



STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

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VIA ELECTRONIC MAIL

October 29, 2018

Jeffrey Barbadora
Real Estate Specialist
Crown Castle
12 Gill Street, Suite 5800
Woburn, MA 01801

RE: **EM-SPRINT-154-181015** – Sprint notice of intent to modify an existing telecommunications facility located at 798 Toby Hill Road, Westbrook, Connecticut.

Dear Mr. Barbadora:

The Connecticut Siting Council (Council) is in receipt of your correspondence of October 26, 2018 submitted in response to the Council's October 15, 2018 notification of an incomplete request for exempt modification with regard to the above-referenced matter.

The submission renders the request for exempt modification complete and the Council will process the request in accordance with the Federal Communications Commission 60-day timeframe.

Thank you for your attention and cooperation.

Sincerely,

Melanie A. Bachman
Executive Director

MAB/FC/IN

Robidoux, Evan

From: Barbadora, Jeff <Jeff.Barbadora@crowncastle.com>
Sent: Friday, October 26, 2018 8:51 AM
To: Robidoux, Evan
Cc: CSC-DL Siting Council
Subject: RE: Council Incomplete Letter for EM-SPRINT-154-181015-TobyHillRd-Westbrook
Attachments: MA.pdf

Good morning,

Please find attached mouth analysis as requested in your October 15th correspondence.

Please let me know if hard copies of the analysis are needed to send to your office.

Thanks,

Jeffrey Barbadora
781-970-0053
12 Gill Street, Suite 5800, Woburn, MA 01801
CrownCastle.com

From: Robidoux, Evan
Sent: Wednesday, October 17, 2018 1:38 PM
To: Barbadora, Jeff
Cc: CSC-DL Siting Council
Subject: Council Incomplete Letter for EM-SPRINT-154-181015-TobyHillRd-Westbrook

Please see the attached correspondence.

Evan Robidoux
Clerk Typist
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

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Date: May 8, 2018
June 26, 2018 (Rev.1)

Charles McGuirt
Crown Castle
2000 Corporate Drive
Canonsburg, PA 15317
(724) 416-2000

Hudson Design Group LLC
45 Beechwood Drive
N. Andover, MA 01845
(978) 557-5553

Subject: Mount Structural Analysis

Carrier Designation: Sprint Equipment Change-Out
Carrier Site Number: CT33XC548
Carrier Site Name: WESTBROOK/ORSINA

Crown Castle Designation: **Crown Castle BU Number:** 876384
Crown Castle Site Name: WESTBROOK/ORSINA
Crown Castle JDE Number: 505984
Crown Castle PO Number: 1207318
Crown Castle Application Number: 441486 Rev. 0

Engineering Firm Designation: **Crown Castle Report Designation:** 3876043

Site Data: 798 Toby Hill Road, Westbrook, CT, 06498
Latitude: 41° 19' 12.60" Longitude: -72° 26' 30.00"

Structure Information: **Tower Height & Type:** 150 ft Monopole
Mount Elevation: 150 ft
Mount Width & Type: 12.5 ft Platform

Dear Charles McGuirt,

Hudson Design Group LLC (HDG) is pleased to submit this "Mount Structural Analysis Report" to determine the structural integrity of Sprint's antenna mounting system with the proposed appurtenance and equipment addition on the abovementioned supporting tower structure. Analysis of the existing supporting tower structure is to be completed by others and therefore is not part of this analysis. Analysis of the antenna mounting system as a tie-off point for fall protection or rigging is not part of this document.

Based upon our analysis, we have determined the adequacy of the antenna mounting system that will support the existing and proposed loading to be:

Platform Mount (Single)

Conditional

This analysis has been performed in accordance with the 2012 International Building Code and the TIA-222-G based on a basic wind speed of 120 mph as required for use in the TIA-222-G Standard Annex B. Exposure Category B with a maximum topographic factor, K_{zt} , of 1.0 and Risk Category II were used in this analysis.

We at HDG appreciate the opportunity of providing our continuing professional services to you and Crown Castle. If you have any questions or need further assistance on this or any other projects, please give us a call.

Mount structural analysis prepared by: HDG
Respectfully Submitted by:



Michael Cabral
Structural Dept. Head



Daniel P. Hamm, P.E.
Principal

TABLE OF CONTENTS

1) INTRODUCTION

2) ANALYSIS CRITERIA

Table 1 - Proposed Equipment Loading Information

Table 2 - Existing and Reserved Equipment Loading Information

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

3.1) Analysis Method

3.2) Assumptions

4) ANALYSIS RESULTS

Table 4 - Mount Component Stresses vs. Capacity

4.1) Recommendations

5) APPENDIX A

Wire Frame and Rendered Models

6) APPENDIX B

RAM Elements Input Calculations

7) APPENDIX C

RAM Elements Analysis Output

8) APPENDIX D

Additional Calculations

1) INTRODUCTION

This mount is a 12'-6" low profile platform by SitePro1, P/N RMQP-496. Fabrication drawings dated July 7, 2015 were available for the proposed mounts. The mount is installed at an elevation of 150 ft on the 150 ft Monopole.

2) ANALYSIS CRITERIA

The mount structural analysis was conducted in accordance with the requirements of TIA-222-G, Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a basic wind speed of 120 mph with no ice, 50 mph with a 1.75 inch escalated ice thickness, Exposure Category B and Topographic category 1 with a crest height of 0 ft. In addition, the mounts have been analyzed for various live loading conditions consisting of a 250 pound man live load applied individually at the midpoint and cantilevered ends of horizontal members as well as a 500 pound man live load applied individually at mount pipe locations using a 3-second gust wind speed of 30 mph.

Table 1 - Proposed Equipment Loading Information

Mount Centerline (ft)	Antenna Centerline (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Proposed Mount Type	Note
150	152	3	CommScope	NNVV-65B-R4	RMQP-496	1,2
	152	3	RFS/Celwave	APXVTM14-ALU-I20	RMQP-496	1,2
	152	3	Alcatel Lucent	TD-RRH 8x20-25	RMQP-496	1,2
	152	6	Alcatel Lucent	800MHz 2x50W RRH	RMQP-496	1,2
	152	3	Alcatel Lucent	PCS 1900MHZ 4X45W-65MHZ	RMQP-496	1,2

Notes:

- 1) Proposed Equipment
- 2) Existing Mount to be Removed

Table 2 - Existing and Reserved Equipment Loading Information

Mount Centerline (ft)	Antenna Centerline (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Existing Mount Type	Note
-	-	-	-	-	-	1

Notes:

- 1) Existing Equipment

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Reference	Source
RFDS	SPRINT	-	ON FILE

3.1) Analysis Method

RAM Elements (Version 14.0.1), a commercially available analysis software package, was used to create a three-dimensional model of the antenna mounting system and calculate member stresses for various loading cases.

3.2) Assumptions

- 1) The antenna mounting system was properly fabricated, installed and maintained in good condition in accordance with its original design and manufacturer's specifications.
- 2) The configuration of antennas, mounts, and other appurtenances are as specified in Table 1 and 2 and the referenced drawings.
- 3) All member connections are assumed to have been designed to meet or exceed the load carrying capacity of the connected member unless otherwise specified in this report.
- 4) Steel grades have been assumed as follows, unless noted otherwise:

Channel, Solid Round, Angle, Plate	ASTM A36 (GR 36)
HSS (Square, Rectangular)	ASTM A500 (GR B)
Pipe	ASTM A53 (GR 53)
Connection Bolts	ASTM A325

This analysis may be affected if any assumptions are not valid or have been made in error. Crown Castle should be notified to determine the effect on the structural integrity of the antenna mounting system.

4) ANALYSIS RESULTS

Table 4(a) - Mount Component Stresses vs. Capacity (Platform Mount, Alpha Sector)

Notes	Component	Member No.	Centerline (ft)	% Capacity	Pass / Fail
1	Face Horizontal	203	150	32	Pass
1	Standoff Members	199	150	53	Pass
2	Mount-to-Tower Connection	-	150	63	Pass

Table 4(b) - Mount Component Stresses vs. Capacity (Platform Mount, Beta Sector)

Notes	Component	Beam No.	Centerline (ft)	% Capacity	Pass / Fail
1	Face Horizontal	202	150	39	Pass
1	Standoff Members	198	150	50	Pass
2	Mount-to-Tower Connection	-	150	63	Pass

Table 4(c) - Mount Component Stresses vs. Capacity (Platform Mount, Gamma Sector)

Notes	Component	Beam No.	Centerline (ft)	% Capacity	Pass / Fail
1	Face Horizontal	201	150	38	Pass
1	Standoff Members	200	150	53	Pass
2	Mount-to-Tower Connection	-	150	63	Pass

Structure Rating (max from all components) =	90%
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Notes:

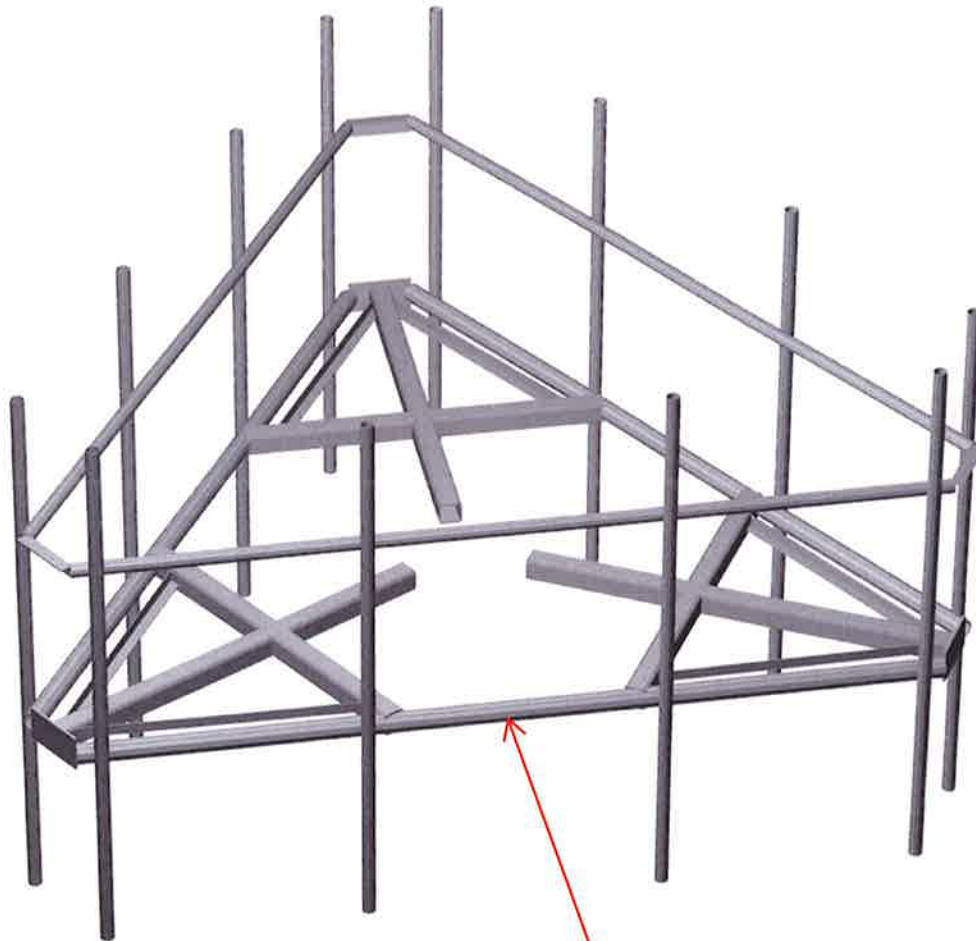
- 1) See additional documentation in "Appendix C – Analysis Output" for calculations supporting the % Capacity consumed.
- 2) See additional documentation in "Appendix D – Additional Calculations" for calculations supporting the % capacity consumed.

4.1) Recommendations

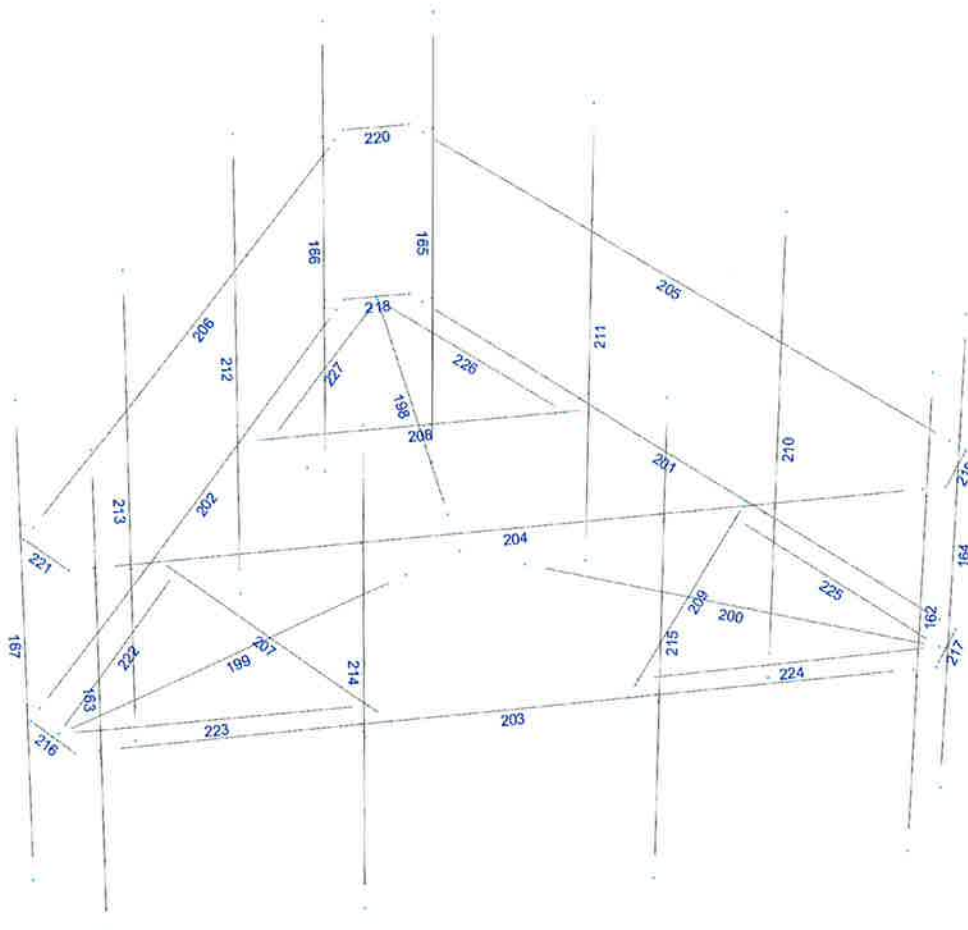
The mount has insufficient capacity to support the proposed loading with the following modifications:

- **Install new 12'-6" Low Profile Platform by SitePro1, P/N RMQP-496 (or approved equal).**

APPENDIX A
WIRE FRAME AND RENDERED MODELS



INSTALL NEW 12'-6" LOW
PROFILE PLATFORM BY
SITEPRO1, P/N RMQP-496
(OR APPROVED EQUAL).



