

# RYKA LAND SERVICES

## STRUCTURAL ANALYSIS REPORT

PRCTI20241032

Prepared For:



**AT&T**

AT&T Mobility  
16221 NE 72nd Way  
Redmond, WA 98052

**City of Puyallup  
Building  
REVIEWED  
FOR  
COMPLIANCE**

BSnowden  
07/15/2024  
11:37:32 AM



Project Name:

**Good Samaritan  
WA6659**

Project Address:

**407 14th Avenue Southeast  
Puyallup, WA 98371**

Site Coordinates:

**47.1795  
-122.2906**



Prepared By:

Ryan McDaniel, P.E.  
May 30, 2024

Calculations required to be provided by  
the Permittee on site for all inspections

**PROJECT SCOPE:**

AT&T Mobility proposes the following: Remove (12) radioheads, (11) distribution units. Add (6) active radio antennas, (12) radioheads, (3) distribution units and (3) antenna mounts.

**ANALYSIS:**

The purpose of this analysis is to determine if the existing installation is adequately supported under the proposed loadings and provide any recommendations for modification in order to bring the support structure into compliance if needed. The installation has been analyzed in accordance with ASCE 7-16. The following parameters were used for lateral analysis:

Basic Wind Speed: 98  
Wind Exposure: B  
Topographic Factor,  $k_{zt}$ : 1.00

Risk Category: IV  
Seismic Design Category: D  
Mapped Parameter,  $S_s$ : 1.267  
Mapped Parameter,  $S_1$ : 0.436

This Structural Analysis Report for the existing AT&T equipment is inclusive of the entire equipment support structure (i.e. antenna/equipment mounting and support frames) and the existing building structures support system in the affected areas where the installations occur. This analysis is based on the specific assumptions and conditions as stated within the following report.

**RESULTS:**

Based on our review of the existing structure loadings, we have determined the following:

Design Element	Capacity	Status
Antenna Mount	16.9%	PASS
Cabinet Equipment Platform	reduced load	PASS
Existing Building Support	reduced load	PASS

**Equipment Support Rating: 16.9% PASS**

Please refer to Appendix A for structural calculations supporting the above results and conclusions sections below for additional comments.

**CONTENTS:**

- 1 - 5 Report
- A Appendix A (Calculations)
- B Appendix B (Referenced Documents)







## 2 Reference Documents

The following data was used to model and analyze the structure.

Date	Document	Author
	2018 IBC	International Code Council
	ASCE 7-16	ASCE
2/21/2024	RFDS	AT&T
09-12-11	Construction Drawings	Cornerstone Engineering
May 12, 2015	Structural Calculations	Cornerstone Engineering

## 3 Design Comments

Telecommunication equipment is being reconfigured on an existing building. New active antennas will be mounted on existing modified mounts at existing mount locations. Existing antennas will be relocated. Some cabinets will be reconfigured at the equipment platform.

Load combinations are applied per ASCE 7-16 Sections 2.4.1 and 2.4.5. Combinations involving reduced dead loads, live loads, are eliminated because they do not apply, or by inspection. The following load combinations remain:

1. D
2. D + L
3. D + S
5. D + 0.6W
8. D + 0.7Ev + 0.7 Eh

The new cabinet configuration includes cabinets which do not weigh as much as previous cabinet configurations. Appendix B includes previous structural analysis of previous equipment configurations. The steel equipment platform passes by inspection. The new antenna mount is checked for the new antenna loads.

The new mounts and building support are analyzed for the scope of this report. The telecommunications equipment does not add an additional %5 weight or 10% lateral load to the existing building and does not require retrofit. Local elements are checked.

## 4 Conclusion

To the best of our knowledge and belief, the Existing Building is adequate to support the proposed loading. The antenna mount will be modified to support the new antenna equipment.

## 5 Scope and Liability

1. This report is prepared with the information furnished to Ryka by our client. If the conditions of the site change, or if new information becomes available, the results of this report are not valid. Ryka should be notified so that the report can be updated and resubmitted.
2. This report is meant to show the level of conformance for the site with the referenced codes. No other assessment is implied.
3. Ryka has not performed invasive testing or inspection which might reveal corrosion, damage, or work not installed per plan. The contractor should report any of these occurrences upon discovery.
4. The contractor hired for construction of items included in this report are responsible for verifying that work described in previous plan sheets has been installed per plan.
5. Ryka has not engineered, tested, or inspected the manufacture of third party vendor items such as mounts, poles, and other support structures. We select equipment from vendors which provide their own engineering and quality control. Ryka cannot be responsible for defective hardware or supports which do not meet the published support capacity.
6. Ryka is not responsible for the conclusions, opinions and recommendations made by others based on the information contained herein.
7. It is assumed that the existing mounting structure is in good condition with no damage that could cause a reduced capacity.

## A Appendix – Structural Calculations



SITE PARAMETERS:

Risk Category = IV (Table 1-1) Latitude = 47.1795 (USGS)  
 Site Soil Classification = D (Table 20.3-1) Longitude = -122.2906 (USGS)

MAPPED ACCELERATION PARAMETERS:

Mapped Parameter,  $S_s$  = 1.267 (USGS)  
 Mapped Parameter,  $S_1$  = 0.436 (USGS)

MAPPED SPECTRAL RESPONSE ACCELERATION PARAMETERS:

Site Coefficient,  $F_a$  = 1.20g (Table 11.4-1)  
 Site Coefficient,  $F_v$  = 1.864g (Table 11.4-2)  
 $S_{MS} = F_a S_s = 1.52g$  (Eq 11.4-4)  
 $S_{M1} = F_v S_1 = 0.813g$  (Eq 11.4-1)

DESIGN SPECTRAL RESPONSE PARAMETERS:

$S_{DS} = \frac{2}{3} S_{MS} = 1.014g$  (Eq 11.4-3)  
 $S_{D1} = \frac{2}{3} S_{M1} = 0.542g$  (Eq 11.4-4)

SEISMIC DESIGN CATEGORY

Seismic Design Category = D (Tables 11.6-1 and 11.6-2)

SEISMIC DESIGN FORCE FOR NONSTRUCTURAL COMPONENTS:

Average Structure Height,  $h$  = 64.67 ft  
 Height of Component,  $z$  = 88.75 ft  
 Importance Factor,  $I_e$  = 1.50 (Sec 13.1-3)  
 Response Mod. Factor,  $R_p$  = 2.5 (Table 13.5-1 or 13.6-1)  
 Amplification Factor,  $a_p$  = 1.0 (Table 13.6-1)  
 $F_{p,max} = 2.433$  (Eqn 13.3-2)  
 $F_{p,min} = 0.456$  (Eqn 13.3-3)  
 Seismic Design Force,  $F_p$  = 0.730 (Eqn 13.3-1)  
 Seismic Design Force,  $F_p$  = 0.730 (Eq 12.8-1)  
 Seismic Design Force,  $F_p$  = 0.511 (ASD)

**DESCRIPTION: ASCE 7-16 Wind Factors**

Risk Category =	IV		(Table 1.5-1)
Wind Speed, V =	98	mph	(Figure 26.5-1)
Directionality Factor, K <sub>d</sub> =	0.90		(Table 26.6-1)
Exposure Category =	B		(Section 26.7)
Topographic Factor, K <sub>zt</sub> =	1.00		(Section 26.8 & Figure 26.8-1)
Ground Elevation Factor, K <sub>e</sub> =	0.997		(Section 26.9 and Table 26.9-1)
Gust Factor, G =	0.85		(Section 26.11.1)
Avg Height of Equipment, z =	88.8	ft	
Velocity Pressure Coeff., K <sub>h</sub> =	0.96		(Table 27.3-1)
velocity pressure, q <sub>h</sub> = 0.00256 K <sub>h</sub> K <sub>zt</sub> K <sub>d</sub> K <sub>e</sub> V <sup>2</sup>			(Eq 26.10-1)
velocity pressure, q <sub>h</sub> = 21.1 psf			(Section 27.4.7 indicates 16 psf min. pressure)

**DESIGN WIND LOADS: OTHER STRUCTURES**

Design Lateral Wind Pressure, P <sub>h</sub> =	17.9	psf	(From Eq. 29.4-2, where F = P C <sub>f</sub> A <sub>r</sub> )
Design Lateral Wind Pressure, P <sub>h</sub> =	10.8	psf	(ASD)















**DESCRIPTION:** Antenna Mast

**BEAM AND LOADING ATTRIBUTES:**

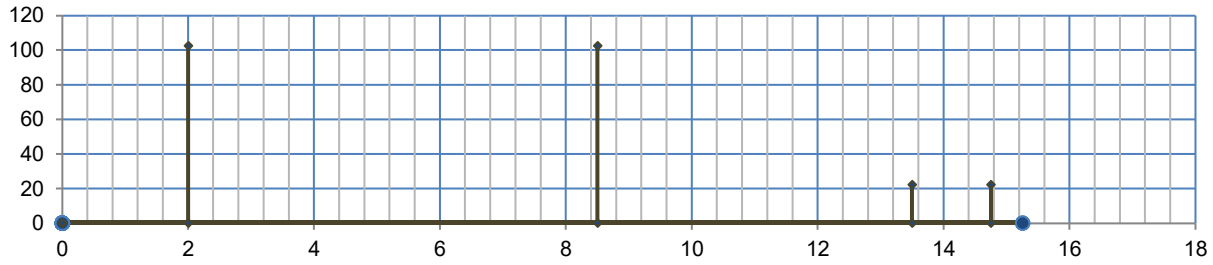
Beam Segments	
x End	EI
0	50,683
15.25	50,683
0	0
0	0

Supports
x
4.25
7
0
0
0

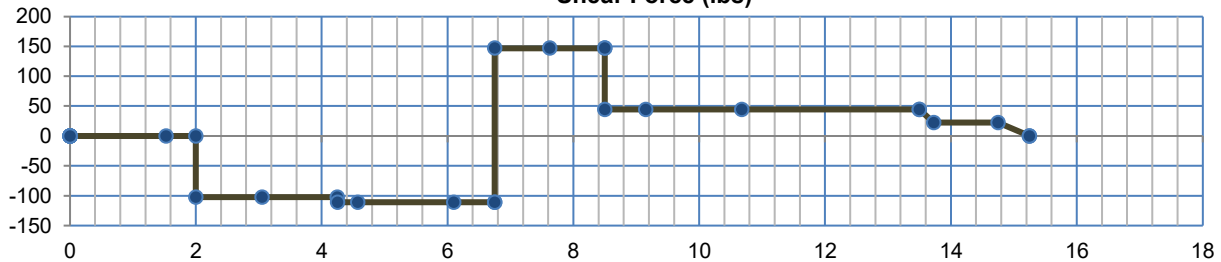
Point Loads		
x	lbs	Moment
2.0	-102.37	0
8.5	-102.37	0
13.5	-22.257	0
14.75	-22.257	0
0	0	0

Distributed Loads			
x Start	x End	lbs	lbs
0.00	15.25	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00

**Loads (lbs)**

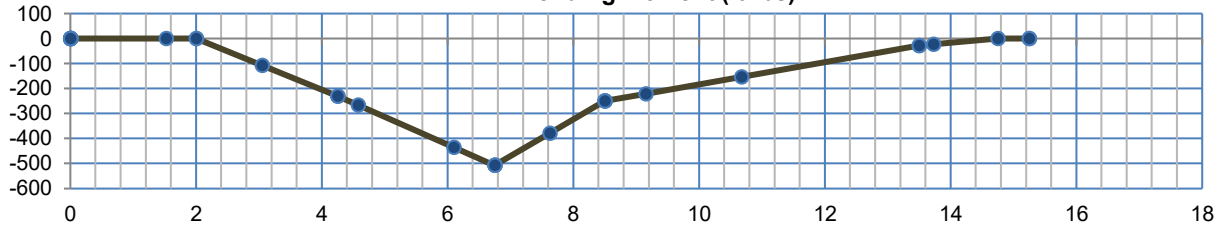


**Shear Force (lbs)**



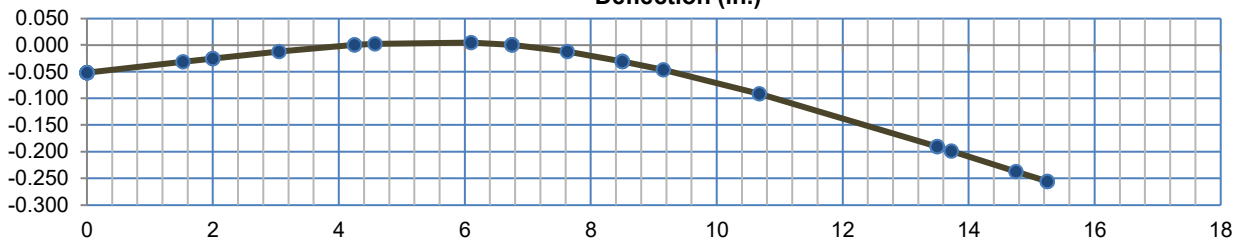
Max. = 147 lbs

**Bending Moment (ft-lbs)**



Max. = 507 ft-lbs

**Deflection (in.)**



Max. = 0.256 in.

<u>DESCRIPTION:</u>	Antenna Mast		
<u>BEAM PROPERTIES:</u>	Beam shape = <b>P 3" Sch 40</b>		
A = 2.230	in <sup>2</sup>	S <sub>x</sub> = 1.720	in <sup>3</sup>
Weight = 7.580	plf	S <sub>y</sub> = 1.720	in <sup>3</sup>
O.D. = 3.500	in	I <sub>x</sub> = 3.020	in <sup>4</sup>
<u>MATERIAL PROPERTIES:</u>		I <sub>y</sub> = 3.020	in <sup>4</sup>
E = 29,000	ksi	r <sub>x</sub> = 1.160	in.
F <sub>y</sub> = 35,000	psi	r <sub>y</sub> = 1.160	in.
<u>BEAM LOADING:</u>			
Unsupported Length, L =	183	in.	
Moment, M =	0.507	kip-ft	
	=	6,089 in-lbs	
Shear, V =	0.147	kips	
Deflection, Δ =	0.256	in.	
Span Length / Deflection =	715		
<u>BEAM STRESS:</u>			
Bending stress, f <sub>bx</sub> =	3,540	psi	
Allowable Bending, F <sub>bx</sub> = 0.6 F <sub>y</sub> =	21,000	psi	
Required S <sub>x</sub> =	0.3	in <sup>3</sup>	<b>O.K.</b>
Shear Stress f <sub>v</sub> =	66	psi	
Allowable Shear Stress = 0.4 F <sub>y</sub> =	14,000	psi <b>O.K.</b>	
Required Area, A =	0.002	in <sup>2</sup>	
<u>SUMMARY:</u>	The calculated shear at the pipe supports is also the load to the mast anchorage. The load is small compared to the capacity of a 1/2" diameter A307 bolt.		
Utilization =	<b>16.86%</b>	of capacity	

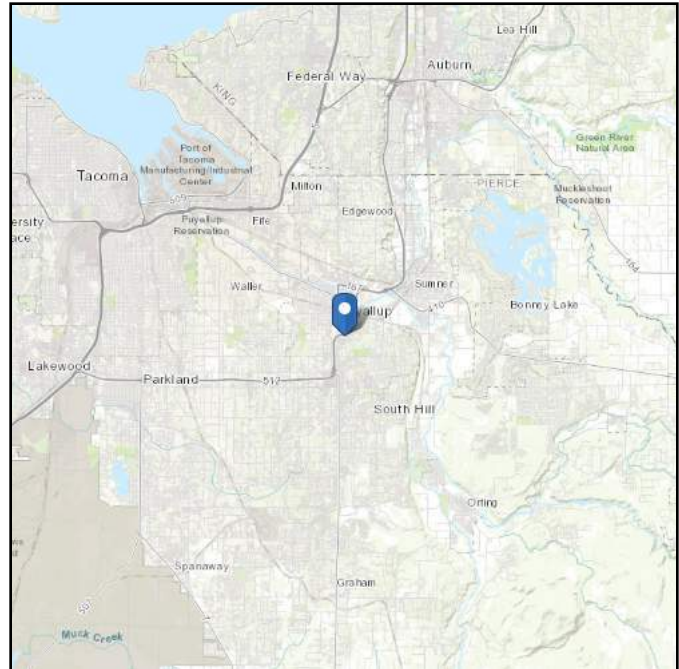
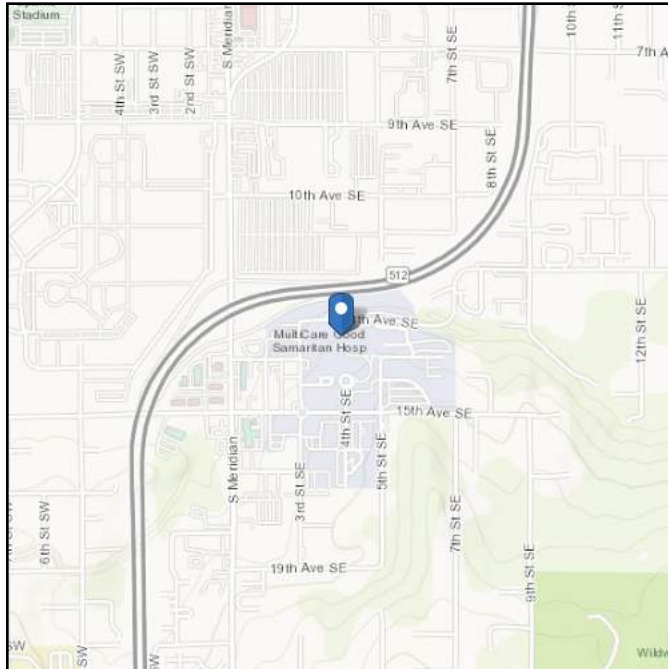
## **B Appendix – Referenced Documents**

# ASCE 7 Hazards Report

**Address:**  
407 14th Ave SE  
Puyallup, Washington  
98372

**Standard:** ASCE/SEI 7-16  
**Risk Category:** II  
**Soil Class:** D - Default (see Section 11.4.3)

**Latitude:** 47.179251  
**Longitude:** -122.289637  
**Elevation:** 122.28247765975831 ft (NAVD 88)



## Wind

### Results:

Wind Speed	98 Vmph
10-year MRI	67 Vmph
25-year MRI	73 Vmph
50-year MRI	78 Vmph
100-year MRI	83 Vmph

Data Source: ASCE/SEI 7-16, Fig. 26.5-1B and Figs. CC.2-1–CC.2-4, and Section 26.5.2

Date Accessed: Sun Apr 02 2023

Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-16 Standard. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (annual exceedance probability = 0.00143, MRI = 700 years).

Site is not in a hurricane-prone region as defined in ASCE/SEI 7-16 Section 26.2.

**Site Soil Class:** D - Default (see Section 11.4.3)

**Results:**

$S_s$ :	1.267	$S_{D1}$ :	N/A
$S_1$ :	0.436	$T_L$ :	6
$F_a$ :	1.2	PGA :	0.5
$F_v$ :	N/A	PGA <sub>M</sub> :	0.6
$S_{MS}$ :	1.52	$F_{PGA}$ :	1.2
$S_{M1}$ :	N/A	$I_e$ :	1
$S_{DS}$ :	1.013	$C_v$ :	1.353

Ground motion hazard analysis may be required. See ASCE/SEI 7-16 Section 11.4.8.

**Data Accessed:** Sun Apr 02 2023

**Date Source:** [USGS Seismic Design Maps](#)

## Ice

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**Results:**

Ice Thickness: 1.00 in.  
Concurrent Temperature: 25 F  
Gust Speed 30 mph

**Data Source:** Standard ASCE/SEI 7-16, Figs. 10-2 through 10-8

**Date Accessed:** Sun Apr 02 2023

Ice thicknesses on structures in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.

Values provided are equivalent radial ice thicknesses due to freezing rain with concurrent 3-second gust speeds, for a 500-year mean recurrence interval, and temperatures concurrent with ice thicknesses due to freezing rain. Thicknesses for ice accretions caused by other sources shall be obtained from local meteorological studies. Ice thicknesses in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.

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The ASCE 7 Hazard Tool is provided for your convenience, for informational purposes only, and is provided “as is” and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE 7 standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

ASCE does not intend, nor should anyone interpret, the results provided by this Tool to replace the sound judgment of a competent professional, having knowledge and experience in the appropriate field(s) of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the contents of this Tool or the ASCE 7 standard.

In using this Tool, you expressly assume all risks associated with your use. Under no circumstances shall ASCE or its officers, directors, employees, members, affiliates, or agents be liable to you or any other person for any direct, indirect, special, incidental, or consequential damages arising from or related to your use of, or reliance on, the Tool or any information obtained therein. To the fullest extent permitted by law, you agree to release and hold harmless ASCE from any and all liability of any nature arising out of or resulting from any use of data provided by the ASCE 7 Hazard Tool.

Ms. Melissa Browning  
General Dynamics Information Technology, Inc.  
19240 Des Moines Memorial Drive South, Suite 300  
SeaTac, WA 98148  
(360) 485-7196

Morrison Hershfield  
1455 Lincoln Parkway, Suite 500  
Atlanta, GA 30346  
(770) 379-8500

Date: October 18, 2019

**Subject: Load Mapping Report**

**AT&T Designation:**

**Site FA:** 10029581  
**Site Name:** GOOD SAMARITAN

**Turf Vendor Number:** WA6659

**Site Address:** 407 14<sup>th</sup> Ave Southeast, Puyallup, WA 98371  
**Site Coordinates:** Latitude: 47.17950° N, Longitude: 122.29055°W

**Tower Description:** 68 ft – Building  
**Mount Description:** **Roof Top Platform**

**Morrison Hershfield Project Number:** GED-577R4 / 1900279.00

Site mapping letter which shows equipment platform location on the existing roof framing and some cabinet weights.

Dear Ms. Browning,

Morrison Hershfield is pleased to submit this “**Load Mapping Report**” for the existing equipment located on the roof top mounted platform, at the above building site. This letter is in response to the letter by the building owner’s structural review consultant, PCS Structural Solutions (PCS), dated August 22, 2019.

Item 1 of the PCS letter suggests that “the existing enclosure was not designed per the requirements of the Risk Category IV that is required for equipment that is being supported off the emergency electrical generation system of the hospital.” We feel that it is not necessary, since the telecommunications equipment does not support emergency operations, or any operations of the hospital. Therefore, the equipment is “down stream” of the hospital equipment, and doesn’t require Risk Category IV design. The International Building Code references ANSI-TIA 222 revision H, for the design of telecommunications support structures, in which Section 2.2.2.1 allows for use of Risk Category II in such cases as this, where non-critical equipment is supported by structures of higher Risk Category. Our understanding is that the equipment platform was designed using Risk Category III, based upon the review of the Smartlink Structural Analysis Report, dated October 28, 2015, for analysis of the structural platform.

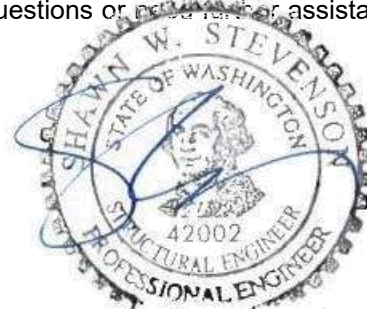
Item 2 of the PCS letter requests that the weights of the existing AT&T platform equipment be provided for review. Subsequently, Shawn Stevenson, SE, with MH called and discussed this item with Donald Scott, SE, with PCI to make sure we could address this concern appropriately. Shawn then visited the project site to map the equipment and any roof top building loads in the area of concern. The following pages include layout sketches with equipment information confirmed on site, along with the weights, as requested. We understand that PCS will be reviewing this information and report back to the building owner and project team with their findings.

We at *Morrison Hershfield* appreciate the opportunity of providing our continuing professional services to you and General Dynamics Information Technology, Inc. If you have any questions or need further assistance on this or any other projects please give us a call.

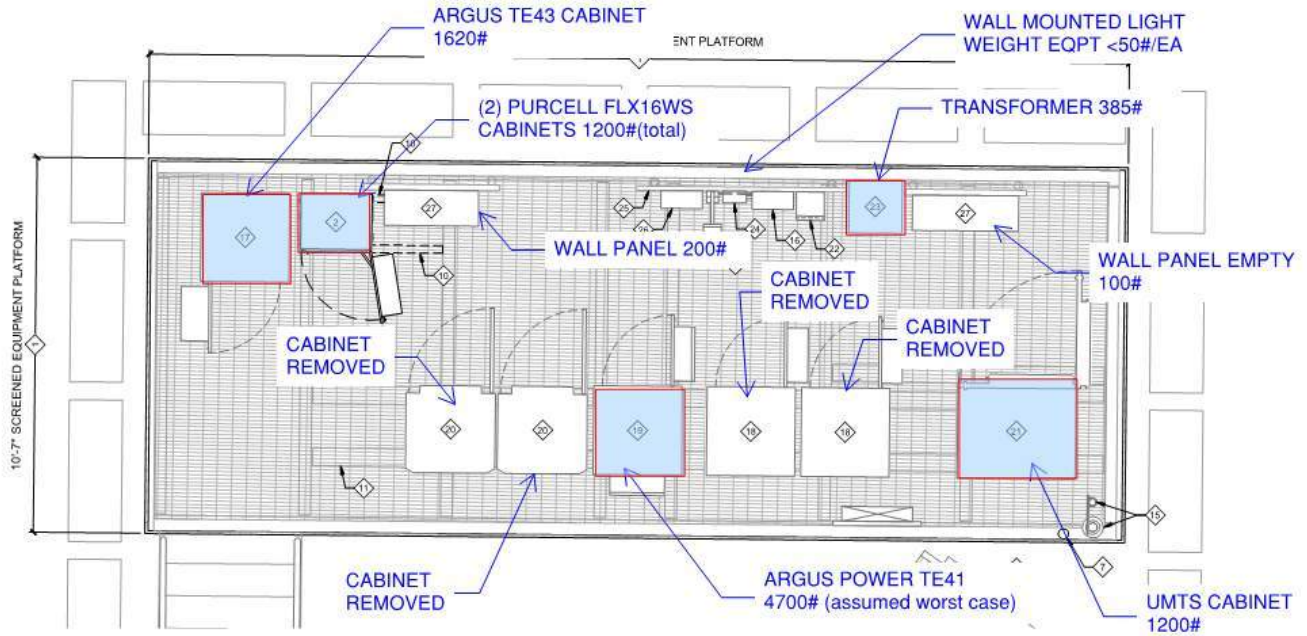
Respectfully submitted by:  
Morrison Hershfield

