



Reviewed for Code Compliance
Permitting and Inspections Department
Approved with Conditions

10/24/2018

(REVISED) STRUCTURAL ANALYSIS REPORT

For

MONUMENT SQ ME

1 Monument Squared
Portland, ME 04101

Antennas Mounted on Ballast Mounts on Rooftop; Equipment Room inside Penthouse



Prepared for:

verizon[✓]

118 Flanders Road
Westborough, MA 01581

Dated: May 31, 2018 (Rev.1)
May 16, 2018

Prepared by:



HUDSON
Design Group LLC

45 Beechwood Drive
North Andover, MA 01845
(P) 978.557.5553 (F) 978.336.5586
www.hudsondesigngroupllc.com





10/24/2018

SCOPE OF WORK:

Hudson Design Group LLC (HDG) has been authorized by Verizon to conduct a structural evaluation of the structure supporting the proposed equipment located in the areas depicted in the latest HDG construction drawings.

This report represents this office's findings, conclusions and recommendations pertaining to the support of Verizon's proposed antennas listed below.

This office conducted an on-site visual survey on April 30, 2018. Attendees included Manuel Tejada (HDG – Field Technician).

CONCLUSION SUMMARY:

Building plans were not available and could not be obtained for our use. A limited visual survey of the structure was completed in or near the areas of the proposed work.

Based on our evaluation, we have determined that the existing antenna mounts **ARE CAPABLE** of supporting the proposed equipment loading with the following modifications:

- **Removed the existing non-penetrating ballast mounts and install new channel non-penetrating ballast mounts (typ. of 1 per sector, total of 4). Reference latest HDG construction drawings for details and location.**

APPURTENANCE CONFIGURATION:

(3) X7CAP-665-VM0 Antennas (72.0"x12.5"x7.1" – Wt. 40 lbs. /each)

(5) QAP-460-VR0 Antennas (50.5"x12.5"x7.1" – Wt. 25 lbs. /each)

(4) B25 RRH4x30-4R RRH's (21.4"x12.0"x7.2" Wt. = 51 lbs. /each)

(4) B66a RRH 4x45 RRH's (25.8"x12.0"x9.0" Wt. = 62 lbs. /each)

(4) Junction Boxes (23.0"x15.7"x10.3" – Wt. 27 lbs. /each)

(4) NHH-45B-R2B Antennas (72.0"x18.0"x7.0" – Wt. 74 lbs. /each)

(4) NHH-65B-R2B Antennas (72.0"x11.9"x7.1" – Wt. 44 lbs. /each)

(4) RFV01U-D2A RRH's (15.0"x15.0"x8.1" Wt. = 71 lbs. /each)

**Proposed equipment shown in bold*



DESIGN CRITERIA:

1. International Building Code (IBC) 2015 with Maine Uniform Building Code Amendments, and ASCE 7-10 (Minimum Design Loads for Buildings and Other Structures).

Wind Analysis:

Basic Wind Speed:	118 mph	(ASCE 7-10 Figure 26.5-1A)
Exposure:	D	(ASCE 7-10 Ch. 26)

Roof:

Ground Snow, P_g :	50 psf	(ASCE 7-10 Figure 7-1)
Occupancy Category:	II	(ASCE 7-10 Table 1.5-1)
Importance Factor (I):	1.0	(ASCE 7-10 Table 1.5-2)
Exposure Factor (C_e):	0.9	(Fully Exposed, Table 7-2)
Thermal Factor (C_t):	1.0	(ASCE 7-10 Table 7-3)

Calculated Flat Roof Snow Load:

$P_f = 0.7 * C_e * C_t * I * P_g$:	32 psf	(ASCE 7-10 Equation 7.3-1)
-------------------------------------	--------	----------------------------

2. EIA/TIA -222- G Structural Standards for Steel Antenna Towers and Antenna Supporting Structures

City/Town:	Portland
County:	Cumberland
Wind Load:	100 mph
Nominal Ice Thickness:	1 inch

3. Approximate height above grade to the center of the antennas:

150'-6" +/-



10/24/2018

EXISTING ROOF CONSTRUCTION:

The existing roof construction consists of a single-ply EPDM membrane over rigid insulation adhered to a reinforced concrete roof slab supported by a system of reinforced concrete beams and columns.

ANTENNA/RRH SUPPORT RECOMMENDATIONS:

The new antennas and RRH's are proposed to be mounted on new non-penetrating ballast mounts located on the roof.

Limitations and Assumptions:

1. Reference the latest HDG construction drawings for all the equipment locations.
2. All detail requirements will be designed and furnished in the construction drawings.
3. Mount all equipment per manufacturer's specifications.
4. All structural members and their connections are assumed to be in good condition and are free from defects with no deterioration to its member capacities.
5. All antennas, coax cables and waveguide cables are assumed to be properly installed and supported as per the manufacturer requirements.
6. If field conditions differ from what is assumed in this report, then the engineer of record is to be notified as soon as possible.

FIELD PHOTOS:



Photo 1: Sample photo illustrating the existing non-penetrating ballast mount.



Photo 2: Sample photo illustrating the existing equipment cabinets



HUDSON
Design Group LLC



Reviewed for Code Compliance
Permitting and Inspections Department
Approved with Conditions

10/24/2018

Wind and Ice Calculations



Date: 5/31/2018

Project Name: MONUMENT SQ ME

Designed By: BD Checked By: MSC



HUDSON
Design Group

Approved for Code Compliance
Permitting and Inspections Department
Approved with Conditions

10/24/2018

2.6.5.2 Velocity Pressure Coeff:

$$K_z = 2.01 (z/z_g)^{2/\alpha}$$

z = 150.5 (ft)

z_g = 700 (ft)

α = 11.5

K_z = 1.539

$$K_{zmin} \leq K_z \leq 2.01$$

Table 2-4

xposur	Z _g	α	K _{zmin}	K _e
B	1200 ft	7.0	0.70	0.9
C	900 ft	9.5	0.85	1.0
D	700 ft	11.5	1.03	1.1

2.6.6.4 Topographic Factor:

Table 2-5

Topo. Category	K _t	f
2	0.43	1.25
3	0.53	2.0
4	0.72	1.5

$$K_{zt} = [1 + (K_e K_t / K_h)]^2$$

$$K_h = e^{(f \cdot z / H)}$$

K_{zt} = #DIV/0!

K_h = #DIV/0!