APPENDIX B
RAM ELEMENTS INPUT CALCULATIONS

Date: 6/26/2018
 Project Name: WESTBROOK/ORSINA
 Project Number: 876384
 Designed By: JN Checked By: MSC



2.6.7 Gust Effect Factor

2.6.7.1 Self Supporting Lattice Structures

Gh = 1.0 Latticed Structures > 600 ft

Gh = 0.85 Latticed Structures 450 ft or less

Gh = 0.85 + 0.15 [h/150 - 3.0] h= ht. of structure

h= 150

Gh= 0.85

2.6.7.2 Guyed Masts

Gh= 0.85

2.6.7.3 Pole Structures

Gh= 1.1

2.6.9 Appurtenances

Gh= 1.0

2.6.7.4 Structures Supported on Other Structures

(Cantilivered tubular or latticed spines, pole, structures on buildings (ht. : width ratio > 5)

Gh= 1.35

Gh= 1.00

2.6.9.2 Design Wind Force on Appurtenances

$F = q_z * Gh * (EPA)_A$

$q_z = 0.00256 * K_z * K_{zt} * K_d * V_{max}^2 * I$

q_z = 39.01

q_{z (ice)} = 6.77

q_{z (30)} = 2.44

K_z = 1.114

K_{zt} = 1.0

K_d = 0.95

V_{max} = 120 mph

V_{max (ice)} = 50 mph

V₃₀ = 30 mph

I = 1.0

Table 2-2

Structure Type	Wind Direction Probability Factor, Kd
Latticed structures with triangular, square or rectangular cross sections	0.85
Tubular pole structures, latticed structures with other cross sections, appurtenances	0.95

Determine Ca:

Table 2-8

Force Coefficients (Ca) for Appurtenances				
Member Type		Aspect Ratio ≤ 2.5	Aspect Ratio = 7	Aspect Ratio ≥ 25
		Ca	Ca	Ca
Flat		1.2	1.4	2.0
Round	C < 32 (Subcritical)	0.7	0.8	1.2
	32 ≤ C ≤ 64 (Transitional)	3.76/(C ^{0.485})	3.37/(C ^{0.415})	38.4/(C ^{1.0})
	C > 64 (Supercritical)	0.5	0.6	0.6

Aspect Ratio is the overall length/width ratio in the plane normal to the wind direction.
 (Aspect ratio is independent of the spacing between support points of a linear appurtenance,
 Note: Linear interpolation may be used for aspect ratios other than those shown.

Ice Thickness = 1.75 in Angle = 0 (deg) Equivalent Angle = 180 (deg)

Appurtenances	Height	Width	Depth	Flat Area	Aspect Ratio	Ca	Force (lbs)	Force (lbs) (w/ Ice)	Force (lbs) (30 mph)
NNVV-65B-R4 Antenna	72.0	19.6	7.8	9.80	3.67	1.25	479	103	30
APXVTM14-ALU-I20 Antenna	56.3	12.6	6.3	4.93	4.47	1.29	247	58	15
800MHz 2x50W RRH	15.8	13.0	14.0	1.43	1.22	1.20	67	18	4
800MHz 2x50W RRH (Shielded)	15.8	0.4	14.0	0.04	39.50	2.48	4	9	0
PCS 1900MHz 4x45W RRH	25.0	11.1	11.4	1.93	2.25	1.20	90	23	6
TD-RRH 8x20-25	26.1	18.6	6.7	3.37	1.40	1.20	158	37	10

Date: 6/26/2018
 Project Name: WESTBROOK/ORSINA
 Project Number: 876384
 Designed By: JN Checked By: MSC



WIND LOADS

Angle = 30 (deg) Ice Thickness = 1.75 in. Equivalent Angle = 210 (deg)

WIND LOADS WITH NO ICE:

Appurtenances	Height	Width	Depth	Flat Area [normal]	Flat Area [side]	Aspect Ratio	Aspect Ratio	Ca (normal)	Ca [side]	Force [lbs]	Force [lbs]	Force [lbs]
NNVV-65B-R4 Antenna	72.0	19.6	7.8	9.80	3.90	3.67	9.23	1.25	1.47	479	224	415
APXVTM14-ALU-I20 Antenna	56.3	12.6	6.3	4.93	2.46	4.47	8.94	1.29	1.46	247	141	221
800MHz 2x50W RRH	15.8	13.0	14.0	1.43	1.54	1.22	1.13	1.20	1.20	67	72	68
800MHZ 2X50W RRH (Shielded)	15.8	6.5	14.0	0.71	1.54	2.43	1.13	1.20	1.20	33	72	43
PCS 1900MHz 4x45W RRH	25.0	11.1	11.4	1.93	1.98	2.25	2.19	1.20	1.20	90	93	91
PCS 1900MHZ 4X45W RRH (Shielded)	25.0	5.6	11.4	0.97	1.98	4.46	2.19	1.29	1.20	49	93	60
TD-RRH 8x20-25	26.1	18.6	6.7	3.37	1.21	1.40	3.90	1.20	1.26	158	60	133
TD-RRH 8x20-25 (Shielded)	26.1	9.3	6.7	1.69	1.21	2.81	3.90	1.21	1.26	80	60	75

WIND LOADS WITH ICE:

NNVV-65B-R4 Antenna	75.5	23.1	11.3	12.11	5.92	3.27	6.68	1.23	1.39	101	56	90
APXVTM14-ALU-I20 Antenna	59.8	16.1	9.8	6.68	4.07	3.72	6.10	1.25	1.36	57	37	52
800MHz 2x50W RRH	19.3	18.2	17.5	2.44	2.34	1.06	1.10	1.20	1.20	20	19	20
800MHZ 2X50W RRH (Shielded)	19.3	9.1	17.5	1.22	2.34	2.12	1.10	1.20	1.20	10	19	12
PCS 1900MHz 4x45W RRH	28.5	16.3	14.9	3.23	2.95	1.75	1.91	1.20	1.20	26	24	26
PCS 1900MHZ 4X45W RRH (Shielded)	30.2	8.2	16.6	1.72	3.48	3.68	1.82	1.25	1.20	15	28	18
TD-RRH 8x20-25	31.3	23.8	11.9	5.17	2.59	1.32	2.63	1.20	1.21	42	21	37
TD-RRH 8x20-25 (Shielded)	31.3	11.9	11.9	2.59	2.59	2.63	2.63	1.21	1.21	21	21	21

WIND LOADS AT 30 MPH:

NNVV-65B-R4 Antenna	72.0	19.6	7.8	9.80	3.90	3.67	9.23	1.25	1.47	30	14	26
APXVTM14-ALU-I20 Antenna	56.3	12.6	6.3	4.93	2.46	4.47	8.94	1.29	1.46	15	9	14
800MHz 2x50W RRH	15.8	13.0	14.0	1.43	1.54	1.22	1.13	1.20	1.20	4	4	4
800MHZ 2X50W RRH (Shielded)	15.8	6.5	14.0	0.71	1.54	2.43	1.13	1.20	1.20	2	4	3
PCS 1900MHz 4x45W RRH	25.0	11.1	11.4	1.93	1.98	2.25	2.19	1.20	1.20	6	6	6
PCS 1900MHZ 4X45W RRH (Shielded)	25.0	5.6	11.4	0.97	1.98	4.46	2.19	1.29	1.20	3	6	4
TD-RRH 8x20-25	26.1	18.6	6.7	3.37	1.21	1.40	3.90	1.20	1.26	10	4	8
TD-RRH 8x20-25 (Shielded)	26.1	9.3	6.7	1.69	1.21	2.81	3.90	1.21	1.26	5	4	5

Date: 6/26/2018
 Project Name: WESTBROOK/ORSINA
 Project Number: 876384
 Designed By: JN Checked By: MSC



WIND LOADS

Angle = 60 (deg)

Ice Thickness = 1.75 in.

Equivalent Angle = 240 (deg)

WIND LOADS WITH NO ICE:

Appurtenances	Height	Width	Depth	Flat Area (normal)	Flat Area (side)	Ratio (normal)	Ratio (side)	Ca (normal)	Ca (side)	Force (lbs) (normal)	Force (lbs) (side)	Force (lbs) (angle)
NNVV-65B-R4 Antenna	72.0	19.6	7.8	9.80	3.90	3.67	9.23	1.25	1.47	479	224	288
APXVTM14-ALU-I20 Antenna	56.3	12.6	6.3	4.93	2.46	4.47	8.94	1.29	1.46	247	141	167
800MHz 2x50W RRH	15.8	13.0	14.0	1.43	1.54	1.22	1.13	1.20	1.20	67	72	71
800MHZ 2X50W RRH (Shielded)	15.8	9.8	14.0	1.08	1.54	1.61	1.13	1.20	1.20	50	72	67
PCS 1900MHz 4x45W RRH	25.0	11.1	11.4	1.93	1.98	2.25	2.19	1.20	1.20	90	93	92
PCS 1900MHZ 4X45W RRH (Shielded)	25.0	8.3	11.4	1.44	1.98	3.01	2.19	1.22	1.20	69	93	87
TD-RRH 8x20-25	26.1	18.6	6.7	3.37	1.21	1.40	3.90	1.20	1.26	158	60	84
TD-RRH 8x20-25 (Shielded)	26.1	14.0	6.7	2.54	1.21	1.86	3.90	1.20	1.26	119	60	75

WIND LOADS WITH ICE:

NNVV-65B-R4 Antenna	75.5	23.1	11.3	12.11	5.92	3.27	6.68	1.23	1.39	101	56	67
APXVTM14-ALU-I20 Antenna	59.8	16.1	9.8	6.68	4.07	3.72	6.10	1.25	1.36	57	37	42
800MHz 2x50W RRH	19.3	18.2	17.5	2.44	2.34	1.06	1.10	1.20	1.20	20	19	19
800MHZ 2X50W RRH (Shielded)	19.3	13.7	17.5	1.84	2.34	1.41	1.10	1.20	1.20	15	19	18
PCS 1900MHz 4x45W RRH	28.5	16.3	14.9	3.23	2.95	1.75	1.91	1.20	1.20	26	24	25
PCS 1900MHZ 4X45W RRH (Shielded)	30.2	12.3	16.6	2.58	3.48	2.46	1.82	1.20	1.20	21	28	26
TD-RRH 8x20-25	31.3	23.8	11.9	5.17	2.59	1.32	2.63	1.20	1.21	42	21	26
TD-RRH 8x20-25 (Shielded)	31.3	17.9	11.9	3.89	2.59	1.75	2.63	1.20	1.21	32	21	24

WIND LOADS AT 30 MPH:

NNVV-65B-R4 Antenna	72.0	19.6	7.8	9.80	3.90	3.67	9.23	1.25	1.47	30	14	18
APXVTM14-ALU-I20 Antenna	56.3	12.6	6.3	4.93	2.46	4.47	8.94	1.29	1.46	15	9	10
800MHz 2x50W RRH	15.8	13.0	14.0	1.43	1.54	1.22	1.13	1.20	1.20	4	4	4
800MHZ 2X50W RRH (Shielded)	15.8	9.8	14.0	1.08	1.54	1.61	1.13	1.20	1.20	3	4	4
PCS 1900MHz 4x45W RRH	25.0	11.1	11.4	1.93	1.98	2.25	2.19	1.20	1.20	6	6	6
PCS 1900MHZ 4X45W RRH (Shielded)	25.0	8.3	11.4	1.44	1.98	3.01	2.19	1.22	1.20	4	6	5
TD-RRH 8x20-25	26.1	18.6	6.7	3.37	1.21	1.40	3.90	1.20	1.26	10	4	5
TD-RRH 8x20-25 (Shielded)	26.1	14.0	6.7	2.54	1.21	1.86	3.90	1.20	1.26	7	4	5

Date: 6/26/2018

Project Name: WESTBROOK/ORSINA

Project Number: 876384

Designed By: JN Checked By: MSC



WIND LOADS

Angle = 90 (deg)

Ice Thickness = 1.75 in.

Equivalent Angle = 270 (deg)

WIND LOADS WITH NO ICE:

Appurtenances	Height	Width	Depth	Flat Area (normal)	Flat Area (side)	Ratio (normal)	Ratio (side)	Ca (normal)	Ca (side)	Force (lbs) (normal)	Force (lbs) (side)	Force (lbs) (angle)
NNVV-65B-R4 Antenna	72.0	19.6	7.8	9.80	3.90	3.67	9.23	1.25	1.47	479	224	224
APXVTM14-ALU-I20 Antenna	56.3	12.6	6.3	4.93	2.46	4.47	8.94	1.29	1.46	247	141	141
800MHz 2x50W RRH	15.8	13.0	14.0	1.43	1.54	1.22	1.13	1.20	1.20	67	72	72
PCS 1900MHz 4x45W RRH	25.0	11.1	11.4	1.93	1.98	2.25	2.19	1.20	1.20	90	93	93
TD-RRH 8x20-25	26.1	18.6	6.7	3.37	1.21	1.40	3.90	1.20	1.26	158	60	60

WIND LOADS WITH ICE:

NNVV-65B-R4 Antenna	75.5	23.1	11.3	12.11	5.92	3.27	6.68	1.23	1.39	101	56	56
APXVTM14-ALU-I20 Antenna	59.8	16.1	9.8	6.68	4.07	3.72	6.10	1.25	1.36	57	37	37
800MHz 2x50W RRH	20.4	17.6	16.0	2.49	2.27	1.16	1.28	1.20	1.20	20	18	18
PCS 1900MHz 4x45W RRH	29.6	15.7	16.0	3.23	3.29	1.89	1.85	1.20	1.20	26	27	27
TD-RRH 8x20-25	31.3	23.8	11.9	5.17	2.59	1.32	2.63	1.20	1.21	42	21	21

WIND LOADS AT 30 MPH:

NNVV-65B-R4 Antenna	72.0	19.6	7.8	9.80	3.90	3.67	9.23	1.25	1.47	30	14	14
APXVTM14-ALU-I20 Antenna	56.3	12.6	6.3	4.93	2.46	4.47	8.94	1.29	1.46	15	9	9
800MHz 2x50W RRH	15.8	13.0	14.0	1.43	1.54	1.22	1.13	1.20	1.20	4	4	4
PCS 1900MHz 4x45W RRH	25.0	11.1	11.4	1.93	1.98	2.25	2.19	1.20	1.20	6	6	6
TD-RRH 8x20-25	26.1	18.6	6.7	3.37	1.21	1.40	3.90	1.20	1.26	10	4	4

Date: 6/26/2018
 Project Name: WESTBROOK/ORSINA
 Project Number: 874384
 Designed By: JN Checked By: MSC



WIND LOADS

Angle = 120 (deg)

Ice Thickness = 1.75 in.

Equivalent Angle = 300 (deg)

WIND LOADS WITH NO ICE:

Appurtenances	Height	Width	Depth	Flat Area (normal)	Flat Area (side)	Ratio (normal)	Ratio (side)	Ca (normal)	Ca (side)	Force (lbs) (normal)	Force (lbs) (side)	Force (lbs) (angle)
NNVV-65B-R4 Antenna	72.0	19.6	7.8	9.80	3.90	3.67	9.23	1.25	1.47	479	224	288
APXVTM14-ALU-I20 Antenna	56.3	12.6	6.3	4.93	2.46	4.47	8.94	1.29	1.46	247	141	167
800MHz 2x50W RRH	15.8	13.0	14.0	1.43	1.54	1.22	1.13	1.20	1.20	67	72	71
800MHZ 2X50W RRH (Shielded)	15.8	9.8	14.0	1.08	1.54	1.61	1.13	1.20	1.20	50	72	67
PCS 1900MHz 4x45W RRH	25.0	11.1	11.4	1.93	1.98	2.25	2.19	1.20	1.20	90	93	92
PCS 1900MHZ 4X45W RRH (Shielded)	25.0	8.3	11.4	1.44	1.98	3.01	2.19	1.22	1.20	69	93	87
TD-RRH 8x20-25	26.1	18.6	6.7	3.37	1.21	1.40	3.90	1.20	1.26	158	60	84
TD-RRH 8x20-25 (Shielded)	26.1	14.0	6.7	2.54	1.21	1.86	3.90	1.20	1.26	119	60	75

WIND LOADS WITH ICE:

NNVV-65B-R4 Antenna	75.5	23.1	11.3	12.11	5.92	3.27	6.68	1.23	1.39	101	56	67
APXVTM14-ALU-I20 Antenna	59.8	16.1	9.8	6.68	4.07	3.72	6.10	1.25	1.36	57	37	42
800MHz 2x50W RRH	19.3	18.2	17.5	2.44	2.34	1.06	1.10	1.20	1.20	20	19	19
800MHZ 2X50W RRH (Shielded)	19.3	13.7	17.5	1.84	2.34	1.41	1.10	1.20	1.20	15	19	18
PCS 1900MHz 4x45W RRH	28.5	16.3	14.9	3.23	2.95	1.75	1.91	1.20	1.20	26	24	25
PCS 1900MHZ 4X45W RRH (Shielded)	30.2	12.3	16.6	2.58	3.48	2.46	1.82	1.20	1.20	21	28	26
TD-RRH 8x20-25	31.3	23.8	11.9	5.17	2.59	1.32	2.63	1.20	1.21	42	21	26
TD-RRH 8x20-25 (Shielded)	31.3	17.9	11.9	3.89	2.59	1.75	2.63	1.20	1.21	32	21	24

WIND LOADS AT 30 MPH:

NNVV-65B-R4 Antenna	72.0	19.6	7.8	9.80	3.90	3.67	9.23	1.25	1.47	30	14	18
APXVTM14-ALU-I20 Antenna	56.3	12.6	6.3	4.93	2.46	4.47	8.94	1.29	1.46	15	9	10
800MHz 2x50W RRH	15.8	13.0	14.0	1.43	1.54	1.22	1.13	1.20	1.20	4	4	4
800MHZ 2X50W RRH (Shielded)	15.8	9.8	14.0	1.08	1.54	1.61	1.13	1.20	1.20	3	4	4
PCS 1900MHz 4x45W RRH	25.0	11.1	11.4	1.93	1.98	2.25	2.19	1.20	1.20	6	6	6
PCS 1900MHZ 4X45W RRH (Shielded)	25.0	8.3	11.4	1.44	1.98	3.01	2.19	1.22	1.20	4	6	5
TD-RRH 8x20-25	26.1	18.6	6.7	3.37	1.21	1.40	3.90	1.20	1.26	10	4	5
TD-RRH 8x20-25 (Shielded)	26.1	14.0	6.7	2.54	1.21	1.86	3.90	1.20	1.26	7	4	5

Date: 6/26/2018
 Project Name: WESTBROOK/ORSINA
 Project Number: 876384
 Designed By: JN Checked By: MSC



WIND LOADS

Angle = 150 (deg)

Ice Thickness = 1.75 in.

