1236 SKID LIFT ANALYSIS

$SWL := 14932\ \mathbf{lbf} \cdot 1.13 = \left(1.687 \cdot 10^{4}\right)\ \mathbf{lbf}$

$SWL_{skid} := 17000\ \mathbf{lbf}$

$DL := SWL_{skid} \cdot 2 = \left(3.4 \cdot 10^{4}\right)\ \mathbf{lbf}$

$\theta_{sling} := 30\ \mathbf{deg} = 0.524$

Complete Skid Main Lift Eye Tearout (Reference: 1236-6005-11D, 1236-6005-11G, and Figure A)
Both lift eyes are dimensionally the same, will have the same sling force applied, and therefore will see the same tearout stress. The material is C.S. A516 GR. 70 NORM.

$F_{sling} := \dfrac{DL}{3 \cdot \cos\left(\theta_{sling}\right)} = \left(1.309 \cdot 10^{4}\right)\ \mathbf{lbf}$ $F_{sling} = 5.936\ \mathbf{tonnef}$

$T_{eye} := 1.0\ \mathbf{in}$

$A_{shear} := 1.132\ \mathbf{in} \cdot 2 \cdot T_{eye} = 2.264\ \mathbf{in}^2$ $A_{norm} := 0.720\ \mathbf{in} \cdot 2 \cdot T_{eye} = 1.44\ \mathbf{in}^2$

$\tau_{shear} := \dfrac{F_{sling}}{A_{shear}} = \left(5.78 \cdot 10^{3}\right)\ \mathbf{psi}$ $\sigma_{norm} := \dfrac{F_{sling}}{A_{norm}} = \left(9.088 \cdot 10^{3}\right)\ \mathbf{psi}$

$\tau_{allow.} := 15200\ \mathbf{psi}$ $\sigma_{allow} := 25333\ \mathbf{psi}$

$SF_1 := \dfrac{\tau_{allow.}}{\tau_{shear}} = 2.63$ $SF_2 := \dfrac{\sigma_{allow}}{\sigma_{norm}} = 2.788$

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Figure A: Main Skid Lift Eye

Weld Shear of Main Lift Eye Due to Direct Shear and Torsion. (Reference 1236-6005-03, 1236-6005-04, and Figures A & B).

$h_{weld} := 8\ in$

$w_{weld} := 1.01\ in$

$L_{weld} := h_{weld} \cdot 2 + w_{weld} \cdot 2 = 18.02\ in$

$T_{weld} := 0.375\ in \cdot .7071 = 0.265\ in$

$A_{weld} := L_{weld} \cdot T_{weld} = 4.778\ in^2$

Material is E71T-1 Weld Wire

$\tau_{allowweld} := 17100\ psi$

$$I_{weldbase} := \frac{\left(\left(1.01\ in + \left(T_{weld} \cdot 2\right)\right) \cdot \left(8\ in + \left(2 \cdot T_{weld}\right)\right)^3\right)}{12} = 79.676\ in^4$$

$$I_{base} := \frac{\left(1.01\ in \cdot (8\ in)^3\right)}{12} = 43.093\ in^4$$

$$I_{weld} := I_{weldbase} - I_{base} = 36.583\ in^4$$

$R := 4\ in + T_{weld} = 4.265\ in$

$D := 2.551\ in$

$Torque := F_{sling} \cdot D = \left(3.338 \cdot 10^4\right)\ in \cdot lbf$

$$\tau_{directshear} := \frac{F_{sling}}{A_{weld}} = \left(2.739 \cdot 10^3\right)\ psi$$

$$\tau_{torsional} := \frac{(Torque \cdot R)}{I_{weld}} = \left(3.892 \cdot 10^3\right)\ psi$$

$$\tau_{total} := \tau_{directshear} + \tau_{torsional} = \left(6.631 \cdot 10^3\right)\ psi$$

$$SF_3 := \frac{\tau_{allowweld}}{\tau_{total}} = 2.579$$

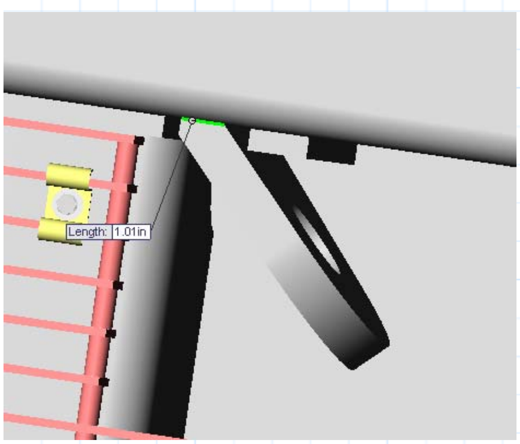

Figure B

Weld Between Plate and Tubing (Reference 1236-6005-11J and 1236-6005-03.)

$h_{weldp} := 9\ in$

$w_{weldp} := 8\ in$

$L_{weldp} := h_{weldp} \cdot 2 + w_{weldp} \cdot 2 = 34\ in$

Material is E71T-1 Weld Wire

$\tau_{allowweld} := 17100\ psi$

$T_{weldp} := .7071 \cdot \frac{3}{8}\ in = 0.265\ in$

$A_{weldp} := T_{weldp} \cdot L_{weldp} = 9.016\ in^2$

$$I_{weldbasep} := \frac{\left(\left(w_{weldp} + \left(T_{weldp} \cdot 2\right)\right) \cdot \left(h_{weldp} + \left(2 \cdot T_{weldp}\right)\right)^3\right)}{12} = 615.329\ in^4$$

$$I_{basep} := \frac{\left(w_{weldp} \cdot \left(h_{weldp}\right)^3\right)}{12} = 486\ in^4$$

$I_{weldp} := I_{weldbasep} - I_{basep} = 129.329\ in^4$

$C := 4\ in + .7071 \cdot (.5)\ in = 4.354\ in$

$D_1 := 2.339\ in + \frac{1}{2}\ in = 2.839\ in$

$Torque_p := F_{sling} \cdot D_1 = \left(3.715 \cdot 10^4\right)\ in \cdot lbf$

$$\tau_{directshearp} := \frac{F_{sling}}{A_{weldp}} = \left(1.452 \cdot 10^3\right)\ psi$$

$$\tau_{torsionalp} := \frac{\left(Torque_p \cdot C\right)}{I_{weldp}} = \left(1.251 \cdot 10^3\right)\ psi$$

$\tau_{totalp} := \tau_{directshearp} + \tau_{torsionalp} = \left(2.702 \cdot 10^3\right)\ psi$

$$SF_4 := \frac{\tau_{allowweld}}{\tau_{totalp}} = 6.328$$

Skid Half Intermediate Lift Eye Tearout (Reference 1236-6005-11E, 1236-6005-11F, and Figure C.)
Both lift eyes are dimensionally the same, will have the same sling force applied, and therefore will see the same tearout stress. The material is C.S. A516 GR. 70 NORM.

