



Zimmerman Metals Inc.

STRUCTURAL CALCULATIONS

SLC-1500 PANEL

Zimmerman Metals Inc.

Over 60 Years of Quality Workmanship and Service

201 East 58th Avenue, Denver, Colo. 80216 / 303-294-0180 / FAX 303-292-5013

TOLL FREE 1-800-247-4202

STRUCTURAL CALCULATIONS FOR ZIMMERMAN METALS SERIES SLC-1500 12" WIDE (STEEL)

Prepared for:
Zimmerman Metals, inc.
201 East 58th Avenue
Denver, CO 80216

Prepared by:
Yoosef Lavi, P.E.
Consulting Engineer
9550 Forest Lane, #108
Dallas, TX 75243
[Job #04-345]

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November 22, 2004

NOV 22 2004

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THEORETICAL ALLOWABLE LIVE AND WIND LOADS

12" ZIMMERMAN SLC-1500									
SPAN (ft)	SINGLE SPAN CONDITION								
	26 Gauge & 50 ksi			24 Gauge & 50 ksi			22 Gauge & 50 ksi		
	LL (S) (psf)	LL (D) (psf)	WL (psf)	LL (S) (psf)	LL (D) (psf)	WL (psf)	LL (S) (psf)	LL (D) (psf)	WL (psf)
2	156.2	156.2	180.0	233.0	233.0	245.4	292.7	292.7	312.8
2.5	99.9	99.9	115.2	149.1	149.1	157.0	187.3	187.3	200.2
3	69.4	69.4	80.0	103.6	103.6	109.1	130.1	130.1	139.0
3.5	51.0	51.0	58.8	76.1	76.1	80.1	95.6	95.6	102.1
4	39.0	39.0	45.0	58.3	58.3	61.3	73.2	73.2	78.2
4.5	30.8	30.8	35.6	46.0	46.0	48.5	57.8	57.8	61.8
5	25.0	25.0	28.8	37.3	37.3	39.3	46.8	46.8	50.0
5.5	20.7	20.7	23.8	30.8	30.8	32.4	38.7	38.7	41.4
SPAN (ft)	TWO SPAN CONDITION								
	26 Gauge & 50 ksi			24 Gauge & 50 ksi			22 Gauge & 50 ksi		
	LL (S) (psf)	LL (D) (psf)	WL (psf)	LL (S) (psf)	LL (D) (psf)	WL (psf)	LL (S) (psf)	LL (D) (psf)	WL (psf)
2	135.3	135.3	207.7	184.5	184.5	309.9	235.2	235.2	389.2
2.5	86.6	86.6	132.9	118.1	118.1	198.3	150.5	150.5	249.1
3	60.1	60.1	92.3	82.0	82.0	137.7	104.5	104.5	173.0
3.5	44.2	44.2	67.8	60.2	60.2	101.2	76.8	76.8	127.1
4	33.8	33.8	51.9	46.1	46.1	77.5	58.8	58.8	97.3
4.5	26.7	26.7	41.0	36.4	36.4	61.2	46.5	46.5	76.9
5	21.7	21.7	33.2	29.5	29.5	49.6	37.6	37.6	62.3
5.5	17.9	17.9	27.5	24.4	24.4	41.0	31.1	31.1	51.5
SPAN (ft)	THREE OR MORE SPAN CONDITION								
	26 Gauge & 50 ksi			24 Gauge & 50 ksi			22 Gauge & 50 ksi		
	LL (S) (psf)	LL (D) (psf)	WL (psf)	LL (S) (psf)	LL (D) (psf)	WL (psf)	LL (S) (psf)	LL (D) (psf)	WL (psf)
2	158.1	158.1	242.6	215.5	215.5	362.0	274.7	274.7	454.7
2.5	101.2	101.2	155.3	137.9	137.9	231.7	175.8	175.8	291.0
3	70.3	70.3	107.8	95.8	95.8	160.9	122.1	122.1	202.1
3.5	51.6	51.6	79.2	70.4	70.4	118.2	89.7	89.7	148.5
4	39.5	39.5	60.7	53.9	53.9	90.5	68.7	68.7	113.7
4.5	31.2	31.2	47.9	42.6	42.6	71.5	54.3	54.3	89.8
5	25.3	25.3	38.8	34.5	34.5	57.9	44.0	44.0	72.8
5.5	20.9	20.9	32.1	28.5	28.5	47.9	36.3	36.3	60.1

Notes:

- * Theoretical allowable loads are based on uniform span lengths.
- * LL (S) is allowable live load based on stress limitation
- * LL (D) is allowable live load based on deflection limitation of L/180
- * WL is allowable wind load and has been increased by 33-1/3%.

SECTION PROPERTIES:				12" ZIMMERMAN SLC-1500					
Gauge	Thickness in.	Weight psf	Yield Stress ksi	Top in Compression (Positive Bending)			Bottom in Compression (Negative Bending)		
				I_{xx}	S_{xx}	M_a	I_{xx}	S_{xx}	M_a
				in ⁴ /ft	in ³ /ft	in.kips/ft	in ⁴ /ft	in ³ /ft	in.kips/ft
26	0.018	1.055	50.0	0.041	0.031	0.937	0.025	0.027	0.812
24	0.024	1.398	50.0	0.060	0.047	1.398	0.036	0.037	1.107
22	0.030	1.734	50.0	0.075	0.059	1.756	0.048	0.047	1.411

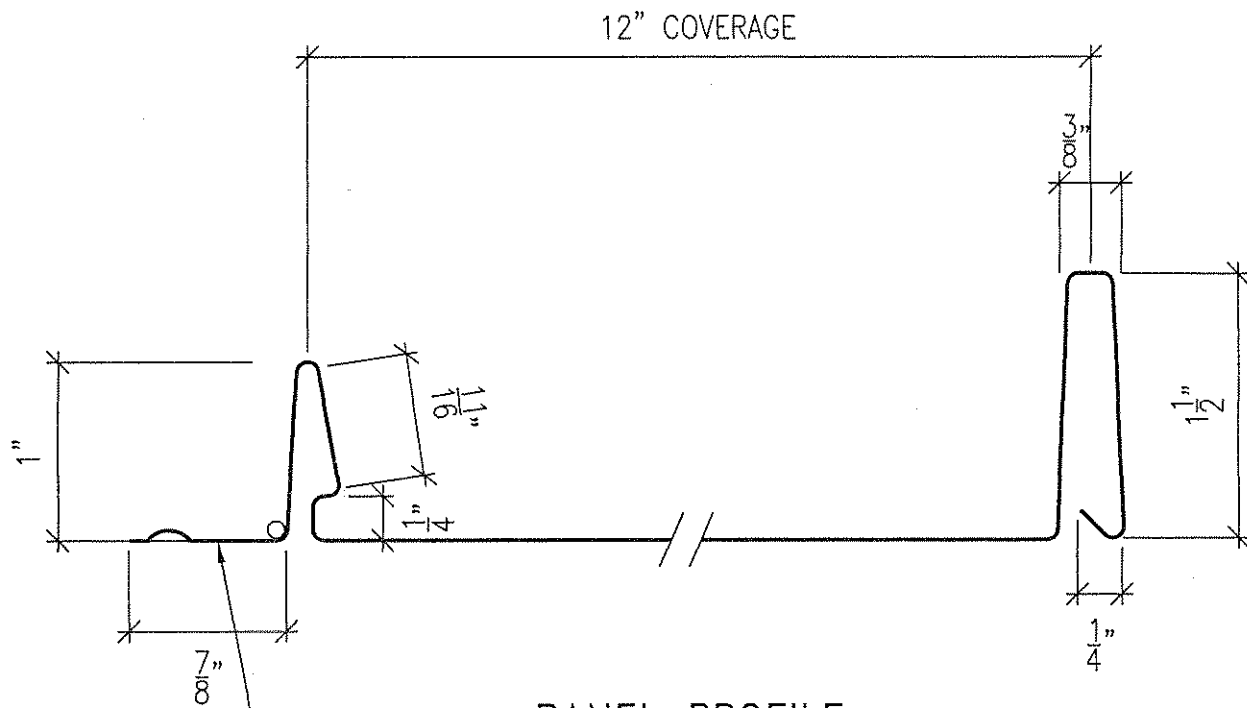
Notes on Section Properties and Load Table:

- * Section properties and allowables are calculated in accordance with 1996 AISI Specifications.
- * I +/- is for deflection determination.
- * S +/- is for bending determination.
- * M_a is allowable bending moment.
- * All values are for one foot of panel width.
- * These loads are for panel strength. Frames, purlins, clips, fasteners and all supports must be designed to resist all loads imposed on the panel,
- * Allowable outward loads based on stress have been increased by 33.33 % for wind uplift.
- * Allowable loads for deflection are based on deflection limitation of span/180.
- * For roof panels, self weight of the panel has to be deducted from the allowable inward load to arrive at the actual 'live load' carrying capacity of the panel.
- * Minimum bearing length must be checked.
- * Minimum deliverable bare steel thickness should not be less than 0.95 of design thickness.

ZIMMERMAN METALS, INC.
201 EAST 58th AVENUE
DENVER, CO 80216

SLC-1500
SNAP LOCK PANEL PROFILE

SCALE: N.T.S.

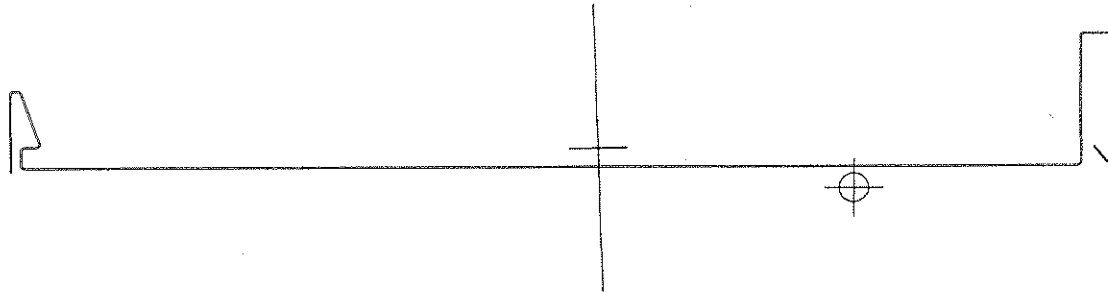


PANEL PROFILE

FASTENING FLANGE
(OPTIONAL)

Section: 12SLC1500-26GA.sct
 ZIMMERMAN 12 " SLC-1500-26 GA
 04-345
 Rev. Date: 11/21/2004 12:49:57 PM
 By: Yoosef Lavi, P.E.

