



Structural Components, LLC
1617 Pearl Street, Unit A
Boulder, CO 80302

Voice: 866-386-7622
Fax: 303-962-3577

November 30, 2009

Re: **Structural Analysis Report - FAILS**
Structure: 380ft Guyed Tower
Site Address:
Site Name:
Site Number:
SC Number: 090028

Dear Mr. Smith:

Per your request, Structural Components, LLC, has completed a structural analysis of the 380ft guyed tower named Exell Cattle Co, located in Potter County, Texas, to verify the tower's compliance to the TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures with the proposed antenna and line configuration for RT & Sons.

We regret to inform you that with the proposed addition of (2) Andrew PL6-59-PXA and (2) 3/8" coax at the 300ft elevation, in addition to the existing loading, the tower does not satisfy the structural strength requirements of the TIA/EIA-222-F standard using an 85 mph fastest-mile (equivalent to 105 mph 3-second gust) basic wind speed with no ice and a 73.6 mph fastest-mile basic wind speed with 1/2" ice.

Please refer to the following structural analysis report, which gives complete details of the analysis including data used, assumptions made, loading considered, and results.

We trust you find this report satisfactory. Please do not hesitate to contact us if you should have any questions or concerns.

Best regards,
Structural Components LLC

1 INTRODUCTION

Structural Components, LLC, has structurally analyzed the following tower at the request of Jay Tichbourne of RT & Sons, to determine whether the tower complies with applicable building codes and design standards for the proposed loading configuration.

Tower Information	
Type	3-Sided Guyed Tower
Height	380ft
Manufacturer	Unknown
Model	Unknown

Site Information	
Site Name	
Site Number	
Address	
County	Potter
State	Texas

The analysis was performed using RISA tower, a structural analysis program developed by RISA Technologies specifically for the communication tower industry.

Information about the tower was provided by RT & Sons. Structural Components, LLC, performed a site visit and tower climb on 02/16/2009.

2 INFORMATION USED IN THE ANALYSIS

The following information was either provided to us or gathered by us for use in the structural analysis.

Data	Document	Author	Date	File
Tower	Steel & Antenna Mapping Report	Structural Components	02/18/2009	Job #090028
Loading	Steel & Antenna Mapping Report Email	Structural Components	02/18/2009	Job #090028
		Stelera	02/10/2009	---
Soil	---	---	---	---
Foundation	---	---	---	---

The following assumptions were made in order to complete the analysis. These assumptions must be checked. If they do not accurately represent the existing or proposed tower, foundation, soil, and loading conditions, we must be notified so that we can make the appropriate changes to our analysis, conclusions, and recommendations.

1. The tower and foundation are constructed as shown in the provided drawings, previous structural analysis reports, mapping reports, photos, and/or other documents.
2. The tower and foundation are in good condition with no corrosion or damage.
3. The tower and foundation have been properly maintained in accordance with industry standards.
4. The foundation was correctly designed and installed in accordance with applicable codes and standards.
5. The tower legs and bracing are assumed to be ASTM A500-46 and A572-50 steel, respectively.

3 DESIGN STANDARD

The tower analysis was performed in accordance with the following design criteria.

Standard:	TIA/EIA-222-F <i>Structural Standards for Steel Antenna Towers and Antenna Supporting Structures</i>
Building Code:	2006 International Building Code
Basic Wind Speed without Ice:	85 mph fastest-mile (equivalent to 105 mph 3-second gust)
Basic Wind Speed with Ice:	73.6 mph fastest-mile
Ice Thickness:	1/2" radial
Serviceability Basic Wind Speed:	50 mph fastest-mile

4 APPURTENANCES

The following antennas, mounts, transmission lines, and other appurtenances were considered for the structural analysis.

