

EXTERIOR HEADER DESIGN PROPERTIES SHEET

Structural Calculations

Job No. B13-161

OCTOBER 29, 2013

Prepared for:

OLMAR SUPPLY INC.

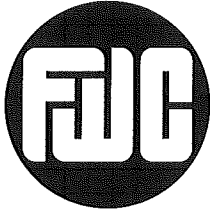
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Prepared by:



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PROJECT EXTERIOR HEADER DESIGN PROPERTIES
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GENERAL NOTES FOR CALCULATION PACKAGE

1. CALCULATIONS CONFORM TO AISI S100-07/S2-10 WHICH IS REFERENCED BY THE 2012 IBC.
2. CALCULATIONS ARE COMPOSED IN THE FOLLOWING MANNER:
 - SINGLE TRACK HEADER PROPERTIES
 - 2-PIECE HEADER PROPERTIES SUMMARY, EXAMPLE CALC, AND CFS OUTPUT
 - 3-PIECE HEADER PROPERTIES SUMMARY, EXAMPLE CALC, AND CFS OUTPUT
 - 5-PIECE HEADER PROPERTIES SUMMARY FOR 6" STUDS, EXAMPLE CALC, CFS OUTPUT, PROPERTIES SUMMARY FOR 8" STUDS, CFS OUTPUT, PROPERTIES FOR 10" STUD, AND CFS OUTPUT
 - ALLOWABLE SHEAR DETERMINATION CALCULATIONS
 - SUMMARY OF HEADER AND TRACK PROPERTIES

Single Track Header Output

Project:
Model:

Date: 10/29/2013

SECTION DESIGNATION: 600T150-43 (33) Single

INPUT PROPERTIES:

Web Height =	6.1614 in	Steel Thickness =	0.0451 in
Top Flange =	1.5000 in	Inside Corner Radius =	0.0712 in
Bottom Flange =	1.5000 in	Yield Stress, Fy =	33.0 ksi
		Fy With Cold-Work, Fya =	33.0 ksi

OUTPUT PROPERTIES:

Effective Section Properties, Strong Axis

Neutral Axis from Top Fiber (Ycg)	3.5062 in
Moment of Inertia for Deflection (Ixx)	1.8897 in ⁴
Section Modulus (Sxx)	0.4736 in ³
Allowable Bending Moment (Ma)	779.85 Ft-Lb

Gross Section Properties of Full Section, Strong Axis

Neutral Axis from Top Fiber (Ycg)	3.0807 in
Moment of Inertia (Ixx)	2.0720 in ⁴
Cross Sectional Area (A)	0.4055 in ²
Radius of Gyration (Rx)	2.2605 in

Section Properties, Weak Axis

Gross Neutral Axis (Xcg) From Web Face	0.2655 in
Gross Moment of Inertia (Iyy)	0.0730 in ⁴
Radius of Gyration (Ry)	0.4244 in
Effective Section Modulus (Syy)	0.0283 in ³
Allowable Moment y-y Axis (May)	46.63 Ft-Lb
Moment of Inertia for Deflection, (IyyD)	0.0408 in ⁴
Allowable Shear in Flanges - Total (Vay-y)	1544.5 lb

Other Section Property Data

Member Weight per Foot of Length	1.3798 lb/ft
Allowable Shear Force In Web (Unpunched)	1377.13 lb
Pao for use in Interaction Equation C5-2	3366 lb

Torsional Properties

Dist. from Shear Center to Neutral Axis (Xo)	-0.6801 in
St. Venant torsion Constant (J x 1000)	0.2749 in ⁴
Warping Constant (Cw)	0.5044 in ⁶
Radii of Gyration (Ro)	2.3984 in
Torsional Flexural Constant (Beta)	0.9196

Warping Torsional Properties

a	Sxx(lip)	Wn(1)	Wn(2)	Wn(3)	Wn(4)	Wn(5)	Wn(6)
(in ³)	(in ³)	(in ²)	(in ²)	(in ²)	(in ²)	(in ²)	(in ²)
69.2	0.4736	3.1815	3.1815	-1.3368	1.3368	-3.1815	-3.1815

Location (1) and (6) are tip of compression and tension lip respectively
 Location (2) and (5) are flange/lip corner of compression and tension side respectively
 Location (3) and (4) are flange/web corner of compression and tension side respectively

Project:
Model:

Date: 10/29/2013

SECTION DESIGNATION: 600T150-54 (50) Single

INPUT PROPERTIES:

Web Height =	6.1981 in	Steel Thickness =	0.0566 in
Top Flange =	1.5000 in	Inside Corner Radius =	0.0849 in
Bottom Flange =	1.5000 in	Yield Stress, Fy =	50.0 ksi
		Fy With Cold-Work, Fya =	50.0 ksi

OUTPUT PROPERTIES:

Effective Section Properties, Strong Axis

Neutral Axis from Top Fiber (Ycg)	3.4931 in
Moment of Inertia for Deflection (Ixx)	2.4004 in ⁴
Section Modulus (Sxx)	0.6091 in ³
Allowable Bending Moment (Ma)	1519.75 Ft-Lb

Gross Section Properties of Full Section, Strong Axis

Neutral Axis from Top Fiber (Ycg)	3.0991 in
Moment of Inertia (Ixx)	2.6110 in ⁴
Cross Sectional Area (A)	0.5087 in ²
Radius of Gyration (Rx)	2.2655 in

Section Properties, Weak Axis

Gross Neutral Axis (Xcg) From Web Face	0.2695 in
Gross Moment of Inertia (Iyy)	0.0907 in ⁴
Radius of Gyration (Ry)	0.4222 in
Effective Section Modulus (Syy)	0.0367 in ³
Allowable Moment y-y Axis (May)	91.47 Ft-Lb
Moment of Inertia for Deflection, (IyyD)	0.0530 in ⁴
Allowable Shear in Flanges - Total (Vay-y)	2883.4 lb

Other Section Property Data

Member Weight per Foot of Length	1.7310 lb/ft
Allowable Shear Force In Web (Unpunched)	2728.34 lb
Pao for use in Interaction Equation C5-2	6590 lb

Torsional Properties

Dist. from Shear Center to Neutral Axis (Xo)	-0.6752 in
St. Venant torsion Constant (J x 1000)	0.5432 in ⁴
Warping Constant (Cw)	0.6325 in ⁶
Radii of Gyration (Ro)	2.4014 in
Torsional Flexural Constant (Beta)	0.9209

Warping Torsional Properties

a	Sxx(lip)	Wn(1)	Wn(2)	Wn(3)	Wn(4)	Wn(5)	Wn(6)
(in ³)	(in ³)	(in ²)	(in ²)	(in ²)	(in ²)	(in ²)	(in ²)
55.1	0.6091	3.1865	3.1865	-1.3327	1.3327	-3.1865	-3.1865

Location (1) and (6) are tip of compression and tension lip respectively
 Location (2) and (5) are flange/lip corner of compression and tension side respectively
 Location (3) and (4) are flange/web corner of compression and tension side respectively

Project:
Model:

Date: 10/29/2013

SECTION DESIGNATION: 600T150-68 (50) Single

INPUT PROPERTIES:

Web Height =	6.2496 in	Steel Thickness =	0.0713 in
Top Flange =	1.5000 in	Inside Corner Radius =	0.1070 in
Bottom Flange =	1.5000 in	Yield Stress, Fy =	50.0 ksi
		Fy With Cold-Work, Fya =	50.0 ksi

OUTPUT PROPERTIES:

Effective Section Properties, Strong Axis

Neutral Axis from Top Fiber (Ycg)	3.3217 in
Moment of Inertia for Deflection (Ixx)	3.1616 in ⁴
Section Modulus (Sxx)	0.8910 in ³
Allowable Bending Moment (Ma)	2222.94 Ft-Lb

Gross Section Properties of Full Section, Strong Axis

Neutral Axis from Top Fiber (Ycg)	3.1248 in
Moment of Inertia (Ixx)	3.3093 in ⁴
Cross Sectional Area (A)	0.6406 in ²
Radius of Gyration (Rx)	2.2729 in

Section Properties, Weak Axis

Gross Neutral Axis (Xcg) From Web Face	0.2746 in
Gross Moment of Inertia (Iyy)	0.1126 in ⁴
Radius of Gyration (Ry)	0.4193 in
Effective Section Modulus (Syy)	0.0622 in ³
Allowable Moment y-y Axis (May)	155.16 Ft-Lb
Moment of Inertia for Deflection, (IyyD)	0.0965 in ⁴
Allowable Shear in Flanges - Total (Vay-y)	3534.0 lb

Other Section Property Data

Member Weight per Foot of Length	2.1798 lb/ft
Allowable Shear Force In Web (Unpunched)	5350.29 lb
Pao for use in Interaction Equation C5-2	10115 lb

Torsional Properties

Dist. from Shear Center to Neutral Axis (Xo)	-0.6689 in
St. Venant torsion Constant (J x 1000)	1.0855 in ⁴
Warping Constant (Cw)	0.7971 in ⁶
Radii of Gyration (Ro)	2.4061 in
Torsional Flexural Constant (Beta)	0.9227

Warping Torsional Properties

a	Sxx(lip)	Wn(1)	Wn(2)	Wn(3)	Wn(4)	Wn(5)	Wn(6)
(in ³)	(in ³)	(in ²)	(in ²)	(in ²)	(in ²)	(in ²)	(in ²)
43.8	0.8910	3.1956	3.1956	-1.3280	1.3280	-3.1956	-3.1956

Location (1) and (6) are tip of compression and tension lip respectively
 Location (2) and (5) are flange/lip corner of compression and tension side respectively
 Location (3) and (4) are flange/web corner of compression and tension side respectively

Project:
Model:

Date: 10/29/2013

SECTION DESIGNATION: 600T150-97 (50) Single

INPUT PROPERTIES:

Web Height =	6.3560 in	Steel Thickness =	0.1017 in
Top Flange =	1.5000 in	Inside Corner Radius =	0.1526 in
Bottom Flange =	1.5000 in	Yield Stress, Fy =	50.0 ksi
		Fy With Cold-Work, Fya =	50.0 ksi

OUTPUT PROPERTIES:

Effective Section Properties, Strong Axis

Neutral Axis from Top Fiber (Ycg)	3.2220 in
Moment of Inertia for Deflection (Ixx)	4.7782 in ⁴
Section Modulus (Sxx)	1.4440 in ³
Allowable Bending Moment (Ma)	3602.68 Ft-Lb

Gross Section Properties of Full Section, Strong Axis

Neutral Axis from Top Fiber (Ycg)	3.1780 in
Moment of Inertia (Ixx)	4.7782 in ⁴
Cross Sectional Area (A)	0.9131 in ²
Radius of Gyration (Rx)	2.2876 in

Section Properties, Weak Axis

Gross Neutral Axis (Xcg) From Web Face	0.2854 in
Gross Moment of Inertia (Iyy)	0.1559 in ⁴
Radius of Gyration (Ry)	0.4132 in
Effective Section Modulus (Syy)	0.1269 in ³
Allowable Moment y-y Axis (May)	316.73 Ft-Lb
Moment of Inertia for Deflection, (IyyD)	0.1559 in ⁴
Allowable Shear in Flanges - Total (Vay-y)	4751.0 lb

Other Section Property Data

Member Weight per Foot of Length	3.1069 lb/ft
Allowable Shear Force In Web (Unpunched)	10885.29 lb
Pao for use in Interaction Equation C5-2	19062 lb

Torsional Properties

Dist. from Shear Center to Neutral Axis (Xo)	-0.6560 in
St. Venant torsion Constant (J x 1000)	3.1479 in ⁴
Warping Constant (Cw)	1.1375 in ⁶
Radii of Gyration (Ro)	2.4154 in
Torsional Flexural Constant (Beta)	0.9262

Warping Torsional Properties

a	Sxx(lip)	Wn(1)	Wn(2)	Wn(3)	Wn(4)	Wn(5)	Wn(6)
(in ³)	(in ³)	(in ²)	(in ²)	(in ²)	(in ²)	(in ²)	(in ²)
30.7	1.4440	3.2138	3.2138	-1.3179	1.3179	-3.2138	-3.2138

Location (1) and (6) are tip of compression and tension lip respectively
 Location (2) and (5) are flange/lip corner of compression and tension side respectively
 Location (3) and (4) are flange/web corner of compression and tension side respectively

2-Piece Track Header Output

Capacity of Two-Piece Headers Acting Compositely

6" Headers

	33 ksi		50 ksi	
	18 ga	16 ga	14 ga	12 ga
Stud Width (in)=	6	6	6	6
Weld V_a (lbs)=	544	985	1241	1771
Weld Spcg (in)=	12	12	12	12
q_a (lbs)=	90.7	164.2	206.8	295.2
thickness (in)=	0.0451	0.0566	0.0713	0.1017
y bar (in)=	1.098	1.098	1.098	1.098
Q_{track} (in ³)=	0.315	0.396	0.498	0.711
I_x (in ⁴)=	0.4105	0.5215	0.7401	1.2501
V_{ay} (lbs)=	236	433	614	1038
M_{ax} (k-in)=	3.84	7.43	10.99	19.66
M_{ay} (k-in)=	26.04	48.57	66.15	99.96
I_y (in ⁴)=	4.21	5.26	6.69	9.58



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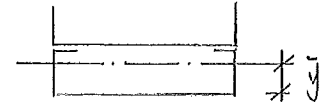
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HEADER DESIGN

DESIGN 2-PIECE HEADER FOR COMPOSITE ACTION FOR VERTICAL LOADING

USE 1B WAGGONER MIN.

