



Zimmerman Metals Inc.

STRUCTURAL CALCULATIONS

TSS2500 PANEL

Zimmerman Metals Inc.

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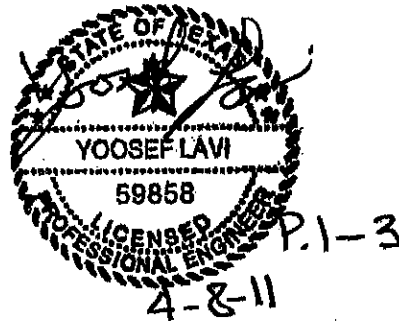
STRUCTURAL CALCULATIONS FOR ZIMMERMAN METALS MODEL TSS-2500 16" WIDE (STEEL)

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

Prepared by:
Lavi & Associates, L.P.
Consulting Engineers
10300 N. Central Expressway Ste # 322
Dallas, TX 75231
[Job #10-228]

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April 8, 2011

SECTION PROPERTIES:				16" ZIMMERMAN TSS2500					
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
24	0.024	1.314	50.0	0.218	0.102	3.051	0.127	0.097	2.897
22	0.030	1.641	50.0	0.302	0.143	4.296	0.177	0.131	3.939
20	0.035	2.122	50.0	0.369	0.178	5.331	0.214	0.155	4.622

Notes on Section Properties and Load Table:

- * Section properties and allowables are calculated in accordance with 2004 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 NOT** 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.

THEORETICAL ALLOWABLE LIVE AND WIND LOADS

16" ZIMMERMAN TSS2500									
SPAN (ft)	SINGLE SPAN CONDITION								
	24 Gauge & 50 ksi			22 Gauge & 50 ksi			20 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)
3	226.0	226.0	214.6	318.2	318.2	291.8	394.9	394.9	342.3
3.5	166.0	166.0	157.6	233.8	233.8	214.4	290.1	290.1	251.5
4	127.1	127.1	120.7	179.0	179.0	164.1	222.1	222.1	192.6
4.5	100.4	100.4	95.4	141.4	141.4	129.7	175.5	175.5	152.1
5	81.4	81.4	77.2	114.6	114.6	105.0	142.2	142.2	123.2
5.5	67.2	67.2	63.8	94.7	94.7	86.8	117.5	117.5	101.9
6	56.5	56.5	53.6	79.6	79.6	72.9	98.7	98.7	85.6
6.5	48.1	48.1	45.7	67.8	67.8	62.2	84.1	84.1	72.9
SPAN (ft)	TWO SPAN CONDITION								
	24 Gauge & 50 ksi			22 Gauge & 50 ksi			20 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)
3	214.6	214.6	226.0	291.8	291.8	318.2	342.3	342.3	394.9
3.5	157.6	157.6	166.0	214.4	214.4	233.8	251.5	251.5	290.1
4	120.7	120.7	127.1	164.1	164.1	179.0	192.6	192.6	222.1
4.5	95.4	95.4	100.4	129.7	129.7	141.4	152.1	152.1	175.5
5	77.2	77.2	81.4	105.0	105.0	114.6	123.2	123.2	142.2
5.5	63.8	63.8	67.2	86.8	86.8	94.7	101.9	101.9	117.5
6	53.6	53.6	56.5	72.9	72.9	79.6	85.6	85.6	98.7
6.5	45.7	45.7	48.1	62.2	62.2	67.8	72.9	72.9	84.1
SPAN (ft)	THREE OR MORE SPAN CONDITION								
	24 Gauge & 50 ksi			22 Gauge & 50 ksi			20 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)
3	250.6	250.6	264.0	340.9	340.9	371.8	399.9	399.9	461.3
3.5	184.2	184.2	194.0	250.4	250.4	273.1	293.8	293.8	338.9
4	141.0	141.0	148.5	191.7	191.7	209.1	225.0	225.0	259.5
4.5	111.4	111.4	117.3	151.5	151.5	165.2	177.7	177.7	205.0
5	90.2	90.2	95.0	122.7	122.7	133.8	144.0	144.0	166.1
5.5	74.6	74.6	78.6	101.4	101.4	110.6	119.0	119.0	137.3
6	62.7	62.7	66.0	85.2	85.2	92.9	100.0	100.0	115.3
6.5	53.4	53.4	56.2	72.6	72.6	79.2	85.2	85.2	98.3

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 NOT been increased by 33-1/3%.