$$F_{sling1} := \frac{\frac{1}{2} DL}{3 \cdot \cos\left(\theta_{sling}\right)} = \left(6.543 \cdot 10^{3}\right)\ lbf \qquad F_{sling1} = 2.968\ tonnef$$

$$T_{eye1} := 1.0\ in$$

$$A_{shear1} := 1.132\ in \cdot 2 \cdot T_{eye1} = 2.264\ in^{2} \qquad A_{norm1} := 0.720\ in \cdot 2 \cdot T_{eye1} = 1.44\ in^{2}$$

$$\tau_{shear1} := \frac{F_{sling1}}{A_{shear1}} = \left(2.89 \cdot 10^{3}\right)\ psi \qquad \sigma_{norm1} := \frac{F_{sling1}}{A_{norm1}} = \left(4.544 \cdot 10^{3}\right)\ psi$$

$$\tau_{allow1} := 15200\ psi \qquad \sigma_{allow1} := 25333\ psi$$

$$SF_{5} := \frac{\tau_{allow1}}{\tau_{shear1}} = 5.259 \qquad SF_{6} := \frac{\sigma_{allow}}{\sigma_{norm1}} = 5.575$$

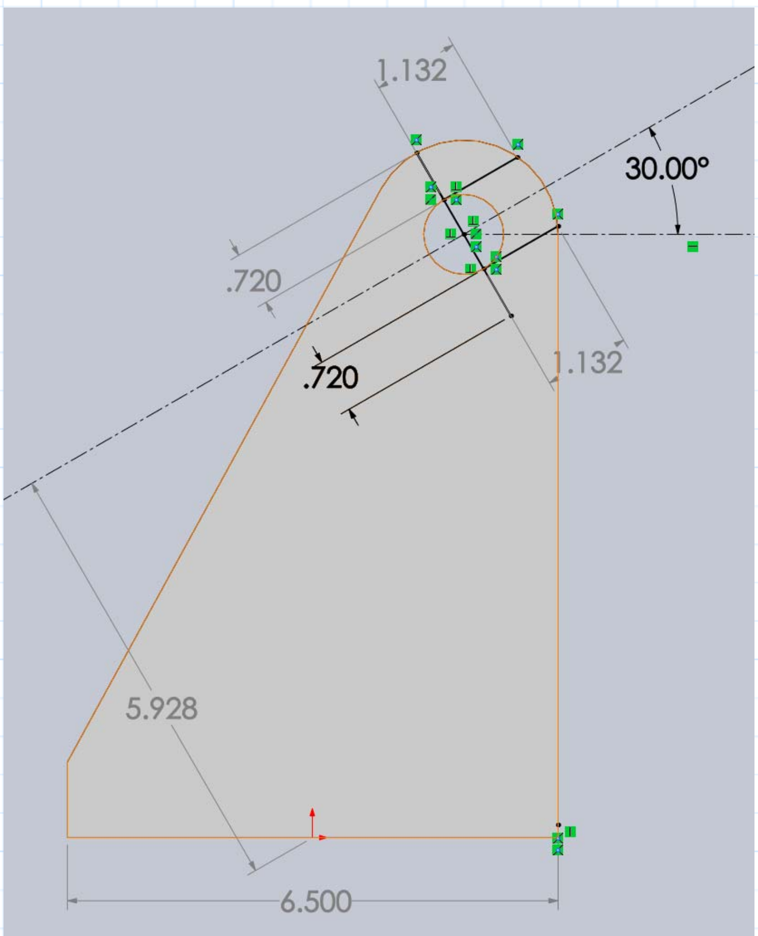

Figure C

Weld Shear of Intermediate Lift Eye (half skid) Due to Direct Shear and Torsion. (Reference 1236-6005-03, 1236-6005-04, and Figure C).

$h_{weld2} := 6.5\ in$

$w_{weld2} := 1.01\ in$

$L_{weld2} := h_{weld2} \cdot 2 + w_{weld2} \cdot 2 = 15.02\ in$

$T_{weld2} := 0.375\ in \cdot .7071 = 0.265\ in$

$A_{weld2} := L_{weld2} \cdot T_{weld2} = 3.983\ in^2$

Material is E71T-1 Weld Wire

$\tau_{allowweld} := 17100\ psi$

$$I_{weldbase2x} := \frac{\left(\left(1\ in + \left(T_{weld2} \cdot 2\right)\right) \cdot \left(8\ in + \left(2 \cdot T_{weld2}\right)\right)^3\right)}{12} = 79.159\ in^4$$

$$I_{base2x} := \frac{\left(1\ in \cdot (8\ in)^3\right)}{12} = 42.667\ in^4$$

$$I_{weld2x} := I_{weldbase2x} - I_{base2x} = 36.492\ in^4$$

$C_2 := 4\ in + .7071 \cdot (.5)\ in = 4.354\ in$

$D_2 := 5.928\ in$

$Torque_2 := F_{sling1} \cdot D_2 = \left(3.879 \cdot 10^4\right)\ in \cdot lbf$

$$\tau_{directshear2} := \frac{F_{sling1}}{A_{weld2}} = \left(1.643 \cdot 10^3\right)\ psi$$

$$\tau_{torsional2x} := \frac{\left(Torque_2 \cdot C_2\right)}{I_{weld2x}} = \left(4.628 \cdot 10^3\right)\ psi$$

$$I_{weldbase2y} := \frac{\left(\left(8\ in + \left(T_{weld2} \cdot 2\right)\right) \cdot \left(1\ in + \left(2 \cdot T_{weld2}\right)\right)^3\right)}{12} = 2.548\ in^4$$

$$I_{base2y} := \frac{\left(8\ in \cdot (1\ in)^3\right)}{12} = 0.667\ in^4$$

$$I_{weld2y} := I_{weldbase2y} - I_{base2y} = 1.881\ in^4$$

$C_3 := 0.5\ in + .7071 \cdot 0.5\ in = 0.854\ in$

$D_3 := 2.192\ in$

$Torque_3 := F_{sling1} \cdot \sin(15.9) \cdot D_3 = -2.737 \cdot 10^3\ in \cdot lbf$

$$\tau_{torsional3y} := \frac{\left(Torque_3 \cdot C_3\right)}{I_{weld2y}} = -1.242 \cdot 10^3\ psi$$

$$\tau_{total2} := \tau_{directshear2} + \tau_{torsional2x} + \left|\tau_{torsional3y}\right| = \left(7.513 \cdot 10^3\right)\ psi$$

$$SF_7 := \frac{\tau_{allowweld}}{\tau_{total2}} = 2.276$$

Buckling of c-channel in half skid lift configuration. The member is assumed to be a pin-ended column for worst case scenario analysis. Reference Figures D & E.