$$f_{ALLOW} = \sqrt{\frac{F_{WELD}}{A_{WELD}}} \left(\frac{2''}{12''} \right)$$



$$P_{NC/\Delta S} = 544 \text{ \#/in} \quad \therefore f_{ALLOW} = 544 \text{ \#/in} \left(\frac{2''}{12''} \right) = 90.7 \text{ \#/in}$$

$$q = \frac{VQ}{I} \Rightarrow V = \frac{qI}{Q}$$

$$\bar{y} = \frac{1.625''(2)(1.625'')^{\frac{1}{2}} + 0.5''(2)(1.625'') + 6''(1.625'') + 1.5''(2)(2.375'')}{(6'' + 1.625''(2) + 0.5''(2) + 6'' + 1.5''(2))}$$

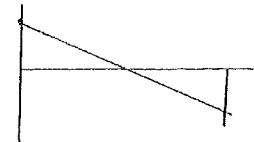
$$= 1.098''$$

$$Q_{TRACK} = t \left[2(1.5'')(2.375'' - 1.098'') + 6''(1.625'' - 1.098'') \right] = 6.993t \quad \text{to } 0.0461''$$

$$= 0.315 \text{ in}^3$$

$$I_x = 0.4105 \text{ in}^4$$

$$V = \frac{90.7 \text{ \#/in} (0.4105 \text{ in}^4)}{0.315 \text{ in}^3} = 118.2 \text{ AVG}$$



$$V_{MAX} = 2(118.2 \text{ \#}) = 236 \text{ \# FOR DISTRIBUTED LOAD}$$

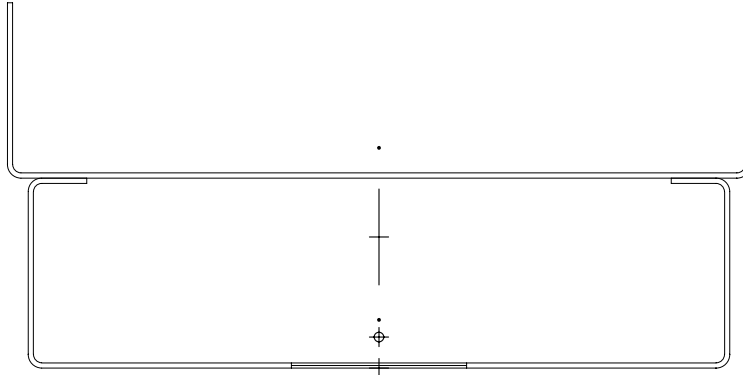
$$W_{MAX} = 2(236 \text{ \#}) = 472 \text{ \# W/ WEBS @ } 12'' \text{ OC}$$

M_{MAX} - FROM CFS

$$M_{AY} = M_{AY TRACK} + M_{AY STUD} = 9.36 \text{ K-in} + 16.68 \text{ K-in} = 26.04 \text{ K-in}$$

$$I_y = I_{TRACK} + I_{STUD} = 1.49 \text{ in}^4 + 2.316 \text{ in}^4 = 4.21 \text{ in}^4$$

CONSERVATIVE, NO COMPOSITE ACTION CONSIDERED



Section Inputs

Material: A653 SS Grade 33

Apply strength increase from cold work of forming.

Modulus of Elasticity, E 29500 ksi
 Yield Strength, Fy 33 ksi
 Tensile Strength, Fu 45 ksi
 Warping Constant Override, Cw 0 in^6
 Torsion Constant Override, J 0 in^4
 Connector Spacing 0 in

Track, Thickness 0.0451 in (18 Gage)

Placement of Part from Origin:

X to center of gravity 0 in
 Y to bottom edge 1.625 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	270.000	0.071200	Single	0.000	0.0000	0.7500
2	6.3559	180.000	0.071200	Cee	0.000	0.0000	3.1779
3	1.5000	90.000	0.071200	Single	0.000	0.0000	0.7500

Stud, Thickness 0.0451 in (18 Gage)

Placement of Part from Origin:

X to center of gravity 0 in
 Y to bottom edge 0 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	360.000	0.071200	None	0.000	0.0000	0.2500
2	1.6250	270.000	0.071200	Single	0.000	0.0000	0.8125
3	6.0000	180.000	0.071200	Cee	0.000	1.5000	3.0000
4	1.6250	90.000	0.071200	Single	0.000	0.0000	0.8125
5	0.5000	360.000	0.071200	None	0.000	0.0000	0.2500

Fully Braced Strength - 2007 North American Specification - US (ASD)

Material Type: A653 SS Grade 33, Fy=33 ksi

Compression

Pao 8066 lb

Ae 0.43995 in²

Tension

Ta 17468 lb

Shear

Vay 3099 lb

Vax 2557 lb

Positive Moment

Maxo 3.835 k-in

Ixe 0.4105 in⁴Sxe(t) 0.1941 in³Sxe(b) 0.4065 in³

Negative Moment

Maxo 4.685 k-in

Ixe 0.4039 in⁴Sxe(t) 0.2371 in³Sxe(b) 0.2842 in³

Positive Moment

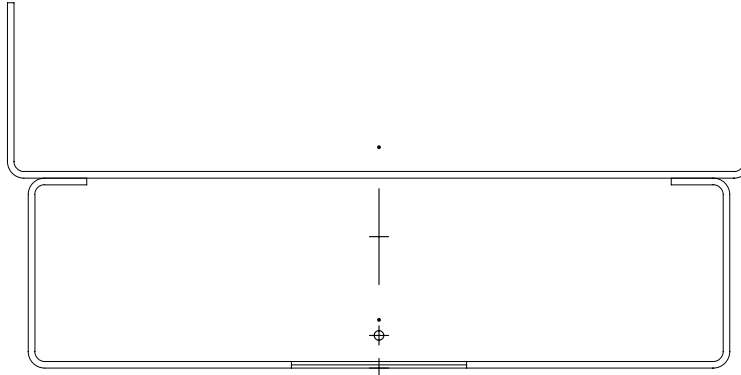
Mayo 24.251 k-in

Iye 4.1412 in⁴Sye(l) 1.3889 in³Sye(r) 1.2273 in³

Negative Moment

Mayo 24.251 k-in

Iye 4.1412 in⁴Sye(l) 1.2273 in³Sye(r) 1.3889 in³



Section Inputs

Material: A653 SQ Grade 50/1

Apply strength increase from cold work of forming.

Modulus of Elasticity, E 29500 ksi
 Yield Strength, Fy 50 ksi
 Tensile Strength, Fu 65 ksi
 Warping Constant Override, Cw 0 in⁶
 Torsion Constant Override, J 0 in⁴
 Connector Spacing 0 in

Track, Thickness 0.0566 in (16 Gage)

Placement of Part from Origin:

X to center of gravity 0 in
 Y to bottom edge 1.625 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	270.000	0.084900	Single	0.000	0.0000	0.7500
2	6.3559	180.000	0.084900	Cee	0.000	0.0000	3.1779
3	1.5000	90.000	0.084900	Single	0.000	0.0000	0.7500

Stud, Thickness 0.0566 in (16 Gage)

Placement of Part from Origin:

X to center of gravity 0 in
 Y to bottom edge 0 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	360.000	0.084900	None	0.000	0.0000	0.2500
2	1.6250	270.000	0.084900	Single	0.000	0.0000	0.8125
3	6.0000	180.000	0.084900	Cee	0.000	1.5000	3.0000
4	1.6250	90.000	0.084900	Single	0.000	0.0000	0.8125
5	0.5000	360.000	0.084900	None	0.000	0.0000	0.2500

Section: 600S162-54 + 600T150-54.sct

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600S162-54 + 600T150-54

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Fully Braced Strength - 2007 North American Specification - US (ASD)

Material Type: A653 SQ Grade 50/1, Fy=50 ksi

Compression

Pao 15121 lb
Ae 0.54434 in²

Positive Moment

Maxo 7.434 k-in
Ixe 0.5215 in⁴
Sxe(t) 0.2483 in³
Sxe(b) 0.5089 in³

Positive Moment

Mayo 45.434 k-in
Iye 5.1226 in⁴
Sye(l) 1.7189 in³
Sye(r) 1.5175 in³

Tension

Ta 32145 lb

Negative Moment

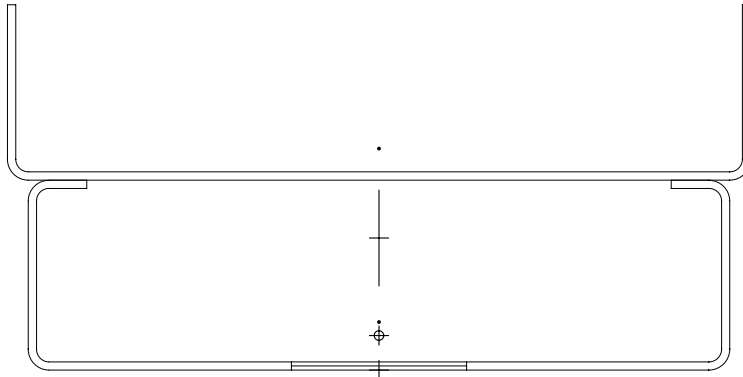
Maxo 8.962 k-in
Ixe 0.5107 in⁴
Sxe(t) 0.2993 in³
Sxe(b) 0.3599 in³

Negative Moment

Mayo 45.434 k-in
Iye 5.1226 in⁴
Sye(l) 1.5175 in³
Sye(r) 1.7189 in³

Shear

Vay 5732 lb
Vax 4015 lb



Section Inputs

Material: A653 SQ Grade 50/1

Apply strength increase from cold work of forming.

Modulus of Elasticity, E 29500 ksi
 Yield Strength, Fy 50 ksi
 Tensile Strength, Fu 65 ksi
 Warping Constant Override, Cw 0 in^6
 Torsion Constant Override, J 0 in^4
 Connector Spacing 0 in

Track, Thickness 0.0713 in (14 Gage)

Placement of Part from Origin:

X to center of gravity 0 in

Y to bottom edge 1.625 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	270.000	0.10690	Single	0.000	0.0000	0.7500
2	6.3559	180.000	0.10690	Cee	0.000	0.0000	3.1779
3	1.5000	90.000	0.10690	Single	0.000	0.0000	0.7500

Stud, Thickness 0.0713 in (14 Gage)

Placement of Part from Origin:

X to center of gravity 0 in

Y to bottom edge 0 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	360.000	0.10690	None	0.000	0.0000	0.2500
2	1.6250	270.000	0.10690	Single	0.000	0.0000	0.8125
3	6.0000	180.000	0.10690	Cee	0.000	1.5000	3.0000
4	1.6250	90.000	0.10690	Single	0.000	0.0000	0.8125
5	0.5000	360.000	0.10690	None	0.000	0.0000	0.2500

Section: 600S162-68 + 600T150-68.sct

EMB

600S162-68 + 600T150-68

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Fully Braced Strength - 2007 North American Specification - US (ASD)

Material Type: A653 SQ Grade 50/1, Fy=50 ksi

Compression

Pao 21988 lb
Ae 0.79157 in²

Positive Moment

Maxo 10.985 k-in
Ixe 0.7401 in⁴
Sxe(t) 0.3669 in³
Sxe(b) 0.6682 in³

Positive Moment

Mayo 60.456 k-in
Iye 6.6125 in⁴
Sye(l) 2.1461 in³
Sye(r) 2.0192 in³

Tension

Ta 40114 lb

Negative Moment

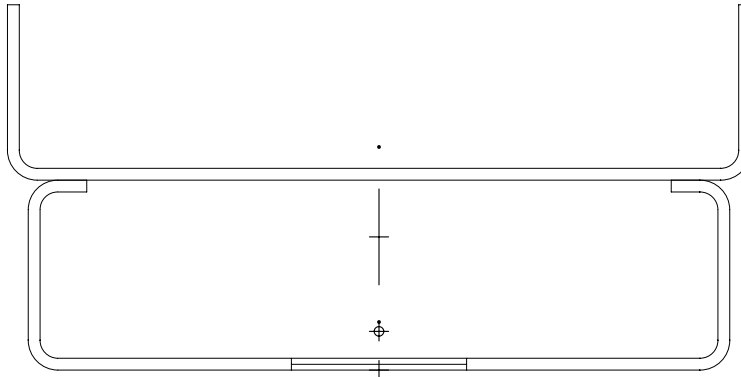
Maxo 12.032 k-in
Ixe 0.7010 in⁴
Sxe(t) 0.4019 in³
Sxe(b) 0.5077 in³

Negative Moment

Mayo 60.456 k-in
Iye 6.6125 in⁴
Sye(l) 2.0192 in³
Sye(r) 2.1461 in³

Shear

Vay 6926 lb
Vax 5940 lb



Section Inputs

Material: A653 SQ Grade 50/1

Apply strength increase from cold work of forming.