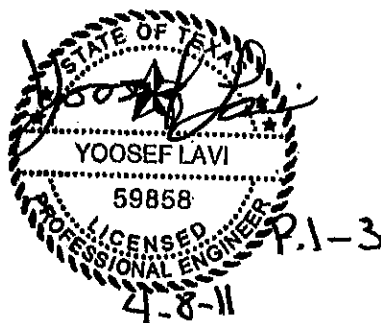
STRUCTURAL CALCULATIONS FOR ZIMMERMAN METALS MODEL TSS-2500 18" WIDE (STEEL)

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

Prepared by:
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Dallas, TX 75231
[Job #10-228]

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April 8, 2011

SECTION PROPERTIES:				18" ZIMMERMAN TSS2500					
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
24	0.024	1.276	50.0	0.199	0.091	2.730	0.113	0.086	2.577
22	0.030	1.595	50.0	0.275	0.129	3.846	0.117	0.117	3.503
20	0.035	1.843	50.0	0.337	0.159	4.774	0.137	0.137	4.110

Notes on Section Properties and Load Table:

- * Section properties and allowables are calculated in accordance with 2004 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 NOT** 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.

THEORETICAL ALLOWABLE LIVE AND WIND LOADS

18" ZIMMERMAN TSS2500									
SPAN (ft)	SINGLE SPAN CONDITION								
	24 Gauge & 50 ksi			22 Gauge & 50 ksi			20 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)
3	202.2	202.2	190.9	284.9	284.9	259.5	353.6	353.6	304.4
3.5	148.6	148.6	140.3	209.3	209.3	190.6	259.8	259.8	223.7
4	113.8	113.8	107.4	160.3	160.3	145.9	198.9	198.9	171.3
4.5	89.9	89.9	84.9	126.6	126.6	115.3	157.2	157.2	135.3
5	72.8	72.8	68.7	102.6	102.6	93.4	127.3	127.3	109.6
5.5	60.2	60.2	56.8	84.8	84.8	77.2	105.2	105.2	90.6
6	50.6	50.6	47.7	71.2	71.2	64.9	88.4	88.4	76.1
6.5	43.1	43.1	40.7	60.7	60.7	55.3	75.3	75.3	64.9
SPAN (ft)	TWO SPAN CONDITION								
	24 Gauge & 50 ksi			22 Gauge & 50 ksi			20 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)
3	190.9	190.9	202.2	259.5	259.5	284.9	304.4	304.4	353.6
3.5	140.3	140.3	148.6	190.6	190.6	209.3	223.7	223.7	259.8
4	107.4	107.4	113.8	145.9	145.9	160.3	171.3	171.3	198.9
4.5	84.9	84.9	89.9	115.3	115.3	126.6	135.3	135.3	157.2
5	68.7	68.7	72.8	93.4	93.4	102.6	109.6	109.6	127.3
5.5	56.8	56.8	60.2	77.2	77.2	84.8	90.6	90.6	105.2
6	47.7	47.7	50.6	64.9	64.9	71.2	76.1	76.1	88.4
6.5	40.7	40.7	43.1	55.3	55.3	60.7	64.9	64.9	75.3
SPAN (ft)	THREE OR MORE SPAN CONDITION								
	24 Gauge & 50 ksi			22 Gauge & 50 ksi			20 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)
3	223.0	223.0	236.2	303.1	303.1	332.8	355.7	355.7	413.1
3.5	163.9	163.9	173.6	222.7	222.7	244.5	261.3	261.3	303.5
4	125.5	125.5	132.9	170.5	170.5	187.2	200.1	200.1	232.4
4.5	99.1	99.1	105.0	134.7	134.7	147.9	158.1	158.1	183.6
5	80.3	80.3	85.0	109.1	109.1	119.8	128.0	128.0	148.7
5.5	66.4	66.4	70.3	90.2	90.2	99.0	105.8	105.8	122.9
6	55.8	55.8	59.1	75.8	75.8	83.2	88.9	88.9	103.3
6.5	47.5	47.5	50.3	64.6	64.6	70.9	75.8	75.8	88.0

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 NOT** been increased by 33-1/3%.

