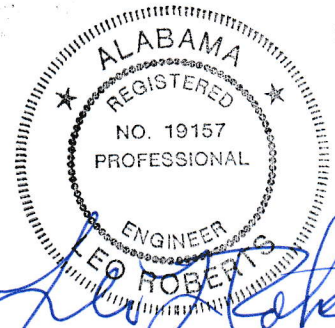




TOWER STRUCTURAL ANALYSIS
350' GUYED TOWER
SITE: TARRANT, ALABAMA
JEFFERSON COUNTY
10-25-13



Leo L. Roberts
11-11-12

LEO L. ROBERTS, P.E.
8809 N. 145th E. AVE. OWASSO, OK 74055
918-272-8680

**Tower Analysis- Tarrant, Alabama- 350' Guyed Tower
Jefferson County**

**10-25-13
Page 2**

Existing Guy Wire System:

<u>Elevation</u>	<u>Size & Type</u>	<u>Ultimate Strength</u>
55'	3/16" EHS	5.0 k
110'	3/16" EHS	5.0 k
165'	3/16" EHS	5.0 k
220'	3/16" EHS	5.0 k
275'	3/16" EHS	5.0 k
330'	3/16" EHS	5.0 k

Method of Analysis:

The tower was analyzed using "Risa Tower" computer program for lattice type guyed structures. This program is well recognized for its accuracy.

The tower was examined for conformance with EIA/TIA-222-F for a 70 MPH and no radial ice. The wind is applied to structure and tower appurtenances in accordance to EIA standards.

Existing and Proposed Loading:

<u>Load</u>	<u>Qty</u>	<u>Elev.</u>	<u>Waveguide</u>	<u>Mount</u>
No antenna	1	5'-350'	7/8" line	Leg
4' Dish	1	100'	Cat 5	Leg
2' Dish	1	100'	Cat 5	Leg
Dragonwave Radio	1	100'	Incl.	Leg

Also there is a red light kit on the tower and 3/4" conduit.

**Tower Analysis- Tarrant, Alabama- 350' Guyed Tower
Jefferson County**

**10-25-13
Page 3**

Results of Analysis:

Guy Wires:

There are (5) of the (6) guy wires which are over stressed. The largest is 53% over stress at 330' elevation.

Leg Members and Bracing Members:

The leg members and the bracing are satisfactory.

Summary and Recommendations:

It is recommended to upgrade the guy wires.

Results of Analysis-Upgraded Guy Wires:

Guy Wires:

<u>Elevation</u>	<u>Safety Factor</u>	<u>Allowable (kip)</u>
55'	2.5	2.0
110'	2.3	2.0
165' (New-5/16" EHS)	2.2	2.0
220'	2.5	2.0
275' (New-5/16" EHS)	2.3	2.0
330' (New-5/16" EHS)	2.7	2.0

Leg Members:

<u>Elevation</u>	<u>Load (kip)</u>	<u>Allowable (kip)</u>
0' - 350'	17.0	17.5

Diagonal Members:

<u>Elevation</u>	<u>Load (kip)</u>	<u>Allowable (kip)</u>
0' - 350'	1.3 kips	3.9 kips

**Tower Analysis- Tarrant, Alabama- 350' Guyed Tower
Jefferson County**

**10-25-13
Page 4**

Results of Analysis-Upgraded Guy Wires:

Horizontal Members:

Not load carrying.

Tower Reactions:

Base-	Down-	32.4 kips		
	Horiz.-	.29 kips		
	Inner: 165 ft.		Outer: 330 ft.	
Anchors-	Uplift-	5.3 kips	Uplift-	6.7 kips
	Horiz.-	7.3 kips	Horiz.-	8.2 kips
	Result.-	9.0 kips	Result.-	10.7 kips

Foundations:

The concrete foundations can not be analyzed without a geotechnical report.

The anchor shafts-1 3/4" dia. anchor shafts have a capacity of 51.9 kips so they are good.

Conclusion:

With the (3) guy wire upgrades, the tower will carry the existing and proposed antennas with no over stresses.

Assumptions:

1. The fasteners will meet the strength of the relative members.
2. The tower guy wires have an initial tension of 10% of their breaking strength.
3. All tower steel is 36M.
4. The anchor shafts are A36 steel.
5. The guy wires are standard EHS type.
6. The tower has no damage.

It is the responsibility of the tower owners and representatives to verify the tower loading.

The tower information to perform this analysis was provided by Mr. Stephen Poole of Crawford Broadcasting.