Modulus of Elasticity, E 29500 ksi
 Yield Strength, Fy 50 ksi
 Tensile Strength, Fu 65 ksi
 Warping Constant Override, Cw 0 in^6
 Torsion Constant Override, J 0 in^4
 Connector Spacing 0 in

Track, Thickness 0.1017 in (12 Gage)

Placement of Part from Origin:

X to center of gravity 0 in

Y to bottom edge 1.625 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	270.000	0.15250	Single	0.000	0.0000	0.7500
2	6.3559	180.000	0.15250	Cee	0.000	0.0000	3.1779
3	1.5000	90.000	0.15250	Single	0.000	0.0000	0.7500

Stud, Thickness 0.1017 in (12 Gage)

Placement of Part from Origin:

X to center of gravity 0 in

Y to bottom edge 0 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	360.000	0.15250	None	0.000	0.0000	0.2500
2	1.6250	270.000	0.15250	Single	0.000	0.0000	0.8125
3	6.0000	180.000	0.15250	Cee	0.000	1.5000	3.0000
4	1.6250	90.000	0.15250	Single	0.000	0.0000	0.8125
5	0.5000	360.000	0.15250	None	0.000	0.0000	0.2500

Fully Braced Strength - 2007 North American Specification - US (ASD)

Material Type: A653 SQ Grade 50/1, Fy=50 ksi

Compression		Positive Moment		Positive Moment	
Pao	38504 lb	Maxo	19.658 k-in	Mayo	88.247 k-in
Ae	1.3862 in ²	Ixe	1.2501 in ⁴	Iye	9.4319 in ⁴
		Sxe(t)	0.6566 in ³	Sye(l)	2.9887 in ³
		Sxe(b)	1.0238 in ³	Sye(r)	2.9474 in ³
Tension		Negative Moment		Negative Moment	
Ta	56097 lb	Maxo	19.467 k-in	Mayo	88.247 k-in
		Ixe	1.1955 in ⁴	Iye	9.4319 in ⁴
		Sxe(t)	0.6502 in ³	Sye(l)	2.9474 in ³
		Sxe(b)	0.9294 in ³	Sye(r)	2.9887 in ³
Shear					
Vay	9010 lb				
Vax	7858 lb				

3-Piece Track Header Output

Capacity of Three-Piece Headers Acting Compositely

6" Headers

	33 ksi	50 ksi		
	18 ga	16 ga	14 ga	12 ga
Stud Width (in)=	6	6	6	6
Weld V_a (lbs)=	544	985	1241	1771
Weld Spcg (in)=	12	12	12	12
q_a (lbs)=	90.7	164.2	206.8	295.2
thickness (in)=	0.0451	0.0566	0.0713	0.1017
\bar{y} (in)=	1.922	1.922	1.922	1.922
Q_1 (in ³)=	0.641	0.804	1.013	1.445
Q_2 (in ³)=	0.696	0.873	1.100	1.569
I_x (in ⁴)=	1.6872	2.1361	2.952	4.779
V_{ay} (lbs)=	440	803	1110	1798
M_{ax} (k-in)=	11.74	22.71	32.90	57.66
M_{ay} (k-in)=	42.72	78.90	105.62	156.69
I_y (in ⁴)=	6.52	8.12	10.21	14.37



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HEADER DESIGN

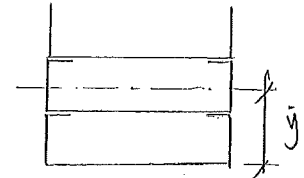
DESIGN 3-PIECE HEADER FOR COMPOSITE ACTION FOR VERTICAL LOADING

USE 18 GAUGE MIN.

$$q_{ALLOW} = \frac{V_{WELD}}{L_{WELD}} \left(\frac{2''}{12''} \right)$$

$$P_{AS/D_2} = 59.4 \#/in \quad \therefore \quad q_{ALLOW} = 59.4 \#/in \left(\frac{2''}{12''} \right) = 9.9 \#/in$$

$$q = \frac{VQ}{I} \Rightarrow V = \frac{qI}{Q}$$



$$\bar{y} = \frac{2 \left[(1.625'')^2 \frac{1}{2} + 0.5''(2)(1.625'') + 6''(1.625'') + 2(1.625'') \left(1.625''/2 + 1.625'' \right) + 2(0.5'')(3.25'') + 6''(3.25'') + 2(1.5'')(4'') \right]}{3(6'') + 4(1.625'') + 4(0.5'') + 2(1.5'')} = 1.922''$$

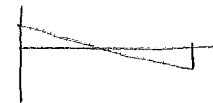
$$Q_1 = 0.0451'' \left[2(1.5'')(4'' - 1.922'') + 6''(3.25'' - 1.922'') \right] = 0.641 \text{ in}^3$$

$$Q_2 = 0.0451'' \left[2(0.5'')(1.922'' - 1.625'') + 2(1.625'')(1.922'' - 1.625''/2) + 6''(1.922'') \right] = 0.696 \text{ in}^3$$

↳ $Q_2 > Q_1$ ∴ IT GOVERNS SHEAR FLOW

$$I = 1.6872 \text{ in}^4$$

$$V = \frac{90.7 \#/in (1.6872 \text{ in}^4)}{0.696 \text{ in}^3} = 219.9 \# \quad \text{AVG}$$



$$V_{max} = 2(219.9 \#) = 440 \# \quad \text{FOR DISTRIBUTED LOAD}$$

$$W_{max} = 2(440 \#) = 880 \# \quad \text{FOR WELD @ 12" OC}$$

$$M_{Ax} = \text{FROM CFJ}$$

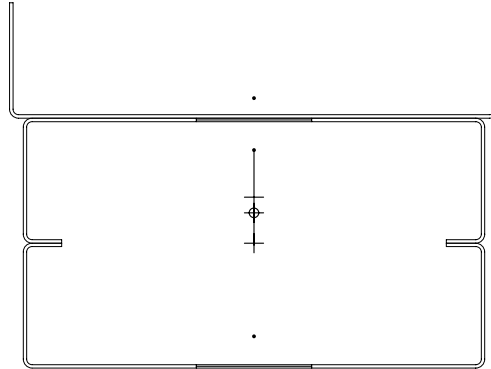
$$M_{Ay} = M_{A_{TRACK}} + M_{A_{STUD}} \times 2 =$$

$$9.36 \text{ Kft} + 2(16.68 \text{ Kft}) = 42.72 \text{ Kft}$$

$$I_{yy} = I_{TRACK} + I_{STUD} \times 2 =$$

$$1.59 \text{ in}^4 + 2(2.316 \text{ Kft}) = 6.52 \text{ Kft}$$

CONSERVATIVE NO COMPOSITE ACTION CONSIDERED



Section Inputs

Material: A653 SS Grade 33

Apply strength increase from cold work of forming.

Modulus of Elasticity, E 29500 ksi
 Yield Strength, Fy 33 ksi
 Tensile Strength, Fu 45 ksi
 Warping Constant Override, Cw 0 in^6
 Torsion Constant Override, J 0 in^4
 Connector Spacing 0 in

Track, Thickness 0.0451 in (18 Gage)

Placement of Part from Origin:

X to center of gravity 0 in
 Y to bottom edge 1.625 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	270.000	0.071200	Single	0.000	0.0000	0.7500
2	6.3559	180.000	0.071200	Cee	0.000	0.0000	3.1779
3	1.5000	90.000	0.071200	Single	0.000	0.0000	0.7500

Stud, Thickness 0.0451 in (18 Gage)

Placement of Part from Origin:

X to center of gravity -4.4403e-8 in
 Y to bottom edge 0 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	180.000	0.071200	None	0.000	0.0000	0.2500
2	1.6250	90.000	0.071200	Single	0.000	0.0000	0.8125
3	6.0000	360.000	0.071200	Cee	0.000	1.5000	3.0000
4	1.6250	270.000	0.071200	Single	0.000	0.0000	0.8125
5	0.5000	180.000	0.071200	None	0.000	0.0000	0.2500

Section: (2) 600S162-43 + 600T150-43.sct

EMB

(2) 600S162-43 + 600T150-43

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By: EMB

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Part 3, Thickness 0.0451 in (18 Gage)

Placement of Part from Origin:

X to center of gravity 0 in

Y to bottom edge -1.625 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	360.000	0.071200	None	0.000	0.0000	0.2500
2	1.6250	270.000	0.071200	Single	0.000	0.0000	0.8125
3	6.0000	180.000	0.071200	Cee	0.000	1.5000	3.0000
4	1.6250	90.000	0.071200	Single	0.000	0.0000	0.8125
5	0.5000	360.000	0.071200	None	0.000	0.0000	0.2500

Fully Braced Strength - 2007 North American Specification - US (ASD)

Material Type: A653 SS Grade 33, Fy=33 ksi

Compression

Positive Moment

Positive Moment

Pao 12759 lb

Maxo 11.742 k-in

Mayo 38.628 k-in

Ae 0.69596 in²Ixe 1.6872 in⁴Iye 6.4589 in⁴Sxe(t) 0.5942 in³Sye(l) 2.1164 in³Sxe(b) 0.8830 in³Sye(r) 1.9548 in³

Tension

Ta 26386 lb

Negative Moment

Negative Moment

Shear

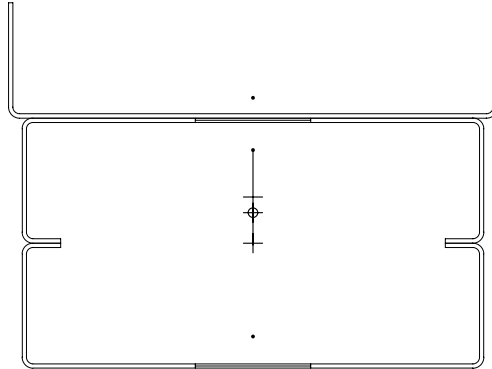
Vay 4653 lb

Maxo 12.210 k-in

Mayo 38.628 k-in

Ixe 1.5797 in⁴Iye 6.4589 in⁴Sxe(t) 0.7202 in³Sye(l) 1.9548 in³Sxe(b) 0.6179 in³Sye(r) 2.1164 in³

Vax 3797 lb



Section Inputs

Material: A653 SQ Grade 50/1

Apply strength increase from cold work of forming.

Modulus of Elasticity, E 29500 ksi
 Yield Strength, Fy 50 ksi
 Tensile Strength, Fu 65 ksi
 Warping Constant Override, Cw 0 in⁶
 Torsion Constant Override, J 0 in⁴
 Connector Spacing 0 in

Track, Thickness 0.0566 in (16 Gage)

Placement of Part from Origin:

X to center of gravity 0 in
 Y to bottom edge 1.625 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	270.000	0.084900	Single	0.000	0.0000	0.7500
2	6.3559	180.000	0.084900	Cee	0.000	0.0000	3.1779
3	1.5000	90.000	0.084900	Single	0.000	0.0000	0.7500

Stud, Thickness 0.0566 in (16 Gage)

Placement of Part from Origin:

X to center of gravity 0 in
 Y to bottom edge 0 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	180.000	0.084900	None	0.000	0.0000	0.2500
2	1.6250	90.000	0.084900	Single	0.000	0.0000	0.8125
3	6.0000	360.000	0.084900	Cee	0.000	1.5000	3.0000
4	1.6250	270.000	0.084900	Single	0.000	0.0000	0.8125
5	0.5000	180.000	0.084900	None	0.000	0.0000	0.2500

Section: (2) 600S162-54 + 600T150-54.sct

EMB

(2) 600S162-54 + 600T150-54

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Part 3, Thickness 0.0566 in (16 Gage)

Placement of Part from Origin:

X to center of gravity 0 in

Y to bottom edge -1.625 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	360.000	0.084900	None	0.000	0.0000	0.2500
2	1.6250	270.000	0.084900	Single	0.000	0.0000	0.8125
3	6.0000	180.000	0.084900	Cee	0.000	1.5000	3.0000
4	1.6250	90.000	0.084900	Single	0.000	0.0000	0.8125
5	0.5000	360.000	0.084900	None	0.000	0.0000	0.2500

Fully Braced Strength - 2007 North American Specification - US (ASD)

Material Type: A653 SQ Grade 50/1, Fy=50 ksi

Compression

Positive Moment

Positive Moment

Pao 23641 lb

Maxo 22.705 k-in

Mayo 71.825 k-in

Ae 0.85109 in²Ixe 2.1361 in⁴Iye 7.9514 in⁴Sxe(t) 0.7583 in³Sye(l) 2.6144 in³Sxe(b) 1.1050 in³Sye(r) 2.3990 in³

Tension

Ta 47467 lb

Negative Moment

Negative Moment

Shear

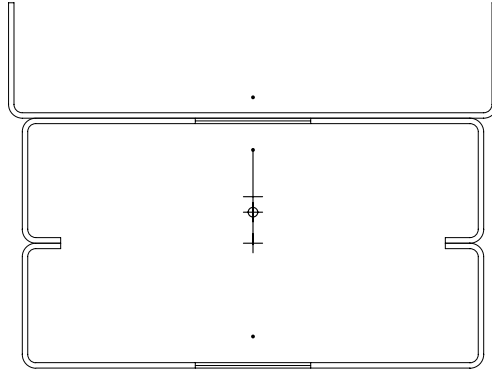
Vay 8580 lb

Maxo 23.131 k-in

Mayo 71.825 k-in

Vax 5962 lb

Ixe 1.9791 in⁴Iye 7.9514 in⁴Sxe(t) 0.9043 in³Sye(l) 2.3990 in³Sxe(b) 0.7726 in³Sye(r) 2.6144 in³



Section Inputs

Material: A653 SQ Grade 50/1

Apply strength increase from cold work of forming.