Yoosef Lavi, P.E.
 Lavi & Associates
 9550 Forest Lane 108
 Dallas, Texas 75243
 Ph: (214) 340-0049, Fax: (214) 340-0067
 ylavi@sbcglobal.net



Section Inputs

Material: A653 SS Grade 50/1
 No 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

Part 1, Thickness 0.0179 in (26 Gage)

Placement of Part from Origin:

X to center of gravity 0 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	0.910	90.000	0.030000	Single	0.000	0.000	0.455
2	0.125	0.000	0.030000	None	0.000	0.000	0.063
3	0.688	-70.000	0.030000	None	0.000	0.000	0.344
4	0.250	180.000	0.030000	None	0.000	0.000	0.125
5	0.250	270.000	0.030000	None	0.000	0.000	0.125
6	11.813	0.000	0.030000	None	0.000	0.000	5.906
7	1.500	90.000	0.030000	Single	0.000	0.000	0.750
8	0.375	0.000	0.030000	None	0.000	0.000	0.188
9	1.550	270.000	0.030000	None	0.000	0.000	0.775
10	0.350	130.000	0.030000	None	0.000	0.000	0.175

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Full Section Properties

Area	0.31061 in ²	Wt.	0.0010561 k/ft	Width	17.353 in
Ix	0.0476 in ⁴	rx	0.391 in	Ixy	0.1675 in ⁴
Sx(t)	0.0370 in ³	y(t)	1.285 in	α	-88.378 deg
Sx(b)	0.1923 in ³	y(b)	0.247 in		
		Height	1.532 in		
Iy	5.9602 in ⁴	ry	4.380 in	Xo	2.851 in
Sy(l)	0.9098 in ³	x(l)	6.551 in	Yo	-0.445 in
Sy(r)	1.0404 in ³	x(r)	5.729 in	jx	-3.088 in
		Width	12.280 in	jy	10.379 in
I1	5.9649 in ⁴	r1	4.382 in		
I2	0.0428 in ⁴	r2	0.371 in		
Ic	6.0077 in ⁴	rc	4.398 in	Cw	0.66197 in ⁶
Io	8.5936 in ⁴	ro	5.260 in	J	0.00003317 in ⁴

Fully Braced Strength - 2001 AISI Specification - US (ASD)

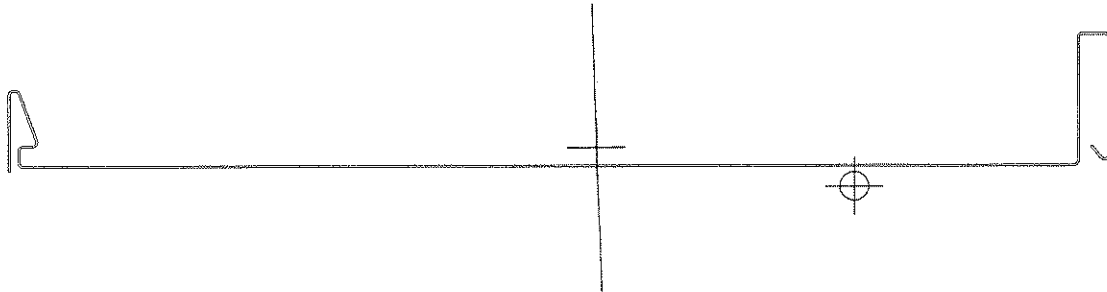
Compression		Positive Moment		Positive Moment	
Pao	2.0812 k	Maxo	0.937 k-in	Mayo	13.727 k-in
Ae	0.074922 in ²	Ixe	0.0411 in ⁴	Iye	3.5987 in ⁴
		Sxe(t)	0.03131 in ³	Sye(l)	0.81226 in ³
Tension		Sxe(b)	0.18655 in ³	Sye(r)	0.45848 in ³
Ta	9.2998 k	Negative Moment		Negative Moment	
		Maxo	0.812 k-in	Mayo	11.382 k-in
Shear		Ixe	0.0254 in ⁴	Iye	3.3497 in ⁴
Vay	0.5442 k	Sxe(t)	0.02713 in ³	Sye(l)	0.38015 in ³
Vax	0.0000 k	Sxe(b)	0.04255 in ³	Sye(r)	0.96583 in ³

Part 1 element 6 w/t exceeds 500.

Part 1 element 9 w/t exceeds 60.

Section: 12SLC1500-24GA.sct
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 9550 Forest Lane 108
 Dallas, Texas 75243
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Section Inputs

Material: A653 SS Grade 50/1
 No 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

Part 1, Thickness 0.0239 in (24 Gage)

Placement of Part from Origin:

X to center of gravity 0 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	0.910	90.000	0.040000	Single	0.000	0.000	0.455
2	0.125	0.000	0.040000	None	0.000	0.000	0.063
3	0.688	-70.000	0.040000	None	0.000	0.000	0.344
4	0.250	180.000	0.040000	None	0.000	0.000	0.125
5	0.250	270.000	0.040000	None	0.000	0.000	0.125
6	11.813	0.000	0.040000	None	0.000	0.000	5.906
7	1.500	90.000	0.040000	Single	0.000	0.000	0.750
8	0.375	0.000	0.040000	None	0.000	0.000	0.188
9	1.550	270.000	0.040000	None	0.000	0.000	0.775
10	0.350	130.000	0.040000	None	0.000	0.000	0.175

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Full Section Properties

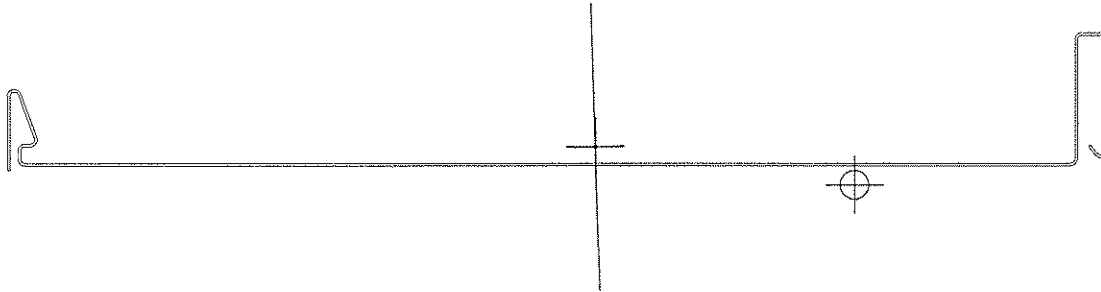
Area	0.41108 in ²	Wt.	0.0013977 k/ft	Width	17.200 in
Ix	0.062 in ⁴	rx	0.388 in	Ixy	0.224 in ⁴
Sx(t)	0.0481 in ³	y(t)	1.285 in	α	-88.348 deg
Sx(b)	0.2442 in ³	y(b)	0.253 in		
		Height	1.538 in		
Iy	7.823 in ⁴	ry	4.362 in	Xo	2.895 in
Sy(l)	1.1956 in ³	x(l)	6.543 in	Yo	-0.437 in
Sy(r)	1.3652 in ³	x(r)	5.731 in	jx	-3.128 in
		Width	12.274 in	jy	10.456 in
I1	7.830 in ⁴	r1	4.364 in		
I2	0.055 in ⁴	r2	0.367 in		
Ic	7.885 in ⁴	rc	4.380 in	Cw	0.83667 in ⁶
Io	11.409 in ⁴	ro	5.268 in	J	0.00007827 in ⁴

Fully Braced Strength - 2001 AISI Specification - US (ASD)

Compression		Positive Moment		Positive Moment	
Pao	3.183 k	Maxo	1.398 k-in	Mayo	21.326 k-in
Ae	0.11459 in ²	Ixe	0.0602 in ⁴	Iye	5.3121 in ⁴
		Sxe(t)	0.0467 in ³	Sye(l)	1.1030 in ³
		Sxe(b)	0.2427 in ³	Sye(r)	0.7123 in ³
Tension		Negative Moment		Negative Moment	
Ta	12.308 k	Maxo	1.107 k-in	Mayo	16.644 k-in
		Ixe	0.0361 in ⁴	Iye	4.7650 in ⁴
Shear		Sxe(t)	0.0370 in ³	Sye(l)	0.5559 in ³
Vay	0.972 k	Sxe(b)	0.0644 in ³	Sye(r)	1.2871 in ³
Vax	0.000 k				

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Section Inputs

Material: A653 SS Grade 50/1
 No 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

Part 1, Thickness 0.0299 in (22 Gage)

Placement of Part from Origin:

X to center of gravity 0 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	0.910	90.000	0.050000	Single	0.000	0.000	0.455
2	0.136	0.000	0.050000	None	0.000	0.000	0.063
3	0.688	-70.000	0.050000	None	0.000	0.000	0.344
4	0.250	180.000	0.050000	None	0.000	0.000	0.125
5	0.250	270.000	0.050000	None	0.000	0.000	0.125
6	11.813	0.000	0.050000	None	0.000	0.000	5.906
7	1.500	90.000	0.050000	Single	0.000	0.000	0.750
8	0.375	0.000	0.050000	None	0.000	0.000	0.188
9	1.550	270.000	0.050000	None	0.000	0.000	0.775
10	0.350	130.000	0.050000	None	0.000	0.000	0.175

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Full Section Properties

Area	0.51003 in ²	Wt.	0.0017341 k/ft	Width	17.058 in
Ix	0.075 in ⁴	rx	0.384 in	Ixy	0.279 in ⁴
Sx(t)	0.0586 in ³	y(t)	1.285 in	α	-88.331 deg
Sx(b)	0.2907 in ³	y(b)	0.259 in		
		Height	1.544 in		
Iy	9.637 in ⁴	ry	4.347 in	Xo	2.925 in
Sy(l)	1.4731 in ³	x(l)	6.542 in	Yo	-0.431 in
Sy(r)	1.6797 in ³	x(r)	5.737 in	jx	-3.151 in
		Width	12.279 in	jy	10.569 in
I1	9.645 in ⁴	r1	4.349 in		
I2	0.067 in ⁴	r2	0.363 in		
Ic	9.712 in ⁴	rc	4.364 in	Cw	1.0002 in ⁶
Io	14.170 in ⁴	ro	5.271 in	J	0.00015199 in ⁴

Fully Braced Strength - 2001 AISI Specification - US (ASD)

Compression		Positive Moment		Positive Moment	
Pao	4.448 k	Maxo	1.756 k-in	Mayo	30.009 k-in
Ae	0.16013 in ²	Ixe	0.0753 in ⁴	Iye	7.1578 in ⁴
		Sxe(t)	0.0586 in ³	Sye(l)	1.3933 in ³
		Sxe(b)	0.2907 in ³	Sye(r)	1.0023 in ³
Tension		Negative Moment		Negative Moment	
Ta	15.270 k	Maxo	1.411 k-in	Mayo	22.510 k-in
		Ixe	0.0479 in ⁴	Iye	6.2844 in ⁴
Shear		Sxe(t)	0.0471 in ³	Sye(l)	0.7518 in ³
Vay	1.217 k	Sxe(b)	0.0908 in ³	Sye(r)	1.6032 in ³
Vax	0.000 k				

STRUCTURAL CALCULATIONS FOR ZIMMERMAN METALS SERIES SLC-1500 14" WIDE (STEEL)

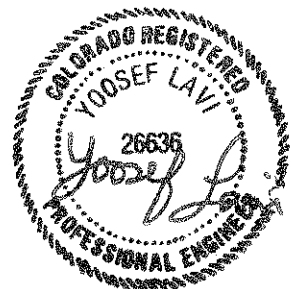
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November 22, 2004