Shawn W. Stevenson, S.E. (WA License No. 42002)  
Senior Engineer

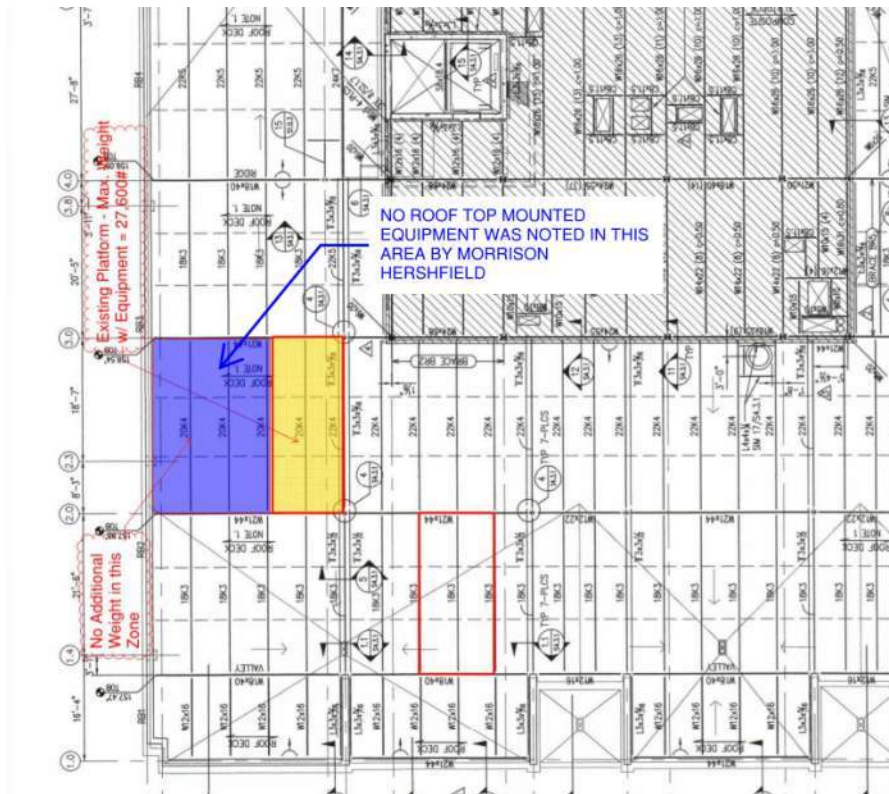
Morrison Hershfield



Exp 3/1/20



**AT&T PLATFORM MAP**



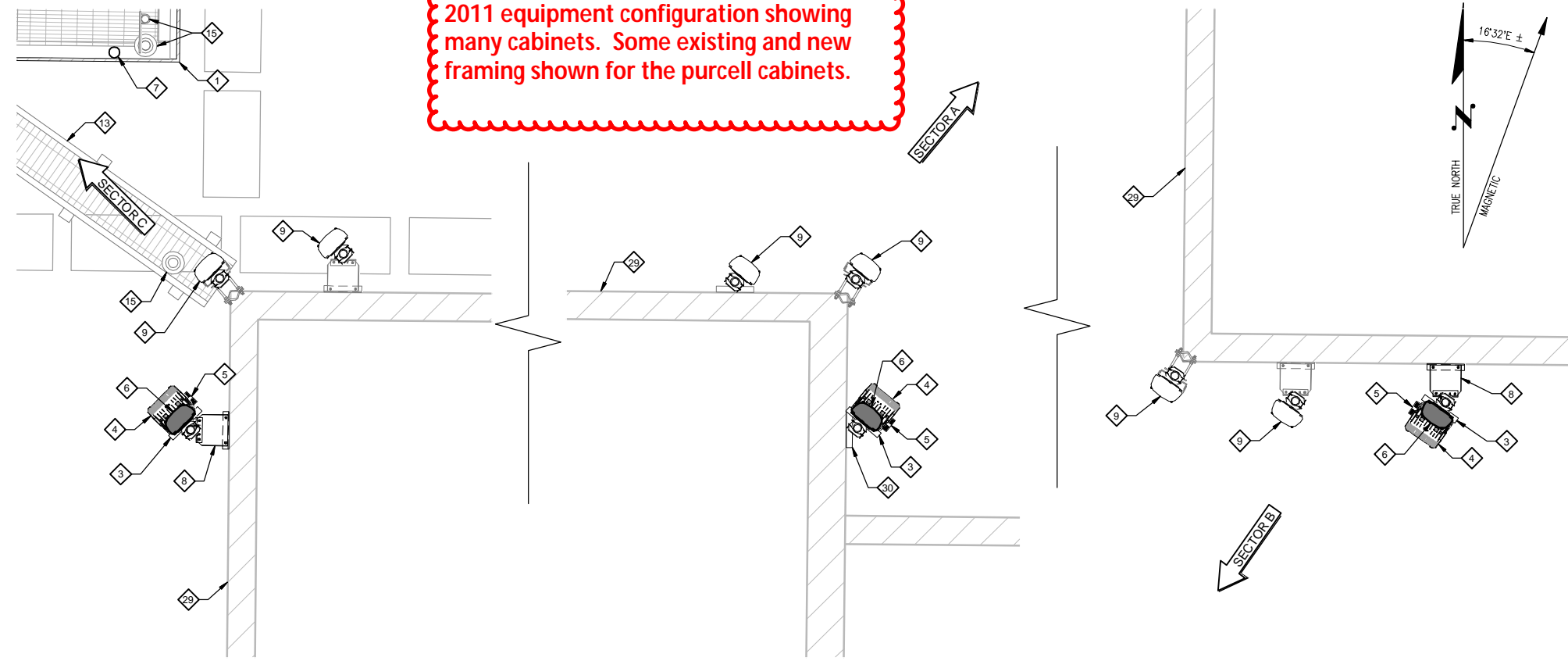
**BUILDING ROOF TOP PARTIAL PLAN**

Note: this sketch was part of an attachment to the PCI structural review letter, dated August 22, 2019. Morrison Hershfield notes have been added in blue.





2011 equipment configuration showing many cabinets. Some existing and new framing shown for the purcell cabinets.



**ENLARGED ANTENNA PLAN**

22"x34" SCALE: 1/2" = 1'-0" 11"x17" SCALE: 1/4" = 1'-0"

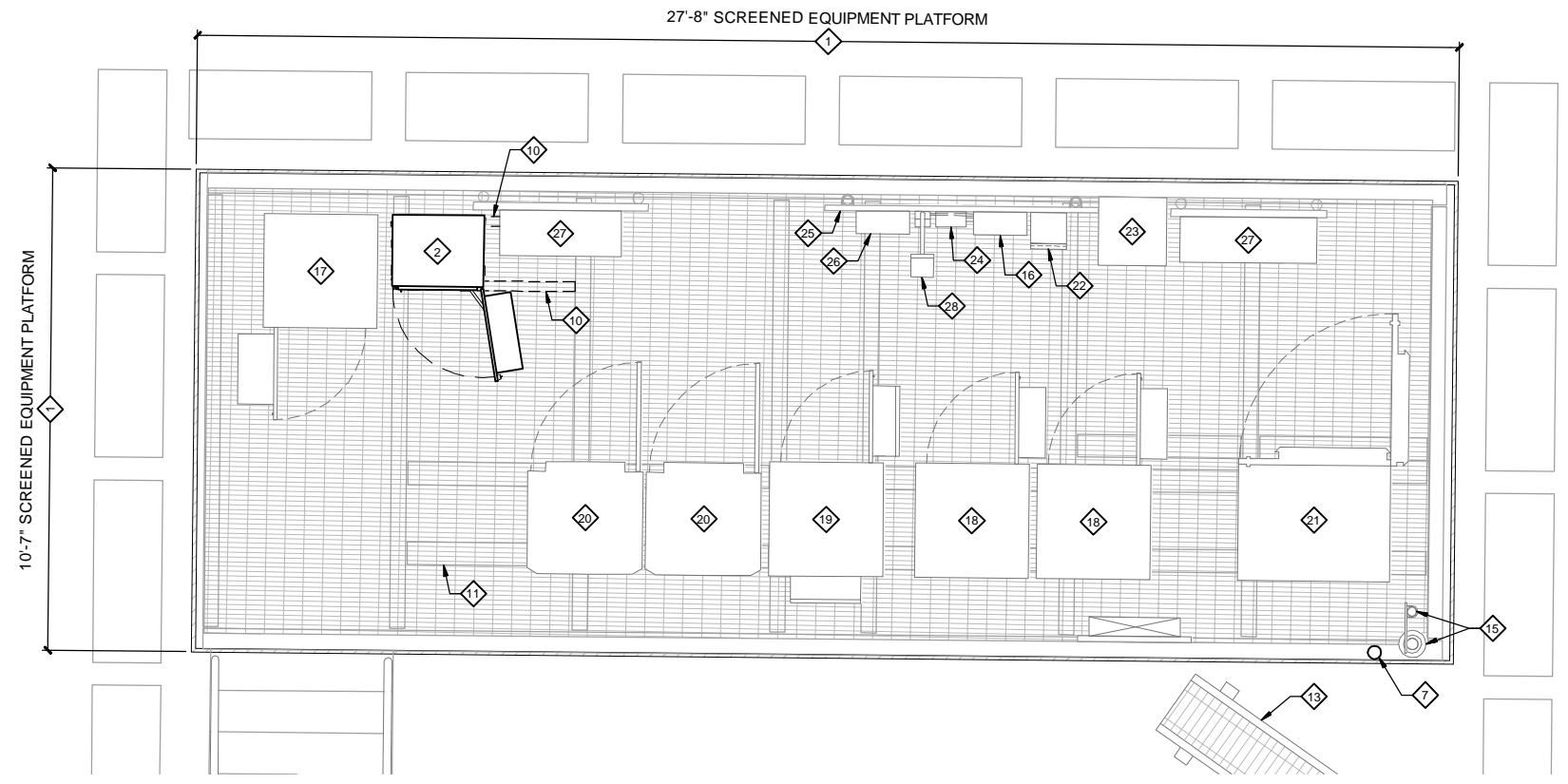
**2**

**CONSTRUCTION PLAN KEYED NOTES**

- 1 EXISTING AT&T SCREENED EQUIPMENT PLATFORM (27' x 10').
- 2 PROPOSED AT&T PURCELL FLX16WS CABINET TO HOUSE LTE EQUIPMENT.
- 3 PROPOSED AT&T RAYCAP SURGE SUPPRESSION BOX MOUNTED BELOW RRH'S ON PROPOSED ANTENNA MOUNT (TYP OF (1) PER SECTOR).
- 4 PROPOSED AT&T 700 MHZ RRH UNIT MOUNTED BELOW ANTENNA ON PROPOSED ANTENNA MOUNT (TYP OF (1) PER SECTOR).
- 5 PROPOSED AT&T AWS RRH UNIT MOUNTED BELOW ANTENNA ON PROPOSED ANTENNA MOUNT (TYP OF (1) PER SECTOR).
- 6 PROPOSED AT&T LTE PANEL ANTENNA TO BE ADDED TO AN EXISTING (3) SECTOR ANTENNA ARRAY (1) LTE ANTENNA PER SECTOR FOR A TOTAL OF (3) NEW LTE ANTENNAS.
- 7 PROPOSED AT&T LTE GPS ANTENNA MOUNTED NEXT TO EXISTING GPS ANTENNA WITHIN SCREENED EQUIPMENT PLATFORM.
- 8 PROPOSED AT&T SLIDER BRACKET WALL MOUNT.
- 9 EXISTING AT&T PANEL ANTENNAS (TO REMAIN).
- 10 PROPOSED AT&T EQUIPMENT SUPPORT BEAM.
- 11 EXISTING AT&T EQUIPMENT SUPPORT BEAM (TO REMAIN).
- 13 EXISTING AT&T CABLE TRAY (TO REMAIN).
- 15 EXISTING AT&T GPS ANTENNAS (TO REMAIN).
- 16 EXISTING AT&T AC PANEL (TO REMAIN).
- 17 EXISTING AT&T ARGUS TE43 CABINET (TO REMAIN).
- 18 EXISTING AT&T BBU CABINET (TO REMAIN).
- 19 EXISTING AT&T ARGUS POWER CABINET (TO REMAIN).
- 20 EXISTING AT&T GSM CABINET (TO REMAIN).
- 21 EXISTING AT&T UMTS CABINET (TO REMAIN).
- 22 EXISTING AT&T GEN PLUG ENCLOSURE (TO REMAIN).
- 23 EXISTING AT&T TRANSFORMER (TO REMAIN).
- 24 EXISTING AT&T SURGE SUPPRESSION BOX (TO REMAIN).
- 25 EXISTING AT&T UTILITY H-FRAME (TO REMAIN).
- 26 EXISTING AT&T TELCO DEMARC (TO REMAIN).
- 27 EXISTING AT&T HOFFMAN BOX (TO REMAIN).
- 28 EXISTING AT&T WATERPROOF SERVICE LIGHT (TO REMAIN)
- 29 EXISTING PENTHOUSE (TO REMAIN).
- 30 PROPOSED AT&T CANTILEVER WALL MOUNT.

**SITE NOTES**

- 1. VERIFY ANTENNA MODEL, RAD CENTER & AZIMUTHS WITH LOCKDOWN SET RF SITE BUILD FORM.



**ENLARGED EQUIPMENT PLAN**

22"x34" SCALE: 1/2" = 1'-0" 11"x17" SCALE: 1/4" = 1'-0"

**1**



**LDC** Commercial Infrastructure Residential Telecom  
THE CIVIL ENGINEERING GROUP  
 14201 NE 200th St., #100 Ph. 425.806.1889  
 Woodinville, WA 98072 Fx. 425.462.2893  
 www.LDCcorp.com

DATE:	9-16-11
DRAWN BY:	RMD
CHECKED BY:	RJA

REVISIONS			
REV	DATE	DESCRIPTION	BY
1	9-16-11	PRELIMINARY CONSTRUCTION	RJA
2	12-13-11	FINAL CONSTRUCTION	RJA

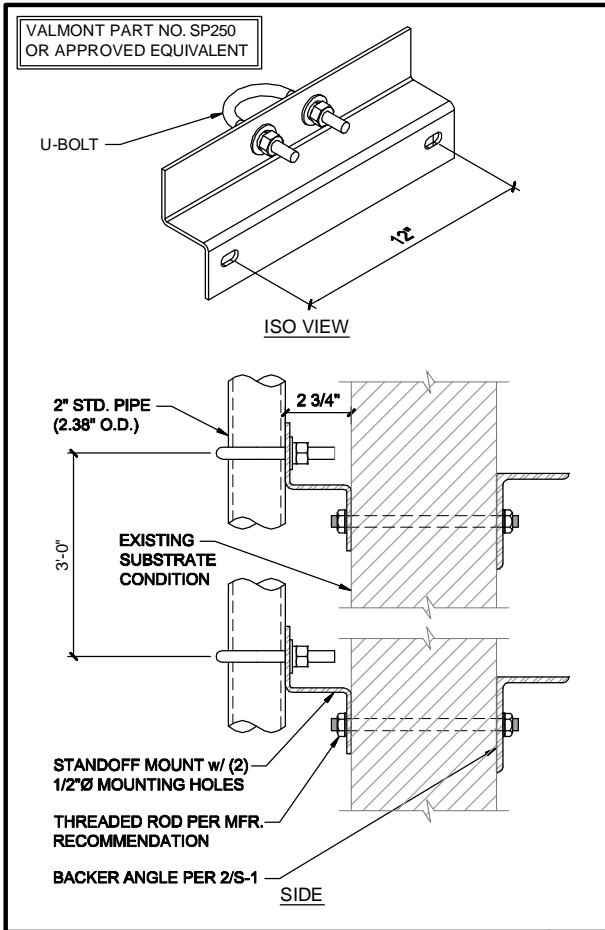


**SITE**  
 WA659  
 GOOD SAMARITAN  
 407 14TH AVE SE  
 PUYALLUP, WA 98372

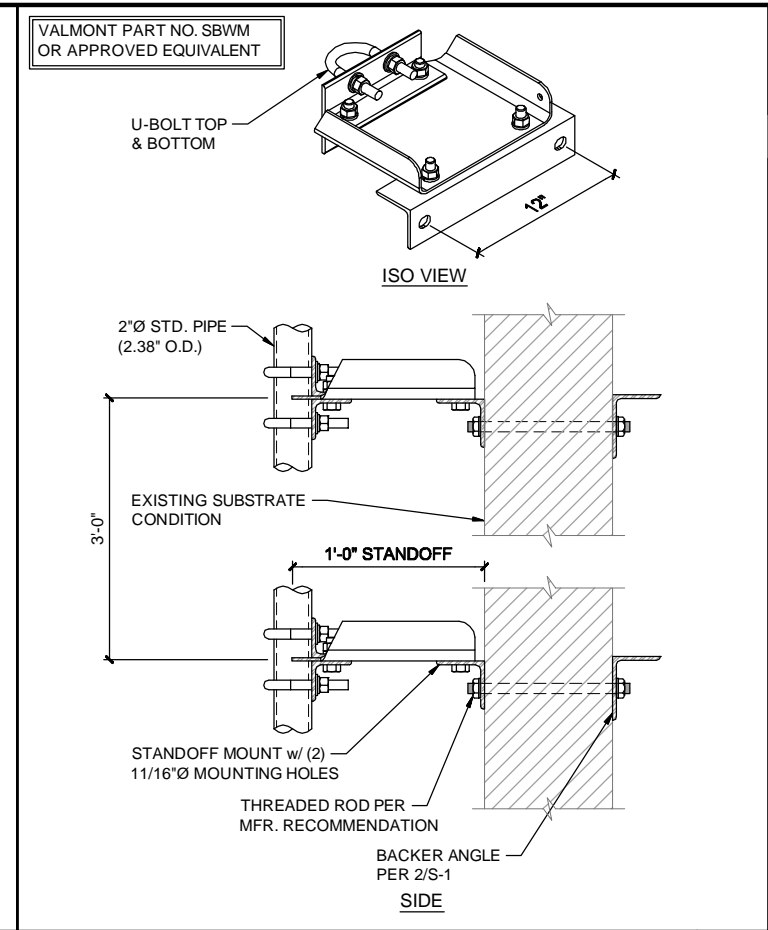
**SHEET TITLE**  
 ENLARGED SITE PLAN

**SHEET NUMBER**  
**A-2**

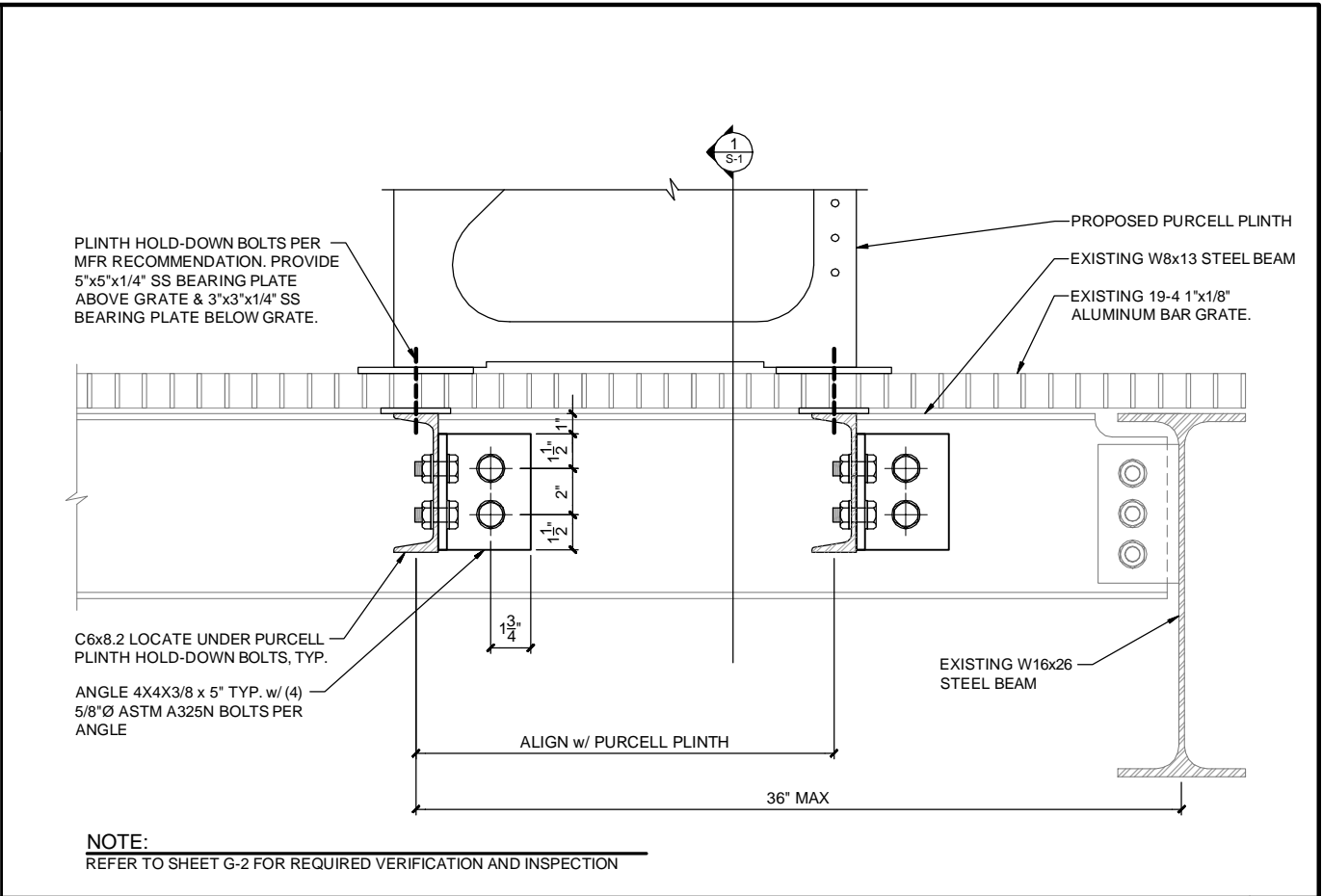
Drawing: P:\2011\Telecom\11-256 AT&T - WA659 Good Samaritan\Drawings\Construction\11-256 CD-A2-0.dwg Plotted: Dec 16, 2011 - 8:30am



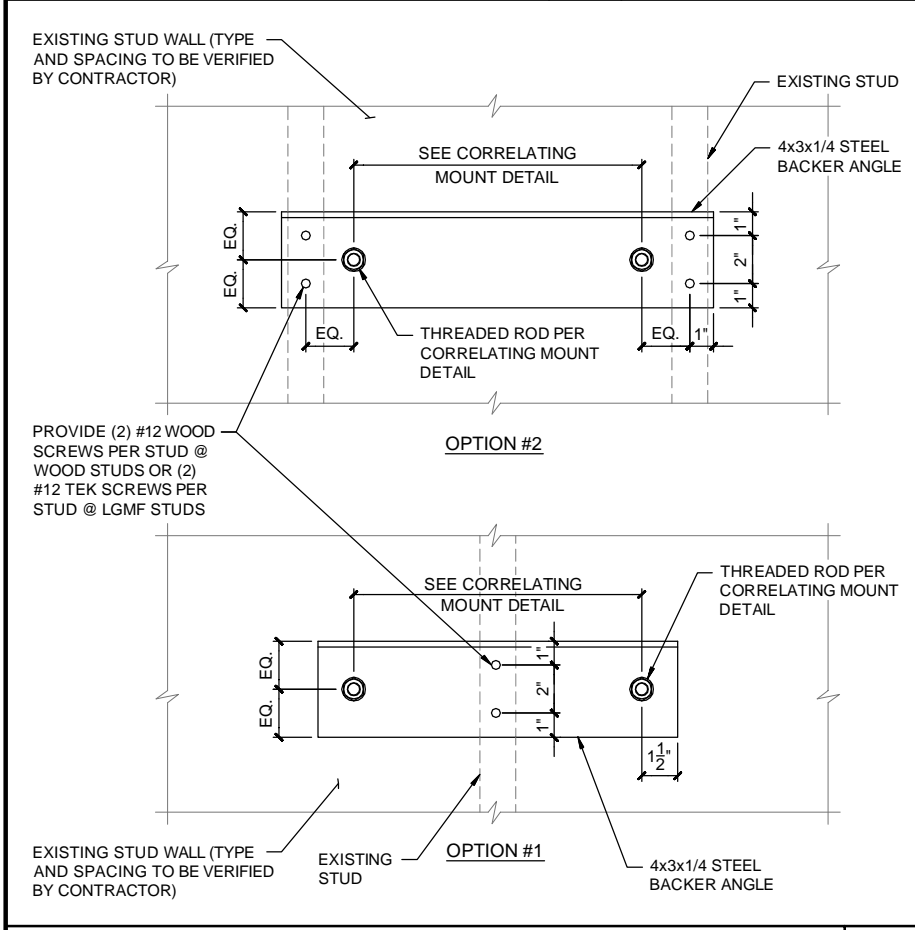
**CANTILEVER WALL MOUNT**  
22"x34" SCALE: 3" = 1'-0" **5**



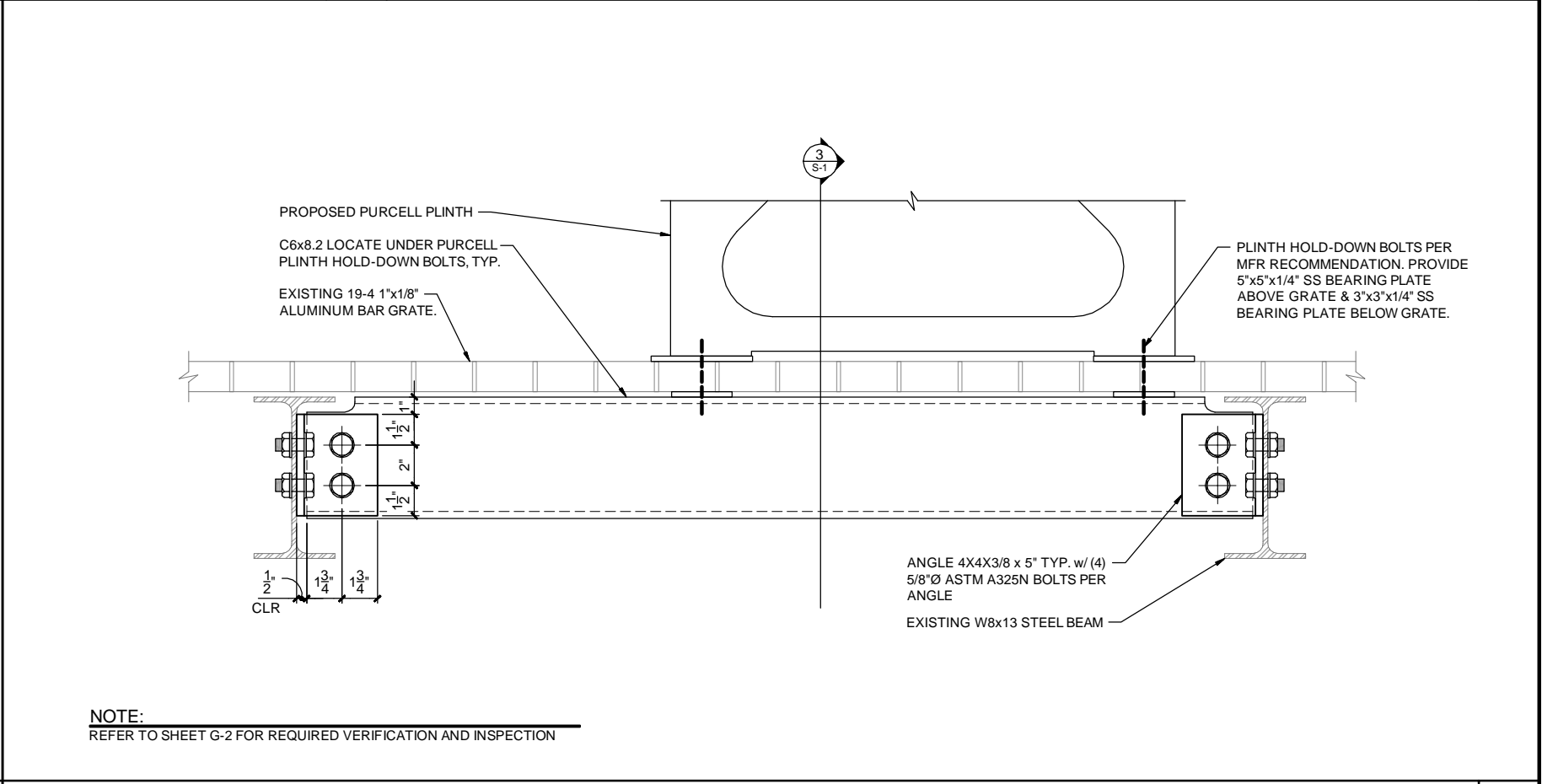
**SLIDER BRACKET WALL MOUNT**  
22"x34" SCALE: 2" = 1'-0" **4**



**AT&T EQUIPMENT SUPPORT BEAM**  
22"x34" SCALE: 3" = 1'-0" **3**



**BACKER ANGLE REQUIREMENTS**  
22"x34" SCALE: 3" = 1'-0" **2**



**AT&T EQUIPMENT SUPPORT BEAM**  
22"x34" SCALE: 3" = 1'-0" **1**



**LDC** Commercial Infrastructure Residential Telecom  
THE CIVIL ENGINEERING GROUP  
14201 NE 200th St., #100 Ph. 425.806.1889  
Woodinville, WA 98072 Fx. 425.462.2893  
www.LDCcorp.com

DATE: 9-16-11  
DRAWN BY: RMD  
CHECKED BY: RJA

REVISIONS			
REV	DATE	DESCRIPTION	BY
1	9-16-11	PRELIMINARY CONSTRUCTION	RJA
2	12-13-11	FINAL CONSTRUCTION	RJA



**SITE**  
WA659  
GOOD SAMARITAN  
407 14TH AVE SE  
PUYALLUP, WA 98372

**SHEET TITLE**  
STRUCTURAL DETAILS

**SHEET NUMBER**  
**S-1**

Drawing: P:\2011\Telecom\11-256 AT&T - WA659 Good Samaritan\Drawings\Construction\11-256 CD-S1-0.dwg Plotter: Dec 16, 2011 - 8:31am

2011 calculations for equipment configuration showing many cabinets.