Equivalent Angle = 330 (deg)

WIND LOADS WITH NO ICE:

Appurtenances	Height	Width	Depth	Flat Area (normal)	Flat Area (side)	Ratio (normal)	Ratio (side)	Ca (normal)	Ca (side)	Force (lbs) (normal)	Force (lbs) (side)	Force (lbs) (angle)
NNVV-65B-R4 Antenna	72.0	19.6	7.8	9.80	3.90	3.67	9.23	1.25	1.47	479	224	415
APXVTM14-ALU-I20 Antenna	56.3	12.6	6.3	4.93	2.46	4.47	8.94	1.29	1.46	247	141	221
800MHz 2x50W RRH	15.8	13.0	14.0	1.43	1.54	1.22	1.13	1.20	1.20	67	72	68
800MHZ 2X50W RRH (Shielded)	15.8	6.5	14.0	0.71	1.54	2.43	1.13	1.20	1.20	33	72	43
PCS 1900MHz 4x45W RRH	25.0	11.1	11.4	1.93	1.98	2.25	2.19	1.20	1.20	90	93	91
PCS 1900MHZ 4X45W RRH (Shielded)	25.0	5.6	11.4	0.97	1.98	4.46	2.19	1.29	1.20	49	93	60
TD-RRH 8x20-25	26.1	18.6	6.7	3.37	1.21	1.40	3.90	1.20	1.26	158	60	133
TD-RRH 8x20-25 (Shielded)	26.1	9.3	6.7	1.69	1.21	2.81	3.90	1.21	1.26	80	60	75

WIND LOADS WITH ICE:

NNVV-65B-R4 Antenna	75.5	23.1	11.3	12.11	5.92	3.27	6.68	1.23	1.39	101	56	90
APXVTM14-ALU-I20 Antenna	59.8	16.1	9.8	6.68	4.07	3.72	6.10	1.25	1.36	57	37	52
800MHz 2x50W RRH	19.3	18.2	17.5	2.44	2.34	1.06	1.10	1.20	1.20	20	19	20
800MHZ 2X50W RRH (Shielded)	19.3	9.1	17.5	1.22	2.34	2.12	1.10	1.20	1.20	10	19	12
PCS 1900MHz 4x45W RRH	28.5	16.3	14.9	3.23	2.95	1.75	1.91	1.20	1.20	26	24	26
PCS 1900MHZ 4X45W RRH (Shielded)	30.2	8.2	16.6	1.72	3.48	3.68	1.82	1.25	1.20	15	28	18
TD-RRH 8x20-25	31.3	23.8	11.9	5.17	2.59	1.32	2.63	1.20	1.21	42	21	37
TD-RRH 8x20-25 (Shielded)	31.3	11.9	11.9	2.59	2.59	2.63	2.63	1.21	1.21	21	21	21

WIND LOADS AT 30 MPH:

NNVV-65B-R4 Antenna	72.0	19.6	7.8	9.80	3.90	3.67	9.23	1.25	1.47	30	14	26
APXVTM14-ALU-I20 Antenna	56.3	12.6	6.3	4.93	2.46	4.47	8.94	1.29	1.46	15	9	14
800MHz 2x50W RRH	15.8	13.0	14.0	1.43	1.54	1.22	1.13	1.20	1.20	4	4	4
800MHZ 2X50W RRH (Shielded)	15.8	6.5	14.0	0.71	1.54	2.43	1.13	1.20	1.20	2	4	3
PCS 1900MHz 4x45W RRH	25.0	11.1	11.4	1.93	1.98	2.25	2.19	1.20	1.20	6	6	6
PCS 1900MHZ 4X45W RRH (Shielded)	25.0	5.6	11.4	0.97	1.98	4.46	2.19	1.29	1.20	3	6	4
TD-RRH 8x20-25	26.1	18.6	6.7	3.37	1.21	1.40	3.90	1.20	1.26	10	4	8
TD-RRH 8x20-25 (Shielded)	26.1	9.3	6.7	1.69	1.21	2.81	3.90	1.21	1.26	5	4	5

Date: 6/26/2018

Project Name: WESTBROOK/ORSINA

Project Number: 876384

Designed By: JN Checked By: MSC



HUDSON
Design Group LLC

ICE WEIGHT CALCULATIONS

Thickness of ice: 0.75 in.
Density of ice: 56 pcf

NNVV-65B-R4 Antenna

Weight of ice based on total radial SF area:
Height (in): 72.0
Width (in): 19.6
Depth (in): 7.8
Total weight of ice on object: 111 lbs
Weight of object: 78 lbs

Combined weight of ice and object:	189 lbs
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APXVTM14-ALU-I20 Antenna

Weight of ice based on total radial SF area:
Height (in): 56.3
Width (in): 12.6
Depth (in): 6.3
Total weight of ice on object: 61 lbs
Weight of object: 57 lbs

Combined weight of ice and object:	118 lbs
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800MHZ 2X50W RRH

Weight of ice based on total radial SF area:
Height (in): 15.8
Width (in): 13.0
Depth (in): 14.0
Total weight of ice on object: 33 lbs
Weight of object: 64 lbs

Combined weight of ice and object:	97 lbs
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PCS 1900MHZ 4X45W RRH

Weight of ice based on total radial SF area:
Height (in): 25.0
Width (in): 11.1
Depth (in): 11.4
Total weight of ice on object: 37 lbs
Weight of object: 60 lbs

Combined weight of ice and object:	97 lbs
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TD-RRH 8x20-25

Weight of ice based on total radial SF area:
Height (in): 26.1
Width (in): 18.6
Depth (in): 6.7
Total weight of ice on object: 42 lbs
Weight of object: 70 lbs

Combined weight of ice and object:	112 lbs
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L2x2x3/16

Weight of ice based on total radial SF area:
Height (in): 2
Width (in): 2

Per foot weight of ice on object:	3 plf
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HSS 4x4x5/16

Weight of ice based on total radial SF area:
Height (in): 4
Width (in): 4

Per foot weight of ice on object:	6 plf
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L2-1/2x2-1/2x1/4

Weight of ice based on total radial SF area:
Height (in): 2.5
Width (in): 2.5

Per foot weight of ice on object:	4 plf
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PL 6x1/2

Weight of ice based on total radial SF area:
Height (in): 6
Width (in): 0.5

Per foot weight of ice on object:	5 plf
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2" pipe

Per foot weight of ice:
diameter (in): 2.38

Per foot weight of ice on object:	3 plf
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3" pipe

Per foot weight of ice:
diameter (in): 3.5

Per foot weight of ice on object:	4 plf
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Current Date: 6/26/2018 9:37 AM

Units system: English

File name: W:\STRUCTURAL DEPARTMENT\ANALYSIS SOFTWARE\RAM Elements\RAM Projects\CROWN CASTLE\876384\876384 (Rev.1).etx\

Load data

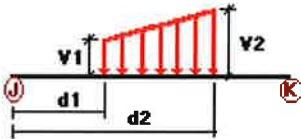
GLOSSARY

Comb : Indicates if load condition is a load combination

Load Conditions

Condition	Description	Comb.	Category
DL	Dead Load	No	DL
W0	Wind Load 0/60/120 deg	No	WIND
W30	Wind Load 30/90/150 deg	No	WIND
Di	Ice Load	No	LL
Wi0	Ice Wind Load 0/60/120 deg	No	WIND
Wi30	Ice Wind Load 30/90/150 deg	No	WIND
WL0	WL 30 mph 0/60/120 deg	No	WIND
WL30	WL 30 mph 30/90/150 deg	No	WIND
LL1	250 lb Live Load Center of Mount	No	LL
LL2	250 lb Live Load End of Mount	No	LL
LLa1	500 lb Live Load Antenna 1	No	LL
LLa2	500 lb Live Load Antenna 2	No	LL

Distributed force on members

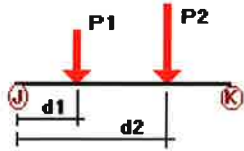


Condition	Member	Dir1	Val1 [Kip/ft]	Val2 [Kip/ft]	Dist1 [ft]	%	Dist2 [ft]	%
DL	198	y	-0.01	-0.01	2.50	No	100.00	Yes
	199	y	-0.01	-0.01	2.50	No	100.00	Yes
	200	y	-0.01	-0.01	2.50	No	100.00	Yes
	207	y	-0.01	0.00	0.00	No	0.00	No
	208	y	-0.01	0.00	0.00	No	0.00	No
	209	y	-0.01	0.00	0.00	No	0.00	No
	222	y	-0.01	0.00	0.00	No	0.00	No
	223	y	-0.01	0.00	0.00	No	0.00	No
	224	y	-0.01	0.00	0.00	No	0.00	No
	225	y	-0.01	0.00	0.00	No	0.00	No
	226	y	-0.01	0.00	0.00	No	0.00	No
	227	y	-0.01	0.00	0.00	No	0.00	No
	W0	164	Z	0.009	0.009	0.00	Yes	100.00
165		Z	0.009	0.009	0.00	Yes	100.00	Yes
166		Z	0.009	0.009	0.00	Yes	100.00	Yes
167		Z	0.009	0.009	0.00	Yes	100.00	Yes
201		Z	0.014	0.014	0.00	Yes	100.00	Yes

	202	Z	0.014	0.014	0.00	Yes	100.00	Yes
	203	Z	0.014	0.014	0.00	Yes	100.00	Yes
	204	Z	0.009	0.009	0.00	Yes	100.00	Yes
	205	Z	0.009	0.009	0.00	Yes	100.00	Yes
	206	Z	0.009	0.009	0.00	Yes	100.00	Yes
	210	Z	0.009	0.009	0.00	Yes	100.00	Yes
	211	Z	0.009	0.009	0.00	Yes	100.00	Yes
	212	Z	0.009	0.009	0.00	Yes	100.00	Yes
	213	Z	0.009	0.009	0.00	Yes	100.00	Yes
	214	Z	0.009	0.009	0.00	Yes	100.00	Yes
	215	Z	0.009	0.009	0.00	Yes	100.00	Yes
	216	Z	0.039	0.039	0.00	Yes	100.00	Yes
	217	Z	0.039	0.039	0.00	Yes	100.00	Yes
	218	Z	0.039	0.039	0.00	Yes	100.00	Yes
	219	Z	0.016	0.016	0.00	Yes	100.00	Yes
	220	Z	0.016	0.016	0.00	Yes	100.00	Yes
	221	Z	0.016	0.016	0.00	Yes	100.00	Yes
W30	162	X	0.009	0.009	0.00	Yes	100.00	Yes
	163	X	0.009	0.009	0.00	Yes	100.00	Yes
	164	x	0.009	0.009	0.00	Yes	100.00	Yes
	165	x	0.009	0.009	0.00	Yes	100.00	Yes
	166	x	0.009	0.009	0.00	Yes	100.00	Yes
	167	x	0.009	0.009	0.00	Yes	100.00	Yes
	201	x	0.014	0.014	0.00	Yes	100.00	Yes
	202	x	0.014	0.014	0.00	Yes	100.00	Yes
	205	x	0.009	0.009	0.00	Yes	100.00	Yes
	206	x	0.009	0.009	0.00	Yes	100.00	Yes
	210	X	0.009	0.009	0.00	Yes	100.00	Yes
	211	X	0.009	0.009	0.00	Yes	100.00	Yes
	212	x	0.009	0.009	0.00	Yes	100.00	Yes
	213	x	0.009	0.009	0.00	Yes	100.00	Yes
	214	x	0.009	0.009	0.00	Yes	100.00	Yes
	215	x	0.009	0.009	0.00	Yes	100.00	Yes
	216	x	0.039	0.039	0.00	Yes	100.00	Yes
	217	x	0.039	0.039	0.00	Yes	100.00	Yes
	219	x	0.016	0.016	0.00	Yes	100.00	Yes
	221	x	0.016	0.016	0.00	Yes	100.00	Yes
Di	162	Y	-0.003	-0.003	0.00	Yes	100.00	Yes
	163	Y	-0.003	-0.003	0.00	Yes	100.00	Yes
	164	Y	-0.003	-0.003	0.00	Yes	100.00	Yes
	165	Y	-0.003	-0.003	0.00	Yes	100.00	Yes
	166	Y	-0.003	-0.003	0.00	Yes	100.00	Yes
	167	Y	-0.003	-0.003	0.00	Yes	100.00	Yes
	198	Y	-0.006	-0.006	0.00	Yes	100.00	Yes
	199	Y	-0.006	-0.006	0.00	Yes	100.00	Yes
	200	Y	-0.006	-0.006	0.00	Yes	100.00	Yes
	201	Y	-0.004	-0.004	0.00	Yes	100.00	Yes
	202	Y	-0.004	-0.004	0.00	Yes	100.00	Yes
	203	Y	-0.004	-0.004	0.00	Yes	100.00	Yes
	204	Y	-0.003	-0.003	0.00	Yes	100.00	Yes
	205	Y	-0.003	-0.003	0.00	Yes	100.00	Yes
	206	Y	-0.003	-0.003	0.00	Yes	100.00	Yes
	207	Y	-0.006	-0.006	0.00	Yes	100.00	Yes
	208	Y	-0.006	-0.006	0.00	Yes	100.00	Yes
	209	Y	-0.006	-0.006	0.00	Yes	100.00	Yes
	210	Y	-0.003	-0.003	0.00	Yes	100.00	Yes
	211	Y	-0.003	-0.003	0.00	Yes	100.00	Yes
	212	Y	-0.003	-0.003	0.00	Yes	100.00	Yes
	213	Y	-0.003	-0.003	0.00	Yes	100.00	Yes
	214	Y	-0.003	-0.003	0.00	Yes	100.00	Yes

