Robinson+Cole

KENNETH C. BALDWIN

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Also admitted in Massachusetts

April 23, 2018

Melanie A. Bachman, Esq.
Executive Director/Staff Attorney
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **EM-VER-117-180316 – 80 Lonetown Road, Redding, Connecticut**

Dear Ms. Bachman:

In preparation for installation of the facility modifications approved in EM-VER-117-180316, the Cellco Partnership construction team discovered that the platform mounting system at this facility needed to be reinforced.

Attached is a Structural Analysis Report confirming that the tower can support the previously approved equipment modifications and the newly designed reinforcement required for the platform mounting system.

If you have any questions or need any additional information regarding this facility please do not hesitate to contact me.

Sincerely,

Kenneth C. Baldwin

Attachment
Copy to:
Tim Parks

17935722-v1

March 30, 2018

verizon

99 East River Road, 9th Floor
East Hartford, CT 06108

RE: Site Name: Redding CT
Site Address: 80 Lonetown Road
Redding, CT 06896

To Whom It May Concern:

Hudson Design Group LLC (HDG) has been authorized by Verizon to perform a mount analysis on the existing Verizon antenna mount to determine its capability of supporting the following equipment loading:

- (6) BXA-80063/6CF Antennas (71.1"x11.2"x4.5" – Wt. = 15 lbs. /each)
- (6) FD9R6004/2C-3L Diplexers (6.5"x5.8"x1.5" – Wt. = 4 lbs. /each)
- **(3) SBNHH-1D65B Antennas (72.9"x11.9"x7.1" – Wt. = 41 lbs. /each)**
- **(6) SBNHH-1D45B Antennas (72.0"x18.0"x7.0" – Wt. = 65 lbs. /each)**
- **(3) RRH 2x60-700U RRH's (21.6"x12.0"x9.0" – Wt. = 58 lbs. /each)**
- **(3) RRH 2x60-PCS RRH's (22.0"x12.0"x9.4" – Wt. = 55 lbs. /each)**
- **(3) RRH 4x45-AWS RRH's (25.8"x12.0"x7.3" – Wt. = 67 lbs. /each)**
- **(2) DB-T1-6Z-8AB-0Z Junction Box (28.9"x15.7"x10.3" – Wt. = 32 lbs. /each)**

**Proposed Loading Shown in Bold.*

No original structural design documents or fabrication drawings were available for the existing mounts. HDG's sub-consultant, ProVertic LLC, conducted a survey climb and mapping of the existing Verizon antenna mounts on February 13, 2018.

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

- **Install new 2" std. (2.38" O.D.) pipe brace, secured to the existing mount and tower (typ. of 1 per sector, total of 3).**
- **Center the existing pipe brace on the existing mount (typ. of 1 per sector, total of 3).**

	Component	Controlling Load Case	Stress Ratio	Pass/Fail
Existing Mount Rating	8	LC2	259%	**FAIL**
Proposed Mount Rating	49	LC2	81%	**PASS**

This analysis was conducted in accordance with EIA/TIA-222-G, Structural Standards for Steel Antenna Towers and Antenna Supporting Structures and the International Building Code 2012 with 2005 Connecticut Supplement with 2016 Amendments. (See the attached analysis).

Reference Documents:

- Mount mapping data prepared by ProVertic LLC.

This determination was based on the following limitations and assumptions:

1. HDG is not responsible for any modifications completed prior to and hereafter which HDG was not directly involved.
2. 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.
3. All antennas, coax cables and waveguide cables are assumed to be properly installed and supported as per the manufacturer's requirements.
4. The existing mount has been adequately secured to the tower structure per the mount manufacturer's specifications.
5. All components pertaining to AT&T's mounts must be tightened and re-plumbed prior to the installation of new appurtenances.
6. HDG performed a localized analysis on the mount itself and not on the supporting tower structure.

Please feel free to contact our office should you have any questions.

Respectfully Submitted,
Hudson Design Group LLC

Michael Cabral
Structural Dept. Head

STATE OF CONNECTICUT
DANIEL HAMM
24178
LICENSED
PROFESSIONAL ENGINEER

Daniel P. Hamm, PE
Principal

FIELD PHOTOS:

p: 978.557.5553 f: 978.336.5586 a: 45 Beechwood Dr., N. Andover, MA 01845
p: 413.588.8139 f: 413.517.0590 a: 116 Pleasant Street, Ste 302, Easthampton, MA 01027

HUDSON
Design Group LLC

Wind & Ice
Calculations

Date: 03/30/2018
Project Name: Redding CT
Designed By: JN **Checked By:** MSC

HDG | HUDSON Design Group LLC

2.6.5.2 Velocity Pressure Coeff:

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

K_z= **0.934**

z= 82 (ft)
z_g= 1200 (ft)
α= 7.0

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

Table 2-4

Exposure	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

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

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

K_{zt}= **1.628532258**

K_h= 1.727387
K_e= 0.9 (from Table 2-4)
K_t= 0.53 (from Table 2-5)
f= 2 (from Table 2-5)
z= 82
H= 300 (Ht. of the crest above surrounding terrain)
K_{zt}= 1.63

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

Category=	3

Date: 03/30/2018
Project Name: Redding CT
Designed By: JN Checked By: MSC

HUDSON Design Group LLC

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=	100	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

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

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

		K_z=	0.934
		K_{zt}=	1.6
q_z=	40.04	K_d=	0.85
$q_{z\ (ice)}$=	8.27	V_{max}=	110
		$V_{max\ (ice)}$=	50
		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: 03/30/2018
Project Name: Redding CT
Designed By: JN Checked By: MSC

HUDSON Design Group LLC

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 = 0.75 in

Appurtenances	Height	Width	Depth	Flat Area	Aspect Ratio	Ca	Force (lbs)	Force (lbs) (3/4" Ice)
BXA-80063/6CF Antenna	71.1	11.2	4.5	5.53	6.35	1.37	**304**	**73**
SBNHH-1D65B Antenna	72.9	11.9	7.1	6.02	6.13	1.36	**328**	**78**
SBNHH-1D45B Antenna	72.0	18.0	7.0	9.00	4.00	1.27	**456**	**104**
RRH 2x60-700U RRH	21.6	12.0	9.0	1.80	1.80	1.20	**86**	**21**
RRH 2x60-PCS RRH	22.0	12.0	9.4	1.83	1.83	1.20	**88**	**22**
RRH 4x45-AWS RRH	25.8	12.0	7.3	2.15	2.15	1.20	**103**	**25**
DB-T1-6Z-8AB-0Z Junction Box	28.9	15.7	10.3	3.15	1.84	1.20	**151**	**36**
FD9R6004/2C-3L Diplexer	6.5	5.8	1.5	0.26	1.12	1.20	**13**	**4**

Date: 03/30/2018
Project Name: Redding CT
Designed By: JN **Checked By:** MSC

HUDSON Design Group LLC

ICE WEIGHT CALCULATIONS

Thickness of ice (in): 0.75
* Density of ice used = 56 PCF

BXA-80063/6CF Antenna

Weight of ice based on total radial SF area:		
Height (in):	71.1	
Width (in):	11.2	
Depth (in):	4.5	
Total weight of ice on object:		57 lbs
Weight of object:	15 lbs	
Combined weight of ice and object:		72 lbs

