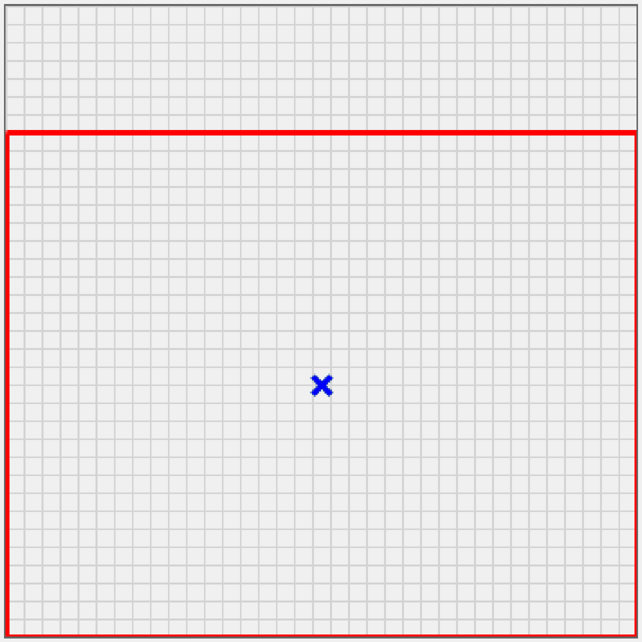
File Help

+Y-Axis All weld lines and load point must be in 1st quadrant!



+X-Axis

Design Output

Max Weld Force (k/in): 6.81

D Required (16ths): 4.89

Code

LRFD

Weld Line Inputs

X1	Y1	X2	Y2
0	0	0	4

Add Weld Line | Remove Weld Line | Clear Welds

Active Weld Lines and Forces @ Ends (k/in)

(0 , 0) ; (5 , 0)	(1.777 , 5.292)
(0 , 4) ; (5 , 4)	(6.808 , 2.645)
(5 , 0) ; (5 , 4)	(5.292 , 2.645)
(0 , 0) ; (0 , 4)	(1.777 , 6.808)

Point Load Information

Load Point Coordinates (in)

Coordinate values relative to origin (0,0,0). +Z is OOP

X 2.5 Y 2 Z 0

Point Loads (kips) Px and Py = Shear, Pz = Axial

Px 4 Py -3 Pz 14

Moment Loads (in-Kips)

Mx 96 My 60 Mz 48

Weld Group Information

Total Weld Length (in): 18

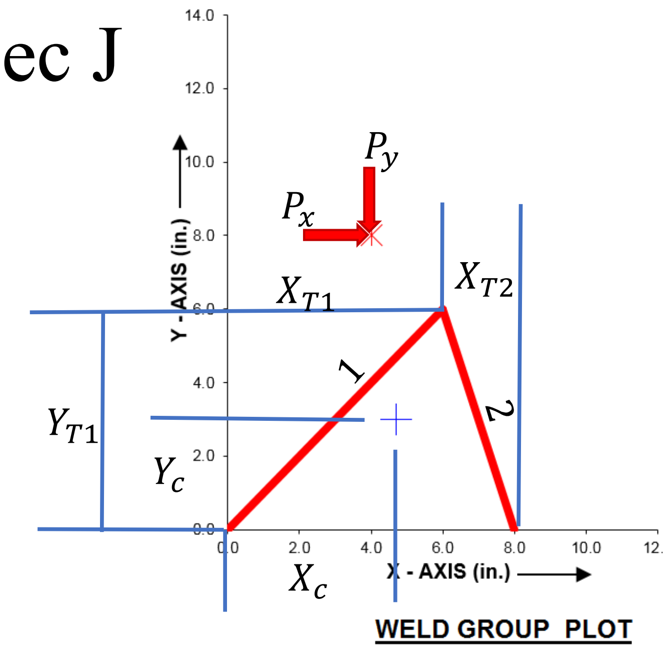
Xc (in): 2.5 Yc (in): 2

Ix (in^3): 50.67 Iy (in^3): 70.83 J (in^3): 121.5

Welded Connection Design – AISC Spec J

General Elastic Method for Any Weld Group w/ Same Size Welds

<ins>General Elastic Method (as adopted from Alex Tomanovich)</ins>



1) Identify Weld Group Main Parameters

- L_{wt} = total length of weld group
- Centroid of Weld Group
  - $X_c = \frac{\sum X_c}{L_{wt}}$ when $X_c = (X_{mid,indv})(L_{w,indv})$
  - $Y_c = \frac{\sum Y_c}{L_{wt}}$ when $Y_c = (Y_{mid,indv})(L_{w,indv})$
- Calculate I_x, I_y, J
  - $I_x = (\sum I_{x0}) - L_{wt}(Y_c)^2 \rightarrow I_{xo1} = \frac{(L_1)(Y_{T\,1})^2}{12} + L_1\left(Y_{mid,1}\right)^2$ continue for each weld
  - $I_y = (\sum I_{y0}) - L_{wt}(X_c)^2 \rightarrow I_{yo1} = \frac{(L_1)(X_{T\,1})^2}{12} + L_1\left(X_{mid,1}\right)^2$ continue for each weld
  - $J = I_x + I_y$

