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

HPC WIRELESS SERVICES

July 3, 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
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 remove the six (6) existing CMDA antennas, and add three (3) dual-band panel antennas to existing pipe masts, and nine (9) RRHs (remote radio heads), at a centerline height of approximately 134', AGL. Sprint will also install three (3) hybriflex cables along the existing coaxial cable run, and will remove the existing coaxial cables. The proposed modifications will not extend the height of the approximately 85' penthouse rooftop guy wired tower, or an approximate height of 139', AGL.

2. Sprint will replace the two (2) existing cabinets with two (2) new cabinets on the existing raised equipment platform, and will add a proposed fiber distribution box mounted along the existing cable route. The existing GPS antenna will be replaced by another GPS antenna. These changes will have no effect on the site boundaries and will not increase the existing leased area.

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 31.917%; the combined site operations will result in a total power density of approximately 31.917%, as Sprint is the only carrier currently at this location.

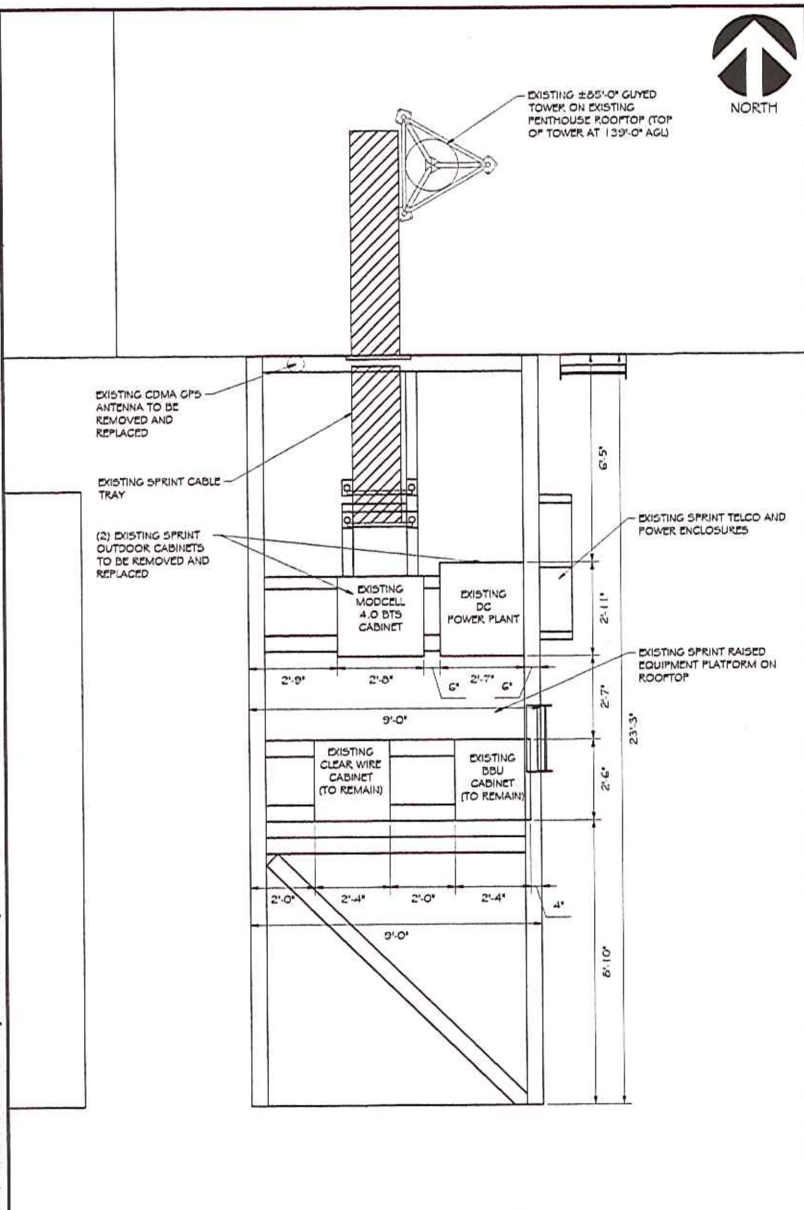
Please contact me by phone at (203) 610-1071 or by e-mail at mjhowlett@optonline.net with questions concerning this matter. Thank you for your consideration.

Respectfully yours,

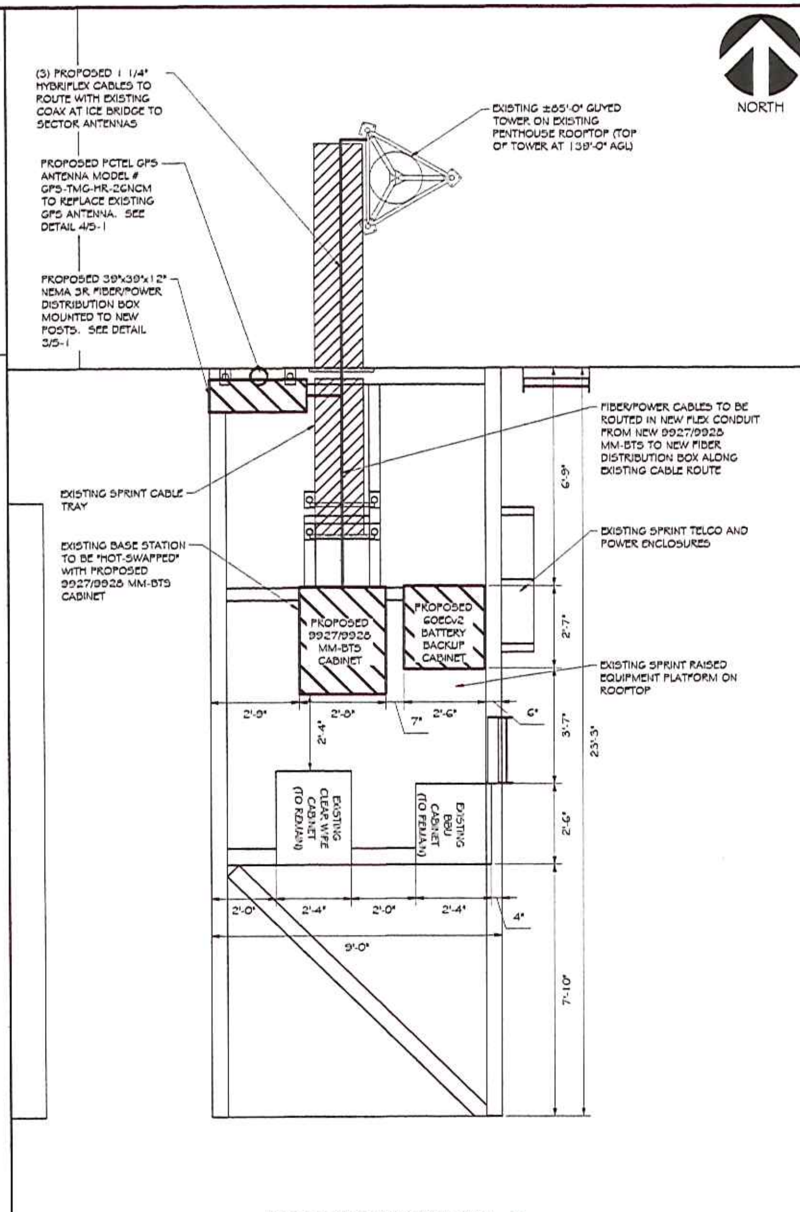
Melanie J. Howlett

Attachments

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



EXISTING EQUIPMENT PLAN (1)
SCALE: 1" = 3.75'



PROPOSED EQUIPMENT PLAN (2)
SCALE: 1" = 3.75'

Sprint
6391 Sprint Parkway
Overland Park, KS 66251

Alcatel·Lucent

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

NETWORK VISION
MMBTS LAUNCH
NORTHERN CT MARKET

Certification & Seal:

MARK	DATE	DESCRIPTION
B	6/27/14	RFDS REVISIONS, FINAL PRELIMINARY CDS
A	3/18/12	90% CD REVIEW

ISSUE PHASE: FINAL PRELIMINARY DATE ISSUED: 06/27/2014

PROJECT TITLE:
UNIVERSITY OF HARTFORD
SITE#: CT03XC078

PROJECT INFORMATION:
202 BLOOMFILED 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-1

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NOTES:

I. SCOPE

A. THIS SECTION COVERS THE SPECIFICATIONS FOR ANTENNA AND COAXIAL CABLE INSTALLATION OF: ANTENNAS, COAXIAL, CONNECTIONS, AND ICE BRIDGE.

B. REFERENCE SPRINT STANDARD CONSTRUCTION SPECIFICATIONS FOR WIRELESS SITES FOR GENERAL REQUIREMENTS.

II. ANTENNAS:

A. ANTENNAS SHALL BE PLUMB AND INSTALLED SO THAT THE ENTIRE WHIP EXTENDS ABOVE VERTICAL PIPE MOUNT. DIRECTIONAL ANTENNAS SHALL BE ORIENTED TO PROPER AZIMUTH, PROVIDED ON THE RF SPECIFICATION SHEET. NOTE: THE ANTENNA MAY BE ORIENTED USING THE REFLECTOR AS THE REFERENCE, ADJUSTING ITS AZIMUTH 180 DEGREES FROM MAXIMUM ANTENNA RADIATION.

B. MICROWAVE ANTENNAS (DISHES) SHALL BE ASSEMBLED PER MANUFACTURER'S DRAWINGS. STIFF ARMS AND RADOMES SHALL BE INSTALLED WITH POLARIZATION PROVIDED BY RF SPECIFICATION SHEET. IF PATH IS NOT READY TO ALIGN, DISH SHOULD BE POINTED TOWARD CALCULATED AZIMUTH, OR DIRECTION OF FIELD STAKE DENOTING OPPOSITE END. 2 STIFF ARMS SHALL BE PROVIDED FOR MICROWAVE DISHES 6'-0" IN DIAMETER OR GREATER.

C. A TRANSIT SHALL BE USED TO PROPERLY ALIGN CELLULAR AND MICROWAVE ANTENNAS.

III. COAXIAL CABLE:

A. COAXIAL CABLE SHALL BE SUPPORTED WITH SNAP-IN HANGERS. SNAP-IN HANGERS SHOULD BE USED EVERY 3 FEET THE ENTIRE HEIGHT OF THE TOWER. ANGLE ADAPTERS OR ROUND MEMBER ADAPTERS WITH BUTTERFLY CLAMPS SHALL BE USED ELSEWHERE, I.E. SIDEARMS, PLATFORMS, AND MICROWAVE MOUNTS.

B. COAXIAL CABLE SHALL ALSO BE SUPPORTED WITH HOISTING GRIPS, INSTALLED AT MAXIMUM INTERVALS OF 200 FEET. HOISTING GRIPS SHALL BE ATTACHED WITH SHACKLES, BOLTED IN THE 7/16" HOLE OF WAVEGUIDE LADDER.

C. ALL JUMPERS USED BETWEEN COAXIAL CABLE AND ANTENNA SHALL BE SUPPORTED WITHIN 18 INCHES OF ANTENNA, USING BUTTERFLY CLAMPS WITH ANGLE ADAPTERS OR ROUND MEMBER ADAPTERS AROUND PIPES. CELLULAR ANTENNAS TYPICALLY USE 6' JUMPERS; MICROWAVE DISHES USE 3' JUMPERS.

D. COAXIAL CABLE SHALL BE NEATLY BENT WHEN REQUIRED, USING A MINIMUM BENDING RADIUS OF 10 TIMES THE DIAMETER OF THE COAXIAL CABLE. DRIP LOOPS SHOULD BEGIN AT THE ICE BRIDGE. THE END IN THE COAXIAL CABLE SHOULD BE AT A LOWER HEIGHT THAN THE ENTRY PORT.

E. COAXIAL CABLE SHALL BE SUPPORTED WITH SNAP-IN HANGERS ON THE WAVEGUIDE LADDER UNDER ICE BRIDGE. COAXIAL CABLE SHOULD BE NEATLY CUT 16" INSIDE BUILDING AND TERMINATED AT THE QUARTER WAVE SHORTS.

F. CONNECTORS WILL NORMALLY BE PROVIDED FIRST OFF REEL FROM FACTORY. CONNECTORS TERMINATED IN BUILDING SHALL BE NEATLY INSTALLED PER MANUFACTURER'S SPECIFICATIONS.

G. COAXIAL CABLES SHOULD BE LABELED WITH TAGS INSIDE THE BUILDING.

H. USE 2" WIDE COLORED TAPE TO INDICATE SECTORS. CONTRACTOR TO USE SECTOR COLOR CODING AS INDICATED IN THESE DRAWINGS OR AS PROVIDED BY SPRINT.

I. ALL EXCEPTIONS NEED TO BE VERIFIED WITH THE PROJECT MANAGER.

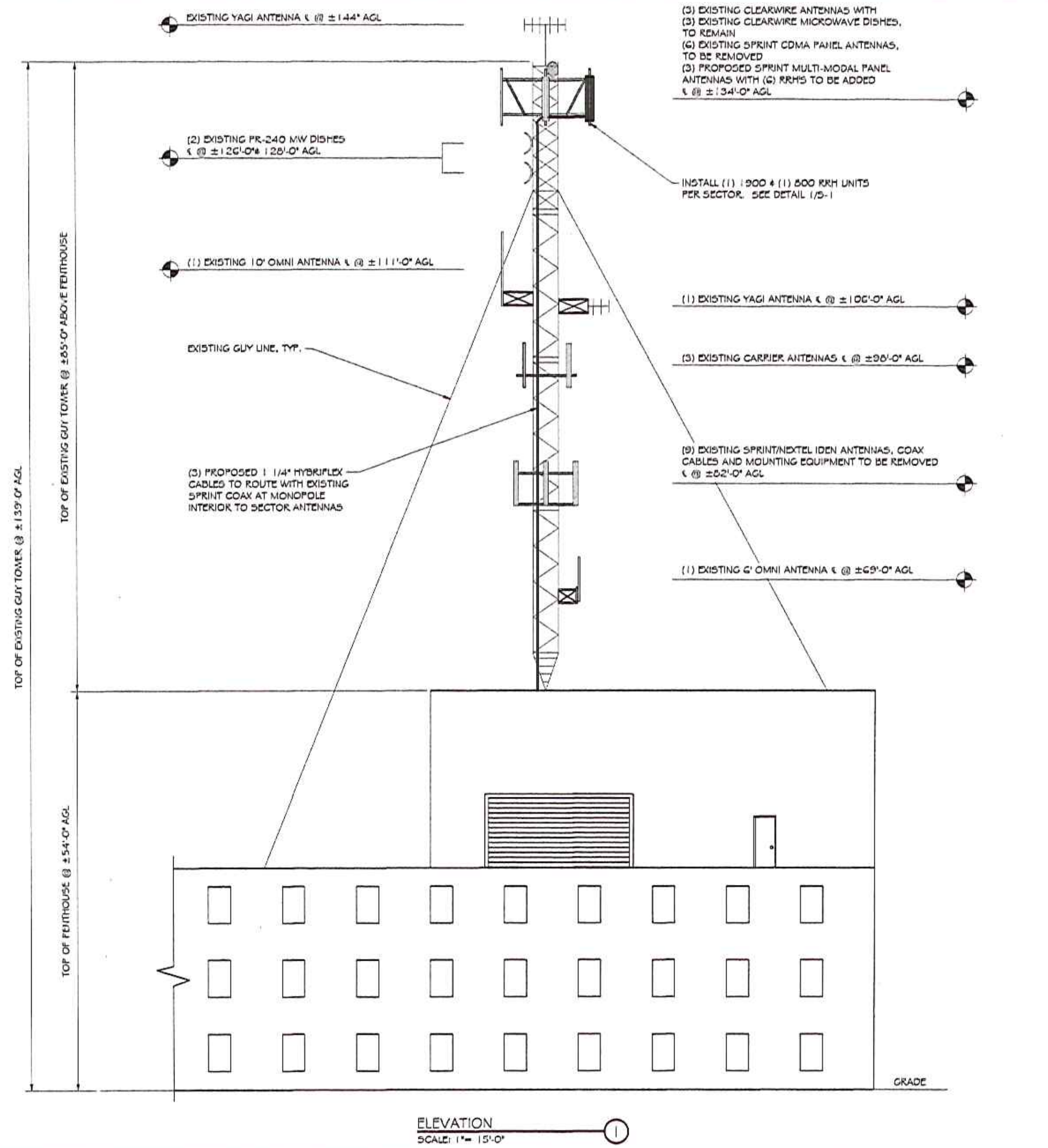
IV. CONNECTORS:

A. ALL CONNECTIONS AND GROUNDING KITS SHALL BE WEATHERPROOFED USING COLD SHRINK OR ANDREW APPROVED WEATHER STRIPPING. NOTE: NO PORTION OF CONNECTOR SHALL BE EXPOSED TO THE ELEMENTS.

B. COAXIAL CABLE SHALL BE GROUNDED USING GROUNDING KITS AT THE TOP (BELOW THE BEND), BOTTOM (ABOVE THE BEND ON TOWER GROUND BAR), AND ON BUILDING GROUND BAR BEFORE ENTRY INTO WAVEGUIDE PORTS. 4" CABLE BOOTS SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS.

C. GROUNDING KITS SHALL BE NEATLY INSTALLED SO THAT THE JUMPER RUNS IN THE SAME DIRECTION AS THE COAXIAL AND GROUND BAR. JUMPER WIRE SHOULD RUN IN A DIRECT PATH TO THE GROUND BAR/ TOWER LADDER, BUT HAVE ADEQUATE SLACK FOR EXPANSION, CONTRACTION, AND REPAIR. NON-OXIDE GREASE SHOULD BE APPLIED BETWEEN LUG AND BAR/TOWER.

D. TOWER GROUND BAR SHALL BE INSTALLED ON THE ANGLE BEHIND THE FIRST DIAGONAL WAVEGUIDE LADDER RUNG, ABOVE 5'-6". GROUND BAR SHALL BE ISOLATED FROM ANGLE USING NEWTON BUSHINGS PROVIDED.



ELEVATION
SCALE: 1"= 15'-0"

Sprint
6391 Sprint Parkway
Overland Park, KS 66251

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

NETWORK VISION
MMBTS LAUNCH
NORTHERN CT MARKET

Certification & Seal:

MARK	DATE	DESCRIPTION
B	6/27/14	RFDS REVISIONS, FINAL PRELIMINARY CDS
A	2/16/12	90% CD REVIEW

ISSUE PHASE: FINAL PRELIMINARY — DATE ISSUED: 06/27/2014

PROJECT TITLE:
UNIVERSITY OF HARTFORD
SITE#: CT03XC078

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

SHEET TITLE:
SITE ELEVATION & NOTES

0 7.5' 15' 30'
11" x 17" - 1" = 15'
22" x 34" - 1" = 7.5'

PROJECT NUMBER: 22996
SHEET NUMBER: A-2

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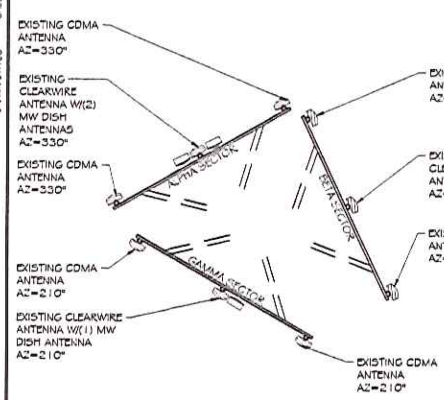


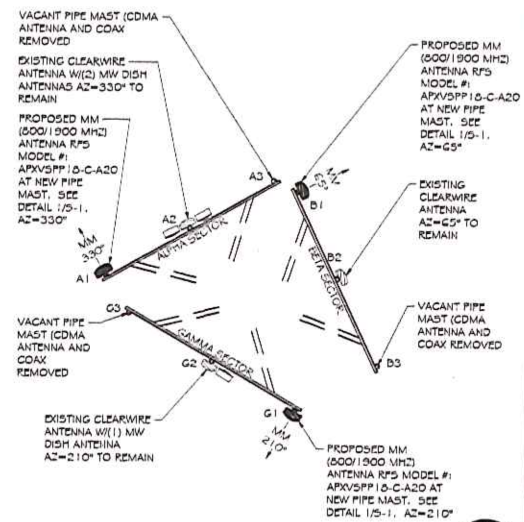
EXISTING ANTENNA LAYOUT (1)
SCALE: NTS

NORTH

HOT-SWAP

INTERIM ANTENNA LAYOUT (2)
SCALE: NTS

NORTH



FINAL ANTENNA LAYOUT (3)
SCALE: NTS

NORTH

ANTENNA AND COAXIAL CABLE SCHEDULE

SECTOR	POS.	AZIMUTH	ANTENNA CENTERLINE	ANTENNA STATUS	TECH.	ANTENNA MAKE/ MODEL	MECH. DOWNTILT (°)	ELEC. DOWNTILT (°)	RRHs	CABLE SIZE	CABLE LENGTH
ALPHA	A-1	330°	134'-0"	EX. TO BE REPLACED	MULTIMODAL	RFS/APXVSPP18-C-A20	1900(0), 800(0)	1900 (0), 800(-6)	(1) 1900, (1) 800	(1) 1 ¼" HYBRIFLEX HYBRID CABLE RFS #HB114-1-08U4-M5J	±110'-0"
	A-2	330°	134'-0"	EX. TO REMAIN	WIMAX	ANTENNA W/(2) MW DISH ANTENNAS	-	-	-	TO REMAIN	±110'-0"
	A-3	330°	134'-0"	EX. TO BE REMOVED	CDMA	-	-	-	-	TO BE REMOVED	±110'-0"
BETA	B-1	65°	134'-0"	EX. TO BE REPLACED	MULTIMODAL	RFS/APXVSPP18-C-A20	1900(0), 800(0)	1900(-3), 800 (-8)	(1) 1900, (1) 800	(1) 1 ¼" HYBRIFLEX HYBRID CABLE RFS #HB114-1-08U4-M5J	±110'-0"
	B-2	65°	134'-0"	EX. TO REMAIN	WIMAX	-	-	-	-	TO REMAIN	±110'-0"
	B-3	65°	134'-0"	EX. TO BE REMOVED	CDMA	-	-	-	-	TO BE REMOVED	±110'-0"
GAMMA	G-1	210°	134'-0"	EX. TO BE REPLACED	MULTIMODAL	RFS/APXVSPP18-C-A20	1900(0), 800(0)	1900(-2), 800(-8)	(1) 1900, (1) 800	(1) 1 ¼" HYBRIFLEX HYBRID CABLE RFS #HB114-1-08U4-M5J	±110'-0"
	G-2	210°	134'-0"	EX. TO REMAIN	WIMAX	ANTENNA W/(1) MW DISH ANTENNA	-	-	-	TO REMAIN	±110'-0"
	G-3	210°	134'-0"	EX. TO BE REMOVED	CDMA	-	-	-	-	EX. TO BE REMOVED	±110'-0"

Sprint
6301 Sprint Parkway
Overland Park, KS 66251

Alcatel·Lucent

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Phone: 608-643-4100 Fax: 608-643-7999
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NETWORK VISION
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NORTHERN CT MARKET

Certification & Seal:

MARK	DATE	DESCRIPTION
B	6/27/14	FPDD REVISIONS, FINAL PRELIMINARY CDS
A	2/16/12	DDR CD REVIEW

ISSUE PHASE: FINAL PRELIMINARY DATE ISSUED: 06/27/2014

PROJECT TITLE:
UNIVERSITY OF HARTFORD
SITE#: CT03XC078

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

SHEET TITLE:
ANTENNA DETAILS & COAX SCHEDULE

SCALE: NONE

PROJECT NUMBER: 22996
SHEET NUMBER: A-3

RAMAKER
& ASSOCIATES, INC.