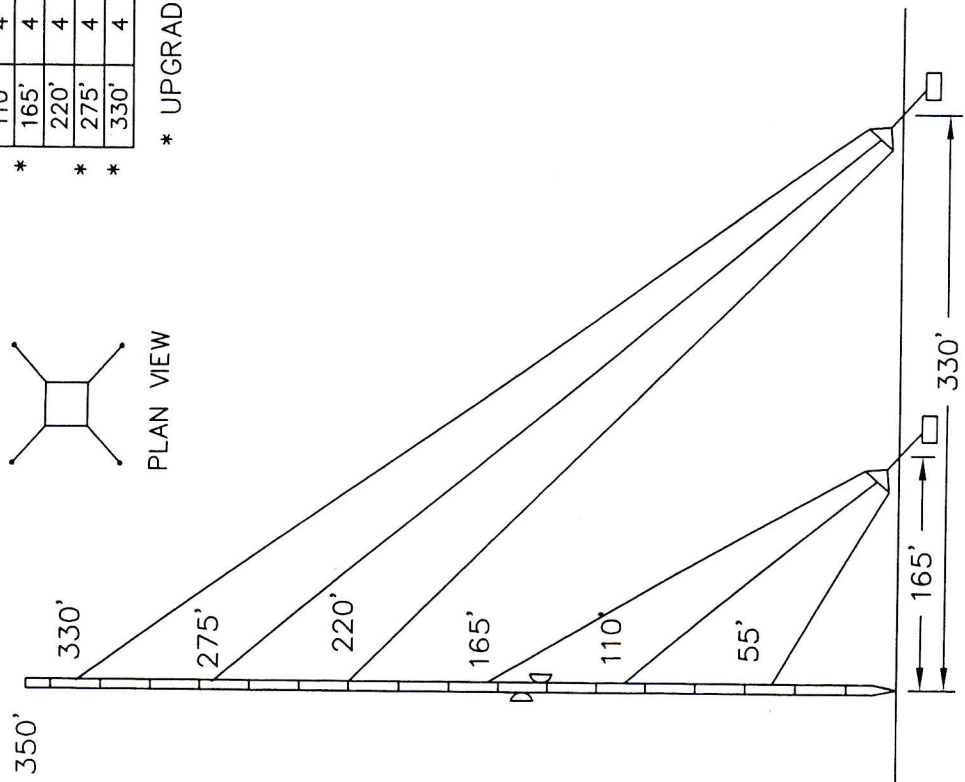
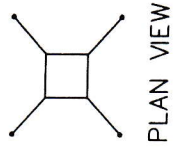
The information received was tower geometry, material sizes, including guy wire sizes and proposed antennas.

ANTENNAS

ELEV.	QTY.	SIZE	CORD LENGTH	CUT LENGTH	INITIAL TENSION	TYPE ANTENNA	QTY.	ELEV.	LINE
55'	4	3/16" EHS			.50	LINE ONLY	1	5'-350'	7/8"
110'	4	3/16" EHS			.50	4' DISH	1	100'	CAT 5
165'	4	5/16" EHS			1.12	2' DISH	1	100'	CAT 5
220'	4	3/16" EHS			.50	DRAGONWAVE RADIO	1	100'	CAT 5
275'	4	5/16" EHS			1.12	JUNCTION BOX	1	100'	CAT 5
330'	4	5/16" EHS			1.12		1	100'	INCL.

TOWER HAS LIGHT KIT AND CONDUIT

* UPGRADED GUY WIRES



BASE REACTIONS ANCHOR REACTIONS ANCHOR REACTIONS

TOWER	20" - SINGLE LACED - 6 BAY
HORIZ	L-1 1/4" X1 1/4" X3/16" A36M
DIAGS	L-1 1/4" X1 1/4" X3/16" A36M
LEGS	L-2" X2" X1/4" A36M

GENERAL NOTES:

1. TOWER IS LOCATED JEFFERSON COUNTY, ALABAMA.
2. TOWER IS ANALYZED FOR A 70 MPH BASIC WIND IN ACCORDANCE WITH THE TIA/EIA-222-F STANDARD.
3. DEFLECTIONS ARE BASED ON A 60 MPH WIND.