December 13, 2011

AT&T Mobility Corporation  
c/o: Paul Long  
Goodman Networks  
8815 122<sup>nd</sup> Ave NE  
Kirkland, WA 98033

RE: **Level 1 Structural Analysis**  
**WA659 Good Samaritan**  
**407 14<sup>th</sup> Ave. SE**  
**Puyallup, WA 98372**

## I. Introduction

At the request of Goodman Networks, we have performed a structural analysis and design of the existing cabinet platform, roof beam, and the new antenna masts and mounts at WA659 Good Samaritan in Puyallup, Washington. The evaluation was completed in conformance with the 2009 International Building Code, the Steel Construction Manual (AISC 13) and the American Society of Civil Engineers Standard 7-05 (ASCE/SEI 7-05) under the following site specific conditions:

Basic Wind Speed: 85 mph  
Exposure Category: B  
Occupancy Category: IV  
Seismic Site Class: D

Based on a visual inspection performed on September 1, 2011 the existing cabinet platform appears to be relatively free of corrosion. This evaluation assumes that the cabinet platform was installed per the original design and has received proper maintenance since it was constructed. Two previous analyses were reviewed for our evaluation and design. One was by TRK Engineering dated May 11, 2006, and the other was by Velocitel, Inc. dated August 12, 2010.

The following sections detail the existing and proposed configurations in the areas subject to change.

## II. Existing Antenna Configuration

Sector	Antenna Model	Antenna Weight	Effective Area
X	Vacant	N/A	N/A
Y	Vacant	N/A	N/A
Z	Vacant	N/A	N/A

## III. Proposed Antenna Configuration

Sector	Antenna Model	Antenna Weight	Effective Area
X	KMW AM-X-CD-17-65-00T-RET	59.5 lbs	7.87 sf
Y	KMW AM-X-CD-14-65-00T-RET	36.4 lbs	3.93 sf
Z	KMW AM-X-CD-17-65-00T-RET	59.5 lbs	7.87 sf

Additional Appurtenances:

1. Mount an Alcatel-Lucent RRH 700MHz unit, and an Alcatel-Lucent RRH AWS unit on the new antenna mast at each new KMW antenna
2. Add Purcell FLX12WS, FLX16WS and a 14" plinth to the existing equipment platform.

#### IV. Conclusion

The subject antenna masts will be 2-inch diameter standard pipe (2.375" O.D.), and the mount bases are assumed to be Valmont Part Number SP250 in Sector X, and Valmont part number SBWM in Sectors Y and Z. Different mounts were used in order to match the existing mounts in the relevant sector. Wind was the controlling load, and the 2-inch pipe masts were judged to be structurally adequate to support the loading in conformance with IBC Chapters 16 and 22. Sail areas were calculated for wind from the front and the side of the antennas. For frontal area the RRH units were assumed to be shielded by the antenna. For side area, a 2" diameter pipe the length of the antenna was added to the side areas of the antenna plus the RRH units. Our evaluation compared proposed gravity plus wind loading with the design capacity of the system. The 2" diameter antenna mast was included in the gravity load. Seismic loads were calculated, but did not control.

The existing roof beam and equipment platform are adequate to support the weight of the new Purcell cabinets and plinth. C6X8.2 channels must be added to the platform to carry the new load because the existing aluminum bar grate which floors the platform lacks sufficient capacity to carry the cabinets without additional support.

LDC must be notified immediately if site conditions are found to vary from our assumptions because additional analysis and design may be necessary.

Our calculations are attached.

Please contact the undersigned with any questions relating to this work.

**LDC, Inc.**



David Ohnsager, P.E., S.E.

**AT&T  
WA659  
Good Samaritan**

***Structural Calculations:  
Cabinet Platform and New Antenna Mounts***

Prepared for

*AT&T Mobility Corporation  
c/o: Paul Long  
Goodman Networks  
8815 122<sup>nd</sup> Ave NE  
Kirkland, WA 98033*

Prepared by

**LDC, Inc.**  
14201 NE 200<sup>th</sup> Street, Suite 100  
Woodinville, WA 98072  
(425) 806-1869

Engineering Review:  
David Ohnsager, P.E., S.E.



December 13, 2011

Job No: 11-256

LDC, Inc.  
11-256

**WA659 Good Samaritan**  
407 14<sup>th</sup> Ave. SE, Puyallup WA 98372

**Design Criteria**

Wind Loading:

Basic Wind Speed:	85 mph
Exposure Category:	B
Occupancy Category:	IV

Seismic Loading:

IBC Site Soil Classification:	D
Seismic Design Category:	D
Occupancy Category:	IV

**WA659 Good Samaritan**  
 407 14th Ave SE Puyallup, WA 98372  
 Project: **11-256**

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 Engineer: **DAO**  
 Date: **11/9/2011**



**Project Description**

1. Add KMW AM-X-CD-17-65-00T-RET LTE panel antennas to sectors X and Z
2. Add KMW AM-X-CD-14-65-00T-RET LTE panel antennas to sector Y
3. Add Alcatel-Lucent RRH 700 MHz and RRH AWS to the antenna masts at new KMW antennas

**Equipment Dimensions and Weights**

	Height (inch)	Width (inch)	Depth (inch)	Front Area (ft^2)	Side Area (ft^2)	Weight (#)
Alcatel Lucent RRH 700 MHz	21.0	12.2	10.8	1.78	1.58	51.0
Alcatel-Lucent RRH AWS	24.4	10.6	6.7	1.80	1.14	43.0
KMW AM-X-CD-14-65-00T-RET	48.0	11.8	5.9	3.93	1.97	36.4
KMW AM-X-CD-17-65-00T-RET	96.0	11.8	6.0	7.87	4.00	59.5
Mounting Hardware (Assumed)						13.0

Total On Antenna Mast:

	Front Area	Side Area	Weight
KMW 14-65 LTE Antenna + RRH Units:	3.9 ft^2	5.47 ft^2	223.0 #
KMW 17-65 LTE Antenna + RRH Units:	7.9 ft^2	8.29 ft^2	260.8 #

- Notes:
1. Front Area assumes both RRH's are mounted behind and shielded by antenna
  2. Side Area assumes Antenna and RRH areas are additive, and includes a 2" std pipe the length of the antenna
  3. Weight includes six sets of mounting hardware plus assumed antenna mast

**Seismic**

Latitude: **47° 10' 46.23" N (47.179508° N)** (From Google Earth)

Longitude: **122° 17' 25.15" W (122.290319° W)** (From Google Earth)

Ss = **1.180** (From USGS Seismic Hazard App. V 5.1)  
 S1 = **0.400** (From USGS Seismic Hazard App. V 5.1)

WA659 Good Samaritan  
407 14th Ave SE Puyallup, WA 98372  
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Date: 11/9/2011

**LDC**

**Description:** Loads on Rooftop Antenna Mounts and Cabinets

**Codes:** 2009 International Building Code (IBC-09), ASCE 7-05, AISC 13th Edition

**Wind Criteria:**

Building Height to Roof = 85.33 ft  
Occupancy Category IV (ASCE 7 Table 1-1 Hospital)  
Surface Roughness = B (ASCE 7 Section 6.5.6.2)  
Exposure Category = B (ASCE 7 Section 6.5.6.3)  
Basic Wind Speed, V (mph) = 85.00 (3 sec gust per ASCE 7 Fig 6-1)  
Exposure Case = 1 (ASCE 7 Table 6-3)  
Directionality Factor, Kd = 0.90 (Square, ASCE 7 Table 6-4)  
Topographic Factor, Kzt = 1.00 (ASCE 7 Section 6.5.7)  
Gust Factor, G = 0.85 (ASCE Section 6.5.8.1 worst case)  
h/D = 8.000 (Component Height/Width for finding Cf)  
Force Coefficient, Cf = 1.433 (ASCE 7 Fig 6-21 Square, Normal to Face)

**Seismic Criteria:**

Latitude: 47° 10' 46.23" N (47.179508° N)  
Longitude: 122° 17' 25.15" W (122.290319° W)  
Zip Code:   
Site Class: D  
Component Amplification Factor, ap = 1.00 (ASCE 7 Table 13.6-1)  
Component Response Modification Factor, Rp = 2.50 (ASCE 7 Table 13.6-1)  
Component Importance Factor, Ip = 1.50 (ASCE 7 13.1.3)



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 407 14th Ave SE Puyallup, WA 98372  
 Project: 11-256

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 Engineer: DAO  
 Date: 11/9/2011



**Description:** Loads on Rooftop Antenna Mounts and Cabinets

**Seismic Load Calculation for Components and System**

(Derived from IBC-09 and ASCE 7)

**Location for Input to USGS Seismic Hazard Application**

Latitude: 47° 10' 46.23" N (47.179508° N)  
 Longitude: 122° 17' 25.15" W (122.290319° W)  
 Zip Code: 0

**Seismic Ground Motion:**

0.2s Spectral Response Acceleration, Site Class B,  $S_s$   
 1.0s Spectral Response Acceleration, Site Class B,  $S_1$   
 Site Class  
 Occupancy Category

1.180	(from USGS App)
0.400	(from USGS App)
<b>D</b>	(ASCE Table 20.3-1)
<b>IV</b>	(IBC Table 1604.5)

**Calculated Values**

Site Coefficient per  $S_s$  & Site Class,  $F_a$   
 Site Coefficient per  $S_1$  & Site Class,  $F_v$   
 $S_{MS} = F_a S_s$   
 $S_{M1} = F_v S_1$   
 $S_{DS} = 2/3 S_{MS}$   
 $S_{D1} = 2/3 S_{M1}$   
 Seismic Design Category per  $S_{DS}$

<b>1.028</b>	(ASCE Table 11.4-1)
<b>1.600</b>	(ASCE Table 11.4-2)
<b>1.213</b>	(ASCE Eqn 11.4-1)
<b>0.640</b>	(ASCE Eqn 11.4-2)
<b>0.809</b>	(ASCE Eqn 11.4-3)
<b>0.427</b>	(ASCE Eqn 11.4-3)
<b>D</b>	(ASCE Table 11.6-1)

**Seismic Design Requirements for Nonstructural Components:**

Height in Structure at Component Point of Attachment,  $z$   
 Component Operating Weight,  $W_p$   
 Component Amplification Factor,  $a_p$   
 Component Response Modification Factor,  $R_p$   
 Component Importance Factor,  $I_p$   
 Average Roof Height of Structure,  $h$

<b>81.17</b>	ft
<b>265.00</b>	lb
<b>1.00</b>	(ASCE Table 13.5-1 or 13.6-1)
<b>2.50</b>	(ASCE Table 13.5-1 or 13.6-1)
<b>1.50</b>	(ASCE Sec 13.1.3)
<b>85.33</b>	ft

Seismic Design Force,  $F_p$   $\frac{0.4 a_p S_{DS} W_p (1+2z/h)}{R_p / I_p}$  (ASCE Eqn 13.3-1)

Max Seismic Design Force,  $F_{pmax}$   $1.6 S_{DS} I_p W_p$  (ASCE Eqn 13.3-2)

Min Seismic Design Force,  $F_{pmin}$   $0.3 S_{DS} I_p W_p$  (ASCE Eqn 13.3-3)

Seismic Design Force, $F_p$	<b>0.563</b> $W_p$ (ULT)
Max Seismic Design Force, $F_{pmax}$	<b>1.941</b> $W_p$
Min Seismic Design Force, $F_{pmin}$	<b>0.364</b> $W_p$

Seismic Design Force, $F_p$	<b>0.563</b> $W_p$ (ULT) =	<b>149.28 lb</b>
Seismic Design Force, $F_p$	<b>0.402</b> $W_p$ (ASD) =	<b>106.63 lb</b>



**Description: Loads on Rooftop Antenna Mounts and Cabinets**

**Wind Load Calculation for Other Structures**

(Derived from IBC-09 and ASCE 7-05)

**Wind Velocity Pressure:**

V =	85.00	mph	Basic Wind Speed (3 second gust, ASCE 7-05 Fig. 6-1))
V' =	85.00	mph	(from ASCE 7-05 Figure 6-1)
h =	85.33	ft	(Building Roof Height)
Delta <sub>h</sub> =	6.92	ft	Height Increment for Pressure Calculation
Case =	1		(from ASCE 7-05 Table 6-3)
Exposure =	B		(from ASCE 7-05 Section 6.5.6.3)
K <sub>d</sub> =	0.900		(Directionality Factor from ASCE 7-05 Table 6-4)
K <sub>zt</sub> =	1.000		(Topographic Factor from ASCE 7-05 Section 6.5.7)
I <sub>w</sub> =	1.150		(Importance Factor from ASCE 7-05 Table 6-1)
G =	0.850		(Gust Factor from ASCE 7-05 Section 6.5.8)
C <sub>f</sub> =	1.433		(Force Coefficient from ASCE 7-05 Figure 6-20, 6-21, 6-22 or 6-23)
C <sub>f2</sub> =	0.000		(Rooftop Equipmt. Increase per ASCE 7-05 Section 6.5.15.1)
Reduction =	0.000	%	(from ASCE 37-02 6.2.1)

**Calculated Values**

q =	19.14	psf	(from ASCE 7-05 6.5.10: $q = 0.00256 * K_d * K_{zt} * V^2 * I_w$ )
G * C <sub>f</sub> =	1.218		
alpha =	7.00		(from ASCE 7-05 Table 6-2)
z <sub>g</sub> =	1200.00		(from ASCE 7-05 Table 6-2)

$q_z = q * K_z * G * C_f$  with  $K_z$  per ASCE 7-05 Table 6-3, Note 2

A = Projected Area at height z

Pressures and Forces at Z feet Above Grade					
z (ft)	K <sub>z</sub>	q <sub>z</sub> (psf)	A (ft <sup>2</sup> )	F (lb)	F(kips)
30.00	0.70	16.34	1.00	16.3	0.02
36.92	0.74	17.34	1.00	17.3	0.02
43.83	0.78	18.21	1.00	18.2	0.02
50.75	0.81	18.99	1.00	19.0	0.02
57.67	0.84	19.69	1.00	19.7	0.02
64.58	0.87	20.34	1.00	20.3	0.02
71.50	0.90	20.94	1.00	20.9	0.02
78.42	0.92	21.50	1.00	21.5	0.02
85.33	0.94	22.03	1.00	22.0	0.02
81.17	0.93	21.71	1.00	21.7	0.02
Total =				197	0.20

(Z per ASCE 7-05 Table 6-3 Note 2)

(Building Roof)

(Point of Interest)

## Antenna Mast

### Loads

#### Gravity

$$\text{Say } P = 265 \# \text{ (Worst Case)}$$

#### Lateral

##### Seismic

$$F_p = 106.6 \#$$

##### Wind

$$W = 21.7 \Rightarrow 22 \text{ psf}$$

$$A_w = 8.29 \text{ ft}^2 \text{ (Worst Case)}$$

$$F_w = W \times A_w = 22 \times 8.3 = 182.6 \Rightarrow 190 \# \leftarrow \text{Controls}$$

### Moment

Assume Mast is 8' cantilever (very conservative)

$$\therefore M = F_w l/2 = 190 \times 4 = 760 \# \text{-ft.}$$

$$M = 0.76 \text{ K-ft.} \Rightarrow 0.8 \text{ K-ft.}$$

### Mast Size

From analysis 2" Std. Pipe (2.38" O.D.) is OK

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**Description:** Antenna Mast: 2" Standard Pipe (O.D. = 2.38", Design Wall Thickness = 0.143")

**Compression and Flexure in Pipe and Rods per AISC 13th Edition Sections E3 and F8**

**Loads (ASD or LRFD) =**  ASD  LRFD

Pr = 0.270 k  
 Mr = 0.800 k-ft

**Dimensions**

D = 2.375 in (Outside Diameter)  
 t = 0.143 in (Design Wall Thickness)  
 Fy = 35.000 ksi  
 E = 29000.000 ksi  
 Lu = 8.000 ft  
 k = 2.000

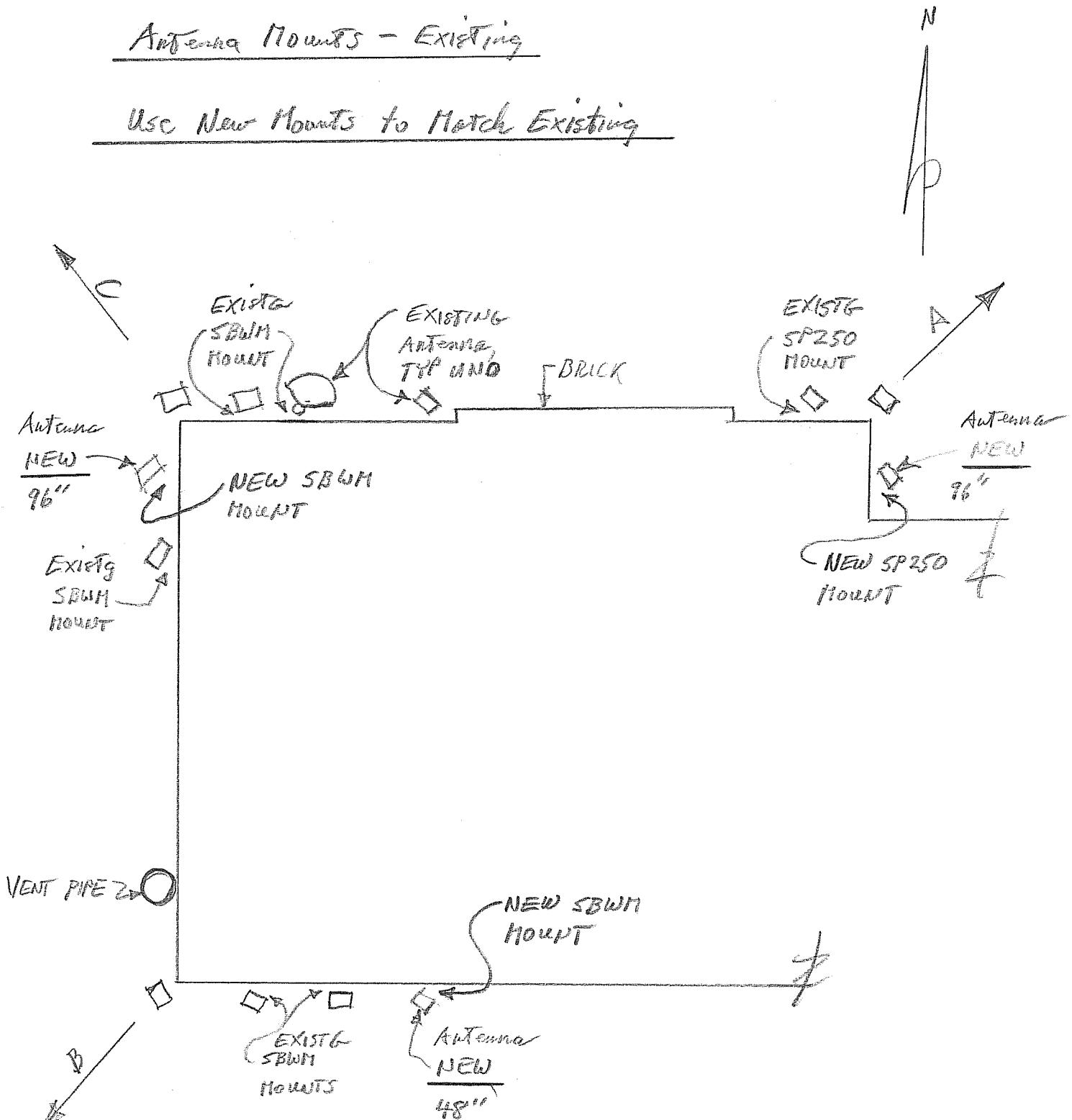
**Calculated Properties**

di = 2.089 in (Inside Diameter)  
 D/t = 16.608  
 Ag = 1.003 in<sup>2</sup>  
 I = 0.627 in<sup>4</sup>  
 r = 0.791 in  
 S = 0.528 in<sup>3</sup>  
 Z = 0.713 in<sup>3</sup>

Compression		Flexure	
<b>Compactness</b>		<b>Compactness</b>	
.11E/Fy = 91.14 (AISC 13 Table B4.1-15)		.07E/Fy = 58.00 (AISC 13 Table B4.1-15)	
Not Slender		.31E/Fy = 256.86 (AISC 13 Table B4.1-15)	
Compact			
Ωc = 1.67	Φc = 0.9	Ωb = 1.67	Φb = 0.9
Lu = 96.00 in		Yielding: Mn = FyZ	
k/r = 242.81		Mn = 24.97 k-in	(AISC 13 F8-1)
4.71sqrt(E/Fy) = 135.58		Local Buckling	
Fe = 4.85 ksi (AISC 13 E3-4)		Mn = N/A	
Fcr = 4.26 ksi (AISC 13 E3-3)			
Pn = 4.27 k (AISC 13 E3-1)			
Pc = 2.56 k (ASD)		Mc = 1.25 k-ft (ASD)	
Pc = 3.84 k (LRFD)		Mc = 1.87 k-ft (LRFD)	
<b>Combined Loads Check</b>			
Pr/Pc < 0.2: Use AISC 13 Eqn H1-1b:		Pr/(2Pc) + Mr/Mc = 0.695 OK	(ASD)

Antenna Mounts - Existing

Use New Mounts to Match Existing



By inspection standard mounting bolts for mounts are OK

Project: WA 659 Good Samaritan

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**LDC**

14201 NE 200th St., #100 • Woodinville, WA 98072 • ph: 425.806.1869 • fx: 425.482.2893 [www.LDCcorp.com](http://www.LDCcorp.com)

## Equipment Cabinets

### Existing Aluminum Bar Grate

From TRK dwg S-1, Bar grate is Fishlow 19-4 1" x 1/8" Aluminum Grate.

From Fisher & Ludlow website the safe uniform load for a 4' span 19-4 1" x 1/8" Bar Grate is 105 psf


$$\therefore M_a = Wl^2/8 = 105 \times 4^2/8 = 210 \text{ \#-ft.}$$

$$\therefore W_a = \frac{8M_a}{l^2} = \frac{8 \times 210}{4^2} = 1680/l^2 \text{ for Uniform Load/ft.}$$

$$M_a = Pl/4 \text{ for Concentrated Load}$$

$$\therefore P_a = 4M_a/l = 840/l \text{ for Concentrated Load @ Mid-Span, \#}$$

9



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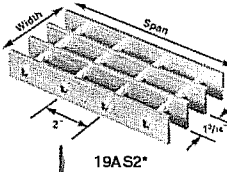
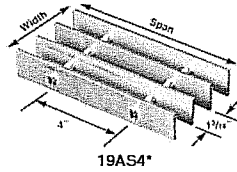
Bar Grating Home	Design Details/Accessories	Light Duty Carbon	Aluminum	Stair Treads	Bar Grating Calculator
Stock List	Types/Construction	Heavy Duty Carbon	Stainless Steel	Load Tables	How To Order

### 19-4/19-2 Aluminum Rectangular Bar Load Table & Panel Width Chart

•Load Table  
•Panel Width Chart

[Back to 'Aluminum Rectangular Bar Load Tables'](#)

#### Swaged - 1-3/16" Center to Center of Bearing Bars - Load Table



\*Also available in pre-locked (19AP4/19AP2) and flush top (19AF4/19AF2). See [Load/Connection](#) for descriptions of each.

Bar Size	Symbol / Approx. Weight**			Ped. Span	Sec. Mod. Per Ft. Of Width	Clear Span																							
	19AP4	19AS4	19AF4			2'-0"	2'-6"	3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	8'-0"	9'-0"											
3/4" x 1/8"	19AP4	19AS4	n/a	31"	.118	U	.237	.152	.105	.077																			
	19AP2	19AS2	n/a			D	.192	.300	.432	.588																			
						C	.237	.189	.158	.135																			
3/4" x 3/16"	19AP4	19AS4	n/a	35"	.178	U	.355	.227	.158	.118																			
	19AP2	19AS2	n/a			D	.192	.300	.432	.588																			
						C	.355	.284	.237	.203																			
1" x 1/8"	19AP4	19AS4	19AF4	39"	.211	U	.421	.269	.187	.137	.105																		
	19AP2	19AS2	19AF2			D	.144	.225	.324	.441	.576																		
						C	.421	.337	.281	.241	.211																		
1" x 3/16"	19AP4	19AS4	19AF4	43"	.316	U	.632	.404	.281	.206	.158	.125																	
	19AP2	19AS2	19AF2			D	.144	.225	.324	.441	.576	.729																	
						C	.632	.505	.421	.361	.316	.281																	
1-1/4" x 1/8"	19AP4	19AS4	19AF4	46"	.329	U	.658	.421	.292	.219	.164	.130																	
	19AP2	19AS2	19AF2			D	.115	.180	.258	.353	.461	.583																	
						C	.658	.526	.439	.378	.329	.292																	
1-1/4" x 3/16"	19AP4	19AS4	19AF4	51"	.493	U	.987	.632	.439	.322	.247	.195	.158																
	19AP2	19AS2	19AF2			D	.115	.180	.258	.353	.461	.583	.729																
						C	.987	.789	.658	.564	.493	.439	.395																
1-1/2" x 1/8"	19AP4	19AS4	19AF4	53"	.474	U	.947	.606	.421	.309	.237	.187	.152																
	19AP2	19AS2	19AF2			D	.095	.150	.216	.294	.384	.486	.600																
						C	.947	.768	.632	.541	.474	.421	.379																
1-1/2" x 3/16"	19AP4	19AS4	19AF4	59"	.711	U	1.421	.909	.632	.464	.355	.261	.227	.188															
	19AP2	19AS2	19AF2			D	.096	.150	.216	.294	.384	.486	.600	.726															
						C	1.421	1.137	.947	.812	.711	.632	.568	.517															
1-3/4" x 1/8"	19AP4	19AS4	19AF4	65"	.967	U	1.934	1.238	.860	.632	.464	.362	.309	.256	.215	.183													
	19AP2	19AS2	19AF2			D	.082	.129	.185	.252	.329	.417	.514	.622	.741	.869													
						C	1.934	1.547	1.289	1.105	.967	.860	.774	.703	.645	.595													
2" x 1/8"	19AP4	19AS4	19AF4	73"	1.253	U	2.526	1.617	1.123	.825	.632	.499	.404	.334	.281	.239	.206												
	19AP2	19AS2	19AF2			D	.072	.113	.162	.221	.288	.365	.450	.545	.648	.761	.882												
						C	2.526	2.021	1.684	1.444	1.263	1.123	1.011	.919	.842	.777	.722												
2-1/4" x 1/8"	19AP4	19AS4	19AF4	83"	1.599	U	3.197	2.046	1.421	1.044	.799	.632	.512	.423	.355	.303	.261	.220											
	19AP2	19AS2	19AF2			D	.064	.100	.144	.196	.256	.324	.400	.484	.578	.676	.784	.904											
						C	3.197	2.658	2.132	1.827	1.599	1.421	1.279	1.163	1.066	.984	.914	.859											
2-1/2" x 1/8"	19AP4	19AS4	19AF4	87"	1.974	U	3.947	2.526	1.754	1.289	.987	.760	.632	.522	.458	.374	.322	.247	.195										
	19AP2	19AS2	19AF2			D	.058	.090	.130	.176	.230	.292	.360	.436	.518	.608	.705	.822	.956										
						C	3.947	3.158	2.632	2.256	1.974	1.754	1.579	1.435	1.316	1.215	1.128	.987	.877										

U = Safe uniform load, lbs/sq ft  
 C = Safe concentrated load, lb/ft of grating width, at mid-span  
 D = Deflection in inches

Data is theoretical and based on 12,000 psi.