UNIVERSITY OF HARTFORD (CT03XC078)

PREPARED FOR:
SPRINT

PREPARED BY:
RAMAKER & ASSOCIATES, INC.
JOB NUMBER: 22996

STRUCTURAL ASSESSMENT
85-FOOT GUYED TOWER

STRUCTURAL ASSESSMENT

SITE:	University of Hartford (CT03XC078) 202 Bloomfield Avenue Hartford, Hartford County, Connecticut 06117
PREPARED FOR:	Alcatel-Lucent 600 Mountain Avenue Murray Hill, New Jersey 07974
CONTACT PERSON:	Alcatel-Lucent John Szilezy Site Acquisition Manager john.szilezy@alcatel-lucent.com
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:	June 19, 2014

Thomas E. Moore
Project Engineer

6/19/14
Date

James R. Skowronski, P.E.
Supervising Engineer

6/19/14
Date

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

TABLE OF CONTENTS

SECTION 1
EXECUTIVE SUMMARY

This report summarizes the structural analysis conducted by Ramaker & Associates, Inc. (Ramaker & Associates) for Alcatel-Lucent on behalf of Sprint (ALU). ALU intends to install additional equipment on an existing 85-foot guyed tower. The tower site is located in Hartford, Hartford County, Connecticut.

ALU is proposing to install three (3) RFS APXVSPP18-C-A20 panel antennas on the existing T-Frames at a centerline elevation of 134 feet AGL. ALU is also proposing to install six (6) ALU 1900MHz RRH units and three (3) 800MHz RRH units at the same elevation. The antennas shall be mounted to the existing T-Frames and fed with three (3) 1-1/4-inch coax. Proposed coax was assumed to be installed on the same face of the tower as the existing Sprint coax.

The existing six (6) Allgon 7250.02 panel antennas and coax at 134 feet AGL shall be removed from the tower under proposed loading conditions. The nine (9) Decibel 844G65VTZASX panel antennas, the three (3) T-Arms, and coax at 82 feet AGL shall also be removed from the tower under proposed loading conditions.

Results of our analysis show that the tower is stressed to a maximum of 74.2 percent of capacity under proposed loading conditions. The supporting steel structure for the tower is stressed to a maximum of 75.0 percent of capacity. All proposed model foundation reactions are less than the original design tower reactions. Therefore, it is anticipated that the existing tower, supporting steel structure, and building structure will provide adequate strength under proposed loading conditions.

Sprint is proposing to modify the existing equipment cabinet layout by removing the existing Modcell 4.0 BTS Cabinet and by removing the existing DC Power Plant Cabinet. The existing cabinets shall be replaced with one (1) 9927 MM-BTS Cabinet (1074 lbs) and one (1) 60ECv2 Battery Backup Cabinet (2830 lbs). The existing platform was analyzed with multiple documentation sources. The members were not field measured, however, the analysis concludes that the existing platform will provide adequate strength under proposed loading conditions. Details of the equipment modifications are contained within the associated Ramaker Construction Drawings.

In summary, the tower and associated platforms will pass the TIA/EIA-222-F code requirements under proposed loading conditions.

SECTION 2
INTRODUCTION

2.1 PROJECT INFORMATION

This report summarizes the structural analysis conducted by Ramaker & Associates, Inc. (Ramaker & Associates) for ALU, 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:

<table>
<tr><th>Elevation</th><th>Appurtenance</th><th>Mount</th><th>Coax</th><th>Status</th></tr>
<tr><td>149</td><td>Decibel DB432-A</td><td rowspan="2">10' Pipe Mount</td><td>1/2</td><td>Existing</td></tr>
<tr><td>144</td><td>8' Yagi</td><td>1/2</td><td>Existing</td></tr>
<tr><td rowspan="3">139</td><td>Andrew VHLP2.5</td><td rowspan="9">(3) T-Frames</td><td>1/2</td><td>Existing</td></tr>
<tr><td>Andrew VHLP2</td><td>1/2</td><td>Existing</td></tr>
<tr><td>Andrew VHLP1</td><td>1/2</td><td>Existing</td></tr>
<tr><td rowspan="6">134</td><td>(6) Allgon 7250.02</td><td>(6) 1-1/4</td><td>Remove</td></tr>
<tr><td>(3) Argus LLPX310R</td><td rowspan="2">(2) 2" Conduit</td><td rowspan="2">Existing</td></tr>
<tr><td>(3) Huawei RRU3702</td></tr>
<tr><td>(3) RFS APXVSPP18-C-A20</td><td rowspan="3">(3) 1-1/4</td><td rowspan="3">Proposed</td></tr>
<tr><td>(6) ALU 1900MHz RRHs</td></tr>
<tr><td>(3) ALU 800MHz RRHs</td></tr>
<tr><td>128</td><td>Scala PR-950</td><td>Leg Mounted</td><td>7/8</td><td>Existing</td></tr>
<tr><td>124</td><td>Scala PR-950</td><td>Leg Mounted</td><td>7/8</td><td>Existing</td></tr>
<tr><td>111</td><td>10' Omni</td><td>4' Standoff</td><td>1/2</td><td>Existing</td></tr>
<tr><td>106</td><td>Decibel DB225</td><td>4' Standoff</td><td>1/2</td><td>Existing</td></tr>
<tr><td>98</td><td>(3) Kathrein 800 10504</td><td>(3) 5' Pipe Mounts</td><td>(6) 7/8</td><td>Existing</td></tr>
<tr><td>82</td><td>(9) Decibel 844G65VTZASX</td><td>(3) T-Arms</td><td>(9) 1-1/4</td><td>Remove</td></tr>
<tr><td>69</td><td>6' Omni</td><td>2' Standoff</td><td>1/2</td><td>Existing</td></tr>
</table>

Proposed coax was assumed to be installed and double-stacked on the same face of the tower as the existing Sprint coax.

Existing tower loading information was secured from the above-mentioned structural analysis reports and from recent site photos. The proposed Alcatel-Lucent (ALU) loading was determined from the ALU RF data sheet, dated 9/7/12. It is the responsibility of ALU to ensure that the current and proposed loading conditions have been appropriately considered. Any deviations should be immediately reported to RAMAKER.

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	32.9
Diagonal	52.1
Horizontal	32.0
Guy Line	68.9
Bolt	74.2
RATING	74.2

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	43.925
Total Shear (k)	—	1.933
Anchor Uplift (k)	21.0	20.994
Anchor Lateral (k)	12.2	11.260

All proposed model foundation reactions are less than the original design tower reactions. Therefore, it is anticipated that the existing tower, supporting steel structure, and building structure will provide adequate strength under proposed loading conditions.

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

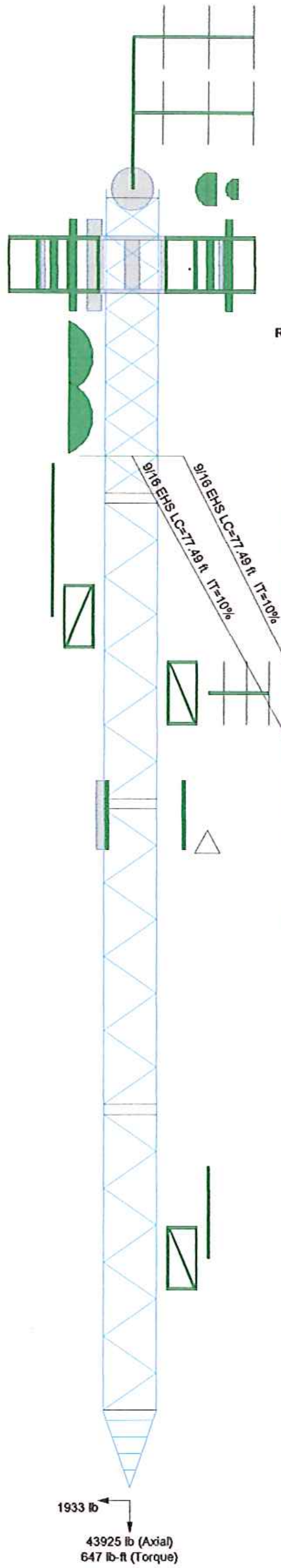
1. 2003 International Building Code.

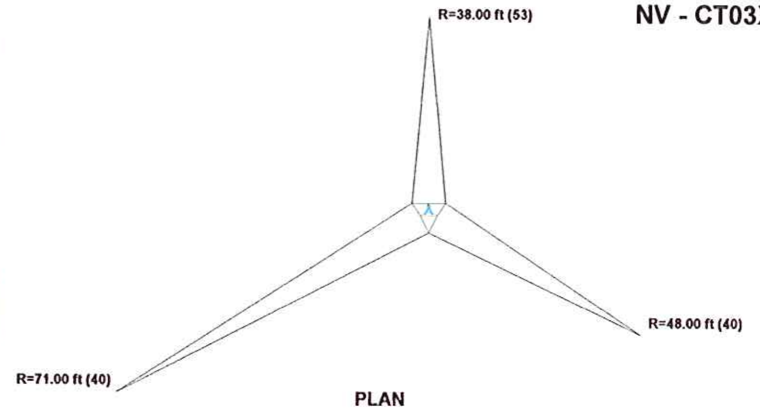
2. Telecommunications Industries Association, Structural Standard for Antenna Supporting Structures and Antennas, TIA Standard ANSI/TIA-222-F 1996, Washington, D.C.

APPENDIX A

TOWER FIGURES

Section	Legs	Leg Grade	Diagonals	Diagonal Grade	Top Girts	Bottom Girts	Horizontals	Top Guy Pull-Offs	Face Width (ft)	# Panels @ (ft)	Weight (lb)	Elevation
												139.0 ft
T1	ROHN 2.5 EH	A572-50	ROHN TS1.5x16 GA	A53-B-42	ROHN TS1.5x16 GA	ROHN TS1.5x16 GA	N.A.	2L2x2x1/4x3/8	3.41667	32 @ 2.40885	1297.7	121.5 ft
T2											596.5	119.0 ft / 99.0 ft
T3								N.A.			596.5	79.0 ft
T4											596.5	59.0 ft
T5			N.A.	N.A.	N.A.	N.A.	L4x4x1/4			5 @ 1.06771	288.1	54.0 ft
											3375.4	





PLAN

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
DB432-A	149	PiROD 15' T-Frame	134
8' Yagi	144	LLPX310R w/Mount Pipe	134
10'x2" Pipe Mount	139	LLPX310R w/Mount Pipe	134
VHLP2.5	139	LLPX310R w/Mount Pipe	134
VHLP2	139	PR-950	128
VHLP1	139	PR-950	124
Huawei RRU3702	134	10' Omni	111
Huawei RRU3702	134	4' Standoff	111
Huawei RRU3702	134	4' Standoff	106
APXVSPP18-C-A20 w/Mount Pipe	134	DB225-A	106
APXVSPP18-C-A20 w/Mount Pipe	134	6" x 2" Pipe Mount	98
APXVSPP18-C-A20 w/Mount Pipe	134	(3) 5'x3" Pipe Mount	98
(2) 1900MHz 4x40W RRH	134	6" x 2" Pipe Mount	98
(2) 1900MHz 4x40W RRH	134	800 10504 w/Mount Pipe	98
(2) 1900MHz 4x40W RRH	134	800 10504 w/Mount Pipe	98
800MHz 2x50W RRH	134	800 10504 w/Mount Pipe	98
800MHz 2x50W RRH	134	6" x 2" Pipe Mount	98
800MHz 2x50W RRH	134	2' Standoff	69
PiROD 15' T-Frame	134	6' Omni	69
PiROD 15' T-Frame	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: 74.2%

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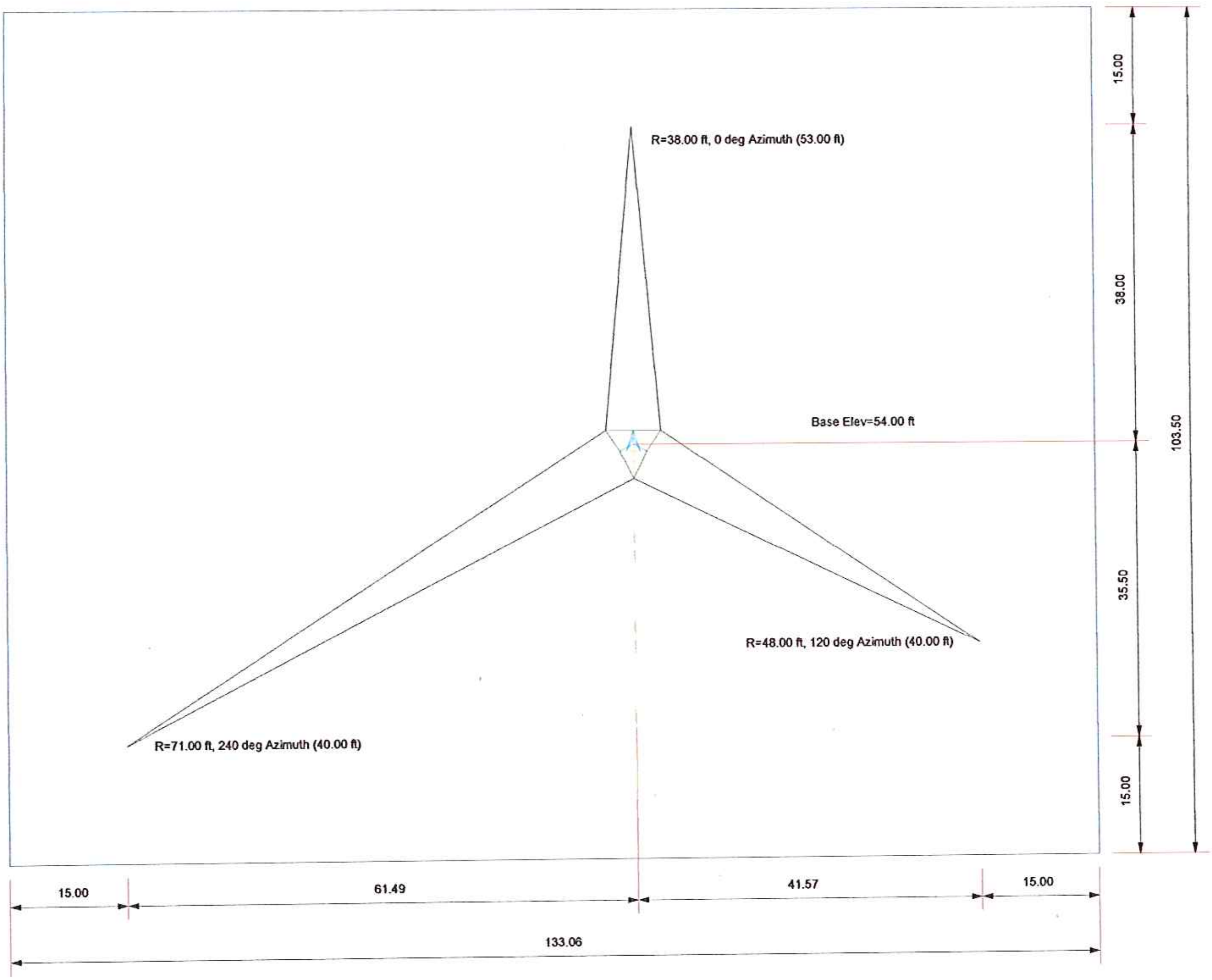
		Project: *22996*	
		Client: Sprint	Drawn by: tmoore · App'd:
		Code: TIA/EIA-222-F	Date: 06/19/14 · Scale: NTS
		Path: I:\22900\22996\Structural\Risa\22996 rev1.eri	Dwg No. E-1

Plot Plan
Total Area - 0.32 Acres



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		Project: *22996*
		Client: Sprint · Drawn by: tmoore · App'd:
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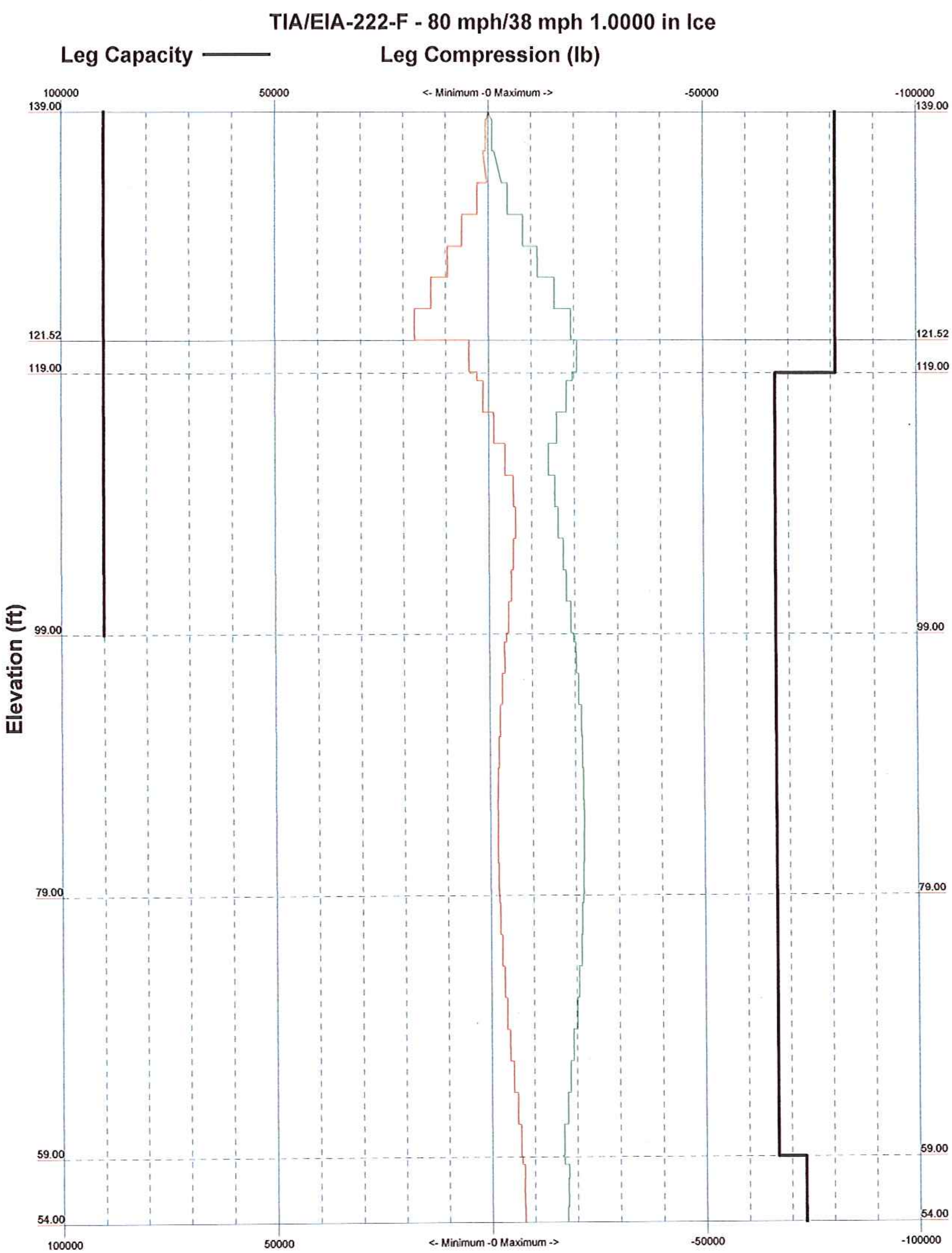
		Path: I:\22900\22996\Structural\Risa\22996 rev1.eri · Dwg No. E-2



