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# Steel Connections Results

## Connection: 5 - HBBB\_DW

Family: Horizontal Beams - Brace (HBBB)  
Type: Gusset  
Description: Typ Bracing Conn

Design code: AISC 360-16 ASD

### Demands

Description	Pu	Load type
	Brace1 [kip]	
TL	50.00	Design
TL2	0.00	Design

### Interface between Gusset - Brace

Connection: Directly bolted  
Demands

Pu	Description	Load type
[kip]		
50.00	TL	Design
0.00	TL2	Design

### Geometric Considerations

Dimensions	Unit	Value	Min.	Max.	Sta.	References
<b>Member</b>						
Longitudinal edge distance	[in]	1.50	1.00	--	✓	Tables J3.4, J3.5
Longitudinal center-to-center spacing (pitch)	[in]	3.00	2.00	12.00	✓	Sec. J3.5
Transverse edge distance	[in]	1.50	1.00	--	✓	Tables J3.4, J3.5
<b>Gusset</b>						
Longitudinal outer edge distance	[in]	1.50	1.00	--	✓	Tables J3.4, J3.5
Longitudinal inner edge distance	[in]	5.00	1.00	--	✓	Tables J3.4, J3.5

### Design Check

Verification	Unit	Capacity	Demand	Ctrl EQ	Ratio	References
<b>Member</b>						
Bolts shear	[Kip]	59.67	50.00	TL	0.84	Tables (7-1..14)
Bolt bearing on brace	[Kip]	123.43	50.00	TL	0.41	Eq. J3-6
Block shear	[Kip]	88.31	50.00	TL	0.57	Eq. J4-5

<b>Gusset</b>							
Bolt bearing on gusset	[Kip]	123.43	50.00	TL	<b>0.41</b>	Eq. J3-6	
<b>Ratio</b>	<b>0.84</b>						

**Checks for gusset Demands**

Pu [kip]	Description	Load type
50.00	TL	Design
0.00	TL2	Design

# Design Check

Verification	Unit	Capacity	Demand	Ctrl EQ	Ratio	References
<b>Gusset</b>						
Tension yielding on the Whitmore section	[Kip]	133.81	50.00	TL	<b>0.37</b>	Eq. J4-1
<b>Gusset (right beam)</b>						
Shear yielding	[Kip]	144.00	25.00	TL	<b>0.17</b>	Eq. J4-3
Flexural strength	[Kip*ft]	89.82	10.42	TL	<b>0.12</b>	Sec. F11
<b>Gusset (front beam)</b>						
Shear yielding	[Kip]	144.00	43.30	TL	<b>0.30</b>	Eq. J4-3
Flexural strength	[Kip*ft]	89.82	18.04	TL	<b>0.20</b>	Sec. F11
<b>Ratio</b>	<b>0.37</b>					

**Checks for brace Demands**

Pu [kip]	Description	Load type
50.00	TL	Design
0.00	TL2	Design

# Design Check

Verification	Unit	Capacity	Demand	Ctrl EQ	Ratio	References
<b>Member</b>						
Yielding strength due to axial load	[Kip]	124.38	50.00	TL	<b>0.40</b>	Eq. J4-1
Tension rupture	[Kip]	132.93	50.00	TL	<b>0.38</b>	Eq. J4-2
<b>Ratio</b>	<b>0.40</b>					

# Girder

**Connection: Directly welded Demands**

Description	Beam			Column			Load type
	Ru [kip]	Pu [kip]	Mu [kip*ft]	Pu [kip]	Mu22 [kip*ft]	Mu33 [kip*ft]	
TL	25.00	43.30	-53.65	0.00	0.00	0.00	Design
TL2	0.00	0.00	0.00	0.00	0.00	0.00	Design

## Geometric Considerations

Dimensions	Unit	Value	Min.	Max.	Sta.	References
<b>Gusset</b>						
Weld size	[1/16in]	5	3	6	✓	Sec. J2.2b

## Design Check

Verification	Unit	Capacity	Demand	Ctrl EQ	Ratio	References
<b>Gusset</b>						
Beam yielding (normal stress)	[Kip]	215.57	172.07	TL	0.80	Eq. B-1, Appendix B, DG29
Shear yielding	[Kip]	144.00	25.00	TL	0.17	Eq. J4-3
Gusset edge tension stress	[Kip/in2]	21.56	4.33	TL	0.20	Eq. B-1, Appendix B, DG29
Gusset edge shear stress	[Kip/in2]	14.40	2.50	TL	0.17	J4-1
Weld capacity	[Kip]	276.53	243.56	TL	0.88	Tables 8-4 .. 8-11
<b>Support</b>						
Web plate strength due out-of-plane transverse load	[Kip]	29.96	43.30	TL	1.45	p.9-16
<b>Ratio</b>	<b>1.45</b>					

## Beam

**Connection: Directly welded**  
**Demands**

Description	Beam			Column			Load type
	Ru [kip]	Pu [kip]	Mu [kip*ft]	Pu [kip]	Mu22 [kip*ft]	Mu33 [kip*ft]	
TL	43.30	25.00	-30.76	0.00	0.00	0.00	Design
TL2	0.00	0.00	0.00	0.00	0.00	0.00	Design

## Geometric Considerations

Dimensions	Unit	Value	Min.	Max.	Sta.	References
<b>Gusset</b>						
Weld size	[1/16in]	3	3	3	✓	Sec. J2.2b

## Design Check

Verification	Unit	Capacity	Demand	Ctrl EQ	Ratio	References
<b>Gusset</b>						
Beam yielding (normal stress)	[Kip]	215.57	98.83	TL	0.46	Eq. B-1, Appendix B, DG29
Shear yielding	[Kip]	144.00	43.30	TL	0.30	Eq. J4-3
Gusset edge tension stress	[Kip/in2]	21.56	2.50	TL	0.12	Eq. B-1, Appendix B, DG29
Gusset edge shear stress	[Kip/in2]	14.40	4.33	TL	0.30	J4-1
Weld capacity	[Kip]	158.33	149.09	TL	0.94	Tables 8-4 .. 8-11
<b>Support</b>						
Web plate strength due out-of-plane transverse load	[Kip]	11.16	25.00	TL	2.24	p.9-16

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<b>Ratio</b>	<b>2.24</b>
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<b>Global critical strength ratio</b>	<b>2.24</b>
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## References

- [14] Dowswell, B. et al, 2016, "Design of wrap-around gusset plates", Structural Design Solutions, LLC.  
[9] AISC 2005, Design Examples Version 13.0, pp. IIC-26 - IIC-27