Elev. (ft) ⁽¹⁾	Appurtenance	Line ⁽²⁾	Notes
380.0	(1) 16 Element Dipole (1) 10ft Omni (1) 15ft Omni (3) 2ft Standoff Mounts (1) Large Red Light	(1) 1/2" (1) 7/8" (1) 7/8" (1) 1" Conduit	Existing
336.0	(1) 8ft 8 Element Dipole (1) 2ft Standoff Mount	(1) 7/8"	Existing
335.0	(1) Wind Station	(3) 1/4"	Existing
300.0	(2) Andrew PL6-59-PXA (2) Pipe Mounts	(2) 3/8"	RT & Sons Proposed
258.0	(1) Pipe Mount (unused)	---	Existing
252.0	(1) Wind Station	(3) 1/4"	Existing
250.0	(2) Small Red Lights	From 1" Conduit	Existing
167.0	(1) Wind Station	(3) 1/4"	Existing
125.0	(2) Small Red Lights	From 1" Conduit	Existing
23.0	(1) 2ft 6 Element Yagi	(1) 1/4"	Existing
14.0	(1) 2ft 6 Element Yagi	(1) 1/4"	Existing
6.5	(1) 12"x12"x12" Solar Panel	From 1" Conduit	Existing

Notes:

1. Elevations reference centerline of panel, yagi, and dish antennas, and base of whip antennas, in relation to the base of the tower.
2. (2) RT & Sons proposed 3/8" TX lines assumed to be located as shown on the Feedline Plan in Appendix A. Contact us for further analysis if the lines cannot be placed as indicated.

5 RESULTS

5.1 TOWER MEMBER STRESS LEVELS

The tower has the following stress ratios in its structural members.

Elev. (ft)	Member	Stress Ratio
0 – 380.0	Tower Legs	2.05
0 – 380.0	Tower Bracing	1.56
0 – 380.0	Guy Wires	1.71

Stress ratio (SR) criteria:

SR ≤ 1.00 is completely within code limits.

SR ≤ 1.05 is considered within acceptable tolerance of code limits.

SR > 1.05 is outside acceptable tolerance of code limits and requires structural modifications.

5.2 FOUNDATION REACTIONS

Reaction Type	Original Design Reactions	Current Analysis Reactions	Foundation Status
Tower Base – Axial (kips)	---	88.82	<i>Insufficient information to analyze</i>
Tower Base – Shear (kips)	---	0.46	
Inner Guy Anchor – Uplift (kips)	---	17.73	
Inner Guy Anchor – Sliding (kips)	---	25.72	
Outer Guy Anchor – Uplift (kips)	---	23.66	
Outer Guy Anchor – Sliding (kips)	---	25.59	

The foundations could not be analyzed due to the lack of original design reactions and a geotechnical engineering report.

5.3 TOWER DEFLECTION

The deflections are listed below for key tower elevations using the serviceability wind speed listed in section 3. At 300ft elevation, the sway and twist results greatly exceed the allowable beam deflections of the proposed dishes (less than 1.0).

Elev. (ft)	Displacement (in)	Sway (deg)	Twist (deg)
380.0	6.79	0.28	4.13
300.0	9.35	0.10	5.14
250.0	6.57	0.32	3.64
167.0	2.49	0.12	1.98
110.0	1.52	0.05	1.16
23.0	0.66	0.10	0.21

6 CONCLUSIONS

The tower does not satisfy the structural strength requirements of the standards and codes listed in section 3, nor the recommended sway and twist requirements for the proposed dishes. **Structural modifications are required.**

7 RECOMMENDATIONS

The following structural analyses/modifications are recommended:

- 1) Perform a full structural analysis on the foundation to verify that it is able to withstand the foundation reactions provided in Section 5.2
- 2) Address all TIA maintenance issues presented in Structural Components' Guyed Tower Steel & Antenna Mapping Report dated 02/18/2009
- 3) Install a tower wrap from 0 to 320ft (TIA maintenance issues "Top girt of section 3 is bent" and "Empty pipe mount at 258" may be ignored). A tower wrap is a new tower structure installed around the existing tower to support all proposed and future antenna loadings. The wrap avoids any removal or downtime of existing antennas and TX lines.

With the proposed tower wrap installed, the tower will be in structural compliance with the TIA/EIA-222-F standard using an 85 mph fastest-mile (equivalent to 105 mph 3-second gust) basic wind speed with no ice and a 73.6 mph fastest-mile basic wind speed with 1/2" ice for RT & Sons proposed loading. Full modification drawings are available upon order.

APPENDIX A
Tower Profile and Calculations

APPENDIX B
Data Provided for Analysis