NOV 22 2004

P.1-9

THEORETICAL ALLOWABLE LIVE AND WIND LOADS

14" ZIMMERMAN SLC-1500									
SPAN (ft)	SINGLE SPAN CONDITION								
	26 Gauge & 50 ksi			24 Gauge & 50 ksi			22 Gauge & 50 ksi		
	LL (S) (psf)	LL (D) (psf)	WL (psf)	LL (S) (psf)	LL (D) (psf)	WL (psf)	LL (S) (psf)	LL (D) (psf)	WL (psf)
2	134.1	134.1	154.5	200.6	200.6	210.5	253.9	253.9	268.3
2.5	85.9	85.9	98.9	128.4	128.4	134.7	162.5	162.5	171.7
3	59.6	59.6	68.7	89.1	89.1	93.6	112.8	112.8	119.2
3.5	43.8	43.8	50.4	65.5	65.5	68.7	82.9	82.9	87.6
4	33.5	33.5	38.6	50.1	50.1	52.6	63.5	63.5	67.1
4.5	26.5	26.5	30.5	39.6	39.6	41.6	50.1	50.1	53.0
5	21.5	21.5	24.7	32.1	32.1	33.7	40.6	40.6	42.9
5.5	17.7	17.7	20.4	26.5	26.5	27.8	33.6	33.6	35.5
SPAN (ft)	TWO SPAN CONDITION								
	26 Gauge & 50 ksi			24 Gauge & 50 ksi			22 Gauge & 50 ksi		
	LL (S) (psf)	LL (D) (psf)	WL (psf)	LL (S) (psf)	LL (D) (psf)	WL (psf)	LL (S) (psf)	LL (D) (psf)	WL (psf)
2	116.1	116.1	178.4	158.3	158.3	266.8	201.7	201.7	337.6
2.5	74.3	74.3	114.2	101.3	101.3	170.7	129.1	129.1	216.1
3	51.6	51.6	79.3	70.3	70.3	118.6	89.7	89.7	150.1
3.5	37.9	37.9	58.3	51.7	51.7	87.1	65.9	65.9	110.2
4	29.0	29.0	44.6	39.6	39.6	66.7	50.4	50.4	84.4
4.5	22.9	22.9	35.2	31.3	31.3	52.7	39.8	39.8	66.7
5	18.6	18.6	28.5	25.3	25.3	42.7	32.3	32.3	54.0
5.5	15.4	15.4	23.6	20.9	20.9	35.3	26.7	26.7	44.6
SPAN (ft)	THREE OR MORE SPAN CONDITION								
	26 Gauge & 50 ksi			24 Gauge & 50 ksi			22 Gauge & 50 ksi		
	LL (S) (psf)	LL (D) (psf)	WL (psf)	LL (S) (psf)	LL (D) (psf)	WL (psf)	LL (S) (psf)	LL (D) (psf)	WL (psf)
2	135.7	135.7	208.4	184.9	184.9	311.6	235.6	235.6	394.4
2.5	86.8	86.8	133.4	118.3	118.3	199.4	150.8	150.8	252.4
3	60.3	60.3	92.6	82.2	82.2	138.5	104.7	104.7	175.3
3.5	44.3	44.3	68.1	60.4	60.4	101.8	76.9	76.9	128.8
4	33.9	33.9	52.1	46.2	46.2	77.9	58.9	58.9	98.6
4.5	26.8	26.8	41.2	36.5	36.5	61.6	46.5	46.5	77.9
5	21.7	21.7	33.3	29.6	29.6	49.9	37.7	37.7	63.1
5.5	17.9	17.9	27.6	24.5	24.5	41.2	31.2	31.2	52.2

Notes:

- * Theoretical allowable loads are based on uniform span lengths.
- * LL (S) is allowable live load based on stress limitation
- * LL (D) is allowable live load based on deflection limitation of L/180
- * WL is allowable wind load and has been increased by 33-1/3%.

SECTION PROPERTIES:				14" ZIMMERMAN SLC-1500					
Gauge	Thickness in.	Weight psf	Yield Stress ksi	Top in Compression (Positive Bending)			Bottom in Compression (Negative Bending)		
				I_{xx}	S_{xx}	M_a	I_{xx}	S_{xx}	M_a
				in ⁴ /ft	in ³ /ft	in.kips/ft	in ⁴ /ft	in ³ /ft	in.kips/ft
26	0.018	1.010	50.0	0.036	0.027	0.805	0.022	0.023	0.697
24	0.024	1.337	50.0	0.053	0.040	1.203	0.031	0.032	0.950
22	0.030	1.661	50.0	0.066	0.051	1.523	0.041	0.040	1.210

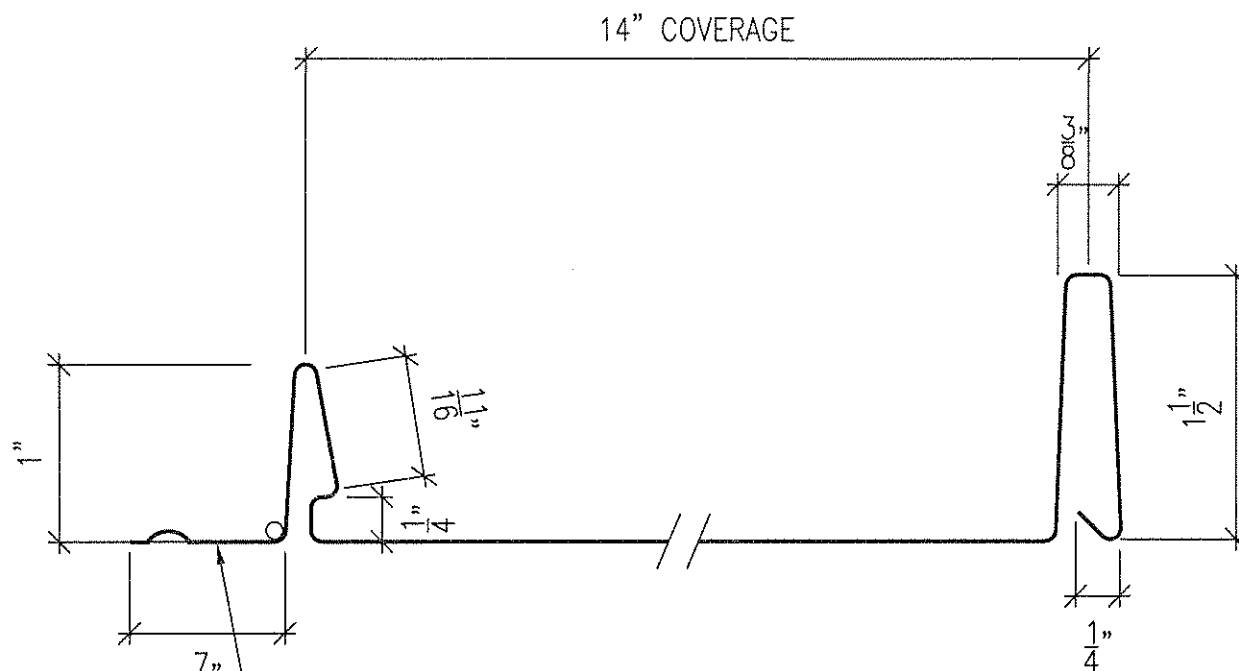
Notes on Section Properties and Load Table:

- * Section properties and allowables are calculated in accordance with 1996 AISI Specifications.
- * I +/- is for deflection determination.
- * S +/- is for bending determination.
- * M_a is allowable bending moment.
- * All values are for one foot of panel width.
- * These loads are for panel strength. Frames, purlins, clips, fasteners and all supports must be designed to resist all loads imposed on the panel,
- * Allowable outward loads based on stress have been increased by 33.33 % for wind uplift.
- * Allowable loads for deflection are based on deflection limitation of span/180.
- * For roof panels, self weight of the panel has to be deducted from the allowable inward load to arrive at the actual 'live load' carrying capacity of the panel.
- * Minimum bearing length must be checked.
- * Minimum deliverable bare steel thickness should not be less than 0.95 of design thickness.

ZIMMERMAN METALS, INC.
201 EAST 58th AVENUE
DENVER, CO 80216

SLC-1500
SNAP LOCK PANEL PROFILE

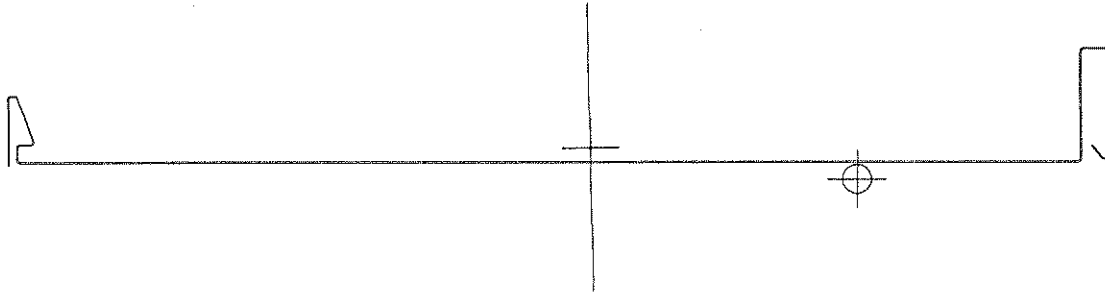
SCALE: N.T.S.



PANEL PROFILE

Section: 14SLC1500-26GA.sct
 ZIMMERMAN 14 " SLC-1500-26 GA
 04-345
 Rev. Date: 11/21/2004 12:52:04 PM
 By: Yoosef Lavi, P.E.

Yoosef Lavi, P.E.
 Lavi & Associates
 9550 Forest Lane 108
 Dallas, Texas 75243
 Ph: (214) 340-0049, Fax: (214) 340-0067
 ylavi@sbcglobal.net



Section Inputs

Material: A653 SS Grade 50/1

No 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

Part 1, Thickness 0.0179 in (26 Gage)

Placement of Part from Origin:

X to center of gravity 0 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	0.910	90.000	0.030000	Single	0.000	0.000	0.455
2	0.125	0.000	0.030000	None	0.000	0.000	0.063
3	0.688	-70.000	0.030000	None	0.000	0.000	0.344
4	0.250	180.000	0.030000	None	0.000	0.000	0.125
5	0.250	270.000	0.030000	None	0.000	0.000	0.125
6	13.812	0.000	0.030000	None	0.000	0.000	6.906
7	1.500	90.000	0.030000	Single	0.000	0.000	0.750
8	0.375	0.000	0.030000	None	0.000	0.000	0.188
9	1.550	270.000	0.030000	None	0.000	0.000	0.775
10	0.350	130.000	0.030000	None	0.000	0.000	0.175

Section: 14SLC1500-26GA.sct
 ZIMMERMAN 14 " SLC-1500-26 GA
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Yoosef Lavi, P.E.
 Lavi & Associates
 9550 Forest Lane 108
 Dallas, Texas 75243
 Ph: (214) 340-0049, Fax: (214) 340-0067
 ylavi@sbcglobal.net

Full Section Properties

Area	0.34640 in ²	Wt.	0.0011778 k/ft	Width	19.352 in
Ix	0.049 in ⁴	rx	0.376 in	Ixy	0.199 in ⁴
Sx(t)	0.0375 in ³	y(t)	1.306 in	α	-88.684 deg
Sx(b)	0.2166 in ³	y(b)	0.226 in		
		Height	1.532 in		
Iy	8.706 in ⁴	ry	5.013 in	Xo	3.454 in
Sy(l)	1.1499 in ³	x(l)	7.571 in	Yo	-0.411 in
Sy(r)	1.2978 in ³	x(r)	6.708 in	jx	-3.687 in
		Width	14.279 in	jy	14.321 in
I1	8.710 in ⁴	r1	5.014 in		
I2	0.044 in ⁴	r2	0.358 in		
Ic	8.755 in ⁴	rc	5.027 in	Cw	0.93975 in ⁶
Io	12.945 in ⁴	ro	6.113 in	J	0.00003700 in ⁴

Fully Braced Strength - 2001 AISI Specification - US (ASD)

