HPC Wireless Services
22 Shelter Rock Lane.
Building C
Danbury, CT, 06810
P.: 203.797.1112

HPC WIRELESS SERVICES

September 5, 2014

VIA OVERNIGHT COURIER

Connecticut Siting Council
10 Franklin Square
New Britain, Connecticut 06051
Attn: Ms. Melanie Bachman, Acting Executive Director

Re: Sprint Spectrum, L.P. – Exempt Modification - 2.5 Equipment Deployment
University of Hartford, 202 Bloomfield Avenue, West Hartford, Connecticut

Dear Ms. Bachman:

This letter and attachments are submitted on behalf of Sprint Spectrum, L.P. ("Sprint"). Sprint is undertaking modifications to certain existing sites in its Connecticut system in order to implement updated technology. Please accept this letter and attachments as notification, pursuant to R.C.S.A. Section 16-50j-73, of construction that constitutes an exempt modification pursuant to R.C.S.A. Section 16-50j-72(b)(2). In compliance with R.C.S.A. Section 16-50j-73, a copy of this letter and attachments is being sent to the Mayor of the Town of West Hartford.

Sprint plans to modify the existing wireless communications facility owned by the University of Hartford, and located at 202 Bloomfield, Avenue, West Hartford, (coordinates 41°-47'-47.76" N, 72°-42'-54.00" W). Attached are plan and elevation drawings depicting the planned changes, and documentation of the structural sufficiency of the structure to accommodate the revised antenna configuration. Also included is a power density report reflecting the modification to Sprint's operations at the site.

The changes to the facility do not constitute a modification as defined in Connecticut General Statutes ("C.G.S.") Section 16-50i(d) because the general physical characteristics of the facility will not be significantly changed. Rather, the planned changes to the facility fall squarely within those activities explicitly provided for in R.C.S.A. Section 16-50j-72(b)(2).

1. Sprint will add three (3) 2.5 antennas to existing pipe masts, and three (3) more RRHs (remote radio heads) on existing pipe masts with one of the three T-arms replaced and relocated, all at a centerline height of approximately 134' AGL. Sprint will also install one (1) hybrid cable along the existing coaxial cable run. The proposed modifications will not extend the height of the approximately 85' penthouse rooftop guy wired tower, or an approximate height of 139' AGL. This application assumes that three

(3) of the six (6) existing CMDA antennas will remain with, and that three (3) new LTE panel antennas and nine (9) RRHs (remote radio heads) will also be installed as proposed in the Exempt Modification Application dated July 3, 2014, filed regarding Sprint's Network Vision Project and approved by this Agency by Letter Decision dated July 25, 2014. (See EM-SPRINT-155-140708. The equipment outlined in that prior application has not yet been installed but is reflected in the supporting documentation attached to this new application.)

2. Sprint will replace equipment within the existing cabinets on the existing concrete pad, and reroute the connection to the power/fiber box. The existing GPS antenna will remain. These changes will have no effect on the site boundaries and will not increase the existing rooftop leased area of nine feet by fifteen feet (9' X 15').

3. The proposed changes will not increase the noise level at the existing facility by six decibels or more. The incremental effect of the proposed changes will be negligible.

4. The changes to the facility will not increase the calculated "worst case" power density for the combined operations at the site to a level at or above the applicable standard for uncontrolled environments as calculated for a mixed frequency site. As indicated on the attached report prepared by EBI Consulting, Sprint's operations at the site will result in a power density of approximately 3.43%; the combined site operations will result in a total power density of approximately 3.43%, as Sprint is the only carrier currently at this location. The report indicates which antennas, existing and proposed, were considered for these calculations.

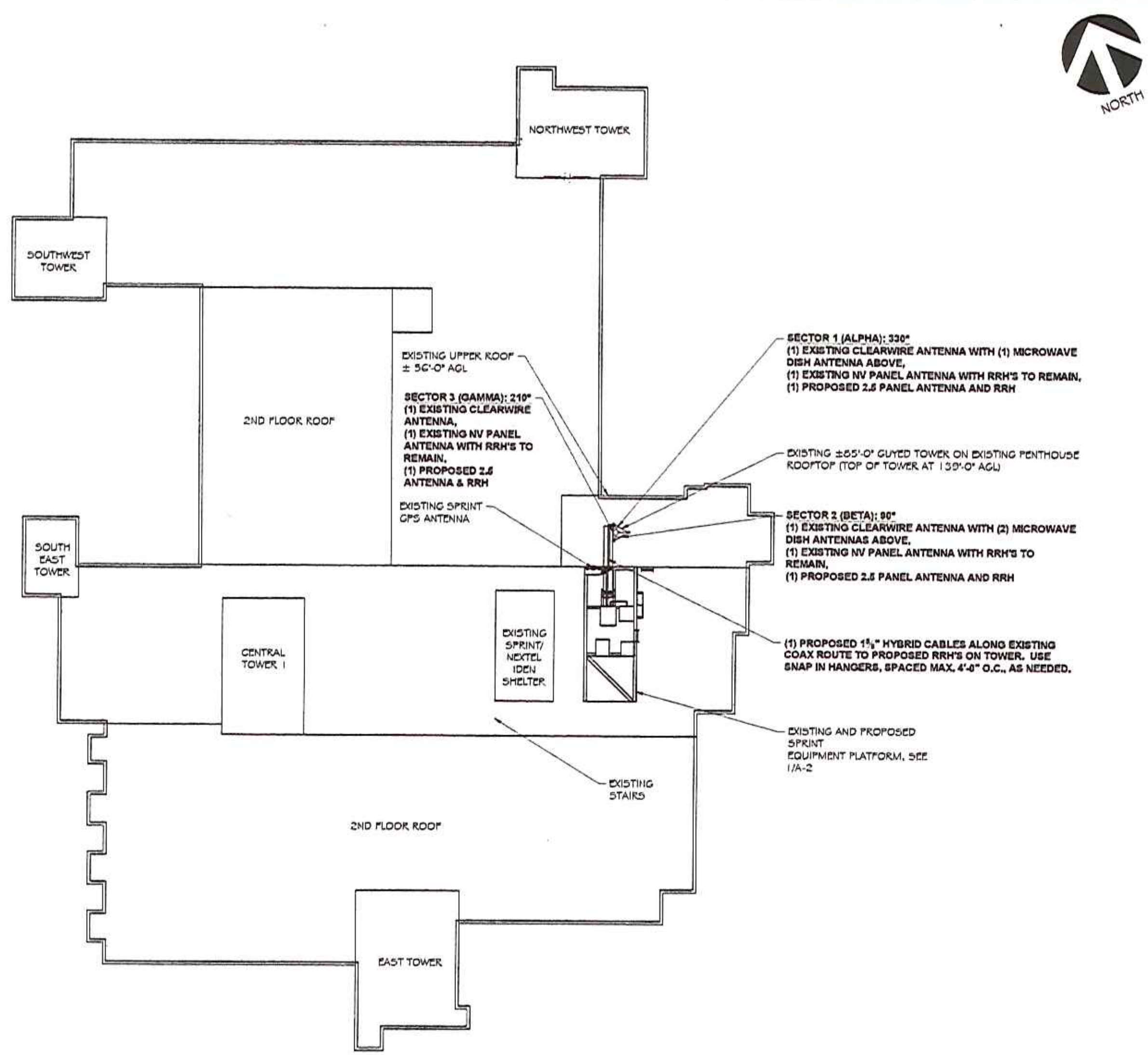
Please contact me by phone at (203) 610-1071 or by e-mail at mjhowlett@optonline.net with questions concerning this matter. Thank you for your consideration.

Respectfully yours,

Melanie J. Howlett

Attachments

cc: Honorable Scott Slifka, Mayor, Town of West Hartford
University of Hartford (underlying property owner)



SITE PLAN
SCALE: 1" = XX'
1

Sprint™
6580 SPRINT PARKWAY
OVERLAND PARK, KANSAS 66251

RAMAKER & ASSOCIATES, INC.
1120 Dallas Street, Sauk City, WI 53583
Phone: 608-643-4100 Fax: 608-643-7999
www.Ramaker.com

HPC WIRELESS SERVICES
22 SHELTER ROCK LN., BLDG C
DANBURY, CT 06810
(203) 797-1112

Certification & Seal:
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Connecticut.

STATE OF CONNECTICUT * JAMES R. SKOWRONSKI No. 28286 LICENSED PROFESSIONAL ENGINEER *

Signature: [signature] Date: 8/20/2014

MARK	DATE	DESCRIPTION

ISSUE PHASE: FINAL — DATE ISSUED: 08/20/2014

PROJECT TITLE:
UNIVERSITY OF HARTFORD
CT03XC078-O

PROJECT INFORMATION:
202 BLOOMFIELD AVENUE
HARTFORD, CT 06117
HARTFORD COUNTY

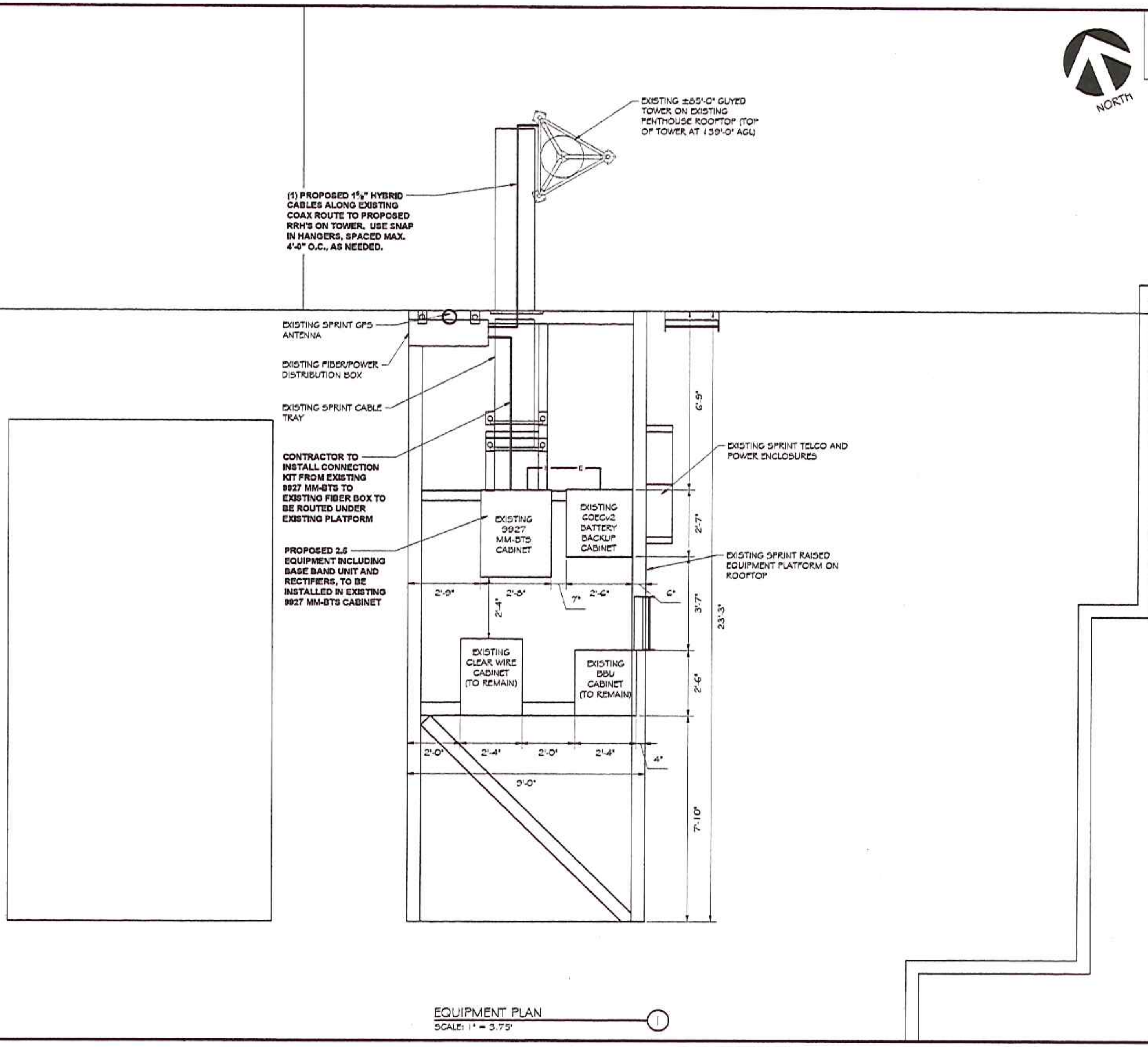
SHEET TITLE:
SITE PLAN

0 10' 20' 40'
11" x 17" - 1" = 20'
22" x 34" - 1" = 10'

PROJECT NUMBER: 22996
SHEET NUMBER: A-1

I:\22900\22996\CAD\Telecom\2.5 spr-t\22996 Sprint 2.5 CD for CT.dwg Printed by: kgalston on Aug 20, 2014 - 1:45pm

DRAWN BY: KJG CHECKED BY: FAB



EQUIPMENT PLAN
SCALE: 1" = 3.75'

Sprint
6580 SPRINT PARKWAY
OVERLAND PARK, KANSAS 66251

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1120 Dallas Street, Sauk City, WI 53583
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STATE OF CONNECTICUT ★ JAMES R. SKOWRONSKI ★ No. 28268 LICENSED PROFESSIONAL ENGINEER

Signature: [signature] Date: 8/20/2014

MARK	DATE	DESCRIPTION

ISSUE PHASE: FINAL DATE ISSUED: 08/20/2014

PROJECT TITLE:
UNIVERSITY OF HARTFORD
CT03XC078-O

PROJECT INFORMATION:
202 BLOOMFIELD AVENUE
HARTFORD, CT 06117
HARTFORD COUNTY

SHEET TITLE:
EQUIPMENT PLAN

0 1.875' 3.75' 7.5'
11" x 17" - 1" = 3.75'
22" x 34" - 1" = 1.875'

PROJECT NUMBER: 22996
SHEET NUMBER: A-2

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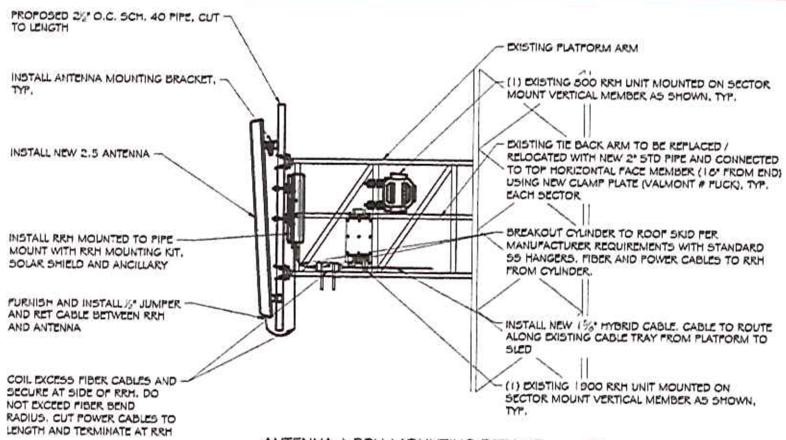

ANTENNA & RRH MOUNTING DETAILS (1)
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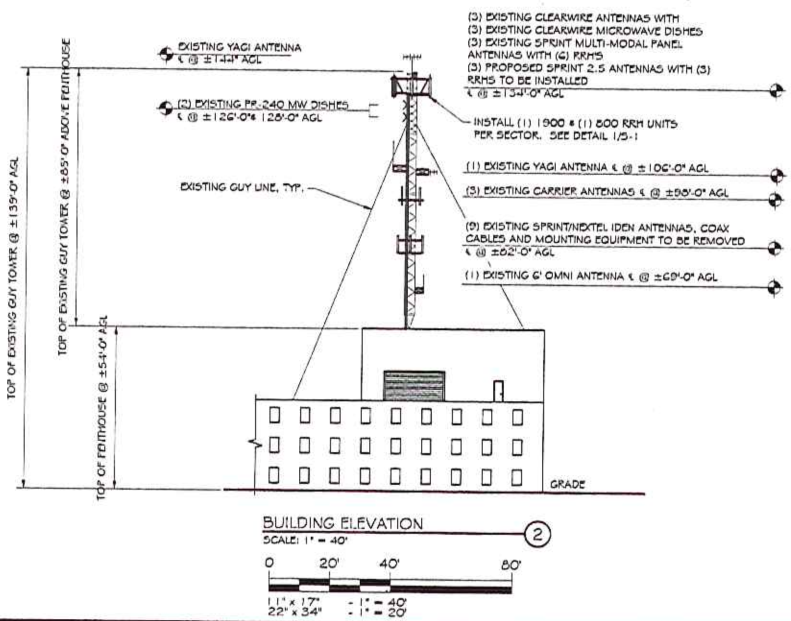

BUILDING ELEVATION (2)
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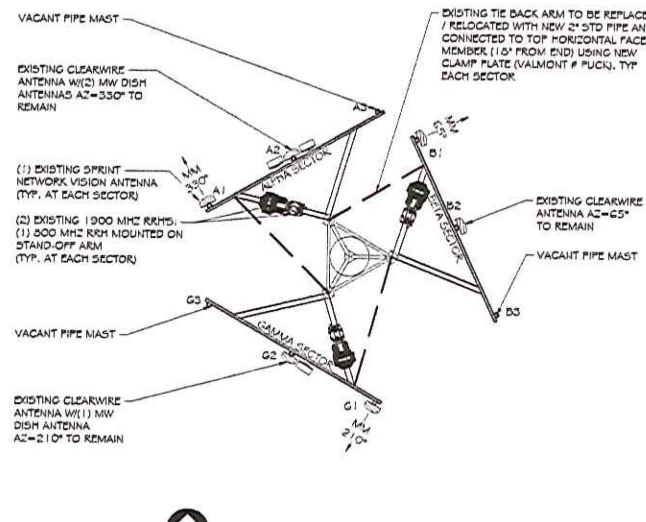

EXISTING ANTENNA ARRAY (3)
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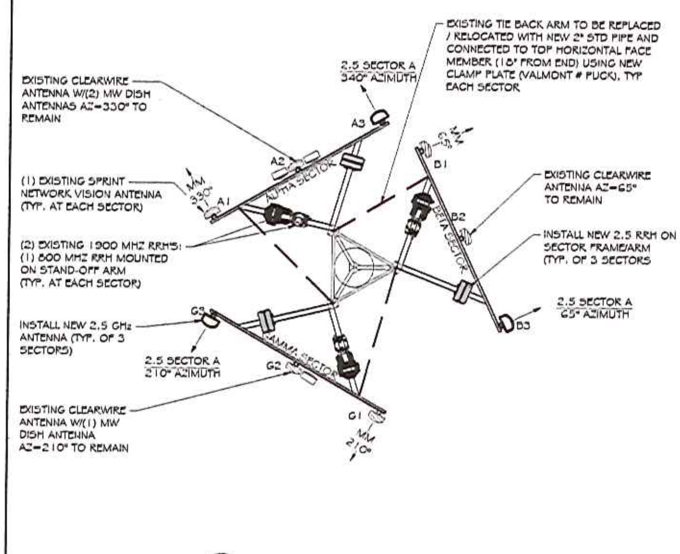

PROPOSED ANTENNA ARRAY (4)
SCALE: NTS

Sprint

6580 SPRINT PARKWAY
OVERLAND PARK, KANSAS 66251

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STATE OF CONNECTICUT ★ JAMES R. SKOWRONSKI ★ No. 25286 LICENSED PROFESSIONAL ENGINEER

Signature: [signature] Date: 8/20/2014

MARK	DATE	DESCRIPTION

ISSUE PHASE: FINAL — DATE ISSUED: 08/20/2014

PROJECT TITLE:
UNIVERSITY OF HARTFORD
CT03XC078-O

PROJECT INFORMATION:
202 BLOOMFIELD AVENUE
HARTFORD, CT 06117
HARTFORD COUNTY

SHEET TITLE:
BUILDING ELEVATIONS & ANTENNA DETAILS

SCALE:
AS NOTED

PROJECT NUMBER: 22996
SHEET NUMBER: A-3

DRAWN BY: KJG CHECKED BY: RAB

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RAMAKER
& ASSOCIATES, INC.

STRUCTURAL ASSESSMENT – 85-FOOT GUYED TOWER
FOR: TRANSCEND WIRELESS – SPRINT

SITE NAME: UNIVERSITY OF HARTFORD
SITE ID: CT03XC078

TOWER: PASS – 79.4%
FOUNDATION: PASS

RAMAKER & ASSOCIATES, INC.
JOB NUMBER: 22996

1120 Dallas Street, Sauk City, WI 53583
Phone: 608-643-4100 ▲ Fax: 608-643-7999
www.ramaker.com

STRUCTURAL ASSESSMENT

SITE:	University of Hartford (CT03XC078) 202 Bloomfield Avenue Hartford, Hartford County, Connecticut 06117
PREPARED FOR:	Transcend Wireless
CONTACT PERSON:	Mike Kithcart Transcend Wireless 48 Spruce Street, Oakland, NJ 07436
PREPARED BY:	Ramaker & Associates, Inc. 1120 Dallas Street Sauk City, Wisconsin 53583 Telephone: (608) 643-4100 Facsimile: (608) 643-7999
RAMAKER JOB NUMBER:	22996
DATE OF REPORT ISSUANCE:	August 7, 2014

Thomas E. Moore
Project Engineer

8/7/14
Date

James R. Skowronski, P.E.
Supervising Engineer

8/7/14
Date

STATE OF CONNECTICUT
JAMES R. SKOWRONSKI
No. 26266
LICENSED
PROFESSIONAL ENGINEER

TABLE OF CONTENTS

LIST OF APPENDICES

SECTION 1

EXECUTIVE SUMMARY

This report summarizes the structural analysis conducted by Ramaker & Associates, Inc. (Ramaker & Associates) for Sprint, who intends to install additional equipment on an existing tower.

The proposed Sprint loading includes installing three (3) RFS APXV9TM14-ALU-120 antennas and three (3) ALU TD-RRH8x20 units on the existing T-Frames at a centerline elevation of 134 feet AGL. The antennas shall be fed with one (1) 1-1/4-inch Hybriflex coax.

Results of our analysis show that the tower is stressed to a maximum of 79.4 percent of capacity under proposed loading conditions. The supporting steel structure for the tower is stressed to a maximum of 77.9 percent of capacity. The proposed model tower base axial reaction is less than the original design tower reaction. However, the guy anchor reactions are 0.06 percent and 8.34 percent greater than the original design reactions. However, by inspection and calculation, the supporting steel structure and building structure will provide adequate strength under proposed loading conditions.

Sprint is proposing to install additional 2.5 equipment within the existing equipment cabinets. The analysis concludes that the existing platform will provide adequate strength under proposed loading conditions.

Results of our mount assessment show that by engineering calculation and inspection, the antenna and RRH mounting structure is capable of supporting the existing and proposed Sprint 2.5 equipment deployment without causing an overstress condition in the antenna and RRH mounting structure, **provided the proposed structural modifications are completed prior to installation of new equipment per construction drawings by Ramaker & Associates.**

In summary, the tower and associated platforms will pass the TIA/EIA-222-F code requirements under proposed loading conditions. The mounting structure will pass the TIA-222 code requirements under proposed loading conditions, **provided the proposed structural modifications are completed prior to installation of new equipment per construction drawings by Ramaker & Associates.**

SECTION 2
INTRODUCTION

2.1 PROJECT INFORMATION

This report summarizes the structural analysis conducted by Ramaker & Associates, Inc. (Ramaker & Associates) for Sprint, who intends to install additional equipment on an existing tower.

2.2 PURPOSE OF REPORT

The analysis activities of this report were conducted for the purposes of creating and analyzing a model of the subject structure under the required loading conditions. Base reactions from the resulting model were also determined for tower foundation and support development. Recommendations regarding the analysis results, loading configuration, and structural modifications are also provided.

2.3 SCOPE OF SERVICES

Ramaker & Associates developed a finite element model (FEM) of the tower, using tnxTower, for member force, joint deflection, and structure reaction determinations. Subsequently, this report was drafted to provide our engineering recommendations. All information contained herein is valid only for the described structure configuration and loading conditions. Ramaker & Associates reserves the right to modify our recommendations should alterations to the tower loading occur.

SECTION 3
MODEL DEVELOPMENT

3.1 INTRODUCTION

Ramaker & Associates, Inc. developed a FEM of the tower superstructure using the tower drawings and site photos. Required static loads consisting of the antenna configuration, wind forces, ice loads, and linear appurtenances (including cable loads) were then applied to the FEM. As a result, all member forces, allowable capacities, and base reactions were computed. Additionally, potentially overstressed members were identified.

3.2 EXISTING STRUCTURE INFORMATION

Tower information was gathered from the Bay State Design structural analysis, job number CT-HFD0036, dated 5/18/10. The URS structural report, job number GDN-086/36930372, dated 9/16/05, was also utilized.

3.3 EXISTING TOWER LOADS

Ramaker & Associates understands that the existing and proposed antenna, cable, and appurtenance configurations are as shown in the following chart:

Elevation	Appurtenance	Mount	Coax	Status
149	Decibel DB432-A	10' Pipe Mount	1/2	Existing
144	8' Yagi		1/2	Existing
139	Andrew VHLP2.5	(3) T-Frames	1/2	Existing
	Andrew VHLP2		1/2	Existing
	Andrew VHLP1		1/2	Existing
134	(3) Argus LLPX310R		(2) 2" Conduit	Existing
	(3) Huawei RRU3702			
	(3) RFS APXVSPP18-C-A20		(3) 1-1/4	Existing
	(6) ALU 1900MHz RRHs			
	(3) ALU 800MHz RRHs			
	(3) RFS APXV9TM14-ALU-120		**(1) 1-1/4**	**Proposed**
	(3) ALU TD-RRH8x20			
128	Scala PR-950	Leg Mounted	7/8	Existing
124	Scala PR-950	Leg Mounted	7/8	Existing
111	10' Omni	4' Standoff	1/2	Existing
106	Decibel DB225	4' Standoff	1/2	Existing
98	(3) Kathrein 800 10504	(3) 5' Pipe Mounts	(6) 7/8	Existing
69	6' Omni	2' Standoff	1/2	Existing

3.4 WIND AND ICE LOAD

Wind forces used in model development are in compliance with the TIA/EIA-222-F Standard, the Connecticut Building Code, and the 2003 International Building Code. The TIA/EIA-222-F Code calls for an analysis to be performed, which assumes a basic wind speed (fastest mile) of 80 miles-per-hour (mph) without ice in Hartford County. The tower is also designed for a 37.6 mph basic wind speed with 1.0-inch of radial ice.

SECTION 4
ANALYSIS RESULTS

4.1 ANALYSIS RESULTS

The tower superstructure was analyzed with the combined existing and proposed antenna loading with and without radial ice. The computed maximum tower member stress capacities are as follows:

Component Type	Percent Capacity
Leg	34.5
Diagonal	56.1
Horizontal	32.7
Guy Line	74.5
Bolt	79.4
RATING	**79.4**

4.2 BASE REACTIONS

The computed maximum reactions under the corresponding maximum moment are as follows:

Load Type	Original Design	Proposed Model
Total Axial (k)	48.5	45.707
Total Shear (k)	—	1.988
Anchor Uplift (k)	21.0	22.752
Anchor Lateral (k)	12.2	12.207

The proposed model tower base axial reaction is less than the original design tower reaction. However, the guy anchor reactions are 0.06 percent and 8.34 percent greater than the original design reactions. However, by engineering judgment and calculation, the supporting steel structure and building structure will provide adequate strength under proposed loading conditions.

4.3 MOUNT ASSESSMENT

Results of our mount assessment show that by engineering calculation and inspection, the antenna and RRH mounting structure is capable of supporting the existing and proposed Sprint 2.5 equipment deployment without causing an overstress condition in the antenna and RRH mounting structure, **provided the proposed structural modifications are completed prior to installation of new equipment per construction drawings by Ramaker & Associates.**

This assessment is inclusive of the entire antenna mounting structure, including tower platforms, arms, and all other aspects of the mounting structure that will support the Sprint 2.5 equipment deployment. This assessment assumes that the mounting structure(s) has been installed correctly, is free from deterioration, and is maintained properly.

SECTION 5
LIMITATIONS

The recommendations contained within this report were developed using general project information provided by the owner, tower manufacturer, general field observations, reference information and laboratory testing data, as applicable. All recommendations pertain only to the proposed tower construction, location, and loading as described in this report. Ramaker & Associates assumes no responsibility for failures caused by factors beyond our control. These include but are not limited to the following:

1. Missing, corroding, and/or deteriorating members
2. Improper manufacturing and/or construction
3. Improper maintenance

Ramaker & Associates assumes no responsibility for modifications completed prior to or hereafter in which Ramaker & Associates was not directly involved. These modifications include but are not limited to the following:

1. Replacing or strengthening bracing members
2. Reinforcing or extending vertical members
3. Installing or removing antenna mounting gates or side arms
4. Changing loading configurations

Furthermore, Ramaker & Associates hereby states that this document represents the entire report and that it assumes no liability for any factual changes that may occur after the date of this report. All representations, recommendations and conclusions are based on the information contained and set forth herein. If you are aware of any information contrary to that contained herein, or if you are aware of any defects arising from the original design, material, fabrication and erection deficiencies, you should disregard this report and immediately contact Ramaker & Associates. Ramaker & Associates isn't liable for any representation, recommendation, or conclusion not expressly stated herein.

The tower owner is responsible for verifying that the existing loading on the tower is consistent with the loading applied to the tower within this report.

SECTION 6
REFERENCES

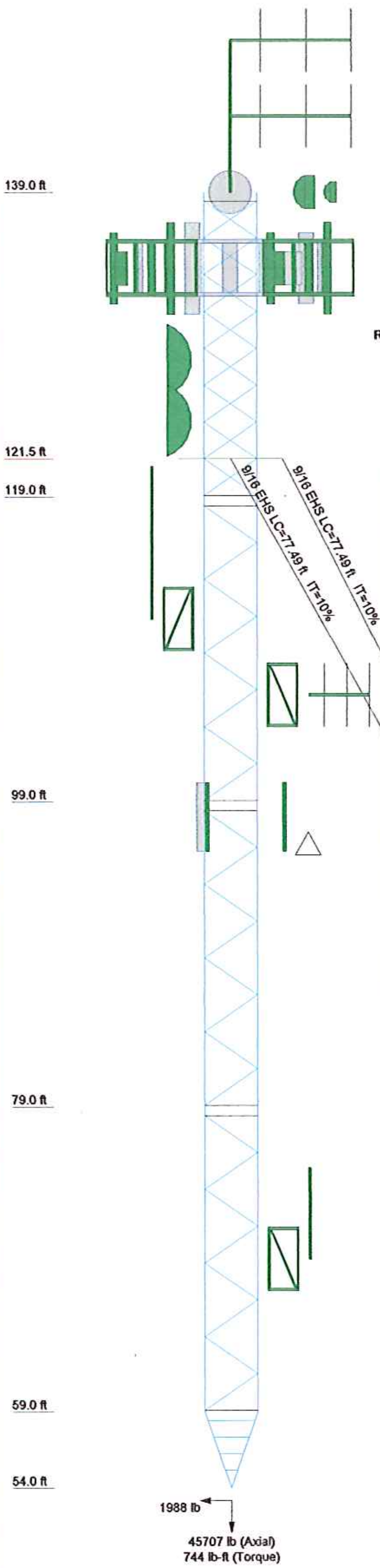
1. 2003 International Building Code.

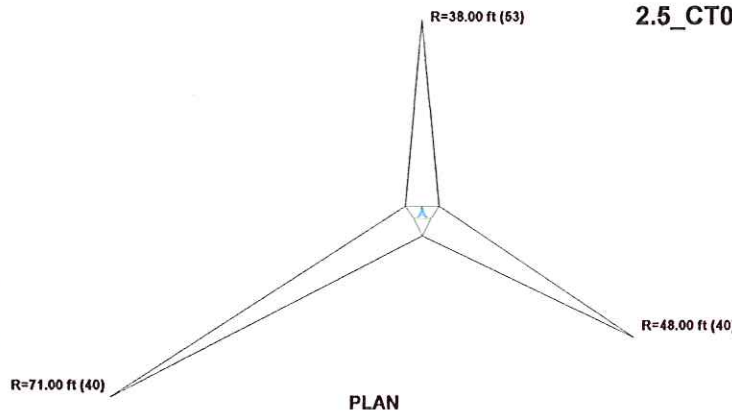
2. Telecommunications Industries Association, Structural Standard for Antenna Supporting Structures and Antennas, TIA Standard ANSI/TIA-222-F 1996, Washington, D.C.