K_e = 0 (from Table 2-4)

K_t = 0 (from Table 2-5)

f = 0 (from Table 2-5)

z = 150.5

H = 0 (Ht. of the crest above surrounding terrain)

K_{zt} = 1.00

(If Category 1 then K_{zt} = 1.0)

Catego 1



Date: 5/31/2018
 Project Name: MONUMENT SQ ME
 Designed By: BD Checked By: MSC



HUDSON
 Design Group, Inc.
 Reviewed for Code Compliance
 Permitting and Inspections Department
 Approved with Conditions

10/24/2018

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= 144.25 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

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

Gh= 1.35 Gh= 1.35

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 = 37.42

q_{z (ice)} = 5.99

K_z = 1.539

K_{zt} = 1.0

K_d = 0.95

V_{max} = 100

V_{max (ice)} = 40

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

Date: 5/31/2018

Project Name: MONUMENT SQ ME

Designed By: BD Checked By: MSC



HUDSON
Design Group LLC



Reviewed for Code Compliance
Permitting and Inspections Department
Approved with Conditions

10/24/2018

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,
and the section length considered to have uniform wind load).

Note: Linear interpolation may be used for aspect ratios other than those shown.

Ice Thickness = **1.00 in**

<u>Appurtenances</u>	<u>Height</u>	<u>Width</u>	<u>Depth</u>	<u>Flat Area</u>	<u>Aspect Ratio</u>	<u>Ca</u>	<u>Force (lbs)</u>	<u>Force (lbs) (1" Ice)</u>
X7CAP-665-VM0 Antenna	72.0	12.5	7.1	6.25	5.76	1.34	425	81
QAP-460-VR0 Antenna	50.5	12.5	7.1	4.38	4.04	1.27	281	54
NHH-45B-R2B Antenna	72.0	18.0	7.0	9.00	4.00	1.27	576	105
NHH-65B-R2B Antenna	72.0	11.9	7.1	5.95	6.05	1.36	408	78
B25 RRH4x30-4R RRH	21.4	12.0	7.2	1.78	1.78	1.20	108	22
B66a RRH 4x45 RRH	25.8	12.0	9.0	2.15	2.15	1.20	130	26
RFV01U-D2A RRH	15.0	15.0	8.1	1.56	1.00	1.20	95	19
RFV01U-D2A RRH (Shielded)	15.0	2.5	8.1	0.26	6.00	1.36	18	6
Junction Box	23.0	15.7	10.3	2.51	1.46	1.20	152	30
Junction Box (Shielded)	23.0	3.2	10.3	0.51	7.19	1.41	36	10

Date: 5/31/2018
 Project Name: MONUMENT SQ ME
 Designed By: BD Checked By: MSC



Reviewed for Code Compliance
 Permitting and Inspections Department
 Approved with Conditions

10/24/2018

ICE WEIGHT CALCULATIONS

Thickness of ice: 1 in.
 Density of ice: 56 pcf

X7CAP-665-VM0 Antenna

Weight of ice based on total radial SF area:
 Height (in): 72.0
 Width (in): 12.5
 Depth (in): 7.1
 Total weight of ice on object: 109 lbs
 Weight of object: 40 lbs
Combined weight of ice and object: 149 lbs

QAP-460-VR0 Antenna

Weight of ice based on total radial SF area:
 Height (in): 50.5
 Width (in): 12.5
 Depth (in): 7.1
 Total weight of ice on object: 79 lbs
 Weight of object: 25 lbs
Combined weight of ice and object: 104 lbs

NHH-45B-R2B Antenna

Weight of ice based on total radial SF area:
 Height (in): 72.0
 Width (in): 18.0
 Depth (in): 7.0
 Total weight of ice on object: 138 lbs
 Weight of object: 74 lbs
Combined weight of ice and object: 212 lbs

NHH-65B-R2B Antenna

Weight of ice based on total radial SF area:
 Height (in): 72.0
 Width (in): 11.9
 Depth (in): 7.1
 Total weight of ice on object: 106 lbs
 Weight of object: 44 lbs
Combined weight of ice and object: 150 lbs

B25 RRH4x30-4R RRH

Weight of ice based on total radial SF area:
 Height (in): 21.4
 Width (in): 12.0
 Depth (in): 7.2
 Total weight of ice on object: 38 lbs
 Weight of object: 51 lbs
Combined weight of ice and object: 89 lbs

B66a RRH 4x45 RRH

Weight of ice based on total radial SF area:
 Height (in): 25.8
 Width (in): 12.0
 Depth (in): 9.0
 Total weight of ice on object: 48 lbs
 Weight of object: 62 lbs
Combined weight of ice and object: 110 lbs

RFV01U-D2A RRH

Weight of ice based on total radial SF area:
 Height (in): 15.0
 Width (in): 15.0
 Depth (in): 8.1
 Total weight of ice on object: 36 lbs
 Weight of object: 71 lbs
Combined weight of ice and object: 107 lbs

Junction Box

Weight of ice based on total radial SF area:
 Height (in): 23.0
 Width (in): 15.7
 Depth (in): 10.3
 Total weight of ice on object: 56 lbs
 Weight of object: 27 lbs
Combined weight of ice and object: 83 lbs

L 3x3x3/16 Angles

Weight of ice based on total radial SF area:
 Height (in): 3
 Width (in): 3
Per foot weight of ice on object: 6 plf

L 2-1/2x2-1/2x3/16 Angles

Weight of ice based on total radial SF area:
 Height (in): 2.5
 Width (in): 2.5
Per foot weight of ice on object: 5 plf

2" pipe

Per foot weight of ice:
 diameter (in): 2.38
Per foot weight of ice on object: 4 plf



HUDSON
Design Group LLC



Reviewed for Code Compliance
Permitting and Inspections Department
Approved with Conditions

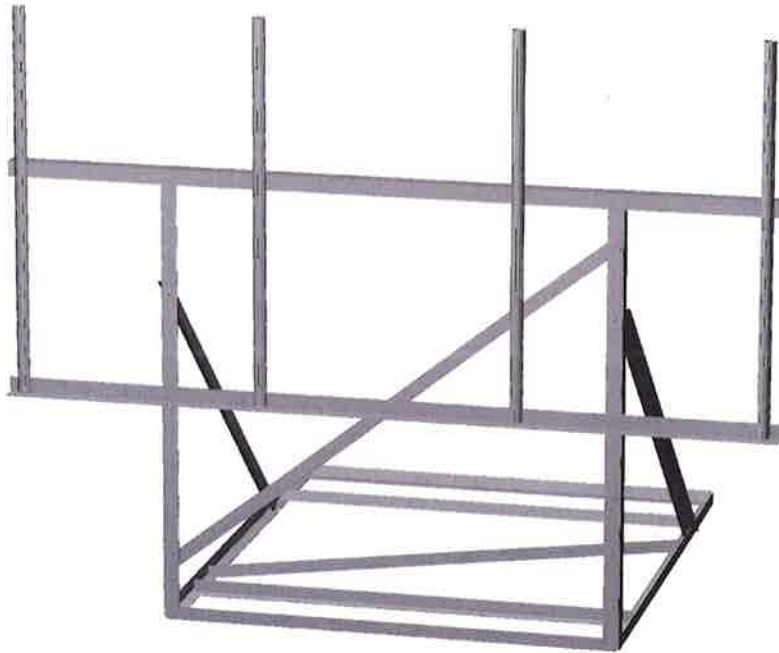
10/24/2018

Antenna Mount Calculations (Existing Conditions)