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Project: 22996		
Client: Sprint	Drawn by: tmoore	App'd:
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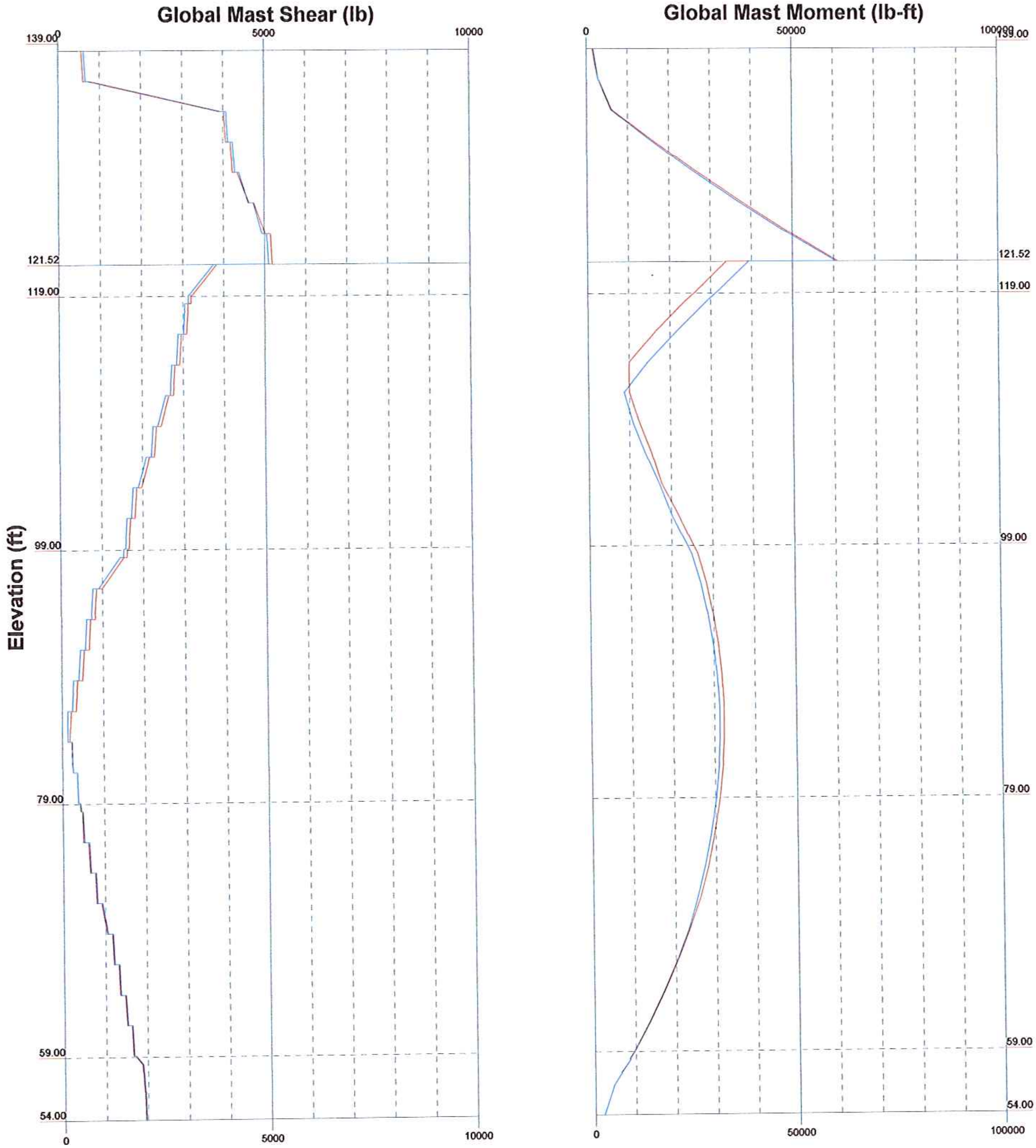
TIA/EIA-222-F - 80 mph/38 mph 1.0000 in Ice

Maximum Values

NV - CT03XC078



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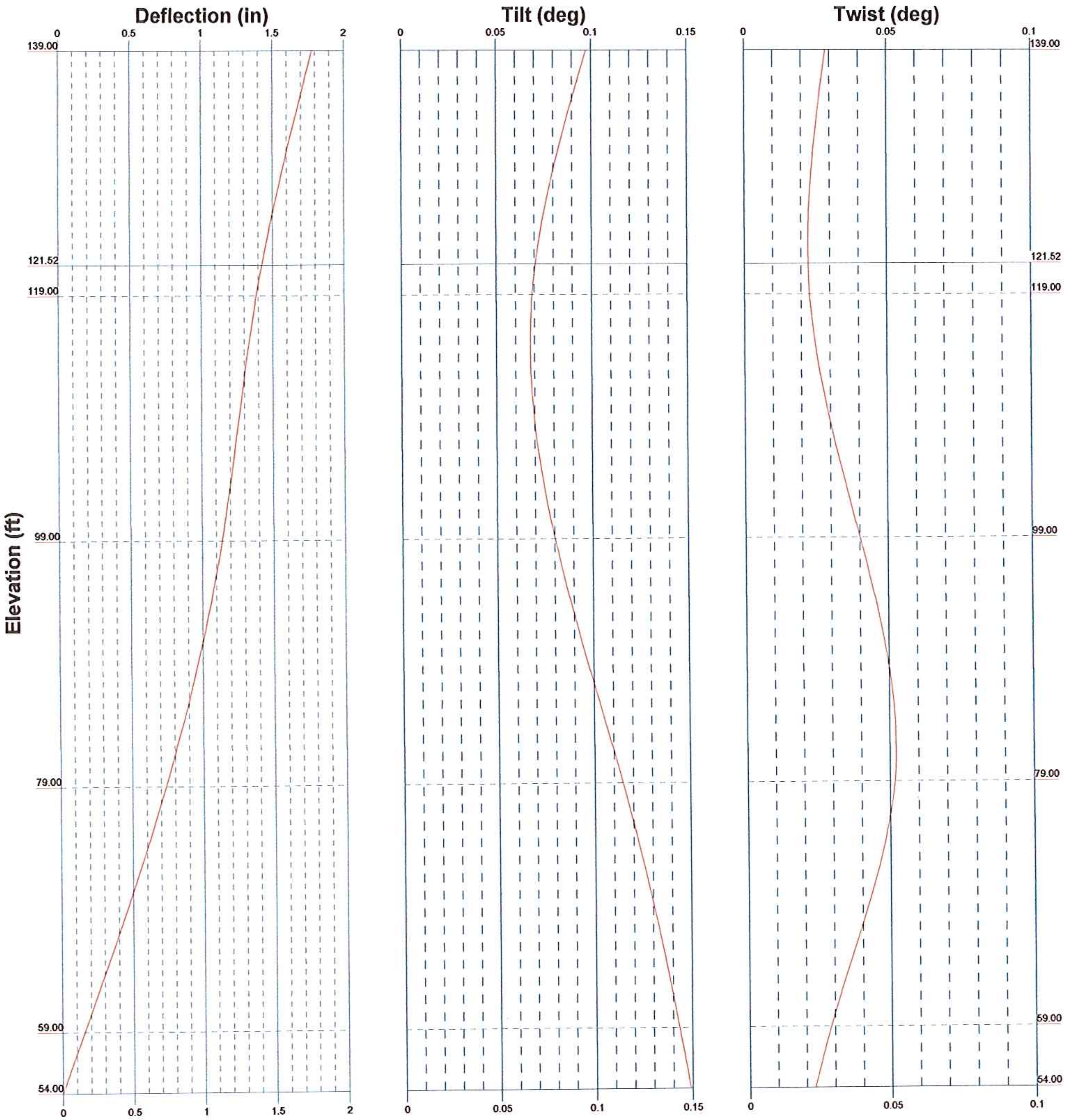
		Project: *22996*	
		Client: Sprint	Drawn by: tmoore / App'd:
		Code: TIA/EIA-222-F	Date: 06/19/14 / Scale: NTS
		Path: I:\22900\22996\Structural\Risa\22996 rev1.eri	Dwg No. E-4

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



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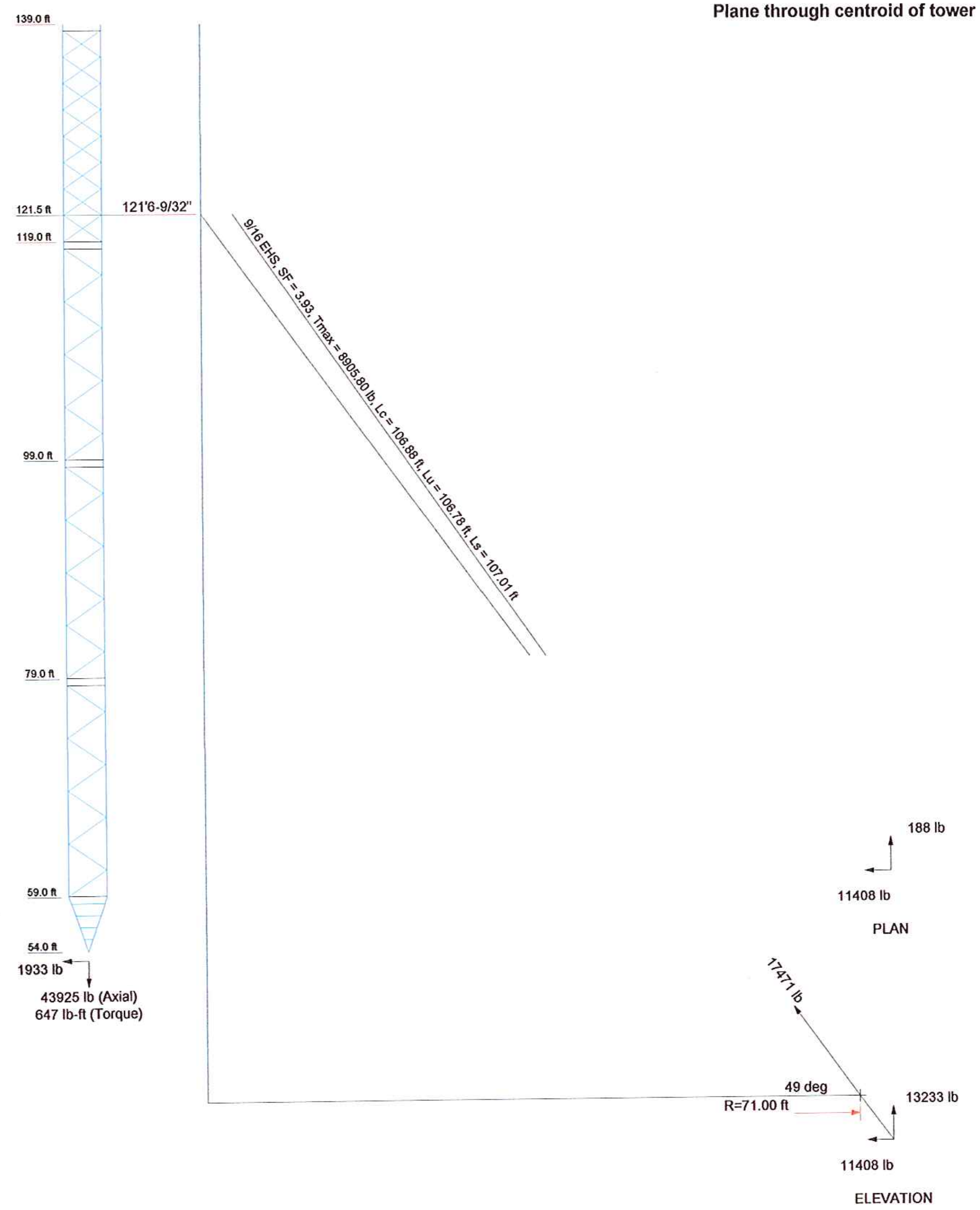
Phone: (608) 643-4100	Client: Sprint	Drawn by: tmoore	App'd:
FAX: (608) 643-7999	Code: TIA/EIA-222-F	Date: 06/19/14	Scale: NTS
Consulting Engineers	Path: I:\22900\22996\Structural\Risa\22996 rev1.eri		Dwg No. E-5

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



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RAMAKER & ASSOCIATES, INC. Consulting Engineers	Project: 22996		
	Client: Sprint	Drawn by: tmoore	App'd:
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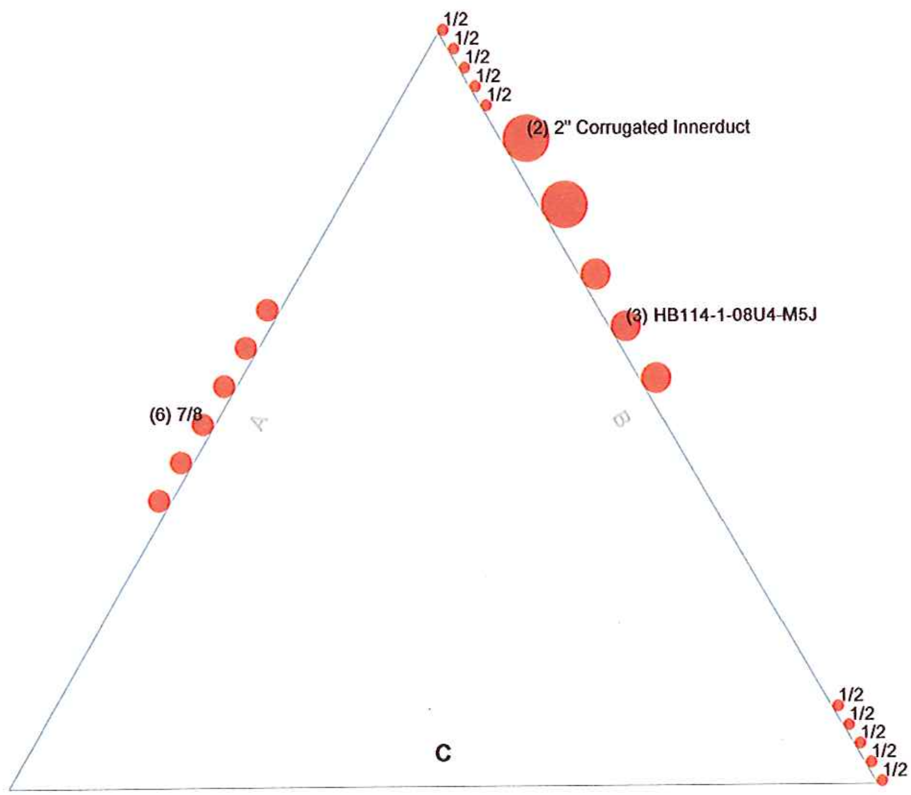
	Path: I:\22900\22996\Structural\Risa\22996 rev1.eri		Dwg No. E-6

Feed Line Plan

Round Flat App In Face App Out Face



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		Project: *22996*	
		Client: Sprint	Drawn by: tmoore	App'd:
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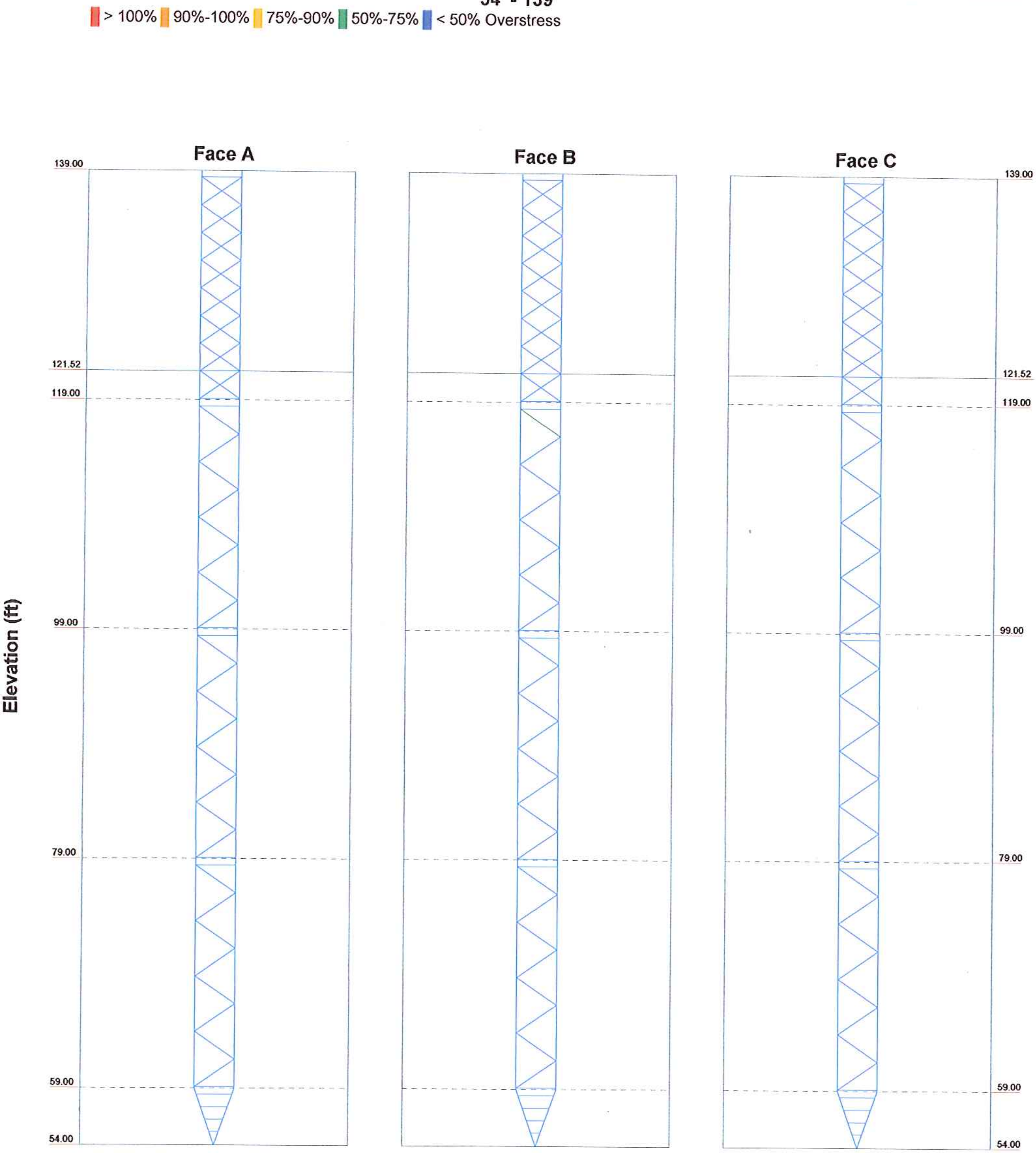
		Path: I:\22900\22996\Structural\Risa\22996 rev1.eri	Dwg No. E-7

Stress Distribution Chart
54' - 139'

NV - CT03XC078



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Job: University of Hartford (CT03XC078		
Project: 22996		
Client: Sprint	Drawn by: tmoore	App'd:
Code: TIA/EIA-222-F	Date: 06/19/14	Scale: NTS
Path: I:\22900\22996\Structural\Risa\22996 rev1.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.

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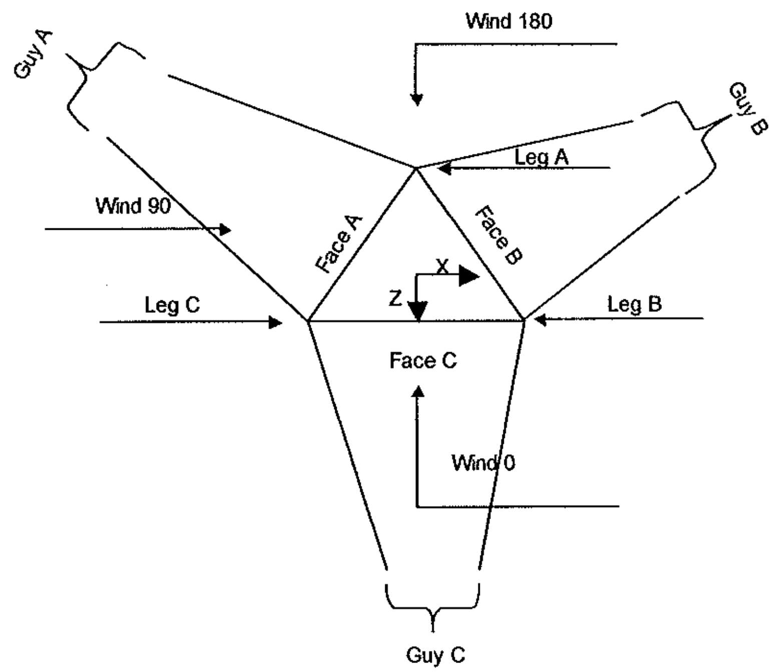
	Client: Sprint	Designed by: tmoore



Face Guyed

Tower Section Geometry

Tower Section	*Tower Elevation*	*Assembly Database*	*Description*	*Section Width*	*Number of Sections*	*Section Length*
	ft			*ft*		*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*	*Diagonal Spacing*	*Bracing Type*	*Has K Brace End Panels*	*Has Horizontals*	*Top Girt Offset*	*Bottom Girt Offset*
	ft	*ft*				*in*	*in*

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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		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	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

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	Client: Sprint	Designed by: tmoore

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Connection Type	Leg Bolt Size in	Leg No.	Diagonal Bolt Size in	Diagonal No.	Top Girt Bolt Size in	Top Girt No.	Bottom Girt Bolt Size in	Bottom Girt No.	Mid Girt Bolt Size in	Mid Girt No.	Long Horizontal Bolt Size in	Long Horizontal No.	Short Horizontal Bolt Size in	Short Horizontal 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

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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 ft	Torque-Arm Bolt Size in	Torque-Arm Number	Torque-Arm Net Width Deduct in	Torque-Arm U	Pull Off Bolt Size in	Pull Off Number	Pull Off Net Width Deduct in	Pull Off U	Diagonal Bolt Size in	Diagonal Number	Diagonal Net Width Deduct in	Diagonal 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

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	Client: Sprint	Designed by: tmoore

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
			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 ft		H ft	V ft	Initial Tension lb	Intercept ft	Initial Tension lb	Intercept ft	Initial Tension lb	Intercept ft	Initial Tension lb	Intercept ft	Initial Tension lb	Intercept ft	Initial Tension lb	Intercept ft	Initial Tension lb	Intercept 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 ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight 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
***************												
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

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
T1	139.00-119.00	A	0.000	0.000	0.000	0.000	0.00
		B	17.223	0.000	0.000	0.000	83.67
		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	23.302	0.000	0.000	0.000	113.31
		C	0.000	0.000	0.000	0.000	0.00
T3	99.00-79.00	A	10.545	0.000	0.000	0.000	61.56

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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
		B	24.317	0.000	0.000	0.000	118.56
		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	24.800	0.000	0.000	0.000	121.06
		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	6.321	0.000	0.000	0.000	30.89
		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		38.669	12.444	0.000	0.000	704.85
		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		52.490	16.592	0.000	0.000	937.33
		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		56.528	16.592	0.000	0.000	966.44
		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		57.589	16.592	0.000	0.000	958.25
		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		14.714	4.148	0.000	0.000	239.13
		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	2.323	18.219	0.144	0.426
		C	0.000	0.000	0.000	0.000
T2	119.00-99.00	A	0.000	0.000	0.000	0.000
		B	1.717	12.922	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	1.792	13.478	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	1.827	13.427	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	2.683	1.686	5.030
		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	2.1551	-1.5178	2.2151	0.3986
T2	119.00-99.00	2.9886	-3.2653	3.3551	-1.3636
T3	99.00-79.00	1.1720	-3.8996	2.0332	-2.2712
T4	79.00-59.00	1.0982	-4.0114	1.9563	-2.5145
T5	59.00-54.00	1.1228	-2.5371	1.5397	-1.7072

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
****************									
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
			0.00			1/2" Ice	2.80	1.03	61.90

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	Client: Sprint	Designed by: tmoore

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" 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
PiROD 15' T-Frame	A	From Leg	4.00	0.0000	134.00	No Ice	15.00	15.00	500.00
			0.00			1/2" Ice	20.60	20.60	650.00
			0.00			1" Ice	26.20	26.20	800.00
						2" Ice	37.40	37.40	1100.00