Modulus of Elasticity, E 29500 ksi
 Yield Strength, Fy 50 ksi
 Tensile Strength, Fu 65 ksi
 Warping Constant Override, Cw 0 in⁶
 Torsion Constant Override, J 0 in⁴
 Connector Spacing 0 in

Track, Thickness 0.0713 in (14 Gage)

Placement of Part from Origin:

X to center of gravity 0 in
 Y to bottom edge 1.625 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	270.000	0.10690	Single	0.000	0.0000	0.7500
2	6.3559	180.000	0.10690	Cee	0.000	0.0000	3.1779
3	1.5000	90.000	0.10690	Single	0.000	0.0000	0.7500

Stud, Thickness 0.0713 in (14 Gage)

Placement of Part from Origin:

X to center of gravity 0 in
 Y to bottom edge 0 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	180.000	0.10690	None	0.000	0.0000	0.2500
2	1.6250	90.000	0.10690	Single	0.000	0.0000	0.8125
3	6.0000	360.000	0.10690	Cee	0.000	1.5000	3.0000
4	1.6250	270.000	0.10690	Single	0.000	0.0000	0.8125
5	0.5000	180.000	0.10690	None	0.000	0.0000	0.2500

Section: (2) 600S162-68 + 600T150-68.sct

EMB

(2) 600S162-68 + 600T150-68

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Rev. Date: 10/24/2013 11:20:53 AM

By: EMB

Printed: 10/28/2013 4:07:11 PM

Part 3, Thickness 0.0713 in (14 Gage)

Placement of Part from Origin:

X to center of gravity 0 in

Y to bottom edge -1.625 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	360.000	0.10690	None	0.000	0.0000	0.2500
2	1.6250	270.000	0.10690	Single	0.000	0.0000	0.8125
3	6.0000	180.000	0.10690	Cee	0.000	1.5000	3.0000
4	1.6250	90.000	0.10690	Single	0.000	0.0000	0.8125
5	0.5000	360.000	0.10690	None	0.000	0.0000	0.2500

Fully Braced Strength - 2007 North American Specification - US (ASD)

Material Type: A653 SQ Grade 50/1, Fy=50 ksi

Compression

Positive Moment

Positive Moment

Pao 33848 lb

Maxo 32.900 k-in

Mayo 93.519 k-in

Ae 1.2185 in²

Ixe 2.952 in⁴

Iye 10.125 in⁴

Sxe(t) 1.0989 in³

Sye(l) 3.2511 in³

Sxe(b) 1.4305 in³

Sye(r) 3.1235 in³

Tension

Ta 59162 lb

Negative Moment

Negative Moment

Shear

Vay 10318 lb

Maxo 31.630 k-in

Mayo 93.519 k-in

Vax 8819 lb

Ixe 2.658 in⁴

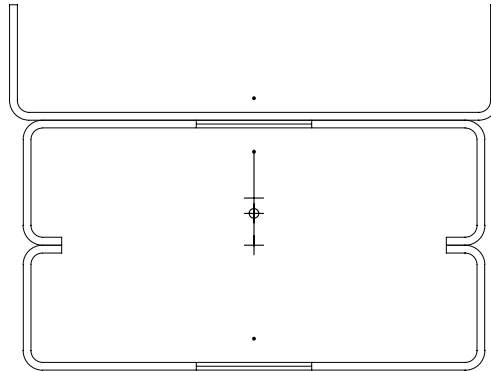
Iye 10.125 in⁴

Sxe(t) 1.1899 in³

Sye(l) 3.1235 in³

Sxe(b) 1.0564 in³

Sye(r) 3.2511 in³



Section Inputs

Material: A653 SQ Grade 50/1

Apply strength increase from cold work of forming.

Modulus of Elasticity, E 29500 ksi
 Yield Strength, Fy 50 ksi
 Tensile Strength, Fu 65 ksi
 Warping Constant Override, Cw 0 in^6
 Torsion Constant Override, J 0 in^4
 Connector Spacing 0 in

Track, Thickness 0.1017 in (12 Gage)

Placement of Part from Origin:

X to center of gravity 0 in
 Y to bottom edge 1.625 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	270.000	0.15250	Single	0.000	0.0000	0.7500
2	6.3559	180.000	0.15250	Cee	0.000	0.0000	3.1779
3	1.5000	90.000	0.15250	Single	0.000	0.0000	0.7500

Stud, Thickness 0.1017 in (12 Gage)

Placement of Part from Origin:

X to center of gravity 5.3946e-8 in
 Y to bottom edge 0 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	180.000	0.15250	None	0.000	0.0000	0.2500
2	1.6250	90.000	0.15250	Single	0.000	0.0000	0.8125
3	6.0000	360.000	0.15250	Cee	0.000	1.5000	3.0000
4	1.6250	270.000	0.15250	Single	0.000	0.0000	0.8125
5	0.5000	180.000	0.15250	None	0.000	0.0000	0.2500

Section: (2) 600S162-97 + 600T150-97.sct

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(2) 600S162-97 + 600T150-97

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Rev. Date: 10/24/2013 10:55:57 AM

By: EMB

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Part 3, Thickness 0.1017 in (12 Gage)

Placement of Part from Origin:

X to center of gravity 0 in

Y to bottom edge -1.625 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	360.000	0.15250	None	0.000	0.0000	0.2500
2	1.6250	270.000	0.15250	Single	0.000	0.0000	0.8125
3	6.0000	180.000	0.15250	Cee	0.000	1.5000	3.0000
4	1.6250	90.000	0.15250	Single	0.000	0.0000	0.8125
5	0.5000	360.000	0.15250	None	0.000	0.0000	0.2500

Fully Braced Strength - 2007 North American Specification - US (ASD)

Material Type: A653 SQ Grade 50/1, Fy=50 ksi

Compression

Positive Moment

Positive Moment

Pao 57947 lb

Maxo 57.66 k-in

Mayo 133.19 k-in

Ae 2.0861 in²Ixe 4.779 in⁴Iye 14.204 in⁴Sxe(t) 1.9259 in³Sye(l) 4.4907 in³Sxe(b) 2.1071 in³Sye(r) 4.4485 in³

Tension

Ta 82519 lb

Negative Moment

Negative Moment

Shear

Vay 13268 lb

Maxo 53.98 k-in

Mayo 133.19 k-in

Ixe 4.354 in⁴Iye 14.204 in⁴Sxe(t) 1.8649 in³Sye(l) 4.4485 in³Sxe(b) 1.8030 in³Sye(r) 4.4907 in³

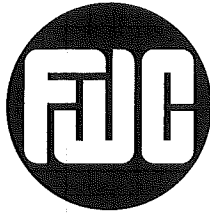
Vax 11663 lb

5-Piece Track Header Output

Capacity of Five-Piece Headers Acting Compositely

Headers with 6" Studs

	33 ksi		50 ksi	
	18 ga	16 ga	14 ga	12 ga
Stud Height (in)=	6	6	6	6
Weld V_a (lbs)=	544	985	1241	1771
Weld Spcg (in)=	12	12	12	12
q_a (lbs)=	90.7	164.2	206.8	295.2
thickness (in)=	0.0451	0.0566	0.0713	0.1017
\bar{y} (in)=	3.616	3.616	3.616	3.616
Q_1 (in ³)=	1.069	1.342	1.690	2.411
Q_2 (in ³)=	0.866	1.087	1.370	1.953
Q_3 (in ³)=	1.366	1.715	2.160	3.081
I_x (in ⁴)=	11.768	14.861	19.879	30.731
V_{ay} (lbs)=	1562	2846	3807	5889
M_{ax} (k-in)=	52.49	100.69	139.36	226.90
M_{ay} (k-in)=	28.08	54.72	80.04	129.69
I_y (in ⁴)=	5.67	7.20	9.49	14.33



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EXTERIOR HEADER
PROJECT DESIGN PROPERTIES
DATE 10/4/13
DESIGNER EMB
PAGE _____

HEADER DESIGN

DESIGN 5-PIECE HEADER FOR COMPOSITE ACTION FOR VERTICAL LOADING
USE 1B GA FOR EXAMPLE CALL.

$$q_{KNOW} = \frac{V_{KNOW}}{A_{KNOW}} \left(\frac{2''}{12''} \right)$$

$$P_{NS}/\Omega_c = 544 \text{ \#/in} \quad \therefore q_{KNOW} = 544 \text{ \#/in} \left(\frac{2''}{12''} \right) = 90.7 \text{ \#/in}$$

$$q = \frac{VQ}{I} \Rightarrow V = \frac{qI}{Q}$$

$$\bar{y} = \frac{\left[1.5''(2)(1.5'')^2 + 0.5''(2)(0.5'')^2 + 6''(2)(6'')^2 + 1.5''(2)(5.25'') + 1.625''(6'')(2) + 0.5''(2)(5.75'') \right.}{\left[6'' + 2(1.625'') + 2(0.5'') + 2(1.5'') + 2(6'') + 2(1.5'') \right]}$$

$$= 3.616''$$

$$Q_1 = 0.0451'' \left[2(1.5'')(6.75'' - 3.616'') + 6''(6'' - 3.616'') \right] = 1.069 \text{ in}^3$$

$$Q_2 = 0.0451'' \left[2(1.5'')(5.25'' - 3.616'') + 6''(6'' - 3.616'') \right] = 0.866 \text{ in}^3$$

$$Q_3 = 0.0451'' \left[2(1.5'')(3.616'' - 0.75'') + 6''(3.616'') \right] = 1.366 \text{ in}^3$$

Q_3 IS LARGEST \therefore IT GOVERNS SHEAR FLOW

$$I_x = 11.768 \text{ in}^4$$

$$V = \frac{90.7 \text{ \#/in} (11.768 \text{ in}^4)}{1.366 \text{ in}^3} = 781.4 \text{ \# AVG}$$

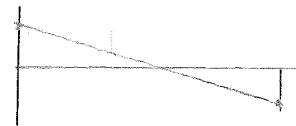
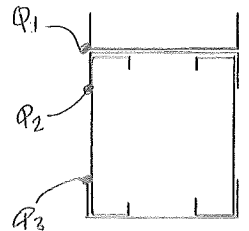
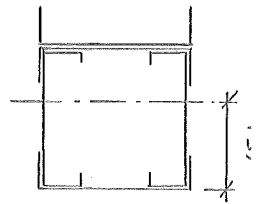
$$V_{max} = 2(781.4 \text{ \#}) = 1562.8 \text{ \# (SHEAR FLOW)}$$

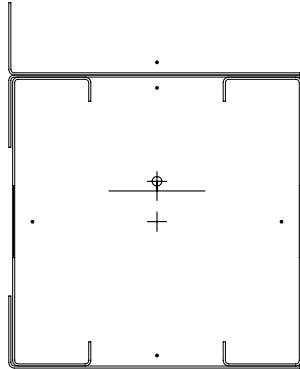
$$W_{max} = 2(1562.8 \text{ \#}) = 3125.6 \text{ \# FOR WELDS @ 12''/c}$$

$$M_{ax} = 52.49 \text{ k-in (FROM CFS)}$$

$$M_{ay} = 3(9.36 \text{ k-in}) = 28.08 \text{ k-in (NEGATIVE CONTRIBUTION FROM STUDS)}$$

$$I_y = 3(1.89 \text{ in}^4) = 5.67 \text{ in}^4 \quad \text{(NEGATIVE CONTRIBUTION FROM STUDS)}$$





Section Inputs

Material: A653 SQ Grade 33

Apply strength increase from cold work of forming.

Modulus of Elasticity, E 29500 ksi
 Yield Strength, Fy 33 ksi
 Tensile Strength, Fu 45 ksi
 Warping Constant Override, Cw 0 in^6
 Torsion Constant Override, J 0 in^4
 Connector Spacing 0 in

Track, Thickness 0.0451 in (18 Gage)

Placement of Part from Origin:

X to center of gravity 0 in

Y to top edge 3.0451 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	90.000	0.071200	Single	0.000	0.0000	0.7500
2	6.1614	0.000	0.071200	Cee	0.000	0.0000	3.0807
3	1.5000	270.000	0.071200	Single	0.000	0.0000	0.7500

Stud, Thickness 0.0451 in (18 Gage)

Placement of Part from Origin:

X to left edge -3 in

Y to center of gravity 0 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	270.000	0.071200	None	0.000	0.0000	0.2500
2	1.6250	180.000	0.071200	Single	0.000	0.0000	0.8125
3	6.0000	90.000	0.071200	Cee	0.000	1.5000	3.0000
4	1.6250	0.000	0.071200	Single	0.000	0.0000	0.8125
5	0.5000	-90.000	0.071200	None	0.000	0.0000	0.2500

Section: (2) 600S162-43 + (3) 600T150-43.sct

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(2) 600S162-43 + (3) 600T150-43

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Part 3, Thickness 0.0451 in (18 Gage)

Placement of Part from Origin:

X to right edge 3 in

Y to center of gravity 0 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	90.000	0.071200	None	0.000	0.0000	0.2500
2	1.6250	360.000	0.071200	Single	0.000	0.0000	0.8125
3	6.0000	270.000	0.071200	Cee	0.000	1.5000	3.0000
4	1.6250	180.000	0.071200	Single	0.000	0.0000	0.8125
5	0.5000	90.000	0.071200	None	0.000	0.0000	0.2500

Part 4, Thickness 0.0451 in (18 Gage)

Placement of Part from Origin:

X to center of gravity 0 in

Y to bottom edge -3.0451 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	270.000	0.071200	Single	0.000	0.0000	0.7500
2	6.1614	180.000	0.071200	Cee	0.000	0.0000	3.0807
3	1.5000	90.000	0.071200	Single	0.000	0.0000	0.7500

Part 5, Thickness 0.0451 in (18 Gage)

Placement of Part from Origin:

X to center of gravity 0 in

Y to bottom edge 3.0451 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	270.000	0.071200	Single	0.000	0.0000	0.7500
2	6.1614	180.000	0.071200	Cee	0.000	0.0000	3.0807
3	1.5000	90.000	0.071200	Single	0.000	0.0000	0.7500

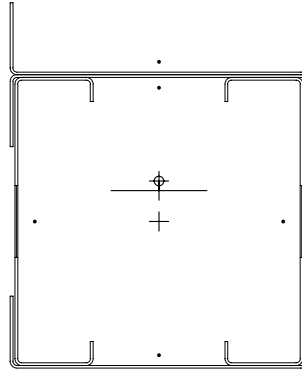
Fully Braced Strength - 2007 North American Specification - US (ASD)