LEO L. ROBERTS, P.E.
(918) 272-8680 - 8809 N. 145TH E. AVE. - OWASSO, OK 74055

TOWER ANALYSIS - 350' - 20" SQUARE TOWER
 SITE: TARRANT, ALABAMA
 JEFFERSON COUNTY

DRAWN BY: TK
 DATE: 10-25-13
 JOB#: _____

DRAWING NO. TAL1013M

A	11-11-13	OUTER GUY ADIUS WAS 230' ERR	BY
NO	DATE	REVISION	

RISATower LEO L. ROBERTS, P.E. 8809 N.145TH E. AVE OWASSO, OK 74055 Phone: 918-272-8680 FAX: 918-272-2508	Job 19158 F With Ice	Page 46 of 48
	Project 350' 20" SQ. Guy Tower	Date 12:24:27 10/25/13
	Client Leo Roberts	Designed by LEO

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	SF*P _{allow} lb	% Capacity	Pass Fail
T1	350 - 340	Leg	L2x2x1/4	3	-1557.92	17718.37	8.8	Pass
		Diagonal	L1 1/4x1 1/4x3/16	17	-492.63	4024.43	12.2	Pass
		Horizontal	L1 1/4x1 1/4x3/16	24	-44.71	7722.60	0.6	Pass
		Top Girt	L1 1/4x1 1/4x3/16	10	-35.16	7722.60	0.5	Pass
		Bottom Girt	L1 1/4x1 1/4x3/16	16	-93.30	7722.60	1.2	Pass
		Inner Bracing	L1 1/4x1 1/4x3/16	5	-8.23	6648.04	0.1	Pass
		T2	340 - 320	Leg	L2x2x1/4	39	-4180.89	17514.15
Diagonal	L1 1/4x1 1/4x3/16			72	-1046.53	3987.56	26.2	Pass
Horizontal	L1 1/4x1 1/4x3/16			76	886.77	12484.38	7.1	Pass
Top Girt	L1 1/4x1 1/4x3/16			43	-111.73	7722.60	1.4	Pass
Bottom Girt	L1 1/4x1 1/4x3/16			50	-125.94	7722.60	1.6	Pass
Inner Bracing	L1 1/4x1 1/4x3/16			42	-32.37	6648.04	0.5	Pass
Guy A@330	5/16			1066	3338.05	5600.00	59.6	Pass
Guy B@330	5/16			1065	1187.71	5600.00	21.2	Pass
Guy C@330	5/16			1064	3337.41	5600.00	59.6	Pass
Guy D@330	5/16			1059	4106.75	5600.00	73.3	Pass
Top Guy Pull-Off@330	L1 1/2x1 1/2x3/16			1063	1078.50	15183.67	7.1	Pass
T3	320 - 300			Leg	L2x2x1/4	97	-4083.69	17514.15
		Diagonal	L1 1/4x1 1/4x3/16	153	-657.86	3987.56	16.5	Pass
		Horizontal	L1 1/4x1 1/4x3/16	149	64.44	12484.38	0.5	Pass
		Top Girt	L1 1/4x1 1/4x3/16	106	-104.36	7722.60	1.4	Pass
		Bottom Girt	L1 1/4x1 1/4x3/16	112	-44.98	7722.60	0.6	Pass
		Inner Bracing	L1 1/4x1 1/4x3/16	102	14.49	17339.40	0.1	Pass
		T4	300 - 280	Leg	L2x2x1/4	159	-7003.43	17514.15
Diagonal	L1 1/4x1 1/4x3/16			173	-1214.74	3987.56	30.5	Pass
Horizontal	L1 1/4x1 1/4x3/16			177	89.15	12484.38	0.7	Pass
Top Girt	L1 1/4x1 1/4x3/16			164	-70.74	7722.60	0.9	Pass
Bottom Girt	L1 1/4x1 1/4x3/16			172	-212.56	7722.60	2.8	Pass
Inner Bracing	L1 1/4x1 1/4x3/16			167	-14.37	6648.04	0.2	Pass
T5	280 - 260			Leg	L2x2x1/4	217	-8088.01	17514.15
		Diagonal	L1 1/4x1 1/4x3/16	268	-1644.03	3987.56	41.2	Pass
		Horizontal	L1 1/4x1 1/4x3/16	272	1128.51	12484.38	9.0	Pass
		Top Girt	L1 1/4x1 1/4x3/16	226	354.49	12484.38	2.8	Pass
		Bottom Girt	L1 1/4x1 1/4x3/16	230	-186.32	7722.60	2.4	Pass
		Inner Bracing	L1 1/4x1 1/4x3/16	222	-167.15	6648.04	2.5	Pass
		Guy A@276.611	5/16	1074	3584.98	5600.00	64.0	Pass
		Guy B@276.611	5/16	1073	1176.60	5600.00	21.0	Pass
		Guy C@276.611	5/16	1072	3587.63	5600.00	64.1	Pass
		Guy D@276.611	5/16	1067	4699.27	5600.00	83.9	Pass
		Top Guy Pull-Off@276.611	L1 1/2x1 1/2x3/16	1071	1372.51	15183.67	9.0	Pass
T6	260 - 240	Leg	L2x2x1/4	277	-12037.60	17514.15	68.7	Pass
		Diagonal	L1 1/4x1 1/4x3/16	333	-1028.85	3987.56	25.8	Pass
		Horizontal	L1 1/4x1 1/4x3/16	305	95.99	12484.38	0.8	Pass
		Top Girt	L1 1/4x1 1/4x3/16	286	-153.13	7722.60	2.0	Pass
		Bottom Girt	L1 1/4x1 1/4x3/16	290	-20.71	7722.60	0.3	Pass
		Inner Bracing	L1 1/4x1 1/4x3/16	282	39.44	17339.40	0.2	Pass
		T7	240 - 220	Leg	L2x2x1/4	337	-12037.90	17514.15
Diagonal	L1 1/4x1 1/4x3/16			353	-922.89	3987.56	23.1	Pass
Horizontal	L1 1/4x1 1/4x3/16			368	97.99	12484.38	0.8	Pass
Top Girt	L1 1/4x1 1/4x3/16			343	42.36	12484.38	0.3	Pass
Bottom Girt	L1 1/4x1 1/4x3/16			349	423.16	12484.38	3.4	Pass
Inner Bracing	L1 1/4x1 1/4x3/16			347	242.44	17339.40	1.4	Pass
Guy A@220.083	3/16			1082	1559.20	2500.00	62.4	Pass
Guy B@220.083	3/16			1081	517.57	2500.00	20.7	Pass
Guy C@220.083	3/16			1080	1557.48	2500.00	62.3	Pass
Guy D@220.083	3/16			1075	2067.10	2500.00	82.7	Pass