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	Client: Sprint	Designed by: tmoore

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
						4" Ice	59.80	59.80	1700.00
PiROD 15' T-Frame	B	From Leg	4.00 0.00 0.00	0.0000	134.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	15.00 20.60 26.20 37.40 59.80	15.00 20.60 26.20 37.40 59.80	500.00 650.00 800.00 1100.00 1700.00
PiROD 15' T-Frame	C	From Leg	4.00 0.00 0.00	0.0000	134.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	15.00 20.60 26.20 37.40 59.80	15.00 20.60 26.20 37.40 59.80	500.00 650.00 800.00 1100.00 1700.00
****************									
10' Omni	C	From Leg	4.00 0.00 5.00	0.0000	111.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.75 3.78 4.83 6.12 8.69	2.75 3.78 4.83 6.12 8.69	30.00 50.21 76.96 150.70 383.40
4' Standoff	C	From Leg	2.00 0.00 0.00	0.0000	111.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.72 4.91 7.10 11.48 20.24	2.72 4.91 7.10 11.48 20.24	50.00 89.00 128.00 206.00 362.00
****************									
DB225-A	B	From Leg	4.00 0.00 0.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.21 5.78 8.35 13.48 23.75	3.21 5.78 8.35 13.48 23.75	37.00 48.10 59.20 81.40 125.80
4' Standoff	B	From Leg	2.00 0.00 0.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.72 4.91 7.10 11.48 20.24	2.72 4.91 7.10 11.48 20.24	50.00 89.00 128.00 206.00 362.00
****************									
800 10504 w/Mount Pipe	A	From Leg	1.00 -2.00 0.00	0.0000	98.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.47 3.84 4.23 5.08 6.99	3.05 3.68 4.33 5.67 8.61	38.05 69.36 106.43 200.70 497.01
800 10504 w/Mount Pipe	B	From Leg	1.00 -2.00 0.00	0.0000	98.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.47 3.84 4.23 5.08 6.99	3.05 3.68 4.33 5.67 8.61	38.05 69.36 106.43 200.70 497.01
800 10504 w/Mount Pipe	C	From Leg	1.00 -2.00 0.00	0.0000	98.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.47 3.84 4.23 5.08 6.99	3.05 3.68 4.33 5.67 8.61	38.05 69.36 106.43 200.70 497.01
6" x 2" Pipe Mount	A	From Leg	1.00 2.00 0.00	0.0000	98.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.43 1.92 2.29 3.06 4.70	1.43 1.92 2.29 3.06 4.70	21.90 32.73 47.61 90.18 230.74
6" x 2" Pipe Mount	B	From Leg	1.00 2.00 0.00	0.0000	98.00	No Ice 1/2" Ice 1" Ice	1.43 1.92 2.29	1.43 1.92 2.29	21.90 32.73 47.61

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	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
****************									
****************									
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 (ft)	Azimuth Adjustment (°)	3 dB Beam Width (°)	Elevation (ft)	Outside Diameter (ft)		Aperture Area (ft^2)	Weight (lb)
PR-950	C	Grid	From	1.00	0.0000		128.00	4.65	No Ice	17.00	38.00
			Leg	0.00					1/2" Ice	17.61	91.75
				0.00					1" Ice	18.22	145.50
									2" Ice	19.44	253.00
									4" Ice	21.88	468.00
PR-950	C	Grid	From	1.00	0.0000		124.00	4.65	No Ice	17.00	38.00
			Leg	0.00					1/2" Ice	17.61	91.75
				0.00					1" Ice	18.22	145.50
									2" Ice	19.44	253.00
									4" Ice	21.88	468.00
VHLP2.5	A	Paraboloid	From	4.00	0.0000		139.00	2.92	No Ice	6.68	48.00
		w/Shroud (HP)	Leg	0.00					1/2" Ice	7.07	76.00
				0.00					1" Ice	7.46	104.00
									2" Ice	8.24	160.00
									4" Ice	9.80	272.00
VHLP2	B	Paraboloid	From	4.00	0.0000		139.00	2.18	No Ice	3.72	27.00
		w/Shroud (HP)	Leg	2.00					1/2" Ice	4.01	54.00
				0.00					1" Ice	4.30	81.00
									2" Ice	4.88	135.00

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft²	Weight lb
									4" Ice	6.04	243.00
VHLP1	B	Paraboloid w/Shroud (HP)	From Leg	4.00 -2.00 0.00	0.0000		139.00	1.28	No Ice	1.28	14.00
									1/2" Ice	1.45	27.00
									1" Ice	1.62	40.00
									2" Ice	1.97	66.00
									4" Ice	2.65	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	7710.73			
Wind 0 deg - No Ice		-32.32	-10821.58	421.66
Wind 30 deg - No Ice		5444.08	-9464.93	530.35
Wind 60 deg - No Ice		9444.76	-5475.28	420.79
Wind 90 deg - No Ice		10904.69	-3.48	167.99
Wind 120 deg - No Ice		9330.63	5460.11	-39.99
Wind 150 deg - No Ice		5305.47	9348.10	-590.37
Wind 180 deg - No Ice		-30.05	10863.72	-564.38
Wind 210 deg - No Ice		-5454.05	9514.78	-579.00
Wind 240 deg - No Ice		-9512.05	5527.53	-505.54
Wind 270 deg - No Ice		-10940.71	-19.76	-139.45
Wind 300 deg - No Ice		-9391.35	-5409.74	166.27
Wind 330 deg - No Ice		-5406.12	-9275.96	569.54
Member Ice	4249.42			
Guy Ice	1272.11			
Total Weight Ice	21337.21			
Wind 0 deg - Ice		275.59	-5667.90	998.62
Wind 30 deg - Ice		3000.71	-4850.72	1183.86
Wind 60 deg - Ice		4968.44	-2872.98	744.12
Wind 90 deg - Ice		5698.37	-177.55	99.74
Wind 120 deg - Ice		5041.37	2599.52	-261.45
Wind 150 deg - Ice		2740.61	4766.03	-434.80
Wind 180 deg - Ice		-22.95	5551.98	-632.88
Wind 210 deg - Ice		-2792.07	4861.58	-725.64
Wind 240 deg - Ice		-4900.09	2836.18	-767.74
Wind 270 deg - Ice		-5601.04	-9.94	-563.42
Wind 300 deg - Ice		-4813.28	-2756.90	-105.64
Wind 330 deg - Ice		-2749.87	-4757.89	430.15
Total Weight	7710.73			
Wind 0 deg - Service		-12.63	-4227.18	164.71
Wind 30 deg - Service		2126.59	-3697.24	207.17
Wind 60 deg - Service		3689.36	-2138.78	164.37
Wind 90 deg - Service		4259.65	-1.36	65.62
Wind 120 deg - Service		3644.78	2132.85	-15.62
Wind 150 deg - Service		2072.45	3651.60	-230.61
Wind 180 deg - Service		-11.74	4243.64	-220.46
Wind 210 deg - Service		-2130.49	3716.71	-226.17
Wind 240 deg - Service		-3715.64	2159.19	-197.48
Wind 270 deg - Service		-4273.71	-7.72	-54.47

tnxTower	Job: University of Hartford (CT03XC078)	Page: 15 of 30
Ramaker & Associates, Inc. 1120 Dallas Street Sauk City, WI 53583 Phone: (608) 643-4100 FAX: (608) 643-7999	Project: 22996	Date: 12:13:33 06/19/14
	Client: Sprint	Designed by: tmoore

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Torques lb-ft
Wind 300 deg - Service		-3668.50	-2113.18	64.95
Wind 330 deg - Service		-2111.77	-3623.42	222.48

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
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

tnxTower	Job University of Hartford (CT03XC078)	Page 16 of 30
Ramaker & Associates, Inc. *1120 Dallas Street* *Sauk City, WI 53583* *Phone: (608) 643-4100* *FAX: (608) 643-7999*	Project 22996	Date 12:13:33 06/19/14
	Client Sprint	Designed by tmoore

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	17314.20	-24.01	-18.92
			Max. Compression	10	-20718.11	518.99	-183.44
			Max. Mx	11	-1448.48	856.48	37.32
			Max. My	7	-1322.44	-431.56	-813.32
			Max. Vy	5	-1448.53	-698.46	24.55
			Max. Vx	8	-1322.88	53.98	-574.11
		Diagonal	Max Tension	11	2003.76	0.00	0.00
			Max. Compression	13	-2113.65	0.00	0.00
			Max. Mx	22	609.23	8.57	0.00
			Max. My	23	125.92	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	95.36	0.00	0.00
			Max. Compression	8	-103.46	0.00	0.00
			Max. Mx	26	-44.06	6.99	0.00
			Max. My	23	-20.26	0.00	-0.00
			Max. Vy	26	8.19	0.00	0.00
			Max. Vx	23	-0.00	0.00	0.00
		Bottom Girt	Max Tension	9	780.32	0.00	0.00
			Max. Compression	7	-400.74	0.00	0.00
			Max. Mx	18	469.36	6.99	0.00
			Max. My	24	310.79	0.00	0.00
			Max. Vy	18	8.19	0.00	0.00
			Max. Vx	24	-0.00	0.00	0.00
		Guy A	Bottom Tension	9	12010.49		
			Top Tension	9	12055.82		
			Top Cable Vert	9	10660.42		
			Top Cable Norm	9	5630.06		
			Top Cable Tan	9	23.82		
			Bot Cable Vert	9	-10570.87		
			Bot Cable Norm	9	5701.26		
			Bot Cable Tan	9	65.48		
		Guy B	Bottom Tension	11	11440.37		
			Top Tension	11	11494.39		
			Top Cable Vert	11	10011.72		
			Top Cable Norm	11	5646.79		
			Top Cable Tan	11	12.39		
			Bot Cable Vert	11	-9903.67		
			Bot Cable Norm	11	5726.73		
			Bot Cable Tan	11	63.31		
		Guy C	Bottom Tension	5	8851.50		
			Top Tension	5	8905.80		
			Top Cable Vert	5	6825.08		
			Top Cable Norm	5	5721.15		
			Top Cable Tan	5	7.79		
			Bot Cable Vert	5	-6699.88		
			Bot Cable Norm	5	5784.32		
			Bot Cable Tan	5	47.93		
		Top Guy Pull-Off	Max Tension	4	5237.50	0.00	0.00
			Max. Compression	10	-4615.60	0.00	0.00
			Max. Mx	18	-1865.69	21.93	0.00
			Max. My	10	2875.59	0.00	-0.00
			Max. Vy	18	-25.67	0.00	0.00
			Max. Vx	10	-0.00	0.00	0.00
		Torque Arm Top	Max Tension	5	6388.28	0.00	0.00
			Max. Compression	9	-3476.55	0.00	0.00
			Max. Mx	9	-523.03	-35037.73	0.00
			Max. My	10	-3034.18	-29383.99	-0.00
			Max. Vy	9	10299.82	-35037.73	0.00
			Max. Vx	10	-0.00	-29383.99	-0.00
T2	119 - 99	Leg	Max Tension	4	2702.80	-472.73	143.42

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
			Max. Compression	9	-19758.16	131.70	-94.94
			Max. Mx	5	-40.70	-532.52	-0.72
			Max. My	2	-9080.97	38.26	508.16
			Max. Vy	5	-1447.93	-532.52	-0.72
			Max. Vx	8	-1322.92	46.81	-422.56
		Diagonal	Max Tension	5	2711.23	0.00	0.00
			Max. Compression	7	-2794.18	0.00	0.00
			Max. Mx	22	-728.63	8.37	0.00
			Max. My	23	102.45	0.00	0.02
			Max. Vy	22	-8.01	0.00	0.00
			Max. Vx	23	0.01	0.00	0.00
		Top Girt	Max Tension	6	1065.39	0.00	0.00
			Max. Compression	4	-920.14	0.00	0.00
			Max. Mx	18	257.04	6.83	0.00
			Max. My	23	-252.95	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	555.93	0.00	0.00
			Max. Compression	6	-505.98	0.00	0.00
			Max. Mx	16	228.79	6.83	0.00
			Max. My	22	247.08	0.00	-0.00
			Max. Vy	16	-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	-22040.85	-17.27	-28.04
			Max. Mx	5	-14876.26	276.16	-110.65
			Max. My	8	-18842.81	35.80	289.74
			Max. Vy	5	-636.37	-148.20	-22.88
			Max. Vx	2	653.40	-28.39	169.09
		Diagonal	Max Tension	13	939.69	0.00	0.00
			Max. Compression	3	-1086.62	0.00	0.00
			Max. Mx	22	260.10	8.15	0.00
			Max. My	21	-111.56	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	363.66	0.00	0.00
			Max. Compression	12	-295.89	0.00	0.00
			Max. Mx	18	158.48	6.64	0.00
			Max. My	22	-108.39	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	152.36	0.00	0.00
			Max. Compression	13	-73.84	0.00	0.00
			Max. Mx	23	42.47	6.64	0.00
			Max. My	22	-59.10	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	-21737.76	85.37	-4.07
			Max. Mx	24	-16132.66	704.26	305.29
			Max. My	21	-16516.84	-65.12	-777.67
			Max. Vy	25	-3526.92	702.84	312.61
			Max. Vx	21	4236.09	-65.12	-777.67
		Diagonal	Max Tension	13	1578.01	0.00	0.00
			Max. Compression	13	-1412.81	0.00	0.00
			Max. Mx	22	963.99	7.88	0.00
			Max. My	21	-231.22	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	8	181.74	0.00	0.00
			Max. Compression	23	-115.98	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. Mx	23	74.93	6.42	0.00
			Max. My	22	153.33	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	21	2225.24	0.00	0.00
			Max. Compression	1	0.00	0.00	0.00
			Max. Mx	23	2097.33	6.42	0.00
			Max. My	22	1698.70	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	-18054.23	108.60	-73.32
			Max. Mx	21	-16974.40	777.67	-60.68
			Max. My	13	-9488.52	-92.12	255.35
			Max. Vy	10	2232.28	741.88	-88.84
			Max. Vx	13	-308.91	-434.75	136.18
		Horizontal	Max Tension	10	1830.75	99.84	-63.95
			Max. Compression	9	-419.15	74.21	32.59
			Max. Mx	7	-294.76	321.03	-63.71
			Max. My	10	313.63	113.64	-115.99
			Max. Vy	13	610.42	317.99	-27.70
			Max. Vx	2	182.87	146.36	38.49

Maximum Reactions

Location	*Condition*	*Gov. Load Comb.*	*Vertical lb*	*Horizontal, X lb*	*Horizontal, Z lb*
Mast	Max. Vert	23	43925.06	1070.90	-615.74
	Max. H_x	11	38430.35	1781.23	38.37
	Max. H_z	2	36087.08	87.91	1747.05
	Max. M_x	1	0.00	48.30	-30.51
	Max. M_z	1	0.00	48.30	-30.51
	Max. Torsion	7	558.86	-809.03	-1667.83
	Min. Vert	27	24901.04	55.34	727.71
	Min. H_x	5	32884.22	-1732.84	-46.99
	Min. H_z	8	31695.67	24.83	-1932.44
	Min. M_x	1	0.00	48.30	-30.51
	Min. M_z	1	0.00	48.30	-30.51
	Min. Torsion	13	-647.04	1018.84	1539.71
Guy C @ 71 ft Elev 40 ft Azimuth 240 deg	Max. Vert	10	-229.39	-123.25	71.26
	Max. H_x	10	-229.39	-123.25	71.26
	Max. H_z	3	-13126.60	-9750.09	5746.09
	Min. Vert	5	-13233.04	-9934.64	5608.42
	Min. H_x	5	-13233.04	-9934.64	5608.42
	Min. H_z	10	-229.39	-123.25	71.26
Guy B @ 48 ft Elev 40 ft Azimuth 120 deg	Max. Vert	6	-590.29	220.07	126.37
	Max. H_x	11	-19506.16	9809.80	5486.77
	Max. H_z	13	-19085.17	9465.16	5598.06
	Min. Vert	11	-19506.16	9809.80	5486.77
	Min. H_x	6	-590.29	220.07	126.37
	Min. H_z	6	-590.29	220.07	126.37
Guy A @ 38 ft	Max. Vert	2	-493.95	0.78	-187.83

tnxTower	Job: University of Hartford (CT03XC078)	Page: 19 of 30
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	Client: Sprint	Designed by: tmoore

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Elev 53 ft Azimuth 0 deg					
	Max. H_x	10	-18005.49	231.99	-9622.79
	Max. H_z	2	-493.95	0.78	-187.83
	Min. Vert	9	-20993.68	157.19	-11260.27
	Min. H_x	6	-18007.02	-188.46	-9622.70
	Min. H_z	9	-20993.68	157.19	-11260.27

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	25383.57	-48.30	30.51	0.00	0.00	19.63
Dead+Wind 0 deg - No Ice+Guy	36087.08	-87.91	-1747.05	0.00	0.00	565.52
Dead+Wind 30 deg - No Ice+Guy	31755.14	836.66	-1539.49	0.00	0.00	382.82
Dead+Wind 60 deg - No Ice+Guy	26700.10	1539.52	-898.05	0.00	0.00	113.43
Dead+Wind 90 deg - No Ice+Guy	32884.22	1732.84	46.99	0.00	0.00	-160.84
Dead+Wind 120 deg - No Ice+Guy	37521.23	1453.22	959.83	0.00	0.00	-387.71
Dead+Wind 150 deg - No Ice+Guy	35880.54	809.03	1667.83	0.00	0.00	-558.86
Dead+Wind 180 deg - No Ice+Guy	31695.67	-24.83	1932.44	0.00	0.00	-481.42
Dead+Wind 210 deg - No Ice+Guy	39183.24	-855.66	1594.14	0.00	0.00	-331.78
Dead+Wind 240 deg - No Ice+Guy	42640.55	-1475.74	869.30	0.00	0.00	-135.09
Dead+Wind 270 deg - No Ice+Guy	38430.35	-1781.23	-38.37	0.00	0.00	130.19
Dead+Wind 300 deg - No Ice+Guy	29734.60	-1660.76	-953.24	0.00	0.00	397.62
Dead+Wind 330 deg - No Ice+Guy	34062.75	-1018.84	-1539.71	0.00	0.00	647.04
Dead+Ice+Temp+Guy	41393.19	-73.92	39.69	0.00	0.00	29.51
Dead+Wind 0 deg+Ice+Temp+Guy	40727.85	-96.56	-1175.96	0.00	0.00	430.69
Dead+Wind 30 deg+Ice+Temp+Guy	40936.76	489.75	-1003.77	0.00	0.00	408.99
Dead+Wind 60 deg+Ice+Temp+Guy	41268.26	929.13	-547.48	0.00	0.00	226.55
Dead+Wind 90 deg+Ice+Temp+Guy	41499.36	1096.49	67.65	0.00	0.00	-9.35
Dead+Wind 120 deg+Ice+Temp+Guy	41733.72	949.59	667.39	0.00	0.00	-175.41
Dead+Wind 150 deg+Ice+Temp+Guy	42724.55	533.27	1097.12	0.00	0.00	-274.41
Dead+Wind 180 deg+Ice+Temp+Guy	43436.83	-56.81	1247.21	0.00	0.00	-335.93
Dead+Wind 210 deg+Ice+Temp+Guy	43771.62	-644.42	1069.22	0.00	0.00	-307.60
Dead+Wind 240 deg+Ice+Temp+Guy	43925.06	-1070.90	615.74	0.00	0.00	-202.24
Dead+Wind 270 deg+Ice+Temp+Guy	43158.45	-1240.58	15.84	0.00	0.00	-21.74
Dead+Wind 300 deg+Ice+Temp+Guy	42297.67	-1096.22	-586.17	0.00	0.00	178.87
Dead+Wind 330 deg+Ice+Temp+Guy	41443.22	-672.44	-1026.40	0.00	0.00	331.46
Dead+Wind 0 deg - Service+Guy	24901.04	-55.34	-727.71	0.00	0.00	211.16
Dead+Wind 30 deg - Service+Guy	24997.65	306.49	-616.66	0.00	0.00	153.21
Dead+Wind 60 deg - Service+Guy	25230.89	576.47	-333.69	0.00	0.00	52.42
Dead+Wind 90 deg - Service+Guy	25506.21	680.48	44.89	0.00	0.00	-58.22
Dead+Wind 120 deg - Service+Guy	25774.71	594.15	414.88	0.00	0.00	-140.23
Dead+Wind 150 deg - Service+Guy	26036.96	327.97	687.83	0.00	0.00	-191.88
Dead+Wind 180 deg - Service+Guy	26155.48	-38.53	781.05	0.00	0.00	-178.09
Dead+Wind 210 deg - Service+Guy	26009.18	-404.89	670.72	0.00	0.00	-119.61
Dead+Wind 240 deg - Service+Guy	25670.84	-673.79	393.80	0.00	0.00	-16.96
Dead+Wind 270 deg - Service+Guy	25472.71	-774.20	21.08	0.00	0.00	99.91
Dead+Wind 300 deg - Service+Guy	25247.28	-685.02	-355.51	0.00	0.00	184.12
Dead+Wind 330 deg - Service+Guy	25016.23	-422.06	-631.08	0.00	0.00	230.60

Solution Summary

tnxTower	Job: University of Hartford (CT03XC078)	Page: 20 of 30
	Project: 22996	Date: 12:13:33 06/19/14
	Client: Sprint	Designed by: tmoore

Ramaker & Associates, Inc.
1120 Dallas Street
Sauk City, WI 53583
Phone: (608) 643-4100
FAX: (608) 643-7999