SBNHH-1D65B Antenna

Weight of ice based on total radial SF area:		
Height (in):	72.9	
Width (in):	11.9	
Depth (in):	7.1	
Total weight of ice on object:		71 lbs
Weight of object:	41 lbs	
Combined weight of ice and object:		112 lbs

SBNHH-1D45B 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:		94 lbs
Weight of object:	65 lbs	
Combined weight of ice and object:		159 lbs

RRH 2x60-700U RRH

Weight of ice based on total radial SF area:		
Height (in):	21.6	
Width (in):	12.0	
Depth (in):	9.0	
Total weight of ice on object:		27 lbs
Weight of object:	58 lbs	
Combined weight of ice and object:		85 lbs

RRH 2x60-PCS RRH

Weight of ice based on total radial SF area:		
Height (in):	22.0	
Width (in):	12.0	
Depth (in):	9.4	
Total weight of ice on object:		28 lbs
Weight of object:	55 lbs	
Combined weight of ice and object:		83 lbs

RRH 4x45-AWS RRH

Weight of ice based on total radial SF area:		
Height (in):	25.8	
Width (in):	12.0	
Depth (in):	7.3	
Total weight of ice on object:		28 lbs
Weight of object:	67 lbs	
Combined weight of ice and object:		95 lbs

DB-T1-6Z-8AB-0Z Junction Box

Weight of ice based on total radial SF area:		
Height (in):	28.9	
Width (in):	15.7	
Depth (in):	10.3	
Total weight of ice on object:		44 lbs
Weight of object:	32 lbs	
Combined weight of ice and object:		76 lbs

FD9R6004/2C-3L Diplexer

Weight of ice based on total radial SF area:		
Height (in):	6.5	
Width (in):	5.8	
Depth (in):	1.5	
Total weight of ice on object:		3 lbs
Weight of object:	4 lbs	
Combined weight of ice and object:		7 lbs

HSS 3x3

Weight of ice based on total radial SF area:		
height (in):	3	
Width (in):	3	
Depth (in):	12	
Per foot weight of ice on object:		2 lbs/ft

L 3x3x3/16

Weight of ice based on total radial SF area:		
height (in):	3	
Width (in):	3	
Depth (in):	12	
Per foot weight of ice on object:		2 lbs/ft

2" Pipe

Per foot weight of ice:		
diameter (in):	2.375	
Per foot weight of ice on object:		2 lbs/ft

3" Pipe

Per foot weight of ice:		
diameter (in):	3.5	
Per foot weight of ice on object:		3 lbs/ft

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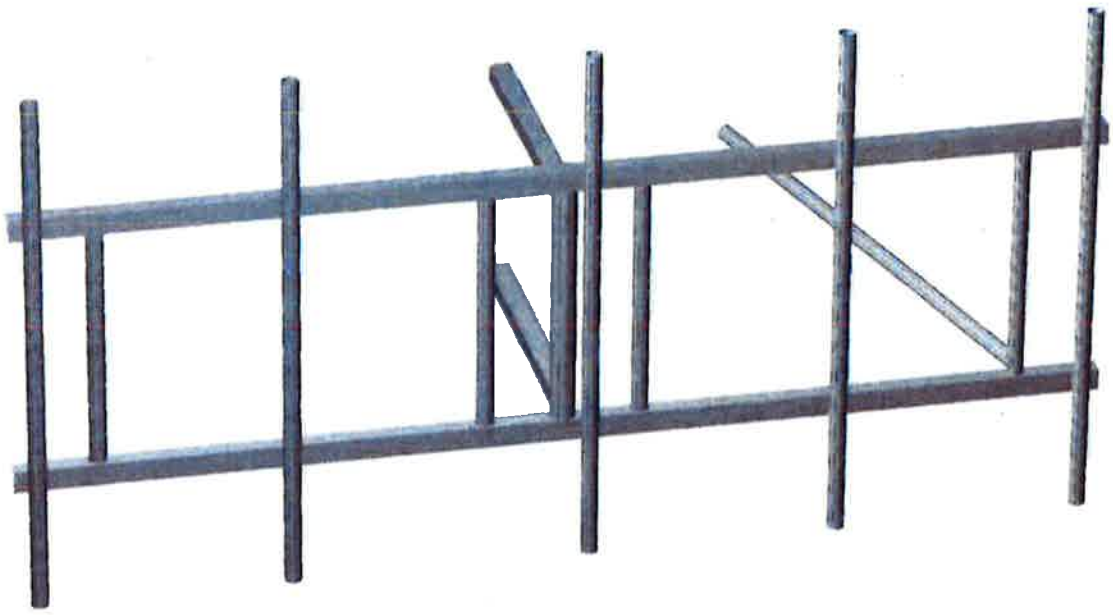
Design Group LLC

Mount Calculations
(Existing Conditions)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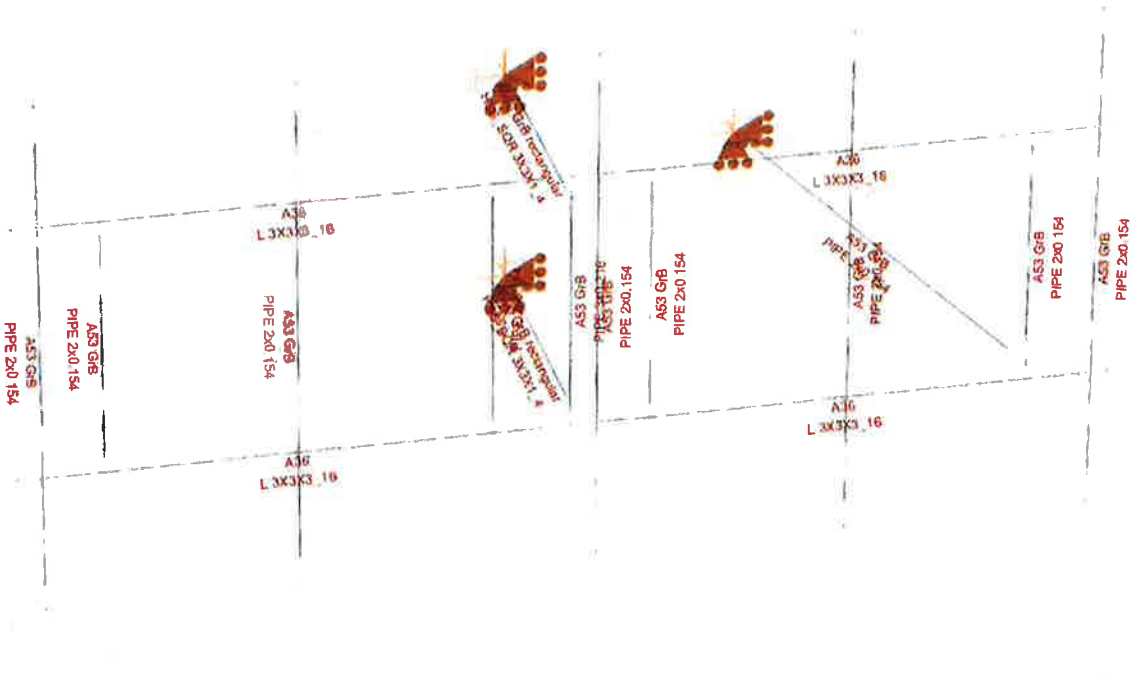
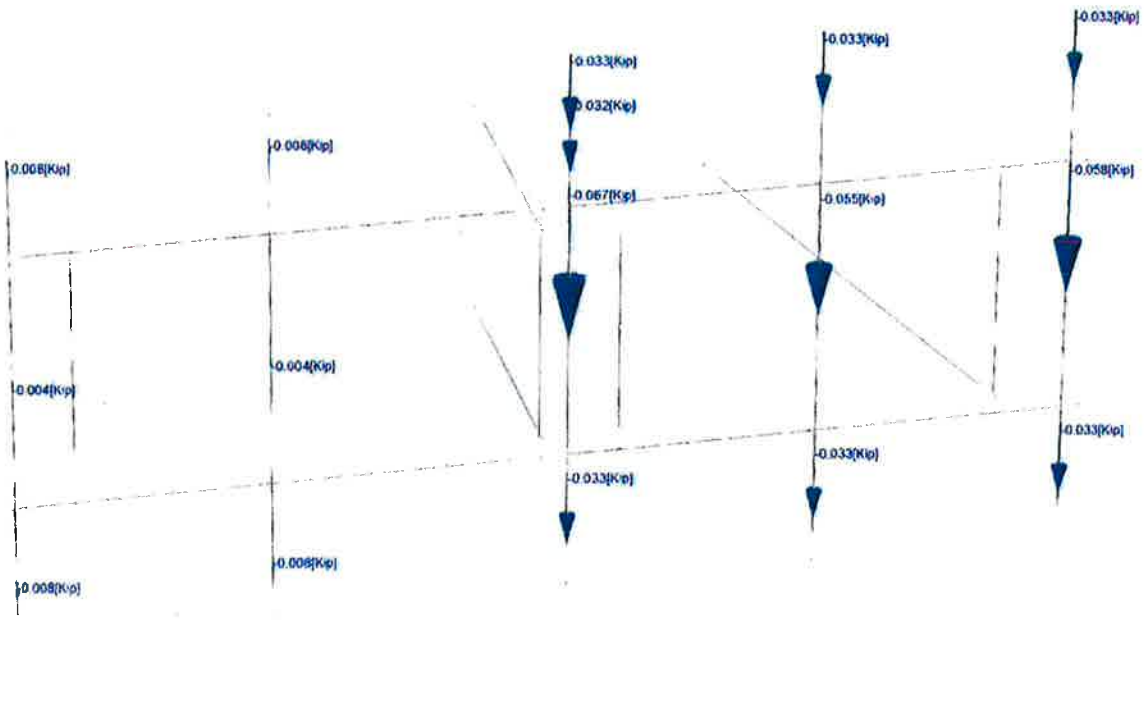
X
Z