$F_{sling1} = (6.543 \cdot 10^3)\ lbf$

$\theta_z := 64.75\ deg$

$\theta_x := 74.88\ deg$

$F_z := F_{sling1} \cdot \cos(\theta_z) = (2.791 \cdot 10^3)\ lbf$

$F_x := F_{sling1} \cdot \cos(\theta_x) = (1.707 \cdot 10^3)\ lbf$

$I_y := 125.1020\ in^4$

$I_x := 4.5753\ in^4$

$C := 1$

$E := 30000000\ psi$

$A_{cs} := 6.08\ in^2$

$l := 137.5\ in$

Material = C.S. A-36

$\sigma_{allow2} := 24000\ psi$

$$P_{ycr} := \frac{C \cdot \pi^2 \cdot E \cdot I_y}{l^2} = (1.959 \cdot 10^6)\ lbf \qquad SF_8 := \frac{P_{ycr}}{F_z} = 701.93$$

$$P_{xcr} := \frac{C \cdot \pi^2 \cdot E \cdot I_x}{l^2} = (7.165 \cdot 10^4)\ lbf \qquad SF_9 := \frac{P_{xcr}}{F_z} = 25.671$$

$$\sigma_{compressive} := \frac{F_z}{A_{cs}} = 459.074\ psi \qquad SF_{10} := \frac{\sigma_{allow2}}{\sigma_{compressive}} = 52.279$$

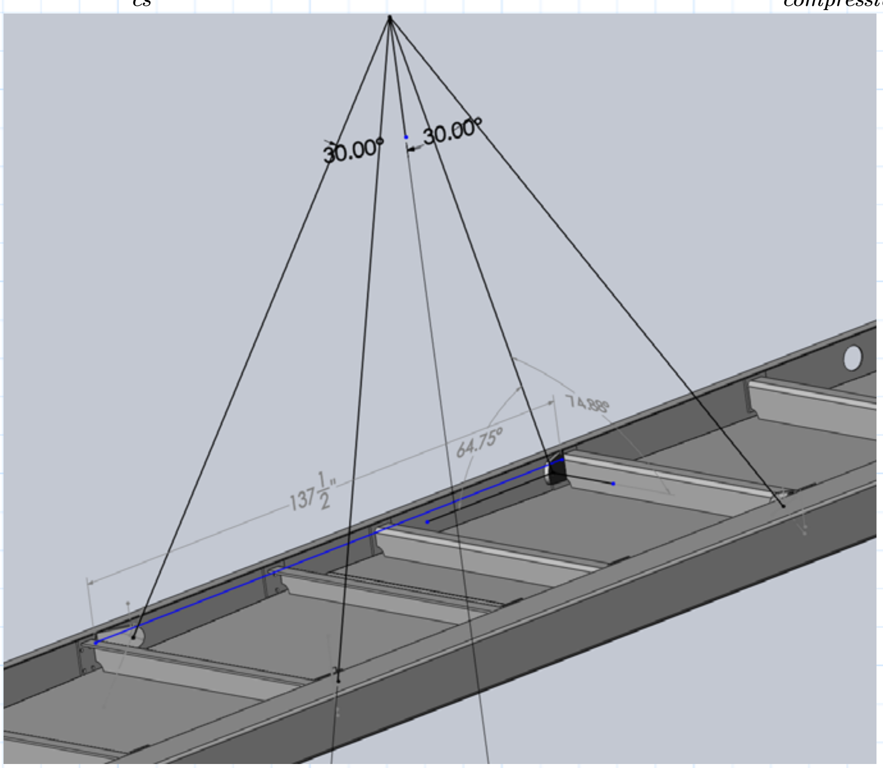

Figure D

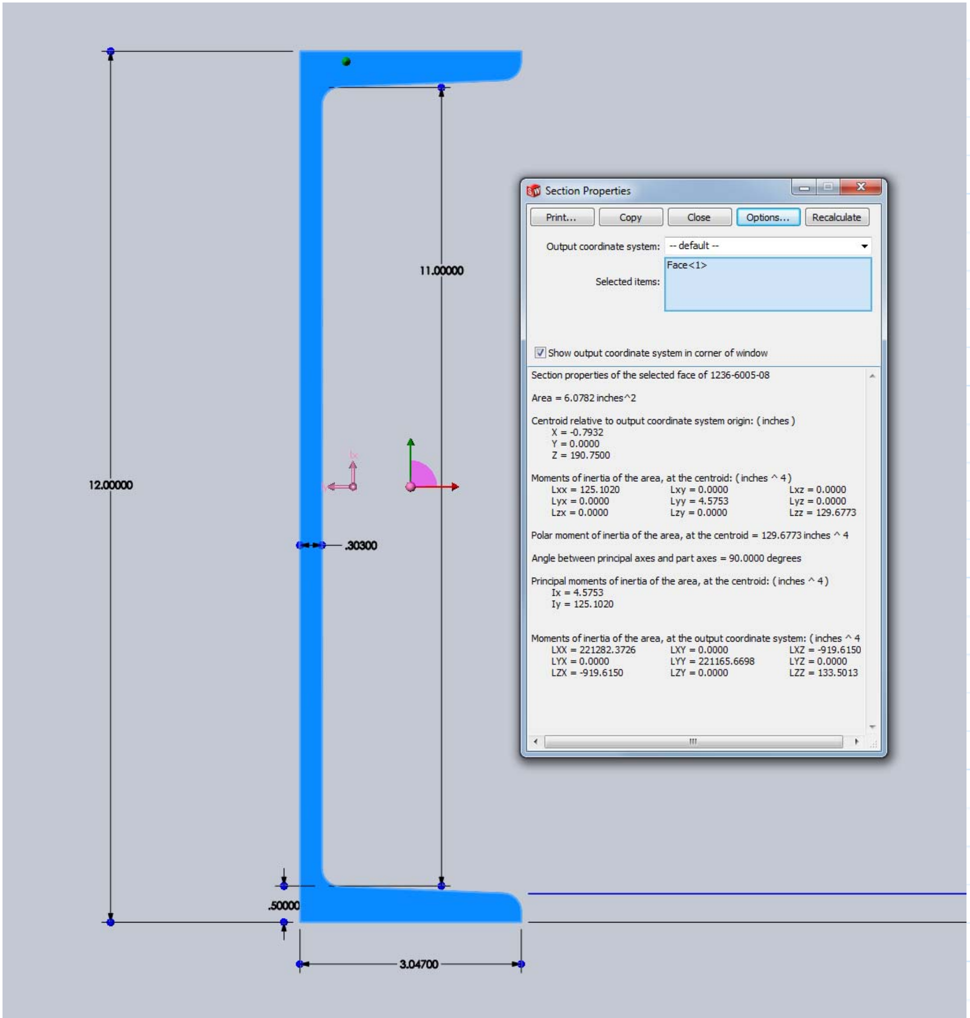
12.00000
11.00000
.30300
.50000
3.04700
Section Properties
Print...
Copy
Close
Options...
Recalculate
Output coordinate system:
-- default --
Selected items:
Face<1>
Show output coordinate system in corner of window
Section properties of the selected face of 1236-6005-08
Area = 6.0782 inches^2
Centroid relative to output coordinate system origin: (inches)
X = -0.7932
Y = 0.0000
Z = 190.7500
Moments of inertia of the area, at the centroid: (inches ^ 4)
Lxx = 125.1020 Lxy = 0.0000 Lxz = 0.0000
Lyx = 0.0000 Lyy = 4.5753 Lyz = 0.0000
Lzx = 0.0000 Lzy = 0.0000 Lzz = 129.6773
Polar moment of inertia of the area, at the centroid = 129.6773 inches ^ 4
Angle between principal axes and part axes = 90.0000 degrees
Principal moments of inertia of the area, at the centroid: (inches ^ 4)
Ix = 4.5753
Iy = 125.1020
Moments of inertia of the area, at the output coordinate system: (inches ^ 4
LXX = 221282.3726 LXY = 0.0000 LXZ = -919.6150
LYX = 0.0000 LYY = 221165.6698 LYZ = 0.0000
LZX = -919.6150 LZY = 0.0000 LZZ = 133.5013