Load Comb.	Sum of Applied Forces PX lb	PY lb	PZ lb	Sum of Reactions PX lb	PY lb	PZ lb	% Error
1	-0.00	-7710.72	0.00	-0.00	7710.72	-0.01	0.000%
2	-56.84	-7753.81	-11465.68	56.83	7753.81	11465.65	0.000%
3	5722.00	-7744.17	-9997.89	-5722.00	7744.17	9997.88	0.000%
4	9938.46	-7724.72	-5767.71	-9938.45	7724.72	5767.71	0.000%
5	11488.95	-7728.61	16.49	-11488.93	7728.61	-16.48	0.000%
6	9859.55	-7726.92	5801.18	-9859.53	7726.92	-5801.17	0.000%
7	5631.06	-7695.16	9923.68	-5631.05	7695.16	-9923.67	0.000%
8	-5.54	-7667.64	11507.83	5.49	7667.64	-11507.82	0.000%
9	-5731.96	-7677.28	10047.75	5731.94	7677.28	-10047.74	0.000%
10	-10005.74	-7696.73	5819.96	10005.71	7696.73	-5819.94	0.000%
11	-11524.96	-7692.85	-39.74	11524.94	7692.85	39.75	0.000%
12	-9920.27	-7694.53	-5750.82	9920.25	7694.53	5750.84	0.000%
13	-5731.71	-7726.29	-9851.55	5731.70	7726.29	9851.53	0.000%
14	0.00	-21337.09	-0.00	-0.01	21337.09	0.00	0.000%
15	248.72	-21383.67	-6375.40	-248.72	21383.67	6375.40	0.000%
16	3306.26	-21373.18	-5436.23	-3306.26	21373.18	5436.22	0.000%
17	5511.29	-21352.09	-3194.31	-5511.28	21352.09	3194.31	0.000%
18	6340.80	-21356.70	-155.65	-6340.78	21356.70	155.66	0.000%
19	5622.84	-21355.20	2974.19	-5622.84	21355.20	-2974.18	0.000%
20	3098.43	-21320.61	5398.27	-3098.43	21320.61	-5398.25	0.000%
21	3.93	-21290.51	6259.48	-3.95	21290.51	-6259.47	0.000%
22	-3097.63	-21301.00	5447.08	3097.61	21301.00	-5447.07	0.000%
23	-5442.93	-21322.10	3157.51	5442.91	21322.10	-3157.50	0.000%
24	-6243.46	-21317.48	-31.84	6243.44	21317.48	31.85	0.000%
25	-5394.74	-21318.98	-3131.56	5394.72	21318.98	3131.57	0.000%
26	-3107.69	-21353.57	-5390.13	3107.67	21353.57	5390.13	0.000%
27	-22.20	-7727.54	-4478.78	22.20	7727.54	4478.78	0.000%
28	2235.16	-7723.78	-3905.43	-2235.16	7723.78	3905.42	0.000%
29	3882.21	-7716.19	-2253.01	-3882.20	7716.19	2253.01	0.000%
30	4487.87	-7717.70	6.44	-4487.86	7717.70	-6.44	0.000%
31	3851.39	-7717.04	2266.09	-3851.38	7717.04	-2266.08	0.000%
32	2199.63	-7704.64	3876.44	-2199.63	7704.64	-3876.43	0.000%
33	-2.16	-7693.89	4495.24	2.16	7693.89	-4495.23	0.000%
34	-2239.05	-7697.65	3924.90	2239.04	7697.65	-3924.89	0.000%
35	-3908.49	-7705.25	2273.42	3908.49	7705.25	-2273.42	0.000%
36	-4501.94	-7703.73	-15.52	4501.92	7703.73	15.53	0.000%
37	-3875.11	-7704.39	-2246.41	3875.09	7704.39	2246.41	0.000%
38	-2238.95	-7716.80	-3848.26	2238.94	7716.80	3848.25	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	0.00000693
3	Yes	17	0.00000001	0.00000001
4	Yes	13	0.00000001	0.00000001
5	Yes	16	0.00000001	0.00000660
6	Yes	17	0.00000001	0.00000001
7	Yes	17	0.00000001	0.00000001
8	Yes	15	0.00000001	0.00000816
9	Yes	18	0.00000001	0.00000001
10	Yes	18	0.00000001	0.00000760
11	Yes	18	0.00000001	0.00000480
12	Yes	16	0.00000001	0.00000637
13	Yes	17	0.00000001	0.00000544

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	0.00000642
19	Yes	12	0.00000001	0.00000001
20	Yes	12	0.00000001	0.00000687
21	Yes	13	0.00000001	0.00000566
22	Yes	14	0.00000001	0.00000662
23	Yes	15	0.00000001	0.00000001
24	Yes	14	0.00000001	0.00000798
25	Yes	13	0.00000001	0.00000764
26	Yes	12	0.00000001	0.00000745
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	0.00000001
34	Yes	11	0.00000001	0.00000889
35	Yes	11	0.00000001	0.00000001
36	Yes	11	0.00000001	0.00000983
37	Yes	11	0.00000001	0.00000001
38	Yes	11	0.00000001	0.00000001

Maximum Tower Deflections - Service Wind

Section No.	*Elevation* *ft*	*Horz. Deflection* *in*	*Gov. Load Comb.*	*Tilt* °	*Twist* °
T1	139 - 119	1.779	33	0.0977	0.0263
T2	119 - 99	1.387	33	0.0715	0.0222
T3	99 - 79	1.141	33	0.0802	0.0400
T4	79 - 59	0.736	33	0.1173	0.0511
T5	59 - 54	0.155	33	0.1443	0.0300

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	1.779	0.0977	0.0263	51956
144.00	8' Yagi	33	1.779	0.0977	0.0263	51956
139.00	VHLP2.5	33	1.779	0.0977	0.0263	51956
134.00	LLPX310R w/Mount Pipe	33	1.669	0.0896	0.0244	51956
128.00	PR-950	33	1.545	0.0808	0.0227	23616
124.00	PR-950	33	1.469	0.0759	0.0221	17319
121.52	Guy	33	1.426	0.0734	0.0220	15081
111.00	10' Omni	33	1.285	0.0694	0.0260	31925
106.00	DB225-A	33	1.229	0.0721	0.0323	68929
98.00	800 10504 w/Mount Pipe	33	1.126	0.0817	0.0413	19653
69.00	6' Omni	33	0.459	0.1318	0.0427	45458

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	139 - 119	8.585	10	0.4834	0.1102
T2	119 - 99	6.584	10	0.4159	0.1057
T3	99 - 79	4.997	10	0.4309	0.1040
T4	79 - 59	3.032	10	0.5211	0.1320
T5	59 - 54	0.626	10	0.5888	0.0868

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	8.585	0.4834	0.1102	21585
144.00	8' Yagi	10	8.585	0.4834	0.1102	21585
139.00	VHLP2.5	10	8.585	0.4834	0.1102	21585
134.00	LLPX310R w/Mount Pipe	10	8.054	0.4627	0.1061	21585
128.00	PR-950	10	7.434	0.4401	0.1075	9811
124.00	PR-950	10	7.041	0.4275	0.1081	7195
121.52	Guy	10	6.809	0.4211	0.1074	6269
111.00	10' Omni	10	5.935	0.4098	0.1012	14580
106.00	DB225-A	10	5.552	0.4141	0.1025	25630
98.00	800 10504 w/Mount Pipe	10	4.912	0.4343	0.1056	7910
69.00	6' Omni	10	1.863	0.5575	0.1117	17968

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	90.59	19438.40	0.005 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	2003.76	2740.50	0.731 ✔	1.333	Member Bearing
		Top Girt	A325N	0.5000	1	95.36	2740.50	0.035 ✔	1.333	Member Bearing
		Bottom Girt	A325N	0.5000	1	780.32	2523.00	0.309 ✔	1.333	Member Bearing
T2	119	Leg	A325N	0.7500	4	675.70	19424.00	0.035 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	1	2711.23	2740.50	0.989 ✔	1.333	Member Bearing
		Top Girt	A325N	0.5000	1	1065.39	2740.50	0.389 ✔	1.333	Member Bearing
		Bottom Girt	A325N	0.5000	1	555.93	2523.00	0.220 ✔	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	939.69	2740.50	0.343 ✔	1.333	Member Bearing
		Top Girt	A325N	0.5000	1	363.66	2740.50	0.133 ✔	1.333	Member Bearing
		Bottom Girt	A325N	0.5000	1	152.36	2523.00	0.060 ✔	1.333	Member Bearing
T4	79	Leg	A325N	0.7500	4	0.00	19438.50	0.000 ✔	1.333	Bolt Tension

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
		Diagonal	A325N	0.5000	1	1578.01	2740.50	0.576 ✔	1.333	Member Bearing
		Top Girt	A325N	0.5000	1	181.74	2740.50	0.066 ✔	1.333	Member Bearing
		Bottom Girt	A325N	0.5000	1	1817.08	2523.00	0.720 ✔	1	Member Bearing
T5	59	Leg	A325N	0.7500	4	0.00	19410.10	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	11881.30	17500.00	2.000	2.946 ✔
	121.52 (A) (184)	9/16 EHS	3500.00	35000.04	12055.80	17500.00	2.000	2.903 ✔
	121.52 (B) (179)	9/16 EHS	3500.00	35000.04	11494.40	17500.00	2.000	3.045 ✔
	121.52 (B) (180)	9/16 EHS	3500.00	35000.04	11141.40	17500.00	2.000	3.141 ✔
	121.52 (C) (172)	9/16 EHS	3500.00	35000.04	8725.41	17500.00	2.000	4.011 ✔
	121.52 (C) (173)	9/16 EHS	3500.00	35000.04	8905.80	17500.00	2.000	3.930 ✔

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 in²	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	-20718.10	60829.50	0.341 ✔
T2	119 - 99	ROHN 2.5 EH	20.00	2.41	62.6 K=2.00	1.00	22.275	2.2535	-19758.20	50197.60	0.394 ✔
T3	99 - 79	ROHN 2.5 EH	20.00	2.41	62.6 K=2.00	1.00	22.275	2.2535	-22040.90	50197.60	0.439 ✔
T4	79 - 59	ROHN 2.5 EH	20.00	2.41	62.6 K=2.00	1.00	22.275	2.2535	-21737.80	50197.60	0.433 ✔
T5	59 - 54	ROHN 2.5 EH	5.38	1.27	16.5 K=1.00	0.85	24.414	2.2535	-14913.00	55018.40	0.271* ✔

* 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	-2113.65	4026.59	0.525 ✓
T2	119 - 99	ROHN TS1.5x16 GA	4.18	3.89	91.4 K=1.00	15.325	0.2627	-2794.18	4026.59	0.694 ✓
T3	99 - 79	ROHN TS1.5x16 GA	4.18	3.89	91.4 K=1.00	15.325	0.2627	-1086.62	4026.59	0.270 ✓
T4	79 - 59	ROHN TS1.5x16 GA	4.18	3.89	91.4 K=1.00	15.325	0.2627	-1412.81	4026.59	0.351 ✓

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	-327.02	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* 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 K=1.00	17.823	0.2627	-103.46	4682.86	0.022 ✓
T2	119 - 99	ROHN TS1.5x16 GA	3.42	3.18	74.7 K=1.00	17.823	0.2627	-920.14	4682.86	0.196 ✓
T3	99 - 79	ROHN TS1.5x16 GA	3.42	3.18	74.7 K=1.00	17.823	0.2627	-295.89	4682.86	0.063 ✓
T4	79 - 59	ROHN TS1.5x16 GA	3.42	3.18	74.7 K=1.00	17.823	0.2627	-115.98	4682.86	0.025 ✓

Bottom Girt 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	3.42	3.18	74.7 K=1.00	15.932	0.2627	-400.74	4186.24	0.096 ✓
T2	119 - 99	ROHN TS1.5x16 GA	3.42	3.18	74.7	15.932	0.2627	-505.98	4186.24	0.121

tnxTower	Job: University of Hartford (CT03XC078)	Page: 25 of 30
Ramaker & Associates, Inc. 1120 Dallas Street Sauk City, WI 53583 Phone: (608) 643-4100 FAX: (608) 643-7999	Project: 22996	Date: 12:13:33 06/19/14
	Client: Sprint	Designed by: tmoore

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 $\frac{P}{P_a}$
					K=1.00					✔
T3	99 - 79	ROHN TS1.5x16 GA	3.42	3.18	74.7 K=1.00	15.932	0.2627	-73.84	4186.24	0.018 ✔

Top Guy Pull-Off 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	2L2x2x1/4x3/8	3.42	3.18	99.8 K=1.00	13.005	1.8750	-4615.60	24383.50	0.189
		2L 'a' > 18.3674 in - 177								

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

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	0.189	0.005	0.000	0.194 ✔	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 $\frac{P}{P_a}$
T1	139 - 119 (174)	C12x25	3.42	3.30	107.7 K=1.00	11.974	7.3500	-3217.59	88005.80	0.037
T1	139 - 119 (175)	C12x25	3.42	3.30	107.7 K=1.00	11.974	7.3500	-3476.32	88005.80	0.040
T1	139 - 119 (181)	C12x25	3.42	3.30	107.7 K=1.00	11.974	7.3500	-3392.75	88005.80	0.039
T1	139 - 119 (182)	C12x25	3.42	3.30	107.7 K=1.00	11.974	7.3500	-3229.91	88005.80	0.037
T1	139 - 119 (185)	C12x25	3.42	3.30	107.7 K=1.00	11.974	7.3500	-3273.77	88005.80	0.037
T1	139 - 119 (186)	C12x25	3.42	3.30	107.7	11.974	7.3500	-3382.20	88005.80	0.038

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 $\frac{P}{P_a}$
					K=1.00					

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	-21824.92	-10.867	21.600	0.503	0.00	-0.000	21.600	0.000
T1	139 - 119 (175)	C12x25	-34341.42	-17.099	21.600	0.792	-0.00	-0.000	21.600	0.000
T1	139 - 119 (181)	C12x25	-32102.92	-15.985	21.600	0.740	-0.00	-0.000	21.600	0.000
T1	139 - 119 (182)	C12x25	-21978.08	-10.943	21.600	0.507	0.00	-0.000	21.600	0.000
T1	139 - 119 (185)	C12x25	-31661.25	-15.765	21.600	0.730	0.00	-0.000	21.600	0.000
T1	139 - 119 (186)	C12x25	-34178.17	-17.018	21.600	0.788	-0.00	-0.000	21.600	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	0.037	0.503	0.000	0.540 ✓	1.333	H1-3 ✓
T1	139 - 119 (175)	C12x25	0.040	0.792	0.000	0.831 ✓	1.333	H1-3 ✓
T1	139 - 119 (181)	C12x25	0.039	0.740	0.000	0.779 ✓	1.333	H1-3 ✓
T1	139 - 119 (182)	C12x25	0.037	0.507	0.000	0.543 ✓	1.333	H1-3 ✓
T1	139 - 119 (185)	C12x25	0.037	0.730	0.000	0.767 ✓	1.333	H1-3 ✓
T1	139 - 119 (186)	C12x25	0.038	0.788	0.000	0.826 ✓	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	17314.20	67606.20	0.256 ✓
T2	119 - 99	ROHN 2.5 EH	20.00	2.41	31.3	30.000	2.2535	2702.80	67606.20	0.040 ✓

Diagonal Design Data (Tension)

tnxTower

Ramaker & Associates, Inc.
1120 Dallas Street
Sauk City, WI 53583
Phone: (608) 643-4100
FAX: (608) 643-7999

Job	Page
University of Hartford (CT03XC078)	
Project	**Date**
22996	12:13:33 06/19/14
Client	**Designed by**
Sprint	tmoore

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	2003.76	6621.31	0.303 ✓
T2	119 - 99	ROHN TS1.5x16 GA	4.18	3.89	91.4	25.200	0.2627	2711.23	6621.31	0.409 ✓
T3	99 - 79	ROHN TS1.5x16 GA	4.18	3.89	91.4	25.200	0.2627	939.69	6621.31	0.142 ✓
T4	79 - 59	ROHN TS1.5x16 GA	4.18	3.89	91.4	25.200	0.2627	1578.01	6621.31	0.238 ✓

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	1462.29	41904.00	0.035* ✓

* 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	95.36	6621.31	0.014 ✓
T2	119 - 99	ROHN TS1.5x16 GA	3.42	3.18	74.7	25.200	0.2627	1065.39	6621.31	0.161 ✓
T3	99 - 79	ROHN TS1.5x16 GA	3.42	3.18	74.7	25.200	0.2627	363.66	6621.31	0.055 ✓
T4	79 - 59	ROHN TS1.5x16 GA	3.42	3.18	74.7	25.200	0.2627	181.74	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	780.32	5675.41	0.137 ✓
T2	119 - 99	ROHN TS1.5x16 GA	3.42	3.18	74.7	21.600	0.2627	555.93	5675.41	0.098 ✓
T3	99 - 79	ROHN TS1.5x16 GA	3.42	3.18	74.7	21.600	0.2627	152.36	5675.41	0.027

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Ramaker & Associates, Inc. 1120 Dallas Street Sauk City, WI 53583 Phone: (608) 643-4100 FAX: (608) 643-7999	Project: 22996	Date: 12:13:33 06/19/14
	Client: Sprint	Designed by: tmoore

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 $\frac{P}{P_a}$
T4	79 - 59	ROHN TS1.5x16 GA	3.42	3.18	74.7	21.600	0.2627	1817.08	5675.41	0.320*

* 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	5237.49	40500.00	0.129

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	0.129	0.011	0.000	0.140	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	2478.49	158760.00	0.016
T1	139 - 119 (175)	C12x25	3.42	3.30	50.7	21.600	7.3500	2195.97	158760.00	0.014
T1	139 - 119 (181)	C12x25	3.42	3.30	50.7	21.600	7.3500	2334.71	158760.00	0.015
T1	139 - 119 (182)	C12x25	3.42	3.30	50.7	21.600	7.3500	2436.71	158760.00	0.015
T1	139 - 119 (185)	C12x25	3.42	3.30	50.7	21.600	7.3500	2387.06	158760.00	0.015
T1	139 - 119 (186)	C12x25	3.42	3.30	50.7	21.600	7.3500	2160.78	158760.00	0.014

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	Client Sprint	Designed by tmoore

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	-19910.00	9.914	21.600	0.459	-0.00	0.000	27.000	0.000
T1	139 - 119 (175)	C12x25	-30375.92	15.125	21.600	0.700	-0.00	0.000	27.000	0.000
T1	139 - 119 (181)	C12x25	-28523.92	14.203	21.600	0.658	-0.00	0.000	27.000	0.000
T1	139 - 119 (182)	C12x25	-19859.50	9.889	21.600	0.458	-0.00	0.000	27.000	0.000
T1	139 - 119 (185)	C12x25	-28733.33	14.307	21.600	0.662	0.00	0.000	27.000	0.000
T1	139 - 119 (186)	C12x25	-30527.00	15.200	21.600	0.704	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	0.016	0.459	0.000	0.475 ✔	1.333	H2-1 ✔
T1	139 - 119 (175)	C12x25	0.014	0.700	0.000	0.714 ✔	1.333	H2-1 ✔
T1	139 - 119 (181)	C12x25	0.015	0.658	0.000	0.672 ✔	1.333	H2-1 ✔
T1	139 - 119 (182)	C12x25	0.015	0.458	0.000	0.473 ✔	1.333	H2-1 ✔
T1	139 - 119 (185)	C12x25	0.015	0.662	0.000	0.677 ✔	1.333	H2-1 ✔
T1	139 - 119 (186)	C12x25	0.014	0.704	0.000	0.717 ✔	1.333	H2-1 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$SF*P_{allow}$ lb	% Capacity	Pass Fail
T1	139 - 119	Leg	ROHN 2.5 EH	1	-20718.10	81085.72	25.6	Pass
		Diagonal	ROHN TS1.5x16 GA	12	-2113.65	5367.44	39.4	Pass
		Top Girt	ROHN TS1.5x16 GA	4	-103.46	6242.25	1.7	Pass
		Bottom Girt	ROHN TS1.5x16 GA	8	780.32	7565.32	10.3	Pass
		Guy A@121.523	9/16	184	12055.80	17500.00	68.9	Pass
		Guy B@121.523	9/16	179	11494.40	17500.00	65.7	Pass
		Guy C@121.523	9/16	173	8905.80	17500.00	50.9	Pass
		Top Guy Pull-Off@121.523	2L2x2x1/4x3/8	177	-4615.60	32503.20	14.5	Pass
		Torque Arm Top@121.523	C12x25	175	-3476.32	117311.72	62.4	Pass
T2	119 - 99	Leg	ROHN 2.5 EH	60	-19758.20	66913.40	29.5	Pass
		Diagonal	ROHN TS1.5x16 GA	89	-2794.18	5367.44	52.1	Pass
		Top Girt	ROHN TS1.5x16 GA	61	-920.14	6242.25	14.7	Pass
		Bottom Girt	ROHN TS1.5x16 GA	65	-505.98	5580.26	9.1	Pass
T3	99 - 79	Leg	ROHN 2.5 EH	93	-22040.90	66913.40	32.9	Pass
		Diagonal	ROHN TS1.5x16 GA	123	-1086.62	5367.44	20.2	Pass
		Top Girt	ROHN TS1.5x16 GA	95	-295.89	6242.25	4.7	Pass
		Bottom Girt	ROHN TS1.5x16 GA	97	152.36	7565.32	2.0	Pass
T4	79 - 59	Leg	ROHN 2.5 EH	126	-21737.80	66913.40	32.5	Pass
		Diagonal	ROHN TS1.5x16 GA	137	-1412.81	5367.44	26.3	Pass
		Top Girt	ROHN TS1.5x16 GA	129	181.74	8826.21	2.1	Pass
		Bottom Girt	ROHN TS1.5x16 GA	130	1817.08	5675.41	32.0	Pass
T5	59 - 54	Leg	ROHN 2.5 EH	158	-14913.00	55018.40	27.1	Pass
		Horizontal	L4x4x1/4	164	-272.43	39797.20	4.2	Pass

