



**HEYER ENGINEERING, PC**  
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November 20, 2015

Jeff Haugen  
Haugen Attachments - Marv Haugen Enterprises  
1851 Heartland Ave.  
Casselton, ND 58012

RE: MIJ Industrial Jib  
Capacity/Structural Analysis

Mr. Haugen:

Heyer Engineering has completed an analysis of the MIJ Industrial Jib attachment. The jib structure was analyzed using IBC 2012 and AISC 14th Ed code requirements. The allowable loading, which maintains a 2 to 1 safety factor against full section yielding, at each connection point is shown in the table below. The jib structure was analyzed with the loading plus an additional 20% impact in the gravity direction and 10% impact in both lateral directions. Documents given to Heyer Engineering from Haugen Attachments include the weldment drawings for the above listed Swivel Jib which are attached to this report.

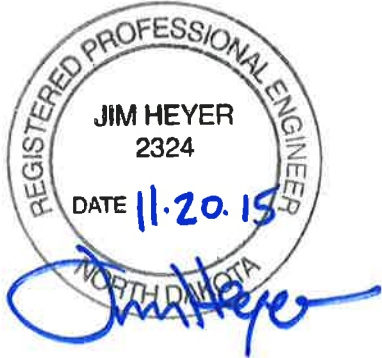
The above referenced Industrial Jib is understood to be built out of rectangular HSS sections and steel plates. All HSS sections have been analyzed using A500 Gr. B structural steel. All other components have been analyzed using A36 structural steel. It is also understood that all components will be fully welded with a minimum of a 3/8" fillet weld.

The results of the analysis are shown in the attached calculations and are summarized below:

Distance from Back of Jib to Pick Point	Capacity
48"	6000 lbs
66"	6000 lbs
84"	4700 lbs
102"	3385 lbs
110.25"	3000 lbs
118.5"	2700 lbs
126.75"	2450 lbs
135"	2230 lbs
143.25"	2050 lbs

In conclusion, the MIJ Industrial Jib is structurally sufficient to support the loads as given in the allowable load chart **ONLY** when following the "Operator's Installation and Safety Manual" as stated by Haugen Attachments – Marv Haugen Enterprises. If there are any questions or comments with the above listed report, please feel free to contact Heyer Engineering at any time.

Sincerely,  
Heyer Engineering, PC





# HEYER ENGINEERING

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Project MIJ

Sheet No. 1

INDUSTRIAL JIB

Job No. 003.0280

Re: \_\_\_\_\_

By: AKW Date 20 NOV 2015

## MIJ INDUSTRIAL JIB

- ANALYSIS AS PER IBC 2012 + AISC 14<sup>TH</sup> ED.
- LOAD CAPACITY AS SHOWN IN REPORT TABLE
  - + 20% IMPACT IN GRAVITY DIRECTION
  - + 10% IMPACT IN BOTH LATERAL DIRECTIONS