Figure E

Buckling of bent plate cross beams in complete skid lift arrangement. The two adjacent members will be treated as one long member to analyze worst case. Reference Figure F & G.

Material = C.S. A-36

$\sigma_{allow2} := 24000\ psi$

$F_{sling} = (1.309 \cdot 10^4)\ lbf$

$\theta_{z1} := 70.55\ deg$

$\theta_{x1} := 68.10\ deg$

$F_{z1} := F_{sling} \cdot \cos(\theta_{z1}) = (4.358 \cdot 10^3)\ lbf$

$F_{x1} := F_{sling} \cdot \cos(\theta_{x1}) = (4.881 \cdot 10^3)\ lbf$

$I_{y1} := 6.4174\ in^4$

$I_{x1} := 25.7589\ in^4$

$C := 1$

$E := 30000000\ psi$

$A_{cs1} := 5.089\ in^2$

$l_1 := 150.61\ in$

$$P_{ycr1} := \frac{C \cdot \pi^2 \cdot E \cdot I_{y1}}{{l_1}^2} = (8.377 \cdot 10^4)\ lbf \qquad SF_{11} := \frac{P_{ycr1}}{F_{z1}} = 19.223$$

$$P_{xcr1} := \frac{C \cdot \pi^2 \cdot E \cdot I_{x1}}{{l_1}^2} = (3.362 \cdot 10^5)\ lbf \qquad SF_{12} := \frac{P_{xcr1}}{F_{z1}} = 77.16$$

$$\sigma_{compressive1} := \frac{F_{z1}}{A_{cs1}} = 856.285\ psi \qquad SF_{13} := \frac{\sigma_{allow2}}{\sigma_{compressive}} = 52.279$$