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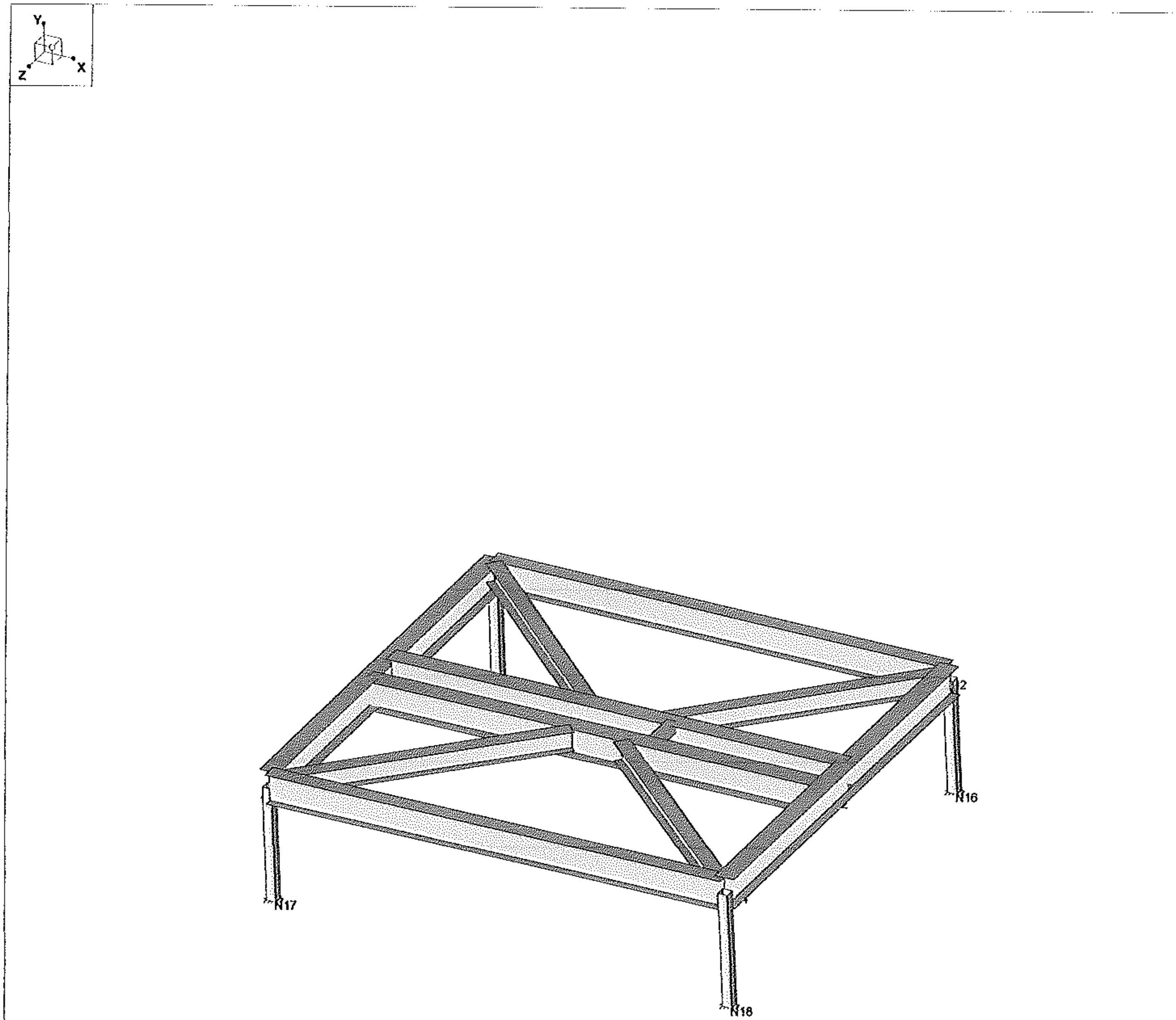
	Client: Sprint	Designed by: tmoore

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$SF*P_{allow}$ lb	% Capacity	Pass Fail
							Summary	
						Leg (T3)	32.9	Pass
						Diagonal (T2)	52.1	Pass
						Horizontal (T5)	4.2	Pass
						Top Girt (T2)	14.7	Pass
						Bottom Girt (T4)	32.0	Pass
						Guy A (T1)	68.9	Pass
						Guy B (T1)	65.7	Pass
						Guy C (T1)	50.9	Pass
						Top Guy Pull-Off (T1)	14.5	Pass
						Torque Arm Top (T1)	62.4	Pass
						Bolt Checks	74.2	Pass
						RATING =	**74.2**	**Pass**

Program Version 6.1.3.1 - 7/25/2013 File:I:/22900/22996/Structural/Risa/22996 rev1.eri

APPENDIX C

TOWER PLATFORM CALCULATIONS



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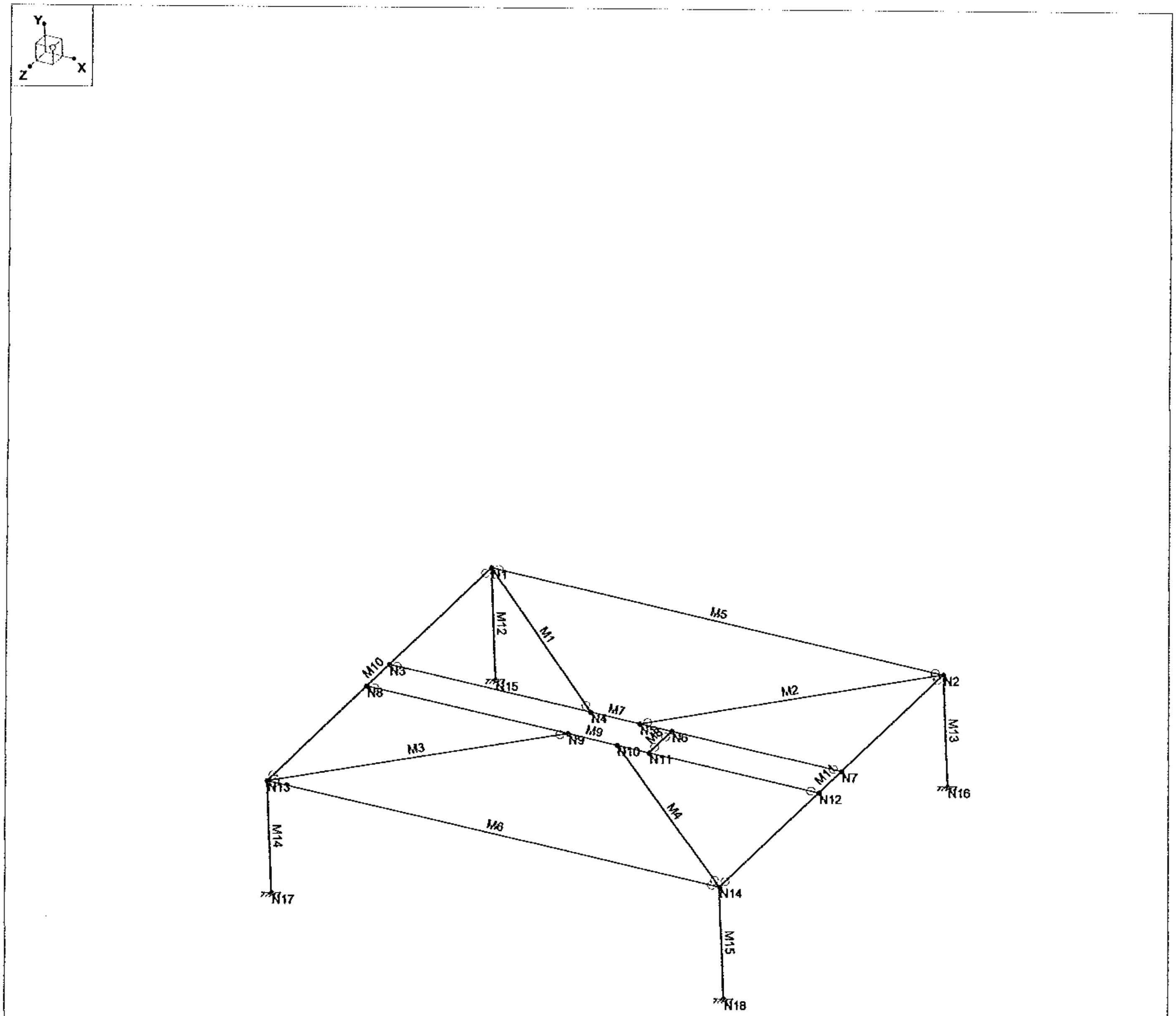

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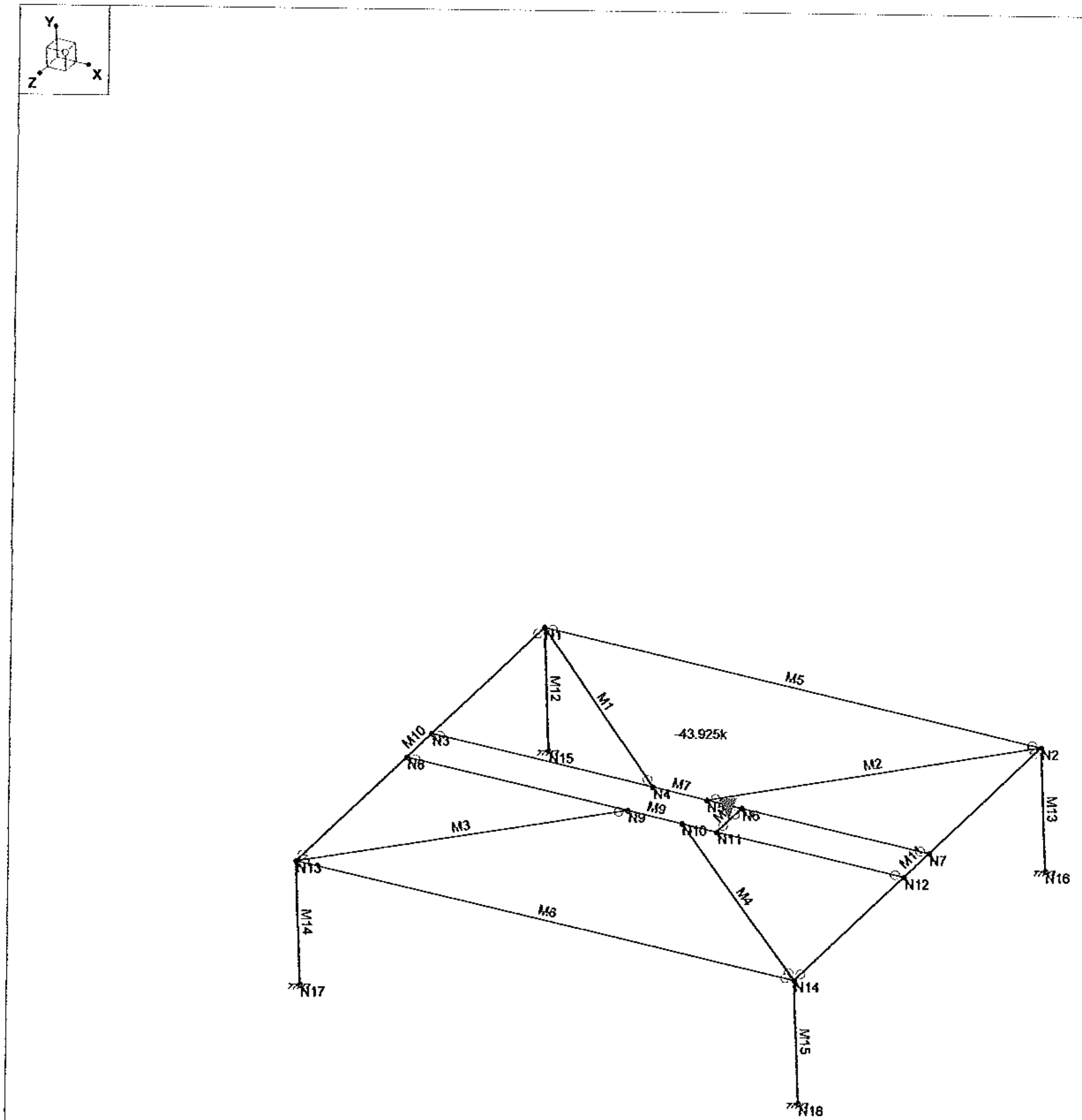

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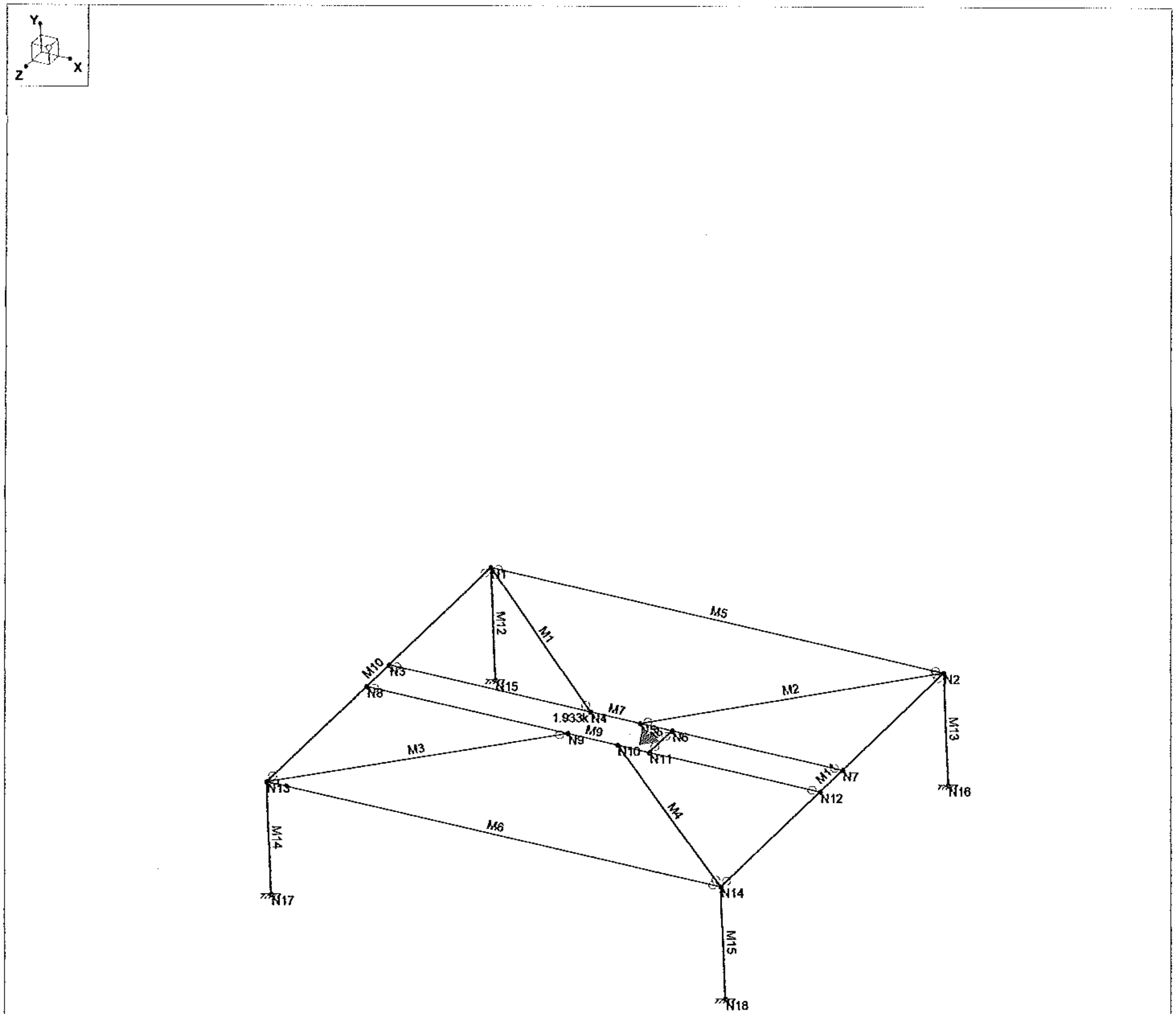

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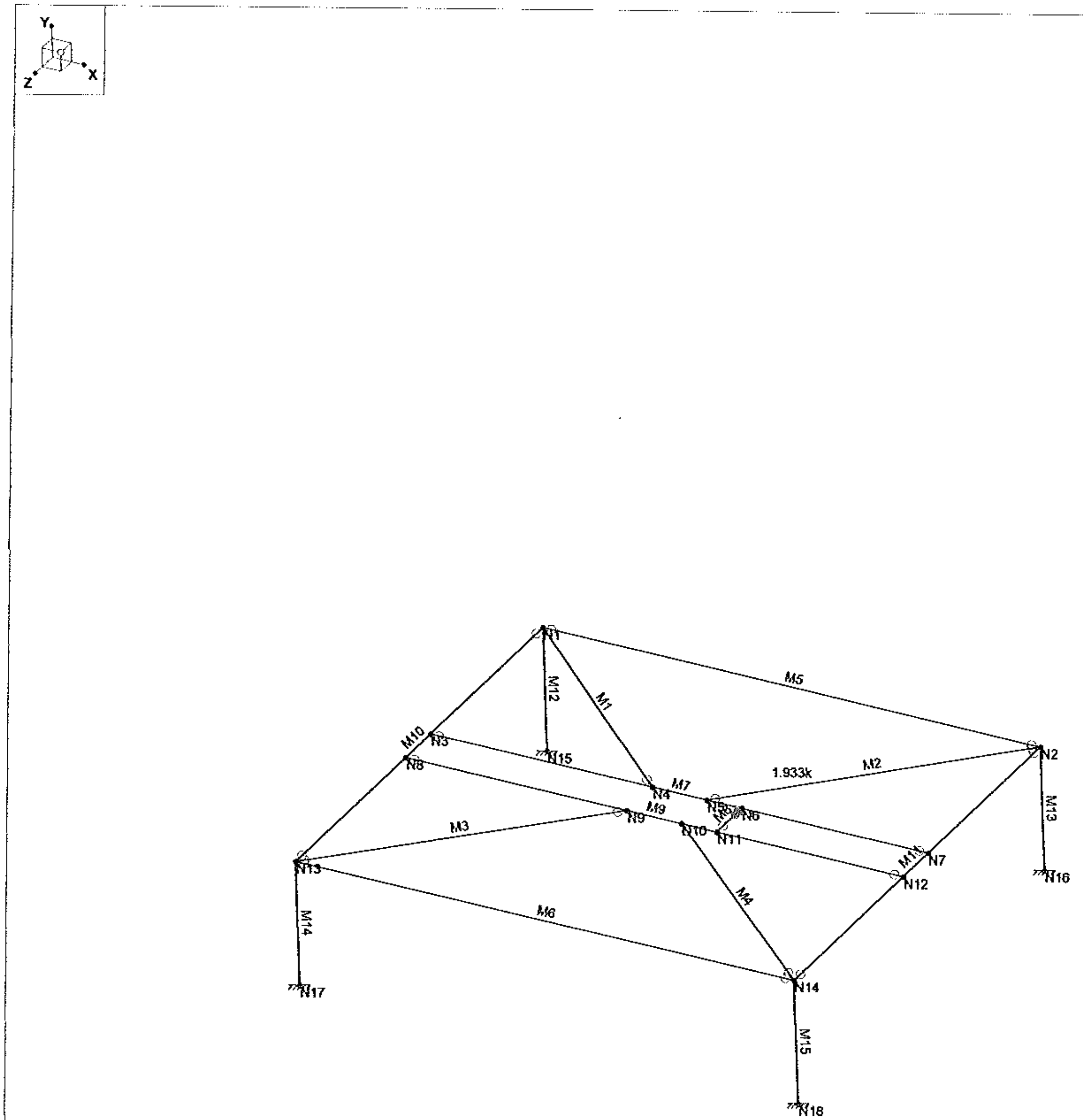


Ramaker & Associates, Inc.	University of Hartford (CT03XC078)	SK - 5
TEM		June 19, 2014 at 1:22 PM
22996		22996 rev1.r3d

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 bo...	L-torq...	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	-43.925	%50

Member Point Loads (BLC 2 : WindX)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M8	X	1.933	%50

Member Point Loads (BLC 3 : WindZ)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M8	Z	1.933	%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	Distribut...	Area(Memb...	Surface(Pla...
1	Dead	DL		-1			1			
2	WindX	WLX					1			
3	WindZ	WLZ					1			

Load Combinations

	Description	Sol...	PD...	SR...	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
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	.488	6	9.462	5	.415	7	1.746	7	0	1	2.05	4
2		min	-.488	4	5.671	14	-.416	5	-1.748	5	0	1	-2.046	6
3	N18	max	.482	14	15.221	7	.552	15	2.384	7	0	1	2.076	4
4		min	-.482	12	9.126	13	-.553	13	-2.386	5	0	1	-2.073	6
5	N16	max	.477	14	14.9	5	.554	15	2.386	7	0	1	2.053	4
6		min	-.477	12	8.934	15	-.553	13	-2.384	5	0	1	-2.05	6
7	N17	max	.493	6	9.659	7	.416	7	1.748	7	0	1	2.073	4
8		min	-.493	4	5.789	14	-.414	5	-1.746	5	0	1	-2.069	6
9	Totals:	max	1.933	14	49.221	1	1.933	15						
10		min	-1.933	12	29.532	12	-1.933	13						