A36
L 3X3X3_16
A53 GrB
PIPE 2x0.154
Y
X
Z

Loads

Concentrated user loads - Members



Loads

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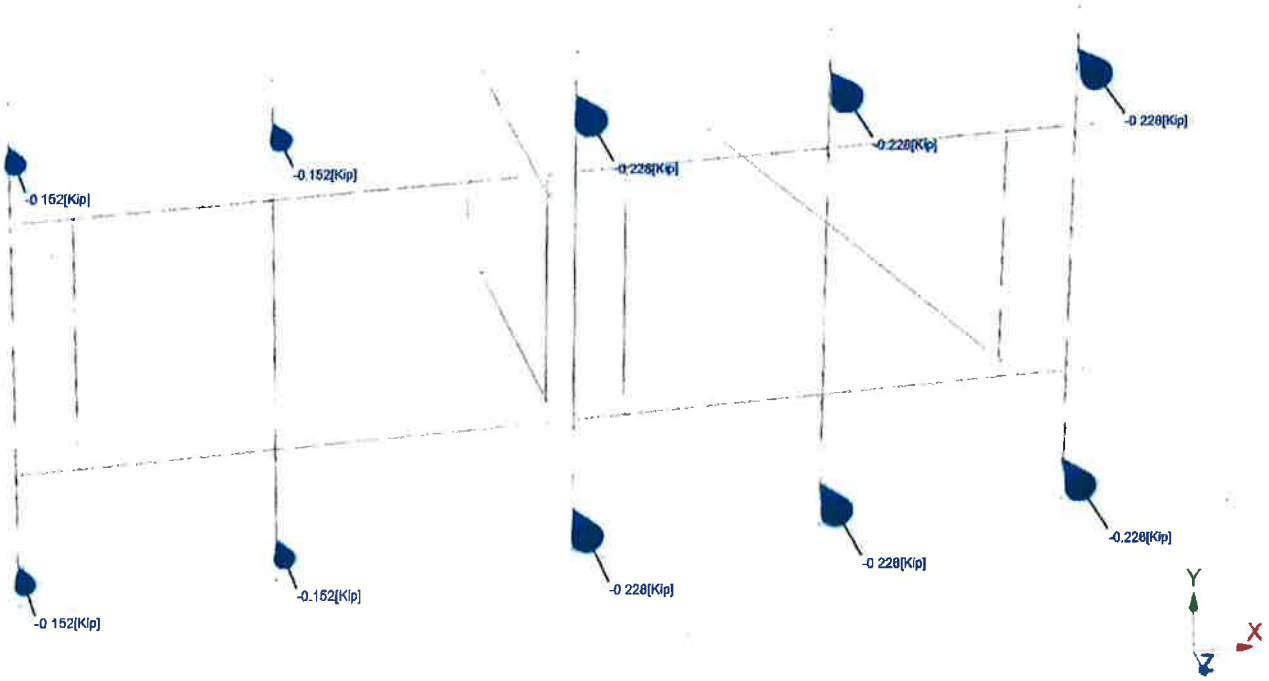
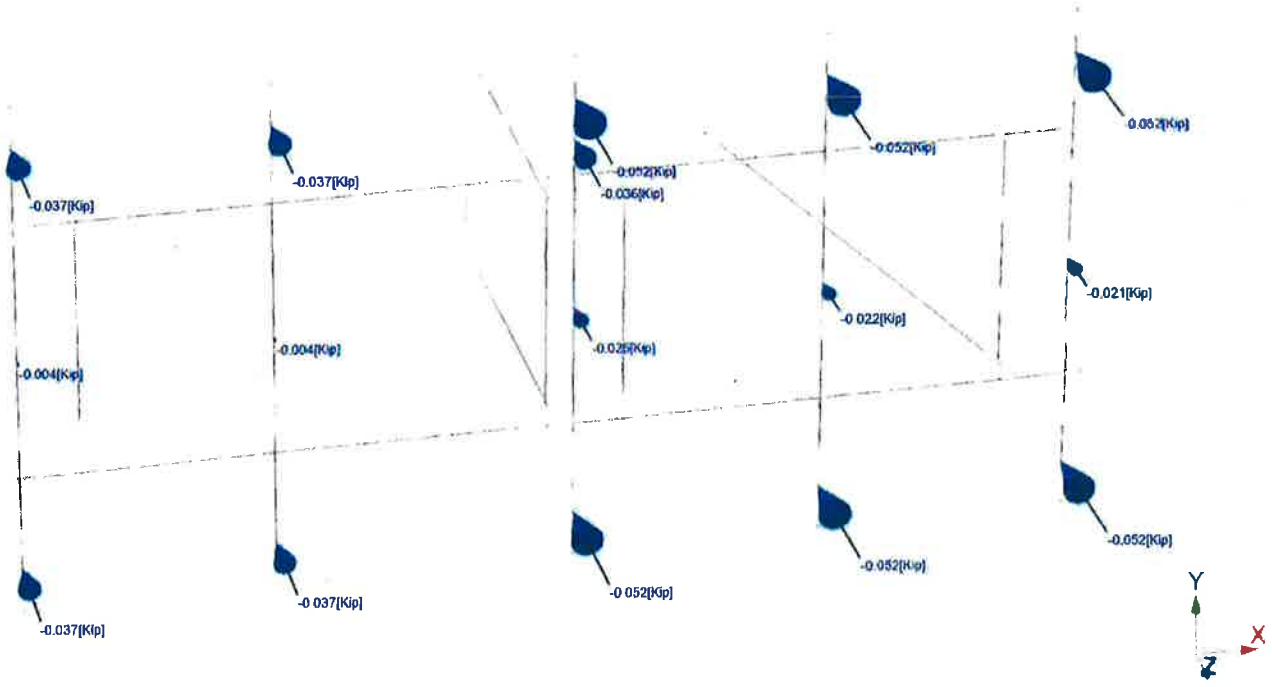