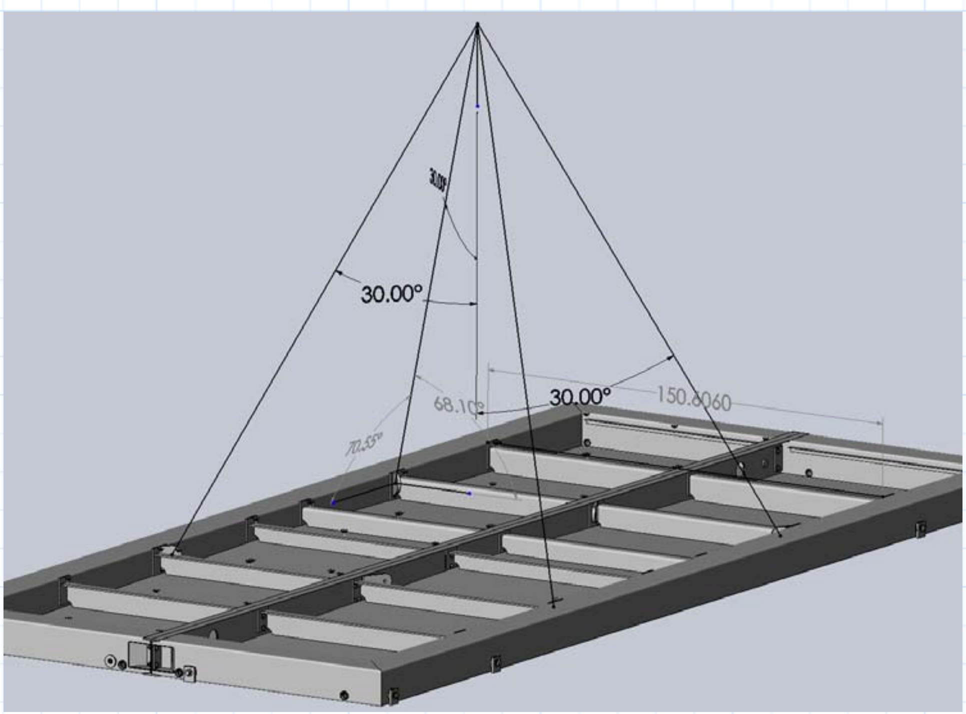

Figure F

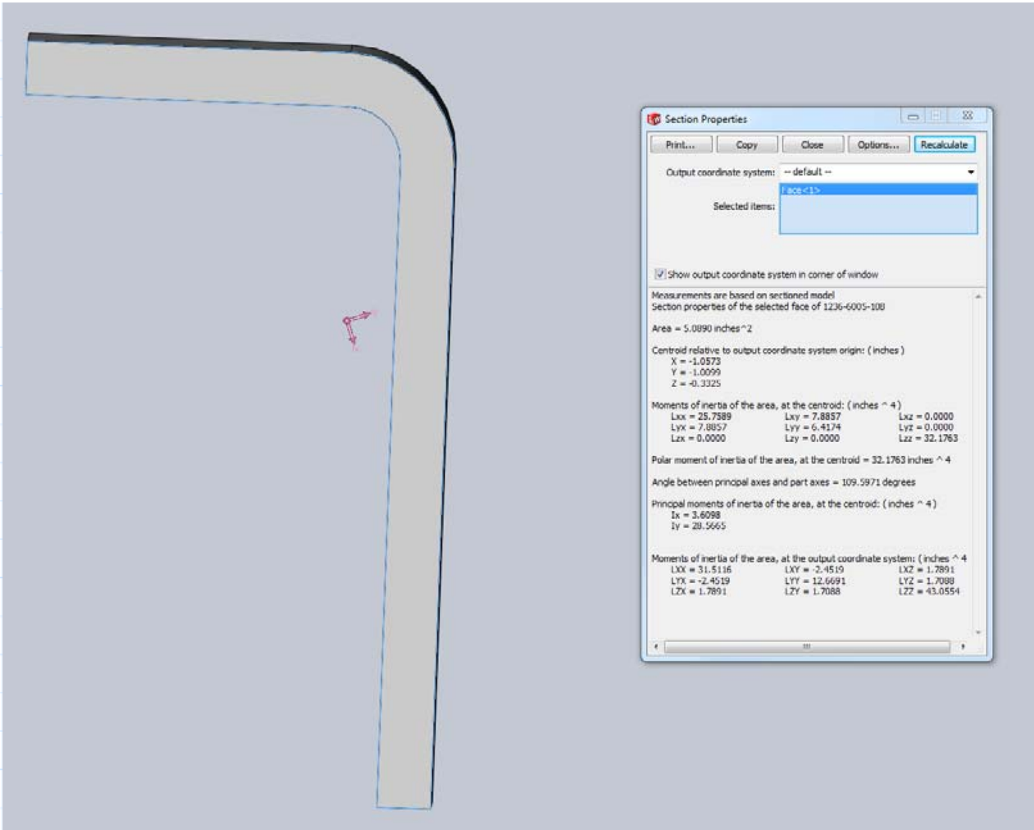

Figure G

No further buckling will be considered since the resultant loads on the square tubing are less and the cross-sectional area is greater.

Skid Connection Bolt analysis:

The bolts being used are 3/4" - 10 UNC Gr. 5 Bolts. There are 12 sets of bolts connecting the 2 skid halves together. This analysis proves that 6 sets will be sufficient. We will use the minimum distance between bolts (db) to be conservative. Two sets are 3.5 inches apart, and 4 sets are 4.4375 inches apart. Reference drawing 1236-6005-01 and Figures H & I.

$$F_w := \frac{1}{2} \cdot DL = \left(1.7 \cdot 10^4\right)\ \mathbf{lbf}$$

$$F_{sling1} = \left(6.543 \cdot 10^3\right)\ \mathbf{lbf}$$

$$x := 73.5241\ \mathbf{in}$$

$$l := \frac{87.8\ \mathbf{in}}{2} = 43.9\ \mathbf{in}$$

N = number of bolt sets

$$N := 6$$

$$d_b := 3.5\ \mathbf{in}$$

$$A_{bolt} := 0.334\ \mathbf{in}^2$$

$$F_{w2} := 2\ F_{sling1} \cdot \cos\left(\theta_{sling}\right) = \left(1.133 \cdot 10^4\right)\ \mathbf{lbf}$$

$$F_{Ay} := F_{w2} - 2 \cdot F_{sling1} \cdot \sin\left(\theta_{x1}\right) = -808.894\ \mathbf{lbf}$$

$$F_{Ax} := 2 \cdot F_{sling1} \cdot \cos\left(\theta_{x1}\right) = \left(4.881 \cdot 10^3\right)\ \mathbf{lbf}$$

$$M_A := l \cdot F_{w2} - 2 \cdot x \cdot F_{sling1} \cdot \sin\left(\theta_{x1}\right) = -3.952 \cdot 10^5\ \mathbf{in} \cdot \mathbf{lbf}$$

$$F_{bolt} := \frac{M_A}{N \cdot d_b} = -1.882 \cdot 10^4\ \mathbf{lbf}$$

$$\sigma_b := \frac{F_{bolt}}{A_{bolt}} = -5.635 \cdot 10^4\ \mathbf{psi}$$

$$\sigma_{allowbolt} := 61333\ \mathbf{psi}$$

$$SF_{14} := \left|\frac{\sigma_{allowbolt}}{\sigma_b}\right| = 1.089$$

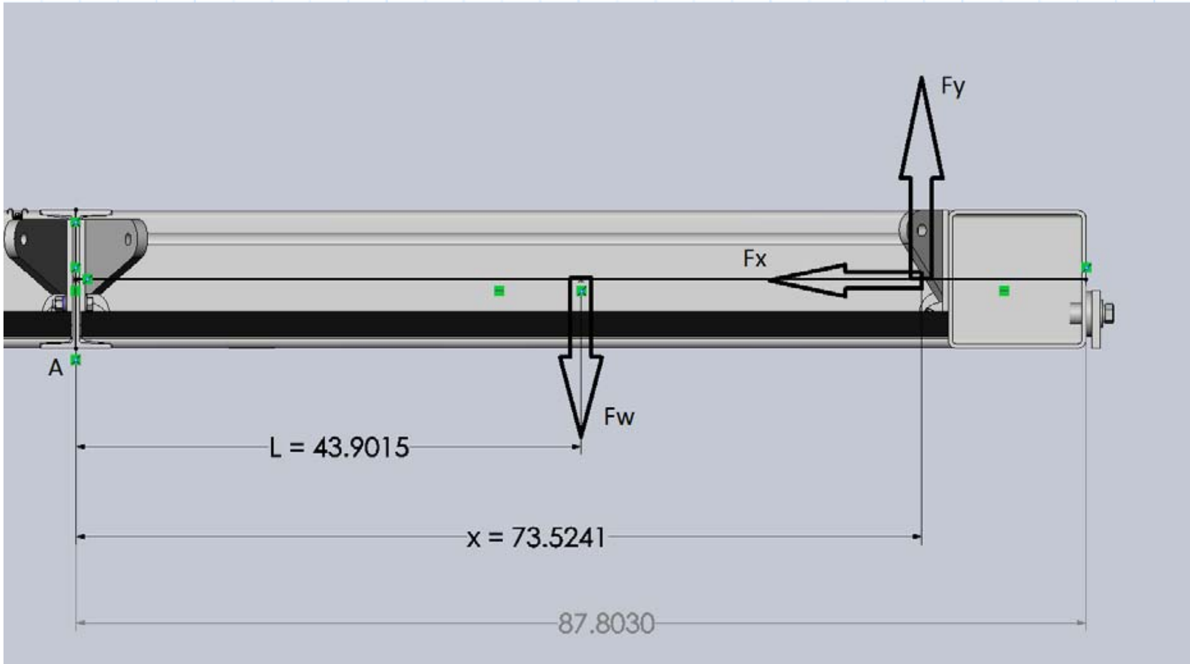

Figure H

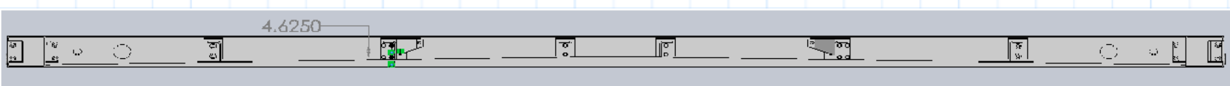

Figure I

Weld shear analysis of weld on bent plate due to direct shear and torsion. The cross-section dimensions will be taken from the bent plate that is in line with the lift eyes. Reference 1236-6005-03, 1236-6005-04, 1236-6005-10B, and Figure J.