Reviewed for Code Compliance
Permitting and Inspections Department
Approved with Conditions

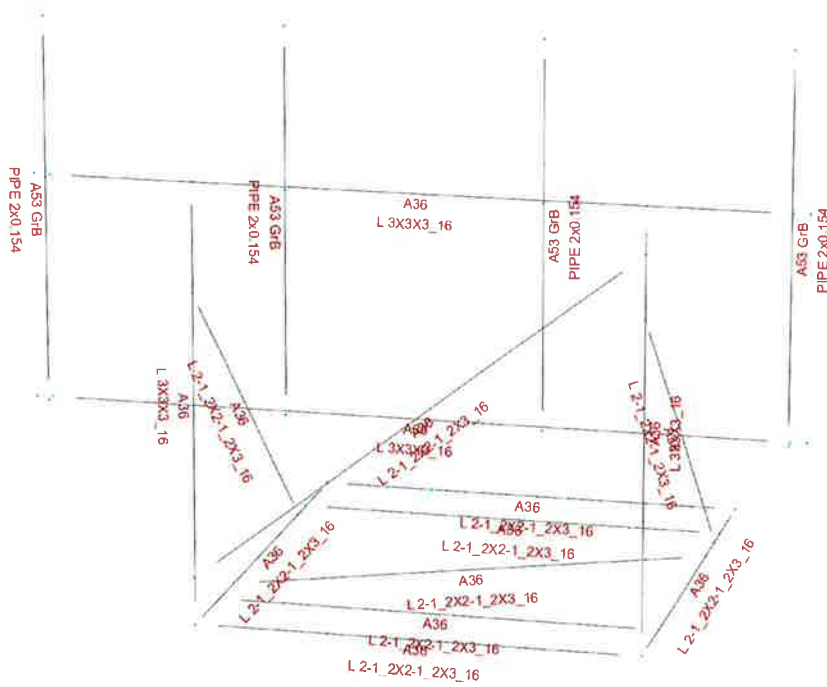
10/24/2018





Reviewed for Code Compliance
Permitting and Inspections Department
Approved with Conditions

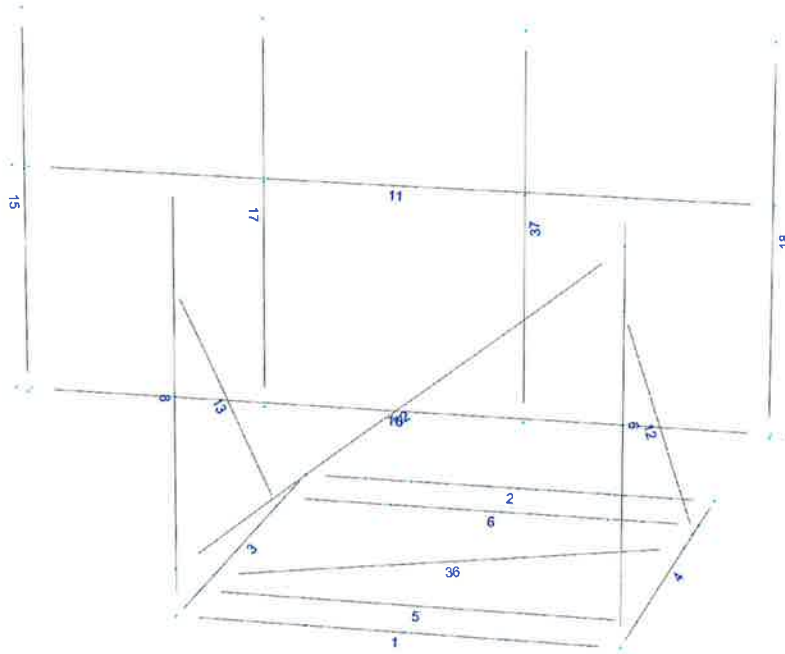
10/24/2018





Reviewed for Code Compliance
Permitting and Inspections Department
Approved with Conditions

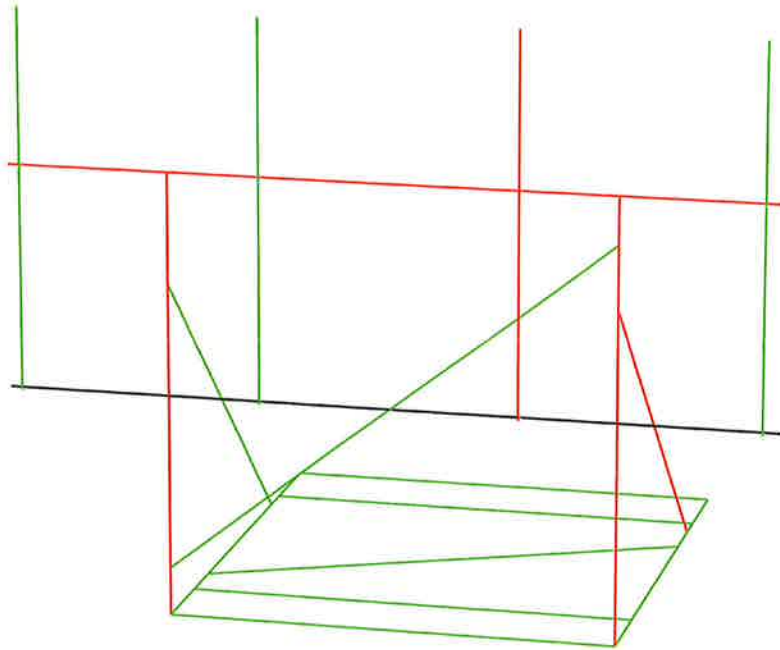
10/24/2018





Reviewed for Code Compliance
Designing for Code Compliance Department
Approved with Conditions