RISATower LEO L. ROBERTS, P.E. 8809 N.145TH E. AVE OWASSO, OK 74055 Phone: 918-272-8680 FAX: 918-272-2508	Job 19158 F With Ice	Page 47 of 48
	Project 350' 20" SQ. Guy Tower	Date 12:24:27 10/25/13
	Client Leo Roberts	Designed by LEO

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	SF*P _{allow} lb	% Capacity	Pass Fail		
T8	220 - 200	Top Guy Pull-Off@220.083	L1 1/2x1 1/2x3/16	1076	514.66	15183.67	3.4	Pass		
		Leg	L2x2x1/4	397	-10200.40	17514.15	58.2	Pass		
		Diagonal	L1 1/4x1 1/4x3/16	453	-575.68	3987.56	14.4	Pass		
		Horizontal	L1 1/4x1 1/4x3/16	444	102.43	12484.38	0.8	Pass		
		Top Girt	L1 1/4x1 1/4x3/16	404	130.09	12484.38	1.0	Pass		
		Bottom Girt	L1 1/4x1 1/4x3/16	412	-64.69	7722.60	0.8	Pass		
		Inner Bracing	L1 1/4x1 1/4x3/16	401	45.34	17339.40	0.3	Pass		
T9	200 - 180	Leg	L2x2x1/4	457	-9492.11	17514.15	54.2	Pass		
		Diagonal	L1 1/4x1 1/4x3/16	473	-1353.83	3987.56	34.0	Pass		
		Horizontal	L1 1/4x1 1/4x3/16	477	114.69	12484.38	0.9	Pass		
		Top Girt	L1 1/4x1 1/4x3/16	464	-80.29	7722.60	1.0	Pass		
		Bottom Girt	L1 1/4x1 1/4x3/16	472	-220.55	7722.60	2.9	Pass		
		Inner Bracing	L1 1/4x1 1/4x3/16	462	50.02	17339.40	0.3	Pass		
		Leg	L2x2x1/4	519	-17012.10	17514.15	97.1	Pass		
T10	180 - 160	Diagonal	L1 1/4x1 1/4x3/16	544	-2069.73	3987.56	51.9	Pass		
		Horizontal	L1 1/4x1 1/4x3/16	540	1106.04	12484.38	8.9	Pass		
		Top Girt	L1 1/4x1 1/4x3/16	523	-205.07	7722.60	2.7	Pass		
		Bottom Girt	L1 1/4x1 1/4x3/16	532	421.24	12484.38	3.4	Pass		
		Inner Bracing	L1 1/4x1 1/4x3/16	528	-375.90	6648.04	5.7	Pass		
		Guy A@163.389	5/16	1090	3514.75	5600.00	62.8	Pass		
		Guy B@163.389	5/16	1089	1153.35	5600.00	20.6	Pass		
		Guy C@163.389	5/16	1088	3510.91	5600.00	62.7	Pass		
		Guy D@163.389	5/16	1083	5053.21	5600.00	90.2	Pass		
		Top Guy Pull-Off@163.389	L1 1/2x1 1/2x3/16	1087	1345.19	15183.67	8.9	Pass		
		T11	160 - 140	Leg	L2x2x1/4	579	-17012.30	17514.15	97.1	Pass
Diagonal	L1 1/4x1 1/4x3/16			634	-1504.01	3987.56	37.7	Pass		
Horizontal	L1 1/4x1 1/4x3/16			630	158.86	12484.38	1.3	Pass		