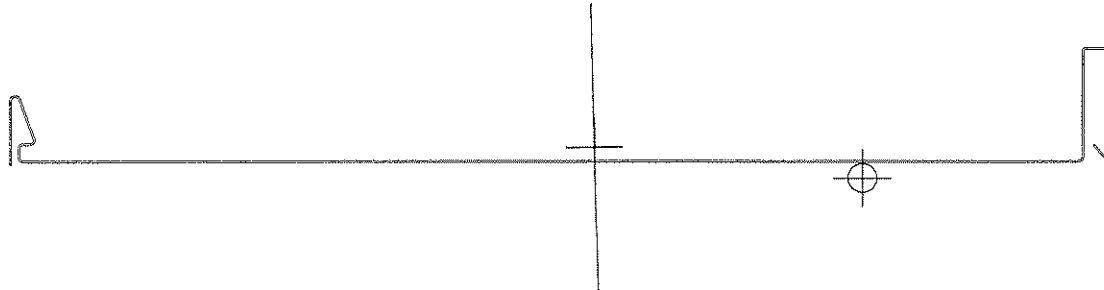
Compression		Positive Moment		Positive Moment	
Pao	2.082 k	Maxo	0.939 k-in	Mayo	16.061 k-in
Ae	0.074956 in ²	Ixe	0.0418 in ⁴	Iye	5.0033 in ⁴
		Sxe(t)	0.0313 in ³	Sye(l)	1.0103 in ³
		Sxe(b)	0.2093 in ³	Sye(r)	0.5364 in ³
Tension		Negative Moment		Negative Moment	
Ta	10.371 k	Maxo	0.813 k-in	Mayo	13.306 k-in
		Ixe	0.0254 in ⁴	Iye	4.6131 in ⁴
Shear		Sxe(t)	0.0271 in ³	Sye(l)	0.4444 in ³
Vay	0.544 k	Sxe(b)	0.0426 in ³	Sye(r)	1.1832 in ³
Vax	0.000 k				

Part 1 element 6 w/t exceeds 500.

Part 1 element 9 w/t exceeds 60.

Section: 14SLC1500-24GA.sct
 ZIMMERMAN 14 " SLC-1500-24 GA
 04-345
 Rev. Date: 11/21/2004 12:57:59 PM
 By: Yoosef Lavi, P.E.

Yoosef Lavi, P.E.
 Lavi & Associates
 9550 Forest Lane 108
 Dallas, Texas 75243
 Ph: (214) 340-0049, Fax: (214) 340-0067
 ylavi@sbcglobal.net



Section Inputs

Material: A653 SS Grade 50/1
 No 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

Part 1, Thickness 0.0239 in (24 Gage)

Placement of Part from Origin:

X to center of gravity 0 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	0.910	90.000	0.040000	Single	0.000	0.000	0.455
2	0.125	0.000	0.040000	None	0.000	0.000	0.063
3	0.688	-70.000	0.040000	None	0.000	0.000	0.344
4	0.250	180.000	0.040000	None	0.000	0.000	0.125
5	0.250	270.000	0.040000	None	0.000	0.000	0.125
6	13.812	0.000	0.040000	None	0.000	0.000	6.906
7	1.500	90.000	0.040000	Single	0.000	0.000	0.750
8	0.375	0.000	0.040000	None	0.000	0.000	0.188
9	1.550	270.000	0.040000	None	0.000	0.000	0.775
10	0.350	130.000	0.040000	None	0.000	0.000	0.175

Section: 14SLC1500-24GA.sct
 ZIMMERMAN 14 " SLC-1500-24 GA
 04-345
 Rev. Date: 11/21/2004 12:57:59 PM
 By: Yoosef Lavi, P.E.

Yoosef Lavi, P.E.
 Lavi & Associates
 9550 Forest Lane 108
 Dallas, Texas 75243
 Ph: (214) 340-0049, Fax: (214) 340-0067
 ylavi@sbcglobal.net

Full Section Properties

Area	0.45886 in ²	Wt.	0.0015601 k/ft	Width	19.199 in
Ix	0.064 in ⁴	rx	0.372 in	Ixy	0.266 in ⁴
Sx(t)	0.0487 in ³	y(t)	1.306 in	α	-88.662 deg
Sx(b)	0.2741 in ³	y(b)	0.232 in		
		Height	1.538 in		
Iy	11.441 in ⁴	ry	4.993 in	Xo	3.510 in
Sy(l)	1.5128 in ³	x(l)	7.563 in	Yo	-0.403 in
Sy(r)	1.7050 in ³	x(r)	6.710 in	jx	-3.739 in
		Width	14.273 in	jy	14.428 in
I1	11.448 in ⁴	rl	4.995 in		
I2	0.057 in ⁴	r2	0.354 in		
Ic	11.505 in ⁴	rc	5.007 in	Cw	1.1890 in ⁶
Io	17.233 in ⁴	ro	6.128 in	J	0.00008737 in ⁴

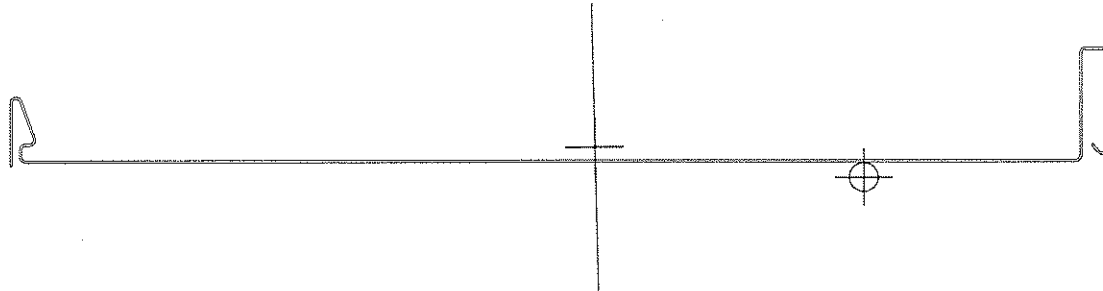
Fully Braced Strength - 2001 AISI Specification - US (ASD)

Compression		Positive Moment		Positive Moment	
Pao	3.185 k	Maxo	1.404 k-in	Mayo	24.984 k-in
Ae	0.11467 in ²	Ixe	0.0615 in ⁴	Iye	7.4169 in ⁴
		Sxe(t)	0.0469 in ³	Sye(l)	1.3773 in ³
Tension		Sxe(b)	0.2718 in ³	Sye(r)	0.8345 in ³
Ta	13.738 k	Negative Moment		Negative Moment	
		Maxo	1.108 k-in	Mayo	19.476 k-in
Shear		Ixe	0.0362 in ⁴	Iye	6.5783 in ⁴
Vay	0.972 k	Sxe(t)	0.0370 in ³	Sye(l)	0.6505 in ³
Vax	0.000 k	Sxe(b)	0.0645 in ³	Sye(r)	1.5811 in ³

Part 1 element 6 w/t exceeds 500.

Section: 14SLC1500-22GA.sct
 ZIMMERMAN 14 " SLC-1500-22 GA
 04-345
 Rev. Date: 11/21/2004 1:02:45 PM
 By: Yoosef Lavi, P.E.

Yoosef Lavi, P.E.
 Lavi & Associates
 9550 Forest Lane 108
 Dallas, Texas 75243
 Ph: (214) 340-0049, Fax: (214) 340-0067
 ylavi@sbcglobal.net



Section Inputs

Material: A653 SS Grade 50/1
 No 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

Part 1, Thickness 0.0299 in (22 Gage)

Placement of Part from Origin:

X to center of gravity 0 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	0.910	90.000	0.050000	Single	0.000	0.000	0.455
2	0.136	0.000	0.050000	None	0.000	0.000	0.063
3	0.688	-70.000	0.050000	None	0.000	0.000	0.344
4	0.250	180.000	0.050000	None	0.000	0.000	0.125
5	0.250	270.000	0.050000	None	0.000	0.000	0.125
6	13.812	0.000	0.050000	None	0.000	0.000	6.906
7	1.500	90.000	0.050000	Single	0.000	0.000	0.750
8	0.375	0.000	0.050000	None	0.000	0.000	0.188
9	1.550	270.000	0.050000	None	0.000	0.000	0.775
10	0.350	130.000	0.050000	None	0.000	0.000	0.175

Section: 14SLC1500-22GA.sct
 ZIMMERMAN 14 " SLC-1500-22 GA
 04-345
 Rev. Date: 11/21/2004 1:02:45 PM
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Yoosef Lavi, P.E.
 Lavi & Associates
 9550 Forest Lane 108
 Dallas, Texas 75243
 Ph: (214) 340-0049, Fax: (214) 340-0067
 ylavi@sbcglobal.net

Full Section Properties

Area	0.56981 in ²	Wt.	0.0019374 k/ft	Width	19.057 in
Ix	0.077 in ⁴	rx	0.369 in	Ixy	0.331 in ⁴
Sx(t)	0.0593 in ³	y(t)	1.306 in	α	-88.650 deg
Sx(b)	0.3254 in ³	y(b)	0.238 in		
		Height	1.544 in		
Iy	14.108 in ⁴	ry	4.976 in	Xo	3.548 in
Sy(l)	1.8660 in ³	x(l)	7.561 in	Yo	-0.397 in
Sy(r)	2.1003 in ³	x(r)	6.717 in	jx	-3.770 in
		Width	14.278 in	jy	14.578 in
I1	14.116 in ⁴	r1	4.977 in		
I2	0.070 in ⁴	r2	0.350 in		
Ic	14.186 in ⁴	rc	4.990 in	Cw	1.4233 in ⁶
Io	21.448 in ⁴	ro	6.135 in	J	0.00016981 in ⁴

Fully Braced Strength - 2001 AISI Specification - US (ASD)

Compression		Positive Moment		Positive Moment	
Pao	4.452 k	Maxo	1.777 k-in	Mayo	35.205 k-in
Ae	0.16028 in ²	Ixe	0.077 in ⁴	Iye	10.032 in ⁴
		Sxe(t)	0.0593 in ³	Sye(l)	1.7458 in ³
		Sxe(b)	0.3254 in ³	Sye(r)	1.1758 in ³
Tension		Negative Moment		Negative Moment	
Ta	17.060 k	Maxo	1.412 k-in	Mayo	26.365 k-in
		Ixe	0.048 in ⁴	Iye	8.695 in ⁴
Shear		Sxe(t)	0.0472 in ³	Sye(l)	0.8806 in ³
Vay	1.217 k	Sxe(b)	0.0912 in ³	Sye(r)	1.9746 in ³
Vax	0.000 k				

STRUCTURAL CALCULATIONS FOR ZIMMERMAN METALS SERIES SLC-1500 16" WIDE (STEEL)

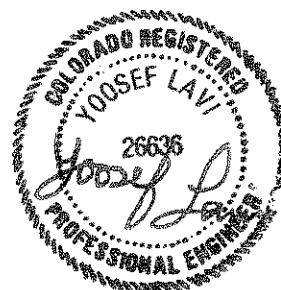
Prepared for:
Zimmerman Metals, inc.
201 East 58th Avenue
Denver, CO 80216

Prepared by:
Yoosef Lavi, P.E.
Consulting Engineer
9550 Forest Lane, #108
Dallas, TX 75243
[Job #04-345]