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



Load data

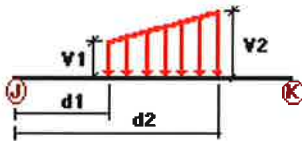
GLOSSARY

Comb : Indicates if load condition is a load combination

Load Conditions

Condition	Description	Comb.	Category
DL	Dead Load	No	DL
Wo	Wind Load (No Ice)	No	WIND
Wi	Wind Load (With Ice)	No	WIND
Di	Ice Load	No	LL

Distributed force on members



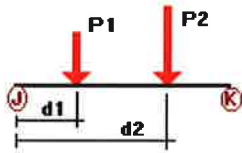
Condition	Member	Dir1	Val1 [Kip/ft]	Val2 [Kip/ft]	Dist1 [ft]	%	Dist2 [ft]	%
Di	1	y	-0.005	0.00	0.00	No	0.00	No
	2	y	-0.005	0.00	0.00	No	0.00	No
	3	y	-0.005	0.00	0.00	No	0.00	No
	4	y	-0.005	0.00	0.00	No	0.00	No
	5	y	-0.005	0.00	0.00	No	0.00	No
	6	y	-0.005	0.00	0.00	No	0.00	No
	8	y	-0.006	0.00	0.00	No	0.00	No
	9	y	-0.006	0.00	0.00	No	0.00	No
	10	y	-0.006	0.00	0.00	No	0.00	No
	11	y	-0.006	0.00	0.00	No	0.00	No
	12	y	-0.005	0.00	0.00	No	0.00	No
	13	y	-0.005	0.00	0.00	No	0.00	No
	15	y	-0.004	0.00	0.00	No	0.00	No
	17	y	-0.004	0.00	0.00	No	0.00	No
	18	y	-0.004	0.00	0.00	No	0.00	No
	32	y	-0.005	0.00	0.00	No	0.00	No
	36	y	-0.005	0.00	0.00	No	0.00	No
37	y	-0.004	0.00	0.00	No	0.00	No	

Concentrated forces on members



Reviewed for Code Compliance
 Permitting and Inspections Department
 Approved with Conditions

10/24/2018



Condition	Member	Dir1	Value1 [Kip]	Dist1 [ft]	%	
DL	15	y	-0.013	0.50	No	
		y	-0.013	5.50	No	
		y	-0.071	4.00	No	
	17	y	-0.051	4.00	No	
		18	y	-0.02	0.50	No
			y	-0.02	5.50	No
	37	y	-0.027	4.00	No	
		y	-0.074	0.50	No	
		y	-0.074	5.50	No	
Wo	15	z	-0.141	0.50	No	
		z	-0.141	5.50	No	
		z	-0.018	4.00	No	
	17	z	-0.108	4.00	No	
		18	z	-0.213	0.50	No
			z	-0.213	5.50	No
	37	z	-0.036	4.00	No	
		z	-0.576	0.50	No	
		z	-0.576	5.50	No	
Wi	15	z	-0.027	0.50	No	
		z	-0.027	5.50	No	
		z	-0.006	4.00	No	
	17	z	-0.022	4.00	No	
		18	z	-0.041	0.50	No
			z	-0.041	5.50	No
	37	z	-0.01	4.00	No	
		z	-0.105	0.50	No	
		z	-0.105	5.50	No	
Di	15	y	-0.04	0.50	No	
		y	-0.04	5.50	No	
		y	-0.036	4.00	No	
	17	y	-0.038	4.00	No	
		18	y	-0.055	0.50	No
			y	-0.055	5.50	No
	37	y	-0.056	4.00	No	
		y	-0.138	0.50	No	
		y	-0.138	5.50	No	
		y	-0.048	4.00	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
Wo	Wind Load (No Ice)	No	0.00	0.00	0.00
Wi	Wind Load (With Ice)	No	0.00	0.00	0.00
Di	Ice Load	No	0.00	0.00	0.00



Earthquake (Dynamic analysis only)

Condition	a/g	Ang. [Deg]	Damp. [%]
DL	0.00	0.00	0.00
Wo	0.00	0.00	0.00
Wi	0.00	0.00	0.00
Di	0.00	0.00	0.00

Reviewed for Code Compliance
Permitting and Inspections Department
Approved with Conditions

10/24/2018

Steel Code Check

Report: Summary - For all selected load conditions

Load conditions to be included in design :

- LC1=1.2DL+1.6Wo
- LC2=0.9DL+1.6Wo
- LC3=1.2DL+Wi+Di
- LC4=1.2DL
- LC5=0.9DL

Description	Section	Member	Ctrl Eq.	Ratio	Status	Reference
	<i>L 2-1_2X2-1_2X3_16</i>	1	LC1 at 0.00%	0.22	OK	Eq. H2-1
			LC2 at 0.00%	0.21	OK	
			LC3 at 0.00%	0.06	OK	
			LC4 at 100.00%	0.04	OK	
			LC5 at 100.00%	0.03	OK	
		2	LC1 at 14.37%	0.00	OK	Eq. H3-8
			LC2 at 14.37%	0.00	OK	
			LC3 at 14.37%	0.00	OK	
			LC4 at 14.37%	0.00	OK	
			LC5 at 14.37%	0.00	OK	
		3	LC1 at 100.00%	0.37	OK	Eq. H2-1
			LC2 at 100.00%	0.37	OK	
			LC3 at 100.00%	0.03	OK	
			LC4 at 100.00%	0.01	OK	
			LC5 at 100.00%	0.01	OK	
		4	LC1 at 100.00%	0.79	OK	Eq. H2-1 Eq. H3-8
			LC2 at 100.00%	0.80	OK	
			LC3 at 25.00%	0.07	OK	
			LC4 at 25.00%	0.03	OK	
			LC5 at 25.00%	0.02	OK	
		5	LC1 at 50.00%	0.04	OK	Sec. F1
			LC2 at 50.00%	0.03	OK	
			LC3 at 50.00%	0.09	OK	
			LC4 at 50.00%	0.04	OK	
			LC5 at 50.00%	0.03	OK	
		6	LC1 at 25.00%	0.00	OK	Eq. H3-8
			LC2 at 25.00%	0.00	OK	
			LC3 at 25.00%	0.01	OK	
			LC4 at 25.00%	0.00	OK	
			LC5 at 25.00%	0.00	OK	
		12	LC1 at 0.00%	1.85	N.G.	Eq. H2-1
			LC2 at 0.00%	1.86	N.G.	
			LC3 at 100.00%	0.20	OK	
			LC4 at 0.00%	0.03	OK	
			LC5 at 0.00%	0.02	OK	
		13	LC1 at 100.00%	0.75	OK	



Eq.