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Project MIS

Sheet No. 2

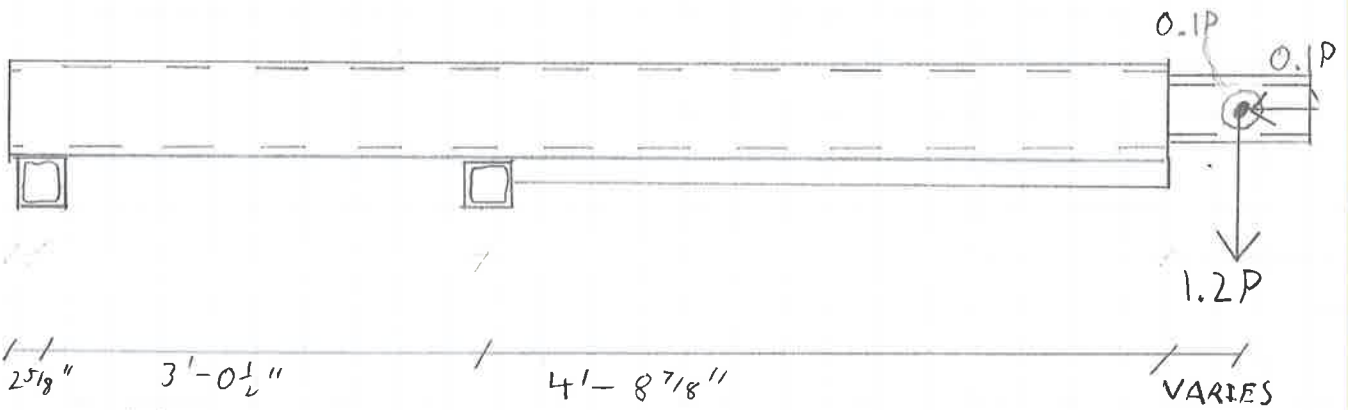
INDUSTRIAL JIB

Job No. 003.0280

Re: \_\_\_\_\_

By: AKW Date 20NOV2015

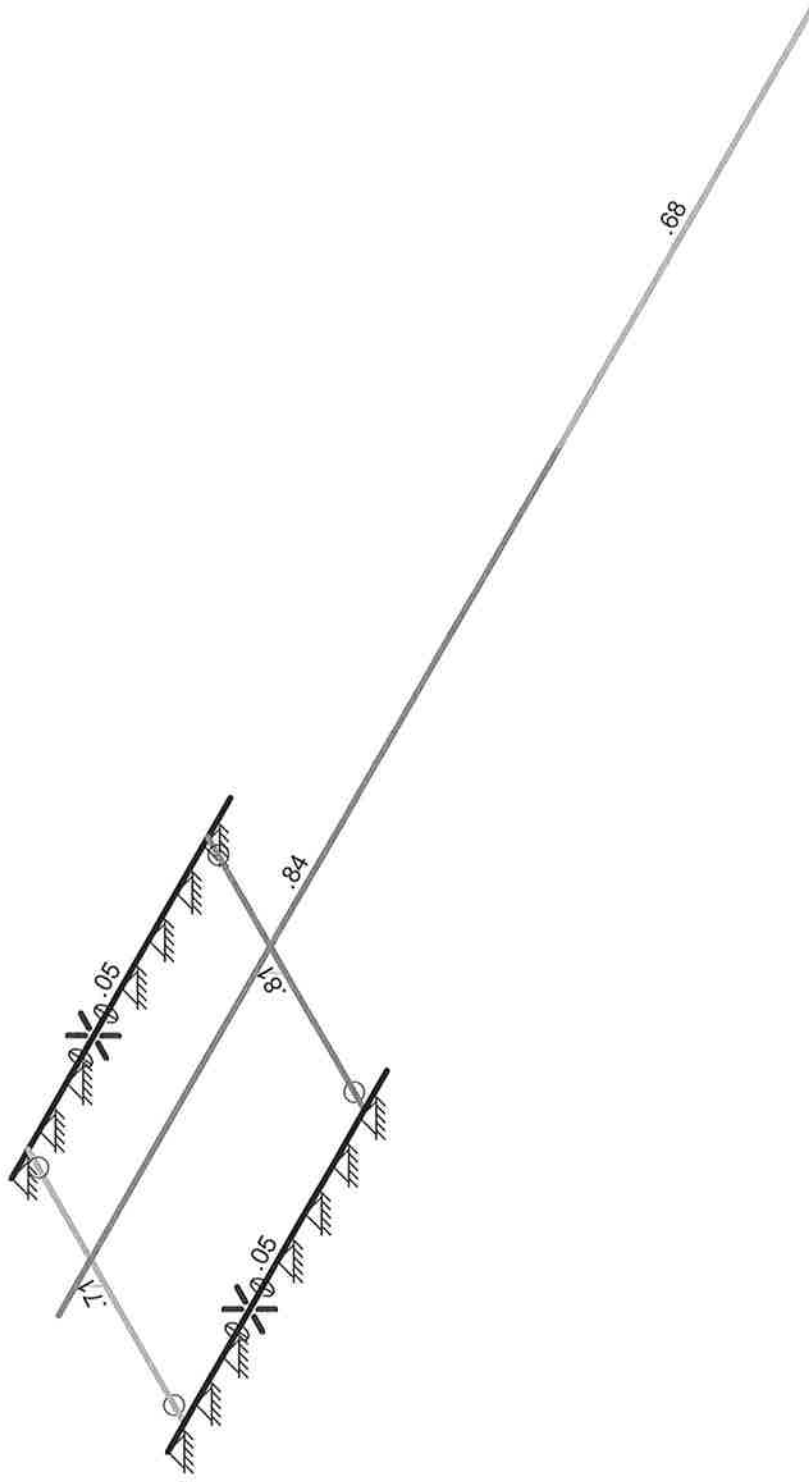
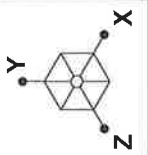
## BENDING + SHEAR UNITY