215	Y	-0.003	-0.003	0.00	Yes	100.00	Yes
216	Y	-0.005	-0.005	0.00	Yes	100.00	Yes
217	Y	-0.005	-0.005	0.00	Yes	100.00	Yes
218	Y	-0.005	-0.005	0.00	Yes	100.00	Yes
219	Y	-0.004	-0.004	0.00	Yes	100.00	Yes
220	Y	-0.004	-0.004	0.00	Yes	100.00	Yes
221	Y	-0.004	-0.004	0.00	Yes	100.00	Yes
222	Y	-0.003	-0.003	0.00	Yes	100.00	Yes
223	Y	-0.003	-0.003	0.00	Yes	100.00	Yes
224	Y	-0.003	-0.003	0.00	Yes	100.00	Yes
225	Y	-0.003	-0.003	0.00	Yes	100.00	Yes
226	Y	-0.003	-0.003	0.00	Yes	100.00	Yes
227	Y	-0.003	-0.003	0.00	Yes	100.00	Yes

Concentrated forces on members



Condition	Member	Dir1	Value1 [Kip]	Dist1 [ft]	%
DL	162	y	-0.039	1.00	No
		y	-0.039	7.00	No
		y	-0.07	1.50	No
	163	y	-0.064	3.50	No
		y	-0.029	1.75	No
		y	-0.029	6.25	No
		y	-0.06	1.50	No
	164	y	-0.064	3.50	No
		y	-0.029	1.75	No
		y	-0.029	6.25	No
	165	y	-0.06	1.50	No
		y	-0.064	3.50	No
		y	-0.039	1.00	No
		y	-0.039	7.00	No
	166	y	-0.07	1.50	No
		y	-0.064	3.50	No
		y	-0.029	1.75	No
		y	-0.029	6.25	No
	167	y	-0.06	1.50	No
		y	-0.064	3.50	No
		y	-0.039	1.00	No
y		-0.039	7.00	No	
W0	162	z	0.24	1.00	No
		z	0.24	7.00	No
	163	z	0.124	1.75	No
		z	0.124	6.25	No
	164	z	0.004	3.50	No
		z	0.084	1.75	No
		z	0.084	6.25	No
		z	0.067	3.50	No

	165	z	0.144	1.00	No
		z	0.144	7.00	No
	166	z	0.084	1.75	No
		z	0.084	6.25	No
		z	0.067	3.50	No
	167	z	0.144	1.00	No
		z	0.144	7.00	No
W30	162	x	0.112	1.00	No
		x	0.112	7.00	No
		x	0.06	1.50	No
		x	0.072	3.50	No
	163	x	0.071	1.75	No
		x	0.071	6.25	No
		x	0.093	1.50	No
		x	0.072	3.50	No
	164	x	0.111	1.75	No
		x	0.111	6.25	No
		x	0.06	1.50	No
		x	0.043	3.50	No
	165	x	0.208	1.00	No
		x	0.208	7.00	No
		x	0.075	1.50	No
		x	0.043	3.50	No
	166	x	0.111	1.75	No
		x	0.111	6.25	No
		x	0.06	1.50	No
		x	0.043	3.50	No
	167	x	0.208	1.00	No
		x	0.208	7.00	No
		x	0.075	1.50	No
		x	0.043	3.50	No
Di	162	y	-0.056	1.00	No
		y	-0.056	7.00	No
		y	-0.042	1.50	No
		y	-0.033	3.50	No
	163	y	-0.031	1.75	No
		y	-0.031	6.25	No
		y	-0.037	1.50	No
		y	-0.033	3.50	No
	164	y	-0.031	1.75	No
		y	-0.031	6.25	No
		y	-0.037	1.50	No
		y	-0.033	3.50	No
	165	y	-0.056	1.00	No
		y	-0.056	7.00	No
		y	-0.042	1.50	No
		y	-0.033	3.50	No
	166	y	-0.031	1.75	No
		y	-0.031	6.25	No
		y	-0.037	1.50	No
		y	-0.033	3.50	No
	167	y	-0.056	1.00	No
		y	-0.056	7.00	No
		y	-0.042	1.50	No
		y	-0.033	3.50	No
Wi0	162	z	0.052	1.00	No
		z	0.052	7.00	No
	163	z	0.029	1.75	No
		z	0.029	6.25	No
		z	0.009	3.50	No

	164	z	0.021	1.75	No
		z	0.021	6.25	No
		z	0.009	3.50	No
	165	z	0.034	1.00	No
		z	0.034	7.00	No
	166	z	0.021	1.75	No
		z	0.021	6.25	No
		z	0.009	3.50	No
	167	z	0.034	1.00	No
		z	0.034	7.00	No
Wi30	162	x	0.028	1.00	No
		x	0.028	7.00	No
		x	0.021	1.50	No
		x	0.018	3.50	No
	163	x	0.019	1.75	No
		x	0.019	6.25	No
		x	0.027	1.50	No
		x	0.018	3.50	No
	164	x	0.026	1.75	No
		x	0.026	6.25	No
		x	0.018	1.50	No
		x	0.012	3.50	No
	165	x	0.045	1.00	No
		x	0.045	7.00	No
		x	0.021	1.50	No
		x	0.012	3.50	No
	166	x	0.026	1.75	No
		x	0.026	6.25	No
		x	0.018	1.50	No
		x	0.012	3.50	No
	167	x	0.045	1.00	No
		x	0.045	7.00	No
		x	0.021	1.50	No
		x	0.012	3.50	No
WLO	162	z	0.015	1.00	No
		z	0.015	7.00	No
	163	z	0.008	1.75	No
		z	0.008	6.25	No
		z	0.001	3.50	No
	164	z	0.005	1.75	No
		z	0.005	6.25	No
		z	0.004	3.50	No
	165	z	0.009	1.00	No
		z	0.009	7.00	No
	166	z	0.005	1.75	No
		z	0.005	6.25	No
		z	0.004	3.50	No
	167	z	0.009	1.00	No
		z	0.009	7.00	No
WL30	162	x	0.007	1.00	No
		x	0.007	7.00	No
		x	0.004	1.50	No
		x	0.004	3.50	No
	163	x	0.005	1.75	No
		x	0.005	6.25	No
		x	0.006	1.50	No
		x	0.004	3.50	No
	164	x	0.007	1.75	No
		x	0.007	6.25	No
		x	0.004	1.50	No

		x	0.003	3.50	No
	165	x	0.013	1.00	No
		x	0.013	7.00	No
		x	0.005	1.50	No
		x	0.003	3.50	No
	166	x	0.007	1.75	No
		x	0.007	6.25	No
		x	0.004	1.50	No
		x	0.003	3.50	No
	167	x	0.013	1.00	No
		x	0.013	7.00	No
		x	0.005	1.50	No
		x	0.003	3.50	No
LLa1	162	y	-0.50	3.00	No
LLa2	163	y	-0.50	3.00	No

Self weight multipliers for load conditions

Condition	Description	Self weight multiplier			
		Comb.	MultX	MultY	MultZ
DL	Dead Load	No	0.00	-1.00	0.00
W0	Wind Load 0/60/120 deg	No	0.00	0.00	0.00
W30	Wind Load 30/90/150 deg	No	0.00	0.00	0.00
Di	Ice Load	No	0.00	0.00	0.00
Wi0	Ice Wind Load 0/60/120 deg	No	0.00	0.00	0.00
Wi30	Ice Wind Load 30/90/150 deg	No	0.00	0.00	0.00
WL0	WL 30 mph 0/60/120 deg	No	0.00	0.00	0.00
WL30	WL 30 mph 30/90/150 deg	No	0.00	0.00	0.00
LL1	250 lb Live Load Center of Mount	No	0.00	0.00	0.00
LL2	250 lb Live Load End of Mount	No	0.00	0.00	0.00
LLa1	500 lb Live Load Antenna 1	No	0.00	0.00	0.00
LLa2	500 lb Live Load Antenna 2	No	0.00	0.00	0.00

Earthquake (Dynamic analysis only)

Condition	a/g	Ang. [Deg]	Damp. [%]
DL	0.00	0.00	0.00
W0	0.00	0.00	0.00
W30	0.00	0.00	0.00
Di	0.00	0.00	0.00
Wi0	0.00	0.00	0.00
Wi30	0.00	0.00	0.00
WL0	0.00	0.00	0.00
WL30	0.00	0.00	0.00
LL1	0.00	0.00	0.00
LL2	0.00	0.00	0.00
LLa1	0.00	0.00	0.00
LLa2	0.00	0.00	0.00

Geometry data

GLOSSARY

- Cb22, Cb33 : Moment gradient coefficients
- Cm22, Cm33 : Coefficients applied to bending term in interaction formula
- d0 : Tapered member section depth at J end of member
- DJX : Rigid end offset distance measured from J node in axis X
- DJY : Rigid end offset distance measured from J node in axis Y
- DJZ : Rigid end offset distance measured from J node in axis Z
- DKX : Rigid end offset distance measured from K node in axis X
- DKY : Rigid end offset distance measured from K node in axis Y
- DKZ : Rigid end offset distance measured from K node in axis Z
- dL : Tapered member section depth at K end of member
- Ig factor : Inertia reduction factor (Effective Inertia/Gross Inertia) for reinforced concrete members
- K22 : Effective length factor about axis 2
- K33 : Effective length factor about axis 3
- L22 : Member length for calculation of axial capacity
- L33 : Member length for calculation of axial capacity
- LB pos : Lateral unbraced length of the compression flange in the positive side of local axis 2
- LB neg : Lateral unbraced length of the compression flange in the negative side of local axis 2
- RX : Rotation about X
- RY : Rotation about Y
- RZ : Rotation about Z
- TO : 1 = Tension only member 0 = Normal member
- TX : Translation in X
- TY : Translation in Y
- TZ : Translation in Z

Nodes

Node	X [ft]	Y [ft]	Z [ft]	Rigid Floor
497	0.00	0.00	4.75	0
498	0.00	0.00	8.58	0
499	2.709	0.00	4.75	0
500	-2.709	0.00	4.75	0
501	0.50	0.00	8.58	0
502	-0.50	0.00	8.58	0
503	-2.212	0.00	4.75	0
504	2.212	0.00	4.75	0
505	0.00	0.00	1.25	0
507	3.0311	0.00	-0.50	0
508	6.348	0.00	-2.415	0
509	1.6766	0.00	-2.8461	0
510	4.3856	0.00	1.8461	0
511	6.098	0.00	-2.848	0
512	6.598	0.00	-1.982	0
513	4.1371	0.00	1.4157	0
514	1.9251	0.00	-2.4157	0
516	-3.0311	0.00	-0.50	0
517	-6.348	0.00	-2.415	0
518	-4.3856	0.00	1.8461	0
519	-1.6766	0.00	-2.8461	0
520	-6.598	0.00	-1.982	0

521	-6.098	0.00	-2.848	0
522	-1.9251	0.00	-2.4157	0
523	-4.1371	0.00	1.4157	0
524	-6.2566	0.00	-2.3622	0
525	0.00	0.00	8.4745	0
526	6.2566	0.00	-2.3622	0
535	2.679	-3.00	5.202	0
536	0.8382	-3.00	8.3942	0
537	6.6062	-3.00	-1.5962	0
538	4.762	-3.00	1.5941	0
539	2.679	5.00	5.202	0
540	0.8382	5.00	8.3942	0
541	6.6062	5.00	-1.5962	0
542	4.762	5.00	1.5941	0
545	-4.762	-3.00	1.5941	0
546	-4.762	5.00	1.5941	0
549	-6.6062	-3.00	-1.5962	0
550	-6.6062	5.00	-1.5962	0
553	-2.679	-3.00	5.202	0
554	-2.679	5.00	5.202	0
557	-0.8382	-3.00	8.3942	0
558	-0.8382	5.00	8.3942	0
561	2.083	-3.00	-3.0461	0
562	2.083	5.00	-3.0461	0
565	5.768	-3.00	-3.048	0
566	5.768	5.00	-3.048	0
569	-2.083	-3.00	-3.0461	0
570	-2.083	5.00	-3.0461	0
573	-5.768	-3.00	-3.048	0
574	-5.768	5.00	-3.048	0
617	6.598	3.00	-1.982	0
618	0.50	3.00	8.58	0
619	6.098	3.00	-2.848	0
620	-6.098	3.00	-2.848	0
621	-6.598	3.00	-1.982	0
622	-0.50	3.00	8.58	0
623	-0.866	0.00	0.75	0
624	0.866	0.00	0.75	0
625	0.00	0.00	2.25	0

Restraints

Node	TX	TY	TZ	RX	RY	RZ
623	1	1	1	1	1	1
624	1	1	1	1	1	1
625	1	1	1	1	1	1

Members

Member	NJ	NK	Description	Section	Material	d0 [in]	dL [in]	Ig factor
162	574	573		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
163	566	565		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
164	550	549		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
165	558	557		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
166	540	536		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
167	541	537		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
198	625	498		HSS_SQR 4X4X5_16	A500 GrB rectangular	0.00	0.00	0.00
199	624	508		HSS_SQR 4X4X5_16	A500 GrB rectangular	0.00	0.00	0.00
200	623	517		HSS_SQR 4X4X5_16	A500 GrB rectangular	0.00	0.00	0.00
201	520	502		PIPE 3x0.216	A53 GrB	0.00	0.00	0.00
202	501	512		PIPE 3x0.216	A53 GrB	0.00	0.00	0.00
203	511	521		PIPE 3x0.216	A53 GrB	0.00	0.00	0.00
204	619	620		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
205	621	622		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
206	618	617		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
207	509	510		HSS_SQR 4X4X5_16	A500 GrB rectangular	0.00	0.00	0.00
208	499	500		HSS_SQR 4X4X5_16	A500 GrB rectangular	0.00	0.00	0.00
209	518	519		HSS_SQR 4X4X5_16	A500 GrB rectangular	0.00	0.00	0.00
210	546	545		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
211	554	553		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
212	539	535		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
213	542	538		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
214	562	561		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
215	570	569		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
216	512	511		PL 6x.5	A36	0.00	0.00	0.00
217	521	520		PL 6x.5	A36	0.00	0.00	0.00
218	502	501		PL 6x.5	A36	0.00	0.00	0.00
219	620	621		L 2-1_2X2-1_2X1_4	A36	0.00	0.00	0.00
220	622	618		L 2-1_2X2-1_2X1_4	A36	0.00	0.00	0.00
221	617	619		L 2-1_2X2-1_2X1_4	A36	0.00	0.00	0.00
222	526	513		L 2X2X3_16	A36	0.00	0.00	0.00
223	514	526		L 2X2X3_16	A36	0.00	0.00	0.00
224	524	522		L 2X2X3_16	A36	0.00	0.00	0.00
225	523	524		L 2X2X3_16	A36	0.00	0.00	0.00
226	525	503		L 2X2X3_16	A36	0.00	0.00	0.00
227	504	525		L 2X2X3_16	A36	0.00	0.00	0.00