Reviewed for Code Compliance
Permitting and Inspections Department
Eq. H2-1 with Conditions

10/24/2018

L 3X3X3_16

PIPE 2x0.154

	LC2 at 100.00%	0.76	OK	
	LC3 at 0.00%	0.12	OK	
	LC4 at 100.00%	0.04	OK	
	LC5 at 100.00%	0.03	OK	
32	LC1 at 50.00%	0.55	OK	
	LC2 at 50.00%	0.55	OK	
	LC3 at 56.25%	0.09	OK	
	LC4 at 50.00%	0.03	OK	
	LC5 at 50.00%	0.02	OK	
36	LC1 at 50.00%	0.05	OK	
	LC2 at 50.00%	0.03	OK	
	LC3 at 50.00%	0.11	OK	Sec. F1
	LC4 at 50.00%	0.05	OK	
	LC5 at 50.00%	0.03	OK	
8	LC1 at 23.44%	1.57	N.G.	
	LC2 at 23.44%	1.57	N.G.	Sec. F1
	LC3 at 50.00%	0.23	OK	
	LC4 at 50.00%	0.10	OK	
	LC5 at 50.00%	0.08	OK	
9	LC1 at 75.00%	3.80	N.G.	
	LC2 at 75.00%	3.80	N.G.	Sec. F1
	LC3 at 75.00%	0.42	OK	
	LC4 at 48.44%	0.10	OK	
	LC5 at 48.44%	0.08	OK	
10	LC1 at 78.91%	0.59	With warnings	Eq. H2-1
	LC2 at 79.69%	0.59	With warnings	Sec. F1
	LC3 at 78.91%	0.38	With warnings	
	LC4 at 78.91%	0.17	With warnings	
	LC5 at 78.91%	0.13	With warnings	
11	LC1 at 66.96%	1.65	N.G.	
	LC2 at 66.96%	1.65	N.G.	Eq. H3-8
	LC3 at 79.46%	0.36	With warnings	
	LC4 at 20.54%	0.14	OK	
	LC5 at 20.54%	0.10	OK	
15	LC1 at 43.75%	0.47	OK	Eq. H1-1b
	LC2 at 43.75%	0.46	OK	
	LC3 at 43.75%	0.12	OK	
	LC4 at 43.75%	0.05	OK	
	LC5 at 43.75%	0.04	OK	
17	LC1 at 43.75%	0.17	OK	Eq. H1-1b
	LC2 at 43.75%	0.17	OK	
	LC3 at 43.75%	0.08	OK	
	LC4 at 43.75%	0.04	OK	
	LC5 at 43.75%	0.03	OK	
18	LC1 at 43.75%	0.70	OK	Eq. H1-1b
	LC2 at 43.75%	0.69	OK	
	LC3 at 43.75%	0.15	OK	
	LC4 at 43.75%	0.04	OK	
	LC5 at 43.75%	0.03	OK	
37	LC1 at 43.75%	1.51	N.G.	
	LC2 at 43.75%	1.51	N.G.	Eq. H1-1b
	LC3 at 40.63%	0.17	OK	
	LC4 at 43.75%	0.03	OK	
	LC5 at 43.75%	0.02	OK	



HUDSON
Design Group LLC



Reviewed for Code Compliance
Permitting and Inspections Department
Approved with Conditions

10/24/2018

Antenna Mount Calculations (Proposed Conditions)

Date: 5/31/2018

Project Name: MONUMENT SQ ME

Designed By: BD Checked By: MSC



HUDSON
Design Group



Reviewed for Code Compliance
Permitting and Inspections Department
Approved with Conditions

10/24/2018

Check Frame Weight Requirements for Overturning:

Centroid Distance, D_c (ft.) =

7

$$F_w = Mo/D_c$$

$$= \boxed{2743.29 \text{ lbs.} < 3158.80 \text{ lbs.} \quad \text{O.K!}}$$

Check Sliding:

Friction Factor=

1.16 (Rubber on Rubber - Adhere rubber mats on the underside of the steel frame)

Sliding =

$T_w / \text{Friction Factor} =$

$$= \boxed{1596.55 \text{ lbs.} < 3158.80 \text{ lbs.} \quad \text{O.K!}}$$

Safety Factor=

Total Wt./ Sliding

$$= \boxed{2.0 \text{ O.K!}}$$

Project: Monument SQ ME

Location: New Pipe Mast
Multi-Loaded Multi-Span Beam
[2015 International Building Code(AISC 14th Ed ASD)]
Pipe 4 x-Strong x 10.0 FT (3 + 7) / ASTM A53-GR.B
Section Adequate By: 12.4%
Controlling Factor: Deflection

Brady Doyle
Hudson Design Group LLC
45 Beechwood Drive
North Andover, MA, 01845

5/31/2018 4:28:24 PM

Reviewed for Code Compliance
Permitting and Inspections Department
Approved with Conditions

10/24/2018

DEFLECTIONS	Center	Right
Live Load	-0.02 IN L/2071	0.62 IN 2L/270
Dead Load	0.00 in	0.05 in
Total Load	-0.02 IN L/1927	0.67 IN 2L/252
Live Load Deflection Criteria: L/240 Total Load Deflection Criteria: L/180		

REACTIONS	A	B
Live Load	0 lb	2688 lb
Dead Load	-101 lb	252 lb
Total Load	-101 lb	2940 lb
Uplift (1.5 F.S)	-1637 lb	0 lb
Bearing Length	0.00 in	0.63 in

BEAM DATA	Center	Right
Span Length	3 ft	7 ft
Unbraced Length-Top	0 ft	0 ft
Unbraced Length-Bottom	3 ft	7 ft

STEEL PROPERTIES
Pipe 4 x-Strong - A53-GR.B

Properties:

Steel Yield Strength: $F_y = 35$ ksi
 Modulus of Elasticity: $E = 29000$ ksi
 Tube Steel Section (X Axis): $d_x = 4.5$ in
 Tube Steel Section (Y Axis): $d_y = 4.5$ in
 Tube Steel Wall Thickness: $t = 0.315$ in
 Area: $A = 4.14$ in²
 Moment of Inertia (X Axis): $I_x = 9.12$ in⁴
 Section Modulus (X Axis): $S_x = 4.05$ in³
 Plastic Section Modulus: $Z = 5.53$ in³