2a) Moment Summations about CG (for each point loaded)

- **USE RIGHT HAND RULE CENTERED ON THE CG_{weld}!!!!**

$M_{xfrom(P_y)} = \left(Z_{load\ point} - Z_{CG_{weld}}\right)(P_y)$

$M_{xfrom(P_z)} = \left(Y_{load\ point} - Y_{CG_{weld}}\right)(P_z)$

$M_{yfrom(P_x)} = \left(Z_{load\ point} - Z_{CG_{weld}}\right)(P_x)$

$M_{yfrom(P_z)} = \left(X_{load\ point} - X_{CG_{weld}}\right)(P_z)$

$M_{zfrom(P_x)} = \left(Y_{load\ point} - Y_{CG_{weld}}\right)(P_x)$

$M_{zfrom(P_y)} = \left(X_{load\ point} - X_{CG_{weld}}\right)(P_y)$

2b) Loads Transformed for Effects @ CG of Weld Group

Notation $M_{xfrom(P_y)}$ indicates moment about x-axis caused by P_y.

- $\sum P_x = Applied\ P_x$
- $\sum P_y = Applied\ P_y$
- $\sum P_z = Applied\ P_z$
- $\sum M_x = Applied M_x + M_{xfrom(P_y)} + M_{xfrom(P_z)}$
- $\sum M_y = Applied M_y + M_{yfrom(P_x)} + M_{yfrom(P_z)}$
- $\sum M_z = Applied M_z + M_{zfrom(P_x)} + M_{zfrom(P_y)}$

Welded Connection Design – AISC Spec J

Elastic Method General Algorithm

General Elastic Method (as adopted from Alex Tomanovich)

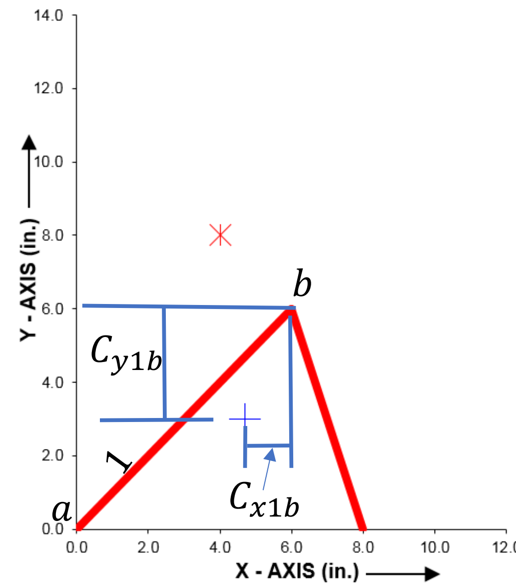
3) Weld Forces @ Individual Points (Weld Ends): The forces are dependent on Cx & Cy, as measured from CG_{weld}

BE AWARE OF THE MOMENT ORIENTATION AND RIGHT HAND RULE!!!

- $f_z = \frac{\sum P_z}{L_{wt}} + \frac{(\sum M_x)(C_{y1b})}{I_x} + \frac{(\sum M_y)(C_{x1b})}{I_y}$
- $f_{vy} = \frac{\sum P_y}{L_{wt}} + \frac{(\sum M_z)(C_{x1b})}{J}$
- $f_{vx} = \frac{\sum P_x}{L_{wt}} + \frac{(\sum M_z)(C_{y1b})}{J}$ (e.g. positive moment about Z will produce force in negative X if C_{y1b} is positive)
- $f_{resultant} = \sqrt{(f_z)^2 + (f_{vy})^2 + (f_{vx})^2}$ $\frac{Force}{Unit\ Length}$ ➔ Usually $\frac{Kips}{in}$

4) Weld Requirements and Base Metal Check

- Fillet weld size required (in 16ths of an inch) = $\frac{f_{resultant}}{0.75 * w * (0.6F_{EXX}) * (unit\ length)} = \frac{f_{resultant}}{1.392\ {}^{k}/_{in}/_{16th}}$ for LRFD.
  - If using ASD, substitute $0.928^{k}/_{in}/_{16th}$ for $1.392\ {}^{k}/_{in}/_{16th}$
- Base Metal Shear Allowable
  - LRFD: $\emptyset R_n = (1.00)(0.6)(F_{ybase})(Base\ Metal\ Thickness)$ ➔ ______ ${}^{force}/_{unit\ length}$ usually $\frac{Kips}{inch}$
  - Refer to AISC Spec. J4
  - $R_n = 0.6F_yA_{gv}$ $w/\ \emptyset = 1.00\ or\ \Omega = 1.5$ $(This\ is\ where\ 0.4F_y\ for\ ASD\ comes\ from)$



WELD GROUP PLOT