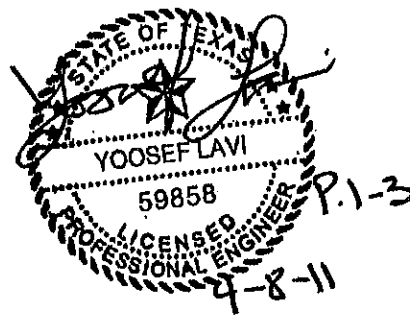
STRUCTURAL CALCULATIONS FOR ZIMMERMAN METALS MODEL TSS-2500 20" WIDE (STEEL)

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

Prepared by:
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Dallas, TX 75231
[Job #10-228]

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April 8, 2011

SECTION PROPERTIES:				20" ZIMMERMAN TSS2500					
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
24	0.024	1.246	50.0	0.182	0.083	2.470	0.102	0.077	2.321
22	0.030	1.557	50.0	0.253	0.116	3.481	0.105	0.105	3.154
20	0.035	1.800	50.0	0.310	0.144	4.322	0.124	0.124	3.701

Notes on Section Properties and Load Table:

- * Section properties and allowables are calculated in accordance with 2004 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 NOT** 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.

THEORETICAL ALLOWABLE LIVE AND WIND LOADS

20" ZIMMERMAN TSS2500									
SPAN (ft)	SINGLE SPAN CONDITION								
	24 Gauge & 50 ksi			22 Gauge & 50 ksi			20 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)
3	183.0	183.0	171.9	257.9	257.9	233.6	320.2	320.2	274.1
3.5	134.4	134.4	126.3	189.5	189.5	171.6	235.2	235.2	201.4
4	102.9	102.9	96.7	145.1	145.1	131.4	180.1	180.1	154.2
4.5	81.3	81.3	76.4	114.6	114.6	103.8	142.3	142.3	121.8
5	65.9	65.9	61.9	92.8	92.8	84.1	115.3	115.3	98.7
5.5	54.4	54.4	51.1	76.7	76.7	69.5	95.3	95.3	81.6
6	45.7	45.7	43.0	64.5	64.5	58.4	80.0	80.0	68.5
6.5	39.0	39.0	36.6	54.9	54.9	49.8	68.2	68.2	58.4

SPAN (ft)	TWO SPAN CONDITION								
	24 Gauge & 50 ksi			22 Gauge & 50 ksi			20 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)
3	171.9	171.9	183.0	233.6	233.6	257.9	274.1	274.1	320.2
3.5	126.3	126.3	134.4	171.6	171.6	189.5	201.4	201.4	235.2
4	96.7	96.7	102.9	131.4	131.4	145.1	154.2	154.2	180.1
4.5	76.4	76.4	81.3	103.8	103.8	114.6	121.8	121.8	142.3
5	61.9	61.9	65.9	84.1	84.1	92.8	98.7	98.7	115.3
5.5	51.1	51.1	54.4	69.5	69.5	76.7	81.6	81.6	95.3
6	43.0	43.0	45.7	58.4	58.4	64.5	68.5	68.5	80.0
6.5	36.6	36.6	39.0	49.8	49.8	54.9	58.4	58.4	68.2

SPAN (ft)	THREE OR MORE SPAN CONDITION								
	24 Gauge & 50 ksi			22 Gauge & 50 ksi			20 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)
3	200.8	200.8	213.8	272.9	272.9	301.2	320.2	320.2	374.0
3.5	147.5	147.5	157.0	200.5	200.5	221.3	235.3	235.3	274.8
4	113.0	113.0	120.2	153.5	153.5	169.5	180.1	180.1	210.4
4.5	89.3	89.3	95.0	121.3	121.3	133.9	142.3	142.3	166.2
5	72.3	72.3	77.0	98.2	98.2	108.4	115.3	115.3	134.7
5.5	59.8	59.8	63.6	81.2	81.2	89.6	95.3	95.3	111.3
6	50.2	50.2	53.4	68.2	68.2	75.3	80.1	80.1	93.5
6.5	42.8	42.8	45.5	58.1	58.1	64.2	68.2	68.2	79.7

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 NOT** been increased by 33-1/3%.