$P \equiv$  ALLOWABLE LOAD

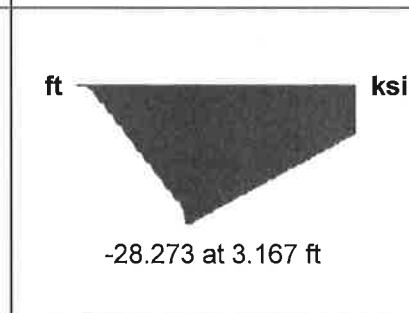
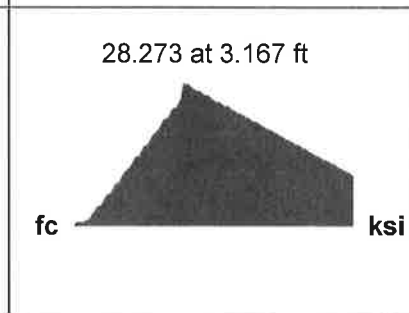
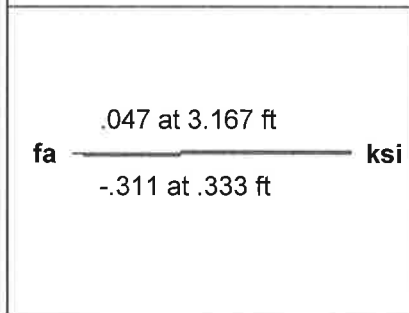
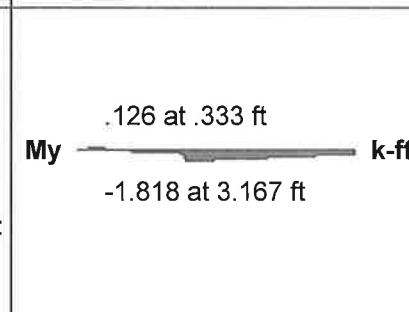
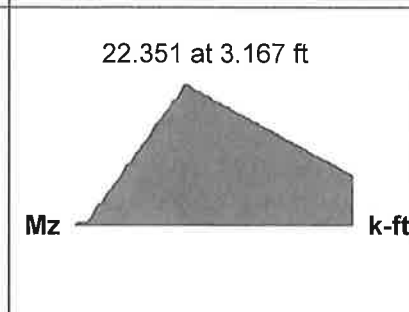
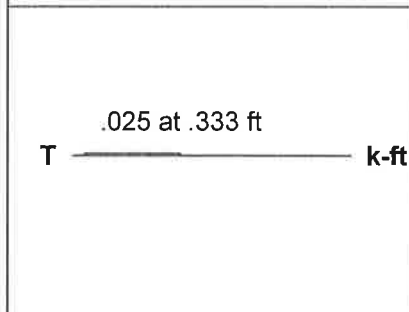
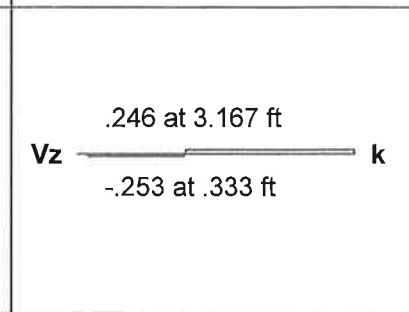
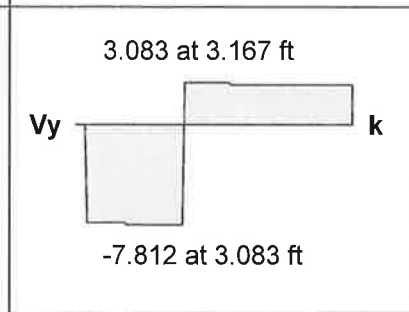
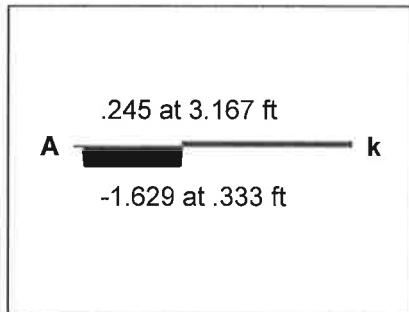
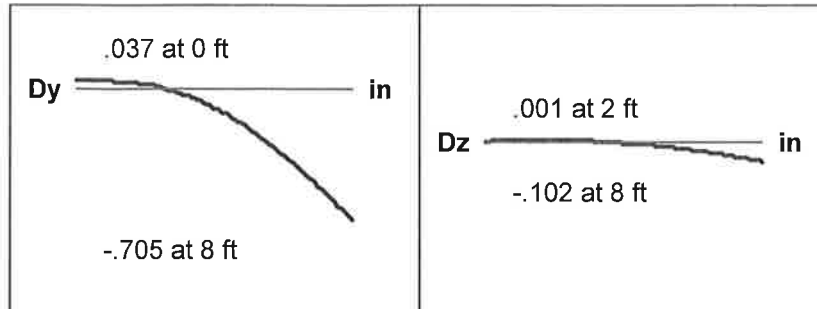
Code Check (Env)