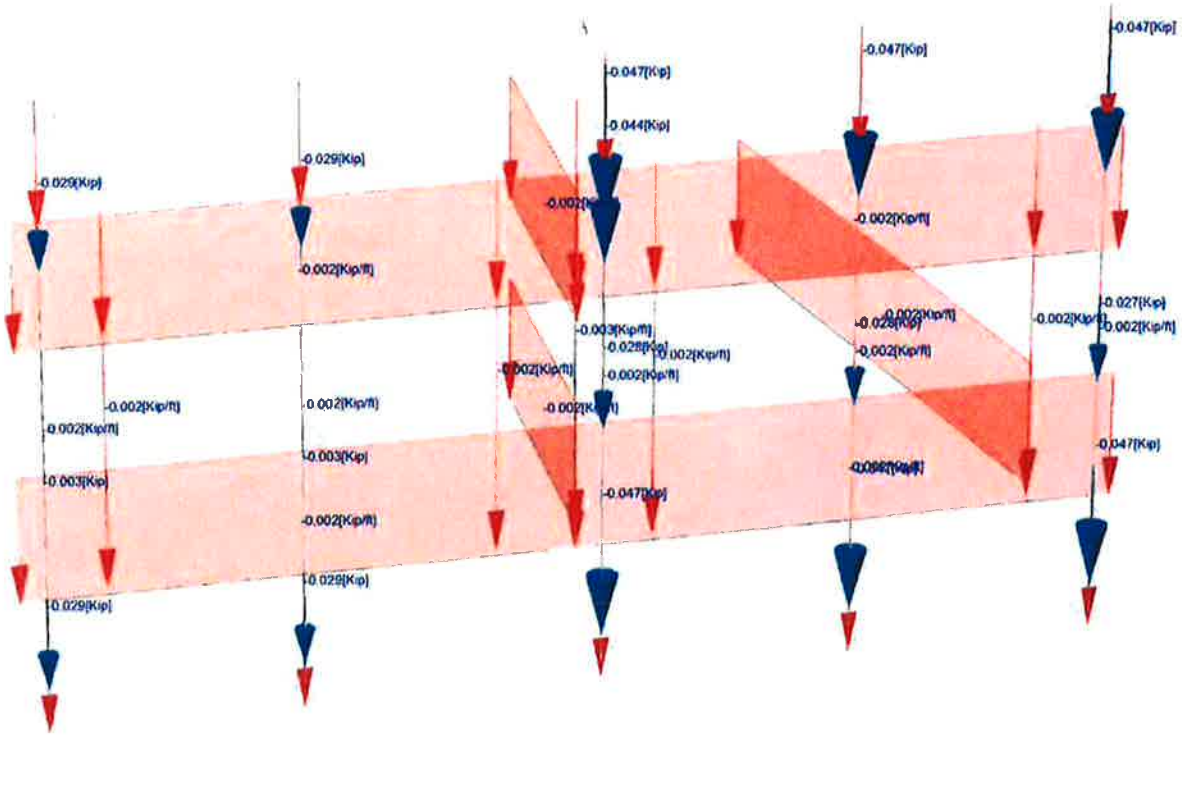
Loads

Concentrated user loads - Members



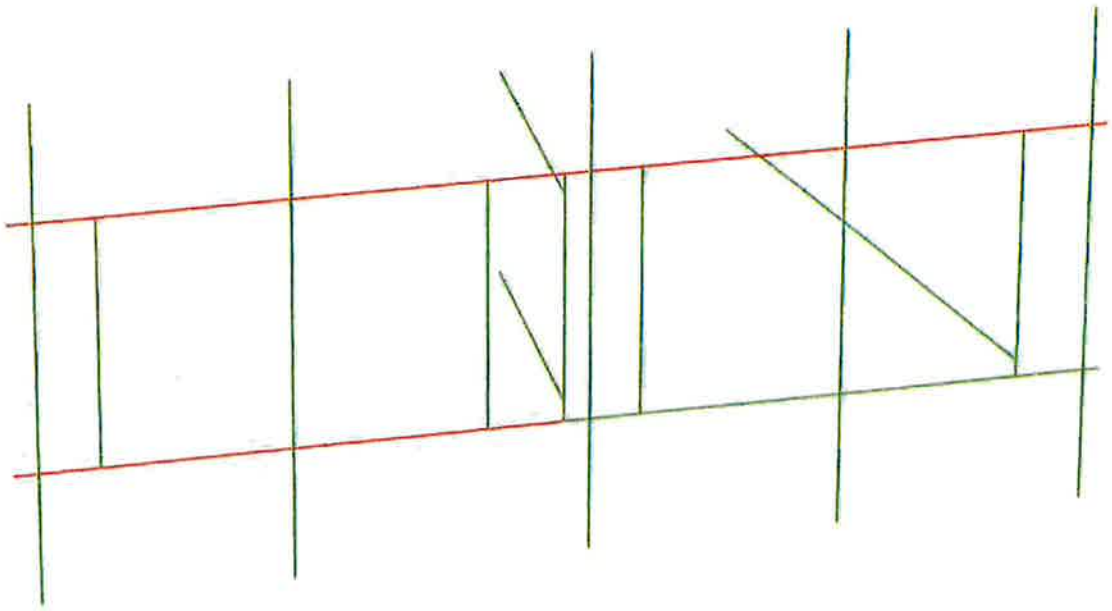
Loads

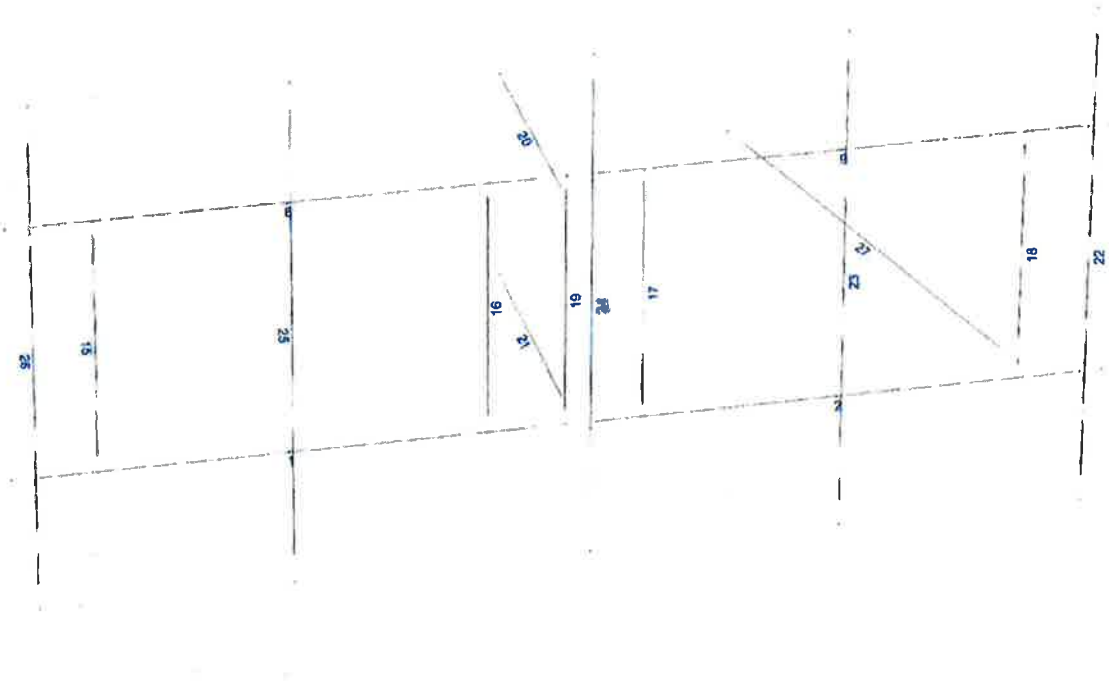
Distributed user loads - Members
Concentrated user loads - Members



Design status

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

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Units system: English
File name: W:\STRUCTURAL DEPARTMENT\ANALYSIS SOFTWARE\RAM Elements\RAM Projects\VERIZON\CT\Redding CT\Redding CT.etz\

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
	HSS_SQR 3X3X1_4	**20**	LC1 at 0.00%	0.31	OK	Eq. H1-1b
			LC2 at 0.00%	0.27	OK	
			LC3 at 100.00%	**0.33**	**OK**	Eq. H1-1b
			LC4 at 100.00%	0.23	OK	
			LC5 at 100.00%	0.17	OK	
		21	LC1 at 0.00%	0.30	OK	Eq. H1-1b
			LC2 at 0.00%	0.28	OK	
			LC3 at 100.00%	**0.41**	**OK**	Eq. H1-1b
			LC4 at 100.00%	0.25	OK	
			LC5 at 100.00%	0.19	OK	
	L 3X3X3_16	**1**	LC1 at 100.00%	2.53	N.G.	
			LC2 at 100.00%	**2.54**	**N.G.**	Sec. F1
			LC3 at 100.00%	0.44	OK	
			LC4 at 85.00%	0.14	OK	
			LC5 at 85.00%	0.11	OK	
		2	LC1 at 0.00%	**0.94**	**OK**	Sec. F1
			LC2 at 0.00%	0.93	OK	
			LC3 at 14.58%	0.48	OK	
			LC4 at 14.58%	0.29	OK	
			LC5 at 14.58%	0.22	OK	
		8	LC1 at 100.00%	**2.59**	**N.G.**	Sec. F1
			LC2 at 100.00%	2.59	N.G.	
			LC3 at 100.00%	0.47	OK	
			LC4 at 100.00%	0.14	OK	
			LC5 at 100.00%	0.11	OK	
		9	LC1 at 0.00%	1.58	N.G.	
			LC2 at 0.00%	**1.64**	**N.G.**	Sec. F1
			LC3 at 14.58%	0.53	OK	
			LC4 at 14.58%	0.37	OK	
			LC5 at 14.58%	0.28	OK	
	PIPE 2x0.154	**15**	LC1 at 100.00%	**0.29**	**OK**	Eq. H1-1b