Material Type: A653 SQ Grade 33, Fy=33 ksi

Compression		Positive Moment		Positive Moment	
Pao	19484 lb	Maxo	52.491 k-in	Mayo	48.512 k-in
Ae	1.0628 in ²	Ixe	11.768 in ⁴	Iye	8.760 in ⁴
		Sxe(t)	2.6564 in ³	Sye(l)	3.3785 in ³
Tension		Sxe(b)	3.7242 in ³	Sye(r)	2.4550 in ³
Ta	42752 lb	Negative Moment		Negative Moment	
		Maxo	52.042 k-in	Mayo	48.512 k-in
Shear		Ixe	11.237 in ⁴	Iye	8.760 in ⁴
Vay	4265 lb	Sxe(t)	3.3811 in ³	Sye(l)	2.4550 in ³
Vax	5424 lb	Sxe(b)	2.6337 in ³	Sye(r)	3.3785 in ³

Section: (2) 600S162-54 + (3) 600T150-54.sct
 (2) 600S162-54 + (3) 600T150-54
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 By: EMB
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Section Inputs

Material: A653 SQ Grade 50/1
 Apply strength increase from cold work of forming.
 Modulus of Elasticity, E 29500 ksi
 Yield Strength, Fy 50 ksi
 Tensile Strength, Fu 65 ksi
 Warping Constant Override, Cw 0 in^6
 Torsion Constant Override, J 0 in^4
 Connector Spacing 0 in

Track, Thickness 0.0566 in (16 Gage)
 Placement of Part from Origin:
 X to center of gravity 0 in
 Y to bottom edge -3.0566 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	270.000	0.084900	Single	0.000	0.0000	0.7500
2	6.1981	180.000	0.084900	Cee	0.000	0.0000	3.0991
3	1.5000	90.000	0.084900	Single	0.000	0.0000	0.7500

Stud, Thickness 0.0566 in (16 Gage)
 Placement of Part from Origin:
 X to right edge 3 in
 Y to center of gravity 0 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	90.000	0.084900	None	0.000	0.0000	0.2500
2	1.6250	360.000	0.084900	Single	0.000	0.0000	0.8125
3	6.0000	270.000	0.084900	Cee	0.000	1.5000	3.0000
4	1.6250	180.000	0.084900	Single	0.000	0.0000	0.8125
5	0.5000	90.000	0.084900	None	0.000	0.0000	0.2500

Section: (2) 600S162-54 + (3) 600T150-54.sct
 (2) 600S162-54 + (3) 600T150-54
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Part 3, Thickness 0.0566 in (16 Gage)

Placement of Part from Origin:

X to left edge -3 in
 Y to center of gravity 0 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	270.000	0.084900	None	0.000	0.0000	0.2500
2	1.6250	180.000	0.084900	Single	0.000	0.0000	0.8125
3	6.0000	90.000	0.084900	Cee	0.000	1.5000	3.0000
4	1.6250	0.000	0.084900	Single	0.000	0.0000	0.8125
5	0.5000	-90.000	0.084900	None	0.000	0.0000	0.2500

Part 4, Thickness 0.0566 in (16 Gage)

Placement of Part from Origin:

X to center of gravity 0 in
 Y to top edge 3.0566 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	90.000	0.084900	Single	0.000	0.0000	0.7500
2	6.1981	0.000	0.084900	Cee	0.000	0.0000	3.0991
3	1.5000	270.000	0.084900	Single	0.000	0.0000	0.7500

Part 5, Thickness 0.0566 in (16 Gage)

Placement of Part from Origin:

X to center of gravity 0 in
 Y to bottom edge 3.0566 in

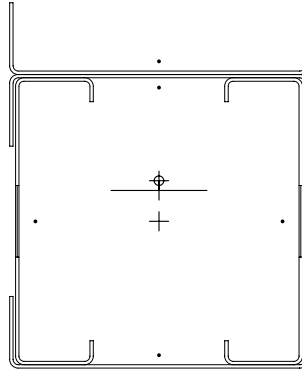
Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	270.000	0.084900	Single	0.000	0.0000	0.7500
2	6.1981	180.000	0.084900	Cee	0.000	0.0000	3.0991
3	1.5000	90.000	0.084900	Single	0.000	0.0000	0.7500

Fully Braced Strength - 2007 North American Specification - US (ASD)

Material Type: A653 SQ Grade 50/1, Fy=50 ksi

Compression		Positive Moment		Positive Moment	
Pao	36810 lb	Maxo	100.69 k-in	Mayo	93.00 k-in
Ae	1.3252 in ²	Ixe	14.861 in ⁴	Iye	11.091 in ⁴
		Sxe(t)	3.3630 in ³	Sye(l)	4.2204 in ³
Tension		Sxe(b)	4.6523 in ³	Sye(r)	3.1063 in ³
Ta	80242 lb				
		Negative Moment		Negative Moment	
		Maxo	97.73 k-in	Mayo	93.00 k-in
Shear		Ixe	14.010 in ⁴	Iye	11.091 in ⁴
Vay	6670 lb	Sxe(t)	4.2184 in ³	Sye(l)	3.1063 in ³
Vax	10659 lb	Sxe(b)	3.2642 in ³	Sye(r)	4.2204 in ³



Section Inputs

Material: A653 SQ Grade 50/1

Apply strength increase from cold work of forming.

Modulus of Elasticity, E 29500 ksi
 Yield Strength, Fy 50 ksi
 Tensile Strength, Fu 65 ksi
 Warping Constant Override, Cw 0 in⁶
 Torsion Constant Override, J 0 in⁴
 Connector Spacing 0 in

Track, Thickness 0.0713 in (14 Gage)

Placement of Part from Origin:

X to center of gravity 2.1115e-7 in

Y to bottom edge -3.0713 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	-90.000	0.10700	Single	0.000	0.0000	0.7500
2	6.2496	180.000	0.10700	Cee	0.000	0.0000	3.1248
3	1.5000	90.000	0.10700	Single	0.000	0.0000	0.7500

Stud, Thickness 0.0713 in (14 Gage)

Placement of Part from Origin:

X to left edge -3 in

Y to center of gravity -3.9064e-7 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	-90.000	0.10700	None	0.000	0.0000	0.2500
2	1.6250	180.000	0.10700	Single	0.000	0.0000	0.8125
3	6.0000	90.000	0.10700	Cee	0.000	1.5000	3.0000
4	1.6250	0.000	0.10700	Single	0.000	0.0000	0.8125
5	0.5000	-90.000	0.10700	None	0.000	0.0000	0.2500

Section: (2) 600S162-68 + (3) 600T150-68.sct
 (2) 600S162-68 + (3) 600T150-68
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Part 3, Thickness 0.0713 in (14 Gage)

Placement of Part from Origin:

X to right edge 3 in
 Y to center of gravity 3.0841e-7 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	90.000	0.10700	None	0.000	0.0000	0.2500
2	1.6250	0.000	0.10700	Single	0.000	0.0000	0.8125
3	6.0000	-90.000	0.10700	Cee	0.000	1.5000	3.0000
4	1.6250	180.000	0.10700	Single	0.000	0.0000	0.8125
5	0.5000	90.000	0.10700	None	0.000	0.0000	0.2500

Part 4, Thickness 0.0713 in (14 Gage)

Placement of Part from Origin:

X to center of gravity -4.5565e-7 in
 Y to top edge 3.0713 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	90.000	0.10700	Single	0.000	0.0000	0.7500
2	6.2496	0.000	0.10700	Cee	0.000	0.0000	3.1248
3	1.5000	-90.000	0.10700	Single	0.000	0.0000	0.7500

Part 5, Thickness 0.0713 in (14 Gage)

Placement of Part from Origin:

X to center of gravity 0 in
 Y to bottom edge 3.0713 in

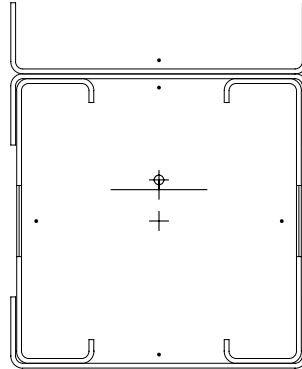
Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	270.000	0.10700	Single	0.000	0.0000	0.7500
2	6.2496	180.000	0.10700	Cee	0.000	0.0000	3.1248
3	1.5000	90.000	0.10700	Single	0.000	0.0000	0.7500

Fully Braced Strength - 2007 North American Specification - US (ASD)

Material Type: A653 SQ Grade 50/1, Fy=50 ksi

Compression		Positive Moment		Positive Moment	
Pao	54064 lb	Maxo	139.36 k-in	Mayo	132.47 k-in
Ae	1.9463 in ²	Ixe	19.879 in ⁴	Iye	15.145 in ⁴
		Sxe(t)	4.6546 in ³	Sye(l)	5.3579 in ³
Tension		Sxe(b)	5.8958 in ³	Sye(r)	4.4245 in ³
Ta	100553 lb				
		Negative Moment		Negative Moment	
		Maxo	141.66 k-in	Mayo	132.47 k-in
Shear		Ixe	19.409 in ⁴	Iye	15.145 in ⁴
Vay	9803 lb	Sxe(t)	5.4817 in ³	Sye(l)	4.4245 in ³
Vax	20657 lb	Sxe(b)	4.7316 in ³	Sye(r)	5.3579 in ³



Section Inputs

Material: A653 SQ Grade 50/1

Apply strength increase from cold work of forming.

Modulus of Elasticity, E 29500 ksi
 Yield Strength, Fy 50 ksi
 Tensile Strength, Fu 65 ksi
 Warping Constant Override, Cw 0 in^6
 Torsion Constant Override, J 0 in^4
 Connector Spacing 0 in

Track, Thickness 0.1017 in (12 Gage)

Placement of Part from Origin:

X to center of gravity 0 in

Y to bottom edge -3.1017 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	-90.000	0.15250	Single	0.000	0.0000	0.7500
2	6.2496	180.000	0.15250	Cee	0.000	0.0000	3.1248
3	1.5000	90.000	0.15250	Single	0.000	0.0000	0.7500

Stud, Thickness 0.1017 in (12 Gage)

Placement of Part from Origin:

X to left edge -3 in

Y to center of gravity -3.9064e-7 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	-90.000	0.15250	None	0.000	0.0000	0.2500
2	1.6250	180.000	0.15250	Single	0.000	0.0000	0.8125
3	6.0000	90.000	0.15250	Cee	0.000	1.5000	3.0000
4	1.6250	0.000	0.15250	Single	0.000	0.0000	0.8125
5	0.5000	-90.000	0.15250	None	0.000	0.0000	0.2500

Section: (2) 600S162-97 + (3) 600T150-97.sct

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(2) 600S162-97 + (3) 600T150-97

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Part 3, Thickness 0.1017 in (12 Gage)

Placement of Part from Origin:

X to right edge 3 in

Y to center of gravity 3.0841e-7 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	90.000	0.15250	None	0.000	0.0000	0.2500
2	1.6250	0.000	0.15250	Single	0.000	0.0000	0.8125
3	6.0000	-90.000	0.15250	Cee	0.000	1.5000	3.0000
4	1.6250	180.000	0.15250	Single	0.000	0.0000	0.8125
5	0.5000	90.000	0.15250	None	0.000	0.0000	0.2500

Part 4, Thickness 0.1017 in (12 Gage)

Placement of Part from Origin:

X to center of gravity 0 in

Y to top edge 3.1017 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	90.000	0.15250	Single	0.000	0.0000	0.7500
2	6.2496	0.000	0.15250	Cee	0.000	0.0000	3.1248
3	1.5000	-90.000	0.15250	Single	0.000	0.0000	0.7500

Part 5, Thickness 0.1017 in (12 Gage)

Placement of Part from Origin:

X to center of gravity 0 in

Y to bottom edge 3.1017 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	270.000	0.15250	Single	0.000	0.0000	0.7500
2	6.2496	180.000	0.15250	Cee	0.000	0.0000	3.1248
3	1.5000	90.000	0.15250	Single	0.000	0.0000	0.7500

Fully Braced Strength - 2007 North American Specification - US (ASD)

Material Type: A653 SQ Grade 50/1, Fy=50 ksi

Compression		Positive Moment		Positive Moment	
Pao	95941 lb	Maxo	226.90 k-in	Mayo	216.09 k-in
Ae	3.4539 in ²	Ixe	30.731 in ⁴	Iye	23.290 in ⁴
		Sxe(t)	7.5784 in ³	Sye(l)	7.7048 in ³
Tension		Sxe(b)	8.4230 in ³	Sye(r)	7.2174 in ³
Ta	140814 lb				
		Negative Moment		Negative Moment	
		Maxo	223.33 k-in	Mayo	216.09 k-in
Shear		Ixe	29.692 in ⁴	Iye	23.290 in ⁴
Vay	12791 lb	Sxe(t)	7.9757 in ³	Sye(l)	7.2174 in ³
Vax	41124 lb	Sxe(b)	7.4594 in ³	Sye(r)	7.7048 in ³

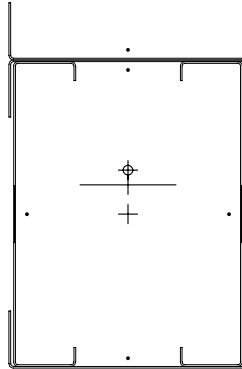
Capacity of Five-Piece Headers Acting Compositely