APPENDIX A

TOWER FIGURES

Section	T5	T4	T3	T2	T1
Legs	ROHN 2.5 EH				
Leg Grade	A572-50				
Diagonals	N.A.	ROHN TS1.5x16 GA			
Diagonal Grade	N.A.	A53-B-42			
Top Girts	N.A.	ROHN TS1.5x16 GA			
Bottom Girts	N.A.	ROHN TS1.5x16 GA			
Horizontals	L4x4x1/4	N.A.			
Top Guy Pull-Offs		N.A.			2L2x2x1/4x3/8
Face Width (ft)					3.41667
# Panels @ (ft)	5 @ 1.06771	32 @ 2.40885			
Weight (lb) 3375.4	288.1	596.5	596.5	596.5	1297.7





DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
DB432-A	149	TD-RRH8x20-25	134
8' Yagi	144	PiROD 12' T-Frame	134
10'x2" Pipe Mount	139	PiROD 12' T-Frame	134
VHLP2.5	139	PiROD 12' T-Frame	134
VHLP2	139	LLPX310R w/Mount Pipe	134
VHLP1	139	LLPX310R w/Mount Pipe	134
Huawei RRU3702	134	LLPX310R w/Mount Pipe	134
Huawei RRU3702	134	PR-950	128
Huawei RRU3702	134	PR-950	124
APXVSPP18-C-A20 w/Mount Pipe	134	10' Omni	111
APXVSPP18-C-A20 w/Mount Pipe	134	4' Standoff	111
APXVSPP18-C-A20 w/Mount Pipe	134	4' Standoff	106
(2) 1900MHz 4x40W RRH	134	DB225-A	106
(2) 1900MHz 4x40W RRH	134	6" x 2" Pipe Mount	98
(2) 1900MHz 4x40W RRH	134	(3) 5'x3" Pipe Mount	98
800MHz 2x50W RRH	134	6" x 2" Pipe Mount	98
800MHz 2x50W RRH	134	800 10504 w/Mount Pipe	98
800MHz 2x50W RRH	134	800 10504 w/Mount Pipe	98
APXV9TM14-ALU-I20 w/Mount Pipe	134	800 10504 w/Mount Pipe	98
APXV9TM14-ALU-I20 w/Mount Pipe	134	6" x 2" Pipe Mount	98
APXV9TM14-ALU-I20 w/Mount Pipe	134	2' Standoff	69
TD-RRH8x20-25	134	6' Omni	69
TD-RRH8x20-25	134		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-50	50 ksi	65 ksi	A53-B-42	42 ksi	63 ksi

TOWER DESIGN NOTES

1. Tower is located in Hartford County, Connecticut.
2. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 38 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 79.4%

RAMAKER & ASSOCIATES, INC. Consulting Engineers	*Ramaker & Associates, Inc.* 1120 Dallas Street Sauk City, WI 53583 Phone: (608) 643-4100 FAX: (608) 643-7999	Job: *University of Hartford (CT03XC078*		
		Project: *22996*		
		Client: Sprint	Drawn by: tmoore	App'd:
		Code: TIA/EIA-222-F	Date: 08/06/14	Scale: NTS
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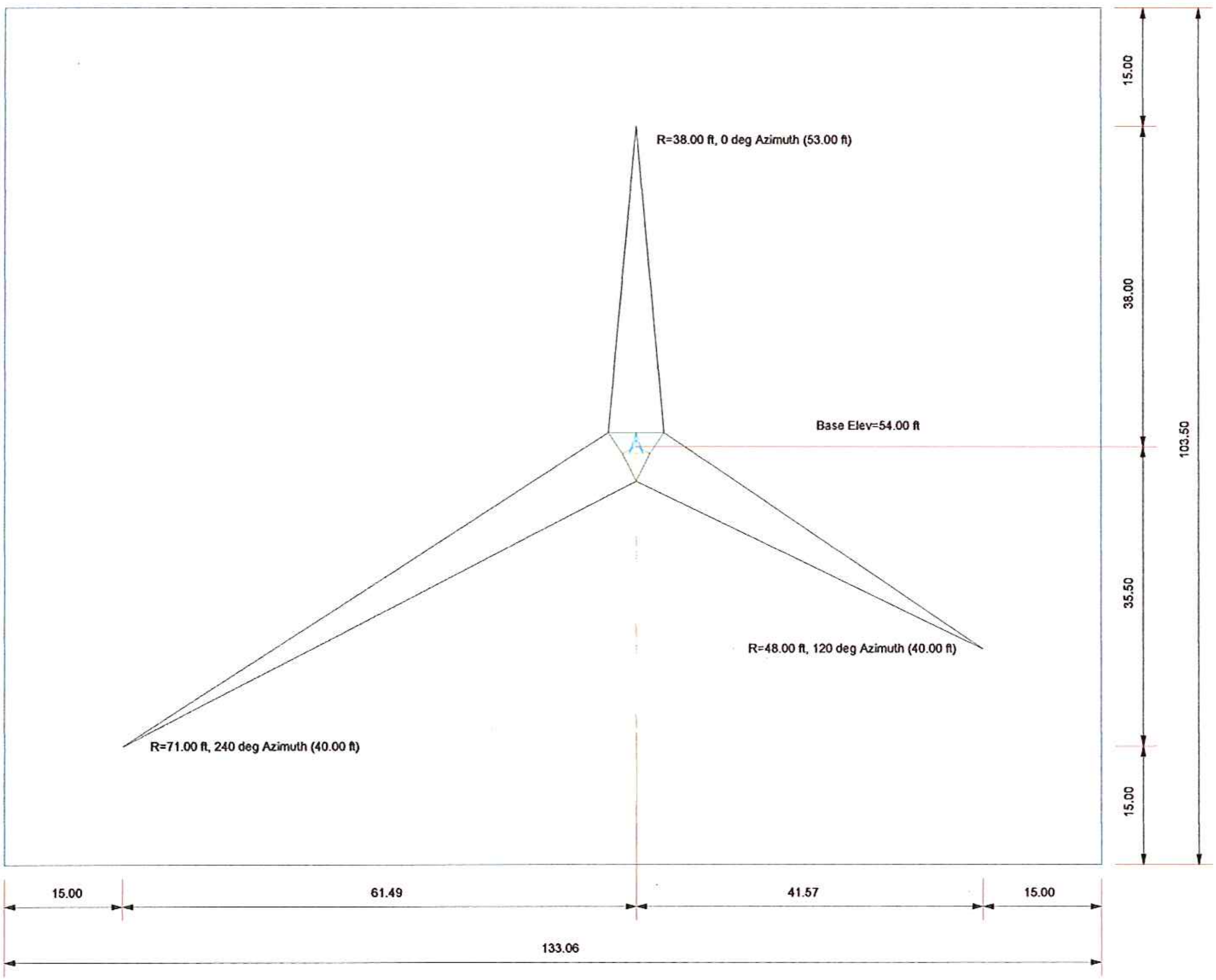
Plot Plan
Total Area - 0.32 Acres



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Consulting Engineers

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Job: *University of Hartford (CT03XC078*		
Project: *22996*		
Client: Sprint	Drawn by: tmoore	App'd:
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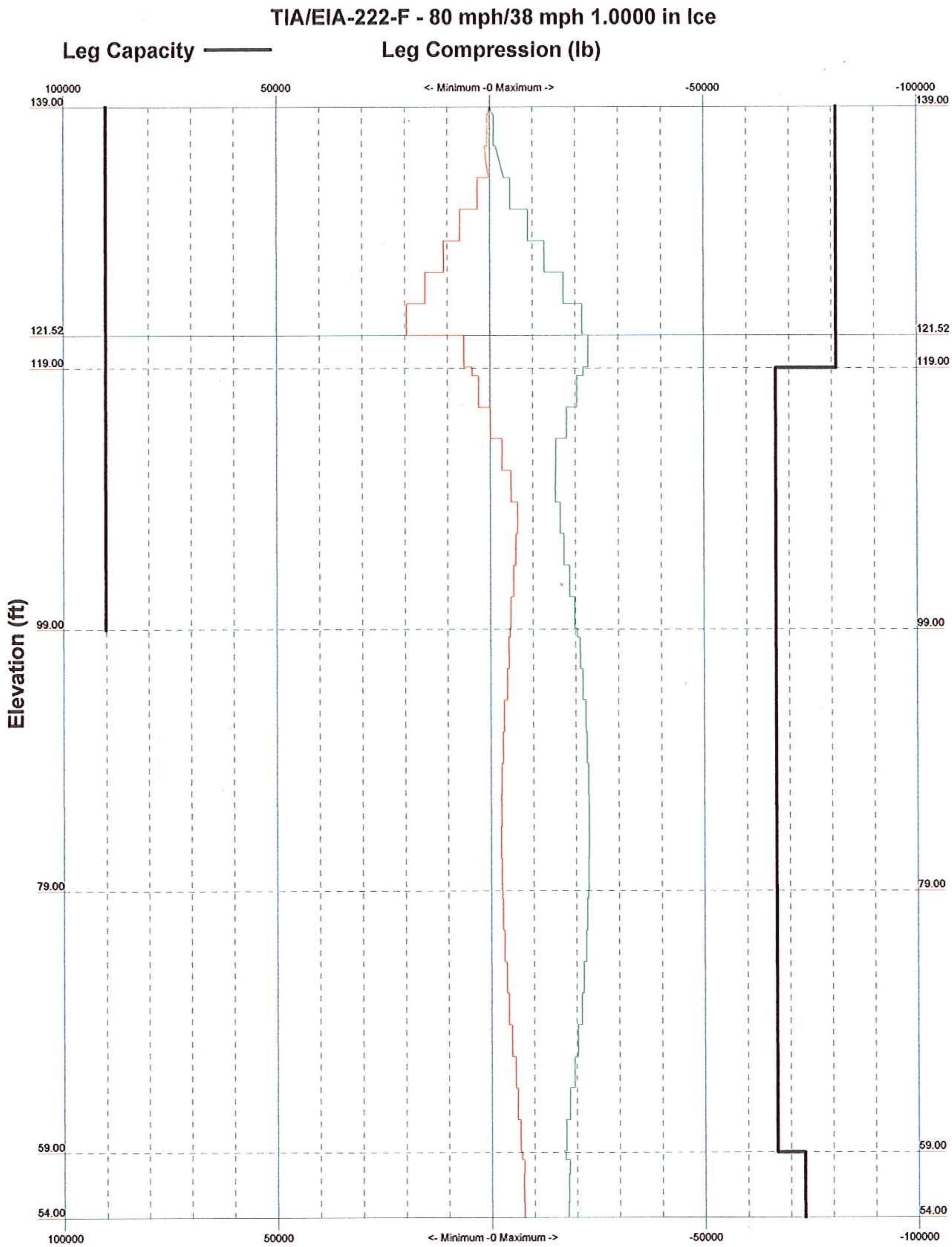
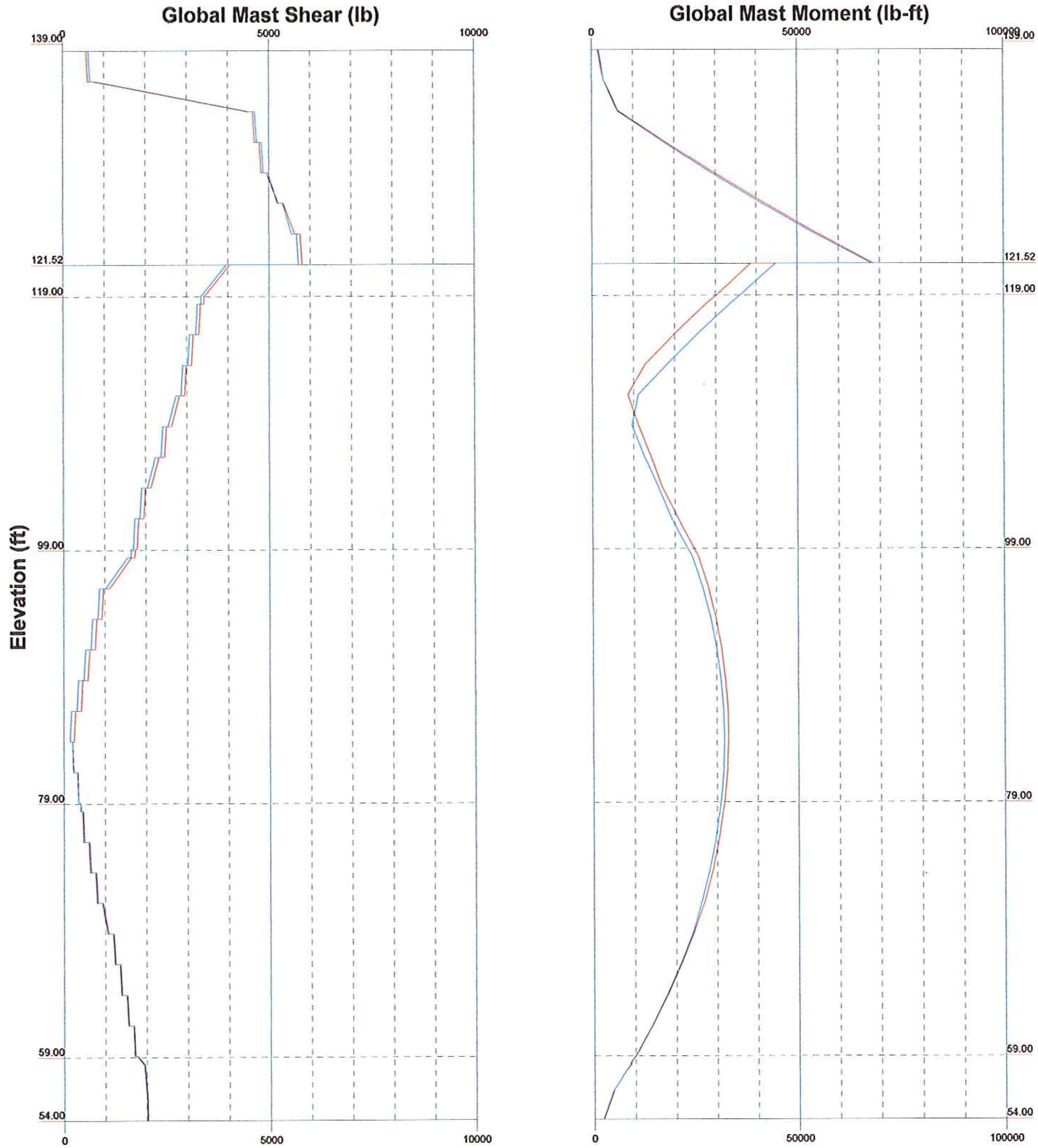


Ramaker & Associates, Inc. 1120 Dallas Street Sauk City, WI 53583 Phone: (608) 643-4100 FAX: (608) 643-7999	Job: University of Hartford (CT03XC078		
RAMAKER & ASSOCIATES, INC. Consulting Engineers	Project: 22996		
	Client: Sprint	Drawn by: tmoore	App'd:
	Code: TIA/EIA-222-F	Date: 08/06/14	Scale: NTS
	Path: I:\22900\22996\Structural\Risa\22996 rev2.eri		Dwg No. E-3

TIA/EIA-222-F - 80 mph/38 mph 1.0000 in Ice

Vx Vz

Maximum Values
2.5_CT03XC078
Mx Mz

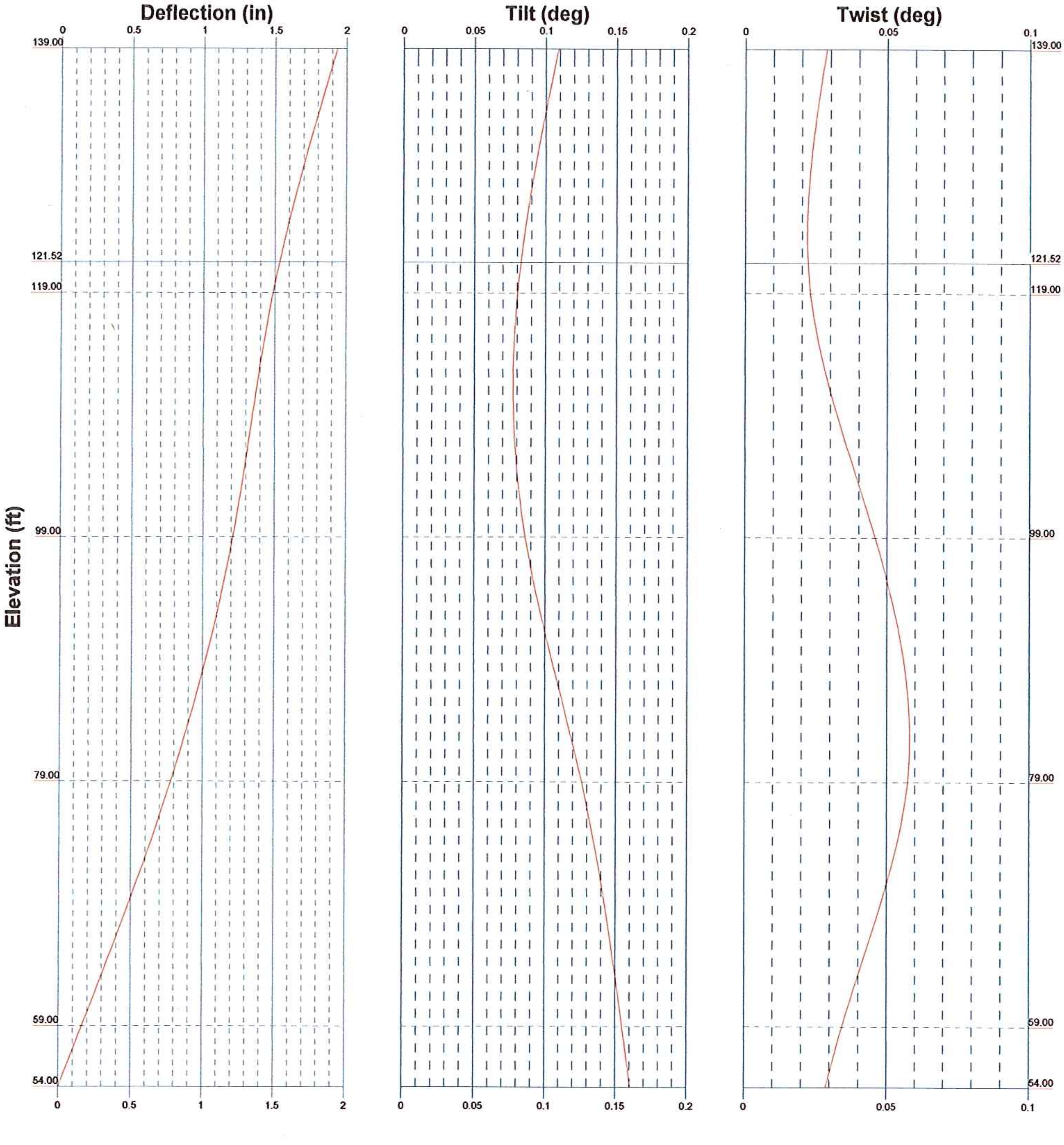


Ramaker & Associates, Inc.	Job: University of Hartford (CT03XC078		
1120 Dallas Street	Project: 22996		
Sauk City, WI 53583	Client: Sprint	Drawn by: tmoore	App'd:
Phone: (608) 643-4100	Code: TIA/EIA-222-F	Date: 08/06/14	Scale: NTS
FAX: (608) 643-7999	Path: I:\22900\22996\Structural\Risa\22996 rev2.eri		Dwg No. E-4

RAMAKER & ASSOCIATES, INC.
Consulting Engineers

TIA/EIA-222-F - Service - 50 mph

Maximum Values

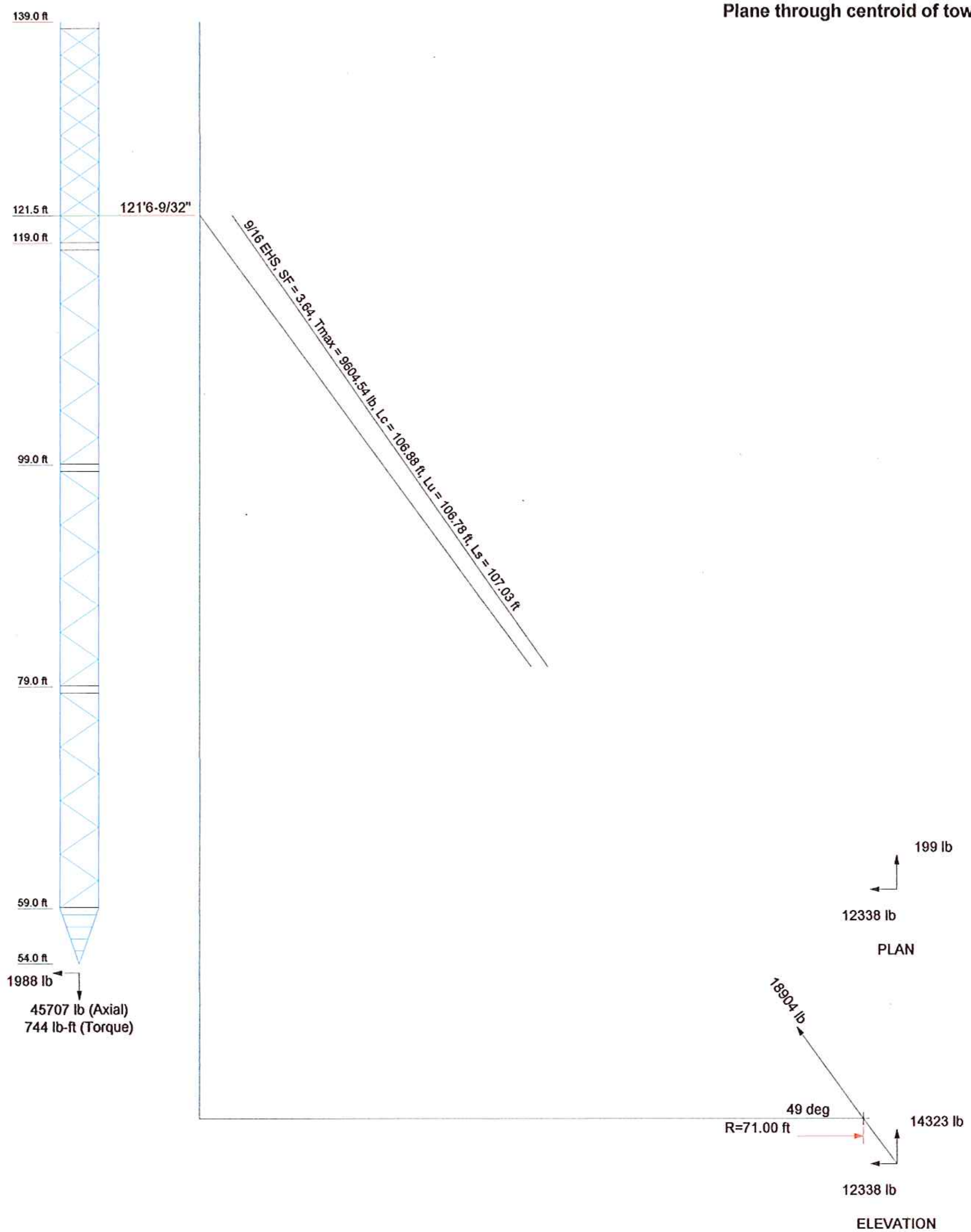


RAMAKER & ASSOCIATES, INC. Consulting Engineers	**Ramaker & Associates, Inc.** 1120 Dallas Street Sauk City, WI 53583 Phone: (608) 643-4100 FAX: (608) 643-7999	Job: **University of Hartford (CT03XC078**		
		Project: **22996**		
		Client: Sprint	Drawn by: tmoore	App'd:
		Code: TIA/EIA-222-F	Date: 08/06/14	Scale: NTS
		Path: I:\22900\22996\Structural\Risa\22996 rev2.eri		Dwg No. E-5

Guy Tensions and Tower Reactions

TIA/EIA-222-F - 80 mph/38 mph 1.0000 in Ice

Maximum Values
Anchor 'C'@71 ft Azimuth 240 deg Elev 40 ft
Plane through centroid of tower

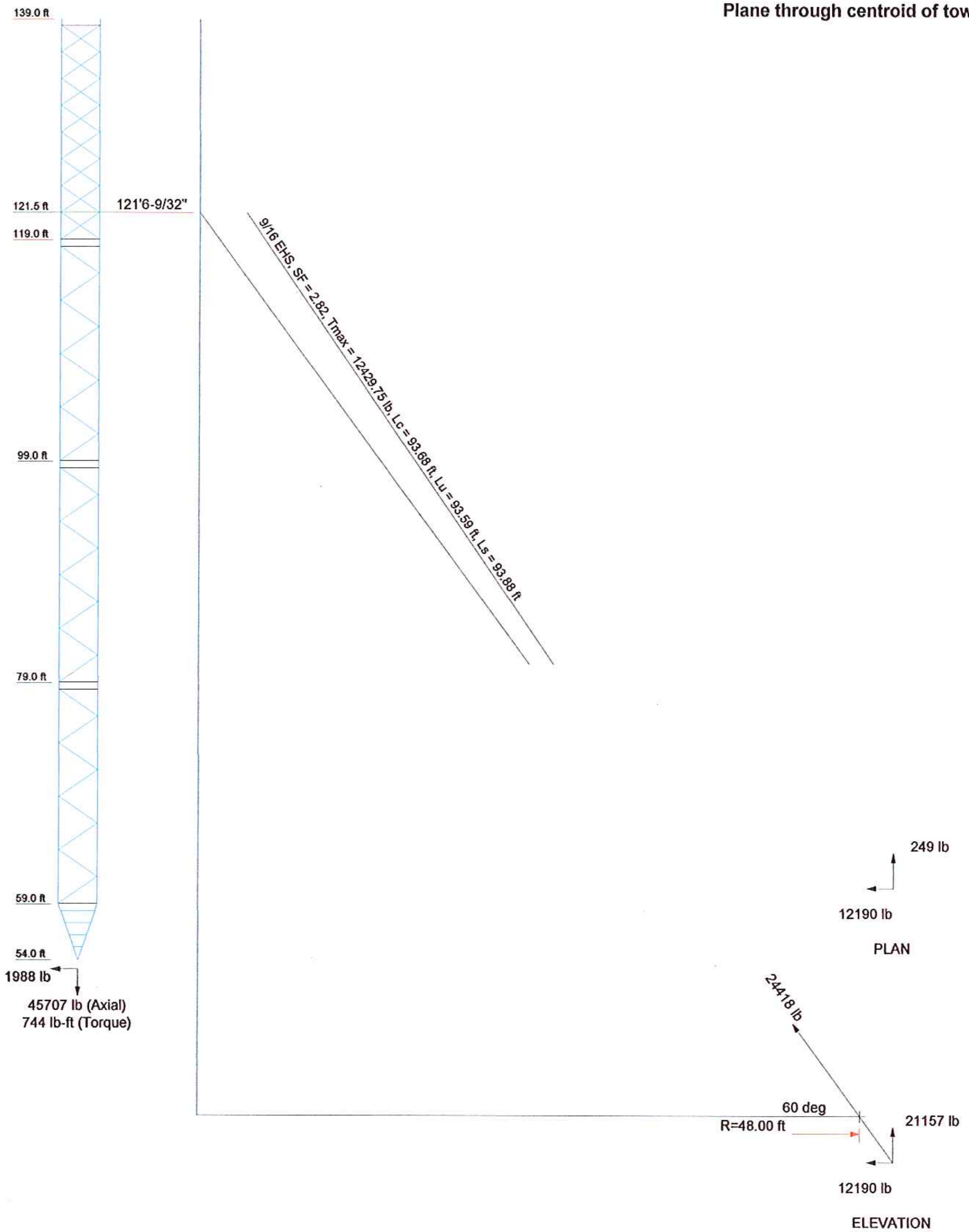


RAMAKER & ASSOCIATES, INC. Consulting Engineers	*Ramaker & Associates, Inc.* 1120 Dallas Street Sauk City, WI 53583 Phone: (608) 643-4100 FAX: (608) 643-7999	Job: *University of Hartford (CT03XC078*		
		Project: *22996*		
		Client: Sprint	Drawn by: tmoore	App'd:
		Code: TIA/EIA-222-F	Date: 08/06/14	Scale: NTS
		Path: I:\22900\22996\Structural\Risa\22996 rev2.eri		Dwg No. E-6

Guy Tensions and Tower Reactions

TIA/EIA-222-F - 80 mph/38 mph 1.0000 in Ice

Maximum Values
Anchor 'B'@48 ft Azimuth 120 deg Elev 40 ft
Plane through centroid of tower



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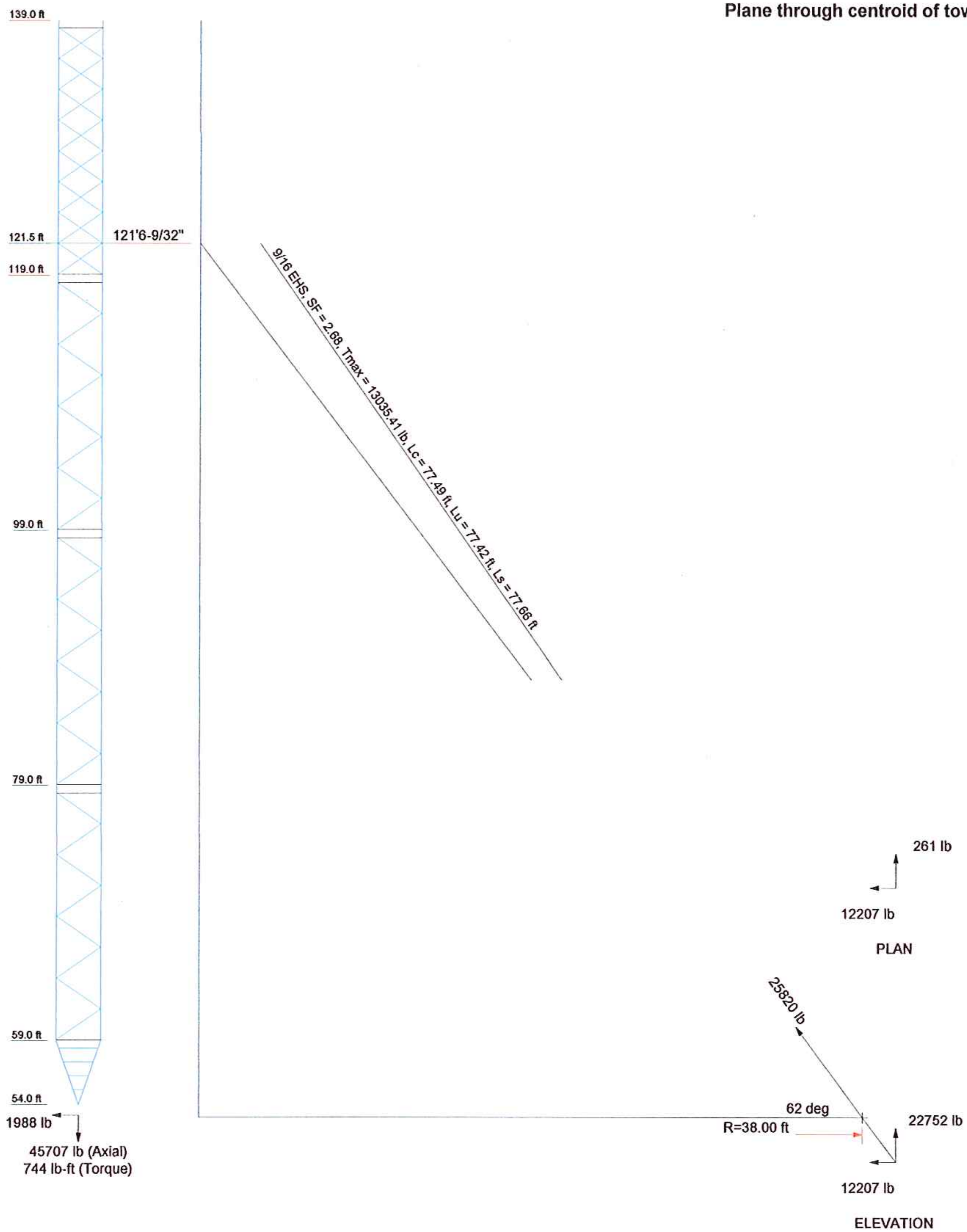
		Project: ***22996***		
		Client: Sprint	Drawn by: tmoore	App'd:
		Code: TIA/EIA-222-F	Date: 08/06/14	Scale: NTS
		Path: I:\22900\22996\Structural\Risa\22996 rev2.eri		Dwg No. E-6

Guy Tensions and Tower Reactions
TIA/EIA-222-F - 80 mph/38 mph 1.0000 in Ice

Maximum Values
Anchor 'A'@38 ft Azimuth 0 deg Elev 53 ft
Plane through centroid of tower

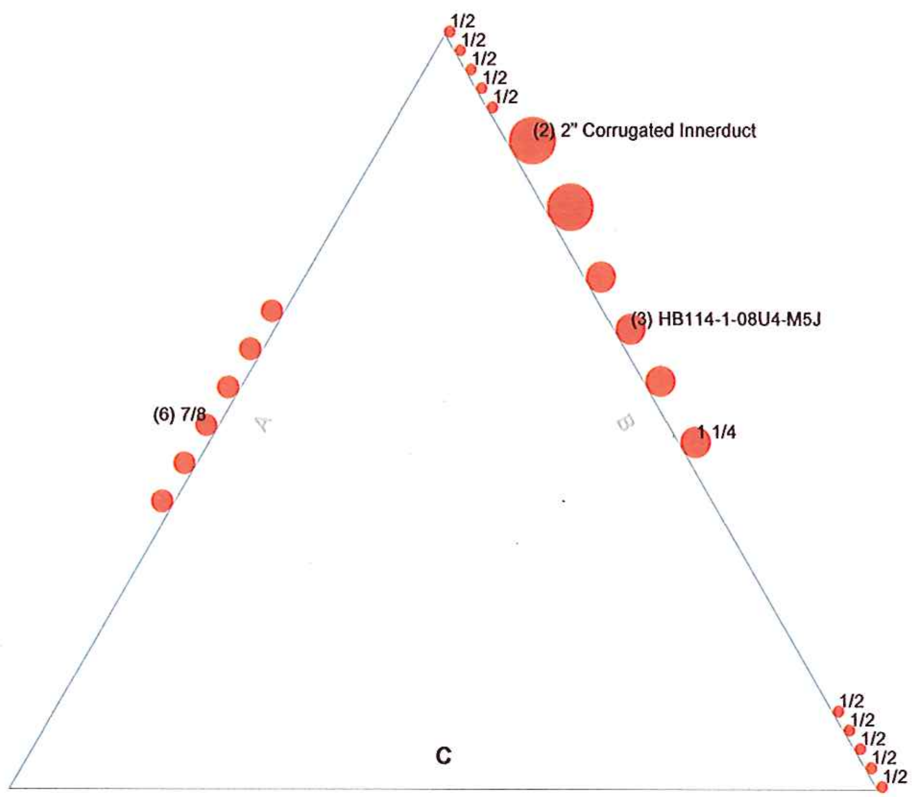


RAMAKER & ASSOCIATES, INC. Consulting Engineers	*Ramaker & Associates, Inc.* 1120 Dallas Street Sauk City, WI 53583 Phone: (608) 643-4100 FAX: (608) 643-7999	Job: *University of Hartford (CT03XC078*	
		Project: *22996*	
		Client: Sprint	Drawn by: tmoore	App'd:
		Code: TIA/EIA-222-F	Date: 08/06/14	Scale: NTS
		Path: I:\22900\22996\Structural\Risa\22996 rev2.eri	Dwg No. E-6

Feed Line Plan

2.5_CT03XC078

Round   Flat   App In Face   App Out Face



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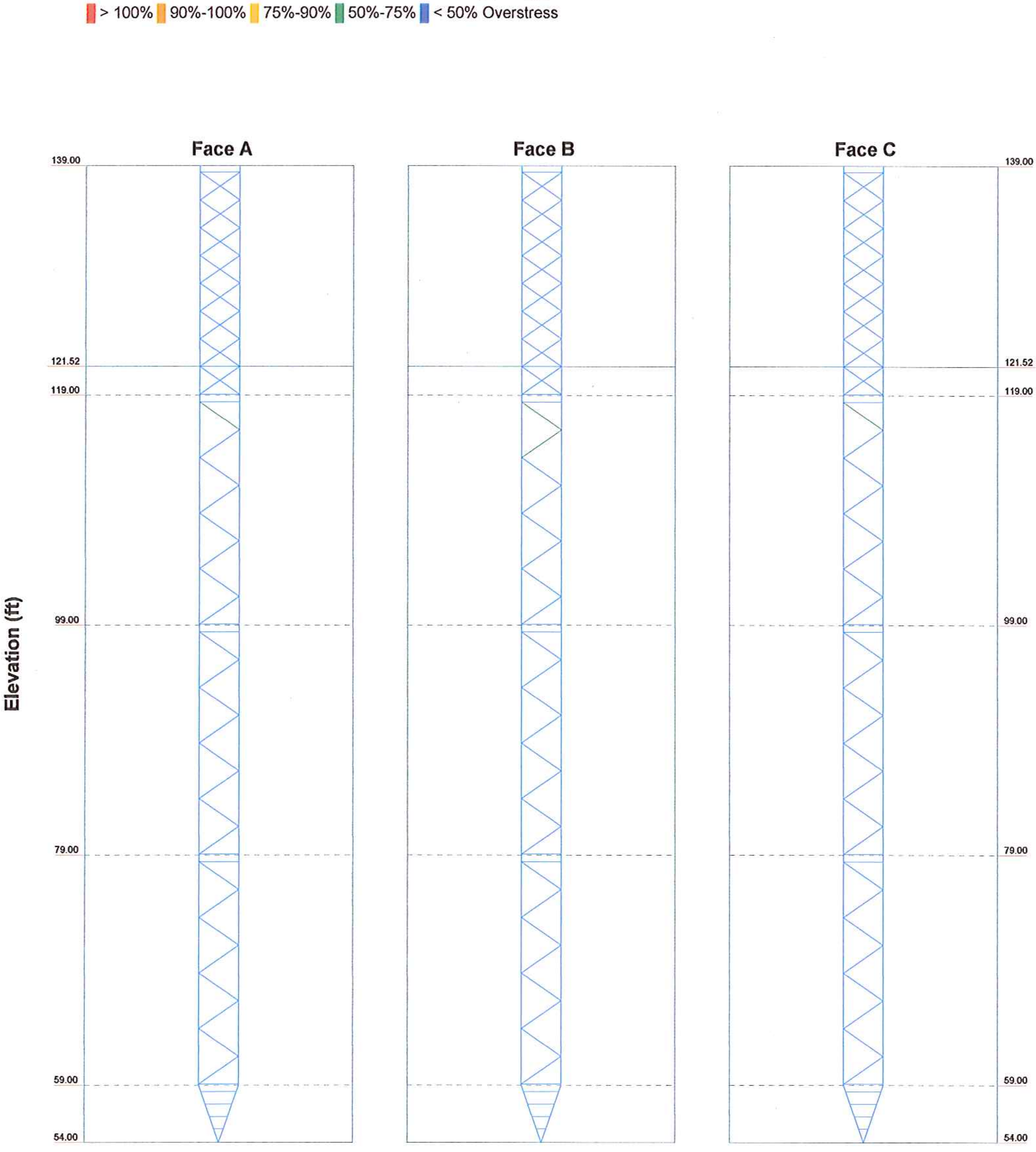
		Project: *22996*			
		Client: Sprint	Drawn by: tmoore	App'd:	
		Code: TIA/EIA-222-F	Date: 08/06/14	Scale: NTS	
		Path: I:\22900\22996\Structural\Risa\22996 rev2.eri		Dwg No. E-7	

Stress Distribution Chart
54' - 139'

2.5_CT03XC078



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Phone: (608) 643-4100
FAX: (608) 643-7999
Consulting Engineers

Job: University of Hartford (CT03XC078			
Project: 22996			
Client: Sprint	Drawn by: tmoore	App'd:	
Code: TIA/EIA-222-F	Date: 08/06/14	Scale: NTS	
Path: I:\22900\22996\Structural\Risa\22996 rev2.eri		Dwg No. E-8	