Envelope Joint Displacements

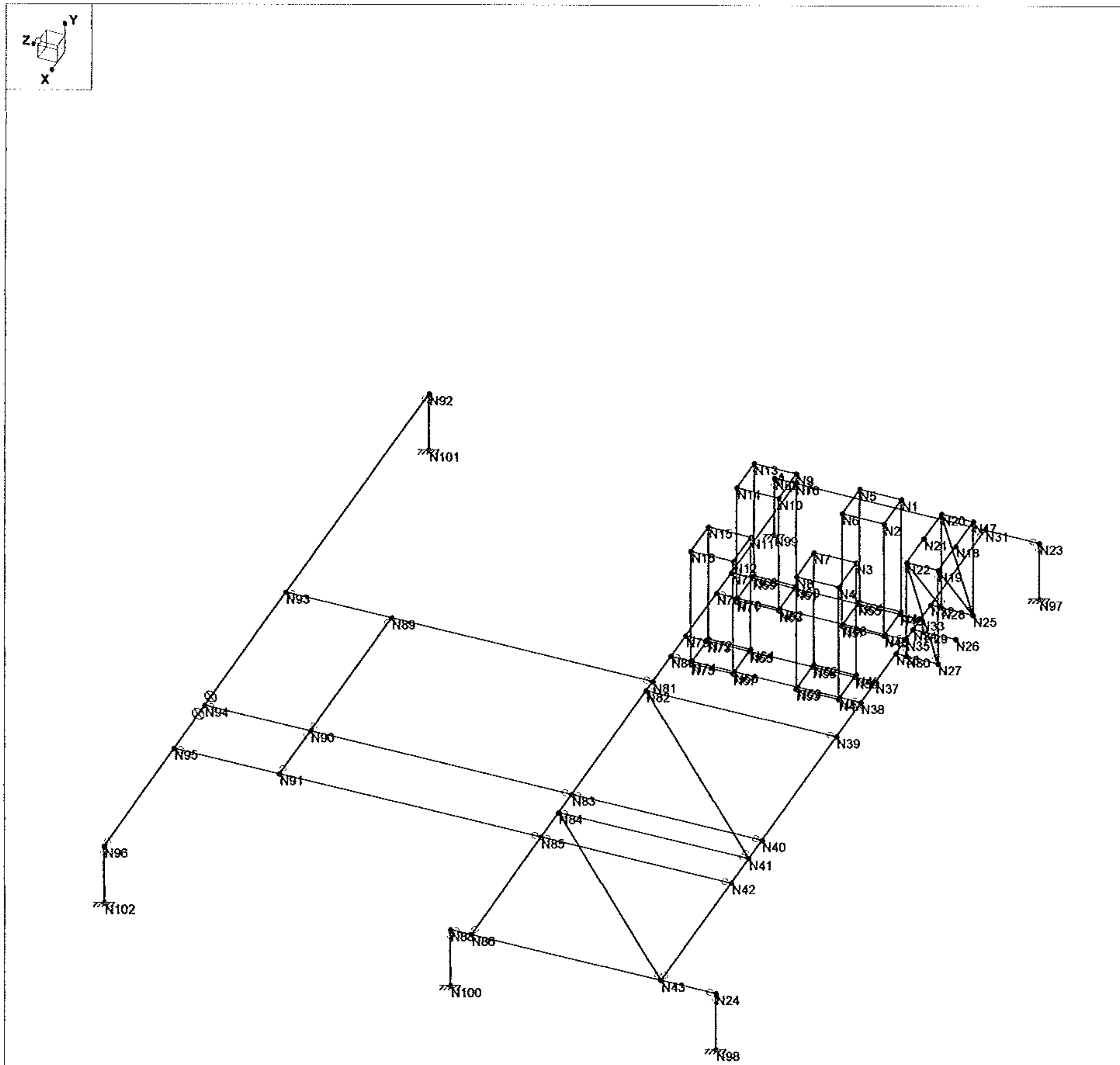
	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation ...	LC	Y Rotation ...	LC	Z Rotation [...	LC
1	N1	max	.08	4	-.002	14	.068	5	2.103e-3	5	0	1	2.461e-3	6
2		min	-.08	6	-.004	5	-.068	7	-2.106e-3	7	0	1	-2.47e-3	4
3	N2	max	.08	4	-.004	15	.093	5	2.868e-3	5	0	1	2.465e-3	6
4		min	-.08	6	-.006	5	-.093	7	-2.866e-3	7	0	1	-2.473e-3	4
5	N3	max	.081	4	-.148	14	.068	5	6.54e-4	5	9.29e-5	7	2.473e-3	6
6		min	-.081	6	-.247	4	-.068	7	3.921e-4	15	-9.29e-5	5	-2.482e-3	4
7	N4	max	.081	4	-.395	13	.078	5	1.019e-3	5	2.842e-4	7	-1.377e-3	13
8		min	-.081	6	-.658	7	-.078	7	3.397e-4	15	-2.842e-4	5	-2.297e-3	7
9	N5	max	.081	4	-.414	13	.085	5	1.052e-3	5	3.389e-4	7	-2.369e-4	15
10		min	-.081	6	-.691	7	-.085	7	3.427e-4	15	-3.389e-4	5	-3.961e-4	5
11	N6	max	.081	4	-.413	13	.089	5	1.053e-3	5	2.728e-4	7	1.038e-3	7
12		min	-.081	6	-.689	7	-.089	7	3.885e-4	15	-2.728e-4	5	6.21e-4	13
13	N7	max	.081	4	-.239	12	.093	5	1.055e-3	5	9.384e-5	7	2.477e-3	6
14		min	-.081	6	-.398	6	-.093	7	6.327e-4	15	-9.384e-5	5	-2.486e-3	4
15	N8	max	.081	4	-.147	14	.068	5	-4.618e-4	13	9.303e-5	7	2.476e-3	6
16		min	-.081	6	-.246	4	-.068	7	-7.701e-4	4	-9.303e-5	5	-2.485e-3	4
17	N9	max	.081	4	-.394	15	.078	5	-4.15e-4	13	2.837e-4	7	-1.375e-3	15
18		min	-.081	6	-.657	5	-.078	7	-1.16e-3	7	-2.837e-4	5	-2.293e-3	5
19	N10	max	.081	4	-.413	15	.085	5	-4.223e-4	13	3.382e-4	7	-2.349e-4	13
20		min	-.081	6	-.689	5	-.085	7	-1.201e-3	7	-3.382e-4	5	-3.928e-4	7
21	N11	max	.081	4	-.412	15	.089	5	-4.732e-4	13	2.723e-4	7	1.041e-3	5
22		min	-.081	6	-.687	5	-.089	7	-1.207e-3	7	-2.723e-4	5	6.228e-4	15
23	N12	max	.081	4	-.238	12	.093	5	-7.447e-4	13	9.389e-5	7	2.48e-3	6
24		min	-.081	6	-.396	6	-.093	7	-1.242e-3	7	-9.389e-5	5	-2.489e-3	4
25	N13	max	.081	4	-.002	14	.068	5	2.105e-3	5	0	1	2.488e-3	6
26		min	-.081	6	-.004	7	-.068	7	-2.104e-3	7	0	1	-2.496e-3	4
27	N14	max	.081	4	-.004	13	.093	5	2.866e-3	5	0	1	2.492e-3	6
28		min	-.081	6	-.007	7	-.093	7	-2.869e-3	7	0	1	-2.501e-3	4
29	N15	max	0	4	0	14	0	5	1.748e-020	5	0	1	2.046e-020	6
30		min	0	6	0	5	0	7	-1.746e-020	7	0	1	-2.05e-020	4
31	N16	max	0	12	0	15	0	13	2.384e-020	5	0	1	2.05e-020	6
32		min	0	14	0	5	0	15	-2.386e-020	7	0	1	-2.053e-020	4
33	N17	max	0	4	0	14	0	5	1.746e-020	5	0	1	2.069e-020	6
34		min	0	6	0	7	0	7	-1.748e-020	7	0	1	-2.073e-020	4
35	N18	max	0	12	0	13	0	13	2.386e-020	5	0	1	2.073e-020	6
36		min	0	14	0	7	0	15	-2.384e-020	7	0	1	-2.076e-020	4

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

	Member	Shape	Code Che...	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	.682	10	7	.222	16	y	7	190.271	314.731	38.263	129.162	1.044	H1-1b
8	M8	W12x50	.147	.75	4	.339	0	y	5	313.341	314.731	38.263	129.162	1.316	H1-1b
9	M9	W12x50	.682	10	5	.222	16	y	5	190.271	314.731	38.263	129.162	1.044	H1-1b
10	M10	W12x50	.465	6.798	4	.144	14.833	y	5	204.222	314.731	38.263	129.162	1.001	H1-1b
11	M11	W12x50	.750	6.798	6	.229	14.833	y	5	204.222	314.731	38.263	129.162	1.001	H1-1b
12	M12	HSS4x4x6	.228	0	4	.019	0	y	4	97.402	103.042	11.479	11.479	1.667	H1-1b
13	M13	HSS4x4x6	.305	0	5	.022	0	z	7	97.402	103.042	11.479	11.479	1.701	H1-1b
14	M14	HSS4x4x6	.231	0	4	.019	0	y	4	97.402	103.042	11.479	11.479	1.668	H1-1b
15	M15	HSS4x4x6	.306	0	7	.022	0	z	5	97.402	103.042	11.479	11.479	1.7	H1-1b

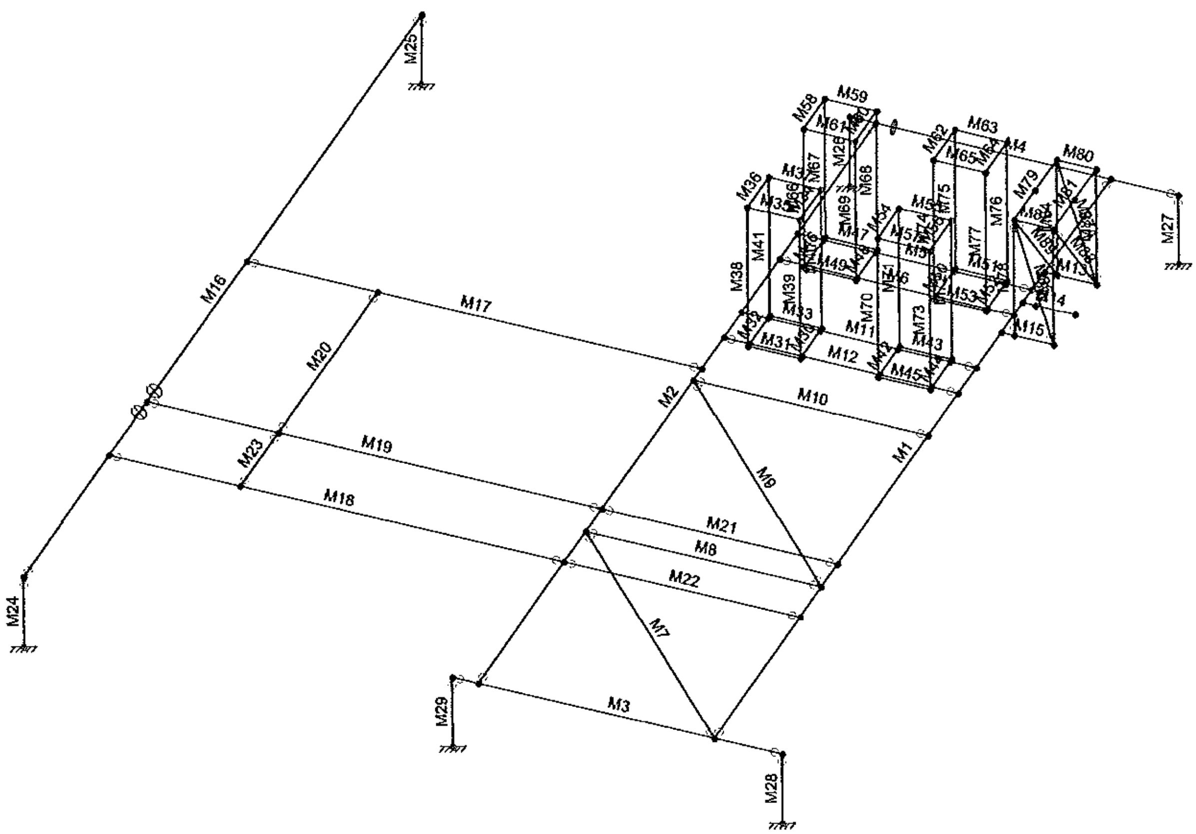
APPENDIX D

EQUIPMENT PLATFORM CALCULATIONS



Loads: BLC 1, Self Weight
Solution: Envelope

Ramaker & Associates, Inc.		SK - 1
TEM	University of Hartford (CT03XC078)	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
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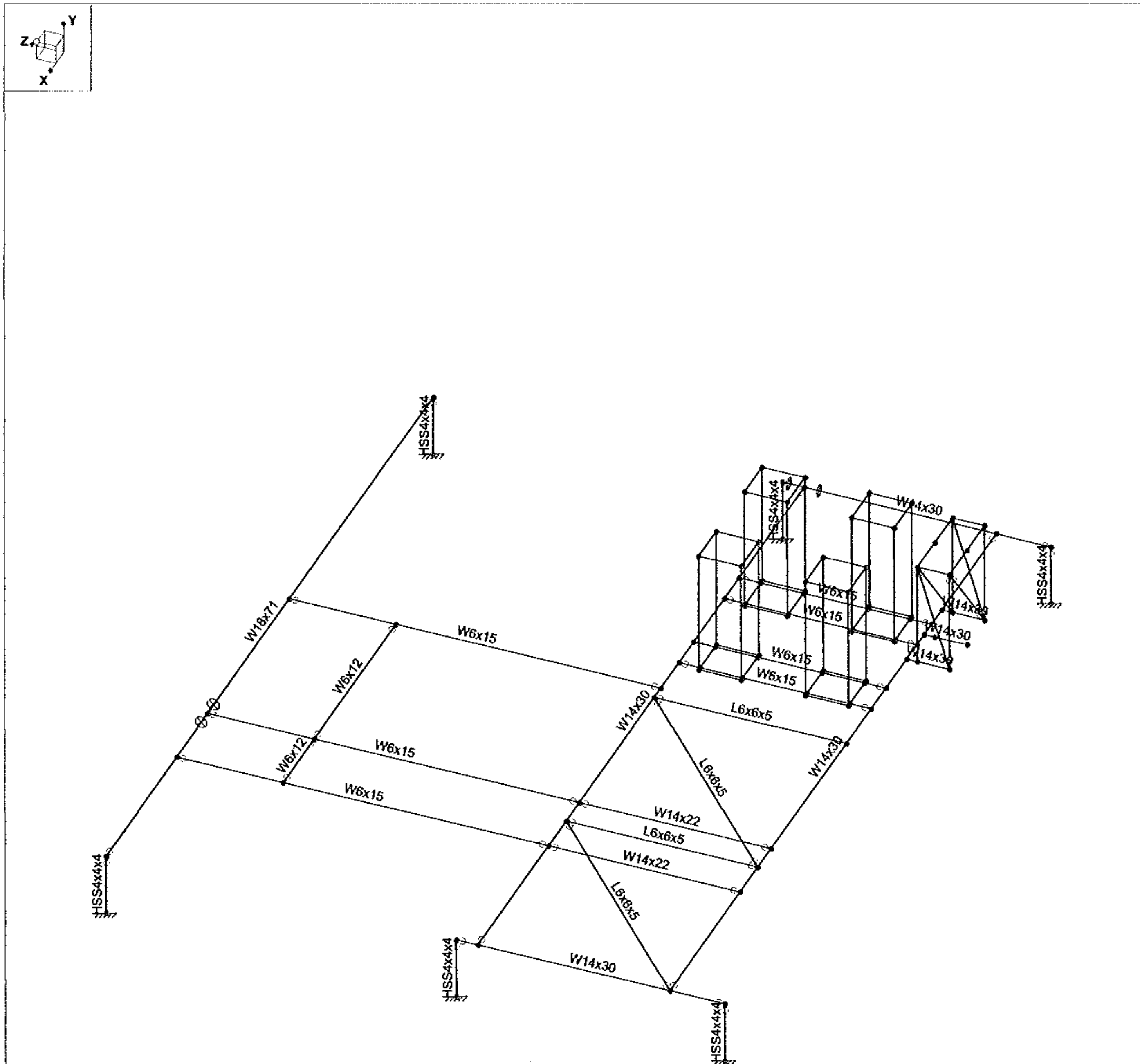

Loads: BLC 1, Self Weight
Solution: Envelope

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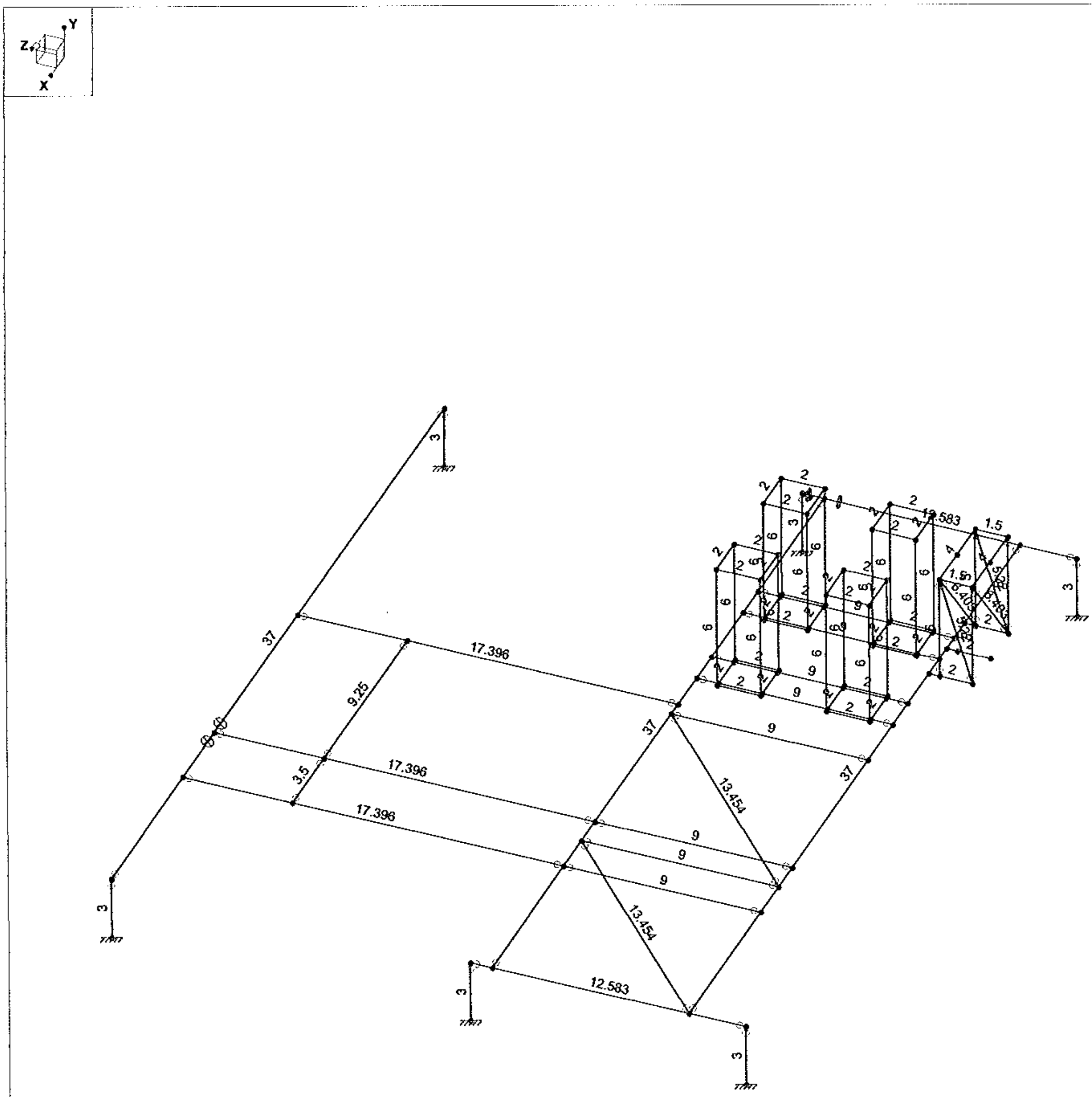

Member Length (ft) Displayed
Loads: BLC 1, Self Weight
Solution: Envelope

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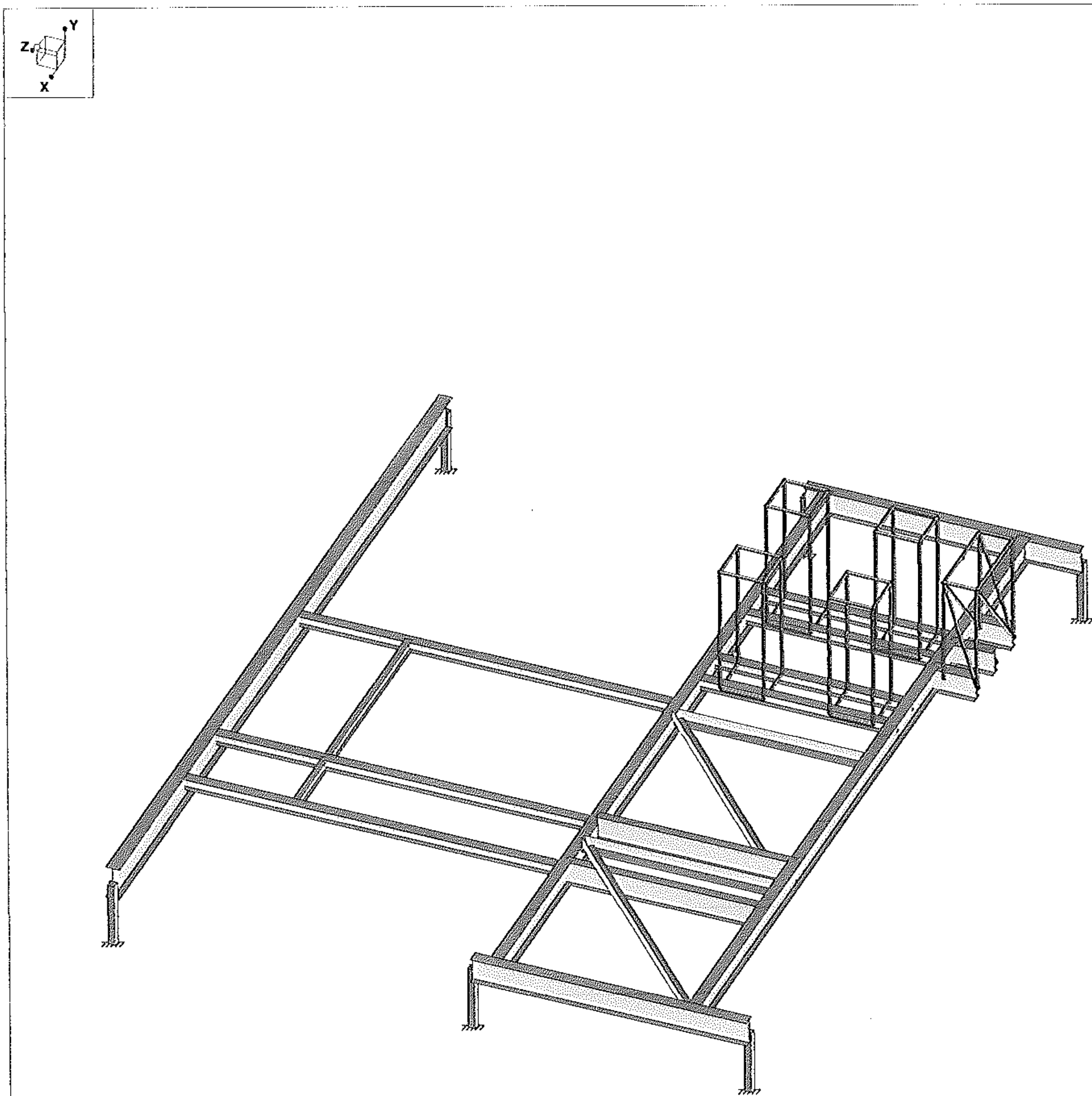