Install with cross rods on top.

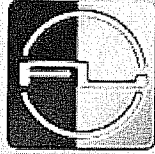
\*\* Weight depends on panel width, cross bar selection, mill tolerance and manufacturing tolerance.

Deflection: To ensure safe pedestrian comfort, maximum deflection (D) should be limited to 1/4" for uniform load of 100 psi (denoted by values to the left of heavy line in table above), however, this can be exceeded for non-pedestrian loading conditions at engineer's discretion.

Serrated Grating: For serrated grating, the depth of grating required for a specified load is 1/4" greater than shown in the above table.

[Back to top](#)

#### 19-4/19-2 Panel Width Chart



**FISHER & LUDLOW**  
 A **NUCOR** Company  
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**PRODUCTS / Bar Grating / Aluminum Grating**

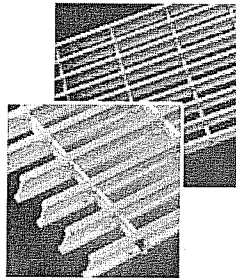
Metric

Imperial

**Bar Grating**

- Standard Grating
- Heavy Duty Grating
- Stainless Steel Grating
- Aluminum Grating**
- Stair Treads
- Manufacturing Tolerance
- Fastening Methods
- Grating Terms
- Safety Grating**
- Expanded Metals**
- Fiberglass Grating**

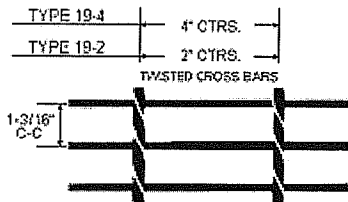
**Fisholow Aluminum Grating**



Fisholow aluminum gratings employ a unique interlocking system that joins the bearing and cross bars together in panels of exceptional rigidity and strength.

Lightweight, corrosion-resistant, non-sparking alloys are ideal for pedestrian platforms in chemical, petroleum, hydro and food processing plants, in sewage, water and waste water treatment facilities. Also available in close mesh and serrated.

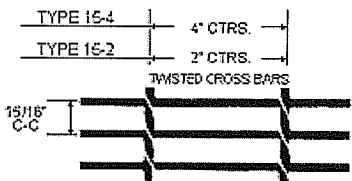
**Standard Mesh Aluminum Grating**



**Standard Bar / I Bar - Type 19**  
 Bearing Bars - 1-3 / 16" centers

View Table of Safe Loads

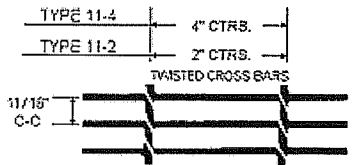
**Close Mesh Aluminum Grating**



Loads, multiply values in Standard Mesh table above By 1.28.

**Type 15P - Standard Bar**  
**Type 15I - I Bar**

View Table of Safe Loads



**ADA Compatible with 3/16" bars**

Loads, multiply values in Standard Mesh table above By 1.71.

**Type 11P - Standard Bar**  
**Type 11I - I Bar**

View Table of Safe Loads

**Table of Safe Loads - Imperial**

**NOTE:**

Choose a span: **4'-0"**

Bearing Bar Size inches	Weight lbs./sq.ft.		Sec. Mod. per foot of width	Span: 4'-0" inches
	Type 19-4	Type 19-2		
1 x 1/8	1.92	2.27	.210	U 105 ←
				D 0.576
				C 211 ←
1 x 3/16	2.72	3.06	.316	D 0.461
				U 158
				D 0.576
1 1/4 x 1/8	2.31	2.65	.329	C 316
				D 0.461
				U 164
1 1/4 x 1/8	2.31	2.65	.329	D 0.461
				C 329
				D 0.369

**Imperial**

U = Safe Uniform Load, in lbs, per sq. ft.  
 C = Safe Concentrated Load, in lbs, per foot of grating width.  
 D = Deflection in inches.



Equipment Cabinets

Purcell Cabinets + Plinth

- FLX16WS = 600# H=30" W=25" D=20"
- FLX12WS = 475# (Assumed) H=23" W=24" D=20"
- Plinth = 100# (Assumed) H=14" W=24" D=20" (Assumed)

Seismic Loads

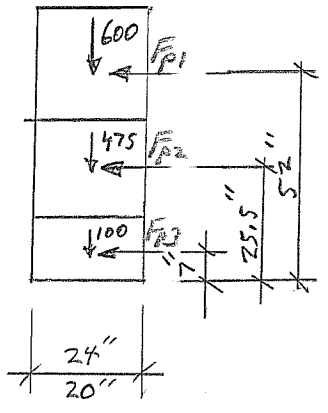
$F_p = .563 W_p$  (ULT)

$F_{p1} = .563 \times 600 = 338\#$        $M_{p1} = 52 \times 338 = 17576 \#-in$

$F_{p2} = .563 \times 475 = 267\#$        $M_{p2} = 25.5 \times 267 = 6809 \#-in$

$F_{p3} = .563 \times 100 = 56\#$        $M_{p3} = 7 \times 56 = 392 \#-in$

$\Sigma F = 661\# = V_u$        $\Sigma M = 24777 \#-in$



Overturning Reactions

Dead Load =  $1.2D/2 = 1.2(600+475+100)/2 = 705\#$  (LRFD)

Long Way

$R = 24777/24 \pm 705 = 1032 \pm 705 \Rightarrow 1737\# \text{ DN}, 327\# \text{ UP}$

Short Way

$R = 24777/20 \pm 705 = 1239 \pm 705 \Rightarrow 1944\# \text{ DN}, 534\# \text{ UP}$

Platform Beams

Use Velocitel Calcs

Assume Worst Case

W8X13

Code Check = 0.397

Additional Load adds to Strong Axis Bending Only.

$M_a = 25.62 \text{ K-ft (from Velocitel Calcs)}$

$w_u = 1.2D + E = 1737/20 = 86.9 \text{ \#/in}$

$R_1 = 1737 \times (96 + 20/2) / 126$

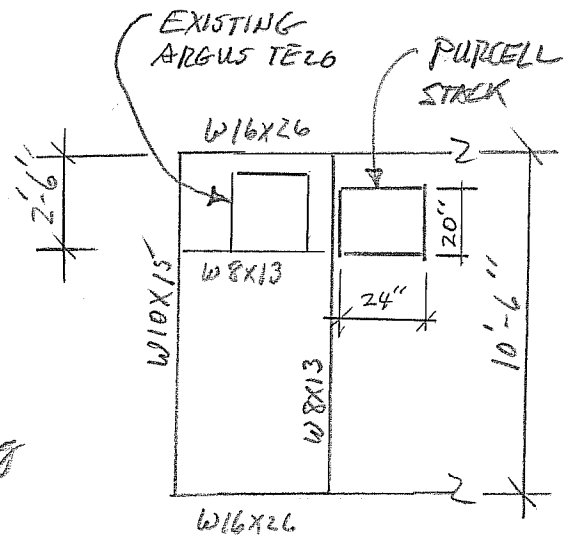
$R_1 = 1461 \text{ \#} \quad R_2 = 1737 - 1461 = 275.7$

$\therefore M = 1461 \times 10 + 1461 \times 16.81 / 2$

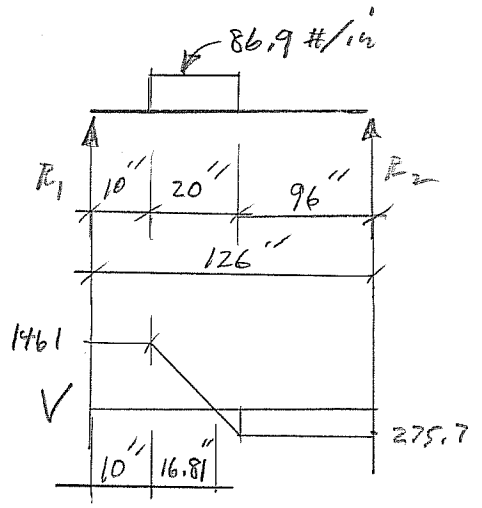
$M = 26890 \text{ \#-in} = 2.24 \text{ K-ft}$

$\frac{M}{M_a} = \frac{2.24}{25.62} = 0.0874$

$0.397 + 0.087 = 0.484 < 1.0$  OK



PLAN



Platform Beams, Cont

W10X15

Not Applicable. New Purcell Cabinet does NOT load W10X15

W16X26

$M_a = 119.34 \text{ K-ft}$  (from Velocity Calcs)

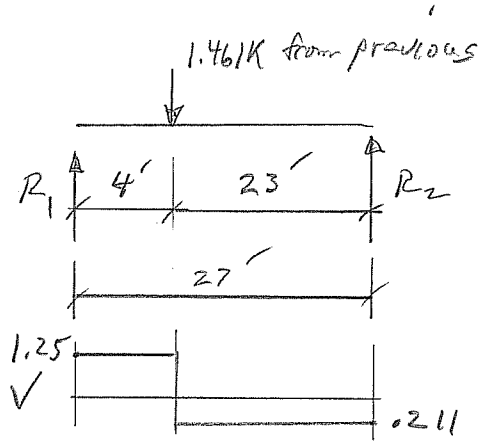
Code Check = .803

$R_1 = 23 \times 1.461 / 27 \Rightarrow 1.25 \text{ K}$

$R_2 = .211 \text{ K}$

$\therefore M = 1.25 \times 4 = 5 \text{ K-ft}$

$\frac{M}{M_a} = \frac{5}{119.34} = .042$



$\therefore \text{Code Check} = .803 + .042 = .845 < 1.0$  OK



15

**Envelope Member Section Forces (Continued)**

Member	Sec		Axial[k]	LC	y Shear	LC z Shear	LC Torque	LC	y-y Moment[k-ft]	LC	z-z Moment	LC
240		min	8.011	1	-1.412	5	0	1	0	1	0	5
241	M25	1	max	8.368	2	0	1	1.266	4	0	1	1
242		min	3.568	1	-1.293	5	0	1	0	1	-1.899	4
243		2	max	8.363	2	0	1	1.266	4	0	1	1
244		min	3.563	1	-1.293	5	0	1	0	1	-1.424	4
245		3	max	8.359	2	0	1	1.266	4	0	1	1
246		min	3.558	1	-1.293	5	0	1	0	1	-.949	4
247		4	max	8.354	2	0	1	1.266	4	0	1	1
248		min	3.552	1	-1.293	5	0	1	0	1	-.475	4
249		5	max	8.35	2	0	1	1.266	4	0	1	1
250		min	3.547	1	-1.293	5	0	1	0	1	0	4
251	M26	1	max	9.576	2	0	1	1.437	4	0	1	1
252		min	4.898	1	-1.294	5	0	1	0	1	-2.155	4
253		2	max	9.572	2	0	1	1.437	4	0	1	1
254		min	4.893	1	-1.294	5	0	1	0	1	-1.616	4
255		3	max	9.567	2	0	1	1.437	4	0	1	1
256		min	4.887	1	-1.294	5	0	1	0	1	-1.078	4
257		4	max	9.563	2	0	1	1.437	4	0	1	1
258		min	4.882	1	-1.294	5	0	1	0	1	-.539	4
259		5	max	9.558	2	0	1	1.437	4	0	1	1
260		min	4.877	1	-1.294	5	0	1	0	1	0	4
261	M27	1	max	11.849	2	0	1	1.438	4	0	1	1
262		min	7.549	1	-1.412	5	0	1	0	1	-2.158	4
263		2	max	11.845	2	0	1	1.438	4	0	1	1
264		min	7.544	1	-1.412	5	0	1	0	1	-1.618	4
265		3	max	11.84	2	0	1	1.438	4	0	1	1
266		min	7.539	1	-1.412	5	0	1	0	1	-1.079	4
267		4	max	11.836	2	0	1	1.438	4	0	1	1
268		min	7.533	1	-1.412	5	0	1	0	1	-.539	4
269		5	max	11.831	2	0	1	1.438	4	0	1	1
270		min	7.528	1	-1.412	5	0	1	0	1	0	4

**Envelope AISC 13th LRFD Steel Code Checks**

Mem...	Shape	Code Check	Loc...	LC	Sh...	LC	Dir	LC	phi*P...	phi*Pnt...	phi*Mn y-y [k-ft]	phi*Mn z-z	Cb	Egn
1	M1	W16X26	803	14...	2	.129	2...	y	2	202.3	248.832	14.796	119.34	1 H1..
2	M2	W16X26	496	14...	2	.095	0	y	2	202.3	248.832	14.796	119.34	1 H1..
3	M3	W10X15	125	5.891	2	.030	1...	y	2	39.824	142.884	6.21	28.637	1... H1..
4	M4	W10X15	119	4.89	2	.028	0	y	2	39.824	142.884	6.21	29.394	1... H1..
5	M5	W8X13	255	5.446	2	.061	1...	y	2	37.619	124.416	5.805	22.591	1... H1..
6	M6	W8X13	308	4.224	2	.090	0	y	2	37.619	124.416	5.805	22.834	1... H1..
7	M7	W8X13	301	2.779	5	.086	0	y	2	37.619	124.416	5.805	24.936	1... H1..
8	M8	W8X13	397	2.779	5	.111	0	y	4	37.619	124.416	5.805	25.622	1... H1..
9	M9	W8X13	378	2.779	4	.129	0	y	4	37.619	124.416	5.805	24.665	1... H1..
10	M10	W8X13	252	4.668	2	.063	0	y	2	37.619	124.416	5.805	23.49	1... H1..
11	M11	W8X13	010	1.5	1	.008	0	y	1	104.9	124.416	5.805	30.78	1... H1..
12	M12	W8X13	035	2.481	1	.017	4	y	1	101.8	124.416	5.805	30.78	1... H1..
13	M13	W8X13	027	1.001	1	.025	0	y	1	118.99	124.416	5.805	30.78	1... H1..
14	M14	W8X13	069	1.519	4	.062	4	y	4	102.2	124.416	5.805	30.78	1... H1..
15	M15	W8X13	004	3.573	1	.008	4...	y	1	104.1	124.416	5.805	30.78	1... H1..
16	M16	W8X13	017	2.507	4	.014	4	y	4	101.4	124.416	5.805	30.78	1... H1..
17	M17	W8X13	018	1.5	5	.012	0	y	5	104.9	124.416	5.805	30.78	1... H1..
18	M18	W8X13	060	2.481	5	.028	4	y	5	101.8	124.416	5.805	30.78	1... H1..
19	M19	W8X13	048	1.001	5	.040	0	y	5	118.99	124.416	5.805	30.78	1... H1..
20	M20	W8X13	113	1.519	5	.072	4	y	5	102.2	124.416	5.805	30.78	1... H1..
21	M21	W8X13	007	3.573	5	.015	4...	y	5	104.1	124.416	5.805	30.78	1... H1..
22	M22	W8X13	017	2.507	4	.013	4	y	4	101.4	124.416	5.805	30.78	1... H1..

Roof Beam

W21x44

From Velocity Codes  $\phi M_n = 250 \text{ K-ft}$ ,

$M_w = 221 \text{ K-ft}$ ,

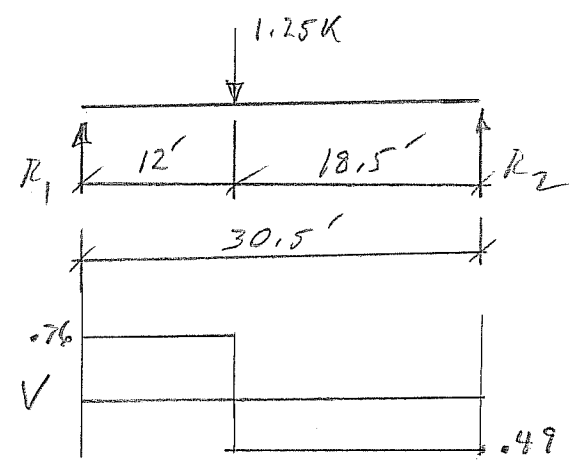
$R_1 = 1.25 \times 18.5 / 30.5 = 0.76 \text{ K}$

$R_2 = 1.25 - 0.76 = 0.49 \text{ K}$

$\therefore M = 0.76 \times 12 = 9.12 \text{ K-ft}$ ,

$\therefore M_w = 221 + 9.12 = 230.1 \text{ K-ft}$ .

$230.1 < 250$  OK



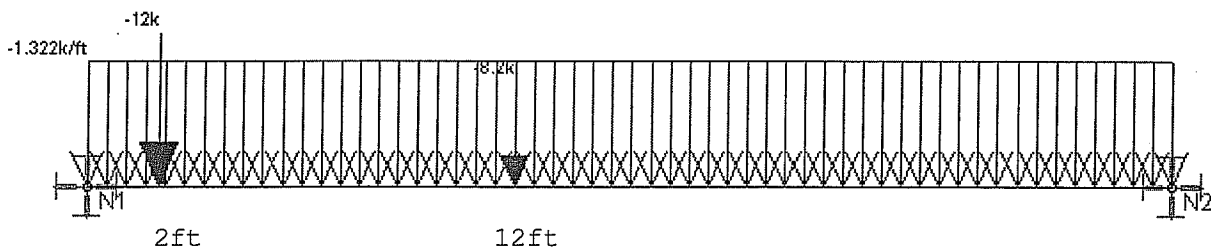
Note: The previous beam checks are very conservative because the moment from the cabinet is added to the worst case condition for the beam, but with the exception of the W21x44 Floor Beam, they do not occur at the same place

Client: AT&T  
Site Name: Good Samaritan  
Site Id: 10029581

570 Colonial Park Dr. Ste #307  
Roswell, GA 30075

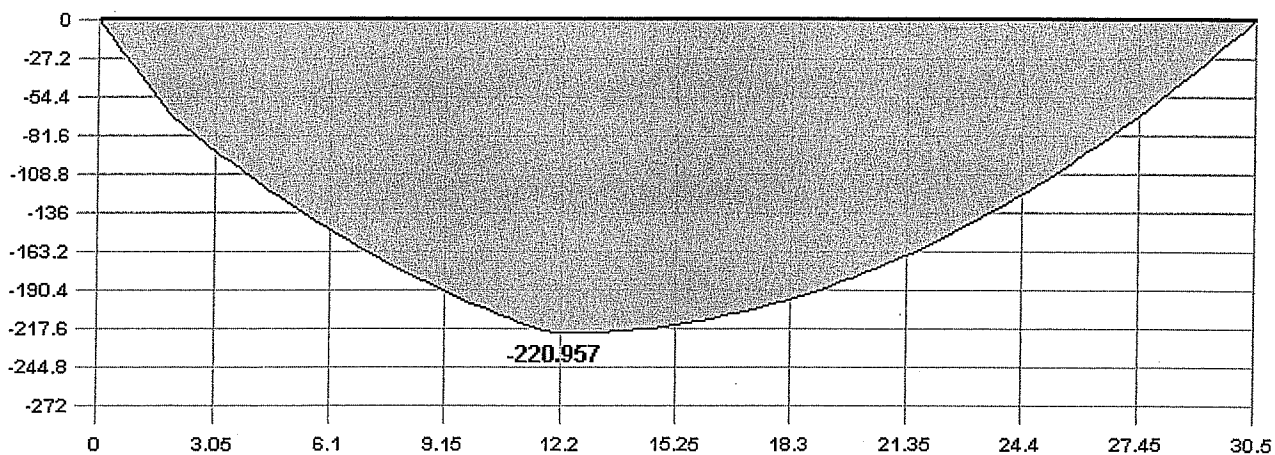


Member Loads



Member Moments

W21X44



$M_u := 221 \text{ kip} \cdot \text{ft}$

$V_u := 36.3 \text{ kip}$

Fy	36 ksi	Y-Y	Z-Z
$\phi_i P_{nc}$	331.965 k	Lb	6 ft
$\phi_i P_{nt}$	421.2 k	KL/r	57.058
$\phi_i M_{ny}$	27.515 k-ft	Sway	No
$\phi_i M_{nz}$	250.232 k-ft	L Comp Flange	6 ft
$\phi_i V_{ny}$	156.19 k	Torque Length	30.5 ft
$\phi_i V_{nz}$	113.724 k		
Cb	1		

$\phi M_n := 250 \text{ kip} \cdot \text{ft}$  >  $M_u = 221 \text{ kip} \cdot \text{ft}$  OK

$\phi V_n := 113.7 \text{ kip}$  >  $V_u = 36.3 \text{ kip}$  OK

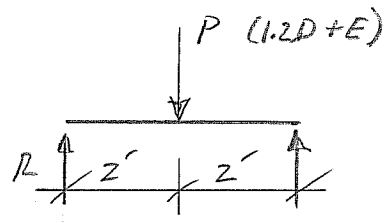
**Therefore, the existing steel girders supporting the equipment platform have adequate capacity to support the additional loads due to the proposed new cabinet. Therefore, the proposed installation can be implemented as intended.**

Purcell Cabinet Support Beams

Try C6X8.2  $F_y = 36 \text{ ksi}$

$P_u = 1737/2 = 868.5$  from previous

Say  $P_u = 1 \text{ K}$  (LRFD)



$\therefore M = Pl/4 = 1 \times 4/4 = 1 \text{ K-ft.}$

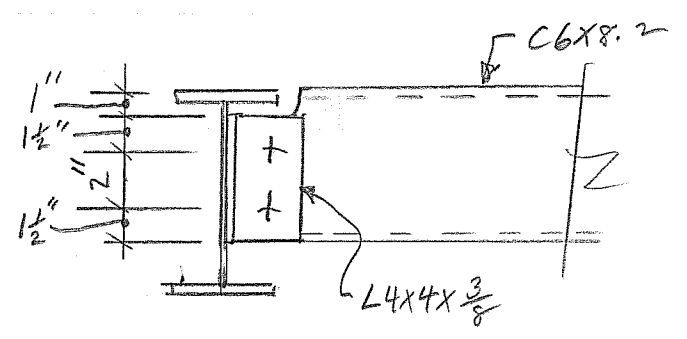
From Analysis  $\phi M_n = 12.66 \text{ K-ft.}$

$12.66 > 1$  OK

Use C6X8.2 support beams

By inspection (2)  $\frac{5}{8}$ "  $\phi$  ASTM A325N bolts @ each end will be OK ( $2 \times 7.36 = 14.72 \text{ K} > 1 \text{ K}$ )

An  $L4 \times 4 \times \frac{3}{8} \times 0'-5"$  will be OK for clip angle thus:







**Strong Axis Bending Capacity**  
**AISC 13 Strong Axis Bending of Channels and Wideflanges Per Sections F2 And F3**

<b>C6X8.2</b>	$\Omega_b =$	1.67	$\Phi_b =$	0.9
---------------	--------------	------	------------	-----

d =	6.000 in	L =	4.00 ft (Span Length)
t <sub>w</sub> =	0.200 in	L <sub>b</sub> =	4.00 ft (Unbraced Length)
b <sub>f</sub> =	1.920 in	C <sub>b</sub> =	1.00 (Conservative)
t <sub>f</sub> =	0.343 in	F <sub>y</sub> =	36 ksi
k =	0.813 in	E =	29000 ksi
S <sub>x</sub> =	4.350 in <sup>3</sup>	M <sub>max</sub> =	k-ft (AISC 13 Eqn F1-1)
Z <sub>x</sub> =	5.160 in <sup>3</sup>	M <sub>A</sub> =	k-ft (AISC 13 Eqn F1-1)
I <sub>y</sub> =	0.687 in <sup>4</sup>	M <sub>B</sub> =	k-ft (AISC 13 Eqn F1-1)
r <sub>y</sub> =	0.536 in	M <sub>C</sub> =	k-ft (AISC 13 Eqn F1-1)
J =	0.074 in <sup>4</sup>	Result =	LRFD (LRFD or ASD)
C <sub>w</sub> =	4.700 in <sup>6</sup>		

**Calculated Values**

M <sub>p</sub> =	185.76 k-in	Equation F2-1	<b>Flange Compactness Check (AISC 13 B4.1-1)</b> b <sub>f</sub> /2t <sub>f</sub> = 2.80 λ <sub>p</sub> = 10.79 Compact Flange λ <sub>r</sub> = 28.38 k <sub>c</sub> = 0.76
M <sub>p</sub> =	15.48 k-ft		
L <sub>p</sub> =	26.77 in	Equation F2-5	
L <sub>p</sub> =	2.23 ft		
h =	4.38 in		<b>Web Compactness Check (AISC 13 B4.1-9)</b> h/t <sub>w</sub> = 21.88 λ <sub>p</sub> = 106.72 Compact Web λ <sub>r</sub> = 161.78
h <sub>0</sub> =	5.66 in		
c =	1.08		
r <sub>ts</sub> =	0.64 in	Equation F2-7	
L <sub>r</sub> =	122.21 in	Equation F2-6	
L <sub>r</sub> =	10.18 ft		

**Yielding Moment:**

M<sub>n</sub> = 185.76 k-in Compact Flanges: Equation F2-1

**Lateral-Torsional Buckling Moment:**

F<sub>cr</sub> = 79.62 ksi Equation F2-4  
 M<sub>n</sub> = 168.83 k-in Equation F2-2

<==== Controls

**Results**

M<sub>c</sub> = 12.66 k-ft LRFD Maximum Moment  
 W = 6.33 k/ft LRFD Maximum Uniform Load

**GENERAL DYNAMICS**  
Information Technology

Ms. Melissa Browning  
General Dynamics Information Technology, Inc.  
19240 Des Moines Memorial Drive South, Suite 300  
SeaTac, WA 98148  
(360) 485-7196



**MORRISON HERSHFIELD**  
Morrison Hershfield  
1455 Lincoln Parkway, Suite 500  
Atlanta, GA 30346  
(770) 379-8500

Date: December 5, 2019

**Subject: Equipment Platform Structural Analysis Report**

2020 equipment configuration showing cabinets and platform screen.

**AT&T Designation:**

**Site USID:** 75153-A  
**Site FA:** 10029581  
**Site Name:** GOOD SAMARITAN

**Site Address:** 407 14th Avenue Southeast, Puyallup, Pierce County, WA 98371  
**Site Coordinates:** Latitude: 47° 10' 46.2" N, Longitude: 122° 17' 26.009" W

**Tower Description:** 68' 1" ft – Building  
**Mount Description:** Roof top Platform

**Morrison Hershfield Project Number:** GED-577R5 / 2000204

Dear Ms. Browning,

Morrison Hershfield is pleased to submit this “**Equipment Platform Structural Analysis Report**” to determine the structural integrity of existing equipment mounting system for the existing equipment on the above mentioned supporting building structure.

This mount analysis has been performed in accordance with the 2015 IBC based upon an ultimate 3-second gust wind speed of 115 mph. Exposure Category C with a maximum topographic factor,  $K_{zt}$ , of 1.0 and Risk Category IV were used in this analysis.

Our analysis demonstrates that the existing equipment platform **IS in conformance** with the requirements of the above noted standards under the effects of loading described.

Summary of Results		
Mount Components	84.3%	Sufficient

We at *Morrison Hershfield* appreciate the opportunity of providing our continuing professional services to you and General Dynamics Information Technology, Inc. If you have any questions or need further assistance on this or any other projects please give us a call.

Respectfully submitted by:  
Morrison Hershfield

Shawn W. Stevenson, S.E. (WA License No. 42002)  
Senior Engineer



## INTRODUCTION

This is a 68' 1" ft tall building. Existing equipment are located on the roof top mounted platform, at the above building site.

## ANALYSIS CRITERIA

The following design parameters have been used in our analysis:

Design Standard:	2015 International Building Code ASCE 7-10, Minimum Design Loads for Building and Other Structures AISC 325-11, Manual of Steel Construction ACI 318-11, Building Code Requirements for Structural Concrete
Design Wind Speed:	115 mph (Ultimate 3-sec gust)
Risk Category:	IV
Exposure Category:	C
Topographic Factor, $K_{zt}$ :	1.0

The mount analysis was based on the following documentation:

**Table 1 – Documentation**

Document	Description	Source
Load Mapping Report	Morrison Hershfield, Site Name: GOOD SAMARITAN, dated 10/18/2019	MH
Previous Mount Analysis	Morrison Hershfield, Site Name: GOOD SAMARITAN, dated 11/08/2018	MH
Previous Platform Analysis	Smartlink, Site Name: GOOD SAMARITAN, dated 10/28/2015	Client
Previous Platform Analysis	Smartlink, Site Name: GOOD SAMARITAN, dated 02/09/2016	Client
As Built Drawings	Smartlink, Site Name: GOOD SAMARITAN, dated 09/09/2016	Client
Roof Framing Plan	Martens Consulting Engineers, Site Name: GOOD SAMARITAN HOSPITAL, dated 10/15/1999	Client
RF Design Sheet	AT&T, RFDS Name: COL01074_liff_&_I225, dated 4/2/2019	Client



## 1.0 ANALYSIS LOADING

The existing equipment considered in this analysis were provided by the client and are noted in Table 2.