APPENDIX B

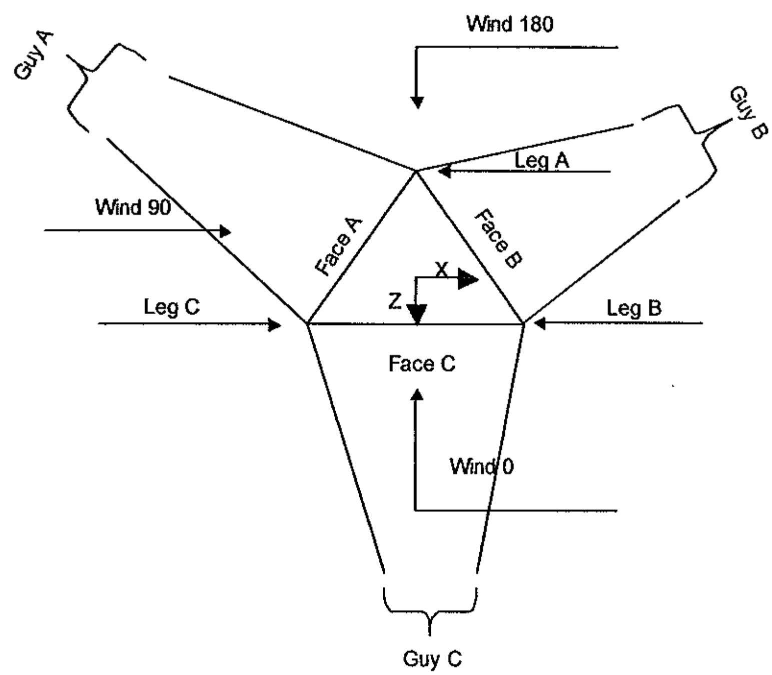
TOWER CALCULATIONS

Tower Input Data

The main tower is a 3x guyed tower with an overall height of 139.00 ft above the ground line.
The base of the tower is set at an elevation of 54.00 ft above the ground line.
The face width of the tower is 3.42 ft at the top and tapered at the base.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

- Tower is located in Hartford County, Connecticut.
- Basic wind speed of 80 mph.
- Nominal ice thickness of 1.0000 in.
- Ice thickness is considered to increase with height.
- Ice density of 56 pcf.
- A wind speed of 38 mph is used in combination with ice.
- Temperature drop of 50 °F.
- Deflections calculated using a wind speed of 50 mph.
- Pressures are calculated at each section.
- Safety factor used in guy design is 2.
- Stress ratio used in tower member design is 1.333.
- Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

tnxTower	Job: University of Hartford (CT03XC078)	Page: 2 of 30
Ramaker & Associates, Inc.	Project: 22996	Date: 15:41:02 08/06/14
1120 Dallas Street Sauk City, WI 53583 Phone: (608) 643-4100 FAX: (608) 643-7999	Client: Sprint	Designed by: tmoore



Face Guyed

Tower Section Geometry

Tower Section	*Tower Elevation* *ft*	*Assembly Database*	*Description*	*Section Width* *ft*	*Number of Sections*	*Section Length* *ft*
T1	139.00-119.00			3.42	1	20.00
T2	119.00-99.00			3.42	1	20.00
T3	99.00-79.00			3.42	1	20.00
T4	79.00-59.00			3.42	1	20.00
T5	59.00-54.00			3.42	1	5.00

Tower Section Geometry *(cont'd)*

Tower Section	*Tower Elevation* *ft*	*Diagonal Spacing* *ft*	*Bracing Type*	*Has K Brace End Panels*	*Has Horizontals*	*Top Girt Offset* *in*	*Bottom Girt Offset* *in*

Tower Section	Tower Elevation ft	Diagonal Spacing ft	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset in	Bottom Girt Offset in
T1	139.00-119.00	2.41	CX Brace	No	No	7.3750	1.3750
T2	119.00-99.00	2.41	K Brace Left	No	No	7.3750	1.3750
T3	99.00-79.00	2.41	K Brace Left	No	No	7.3750	1.3750
T4	79.00-59.00	2.41	K Brace Left	No	No	7.3750	1.3750
T5	59.00-54.00	1.07	K Brace Left	No	Yes	7.3750	1.3750

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 139.00-119.00	Pipe	ROHN 2.5 EH	A572-50 (50 ksi)	Pipe	ROHN TS1.5x16 GA	A53-B-42 (42 ksi)
T2 119.00-99.00	Pipe	ROHN 2.5 EH	A572-50 (50 ksi)	Pipe	ROHN TS1.5x16 GA	A53-B-42 (42 ksi)
T3 99.00-79.00	Pipe	ROHN 2.5 EH	A572-50 (50 ksi)	Pipe	ROHN TS1.5x16 GA	A53-B-42 (42 ksi)
T4 79.00-59.00	Pipe	ROHN 2.5 EH	A572-50 (50 ksi)	Pipe	ROHN TS1.5x16 GA	A53-B-42 (42 ksi)
T5 59.00-54.00	Pipe	ROHN 2.5 EH	A572-50 (50 ksi)	Pipe		A53-B-42 (42 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 139.00-119.00	Pipe	ROHN TS1.5x16 GA	A53-B-42 (42 ksi)	Pipe	ROHN TS1.5x16 GA	A36 (36 ksi)
T2 119.00-99.00	Pipe	ROHN TS1.5x16 GA	A53-B-42 (42 ksi)	Pipe	ROHN TS1.5x16 GA	A36 (36 ksi)
T3 99.00-79.00	Pipe	ROHN TS1.5x16 GA	A53-B-42 (42 ksi)	Pipe	ROHN TS1.5x16 GA	A36 (36 ksi)
T4 79.00-59.00	Pipe	ROHN TS1.5x16 GA	A53-B-42 (42 ksi)	Pipe	ROHN TS1.5x16 GA	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	No. of Mid Girts	Mid Girt Type	Mid Girt Size	Mid Girt Grade	Horizontal Type	Horizontal Size	Horizontal Grade
T5 59.00-54.00	None	Flat Bar		A36 (36 ksi)	Equal Angle	L4x4x1/4	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation *ft*	*Gusset Area (per face)* ft^2	*Gusset Thickness* *in*	*Gusset Grade*	*Adjust. Factor* A_f	*Adjust. Factor* A_r	*Weight Mult.*	*Double Angle Stitch Bolt Spacing Diagonals* *in*	*Double Angle Stitch Bolt Spacing Horizontals* *in*
T1 139.00-119.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	36.0000	36.0000
T2 119.00-99.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	36.0000	36.0000
T3 99.00-79.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	36.0000	36.0000
T4 79.00-59.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	36.0000	36.0000
T5 59.00-54.00	0.00	0.0000	A36 (36 ksi)	1	1	1.05	36.0000	36.0000

Tower Section Geometry *(cont'd)*

Tower Elevation *ft*	*Calc K Single Angles*	*Calc K Solid Rounds*	*K Factors*[1] *Legs*	*X Brace Diags X Y*	*K Brace Diags X Y*	*Single Diags X Y*	*Girts X Y*	*Horiz. X Y*	*Sec. Horiz. X Y*	*Inner Brace X Y*
T1 139.00-119.00	No	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T2 119.00-99.00	No	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T3 99.00-79.00	No	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T4 79.00-59.00	No	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T5 59.00-54.00	No	No	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1

[1]*Note: K factors are applied to member segment lengths. K-braces without inner supporting members will have the K factor in the out-of-plane direction applied to the overall length.*

Tower Section Geometry *(cont'd)*

Tower Elevation *ft*	*Leg* *Net Width Deduct* in	*Leg* *U*	*Diagonal* *Net Width Deduct* in	*Diagonal* *U*	*Top Girt* *Net Width Deduct* in	*Top Girt* *U*	*Bottom Girt* *Net Width Deduct* in	*Bottom Girt* *U*	*Mid Girt* *Net Width Deduct* in	*Mid Girt* *U*	*Long Horizontal* *Net Width Deduct* in	*Long Horizontal* *U*	*Short Horizontal* *Net Width Deduct* in	*Short Horizontal* *U*
T1 139.00-119.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T2 119.00-99.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T3 99.00-79.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T4 79.00-59.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T5 59.00-54.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

Tower Section Geometry *(cont'd)*

Tower Elevation ft	*Leg Connection Type*	*Leg*		*Diagonal*		*Top Girt*		*Bottom Girt*		*Mid Girt*		*Long Horizontal*		*Short Horizontal*	
		Bolt Size in	*No.*	*Bolt Size* in	*No.*	*Bolt Size* in	*No.*	*Bolt Size* in	*No.*	*Bolt Size* in	*No.*	*Bolt Size* in	*No.*	*Bolt Size* in	*No.*
T1 139.00-119.00	Flange	0.7500 A325N	4	0.5000 A325N	1	0.5000 A325N	1	0.5000 A325N	1	0.6250 A325N	0	0.5000 A325N	0	0.6250 A325N	0
T2 119.00-99.00	Flange	0.7500 A325N	4	0.5000 A325N	1	0.5000 A325N	1	0.5000 A325N	1	0.6250 A325N	0	0.5000 A325N	0	0.6250 A325N	0
T3 99.00-79.00	Flange	0.7500 A325N	4	0.5000 A325N	1	0.5000 A325N	1	0.5000 A325N	1	0.6250 A325N	0	0.5000 A325N	0	0.6250 A325N	0
T4 79.00-59.00	Flange	0.7500 A325N	4	0.5000 A325N	1	0.5000 A325N	1	0.5000 A325N	1	0.6250 A325N	0	0.5000 A325N	0	0.6250 A325N	0
T5 59.00-54.00	Flange	0.7500 A325N	4	0.5000 A325N	0	0.5000 A325N	0	0.5000 A325N	0	0.6250 A325N	0	0.5000 A325N	0	0.6250 A325N	0

Guy Data

Guy Elevation ft	*Guy Grade*		*Guy Size*	*Initial Tension* lb	*%*	*Guy Modulus* ksi	*Guy Weight* plf	*L_u* ft	*Anchor Radius* ft	*Anchor Azimuth Adj.* °	*Anchor Elevation* ft	*End Fitting Efficiency* %
121.523	EHS	A	9/16	3500.00	10%	21000	0.671	77.43	38.00	0.0000	53.00	100%
		B	9/16	3500.00	10%	21000	0.671	93.60	48.00	0.0000	40.00	100%
		C	9/16	3500.00	10%	21000	0.671	106.78	71.00	0.0000	40.00	100%

Guy Data*(cont'd)*

Guy Elevation ft	*Mount Type*	*Torque-Arm Spread* ft	*Torque-Arm Leg Angle* °	*Torque-Arm Style*	*Torque-Arm Grade*	*Torque-Arm Type*	*Torque-Arm Size*
121.523	Torque Arm	6.83	0.0000	Channel	A36 (36 ksi)	Channel	C12x25

Guy Data *(cont'd)*

Guy Elevation ft	*Diagonal Grade*	*Diagonal Type*	*Upper Diagonal Size*	*Lower Diagonal Size*	*Is Strap.*	*Pull-Off Grade*	*Pull-Off Type*	*Pull-Off Size*
121.52	A572-50 (50 ksi)	Solid Round			No	A36 (36 ksi)	Double Equal Angle	2L2x2x1/4x3/8

Guy Data *(cont'd)*

Guy Elevation ft	Cable Weight A lb	Cable Weight B lb	Cable Weight C lb	Cable Weight D lb	Tower Intercept A ft	Tower Intercept B ft	Tower Intercept C ft	Tower Intercept D ft
121.523	51.95	62.81	71.65		0.57 1.3 sec/pulse	0.83 1.6 sec/pulse	1.09 1.8 sec/pulse	

Guy Data *(cont'd)*

Guy Elevation ft	Calc K Single Angles	Calc K Solid Rounds	Torque Arm K_x	Torque Arm K_y	Pull Off K_x	Pull Off K_y	Diagonal K_x	Diagonal K_y
121.523	No	No	1	1	1	1	1	1

Guy Data *(cont'd)*

Guy Elevation	Torque-Arm				Pull Off				Diagonal			
ft	Bolt Size in	Number	Net Width Deduct in	U	Bolt Size in	Number	Net Width Deduct in	U	Bolt Size in	Number	Net Width Deduct in	U
121.523	0.0000 A325N	0	0.0000	1	0.6250 A325N	0	0.0000	0.75	0.6250 A325N	0	0.0000	0.75

Guy Pressures

Guy Elevation ft	Guy Location	z ft	q_z psf	q_z Ice psf	Ice Thickness in
121.523	A	87.26	22	5	1.1238
	B	80.76	21	5	1.1134
	C	80.76	21	5	1.1134

Guy-Mast Forces (Excluding Wind) - No Ice

Guy Elevation ft	Guy Location	Chord Angle °	Guy Tension Top Bottom lb	F_x lb	F_y lb	F_z lb	M_x lb-ft	M_y lb-ft	M_z lb-ft
121.523	A	62.1603	3545.94 3500.00	-155.33	3141.18	-1637.85	-6196.33	5902.40	-10732.36
	A	62.1603	3545.94 3500.00	155.33	3141.18	-1637.85	-6196.33	-5902.40	10732.36
	B	60.4839	3554.65	1565.14	3100.92	755.09	12233.85	6174.84	0.00

Guy Elevation *ft*	*Guy Location*	*Chord Angle* °	*Guy Tension Top Bottom lb*	F_x *lb*	F_y *lb*	F_z *lb*	M_x *lb-ft*	M_y *lb-ft*	M_z *lb-ft*
			3500.00						
	B	60.4839	3554.65 3500.00	1436.50	3100.92	977.91	-6116.93	-6174.84	-10594.83
	C	49.7102	3554.66 3500.00	-1916.49	2726.39	1236.69	-5378.12	8005.85	9315.18
	C	49.7102	3554.66 3500.00	-2029.25	2726.39	1041.39	10756.25	-8005.85	0.00
			Sum:	**-944.10**	17936.99	**735.37**	**-897.61**	0.00	**-1279.64**

Guy-Mast Forces (Excluding Wind) - Ice

Guy Elevation *ft*	*Guy Location*	*Chord Angle* °	*Guy Tension Top Bottom lb*	F_x *lb*	F_y *lb*	F_z *lb*	M_x *lb-ft*	M_y *lb-ft*	M_z *lb-ft*
121.523	A	62.1603	5027.23 4822.79	-217.10	4470.49	-2289.24	-8818.55	8249.82	-15274.17
	A	62.1603	5027.23 4822.79	217.10	4470.49	-2289.24	-8818.55	-8249.82	15274.17
	B	60.4839	5090.38 4850.05	2204.79	4463.12	1063.68	17608.03	8698.39	0.00
	B	60.4839	5090.38 4850.05	2023.57	4463.12	1377.56	-8804.01	-8698.39	-15249.00
	C	49.7102	5218.40 4978.08	-2769.06	4046.13	1786.84	-7981.46	11567.34	13824.29
	C	49.7102	5218.40 4978.08	-2931.98	4046.13	1504.66	15962.91	-11567.34	0.00
			Sum:	**-1472.69**	25959.49	**1154.27**	**-851.62**	0.00	**-1424.71**

Guy-Mast Forces (Excluding Wind) - Service

Guy Elevation *ft*	*Guy Location*	*Chord Angle* °	*Guy Tension Top Bottom lb*	F_x *lb*	F_y *lb*	F_z *lb*	M_x *lb-ft*	M_y *lb-ft*	M_z *lb-ft*
121.523	A	62.1603	3545.94 3500.00	-155.33	3141.18	-1637.85	-6196.33	5902.40	-10732.36
	A	62.1603	3545.94 3500.00	155.33	3141.18	-1637.85	-6196.33	-5902.40	10732.36
	B	60.4839	3554.65 3500.00	1565.14	3100.92	755.09	12233.85	6174.84	0.00
	B	60.4839	3554.65 3500.00	1436.50	3100.92	977.91	-6116.93	-6174.84	-10594.83
	C	49.7102	3554.66 3500.00	-1916.49	2726.39	1236.69	-5378.12	8005.85	9315.18
	C	49.7102	3554.66 3500.00	-2029.25	2726.39	1041.39	10756.25	-8005.85	0.00

tnxTower	Job: University of Hartford (CT03XC078)	Page: 8 of 30
Ramaker & Associates, Inc. 1120 Dallas Street Sauk City, WI 53583 Phone: (608) 643-4100 FAX: (608) 643-7999	Project: 22996	Date: 15:41:02 08/06/14
	Client: Sprint	Designed by: tmoore

Guy Elevation	Guy Location	Chord Angle	Guy Tension Top Bottom lb	F_x	F_y	F_z	M_x	M_y	M_z
ft		°		lb	lb	lb	lb-ft	lb-ft	lb-ft
			Sum:	**-944.10**	17936.99	**735.37**	**-897.61**	0.00	**-1279.64**

Guy-Tensioning Information

				Temperature At Time Of Tensioning													
				0 F		20 F		40 F		60 F		80 F		100 F		120 F	
Guy Elevation		H	V	Initial Tension	Intercept	Initial Tension	Intercept	Initial Tension	Intercept	Initial Tension	Intercept	Initial Tension	Intercept	Initial Tension	Intercept	Initial Tension	Intercept
ft		ft	ft	lb	ft	lb	ft	lb	ft	lb	ft	lb	ft	lb	ft	lb	ft
121.523	A	36.19	68.52	3846	0.52	3731	0.54	3615	0.55	3500	0.57	3385	0.59	3270	0.61	3155	0.63
	B	46.15	81.52	3884	0.75	3756	0.78	3628	0.80	3500	0.83	3372	0.87	3244	0.90	3117	0.94
	C	69.11	81.52	4158	0.91	3938	0.97	3719	1.02	3500	1.09	3282	1.16	3065	1.24	2849	1.33

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Component Type	Placement	Face Offset	Lateral Offset	#	# Per Row	Clear Spacing	Width or Diameter	Perimeter	Weight
				ft	in	(Frac FW)			in	in	in	plf
1/2	B	Yes	Ar (CfAe)	139.00 - 54.00	0.0000	0.5	1	1	0.5800	0.5800		0.25
1/2	B	Yes	Ar (CfAe)	139.00 - 54.00	0.0000	0.475	1	1	0.5800	0.5800		0.25
1/2	B	Yes	Ar (CfAe)	139.00 - 54.00	0.0000	0.45	1	1	0.5800	0.5800		0.25
1/2	B	Yes	Ar (CfAe)	139.00 - 54.00	0.0000	0.425	1	1	0.5800	0.5800		0.25
1/2	B	Yes	Ar (CfAe)	139.00 - 54.00	0.0000	0.4	1	1	0.5800	0.5800		0.25
2" Corrugated Innerduct	B	Yes	Ar (CfAe)	134.00 - 54.00	0.0000	-0.3	2	2	1.5000 2.3750	2.3750		0.22
1/2	B	Yes	Ar (CfAe)	128.00 - 54.00	0.0000	-0.425	1	1	0.5800	0.5800		0.25
1/2	B	Yes	Ar (CfAe)	124.00 - 54.00	0.0000	-0.45	1	1	0.5800	0.5800		0.25
1/2	B	Yes	Ar (CfAe)	111.00 - 54.00	0.0000	-0.475	1	1	0.5800	0.5800		0.25
1/2	B	Yes	Ar (CfAe)	106.00 - 54.00	0.0000	-0.5	1	1	0.5800	0.5800		0.25
7/8	A	Yes	Ar (CfAe)	98.00 - 54.00	0.0000	0	6	6	1.1100	1.1100		0.54
1/2	B	Yes	Ar (CfAe)	69.00 - 54.00	0.0000	-0.4	1	1	0.5800	0.5800		0.25
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HB114-1-08U4-M5J	B	Yes	Ar (CfAe)	134.00 - 54.00	0.0000	-0.1	3	3	1.5000 1.5400	1.5400		1.08
1 1/4	B	Yes	Ar (CfAe)	134.00 - 54.00	0.0000	0.05	1	1	1.5500	1.5500		0.66

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation	Face	A_R	A_F	C_AA_A In Face	C_AA_A Out Face	Weight
	ft		ft²	ft²	ft²	ft²	lb
T1	139.00-119.00	A	0.000	0.000	0.000	0.000	0.00
		B	19.160	0.000	0.000	0.000	93.57
		C	0.000	0.000	0.000	0.000	0.00
T2	119.00-99.00	A	0.000	0.000	0.000	0.000	0.00
		B	25.885	0.000	0.000	0.000	126.51
		C	0.000	0.000	0.000	0.000	0.00

Tower Section	Tower Elevation ft	Face	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight lb
T3	99.00-79.00	A	10.545	0.000	0.000	0.000	61.56
		B	26.900	0.000	0.000	0.000	131.76
		C	0.000	0.000	0.000	0.000	0.00
T4	79.00-59.00	A	11.100	0.000	0.000	0.000	64.80
		B	27.383	0.000	0.000	0.000	134.26
		C	0.000	0.000	0.000	0.000	0.00
T5	59.00-54.00	A	2.775	0.000	0.000	0.000	16.20
		B	6.967	0.000	0.000	0.000	34.19
		C	0.000	0.000	0.000	0.000	0.00

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight lb
T1	139.00-119.00	A	1.178	0.000	0.000	0.000	0.000	0.00
		B		43.551	12.444	0.000	0.000	773.62
		C		0.000	0.000	0.000	0.000	0.00
T2	119.00-99.00	A	1.154	0.000	0.000	0.000	0.000	0.00
		B		58.921	16.592	0.000	0.000	1026.79
		C		0.000	0.000	0.000	0.000	0.00
T3	99.00-79.00	A	1.126	5.325	17.575	0.000	0.000	360.10
		B		62.866	16.592	0.000	0.000	1053.31
		C		0.000	0.000	0.000	0.000	0.00
T4	79.00-59.00	A	1.093	5.492	18.500	0.000	0.000	370.44
		B		63.814	16.592	0.000	0.000	1041.99
		C		0.000	0.000	0.000	0.000	0.00
T5	59.00-54.00	A	1.067	1.351	4.625	0.000	0.000	90.98
		B		16.249	4.148	0.000	0.000	259.48
		C		0.000	0.000	0.000	0.000	0.00

Feed Line Shielding

Section	Elevation ft	Face	A_R ft²	A_R Ice ft²	A_F ft²	A_F Ice ft²
T1	139.00-119.00	A	0.000	0.000	0.000	0.000
		B	2.584	19.959	0.160	0.467
		C	0.000	0.000	0.000	0.000
T2	119.00-99.00	A	0.000	0.000	0.000	0.000
		B	1.907	14.125	0.000	0.000
		C	0.000	0.000	0.000	0.000
T3	99.00-79.00	A	0.777	4.221	0.000	0.000
		B	1.982	14.647	0.000	0.000
		C	0.000	0.000	0.000	0.000
T4	79.00-59.00	A	0.818	4.343	0.000	0.000
		B	2.018	14.554	0.000	0.000
		C	0.000	0.000	0.000	0.000
T5	59.00-54.00	A	0.000	0.850	0.740	1.594
		B	0.000	2.901	1.858	5.439
		C	0.000	0.000	0.000	0.000

Feed Line Center of Pressure

Section	*Elevation* *ft*	CP_X *in*	CP_Z *in*	CP_X *Ice* *in*	CP_Z *Ice* *in*
T1	139.00-119.00	2.3794	-1.5868	2.4068	0.3015
T2	119.00-99.00	3.3096	-3.3106	3.6567	-1.4748
T3	99.00-79.00	1.5048	-3.9190	2.3348	-2.3399
T4	79.00-59.00	1.4292	-4.0272	2.2548	-2.5747
T5	59.00-54.00	1.3580	-2.6053	1.7772	-1.7980

Discrete Tower Loads

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* *ft ft ft*	*Azimuth Adjustment* *°*	*Placement* *ft*		C_AA_A *Front* *ft²*	C_AA_A *Side* *ft²*	*Weight* *lb*
DB432-A	C	From Face	0.00	0.0000	149.00	No Ice	0.30	0.30	5.00
			0.00			1/2" Ice	0.54	0.54	6.50
			0.00			1" Ice	0.78	0.78	8.00
						2" Ice	1.26	1.26	11.00
						4" Ice	2.22	2.22	17.00
8' Yagi	C	From Face	0.00	0.0000	144.00	No Ice	4.17	4.17	40.00
			0.00			1/2" Ice	10.85	10.85	85.88
			0.00			1" Ice	17.54	17.54	172.70
						2" Ice	30.99	30.99	469.78
						4" Ice	58.08	58.08	1561.95
10'x2" Pipe Mount	C	From Face	0.00	0.0000	139.00	No Ice	2.38	2.38	36.50
			0.00			1/2" Ice	3.40	3.40	54.35
			5.00			1" Ice	4.45	4.45	78.71
						2" Ice	5.91	5.91	147.54
						4" Ice	8.47	8.47	369.96
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LLPX310R w/Mount Pipe	A	From Leg	4.00	0.0000	134.00	No Ice	5.22	3.16	45.81
			0.00			1/2" Ice	5.66	3.74	85.21
			0.00			1" Ice	6.12	4.33	130.09
						2" Ice	7.06	5.61	239.19
						4" Ice	9.11	8.50	561.92
LLPX310R w/Mount Pipe	B	From Leg	4.00	0.0000	134.00	No Ice	5.22	3.16	45.81
			0.00			1/2" Ice	5.66	3.74	85.21
			0.00			1" Ice	6.12	4.33	130.09
						2" Ice	7.06	5.61	239.19
						4" Ice	9.11	8.50	561.92
LLPX310R w/Mount Pipe	C	From Leg	4.00	0.0000	134.00	No Ice	5.22	3.16	45.81
			0.00			1/2" Ice	5.66	3.74	85.21
			0.00			1" Ice	6.12	4.33	130.09
						2" Ice	7.06	5.61	239.19
						4" Ice	9.11	8.50	561.92
Huawei RRU3702	A	From Leg	4.00	0.0000	134.00	No Ice	2.59	0.87	47.00
			0.00			1/2" Ice	2.80	1.03	61.90
			0.00			1" Ice	3.03	1.19	79.44
						2" Ice	3.51	1.55	123.21
						4" Ice	4.57	2.37	250.96
Huawei RRU3702	B	From Leg	4.00	0.0000	134.00	No Ice	2.59	0.87	47.00

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight lb
			0.00			1/2" Ice	2.80	1.03	61.90
			0.00			1" Ice	3.03	1.19	79.44
						2" Ice	3.51	1.55	123.21
						4" Ice	4.57	2.37	250.96
Huawei RRU3702	C	From Leg	4.00	0.0000	134.00	No Ice	2.59	0.87	47.00
			0.00			1/2" Ice	2.80	1.03	61.90
			0.00			1" Ice	3.03	1.19	79.44
						2" Ice	3.51	1.55	123.21
						4" Ice	4.57	2.37	250.96
APXVSPP18-C-A20 w/Mount Pipe	A	From Leg	4.00	0.0000	134.00	No Ice	8.56	6.95	82.55
			-2.50			1/2" Ice	9.21	8.13	150.82
			0.00			1" Ice	9.83	9.03	227.06
						2" Ice	11.10	10.85	407.06
						4" Ice	13.75	14.86	911.21
APXVSPP18-C-A20 w/Mount Pipe	B	From Leg	4.00	0.0000	134.00	No Ice	8.56	6.95	82.55
			-2.50			1/2" Ice	9.21	8.13	150.82
			0.00			1" Ice	9.83	9.03	227.06
						2" Ice	11.10	10.85	407.06
						4" Ice	13.75	14.86	911.21
APXVSPP18-C-A20 w/Mount Pipe	C	From Leg	4.00	0.0000	134.00	No Ice	8.56	6.95	82.55
			-2.50			1/2" Ice	9.21	8.13	150.82
			0.00			1" Ice	9.83	9.03	227.06
						2" Ice	11.10	10.85	407.06
						4" Ice	13.75	14.86	911.21
(2) 1900MHz 4x40W RRH	A	From Leg	4.00	0.0000	134.00	No Ice	2.71	2.61	59.50
			-2.50			1/2" Ice	2.95	2.84	82.62
			0.00			1" Ice	3.20	3.09	108.98
						2" Ice	3.72	3.61	172.17
						4" Ice	4.86	4.74	345.91
(2) 1900MHz 4x40W RRH	B	From Leg	4.00	0.0000	134.00	No Ice	2.71	2.61	59.50
			-2.50			1/2" Ice	2.95	2.84	82.62
			0.00			1" Ice	3.20	3.09	108.98
						2" Ice	3.72	3.61	172.17
						4" Ice	4.86	4.74	345.91
(2) 1900MHz 4x40W RRH	C	From Leg	4.00	0.0000	134.00	No Ice	2.71	2.61	59.50
			-2.50			1/2" Ice	2.95	2.84	82.62
			0.00			1" Ice	3.20	3.09	108.98
						2" Ice	3.72	3.61	172.17
						4" Ice	4.86	4.74	345.91
800MHz 2x50W RRH	A	From Leg	4.00	0.0000	134.00	No Ice	2.40	2.25	64.00
			-2.50			1/2" Ice	2.61	2.46	86.12
			0.00			1" Ice	2.83	2.68	111.30
						2" Ice	3.30	3.13	171.62
						4" Ice	4.34	4.15	337.52
800MHz 2x50W RRH	B	From Leg	4.00	0.0000	134.00	No Ice	2.40	2.25	64.00
			-2.50			1/2" Ice	2.61	2.46	86.12
			0.00			1" Ice	2.83	2.68	111.30
						2" Ice	3.30	3.13	171.62
						4" Ice	4.34	4.15	337.52
800MHz 2x50W RRH	C	From Leg	4.00	0.0000	134.00	No Ice	2.40	2.25	64.00
			-2.50			1/2" Ice	2.61	2.46	86.12
			0.00			1" Ice	2.83	2.68	111.30
						2" Ice	3.30	3.13	171.62
						4" Ice	4.34	4.15	337.52
APXV9TM14-ALU-I20 w/Mount Pipe	A	From Leg	4.00	0.0000	134.00	No Ice	7.21	5.03	77.02
			5.00			1/2" Ice	7.77	5.89	132.43
			0.00			1" Ice	8.31	6.63	194.59

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert (ft, ft, ft)	Azimuth Adjustment (°)	Placement (ft)		C_AA_A Front (ft^2)	C_AA_A Side (ft^2)	Weight (lb)
						2" Ice	9.42	8.20	342.42
						4" Ice	11.77	11.67	762.71
APXV9TM14-ALU-I20 w/Mount Pipe	B	From Leg	4.00	0.0000	134.00	No Ice	7.21	5.03	77.02
			5.00			1/2" Ice	7.77	5.89	132.43
			0.00			1" Ice	8.31	6.63	194.59
						2" Ice	9.42	8.20	342.42
						4" Ice	11.77	11.67	762.71
APXV9TM14-ALU-I20 w/Mount Pipe	C	From Leg	4.00	0.0000	134.00	No Ice	7.21	5.03	77.02
			5.00			1/2" Ice	7.77	5.89	132.43
			0.00			1" Ice	8.31	6.63	194.59
						2" Ice	9.42	8.20	342.42
						4" Ice	11.77	11.67	762.71
TD-RRH8x20-25	A	From Leg	4.00	0.0000	134.00	No Ice	4.72	1.70	70.00
			4.00			1/2" Ice	5.01	1.92	97.14
			0.00			1" Ice	5.32	2.14	127.80
						2" Ice	5.95	2.62	200.48
						4" Ice	7.31	3.68	396.71
TD-RRH8x20-25	B	From Leg	4.00	0.0000	134.00	No Ice	4.72	1.70	70.00
			4.00			1/2" Ice	5.01	1.92	97.14
			0.00			1" Ice	5.32	2.14	127.80
						2" Ice	5.95	2.62	200.48
						4" Ice	7.31	3.68	396.71
TD-RRH8x20-25	C	From Leg	4.00	0.0000	134.00	No Ice	4.72	1.70	70.00
			4.00			1/2" Ice	5.01	1.92	97.14
			0.00			1" Ice	5.32	2.14	127.80
						2" Ice	5.95	2.62	200.48
						4" Ice	7.31	3.68	396.71
PiROD 12' T-Frame	A	From Leg	4.00	0.0000	134.00	No Ice	12.20	12.20	360.00
			0.00			1/2" Ice	17.60	17.60	490.00
			0.00			1" Ice	23.00	23.00	620.00
						2" Ice	33.80	33.80	880.00
						4" Ice	55.40	55.40	1400.00
PiROD 12' T-Frame	B	From Leg	4.00	0.0000	134.00	No Ice	12.20	12.20	360.00
			0.00			1/2" Ice	17.60	17.60	490.00
			0.00			1" Ice	23.00	23.00	620.00
						2" Ice	33.80	33.80	880.00
						4" Ice	55.40	55.40	1400.00
PiROD 12' T-Frame	C	From Leg	4.00	0.0000	134.00	No Ice	12.20	12.20	360.00
			0.00			1/2" Ice	17.60	17.60	490.00
			0.00			1" Ice	23.00	23.00	620.00
						2" Ice	33.80	33.80	880.00
						4" Ice	55.40	55.40	1400.00
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10' Omni	C	From Leg	4.00	0.0000	111.00	No Ice	2.75	2.75	30.00
			0.00			1/2" Ice	3.78	3.78	50.21
			5.00			1" Ice	4.83	4.83	76.96
						2" Ice	6.12	6.12	150.70
						4" Ice	8.69	8.69	383.40
4' Standoff	C	From Leg	2.00	0.0000	111.00	No Ice	2.72	2.72	50.00
			0.00			1/2" Ice	4.91	4.91	89.00
			0.00			1" Ice	7.10	7.10	128.00
						2" Ice	11.48	11.48	206.00
						4" Ice	20.24	20.24	362.00
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DB225-A	B	From Leg	4.00	0.0000	106.00	No Ice	3.21	3.21	37.00
			0.00			1/2" Ice	5.78	5.78	48.10
			0.00			1" Ice	8.35	8.35	59.20

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* ft ft ft	*Azimuth Adjustment* °	*Placement* ft		C_AA_A *Front* ft^2	C_AA_A *Side* ft^2	*Weight* lb
						2" Ice	13.48	13.48	81.40
						4" Ice	23.75	23.75	125.80
4' Standoff	B	From Leg	2.00	0.0000	106.00	No Ice	2.72	2.72	50.00
			0.00			1/2" Ice	4.91	4.91	89.00
			0.00			1" Ice	7.10	7.10	128.00
						2" Ice	11.48	11.48	206.00
						4" Ice	20.24	20.24	362.00
****************									
800 10504 w/Mount Pipe	A	From Leg	1.00	0.0000	98.00	No Ice	3.47	3.05	38.05
			-2.00			1/2" Ice	3.84	3.68	69.36
			0.00			1" Ice	4.23	4.33	106.43
						2" Ice	5.08	5.67	200.70
						4" Ice	6.99	8.61	497.01
800 10504 w/Mount Pipe	B	From Leg	1.00	0.0000	98.00	No Ice	3.47	3.05	38.05
			-2.00			1/2" Ice	3.84	3.68	69.36
			0.00			1" Ice	4.23	4.33	106.43
						2" Ice	5.08	5.67	200.70
						4" Ice	6.99	8.61	497.01
800 10504 w/Mount Pipe	C	From Leg	1.00	0.0000	98.00	No Ice	3.47	3.05	38.05
			-2.00			1/2" Ice	3.84	3.68	69.36
			0.00			1" Ice	4.23	4.33	106.43
						2" Ice	5.08	5.67	200.70
						4" Ice	6.99	8.61	497.01
6" x 2" Pipe Mount	A	From Leg	1.00	0.0000	98.00	No Ice	1.43	1.43	21.90
			2.00			1/2" Ice	1.92	1.92	32.73
			0.00			1" Ice	2.29	2.29	47.61
						2" Ice	3.06	3.06	90.18
						4" Ice	4.70	4.70	230.74
6" x 2" Pipe Mount	B	From Leg	1.00	0.0000	98.00	No Ice	1.43	1.43	21.90
			2.00			1/2" Ice	1.92	1.92	32.73
			0.00			1" Ice	2.29	2.29	47.61
						2" Ice	3.06	3.06	90.18
						4" Ice	4.70	4.70	230.74
6" x 2" Pipe Mount	C	From Leg	1.00	0.0000	98.00	No Ice	1.43	1.43	21.90
			2.00			1/2" Ice	1.92	1.92	32.73
			0.00			1" Ice	2.29	2.29	47.61
						2" Ice	3.06	3.06	90.18
						4" Ice	4.70	4.70	230.74
(3) 5'x3" Pipe Mount	C	None		0.0000	98.00	No Ice	1.50	1.50	37.90
						1/2" Ice	1.81	1.81	56.93
						1" Ice	2.14	2.14	78.91
						2" Ice	2.87	2.87	126.83
						4" Ice	4.70	4.70	275.49
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6' Omni	B	From Leg	4.00	0.0000	69.00	No Ice	2.11	2.11	37.30
			0.00			1/2" Ice	2.60	2.60	56.00
			3.00			1" Ice	3.13	3.13	79.69
						2" Ice	4.26	4.26	143.72
						4" Ice	6.77	6.77	354.03
2' Standoff	B	From Leg	2.00	0.0000	69.00	No Ice	1.80	1.80	33.00
			0.00			1/2" Ice	3.30	3.30	59.00
			0.00			1" Ice	4.80	4.80	85.00
						2" Ice	7.80	7.80	137.00
						4" Ice	13.80	13.80	241.00