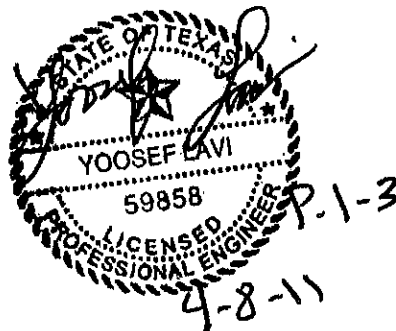
STRUCTURAL CALCULATIONS FOR ZIMMERMAN METALS MODEL TSS-2500 24" WIDE (STEEL)

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

Prepared by:
Lavi & Associates, L.P.
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10300 N. Central Expressway Ste # 322
Dallas, TX 75231
[Job #10-228]

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April 8, 2011

SECTION PROPERTIES:				24" ZIMMERMAN TSS2500					
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
24	0.024	1.201	50.0	0.157	0.069	2.075	0.085	0.065	1.936
22	0.030	1.500	50.0	0.218	0.098	2.926	0.088	0.088	2.630
20	0.035	1.736	50.0	0.268	0.122	3.635	0.103	0.103	3.086

Notes on Section Properties and Load Table:

- * Section properties and allowables are calculated in accordance with 2004 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 NOT** 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.

THEORETICAL ALLOWABLE LIVE AND WIND LOADS

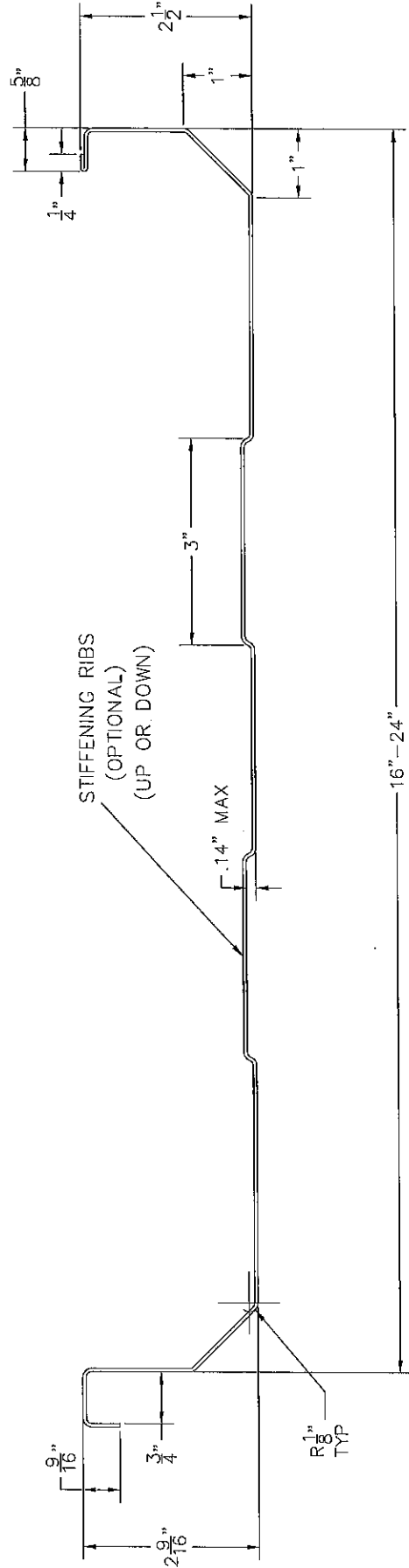
24" ZIMMERMAN TSS2500									
SPAN (ft)	SINGLE SPAN CONDITION								
	24 Gauge & 50 ksi			22 Gauge & 50 ksi			20 Gauge & 50 ksi		
	LL (S) (psf)	LL (D) (psf)	WL (psf)	LL (S) (psf)	LL (D) (psf)	WL (psf)	LL (S) (psf)	LL (D) (psf)	WL (psf)
3	153.7	153.7	143.4	216.7	216.7	194.8	269.2	269.2	228.6
3.5	112.9	112.9	105.4	159.2	159.2	143.1	197.8	197.8	167.9
4	86.4	86.4	80.7	121.9	121.9	109.6	151.4	151.4	128.6
4.5	68.3	68.3	63.7	96.3	96.3	86.6	119.7	119.7	101.6
5	55.3	55.3	51.6	78.0	78.0	70.1	96.9	96.9	82.3
5.5	45.7	45.7	42.7	64.5	64.5	58.0	80.1	80.1	68.0
6	38.4	38.4	35.9	54.2	54.2	48.7	67.3	67.3	57.1
6.5	32.7	32.7	30.5	46.2	46.2	41.5	57.3	57.3	48.7
SPAN (ft)	TWO SPAN CONDITION								
	24 Gauge & 50 ksi			22 Gauge & 50 ksi			20 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)