TABLE OF CONTENTS

1.	Theoretical allowable live and wind loads	1
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4.	Calculations	4-9

November 22, 2004



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P.1-9

THEORETICAL ALLOWABLE LIVE AND WIND LOADS

16" ZIMMERMAN SLC-1500									
SPAN (ft)	SINGLE SPAN CONDITION								
	26 Gauge & 50 ksi			24 Gauge & 50 ksi			22 Gauge & 50 ksi		
	LL (S) (psf)	LL (D) (psf)	WL (psf)	LL (S) (psf)	LL (D) (psf)	WL (psf)	LL (S) (psf)	LL (D) (psf)	WL (psf)
2	117.5	117.5	135.2	175.5	175.5	184.2	224.3	224.3	234.9
2.5	75.2	75.2	86.5	112.3	112.3	117.9	143.5	143.5	150.3
3	52.2	52.2	60.1	78.0	78.0	81.9	99.7	99.7	104.4
3.5	38.4	38.4	44.1	57.3	57.3	60.1	73.2	73.2	76.7
4	29.4	29.4	33.8	43.9	43.9	46.1	56.1	56.1	58.7
4.5	23.2	23.2	26.7	34.7	34.7	36.4	44.3	44.3	46.4
5	18.8	18.8	21.6	28.1	28.1	29.5	35.9	35.9	37.6
5.5	15.5	15.5	17.9	23.2	23.2	24.4	29.7	29.7	31.1
SPAN (ft)	TWO SPAN CONDITION								
	26 Gauge & 50 ksi			24 Gauge & 50 ksi			22 Gauge & 50 ksi		
	LL (S) (psf)	LL (D) (psf)	WL (psf)	LL (S) (psf)	LL (D) (psf)	WL (psf)	LL (S) (psf)	LL (D) (psf)	WL (psf)
2	101.6	101.6	156.3	138.5	138.5	233.4	176.6	176.6	298.3
2.5	65.0	65.0	100.0	88.6	88.6	149.4	113.0	113.0	190.9
3	45.2	45.2	69.5	61.6	61.6	103.7	78.5	78.5	132.6
3.5	33.2	33.2	51.0	45.2	45.2	76.2	57.7	57.7	97.4
4	25.4	25.4	39.1	34.6	34.6	58.4	44.2	44.2	74.6
4.5	20.1	20.1	30.9	27.4	27.4	46.1	34.9	34.9	58.9
5	16.3	16.3	25.0	22.2	22.2	37.3	28.3	28.3	47.7
5.5	13.4	13.4	20.7	18.3	18.3	30.9	23.4	23.4	39.4
SPAN (ft)	THREE OR MORE SPAN CONDITION								
	26 Gauge & 50 ksi			24 Gauge & 50 ksi			22 Gauge & 50 ksi		
	LL (S) (psf)	LL (D) (psf)	WL (psf)	LL (S) (psf)	LL (D) (psf)	WL (psf)	LL (S) (psf)	LL (D) (psf)	WL (psf)
2	118.7	118.7	182.6	161.8	161.8	272.7	206.3	206.3	348.4
2.5	76.0	76.0	116.8	103.6	103.6	174.5	132.1	132.1	223.0
3	52.8	52.8	81.1	71.9	71.9	121.2	91.7	91.7	154.9
3.5	38.8	38.8	59.6	52.8	52.8	89.0	67.4	67.4	113.8
4	29.7	29.7	45.6	40.4	40.4	68.2	51.6	51.6	87.1
4.5	23.5	23.5	36.1	32.0	32.0	53.9	40.8	40.8	68.8
5	19.0	19.0	29.2	25.9	25.9	43.6	33.0	33.0	55.7
5.5	15.7	15.7	24.1	21.4	21.4	36.1	27.3	27.3	46.1

Notes:

- * Theoretical allowable loads are based on uniform span lengths.
- * LL (S) is allowable live load based on stress limitation
- * LL (D) is allowable live load based on deflection limitation of L/180
- * WL is allowable wind load and has been increased by 33-1/3%.

SECTION PROPERTIES:				16" ZIMMERMAN SLC-1500					
Gauge	Thickness in.	Weight psf	Yield Stress ksi	Top in Compression (Positive Bending)			Bottom in Compression (Negative Bending)		
				I_{xx}	S_{xx}	M_a	I_{xx}	S_{xx}	M_a
				in ⁴ /ft	in ³ /ft	in.kips/ft	in ⁴ /ft	in ³ /ft	in.kips/ft
26	0.018	0.975	50.0	0.032	0.024	0.705	0.019	0.020	0.610
24	0.024	1.292	50.0	0.047	0.035	1.053	0.027	0.028	0.831
22	0.030	1.606	50.0	0.059	0.045	1.346	0.036	0.035	1.060

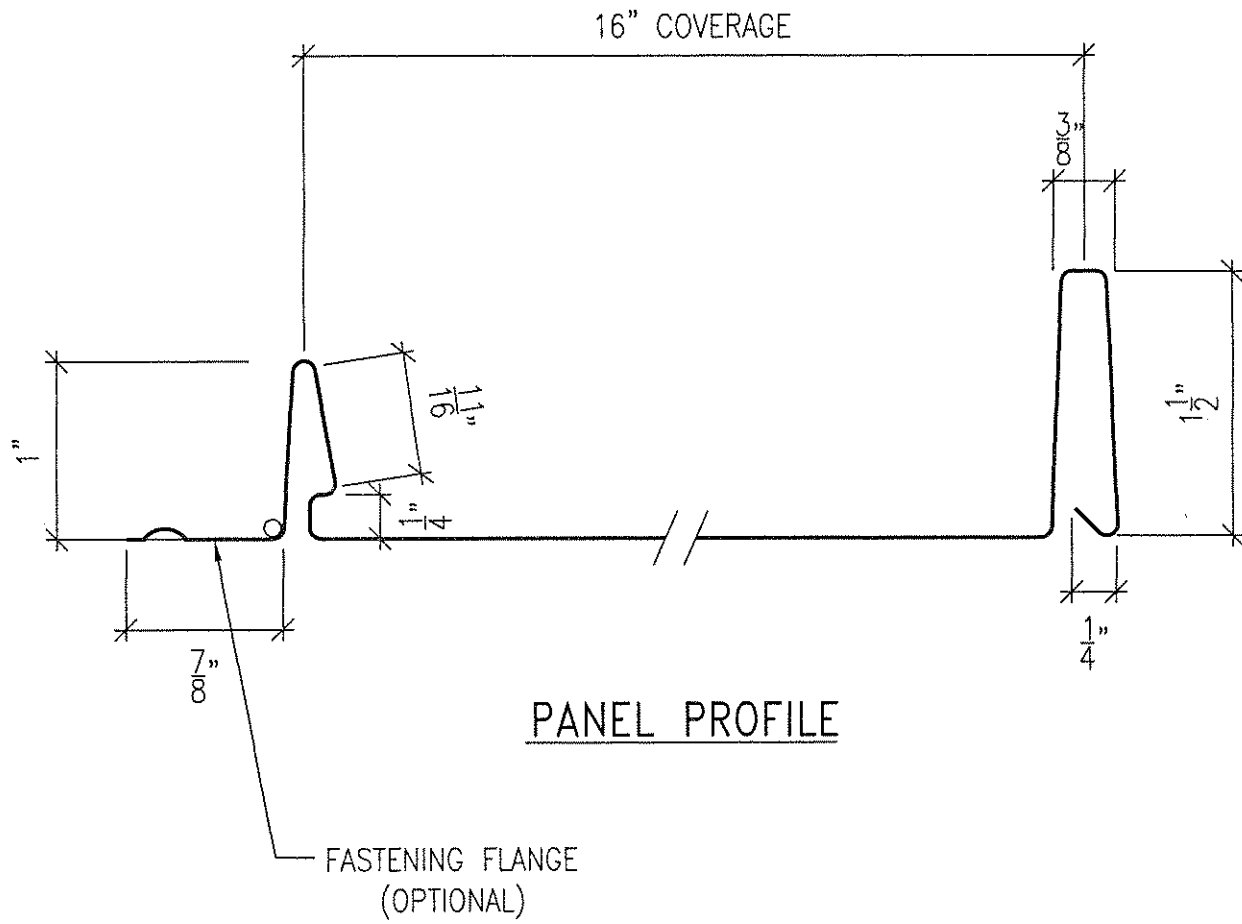
Notes on Section Properties and Load Table:

- * Section properties and allowables are calculated in accordance with 1996 AISI Specifications.
- * I +/- is for deflection determination.
- * S +/- is for bending determination.
- * M_a is allowable bending moment.
- * All values are for one foot of panel width.
- * These loads are for panel strength. Frames, purlins, clips, fasteners and all supports must be designed to resist all loads imposed on the panel,
- * Allowable outward loads based on stress have been increased by 33.33 % for wind uplift.
- * Allowable loads for deflection are based on deflection limitation of span/180.
- * For roof panels, self weight of the panel has to be deducted from the allowable inward load to arrive at the actual 'live load' carrying capacity of the panel.
- * Minimum bearing length must be checked.
- * Minimum deliverable bare steel thickness should not be less than 0.95 of design thickness.

ZIMMERMAN METALS, INC.
201 EAST 58th AVENUE
DENVER, CO 80216

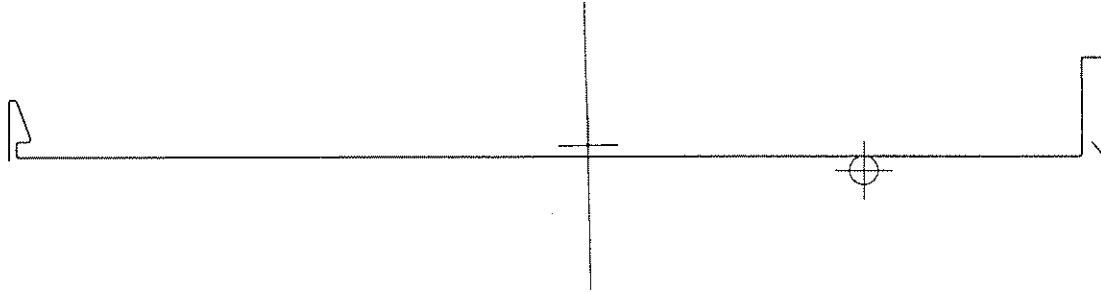
SLC-1500
SNAP LOCK PANEL PROFILE

SCALE: N.T.S.



Section: 16SLC1500-26GA.sct
 ZIMMERMAN 16 " SLC-1500-26 GA
 04-345
 Rev. Date: 11/21/2004 12:54:52 PM
 By: Yoosef Lavi, P.E.

Yoosef Lavi, P.E.
 Lavi & Associates
 9550 Forest Lane 108
 Dallas, Texas 75243
 Ph: (214) 340-0049, Fax: (214) 340-0067
 ylavi@sbcglobal.net



Section Inputs

Material: A653 SS Grade 50/1
 No 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

Part 1, Thickness 0.0179 in (26 Gage)

Placement of Part from Origin:

X to center of gravity 0 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	0.910	90.000	0.030000	Single	0.000	0.000	0.455
2	0.125	0.000	0.030000	None	0.000	0.000	0.063
3	0.688	-70.000	0.030000	None	0.000	0.000	0.344
4	0.250	180.000	0.030000	None	0.000	0.000	0.125
5	0.250	270.000	0.030000	None	0.000	0.000	0.125
6	15.812	0.000	0.030000	None	0.000	0.000	7.906
7	1.500	90.000	0.030000	Single	0.000	0.000	0.750
8	0.375	0.000	0.030000	None	0.000	0.000	0.188
9	1.550	270.000	0.030000	None	0.000	0.000	0.775
10	0.350	130.000	0.030000	None	0.000	0.000	0.175

Section: 16SLC1500-26GA.sct
 ZIMMERMAN 16 " SLC-1500-26 GA
 04-345
 Rev. Date: 11/21/2004 12:54:52 PM
 By: Yoosef Lavi, P.E.

