stress to tensile stress ratio		0.79	--	0.80	✓	Table K2.1

Design Check

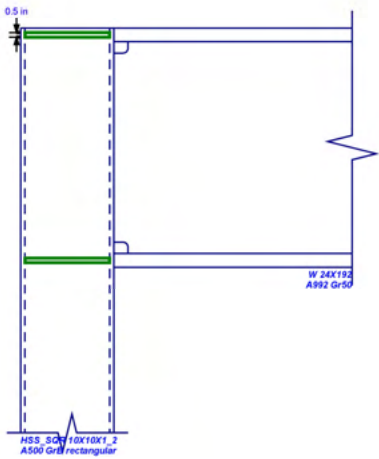
Verification	Unit	Capacity	Demand	Ctrl EQ	Ratio	References
Support						
Local yielding due to uneven load distribution	[Kip]	116.37	51.43	DL	0.44	Eq. J4-1
Diaphragm						
Plate weld capacity	[Kip]	77.57	51.43	DL	0.66	Eq. J2-4
Shear yielding	[Kip]	195.91	51.43	DL	0.26	Eq. J4-3
Shear rupture	[Kip]	236.73	51.43	DL	0.22	Eq. J4-4
Weld to HSS column	[Kip]	101.01	51.43	DL	0.51	Eq. J2-4
Sidewall shear at welds	[Kip]	220.16	51.43	DL	0.23	Eq. J4-4

Global critical strength ratio 0.66

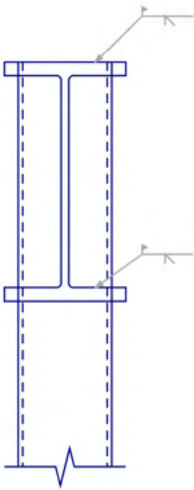
Top view



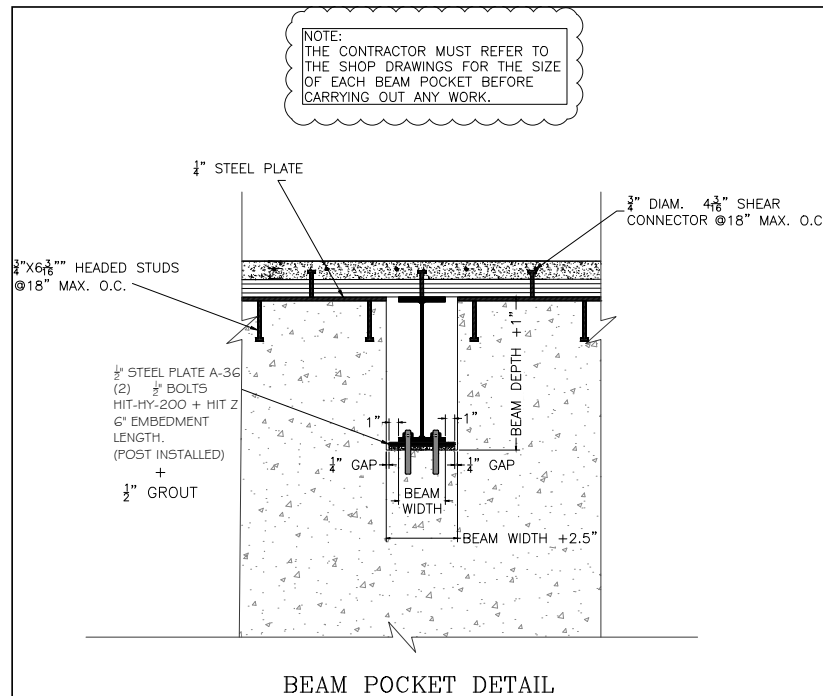
Lateral view



Front view



13) Bearing Connection – W12x22 Steel Beam to 10" thick wall using 1/2" thick steel bearing plate with (2) 1/2" dia. HIT-HY 200 + HIT Z 6" Embedded Anchors - For – 5 kips