Solution: Envelope

Ramaker & Associates, Inc.	University of Hartford (CT03XC078)	SK - 5
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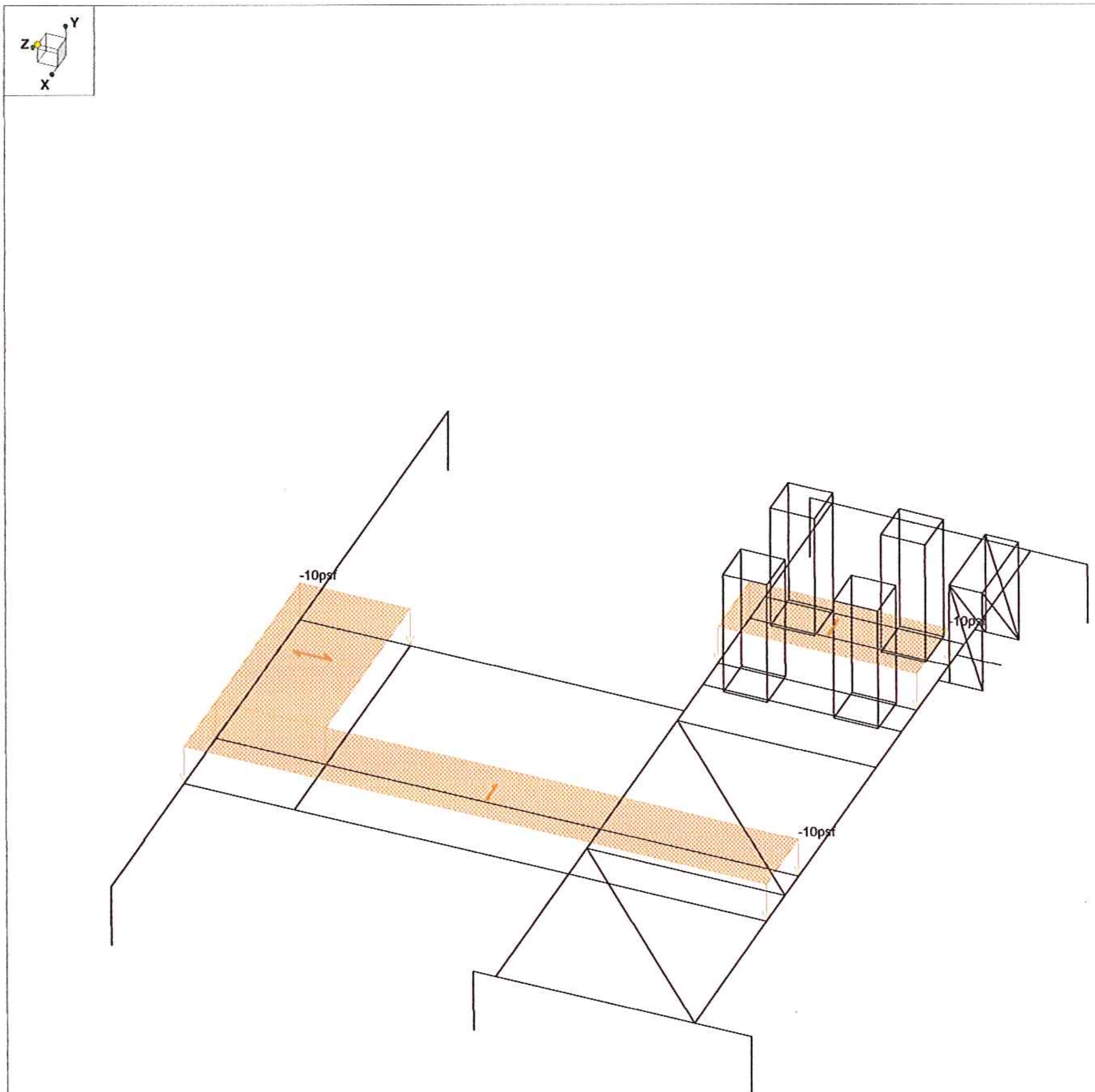

Loads: BLC 2, Grating
Solution: Envelope

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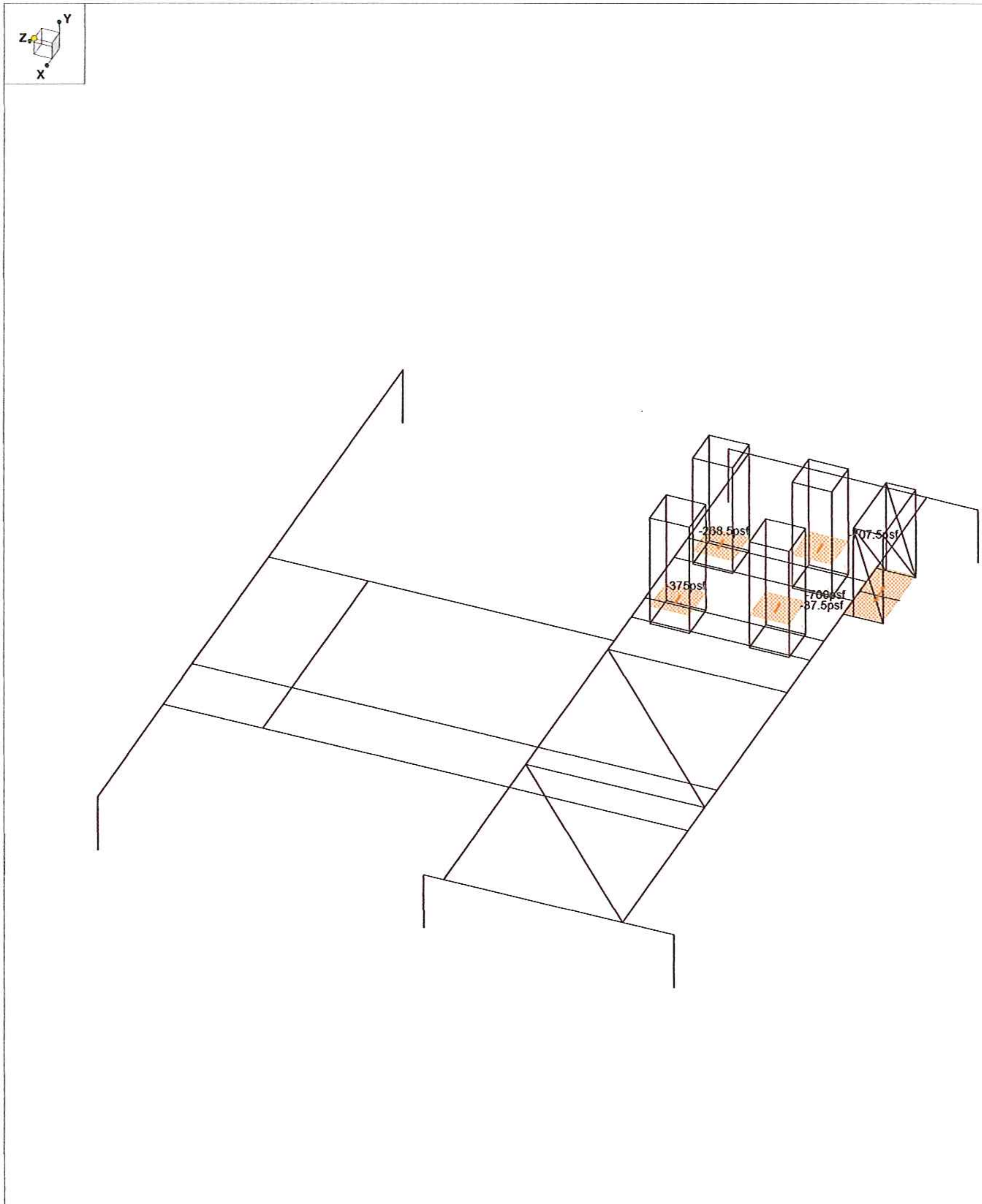

Loads: BLC 3, Cabinets
Solution: Envelope

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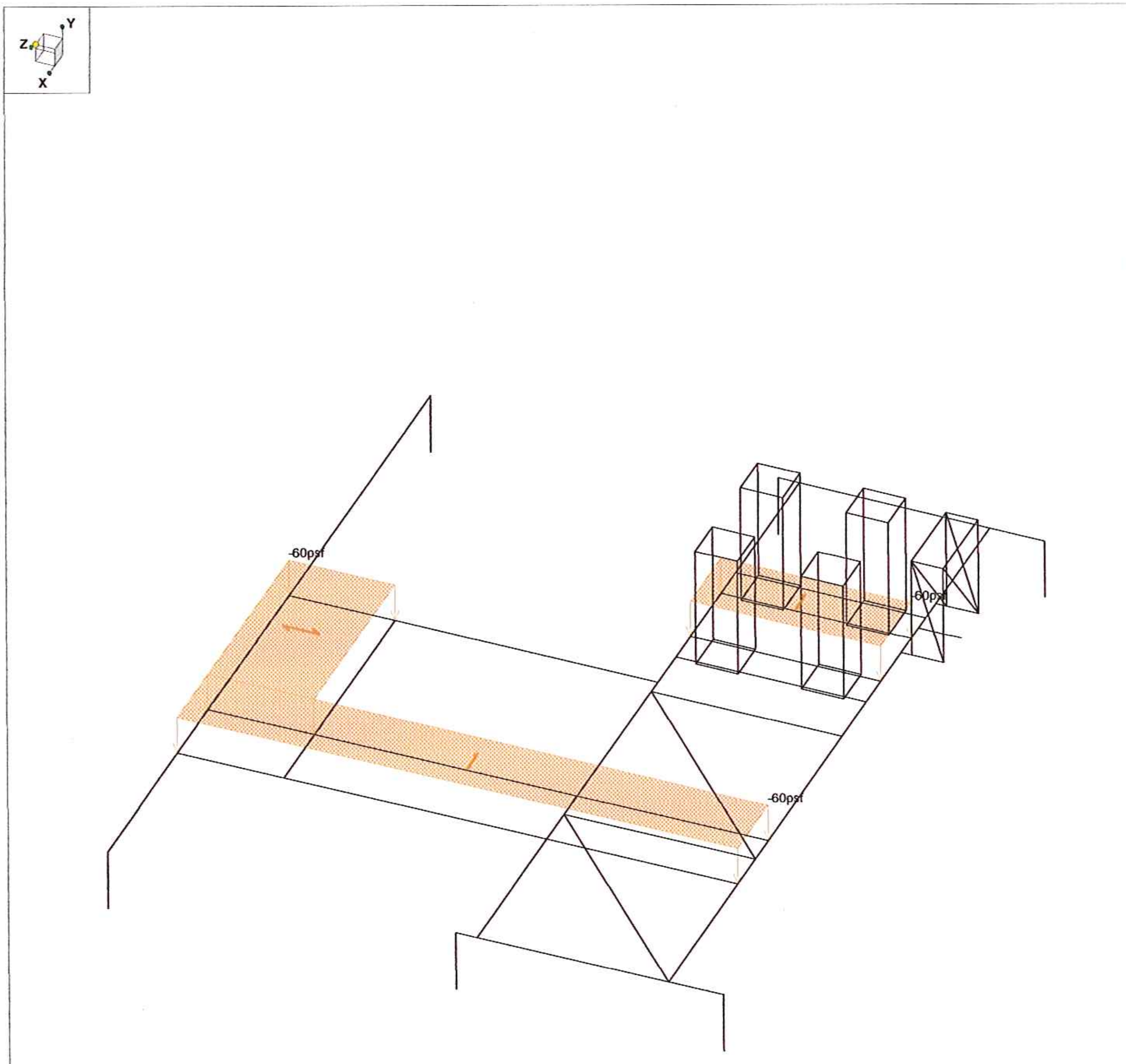
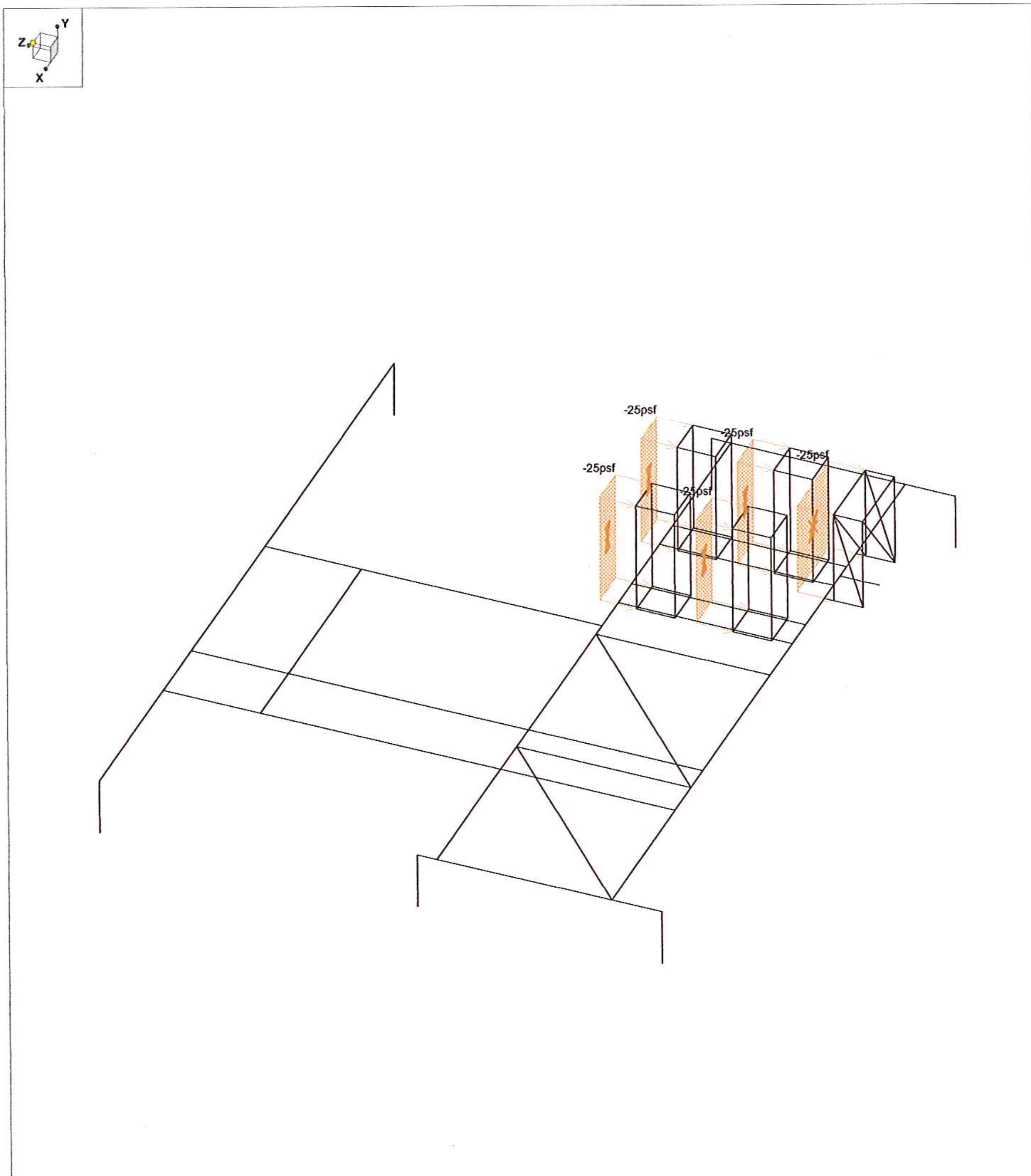


Loads: BLC 4, Live
Solution: Envelope

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.		SK - 9
TEM	University of Hartford (CT03XC078)	Sept 26, 2012 at 1:26 PM
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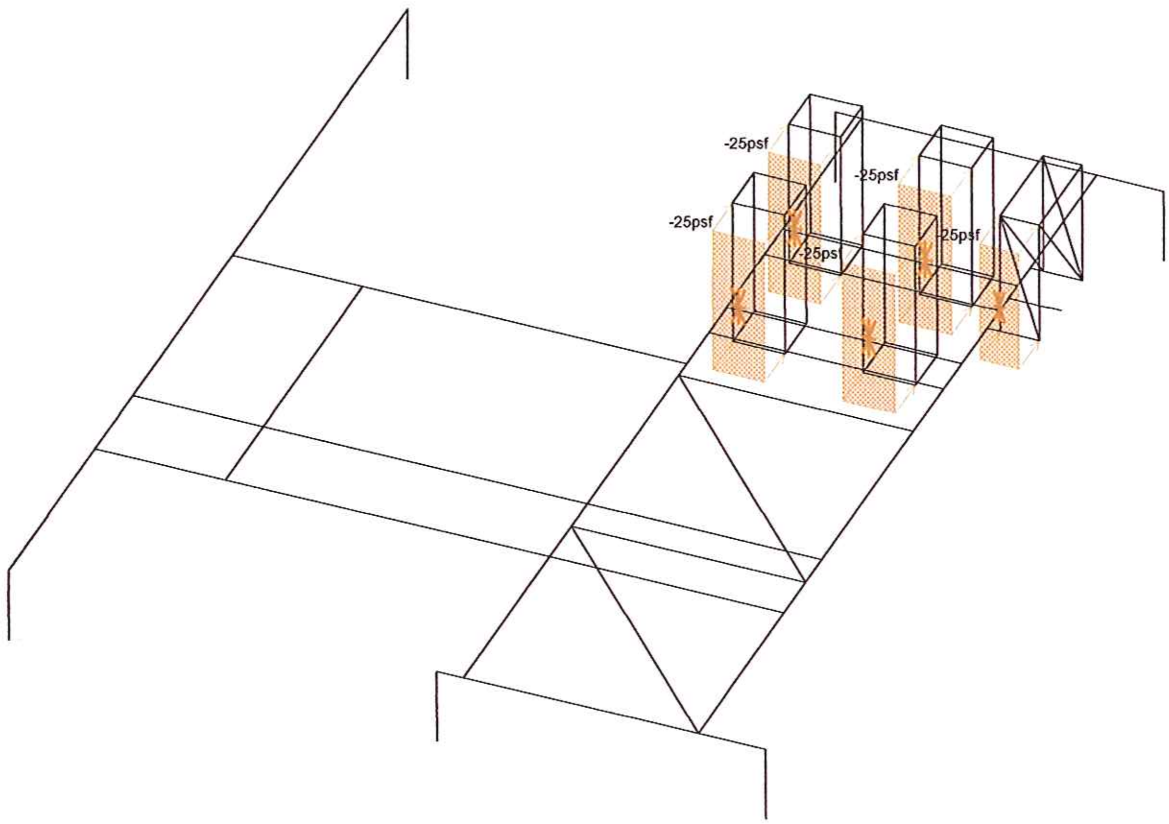

Loads: BLC 6, Wind X
Solution: Envelope

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	

Company : Ramaker & Associates, Inc.
Designer : TEM
Job Number : 22996

University of Hartford (CT03XC078)

Sept 26, 2012
1:27 PM
Checked By:_____

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

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RADIO FREQUENCY EMISSIONS ANALYSIS REPORT EVALUATION OF HUMAN EXPOSURE POTENTIAL TO NON-IONIZING EMISSIONS

Sprint Existing Facility

Site ID: CT03XC078

University of Hartford
202 Bloomfield Avenue
Hartford, CT 06117

July 1, 2014

EBI Project Number: 62143752

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

EBI Consulting
environmental | engineering | due diligence

July 1, 2014

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

Re: Emissions Values for Site: **CT03XC078 – University of Hartford**

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 emissions 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 is approximately 567 $\mu W/cm^2$, and the general population exposure limit for the PCS band 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 the main lobe of the antenna was focused at the base of the tower to present a worst case scenario. Actual values seen from this site will be dramatically less than those shown in this report. 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) 6 CDMA Carriers (1900 MHz) were considered for each sector of the proposed installation.
2) 1 CDMA Carrier (850 MHz) was considered for each sector of the proposed installation
3) 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.
4) For the following calculations the sample point was the top of a six foot person standing at the base of the tower. The actual gain in this direction was used per the manufactures supplied specifications.
5) The antenna used in this modeling is the APXVSPP18-C-A20. This is based on feedback from the carrier with regards to anticipated antenna selection. This antenna 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. All calculations were performed assuming the main lobe of the antenna was focused at the base of the tower to present a worst case scenario.

6) The antenna mounting height centerline of the proposed antennas is **134 feet** above ground level (AGL)
7) This facility does not appear in the Connecticut Siting Council active database for emissions values. This report includes emissions values from Sprint radio equipment exclusively.

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

Site ID	CT03XC078 - University of Hartford
Site Addresss	202 Bloomfield Avenue, 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 in direction of sample point (dBd)	Antenna Height (ft)	analysis height	Cable Size	Cable Loss (dB)	Additional Loss	ERP	Power Density Value	Power Density Percentage
1a	RFS	APXVSPP18-C-A20	RRH	1900 MHz	CDMA / LTE	20	6	120	15.9	134	128	1/2 "	0.5	0	4160.8422	91.29927	9.12993%
1a	RFS	APXVSPP18-C-A20	RRH	850 MHz	CDMA / LTE	20	1	20	13.4	134	128	1/2 "	0.5	0	389.96892	8.556892	1.50915%
												Sector total Power Density Value:			10.639%		

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 in direction of sample point (dBd)	Antenna Height (ft)	analysis height	Cable Size	Cable Loss (dB)	Additional Loss	ERP	Power Density Value	Power Density Percentage
2a	RFS	APXVSPP18-C-A20	RRH	1900 MHz	CDMA / LTE	20	6	120	15.9	134	128	1/2 "	0.5	0	4160.8422	91.29927	9.12993%
2a	RFS	APXVSPP18-C-A20	RRH	850 MHz	CDMA / LTE	20	1	20	13.4	134	128	1/2 "	0.5	0	389.96892	8.556892	1.50915%
												Sector total Power Density Value:			10.639%		

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 in direction of sample point (dBd)	Antenna Height (ft)	analysis height	Cable Size	Cable Loss (dB)	Additional Loss	ERP	Power Density Value	Power Density Percentage
3a	RFS	APXVSPP18-C-A20	RRH	1900 MHz	CDMA / LTE	20	6	120	15.9	134	128	1/2 "	0.5	0	4160.8422	91.29927	9.12993%
3a	RFS	APXVSPP18-C-A20	RRH	850 MHz	CDMA / LTE	20	1	20	13.4	134	128	1/2 "	0.5	0	389.96892	8.556892	1.50915%
												Sector total Power Density Value:			10.639%		

Site Composite MPE %	
Carrier	MPE %
Sprint	31.917%
Total Site MPE %	31.917%

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Summary

All calculations performed for this analysis yielded results that were well within the allowable limits for general public exposure to RF Emissions.

The anticipated Maximum Composite contributions from the Sprint facility are **31.917% (10.639% from each sector)** of the allowable FCC established general public limit considering all three sectors simultaneously sampled at the ground level.

This facility does not appear in the Connecticut Siting Council active database for emissions values. This report includes emissions values from Sprint radio equipment exclusively.

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

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