			LC2 at 100.00%	0.28	OK	
			LC3 at 100.00%	0.14	OK	
			LC4 at 100.00%	0.05	OK	
			LC5 at 100.00%	0.04	OK	
		16	LC1 at 100.00%	**0.33**	**OK**	Eq. H1-1b
			LC2 at 100.00%	0.31	OK	

		LC3 at 100.00%	0.18	OK	
		LC4 at 100.00%	0.07	OK	
		LC5 at 100.00%	0.05	OK	
	17	LC1 at 100.00%	**0.32**	**OK**	Eq. H1-1b
		LC2 at 100.00%	0.28	OK	
		LC3 at 0.00%	0.29	OK	
		LC4 at 0.00%	0.16	OK	
		LC5 at 0.00%	0.12	OK	
	18	LC1 at 9.38%	**0.65**	**OK**	Eq. H1-1b
		LC2 at 9.38%	0.61	OK	
		LC3 at 9.38%	0.36	OK	
		LC4 at 9.38%	0.17	OK	
		LC5 at 9.38%	0.13	OK	
	22	LC1 at 25.00%	**0.30**	**OK**	Eq. H1-1b
		LC2 at 75.00%	0.29	OK	
		LC3 at 72.92%	0.11	OK	
		LC4 at 25.00%	0.06	OK	
		LC5 at 25.00%	0.05	OK	
	23	LC1 at 72.92%	**0.44**	**OK**	Eq. H1-1b
		LC2 at 72.92%	0.41	OK	
		LC3 at 72.92%	0.27	OK	
		LC4 at 25.00%	0.16	OK	
		LC5 at 25.00%	0.12	OK	
	24	LC1 at 75.00%	**0.29**	**OK**	Eq. H1-1b
		LC2 at 75.00%	0.29	OK	
		LC3 at 72.92%	0.09	OK	
		LC4 at 72.92%	0.05	OK	
		LC5 at 72.92%	0.03	OK	
	25	LC1 at 25.00%	**0.47**	**OK**	Eq. H1-1b
		LC2 at 25.00%	0.46	OK	
		LC3 at 72.92%	0.18	OK	
		LC4 at 25.00%	0.07	OK	
		LC5 at 25.00%	0.05	OK	
	26	LC1 at 25.00%	**0.27**	**OK**	Eq. H1-1b
		LC2 at 25.00%	0.27	OK	
		LC3 at 72.92%	0.07	OK	
		LC4 at 25.00%	0.02	OK	
		LC5 at 25.00%	0.02	OK	
	27	LC1 at 100.00%	**0.67**	**OK**	Eq. H1-1b
		LC2 at 100.00%	0.66	OK	
		LC3 at 0.00%	0.35	OK	
		LC4 at 0.00%	0.20	OK	
		LC5 at 0.00%	0.15	OK	
PIPE 3x0.216	19	LC1 at 91.67%	0.37	OK	
		LC2 at 91.67%	**0.37**	**OK**	Eq. H3-1
		LC3 at 8.33%	0.31	OK	Eq. H1-1b
		LC4 at 8.33%	0.18	OK	
		LC5 at 8.33%	0.14	OK	