Yoosef Lavi, P.E.
 Lavi & Associates
 9550 Forest Lane 108
 Dallas, Texas 75243
 Ph: (214) 340-0049, Fax: (214) 340-0067
 ylavi@sbcglobal.net

Full Section Properties

Area	0.38220 in ²	Wt.	0.0012995 k/ft	Width	21.352 in
Ix	0.050 in ⁴	rx	0.362 in	Ixy	0.231 in ⁴
Sx(t)	0.0378 in ³	y(t)	1.323 in	α	-88.908 deg
Sx(b)	0.2399 in ³	y(b)	0.209 in		
		Height	1.532 in		
Iy	12.144 in ⁴	ry	5.637 in	Xo	4.071 in
Sy(l)	1.4141 in ³	x(l)	8.588 in	Yo	-0.382 in
Sy(r)	1.5790 in ³	x(r)	7.691 in	jx	-4.300 in
		Width	16.279 in	jy	18.964 in
I1	12.149 in ⁴	r1	5.638 in		
I2	0.046 in ⁴	r2	0.346 in		
Ic	12.195 in ⁴	rc	5.649 in	Cw	1.2735 in ⁶
Io	18.586 in ⁴	ro	6.973 in	J	0.00004082 in ⁴

Fully Braced Strength - 2001 AISI Specification - US (ASD)

Compression		Positive Moment		Positive Moment	
Pao	2.083 k	Maxo	0.940 k-in	Mayo	18.396 k-in
Ae	0.074981 in ²	Ixe	0.0423 in ⁴	Iye	6.6565 in ⁴
		Sxe(t)	0.0314 in ³	Sye(l)	1.2223 in ³
Tension		Sxe(b)	0.2310 in ³	Sye(r)	0.6144 in ³
Ta	11.443 k	Negative Moment		Negative Moment	
		Maxo	0.813 k-in	Mayo	15.227 k-in
Shear		Ixe	0.0254 in ⁴	Iye	6.0878 in ⁴
Vay	0.544 k	Sxe(t)	0.0272 in ³	Sye(l)	0.5086 in ³
Vax	0.000 k	Sxe(b)	0.0427 in ³	Sye(r)	1.4127 in ³

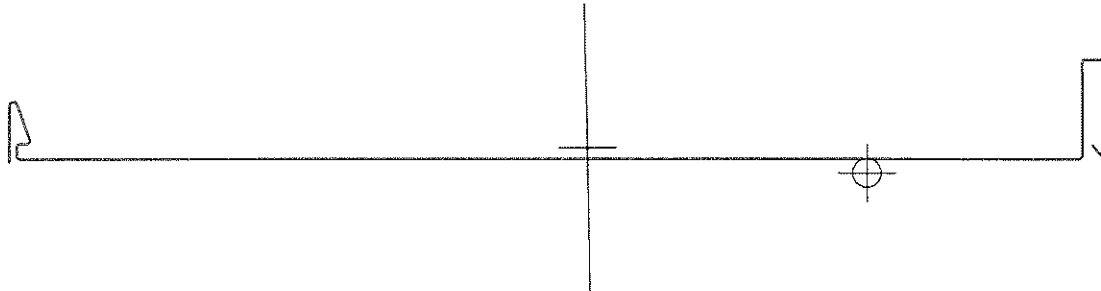
Part 1 element 6 w/t exceeds 500.

Part 1 element 9 w/t exceeds 60.

5

Section: 16SLC1500-24GA.sct
 ZIMMERMAN 16 " SLC-1500-24 GA
 04-345
 Rev. Date: 11/21/2004 12:58:31 PM
 By: Yoosef Lavi, P.E.

Yoosef Lavi, P.E.
 Lavi & Associates
 9550 Forest Lane 108
 Dallas, Texas 75243
 Ph: (214) 340-0049, Fax: (214) 340-0067
 ylavi@sbcglobal.net



Section Inputs

Material: A653 SS Grade 50/1

No 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

Part 1, Thickness 0.0239 in (24 Gage)

Placement of Part from Origin:

X to center of gravity 0 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	0.910	90.000	0.040000	Single	0.000	0.000	0.455
2	0.125	0.000	0.040000	None	0.000	0.000	0.063
3	0.688	-70.000	0.040000	None	0.000	0.000	0.344
4	0.250	180.000	0.040000	None	0.000	0.000	0.125
5	0.250	270.000	0.040000	None	0.000	0.000	0.125
6	15.812	0.000	0.040000	None	0.000	0.000	7.906
7	1.500	90.000	0.040000	Single	0.000	0.000	0.750
8	0.375	0.000	0.040000	None	0.000	0.000	0.188
9	1.550	270.000	0.040000	None	0.000	0.000	0.775
10	0.350	130.000	0.040000	None	0.000	0.000	0.175

Section: 16SLC1500-24GA.sct
 ZIMMERMAN 16 " SLC-1500-24 GA
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 Dallas, Texas 75243
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 ylavi@sbcglobal.net

Full Section Properties

Area	0.50666 in ²	Wt.	0.0017227 k/ft	Width	21.199 in
Ix	0.065 in ⁴	rx	0.358 in	Ixy	0.308 in ⁴
Sx(t)	0.0491 in ³	y(t)	1.323 in	α	-88.891 deg
Sx(b)	0.3027 in ³	y(b)	0.215 in		
		Height	1.538 in		
Iy	15.978 in ⁴	ry	5.616 in	Xo	4.140 in
Sy(l)	1.8624 in ³	x(l)	8.579 in	Yo	-0.374 in
Sy(r)	2.0766 in ³	x(r)	7.694 in	jx	-4.363 in
		Width	16.273 in	jy	19.105 in
I1	15.984 in ⁴	r1	5.617 in		
I2	0.059 in ⁴	r2	0.341 in		
Ic	16.043 in ⁴	rc	5.627 in	Cw	1.6123 in ⁶
Io	24.796 in ⁴	ro	6.996 in	J	0.00009647 in ⁴

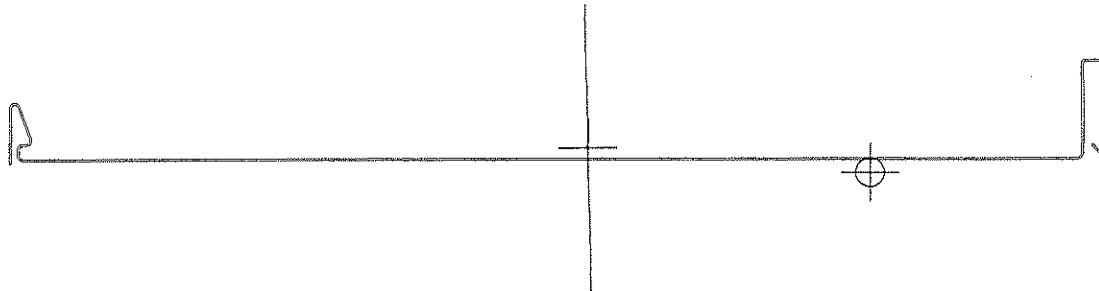
Fully Braced Strength - 2001 AISI Specification - US (ASD)

Compression		Positive Moment		Positive Moment	
Pao	3.187 k	Maxo	1.404 k-in	Mayo	28.643 k-in
Ae	0.11473 in ²	Ixe	0.0623 in ⁴	Iye	9.9021 in ⁴
		Sxe(t)	0.0469 in ³	Sye(l)	1.6719 in ³
		Sxe(b)	0.2993 in ³	Sye(r)	0.9567 in ³
Tension		Negative Moment		Negative Moment	
Ta	15.170 k	Maxo	1.108 k-in	Mayo	22.305 k-in
		Ixe	0.0362 in ⁴	Iye	8.6986 in ⁴
Shear		Sxe(t)	0.0370 in ³	Sye(l)	0.7450 in ³
Vay	0.972 k	Sxe(b)	0.0646 in ³	Sye(r)	1.8923 in ³
Vax	0.000 k				

Part 1 element 6 w/t exceeds 500.

Section: 16SLC1500-22GA.sct
 ZIMMERMAN 16 " SLC-1500-22 GA
 04-345
 Rev. Date: 11/21/2004 1:03:08 PM
 By: Yoosef Lavi, P.E.

Yoosef Lavi, P.E.
 Lavi & Associates
 9550 Forest Lane 108
 Dallas, Texas 75243
 Ph: (214) 340-0049, Fax: (214) 340-0067
 ylavi@sbcglobal.net



Section Inputs

Material: A653 SS Grade 50/1
 No 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

Part 1, Thickness 0.0299 in (22 Gage)

Placement of Part from Origin:

X to center of gravity 0 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	0.910	90.000	0.050000	Single	0.000	0.000	0.455
2	0.136	0.000	0.050000	None	0.000	0.000	0.063
3	0.688	-70.000	0.050000	None	0.000	0.000	0.344
4	0.250	180.000	0.050000	None	0.000	0.000	0.125
5	0.250	270.000	0.050000	None	0.000	0.000	0.125
6	15.812	0.000	0.050000	None	0.000	0.000	7.906
7	1.500	90.000	0.050000	Single	0.000	0.000	0.750
8	0.375	0.000	0.050000	None	0.000	0.000	0.188
9	1.550	270.000	0.050000	None	0.000	0.000	0.775
10	0.350	130.000	0.050000	None	0.000	0.000	0.175

Section: 16SLC1500-22GA.sct
 ZIMMERMAN 16 " SLC-1500-22 GA
 04-345
 Rev. Date: 11/21/2004 1:03:08 PM
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 Lavi & Associates
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 Dallas, Texas 75243
 Ph: (214) 340-0049, Fax: (214) 340-0067
 ylavi@sbcglobal.net

Full Section Properties

Area	0.62961 in ²	Wt.	0.0021407 k/ft	Width	21.057 in
Ix	0.079 in ⁴	rx	0.355 in	Ixy	0.383 in ⁴
Sx(t)	0.0599 in ³	y(t)	1.323 in	α	-88.882 deg
Sx(b)	0.3584 in ³	y(b)	0.221 in		
		Height	1.544 in		
Iy	19.720 in ⁴	ry	5.597 in	Xo	4.186 in
Sy(l)	2.2994 in ³	x(l)	8.576 in	Yo	-0.368 in
Sy(r)	2.5605 in ³	x(r)	7.702 in	jx	-4.403 in
		Width	16.278 in	jy	19.296 in
I1	19.728 in ⁴	r1	5.598 in		
I2	0.072 in ⁴	r2	0.338 in		
Ic	19.800 in ⁴	rc	5.608 in	Cw	1.9316 in ⁶
Io	30.915 in ⁴	ro	7.007 in	J	0.00018763 in ⁴

Fully Braced Strength - 2001 AISI Specification - US (ASD)

Compression		Positive Moment		Positive Moment	
Pao	4.456 k	Maxo	1.794 k-in	Mayo	40.401 k-in
Ae	0.16040 in ²	Ixe	0.079 in ⁴	Iye	13.435 in ⁴
		Sxe(t)	0.0599 in ³	Sye(l)	2.1254 in ³
Tension		Sxe(b)	0.3584 in ³	Sye(r)	1.3494 in ³
Ta	18.851 k	Negative Moment		Negative Moment	
		Maxo	1.413 k-in	Mayo	30.213 k-in
Shear		Ixe	0.048 in ⁴	Iye	11.519 in ⁴
Vay	1.217 k	Sxe(t)	0.0472 in ³	Sye(l)	1.0091 in ³
Vax	0.000 k	Sxe(b)	0.0915 in ³	Sye(r)	2.3686 in ³

Part 1 element 6 w/t exceeds 500.