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert	Azimuth Adjustment	3 dB Beam Width	Elevation	Outside Diameter		Aperture Area	Weight
				ft	°	°	ft	ft		ft²	lb
PR-950	C	Grid	From Leg	1.00 0.00 0.00	0.0000		128.00	4.65	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	17.00 17.61 18.22 19.44 21.88	38.00 91.75 145.50 253.00 468.00
PR-950	C	Grid	From Leg	1.00 0.00 0.00	0.0000		124.00	4.65	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	17.00 17.61 18.22 19.44 21.88	38.00 91.75 145.50 253.00 468.00
VHLP2.5	A	Paraboloid w/Shroud (HP)	From Leg	4.00 0.00 0.00	0.0000		139.00	2.92	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.68 7.07 7.46 8.24 9.80	48.00 76.00 104.00 160.00 272.00
VHLP2	B	Paraboloid w/Shroud (HP)	From Leg	4.00 2.00 0.00	0.0000		139.00	2.18	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.72 4.01 4.30 4.88 6.04	27.00 54.00 81.00 135.00 243.00
VHLP1	B	Paraboloid w/Shroud (HP)	From Leg	4.00 -2.00 0.00	0.0000		139.00	1.28	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.28 1.45 1.62 1.97 2.65	14.00 27.00 40.00 66.00 118.00

Force Totals (Does not include forces on guys)

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Torques lb-ft
Leg Weight	2062.25			
Bracing Weight	1313.17			
Total Member Self-Weight	3375.43			
Guy Weight	372.82			
Total Weight	7784.59			
Wind 0 deg - No Ice		-32.32	-11712.86	613.34
Wind 30 deg - No Ice		5891.62	-10240.10	641.81
Wind 60 deg - No Ice		10221.03	-5923.45	421.67
Wind 90 deg - No Ice		11799.78	-3.48	58.36
Wind 120 deg - No Ice		10102.50	5905.75	-230.11
Wind 150 deg - No Ice		5753.02	10123.27	-811.46
Wind 180 deg - No Ice		-30.05	11760.08	-756.48
Wind 210 deg - No Ice		-5901.59	10289.95	-690.46
Wind 240 deg - No Ice		-10283.92	5973.17	-507.11
Wind 270 deg - No Ice		-11835.79	-19.76	-29.81
Wind 300 deg - No Ice		-10167.62	-5857.92	357.49
Wind 330 deg - No Ice		-5853.66	-10051.13	790.64

Load Case	*Vertical Forces* *lb*	*Sum of Forces X* *lb*	*Sum of Forces Z* *lb*	*Sum of Torques* *lb-ft*
Member Ice	4249.42			
Guy Ice	1272.11			
Total Weight Ice	22212.75			
Wind 0 deg - Ice		275.59	-5874.88	1090.37
Wind 30 deg - Ice		3116.02	-5050.45	1255.22
Wind 60 deg - Ice		5169.12	-2988.84	771.72
Wind 90 deg - Ice		5929.00	-177.55	75.98
Wind 120 deg - Ice		5220.63	2703.01	-328.59
Wind 150 deg - Ice		2855.92	4965.76	-529.92
Wind 180 deg - Ice		-22.95	5783.70	-729.09
Wind 210 deg - Ice		-2907.39	5061.31	-796.99
Wind 240 deg - Ice		-5079.34	2939.67	-792.35
Wind 270 deg - Ice		-5831.67	-9.94	-539.65
Wind 300 deg - Ice		-5013.95	-2872.75	-37.04
Wind 330 deg - Ice		-2865.18	-4957.62	525.27
Total Weight	7784.59			
Wind 0 deg - Service		-12.63	-4575.34	239.59
Wind 30 deg - Service		2301.42	-4000.04	250.71
Wind 60 deg - Service		3992.59	-2313.85	164.72
Wind 90 deg - Service		4609.29	-1.36	22.80
Wind 120 deg - Service		3946.29	2306.93	-89.89
Wind 150 deg - Service		2247.27	3954.40	-316.98
Wind 180 deg - Service		-11.74	4593.78	-295.50
Wind 210 deg - Service		-2305.31	4019.51	-269.71
Wind 240 deg - Service		-4017.16	2333.27	-198.09
Wind 270 deg - Service		-4623.36	-7.72	-11.65
Wind 300 deg - Service		-3971.73	-2288.25	139.64
Wind 330 deg - Service		-2286.59	-3926.22	308.84

Load Combinations

Comb. No.	*Description*
1	Dead Only
2	Dead+Wind 0 deg - No Ice+Guy
3	Dead+Wind 30 deg - No Ice+Guy
4	Dead+Wind 60 deg - No Ice+Guy
5	Dead+Wind 90 deg - No Ice+Guy
6	Dead+Wind 120 deg - No Ice+Guy
7	Dead+Wind 150 deg - No Ice+Guy
8	Dead+Wind 180 deg - No Ice+Guy
9	Dead+Wind 210 deg - No Ice+Guy
10	Dead+Wind 240 deg - No Ice+Guy
11	Dead+Wind 270 deg - No Ice+Guy
12	Dead+Wind 300 deg - No Ice+Guy
13	Dead+Wind 330 deg - No Ice+Guy
14	Dead+Ice+Temp+Guy
15	Dead+Wind 0 deg+Ice+Temp+Guy
16	Dead+Wind 30 deg+Ice+Temp+Guy
17	Dead+Wind 60 deg+Ice+Temp+Guy
18	Dead+Wind 90 deg+Ice+Temp+Guy
19	Dead+Wind 120 deg+Ice+Temp+Guy
20	Dead+Wind 150 deg+Ice+Temp+Guy
21	Dead+Wind 180 deg+Ice+Temp+Guy

Comb. No.	Description
22	Dead+Wind 210 deg+Ice+Temp+Guy
23	Dead+Wind 240 deg+Ice+Temp+Guy
24	Dead+Wind 270 deg+Ice+Temp+Guy
25	Dead+Wind 300 deg+Ice+Temp+Guy
26	Dead+Wind 330 deg+Ice+Temp+Guy
27	Dead+Wind 0 deg - Service+Guy
28	Dead+Wind 30 deg - Service+Guy
29	Dead+Wind 60 deg - Service+Guy
30	Dead+Wind 90 deg - Service+Guy
31	Dead+Wind 120 deg - Service+Guy
32	Dead+Wind 150 deg - Service+Guy
33	Dead+Wind 180 deg - Service+Guy
34	Dead+Wind 210 deg - Service+Guy
35	Dead+Wind 240 deg - Service+Guy
36	Dead+Wind 270 deg - Service+Guy
37	Dead+Wind 300 deg - Service+Guy
38	Dead+Wind 330 deg - Service+Guy

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
T1	139 - 119	Leg	Max Tension	8	19574.90	-23.89	-20.05
			Max. Compression	10	-23054.04	553.27	-197.29
			Max. Mx	11	-1448.97	945.22	39.90
			Max. My	7	-1319.05	-475.46	-892.03
			Max. Vy	5	-1538.65	-744.60	27.91
			Max. Vx	8	-1403.92	53.86	-611.54
		Diagonal	Max Tension	11	2251.47	0.00	0.00
			Max. Compression	13	-2273.97	0.00	0.00
			Max. Mx	22	682.98	8.57	0.00
			Max. My	23	136.66	0.00	0.02
			Max. Vy	22	-8.20	0.00	0.00
			Max. Vx	23	0.02	0.00	0.00
		Top Girt	Max Tension	2	90.24	0.00	0.00
			Max. Compression	8	-98.54	0.00	0.00
			Max. Mx	23	52.50	6.99	0.00
			Max. My	23	-19.39	0.00	-0.00
			Max. Vy	23	8.19	0.00	0.00
			Max. Vx	23	-0.00	0.00	0.00
		Bottom Girt	Max Tension	9	836.21	0.00	0.00
			Max. Compression	7	-429.44	0.00	0.00
			Max. Mx	18	480.56	6.99	0.00
			Max. My	10	155.06	0.00	0.00
			Max. Vy	18	8.19	0.00	0.00
			Max. Vx	10	-0.00	0.00	0.00
		Guy A	Bottom Tension	9	12990.16		
			Top Tension	9	13035.41		
			Top Cable Vert	9	11521.42		
			Top Cable Norm	9	6097.33		
			Top Cable Tan	9	35.08		
			Bot Cable Vert	9	-11431.87		
			Bot Cable Norm	9	6168.52		
			Bot Cable Tan	9	76.73		
		Guy B	Bottom Tension	11	12375.81		
			Top Tension	11	12429.75		
			Top Cable Vert	11	10821.16		
			Top Cable Norm	11	6115.60		

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
			Top Cable Tan	11	21.62		
			Bot Cable Vert	11	-10713.11		
			Bot Cable Norm	11	6195.54		
			Bot Cable Tan	11	72.55		
		Guy C	Bottom Tension	5	9550.29		
			Top Tension	5	9604.54		
			Top Cable Vert	5	7355.90		
			Top Cable Norm	5	6175.60		
			Top Cable Tan	5	2.82		
			Bot Cable Vert	5	-7230.69		
			Bot Cable Norm	5	6238.77		
			Bot Cable Tan	5	52.90		
		Top Guy Pull-Off	Max Tension	4	5721.61	0.00	0.00
			Max. Compression	10	-5073.71	0.00	0.00
			Max. Mx	26	2370.10	21.93	0.00
			Max. My	10	3140.47	0.00	-0.00
			Max. Vy	26	-25.67	0.00	0.00
			Max. Vx	10	-0.00	0.00	0.00
		Torque Arm Top	Max Tension	5	6928.43	0.00	0.00
			Max. Compression	9	-3803.35	0.00	0.00
			Max. Mx	9	-580.12	-38010.45	0.00
			Max. My	10	-3317.61	-31976.31	-0.00
			Max. Vy	9	11169.88	-38010.45	0.00
			Max. Vx	10	-0.00	-31976.31	-0.00
T2	119 - 99	Leg	Max Tension	4	4142.32	-502.22	154.81
			Max. Compression	10	-21904.61	-304.41	111.46
			Max. Mx	5	836.05	-568.33	0.58
			Max. My	2	-9422.26	38.17	549.18
			Max. Vy	5	-1537.81	-568.33	0.58
			Max. Vx	8	-1403.83	46.92	-450.71
		Diagonal	Max Tension	13	2899.66	0.00	0.00
			Max. Compression	7	-3009.98	0.00	0.00
			Max. Mx	22	-744.99	8.37	0.00
			Max. My	23	100.52	0.00	0.02
			Max. Vy	22	-8.01	0.00	0.00
			Max. Vx	23	0.02	0.00	0.00
		Top Girt	Max Tension	6	1151.08	0.00	0.00
			Max. Compression	4	-984.10	0.00	0.00
			Max. Mx	18	260.86	6.83	0.00
			Max. My	23	-252.13	0.00	-0.00
			Max. Vy	18	8.00	0.00	0.00
			Max. Vx	23	-0.00	0.00	0.00
		Bottom Girt	Max Tension	12	592.73	0.00	0.00
			Max. Compression	6	-542.16	0.00	0.00
			Max. Mx	18	-83.12	6.83	0.00
			Max. My	22	252.65	0.00	-0.00
			Max. Vy	18	8.00	0.00	0.00
			Max. Vx	22	-0.00	0.00	0.00
T3	99 - 79	Leg	Max Tension	1	0.00	0.00	0.00
			Max. Compression	9	-23066.78	-18.36	-28.40
			Max. Mx	5	-15093.88	293.80	-116.13
			Max. My	8	-19027.23	34.16	305.53
			Max. Vy	5	-695.27	-164.71	-22.64
			Max. Vx	2	707.80	-30.09	185.69
		Diagonal	Max Tension	13	1043.98	0.00	0.00
			Max. Compression	3	-1200.44	0.00	0.00
			Max. Mx	22	236.61	8.15	0.00
			Max. My	21	-122.36	0.00	0.02
			Max. Vy	22	-7.80	0.00	0.00
			Max. Vx	21	-0.02	0.00	0.00
		Top Girt	Max Tension	6	400.87	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
			Max. Compression	12	-327.28	0.00	0.00
			Max. Mx	18	161.52	6.64	0.00
			Max. My	22	-112.56	0.00	-0.00
			Max. Vy	18	-7.78	0.00	0.00
			Max. Vx	22	0.00	0.00	0.00
		Bottom Girt	Max Tension	24	148.33	0.00	0.00
			Max. Compression	13	-70.61	0.00	0.00
			Max. Mx	23	44.95	6.64	0.00
			Max. My	22	-51.28	0.00	-0.00
			Max. Vy	23	-7.78	0.00	0.00
			Max. Vx	22	0.00	0.00	0.00
T4	79 - 59	Leg	Max Tension	1	0.00	0.00	0.00
			Max. Compression	9	-22839.68	86.01	2.64
			Max. Mx	10	-16848.13	736.45	305.79
			Max. My	9	-16857.55	-43.51	-797.38
			Max. Vy	25	-3582.37	713.61	317.24
			Max. Vx	10	4371.70	-27.87	-784.49
		Diagonal	Max Tension	13	1666.52	0.00	0.00
			Max. Compression	13	-1485.11	0.00	0.00
			Max. Mx	22	941.24	7.88	0.00
			Max. My	21	-246.96	0.00	0.02
			Max. Vy	22	-7.54	0.00	0.00
			Max. Vx	21	0.02	0.00	0.00
		Top Girt	Max Tension	13	179.29	0.00	0.00
			Max. Compression	23	-111.13	0.00	0.00
			Max. Mx	23	73.78	6.42	0.00
			Max. My	22	147.02	0.00	-0.00
			Max. Vy	23	-7.52	0.00	0.00
			Max. Vx	22	0.00	0.00	0.00
		Bottom Girt	Max Tension	10	2288.51	0.00	0.00
			Max. Compression	1	0.00	0.00	0.00
			Max. Mx	23	2153.79	6.42	0.00
			Max. My	22	1757.79	0.00	-0.00
			Max. Vy	23	-7.52	0.00	0.00
			Max. Vx	22	0.00	0.00	0.00
T5	59 - 54	Leg	Max Tension	1	0.00	0.00	0.00
			Max. Compression	21	-18373.76	110.81	-78.23
			Max. Mx	9	-17308.67	797.38	-42.17
			Max. My	13	-10181.89	-97.57	293.86
			Max. Vy	10	2382.63	790.68	-94.00
			Max. Vx	13	-331.37	-462.86	145.59
		Horizontal	Max Tension	10	1954.71	106.01	-66.46
			Max. Compression	9	-443.18	81.96	37.45
			Max. Mx	13	298.13	354.30	-31.80
			Max. My	10	335.24	125.39	-133.88
			Max. Vy	13	685.05	354.30	-31.80
			Max. Vx	2	216.89	168.53	49.40

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Mast	Max. Vert	10	45707.18	1469.52	-870.03
	Max. H_x	11	40973.44	1797.87	52.12
	Max. H_z	2	38535.00	94.55	1757.97
	Max. M_x	1	0.00	49.04	-30.79

Location	*Condition*	*Gov. Load Comb.*	*Vertical lb*	*Horizontal, X lb*	*Horizontal, Z lb*
	Max. M_z	1	0.00	49.04	-30.79
	Max. Torsion	7	647.76	-807.24	-1704.89
	Min. Vert	27	24917.01	57.17	750.59
	Min. H_x	5	34764.80	-1760.17	-44.40
	Min. H_z	8	32797.68	24.35	-1987.43
	Min. M_x	1	0.00	49.04	-30.79
	Min. M_z	1	0.00	49.04	-30.79
	Min. Torsion	13	-744.31	1048.38	1555.71
Guy C @ 71 ft Elev 40 ft Azimuth 240 deg	Max. Vert	10	-210.50	-109.56	63.35
	Max. H_x	10	-210.50	-109.56	63.35
	Max. H_z	3	-14230.58	-10562.01	6225.49
	Min. Vert	5	-14322.51	-10745.10	6065.70
	Min. H_x	5	-14322.51	-10745.10	6065.70
	Min. H_z	10	-210.50	-109.56	63.35
Guy B @ 48 ft Elev 40 ft Azimuth 120 deg	Max. Vert	6	-534.99	193.11	110.80
	Max. H_x	11	-21157.18	10642.85	5946.27
	Max. H_z	13	-20734.36	10279.59	6086.59
	Min. Vert	11	-21157.18	10642.85	5946.27
	Min. H_x	6	-534.99	193.11	110.80
	Min. H_z	6	-534.99	193.11	110.80
Guy A @ 38 ft Elev 53 ft Azimuth 0 deg	Max. Vert	2	-448.02	0.76	-163.72
	Max. H_x	10	-19561.91	261.18	-10458.26
	Max. H_z	2	-448.02	0.76	-163.72
	Min. Vert	9	-22751.72	180.25	-12207.22
	Min. H_x	6	-19529.12	-210.39	-10439.54
	Min. H_z	9	-22751.72	180.25	-12207.22

Tower Mast Reaction Summary

Load Combination	*Vertical lb*	*Shear$_x$ lb*	*Shear$_z$ lb*	*Overturning Moment, M_x lb-ft*	*Overturning Moment, M_z lb-ft*	*Torque lb-ft*
Dead Only	25457.39	-49.04	30.79	0.00	0.00	19.69
Dead+Wind 0 deg - No Ice+Guy	38535.00	-94.55	-1757.97	0.00	0.00	650.48
Dead+Wind 30 deg - No Ice+Guy	33631.14	854.13	-1562.09	0.00	0.00	433.53
Dead+Wind 60 deg - No Ice+Guy	27079.91	1583.60	-925.20	0.00	0.00	112.54
Dead+Wind 90 deg - No Ice+Guy	34764.80	1760.17	44.40	0.00	0.00	-208.45
Dead+Wind 120 deg - No Ice+Guy	40026.09	1458.16	974.19	0.00	0.00	-465.48
Dead+Wind 150 deg - No Ice+Guy	38129.66	807.24	1704.89	0.00	0.00	-647.76
Dead+Wind 180 deg - No Ice+Guy	32797.68	-24.35	1987.43	0.00	0.00	-566.68
Dead+Wind 210 deg - No Ice+Guy	41769.52	-850.76	1621.24	0.00	0.00	-380.20
Dead+Wind 240 deg - No Ice+Guy	45707.18	-1469.52	870.03	0.00	0.00	-137.83
Dead+Wind 270 deg - No Ice+Guy	40973.44	-1797.87	-52.12	0.00	0.00	174.52
Dead+Wind 300 deg - No Ice+Guy	30761.97	-1704.75	-982.78	0.00	0.00	483.92
Dead+Wind 330 deg - No Ice+Guy	36261.33	-1048.38	-1555.71	0.00	0.00	744.31
Dead+Ice+Temp+Guy	42229.43	-78.35	41.09	0.00	0.00	30.17
Dead+Wind 0 deg+Ice+Temp+Guy	41500.31	-101.64	-1147.87	0.00	0.00	465.64
Dead+Wind 30 deg+Ice+Temp+Guy	41740.86	469.12	-977.22	0.00	0.00	437.43
Dead+Wind 60 deg+Ice+Temp+Guy	42097.47	898.03	-531.18	0.00	0.00	236.82
Dead+Wind 90 deg+Ice+Temp+Guy	42366.14	1061.23	69.97	0.00	0.00	-19.25
Dead+Wind 120 deg+Ice+Temp+Guy	42591.45	920.50	655.96	0.00	0.00	-200.01

tnxTower	Job University of Hartford (CT03XC078)	Page 20 of 30
	Project 22996	Date 15:41:02 08/06/14
Ramaker & Associates, Inc. *1120 Dallas Street* *Sauk City, WI 53583* *Phone: (608) 643-4100* *FAX: (608) 643-7999*	Client Sprint	Designed by tmoore

Load Combination	*Vertical* *lb*	*Shear$_x$* *lb*	*Shear$_z$* *lb*	*Overturning Moment, M_x* *lb-ft*	*Overturning Moment, M_z* *lb-ft*	*Torque* *lb-ft*
Dead+Wind 150 deg+Ice+Temp+Guy	43661.89	513.30	1073.50	0.00	0.00	-308.42
Dead+Wind 180 deg+Ice+Temp+Guy	44438.22	-60.65	1218.86	0.00	0.00	-371.36
Dead+Wind 210 deg+Ice+Temp+Guy	44948.91	-630.61	1043.12	0.00	0.00	-334.73
Dead+Wind 240 deg+Ice+Temp+Guy	45212.00	-1045.97	600.28	0.00	0.00	-213.99
Dead+Wind 270 deg+Ice+Temp+Guy	44323.43	-1211.45	14.83	0.00	0.00	-15.44
Dead+Wind 300 deg+Ice+Temp+Guy	43234.35	-1073.63	-571.12	0.00	0.00	204.03
Dead+Wind 330 deg+Ice+Temp+Guy	42278.82	-662.05	-1000.10	0.00	0.00	366.57
Dead+Wind 0 deg - Service+Guy	24917.01	-57.17	-750.59	0.00	0.00	239.77
Dead+Wind 30 deg - Service+Guy	25026.32	315.80	-636.94	0.00	0.00	169.69
Dead+Wind 60 deg - Service+Guy	25282.05	594.67	-344.74	0.00	0.00	51.56
Dead+Wind 90 deg - Service+Guy	25585.73	701.63	46.51	0.00	0.00	-76.06
Dead+Wind 120 deg - Service+Guy	25873.25	611.73	427.71	0.00	0.00	-169.32
Dead+Wind 150 deg - Service+Guy	26168.40	338.98	709.62	0.00	0.00	-225.03
Dead+Wind 180 deg - Service+Guy	26308.74	-38.29	805.87	0.00	0.00	-206.78
Dead+Wind 210 deg - Service+Guy	26180.12	-415.64	690.98	0.00	0.00	-137.16
Dead+Wind 240 deg - Service+Guy	25808.61	-691.76	404.22	0.00	0.00	-17.32
Dead+Wind 270 deg - Service+Guy	25602.37	-796.63	20.09	0.00	0.00	117.66
Dead+Wind 300 deg - Service+Guy	25317.44	-705.69	-368.73	0.00	0.00	213.63
Dead+Wind 330 deg - Service+Guy	25048.78	-434.74	-652.59	0.00	0.00	263.91

Solution Summary

	Sum of Applied Forces			*Sum of Reactions*			
Load Comb.	*PX* *lb*	*PY* *lb*	*PZ* *lb*	*PX* *lb*	*PY* *lb*	*PZ* *lb*	*% Error*
1	-0.00	-7784.58	0.00	-0.00	7784.58	-0.01	0.000%
2	-56.84	-7827.67	-12356.96	56.83	7827.67	12356.92	0.000%
3	6169.54	-7818.04	-10773.06	-6169.54	7818.04	10773.04	0.000%
4	10714.72	-7798.58	-6215.89	-10714.71	7798.58	6215.90	0.000%
5	12384.03	-7802.47	16.49	-12384.00	7802.47	-16.47	0.000%
6	10631.42	-7800.78	6246.82	-10631.40	7800.78	-6246.80	0.000%
7	6078.60	-7769.02	10698.85	-6078.59	7769.02	-10698.84	0.000%
8	-5.54	-7741.50	12404.18	5.49	7741.50	-12404.18	0.000%
9	-6179.51	-7751.14	10822.91	6179.48	7751.14	-10822.90	0.000%
10	-10777.61	-7770.59	6265.60	10777.57	7770.59	-6265.57	0.000%
11	-12420.04	-7766.71	-39.74	12420.02	7766.71	39.75	0.000%
12	-10696.54	-7768.39	-6198.99	10696.51	7768.39	6199.03	0.000%
13	-6179.25	-7800.16	-10626.72	6179.25	7800.15	10626.68	0.000%
14	0.00	-22212.63	-0.00	-0.01	22212.63	0.00	0.000%
15	248.72	-22259.20	-6582.38	-248.72	22259.20	6582.38	0.000%
16	3421.58	-22248.72	-5635.96	-3421.58	22248.72	5635.95	0.000%
17	5711.96	-22227.62	-3310.17	-5711.95	22227.62	3310.17	0.000%
18	6571.42	-22232.23	-155.65	-6571.41	22232.23	155.67	0.000%
19	5802.09	-22230.74	3077.68	-5802.09	22230.74	-3077.67	0.000%
20	3213.75	-22196.14	5598.00	-3213.74	22196.14	-5597.98	0.000%
21	3.93	-22166.05	6491.20	-3.95	22166.05	-6491.19	0.000%
22	-3212.94	-22176.54	5646.81	3212.91	22176.54	-5646.80	0.000%
23	-5622.18	-22197.63	3261.00	5622.15	22197.63	-3260.99	0.000%
24	-6474.09	-22193.02	-31.84	6474.08	22193.02	31.85	0.000%
25	-5595.42	-22194.51	-3247.42	5595.39	22194.51	3247.44	0.000%
26	-3223.01	-22229.11	-5589.86	3222.99	22229.11	5589.85	0.000%
27	-22.20	-7801.40	-4826.94	22.20	7801.40	4826.93	0.000%
28	2409.98	-7797.64	-4208.23	-2409.98	7797.64	4208.22	0.000%
29	4185.44	-7790.05	-2428.08	-4185.43	7790.05	2428.08	0.000%
30	4837.51	-7791.56	6.44	-4837.51	7791.56	-6.44	0.000%
31	4152.90	-7790.90	2440.16	-4152.89	7790.90	-2440.16	0.000%
32	2374.45	-7778.50	4179.24	-2374.45	7778.50	-4179.23	0.000%
33	-2.16	-7767.75	4845.38	2.16	7767.75	-4845.37	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	*PX lb*	*PY lb*	*PZ lb*	*PX lb*	*PY lb*	*PZ lb*	*% Error*
34	-2413.87	-7771.51	4227.70	2413.87	7771.51	-4227.70	0.000%
35	-4210.01	-7779.11	2447.50	4209.99	7779.11	-2447.49	0.000%
36	-4851.58	-7777.59	-15.52	4851.58	7777.59	15.52	0.000%
37	-4178.34	-7778.25	-2421.48	4178.32	7778.25	2421.48	0.000%
38	-2413.77	-7790.66	-4151.06	2413.76	7790.66	4151.05	0.000%

Non-Linear Convergence Results

Load Combination	*Converged?*	*Number of Cycles*	*Displacement Tolerance*	*Force Tolerance*
1	Yes	11	0.00000001	0.00000001
2	Yes	17	0.00000001	0.00000858
3	Yes	17	0.00000001	0.00000001
4	Yes	13	0.00000001	0.00000001
5	Yes	16	0.00000001	0.00000909
6	Yes	17	0.00000001	0.00000535
7	Yes	17	0.00000001	0.00000001
8	Yes	16	0.00000001	0.00000649
9	Yes	18	0.00000001	0.00000556
10	Yes	18	0.00000001	0.00000900
11	Yes	18	0.00000001	0.00000597
12	Yes	17	0.00000001	0.00000589
13	Yes	17	0.00000001	0.00000703
14	Yes	12	0.00000001	0.00000001
15	Yes	12	0.00000001	0.00000001
16	Yes	12	0.00000001	0.00000001
17	Yes	12	0.00000001	0.00000001
18	Yes	12	0.00000001	0.00000789
19	Yes	12	0.00000001	0.00000001
20	Yes	12	0.00000001	0.00000801
21	Yes	13	0.00000001	0.00000656
22	Yes	14	0.00000001	0.00000968
23	Yes	15	0.00000001	0.00000707
24	Yes	15	0.00000001	0.00000001
25	Yes	13	0.00000001	0.00000898
26	Yes	12	0.00000001	0.00000772
27	Yes	11	0.00000001	0.00000001
28	Yes	11	0.00000001	0.00000001
29	Yes	10	0.00000001	0.00000001
30	Yes	11	0.00000001	0.00000001
31	Yes	11	0.00000001	0.00000001
32	Yes	11	0.00000001	0.00000001
33	Yes	11	0.00000001	0.00000815
34	Yes	12	0.00000001	0.00000001
35	Yes	11	0.00000001	0.00000880
36	Yes	12	0.00000001	0.00000001
37	Yes	11	0.00000001	0.00000909
38	Yes	11	0.00000001	0.00000001

Maximum Tower Deflections - Service Wind

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Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	139 - 119	1.935	33	0.1116	0.0273
T2	119 - 99	1.488	33	0.0820	0.0232
T3	99 - 79	1.211	33	0.0875	0.0463
T4	79 - 59	0.778	33	0.1247	0.0586
T5	59 - 54	0.164	33	0.1524	0.0346

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
149.00	DB432-A	33	1.935	0.1116	0.0273	46910
144.00	8' Yagi	33	1.935	0.1116	0.0273	46910
139.00	VHLP2.5	33	1.935	0.1116	0.0273	46910
134.00	LLPX310R w/Mount Pipe	33	1.811	0.1027	0.0255	46910
128.00	PR-950	33	1.668	0.0928	0.0238	21323
124.00	PR-950	33	1.582	0.0872	0.0231	15637
121.52	Guy	33	1.533	0.0844	0.0230	13613
111.00	10' Omni	33	1.371	0.0785	0.0296	27677
106.00	DB225-A	33	1.308	0.0801	0.0363	81378
98.00	800 10504 w/Mount Pipe	33	1.195	0.0890	0.0478	19403
69.00	6' Omni	33	0.484	0.1396	0.0488	44007

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	139 - 119	9.798	10	0.5623	0.1161
T2	119 - 99	7.468	10	0.4863	0.1049
T3	99 - 79	5.612	10	0.4952	0.1198
T4	79 - 59	3.383	10	0.5863	0.1537
T5	59 - 54	0.697	10	0.6562	0.1003

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
149.00	DB432-A	10	9.798	0.5623	0.1161	19371
144.00	8' Yagi	10	9.798	0.5623	0.1161	19371
139.00	VHLP2.5	10	9.798	0.5623	0.1161	19371
134.00	LLPX310R w/Mount Pipe	10	9.181	0.5394	0.1120	19371
128.00	PR-950	10	8.460	0.5142	0.1078	8805
124.00	PR-950	10	8.002	0.4999	0.1066	6457
121.52	Guy	10	7.732	0.4925	0.1057	5624
111.00	10' Omni	10	6.706	0.4771	0.1064	12347
106.00	DB225-A	10	6.258	0.4798	0.1074	28117
98.00	800 10504 w/Mount Pipe	10	5.515	0.4985	0.1240	7781

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	Client: Sprint	Designed by: tmoore

Elevation *ft*	*Appurtenance*	*Gov. Load Comb.*	*Deflection* *in*	*Tilt* *°*	*Twist* *°*	*Radius of Curvature* *ft*
69.00	6' Omni	10	2.075	0.6238	0.1294	17291

Bolt Design Data

Section No.	*Elevation* *ft*	*Component Type*	*Bolt Grade*	*Bolt Size* *in*	*Number Of Bolts*	*Maximum Load per Bolt* *lb*	*Allowable Load* *lb*	*Ratio Load / Allowable*	*Allowable Ratio*	*Criteria*
T1	139	Leg	A325N	0.7500	4	90.64	19438.40	0.005 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	2251.47	2740.50	0.822 ✔	1.333	Member Bearing
		Top Girt	A325N	0.5000	1	90.24	2740.50	0.033 ✔	1.333	Member Bearing
		Bottom Girt	A325N	0.5000	1	836.21	2523.00	0.331 ✔	1.333	Member Bearing
T2	119	Leg	A325N	0.7500	4	1035.58	19422.20	0.053 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	2899.66	2740.50	1.058 ✔	1.333	Member Bearing
		Top Girt	A325N	0.5000	1	1151.08	2740.50	0.420 ✔	1.333	Member Bearing
		Bottom Girt	A325N	0.5000	1	592.73	2523.00	0.235 ✔	1.333	Member Bearing
T3	99	Leg	A325N	0.7500	4	0.00	19438.50	0.000 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	1043.98	2740.50	0.381 ✔	1.333	Member Bearing
		Top Girt	A325N	0.5000	1	400.87	2740.50	0.146 ✔	1.333	Member Bearing
		Bottom Girt	A325N	0.5000	1	148.33	2523.00	0.059 ✔	1.333	Member Bearing
T4	79	Leg	A325N	0.7500	4	0.00	19438.50	0.000 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	1666.52	2740.50	0.608 ✔	1.333	Member Bearing
		Top Girt	A325N	0.5000	1	179.29	2740.50	0.065 ✔	1.333	Member Bearing
		Bottom Girt	A325N	0.5000	1	1854.97	2523.00	0.735 ✔	1	Member Bearing
T5	59	Leg	A325N	0.7500	4	0.00	19409.10	0.000 ✔	1.333	Bolt Tension

Guy Design Data

Section No.	*Elevation* *ft*	*Size*	*Initial Tension* *lb*	*Breaking Load* *lb*	*Actual T* *lb*	*Allowable* T_a *lb*	*Required S.F.*	*Actual S.F.*
T1	121.52 (A) (183)	9/16 EHS	3500.00	35000.04	12900.40	17500.00	2.000	2.713 ✔
	121.52 (A) (184)	9/16 EHS	3500.00	35000.04	13035.40	17500.00	2.000	2.685 ✔
	121.52 (B) (179)	9/16 EHS	3500.00	35000.04	12429.70	17500.00	2.000	2.816 ✔
	121.52 (B) (180)	9/16 EHS	3500.00	35000.04	12112.60	17500.00	2.000	2.890 ✔
	121.52 (C) (172)	9/16 EHS	3500.00	35000.04	9427.89	17500.00	2.000	3.712 ✔
	121.52 (C) (173)	9/16 EHS	3500.00	35000.04	9604.54	17500.00	2.000	3.644 ✔

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Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	Mast Stability Index	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	139 - 119	ROHN 2.5 EH	20.00	2.41	31.3 K=1.00	1.00	26.993	2.2535	-23054.00	60829.50	0.379 ✔
T2	119 - 99	ROHN 2.5 EH	20.00	2.41	62.6 K=2.00	1.00	22.275	2.2535	-21904.60	50197.60	0.436 ✔
T3	99 - 79	ROHN 2.5 EH	20.00	2.41	62.6 K=2.00	1.00	22.275	2.2535	-23066.80	50197.60	0.460 ✔
T4	79 - 59	ROHN 2.5 EH	20.00	2.41	62.6 K=2.00	1.00	22.275	2.2535	-22839.70	50197.60	0.455 ✔
T5	59 - 54	ROHN 2.5 EH	5.38	1.27	16.5 K=1.00	0.85	24.414	2.2535	-15216.40	55018.40	0.277* ✔

* DL controls

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	139 - 119	ROHN TS1.5x16 GA	4.18	3.89	91.4 K=1.00	15.325	0.2627	-2273.97	4026.59	0.565 ✔
T2	119 - 99	ROHN TS1.5x16 GA	4.18	3.89	91.4 K=1.00	15.325	0.2627	-3009.98	4026.59	0.748 ✔
T3	99 - 79	ROHN TS1.5x16 GA	4.18	3.89	91.4 K=1.00	15.325	0.2627	-1200.44	4026.59	0.298 ✔
T4	79 - 59	ROHN TS1.5x16 GA	4.18	3.89	91.4 K=1.00	15.325	0.2627	-1485.11	4026.59	0.369 ✔

Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T5	59 - 54	L4x4x1/4	2.27	2.03	30.6 K=1.00	19.261	1.9400	-334.41	37366.00	0.009* ✔

* DL controls

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in²	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	139 - 119	ROHN TS1.5x16 GA	3.42	3.18	74.7 K=1.00	17.823	0.2627	-98.54	4682.86	0.021
T2	119 - 99	ROHN TS1.5x16 GA	3.42	3.18	74.7 K=1.00	17.823	0.2627	-984.10	4682.86	0.210
T3	99 - 79	ROHN TS1.5x16 GA	3.42	3.18	74.7 K=1.00	17.823	0.2627	-327.28	4682.86	0.070
T4	79 - 59	ROHN TS1.5x16 GA	3.42	3.18	74.7 K=1.00	17.823	0.2627	-111.13	4682.86	0.024