$$C_{bp} := 2.5\ in$$

$$C_{bpweld} := 2.5\ in + 0.25\ in \cdot 0.7071 = 2.677\ in$$

Weld Material is E71T-1 Weld Wire

$$\tau_{allowweld} := 17100\ psi$$

$$I_{ybp} := 13.2569\ in^4$$

$$\sigma_{bending} := \frac{M_A \cdot C_{bp}}{6 \cdot I_{ybp}} = -1.242 \cdot 10^4\ psi$$

$$I_{yweld} := 12.4102\ in^4$$

$$\sigma_{bendweld} := \frac{M_A \cdot C_{bpweld}}{6 \cdot I_{yweld}} = -1.421 \cdot 10^4\ psi$$

$$A_{weld2} := 3.1931\ in^2$$

$$\tau_{direct} := \frac{F_{Ay}}{A_{weld2}} = -253.326\ psi$$

$$\sigma_{vonmises} := \sqrt{\sigma_{bendweld}^{\ 2} + 3 \cdot \tau_{direct}^{\ 2}} = \left(1.421 \cdot 10^4\right)\ psi$$

$$SF_{15} := \frac{\tau_{allowweld}}{\sigma_{vonmises}} = 1.203$$

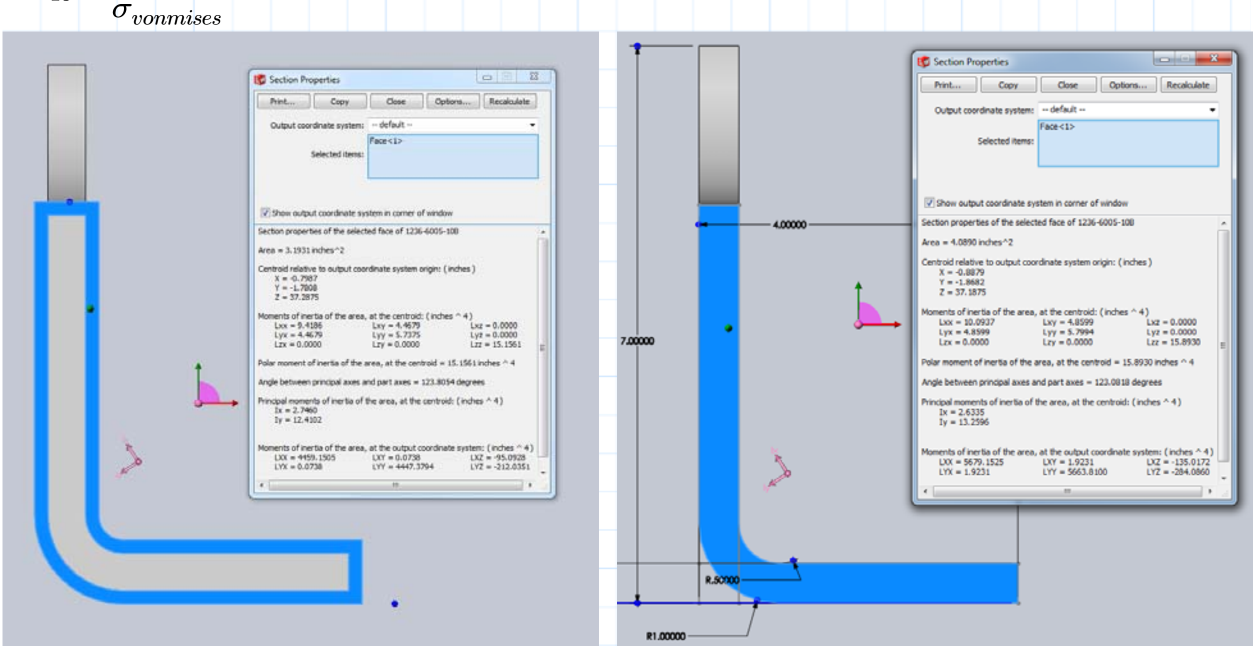

Figure J

Bent Plate weld analysis due to weight of ROV trencher. See drawing 1236-6005-03, 1236-6005-04, 1236-6005-10A, and Figure K.

$a := 16.103\ in$

$b := 59.200\ in$

$l := 75.303\ in$

$I_{yweld2} := 8.5896\ in^4$

$C_{bp2} := 2\ in$

$C_{bpweld2} := 2\ in + 0.25\ in \cdot .707 = 2.177\ in$

Weld Material is E71T-1 Weld Wire

$\sigma_{allowweld} := 38000\ psi$

$$F_{track} := \frac{39683\ lbf}{2} = \left(1.984 \cdot 10^4\right)\ lbf$$

$$F_{bp} := \frac{F_{track}}{2} = \left(9.921 \cdot 10^3\right)\ lbf$$

$$R_a := \frac{F_{bp} \cdot b^2}{l^3} \cdot (3 \cdot a + b) = \left(8.754 \cdot 10^3\right)\ lbf$$

$$R_b := \frac{F_{bp} \cdot a^2}{l^3} \cdot (3 \cdot b + a) = \left(1.167 \cdot 10^3\right)\ lbf$$

$$M_a := \frac{F_{bp} \cdot a \cdot b^2}{l^2} = \left(9.873 \cdot 10^4\right)\ in \cdot lbf$$

$$M_b := \frac{F_{bp} \cdot a^2 \cdot b}{l^2} = \left(2.686 \cdot 10^4\right)\ in \cdot lbf$$

$$\sigma_{aweld} := \frac{M_a \cdot C_{bpweld2}}{I_{yweld2}} = \left(2.502 \cdot 10^4\right)\ psi \qquad \tau_{aweld} := \frac{R_a}{A_{weld2}} = \left(2.741 \cdot 10^3\right)\ psi$$

$$\sigma_{bweld} := \frac{M_b \cdot C_{bpweld2}}{I_{yweld2}} = \left(6.806 \cdot 10^3\right)\ psi \qquad \tau_{bweld} := \frac{R_b}{A_{weld2}} = 365.464\ psi$$

$$\sigma_{avon} := \sqrt{\left(\sigma_{aweld}\right)^2 + 3 \cdot \left(\tau_{aweld}\right)^2} = \left(2.547 \cdot 10^4\right)\ psi \qquad SF_{16} := \frac{\sigma_{allowweld}}{\sigma_{avon}} = 1.492$$

$$\sigma_{bvon} := \sqrt{\left(\sigma_{bweld}\right)^2 + 3 \cdot \left(\tau_{bweld}\right)^2} = \left(6.835 \cdot 10^3\right)\ psi \qquad SF_{17} := \frac{\sigma_{allowweld}}{\sigma_{bvon}} = 5.559$$