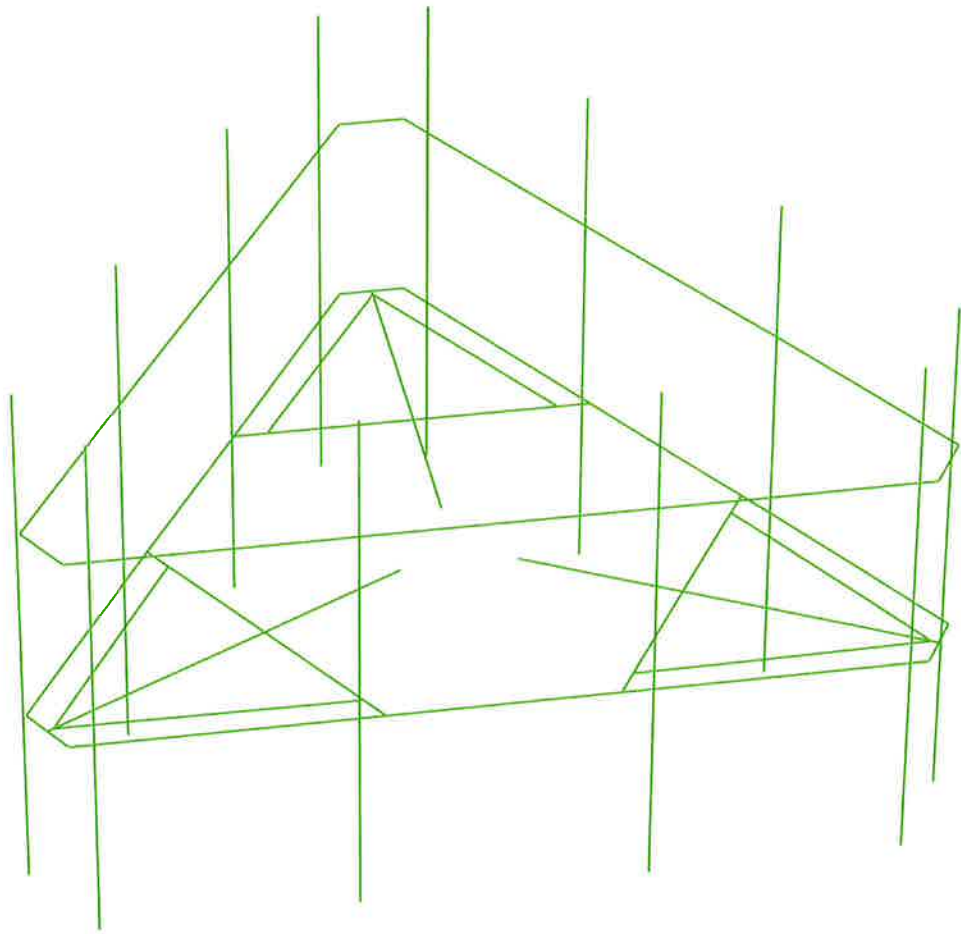
Orientation of local axes

Member	Rotation [Deg]	Axes23	NX	NY	NZ
164	0.00	2	-0.50	0.00	-0.866
165	0.00	2	-0.50	0.00	-0.866
166	0.00	2	-0.50	0.00	0.866
167	0.00	2	-0.50	0.00	0.866
219	90.00	0	0.00	0.00	0.00
220	90.00	0	0.00	0.00	0.00
221	90.00	0	0.00	0.00	0.00

APPENDIX C
RAM ELEMENTS ANALYSIS OUTPUT

Design status

- Not designed
- Error on design
- Design O.K.
- With warnings



Current Date: 6/26/2018 9:35 AM

Units system: English

File name: W:\STRUCTURAL DEPARTMENT\ANALYSIS SOFTWARE\RAM Elements\RAM Projects\CROWN CASTLE\876384\876384 (Rev.1).etx\

Steel Code Check

Report: Summary - For all selected load conditions

Load conditions to be included in design :

- LC1=1.2DL+1.6W0
- LC2=1.2DL+1.6W30
- LC3=1.2DL-1.6W0
- LC4=1.2DL-1.6W30
- LC5=0.9DL+1.6W0
- LC6=0.9DL+1.6W30
- LC7=0.9DL-1.6W0
- LC8=0.9DL-1.6W30
- LC9=1.2DL+Di+Wi0
- LC10=1.2DL+Di+Wi30
- LC11=1.2DL+Di-Wi0
- LC12=1.2DL+Di-Wi30
- LC13=1.2DL
- LC14=0.9DL
- LC15=1.2DL+1.5LL1
- LC16=1.2DL+1.5LL2
- LC17=1.2DL+WL0+1.5LLa1
- LC18=1.2DL+WL30+1.5LLa1
- LC19=1.2DL-WL0+1.5LLa1
- LC20=1.2DL-WL30+1.5LLa1
- LC21=1.2DL+WL0+1.5LLa2
- LC22=1.2DL+WL30+1.5LLa2
- LC23=1.2DL-WL0+1.5LLa2
- LC24=1.2DL-WL30+1.5LLa2

Description	Section	Member	Ctrl Eq.	Ratio	Status	Reference
	<i>HSS_SQR 4X4X5_16</i>	198	LC1 at 0.00%	0.50	OK	Eq. H1-1b
			LC10 at 0.00%	0.40	OK	
			LC11 at 0.00%	0.38	OK	
			LC12 at 0.00%	0.40	OK	
			LC13 at 0.00%	0.26	OK	
			LC14 at 0.00%	0.19	OK	
			LC15 at 0.00%	0.26	OK	
			LC16 at 0.00%	0.26	OK	
			LC17 at 0.00%	0.21	OK	
			LC18 at 0.00%	0.21	OK	
			LC19 at 0.00%	0.21	OK	
			LC2 at 0.00%	0.39	OK	
			LC20 at 0.00%	0.21	OK	
			LC21 at 0.00%	0.22	OK	
			LC22 at 0.00%	0.21	OK	
			LC23 at 0.00%	0.21	OK	
			LC24 at 0.00%	0.21	OK	
			LC3 at 0.00%	0.09	OK	
			LC4 at 0.00%	0.40	OK	
			LC5 at 0.00%	0.43	OK	
			LC6 at 0.00%	0.33	OK	
			LC7 at 37.50%	0.05	OK	
			LC8 at 0.00%	0.33	OK	
			LC9 at 0.00%	0.41	OK	

199	LC1 at 0.00%	0.20	OK	
	LC10 at 0.00%	0.42	OK	
	LC11 at 0.00%	0.40	OK	
	LC12 at 0.00%	0.37	OK	
	LC13 at 0.00%	0.26	OK	
	LC14 at 0.00%	0.19	OK	
	LC15 at 0.00%	0.26	OK	
	LC16 at 0.00%	0.26	OK	
	LC17 at 0.00%	0.24	OK	
	LC18 at 0.00%	0.24	OK	
	LC19 at 0.00%	0.24	OK	
	LC2 at 0.00%	0.51	OK	
	LC20 at 0.00%	0.23	OK	
	LC21 at 0.00%	0.52	OK	
	LC22 at 0.00%	0.53	OK	Eq. H1-1b
	LC23 at 0.00%	0.52	OK	
	LC24 at 0.00%	0.51	OK	
	LC3 at 0.00%	0.40	OK	
	LC4 at 37.50%	0.06	OK	
	LC5 at 0.00%	0.14	OK	
	LC6 at 0.00%	0.45	OK	
	LC7 at 0.00%	0.34	OK	
	LC8 at 37.50%	0.07	OK	
	LC9 at 0.00%	0.39	OK	
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200	LC1 at 0.00%	0.27	OK	
	LC10 at 0.00%	0.37	OK	
	LC11 at 0.00%	0.41	OK	
	LC12 at 0.00%	0.42	OK	
	LC13 at 0.00%	0.26	OK	
	LC14 at 0.00%	0.19	OK	
	LC15 at 0.00%	0.26	OK	
	LC16 at 0.00%	0.26	OK	
	LC17 at 0.00%	0.52	OK	
	LC18 at 0.00%	0.51	OK	
	LC19 at 0.00%	0.52	OK	
	LC2 at 37.50%	0.06	OK	
	LC20 at 0.00%	0.53	OK	Eq. H1-1b
	LC21 at 0.00%	0.24	OK	
	LC22 at 0.00%	0.23	OK	
	LC23 at 0.00%	0.24	OK	
	LC24 at 0.00%	0.24	OK	
	LC3 at 0.00%	0.46	OK	
	LC4 at 0.00%	0.52	OK	
	LC5 at 0.00%	0.20	OK	
	LC6 at 37.50%	0.07	OK	
	LC7 at 0.00%	0.40	OK	
	LC8 at 0.00%	0.45	OK	
	LC9 at 0.00%	0.39	OK	
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207	LC1 at 48.44%	0.08	OK	
	LC10 at 50.00%	0.14	OK	
	LC11 at 50.00%	0.14	OK	
	LC12 at 50.00%	0.13	OK	
	LC13 at 50.00%	0.09	OK	
	LC14 at 50.00%	0.07	OK	
	LC15 at 50.00%	0.09	OK	
	LC16 at 50.00%	0.09	OK	
	LC17 at 48.44%	0.10	OK	
	LC18 at 48.44%	0.10	OK	
	LC19 at 48.44%	0.10	OK	
	LC2 at 50.00%	0.20	OK	Eq. H1-1b
	LC20 at 48.44%	0.10	OK	
	LC21 at 50.00%	0.15	OK	

LC22 at 50.00%	0.15	OK	
LC23 at 50.00%	0.15	OK	
LC24 at 50.00%	0.15	OK	
LC3 at 48.44%	0.15	OK	Eq. H1-1b
LC4 at 100.00%	0.08	OK	Eq. H1-1b
LC5 at 0.00%	0.06	OK	
LC6 at 50.00%	0.18	OK	
LC7 at 48.44%	0.13	OK	
LC8 at 100.00%	0.08	OK	
LC9 at 50.00%	0.13	OK	

208	LC1 at 50.00%	0.17	OK	Eq. H1-1b
	LC10 at 50.00%	0.14	OK	
	LC11 at 50.00%	0.13	OK	
	LC12 at 50.00%	0.13	OK	
	LC13 at 50.00%	0.09	OK	
	LC14 at 50.00%	0.07	OK	
	LC15 at 50.00%	0.09	OK	
	LC16 at 50.00%	0.09	OK	
	LC17 at 50.00%	0.08	OK	
	LC18 at 50.00%	0.08	OK	
	LC19 at 50.00%	0.08	OK	
	LC2 at 48.44%	0.13	OK	
	LC20 at 50.00%	0.08	OK	
	LC21 at 48.44%	0.08	OK	
	LC22 at 48.44%	0.08	OK	
	LC23 at 48.44%	0.08	OK	
	LC24 at 48.44%	0.08	OK	
	LC3 at 48.44%	0.06	OK	
	LC4 at 50.00%	0.13	OK	
	LC5 at 50.00%	0.15	OK	
	LC6 at 48.44%	0.11	OK	
	LC7 at 100.00%	0.04	OK	
	LC8 at 50.00%	0.11	OK	
	LC9 at 50.00%	0.14	OK	

209	LC1 at 50.00%	0.09	OK	
	LC10 at 50.00%	0.13	OK	
	LC11 at 50.00%	0.14	OK	
	LC12 at 50.00%	0.14	OK	
	LC13 at 50.00%	0.09	OK	
	LC14 at 50.00%	0.07	OK	
	LC15 at 50.00%	0.09	OK	
	LC16 at 50.00%	0.09	OK	
	LC17 at 50.00%	0.15	OK	
	LC18 at 50.00%	0.15	OK	
	LC19 at 50.00%	0.15	OK	
	LC2 at 0.00%	0.07	OK	Eq. H1-1b
	LC20 at 50.00%	0.15	OK	
	LC21 at 50.00%	0.10	OK	
	LC22 at 50.00%	0.10	OK	
	LC23 at 50.00%	0.10	OK	
	LC24 at 50.00%	0.10	OK	
	LC3 at 50.00%	0.16	OK	
	LC4 at 48.44%	0.20	OK	Eq. H1-1b
	LC5 at 50.00%	0.07	OK	
	LC6 at 0.00%	0.07	OK	
	LC7 at 50.00%	0.14	OK	
	LC8 at 48.44%	0.17	OK	
	LC9 at 50.00%	0.13	OK	

L 2-1_2X2-1_2X1_4	219	LC1 at 0.00%	0.53	OK	Sec. F1
		LC10 at 100.00%	0.15	OK	
		LC11 at 100.00%	0.15	OK	

LC12 at 0.00%	0.14	OK
LC13 at 100.00%	0.09	OK
LC14 at 100.00%	0.07	OK
LC15 at 100.00%	0.09	OK
LC16 at 100.00%	0.09	OK
LC17 at 0.00%	0.18	OK
LC18 at 0.00%	0.16	OK
LC19 at 100.00%	0.16	OK
LC2 at 100.00%	0.33	OK
LC20 at 0.00%	0.17	OK
LC21 at 0.00%	0.14	OK
LC22 at 0.00%	0.13	OK
LC23 at 0.00%	0.13	OK
LC24 at 0.00%	0.14	OK
LC3 at 0.00%	0.41	OK
LC4 at 100.00%	0.23	OK
LC5 at 0.00%	0.51	OK
LC6 at 100.00%	0.31	OK
LC7 at 0.00%	0.42	OK
LC8 at 100.00%	0.24	OK
LC9 at 0.00%	0.17	OK

Sec. F1

220

LC1 at 100.00%	0.17	OK
LC10 at 0.00%	0.18	OK
LC11 at 0.00%	0.14	OK
LC12 at 100.00%	0.16	OK
LC13 at 100.00%	0.09	OK
LC14 at 100.00%	0.07	OK
LC15 at 100.00%	0.09	OK
LC16 at 100.00%	0.09	OK
LC17 at 0.00%	0.14	OK
LC18 at 0.00%	0.15	OK
LC19 at 0.00%	0.14	OK
LC2 at 0.00%	0.59	OK
LC20 at 0.00%	0.14	OK
LC21 at 100.00%	0.14	OK
LC22 at 0.00%	0.14	OK
LC23 at 100.00%	0.14	OK
LC24 at 100.00%	0.15	OK
LC3 at 0.00%	0.17	OK
LC4 at 0.00%	0.47	OK
LC5 at 100.00%	0.15	OK
LC6 at 0.00%	0.57	OK
LC7 at 0.00%	0.16	OK
LC8 at 0.00%	0.47	OK
LC9 at 100.00%	0.14	OK

Sec. F1

221

LC1 at 100.00%	0.34	OK
LC10 at 100.00%	0.16	OK
LC11 at 0.00%	0.15	OK
LC12 at 0.00%	0.17	OK
LC13 at 100.00%	0.09	OK
LC14 at 100.00%	0.07	OK
LC15 at 100.00%	0.09	OK
LC16 at 100.00%	0.09	OK
LC17 at 100.00%	0.14	OK
LC18 at 100.00%	0.14	OK
LC19 at 100.00%	0.13	OK
LC2 at 0.00%	0.32	OK
LC20 at 100.00%	0.13	OK
LC21 at 100.00%	0.17	OK
LC22 at 100.00%	0.17	OK
LC23 at 100.00%	0.16	OK
LC24 at 100.00%	0.16	OK

Sec. F1

		LC3 at 0.00%	0.33	OK	
		LC4 at 0.00%	0.44	OK	Sec. F1
		LC5 at 100.00%	0.32	OK	
		LC6 at 0.00%	0.33	OK	
		LC7 at 0.00%	0.31	OK	
		LC8 at 0.00%	0.42	OK	
		LC9 at 100.00%	0.15	OK	
		<hr/>			
L 2X2X3_16	222	LC1 at 100.00%	0.10	OK	
		LC10 at 100.00%	0.19	OK	
		LC11 at 100.00%	0.17	OK	
		LC12 at 100.00%	0.17	OK	
		LC13 at 100.00%	0.12	OK	
		LC14 at 100.00%	0.09	OK	
		LC15 at 100.00%	0.12	OK	
		LC16 at 100.00%	0.12	OK	
		LC17 at 100.00%	0.12	OK	
		LC18 at 100.00%	0.12	OK	
		LC19 at 100.00%	0.12	OK	
		LC2 at 100.00%	0.42	OK	Eq. H2-1
		LC20 at 100.00%	0.12	OK	
		LC21 at 100.00%	0.19	OK	
		LC22 at 100.00%	0.19	OK	Sec. F1
		LC23 at 100.00%	0.19	OK	
		LC24 at 100.00%	0.19	OK	
		LC3 at 100.00%	0.14	OK	
		LC4 at 0.00%	0.19	OK	Eq. H2-1
		LC5 at 100.00%	0.07	OK	
		LC6 at 100.00%	0.39	OK	
		LC7 at 100.00%	0.11	OK	
		LC8 at 0.00%	0.17	OK	
		LC9 at 100.00%	0.17	OK	
		<hr/>			
	223	LC1 at 100.00%	0.18	OK	Eq. H2-1
		LC10 at 0.00%	0.18	OK	
		LC11 at 0.00%	0.18	OK	
		LC12 at 0.00%	0.16	OK	
		LC13 at 0.00%	0.12	OK	
		LC14 at 0.00%	0.09	OK	
		LC15 at 0.00%	0.12	OK	
		LC16 at 0.00%	0.12	OK	
		LC17 at 0.00%	0.13	OK	
		LC18 at 0.00%	0.13	OK	
		LC19 at 0.00%	0.13	OK	
		LC2 at 0.00%	0.27	OK	
		LC20 at 0.00%	0.13	OK	
		LC21 at 0.00%	0.19	OK	
		LC22 at 0.00%	0.20	OK	Sec. F1
		LC23 at 0.00%	0.20	OK	
		LC24 at 0.00%	0.19	OK	
		LC3 at 0.00%	0.31	OK	Eq. H2-1
		LC4 at 0.00%	0.11	OK	
		LC5 at 100.00%	0.16	OK	
		LC6 at 0.00%	0.24	OK	
		LC7 at 0.00%	0.29	OK	
		LC8 at 56.25%	0.09	OK	
		LC9 at 0.00%	0.17	OK	
		<hr/>			
	224	LC1 at 100.00%	0.19	OK	
		LC10 at 100.00%	0.17	OK	
		LC11 at 100.00%	0.18	OK	
		LC12 at 100.00%	0.18	OK	
		LC13 at 100.00%	0.12	OK	
		LC14 at 100.00%	0.09	OK	