Top Girt	L1 1/4x1 1/4x3/16			584	370.57	12484.38	3.0	Pass		
Bottom Girt	L1 1/4x1 1/4x3/16			590	-133.27	7722.60	1.7	Pass		
Inner Bracing	L1 1/4x1 1/4x3/16			582	92.71	17339.40	0.5	Pass		
Leg	L2x2x1/4			639	-8134.00	17514.15	46.4	Pass		
T12	140 - 120	Diagonal	L1 1/4x1 1/4x3/16	694	-848.14	3987.56	21.3	Pass		
		Horizontal	L1 1/4x1 1/4x3/16	689	130.61	12484.38	1.0	Pass		
		Top Girt	L1 1/4x1 1/4x3/16	646	-86.18	7722.60	1.1	Pass		
		Bottom Girt	L1 1/4x1 1/4x3/16	650	70.39	12484.38	0.6	Pass		
		Inner Bracing	L1 1/4x1 1/4x3/16	642	58.65	17339.40	0.3	Pass		
		Leg	L2x2x1/4	697	-11084.50	17514.15	63.3	Pass		
		Diagonal	L1 1/4x1 1/4x3/16	721	-1511.52	3987.56	37.9	Pass		
T13	120 - 100	Horizontal	L1 1/4x1 1/4x3/16	736	611.27	12484.38	4.9	Pass		
		Top Girt	L1 1/4x1 1/4x3/16	706	143.51	12484.38	1.1	Pass		
		Bottom Girt	L1 1/4x1 1/4x3/16	712	246.35	12484.38	2.0	Pass		
		Inner Bracing	L1 1/4x1 1/4x3/16	708	-122.44	6648.04	1.8	Pass		
		Guy A@110	3/16	1098	1490.07	2500.00	59.6	Pass		
		Guy B@110	3/16	1097	508.75	2500.00	20.4	Pass		
		Guy C@110	3/16	1096	1490.39	2500.00	59.6	Pass		
		Guy D@110	3/16	1091	2189.36	2500.00	87.6	Pass		
		Top Guy Pull-Off@110	L1 1/2x1 1/2x3/16	1095	743.43	15183.67	4.9	Pass		
		T14	100 - 80	Leg	L2x2x1/4	757	-12433.40	17514.15	71.0	Pass
				Diagonal	L1 1/4x1 1/4x3/16	814	-726.19	3987.56	18.2	Pass
Horizontal	L1 1/4x1 1/4x3/16			809	138.33	12484.38	1.1	Pass		
Top Girt	L1 1/4x1 1/4x3/16			764	159.83	12484.38	1.3	Pass		
Bottom Girt	L1 1/4x1 1/4x3/16			769	61.22	12484.38	0.5	Pass		
Inner Bracing	L1 1/4x1 1/4x3/16			768	58.22	17339.40	0.3	Pass		
Leg	L2x2x1/4			817	-12359.10	17514.15	70.6	Pass		
T15	80 - 60	Diagonal	L1 1/4x1 1/4x3/16	833	-1128.01	3987.56	28.3	Pass		
		Horizontal	L1 1/4x1 1/4x3/16	837	140.54	12484.38	1.1	Pass		
		Top Girt	L1 1/4x1 1/4x3/16	826	69.98	12484.38	0.6	Pass		
		Bottom Girt	L1 1/4x1 1/4x3/16	830	246.90	12484.38	2.0	Pass		
		Bottom Girt	L1 1/4x1 1/4x3/16	830	246.90	12484.38	2.0	Pass		