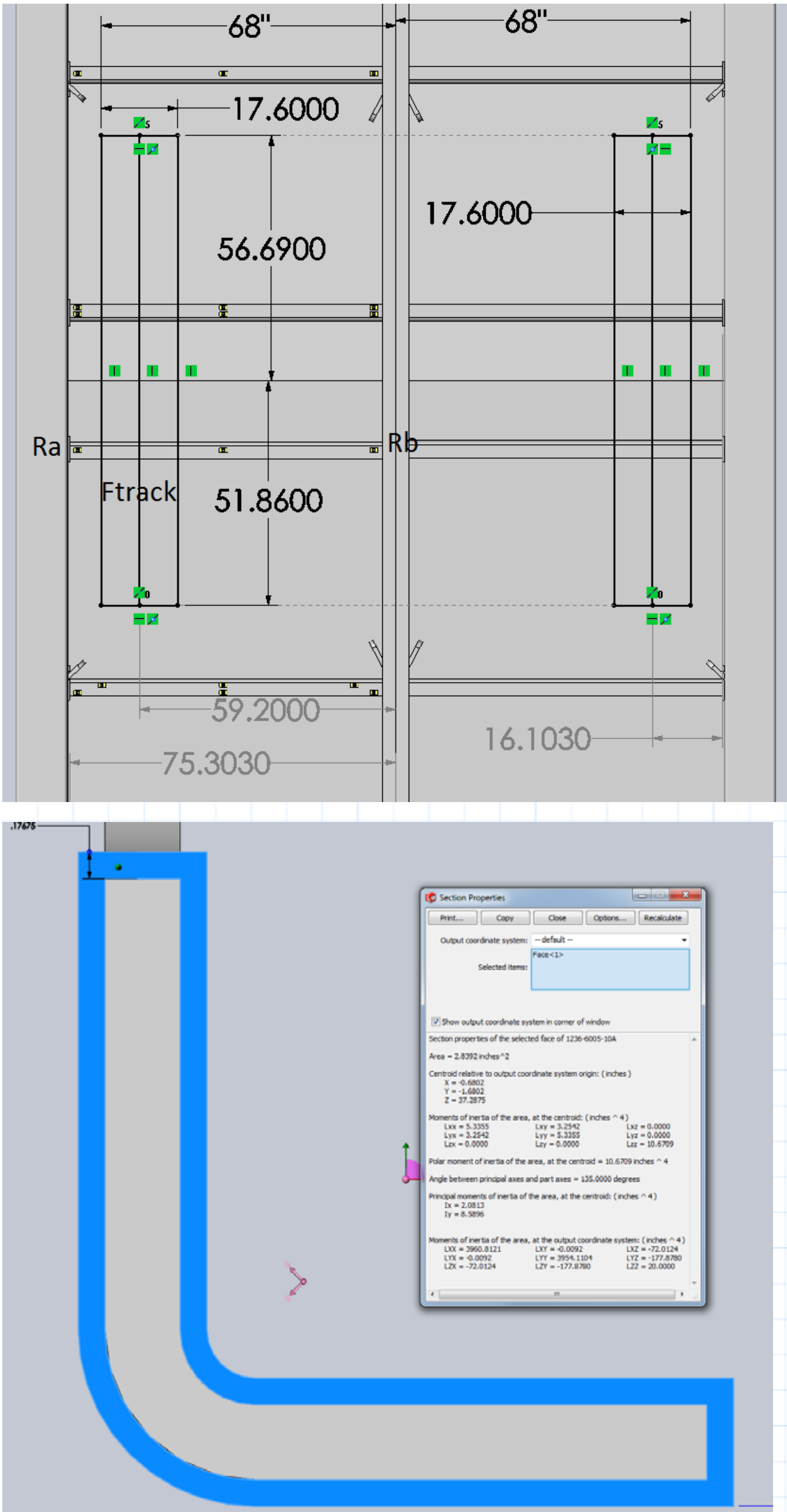
68"
68"
17.6000
17.6000
56.6900
Ra
Rb
Ftrack
51.8600
59.2000
16.1030
75.3030
.17675
Section Properties
Print...
Copy
Close
Options...
Recalculate
Output coordinate system: -- default --
Selected items: Face<1>
Show output coordinate system in corner of window
Section properties of the selected face of 1236-6005-10A
Area = 2.8392 inches^2
Centroid relative to output coordinate system origin: (inches)
X = -0.6802
Y = -1.6802
Z = 37.2875
Moments of inertia of the area, at the centroid: (inches ^ 4)
Lxx = 5.3355 Lxy = 3.2542 Lxz = 0.0000
Lyx = 3.2542 Lyy = 5.3355 Lyz = 0.0000
Lzx = 0.0000 Lzy = 0.0000 Lzz = 10.6709
Polar moment of inertia of the area, at the centroid = 10.6709 inches ^ 4
Angle between principal axes and part axes = 135.0000 degrees
Principal moments of inertia of the area, at the centroid: (inches ^ 4)
Ix = 2.0813
Iy = 8.5896
Moments of inertia of the area, at the output coordinate system: (inches ^ 4)
LXX = 3960.8121 LXY = -0.0092 LXZ = -72.0124
LYX = -0.0092 LYY = 3954.1104 LYZ = -177.8780
LZX = -72.0124 LZY = -177.8780 LZZ = 20.0000

Figure K

Bent Plate material analysis due to weight of ROV trencher. See drawing 1236-6005-10A and Figures K and L.

$a := 16.103\ in$

$b := 59.200\ in$

$l := 75.303\ in$

$I_{ybp2} := 8.8169\ in^4$

$A_{bp2} := 3.5890\ in^2$

$C_{bp3} := 3.1625\ in$

$I_{ybp3} := 19.7587\ in^4$

$A_{bp3} := 4.589\ in^2$

Material is C.S. A-131, Gr. EH-36.

$\sigma_{allowEH36} := 34000\ psi$

$$F_{track} := \frac{39683\ lbf}{2} = \left(1.984 \cdot 10^4\right)\ lbf$$

$$F_{bp} := \frac{F_{track}}{2} = \left(9.921 \cdot 10^3\right)\ lbf$$

$$R_a := \frac{F_{bp} \cdot b^2}{l^3} \cdot (3 \cdot a + b) = \left(8.754 \cdot 10^3\right)\ lbf$$

$$R_b := \frac{F_{bp} \cdot a^2}{l^3} \cdot (3 \cdot b + a) = \left(1.167 \cdot 10^3\right)\ lbf$$

$$M_a := \frac{F_{bp} \cdot a \cdot b^2}{l^2} = \left(9.873 \cdot 10^4\right)\ in \cdot lbf$$

$$M_b := \frac{F_{bp} \cdot a^2 \cdot b}{l^2} = \left(2.686 \cdot 10^4\right)\ in \cdot lbf$$

$$M_c := \frac{F_{bp} \cdot b^2}{l^3} \left(a \cdot (3 \cdot a + b) - a \cdot l\right) = \left(4.223 \cdot 10^4\right)\ in \cdot lbf$$

$$\sigma_{abp} := \frac{M_a \cdot C_{bp2}}{I_{ybp2}} = \left(2.24 \cdot 10^4\right)\ psi \qquad \tau_{abp} := \frac{R_a}{A_{bp2}} = \left(2.439 \cdot 10^3\right)\ psi$$