**Table 2 – Equipment Loads**

Mounting Level (ft)	Existing Equipment Description	Note
67.5	(1) Argus TE43 Cabinet	1
	(2) Purcell FLX16WS Cabinet	
	(1) Argus TE41 Cabinet	
	(1) UMTS Cabinet	
	(1) Transformer	
	(1) Hoffman Box	
	(1) Surge Suppressor Box	
	(1) Telco Demarc	
	(1) AC Panel	

Note: Any discrepancies in loading from this listing should be brought to Morrison Hershfield's attention; results of this assessment cannot be used if the loading is different.

1. Existing equipment.

## ANALYSIS PROCEDURE

RISA-3D (version 17.0.4), 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.

## 2.0 ASSUMPTIONS

- 1) The antenna mounting system was properly fabricated, installed and maintained in good condition in accordance with its original design and/or manufacturer's specifications.
- 2) The configuration of antennas, mounts, and other appurtenances are as specified.
- 3) All member connections are assumed to have been designed to meet or exceed the load carrying capacity of the connected members unless otherwise specified in this report.
- 4) This analysis assumes the screen wall system and its connection to the building structure to have been designed to meet or exceed the current wind loading requirements.
- 5) The analysis will be required to be revised if the existing conditions in the field differ from those shown in the above-referenced documents or assumed in this analysis. No allowance was made for any damaged, missing, or rusted members.
- 6) Steel grades have been assumed as follows, unless noted otherwise:
 

Channel, Solid Round, Angle, Plate	ASTM A36 (GR 36)
HSS (Rectangular)	ASTM 500 (GR B-46)
Pipe	ASTM A53 (GR 35)
- 7) The existing platform geometry and member sizes are taken from the previous platform structural analysis by Smartlink, Site Name: GOOD SAMARITAN, dated 02/09/2016 and is considered to be correct.
- 8) The equipment loading is taken from load mapping report prepared by Morrison Hershfield, Site Name: GOOD SAMARITAN, dated 10/18/2019, and are considered to be correct.

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



### 3.0 SUMMARY OF RESULTS

The following tables summarize the location and utilized percentage of available capacity for each component of the mount. With consideration to the appropriate safety factors, 100% represents the full capacity of the component. Percentages below 100% indicate available capacity and conformance of the component. Percentages between 100% and 105% indicate an acceptable capacity. Percentages above 105% indicate an overstressed situation requiring structural modification to ensure conformance with the applicable codes and standards.

A full seismic analysis has been performed in accordance with ASCE 7-10. However, the results due to seismic analysis are not controlling; the analysis results due to wind loading are controlling for the overall capacity.

Based on our analysis results, the existing roof top platform **ARE within capacity** to support the loads under the current loading scenario.

#### Mount Component Stresses vs. Capacity (Roof top Platform)

Component	Critical Member	% Capacity	Pass / Fail
Platform Support	M25	84.3	Pass
Platform Perimeter Beam (N and S)	M22	8.0	Pass
Platform Perimeter Beam (E and W)	M23	1.7	Pass
Secondary Framing	M3	27.9	Pass
Support Framing	M41	3.5	Pass

<b>Structure Rating (max from all components) =</b>	<b>84.3%</b>
---	--------------

### 4.0 RECOMMENDATIONS

The existing platform have sufficient capacity to support the equipment loads. No modifications are required at this time.

**ATTACHMENTS:** Software Input Calculations, Wire Frame and Rendered Models, Software Analysis Output & ASCE hazard tool report

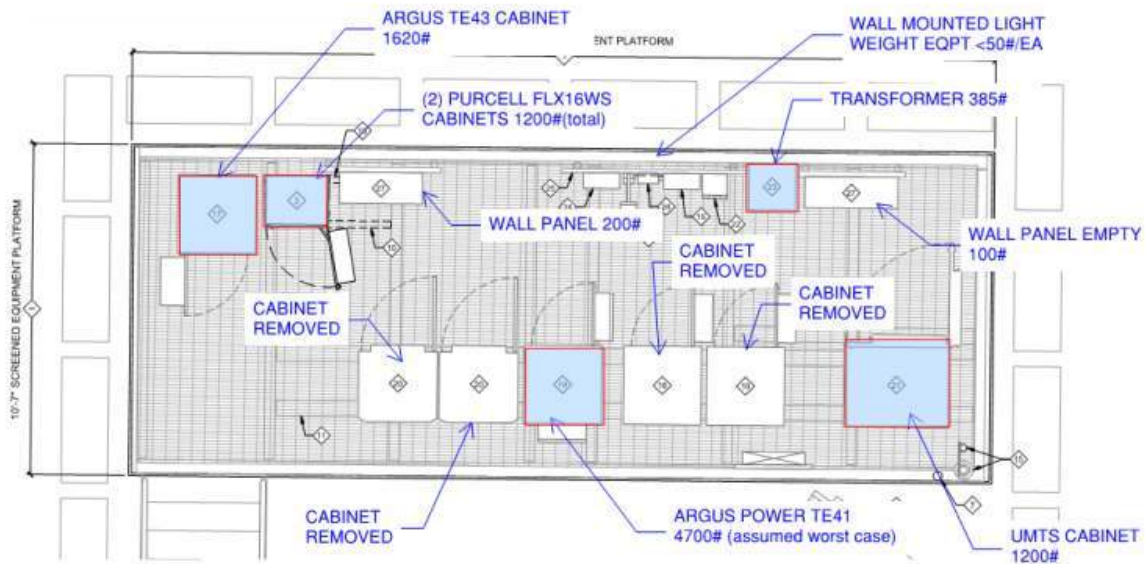


**Stealth Enclosed Platform:**



Weight of Stealth Screen Enclosure = **28plf (from previous analysis)**

**Weight of Equipment:**



**AT&T PLATFORM MAP**



**WIND LOAD CALCULATIONS ON APPURTENANCES AND MOUNTS:**

**Code Search**

Code:

**Occupancy:**

Occupancy Group =  Business

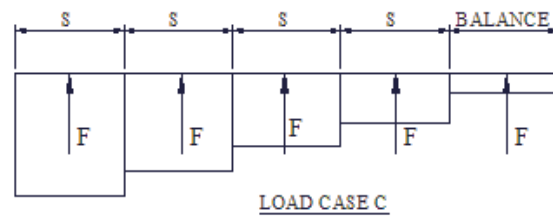
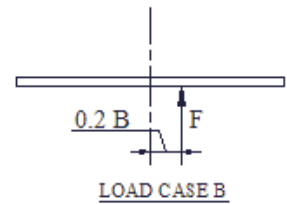
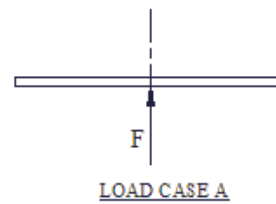
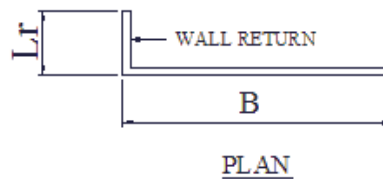
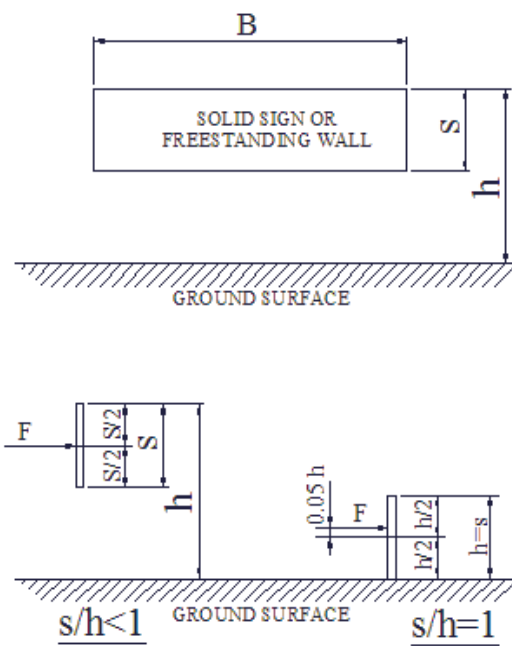
**Risk Category & Importance Factors:**

Risk Category:

**Wind Loads - Other Structures: ASCE 7- 10**

Ultimate Wind Pressures

Wind Factor = 1.00  
 Gust Effect Factor (G) = 0.85 Ultimate Wind Speed = 115 mph  
 Kzt = 1.00 Exposure = C



**Front:**

**A. Solid Freestanding Walls & Solid Signs (& open signs with less than 30% open)**

		s/h =	0.08	<b>Case A &amp; B</b>
Dist to sign top (h)	73.5 ft	B/s =	4.61	C <sub>r</sub> = 1.85
Height (s)	6.0 ft	Lr/s =	0.00	F = qz G C <sub>f</sub> A <sub>s</sub> = 53.7 As
Width (B)	27.7 ft	Kz =	1.186	A <sub>s</sub> = 166.2 sf
Wall Return (Lr) =		qz =	34.1 psf	F = 8921 lbs
Directionality (Kd)	0.85	ASCE7 Load Combinations Used		
Percent of open area to gross area	0.0%	Open reduction factor =	1.00	<b>CaseC</b>
				Horiz dist from windward edge
		<b>Case C reduction factors</b>		C <sub>f</sub>
		Factor if s/h>0.8 =	1.00	F=qzGC <sub>f</sub> A <sub>s</sub> (psf)
		Wall return factor		0 to s 3.02 87.7 As
		for C <sub>f</sub> at 0 to s =	1.00	s to 2s 1.96 56.9 As
				2s to 3s 1.39 40.4 As
				3s to 10s 1.07 31.0 As

**Side:**

**A. Solid Freestanding Walls & Solid Signs (& open signs with less than 30% open)**

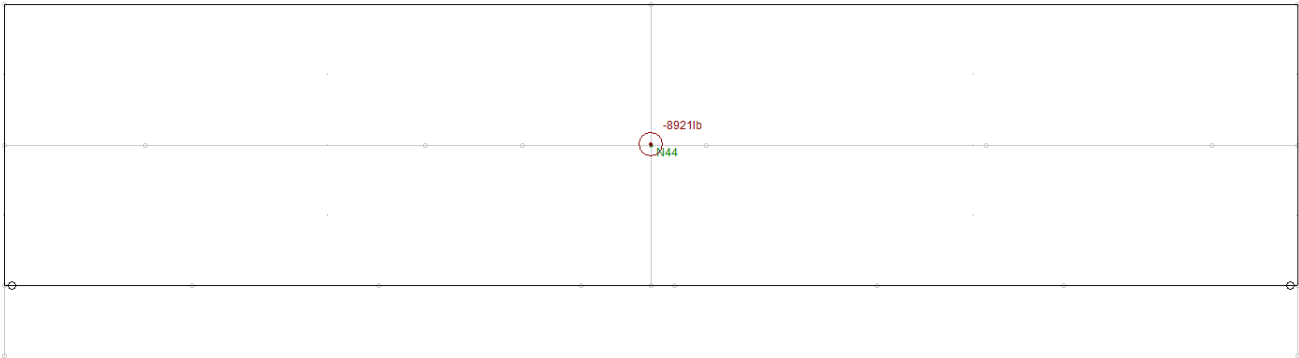
		s/h =	0.08	<b>Case A &amp; B</b>
Dist to sign top (h)	73.5 ft	B/s =	1.75	C <sub>r</sub> = 1.80
Height (s)	6.0 ft	Lr/s =	0.00	F = qz G C <sub>f</sub> A <sub>s</sub> = 52.2 As
Width (B)	10.5 ft	Kz =	1.186	A <sub>s</sub> = 63.0 sf
Wall Return (Lr) =		qz =	34.1 psf	F = 3290 lbs
Directionality (Kd)	0.85	ASCE7 Load Combinations Used		
Percent of open area to gross area	0.0%	Open reduction factor =	1.00	<b>CaseC</b>
				Horiz dist from windward edge
		<b>Case C reduction factors</b>		C <sub>f</sub>
		Factor if s/h>0.8 =	1.00	F=qzGC <sub>f</sub> A <sub>s</sub> (psf)
		Wall return factor		0 to s 2.25 65.3 As
		for C <sub>f</sub> at 0 to s =	1.00	s to 2s 1.50 43.5 As





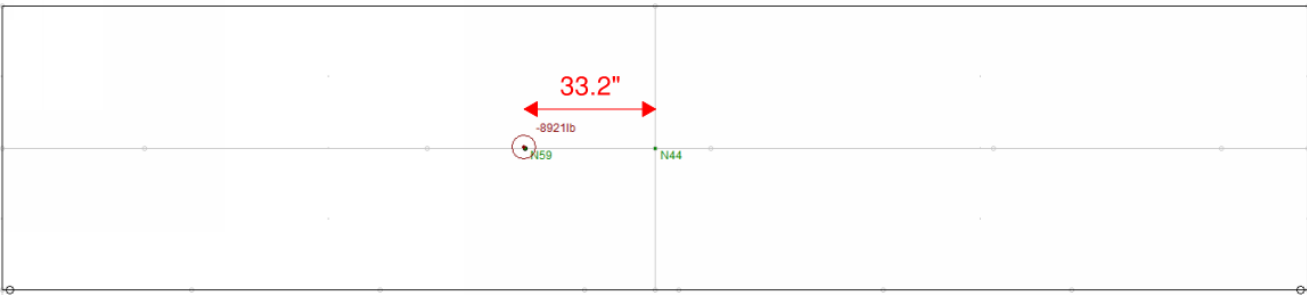
**Front Face:**

**Load Case A:** Applying the wind force on the front face 8921 lb directly at the centre

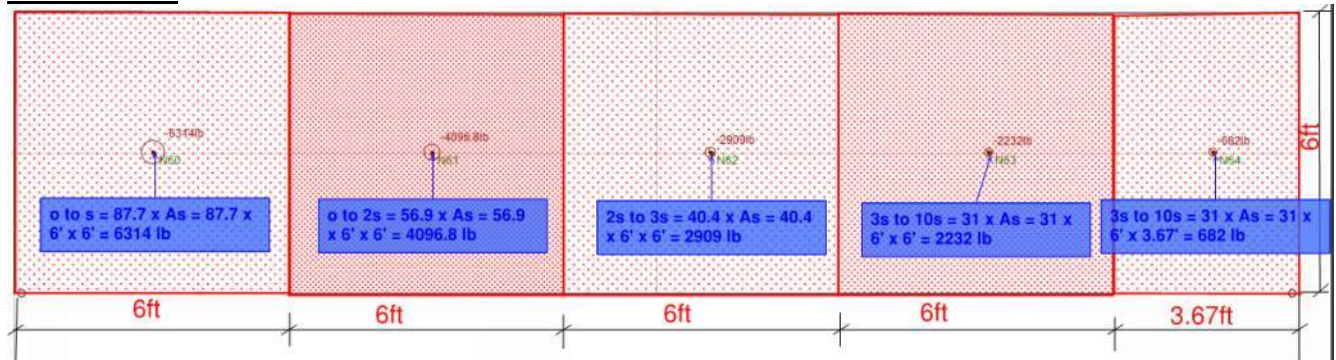


**Load Case B:**

Applying the wind force calculated on the front face 8921 lb at the 0.2 x length of the face = 0.2 x 166 = 33.2 in

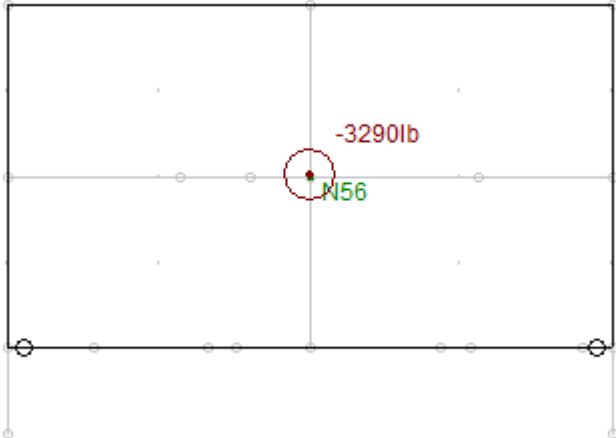


**Load Case B:**



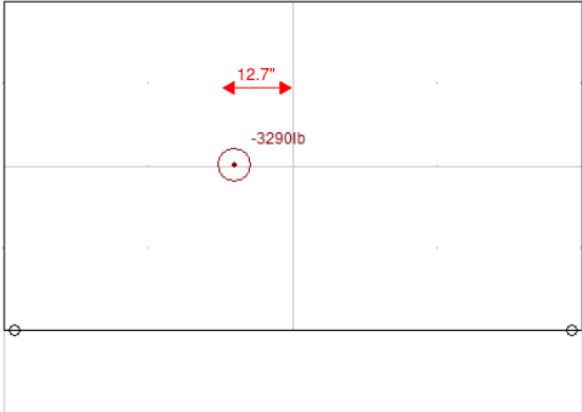
**Side Face:**

**Load Case A:** Applying the wind force on the side face 3290 lb directly at the centre

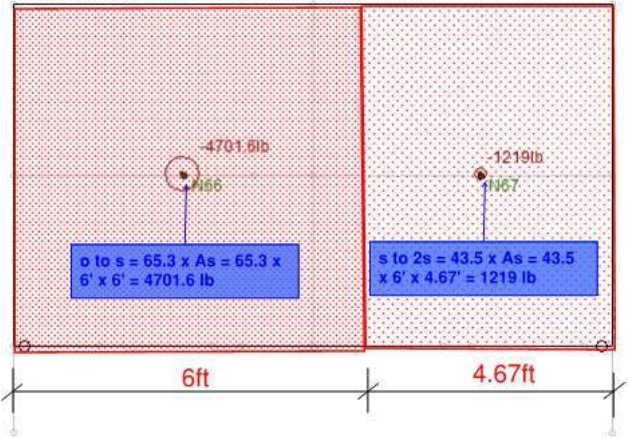


**Load Case B:**

Applying the wind force calculated on the front face 3290 lb at the 0.2 x length of the face = 0.2 x 63.5 = 12.7 in



**Load Case B:**



**SEISMIC LOAD CALCULATIONS ON APPURTENANCES AND MOUNTS:**

Per Table 15.4-1, ASCE 7-10 for Steel storage racks,  
 Response modification coefficient,  $R = 4.0$   
 Overstrength factor,  $\Omega = 2.0$

Per Table 13.6-1, ASCE 7-10 for generators, batteries and other electrical equipment  
 Component amplification factor,  $a_p = 1.0$   
 Component response modification factor,  $R_p = 2.5$

**Seismic Loads:** IBC 2015 Strength Level Forces

Risk Category : IV  
 Importance Factor (I) : 1.50  
 Site Class : **D** Class D

$S_s$  (0.2 sec) = 125.00 %g  
 $S_1$  (1.0 sec) = 48.00 %g

$F_a = 1.000$	$S_{ms} = 1.250$	$S_{DS} = 0.833$	Design Category = D
$F_v = 1.520$	$S_{m1} = 0.730$	$S_{D1} = 0.486$	Design Category = D

**MECH AND ELEC COMPONENTS SEISMIC COEFFICIENTS**

Mech or Electrical Component : Generators, batteries, inverters, motors, transformers, and other electrical components

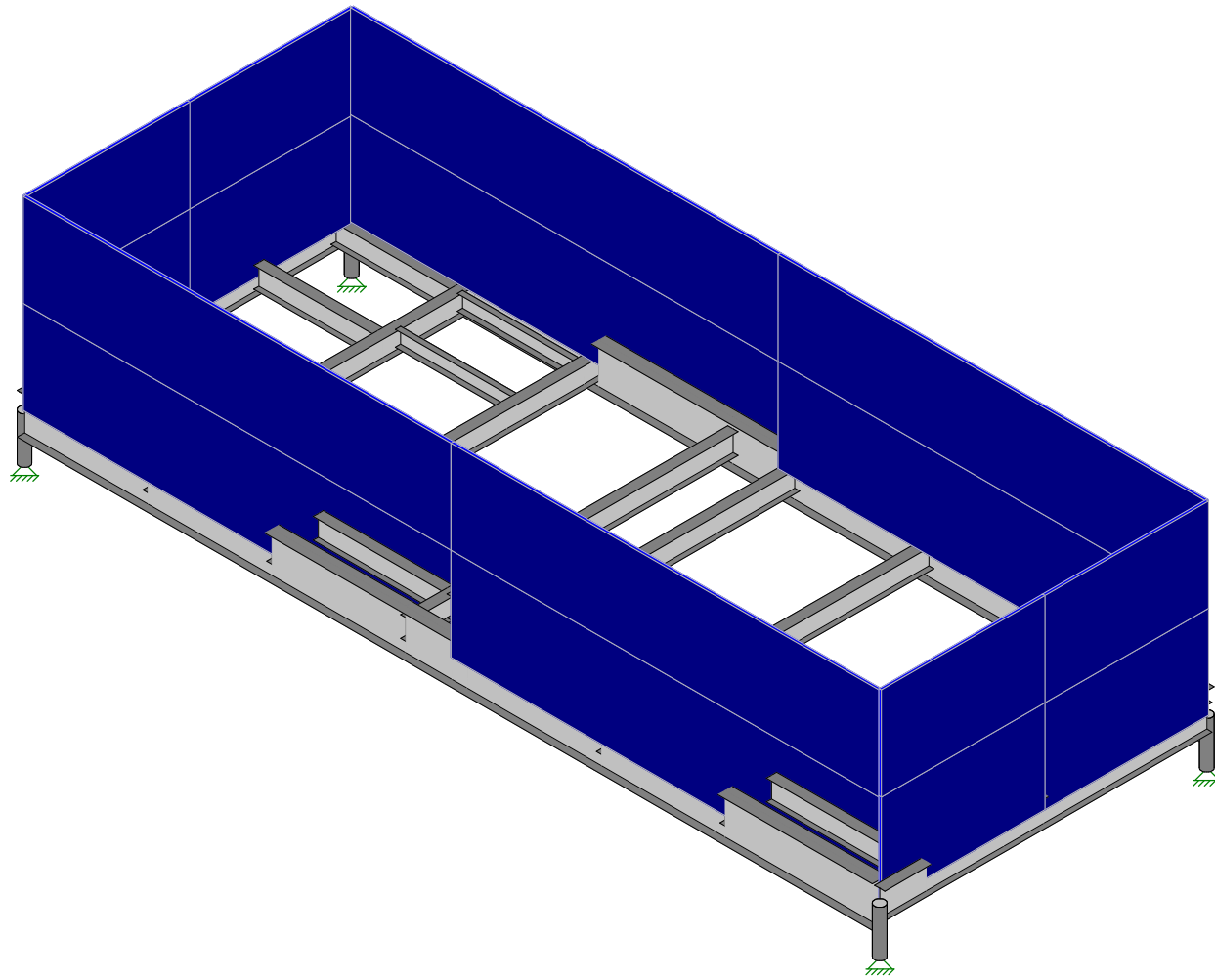
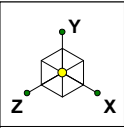
Importance Factor ( $I_p$ ) : Ip = 1.5 Life safety component required to function after an earthquake (e.g. fire protection sprinkler s

Component Amplification Factor ( $a_p$ ) = 1  $h = 64.7$  feet  
 Comp Response Modification Factor ( $R_p$ ) = 2.5  $z = 67.5$  feet  $z/h = 1.00$

$F_p = 0.4 a_p S_{ds} I_p W_p (1 + 2z/h) / R_p = 0.600 W_p$   
 not greater than  $F_p = 1.6 S_{ds} I_p W_p = 2.000 W_p$   
 but not less than  $F_p = 0.3 S_{ds} I_p W_p = 0.375 W_p$  use  $F_p = 0.600 W_p$

Cabinets	Wp (lbs)	Seismic Design force ( $F_p = 0.600 W_p$ lbs)
ARGUS TE43 Cabinet	1620	972
Purcell FLX16WS Cabinet	1200	720
Argus TE41 Cabinet	4700	2820
UMTS Cabinet	1200	720





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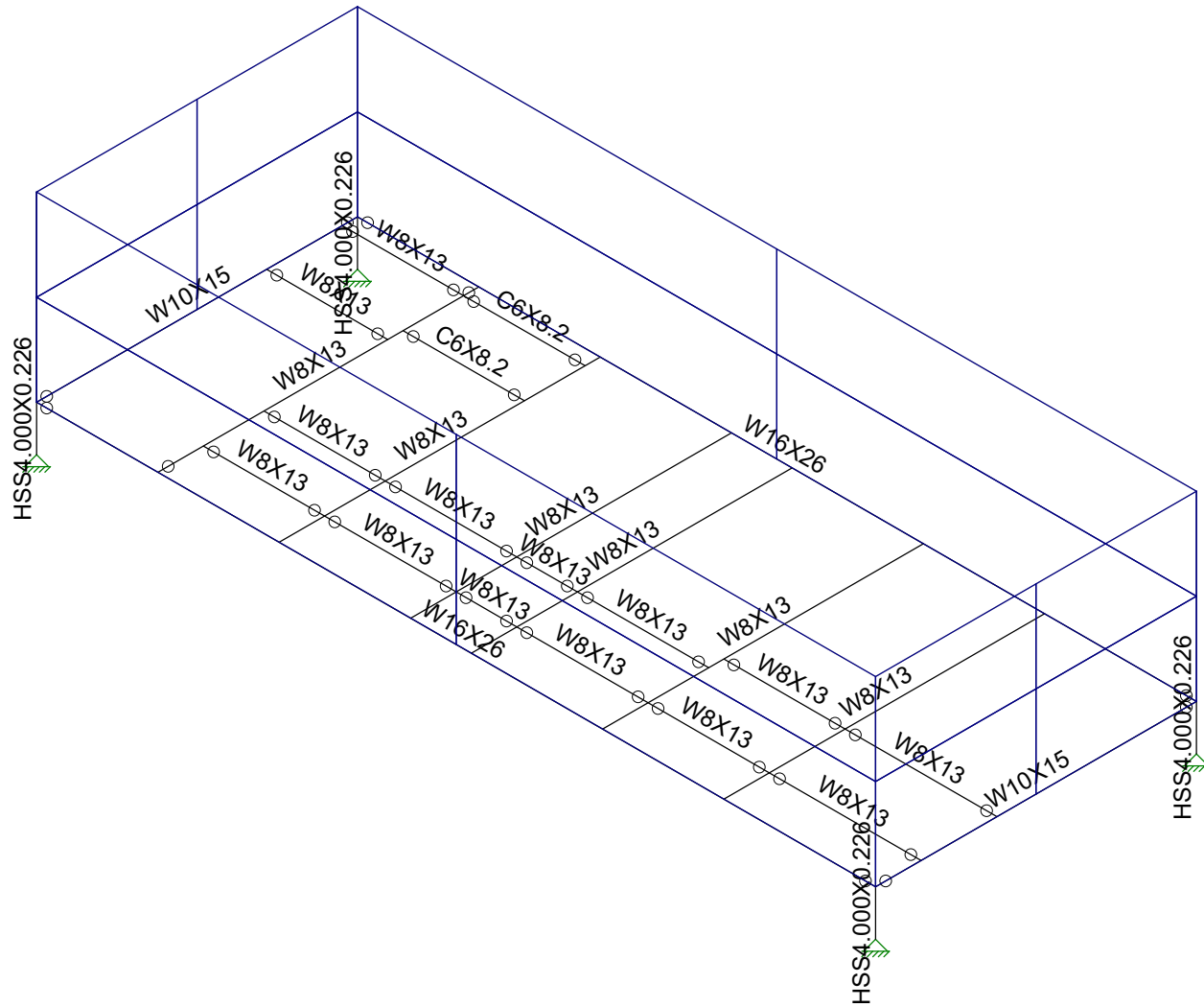
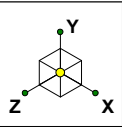
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Platform Analysis.r3d