LC15 at 100.00%	0.12	OK	
LC16 at 100.00%	0.12	OK	
LC17 at 100.00%	0.20	OK	
LC18 at 100.00%	0.19	OK	
LC19 at 100.00%	0.19	OK	
LC2 at 100.00%	0.12	OK	
LC20 at 100.00%	0.20	OK	Sec. F1
LC21 at 100.00%	0.13	OK	
LC22 at 100.00%	0.13	OK	
LC23 at 100.00%	0.13	OK	
LC24 at 100.00%	0.13	OK	
LC3 at 100.00%	0.33	OK	Eq. H2-1
LC4 at 100.00%	0.27	OK	
LC5 at 0.00%	0.17	OK	
LC6 at 43.75%	0.10	OK	
LC7 at 100.00%	0.30	OK	
LC8 at 100.00%	0.24	OK	
LC9 at 100.00%	0.17	OK	

225

LC1 at 0.00%	0.11	OK	
LC10 at 0.00%	0.17	OK	
LC11 at 0.00%	0.17	OK	
LC12 at 0.00%	0.19	OK	
LC13 at 0.00%	0.12	OK	
LC14 at 0.00%	0.09	OK	
LC15 at 0.00%	0.12	OK	
LC16 at 0.00%	0.12	OK	
LC17 at 0.00%	0.19	OK	
LC18 at 0.00%	0.19	OK	
LC19 at 0.00%	0.19	OK	
LC2 at 100.00%	0.19	OK	Eq. H2-1
LC20 at 0.00%	0.19	OK	Sec. F1
LC21 at 0.00%	0.12	OK	
LC22 at 0.00%	0.12	OK	
LC23 at 0.00%	0.12	OK	
LC24 at 0.00%	0.12	OK	
LC3 at 0.00%	0.15	OK	
LC4 at 0.00%	0.41	OK	Eq. H2-1
LC5 at 0.00%	0.08	OK	
LC6 at 100.00%	0.17	OK	
LC7 at 0.00%	0.12	OK	
LC8 at 0.00%	0.38	OK	
LC9 at 0.00%	0.17	OK	

226

LC1 at 100.00%	0.33	OK	Eq. H2-1
LC10 at 100.00%	0.17	OK	
LC11 at 100.00%	0.17	OK	
LC12 at 100.00%	0.17	OK	
LC13 at 100.00%	0.12	OK	
LC14 at 100.00%	0.09	OK	
LC15 at 100.00%	0.12	OK	
LC16 at 100.00%	0.12	OK	
LC17 at 100.00%	0.13	OK	
LC18 at 100.00%	0.12	OK	
LC19 at 100.00%	0.12	OK	
LC2 at 0.00%	0.20	OK	Eq. H2-1
LC20 at 100.00%	0.12	OK	
LC21 at 100.00%	0.11	OK	
LC22 at 100.00%	0.11	OK	
LC23 at 100.00%	0.11	OK	
LC24 at 100.00%	0.11	OK	
LC3 at 100.00%	0.16	OK	
LC4 at 100.00%	0.25	OK	
LC5 at 100.00%	0.31	OK	

		LC6 at 0.00%	0.19	OK	
		LC7 at 100.00%	0.13	OK	
		LC8 at 100.00%	0.22	OK	
		LC9 at 100.00%	0.18	OK	
	227	LC1 at 0.00%	0.33	OK	Eq. H2-1
		LC10 at 0.00%	0.17	OK	
		LC11 at 0.00%	0.17	OK	
		LC12 at 0.00%	0.17	OK	
		LC13 at 0.00%	0.12	OK	
		LC14 at 0.00%	0.09	OK	
		LC15 at 0.00%	0.12	OK	
		LC16 at 0.00%	0.12	OK	
		LC17 at 0.00%	0.11	OK	
		LC18 at 0.00%	0.11	OK	
		LC19 at 0.00%	0.11	OK	
		LC2 at 0.00%	0.24	OK	
		LC20 at 0.00%	0.11	OK	
		LC21 at 0.00%	0.13	OK	
		LC22 at 0.00%	0.12	OK	
		LC23 at 0.00%	0.12	OK	
		LC24 at 0.00%	0.12	OK	
		LC3 at 0.00%	0.15	OK	
		LC4 at 100.00%	0.20	OK	Eq. H2-1
		LC5 at 0.00%	0.31	OK	
		LC6 at 0.00%	0.21	OK	
		LC7 at 0.00%	0.12	OK	
		LC8 at 100.00%	0.18	OK	
		LC9 at 0.00%	0.18	OK	
PIPE 2x0.154	162	LC1 at 60.42%	0.64	OK	
		LC10 at 60.42%	0.45	OK	
		LC11 at 60.42%	0.35	OK	
		LC12 at 60.42%	0.34	OK	
		LC13 at 60.42%	0.25	OK	
		LC14 at 60.42%	0.19	OK	
		LC15 at 60.42%	0.25	OK	
		LC16 at 60.42%	0.25	OK	
		LC17 at 60.42%	0.48	OK	
		LC18 at 60.42%	0.48	OK	
		LC19 at 60.42%	0.46	OK	
		LC2 at 60.42%	0.70	OK	Eq. H1-1b
		LC20 at 60.42%	0.46	OK	
		LC21 at 60.42%	0.30	OK	
		LC22 at 60.42%	0.30	OK	
		LC23 at 60.42%	0.27	OK	
		LC24 at 60.42%	0.27	OK	
		LC3 at 62.50%	0.62	OK	
		LC4 at 60.42%	0.39	OK	
		LC5 at 62.50%	0.62	OK	
		LC6 at 60.42%	0.64	OK	
		LC7 at 62.50%	0.62	OK	
		LC8 at 60.42%	0.40	OK	
		LC9 at 60.42%	0.44	OK	
	163	LC1 at 60.42%	0.47	OK	
		LC10 at 60.42%	0.34	OK	
		LC11 at 60.42%	0.36	OK	
		LC12 at 60.42%	0.43	OK	
		LC13 at 60.42%	0.25	OK	
		LC14 at 60.42%	0.18	OK	
		LC15 at 60.42%	0.25	OK	
		LC16 at 60.42%	0.25	OK	
		LC17 at 60.42%	0.29	OK	

	LC18 at 60.42%	0.27	OK	
	LC19 at 60.42%	0.28	OK	
	LC2 at 60.42%	0.34	OK	
	LC20 at 60.42%	0.29	OK	
	LC21 at 60.42%	0.47	OK	
	LC22 at 60.42%	0.45	OK	
	LC23 at 60.42%	0.46	OK	
	LC24 at 60.42%	0.48	OK	
	LC3 at 60.42%	0.39	OK	
	LC4 at 60.42%	0.62	OK	Eq. H1-1b
	LC5 at 60.42%	0.41	OK	
	LC6 at 60.42%	0.36	OK	
	LC7 at 60.42%	0.37	OK	
	LC8 at 60.42%	0.54	OK	
	LC9 at 60.42%	0.41	OK	
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164	LC1 at 60.42%	0.58	OK	
	LC10 at 60.42%	0.43	OK	
	LC11 at 60.42%	0.37	OK	
	LC12 at 60.42%	0.34	OK	
	LC13 at 60.42%	0.25	OK	
	LC14 at 60.42%	0.18	OK	
	LC15 at 60.42%	0.25	OK	
	LC16 at 60.42%	0.25	OK	
	LC17 at 60.42%	0.39	OK	
	LC18 at 60.42%	0.40	OK	
	LC19 at 60.42%	0.38	OK	
	LC2 at 60.42%	0.69	OK	Eq. H1-1b
	LC20 at 60.42%	0.37	OK	
	LC21 at 60.42%	0.26	OK	
	LC22 at 60.42%	0.27	OK	
	LC23 at 60.42%	0.25	OK	
	LC24 at 60.42%	0.25	OK	
	LC3 at 60.42%	0.43	OK	
	LC4 at 62.50%	0.32	OK	Eq. H1-1b
	LC5 at 60.42%	0.56	OK	
	LC6 at 60.42%	0.63	OK	
	LC7 at 60.42%	0.45	OK	
	LC8 at 62.50%	0.32	OK	
	LC9 at 60.42%	0.40	OK	
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165	LC1 at 62.50%	0.58	OK	
	LC10 at 60.42%	0.40	OK	
	LC11 at 60.42%	0.45	OK	
	LC12 at 60.42%	0.39	OK	
	LC13 at 60.42%	0.25	OK	
	LC14 at 60.42%	0.19	OK	
	LC15 at 60.42%	0.25	OK	
	LC16 at 60.42%	0.25	OK	
	LC17 at 60.42%	0.29	OK	
	LC18 at 60.42%	0.31	OK	
	LC19 at 60.42%	0.32	OK	
	LC2 at 62.50%	0.80	OK	Eq. H1-1b
	LC20 at 60.42%	0.30	OK	
	LC21 at 60.42%	0.26	OK	
	LC22 at 60.42%	0.28	OK	
	LC23 at 60.42%	0.29	OK	
	LC24 at 60.42%	0.27	OK	
	LC3 at 60.42%	0.74	OK	
	LC4 at 60.42%	0.86	OK	Eq. H1-1b
	LC5 at 62.50%	0.58	OK	
	LC6 at 62.50%	0.80	OK	
	LC7 at 60.42%	0.68	OK	
	LC8 at 60.42%	0.84	OK	

	LC9 at 60.42%	0.34	OK	
166	LC1 at 62.50%	0.26	OK	
	LC10 at 60.42%	0.39	OK	
	LC11 at 60.42%	0.42	OK	
	LC12 at 60.42%	0.39	OK	
	LC13 at 60.42%	0.25	OK	
	LC14 at 60.42%	0.18	OK	
	LC15 at 60.42%	0.25	OK	
	LC16 at 60.42%	0.25	OK	
	LC17 at 60.42%	0.26	OK	
	LC18 at 60.42%	0.27	OK	
	LC19 at 60.42%	0.28	OK	
	LC2 at 60.42%	0.72	OK	Eq. H1-1b
	LC20 at 60.42%	0.27	OK	
	LC21 at 60.42%	0.29	OK	
	LC22 at 60.42%	0.30	OK	
	LC23 at 60.42%	0.31	OK	
	LC24 at 60.42%	0.30	OK	
	LC3 at 60.42%	0.62	OK	
	LC4 at 60.42%	0.57	OK	
	LC5 at 62.50%	0.26	OK	
	LC6 at 60.42%	0.70	OK	
	LC7 at 60.42%	0.56	OK	
	LC8 at 60.42%	0.58	OK	
	LC9 at 60.42%	0.35	OK	
167	LC1 at 60.42%	0.60	OK	
	LC10 at 60.42%	0.32	OK	
	LC11 at 60.42%	0.37	OK	
	LC12 at 60.42%	0.47	OK	
	LC13 at 60.42%	0.25	OK	
	LC14 at 60.42%	0.19	OK	
	LC15 at 60.42%	0.25	OK	
	LC16 at 60.42%	0.25	OK	
	LC17 at 60.42%	0.27	OK	
	LC18 at 60.42%	0.24	OK	
	LC19 at 60.42%	0.26	OK	
	LC2 at 62.50%	0.80	OK	Eq. H1-1b
	LC20 at 60.42%	0.28	OK	
	LC21 at 60.42%	0.39	OK	
	LC22 at 60.42%	0.37	OK	
	LC23 at 60.42%	0.38	OK	
	LC24 at 60.42%	0.41	OK	
	LC3 at 62.50%	0.58	OK	
	LC4 at 60.42%	0.90	OK	Eq. H1-1b
	LC5 at 60.42%	0.58	OK	
	LC6 at 62.50%	0.80	OK	
	LC7 at 62.50%	0.58	OK	
	LC8 at 60.42%	0.84	OK	
	LC9 at 60.42%	0.42	OK	
204	LC1 at 97.50%	0.51	OK	Eq. H3-6
	LC10 at 67.50%	0.31	OK	
	LC11 at 32.50%	0.29	OK	
	LC12 at 32.50%	0.31	OK	
	LC13 at 67.50%	0.19	OK	
	LC14 at 67.50%	0.14	OK	
	LC15 at 67.50%	0.19	OK	
	LC16 at 67.50%	0.19	OK	
	LC17 at 67.50%	0.32	OK	
	LC18 at 67.50%	0.33	OK	
	LC19 at 67.50%	0.32	OK	
	LC2 at 96.25%	0.43	OK	Eq. H1-1b

	LC20 at 67.50%	0.32	OK	
	LC21 at 32.50%	0.32	OK	
	LC22 at 32.50%	0.32	OK	
	LC23 at 32.50%	0.32	OK	
	LC24 at 32.50%	0.32	OK	
	LC3 at 97.50%	0.37	OK	
	LC4 at 3.75%	0.42	OK	Eq. H1-1b
	LC5 at 97.50%	0.49	OK	
	LC6 at 96.25%	0.41	OK	
	LC7 at 97.50%	0.39	OK	
	LC8 at 3.75%	0.40	OK	
	LC9 at 67.50%	0.30	OK	
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205	LC1 at 32.50%	0.30	OK	
	LC10 at 32.50%	0.31	OK	
	LC11 at 67.50%	0.31	OK	
	LC12 at 67.50%	0.29	OK	
	LC13 at 67.50%	0.19	OK	
	LC14 at 67.50%	0.14	OK	
	LC15 at 67.50%	0.19	OK	
	LC16 at 67.50%	0.19	OK	
	LC17 at 32.50%	0.31	OK	
	LC18 at 32.50%	0.31	OK	Eq. H1-1b
	LC19 at 32.50%	0.31	OK	
	LC2 at 97.50%	0.66	OK	Eq. H3-6
	LC20 at 32.50%	0.31	OK	
	LC21 at 32.50%	0.19	OK	
	LC22 at 32.50%	0.19	OK	
	LC23 at 67.50%	0.19	OK	
	LC24 at 67.50%	0.19	OK	
	LC3 at 96.25%	0.45	OK	Eq. H1-1b
	LC4 at 97.50%	0.53	OK	
	LC5 at 32.50%	0.27	OK	
	LC6 at 97.50%	0.64	OK	
	LC7 at 96.25%	0.41	OK	
	LC8 at 97.50%	0.55	OK	
	LC9 at 32.50%	0.30	OK	
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206	LC1 at 96.25%	0.32	OK	
	LC10 at 32.50%	0.29	OK	
	LC11 at 32.50%	0.30	OK	
	LC12 at 96.25%	0.33	OK	
	LC13 at 67.50%	0.19	OK	
	LC14 at 67.50%	0.14	OK	
	LC15 at 67.50%	0.19	OK	
	LC16 at 67.50%	0.19	OK	
	LC17 at 67.50%	0.19	OK	
	LC18 at 32.50%	0.19	OK	
	LC19 at 32.50%	0.19	OK	
	LC2 at 2.50%	0.36	OK	
	LC20 at 67.50%	0.20	OK	
	LC21 at 67.50%	0.31	OK	
	LC22 at 67.50%	0.30	OK	
	LC23 at 67.50%	0.31	OK	
	LC24 at 67.50%	0.31	OK	Eq. H1-1b
	LC3 at 3.75%	0.33	OK	Eq. H1-1b
	LC4 at 96.25%	0.60	OK	Eq. H1-1b
	LC5 at 96.25%	0.29	OK	
	LC6 at 2.50%	0.38	OK	
	LC7 at 97.50%	0.29	OK	
	LC8 at 96.25%	0.56	OK	
	LC9 at 67.50%	0.30	OK	
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210	LC1 at 60.42%	0.56	OK	