Bottom Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in²	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	139 - 119	ROHN TS1.5x16 GA	3.42	3.18	74.7 K=1.00	15.932	0.2627	-429.44	4186.24	0.103
T2	119 - 99	ROHN TS1.5x16 GA	3.42	3.18	74.7 K=1.00	15.932	0.2627	-542.16	4186.24	0.130
T3	99 - 79	ROHN TS1.5x16 GA	3.42	3.18	74.7 K=1.00	15.932	0.2627	-70.61	4186.24	0.017

Top Guy Pull-Off Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in²	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	139 - 119	2L2x2x1/4x3/8 2L 'a' > 18.3674 in - 177	3.42	3.18	99.8 K=1.00	13.005	1.8750	-5073.71	24383.50	0.208

Top Guy Pull-Off Bending Design Data

Section No.	Elevation ft	Size	Actual M_x lb-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y lb-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
T1	139 - 119	2L2x2x1/4x3/8	9.78	-0.100	21.600	0.005	-0.00	-0.000	21.600	0.000

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Top Guy Pull-Off Interaction Design Data

Section No.	Elevation ft	Size	Ratio P/P_a	Ratio f_{bx}/F_{bx}	Ratio f_{by}/F_{by}	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
T1	139 - 119	2L2x2x1/4x3/8	0.208	0.005	0.000	0.213 ✓	1.333	H1-3 ✓

Torque-Arm Top Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio P/P_a
T1	139 - 119 (174)	C12x25	3.42	3.30	107.7 K=1.00	11.974	7.3500	-3524.54	88005.80	0.040
T1	139 - 119 (175)	C12x25	3.42	3.30	107.7 K=1.00	11.974	7.3500	-3803.09	88005.80	0.043
T1	139 - 119 (181)	C12x25	3.42	3.30	107.7 K=1.00	11.974	7.3500	-3711.56	88005.80	0.042
T1	139 - 119 (182)	C12x25	3.42	3.30	107.7 K=1.00	11.974	7.3500	-3541.77	88005.80	0.040
T1	139 - 119 (185)	C12x25	3.42	3.30	107.7 K=1.00	11.974	7.3500	-3597.35	88005.80	0.041
T1	139 - 119 (186)	C12x25	3.42	3.30	107.7 K=1.00	11.974	7.3500	-3720.05	88005.80	0.042

Torque-Arm Top Bending Design Data

Section No.	Elevation ft	Size	Actual M_x lb-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio f_{bx}/F_{bx}	Actual M_y lb-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio f_{by}/F_{by}
T1	139 - 119 (174)	C12x25	-23681.75	-11.792	21.600	0.546	0.00	-0.000	21.600	0.000
T1	139 - 119 (175)	C12x25	-37247.50	-18.547	21.600	0.859	-0.00	-0.000	21.600	0.000
T1	139 - 119 (181)	C12x25	-34833.83	-17.345	21.600	0.803	-0.00	-0.000	21.600	0.000
T1	139 - 119 (182)	C12x25	-23795.75	-11.849	21.600	0.549	0.00	-0.000	21.600	0.000
T1	139 - 119 (185)	C12x25	-34458.92	-17.158	21.600	0.794	0.00	-0.000	21.600	0.000
T1	139 - 119 (186)	C12x25	-37098.67	-18.472	21.600	0.855	-0.00	-0.000	21.600	0.000

Torque-Arm Top Interaction Design Data

Section No.	Elevation ft	Size	Ratio P/P_a	Ratio f_{bx}/F_{bx}	Ratio f_{by}/F_{by}	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
T1	139 - 119 (174)	C12x25	0.040	0.546	0.000	0.586 ✓	1.333	H1-3 ✓
T1	139 - 119 (175)	C12x25	0.043	0.859	0.000	0.902 ✓	1.333	H1-3 ✓
T1	139 - 119 (181)	C12x25	0.042	0.803	0.000	0.845 ✓	1.333	H1-3 ✓
T1	139 - 119 (182)	C12x25	0.040	0.549	0.000	0.589 ✓	1.333	H1-3 ✓
T1	139 - 119 (185)	C12x25	0.041	0.794	0.000	0.835 ✓	1.333	H1-3 ✓

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Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
T1	139 - 119 (186)	C12x25	0.042	0.855	0.000	0.897 ✓	1.333	H1-3 ✓

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	139 - 119	ROHN 2.5 EH	20.00	2.41	31.3	30.000	2.2535	19574.90	67606.20	0.290 ✓
T2	119 - 99	ROHN 2.5 EH	20.00	2.41	31.3	30.000	2.2535	4142.32	67606.20	0.061 ✓

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	139 - 119	ROHN TS1.5x16 GA	4.18	3.89	91.4	25.200	0.2627	2251.47	6621.31	0.340 ✓
T2	119 - 99	ROHN TS1.5x16 GA	4.18	3.89	91.4	25.200	0.2627	2899.66	6621.31	0.438 ✓
T3	99 - 79	ROHN TS1.5x16 GA	4.18	3.89	91.4	25.200	0.2627	1043.98	6621.31	0.158 ✓
T4	79 - 59	ROHN TS1.5x16 GA	4.18	3.89	91.4	25.200	0.2627	1666.52	6621.31	0.252 ✓

Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T5	59 - 54	L4x4x1/4	3.00	2.76	26.5	21.600	1.9400	1492.03	41904.00	0.036* ✓

* DL controls

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	139 - 119	ROHN TS1.5x16 GA	3.42	3.18	74.7	25.200	0.2627	90.24	6621.31	0.014 ✔
T2	119 - 99	ROHN TS1.5x16 GA	3.42	3.18	74.7	25.200	0.2627	1151.08	6621.31	0.174 ✔
T3	99 - 79	ROHN TS1.5x16 GA	3.42	3.18	74.7	25.200	0.2627	400.87	6621.31	0.061 ✔
T4	79 - 59	ROHN TS1.5x16 GA	3.42	3.18	74.7	25.200	0.2627	179.29	6621.31	0.027 ✔

Bottom Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	139 - 119	ROHN TS1.5x16 GA	3.42	3.18	74.7	21.600	0.2627	836.21	5675.41	0.147 ✔
T2	119 - 99	ROHN TS1.5x16 GA	3.42	3.18	74.7	21.600	0.2627	592.73	5675.41	0.104 ✔
T3	99 - 79	ROHN TS1.5x16 GA	3.42	3.18	74.7	21.600	0.2627	148.33	5675.41	0.026 ✔
T4	79 - 59	ROHN TS1.5x16 GA	3.42	3.18	74.7	21.600	0.2627	1854.97	5675.41	0.327* ✔

* DL controls

Top Guy Pull-Off Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	139 - 119	2L2x2x1/4x3/8 2L 'a' > 18.3674 in - 177	3.42	3.18	62.6	21.600	1.8750	5721.61	40500.00	0.141

Top Guy Pull-Off Bending Design Data

Section No.	Elevation ft	Size	Actual M_x lb-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y lb-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
T1	139 - 119	2L2x2x1/4x3/8	9.78	0.238	21.600	0.011	-0.00	0.000	21.600	0.000

Top Guy Pull-Off Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
T1	139 - 119	2L2x2x1/4x3/8	0.141	0.011	0.000	0.152 ✓	1.333	H2-1 ✓

Torque-Arm Top Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	139 - 119 (174)	C12x25	3.42	3.30	50.7	21.600	7.3500	2683.29	158760.00	0.017
T1	139 - 119 (175)	C12x25	3.42	3.30	50.7	21.600	7.3500	2417.66	158760.00	0.015
T1	139 - 119 (181)	C12x25	3.42	3.30	50.7	21.600	7.3500	2567.79	158760.00	0.016
T1	139 - 119 (182)	C12x25	3.42	3.30	50.7	21.600	7.3500	2646.99	158760.00	0.017
T1	139 - 119 (185)	C12x25	3.42	3.30	50.7	21.600	7.3500	2602.42	158760.00	0.016
T1	139 - 119 (186)	C12x25	3.42	3.30	50.7	21.600	7.3500	2368.41	158760.00	0.015

Torque-Arm Top Bending Design Data

Section No.	Elevation ft	Size	Actual M_x lb-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y lb-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
T1	139 - 119 (174)	C12x25	-21613.50	10.762	21.600	0.498	-0.00	0.000	27.000	0.000
T1	139 - 119 (175)	C12x25	-33019.58	16.441	21.600	0.761	-0.00	0.000	27.000	0.000
T1	139 - 119 (181)	C12x25	-31063.92	15.467	21.600	0.716	-0.00	0.000	27.000	0.000
T1	139 - 119 (182)	C12x25	-21601.25	10.756	21.600	0.498	-0.00	0.000	27.000	0.000
T1	139 - 119 (185)	C12x25	-31277.58	15.574	21.600	0.721	0.00	0.000	27.000	0.000
T1	139 - 119 (186)	C12x25	-33233.00	16.547	21.600	0.766	0.00	0.000	27.000	0.000

Torque-Arm Top Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
T1	139 - 119 (174)	C12x25	0.017	0.498	0.000	0.515 ✓	1.333	H2-1 ✓
T1	139 - 119 (175)	C12x25	0.015	0.761	0.000	0.776 ✓	1.333	H2-1 ✓
T1	139 - 119 (181)	C12x25	0.016	0.716	0.000	0.732 ✓	1.333	H2-1 ✓
T1	139 - 119 (182)	C12x25	0.017	0.498	0.000	0.515 ✓	1.333	H2-1 ✓
T1	139 - 119 (185)	C12x25	0.016	0.721	0.000	0.737 ✓	1.333	H2-1 ✓
T1	139 - 119 (186)	C12x25	0.015	0.766	0.000	0.781 ✓	1.333	H2-1 ✓

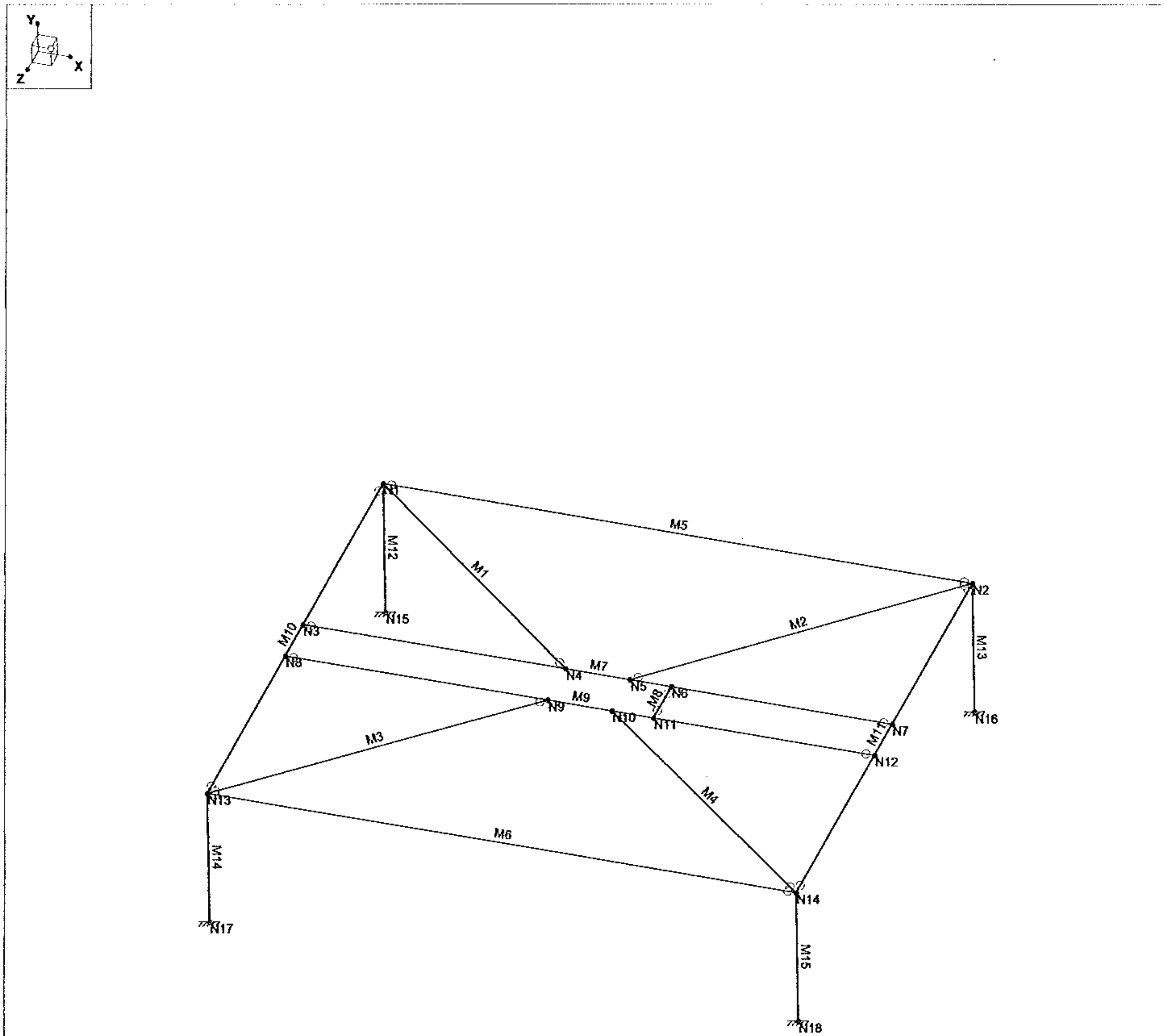
Section Capacity Table

tnxTower	Job: University of Hartford (CT03XC078)	Page: 30 of 30
Ramaker & Associates, Inc. *1120 Dallas Street* *Sauk City, WI 53583* *Phone: (608) 643-4100* *FAX: (608) 643-7999*	Project: 22996	Date: 15:41:02 08/06/14
	Client: Sprint	Designed by: tmoore

Section No.	*Elevation ft*	*Component Type*	*Size*	*Critical Element*	*P lb*	*SF*Pallow lb*	*% Capacity*	*Pass Fail*
T1	139 - 119	Leg	ROHN 2.5 EH	1	-23054.00	81085.72	28.4	Pass
		Diagonal	ROHN TS1.5x16 GA	12	-2273.97	5367.44	42.4	Pass
		Top Girt	ROHN TS1.5x16 GA	4	-98.54	6242.25	1.6	Pass
		Bottom Girt	ROHN TS1.5x16 GA	8	836.21	7565.32	11.1	Pass
		Guy A@121.523	9/16	184	13035.40	17500.00	74.5	Pass
		Guy B@121.523	9/16	179	12429.70	17500.00	71.0	Pass
		Guy C@121.523	9/16	173	9604.54	17500.00	54.9	Pass
		Top Guy Pull-Off@121.523	2L2x2x1/4x3/8	177	-5073.71	32503.20	16.0	Pass
		Torque Arm Top@121.523	C12x25	175	-3803.09	117311.72	67.7	Pass
T2	119 - 99	Leg	ROHN 2.5 EH	58	-21904.60	66913.40	32.7	Pass
		Diagonal	ROHN TS1.5x16 GA	89	-3009.98	5367.44	56.1	Pass
		Top Girt	ROHN TS1.5x16 GA	61	-984.10	6242.25	15.8	Pass
		Bottom Girt	ROHN TS1.5x16 GA	65	-542.16	5580.26	9.7	Pass
T3	99 - 79	Leg	ROHN 2.5 EH	93	-23066.80	66913.40	34.5	Pass
		Diagonal	ROHN TS1.5x16 GA	123	-1200.44	5367.44	22.4	Pass
		Top Girt	ROHN TS1.5x16 GA	95	-327.28	6242.25	5.2	Pass
		Bottom Girt	ROHN TS1.5x16 GA	97	148.33	7565.32	2.0	Pass
T4	79 - 59	Leg	ROHN 2.5 EH	126	-22839.70	66913.40	34.1	Pass
		Diagonal	ROHN TS1.5x16 GA	137	-1485.11	5367.44	27.7	Pass
		Top Girt	ROHN TS1.5x16 GA	128	179.29	8826.21	2.0	Pass
		Bottom Girt	ROHN TS1.5x16 GA	130	1854.97	5675.41	32.7	Pass
T5	59 - 54	Leg	ROHN 2.5 EH	158	-15216.40	55018.40	27.7	Pass
		Horizontal	L4x4x1/4	164	-277.97	39797.20	4.8	Pass
							Summary	
						Leg (T3)	34.5	Pass
						Diagonal (T2)	56.1	Pass
						Horizontal (T5)	4.8	Pass
						Top Girt (T2)	15.8	Pass
						Bottom Girt (T4)	32.7	Pass
						Guy A (T1)	74.5	Pass
						Guy B (T1)	71.0	Pass
						Guy C (T1)	54.9	Pass
						Top Guy Pull-Off (T1)	16.0	Pass
						Torque Arm Top (T1)	67.7	Pass
						Bolt Checks	79.4	Pass
						RATING =	**79.4**	**Pass**

APPENDIX C

TOWER PLATFORM CALCULATIONS



Results for LC 1, ASCE 1

Ramaker & Associates, Inc.	University of Hartford (CT03XC078)	SK - 1
TEM		Aug 7, 2014 at 8:20 AM
22996		22996 rev2.r3d

Global

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Increase Nailing Capacity for Wind?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automaticly Iterate Stiffness for Walls?	Yes
Maximum Iteration Number for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 13th(360-05): ASD
Adjust Stiffness?	Yes(Iterative)
RISAConnection Code	None
Cold Formed Steel Code	None
Wood Code	None
Wood Temperature	< 100F
Concrete Code	None
Masonry Code	None
Aluminum Code	None - Building

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	Exact Integration
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	No
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

Global, Continued

Seismic Code	ASCE 7-10
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	Yes
Ct Z	.02
Ct X	.02
T Z (sec)	Not Entered
T X (sec)	Not Entered
R Z	3
R X	3
Ct Exp. Z	.75
Ct Exp. X	.75
SD1	1
SDS	1
S1	1
TL (sec)	5
Risk Cat	I or II
Seismic Detailing Code	ASCE 7-05
Om Z	1
Om X	1
Rho Z	1
Rho X	1

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1E5 F)	Density[k/ft^3]	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	65	1.1
3	A992	29000	11154	.3	.65	.49	50	1.1	65	1.1
4	A500 Gr.42	29000	11154	.3	.65	.49	42	1.4	58	1.3
5	A500 Gr.46	29000	11154	.3	.65	.49	46	1.4	58	1.3

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design R...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	HR1	W8x24	Beam	Wide Flange	A36 Gr.36	Typical	7.08	18.3	82.7	.346
2	HR2	W12x30	Beam	Wide Flange	A36 Gr.36	Typical	8.79	20.3	238	.457
3	HR3	W12x50	Beam	Wide Flange	A36 Gr.36	Typical	14.6	56.3	391	1.71
4	HR4	HSS4x4x6	Column	Wide Flange	A36 Gr.36	Typical	4.78	10.3	10.3	17.5

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diaphra...
1	N1	0	0	20	0	
2	N2	16	0	20	0	
3	N3	0	0	26.75	0	
4	N4	7.125	0	26.75	0	
5	N5	8.875	0	26.75	0	
6	N6	10	0	26.75	0	
7	N7	16	0	26.75	0	
8	N8	0	0	28.25	0	
9	N9	7.125	0	28.25	0	
10	N10	8.875	0	28.25	0	
11	N11	10	0	28.25	0	
12	N12	16	0	28.25	0	
13	N13	0	0	34.8326	0	
14	N14	16	0	34.8326	0	

Joint Coordinates and Temperatures (Continued)

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diaphra...
15	N15	0	-4	20	0	
16	N16	16	-4	20	0	
17	N17	0	-4	34.8326	0	
18	N18	16	-4	34.8326	0	

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]	Footing
1	N15	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction	
2	N18	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction	
3	N16	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction	
4	N17	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction	

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(...	Section/Shape	Type	Design List	Material	Design R...
1	M1	N4	N1			HR1	Beam	Wide Flange	A36 Gr.36	Typical
2	M2	N2	N5			HR1	Beam	Wide Flange	A36 Gr.36	Typical
3	M3	N13	N9			HR1	Beam	Wide Flange	A36 Gr.36	Typical
4	M4	N10	N14			HR1	Beam	Wide Flange	A36 Gr.36	Typical
5	M5	N1	N2			HR2	Beam	Wide Flange	A36 Gr.36	Typical
6	M6	N13	N14			HR2	Beam	Wide Flange	A36 Gr.36	Typical
7	M7	N3	N7			HR3	Beam	Wide Flange	A36 Gr.36	Typical
8	M8	N6	N11			HR3	Beam	Wide Flange	A36 Gr.36	Typical
9	M9	N8	N12			HR3	Beam	Wide Flange	A36 Gr.36	Typical
10	M10	N1	N13			HR3	Beam	Wide Flange	A36 Gr.36	Typical
11	M11	N2	N14			HR3	Beam	Wide Flange	A36 Gr.36	Typical
12	M12	N15	N1			HR4	Column	Wide Flange	A36 Gr.36	Typical
13	M13	N16	N2			HR4	Column	Wide Flange	A36 Gr.36	Typical
14	M14	N17	N13			HR4	Column	Wide Flange	A36 Gr.36	Typical
15	M15	N18	N14			HR4	Column	Wide Flange	A36 Gr.36	Typical

Hot Rolled Steel Design Parameters

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp to...	Lcomp b...	L-torque...	Kyy	Kzz	Cb	Function
1	M1	HR1	9.8147			Segment						Lateral
2	M2	HR1	9.8147			Segment						Lateral
3	M3	HR1	9.7003			Segment						Lateral
4	M4	HR1	9.7003			Segment						Lateral
5	M5	HR2	16			Segment						Lateral
6	M6	HR2	16			Segment						Lateral
7	M7	HR3	16			Segment						Lateral
8	M8	HR3	1.5			Segment						Lateral
9	M9	HR3	16			Segment						Lateral
10	M10	HR3	14.8326			Segment						Lateral
11	M11	HR3	14.8326			Segment						Lateral
12	M12	HR4	4									Lateral
13	M13	HR4	4									Lateral
14	M14	HR4	4									Lateral
15	M15	HR4	4									Lateral

Joint Loads and Enforced Displacements

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
	No Data to Print ...		

Member Point Loads (BLC 1 : Dead)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M8	Y	-45.707	%50

Member Point Loads (BLC 2 : WindX)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M8	X	1.988	%50

Member Point Loads (BLC 3 : WindZ)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M8	Z	1.988	%50

Member Distributed Loads

Member Label	Direction	Start Magnitude[k/ft...	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
		No Data to Print ...			

Member Area Loads

Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[ksf]
			No Data to Print ...			

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed	Area(Me...	Surface(Pl...
1	Dead	DL		-1			1			
2	WindX	WLX					1			
3	WindZ	WLZ					1			

Load Combinations

	Description	Solve	PDelta	SRSS	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact..	BLC	Fact..	BLC	Fact...
1	ASCE 1	Yes	Y		DL	1														
2	ASCE 2	Yes	Y		DL	1	LL	1	LLS	1										
3	ASCE 3 (a)	Yes	Y		DL	1														
4	ASCE 5 (a) (a)	Yes	Y		DL	1	WLX	1												
5	ASCE 5 (a) (b)	Yes	Y		DL	1	WLZ	1												
6	ASCE 5 (a) (c)	Yes	Y		DL	1	WLX	-1												
7	ASCE 5 (a) (d)	Yes	Y		DL	1	WLZ	-1												
8	ASCE 6 (a) (a)	Yes	Y		DL	1	WLX	.75	LL	.75	LLS	.75								
9	ASCE 6 (a) (b)	Yes	Y		DL	1	WLZ	.75	LL	.75	LLS	.75								
10	ASCE 6 (a) (c)	Yes	Y		DL	1	WLX	-.75	LL	.75	LLS	.75								
11	ASCE 6 (a) (d)	Yes	Y		DL	1	WLZ	-.75	LL	.75	LLS	.75								
12	ASCE 7 (a)	Yes	Y		DL	.6	WLX	1												
13	ASCE 7 (b)	Yes	Y		DL	.6	WLZ	1												
14	ASCE 7 (c)	Yes	Y		DL	.6	WLX	-1												
15	ASCE 7 (d)	Yes	Y		DL	.6	WLZ	-1												

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N15	max	.502	6	9.793	5	.427	7	1.8	7	0	1	2.114	4
2		min	-.502	4	5.869	15	-.428	5	-1.801	5	0	1	-2.11	6
3	N18	max	.495	14	15.784	7	.568	15	2.459	7	0	1	2.141	4
4		min	-.495	12	9.464	13	-.569	13	-2.461	5	0	1	-2.137	6
5	N16	max	.49	14	15.451	5	.569	15	2.461	7	0	1	2.117	4
6		min	-.49	12	9.264	15	-.568	13	-2.459	5	0	1	-2.113	6
7	N17	max	.507	6	9.997	7	.428	7	1.802	7	0	1	2.138	4
8		min	-.507	4	5.992	14	-.426	5	-1.8	5	0	1	-2.133	6
9	Totals:	max	1.988	14	51.003	6	1.988	15						
10		min	-1.988	12	30.602	14	-1.988	13						

Envelope Joint Displacements

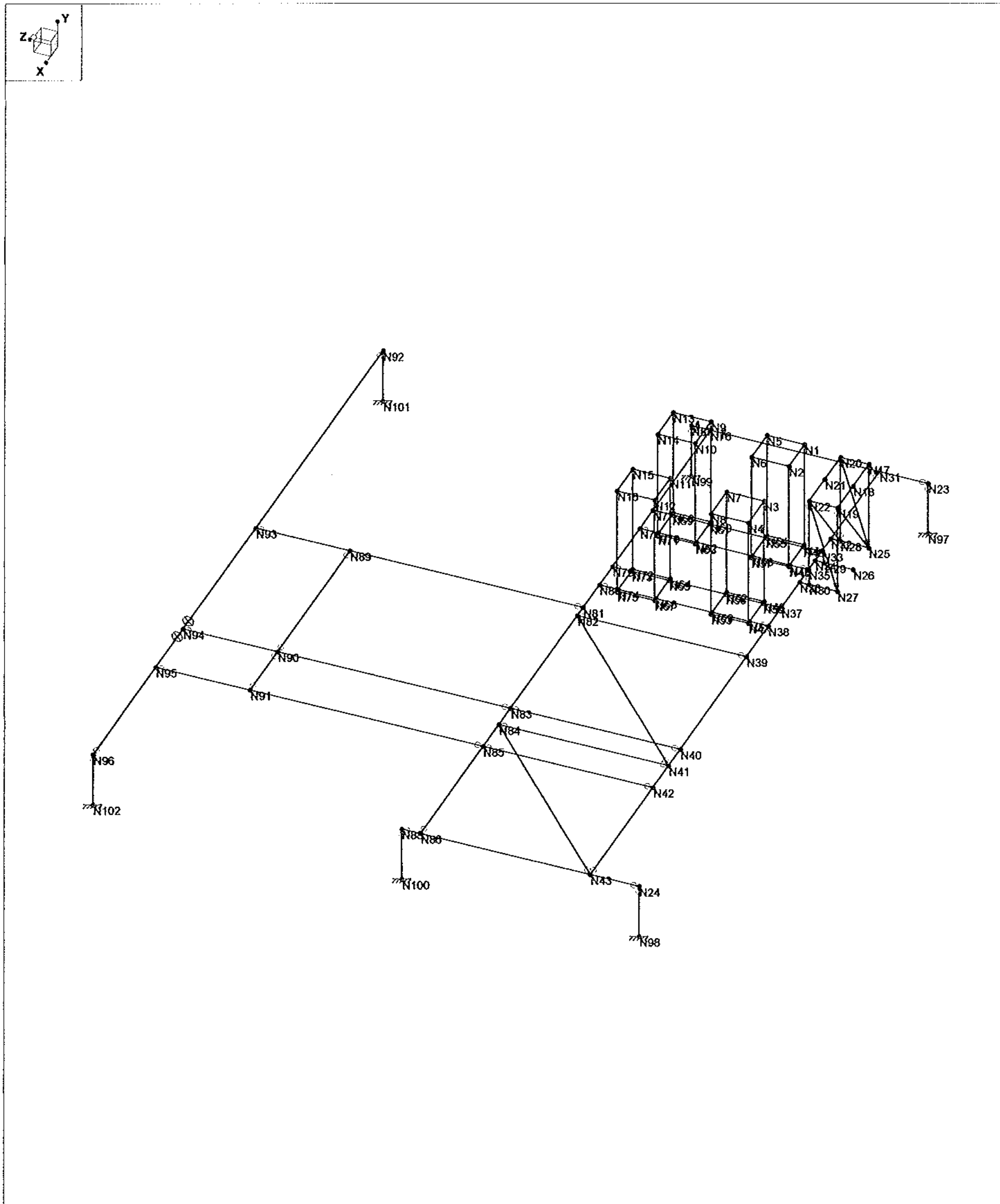
	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation ...	LC	Y Rotation ...	LC	Z Rotation [...	LC
1	N1	max	.082	4	-.003	15	.07	5	2.168e-3	5	0	1	2.537e-3	6
2		min	-.082	6	-.004	5	-.07	7	-2.171e-3	7	0	1	-2.546e-3	4
3	N2	max	.083	4	-.004	15	.096	5	2.958e-3	5	0	1	2.541e-3	6
4		min	-.082	6	-.007	5	-.096	7	-2.956e-3	7	0	1	-2.55e-3	4
5	N3	max	.084	4	-.154	14	.07	5	6.784e-4	5	9.609e-5	7	2.55e-3	6
6		min	-.084	6	-.256	4	-.07	7	4.067e-4	15	-9.609e-5	5	-2.559e-3	4
7	N4	max	.084	4	-.41	13	.08	5	1.057e-3	5	2.929e-4	7	-1.432e-3	13
8		min	-.084	6	-.683	7	-.08	7	3.54e-4	15	-2.929e-4	5	-2.389e-3	7
9	N5	max	.084	4	-.43	13	.087	5	1.091e-3	5	3.492e-4	7	-2.473e-4	15
10		min	-.084	6	-.717	7	-.087	7	3.572e-4	15	-3.492e-4	5	-4.135e-4	5
11	N6	max	.084	4	-.429	13	.092	5	1.092e-3	5	2.812e-4	7	1.077e-3	7
12		min	-.084	6	-.716	7	-.092	7	4.046e-4	15	-2.812e-4	5	6.443e-4	13
13	N7	max	.084	4	-.248	12	.096	5	1.096e-3	5	9.706e-5	7	2.554e-3	6
14		min	-.084	6	-.413	6	-.096	7	6.571e-4	15	-9.706e-5	5	-2.563e-3	4
15	N8	max	.084	4	-.153	14	.07	5	-4.79e-4	13	9.623e-5	7	2.553e-3	6
16		min	-.084	6	-.255	4	-.07	7	-7.988e-4	4	-9.623e-5	5	-2.562e-3	4
17	N9	max	.084	4	-.409	15	.08	5	-4.322e-4	13	2.924e-4	7	-1.43e-3	15
18		min	-.084	6	-.682	5	-.08	7	-1.203e-3	7	-2.924e-4	5	-2.385e-3	5
19	N10	max	.084	4	-.429	15	.087	5	-4.398e-4	13	3.484e-4	7	-2.452e-4	13
20		min	-.084	6	-.716	5	-.087	7	-1.245e-3	7	-3.484e-4	5	-4.101e-4	7
21	N11	max	.084	4	-.428	15	.092	5	-4.925e-4	13	2.806e-4	7	1.08e-3	5
22		min	-.084	6	-.714	5	-.092	7	-1.252e-3	7	-2.806e-4	5	6.462e-4	15
23	N12	max	.084	4	-.247	12	.096	5	-7.733e-4	13	9.711e-5	7	2.557e-3	6
24		min	-.084	6	-.411	6	-.096	7	-1.289e-3	7	-9.711e-5	5	-2.566e-3	4
25	N13	max	.083	4	-.003	14	.07	5	2.17e-3	5	0	1	2.565e-3	6
26		min	-.083	6	-.004	7	-.07	7	-2.168e-3	7	0	1	-2.574e-3	4
27	N14	max	.084	4	-.004	13	.096	5	2.956e-3	5	0	1	2.569e-3	6
28		min	-.083	6	-.007	7	-.096	7	-2.959e-3	7	0	1	-2.578e-3	4
29	N15	max	0	4	0	15	0	5	1.801e-020	5	0	1	2.11e-020	6
30		min	0	6	0	5	0	7	-1.8e-020	7	0	1	-2.114e-020	4
31	N16	max	0	12	0	15	0	13	2.459e-020	5	0	1	2.113e-020	6
32		min	0	14	0	5	0	15	-2.461e-020	7	0	1	-2.117e-020	4
33	N17	max	0	4	0	14	0	5	1.8e-020	5	0	1	2.133e-020	6
34		min	0	6	0	7	0	7	-1.802e-020	7	0	1	-2.138e-020	4
35	N18	max	0	12	0	13	0	13	2.461e-020	5	0	1	2.137e-020	6
36		min	0	14	0	7	0	15	-2.459e-020	7	0	1	-2.141e-020	4

Envelope AISC 13th(360-05): ASD Steel Code Checks

	Member	Shape	Code C...	Loc[ft]	LC	Shear ...	Loc[ft]	Dir	LC	Pnc/om [...	Pnt/om [k]	Mnyy...	Mnzz/o...	Cb	Eqn
1	M1	W8x24	.010	4.907	7	.011	0	y	6	115.059	152.623	15.395	41.497	1.136	H1-1b
2	M2	W8x24	.011	4.907	4	.012	9.815	y	7	115.059	152.623	15.395	41.497	1.136	H1-1b
3	M3	W8x24	.010	4.85	5	.011	9.7	y	6	115.815	152.623	15.395	41.497	1.136	H1-1b
4	M4	W8x24	.011	4.85	4	.013	0	y	5	115.815	152.623	15.395	41.497	1.136	H1-1b
5	M5	W12x30	.018	8	5	.007	0	y	5	81.776	189.485	17.174	63.901	1.136	H1-1b
6	M6	W12x30	.018	8	7	.007	0	y	7	81.776	189.485	17.174	63.901	1.136	H1-1b
7	M7	W12x50	.708	10	7	.230	16	y	7	190.271	314.731	38.263	129.162	1.044	H1-1b
8	M8	W12x50	.153	.75	4	.352	0	y	5	313.341	314.731	38.263	129.162	1.316	H1-1b
9	M9	W12x50	.708	10	5	.231	16	y	5	190.271	314.731	38.263	129.162	1.044	H1-1b
10	M10	W12x50	.483	6.798	4	.149	14.833	y	5	204.222	314.731	38.263	129.162	1.001	H1-1b
11	M11	W12x50	.779	6.798	6	.238	14.833	y	5	204.222	314.731	38.263	129.162	1.001	H1-1b
12	M12	HSS4x4x6	.236	0	4	.020	0	y	4	97.402	103.042	11.479	11.479	1.667	H1-1b
13	M13	HSS4x4x6	.315	0	5	.023	0	z	7	97.402	103.042	11.479	11.479	1.701	H1-1b
14	M14	HSS4x4x6	.239	0	4	.020	0	y	4	97.402	103.042	11.479	11.479	1.668	H1-1b
15	M15	HSS4x4x6	.317	0	7	.023	0	z	5	97.402	103.042	11.479	11.479	1.7	H1-1b