Current Date: 3/30/2018 1:16 PM
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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
1	0.00	0.00	0.00	0
2	6.125	0.00	0.00	0
3	-6.125	0.00	0.00	0
6	5.1667	0.00	0.00	0
7	-5.1667	0.00	0.00	0
8	-0.8747	0.00	0.00	0
9	0.8747	0.00	0.00	0
18	0.00	3.00	0.00	0
19	6.125	3.00	0.00	0
20	-6.125	3.00	0.00	0
23	5.1667	3.00	0.00	0
24	-5.1667	3.00	0.00	0
25	-0.8747	3.00	0.00	0
26	0.8747	3.00	0.00	0
35	0.00	2.75	0.00	0
36	0.00	0.25	0.00	0
37	0.00	2.75	-3.50	0
38	0.00	0.25	-3.50	0
39	5.875	4.50	0.20	0
40	5.875	-1.50	0.20	0
41	3.0625	4.50	0.20	0
42	3.0625	-1.50	0.20	0

43	0.25	4.50	0.20	0
44	0.25	-1.50	0.20	0
45	-3.0625	4.50	0.20	0
46	-3.0625	-1.50	0.20	0
47	-5.875	4.50	0.20	0
48	-5.875	-1.50	0.20	0
49	5.1667	0.20	0.00	0
50	3.50	0.20	-7.00	0

Restraints

Node	TX	TY	TZ	RX	RY	RZ
37	1	1	1	1	1	1
38	1	1	1	1	1	1
50	1	1	1	1	1	1

Members

Member	NJ	NK	Description	Section	Material	d0 [in]	dL [in]	lg factor
1	3	1		L 3X3X3_16	A36	0.00	0.00	0.00
2	1	2		L 3X3X3_16	A36	0.00	0.00	0.00
8	20	18		L 3X3X3_16	A36	0.00	0.00	0.00
9	18	19		L 3X3X3_16	A36	0.00	0.00	0.00
15	7	24		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
16	8	25		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
17	9	26		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
18	6	23		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
19	18	1		PIPE 3x0.216	A53 GrB	0.00	0.00	0.00
20	35	37		HSS_SQR 3X3X1_4	A500 GrB rectangular	0.00	0.00	0.00
21	36	38		HSS_SQR 3X3X1_4	A500 GrB rectangular	0.00	0.00	0.00
22	39	40		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
23	41	42		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
24	43	44		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
25	45	46		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
26	47	48		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
27	50	49		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00

Orientation of local axes

Member	Rotation [Deg]	Axes23	NX	NY	NZ
1	180.00	0	0.00	0.00	0.00
2	180.00	0	0.00	0.00	0.00
8	180.00	0	0.00	0.00	0.00
9	180.00	0	0.00	0.00	0.00

Rigid end offsets

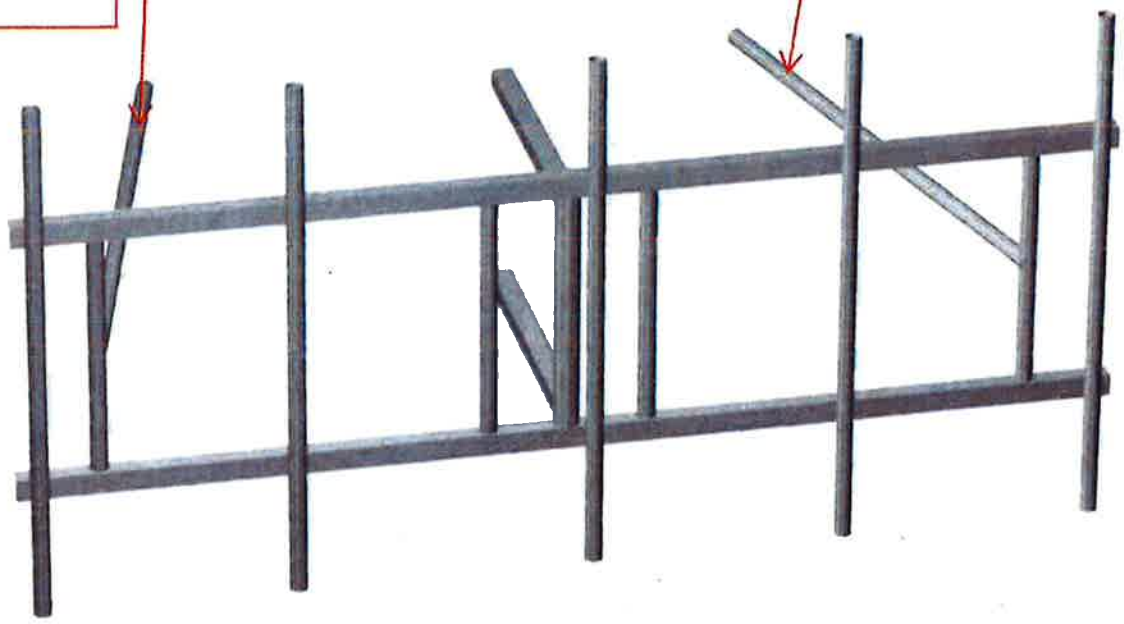
Member	DJX [in]	DJY [in]	DJZ [in]	DKX [in]	DKY [in]	DKZ [in]
15	0.00	0.75	-0.75	0.00	0.75	-0.75
16	0.00	0.75	-0.75	0.00	0.75	-0.75
17	0.00	0.75	-0.75	0.00	0.75	-0.75
18	0.00	0.75	-0.75	0.00	0.75	-0.75
19	0.00	0.75	-1.00	0.00	0.75	-1.00

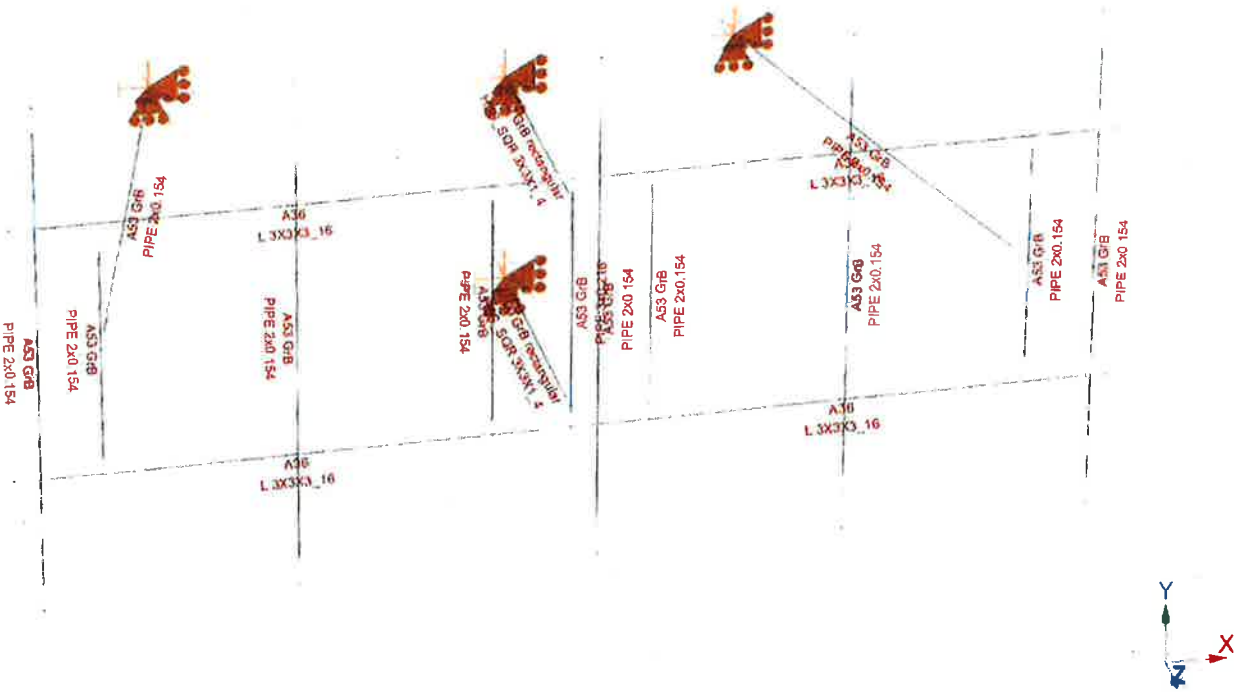
HUDSON
Design Group LLC

Mount Calculations
(Proposed Conditions)

INSTALL NEW 2" STD. (2.38" O.D.) PIPE BRACE, SECURE TO EXISTING MOUNT AND TOWER (TYP. OF 1 PER SECTOR, TOTAL OF 3).