STRUCTURAL CALCULATIONS FOR ZIMMERMAN METALS SERIES SLC-1500 20" WIDE (STEEL)

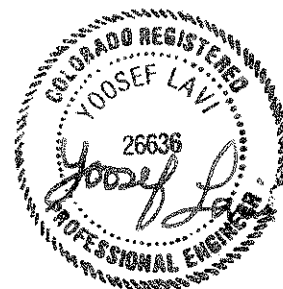
Prepared for:
Zimmerman Metals, inc.
201 East 58th Avenue
Denver, CO 80216

Prepared by:
Yoosef Lavi, P.E.
Consulting Engineer
9550 Forest Lane, #108
Dallas, TX 75243
[Job #04-345]

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November 22, 2004



NOV 22 2004

P.1-9

THEORETICAL ALLOWABLE LIVE AND WIND LOADS

20" ZIMMERMAN SLC-1500									
SPAN (ft)	SINGLE SPAN CONDITION								
	26 Gauge & 50 ksi			24 Gauge & 50 ksi			22 Gauge & 50 ksi		
	LL (S) (psf)	LL (D) (psf)	WL (psf)	LL (S) (psf)	LL (D) (psf)	WL (psf)	LL (S) (psf)	LL (D) (psf)	WL (psf)
2	94.1	94.1	108.1	140.4	140.4	147.5	176.0	176.0	188.2
2.5	60.2	60.2	69.2	89.9	89.9	94.4	112.6	112.6	120.4
3	41.8	41.8	48.1	62.4	62.4	65.6	78.2	78.2	83.6
3.5	30.7	30.7	35.3	45.8	45.8	48.2	57.5	57.5	61.5
4	23.5	23.5	27.0	35.1	35.1	36.9	44.0	44.0	47.0
4.5	18.6	18.6	21.4	27.7	27.7	29.1	34.8	34.8	37.2
5	15.1	15.1	17.3	22.5	22.5	23.6	28.2	28.2	30.1
5.5	12.4	12.4	14.3	18.6	18.6	19.5	23.3	23.3	24.9
SPAN (ft)	TWO SPAN CONDITION								
	26 Gauge & 50 ksi			24 Gauge & 50 ksi			22 Gauge & 50 ksi		
	LL (S) (psf)	LL (D) (psf)	WL (psf)	LL (S) (psf)	LL (D) (psf)	WL (psf)	LL (S) (psf)	LL (D) (psf)	WL (psf)
2	81.3	81.3	125.2	110.9	110.9	186.7	141.5	141.5	234.1
2.5	52.0	52.0	80.1	71.0	71.0	119.5	90.6	90.6	149.8
3	36.1	36.1	55.6	49.3	49.3	83.0	62.9	62.9	104.0
3.5	26.5	26.5	40.9	36.2	36.2	61.0	46.2	46.2	76.4
4	20.3	20.3	31.3	27.7	27.7	46.7	35.4	35.4	58.5
4.5	16.1	16.1	24.7	21.9	21.9	36.9	28.0	28.0	46.2
5	13.0	13.0	20.0	17.7	17.7	29.9	22.6	22.6	37.5
5.5	10.8	10.8	16.5	14.7	14.7	24.7	18.7	18.7	31.0
SPAN (ft)	THREE OR MORE SPAN CONDITION								
	26 Gauge & 50 ksi			24 Gauge & 50 ksi			22 Gauge & 50 ksi		
	LL (S) (psf)	LL (D) (psf)	WL (psf)	LL (S) (psf)	LL (D) (psf)	WL (psf)	LL (S) (psf)	LL (D) (psf)	WL (psf)
2	95.0	95.0	146.2	129.6	129.6	218.1	165.3	165.3	273.5
2.5	60.8	60.8	93.6	82.9	82.9	139.6	105.8	105.8	175.0
3	42.2	42.2	65.0	57.6	57.6	97.0	73.5	73.5	121.5
3.5	31.0	31.0	47.7	42.3	42.3	71.2	54.0	54.0	89.3
4	23.7	23.7	36.6	32.4	32.4	54.5	41.3	41.3	68.4
4.5	18.8	18.8	28.9	25.6	25.6	43.1	32.7	32.7	54.0
5	15.2	15.2	23.4	20.7	20.7	34.9	26.4	26.4	43.8
5.5	12.6	12.6	19.3	17.1	17.1	28.8	21.9	21.9	36.2

Notes:

- * Theoretical allowable loads are based on uniform span lengths.
- * LL (S) is allowable live load based on stress limitation
- * LL (D) is allowable live load based on deflection limitation of L/180
- * WL is allowable wind load and has been increased by 33-1/3%.

SECTION PROPERTIES:				20" ZIMMERMAN SLC-1500					
Gauge	Thickness in.	Weight psf	Yield Stress ksi	Top in Compression (Positive Bending)			Bottom in Compression (Negative Bending)		
				I_{xx}	S_{xx}	M_a	I_{xx}	S_{xx}	M_a
				in ⁴ /ft	in ³ /ft	in.kips/ft	in ⁴ /ft	in ³ /ft	in.kips/ft
26	0.018	0.926	50.0	0.026	0.019	0.565	0.015	0.016	0.488
24	0.024	1.229	50.0	0.038	0.028	0.842	0.022	0.022	0.665
22	0.030	1.528	50.0	0.048	0.035	1.056	0.029	0.028	0.849

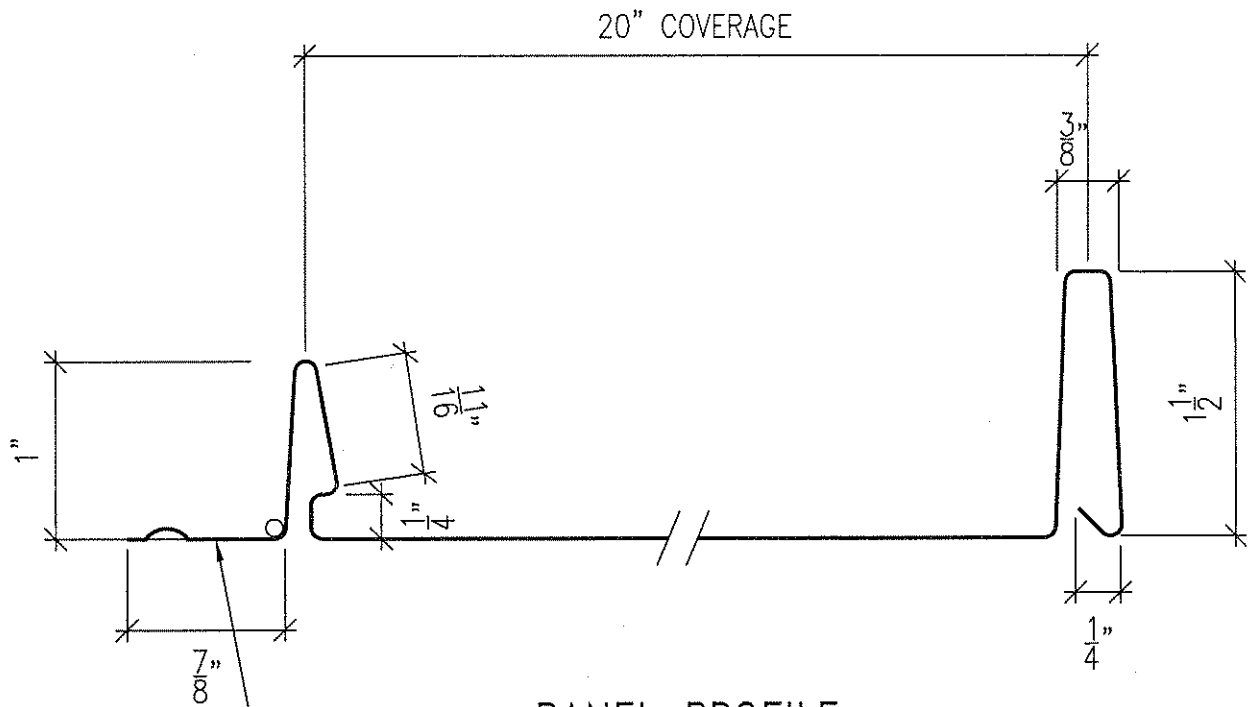
Notes on Section Properties and Load Table:

- * Section properties and allowables are calculated in accordance with 1996 AISI Specifications.
- * I +/- is for deflection determination.
- * S +/- is for bending determination.
- * M_a is allowable bending moment.
- * All values are for one foot of panel width.
- * These loads are for panel strength. Frames, purlins, clips, fasteners and all supports must be designed to resist all loads imposed on the panel,
- * Allowable outward loads based on stress have been increased by 33.33 % for wind uplift.
- * Allowable loads for deflection are based on deflection limitation of span/180.
- * For roof panels, self weight of the panel has to be deducted from the allowable inward load to arrive at the actual 'live load' carrying capacity of the panel.
- * Minimum bearing length must be checked.
- * Minimum deliverable bare steel thickness should not be less than 0.95 of design thickness.

ZIMMERMAN METALS, INC.
201 EAST 58th AVENUE
DENVER, CO 80216

SLC-1500
SNAP LOCK PANEL PROFILE

SCALE: N.T.S.

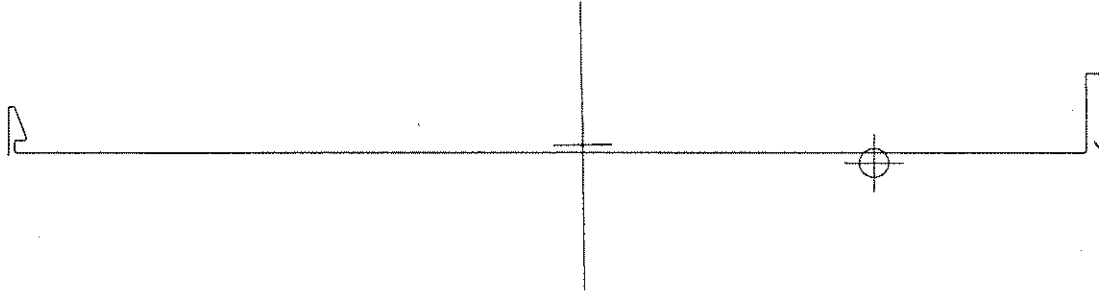


PANEL PROFILE

FASTENING FLANGE
(OPTIONAL)

Section: 20SLC1500-26GA.sct
 ZIMMERMAN 20 " SLC-1500-26 GA
 04-345
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 By: Yoosef Lavi, P.E.