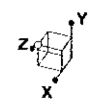
APPENDIX D

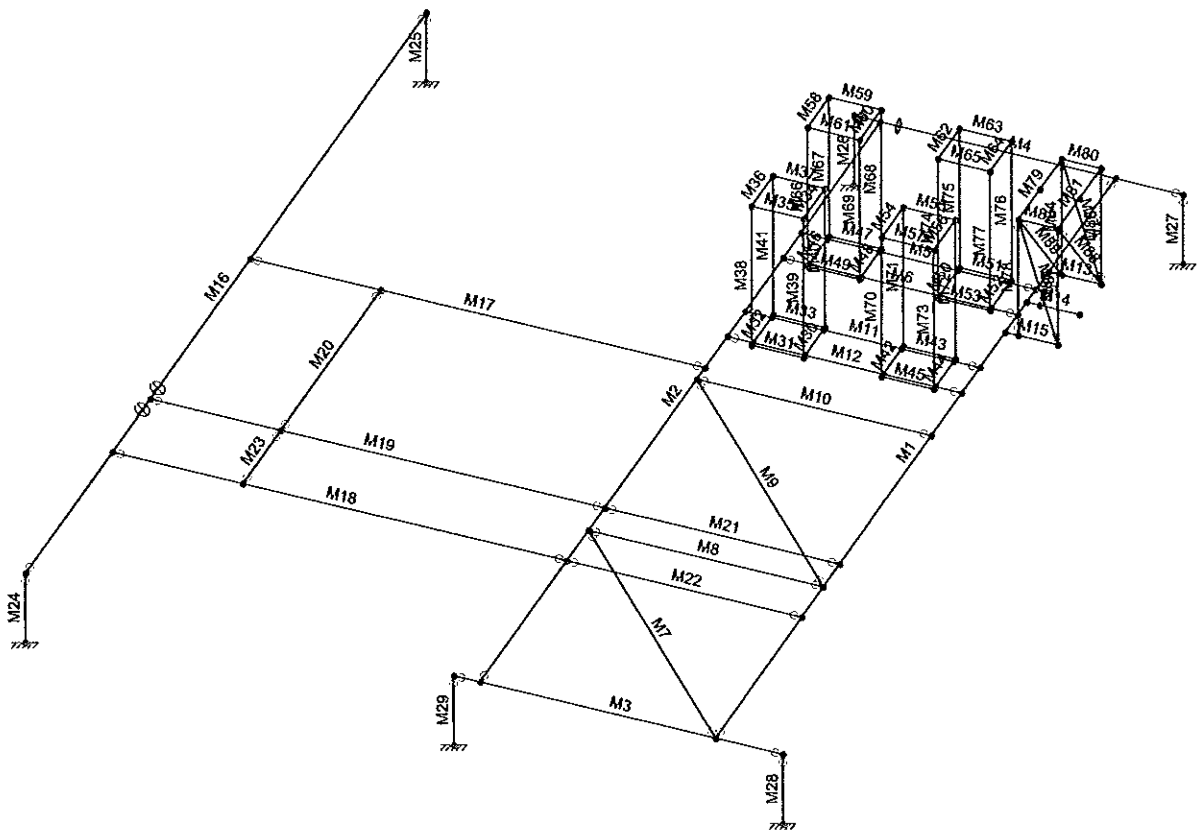
EQUIPMENT PLATFORM CALCULATIONS



Loads: BLC 1, Self Weight
Solution: Envelope

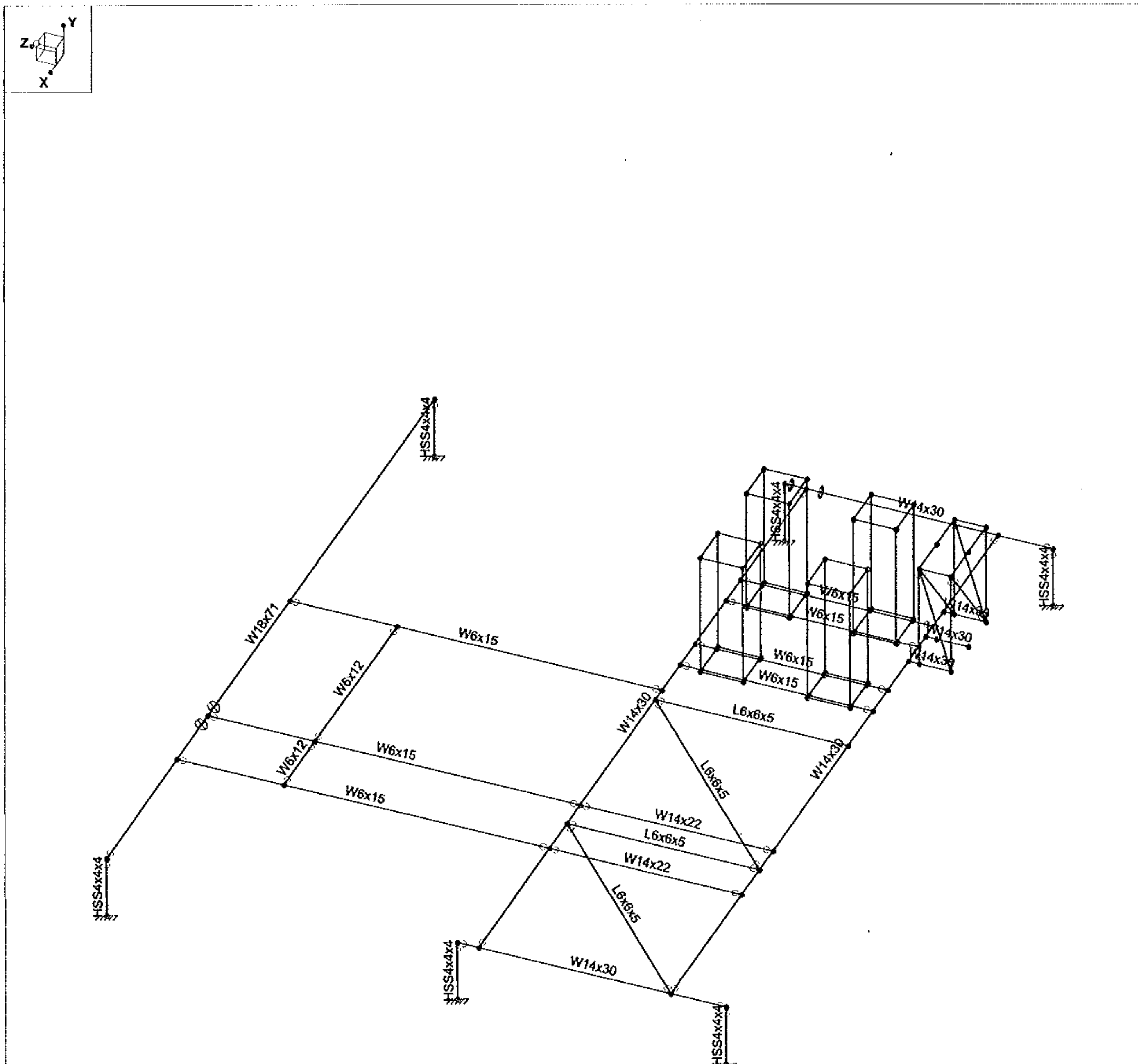
Ramaker & Associates, Inc.	University of Hartford (CT03XC078)	SK - 1
TEM		Sept 26, 2012 at 1:24 PM
22996		22996 C.r3d





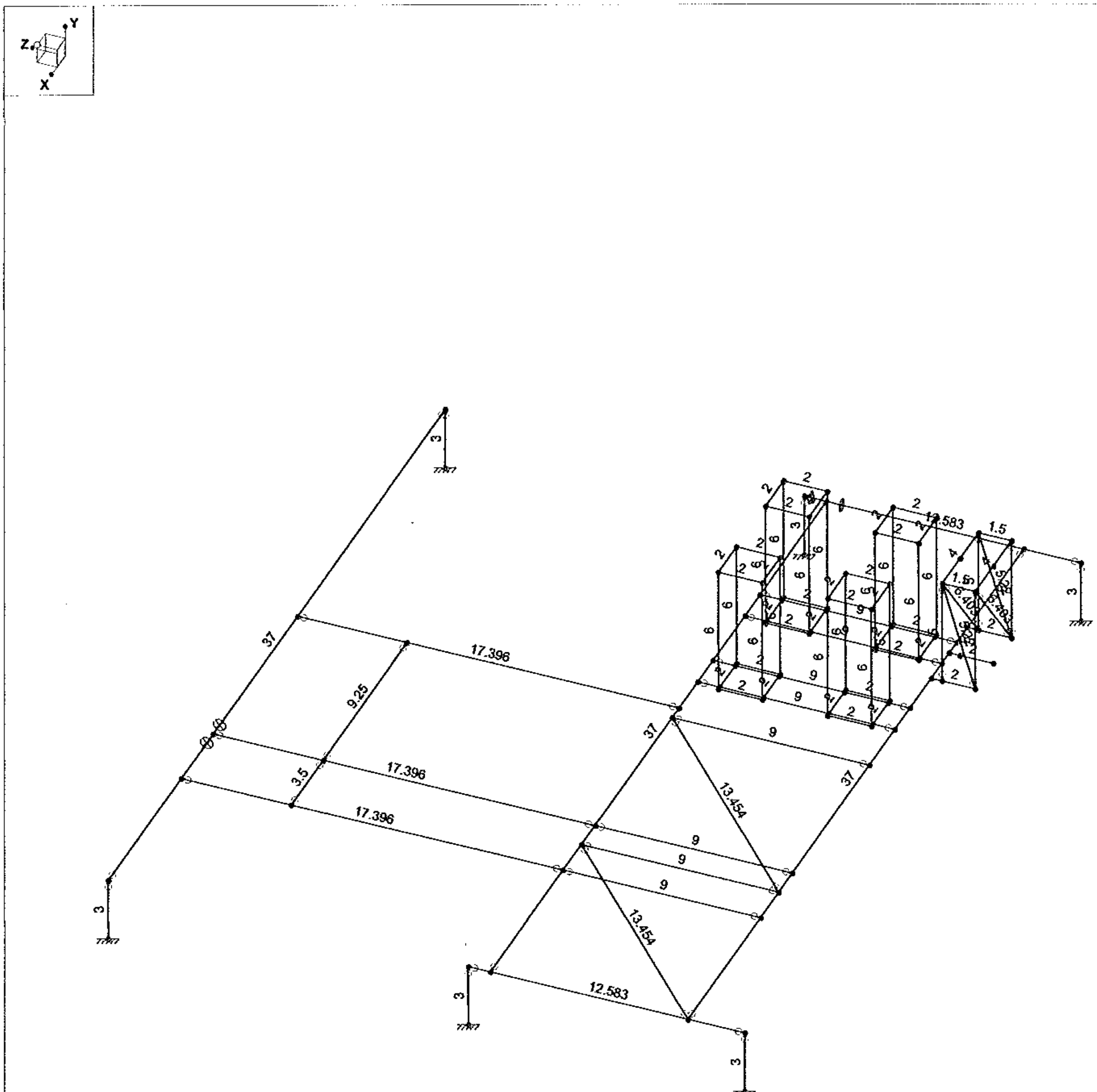
Loads: BLC 1, Self Weight
Solution: Envelope

Ramaker & Associates, Inc.	University of Hartford (CT03XC078)	SK - 2
TEM		Sept 26, 2012 at 1:24 PM
22996		22996 C.r3d



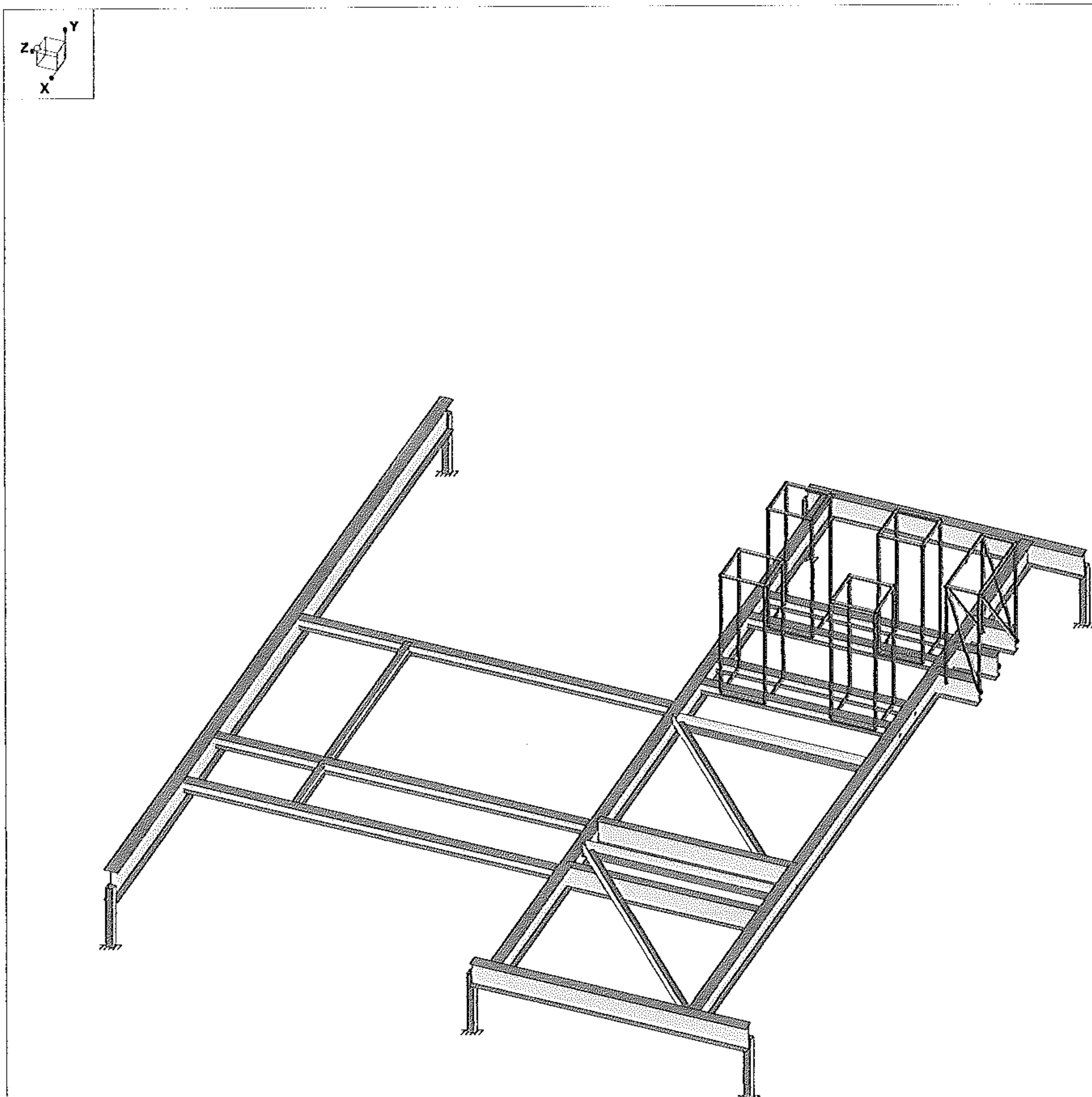
Loads: BLC 1, Self Weight
Solution: Envelope

Ramaker & Associates, Inc.	University of Hartford (CT03XC078)	SK - 3
TEM		Sept 26, 2012 at 1:24 PM
22996		22996 C.r3d



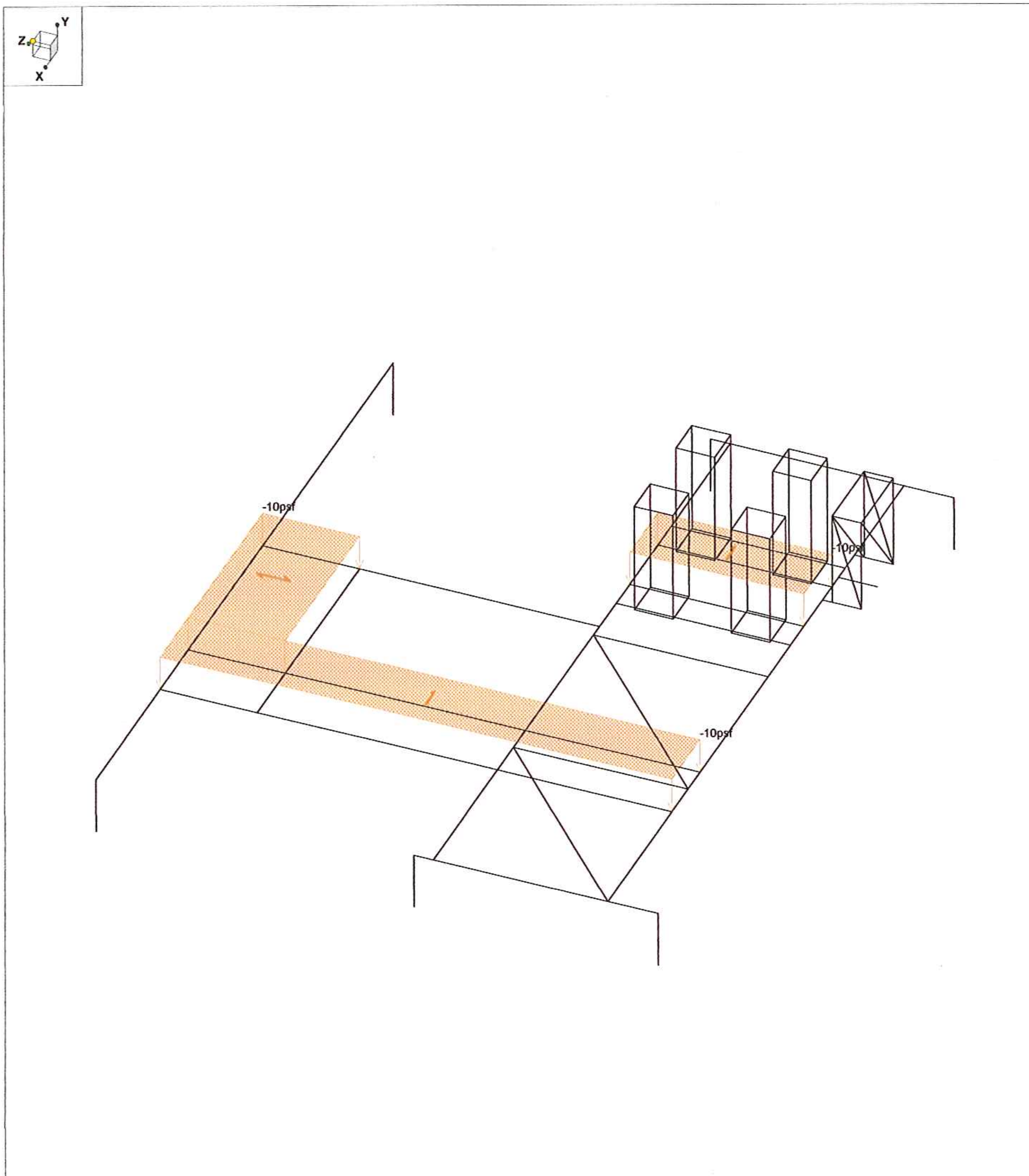
Member Length (ft) Displayed
Loads: BLC 1, Self Weight
Solution: Envelope

Ramaker & Associates, Inc.		SK - 4
TEM	University of Hartford (CT03XC078)	Sept 26, 2012 at 1:25 PM
22996		22996 C.r3d



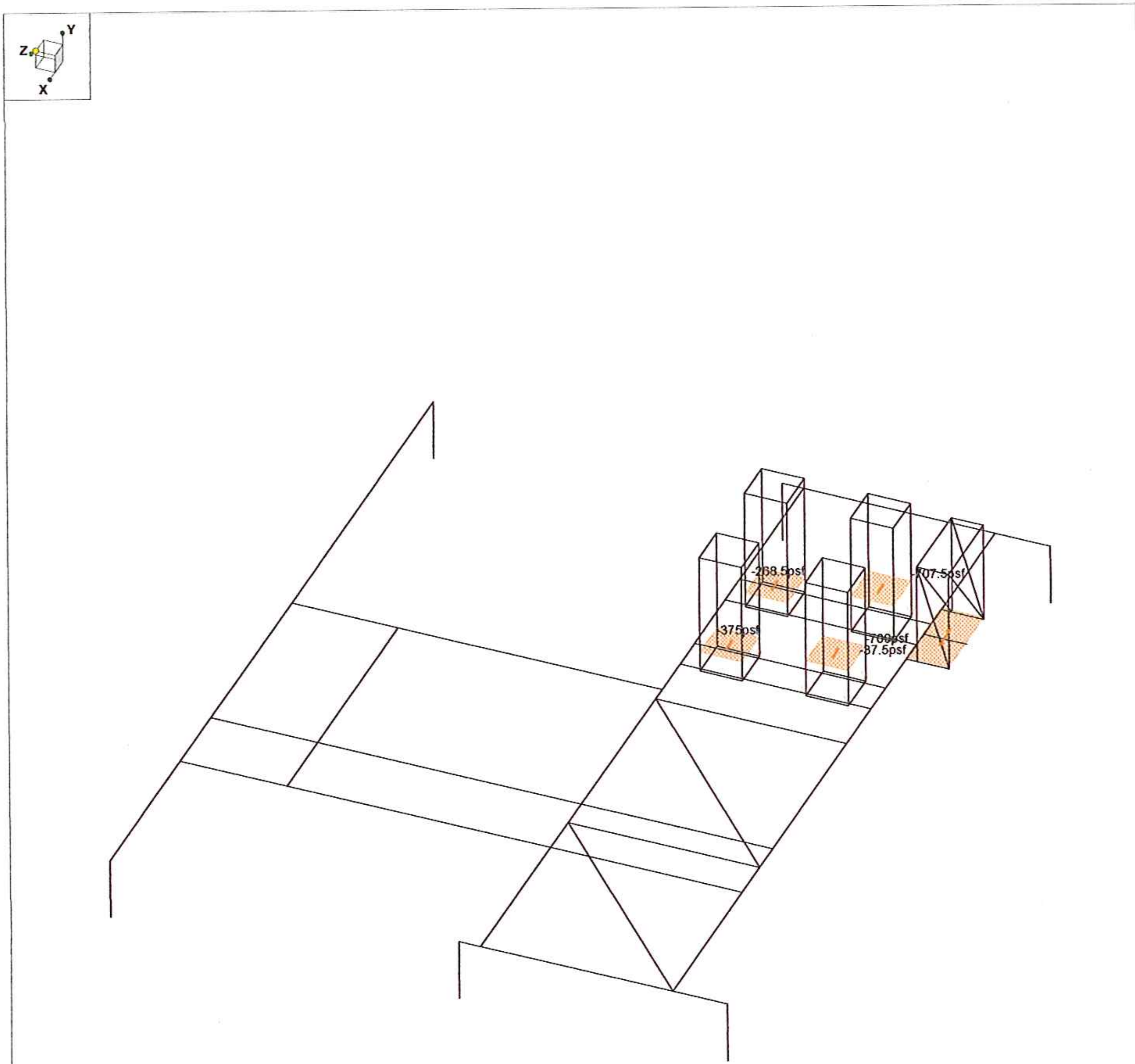
Solution: Envelope

Ramaker & Associates, Inc.	University of Hartford (CT03XC078)	SK - 5
TEM		Sept 26, 2012 at 1:25 PM
22996		22996 C.r3d



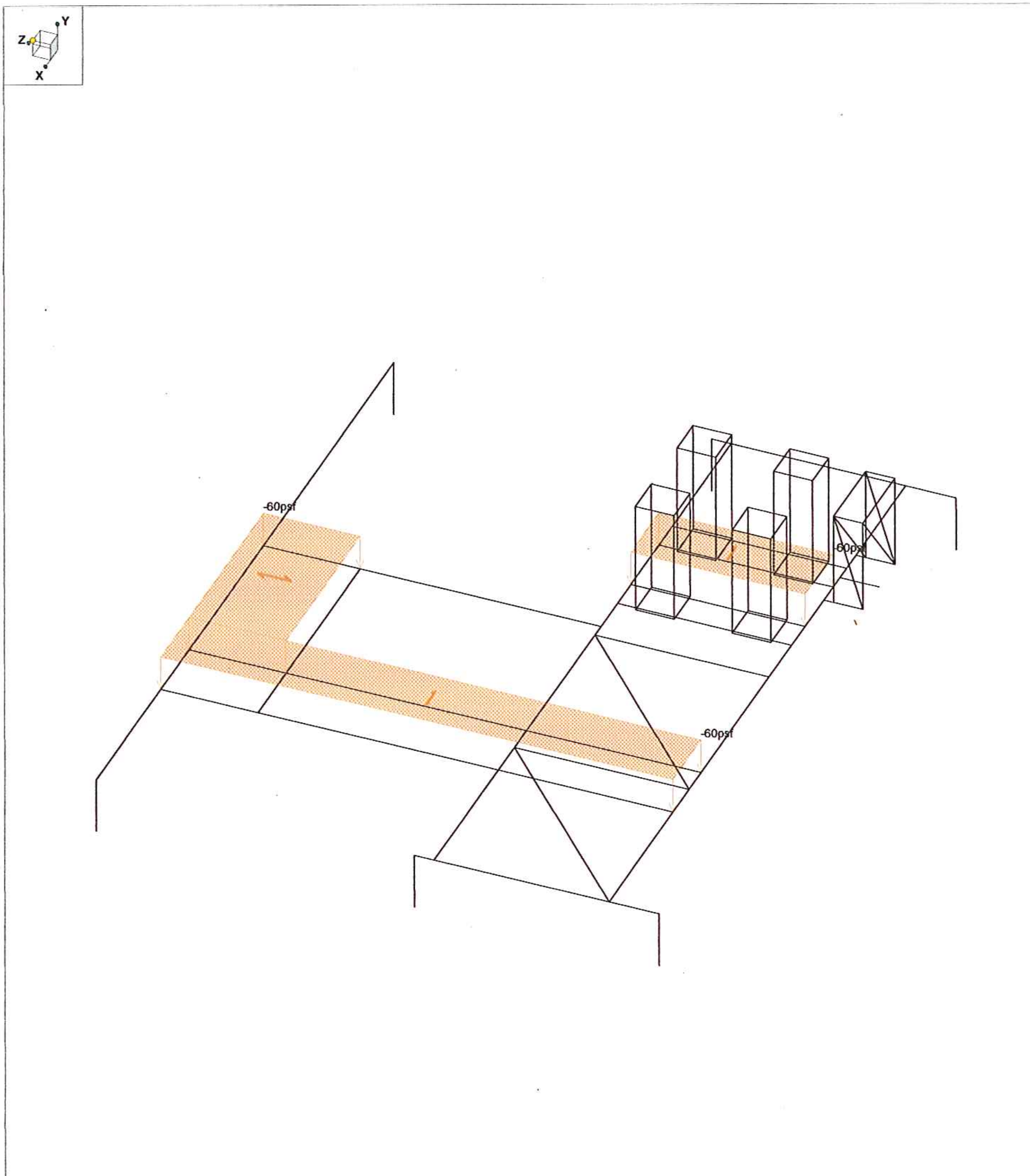
Loads: BLC 2, Grating
Solution: Envelope

Ramaker & Associates, Inc.	University of Hartford (CT03XC078)	SK - 6
TEM		Sept 26, 2012 at 1:25 PM
22996		22996 C.r3d



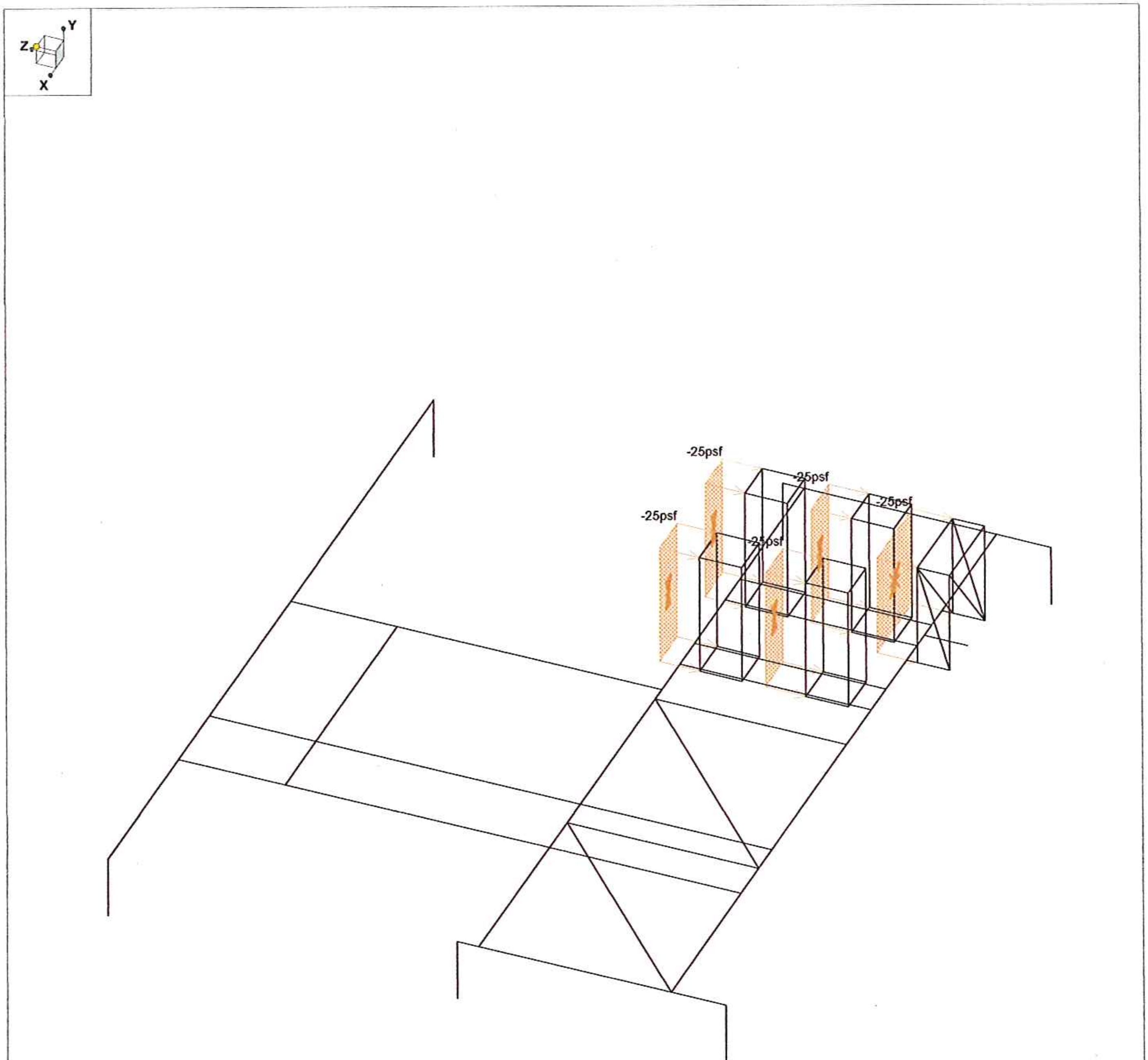
Loads: BLC 3, Cabinets
Solution: Envelope

Ramaker & Associates, Inc.	University of Hartford (CT03XC078)	SK - 7
TEM		Sept 26, 2012 at 1:26 PM
22996		22996 C.r3d



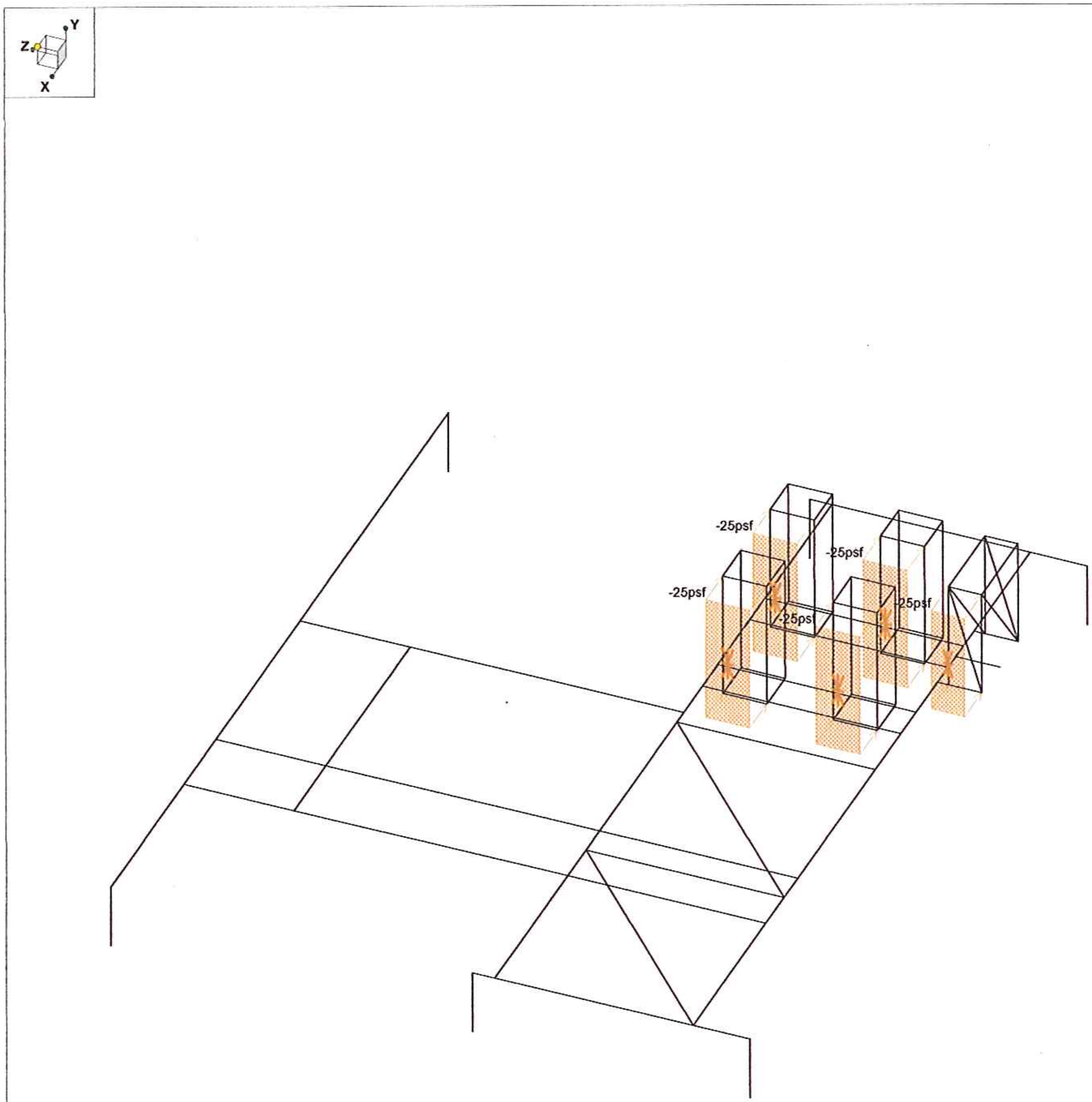
Loads: BLC 4, Live
Solution: Envelope

Ramaker & Associates, Inc.	University of Hartford (CT03XC078)	SK - 8
TEM		Sept 26, 2012 at 1:26 PM
22996		22996 C.r3d



Loads: BLC 5, Wind Z
Solution: Envelope

Ramaker & Associates, Inc.	University of Hartford (CT03XC078)	SK - 9
TEM		Sept 26, 2012 at 1:26 PM
22996		22996 C.r3d



Loads: BLC 6, Wind X
Solution: Envelope

Ramaker & Associates, Inc.	University of Hartford (CT03XC078)	SK - 10
TEM		Sept 26, 2012 at 1:26 PM
22996		22996 C.r3d

Global

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Increase Nailing Capacity for Wind?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automaticly Iterate Stiffness for Walls?	Yes
Maximum Iteration Number for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 14th(360-10): LRFD
Adjust Stiffness?	Yes(Iterative)
RISAConnection Code	AISC 13th(360-05): ASD
Cold Formed Steel Code	AISI S100-07: ASD
Wood Code	AF&PA NDS-05/08: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-11
Masonry Code	ACI 530-08: ASD
Aluminum Code	AA ADM1-05: ASD - Building

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	Exact Integration
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

Global, Continued

Seismic Code	ASCE 7-10
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	Yes
Ct Z	.02
Ct X	.02
T Z (sec)	Not Entered
T X (sec)	Not Entered
R Z	3
R X	3
Ct Exp. Z	.75
Ct Exp. X	.75
SD1	1
SDS	1
S1	1
TL (sec)	5
Risk Cat	I or II
Seismic Detailing Code	ASCE 7-05
Om Z	1
Om X	1
Rho Z	1
Rho X	1

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1E...	Density[k/ft...	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	65	1.1
3	A992	29000	11154	.3	.65	.49	50	1.1	65	1.1
4	A500 Gr.42	29000	11154	.3	.65	.49	42	1.4	58	1.3
5	A500 Gr.46	29000	11154	.3	.65	.49	46	1.4	58	1.3

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rules	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	HR1	W14x30	Beam	Wide Flange	A36 Gr.36	Typical	8.85	19.6	291	.38
2	HR2	L6x6x5	HBrace	Wide Flange	A36 Gr.36	Typical	3.67	13	13	.129
3	HR3	W6x15	Beam	Wide Flange	A36 Gr.36	Typical	4.43	9.32	29.1	.101
4	HR4	W6x12	Beam	Wide Flange	A36 Gr.36	Typical	3.55	2.99	22.1	.09
5	HR5	W14x22	Beam	Wide Flange	A36 Gr.36	Typical	6.49	7	199	.208
6	HR6	HSS4x4x4	Beam	Wide Flange	A36 Gr.36	Typical	3.37	7.8	7.8	12.8