Headers with 8" Studs

	33 ksi		50 ksi	
	18 ga	16 ga	14 ga	12 ga
Stud Height (in)=	8	8	8	8
Weld V_a (lbs)=	544	985	1241	1771
Weld Spc (in)=	12	12	12	12
q_a (lbs)=	90.7	164.2	206.8	295.2
thickness (in)=	0.0451	0.0566	0.0713	0.1017
y bar (in)=	4.743	4.743	4.743	4.743
Q_1 (in ³)=	1.424	1.787	2.251	3.210
Q_2 (in ³)=	1.221	1.532	1.930	2.753
Q_3 (in ³)=	1.824	2.289	2.883	4.112
I_x (in ⁴)=	21.63	27.316	36.767	56.565
V_{ay} (lbs)=	2151	3919	5276	8120
M_{ax} (k-in)=	76.81	147.84	208.92	339.50
M_{ay} (k-in)=	28.08	54.72	80.04	129.69
I_y (in ⁴)=	5.67	7.20	9.49	14.33

Section: (2) 800S162-43 + (3) 600T150-43.sct
 (2) 800S162-43 + (3) 600T150-43
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 By: EMB
 Printed: 10/28/2013 4:19:00 PM

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Section Inputs

Material: A653 SS Grade 33
 Apply strength increase from cold work of forming.
 Modulus of Elasticity, E 29500 ksi
 Yield Strength, Fy 33 ksi
 Tensile Strength, Fu 45 ksi
 Warping Constant Override, Cw 0 in⁶
 Torsion Constant Override, J 0 in⁴
 Connector Spacing 0 in

Track, Thickness 0.0451 in (18 Gage)
 Placement of Part from Origin:
 X to center of gravity 0 in
 Y to bottom edge -4.0451 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	-90.000	0.071200	Single	0.000	0.0000	0.7500
2	6.2496	180.000	0.071200	Cee	0.000	0.0000	3.1248
3	1.5000	90.000	0.071200	Single	0.000	0.0000	0.7500

Stud, Thickness 0.0451 in (18 Gage)
 Placement of Part from Origin:
 X to left edge -3 in
 Y to center of gravity -3.9064e-7 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	-90.000	0.071200	None	0.000	0.0000	0.2500
2	1.6250	180.000	0.071200	Single	0.000	0.0000	0.8125
3	8.0000	90.000	0.071200	Cee	0.000	1.5000	4.0000
4	1.6250	0.000	0.071200	Single	0.000	0.0000	0.8125
5	0.5000	-90.000	0.071200	None	0.000	0.0000	0.2500

Section: (2) 800S162-43 + (3) 600T150-43.sct
 (2) 800S162-43 + (3) 600T150-43
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Part 3, Thickness 0.0451 in (18 Gage)
 Placement of Part from Origin:
 X to right edge 3 in
 Y to center of gravity 3.0841e-7 in
 Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	90.000	0.071200	None	0.000	0.0000	0.2500
2	1.6250	0.000	0.071200	Single	0.000	0.0000	0.8125
3	8.0000	-90.000	0.071200	Cee	0.000	1.5000	4.0000
4	1.6250	180.000	0.071200	Single	0.000	0.0000	0.8125
5	0.5000	90.000	0.071200	None	0.000	0.0000	0.2500

Part 4, Thickness 0.0451 in (18 Gage)
 Placement of Part from Origin:
 X to center of gravity 0 in
 Y to top edge 4.0451 in
 Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	90.000	0.071200	Single	0.000	0.0000	0.7500
2	6.2496	0.000	0.071200	Cee	0.000	0.0000	3.1248
3	1.5000	-90.000	0.071200	Single	0.000	0.0000	0.7500

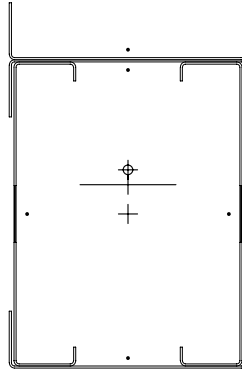
Part 5, Thickness 0.0451 in (18 Gage)
 Placement of Part from Origin:
 X to center of gravity 0 in
 Y to bottom edge 4.0451 in
 Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	270.000	0.071200	Single	0.000	0.0000	0.7500
2	6.2496	180.000	0.071200	Cee	0.000	0.0000	3.1248
3	1.5000	90.000	0.071200	Single	0.000	0.0000	0.7500

Fully Braced Strength - 2007 North American Specification - US (ASD)

Material Type: A653 SS Grade 33, Fy=33 ksi

Compression		Positive Moment		Positive Moment	
Pao	19570 lb	Maxo	76.814 k-in	Mayo	49.697 k-in
Ae	1.0675 in ²	Ixe	21.630 in ⁴	Iye	9.447 in ⁴
		Sxe(t)	3.8872 in ³	Sye(l)	3.7890 in ³
Tension		Sxe(b)	5.3729 in ³	Sye(r)	2.5150 in ³
Ta	46553 lb				
		Negative Moment		Negative Moment	
		Maxo	70.866 k-in	Mayo	49.697 k-in
Shear		Ixe	20.357 in ⁴	Iye	9.447 in ⁴
Vay	3225 lb	Sxe(t)	5.2013 in ³	Sye(l)	2.5150 in ³
Vax	5326 lb	Sxe(b)	3.5862 in ³	Sye(r)	3.7890 in ³



Section Inputs

Material: A653 SQ Grade 50/1

Apply strength increase from cold work of forming.

Modulus of Elasticity, E 29500 ksi
 Yield Strength, Fy 50 ksi
 Tensile Strength, Fu 65 ksi
 Warping Constant Override, Cw 0 in^6
 Torsion Constant Override, J 0 in^4
 Connector Spacing 0 in

Track, Thickness 0.0566 in (16 Gage)

Placement of Part from Origin:

X to center of gravity 0 in
 Y to bottom edge -4.0566 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	-90.000	0.084900	Single	0.000	0.0000	0.7500
2	6.2496	180.000	0.084900	Cee	0.000	0.0000	3.1248
3	1.5000	90.000	0.084900	Single	0.000	0.0000	0.7500

Stud, Thickness 0.0566 in (16 Gage)

Placement of Part from Origin:

X to left edge -3 in
 Y to center of gravity -3.9064e-7 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	-90.000	0.084900	None	0.000	0.0000	0.2500
2	1.6250	180.000	0.084900	Single	0.000	0.0000	0.8125
3	8.0000	90.000	0.084900	Cee	0.000	1.5000	4.0000
4	1.6250	0.000	0.084900	Single	0.000	0.0000	0.8125
5	0.5000	-90.000	0.084900	None	0.000	0.0000	0.2500

Section: (2) 800S162-54 + (3) 600T150-54.sct

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(2) 800S162-54 + (3) 600T150-54

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Part 3, Thickness 0.0566 in (16 Gage)

Placement of Part from Origin:

X to right edge 3 in

Y to center of gravity 3.0841e-7 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	90.000	0.084900	None	0.000	0.0000	0.2500
2	1.6250	0.000	0.084900	Single	0.000	0.0000	0.8125
3	8.0000	-90.000	0.084900	Cee	0.000	1.5000	4.0000
4	1.6250	180.000	0.084900	Single	0.000	0.0000	0.8125
5	0.5000	90.000	0.084900	None	0.000	0.0000	0.2500

Part 4, Thickness 0.0566 in (16 Gage)

Placement of Part from Origin:

X to center of gravity 0 in

Y to top edge 4.0566 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	90.000	0.084900	Single	0.000	0.0000	0.7500
2	6.2496	0.000	0.084900	Cee	0.000	0.0000	3.1248
3	1.5000	-90.000	0.084900	Single	0.000	0.0000	0.7500

Part 5, Thickness 0.0566 in (16 Gage)

Placement of Part from Origin:

X to center of gravity 0 in

Y to bottom edge 4.0566 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	270.000	0.084900	Single	0.000	0.0000	0.7500
2	6.2496	180.000	0.084900	Cee	0.000	0.0000	3.1248
3	1.5000	90.000	0.084900	Single	0.000	0.0000	0.7500

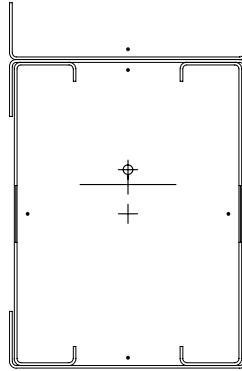
Fully Braced Strength - 2007 North American Specification - US (ASD)

Material Type: A653 SQ Grade 50/1, Fy=50 ksi

Compression		Positive Moment		Positive Moment	
Pao	36976 lb	Maxo	147.84 k-in	Mayo	95.13 k-in
Ae	1.3311 in ²	Ixe	27.316 in ⁴	Iye	11.876 in ⁴
		Sxe(t)	4.9380 in ³	Sye(l)	4.7273 in ³
Tension		Sxe(b)	6.6927 in ³	Sye(r)	3.1775 in ³
Ta	87884 lb	Negative Moment		Negative Moment	
		Maxo	133.11 k-in	Mayo	95.13 k-in
Shear		Ixe	25.338 in ⁴	Iye	11.876 in ⁴
Vay	6390 lb	Sxe(t)	6.4738 in ³	Sye(l)	3.1775 in ³
Vax	10546 lb	Sxe(b)	4.4458 in ³	Sye(r)	4.7273 in ³

Section: (2) 800S162-68 + (3) 600T150-68.sct
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Section Inputs

Material: A653 SQ Grade 50/1
 Apply strength increase from cold work of forming.
 Modulus of Elasticity, E 29500 ksi
 Yield Strength, Fy 50 ksi
 Tensile Strength, Fu 65 ksi
 Warping Constant Override, Cw 0 in⁶
 Torsion Constant Override, J 0 in⁴
 Connector Spacing 0 in

Track, Thickness 0.0713 in (14 Gage)
 Placement of Part from Origin:
 X to center of gravity 0 in
 Y to bottom edge -4.0713 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	-90.000	0.10690	Single	0.000	0.0000	0.7500
2	6.2496	180.000	0.10690	Cee	0.000	0.0000	3.1248
3	1.5000	90.000	0.10690	Single	0.000	0.0000	0.7500

Stud, Thickness 0.0713 in (14 Gage)
 Placement of Part from Origin:
 X to left edge -3 in
 Y to center of gravity -3.9064e-7 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	-90.000	0.10690	None	0.000	0.0000	0.2500
2	1.6250	180.000	0.10690	Single	0.000	0.0000	0.8125
3	8.0000	90.000	0.10690	Cee	0.000	1.5000	4.0000
4	1.6250	0.000	0.10690	Single	0.000	0.0000	0.8125
5	0.5000	-90.000	0.10690	None	0.000	0.0000	0.2500

Section: (2) 800S162-68 + (3) 600T150-68.sct
 (2) 800S162-68 + (3) 600T150-68
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Part 3, Thickness 0.0713 in (14 Gage)

Placement of Part from Origin:

X to right edge 3 in
 Y to center of gravity 3.0841e-7 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	90.000	0.10690	None	0.000	0.0000	0.2500
2	1.6250	0.000	0.10690	Single	0.000	0.0000	0.8125
3	8.0000	-90.000	0.10690	Cee	0.000	1.5000	4.0000
4	1.6250	180.000	0.10690	Single	0.000	0.0000	0.8125
5	0.5000	90.000	0.10690	None	0.000	0.0000	0.2500

Part 4, Thickness 0.0713 in (14 Gage)

Placement of Part from Origin:

X to center of gravity 0 in
 Y to top edge 4.0713 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	90.000	0.10690	Single	0.000	0.0000	0.7500
2	6.2496	0.000	0.10690	Cee	0.000	0.0000	3.1248
3	1.5000	-90.000	0.10690	Single	0.000	0.0000	0.7500

Part 5, Thickness 0.0713 in (14 Gage)

Placement of Part from Origin:

X to center of gravity 0 in
 Y to bottom edge 4.0713 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	270.000	0.10690	Single	0.000	0.0000	0.7500
2	6.2496	180.000	0.10690	Cee	0.000	0.0000	3.1248
3	1.5000	90.000	0.10690	Single	0.000	0.0000	0.7500

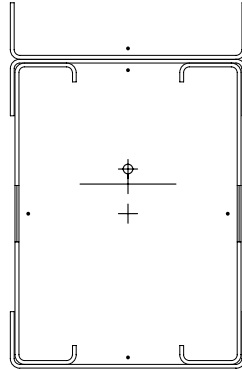
Fully Braced Strength - 2007 North American Specification - US (ASD)

Material Type: A653 SQ Grade 50/1, Fy=50 ksi

Compression		Positive Moment		Positive Moment	
Pao	54381 lb	Maxo	208.92 k-in	Mayo	135.71 k-in
Ae	1.9577 in ²	Ixe	36.767 in ⁴	Iye	16.122 in ⁴
		Sxe(t)	6.9779 in ³	Sye(l)	5.9877 in ³
Tension		Sxe(b)	8.4067 in ³	Sye(r)	4.5326 in ³
Ta	109824 lb				
		Negative Moment		Negative Moment	
		Maxo	188.23 k-in	Mayo	135.71 k-in
Shear		Ixe	34.626 in ⁴	Iye	16.122 in ⁴
Vay	10227 lb	Sxe(t)	8.3740 in ³	Sye(l)	4.5326 in ³
Vax	20658 lb	Sxe(b)	6.2868 in ³	Sye(r)	5.9877 in ³

Section: (2) 800S162-97 + (3) 600T150-97.sct
 (2) 800S162-97 + (3) 600T150-97
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 Printed: 10/28/2013 4:20:56 PM