$$\sigma_{bbp} := \frac{M_b \cdot C_{bp2}}{I_{ybp2}} = \left(6.092 \cdot 10^3\right)\ psi \qquad \tau_{bbp} := \frac{R_b}{A_{bp2}} = 325.15\ psi$$

$$\sigma_{cbp} := \frac{M_c \cdot C_{bp3}}{I_{ybp3}} = \left(6.759 \cdot 10^3\right)\ psi \qquad \tau_{cbp} := \frac{R_a}{A_{bp3}} = \left(1.908 \cdot 10^3\right)\ psi$$

$$\sigma_{avonbp} := \sqrt{\left(\sigma_{abp}\right)^2 + 3 \cdot \left(\tau_{abp}\right)^2} = \left(2.279 \cdot 10^4\right)\ psi \qquad SF_{16} := \frac{\sigma_{allowEH36}}{\sigma_{avonbp}} = 1.492$$

$$\sigma_{bvonbp} := \sqrt{\left(\sigma_{bbp}\right)^2 + 3 \cdot \left(\tau_{bbp}\right)^2} = \left(6.118 \cdot 10^3\right)\ psi \qquad SF_{17} := \frac{\sigma_{allowEH36}}{\sigma_{bvonbp}} = 5.557$$

$$\sigma_{cvonbp} := \sqrt{\left(\sigma_{cbp}\right)^2 + 3 \cdot \left(\tau_{cbp}\right)^2} = \left(7.523 \cdot 10^3\right)\ psi \qquad SF_{17} := \frac{\sigma_{allowEH36}}{\sigma_{cvonbp}} = 4.519$$

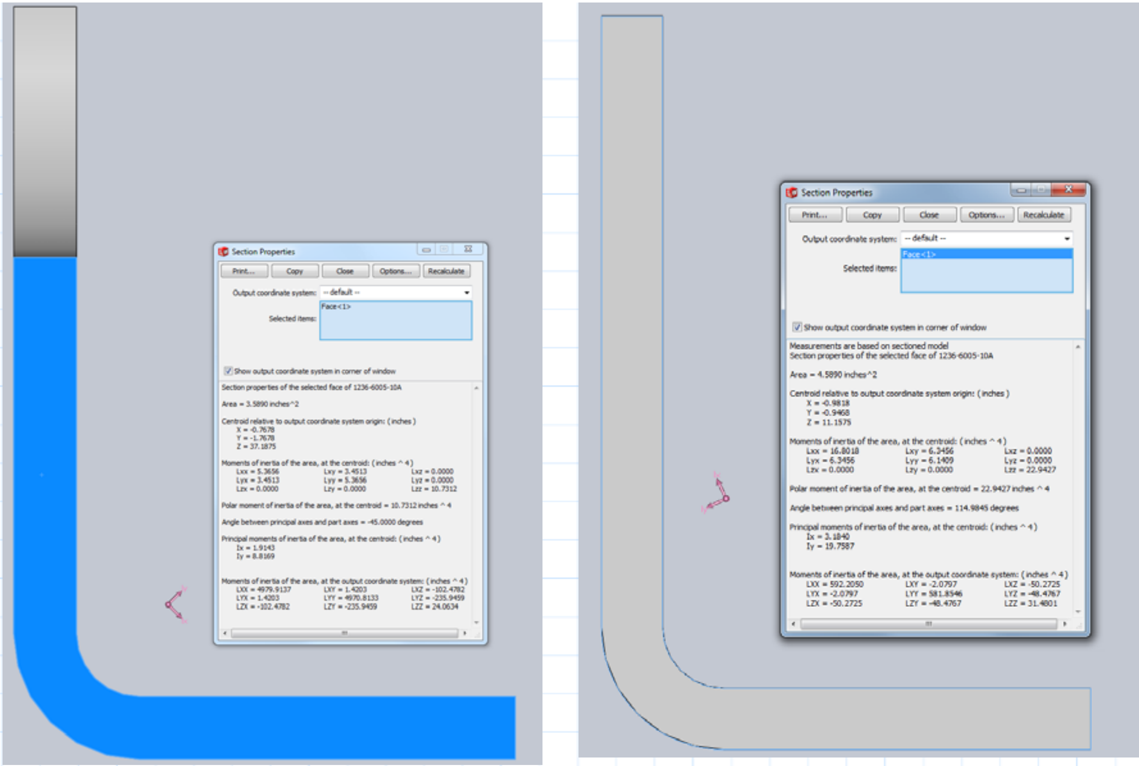
Section Properties
Print...
Copy
Close
Options...
Recalculate
Output coordinate system: -- default --
Selected items: Face<1>
Show output coordinate system in corner of window
Section properties of the selected face of 1236-6005-10A
Area = 3.5890 inches^2
Centroid relative to output coordinate system origin: (inches)
X = -0.7678
Y = -1.7678
Z = 37.1875
Moments of inertia of the area, at the centroid: (inches ^ 4)
Lxx = 5.3656 Lxy = 3.4513 Lxz = 0.0000
Lyx = 3.4513 Lyy = 5.3656 Lyz = 0.0000
Lzx = 0.0000 Lzy = 0.0000 Lzz = 10.7312
Polar moment of inertia of the area, at the centroid = 10.7312 inches ^ 4
Angle between principal axes and part axes = -45.0000 degrees
Principal moments of inertia of the area, at the centroid: (inches ^ 4)
Ix = 1.9143
Iy = 8.8169
Moments of inertia of the area, at the output coordinate system: (inches ^ 4)
LXX = 4979.9137 LXY = 1.4203 LXZ = -102.4782
LYX = 1.4203 LYY = 4970.8133 LYZ = -235.9459
LZX = -102.4782 LZY = -235.9459 LZZ = 24.0634
Section Properties
Print...
Copy
Close
Options...
Recalculate
Output coordinate system: -- default --
Selected items: Face<1>
Show output coordinate system in corner of window
Measurements are based on sectioned model
Section properties of the selected face of 1236-6005-10A
Area = 4.5890 inches^2
Centroid relative to output coordinate system origin: (inches)
X = -0.9818
Y = -0.9468
Z = 11.1575
Moments of inertia of the area, at the centroid: (inches ^ 4)
Lxx = 16.8018 Lxy = 6.3456 Lxz = 0.0000
Lyx = 6.3456 Lyy = 6.1409 Lyz = 0.0000
Lzx = 0.0000 Lzy = 0.0000 Lzz = 22.9427
Polar moment of inertia of the area, at the centroid = 22.9427 inches ^ 4
Angle between principal axes and part axes = 114.9845 degrees
Principal moments of inertia of the area, at the centroid: (inches ^ 4)
Ix = 3.1840
Iy = 19.7587
Moments of inertia of the area, at the output coordinate system: (inches ^ 4)
LXX = 592.2050 LXY = -2.0797 LXZ = -50.2725
LYX = -2.0797 LYY = 581.8546 LYZ = -48.4767
LZX = -50.2725 LZY = -48.4767 LZZ = 31.4801

Figure L