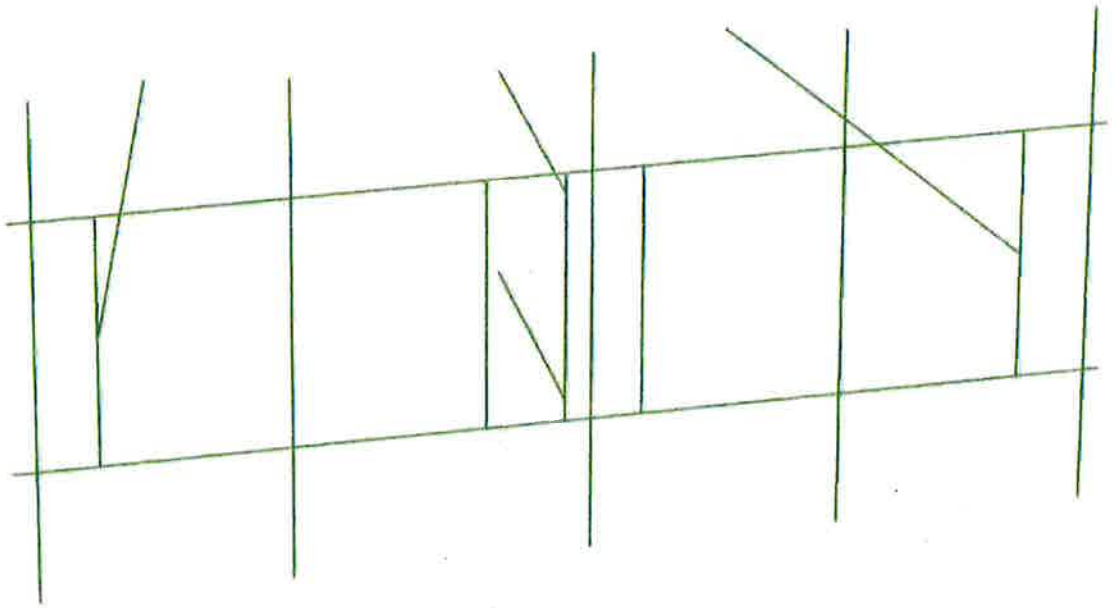
CENTER THE EXISTING PIPE BRACE ON THE EXISTING MOUNT (TYP. OF 1 PER SECTOR, TOTAL OF 3).

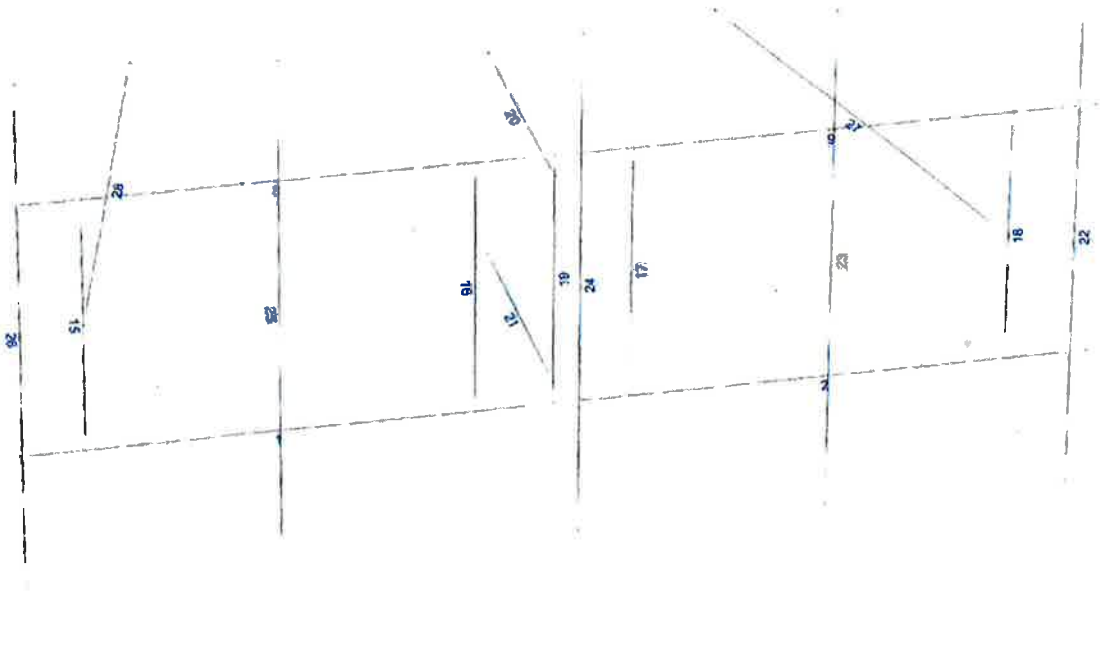



A53 GrB
PIPE 2x0.154
A36
L 3X3X3_16
A53 GrB
PIPE 2x0.154
A53 GrB
PIPE 2x0.154
A53 GrB
PIPE 2x0.154
A53 GrB
PIPE 2x0.154
A36
L 3X3X3_16
A36
L 3X3X3_16
Y
X
Z

Design status

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




Y
X
Z

Bentley Hewlett-Packard Company

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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
	HSS_SQR 3X3X1_4	20	LC1 at 100.00%	0.27	OK	
			LC2 at 100.00%	0.21	OK	
			LC3 at 100.00%	**0.38**	**OK**	Eq. H1-1b
			LC4 at 100.00%	0.23	OK	
			LC5 at 100.00%	0.17	OK	
		21	LC1 at 100.00%	0.21	OK	
			LC2 at 100.00%	0.14	OK	
			LC3 at 100.00%	**0.38**	**OK**	Eq. H1-1b
			LC4 at 100.00%	0.24	OK	
			LC5 at 100.00%	0.18	OK	
	L 3X3X3_16	1	LC1 at 5.00%	0.32	OK	
			LC2 at 5.00%	**0.32**	**OK**	Eq. H3-8
			LC3 at 85.00%	0.29	OK	Sec. F1
			LC4 at 85.00%	0.17	OK	
			LC5 at 85.00%	0.13	OK	
		2	LC1 at 3.13%	0.75	OK	
			LC2 at 3.13%	**0.75**	**OK**	Eq. H3-8
			LC3 at 14.58%	0.47	OK	Eq. H2-1
			LC4 at 14.58%	0.29	OK	
			LC5 at 14.58%	0.22	OK	
		8	LC1 at 15.00%	**0.37**	**OK**	Eq. H3-8
			LC2 at 15.00%	0.37	OK	
			LC3 at 100.00%	0.30	OK	
			LC4 at 100.00%	0.16	OK	
			LC5 at 100.00%	0.12	OK	
		9	LC1 at 0.00%	0.64	OK	
			LC2 at 0.00%	**0.66**	**OK**	Eq. H3-8
			LC3 at 14.58%	0.64	OK	Sec. F1
			LC4 at 14.58%	0.38	OK	
			LC5 at 14.58%	0.28	OK	
	PIPE 2x0.154	15	LC1 at 46.88%	**0.47**	**OK**	Eq. H1-1b
			LC2 at 46.88%	0.46	OK	
			LC3 at 100.00%	0.13	OK	
			LC4 at 100.00%	0.06	OK	
			LC5 at 100.00%	0.04	OK	
		16	LC1 at 100.00%	0.14	OK	
			LC2 at 100.00%	0.12	OK	