3	143.4	143.4	153.7	194.8	194.8	216.7	228.6	228.6	269.2
3.5	105.4	105.4	112.9	143.1	143.1	159.2	167.9	167.9	197.8
4	80.7	80.7	86.4	109.6	109.6	121.9	128.6	128.6	151.4
4.5	63.7	63.7	68.3	86.6	86.6	96.3	101.6	101.6	119.7
5	51.6	51.6	55.3	70.1	70.1	78.0	82.3	82.3	96.9
5.5	42.7	42.7	45.7	58.0	58.0	64.5	68.0	68.0	80.1
6	35.9	35.9	38.4	48.7	48.7	54.2	57.1	57.1	67.3
6.5	30.5	30.5	32.7	41.5	41.5	46.2	48.7	48.7	57.3
SPAN (ft)	THREE OR MORE SPAN CONDITION								
	24 Gauge & 50 ksi			22 Gauge & 50 ksi			20 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)
3	167.5	167.5	179.5	227.5	227.5	253.2	267.0	267.0	314.5
3.5	123.1	123.1	131.9	167.2	167.2	186.0	196.2	196.2	231.1
4	94.2	94.2	101.0	128.0	128.0	142.4	150.2	150.2	176.9
4.5	74.5	74.5	79.8	101.1	101.1	112.5	118.7	118.7	139.8
5	60.3	60.3	64.6	81.9	81.9	91.2	96.1	96.1	113.2
5.5	49.8	49.8	53.4	67.7	67.7	75.3	79.5	79.5	93.6
6	41.9	41.9	44.9	56.9	56.9	63.3	66.8	66.8	78.6
6.5	35.7	35.7	38.2	48.5	48.5	53.9	56.9	56.9	67.0

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 NOT** been increased by 33-1/3%.

MODEL TSS-2500

26 TO 20 Ga, GRADE "D", 50 KSI MIN. YIELD



ZIMMERMAN METALS INC.		201 E 58th AVE. DENVER, CO 80216 (303) 294-0180	
TITLE	TOLERANCES	UNLESS OTHERWISE SPECIFIED	3/4 ANGLE PROJ.
2-1/2" TRAPEZOIDAL	XX = ±0.015	FRACTION = 1/16"	3/4 ANGLE PROJ.
STANDING SEAM	XXX = ±0.005	ANGLES = 1/2"	3/4 ANGLE PROJ.
			3/4 ANGLE PROJ.
MACH. MOD. NO.	PROPRIETARY INFORMATION NOTICE		
	THIS DOCUMENT CONTAINS PROPRIETARY & CONFIDENTIAL INFORMATION		
	WHICH SHALL NOT BE REPRODUCED, TRANSMITTED TO OTHERS,		
	OR IN ANY MANNER WITHOUT THE WRITTEN PERMISSION OF ZIMMERMAN METALS INC. OF		
		DATE	DATE
DRAWING NO.	SCALE	DRAWN BY	DATE
TSS-2500	NIS	CEL	6/14/10
NOTES: ALL DIMENSIONS ± 10%		APPROV BY	DATE
MATERIAL USED: 6"			