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diap...
1	N1	7.148	6	3.583	0	
2	N2	9.148	6	3.583	0	
3	N3	12.348	6	3.583	0	
4	N4	14.348	6	3.583	0	
5	N5	7.148	6	5.583	0	
6	N6	9.148	6	5.583	0	
7	N7	12.348	6	5.583	0	
8	N8	14.348	6	5.583	0	
9	N9	7.148	6	8.583	0	
10	N10	9.148	6	8.583	0	
11	N11	12.348	6	8.583	0	
12	N12	14.348	6	8.583	0	
13	N13	7.148	6	10.583	0	

Joint Coordinates and Temperatures (Continued)

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diap...
14	N14	9.148	6	10.583	0	
15	N15	12.348	6	10.583	0	
16	N16	14.348	6	10.583	0	
17	N17	6.1715	5	0.583	0	
18	N18	8.1715	5	0.583	0	
19	N19	10.1715	5	0.583	0	
20	N20	6.1715	5	2.083	0	
21	N21	8.1715	5	2.083	0	
22	N22	10.1715	5	2.083	0	
23	N23	0	0	0	0	
24	N24	37	0	0	0	
25	N25	6.1715	0	0.583	0	
26	N26	8.1715	0	0.583	0	
27	N27	10.1715	0	0.583	0	
28	N28	6.1715	0	2.083	0	
29	N29	8.1715	0	2.083	0	
30	N30	10.1715	0	2.083	0	
31	N31	0	0	2.583	0	
32	N32	6.1715	0	2.583	0	
33	N33	7.333	0	2.583	0	
34	N34	8.1715	0	2.583	0	
35	N35	9.01	0	2.583	0	
36	N36	10.1715	0	2.583	0	
37	N37	12.51	0	2.583	0	
38	N38	14.187	0	2.583	0	
39	N39	17	0	2.583	0	
40	N40	25.5	0	2.583	0	
41	N41	27	0	2.583	0	
42	N42	29	0	2.583	0	
43	N43	37	0	2.583	0	
44	N44	7.148	0	3.583	0	
45	N45	9.148	0	3.583	0	
46	N46	12.348	0	3.583	0	
47	N47	14.348	0	3.583	0	
48	N48	7.333	0	3.583	0	
49	N49	9.01	0	3.583	0	
50	N50	12.51	0	3.583	0	
51	N51	14.187	0	3.583	0	
52	N52	12.348	0	5.583	0	
53	N53	14.348	0	5.583	0	
54	N54	7.148	0	5.583	0	
55	N55	7.333	0	5.583	0	
56	N56	9.01	0	5.583	0	
57	N57	9.148	0	5.583	0	
58	N58	12.51	0	5.583	0	
59	N59	14.187	0	5.583	0	
60	N60	7.148	0	8.583	0	
61	N61	7.333	0	8.583	0	
62	N62	9.01	0	8.583	0	
63	N63	9.148	0	8.583	0	
64	N64	12.348	0	8.583	0	
65	N65	12.51	0	8.583	0	
66	N66	14.187	0	8.583	0	
67	N67	14.348	0	8.583	0	
68	N68	7.148	0	10.583	0	
69	N69	7.333	0	10.583	0	
70	N70	9.01	0	10.583	0	

Joint Coordinates and Temperatures (Continued)

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diap...
71	N71	9.148	0	10.583	0	
72	N72	12.348	0	10.583	0	
73	N73	12.51	0	10.583	0	
74	N74	14.187	0	10.583	0	
75	N75	14.348	0	10.583	0	
76	N76	0	0	11.583	0	
77	N77	7.333	0	11.583	0	
78	N78	9.01	0	11.583	0	
79	N79	12.51	0	11.583	0	
80	N80	14.187	0	11.583	0	
81	N81	16.25	0	11.583	0	
82	N82	17	0	11.583	0	
83	N83	25.5	0	11.583	0	
84	N84	27	0	11.583	0	
85	N85	29	0	11.583	0	
86	N86	37	0	11.583	0	
87	N87	0	0	12.583	0	
88	N88	37	0	12.583	0	
89	N89	16.25	0	23.97883	0	
90	N90	25.5	0	23.97883	0	
91	N91	29	0	23.97883	0	
92	N92	0	0	28.97883	0	
93	N93	16.25	0	28.97883	0	
94	N94	25.5	0	28.97883	0	
95	N95	29	0	28.97883	0	
96	N96	37	0	28.97883	0	
97	N97	0	-3	0	0	
98	N98	37	-3	0	0	
99	N99	0	-3	12.583	0	
100	N100	37	-3	12.583	0	
101	N101	0	-3	28.97883	0	
102	N102	37	-3	28.97883	0	

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]	Footing
1	N102	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction	
2	N100	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction	
3	N98	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction	
4	N97	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction	
5	N99	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction	
6	N101	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction	
7	N94				Reaction			
8	N76						Reaction	

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
1	M1	N31	N43			HR1	Beam	Wide Flange	A36 Gr.36	Typical
2	M2	N76	N86			HR1	Beam	Wide Flange	A36 Gr.36	Typical
3	M3	N24	N88			HR1	Beam	Wide Flange	A36 Gr.36	Typical
4	M4	N23	N87			HR1	Beam	Wide Flange	A36 Gr.36	Typical
5	M5	N77	N33			HR3	Beam	Wide Flange	A36 Gr.36	Typical
6	M6	N78	N35			HR3	Beam	Wide Flange	A36 Gr.36	Typical
7	M7	N43	N84			HR2	HBrace	Wide Flange	A36 Gr.36	Typical
8	M8	N84	N41			HR2	HBrace	Wide Flange	A36 Gr.36	Typical
9	M9	N41	N82			HR2	HBrace	Wide Flange	A36 Gr.36	Typical

Member Primary Data (Continued)

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
10	M10	N82	N39			HR2	HBrace	Wide Flange	A36 Gr.36	Typical
11	M11	N79	N37			HR3	Beam	Wide Flange	A36 Gr.36	Typical
12	M12	N80	N38			HR3	Beam	Wide Flange	A36 Gr.36	Typical
13	M13	N32	N25			HR1	Beam	Wide Flange	A36 Gr.36	Typical
14	M14	N34	N26			HR1	Beam	Wide Flange	A36 Gr.36	Typical
15	M15	N36	N27			HR1	Beam	Wide Flange	A36 Gr.36	Typical
16	M16	N92	N96			W18x71	Beam	Wide Flange	A36 Gr.36	Typical
17	M17	N93	N81			HR3	Beam	Wide Flange	A36 Gr.36	Typical
18	M18	N95	N85			HR3	Beam	Wide Flange	A36 Gr.36	Typical
19	M19	N94	N83			HR3	Beam	Wide Flange	A36 Gr.36	Typical
20	M20	N89	N90			HR4	Beam	Wide Flange	A36 Gr.36	Typical
21	M21	N83	N40			HR5	Beam	Wide Flange	A36 Gr.36	Typical
22	M22	N85	N42			HR5	Beam	Wide Flange	A36 Gr.36	Typical
23	M23	N90	N91			HR4	Beam	Wide Flange	A36 Gr.36	Typical
24	M24	N102	N96			HR6	Beam	Wide Flange	A36 Gr.36	Typical
25	M25	N101	N92			HR6	Beam	Wide Flange	A36 Gr.36	Typical
26	M26	N99	N87			HR6	Beam	Wide Flange	A36 Gr.36	Typical
27	M27	N97	N23			HR6	Beam	Wide Flange	A36 Gr.36	Typical
28	M28	N98	N24			HR6	Beam	Wide Flange	A36 Gr.36	Typical
29	M29	N100	N88			HR6	Beam	Wide Flange	A36 Gr.36	Typical
30	M30	N64	N67			RIGID	None	None	RIGID	Typical
31	M31	N67	N75			RIGID	None	None	RIGID	Typical
32	M32	N75	N72			RIGID	None	None	RIGID	Typical
33	M33	N72	N64			RIGID	None	None	RIGID	Typical
34	M34	N11	N12			RIGID	None	None	RIGID	Typical
35	M35	N12	N16			RIGID	None	None	RIGID	Typical
36	M36	N16	N15			RIGID	None	None	RIGID	Typical
37	M37	N15	N11			RIGID	None	None	RIGID	Typical
38	M38	N75	N16			RIGID	None	None	RIGID	Typical
39	M39	N67	N12			RIGID	None	None	RIGID	Typical
40	M40	N64	N11			RIGID	None	None	RIGID	Typical
41	M41	N72	N15			RIGID	None	None	RIGID	Typical
42	M42	N53	N52			RIGID	None	None	RIGID	Typical
43	M43	N52	N46			RIGID	None	None	RIGID	Typical
44	M44	N46	N47			RIGID	None	None	RIGID	Typical
45	M45	N47	N53			RIGID	None	None	RIGID	Typical
46	M46	N71	N68			RIGID	None	None	RIGID	Typical
47	M47	N68	N60			RIGID	None	None	RIGID	Typical
48	M48	N60	N63			RIGID	None	None	RIGID	Typical
49	M49	N63	N71			RIGID	None	None	RIGID	Typical
50	M50	N57	N54			RIGID	None	None	RIGID	Typical
51	M51	N54	N44			RIGID	None	None	RIGID	Typical
52	M52	N44	N45			RIGID	None	None	RIGID	Typical
53	M53	N45	N57			RIGID	None	None	RIGID	Typical
54	M54	N8	N7			RIGID	None	None	RIGID	Typical
55	M55	N7	N3			RIGID	None	None	RIGID	Typical
56	M56	N3	N4			RIGID	None	None	RIGID	Typical
57	M57	N4	N8			RIGID	None	None	RIGID	Typical
58	M58	N14	N13			RIGID	None	None	RIGID	Typical
59	M59	N13	N9			RIGID	None	None	RIGID	Typical
60	M60	N9	N10			RIGID	None	None	RIGID	Typical
61	M61	N10	N14			RIGID	None	None	RIGID	Typical
62	M62	N6	N5			RIGID	None	None	RIGID	Typical
63	M63	N5	N1			RIGID	None	None	RIGID	Typical
64	M64	N1	N2			RIGID	None	None	RIGID	Typical
65	M65	N2	N6			RIGID	None	None	RIGID	Typical
66	M66	N71	N14			RIGID	None	None	RIGID	Typical

Member Primary Data (Continued)

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
67	M67	N68	N13			RIGID	None	None	RIGID	Typical
68	M68	N60	N9			RIGID	None	None	RIGID	Typical
69	M69	N63	N10			RIGID	None	None	RIGID	Typical
70	M70	N53	N8			RIGID	None	None	RIGID	Typical
71	M71	N52	N7			RIGID	None	None	RIGID	Typical
72	M72	N46	N3			RIGID	None	None	RIGID	Typical
73	M73	N47	N4			RIGID	None	None	RIGID	Typical
74	M74	N57	N6			RIGID	None	None	RIGID	Typical
75	M75	N54	N5			RIGID	None	None	RIGID	Typical
76	M76	N44	N1			RIGID	None	None	RIGID	Typical
77	M77	N45	N2			RIGID	None	None	RIGID	Typical
78	M78	N30	N22			RIGID	None	None	RIGID	Typical
79	M79	N22	N20			RIGID	None	None	RIGID	Typical
80	M80	N20	N17			RIGID	None	None	RIGID	Typical
81	M81	N17	N19			RIGID	None	None	RIGID	Typical
82	M82	N19	N22			RIGID	None	None	RIGID	Typical
83	M84	N28	N20			RIGID	None	None	RIGID	Typical
84	M85	N17	N25			RIGID	None	None	RIGID	Typical
85	M87	N27	N19			RIGID	None	None	RIGID	Typical
86	M86	N27	N22			RIGID	None	None	RIGID	Typical
87	M87A	N25	N20			RIGID	None	None	RIGID	Typical
88	M88	N25	N19			RIGID	None	None	RIGID	Typical
89	M89	N28	N22			RIGID	None	None	RIGID	Typical

Hot Rolled Steel Design Parameters

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[ft]	Lcomp bot[ft]	L-torq...	Kyy	Kzz	Cb	Function
1	M1	HR1	37	10		10						Lateral
2	M2	HR1	37	10		10						Lateral
3	M3	HR1	12.583									Lateral
4	M4	HR1	12.583									Lateral
5	M5	HR3	9									Lateral
6	M6	HR3	9									Lateral
7	M7	HR2	13.454									Lateral
8	M8	HR2	9									Lateral
9	M9	HR2	13.454									Lateral
10	M10	HR2	9									Lateral
11	M11	HR3	9									Lateral
12	M12	HR3	9									Lateral
13	M13	HR1	2									Lateral
14	M14	HR1	2									Lateral
15	M15	HR1	2									Lateral
16	M16	W18x71	37									Lateral
17	M17	HR3	17.396									Lateral
18	M18	HR3	17.396									Lateral
19	M19	HR3	17.396									Lateral
20	M20	HR4	9.25									Lateral
21	M21	HR5	9									Lateral
22	M22	HR5	9									Lateral
23	M23	HR4	3.5									Lateral
24	M24	HR6	3									Lateral
25	M25	HR6	3									Lateral
26	M26	HR6	3									Lateral
27	M27	HR6	3									Lateral
28	M28	HR6	3									Lateral
29	M29	HR6	3									Lateral

Joint Loads and Enforced Displacements

Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*ft^2)]
No Data to Print ...			

Member Point Loads

Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
No Data to Print ...			

Member Distributed Loads (BLC 7 : BLC 2 Transient Area Loads)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M16	Y	-.025	-.025	16.25	25.5
2	M20	Y	-.025	-.025	9.215e-15	9.25
3	M18	Y	-.017	-.017	1.679e-14	17.366
4	M19	Y	-.018	-.018	2.359e-15	17.366
5	M21	Y	-.018	-.018	0	9
6	M22	Y	-.018	-.018	0	9
7	M6	Y	-.01	-.01	5.607e-15	9
8	M11	Y	-.01	-.01	1.665e-16	9
9	M33	Y	-.017	-.017	.038	2
10	M43	Y	-.018	-.018	0	1.962
11	M49	Y	-.018	-.018	0	1.962
12	M53	Y	-.016	-.016	.038	2

Member Distributed Loads (BLC 8 : BLC 3 Transient Area Loads)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M13	Y	-.038	-.038	1.665e-16	2
2	M14	Y	-.075	-.075	4.163e-17	2
3	M15	Y	-.037	-.037	0	2
4	M5	Y	-.269	-.269	1	3
5	M6	Y	-.269	-.269	1	3
6	M5	Y	-.708	-.708	6	8
7	M6	Y	-.708	-.708	6	8
8	M11	Y	-.375	-.375	1	3
9	M12	Y	-.375	-.375	1	3
10	M11	Y	-.7	-.7	6	8
11	M12	Y	-.7	-.7	6	8

Member Distributed Loads (BLC 9 : BLC 5 Transient Area Loads)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M32	Z	-.015	-.015	2.456e-15	2
2	M36	Z	-.015	-.015	1.207e-15	2
3	M38	Z	-.021	-.021	.2	5.8
4	M41	Z	-.021	-.021	.2	5.8
5	M46	Z	-.015	-.015	0	2
6	M58	Z	-.015	-.015	3.608e-15	2
7	M66	Z	-.021	-.021	.2	5.8
8	M67	Z	-.021	-.021	.2	5.8
9	M50	Z	-.015	-.015	0	2
10	M62	Z	-.015	-.015	3.608e-15	2
11	M74	Z	-.021	-.021	.2	5.8
12	M75	Z	-.021	-.021	.2	5.8
13	M42	Z	-.015	-.015	2.456e-15	2
14	M54	Z	-.015	-.015	1.207e-15	2
15	M70	Z	-.021	-.021	.2	5.8
16	M71	Z	-.021	-.021	.2	5.8

Member Distributed Loads (BLC 9 : BLC 5 Transient Area Loads) (Continued)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
17	M78	Z	-.024	-.024	5.274e-16	4.583
18	M79	Z	-.02	-.02	.4	3.6
19	M84	Z	-.019	-.019	.417	5
20	M89	Z	-.008	-.044	0	1.281
21	M89	Z	-.044	-.061	1.281	2.561
22	M89	Z	-.061	-.05	2.561	3.842
23	M89	Z	-.05	-.027	3.842	5.122
24	M89	Z	-.027	-.005	5.122	6.403

Member Distributed Loads (BLC 10 : BLC 4 Transient Area Loads)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M16	Y	-.15	-.15	16.25	25.5
2	M20	Y	-.15	-.15	9.215e-15	9.25
3	M18	Y	-.105	-.105	1.679e-14	17.366
4	M19	Y	-.105	-.105	2.359e-15	17.366
5	M21	Y	-.105	-.105	0	9
6	M22	Y	-.105	-.105	0	9
7	M6	Y	-.105	-.105	5.607e-15	.346
8	M6	Y	-.105	-.105	.346	.692
9	M6	Y	-.105	-.063	.692	1.038
10	M6	Y	-.063	-.011	1.038	1.385
11	M6	Y	-.011	-1.234e-17	1.385	1.731
12	M6	Y	-1.234e-17	-1.234e-17	1.731	2.077
13	M6	Y	-1.234e-17	-1.234e-17	2.077	2.423
14	M6	Y	-1.234e-17	-1.234e-17	2.423	2.769
15	M6	Y	-1.234e-17	-.053	2.769	3.115
16	M6	Y	-.053	-.105	3.115	3.462
17	M6	Y	-.105	-.105	3.462	3.808
18	M6	Y	-.105	-.105	3.808	4.154
19	M6	Y	-.105	-.105	4.154	4.5
20	M6	Y	-.105	-.105	4.5	4.846
21	M6	Y	-.105	-.105	4.846	5.192
22	M6	Y	-.105	-.105	5.192	5.538
23	M6	Y	-.105	-.084	5.538	5.885
24	M6	Y	-.084	-.042	5.885	6.231
25	M6	Y	-.042	-.01	6.231	6.577
26	M6	Y	-.01	-1.234e-17	6.577	6.923
27	M6	Y	-1.234e-17	-1.234e-17	6.923	7.269
28	M6	Y	-1.234e-17	-1.234e-17	7.269	7.615
29	M6	Y	-1.234e-17	-.053	7.615	7.962
30	M6	Y	-.053	-.105	7.962	8.308
31	M6	Y	-.105	-.105	8.308	8.654
32	M6	Y	-.105	-.105	8.654	9
33	M11	Y	-.105	-.105	1.665e-16	.346
34	M11	Y	-.105	-.105	.346	.692
35	M11	Y	-.105	-.052	.692	1.038
36	M11	Y	-.052	-1.234e-17	1.038	1.385
37	M11	Y	-1.234e-17	-1.234e-17	1.385	1.731
38	M11	Y	-1.234e-17	-1.234e-17	1.731	2.077
39	M11	Y	-1.234e-17	-.011	2.077	2.423
40	M11	Y	-.011	-.032	2.423	2.769
41	M11	Y	-.032	-.074	2.769	3.115
42	M11	Y	-.074	-.105	3.115	3.462
43	M11	Y	-.105	-.105	3.462	3.808
44	M11	Y	-.105	-.105	3.808	4.154
45	M11	Y	-.105	-.105	4.154	4.5
46	M11	Y	-.105	-.105	4.5	4.846

Member Distributed Loads (BLC 10 : BLC 4 Transient Area Loads) (Continued)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
47	M11	Y	-.105	-.105	4.846	5.192
48	M11	Y	-.105	-.105	5.192	5.538
49	M11	Y	-.105	-.053	5.538	5.885
50	M11	Y	-.053	-1.234e-17	5.885	6.231
51	M11	Y	-1.234e-17	-1.234e-17	6.231	6.577
52	M11	Y	-1.234e-17	-1.234e-17	6.577	6.923
53	M11	Y	-1.234e-17	-1.234e-17	6.923	7.269
54	M11	Y	-1.234e-17	-.01	7.269	7.615
55	M11	Y	-.01	-.063	7.615	7.962
56	M11	Y	-.063	-.105	7.962	8.308
57	M11	Y	-.105	-.105	8.308	8.654
58	M11	Y	-.105	-.105	8.654	9
59	M33	Y	-.112	-.112	.038	.365
60	M33	Y	-.112	-.112	.365	.692
61	M33	Y	-.112	-.112	.692	1.019
62	M33	Y	-.112	-.101	1.019	1.346
63	M33	Y	-.101	-.079	1.346	1.673
64	M33	Y	-.079	-.057	1.673	2
65	M43	Y	-.112	-.112	0	.327
66	M43	Y	-.112	-.112	.327	.654
67	M43	Y	-.112	-.112	.654	.981
68	M43	Y	-.112	-.112	.981	1.308
69	M43	Y	-.112	-.101	1.308	1.635
70	M43	Y	-.101	-.079	1.635	1.962
71	M49	Y	-.112	-.112	0	.327
72	M49	Y	-.112	-.112	.327	.654
73	M49	Y	-.112	-.112	.654	.981
74	M49	Y	-.112	-.112	.981	1.308
75	M49	Y	-.112	-.101	1.308	1.635
76	M49	Y	-.101	-.079	1.635	1.962
77	M53	Y	-.113	-.113	.038	.365
78	M53	Y	-.113	-.113	.365	.692
79	M53	Y	-.113	-.113	.692	1.019
80	M53	Y	-.113	-.102	1.019	1.346
81	M53	Y	-.102	-.069	1.346	1.673
82	M53	Y	-.069	-.024	1.673	2

Member Area Loads (BLC 2 : Grating)

	Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[psf]
1	N93	N89	N90	N94	Y	A-B	-10
2	N40	N42	N95	N94	Y	A-B	-10
3	N35	N37	N79	N78	Y	A-B	-10

Member Area Loads (BLC 3 : Cabinets)

	Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[psf]
1	N36	N32	N25	N27	Y	A-B	-37.5
2	N60	N63	N71	N68	Y	A-B	-268.5
3	N44	N45	N57	N54	Y	A-B	-707.5
4	N64	N67	N75	N72	Y	A-B	-375
5	N46	N47	N53	N52	Y	A-B	-700

Member Area Loads (BLC 4 : Live)

	Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[psf]
1	N93	N89	N90	N94	Y	A-B	-60
2	N40	N42	N95	N94	Y	A-B	-60

Member Area Loads (BLC 4 : Live) (Continued)

	Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[psf]
3	N35	N37	N79	N78	Y	A-B	-60

Member Area Loads (BLC 5 : Wind Z)

	Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[psf]
1	N15	N16	N75	N72	Z	Two Way	-25
2	N13	N14	N71	N68	Z	Two Way	-25
3	N5	N6	N57	N54	Z	Two Way	-25
4	N7	N8	N53	N52	Z	Two Way	-25
5	N20	N22	N30	N28	Z	Two Way	-25

Member Area Loads (BLC 6 : Wind X)

	Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[psf]
1	N16	N12	N67	N75	X	Two Way	-25
2	N14	N10	N63	N71	X	Two Way	-25
3	N8	N4	N47	N53	X	Two Way	-25
4	N6	N2	N45	N57	X	Two Way	-25
5	N22	N19	N27	N30	X	Two Way	-25

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed	Area(Me...	Surface(P...
1	Self Weight	DL		-1						
2	Grating	DL							3	
3	Cabinets	DL							5	
4	Live	LL							3	
5	Wind Z	WLZ							5	
6	Wind X	None							5	
7	BLC 2 Transient Area..	None						12		
8	BLC 3 Transient Area..	None						11		
9	BLC 5 Transient Area..	None						24		
10	BLC 4 Transient Area..	None						82		

Load Combinations

	Description	Sol...	PD...	SR...	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	ASCE Strength 3 (...	Yes	Y		DL	1.2	WLX	.5												
2	ASCE Strength 3 (...	Yes	Y		DL	1.2	WLZ	.5												
3	ASCE Strength 3 (...	Yes	Y		DL	1.2	WLX	-.5												
4	ASCE Strength 3 (...	Yes	Y		DL	1.2	WLZ	-.5												
5	ASCE Strength 4 (...	Yes	Y		DL	1.2	WLX	1	LL	.5	LLS	1								
6	ASCE Strength 4 (...	Yes	Y		DL	1.2	WLZ	1	LL	.5	LLS	1								
7	ASCE Strength 4 (...	Yes	Y		DL	1.2	WLX	-1	LL	.5	LLS	1								
8	ASCE Strength 4 (...	Yes	Y		DL	1.2	WLZ	-1	LL	.5	LLS	1								
9	ASCE Strength 6 (a)	Yes	Y		DL	.9	WLX	1												
10	ASCE Strength 6 (b)	Yes	Y		DL	.9	WLZ	1												
11	ASCE Strength 6 (c)	Yes	Y		DL	.9	WLX	-1												
12	ASCE Strength 6 (d)	Yes	Y		DL	.9	WLZ	-1												
13	ASCE Strength 1	Yes	Y		DL	1.4														
14	ASCE Strength 2 (a)	Yes	Y		DL	1.2	LL	1.6	LLS	1.6										

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N102	max	0	8	6.8358	14	.0383	6	.1161	6	0	1	0	9
2		min	0	9	1.9037	12	-.0383	8	-.116	8	0	1	0	8

Envelope Joint Reactions (Continued)

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
3	N100	max	.313	10	7.7949	14	.3147	10	.954	6	0	1	.9499	8
4		min	-.3133	12	2.8152	10	-.3146	12	-.954	8	0	1	-.9486	6
5	N98	max	.3137	12	4.7525	14	.3164	6	.9579	6	0	1	.9473	6
6		min	-.3136	10	2.2316	12	-.3166	8	-.9579	8	0	1	-.9473	8
7	N97	max	.3033	12	6.6149	14	.4656	6	1.4176	6	0	1	.9204	6
8		min	-.303	10	3.7047	12	-.4663	8	-1.4177	8	0	1	-.9198	8
9	N99	max	.3036	10	8.144	14	.4657	10	1.4173	6	0	1	.9236	8
10		min	-.3036	12	3.7473	10	-.465	12	-1.4174	8	0	1	-.9221	6
11	N101	max	0	6	4.5731	14	.0998	6	.3016	6	0	1	0	14
12		min	0	14	1.6089	12	-.0999	8	-.3017	8	0	1	0	6
13	N94	max	0	1	0	1	0	1	0	1	0	1	0	1
14		min	0	1	0	1	0	1	0	1	0	1	0	1
15	N76	max	0	1	0	1	0	1	0	1	0	1	0	1
16		min	0	1	0	1	0	1	0	1	0	1	0	1
17	Totals:	max	0	14	38.7152	14	1.6999	10						
18		min	0	12	16.7866	12	-1.7	8						

Envelope AISC 14th(360-10): LRFD Steel Code Checks

	Member	Shape	Code Check	Loc[ft]	LC	Shear C...	Loc[ft]	Dir	...	phi*Pn...	phi*Pn...	phi*M...	phi*M...	...	Eqn
1	M1	W14x30	.646	14.2604	14	.942	0	z	6	203.6...	286.74	24.273	112.492	1	H1-1b
2	M2	W14x30	.647	16.5729	14	.092	37	y	14	203.6...	286.74	24.273	112.492	1	H1-1b
3	M3	W14x30	.112	2.6215	8	.096	12.583	y	14	166.7...	286.74	24.273	116.2...	...	H1-1b
4	M4	W14x30	.150	2.6215	8	.101	12.583	y	14	166.7...	286.74	24.273	122.5...	...	H1-1b
5	M5	W6x15	.197	6	14	.106	9	y	13	107.1...	143.532	12.5354	28.7097	...	H1-1b
6	M6	W6x15	.189	6	6	.139	9	y	14	107.1...	143.532	12.5354	28.7097	...	H1-1b
7	M7	L6x6x5	.069	6.7268	6	.003	0	y	13	44.1155	118.908	8.0687	14.0904	...	H2-1
8	M8	L6x6x5	.028	4.5	8	.004	9	y	14	68.6435	118.908	8.0687	16.1524	...	H2-1
9	M9	L6x6x5	.067	6.7268	6	.073	0	y	6	44.1155	118.908	8.0687	14.0904	...	H2-1
10	M10	L6x6x5	.026	4.5	8	.004	9	y	14	68.6435	118.908	8.0687	16.1524	...	H2-1
11	M11	W6x15	.201	6	14	.131	0	y	14	107.1...	143.532	12.5354	28.7097	...	H1-1b
12	M12	W6x15	.187	3	14	.113	9	y	14	107.1...	143.532	12.5354	28.7097	...	H1-1b
13	M13	W14x30	.378	0	6	.123	1	z	14	272.6...	286.74	24.273	127.71	...	H1-1b
14	M14	W14x30	.002	0	13	.004	0	y	13	272.6...	286.74	24.273	127.71	...	H1-1b
15	M15	W14x30	.344	0	14	.158	1	z	14	272.6...	286.74	24.273	127.71	...	H1-1b
16	M16	W18x71	.384	21.9688	14	.034	37	y	14	69.1021	677.16	66.69	177.7...	...	H1-1b
17	M17	W6x15	.186	5.0738	14	.038	0	y	14	48.3173	143.532	12.5354	28.0341	...	H1-1b
18	M18	W6x15	.329	8.6979	14	.069	0	y	14	48.3173	143.532	12.5354	23.9867	...	H1-1b
19	M19	W6x15	.479	6.8858	14	.098	0	y	14	48.3173	143.532	12.5354	24.1078	...	H1-1b
20	M20	W6x12	.148	4.625	14	.049	9.25	y	14	53.2496	115.02	6.264	20.6045	...	H1-1b
21	M21	W14x22	.027	4.5	14	.016	0	y	14	118.7...	210.276	11.853	79.8259	...	H1-1b
22	M22	W14x22	.027	4.5	14	.018	0	y	14	118.7...	210.276	11.853	79.8259	...	H1-1b
23	M23	W6x12	.001	1.75	13	.017	0	z	14	103.0...	115.02	6.264	22.41	...	H1-1b
24	M24	HSS4x4x4	.032	0	14	.001	0	z	6	106.0...	109.188	12.663	12.663	1	H1-1b
25	M25	HSS4x4x4	.038	0	6	.003	0	z	8	106.0...	109.188	12.663	12.663	...	H1-1b
26	M26	HSS4x4x4	.216	0	8	.016	0	z	8	106.0...	109.188	12.663	12.663	...	H1-1b
27	M27	HSS4x4x4	.213	0	6	.016	0	z	8	106.0...	109.188	12.663	12.663	...	H1-1b
28	M28	HSS4x4x4	.168	0	6	.011	0	z	8	106.0...	109.188	12.663	12.663	...	H1-1b
29	M29	HSS4x4x4	.175	0	8	.011	0	z	8	106.0...	109.188	12.663	12.663	...	H1-1b

APPENDIX E
MOUNT CALCULATIONS

Applied Technology Council

WINDSPEED BY LOCATION

Search Results

Latitude: 41.7966
Longitude: -72.7150

ASCE 7-10 Wind Speeds (3-sec peak gust MPH*):

Risk Category I: 111
Risk Category II: 122
Risk Category III-IV: 131
MRI 10 Year:** 76
MRI 25 Year:** 86
MRI 50 Year:** 92
MRI 100 Year:** 99

ASCE 7-05: 98
ASCE 7-93: 80

*MPH(Miles per hour)
**MRI Mean Recurrence Interval (years)
Users should consult with local building officials to determine if there are community-specific wind speed requirements that govern.