No Calc
> 1.0
.90-1.0
.75-.90
.50-.75
0-.50



Member Code Checks Displayed (Enveloped)  
Results for LC 1, Position 1

Beam: **M5**  
 Shape: **HSS8x4x4**  
 Material: **A500 Gr.B Rect**  
 Length: **8 ft**  
 I Joint: **N11**  
 J Joint: **N12**  
**LC 7: Position 7**  
 Code Check: **0.835 (bending)**  
 Report Based On 97 Sections



**AISC 14th(360-10): ASD Code Check**  
**Direct Analysis Method**

Max Bending Check **0.835**  
 Location **3.167 ft**  
 Equation **H1-1b**

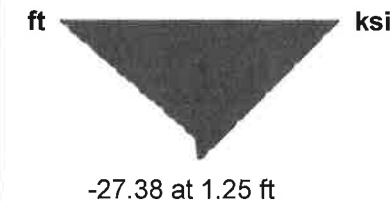
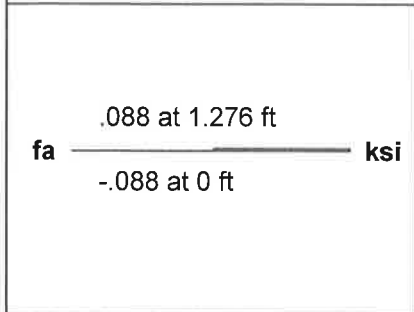
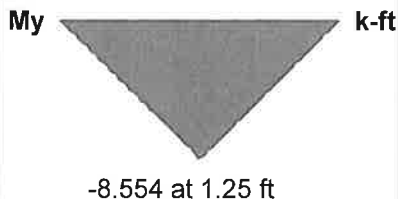
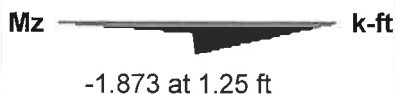
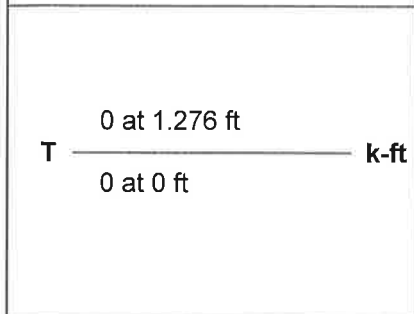
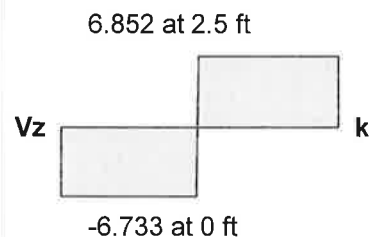
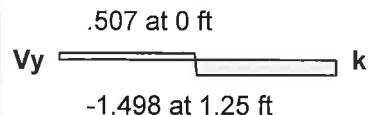
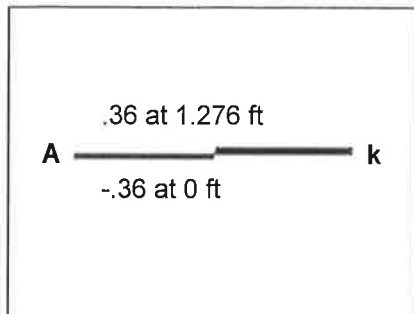
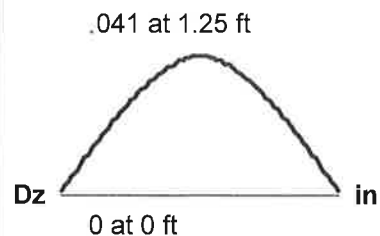
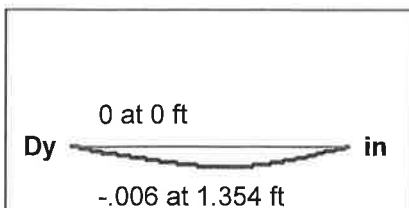
Max Shear Check **0.140 (y)**  
 Location **3.083 ft**  
 Max Defl Ratio **L/129**