Yoosef Lavi, P.E.
 Lavi & Associates
 9550 Forest Lane 108
 Dallas, Texas 75243
 Ph: (214) 340-0049, Fax: (214) 340-0067
 ylavi@sbcglobal.net



Section Inputs

Material: A653 SS Grade 50/1
 No 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

Part 1, Thickness 0.0179 in (26 Gage)

Placement of Part from Origin:

X to center of gravity 0 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	0.910	90.000	0.030000	Single	0.000	0.000	0.455
2	0.125	0.000	0.030000	None	0.000	0.000	0.063
3	0.688	-70.000	0.030000	None	0.000	0.000	0.344
4	0.250	180.000	0.030000	None	0.000	0.000	0.125
5	0.250	270.000	0.030000	None	0.000	0.000	0.125
6	19.812	0.000	0.030000	None	0.000	0.000	9.906
7	1.500	90.000	0.030000	Single	0.000	0.000	0.750
8	0.375	0.000	0.030000	None	0.000	0.000	0.188
9	1.550	270.000	0.030000	None	0.000	0.000	0.775
10	0.350	130.000	0.030000	None	0.000	0.000	0.175

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 Lavi & Associates
 9550 Forest Lane 108
 Dallas, Texas 75243
 Ph: (214) 340-0049, Fax: (214) 340-0067
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Full Section Properties

Area	0.45380 in ²	Wt.	0.0015429 k/ft	Width	25.352 in
Ix	0.052 in ⁴	rx	0.338 in	Ixy	0.295 in ⁴
Sx(t)	0.0383 in ³	y(t)	1.350 in	α	-89.209 deg
Sx(b)	0.2841 in ³	y(b)	0.182 in		
		Height	1.532 in		
Iy	21.386 in ⁴	ry	6.865 in	Xo	5.339 in
Sy(l)	2.0150 in ³	x(l)	10.613 in	Yo	-0.333 in
Sy(r)	2.2125 in ³	x(r)	9.666 in	jx	-5.555 in
		Width	20.279 in	jy	30.352 in
I1	21.390 in ⁴	r1	6.866 in		
I2	0.048 in ⁴	r2	0.324 in		
Ic	21.438 in ⁴	rc	6.873 in	Cw	2.1134 in ⁶
Io	34.423 in ⁴	ro	8.709 in	J	0.00004847 in ⁴

Fully Braced Strength - 2001 AISI Specification - US (ASD)

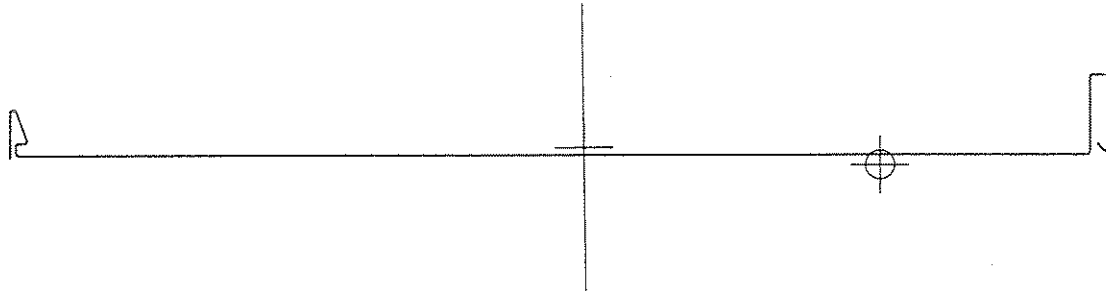
Compression		Positive Moment		Positive Moment	
Pao	2.084 k	Maxo	0.941 k-in	Mayo	23.071 k-in
Ae	0.075015 in ²	Ixe	0.043 in ⁴	Iye	10.724 in ⁴
		Sxe(t)	0.0314 in ³	Sye(l)	1.6854 in ³
		Sxe(b)	0.2717 in ³	Sye(r)	0.7706 in ³
Tension		Negative Moment		Negative Moment	
Ta	13.587 k	Maxo	0.813 k-in	Mayo	19.067 k-in
		Ixe	0.025 in ⁴	Iye	9.680 in ⁴
Shear		Sxe(t)	0.0272 in ³	Sye(l)	0.6368 in ³
Vay	0.544 k	Sxe(b)	0.0427 in ³	Sye(r)	1.9055 in ³
Vax	0.000 k				

Part 1 element 6 w/t exceeds 500.

Part 1 element 9 w/t exceeds 60.

Section: 20SLC1500-24GA.sct
 ZIMMERMAN 20 " SLC-1500-24 GA
 04-345
 Rev. Date: 11/21/2004 12:59:07 PM
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Yoosef Lavi, P.E.
 Lavi & Associates
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Section Inputs

Material: A653 SS Grade 50/1
 No 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

Part 1, Thickness 0.0239 in (24 Gage)

Placement of Part from Origin:

X to center of gravity 0 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	0.910	90.000	0.040000	Single	0.000	0.000	0.455
2	0.125	0.000	0.040000	None	0.000	0.000	0.063
3	0.688	-70.000	0.040000	None	0.000	0.000	0.344
4	0.250	180.000	0.040000	None	0.000	0.000	0.125
5	0.250	270.000	0.040000	None	0.000	0.000	0.125
6	19.812	0.000	0.040000	None	0.000	0.000	9.906
7	1.500	90.000	0.040000	Single	0.000	0.000	0.750
8	0.375	0.000	0.040000	None	0.000	0.000	0.188
9	1.550	270.000	0.040000	None	0.000	0.000	0.775
10	0.350	130.000	0.040000	None	0.000	0.000	0.175

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 04-345
 Rev. Date: 11/21/2004 12:59:07 PM
 By: Yoosef Lavi, P.E.

Yoosef Lavi, P.E.
 Lavi & Associates
 9550 Forest Lane 108
 Dallas, Texas 75243
 Ph: (214) 340-0049, Fax: (214) 340-0067
 ylavi@sbcglobal.net

Full Section Properties

Area	0.60226 in ²	Wt.	0.0020477 k/ft	Width	25.199 in
Ix	0.067 in ⁴	rx	0.334 in	Ixy	0.393 in ⁴
Sx(t)	0.0498 in ³	y(t)	1.349 in	α	-89.199 deg
Sx(b)	0.3564 in ³	y(b)	0.189 in		
		Height	1.538 in		
Iy	28.185 in ⁴	ry	6.841 in	Xo	5.431 in
Sy(l)	2.6580 in ³	x(l)	10.604 in	Yo	-0.326 in
Sy(r)	2.9149 in ³	x(r)	9.669 in	jx	-5.641 in
		Width	20.273 in	jy	30.574 in
I1	28.191 in ⁴	r1	6.842 in		
I2	0.062 in ⁴	r2	0.320 in		
Ic	28.252 in ⁴	rc	6.849 in	Cw	2.6770 in ⁶
Io	46.078 in ⁴	ro	8.747 in	J	0.00011467 in ⁴

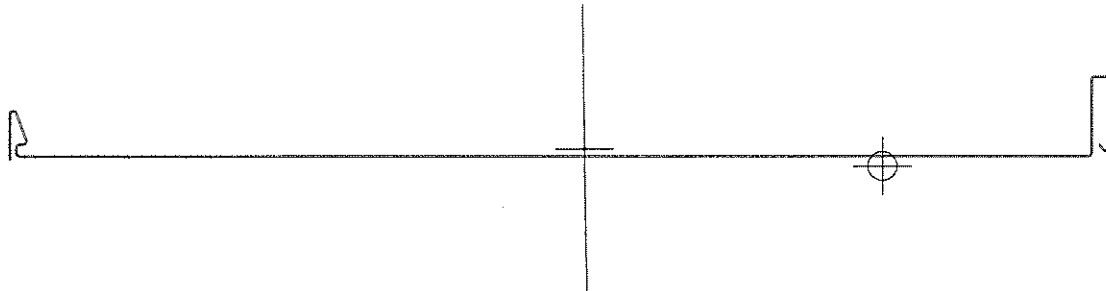
Fully Braced Strength - 2001 AISI Specification - US (ASD)

Compression		Positive Moment		Positive Moment	
Pao	3.189 k	Maxo	1.404 k-in	Mayo	35.967 k-in
Ae	0.11482 in ²	Ixe	0.064 in ⁴	Iye	16.040 in ⁴
		Sxe(t)	0.0469 in ³	Sye(l)	2.3176 in ³
Tension		Sxe(b)	0.3506 in ³	Sye(r)	1.2013 in ³
Ta	18.032 k	Negative Moment		Negative Moment	
		Maxo	1.109 k-in	Mayo	27.954 k-in
Shear		Ixe	0.036 in ⁴	Iye	13.873 in ⁴
Vay	0.972 k	Sxe(t)	0.0370 in ³	Sye(l)	0.9337 in ³
Vax	0.000 k	Sxe(b)	0.0648 in ³	Sye(r)	2.5625 in ³

Part 1 element 6 w/t exceeds 500.

Section: 20SLC1500-22GA.sct
 ZIMMERMAN 20 " SLC-1500-22 GA
 04-345
 Rev. Date: 11/21/2004 1:03:32 PM
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Yoosef Lavi, P.E.
 Lavi & Associates
 9550 Forest Lane 108
 Dallas, Texas 75243
 Ph: (214) 340-0049, Fax: (214) 340-0067
 ylavi@sbcglobal.net



Section Inputs

Material: A653 SS Grade 50/1
 No 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

Part 1, Thickness 0.0299 in (22 Gage)

Placement of Part from Origin:

X to center of gravity 0 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	0.910	90.000	0.050000	Single	0.000	0.000	0.455
2	0.136	0.000	0.050000	None	0.000	0.000	0.063
3	0.688	-70.000	0.050000	None	0.000	0.000	0.344
4	0.250	180.000	0.050000	None	0.000	0.000	0.125
5	0.250	270.000	0.050000	None	0.000	0.000	0.125
6	19.812	0.000	0.050000	None	0.000	0.000	9.906
7	1.500	90.000	0.050000	Single	0.000	0.000	0.750
8	0.375	0.000	0.050000	None	0.000	0.000	0.188
9	1.550	270.000	0.050000	None	0.000	0.000	0.775
10	0.350	130.000	0.050000	None	0.000	0.000	0.175

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Full Section Properties

Area	0.74921 in ²	Wt.	0.0025473 k/ft	Width	25.057 in
Ix	0.082 in ⁴	rx	0.331 in	Ixy	0.489 in ⁴
Sx(t)	0.0607 in ³	y(t)	1.349 in	α	-89.194 deg
Sx(b)	0.4195 in ³	y(b)	0.195 in		
		Height	1.544 in		
Iy	34.841 in ⁴	ry	6.819 in	Xo	5.492 in
Sy(l)	3.2869 in ³	x(l)	10.600 in	Yo	-0.320 in
Sy(r)	3.6001 in ³	x(r)	9.678 in	jx	-5.696 in
		Width	20.278 in	jy	30.859 in
I1	34.848 in ⁴	rl	6.820 in		
I2	0.075 in ⁴	r2	0.316 in		
Ic	34.923 in ⁴	rc	6.827 in	Cw	3.2103 in ⁶
Io	57.595 in ⁴	ro	8.768 in	J	0.00022327 in ⁴

Fully Braced Strength - 2001 AISI Specification - US (ASD)

Compression		Positive Moment		Positive Moment	
Pao	4.460 k	Maxo	1.760 k-in	Mayo	50.801 k-in
Ae	0.16057 in ²	Ixe	0.080 in ⁴	Iye	21.869 in ⁴
		Sxe(t)	0.0588 in ³	Sye(l)	2.9596 in ³
		Sxe(b)	0.4247 in ³	Sye(r)	1.6968 in ³
Tension		Negative Moment		Negative Moment	
Ta	22.432 k	Maxo	1.415 k-in	Mayo	37.904 k-in
		Ixe	0.048 in ⁴	Iye	18.426 in ⁴
Shear		Sxe(t)	0.0473 in ³	Sye(l)	1.2660 in ³
Vay	1.217 k	Sxe(b)	0.0919 in ³	Sye(r)	3.2192 in ³
Vax	0.000 k				

Part 1 element 6 w/t exceeds 500.