	LC10 at 60.42%	0.33	OK	
	LC11 at 60.42%	0.27	OK	
	LC12 at 60.42%	0.26	OK	
	LC13 at 60.42%	0.19	OK	
	LC14 at 60.42%	0.14	OK	
	LC15 at 60.42%	0.19	OK	
	LC16 at 60.42%	0.19	OK	
	LC17 at 60.42%	0.28	OK	
	LC18 at 60.42%	0.28	OK	
	LC19 at 60.42%	0.26	OK	
	LC2 at 60.42%	0.56	OK	Eq. H1-1b
	LC20 at 60.42%	0.26	OK	
	LC21 at 60.42%	0.18	OK	
	LC22 at 60.42%	0.18	OK	
	LC23 at 60.42%	0.16	OK	
	LC24 at 60.42%	0.16	OK	
	LC3 at 60.42%	0.40	OK	
	LC4 at 60.42%	0.27	OK	
	LC5 at 60.42%	0.51	OK	
	LC6 at 60.42%	0.52	OK	
	LC7 at 60.42%	0.39	OK	
	LC8 at 60.42%	0.27	OK	
	LC9 at 60.42%	0.33	OK	
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211	LC1 at 25.00%	0.24	OK	
	LC10 at 60.42%	0.22	OK	
	LC11 at 25.00%	0.29	OK	
	LC12 at 25.00%	0.30	OK	
	LC13 at 25.00%	0.16	OK	
	LC14 at 25.00%	0.12	OK	
	LC15 at 25.00%	0.16	OK	
	LC16 at 25.00%	0.16	OK	
	LC17 at 60.42%	0.26	OK	
	LC18 at 25.00%	0.25	OK	
	LC19 at 60.42%	0.27	OK	
	LC2 at 60.42%	0.48	OK	
	LC20 at 60.42%	0.28	OK	
	LC21 at 25.00%	0.15	OK	
	LC22 at 25.00%	0.15	OK	
	LC23 at 25.00%	0.17	OK	
	LC24 at 25.00%	0.17	OK	
	LC3 at 25.00%	0.56	OK	Eq. H1-1b
	LC4 at 60.42%	0.64	OK	Eq. H1-1b
	LC5 at 25.00%	0.28	OK	
	LC6 at 60.42%	0.45	OK	
	LC7 at 25.00%	0.51	OK	
	LC8 at 60.42%	0.61	OK	
	LC9 at 25.00%	0.22	OK	
<hr/>				
212	LC1 at 25.00%	0.19	OK	
	LC10 at 25.00%	0.29	OK	
	LC11 at 25.00%	0.28	OK	
	LC12 at 60.42%	0.22	OK	
	LC13 at 25.00%	0.16	OK	
	LC14 at 25.00%	0.12	OK	
	LC15 at 25.00%	0.16	OK	
	LC16 at 25.00%	0.16	OK	
	LC17 at 25.00%	0.15	OK	
	LC18 at 25.00%	0.17	OK	
	LC19 at 25.00%	0.16	OK	
	LC2 at 60.42%	0.65	OK	Eq. H1-1b
	LC20 at 60.42%	0.15	OK	
	LC21 at 60.42%	0.25	OK	
	LC22 at 60.42%	0.27	OK	

	LC23 at 60.42%	0.27	OK	
	LC24 at 25.00%	0.25	OK	
	LC3 at 25.00%	0.49	OK	
	LC4 at 60.42%	0.47	OK	
	LC5 at 25.00%	0.23	OK	
	LC6 at 60.42%	0.61	OK	
	LC7 at 25.00%	0.45	OK	
	LC8 at 60.42%	0.44	OK	
	LC9 at 25.00%	0.22	OK	
<hr/>				
213	LC1 at 60.42%	0.54	OK	
	LC10 at 60.42%	0.27	OK	
	LC11 at 60.42%	0.28	OK	
	LC12 at 60.42%	0.34	OK	
	LC13 at 60.42%	0.19	OK	
	LC14 at 60.42%	0.15	OK	
	LC15 at 60.42%	0.19	OK	
	LC16 at 60.42%	0.19	OK	
	LC17 at 60.42%	0.18	OK	
	LC18 at 60.42%	0.17	OK	
	LC19 at 60.42%	0.17	OK	
	LC2 at 60.42%	0.31	OK	
	LC20 at 60.42%	0.19	OK	
	LC21 at 60.42%	0.28	OK	
	LC22 at 60.42%	0.26	OK	
	LC23 at 60.42%	0.26	OK	
	LC24 at 60.42%	0.28	OK	
	LC3 at 60.42%	0.35	OK	
	LC4 at 60.42%	0.60	OK	Eq. H1-1b
	LC5 at 60.42%	0.49	OK	
	LC6 at 60.42%	0.32	OK	
	LC7 at 60.42%	0.34	OK	
	LC8 at 60.42%	0.55	OK	
	LC9 at 60.42%	0.33	OK	
<hr/>				
214	LC1 at 60.42%	0.44	OK	
	LC10 at 60.42%	0.24	OK	
	LC11 at 60.42%	0.27	OK	
	LC12 at 60.42%	0.33	OK	
	LC13 at 60.42%	0.18	OK	
	LC14 at 60.42%	0.13	OK	
	LC15 at 60.42%	0.18	OK	
	LC16 at 60.42%	0.18	OK	
	LC17 at 60.42%	0.20	OK	
	LC18 at 60.42%	0.19	OK	
	LC19 at 60.42%	0.20	OK	
	LC2 at 60.42%	0.43	OK	
	LC20 at 60.42%	0.21	OK	
	LC21 at 60.42%	0.30	OK	
	LC22 at 60.42%	0.28	OK	
	LC23 at 60.42%	0.29	OK	
	LC24 at 60.42%	0.31	OK	
	LC3 at 60.42%	0.37	OK	
	LC4 at 60.42%	0.57	OK	Eq. H1-1b
	LC5 at 60.42%	0.39	OK	
	LC6 at 60.42%	0.44	OK	Eq. H1-1b
	LC7 at 60.42%	0.35	OK	
	LC8 at 60.42%	0.53	OK	
	LC9 at 60.42%	0.29	OK	
<hr/>				
215	LC1 at 60.42%	0.46	OK	Eq. H1-1b
	LC10 at 60.42%	0.34	OK	
	LC11 at 60.42%	0.28	OK	
	LC12 at 60.42%	0.24	OK	

		LC13 at 60.42%	0.18	OK	
		LC14 at 60.42%	0.13	OK	
		LC15 at 60.42%	0.18	OK	
		LC16 at 60.42%	0.18	OK	
		LC17 at 60.42%	0.30	OK	
		LC18 at 60.42%	0.31	OK	
		LC19 at 60.42%	0.29	OK	
		LC2 at 60.42%	0.60	OK	Eq. H1-1b
		LC20 at 60.42%	0.29	OK	
		LC21 at 60.42%	0.21	OK	
		LC22 at 60.42%	0.22	OK	
		LC23 at 60.42%	0.20	OK	
		LC24 at 60.42%	0.19	OK	
		LC3 at 60.42%	0.41	OK	
		LC4 at 60.42%	0.40	OK	
		LC5 at 60.42%	0.42	OK	
		LC6 at 60.42%	0.55	OK	
		LC7 at 60.42%	0.39	OK	
		LC8 at 60.42%	0.41	OK	
		LC9 at 60.42%	0.30	OK	
<hr/>					
PIPE 3x0.216	201	LC1 at 63.39%	0.35	OK	Eq. H1-1b
		LC10 at 63.39%	0.21	OK	
		LC11 at 36.61%	0.22	OK	
		LC12 at 36.61%	0.24	OK	
		LC13 at 36.61%	0.14	OK	
		LC14 at 36.61%	0.10	OK	
		LC15 at 36.61%	0.14	OK	
		LC16 at 36.61%	0.14	OK	
		LC17 at 36.61%	0.26	OK	
		LC18 at 36.61%	0.26	OK	
		LC19 at 36.61%	0.27	OK	
		LC2 at 63.39%	0.24	OK	
		LC20 at 36.61%	0.27	OK	Eq. H1-1b
		LC21 at 36.61%	0.14	OK	
		LC22 at 36.61%	0.13	OK	
		LC23 at 36.61%	0.14	OK	
		LC24 at 36.61%	0.14	OK	
		LC3 at 36.61%	0.28	OK	
		LC4 at 36.61%	0.38	OK	Eq. H1-1b
		LC5 at 63.39%	0.32	OK	
		LC6 at 63.39%	0.21	OK	
		LC7 at 36.61%	0.25	OK	
		LC8 at 36.61%	0.35	OK	
		LC9 at 63.39%	0.23	OK	Eq. H1-1b
<hr/>					
	202	LC1 at 36.61%	0.30	OK	Eq. H1-1b
		LC10 at 63.39%	0.23	OK	
		LC11 at 63.39%	0.22	OK	
		LC12 at 36.61%	0.22	OK	
		LC13 at 36.61%	0.14	OK	
		LC14 at 36.61%	0.10	OK	
		LC15 at 36.61%	0.14	OK	
		LC16 at 36.61%	0.14	OK	
		LC17 at 63.39%	0.13	OK	
		LC18 at 63.39%	0.14	OK	
		LC19 at 63.39%	0.14	OK	
		LC2 at 63.39%	0.39	OK	Eq. H1-1b
		LC20 at 63.39%	0.13	OK	
		LC21 at 63.39%	0.26	OK	
		LC22 at 63.39%	0.27	OK	Eq. H1-1b
		LC23 at 63.39%	0.26	OK	
		LC24 at 63.39%	0.26	OK	
		LC3 at 63.39%	0.23	OK	

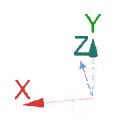
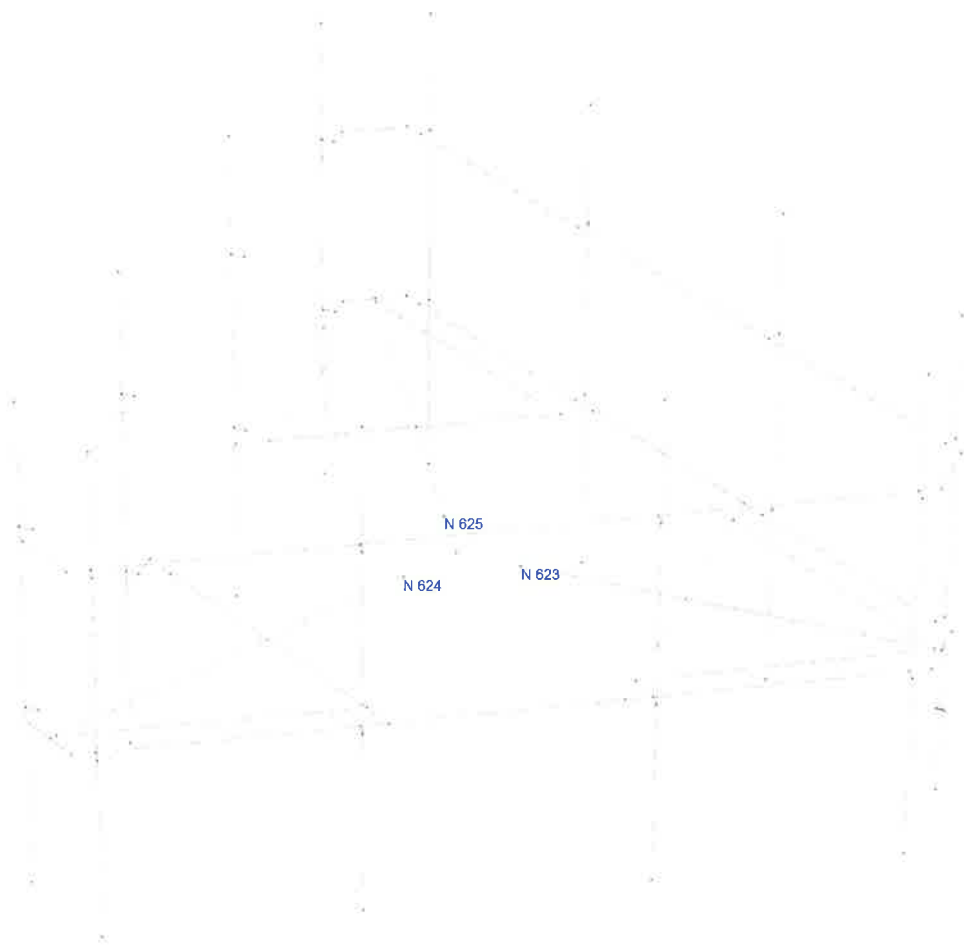
		LC4 at 36.61%	0.25	OK	
		LC5 at 36.61%	0.26	OK	
		LC6 at 63.39%	0.35	OK	
		LC7 at 63.39%	0.20	OK	
		LC8 at 36.61%	0.22	OK	
		LC9 at 36.61%	0.23	OK	Eq. H1-1b
		<hr/>			
	203	LC1 at 64.29%	0.15	OK	
		LC10 at 36.61%	0.24	OK	
		LC11 at 36.61%	0.22	OK	
		LC12 at 63.39%	0.23	OK	
		LC13 at 36.61%	0.14	OK	
		LC14 at 36.61%	0.10	OK	
		LC15 at 36.61%	0.14	OK	
		LC16 at 36.61%	0.14	OK	
		LC17 at 63.39%	0.22	OK	
		LC18 at 63.39%	0.22	OK	
		LC19 at 63.39%	0.23	OK	
		LC2 at 36.61%	0.32	OK	Eq. H1-1b
		LC20 at 63.39%	0.23	OK	
		LC21 at 36.61%	0.23	OK	
		LC22 at 36.61%	0.23	OK	
		LC23 at 36.61%	0.23	OK	
		LC24 at 36.61%	0.22	OK	
		LC3 at 36.61%	0.24	OK	Eq. H1-1b
		LC4 at 63.39%	0.32	OK	Eq. H1-1b
		LC5 at 64.29%	0.13	OK	
		LC6 at 36.61%	0.29	OK	
		LC7 at 36.61%	0.21	OK	
		LC8 at 63.39%	0.29	OK	
		LC9 at 36.61%	0.21	OK	
		<hr/>			
PL 6x.5	216	LC1 at 50.00%	0.20	OK	Eq. H1-1b
		LC10 at 50.00%	0.07	OK	
		LC11 at 0.00%	0.07	OK	
		LC12 at 50.00%	0.07	OK	
		LC13 at 50.00%	0.04	OK	
		LC14 at 50.00%	0.03	OK	
		LC15 at 50.00%	0.04	OK	
		LC16 at 50.00%	0.04	OK	
		LC17 at 0.00%	0.05	OK	
		LC18 at 0.00%	0.05	OK	
		LC19 at 0.00%	0.05	OK	
		LC2 at 46.88%	0.21	OK	
		LC20 at 0.00%	0.05	OK	
		LC21 at 0.00%	0.09	OK	
		LC22 at 0.00%	0.09	OK	
		LC23 at 0.00%	0.09	OK	Eq. H3-1
		LC24 at 0.00%	0.09	OK	
		LC3 at 50.00%	0.18	OK	
		LC4 at 46.88%	0.22	OK	Eq. H1-1b
		LC5 at 50.00%	0.19	OK	
		LC6 at 46.88%	0.21	OK	
		LC7 at 50.00%	0.19	OK	
		LC8 at 46.88%	0.22	OK	
		LC9 at 50.00%	0.07	OK	
		<hr/>			
	217	LC1 at 46.88%	0.17	OK	Eq. H1-1b
		LC10 at 50.00%	0.07	OK	
		LC11 at 50.00%	0.07	OK	
		LC12 at 0.00%	0.07	OK	
		LC13 at 50.00%	0.04	OK	
		LC14 at 50.00%	0.03	OK	
		LC15 at 50.00%	0.04	OK	