Sponsored by the ATC Endowment Fund Applied Technology Council 201 Redwood Shores Parkway, Suite 240 Redwood City, California 94065 (650) 595-1542

RAMAKER & ASSOCIATES, INC.
1120 Dallas Street
Sauk City, WI 53583
Office: (608) 643-4100

Job:	22996
Project:	University of Hartford (CT03XC078)
By:	JMO
Date:	8/5/2014

Wind Load on Antennas TIA-222

2.6.9.6 Velocity Pressure

$q_z = 0.00256\ K_z\ K_{zt}\ K_d\ V^2\ I$

Occupancy:	II	Classification of Structures (Table 2-1)
Exposure:	C	Exposure Category
V:	98 mph	Basic Wind Speed (Annex B)
z:	134 ft	Height above ground level to the center of the antenna
I:	1.00	Importance Factor (Table 2-3)
K_z:	1.35	Velocity Pressure Coefficient (2.6.5.2)
K_{zt}:	1	Topographic Factor (2.6.6.4)
K_d:	0.95	Wind Direction Probability Factor (Table 2-2)
q_z =	**31.4 psf**	
G_h:	1.00	Appurtenances and their Connections

Mount & Antenna Wind Loads

Appurtenance	Height	Width	h/D	Shape	C_a	A_f	$F = q_z G_h C_a A_a$	
Pipe2STD x 9.5 ft	114.0 in	2.4 in	47.9	Round	1.200	1.88 sf	**71.1 lb**	7.5 plf
Pipe2-1/2STD x 13 ft	156.0 in	2.9 in	54.2	Round	1.200	3.12 sf	**117.7 lb**	9.1 plf
Pipe1STD x 4.3 ft	51.6 in	1.3 in	39.1	Round	1.200	0.47 sf	**17.8 lb**	4.2 plf
Pipe2STD x 3.5 ft	42.0 in	2.4 in	17.6	Round	1.037	0.69 sf	**22.6 lb**	6.5 plf
Pipe3STD x 9 ft	108.0 in	3.5 in	30.9	Round	1.158	2.63 sf	**95.6 lb**	10.6 plf
LLPX310R	42.4 in	11.8 in	3.6	Flat	1.248	3.48 sf	**136.5 lb**	
DAP	16.1 in	11.6 in	1.4	Flat	1.200	1.30 sf	**49.2 lb**	
VHLP2.5	35.0 in	0.0 in	1.0	Generic	1.262	6.68 sf	**265.0 lb**	
VHLP2	26.1 in	0.0 in	1.0	Generic	1.262	3.72 sf	**147.4 lb**	
VHLP1	15.3 in	0.0 in	1.0	Generic	1.262	1.28 sf	**50.7 lb**	
APXVSPP18-C-A20	72.0 in	11.9 in	6.1	Flat	1.358	5.95 sf	**253.9 lb**	
1900MHz 4x45W RRH	25.1 in	11.1 in	2.3	Flat	1.200	1.93 sf	**73.0 lb**	
800MHz 2x50W RRH	19.0 in	13.0 in	1.5	Flat	1.200	1.72 sf	**64.7 lb**	
APXV9TM14-ALU-120	56.3 in	12.6 in	4.5	Flat	1.287	4.93 sf	**199.4 lb**	
TD-RRH8x20	26.1 in	18.6 in	1.4	Flat	1.200	3.37 sf	**127.2 lb**	

RAMAKER & ASSOCIATES, INC.
1120 Dallas Street
Sauk City, WI 53583
Office: (608) 643-4100

Job:	22996
Project:	University of Hartford (CT03XC078)
By:	JMO
Date:	8/5/2014

Wind Load on Antennas TIA-222

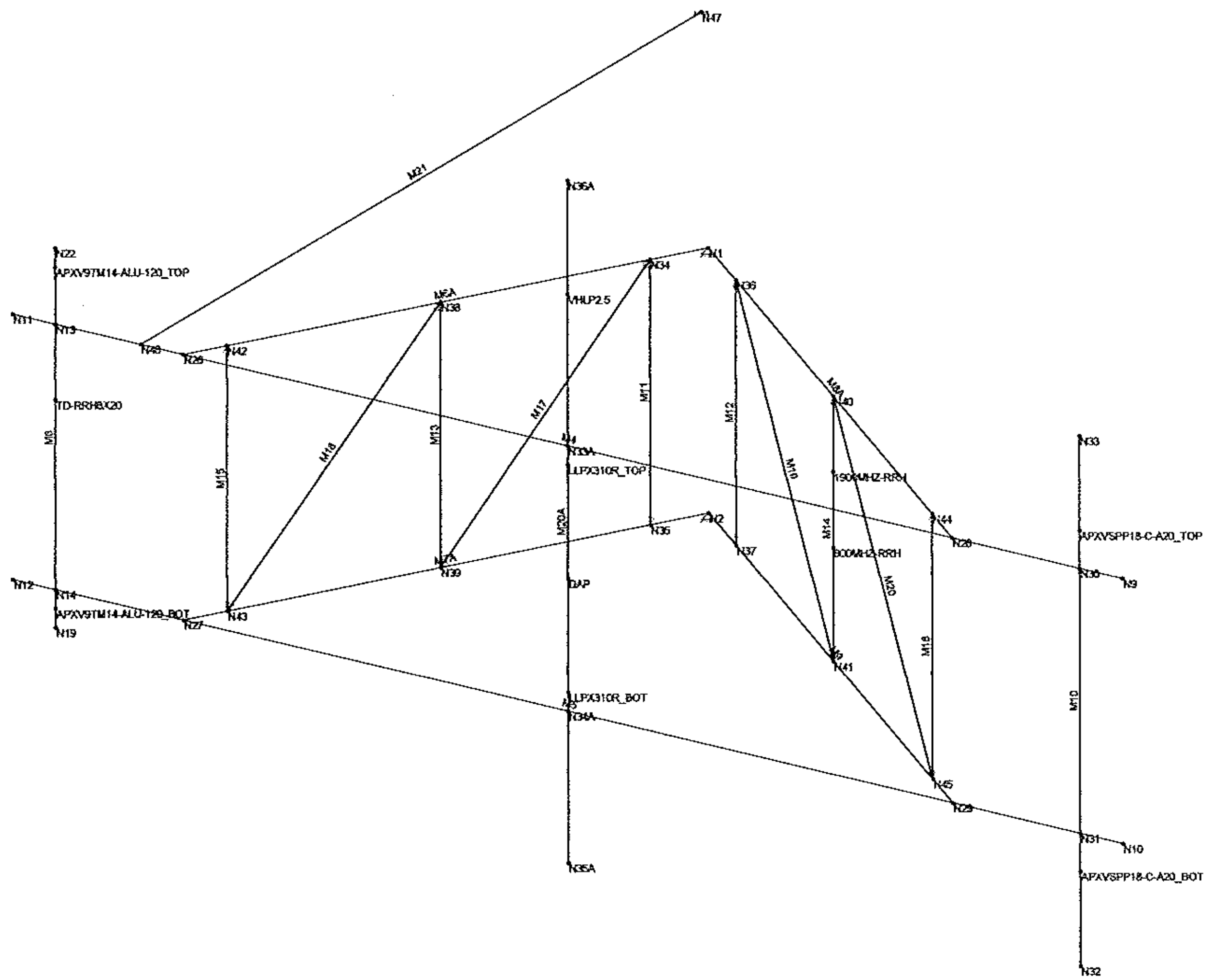
2.6.9.6 Velocity Pressure

$q_z = 0.00256\ K_z\ K_{zt}\ K_d\ V^2\ I$

Occupancy:	II	Classification of Structures (Table 2-1)
Exposure:	C	Exposure Category
V:	98 mph	Basic Wind Speed (Annex B)
z:	134 ft	Height above ground level to the center of the antenna
I:	1.00	Importance Factor (Table 2-3)
K_z:	1.35	Velocity Pressure Coefficient (2.6.5.2)
K_{zt}:	1	Topographic Factor (2.6.6.4)
K_d:	0.95	Wind Direction Probability Factor (Table 2-2)
q_z =	**31.4 psf**	
G_h:	1.00	Appurtenances and their Connections

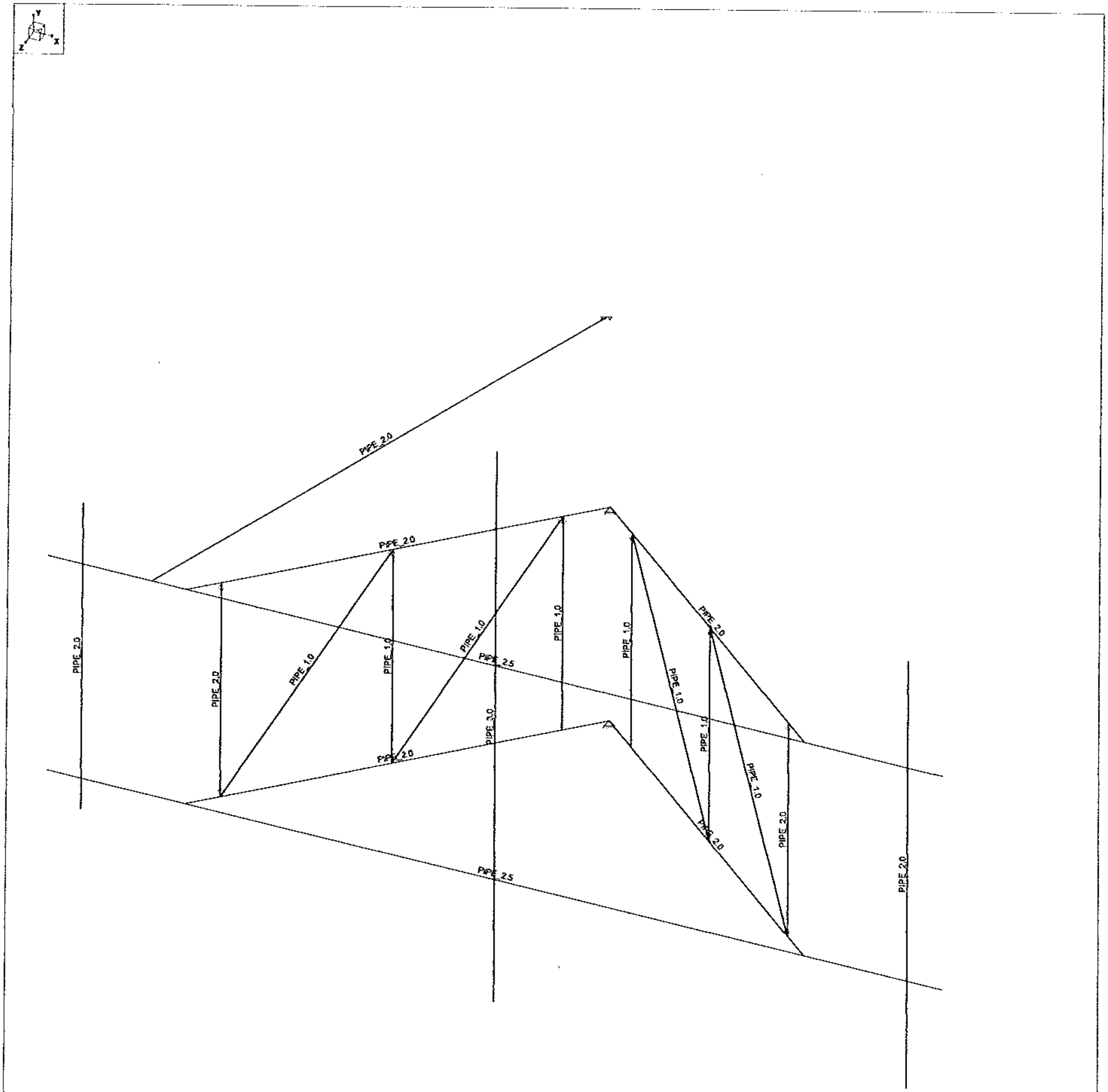
Mount & Antenna Wind Loads

Appurtenance	Height	Depth	h/D	Shape	C_a	A_f	$F = q_z\ G_h\ C_a\ A_a$	
Pipe2STD x 9.5 ft	114.0 in	2.4 in	47.9	Round	1.200	1.88 sf	**71.1 lb**	7.5 plf
Pipe2-1/2STD x 13 ft	156.0 in	2.9 in	54.2	Round	1.200	3.12 sf	**117.7 lb**	9.1 plf
Pipe1STD x 4.3 ft	51.6 in	1.3 in	39.1	Round	1.200	0.47 sf	**17.8 lb**	4.2 plf
Pipe2STD x 3.5 ft	42.0 in	2.4 in	17.6	Round	1.037	0.69 sf	**22.6 lb**	6.5 plf
Pipe3STD x 9 ft	108.0 in	3.5 in	30.9	Round	1.158	2.63 sf	**95.6 lb**	10.6 plf
LLPX310R	42.4 in	4.5 in	9.4	Flat	1.479	1.33 sf	**62.0 lb**	
DAP	16.1 in	5.3 in	3.1	Flat	1.224	0.59 sf	**22.8 lb**	
VHLP2.5	35.0 in	0.0 in	1.0	Generic	0.625	6.68 sf	**131.3 lb**	
VHLP2	26.1 in	0.0 in	1.0	Generic	0.625	3.72 sf	**73.0 lb**	
VHLP1	15.3 in	0.0 in	1.0	Generic	0.625	1.28 sf	**25.1 lb**	
APXVSPP18-C-A20	72.0 in	7.0 in	10.3	Flat	1.509	3.50 sf	**166.3 lb**	
1900MHz 4x45W RRH	25.1 in	10.7 in	2.3	Flat	1.200	1.86 sf	**70.3 lb**	
800MHz 2x50W RRH	19.0 in	12.2 in	1.6	Flat	1.200	1.61 sf	**60.7 lb**	
APXV9TM14-ALU-120	56.3 in	6.3 in	8.9	Flat	1.465	2.46 sf	**113.4 lb**	
TD-RRH8x20	26.1 in	6.7 in	3.9	Flat	1.262	1.21 sf	**48.2 lb**	



Envelope Only Solution

Ramaker & Associates	University of Hartford (CT03XC078)	SK - 1
JMO		Aug 5, 2014 at 7:55 AM
22996		22996 Mount.r3d



Envelope Only Solution

Ramaker & Associates	University of Hartford (CT03XC078)	SK - 2
JMO		Aug 5, 2014 at 7:55 AM
22996		22996 Mount.r3d

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1E...	Density[k/ft...	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	65	1.1
3	A992	29000	11154	.3	.65	.49	50	1.1	65	1.1
4	A500 Gr.42	29000	11154	.3	.65	.49	42	1.4	58	1.3
5	A500 Gr.46	29000	11154	.3	.65	.49	46	1.4	58	1.3
6	A53 Gr. B	29000	11154	.3	.65	.49	35	1.5	60	1.2

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design R...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	pipe 3.0	PIPE_3.0	Beam	Pipe	A53 Gr. B	Typical	2.07	2.85	2.85	5.69
2	pipe 2.5	PIPE_2.5	Beam	Pipe	A53 Gr. B	Typical	1.61	1.45	1.45	2.89
3	pipe 2.0	PIPE_2.0	Beam	Pipe	A53 Gr. B	Typical	1.02	.627	.627	1.25
4	pipe 1.0	PIPE_1.0	Beam	Pipe	A53 Gr. B	Typical	.469	.083	.083	.166

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
1	M4	N11	N9			pipe 2.5	Beam	Pipe	A53 Gr. B	Typical
2	M5	N12	N10			pipe 2.5	Beam	Pipe	A53 Gr. B	Typical
3	M6	N22	N19			pipe 2.0	Beam	Pipe	A53 Gr. B	Typical
4	M6A	N1	N26			pipe 2.0	Beam	Pipe	A53 Gr. B	Typical
5	M7A	N2	N27			pipe 2.0	Beam	Pipe	A53 Gr. B	Typical
6	M8A	N1	N28			pipe 2.0	Beam	Pipe	A53 Gr. B	Typical
7	M9	N2	N29			pipe 2.0	Beam	Pipe	A53 Gr. B	Typical
8	M10	N33	N32			pipe 2.0	Beam	Pipe	A53 Gr. B	Typical
9	M11	N34	N35			pipe 1.0	Beam	Pipe	A53 Gr. B	Typical
10	M12	N36	N37			pipe 1.0	Beam	Pipe	A53 Gr. B	Typical
11	M13	N38	N39			pipe 1.0	Beam	Pipe	A53 Gr. B	Typical
12	M14	N40	N41			pipe 1.0	Beam	Pipe	A53 Gr. B	Typical
13	M15	N42	N43			pipe 2.0	Beam	Pipe	A53 Gr. B	Typical
14	M16	N44	N45			pipe 2.0	Beam	Pipe	A53 Gr. B	Typical
15	M17	N34	N39			pipe 1.0	Beam	Pipe	A53 Gr. B	Typical
16	M18	N38	N43			pipe 1.0	Beam	Pipe	A53 Gr. B	Typical
17	M19	N36	N41			pipe 1.0	Beam	Pipe	A53 Gr. B	Typical
18	M20	N40	N45			pipe 1.0	Beam	Pipe	A53 Gr. B	Typical
19	M21	N48	N47			pipe 2.0	Beam	Pipe	A53 Gr. B	Typical
20	M20A	N36A	N35A			pipe 3.0	Beam	Pipe	A53 Gr. B	Typical

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diap...
1	N1	0	-.25	-3	0	
2	N2	0	-3.75	-3	0	
3	N9	6.5	-.25	1	0	
4	N10	6.5	-3.75	1	0	
5	N11	-6.5	-.25	1	0	
6	N12	-6.5	-3.75	1	0	
7	N13	-6	-.25	1	0	
8	N14	-6	-3.75	1	0	
9	N19	-6	-4.25	1	0	
10	N22	-6	.75	1	0	
11	N26	-4.5	-.25	1	0	
12	N27	-4.5	-3.75	1	0	

Joint Coordinates and Temperatures (Continued)

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diap...
13	N28	4.5	-.25	1	0	
14	N29	4.5	-3.75	1	0	
15	N30	6	-.25	1	0	
16	N31	6	-3.75	1	0	
17	N32	6	-5.5	1	0	
18	N33	6	1.5	1	0	
19	N34	-0.500764	-.25	-2.554876	0	
20	N35	-0.500764	-3.75	-2.554876	0	
21	N36	0.500764	-.25	-2.554876	0	
22	N37	0.500764	-3.75	-2.554876	0	
23	N38	-2.302021	-.25	-0.953759	0	
24	N39	-2.302021	-3.75	-0.953759	0	
25	N40	2.302021	-.25	-0.953759	0	
26	N41	2.302021	-3.75	-0.953759	0	
27	N42	-4.126447	-.25	0.667953	0	
28	N43	-4.126447	-3.75	0.667953	0	
29	N44	4.126447	-.25	0.667953	0	
30	N45	4.126447	-3.75	0.667953	0	
31	N47	-1.752454	-.25	-7.036861	0	
32	N33A	0	-.25	1	0	
33	N34A	0	-3.75	1	0	
34	N35A	0	-5.75	1	0	
35	N36A	0	3.25	1	0	
36	APXVSPP18-C-A20_TOP	6	.25	1	0	
37	APXVSPP18-C-A20_BOT	6	-4.25	1	0	
38	1900MHZ-RRH	2.302021	-1.25	-0.953759	0	
39	800MHZ-RRH	2.302021	-2.25	-0.953759	0	
40	LLPX310R_BOT	0	-3.5	1	0	
41	LLPX310R_TOP	0	-.5	1	0	
42	DAP	0	-2	1	0	
43	VHLP2.5	0	1.75	1	0	
44	APXV9TM14-ALU-120_BOT	-6	-4	1	0	
45	APXV9TM14-ALU-120_TOP	-6	.5	1	0	
46	TD-RRH8X20	-6	-1.25	1	0	
47	N48	-5	-.25	1	0	

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]	Footing
1	N1	Reaction	Reaction	Reaction				
2	N2	Reaction	Reaction	Reaction				
3	N9							
4	N10							
5	N11							
6	N12							
7	N13							
8	N14							
9	N19							
10	N22							
11	N30							
12	N31							
13	N32							
14	N33							
15	N47	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction	
16	N33A							
17	N34A							

Joint Boundary Conditions (Continued)

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]	Footing
18	N35A							
19	N36A							
20	APXVSPP18-C-A2...							
21	APXVSPP18-C-A2...							
22	1900MHZ-RRH							
23	800MHZ-RRH							
24	LLPX310R_BOT							
25	LLPX310R_TOP							
26	DAP							
27	VHLP2.5							
28	APXV9TM14-ALU-...							
29	APXV9TM14-ALU-...							
30	TD-RRH8X20							

Joint Loads and Enforced Displacements (BLC 1 : DL)

	Joint Label	L,D,M	Direction	Magnitude[(lb,lb-ft), (in,rad), (lb*...
1	APXVSPP18-C-A20_TOP	L	Y	-28.5
2	APXVSPP18-C-A20_BOT	L	Y	-28.5
3	1900MHZ-RRH	L	Y	-60
4	800MHZ-RRH	L	Y	-64
5	DAP	L	Y	-33
6	LLPX310R_BOT	L	Y	-14
7	LLPX310R_TOP	L	Y	-14
8	VHLP2.5	L	Y	-48
9	APXV9TM14-ALU-120_BOT	L	Y	-27.5
10	APXV9TM14-ALU-120_TOP	L	Y	-27.5
11	TD-RRH8X20	L	Y	-70

Joint Loads and Enforced Displacements (BLC 2 : WLz)

	Joint Label	L,D,M	Direction	Magnitude[(lb,lb-ft), (in,rad), (lb*...
1	APXVSPP18-C-A20_TOP	L	Z	-126.9
2	APXVSPP18-C-A20_BOT	L	Z	-126.9
3	1900MHZ-RRH	L	Z	-73
4	800MHZ-RRH	L	Z	-64.7
5	DAP	L	Z	-49.2
6	LLPX310R_BOT	L	Z	-68.3
7	LLPX310R_TOP	L	Z	-68.3
8	VHLP2.5	L	Z	-131.3
9	APXV9TM14-ALU-120_BOT	L	Z	-99.7
10	APXV9TM14-ALU-120_TOP	L	Z	-99.7
11	TD-RRH8X20	L	Z	-127.2

Joint Loads and Enforced Displacements (BLC 3 : WLx)

	Joint Label	L,D,M	Direction	Magnitude[(lb,lb-ft), (in,rad), (lb*...
1	APXVSPP18-C-A20_TOP	L	X	-83.1
2	APXVSPP18-C-A20_BOT	L	X	-83.1
3	1900MHZ-RRH	L	X	-70.3
4	800MHZ-RRH	L	X	-60.7
5	DAP	L	X	-22.8
6	LLPX310R_BOT	L	X	-31
7	LLPX310R_TOP	L	X	-31
8	VHLP2.5	L	X	-265
9	APXV9TM14-ALU-120_BOT	L	X	-56.7
10	APXV9TM14-ALU-120_TOP	L	X	-56.7

Joint Loads and Enforced Displacements (BLC 3 : WLx) (Continued)

	Joint Label	L,D,M	Direction	Magnitude[(lb,lb-ft), (in,rad), (lb*...
11	TD-RRH8X20	L	X	-48.2

Member Distributed Loads (BLC 2 : WLz)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M6	Z	-7.5	-7.5	0	0
2	M4	Z	-9.1	-9.1	0	0
3	M5	Z	-9.1	-9.1	0	0
4	M6A	PZ	-7.5	-7.5	0	0
5	M7A	PZ	-7.5	-7.5	0	0
6	M8A	PZ	-7.5	-7.5	0	0
7	M9	PZ	-7.5	-7.5	0	0
8	M21	PZ	-7.5	-7.5	0	0
9	M15	PZ	-6.5	-6.5	0	0
10	M16	PZ	-6.5	-6.5	0	0
11	M11	PZ	-4.2	-4.2	0	0
12	M12	PZ	-4.2	-4.2	0	0
13	M13	PZ	-4.2	-4.2	0	0
14	M14	PZ	-4.2	-4.2	0	0
15	M17	PZ	-4.2	-4.2	0	0
16	M18	PZ	-4.2	-4.2	0	0
17	M19	PZ	-4.2	-4.2	0	0
18	M20	PZ	-4.2	-4.2	0	0

Member Distributed Loads (BLC 3 : WLx)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M6	X	-7.5	-7.5	0	0
2	M10	X	-7.5	-7.5	0	0
3	M6A	PX	-7.5	-7.5	0	0
4	M7A	PX	-7.5	-7.5	0	0
5	M8A	PX	-7.5	-7.5	0	0
6	M9	PX	-7.5	-7.5	0	0
7	M21	PX	-7.5	-7.5	0	0
8	M15	PX	-6.5	-6.5	0	0
9	M16	PX	-6.5	-6.5	0	0
10	M11	PX	-4.2	-4.2	0	0
11	M12	PX	-4.2	-4.2	0	0
12	M13	PX	-4.2	-4.2	0	0
13	M14	PX	-4.2	-4.2	0	0
14	M17	PX	-4.2	-4.2	0	0
15	M18	PX	-4.2	-4.2	0	0
16	M19	PX	-4.2	-4.2	0	0
17	M20	PX	-4.2	-4.2	0	0
18	M20A	PX	-10.6	-10.6	0	0

Member Area Loads

Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[psf]
No Data to Print ...						

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed	Area(Me...	Surface(P...
1	DL	DL		-1		11				
2	WLz	WLZ				11		18		
3	WLx	WLX				11		18		
4	LL1	LL					1			
5	LL2	None					1			

Load Combinations

	Description	Sol..	PDelta	SR..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact...
1	1.4DL	Yes	Y		DL	1.4														
2	1.2DL+1.6WLz	Yes	Y		DL	1.2	WLZ	1.6												
3	1.2DL-1.6WLz	Yes	Y		DL	1.2	WLZ	-1.6												
4	1.2DL+1.6WLx	Yes	Y		DL	1.2	W...	1.6												
5	1.2DL-1.6WLx	Yes	Y		DL	1.2	W...	-1.6												
6	1.2DL+1.6(0.75WLz+0.75WLx)	Yes	Y		DL	1.2	WLZ	1.2	W...	1.2										
7	1.2DL+1.6(0.75WLz-0.75WLx)	Yes	Y		DL	1.2	WLZ	1.2	W...	-1.2										
8	1.2DL-1.6(0.75WLz-0.75WLx)	Yes	Y		DL	1.2	WLZ	-1.2	W...	1.2										
9	1.2DL-1.6(0.75WLz+0.75WLx)	Yes	Y		DL	1.2	WLZ	-1.2	W...	-1.2										
10	1.2DL+1.5LLend	Yes	Y		DL	1.2	LL	1.5												
11	1.2DL+1.5LLmid	Yes	Y		DL	1.2	5	1.5												
12	1.2DL+1.5LL+10%1.6WLz	Yes	Y		DL	1.2	LL	1.5	WLZ	.16										
13	1.2DL+1.5LL-10%1.6WLz	Yes	Y		DL	1.2	LL	1.5	WLZ	-.16										
14	1.2DL+1.5LL+10%1.6WLx	Yes	Y		DL	1.2	LL	1.5	W...	.16										
15	1.2DL+1.5LL-10%1.6WLx	Yes	Y		DL	1.2	LL	1.5	W...	-.16										
16	1.2DL+1.5LL+10%1.6(0.75WLz+...	Yes	Y		DL	1.2	LL	1.5	WLZ	.12	W...	.12								
17	1.2DL+1.5LL+10%1.6(0.75WLz-...	Yes	Y		DL	1.2	LL	1.5	WLZ	.12	W...	-.12								
18	1.2DL+1.5LL-10%1.6(0.75WLz-0...	Yes	Y		DL	1.2	LL	1.5	WLZ	-.12	W...	.12								
19	1.2DL+1.5LL-10%1.6(0.75WLz+...	Yes	Y		DL	1.2	LL	1.5	WLZ	-.12	W...	-.12								
20	1.2DL+1.5LL+10%1.6WLz	Yes	Y		DL	1.2	5	1.5	WLZ	.16										
21	1.2DL+1.5LL-10%1.6WLz	Yes	Y		DL	1.2	5	1.5	WLZ	-.16										
22	1.2DL+1.5LL+10%1.6WLx	Yes	Y		DL	1.2	5	1.5	W...	.16										
23	1.2DL+1.5LL-10%1.6WLx	Yes	Y		DL	1.2	5	1.5	W...	-.16										
24	1.2DL+1.5LL+10%1.6(0.75WLz+...	Yes	Y		DL	1.2	5	1.5	WLZ	.12	W...	.12								
25	1.2DL+1.5LL+10%1.6(0.75WLz-...	Yes	Y		DL	1.2	5	1.5	WLZ	.12	W...	-.12								
26	1.2DL+1.5LL-10%1.6(0.75WLz-0...	Yes	Y		DL	1.2	5	1.5	WLZ	-.12	W...	.12								
27	1.2DL+1.5LL-10%1.6(0.75WLz+...	Yes	Y		DL	1.2	5	1.5	WLZ	-.12	W...	-.12								
28	DL		Y		DL	1														
29	WLz		Y		WLZ	1														
30	WLx		Y		W...	1														

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
1	N1	max	2478.514	4	722.402	24	1694.819	7	0	1	0	1	0	1
2		min	-2377.67	5	503.368	9	-3599.72	8	0	1	0	1	0	1
3	N2	max	691.602	14	661.691	13	1934.808	2	0	1	0	1	0	1
4		min	-527.662	5	456.895	2	-25.95	3	0	1	0	1	0	1
5	N47	max	756.037	5	28.114	7	2098.149	4	-12.146	8	197.033	4	7.483	8
6		min	-757.549	4	9.645	8	-2101.911	5	-51.754	7	-196.124	5	-30.684	7
7	Totals:	max	2149.295	4	1394.977	23	2622.682	2						
8		min	-2149.295	5	1019.977	4	-2622.682	3						

Envelope AISC 13th(360-05): LRFD Steel Code Checks

	Member	Shape	Code Ch...	Loc[ft]	LC	Shear ...	Loc[ft]	Dir	LC	phi*Pnc ...	phi*Pnt [...	phi*Mn ...	phi*Mn ...	Cb	Eqn
1	M4	PIPE_2.5	.276	2.031	8	.180	1.896		5	13460.4...	50715	3596.25	3596.25	1...	H1-1b
2	M5	PIPE_2.5	.129	2.031	7	.067	1.896		5	13460.4...	50715	3596.25	3596.25	1...	H1-1b
3	M6	PIPE_2.0	.146	1.042	9	.060	1.042		4	23808.54	32130	1871.625	1871.625	2...	H1-1b
4	M6A	PIPE_2.0	.209	6.021	5	.054	0		7	20804.28	32130	1871.625	1871.625	2...	H1-1b
5	M7A	PIPE_2.0	.136	.69	25	.049	5.582		5	20804.28	32130	1871.625	1871.625	2...	H1-1b
6	M8A	PIPE_2.0	.165	.627	18	.073	0		16	20804.28	32130	1871.625	1871.625	2...	H1-1b
7	M9	PIPE_2.0	.180	.69	16	.067	0		18	20804.28	32130	1871.625	1871.625	2...	H1-1b
8	M10	PIPE_2.0	.133	5.25	15	.035	1.75		2	17855.0...	32130	1871.625	1871.625	1...	H1-1b
9	M11	PIPE_1.0	.042	1.75	9	.006	0		4	8869.951	14773.5	464.625	464.625	1...	H1-1b
10	M12	PIPE_1.0	.044	1.75	8	.010	0		9	8869.951	14773.5	464.625	464.625	1...	H1-1b
11	M13	PIPE_1.0	.055	1.75	9	.010	0		7	8869.951	14773.5	464.625	464.625	1...	H1-1b
12	M14	PIPE_1.0	.381	2.005	6	.043	0		9	8869.951	14773.5	464.625	464.625	1...	H1-1b
13	M15	PIPE_2.0	.014	1.75	8	.041	0		5	27741.09	32130	1871.625	1871.625	1...	H1-1b
14	M16	PIPE_2.0	.012	1.75	8	.020	3.5		7	27741.09	32130	1871.625	1871.625	1...	H1-1b
15	M17	PIPE_1.0	.060	2.125	9	.012	4.249		5	6964.209	14773.5	464.625	464.625	1...	H1-1b
16	M18	PIPE_1.0	.051	2.134	9	.014	0		5	6920.73	14773.5	464.625	464.625	1...	H1-1b
17	M19	PIPE_1.0	.062	2.125	8	.016	0		8	6964.209	14773.5	464.625	464.625	1...	H1-1b
18	M20	PIPE_1.0	.046	2.134	8	.015	0		9	6920.73	14773.5	464.625	464.625	1...	H1-1b
19	M21	PIPE_2.0	.191	8.668	4	.016	8.668		4	13051.4...	32130	1871.625	1871.625	3	H1-1b
20	M20A	PIPE_3.0	.164	3.469	4	.031	3.563		5	42263.9...	65205	5748.75	5748.75	1...	H1-1b

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environmental | engineering | due diligence

RADIO FREQUENCY FCC REGULATORY COMPLIANCE MAXIMUM PERMISSIBLE EXPOSURE (MPE) ASSESSMENT

Sprint Existing Facility

Site ID: CT03XC078

University of Hartford

202 Bloomfield Avenue
Hartford, CT 06117

August 28, 2014

EBI Project Number: 62144449

21 B Street · Burlington, MA 01803 · Tel: (781) 273.2500 · Fax: (781) 273.3311

EBI Consulting
environmental | engineering | due diligence

August 28, 2014

Sprint
Attn: RF Engineering Manager
1 International Boulevard, Suite 800
Mahwah, NJ 07495

Re: Radio Frequency Maximum Permissible Exposure (MPE) Assessment for Site:
CT03XC078 - University of Hartford

Site Total: 3.43% - MPE% in full compliance

EBI Consulting was directed to analyze the proposed upgrades to the existing Sprint facility located at **202 Bloomfield Avenue, Hartford, CT**, for the purpose of determining whether the radio frequency (RF) exposure levels from the proposed Sprint equipment upgrades on this property are within specified federal limits.

All information used in this report was analyzed as a percentage of current Maximum Permissible Exposure (% MPE) as listed in the FCC OET Bulletin 65 Edition 97-01and ANSI/IEEE Std C95.1. The FCC regulates Maximum Permissible Exposure in units of microwatts per square centimeter (μW/cm2). The number of μW/cm2 calculated at each sample point is called the power density. The exposure limit for power density varies depending upon the frequencies being utilized. Wireless Carriers and Paging Services use different frequency bands each with different exposure limits, therefore it is necessary to report results and limits in terms of percent MPE rather than power density.

All results were compared to the FCC (Federal Communications Commission) radio frequency exposure rules, 47 CFR 1.1307(b)(1) – (b)(3), to determine compliance with the Maximum Permissible Exposure (MPE) limits for General Population/Uncontrolled environments as defined below.

General population/uncontrolled exposure limits apply to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Therefore, members of the general public would always be considered under this category when exposure is not employment related, for example, in the case of a telecommunications tower that exposes persons in a nearby residential area.

Public exposure to radio frequencies is regulated and enforced in units of microwatts per square centimeter ($\mu W/cm^2$). The general population exposure limit for the cellular band (850 MHz Band) is approximately 567 $\mu W/cm^2$, and the general population exposure limit for the 1900 MHz and 2500 MHz bands is 1000 $\mu W/cm^2$. Because each carrier will be using different frequency bands, and each frequency band has different exposure limits, it is necessary to report percent of MPE rather than power density.

Occupational/controlled exposure limits apply to situations in which persons are exposed as a consequence of their employment and in which those persons who are exposed have been made fully aware of the potential for exposure and can exercise control over their exposure. Occupational/controlled exposure limits also apply where exposure is of a transient nature as a result of incidental passage through a location where exposure levels may be above general population/uncontrolled limits (see below), as long as the exposed person has been made fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Additional details can be found in FCC OET 65.

CALCULATIONS

Calculations were done for the proposed upgrades to the existing Sprint Wireless antenna facility located at **202 Bloomfield Avenue, Hartford, CT**, using the equipment information listed below. All calculations were performed per the specifications under FCC OET 65. All calculations were performed assuming a lobe representing the maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB, was focused at the base of the tower. For this report the sample point is the top of a 6 foot person standing at the base of the tower.

For all calculations, all emissions were calculated using the following assumptions:

1) 3 channels in the 1900 MHz Band were considered for each sector of the proposed installation.

2) 1 channel in the 800 MHz Band was considered for each sector of the proposed installation

3) 2 channels in the 2500 MHz Band were considered for each sector of the proposed installation.

4) All radios at the proposed installation were considered to be running at full power and were uncombined in their RF transmissions paths per carrier prescribed configuration. Per FCC OET Bulletin No. 65 - Edition 97-01 recommendations to achieve the maximum anticipated value at each sample point, all power levels emitting from the proposed antenna installation are increased by a factor of 2.56 to account for possible in-phase reflections from the surrounding environment. This is rarely the case, and if so, is never continuous.

5) For the following calculations the sample point was the top of a six foot person standing at the base of the tower. The maximum gain of the antenna per the antenna manufactures supplied specifications minus 10 dB was used in this direction. This value is a very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.

6) The antennas used in this modeling are the RFS APXVSPP18-C-A20 and the RFS APXVTM14-C-I20. This is based on feedback from the carrier with regards to anticipated antenna selection. The RFS APXVSPP18-C-A20 has a 15.9 dBd gain value at its main lobe at 1900 MHz and 13.4 dBd at its main lobe for 850 MHz. The RFS APXVTM14-C-I20 has a 15.9 dBd gain value at its main lobe at 2500 MHz. The maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB, was used for all calculations. This value is a very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.

7) The antenna mounting height centerline for the proposed antennas is **134 feet** above ground level (AGL).

8) Emissions values for additional carriers were taken from the Connecticut Siting Council active database. Values in this database are provided by the individual carriers themselves.

All calculation were done with respect to uncontrolled / general public threshold limits

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Summary

All calculations performed for this analysis yielded results that were well within the allowable limits for general public Maximum Permissible Exposure (MPE) to radio frequency energy.

The anticipated Maximum Composite contributions from the Sprint facility are **3.43% (1.14% from sector 1, 1.14% from sector 2 and 1.14% from sector 3)** of the allowable FCC established general public limit considering all three sectors simultaneously sampled at the ground level.

The anticipated composite MPE value for this site assuming all carriers present is **3.43%** of the allowable FCC established general public limit sampled at 6 feet above ground level. This total composite site value is based upon MPE values listed in the Connecticut Siting Council database for existing carrier emissions. There were no additional carriers listed in the Connecticut Siting Council database for this site.

FCC guidelines state that if a site is found to be out of compliance (over allowable thresholds), that carriers over a 5% contribution to the composite value will require measures to bring the site into compliance. For this facility, the composite values calculated were well within the allowable 100% threshold standard per the federal government.

Scott Heffernan
RF Engineering Director

EBI Consulting
21 B Street
Burlington, MA 01803

Site ID	CT03XC078 - University of Hartford
Site Addresss	202 Bloomfield Avenue, West Hartford, CT, 06117
Site Type	Rooftop Guyed Tower

Sector 1

Antenna Number	Antenna Make	Antenna Model	Radio Type	Frequency Band	Technology	Power Out Per Channel (Watts)	Number of Channels	Composite Power	Antenna Gain (10 db reduction)	Antenna Height (ft)	analysis height	Cable Size	Cable Loss (dB)	Additional Loss (dB)	Power Density Percentage
1a	RFS	APXVSPP18-C-A20	RRH	1900 MHz	CDMA / LTE	20	3	60	5.9	134	128	1/2 "	0.5	0	0.46%
1a	RFS	APXVSPP18-C-A20	RRH	850 MHz	CDMA / LTE	20	1	20	3.4	134	128	1/2 "	0.5	0	0.15%
1B	RFS	APXVTMM14-C-120	RRH	2500 MHz	CDMA / LTE	20	2	40	5.9	134	128	1/2 "	0.5	0	0.54%
												Sector total Power Density Value:			1.14%

Sector 2

Antenna Number	Antenna Make	Antenna Model	Radio Type	Frequency Band	Technology	Power Out Per Channel (Watts)	Number of Channels	Composite Power	Antenna Gain (10 db reduction)	Antenna Height (ft)	analysis height	Cable Size	Cable Loss (dB)	Additional Loss (dB)	Power Density Percentage
2a	RFS	APXVSPP18-C-A20	RRH	1900 MHz	CDMA / LTE	20	3	60	5.9	134	128	1/2 "	0.5	0	0.46%
2a	RFS	APXVSPP18-C-A20	RRH	850 MHz	CDMA / LTE	20	1	20	3.4	134	128	1/2 "	0.5	0	0.15%
2B	RFS	APXVTMM14-C-120	RRH	2500 MHz	CDMA / LTE	20	2	40	5.9	134	128	1/2 "	0.5	0	0.54%
												Sector total Power Density Value:			1.14%

Sector 3

Antenna Number	Antenna Make	Antenna Model	Radio Type	Frequency Band	Technology	Power Out Per Channel (Watts)	Number of Channels	Composite Power	Antenna Gain (10 db reduction)	Antenna Height (ft)	analysis height	Cable Size	Cable Loss (dB)	Additional Loss (dB)	Power Density Percentage
3a	RFS	APXVSPP18-C-A20	RRH	1900 MHz	CDMA / LTE	20	3	60	5.9	134	128	1/2 "	0.5	0	0.46%
3a	RFS	APXVSPP18-C-A20	RRH	850 MHz	CDMA / LTE	20	1	20	3.4	134	128	1/2 "	0.5	0	0.15%
3B	RFS	APXVTMM14-C-120	RRH	2500 MHz	CDMA / LTE	20	2	40	5.9	134	128	1/2 "	0.5	0	0.54%
												Sector total Power Density Value:			1.14%

Site Composite MPE %

Carrier	MPE %
Sprint	3.43%
Total Site MPE %	3.43%