RISATower LEO L. ROBERTS, P.E. 8809 N.145TH E. AVE OWASSO, OK 74055 Phone: 918-272-8680 FAX: 918-272-2508	Job 19158 F With Ice	Page 48 of 48
	Project 350' 20" SQ. Guy Tower	Date 12:24:27 10/25/13
	Client Leo Roberts	Designed by LEO

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	SF*P _{allow} lb	% Capacity	Pass Fail		
T16	60 - 40	Inner Bracing	L1 1/4x1 1/4x3/16	828	49.65	17339.40	0.3	Pass		
		Leg	L2x2x1/4	877	-11818.70	17514.15	67.5	Pass		
		Diagonal	L1 1/4x1 1/4x3/16	936	-1535.41	3987.56	38.5	Pass		
		Horizontal	L1 1/4x1 1/4x3/16	932	647.93	12484.38	5.2	Pass		
		Top Girt	L1 1/4x1 1/4x3/16	886	312.72	12484.38	2.5	Pass		
		Bottom Girt	L1 1/4x1 1/4x3/16	892	127.38	12484.38	1.0	Pass		
		Inner Bracing	L1 1/4x1 1/4x3/16	882	-175.16	6648.04	2.6	Pass		
		Guy A@56.6111	3/16	1106	1354.15	2500.00	54.2	Pass		
		Guy B@56.6111	3/16	1105	504.48	2500.00	20.2	Pass		
		Guy C@56.6111	3/16	1104	1360.63	2500.00	54.4	Pass		
		Guy D@56.6111	3/16	1099	2007.24	2500.00	80.3	Pass		
		Top Guy Pull-Off@56.6111	L1 1/2x1 1/2x3/16	1103	788.02	15183.67	5.2	Pass		
		T17	40 - 20	Leg	L2x2x1/4	937	-12482.70	17514.15	71.3	Pass
				Diagonal	L1 1/4x1 1/4x3/16	994	-618.83	3987.56	15.5	Pass
Horizontal	L1 1/4x1 1/4x3/16			968	141.36	12484.38	1.1	Pass		
Top Girt	L1 1/4x1 1/4x3/16			944	101.49	12484.38	0.8	Pass		
Bottom Girt	L1 1/4x1 1/4x3/16			949	63.17	12484.38	0.5	Pass		
Inner Bracing	L1 1/4x1 1/4x3/16			942	48.38	17339.40	0.3	Pass		
T18	20 - 6	Leg	L2x2x1/4	997	-12280.00	16368.44	75.0	Pass		
		Diagonal	L1 1/4x1 1/4x3/16	1024	-733.54	3792.52	19.3	Pass		
		Horizontal	L1 1/4x1 1/4x3/16	1028	125.22	12484.38	1.0	Pass		
		Top Girt	L1 1/4x1 1/4x3/16	1006	90.88	12484.38	0.7	Pass		
		Bottom Girt	L1 1/4x1 1/4x3/16	1009	467.06	12484.38	3.7	Pass		
		Inner Bracing	L1 1/4x1 1/4x3/16	1007	340.25	17339.40	2.0	Pass		
T19	6 - 0	Leg	L2x2x1/4	1041	-10081.30	19297.97	52.2	Pass		
		Diagonal	L1 1/4x1 1/4x3/16	1055	-322.19	5061.32	6.4	Pass		
		Horizontal	L1 1/4x1 1/4x3/16	1053	83.93	12484.38	0.7	Pass		
		Top Girt	L1 1/4x1 1/4x3/16	1047	451.61	12484.38	3.6	Pass		
		Inner Bracing	L1 1/4x1 1/4x3/16	1046	350.08	17339.40	2.0	Pass		
Summary										
						Leg (T11)	97.1	Pass		
						Diagonal (T10)	51.9	Pass		
						Horizontal (T5)	9.0	Pass		
						Top Girt (T19)	3.6	Pass		
						Bottom Girt (T18)	3.7	Pass		
						Inner Bracing (T10)	5.7	Pass		
						Guy A (T5)	64.0	Pass		
						Guy B (T2)	21.2	Pass		
						Guy C (T5)	64.1	Pass		
						Guy D (T10)	90.2	Pass		
						Top Guy Pull-Off (T5)	9.0	Pass		
						Bolt Checks	6.0	Pass		
						RATING =	97.1	Pass		