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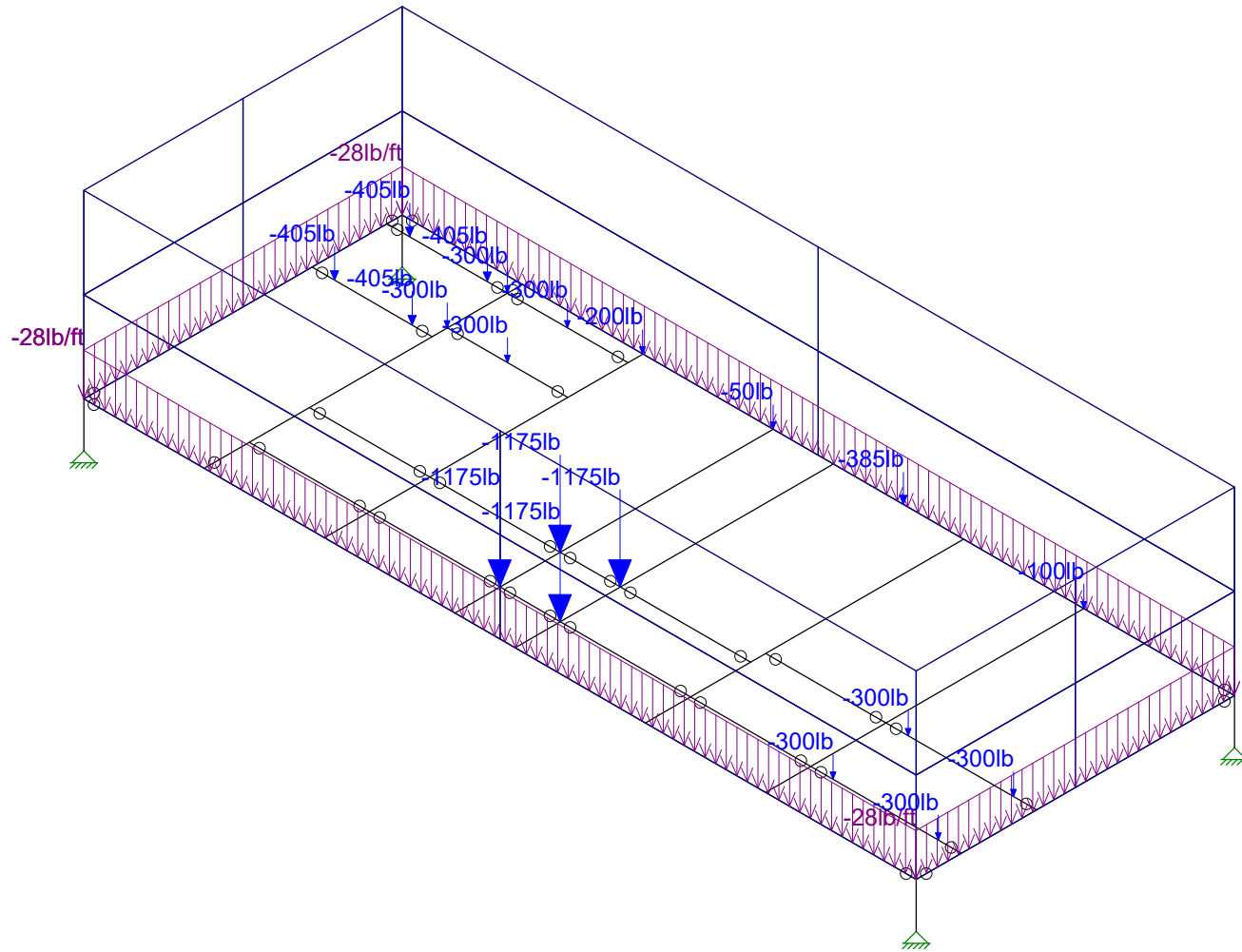
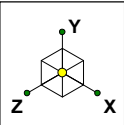
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Platform Analysis.r3d

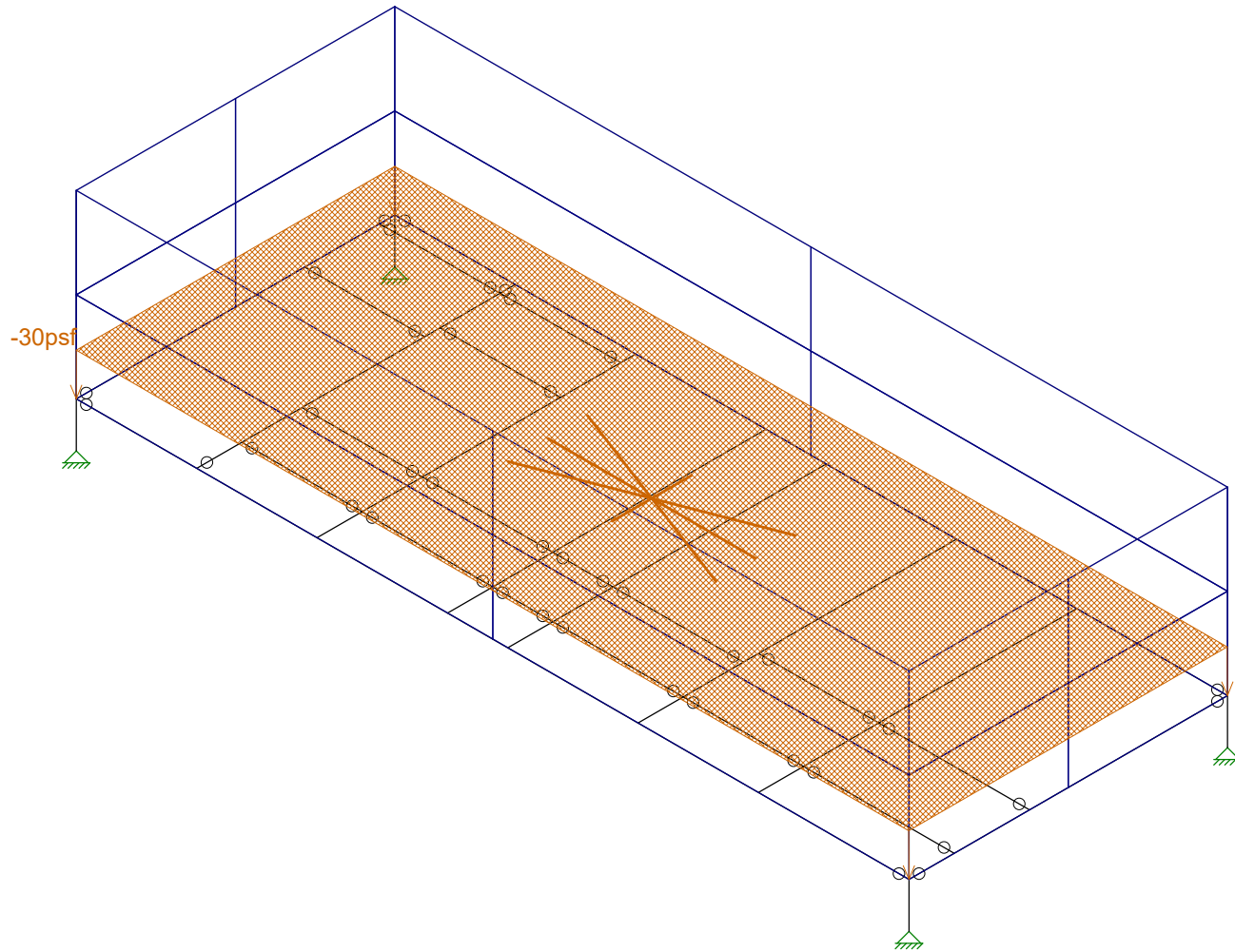
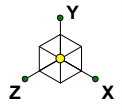


Loads: BLC 1, Dead Load  
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SK - 3  
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Platform Analysis.r3d



Loads: BLC 8, Snow Load  
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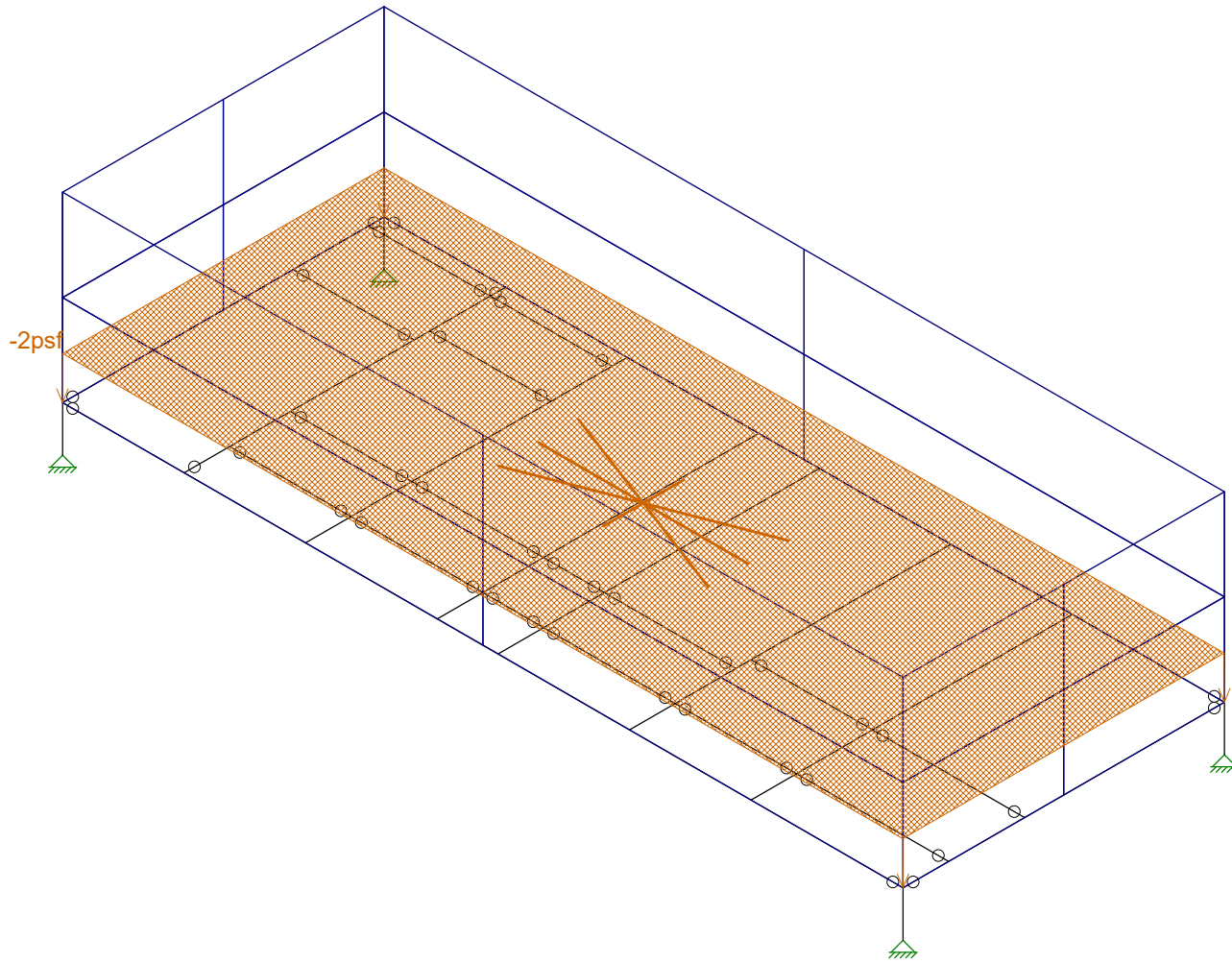
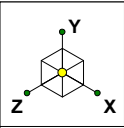
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SK - 5

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Platform Analysis.r3d



Loads: BLC 9, Weight Of aluminum grating  
Envelope Only Solution

Morrison Hershfield

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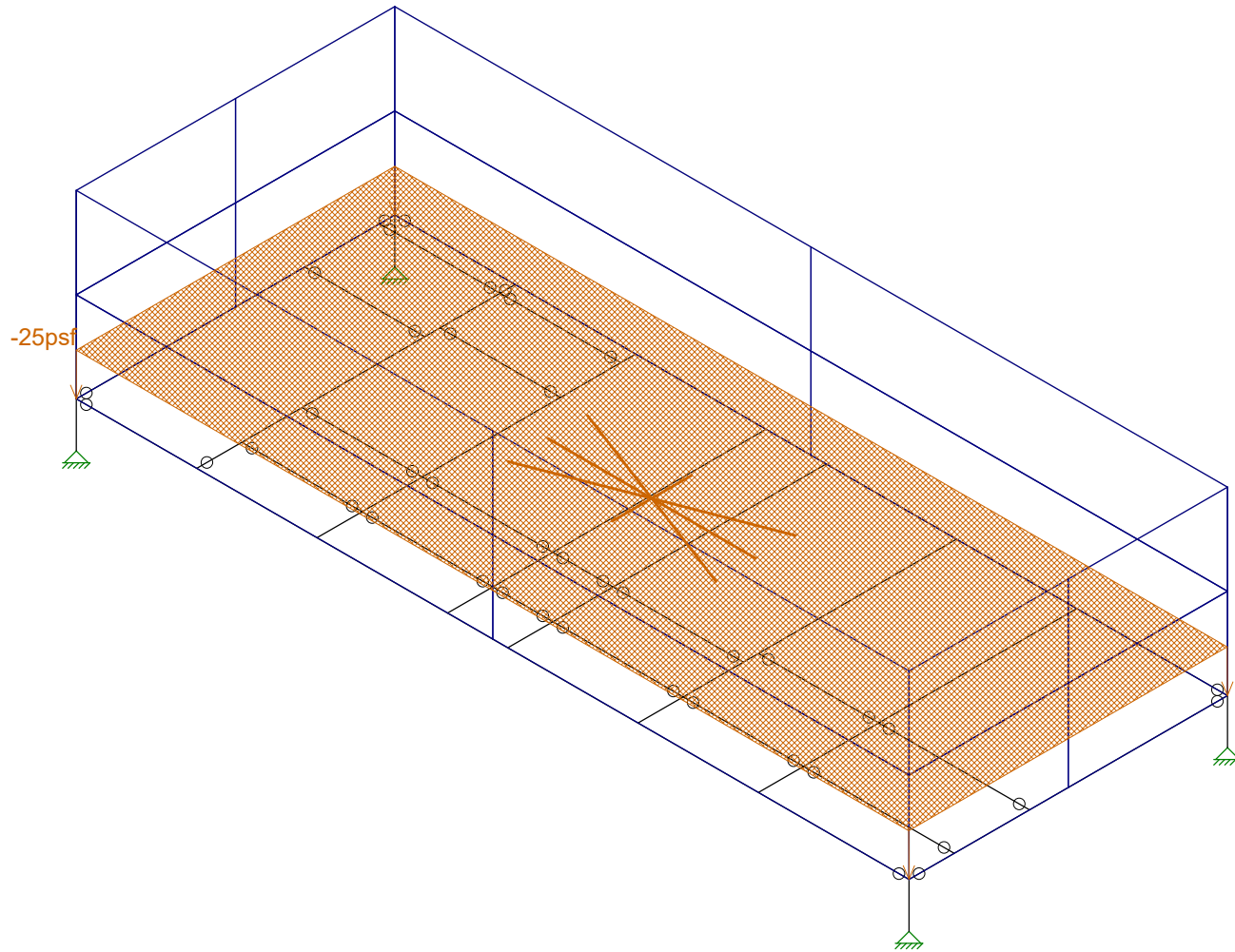
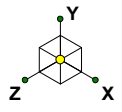
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SK - 6

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Platform Analysis.r3d





Loads: BLC 10, Live Load  
Envelope Only Solution

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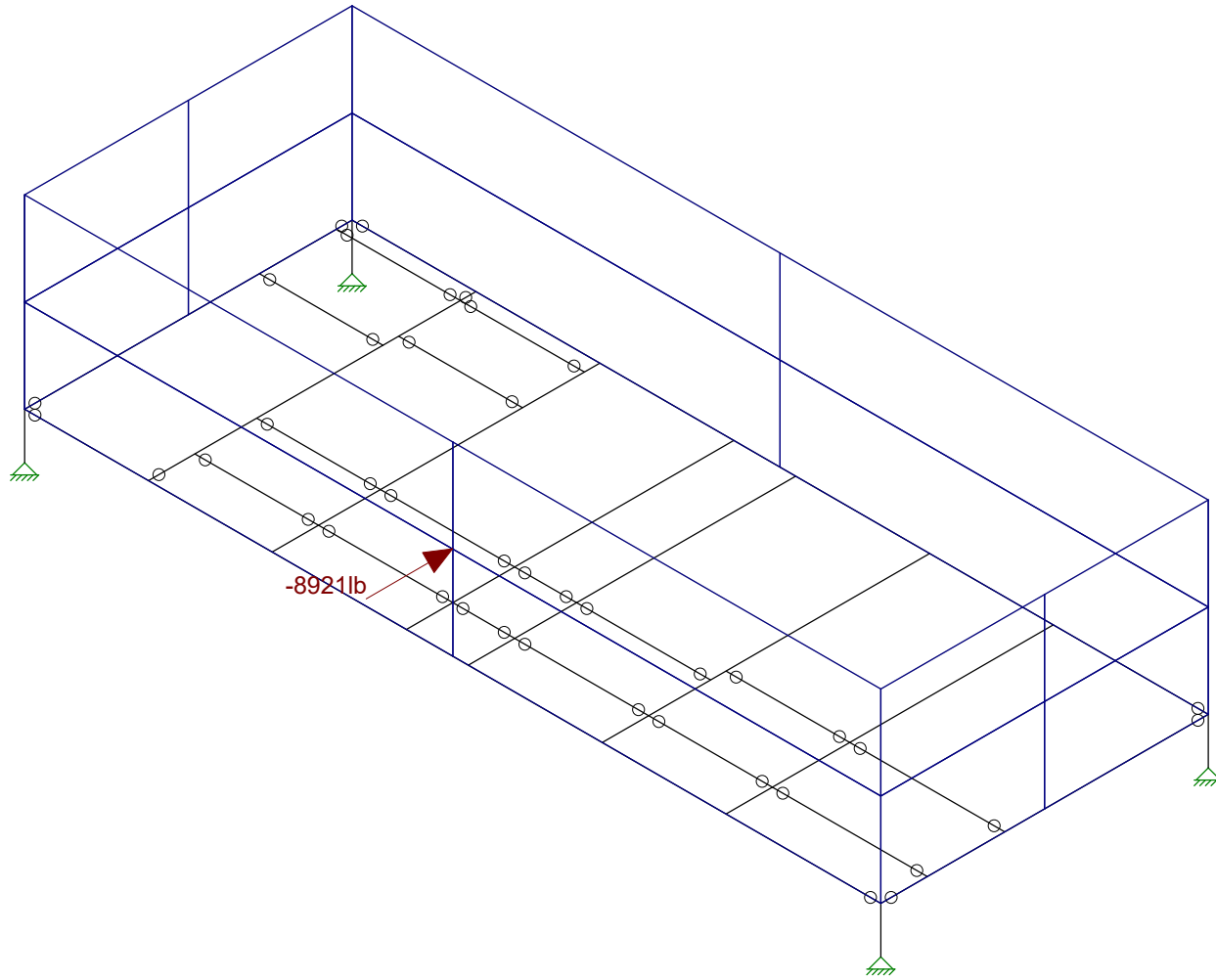
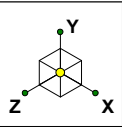
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SK - 7

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Platform Analysis.r3d

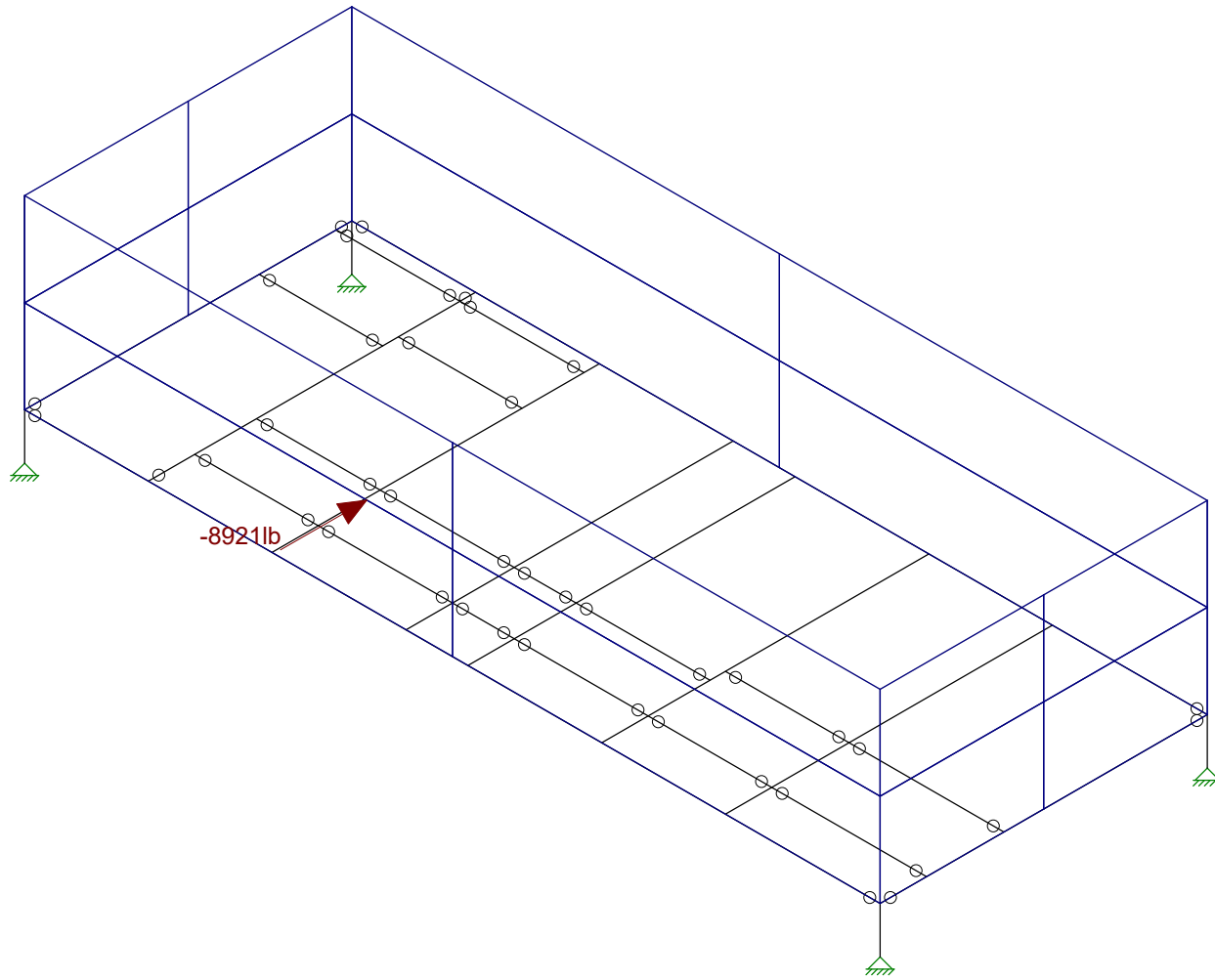
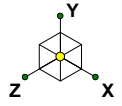


Loads: BLC 2, LCA Z  
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SK - 8  
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Platform Analysis.r3d

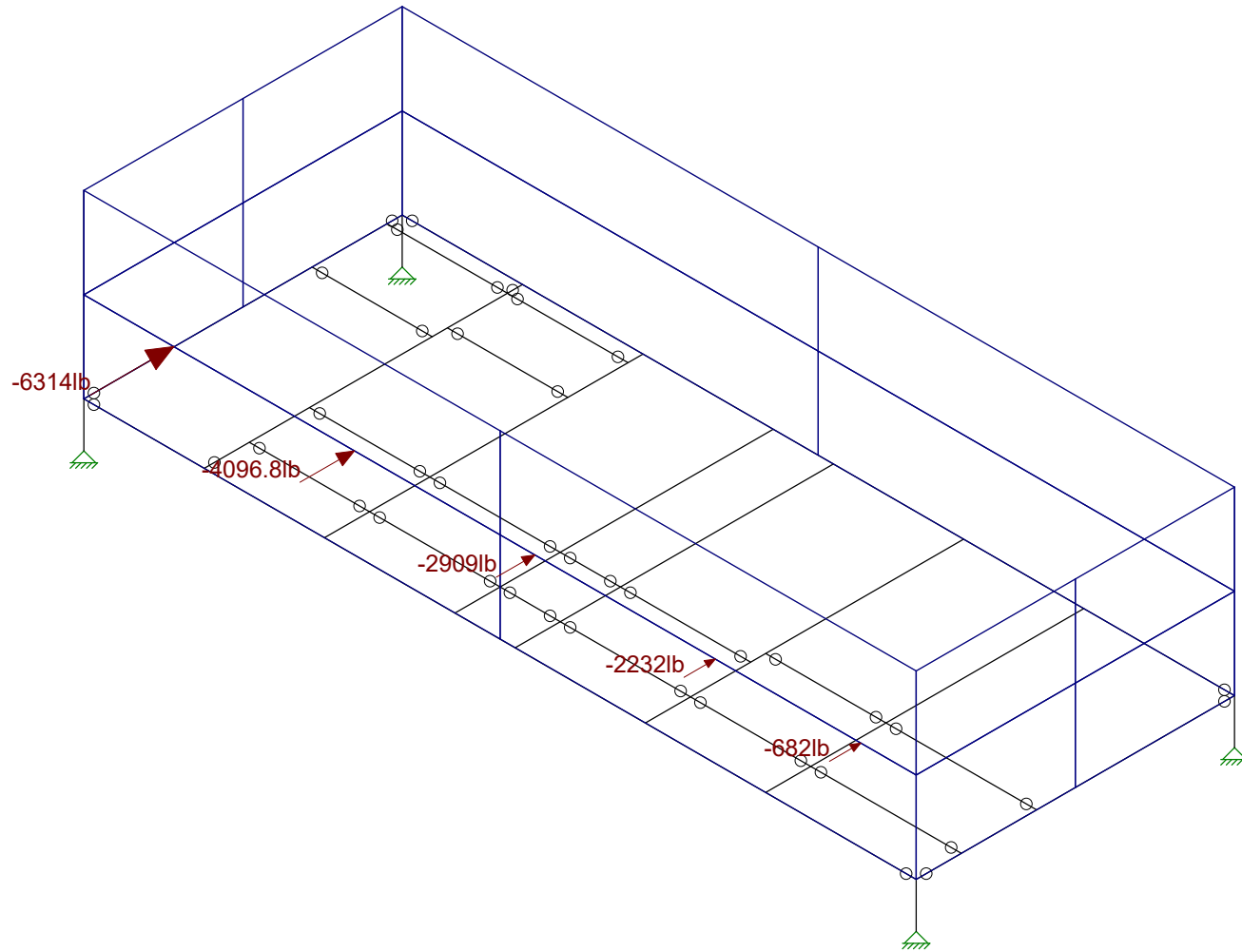
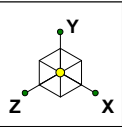


Loads: BLC 3, LCB Z  
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Platform Analysis.r3d