MAXIMUM CAPACITY OF 1/2" THICK BEARING PLATE: -

The allowable bearing force of the Bearing Plate is given as

$$R_u = (T_r^2 \times f_y \times A / 1.67) / (2 \times n^2)$$

Where, T_{req} = thickness of bearing plate for bearing force (R_u)

$$n = (6/2 - k) = (6/2 - 0.725) = 2.275 \text{ in}$$

B = length of plate

k = Dimension from the outside of the flange to the center of the web where the radius ends

f_y = Yield strength of section

A = Bearing area of plate

$$= (6 \times 8)$$

$$= 48 \text{ in}^2$$

$$T_r = 0.5 \text{ in}$$

So, the Required thickness of Plate,

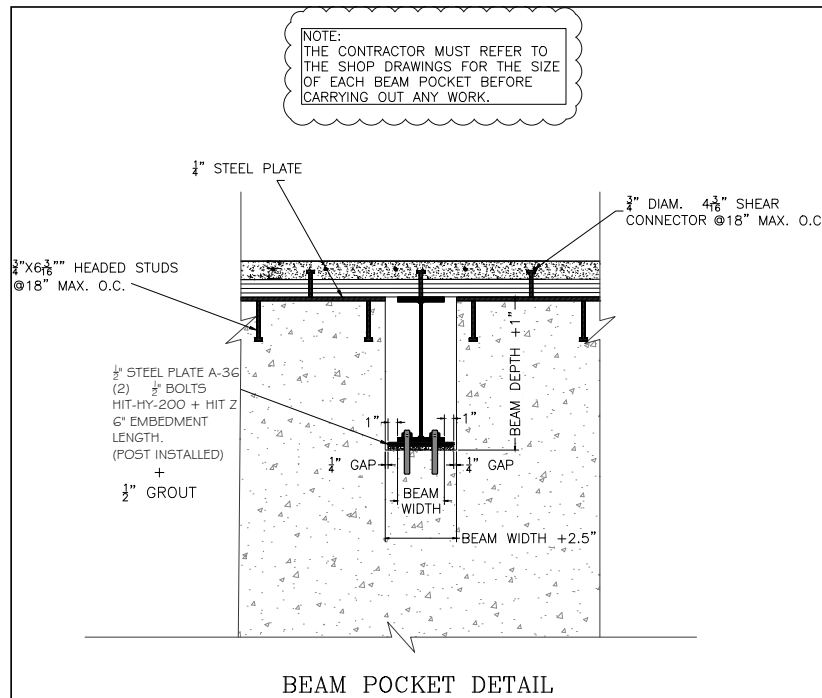
$$R_u = (0.5^2 \times 36 \times 48 / 1.67) / (2 \times 2.275^2)$$

$$R_u = 24.99 \text{ Kips}$$

$$> 5 \text{ kips Actual Reaction}$$

Hence, 1/2" Thick Bearing plate is O.K.

14) Bearing Connection – W18x35 & W18x40 Steel Beam to 10" thick wall using 1/2" thick steel bearing plate with (2) 1/2" dia. HIT-HY 200 + HIT Z 6" Embedded Anchors - For – 27 kips **NO GOOD, USE a 3/4" Thick Plate**



MAXIMUM CAPACITY OF 1/2" THICK BEARING PLATE: -

The allowable bearing force of the Bearing Plate is given as

$$R_u = (T_r^2 \times f_y \times A / 1.67) / (2 \times n^2)$$

Where, T_{req} = thickness of bearing plate for bearing force (R_u)

$$n = (8/2 - k) = (8/2 - 0.827) \\ = 3.173 \text{ in}$$

B = length of plate

k = Dimension from the outside of the flange to the center of the web where the radius ends

f_y = Yield strength of section

A = Bearing area of plate

$$= (8 \times 8)$$

$$= 64 \text{ in}^2$$

$$T_r = 0.5 \text{ in}$$

So, the Required thickness of Plate,

$$R_u = (0.5^2 \times 36 \times 64 / 1.67) / (2 \times 3.173^2)$$

$$R_u = 17.15 \text{ Kips}$$

$$< 27 \text{ kips Actual Reaction}$$

Hence, NOT O.K.

Try 3/4" Thick Bearing plate

$$R_u = (0.75^2 \times 36 \times 64 / 1.67) / (2 \times 3.173^2)$$

$$R_u = 38.54 \text{ Kips}$$

$$> 27 \text{ kips Actual Reaction}$$

Hence, O.K.

Hence, Provide 3/4" Thick Bearing Plate