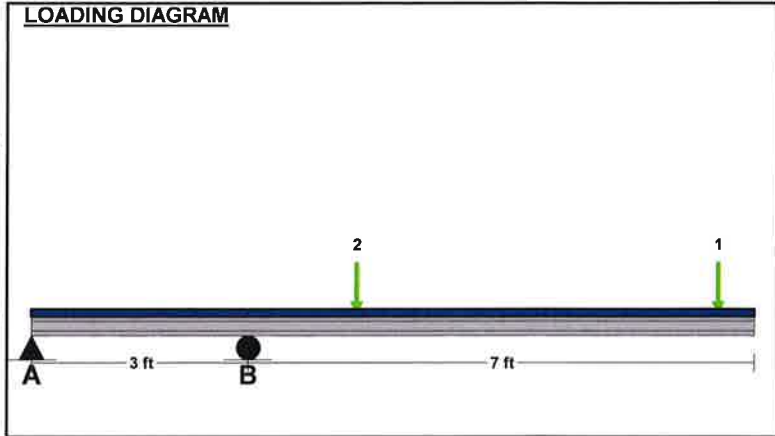
Design Properties per AISC 14th Edition Steel Manual:

Flange Buckling Ratio: $FBR = 14.29$
 Allowable Flange Buckling Ratio: $AFBR = 58$
 Allowable Flange Buckling Ratio non-compact: $AFBR_{NC} = 256.86$
 Nominal Flexural Strength w/ Safety Factor: $M_n = 9658$ ft-lb
 Controlling Equation: $F8-1$
 Shear Buckling Stress Coefficient Eqn. G6-2a: $F_{cr} = 21$ ksi
 Nominal Shear Strength w/ Safety Factor: $V_n = 26030$ lb

Controlling Moment: -4979 ft-lb
 Over right support of span 2 (Center Span)
 Created by combining all dead loads and live loads on span(s) 2, 3

Controlling Shear: -1682 lb
 At right support of span 2 (Center Span)
 Created by combining all dead loads and live loads on span(s)

Comparisons with required sections:	Req'd	Provided
Moment of Inertia (deflection):	8.11 in ⁴	9.12 in ⁴
Moment:	-4979 ft-lb	9658 ft-lb
Shear:	-1682 lb	26030 lb



UNIFORM LOADS	Center	Right
Uniform Live Load	0 plf	0 plf
Uniform Dead Load	0 plf	0 plf
Beam Self Weight	15 plf	15 plf
Total Uniform Load	15 plf	15 plf

POINT LOADS - RIGHT SPAN		
Load Number	One	Two
Live Load	576 lb	576 lb
Dead Load	0 lb	0 lb
Location	6.5 ft	1.5 ft

NOTES



CERTIFICATE OF LIABILITY INSURANCE



THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

Permitting and Inspections Department
Approved with Conditions

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER USI Insurance Services LLC 3 Executive Park Drive, Suite 300 Bedford NH 03110	CONTACT NAME: PHONE (A/C, No, Ext): 855-874-0123		FAX (A/C, No):
	E-MAIL ADDRESS:		
INSURER(S) AFFORDING COVERAGE			NAIC #
INSURER A : Admiral Insurance Co.			24856
INSURER B : Hanover Insurance Company			22292
INSURER C : Starr Indemnity & Liability Company			38318
INSURER D : Commerce & Industry Insurance Co.			19410
INSURER E : Lloyd's of London			85202
INSURER F :			

COVERAGES **CERTIFICATE NUMBER: 894147753** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS		
A	<input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS-MADE <input checked="" type="checkbox"/> OCCUR <input checked="" type="checkbox"/> BI/PD Ded:15,000 GEN'L AGGREGATE LIMIT APPLIES PER: <input type="checkbox"/> POLICY <input checked="" type="checkbox"/> PRO-JECT <input type="checkbox"/> LOC OTHER:			CA00002924401	1/1/2018	1/1/2019	EACH OCCURRENCE	\$ 1,000,000	
							DAMAGE TO RENTED PREMISES (Ea occurrence)	\$ 50,000	
							MED EXP (Any one person)	\$ 5,000	
							PERSONAL & ADV INJURY	\$ 1,000,000	
							GENERAL AGGREGATE	\$ 2,000,000	
							PRODUCTS - COMP/OP AGG	\$ 2,000,000	
								\$	
B	<input checked="" type="checkbox"/> AUTOMOBILE LIABILITY <input checked="" type="checkbox"/> ANY AUTO <input type="checkbox"/> ALL OWNED AUTOS <input type="checkbox"/> SCHEDULED AUTOS <input checked="" type="checkbox"/> HIRED AUTOS <input checked="" type="checkbox"/> NON-OWNED AUTOS			AWV697898709	1/1/2018	1/1/2019	COMBINED SINGLE LIMIT (Ea accident)	\$ 1,000,000	
							BODILY INJURY (Per person)	\$	
							BODILY INJURY (Per accident)	\$	
							PROPERTY DAMAGE (Per accident)	\$	
								\$	
C	<input checked="" type="checkbox"/> UMBRELLA LIAB <input checked="" type="checkbox"/> OCCUR <input type="checkbox"/> EXCESS LIAB <input type="checkbox"/> CLAIMS-MADE <input type="checkbox"/> DED <input checked="" type="checkbox"/> RETENTION \$ 0			1000584869181	1/1/2018	1/1/2019	EACH OCCURRENCE	\$ 10,000,000	
							AGGREGATE	\$ 10,000,000	
								\$	
D	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below			WC14220402	8/1/2017	8/1/2018	<input checked="" type="checkbox"/> PER STATUTE <input type="checkbox"/> OTHER <input type="checkbox"/> Y <input checked="" type="checkbox"/> N <input type="checkbox"/> N/A	E.L. EACH ACCIDENT	\$ 1,000,000
								E.L. DISEASE - EA EMPLOYEE	\$ 1,000,000
								E.L. DISEASE - POLICY LIMIT	\$ 1,000,000
B	Inland Marine			IHV707584308	1/1/2018	1/1/2019		\$150K/\$2,500 Ded.	
E	Professional Liab			PGIARK0821100	1/1/2018	1/1/2019		\$2MM/\$2MM/\$20K Ded.	


DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)
 This certificate covers all operations usual and customary to the insured's business.

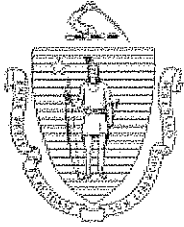
Type of Insurance - Contractors Pollution Liability/Policy # G2710020A005 / Company: Ace American Insurance Company; Term: 01/01/2018 - 01/01/2019; Limit \$5,000,000 Each Pollution Condition / \$10,000,000 General Aggregate/ \$5,000 Deductible.