Loads: BLC 4, LCC Z  
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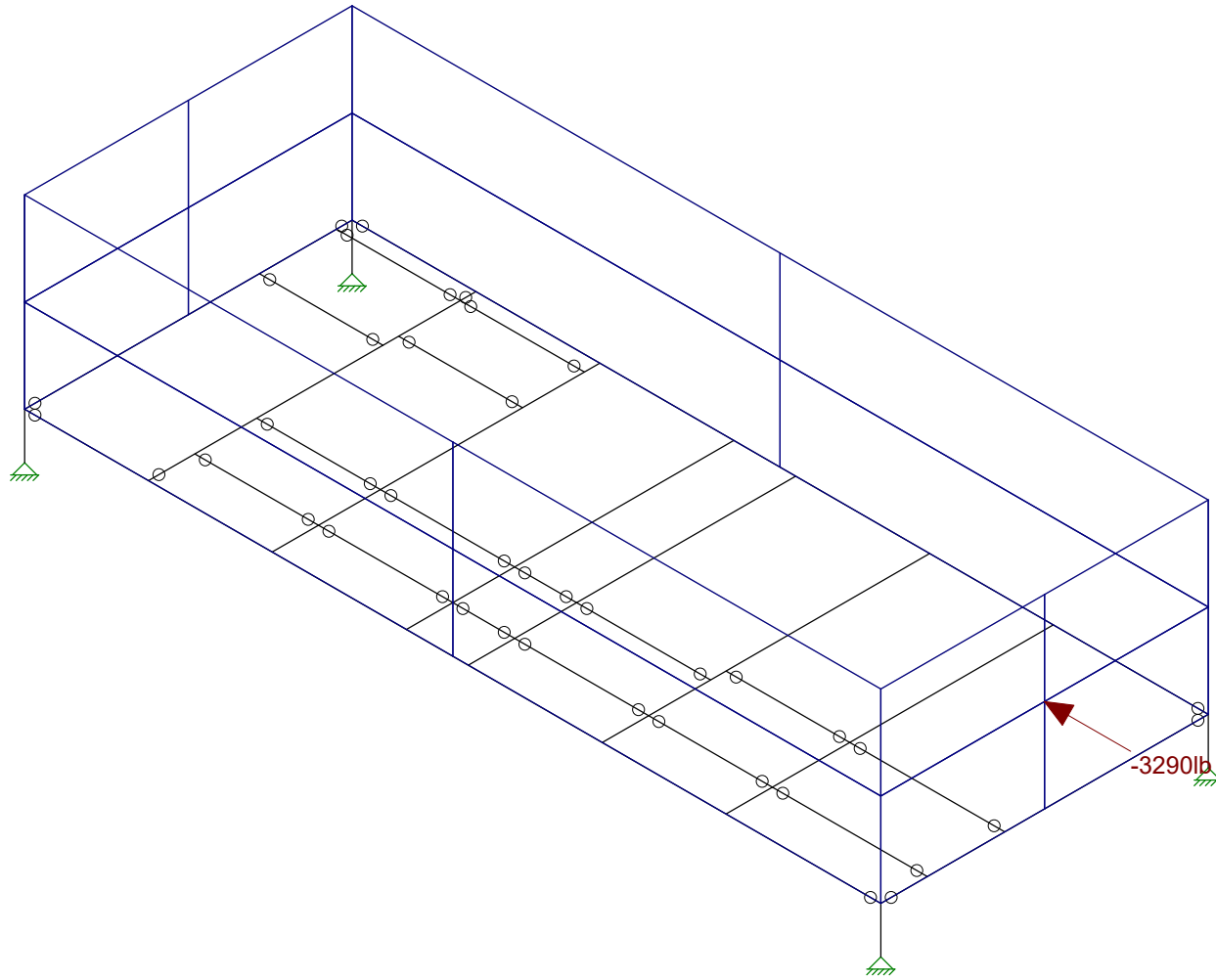
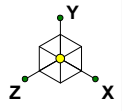
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SK - 10

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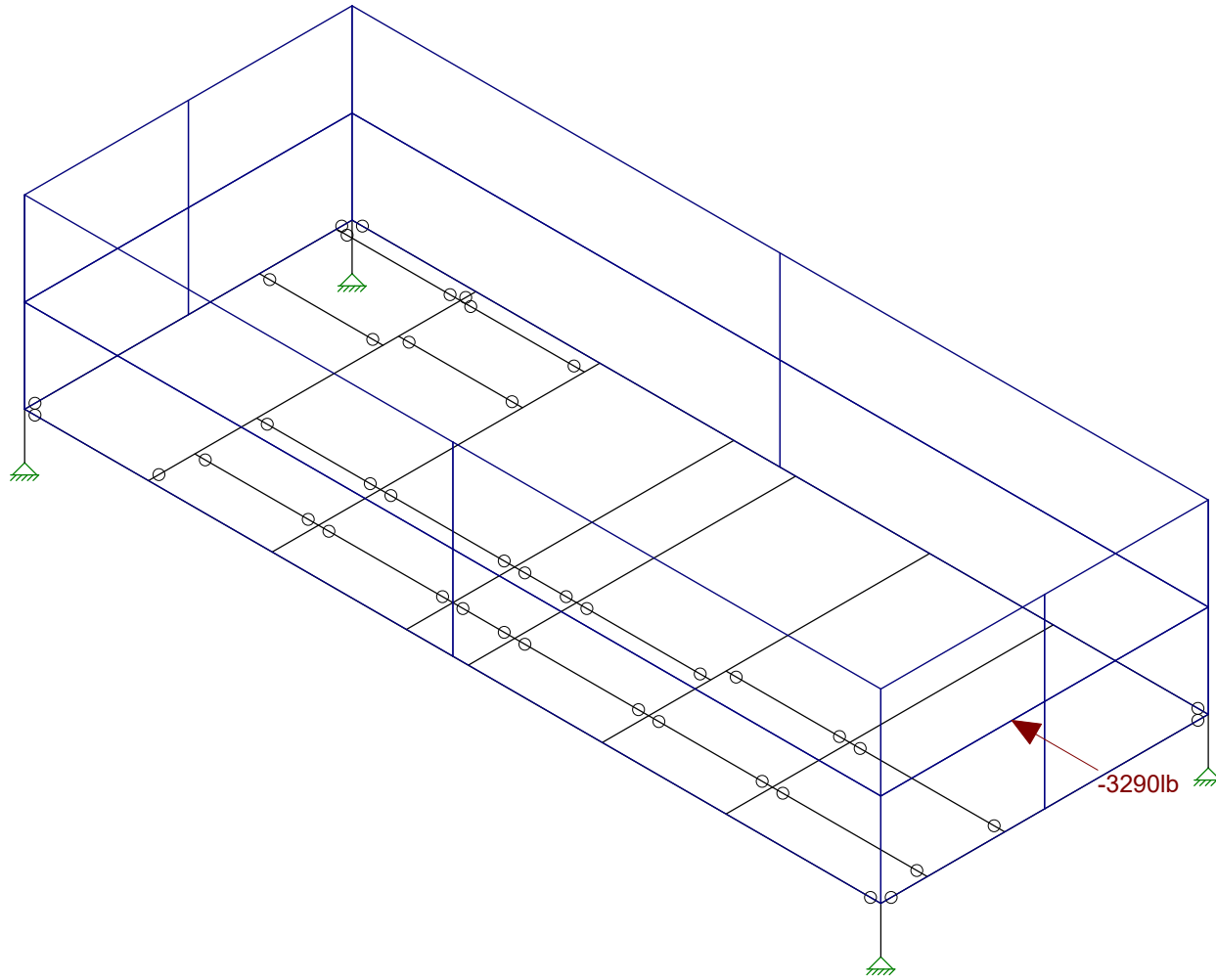
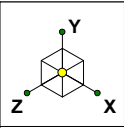


Loads: BLC 5, LCA X  
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Platform Analysis.r3d

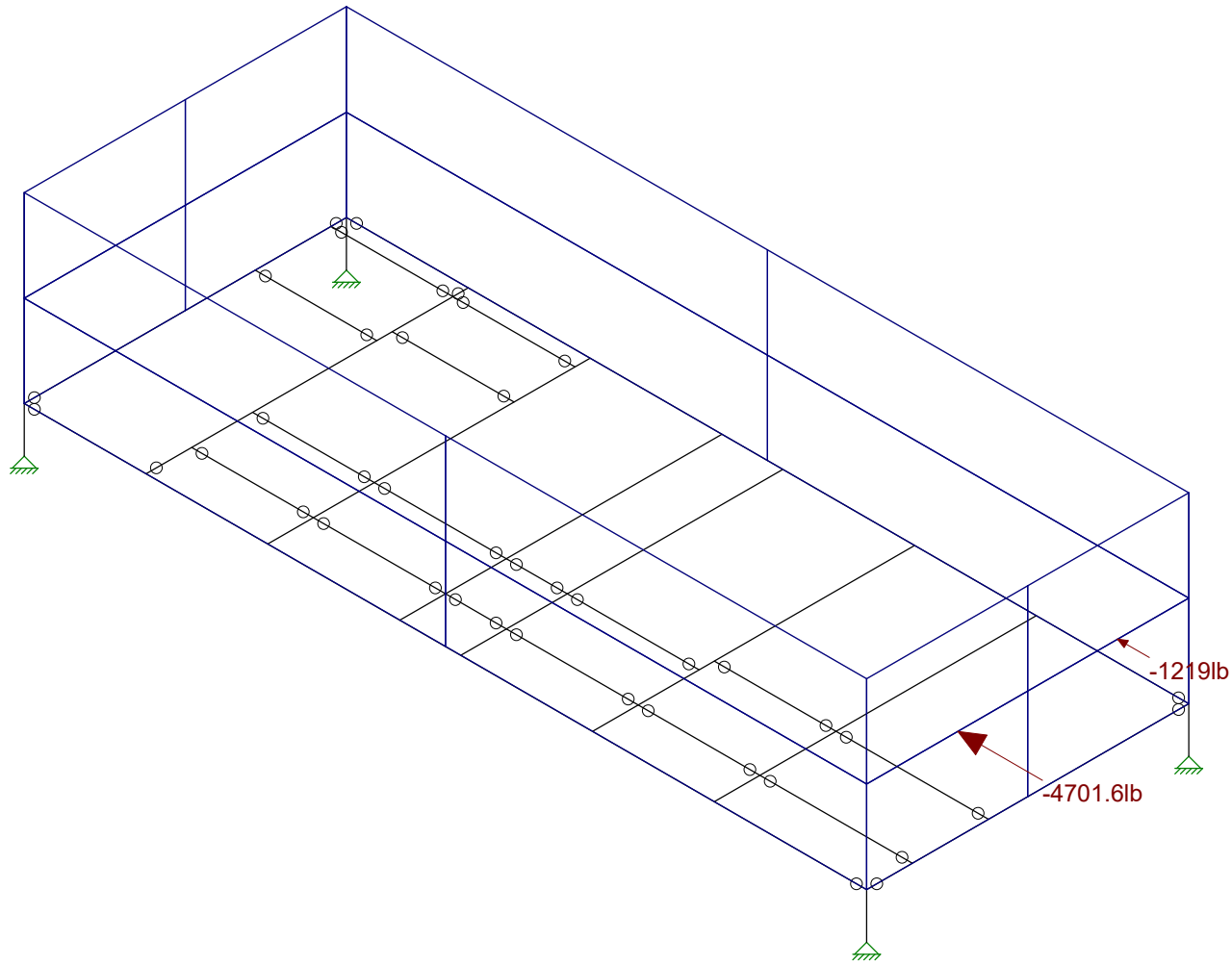
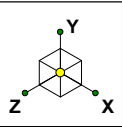


Loads: BLC 6, LCB X  
Envelope Only Solution

Morrison Hershfield  
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GED-577R5 / 2000204

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SK - 12  
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Platform Analysis.r3d



Loads: BLC 7, LCC X  
Envelope Only Solution

Morrison Hershfield

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SK - 13

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Platform Analysis.r3d



### Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (/...	Density[k/ft^3]	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A53 Gr.B	29000	11154	.3	.65	.49	35	1.6	60	1.2
2	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
3	A500 Gr.B Rect	29000	11154	.3	.65	.53	46	1.4	58	1.3
4	A500 Gr.B RND	29000	11154	.3	.65	.53	42	1.4	58	1.3
5	A992	29000	11154	.3	.65	.49	50	1.1	65	1.1

### Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Desig...	A [in2]	Iyy [in..	Izz [i...	J [in4]
1	Platform Support	HSS4.000X0.2...	Column	HSS Pipe	A500 Gr.B RND	Typical	2.5	4.5	4.5	9.01
2	Platform Perimeter Beam (N and...	W16X26	Beam	Wide Flange	A992	Typical	7.68	9.59	301	.26
3	Platform Perimeter Beam (E and...	W10X15	Beam	Wide Flange	A992	Typical	4.41	2.89	68.9	.1
4	Secondary Framing	W8X13	Beam	Wide Flange	A992	Typical	3.84	2.73	39.6	.09
5	Support Framing	C6X8.2	Beam	Channel	A992	Typical	2.39	.69	13.1	.07

### Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]
1	N5	Reaction	Reaction	Reaction			
2	N7	Reaction	Reaction	Reaction			
3	N6	Reaction	Reaction	Reaction			
4	N8	Reaction	Reaction	Reaction			

### Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distribu...	Area(M...	Surface...
1	Dead Load	DL		-1			20	4		
2	LCA Z	OL1				1				
3	LCB Z	OL2				1				
4	LCC Z	OL3				5				
5	LCA X	OL4				1				
6	LCB X	OL5				1				
7	LCC X	OL6				2				
8	Snow Load	SL							1	
9	Weight Of aluminum gr...	DL							1	
10	Live Load	LL							1	
11	BLC 9 Transient Area ...	None						132		
12	BLC 10 Transient Area...	None						132		
13	BLC 8 Transient Area ...	None						132		

### Member Point Loads (BLC 1 : Dead Load)

	Member Label	Direction	Magnitude[lb.lb-ft]	Location[in. %]
1	M17	Y	-300	9
2	M19	Y	-300	9
3	M17	Y	-300	51
4	M19	Y	-300	51
5	M13	Y	-1175	0
6	M12	Y	-1175	0
7	M13	Y	-1175	%100
8	M12	Y	-1175	%100
9	M7	Y	-405	9
10	M20	Y	-405	9
11	M7	Y	-405	40





**Member Point Loads (BLC 1 : Dead Load) (Continued)**

	Member Label	Direction	Magnitude[lb,lb-ft]	Location[in, %]
12	M20	Y	-405	40
13	M41	Y	-300	0
14	M42	Y	-300	0
15	M41	Y	-300	%50
16	M42	Y	-300	%50
17	M2	Y	-200	%100
18	M3	Y	-50	%100
19	M22	Y	-385	200
20	M6	Y	-100	%100

**Member Distributed Loads (BLC 1 : Dead Load)**

	Member Label	Direction	Start Magnitude[lb/ft,F,psf]	End Magnitude[lb/ft,F,p...]	Start Location[in, %]	End Location[in, %]
1	M21	PY	-28	-28	0	0
2	M22	PY	-28	-28	0	0
3	M23	PY	-28	-28	0	0
4	M24	PY	-28	-28	0	0

**Member Distributed Loads (BLC 11 : BLC 9 Transient Area Loads)**

	Member Label	Direction	Start Magnitude[lb/ft,F,psf]	End Magnitude[lb/ft,F,p...]	Start Location[in, %]	End Location[in, %]
1	M1	Y	-2.76	-3.87	0	25.4
2	M1	Y	-3.87	-5.75	25.4	50.8
3	M1	Y	-5.75	-4.94	50.8	76.2
4	M1	Y	-4.94	-2.5	76.2	101.6
5	M1	Y	-2.5	-1.91	101.6	127
6	M2	Y	-3.82	-2.65	0	25.4
7	M2	Y	-2.65	-3.85	25.4	50.8
8	M2	Y	-3.85	-5.65	50.8	76.2
9	M2	Y	-5.65	-4.27	76.2	101.6
10	M2	Y	-4.27	-1.5	101.6	127
11	M3	Y	-1.88	-2.1	0	25.4
12	M3	Y	-2.1	-3.48	25.4	50.8
13	M3	Y	-3.48	-6.13	50.8	76.2
14	M3	Y	-6.13	-5.03	76.2	101.6
15	M3	Y	-5.03	-2.4	101.6	127
16	M4	Y	-1.88	-1.98	0	25.4
17	M4	Y	-1.98	-3.52	25.4	50.8
18	M4	Y	-3.52	-6.34	50.8	76.2
19	M4	Y	-6.34	-4.81	76.2	101.6
20	M4	Y	-4.81	-1.8	101.6	127
21	M5	Y	-1.9	-2.33	0	25.4
22	M5	Y	-2.33	-4.16	25.4	50.8
23	M5	Y	-4.16	-7.26	50.8	76.2
24	M5	Y	-7.26	-6.44	76.2	101.6
25	M5	Y	-6.44	-1.82	101.6	127
26	M6	Y	-2.93	-2.6	0	25.4
27	M6	Y	-2.6	-4.1	25.4	50.8
28	M6	Y	-4.1	-7.3	50.8	76.2
29	M6	Y	-7.3	-7.57	76.2	101.6
30	M6	Y	-7.57	-5.06	101.6	127
31	M7	Y	-2.3	-2.34	0	9.6
32	M7	Y	-2.34	-5.99	9.6	19.2
33	M7	Y	-5.99	-7.04	19.2	28.8
34	M7	Y	-7.04	-3.56	28.8	38.4
35	M7	Y	-3.56	-2.3	38.4	48
36	M8	Y	-1.85	-3.36	4.8	17.6



**Member Distributed Loads (BLC 11 : BLC 9 Transient Area Loads) (Continued)**

Member Label	Direction	Start Magnitude[lb/ft,F,psf]	End Magnitude[lb/ft,F,p...	Start Location[in, %]	End Location[in, %]	
37	M8	Y	-3.36	-3.05	17.6	30.4
38	M8	Y	-3.05	-.93	30.4	43.2
39	M9	Y	-.97	-2.99	0	12
40	M9	Y	-2.99	-6.02	12	24
41	M9	Y	-6.02	-5.15	24	36
42	M9	Y	-5.15	-.36	36	48
43	M10	Y	-.93	-3.05	5.2	19.07
44	M10	Y	-3.05	-3.36	19.07	32.93
45	M10	Y	-3.36	-1.85	32.93	46.8
46	M11	Y	-.44	-4.74	0	13
47	M11	Y	-4.74	-6.57	13	26
48	M11	Y	-6.57	-4.05	26	39
49	M11	Y	-4.05	-.44	39	52
50	M12	Y	-1.76	-1.76		24
51	M13	Y	-3.4	-3.4	.0004422	24
52	M14	Y	-.45	-3.58	0	10.4
53	M14	Y	-3.58	-5.57	10.4	20.8
54	M14	Y	-5.57	-5.55	20.8	31.2
55	M14	Y	-5.55	-3.68	31.2	41.6
56	M14	Y	-3.68	-.82	41.6	52
57	M15	Y	-4.66	-2.48	5.2	14.56
58	M15	Y	-2.48	-2.73	14.56	23.92
59	M15	Y	-2.73	-3.92	23.92	33.28
60	M15	Y	-3.92	-2.24	33.28	42.64
61	M15	Y	-2.24	.03	42.64	52
62	M16	Y	-.15	-2.39	0	8.64
63	M16	Y	-2.39	-3.88	8.64	17.28
64	M16	Y	-3.88	-4.15	17.28	25.92
65	M16	Y	-4.15	-3.69	25.92	34.56
66	M16	Y	-3.69	-.2	34.56	43.2
67	M17	Y	-.46	-2.95	.02	10.01
68	M17	Y	-2.95	-4.2	10.01	20.01
69	M17	Y	-4.2	-4.21	20.01	30
70	M17	Y	-4.21	-4.2	30	39.99
71	M17	Y	-4.2	-2.95	39.99	49.99
72	M17	Y	-2.95	-.46	49.99	59.98
73	M18	Y	-.11	-2.74	0	8.64
74	M18	Y	-2.74	-4.76	8.64	17.28
75	M18	Y	-4.76	-7.01	17.28	25.92
76	M18	Y	-7.01	-4.45	25.92	34.56
77	M18	Y	-4.45	-.11	34.56	43.2
78	M19	Y	-3.23	-4.99	6	18
79	M19	Y	-4.99	-5.9	18	30
80	M19	Y	-5.9	-5.04	30	42
81	M19	Y	-5.04	-3.27	42	54
82	M20	Y	-1.01	-1.73	0	9.6
83	M20	Y	-1.73	-2.97	9.6	19.2
84	M20	Y	-2.97	-3.17	19.2	28.8
85	M20	Y	-3.17	-1.81	28.8	38.4
86	M20	Y	-1.81	-.44	38.4	48
87	M21	Y	-3.03	-2.57	0	25.54
88	M21	Y	-2.57	-1.87	25.54	51.08
89	M21	Y	-1.87	-.92	51.08	76.62
90	M21	Y	-.92	-.98	76.62	102.15
91	M21	Y	-.98	-.1	102.15	127.69
92	M21	Y	-.1	-.94	127.69	153.23
93	M21	Y	-.94	-1.45	153.23	178.77







**Member Distributed Loads (BLC 12 : BLC 10 Transient Area Loads) (Continued)**

Member Label	Direction	Start Magnitude[lb/ft,F,psf]	End Magnitude[lb/ft,F,p...	Start Location[in, %]	End Location[in, %]	
72	M17	Y	-36.91	-5.8	49.99	59.98
73	M18	Y	-1.33	-34.2	0	8.64
74	M18	Y	-34.2	-59.46	8.64	17.28
75	M18	Y	-59.46	-87.57	17.28	25.92
76	M18	Y	-87.57	-55.66	25.92	34.56
77	M18	Y	-55.66	-1.33	34.56	43.2
78	M19	Y	-40.32	-62.4	6	18
79	M19	Y	-62.4	-73.74	18	30
80	M19	Y	-73.74	-62.98	30	42
81	M19	Y	-62.98	-40.87	42	54
82	M20	Y	-12.67	-21.63	0	9.6
83	M20	Y	-21.63	-37.11	9.6	19.2
84	M20	Y	-37.11	-39.59	19.2	28.8
85	M20	Y	-39.59	-22.57	28.8	38.4
86	M20	Y	-22.57	-5.54	38.4	48
87	M21	Y	-37.86	-32.18	0	25.54
88	M21	Y	-32.18	-23.35	25.54	51.08
89	M21	Y	-23.35	-11.5	51.08	76.62
90	M21	Y	-11.5	-12.23	76.62	102.15
91	M21	Y	-12.23	-12.48	102.15	127.69
92	M21	Y	-12.48	-11.74	127.69	153.23
93	M21	Y	-11.74	-18.17	153.23	178.77
94	M21	Y	-18.17	-12.53	178.77	204.31
95	M21	Y	-12.53	-11.76	204.31	229.85
96	M21	Y	-11.76	-15.22	229.85	255.38
97	M21	Y	-15.22	-13.72	255.38	280.92
98	M21	Y	-13.72	-18.1	280.92	306.46
99	M21	Y	-18.1	-25.45	306.46	332
100	M22	Y	-7.81	-5.61	0	25.54
101	M22	Y	-5.61	-5.61	25.54	51.08
102	M22	Y	-5.61	-6.73	51.08	76.62
103	M22	Y	-6.73	-21.93	76.62	102.15
104	M22	Y	-21.93	-32.32	102.15	127.69
105	M22	Y	-32.32	-30	127.69	153.23
106	M22	Y	-30	-28.27	153.23	178.77
107	M22	Y	-28.27	-30.85	178.77	204.31
108	M22	Y	-30.85	-31.12	204.31	229.85
109	M22	Y	-31.12	-12.36	229.85	255.38
110	M22	Y	-12.36	-19.35	255.38	280.92
111	M22	Y	-19.35	-34.82	280.92	306.46
112	M22	Y	-34.82	-27.27	306.46	332
113	M23	Y	-1.87	-33.86	0	25.4
114	M23	Y	-33.86	-48.71	25.4	50.8
115	M23	Y	-48.71	-35.56	50.8	76.2
116	M23	Y	-35.56	-20.83	76.2	101.6
117	M23	Y	-20.83	-7.7	101.6	127
118	M24	Y	-16.55	-18.01	12.7	33.02
119	M24	Y	-18.01	-31.19	33.02	53.34
120	M24	Y	-31.19	-65.05	53.34	73.66
121	M24	Y	-65.05	-61.23	73.66	93.98
122	M24	Y	-61.23	-10.77	93.98	114.3
123	M41	Y	-3.91	-42.71	0	9.6
124	M41	Y	-42.71	-62.33	9.6	19.2
125	M41	Y	-62.33	-75.56	19.2	28.8
126	M41	Y	-75.56	-56.25	28.8	38.4
127	M41	Y	-56.25	-3.91	38.4	48
128	M42	Y	-9.06	-22.47	0	9.6



**Member Distributed Loads (BLC 12 : BLC 10 Transient Area Loads) (Continued)**

	Member Label	Direction	Start Magnitude[lb/ft.F.psf]	End Magnitude[lb/ft.F.p...	Start Location[in.%]	End Location[in.%]
129	M42	Y	-22.47	-31.93	9.6	19.2
130	M42	Y	-31.93	-32.02	19.2	28.8
131	M42	Y	-32.02	-22.39	28.8	38.4
132	M42	Y	-22.39	-8.46	38.4	48

**Member Distributed Loads (BLC 13 : BLC 8 Transient Area Loads)**

	Member Label	Direction	Start Magnitude[lb/ft.F.psf]	End Magnitude[lb/ft.F.p...	Start Location[in.%]	End Location[in.%]
1	M1	Y	-41.44	-58.02	0	25.4
2	M1	Y	-58.02	-86.2	25.4	50.8
3	M1	Y	-86.2	-74.06	50.8	76.2
4	M1	Y	-74.06	-37.56	76.2	101.6
5	M1	Y	-37.56	-28.65	101.6	127
6	M2	Y	-57.28	-39.7	0	25.4
7	M2	Y	-39.7	-57.8	25.4	50.8
8	M2	Y	-57.8	-84.79	50.8	76.2
9	M2	Y	-84.79	-64.06	76.2	101.6
10	M2	Y	-64.06	-22.43	101.6	127
11	M3	Y	-28.21	-31.55	0	25.4
12	M3	Y	-31.55	-52.16	25.4	50.8
13	M3	Y	-52.16	-91.89	50.8	76.2
14	M3	Y	-91.89	-75.43	76.2	101.6
15	M3	Y	-75.43	-3.62	101.6	127
16	M4	Y	-28.26	-29.67	0	25.4
17	M4	Y	-29.67	-52.87	25.4	50.8
18	M4	Y	-52.87	-95.11	50.8	76.2
19	M4	Y	-95.11	-72.12	76.2	101.6
20	M4	Y	-72.12	-2.74	101.6	127
21	M5	Y	-28.57	-34.99	0	25.4
22	M5	Y	-34.99	-62.39	25.4	50.8
23	M5	Y	-62.39	-108.9	50.8	76.2
24	M5	Y	-108.9	-96.58	76.2	101.6
25	M5	Y	-96.58	-27.27	101.6	127
26	M6	Y	-44.02	-38.95	0	25.4
27	M6	Y	-38.95	-61.56	25.4	50.8
28	M6	Y	-61.56	-109.55	50.8	76.2
29	M6	Y	-109.55	-113.55	76.2	101.6
30	M6	Y	-113.55	-75.87	101.6	127
31	M7	Y	-3.52	-35.08	0	9.6
32	M7	Y	-35.08	-89.92	9.6	19.2
33	M7	Y	-89.92	-105.53	19.2	28.8
34	M7	Y	-105.53	-53.44	28.8	38.4
35	M7	Y	-53.44	-3.52	38.4	48
36	M8	Y	-27.8	-50.39	4.8	17.6
37	M8	Y	-50.39	-45.79	17.6	30.4
38	M8	Y	-45.79	-14	30.4	43.2
39	M9	Y	-14.58	-44.84	0	12
40	M9	Y	-44.84	-90.23	12	24
41	M9	Y	-90.23	-77.29	24	36
42	M9	Y	-77.29	-5.47	36	48
43	M10	Y	-14	-45.79	5.2	19.07
44	M10	Y	-45.79	-50.37	19.07	32.93
45	M10	Y	-50.37	-27.75	32.93	46.8
46	M11	Y	-6.65	-71.04	0	13
47	M11	Y	-71.04	-98.52	13	26
48	M11	Y	-98.52	-60.72	26	39
49	M11	Y	-60.72	-6.65	39	52