LC16 at 50.00%	0.04	OK	
LC17 at 50.00%	0.09	OK	
LC18 at 50.00%	0.09	OK	Eq. H3-1
LC19 at 50.00%	0.09	OK	
LC2 at 50.00%	0.26	OK	Eq. H1-1b
LC20 at 50.00%	0.09	OK	
LC21 at 50.00%	0.05	OK	
LC22 at 50.00%	0.05	OK	
LC23 at 50.00%	0.05	OK	
LC24 at 50.00%	0.05	OK	
LC3 at 0.00%	0.16	OK	Eq. H1-1b
LC4 at 50.00%	0.24	OK	
LC5 at 46.88%	0.17	OK	
LC6 at 50.00%	0.25	OK	
LC7 at 0.00%	0.16	OK	
LC8 at 50.00%	0.25	OK	
LC9 at 50.00%	0.07	OK	

218

LC1 at 50.00%	0.19	OK	
LC10 at 0.00%	0.07	OK	
LC11 at 50.00%	0.07	OK	
LC12 at 50.00%	0.07	OK	
LC13 at 50.00%	0.04	OK	
LC14 at 50.00%	0.03	OK	
LC15 at 50.00%	0.04	OK	
LC16 at 50.00%	0.04	OK	
LC17 at 50.00%	0.05	OK	
LC18 at 50.00%	0.05	OK	
LC19 at 50.00%	0.05	OK	
LC2 at 50.00%	0.16	OK	
LC20 at 50.00%	0.05	OK	
LC21 at 0.00%	0.05	OK	
LC22 at 0.00%	0.05	OK	
LC23 at 0.00%	0.05	OK	
LC24 at 0.00%	0.05	OK	
LC3 at 50.00%	0.20	OK	Eq. H1-1b
LC4 at 50.00%	0.17	OK	
LC5 at 50.00%	0.19	OK	
LC6 at 50.00%	0.16	OK	
LC7 at 50.00%	0.20	OK	
LC8 at 50.00%	0.17	OK	
LC9 at 0.00%	0.07	OK	

APPENDIX D
ADDITIONAL CALCUATIONS



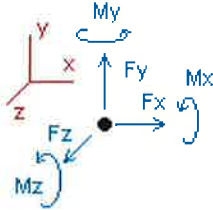
Current Date: 6/26/2018 9:37 AM

Units system: English

File name: W:\STRUCTURAL DEPARTMENT\ANALYSIS SOFTWARE\RAM Elements\RAM Projects\CROWN CASTLE\876384\876384 (Rev.1).etx

Analysis result

Reactions



Direction of positive forces and moments

Node	Forces [Kip]			Moments [Kip*ft]		
	FX	FY	FZ	MX	MY	MZ
Condition LC1=1.2DL+1.6W0						
623	-0.98318	0.84656	-1.49804	0.52299	-1.26731	-2.09352
624	1.13074	0.85243	-1.16243	0.53318	0.50174	2.09006
625	-0.14756	1.95949	-2.94676	-5.86437	-0.33748	-0.00163
SUM	0.00000	3.65847	-5.60723	-4.80820	-1.10305	-0.00508
Condition LC2=1.2DL+1.6W30						
623	-2.62681	0.32184	-1.38335	0.52748	-0.04097	0.02433
624	-2.56398	2.11995	1.28695	2.78710	0.02576	5.79942
625	-1.07483	1.21668	0.09640	-3.31880	-1.73429	0.96317
SUM	-6.26562	3.65847	0.00000	-0.00421	-1.74950	6.78691
Condition LC3=1.2DL-1.6W0						
623	0.86158	1.59242	1.42773	2.81463	1.26739	-3.67329
624	-1.00905	1.58656	1.09227	2.79222	-0.50165	3.68380
625	0.14747	0.47949	3.08722	-0.79864	0.33756	-0.00543
SUM	0.00000	3.65847	5.60723	4.80820	1.10331	0.00508
Condition LC4=1.2DL-1.6W30						
623	2.50522	2.11715	1.31305	2.81014	0.04106	-5.79114
624	2.68566	0.31903	-1.35711	0.53829	-0.02567	-0.02555
625	1.07474	1.22230	0.04406	-3.34422	1.73437	-0.97023
SUM	6.26562	3.65847	0.00000	0.00421	1.74976	-6.78691
Condition LC5=0.9DL+1.6W0						
623	-0.96798	0.54169	-1.48925	0.10579	-1.26732	-1.37267
624	1.11552	0.54755	-1.15366	0.11750	0.50173	1.36833
625	-0.14755	1.65462	-2.96432	-5.03149	-0.33749	-0.00074
SUM	0.00000	2.74386	-5.60723	-4.80820	-1.10308	-0.00508

Condition LC6=0.9DL+1.6W30						
623	-2.61162	0.01696	-1.37457	0.11028	-0.04098	0.74518
624	-2.57919	1.81508	1.29572	2.37143	0.02575	5.07768
625	-1.07482	0.91181	0.07884	-2.48592	-1.73430	0.96405
SUM	-6.26562	2.74386	0.00000	-0.00421	-1.74953	6.78691
Condition LC7=0.9DL-1.6W0						
623	0.87678	1.28755	1.43652	2.39742	1.26738	-2.95244
624	-1.02426	1.28168	1.10104	2.37654	-0.50166	2.96207
625	0.14748	0.17462	3.06967	0.03423	0.33755	-0.00455
SUM	0.00000	2.74386	5.60723	4.80820	1.10327	0.00508
Condition LC8=0.9DL-1.6W30						
623	2.52042	1.81227	1.32184	2.39293	0.04105	-5.07029
624	2.67045	0.01416	-1.34834	0.12261	-0.02568	-0.74728
625	1.07475	0.91743	0.02650	-2.51134	1.73436	-0.96935
SUM	6.26562	2.74386	0.00000	0.00421	1.74973	-6.78691
Condition LC9=1.2DL+Di+Wi0						
623	-0.17582	1.79800	-0.15570	2.46721	-0.07831	-4.33326
624	0.18542	1.79884	-0.12974	2.45274	0.02252	4.34156
625	-0.00960	1.87918	-0.12356	-5.26170	-0.02269	-0.00903
SUM	0.00000	5.47602	-0.40900	-0.34175	-0.07848	-0.00073
Condition LC10=1.2DL+Di+Wi30						
623	-0.35273	1.72354	-0.19027	2.41177	0.01009	-4.05950
624	-0.16927	1.92750	0.07695	2.66330	0.01827	4.73505
625	-0.06600	1.82498	0.11332	-5.07561	-0.10799	0.09281
SUM	-0.58800	5.47602	0.00000	-0.00054	-0.07963	0.76836
Condition LC11=1.2DL+Di-Wi0						
623	-0.01469	1.85268	0.04546	2.62536	0.07853	-4.45163
624	0.00531	1.85184	0.01988	2.60891	-0.02230	4.46117
625	0.00938	1.77150	0.34367	-4.89252	0.02291	-0.00881
SUM	0.00000	5.47602	0.40900	0.34174	0.07914	0.00073
Condition LC12=1.2DL+Di-Wi30						
623	0.16222	1.92715	0.08002	2.68079	-0.00987	-4.72539
624	0.36000	1.72318	-0.18681	2.39835	-0.01805	4.06768
625	0.06578	1.82570	0.10679	-5.07861	0.10821	-0.11066
SUM	0.58800	5.47602	0.00000	0.00053	0.08029	-0.76836
Condition LC13=1.2DL						
623	-0.06080	1.21949	-0.03515	1.66881	0.00004	-2.88341
624	0.06084	1.21949	-0.03508	1.66270	0.00004	2.88693
625	-0.00004	1.21949	0.07023	-3.33151	0.00004	-0.00353
SUM	0.00000	3.65847	0.00000	0.00000	0.00013	0.00000

Condition LC14=0.9DL

623	-0.04560	0.91462	-0.02636	1.25161	0.00003	-2.16255
624	0.04563	0.91462	-0.02631	1.24702	0.00003	2.16520
625	-0.00003	0.91462	0.05267	-2.49863	0.00003	-0.00265
SUM	0.00000	2.74386	0.00000	0.00000	0.00010	0.00000

Condition LC15=1.2DL+1.5LL1

623	-0.06080	1.21949	-0.03515	1.66881	0.00004	-2.88341
624	0.06084	1.21949	-0.03508	1.66270	0.00004	2.88693
625	-0.00004	1.21949	0.07023	-3.33151	0.00004	-0.00353
SUM	0.00000	3.65847	0.00000	0.00000	0.00013	0.00000

Condition LC16=1.2DL+1.5LL2

623	-0.06080	1.21949	-0.03515	1.66881	0.00004	-2.88341
624	0.06084	1.21949	-0.03508	1.66270	0.00004	2.88693
625	-0.00004	1.21949	0.07023	-3.33151	0.00004	-0.00353
SUM	0.00000	3.65847	0.00000	0.00000	0.00013	0.00000

Condition LC17=1.2DL+WL0+1.5LLa1

623	-0.11013	2.19433	-0.08267	3.46449	-0.02859	-5.69711
624	0.10391	1.16816	-0.05170	1.75161	-0.01348	2.47231
625	0.00622	1.04599	0.02337	-2.74335	0.00764	-0.21250
SUM	0.00000	4.40847	-0.11100	2.47275	-0.03443	-3.43729

Condition LC18=1.2DL+WL30+1.5LLa1

623	-0.15417	2.17675	-0.09042	3.45305	-0.00587	-5.63156
624	0.01132	1.20054	0.00274	1.80525	-0.01567	2.57039
625	-0.00915	1.03119	0.08769	-2.69225	-0.01592	-0.18739
SUM	-0.15200	4.40847	0.00000	2.56605	-0.03747	-3.24856

Condition LC19=1.2DL-WL0+1.5LLa1

623	-0.06851	2.20924	-0.02401	3.50790	0.02365	-5.72931
624	0.05305	1.18262	-0.01504	1.79393	-0.01619	2.50496
625	0.01546	1.01662	0.15005	-2.64213	0.02903	-0.21255
SUM	0.00000	4.40847	0.11100	2.65969	0.03649	-3.43690

Condition LC20=1.2DL-WL30+1.5LLa1

623	-0.02447	2.22682	-0.01625	3.51934	0.00094	-5.79486
624	0.14564	1.15024	-0.06948	1.74029	-0.01400	2.40689
625	0.03083	1.03142	0.08574	-2.69324	0.05259	-0.23766
SUM	0.15200	4.40847	0.00000	2.56639	0.03953	-3.62563

Condition LC21=1.2DL+WL0+1.5LLa2

623	-0.09925	1.16793	-0.06278	1.75718	-0.01120	-2.46901
624	0.11480	2.19456	-0.07160	3.45893	0.00391	5.70041
625	-0.01554	1.04599	0.02337	-2.74335	-0.02894	0.20549
SUM	0.00000	4.40847	-0.11100	2.47275	-0.03623	3.43690

Condition **LC22=1.2DL+WL30+1.5LLa2**

623	-0.14329	1.15035	-0.07053	1.74574	0.01152	-2.40346
624	0.02221	2.22694	-0.01715	3.51256	0.00172	5.79849
625	-0.03092	1.03119	0.08769	-2.69225	-0.05251	0.23060
SUM	-0.15200	4.40847	0.00000	2.56605	-0.03927	3.62563

Condition **LC23=1.2DL-WL0+1.5LLa2**

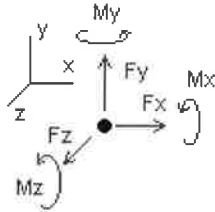
623	-0.05763	1.18285	-0.00412	1.80058	0.04104	-2.50121
624	0.06393	2.20901	-0.03493	3.50124	0.00120	5.73306
625	-0.00631	1.01662	0.15005	-2.64213	-0.00755	0.20544
SUM	0.00000	4.40847	0.11100	2.65969	0.03469	3.43729

Condition **LC24=1.2DL-WL30+1.5LLa2**

623	-0.01359	1.20042	0.00364	1.81202	0.01833	-2.56676
624	0.15652	2.17663	-0.08937	3.44761	0.00339	5.63499
625	0.00907	1.03142	0.08574	-2.69324	0.01601	0.18033
SUM	0.15200	4.40847	0.00000	2.56639	0.03773	3.24856

Envelope for nodal reactions

Note.- I_c is the controlling load condition



Direction of positive forces and moments

Envelope of nodal reactions for :

- LC1=1.2DL+1.6W0
- LC2=1.2DL+1.6W30
- LC3=1.2DL-1.6W0
- LC4=1.2DL-1.6W30
- LC5=0.9DL+1.6W0
- LC6=0.9DL+1.6W30
- LC7=0.9DL-1.6W0
- LC8=0.9DL-1.6W30
- LC9=1.2DL+Di+Wi0
- LC10=1.2DL+Di+Wi30
- LC11=1.2DL+Di-Wi0
- LC12=1.2DL+Di-Wi30
- LC13=1.2DL
- LC14=0.9DL
- LC15=1.2DL+1.5LL1
- LC16=1.2DL+1.5LL2
- LC17=1.2DL+WL0+1.5LLa1
- LC18=1.2DL+WL30+1.5LLa1
- LC19=1.2DL-WL0+1.5LLa1
- LC20=1.2DL-WL30+1.5LLa1
- LC21=1.2DL+WL0+1.5LLa2
- LC22=1.2DL+WL30+1.5LLa2

LC23=1.2DL-WL0+1.5LLa2
 LC24=1.2DL-WL30+1.5LLa2

Node		Forces						Moments					
		Fx [Kip]	lc	Fy [Kip]	lc	Fz [Kip]	lc	Mx [Kip*ft]	lc	My [Kip*ft]	lc	Mz [Kip*ft]	lc
623	Max	2.520	LC8	2.227	LC20	1.437	LC7	3.51934	LC20	1.26739	LC3	0.74518	LC6
	Min	-2.627	LC2	0.017	LC6	-1.498	LC1	0.10579	LC5	-1.26732	LC5	-5.79486	LC20
624	Max	2.686	LC4	2.227	LC22	1.296	LC6	3.51256	LC22	0.50174	LC1	5.79942	LC2
	Min	-2.579	LC6	0.014	LC8	-1.357	LC4	0.11750	LC5	-0.50166	LC7	-0.74728	LC8
625	Max	1.075	LC8	1.959	LC1	3.087	LC3	0.03423	LC7	1.73437	LC4	0.96405	LC6
	Min	-1.075	LC2	0.175	LC7	-2.964	LC5	-5.86437	LC1	-1.73430	LC6	-0.97023	LC4

Date: 6/26/2018

Project Name: WESTBROOK/ORSINA

Project Number: 876384

Designed By: JN Checked By: MSC



HUDSON
Design Group LLC

CHECK CONNECTION CAPACITY (Worse Case)

Reference: AISC Steel Construction Manual 9th Edition (ASD)

Bolt Type = Threaded Rod
Bolt Diameter = 1/2 in.
Steel Grade = A36

Allowable Tensile Load =

$F_{Tall} = 3750 \text{ lbs.}$

Allowable Shear Load =

$F_{Vall} = 1940 \text{ lbs.}$

WIND FORCES

Reaction $F = 2686 \text{ lbs.}$

GRAVITY LOADS

Ice and Equipment 2227 lbs.

No. of Supports = 1

No. of Bolts / Support = 3

Tension Design Load /Bolts =

$f_t = 895.33 \text{ lbs.} < 3750 \text{ lbs.}$ **Therefore, OK !**

Shear Design Load / Bolts=

$f_v = 742.33 \text{ lbs.} < 1940 \text{ lbs.}$ **Therefore, OK !**

CHECK COMBINED TENSION AND SHEAR

$f_t / F_T + f_v / F_V \leq 1.0$
0.239 + 0.383 = 0.621 < 1.0 **Therefore, OK !**