PROOF OF INSURANCE FOR SITE ACQUISITIONS, LLC d/b/a SAI COMMUNICATIONS AND SAI BUILDERS, LLC.

CERTIFICATE HOLDER

CANCELLATION

Site Acquisitions, LLC 12 INDUSTRIAL WAY Salem NH 03079 PROOF OF INSURANCE	<p>SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.</p> <p>AUTHORIZED REPRESENTATIVE</p> 
---	---



The Commonwealth of Massachusetts
 Department of Industrial Accidents
 Office of Investigations
 1 Congress Street, Suite 100
 Boston, MA 02114-2017
 www.mass.gov/dia



Reviewed for Code Compliance
 Permitting and Inspections Department
 Approved with Conditions

10/24/2018

Workers' Compensation Insurance Affidavit: Builders/Contractors/Electricians/Plumbers
Applicant Information **Please Print Legibly**

Name (Business/Organization/Individual): Site Acquisitions, LLC d/b/a SAI Group

Address: 12 Industrial Way

City/State/Zip: Salem, NH 03079 Phone #: 603.421.0470

<p>Are you an employer? Check the appropriate box:</p> <p>1. <input checked="" type="checkbox"/> I am a employer with <u>140</u> employees (full and/or part-time).*</p> <p>2. <input type="checkbox"/> I am a sole proprietor or partnership and have no employees working for me in any capacity. [No workers' comp. insurance required.]</p> <p>3. <input type="checkbox"/> I am a homeowner doing all work myself. [No workers' comp. insurance required.] †</p> <p>4. <input type="checkbox"/> I am a general contractor and I have hired the sub-contractors listed on the attached sheet. These sub-contractors have employees and have workers' comp. insurance. ‡</p> <p>5. <input type="checkbox"/> We are a corporation and its officers have exercised their right of exemption per MGL c. 152, §1(4), and we have no employees. [No workers' comp. insurance required.]</p>	<p>Type of project (required):</p> <p>6. <input type="checkbox"/> New construction</p> <p>7. <input type="checkbox"/> Remodeling</p> <p>8. <input type="checkbox"/> Demolition</p> <p>9. <input type="checkbox"/> Building addition</p> <p>10. <input type="checkbox"/> Electrical repairs or additions</p> <p>11. <input type="checkbox"/> Plumbing repairs or additions</p> <p>12. <input type="checkbox"/> Roof repairs</p> <p>13. <input checked="" type="checkbox"/> Other <u>telecommunications</u></p>
---	--

*Any applicant that checks box #1 must also fill out the section below showing their workers' compensation policy information.
 † Homeowners who submit this affidavit indicating they are doing all work and then hire outside contractors must submit a new affidavit indicating such.
 ‡ Contractors that check this box must attached an additional sheet showing the name of the sub-contractors and state whether or not those entities have employees. If the sub-contractors have employees, they must provide their workers' comp. policy number.

I am an employer that is providing workers' compensation insurance for my employees. Below is the policy and job site information.

Insurance Company Name: Granite State Insurance Co.

Policy # or Self-ins. Lic. #: WC62499085 Expiration Date: 8/1/2019

Job Site Address: _____ City/State/Zip: _____

Attach a copy of the workers' compensation policy declaration page (showing the policy number and expiration date). Failure to secure coverage as required under Section 25A of MGL c. 152 can lead to the imposition of criminal penalties of a fine up to \$1,500.00 and/or one-year imprisonment, as well as civil penalties in the form of a STOP WORK ORDER and a fine of up to \$250.00 a day against the violator. Be advised that a copy of this statement may be forwarded to the Office of Investigations of the DIA for insurance coverage verification.

I do hereby certify under the pains and penalties of perjury that the information provided above is true and correct.

Signature: [Handwritten Signature] Date: _____

Phone #: 603.421.0470

Official use only. Do not write in this area, to be completed by city or town official.

City or Town: _____ Permit/License # _____

Issuing Authority (circle one):
 1. Board of Health 2. Building Department 3. City/Town Clerk 4. Electrical Inspector 5. Plumbing Inspector
 6. Other _____

Contact Person: _____ Phone #: _____



CERTIFICATE OF LIABILITY INSURANCE



THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER USI Insurance Services LLC 3 Executive Park Drive, Suite 300 Bedford NH 03110	CONTACT NAME: PHONE (A/C, No, Ext): 855-874-0123	FAX (A/C, No):	
	E-MAIL ADDRESS:		
INSURER(S) AFFORDING COVERAGE		NAIC #	
INSURED Site Acquisitions, LLC dba SAI Group 12 Industrial Way Salem NH 03079	INSURER A : Admiral Insurance Co.		24856
	INSURER B : Hanover Insurance Company		22292
	INSURER C : Starr Indemnity & Liability Company		38318
	INSURER D : Lloyd's of London		85202
	INSURER E : Granite State Insurance Company		23809
INSURER F :			

COVERAGES

CERTIFICATE NUMBER: 112315812

REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	GENERAL LIABILITY <input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS-MADE <input checked="" type="checkbox"/> OCCUR <input checked="" type="checkbox"/> BI/PD Ded:15,000 GEN'L AGGREGATE LIMIT APPLIES PER: <input type="checkbox"/> POLICY <input checked="" type="checkbox"/> PROJECT <input type="checkbox"/> LOC			CA00002924401	1/1/2018	1/1/2019	EACH OCCURRENCE	\$ 1,000,000
							DAMAGE TO RENTED PREMISES (Ea occurrence)	\$ 300,000
							MED EXP (Any one person)	\$ 5,000
							PERSONAL & ADV INJURY	\$ 1,000,000
							GENERAL AGGREGATE	\$ 2,000,000
							PRODUCTS - COMP/OP AGG	\$ 2,000,000
								\$
B	AUTOMOBILE LIABILITY <input checked="" type="checkbox"/> ANY AUTO <input type="checkbox"/> ALL OWNED AUTOS <input checked="" type="checkbox"/> HIRED AUTOS <input type="checkbox"/> SCHEDULED AUTOS <input checked="" type="checkbox"/> NON-OWNED AUTOS			AWV697898709	1/1/2018	1/1/2019	COMBINED SINGLE LIMIT (Ea accident)	\$ 1,000,000
							BODILY INJURY (Per person)	\$
							BODILY INJURY (Per accident)	\$
							PROPERTY DAMAGE (Per accident)	\$
								\$
C	<input checked="" type="checkbox"/> UMBRELLA LIAB <input type="checkbox"/> EXCESS LIAB <input type="checkbox"/> DED <input checked="" type="checkbox"/> RETENTION \$ 0			1000584869181	1/1/2018	1/1/2019	EACH OCCURRENCE	\$ 10,000,000
							AGGREGATE	\$ 10,000,000
								\$
E	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below			WC62499085	8/1/2018	8/1/2019	<input checked="" type="checkbox"/> WC STATUTORY LIMITS <input type="checkbox"/> OTHER	
							E.L. EACH ACCIDENT	\$ 1,000,000
							E.L. DISEASE - EA EMPLOYEE	\$ 1,000,000
							E.L. DISEASE - POLICY LIMIT	\$ 1,000,000
B	Inland Marine			IHV707584308	1/1/2018	1/1/2019		\$150K/\$2,500 Ded.
D	Professional			PGIARK0821100	1/1/2018	1/1/2019		\$2MM/\$2MM/\$20K Ded