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Section Inputs

Material: A653 SQ Grade 50/1
 Apply strength increase from cold work of forming.
 Modulus of Elasticity, E 29500 ksi
 Yield Strength, Fy 50 ksi
 Tensile Strength, Fu 65 ksi
 Warping Constant Override, Cw 0 in^6
 Torsion Constant Override, J 0 in^4
 Connector Spacing 0 in

Track, Thickness 0.1017 in (12 Gage)
 Placement of Part from Origin:
 X to center of gravity 0 in
 Y to bottom edge -4.1017 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	-90.000	0.15250	Single	0.000	0.0000	0.7500
2	6.2496	180.000	0.15250	Cee	0.000	0.0000	3.1248
3	1.5000	90.000	0.15250	Single	0.000	0.0000	0.7500

Stud, Thickness 0.1017 in (12 Gage)
 Placement of Part from Origin:
 X to left edge -3 in
 Y to center of gravity -3.9064e-7 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	-90.000	0.15250	None	0.000	0.0000	0.2500
2	1.6250	180.000	0.15250	Single	0.000	0.0000	0.8125
3	8.0000	90.000	0.15250	Cee	0.000	1.5000	4.0000
4	1.6250	0.000	0.15250	Single	0.000	0.0000	0.8125
5	0.5000	-90.000	0.15250	None	0.000	0.0000	0.2500

Section: (2) 800S162-97 + (3) 600T150-97.sct
 (2) 800S162-97 + (3) 600T150-97
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Part 3, Thickness 0.1017 in (12 Gage)

Placement of Part from Origin:

X to right edge 3 in
 Y to center of gravity 3.0841e-7 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	90.000	0.15250	None	0.000	0.0000	0.2500
2	1.6250	0.000	0.15250	Single	0.000	0.0000	0.8125
3	8.0000	-90.000	0.15250	Cee	0.000	1.5000	4.0000
4	1.6250	180.000	0.15250	Single	0.000	0.0000	0.8125
5	0.5000	90.000	0.15250	None	0.000	0.0000	0.2500

Part 4, Thickness 0.1017 in (12 Gage)

Placement of Part from Origin:

X to center of gravity 0 in
 Y to top edge 4.1017 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	90.000	0.15250	Single	0.000	0.0000	0.7500
2	6.2496	0.000	0.15250	Cee	0.000	0.0000	3.1248
3	1.5000	-90.000	0.15250	Single	0.000	0.0000	0.7500

Part 5, Thickness 0.1017 in (12 Gage)

Placement of Part from Origin:

X to center of gravity 0 in
 Y to bottom edge 4.1017 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	270.000	0.15250	Single	0.000	0.0000	0.7500
2	6.2496	180.000	0.15250	Cee	0.000	0.0000	3.1248
3	1.5000	90.000	0.15250	Single	0.000	0.0000	0.7500

Fully Braced Strength - 2007 North American Specification - US (ASD)

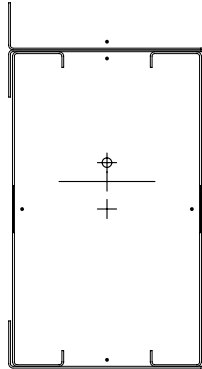
Material Type: A653 SQ Grade 50/1, Fy=50 ksi

Compression		Positive Moment		Positive Moment	
Pao	95102 lb	Maxo	339.50 k-in	Mayo	219.61 k-in
Ae	3.4237 in ²	Ixe	56.565 in ⁴	Iye	24.714 in ⁴
		Sxe(t)	11.339 in ³	Sye(l)	8.580 in ³
Tension		Sxe(b)	11.997 in ³	Sye(r)	7.335 in ³
Ta	154035 lb	Negative Moment		Negative Moment	
		Maxo	314.02 k-in	Mayo	219.61 k-in
Shear		Ixe	54.613 in ⁴	Iye	24.714 in ⁴
Vay	17801 lb	Sxe(t)	12.146 in ³	Sye(l)	7.335 in ³
Vax	41124 lb	Sxe(b)	10.488 in ³	Sye(r)	8.580 in ³

Capacity of Five-Piece Headers Acting Compositely

Headers with 10" Studs

	50 ksi		
	16 ga	14 ga	12 ga
Stud Height (in)=	10	10	10
Weld V_a (lbs)=	985	1241	1771
Weld Spcg (in)=	12	12	12
q_a (lbs)=	164.2	206.8	295.2
thickness (in)=	0.0566	0.0713	0.1017
\bar{y} (in)=	5.851	5.851	5.851
Q_1 (in ³)=	2.241	2.823	4.026
Q_2 (in ³)=	1.986	2.502	3.568
Q_3 (in ³)=	2.853	3.594	5.127
I_x (in ⁴)=	43.732	59.133	91.642
V_{ay} (lbs)=	5032	6805	10552
M_{ax} (k-in)=	195.46	278.69	462.32
M_{ay} (k-in)=	54.72	80.04	129.69
I_y (in ⁴)=	7.20	9.49	14.33



Section Inputs

Material: A653 SQ Grade 50/1

Apply strength increase from cold work of forming.

Modulus of Elasticity, E 29500 ksi
 Yield Strength, Fy 50 ksi
 Tensile Strength, Fu 65 ksi
 Warping Constant Override, Cw 0 in^6
 Torsion Constant Override, J 0 in^4
 Connector Spacing 0 in

Track, Thickness 0.0566 in (16 Gage)

Placement of Part from Origin:

X to center of gravity 0 in
 Y to bottom edge -5.0566 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	-90.000	0.084900	Single	0.000	0.0000	0.7500
2	6.2496	180.000	0.084900	Cee	0.000	0.0000	3.1248
3	1.5000	90.000	0.084900	Single	0.000	0.0000	0.7500

Stud, Thickness 0.0566 in (16 Gage)

Placement of Part from Origin:

X to left edge -3 in
 Y to center of gravity -3.9064e-7 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	-90.000	0.084900	None	0.000	0.0000	0.2500
2	1.6250	180.000	0.084900	Single	0.000	0.0000	0.8125
3	10.0000	90.000	0.084900	Cee	0.000	1.5000	5.0000
4	1.6250	0.000	0.084900	Single	0.000	0.0000	0.8125
5	0.5000	-90.000	0.084900	None	0.000	0.0000	0.2500

Section: (2) 1000S162-54 + (3) 600T150-54.sct

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(2) 1000S162-54 + (3) 600T150-54

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By: EMB

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Part 3, Thickness 0.0566 in (16 Gage)

Placement of Part from Origin:

X to right edge 3 in

Y to center of gravity 3.0841e-7 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	90.000	0.084900	None	0.000	0.0000	0.2500
2	1.6250	0.000	0.084900	Single	0.000	0.0000	0.8125
3	10.0000	-90.000	0.084900	Cee	0.000	1.5000	5.0000
4	1.6250	180.000	0.084900	Single	0.000	0.0000	0.8125
5	0.5000	90.000	0.084900	None	0.000	0.0000	0.2500

Part 4, Thickness 0.0566 in (16 Gage)

Placement of Part from Origin:

X to center of gravity 0 in

Y to top edge 5.0566 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	90.000	0.084900	Single	0.000	0.0000	0.7500
2	6.2496	0.000	0.084900	Cee	0.000	0.0000	3.1248
3	1.5000	-90.000	0.084900	Single	0.000	0.0000	0.7500

Part 5, Thickness 0.0566 in (16 Gage)

Placement of Part from Origin:

X to center of gravity 0 in

Y to bottom edge 5.0566 in

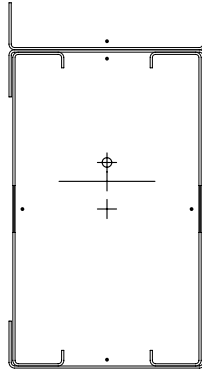
Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	270.000	0.084900	Single	0.000	0.0000	0.7500
2	6.2496	180.000	0.084900	Cee	0.000	0.0000	3.1248
3	1.5000	90.000	0.084900	Single	0.000	0.0000	0.7500

Fully Braced Strength - 2007 North American Specification - US (ASD)

Material Type: A653 SQ Grade 50/1, Fy=50 ksi

Compression		Positive Moment		Positive Moment	
Pao	37055 lb	Maxo	195.46 k-in	Mayo	96.42 k-in
Ae	1.3340 in ²	Ixe	43.732 in ⁴	Iye	12.447 in ⁴
		Sxe(t)	6.5285 in ³	Sye(l)	5.2190 in ³
Tension		Sxe(b)	8.8985 in ³	Sye(r)	3.2205 in ³
Ta	94966 lb				
		Negative Moment		Negative Moment	
		Maxo	169.04 k-in	Mayo	96.42 k-in
Shear		Ixe	40.144 in ⁴	Iye	12.447 in ⁴
Vay	4714 lb	Sxe(t)	8.9152 in ³	Sye(l)	3.2205 in ³
Vax	10546 lb	Sxe(b)	5.6458 in ³	Sye(r)	5.2190 in ³



Section Inputs

Material: A653 SQ Grade 50/1

Apply strength increase from cold work of forming.

Modulus of Elasticity, E 29500 ksi
 Yield Strength, Fy 50 ksi
 Tensile Strength, Fu 65 ksi
 Warping Constant Override, Cw 0 in⁶
 Torsion Constant Override, J 0 in⁴
 Connector Spacing 0 in

Track, Thickness 0.0713 in (14 Gage)

Placement of Part from Origin:

X to center of gravity 0 in

Y to bottom edge -5.0713 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	-90.000	0.10690	Single	0.000	0.0000	0.7500
2	6.2496	180.000	0.10690	Cee	0.000	0.0000	3.1248
3	1.5000	90.000	0.10690	Single	0.000	0.0000	0.7500

Stud, Thickness 0.0713 in (14 Gage)

Placement of Part from Origin:

X to left edge -3 in

Y to center of gravity 0 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	-90.000	0.10690	None	0.000	0.0000	0.2500
2	1.6250	180.000	0.10690	Single	0.000	0.0000	0.8125
3	10.0000	90.000	0.10690	Cee	0.000	1.5000	5.0000
4	1.6250	0.000	0.10690	Single	0.000	0.0000	0.8125
5	0.5000	-90.000	0.10690	None	0.000	0.0000	0.2500

Section: (2) 1000S162-68 + (3) 600T150-68.sct

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(2) 1000S162-54 + (3) 600T150-54

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Part 3, Thickness 0.0713 in (14 Gage)

Placement of Part from Origin:

X to right edge 3 in

Y to center of gravity 0 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	90.000	0.10690	None	0.000	0.0000	0.2500
2	1.6250	0.000	0.10690	Single	0.000	0.0000	0.8125
3	10.0000	-90.000	0.10690	Cee	0.000	1.5000	5.0000
4	1.6250	180.000	0.10690	Single	0.000	0.0000	0.8125
5	0.5000	90.000	0.10690	None	0.000	0.0000	0.2500

Part 4, Thickness 0.0713 in (14 Gage)

Placement of Part from Origin:

X to center of gravity 0 in

Y to top edge 5.0713 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	90.000	0.10690	Single	0.000	0.0000	0.7500
2	6.2496	0.000	0.10690	Cee	0.000	0.0000	3.1248
3	1.5000	-90.000	0.10690	Single	0.000	0.0000	0.7500

Part 5, Thickness 0.0713 in (14 Gage)

Placement of Part from Origin:

X to center of gravity 0 in

Y to bottom edge 5.0713 in

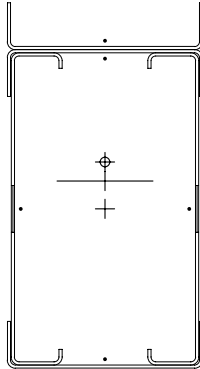
Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	270.000	0.10690	Single	0.000	0.0000	0.7500
2	6.2496	180.000	0.10690	Cee	0.000	0.0000	3.1248
3	1.5000	90.000	0.10690	Single	0.000	0.0000	0.7500

Fully Braced Strength - 2007 North American Specification - US (ASD)

Material Type: A653 SQ Grade 50/1, Fy=50 ksi

Compression		Positive Moment		Positive Moment	
Pao	54544 lb	Maxo	278.69 k-in	Mayo	138.04 k-in
Ae	1.9636 in ²	Ixe	59.133 in ⁴	Iye	16.976 in ⁴
		Sxe(t)	9.308 in ³	Sye(l)	6.611 in ³
Tension		Sxe(b)	11.179 in ³	Sye(r)	4.610 in ³
Ta	119093 lb				
		Negative Moment		Negative Moment	
Shear		Maxo	240.37 k-in	Mayo	138.04 k-in
Vay	9440 lb	Ixe	55.114 in ⁴	Iye	16.976 in ⁴
Vax	20658 lb	Sxe(t)	11.536 in ³	Sye(l)	4.610 in ³
		Sxe(b)	8.028 in ³	Sye(r)	6.611 in ³



Section Inputs

Material: A653 SQ Grade 50/1

Apply strength increase from cold work of forming.