		LC3 at 100.00%	**0.15**	**OK**	Eq. H1-1b
		LC4 at 100.00%	0.08	OK	
		LC5 at 100.00%	0.06	OK	
	17	LC1 at 100.00%	0.24	OK	
		LC2 at 100.00%	0.20	OK	
		LC3 at 0.00%	**0.28**	**OK**	Eq. H1-1b
		LC4 at 0.00%	0.16	OK	
		LC5 at 0.00%	0.12	OK	
	18	LC1 at 50.00%	**0.76**	**OK**	Eq. H1-1b
		LC2 at 50.00%	0.75	OK	
		LC3 at 100.00%	0.23	OK	
		LC4 at 100.00%	0.12	OK	
		LC5 at 100.00%	0.09	OK	
	22	LC1 at 25.00%	**0.33**	**OK**	Eq. H1-1b
		LC2 at 25.00%	0.32	OK	
		LC3 at 72.92%	0.12	OK	
		LC4 at 25.00%	0.06	OK	
		LC5 at 25.00%	0.04	OK	
	23	LC1 at 72.92%	**0.39**	**OK**	Eq. H1-1b
		LC2 at 72.92%	0.36	OK	
		LC3 at 72.92%	0.27	OK	
		LC4 at 25.00%	0.16	OK	
		LC5 at 25.00%	0.12	OK	
	24	LC1 at 75.00%	**0.29**	**OK**	Eq. H1-1b
		LC2 at 75.00%	0.29	OK	
		LC3 at 72.92%	0.09	OK	
		LC4 at 72.92%	0.05	OK	
		LC5 at 72.92%	0.03	OK	
	25	LC1 at 72.92%	**0.25**	**OK**	Eq. H1-1b
		LC2 at 72.92%	0.23	OK	
		LC3 at 72.92%	0.15	OK	
		LC4 at 25.00%	0.07	OK	
		LC5 at 25.00%	0.05	OK	
	26	LC1 at 25.00%	**0.21**	**OK**	Eq. H1-1b
		LC2 at 25.00%	0.21	OK	
		LC3 at 72.92%	0.06	OK	
		LC4 at 25.00%	0.02	OK	
		LC5 at 25.00%	0.02	OK	
	27	LC1 at 0.00%	0.23	OK	
		LC2 at 0.00%	0.18	OK	
		LC3 at 0.00%	**0.29**	**OK**	Eq. H1-1b
		LC4 at 0.00%	0.18	OK	
		LC5 at 0.00%	0.14	OK	
	28	LC1 at 100.00%	**0.08**	**OK**	Eq. H1-1b
		LC2 at 100.00%	0.08	OK	
		LC3 at 100.00%	0.04	OK	
		LC4 at 100.00%	0.03	OK	
		LC5 at 100.00%	0.03	OK	
PIPE 3x0.216	**19**	LC1 at 89.58%	0.21	OK	
		LC2 at 89.58%	0.16	OK	
		LC3 at 8.33%	**0.31**	**OK**	Eq. H1-1b
		LC4 at 8.33%	0.19	OK	
		LC5 at 8.33%	0.14	OK	

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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
1	0.00	0.00	0.00	0
2	6.125	0.00	0.00	0
3	-6.125	0.00	0.00	0
6	5.1667	0.00	0.00	0
7	-5.1667	0.00	0.00	0
8	-0.8747	0.00	0.00	0
9	0.8747	0.00	0.00	0
18	0.00	3.00	0.00	0
19	6.125	3.00	0.00	0
20	-6.125	3.00	0.00	0
23	5.1667	3.00	0.00	0
24	-5.1667	3.00	0.00	0
25	-0.8747	3.00	0.00	0
26	0.8747	3.00	0.00	0
35	0.00	2.75	0.00	0
36	0.00	0.25	0.00	0
37	0.00	2.75	-3.50	0
38	0.00	0.25	-3.50	0
39	5.875	4.50	0.20	0
40	5.875	-1.50	0.20	0
41	3.0625	4.50	0.20	0
42	3.0625	-1.50	0.20	0

43	0.25	4.50	0.20	0
44	0.25	-1.50	0.20	0
45	-3.0625	4.50	0.20	0
46	-3.0625	-1.50	0.20	0
47	-5.875	4.50	0.20	0
48	-5.875	-1.50	0.20	0
49	5.1667	1.50	0.00	0
50	3.50	1.50	-7.00	0
51	-5.1667	1.50	0.00	0
52	-3.50	1.50	-7.00	0

Restraints

Node	TX	TY	TZ	RX	RY	RZ
37	1	1	1	1	1	1
38	1	1	1	1	1	1
50	1	1	1	1	1	1
52	1	1	1	1	1	1

Members

Member	NJ	NK	Description	Section	Material	d0 [in]	dL [in]	lg factor
1	3	1		L 3X3X3_16	A36	0.00	0.00	0.00
2	1	2		L 3X3X3_16	A36	0.00	0.00	0.00
8	20	18		L 3X3X3_16	A36	0.00	0.00	0.00
9	18	19		L 3X3X3_16	A36	0.00	0.00	0.00
15	7	24		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
16	8	25		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
17	9	26		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
18	6	23		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
19	18	1		PIPE 3x0.216	A53 GrB	0.00	0.00	0.00
20	35	37		HSS_SQR 3X3X1_4	A500 GrB rectangular	0.00	0.00	0.00
21	36	38		HSS_SQR 3X3X1_4	A500 GrB rectangular	0.00	0.00	0.00
22	39	40		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
23	41	42		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
24	43	44		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
25	45	46		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
26	47	48		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
27	50	49		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00
28	52	51		PIPE 2x0.154	A53 GrB	0.00	0.00	0.00

Orientation of local axes

Member	Rotation [Deg]	Axes23	NX	NY	NZ
1	180.00	0	0.00	0.00	0.00
2	180.00	0	0.00	0.00	0.00
8	180.00	0	0.00	0.00	0.00
9	180.00	0	0.00	0.00	0.00

Rigid end offsets

Member	DJX [in]	DJY [in]	DJZ [in]	DKX [in]	DKY [in]	DKZ [in]
15	0.00	0.75	-0.75	0.00	0.75	-0.75
16	0.00	0.75	-0.75	0.00	0.75	-0.75
17	0.00	0.75	-0.75	0.00	0.75	-0.75
18	0.00	0.75	-0.75	0.00	0.75	-0.75
19	0.00	0.75	-1.00	0.00	0.75	-1.00