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)
 This certificate covers all operations usual and customary to the insured's business.


Type of Insurance - Contractors Pollution Liability/Policy # G2710020A005 / Company: Ace American Insurance Company; Term: 01/01/2018 - 01/01/2019; Limit \$5,000,000 Each Pollution Condition / \$10,000,000 General Aggregate/ \$5,000 Deductible.

Hanover Policy #IHV707584308 includes coverage for equipment leased or rented from others \$100,000.

PROOF OF INSURANCE FOR SITE ACQUISITIONS, LLC d/b/a SAI Group AND SAI BUILDERS, LLC.

CERTIFICATE HOLDER

CANCELLATION

Site Acquisitions, LLC 12 Industrial Way Salem NH 03079 PROOF OF INSURANCE	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS. AUTHORIZED REPRESENTATIVE 
---	---



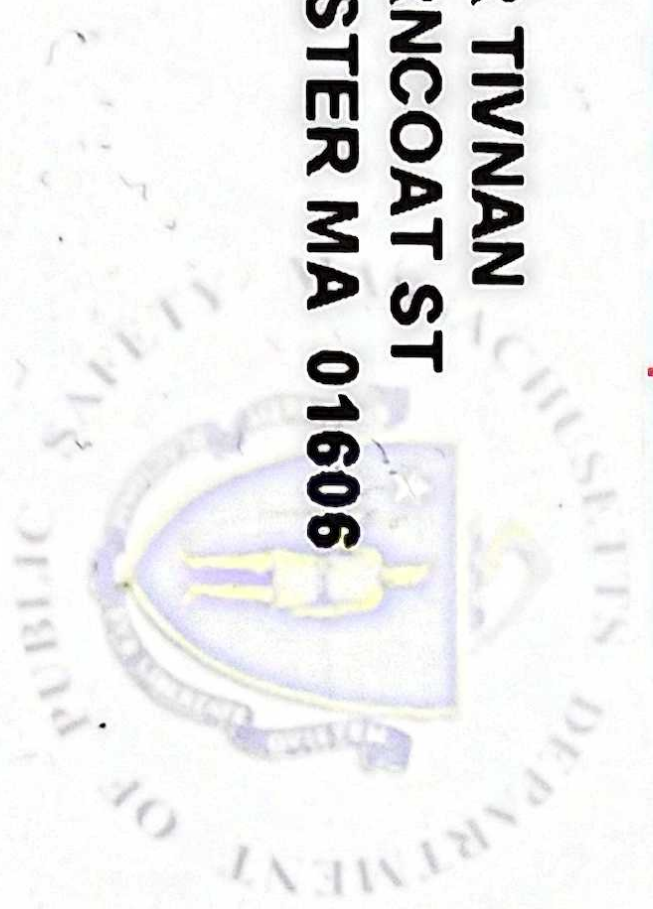
Reviewed for Code Compliance
Permitting and Inspections Department
Approved with Conditions
10/24/2018

**Massachusetts Department of Public Safety
Board of Building Regulations and Standards**

License: CS-103885

Construction Supervisor

**DAVID R TIVNAN
366 BURNCOAT ST
WORCESTER MA 01606**



Matthew Moran
Commissioner

**Expiration:
01/01/2019**



Reviewed for Code Compliance
Permitting and Inspections Department
Approved with Conditions

10/24/2018

June 7, 2018

Lori A. Cram, Property Manager
FINARD PROPERTIES LLC
One Monument Square
Portland, ME 04101

VIA UPS Ground and Email

RE: Proposed Modifications to Existing Verizon Wireless Equipment
Site Name: Monument Square, ME
Site Address: 1 Monument Square, Portland, ME

Ms. Cram,

I am writing to notify you that Verizon Wireless ("VZW") would like to make some antenna modifications to their existing antenna equipment at the above-referenced location. VZW proposes to replace eight (8) antennas with eight (8) new antennas and replace 3 remote radio units with 3 new remote radio units (Final Antenna Count = 16, Final Remote Radio Count = 9). These changes do not exceed the current lease rights of Verizon Wireless under the 6th Amendment dated 9/30/14.

Attached please find drawings and a structural analysis of the proposed modifications.

We look to you for your consent to proceed with the proposed equipment modifications. Please note that by giving your approval you are also granting permission to Verizon Wireless to act on your behalf in the filing of all applications for any and all permits related to the replacement equipment at the referenced site.

Please indicate your consent to this matter by signing below, scanning and returning to me via e-mail at jonathan.mcneal@sai-comm.com . Please also send original to the address below. Should you have any questions I may be reached by phone at (603) 738-0002 or via email.

(over)

12 Industrial Way
Salem, NH 03079

225 Cedar Hill Street
Suite 118
Marlborough, MA 01752

I approve the changes referenced above and on the Construction Drawings by Hudson
6/1/18:



Reviewed for Code Compliance
Permitting and Inspections Department
Approved with Conditions

10/24/2018

Thank you for your attention to this Landlord/Authorized Agent's Consent
matter.

Sincerely,

Jonathan McNeal
Site Acquisition

Name:	<u>Lori Cram</u>
Telephone:	<u>207-899-9213</u>
Signature:	<u>Lori Cram</u>
Date:	<u>06-21-18</u>

Jonathan McNeal



SAI Communications

12 Industrial Way **PLEASE NOTE OUR NEW ADDRESS!!!**

Salem, NH 03079

603-738-0002

Jonathan.McNeal@sai-comm.com

12 Industrial Way
Salem, NH 03079

225 Cedar Hill Street
Suite 118
Marlborough, MA 01752