Modulus of Elasticity, E 29500 ksi
 Yield Strength, Fy 50 ksi
 Tensile Strength, Fu 65 ksi
 Warping Constant Override, Cw 0 in^6
 Torsion Constant Override, J 0 in^4
 Connector Spacing 0 in

Track, Thickness 0.1017 in (12 Gage)

Placement of Part from Origin:

X to center of gravity 0 in
 Y to bottom edge -5.1017 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	-90.000	0.15250	Single	0.000	0.0000	0.7500
2	6.2496	180.000	0.15250	Cee	0.000	0.0000	3.1248
3	1.5000	90.000	0.15250	Single	0.000	0.0000	0.7500

Stud, Thickness 0.1017 in (12 Gage)

Placement of Part from Origin:

X to left edge -3 in
 Y to center of gravity 0 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	-90.000	0.15250	None	0.000	0.0000	0.2500
2	1.6250	180.000	0.15250	Single	0.000	0.0000	0.8125
3	10.0000	90.000	0.15250	Cee	0.000	1.5000	5.0000
4	1.6250	0.000	0.15250	Single	0.000	0.0000	0.8125
5	0.5000	-90.000	0.15250	None	0.000	0.0000	0.2500

Section: (2) 1000S162-97 + (3) 600T150-97.sct

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(2) 1000S162-54 + (3) 600T150-54

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Part 3, Thickness 0.1017 in (12 Gage)

Placement of Part from Origin:

X to right edge 3 in

Y to center of gravity 0 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	0.5000	90.000	0.15250	None	0.000	0.0000	0.2500
2	1.6250	0.000	0.15250	Single	0.000	0.0000	0.8125
3	10.0000	-90.000	0.15250	Cee	0.000	1.5000	5.0000
4	1.6250	180.000	0.15250	Single	0.000	0.0000	0.8125
5	0.5000	90.000	0.15250	None	0.000	0.0000	0.2500

Part 4, Thickness 0.1017 in (12 Gage)

Placement of Part from Origin:

X to center of gravity 0 in

Y to top edge 5.1017 in

Outside dimensions, Open shape

	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	90.000	0.15250	Single	0.000	0.0000	0.7500
2	6.2496	0.000	0.15250	Cee	0.000	0.0000	3.1248
3	1.5000	-90.000	0.15250	Single	0.000	0.0000	0.7500

Part 5, Thickness 0.1017 in (12 Gage)

Placement of Part from Origin:

X to center of gravity 0 in

Y to bottom edge 5.1017 in

Outside dimensions, Open shape

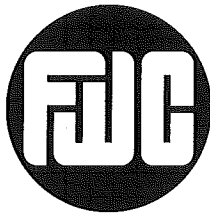
	Length (in)	Angle (deg)	Radius (in)	Web	k Coef.	Hole Size (in)	Distance (in)
1	1.5000	270.000	0.15250	Single	0.000	0.0000	0.7500
2	6.2496	180.000	0.15250	Cee	0.000	0.0000	3.1248
3	1.5000	90.000	0.15250	Single	0.000	0.0000	0.7500

Fully Braced Strength - 2007 North American Specification - US (ASD)

Material Type: A653 SQ Grade 50/1, Fy=50 ksi

Compression		Positive Moment		Positive Moment	
Pao	95594 lb	Maxo	462.32 k-in	Mayo	225.53 k-in
Ae	3.4414 in ²	Ixe	91.642 in ⁴	Iye	26.235 in ⁴
		Sxe(t)	15.442 in ³	Sye(l)	9.482 in ³
Tension		Sxe(b)	15.886 in ³	Sye(r)	7.533 in ³
Ta	167256 lb	Negative Moment		Negative Moment	
		Maxo	402.22 k-in	Mayo	225.53 k-in
Shear		Ixe	87.189 in ⁴	Iye	26.235 in ⁴
Vay	20001 lb	Sxe(t)	16.724 in ³	Sye(l)	7.533 in ³
Vax	41124 lb	Sxe(b)	13.434 in ³	Sye(r)	9.482 in ³

Allowable Shear Determination



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HEADER DESIGN

- DETERMINE ALLOWABLE SHEAR @ TRACK HEADER

• FOR V_{ax} , CAPACITY IS NO. OF #10 SMS TIMES V_a SREW

FOR 43 MIL @ TRACK HEADER:

$$V_{ax} = 3(263\#) = 789\#$$

FOR 54 MIL, 60, AND 97 MIL @ TRACK HEADER

$$V_{ax} = 3(534\#) = 1602\#$$

↑ LIMITED BY 54 MIL JAMB

• FOR V_{ay} , CAPACITY IS NO. OF #10 SMS TIMES V_a SREW

ALLOWABLE SHEARS ARE EQUAL TO V_{ax}

- ALLOWABLE SHEAR FOR 2-PIECE HEADER

• FOR V_{ax} , CAPACITY IS NO. OF #10 SMS TIMES V_a SREW

FOR 43 MIL

$$V_{ax} = 4(263\#) = 1052\#$$

FOR 54, 60, & 97 MIL

$$V_{ax} = 4(534\#) = 2136\#$$

• FOR V_{ay} , CAPACITY IS EITHER SHEAR FLOW OR ALLOWABLE SHEAR IN SREWS

FOR 43 MIL

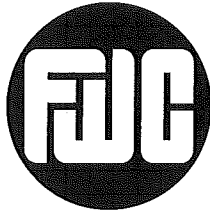
$$V_{ay} \text{ SHEAR FLOW} = 282\# \leftarrow \text{GOVERNS}$$

$$V_{ay} \text{ SREW} = 4(263) = 1052\#$$

FOR 54, 60, & 97 MIL

$$V_{ay} \text{ SREW} = 4(534\#) = 2136\#$$

↑ COMPARE TO SHEAR FLOW.
SHEAR FLOW GOVERNS



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- DETERMINE ALLOWABLE SHEAR FOR 3-PIECE HEADERS

NOTE: V_{ax} AND V_{ay} ARE DETERMINED THE SAME FASHION AS THE 2-PIECE W/ THE CAPACITY FOR V_{ax} BEING GOVERNED BY THE CAPACITY OF THE SCREWS. V_{ay} IS GOVERNED BY SHEAR FLOW AND VALUES ARE SHOWN ON THE SUMMARY PAGE.

- DETERMINE ALLOWABLE SHEAR FOR 4-PIECE HEADERS

FOR BOX HEADERS, WEB CRIPPLING CAN CONTROL

FROM THE SUMMARY PAGE, V_{ay} SHEAR FLOW IS TYPICALLY VERY HIGH, SO

WEB CRIPPLING OR SHEAR IN THE SCREWS GOVERNS.

FOR V_{ax} :

- AT 43 mil

$$V_{ax} = 6(263\#) = 1578\#$$

- AT 54, 63 & 97 mil

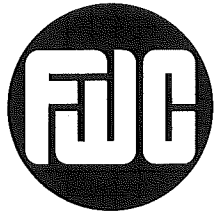
$$V_{ax} = 6(534\#) = 3204\#$$

SEE THE SUMMARY PAGE FOR ALLOWABLE WEB CRIPPLING LOADS.

SINCE THERE ARE (2) STUDS PER BOX HEADER, V_{ay} VALUES GOVERNED

BY WEB CRIPPLING ARE 2 TIMES THE WEB CRIPPLING LOAD FOR (1) STUD.

THAT VALUE IS COMPARED TO THE ALLOWABLE SHEAR FOR THE SCREWS AND THE LOWEST VALUE IS USED.



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WEB CRIPPLING

$$P_n = Ct^2 F_y \sin \theta \left(1 - C_R \sqrt{\frac{R}{E}} \right) \left(1 + C_{N1} \sqrt{\frac{N'}{E}} \right) \left(1 - C_{N2} \sqrt{\frac{k}{E}} \right)$$

EX: 600S162-43 , UNFASTENED , ONE-FLANGE LOADING (SINGLE WEB)

$C = 4$

$C_R = 0.14$

$C_{N1} = 0.35$

$C_{N2} = 0.02$

$R = 0.0712''$

$N = 1.625''$

$k = 5.767''$

$t = 0.0451''$

$F_y = 33000 \text{ psi}$

$$P_n = 4(0.0451'')^2 33000 \text{ psi} (1) \left(1 - 0.14 \sqrt{\frac{0.0712''}{33000 \text{ psi}}} \right) \left(1 + 0.35 \sqrt{\frac{1.625''}{33000 \text{ psi}}} \right) \left(1 - 0.02 \sqrt{\frac{5.767''}{33000 \text{ psi}}} \right)$$

= 530.9 #

$J_w = 1.85$

$P_n / J_w = 287 \text{ #}$

WEB CRIPPLING VALUES PER STUD

STUD	LOAD (LBS)
600S162-43	287
600S162-54	659
600S162-66	1000
600S162-77	1496
800S162-43	274
800S162-54	632
800S162-66	964
800S162-77	1341
1000S162-54	609
1000S162-66	933
1000S162-77	1793

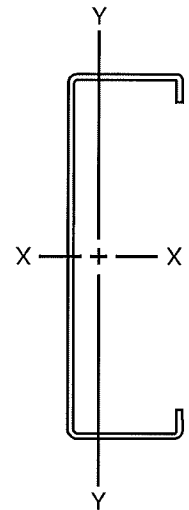


Gross Properties

- I_x : Moment of inertia of the cross section about the x-axis.
- S_x : Section modulus about the x-axis.
- R_x : Radius of gyration of cross section about the x-axis.
- I_y : Moment of inertia of cross section about the y-axis.
- R_y : Radius of gyration of cross section about the y-axis.

Effective Properties

- I_{xe} : Effective moment of inertia about the x-axis.
- S_{xe} : Effective section modulus about the x-axis.
- M_{al} : Allowable moment based on local buckling.
- M_{ad} : Allowable moment based on distortional buckling, assuming $K\phi = 0$.
- M_a : Allowable moment for track and channel members, based on local buckling only.
- V_{ag} : Allowable strong axis shear away from punchout, calculated in accordance with AISI S100 Section C3.2.1.
- V_{anet} : Allowable strong axis shear at the punchout, calculated in accordance with AISI S100 Section C3.2.2.



Torsional and Other Properties

- J : St. Venant torsional constant. The numbers shown in the tables for J have been multiplied by 1,000. The actual values can be obtained by dividing the listed numbers by 1,000.
- C_w : Torsional warping constant.
- X_o : Distance from the shear center to the centroid along the principal x-axis.
- m : Distance from shear center to mid-plane of web.
- R_o : Polar radius of gyration of cross section about the shear center.
- β : $1 - (X_o/R_o)^2$
- L_u : Critical unbraced length for lateral-torsional buckling. Members are considered fully braced when unbraced length is less than L_u .
- $K\phi$: Distortional buckling moment (M_{ad}) is calculated without the beneficial effect of sheathing to rotational stiffness. $K\phi = 0$.

Web Depth (h) to Thickness (t) Ratios ^{2,3,4}

Mil Thickness	18 mil	27 mil	30 mil	33 mil	43 mil	54 mil	68 mil	97 mil	118 mil									
Design Thickness (in)	0.0188	0.0283	0.0312	0.0346	0.0451	0.0566	0.0713	0.1017	0.1242									
Inside Bend Radius (in)	0.0843	0.0796	0.0781	0.0764	0.0712	0.0849	0.1069	0.1525	0.1863									
Depth (in)	h (in)	h/t	h (in)	h/t	h (in)	h/t	h (in)	h/t	h (in)	h/t	h (in)	h/t	h (in)	h/t	h (in)	h/t		
1.625	1.419	75	1.409	50	1.406	45	1.403	41	1.392	31	1.342	24	1.269	18	1.117	11	1.004	8
2.5	2.294	122	2.284	81	2.281	73	2.278	66	2.267	50	2.217	39	2.144	30	1.992	20	1.879	15
3.5	3.294	175	3.284	116	3.281	105	3.278	95	3.267	72	3.217	57	3.144	44	2.992	29	2.879	23
3.625	3.419	182	3.409	120	3.406	109	3.403	98	3.392	75	3.342	59	3.269	46	3.117	31	3.004	24
4	3.794	202 ¹	3.784	134	3.781	121	3.778	109	3.767	84	3.717	66	3.644	51	3.492	34	3.379	27
5.5	5.294	-	5.284	187	5.281	169	5.278	153	5.267	117	5.217	92	5.144	72	4.992	49	4.879	39
6	5.794	-	5.784	204 ¹	5.781	185	5.778	167	5.767	128	5.717	101	5.644	79	5.492	54	5.379	43
8	7.794	-	7.784	-	7.781	249 ¹	7.778	225 ¹	7.767	172	7.717	136	7.644	107	7.492	74	7.379	59
10	9.794	-	9.784	-	9.781	-	9.778	-	9.767	217 ¹	9.717	172	9.644	135	9.492	93	9.379	76
12	11.794	-	11.784	-	11.781	-	11.778	-	11.767	-	11.717	207 ¹	11.644	164	11.492	113	11.379	92
14	13.794	-	13.784	-	13.781	-	13.778	-	13.767	-	13.717	242 ¹	13.644	192	13.492	133	13.379	108
16	15.794	-	15.784	-	15.781	-	15.778	-	15.767	-	15.717	-	15.644	220 ¹	15.492	152	15.379	124

¹h/t exceeds 200

²h value used for h/t calculation is the flat width of the web. For S members, this is the out-to-out member size, minus twice the thickness, minus twice the inside bend radius.

³h/t values exceeding 260 are marked with a dash (-).

⁴h/t values in this table apply to S (studs and joists) members only and do not apply to tracks and channels.

Member	I_y (in ⁴)	M_{ay} (k-in)
600S162-43	2.316	16.68
600S162-54	2.860	30.33
600S162-68	3.525	39.47
600S162-97	4.797	56.73
600T150-43	1.890	9.36
600T150-54	2.400	18.24
600T150-68	3.162	26.68
600T150-97	4.778	43.23
800S162-43	4.500	20.14
800S162-54	5.600	36.79
800S162-68	7.070	49.80
800S162-97	9.713	72.70
1000S162-54	9.391	47.07
1000S162-68	11.978	64.51
1000S162-97	16.967	97.89