Bending Flange **Compact**  
 Bending Web **Compact**

Compression Flange **Non-Slender**  
 Compression Web **Non-Slender**

Fy	<b>46 ksi</b>	Lb	<b>8 ft</b>	z-z	<b>8 ft</b>
Pnc/om	<b>115.186 k</b>	KL/r	<b>57.91</b>		<b>33.709</b>
Pnt/om	<b>144.335 k</b>				
Mny/om	<b>17.777 k-ft</b>	L Comp Flange	<b>8 ft</b>		
Mnz/om	<b>30.529 k-ft</b>	Warp Length	<b>NC</b>		
Vny/om	<b>56.229 k</b>	L-torque	<b>8 ft</b>		
Vnz/om	<b>25.423 k</b>	Tau_b	<b>1</b>		
Tn/om	<b>18.711 k-ft</b>				
Cb	<b>1.297</b>				

Beam: **M4**  
 Shape: **HSS4x4x5**  
 Material: **A500 Gr.B Rect**  
 Length: **2.5 ft**  
 I Joint: **N8**  
 J Joint: **N7**  
**LC 3: Position 3**  
 Code Check: **0.814 (bending)**  
 Report Based On 97 Sections



**AISC 14th(360-10): ASD Code Check**  
**Direct Analysis Method**

Max Bending Check **0.814**  
 Location **1.25 ft**  
 Equation **H1-1b**

Max Shear Check **0.228 (z)**  
 Location **2.5 ft**  
 Max Defl Ratio **L/739**

Bending Flange **Compact**  
 Bending Web **Compact**

Compression Flange **Non-Slender**  
 Compression Web **Non-Slender**

Fy **46 ksi**  
 Pnc/om **109.908 k**  
 Pnt/om **112.934 k**  
 Mny/om **12.831 k-ft**  
 Mnz/om **12.831 k-ft**  
 Vny/om **30.078 k**  
 Vnz/om **30.078 k**  
 Tn/om **10.896 k-ft**  
 Cb **1.469**

y-y z-z  
 Lb **2.5 ft** **2.5 ft**  
 KL/r **20.093** **20.093**  
 L Comp Flange **2.5 ft**  
 Warp Length **NC**  
 L-torque **2.5 ft**  
 Tau\_b **1**

BLOCK SHEAR OF CONNECTION PLATE

$$\frac{R_n}{\Omega} = \frac{0.60 F_y A_{nv} + U_{bs} F_u A_{nt}}{\Omega}$$

$$\frac{R_n}{\Omega} = \frac{0.60 (36 \text{ ksi}) (1.25 \text{ in}^2) + (1.0) (58 \text{ ksi}) (0 \text{ in}^2)}{2} = 13.5 \text{ k}$$

$$u = \frac{6 \text{ k}}{13.5 \text{ k}} = 0.44 \phi_{t}$$