**Member Distributed Loads (BLC 13 : BLC 8 Transient Area Loads) (Continued)**

Member Label	Direction	Start Magnitude[lb/ft,F.psf]	End Magnitude[lb/ft,F.p...	Start Location[in,%]	End Location[in,%]
107	M22	Y	-33.92	-37.02	178.77 204.31
108	M22	Y	-37.02	-37.35	204.31 229.85
109	M22	Y	-37.35	-14.83	229.85 255.38
110	M22	Y	-14.83	-23.22	255.38 280.92
111	M22	Y	-23.22	-41.78	280.92 306.46
112	M22	Y	-41.78	-32.72	306.46 332
113	M23	Y	-2.24	-40.63	0 25.4
114	M23	Y	-40.63	-58.46	25.4 50.8
115	M23	Y	-58.46	-42.67	50.8 76.2
116	M23	Y	-42.67	-25	76.2 101.6
117	M23	Y	-25	-9.25	101.6 127
118	M24	Y	-19.86	-21.61	12.7 33.02
119	M24	Y	-21.61	-37.43	33.02 53.34
120	M24	Y	-37.43	-78.06	53.34 73.66
121	M24	Y	-78.06	-73.47	73.66 93.98
122	M24	Y	-73.47	-12.92	93.98 114.3
123	M41	Y	-4.69	-51.25	0 9.6
124	M41	Y	-51.25	-74.79	9.6 19.2
125	M41	Y	-74.79	-90.68	19.2 28.8
126	M41	Y	-90.68	-67.5	28.8 38.4
127	M41	Y	-67.5	-4.69	38.4 48
128	M42	Y	-10.87	-26.97	0 9.6
129	M42	Y	-26.97	-38.32	9.6 19.2
130	M42	Y	-38.32	-38.43	19.2 28.8
131	M42	Y	-38.43	-26.87	28.8 38.4
132	M42	Y	-26.87	-10.15	38.4 48

**Load Combinations**

Description	S...	P...	S...	BLC	Fa...	BLC	Fa...	BLC	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	1.4 DL	Y	Y		1	1.4													
2	1.2 DL + 1.0 LCA X	Y	Y		1	1.2	5	1											
3	1.2 DL - 1.0 LCA X	Y	Y		1	1.2	5	-1											
4	1.2 DL + 1.0 LCB X	Y	Y		1	1.2	6	1											
5	1.2 DL - 1.0 LCB X	Y	Y		1	1.2	6	-1											
6	1.2 DL + 1.0 LCC X	Y	Y		1	1.2	7	1											
7	1.2 DL + 1.0 LCC X	Y	Y		1	1.2	7	-1											
8	1.2 DL + 1.0 LCA Z	Y	Y		1	1.2	2	1											
9	1.2 DL - 1.0 LCA Z	Y	Y		1	1.2	2	-1											
10	1.2 DL + 1.0 LCB Z	Y	Y		1	1.2	3	1											
11	1.2 DL - 1.0 LCB Z	Y	Y		1	1.2	3	-1											
12	1.2 DL + 1.0 LCC Z	Y	Y		1	1.2	4	1											
13	1.2 DL - 1.0 LCC Z	Y	Y		1	1.2	4	-1											
14	0.9 DL + 1.0 LCA X	Y	Y		1	.9	5	1											
15	0.9 DL - 1.0 LCA X	Y	Y		1	.9	5	-1											
16	0.9 DL + 1.0 LCB X	Y	Y		1	.9	6	1											
17	0.9 DL - 1.0 LCB X	Y	Y		1	.9	6	-1											
18	0.9 DL + 1.0 LCC X	Y	Y		1	.9	7	1											
19	0.9 DL + 1.0 LCC X	Y	Y		1	.9	7	-1											
20	0.9 DL + 1.0 LCA Z	Y	Y		1	.9	2	1											
21	0.9 DL - 1.0 LCA Z	Y	Y		1	.9	2	-1											
22	0.9 DL + 1.0 LCB Z	Y	Y		1	.9	3	1											
23	0.9 DL - 1.0 LCB Z	Y	Y		1	.9	3	-1											
24	0.9 DL + 1.0 LCC Z	Y	Y		1	.9	4	1											
25	0.9 DL - 1.0 LCC Z	Y	Y		1	.9	4	-1											
26	IBC 16-1	Y	Y		DL	1.4													





**Load Combinations (Continued)**

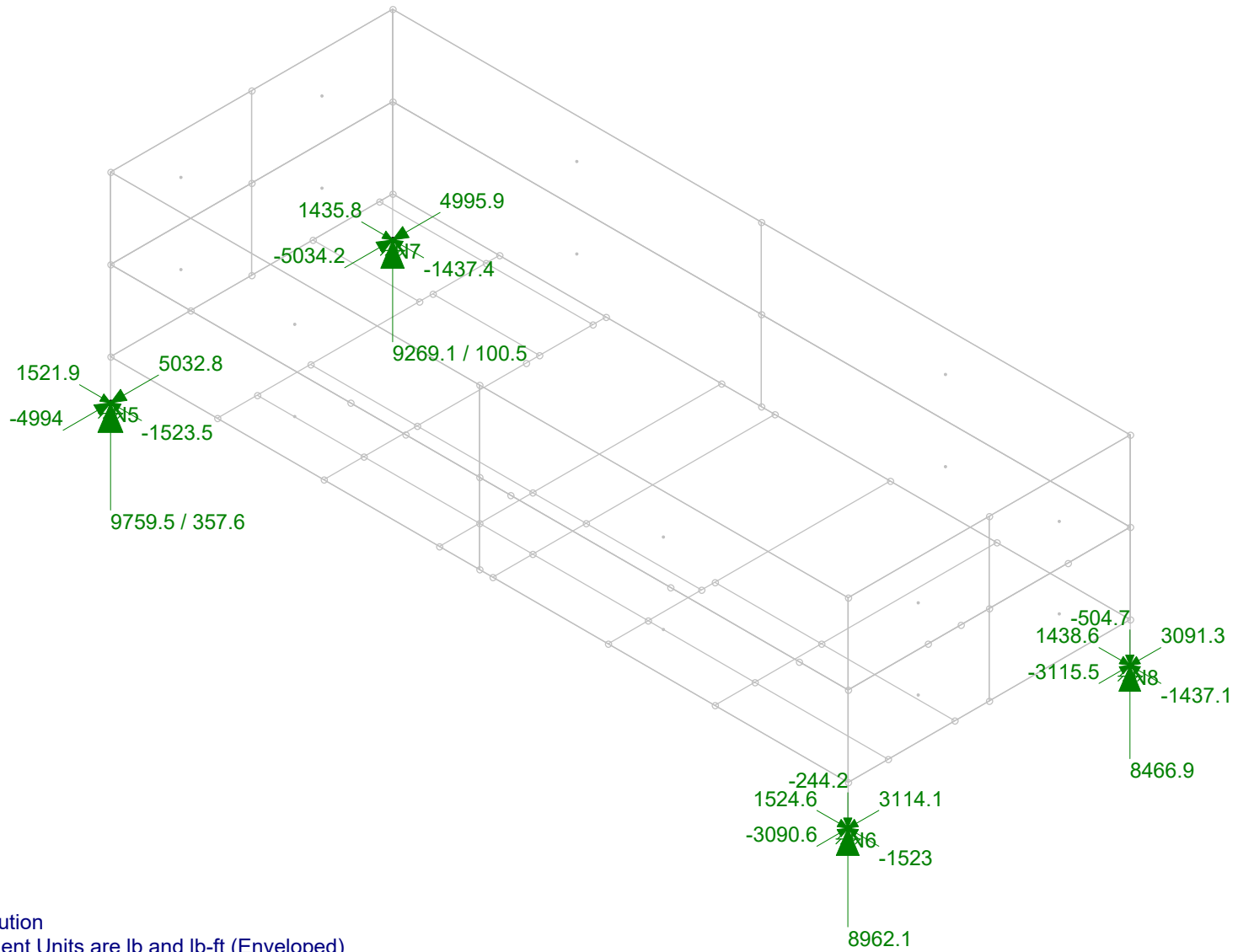
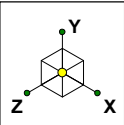
	Description	S...	P...	S...	BLC	Fa...	BLC	Fa...	BLC	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
27	IBC 16-2 (a)	Y...	Y		DL	1.2	LL	1.6	LLS	1.6										
28	IBC 16-2 (b)	Y...	Y		DL	1.2	LL	1.6	LLS	1.6	SL	.5	S...	.5						
29	IBC 16-3 (c)	Y...	Y		DL	1.2	SL	1.6	SLN	1.6	LL	.5	L...	1						

**Envelope Joint Reactions**

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
1	N5	max	1521.898	18	9759.458	29	5032.808	24	0	29	0	29	0	29
2		min	-1523.486	19	357.582	24	-4994.045	25	0	1	0	1	0	1
3	N7	max	1435.836	18	9269.093	29	4995.94	12	0	29	0	29	0	29
4		min	-1437.394	19	100.492	25	-5034.163	13	0	1	0	1	0	1
5	N6	max	1524.646	6	8962.089	29	3114.058	24	0	29	0	29	0	29
6		min	-1522.994	7	-244.235	24	-3090.55	25	0	1	0	1	0	1
7	N8	max	1438.552	6	8466.897	29	3091.331	12	0	29	0	29	0	29
8		min	-1437.058	7	-504.681	25	-3115.483	13	0	1	0	1	0	1
9	Totals:	max	5920.599	18	36457.537	29	16233.796	24						
10		min	-5920.599	19	13530.05	24	-16233.796	25						

**Envelope AISC 15th(360-16): LRFD Steel Code Checks**

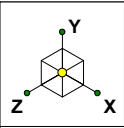
	Member	Shape	Code Che...	Loc[in]	LC	Shear Check	Loc[in]	Dir	LC	phi*Pn...	phi*...	phi*...	phi*...	Eqn
1	M1	W8X13	.228	87.313	29	.059	127	y	29	38237...	172...	806...	244...	H1...
2	M2	W8X13	.168	58.208	29	.029	127	y	29	38237...	172...	806...	239...	H1...
3	M3	W8X13	.279	42.333	29	.060	0	y	29	38237...	172...	806...	269...	H1...
4	M4	W8X13	.275	42.333	29	.060	0	y	29	38237...	172...	806...	269...	H1...
5	M5	W8X13	.155	54.24	29	.026	0	y	29	38237...	172...	806...	247...	H1...
6	M6	W8X13	.211	48.948	29	.038	0	y	29	38237...	172...	806...	255...	H1...
7	M7	W8X13	.016	24	29	.018	48	y	29	13634...	172...	806...	42750...	H1...
8	M8	W8X13	.005	23.5	29	.004	0	y	29	13634...	172...	806...	42750...	H1...
9	M9	W8X13	.008	25	29	.006	48	y	29	13634...	172...	806...	42750...	H1...
10	M10	W8X13	.006	26.542	29	.006	52	y	29	13084...	172...	806...	42750...	H1...
11	M11	W8X13	.009	25.458	29	.006	0	y	29	13084...	172...	806...	42750...	H1...
12	M12	W8X13	.001	12	29	.001	24	y	29	16286...	172...	806...	42750...	H1...
13	M13	W8X13	.001	12	29	.003	24	y	29	16286...	172...	806...	42750...	H1...
14	M14	W8X13	.009	26	29	.006	52	y	29	13084...	172...	806...	42750...	H1...
15	M15	W8X13	.006	26.542	29	.007	0	y	29	13084...	172...	806...	42750...	H1...
16	M16	W8X13	.006	24	29	.005	0	y	29	13634...	172...	806...	42750...	H1...
17	M17	W8X13	.017	30	29	.016	0	y	29	11932...	172...	806...	406...	H1...
18	M18	W8X13	.008	24.5	29	.005	0	y	29	13634...	172...	806...	42750...	H1...
19	M19	W8X13	.019	30	29	.014	60	y	29	11932...	172...	806...	410...	H1...
20	M20	W8X13	.013	23	29	.018	48	y	29	13634...	172...	806...	421...	H1...
21	M21	W16X26	.076	166	29	.156	166	y	29	78609.9	345...	20550	165...	H1...
22	M22	W16X26	.080	166	29	.127	166	y	29	78609.9	345...	20550	165...	H1...
23	M23	W10X15	.017	91.281	29	.014	127	y	29	10533...	198...	8625	60000...	H1...
24	M24	W10X15	.016	63.5	29	.018	63.5	y	29	10533...	198...	8625	60000...	H1...
25	M25	HSS4.000X0.226	.843	18	13	.178	0		12	93461...	94500	9513	9513...	H1...
26	M26	HSS4.000X0.226	.841	18	12	.178	0		12	93461...	94500	9513	9513...	H1...
27	M27	HSS4.000X0.226	.536	18	13	.111	0		13	93461...	94500	9513	9513...	H1...
28	M28	HSS4.000X0.226	.534	18	12	.111	0		12	93461...	94500	9513	9513...	H1...
29	M41	C6X8.2	.035	24	29	.016	48	y	29	59853...	107...	292...	19350...	H1...
30	M42	C6X8.2	.027	24	29	.013	0	y	29	59853...	107...	292...	19350...	H1...



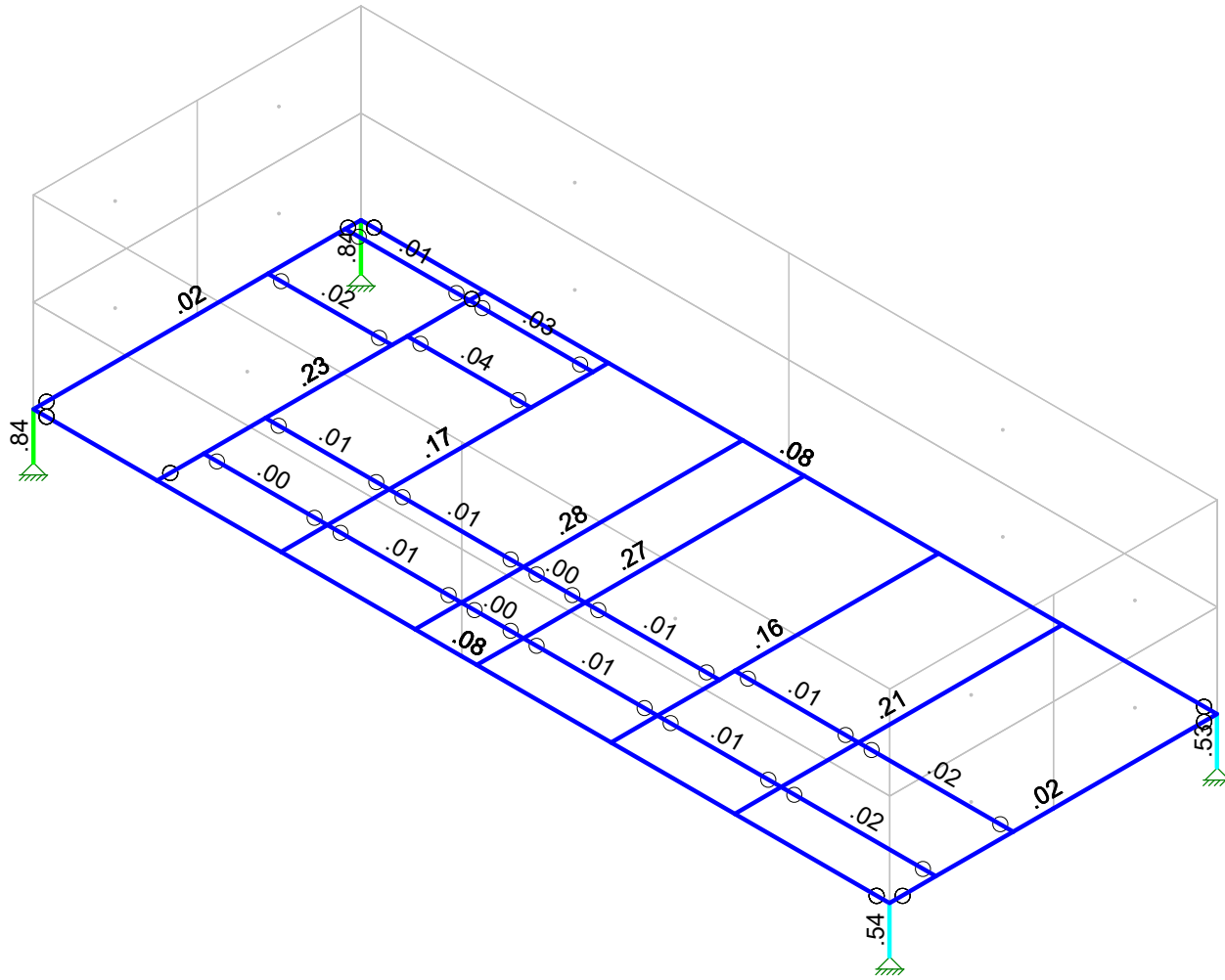
Morrison Hershfield  
ML  
GED-577R5 / 2000204

75153-A /GOOD SAMARITAN

SK - 14  
Dec 5, 2019 at 2:40 PM  
Platform Analysis.r3d

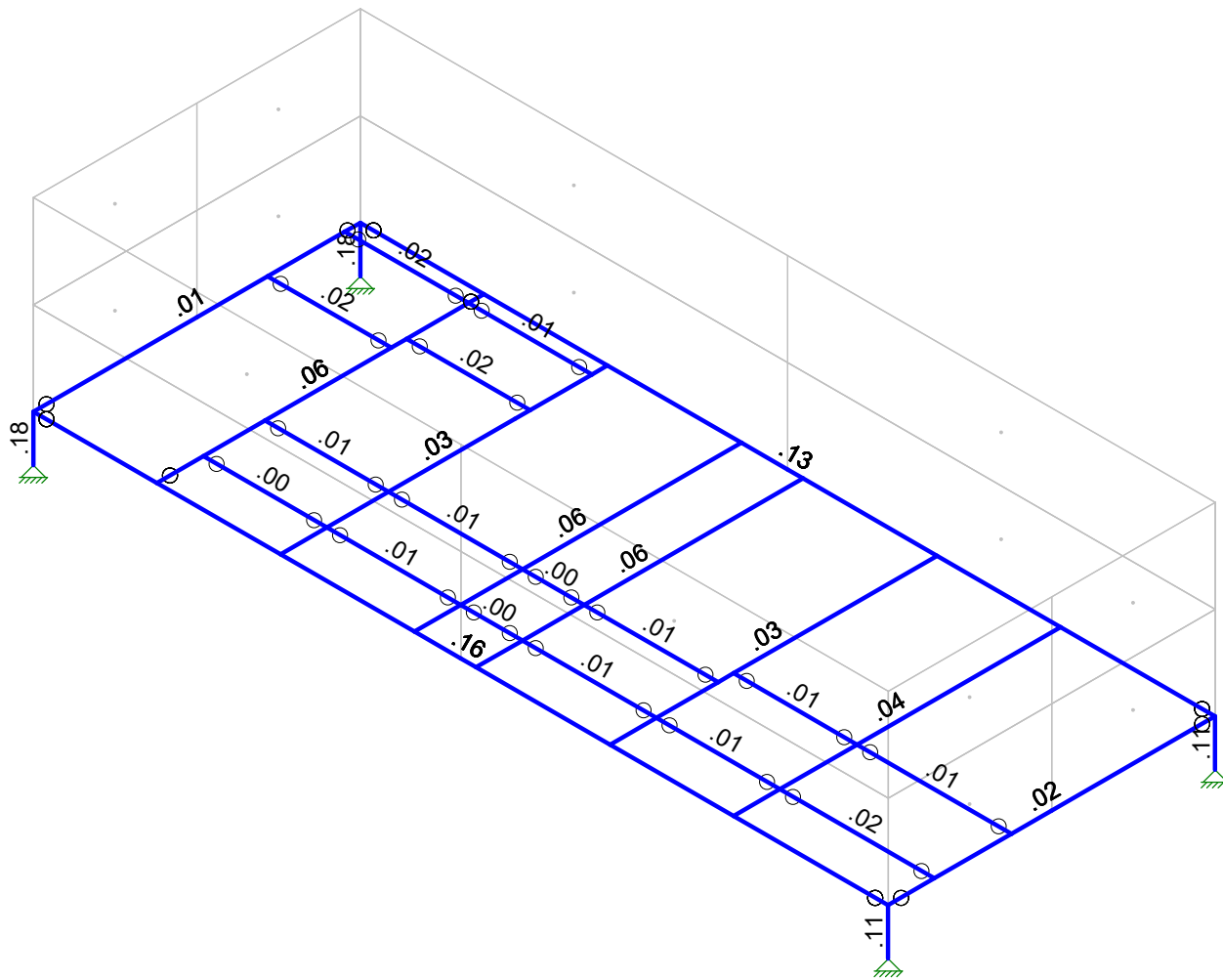
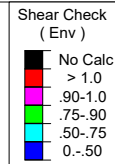
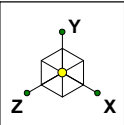


Code Check ( Env )	
Black	No Calc
Red	> 1.0
Pink	.90-1.0
Green	.75-.90
Cyan	.50-.75
Blue	0.-.50



Member Code Checks Displayed (Enveloped)  
Envelope Only Solution

Morrison Hershfield	75153-A /GOOD SAMARITAN	SK - 16
ML		Dec 5, 2019 at 2:42 PM
GED-577R5 / 2000204		Platform Analysis.r3d



Member Shear Checks Displayed (Enveloped)  
Envelope Only Solution

Morrison Hershfield

ML

GED-577R5 / 2000204

75153-A /GOOD SAMARITAN

SK - 17

Dec 5, 2019 at 2:43 PM

Platform Analysis.r3d





**Member Point Loads (BLC 1 : Dead Load) (Continued)**

	Member Label	Direction	Magnitude[lb,lb-ft]	Location[in, %]
19	M22	Y	-385	200
20	M6	Y	-100	%100

**Member Distributed Loads (BLC 5 : BLC 3 Transient Area Loads)**

	Member Label	Direction	Start Magnitude[lb/ft,F,psf]	End Magnitude[lb/ft,F,p...]	Start Location[in, %]	End Location[in, %]
1	M1	Y	-2.76	-3.87	0	25.4
2	M1	Y	-3.87	-5.75	25.4	50.8
3	M1	Y	-5.75	-4.94	50.8	76.2
4	M1	Y	-4.94	-2.5	76.2	101.6
5	M1	Y	-2.5	-1.91	101.6	127
6	M2	Y	-3.82	-2.65	0	25.4
7	M2	Y	-2.65	-3.85	25.4	50.8
8	M2	Y	-3.85	-5.65	50.8	76.2
9	M2	Y	-5.65	-4.27	76.2	101.6
10	M2	Y	-4.27	-1.5	101.6	127
11	M3	Y	-1.88	-2.1	0	25.4
12	M3	Y	-2.1	-3.48	25.4	50.8
13	M3	Y	-3.48	-6.13	50.8	76.2
14	M3	Y	-6.13	-5.03	76.2	101.6
15	M3	Y	-5.03	-2.24	101.6	127
16	M4	Y	-1.88	-1.98	0	25.4
17	M4	Y	-1.98	-3.52	25.4	50.8
18	M4	Y	-3.52	-6.34	50.8	76.2
19	M4	Y	-6.34	-4.81	76.2	101.6
20	M4	Y	-4.81	-1.18	101.6	127
21	M5	Y	-1.9	-2.33	0	25.4
22	M5	Y	-2.33	-4.16	25.4	50.8
23	M5	Y	-4.16	-7.26	50.8	76.2
24	M5	Y	-7.26	-6.44	76.2	101.6
25	M5	Y	-6.44	-1.82	101.6	127
26	M6	Y	-2.93	-2.6	0	25.4
27	M6	Y	-2.6	-4.1	25.4	50.8
28	M6	Y	-4.1	-7.3	50.8	76.2
29	M6	Y	-7.3	-7.57	76.2	101.6
30	M6	Y	-7.57	-5.06	101.6	127
31	M7	Y	-2.23	-2.34	0	9.6
32	M7	Y	-2.34	-5.99	9.6	19.2
33	M7	Y	-5.99	-7.04	19.2	28.8
34	M7	Y	-7.04	-3.56	28.8	38.4
35	M7	Y	-3.56	-2.23	38.4	48
36	M8	Y	-1.85	-3.36	4.8	17.6
37	M8	Y	-3.36	-3.05	17.6	30.4
38	M8	Y	-3.05	-.93	30.4	43.2
39	M9	Y	-.97	-2.99	0	12
40	M9	Y	-2.99	-6.02	12	24
41	M9	Y	-6.02	-5.15	24	36
42	M9	Y	-5.15	-.36	36	48
43	M10	Y	-.93	-3.05	5.2	19.07
44	M10	Y	-3.05	-3.36	19.07	32.93
45	M10	Y	-3.36	-1.85	32.93	46.8
46	M11	Y	-.44	-4.74	0	13
47	M11	Y	-4.74	-6.57	13	26
48	M11	Y	-6.57	-4.05	26	39
49	M11	Y	-4.05	-.44	39	52
50	M12	Y	-1.76	-1.76		24



**Member Distributed Loads (BLC 5 : BLC 3 Transient Area Loads) (Continued)**

Member Label	Direction	Start Magnitude[lb/ft,F,psf]	End Magnitude[lb/ft,F,p...	Start Location[in, %]	End Location[in, %]	
51	M13	Y	-3.4	-3.4	.0004422	24
52	M14	Y	-45	-3.58	0	10.4
53	M14	Y	-3.58	-5.57	10.4	20.8
54	M14	Y	-5.57	-5.55	20.8	31.2
55	M14	Y	-5.55	-3.68	31.2	41.6
56	M14	Y	-3.68	-.82	41.6	52
57	M15	Y	-4.66	-2.48	5.2	14.56
58	M15	Y	-2.48	-2.73	14.56	23.92
59	M15	Y	-2.73	-3.92	23.92	33.28
60	M15	Y	-3.92	-2.24	33.28	42.64
61	M15	Y	-2.24	.03	42.64	52
62	M16	Y	-.15	-2.39	0	8.64
63	M16	Y	-2.39	-3.88	8.64	17.28
64	M16	Y	-3.88	-4.15	17.28	25.92
65	M16	Y	-4.15	-3.69	25.92	34.56
66	M16	Y	-3.69	-.2	34.56	43.2
67	M17	Y	-.46	-2.95	.02	10.01
68	M17	Y	-2.95	-4.2	10.01	20.01
69	M17	Y	-.42	-4.21	20.01	30
70	M17	Y	-4.21	-4.2	30	39.99
71	M17	Y	-.42	-2.95	39.99	49.99
72	M17	Y	-2.95	-.46	49.99	59.98
73	M18	Y	-.11	-2.74	0	8.64
74	M18	Y	-2.74	-4.76	8.64	17.28
75	M18	Y	-4.76	-7.01	17.28	25.92
76	M18	Y	-7.01	-4.45	25.92	34.56
77	M18	Y	-4.45	-.11	34.56	43.2
78	M19	Y	-3.23	-4.99	6	18
79	M19	Y	-4.99	-5.9	18	30
80	M19	Y	-5.9	-5.04	30	42
81	M19	Y	-5.04	-3.27	42	54
82	M20	Y	-1.01	-1.73	0	9.6
83	M20	Y	-1.73	-2.97	9.6	19.2
84	M20	Y	-2.97	-3.17	19.2	28.8
85	M20	Y	-3.17	-1.81	28.8	38.4
86	M20	Y	-1.81	-.44	38.4	48
87	M21	Y	-3.03	-2.57	0	25.54
88	M21	Y	-2.57	-1.87	25.54	51.08
89	M21	Y	-1.87	-.92	51.08	76.62
90	M21	Y	-.92	-.98	76.62	102.15
91	M21	Y	-.98	-.1	102.15	127.69
92	M21	Y	-.1	-.94	127.69	153.23
93	M21	Y	-.94	-1.45	153.23	178.77
94	M21	Y	-1.45	-.1	178.77	204.31
95	M21	Y	-.1	-.94	204.31	229.85
96	M21	Y	-.94	-1.22	229.85	255.38
97	M21	Y	-1.22	-1.1	255.38	280.92
98	M21	Y	-1.1	-1.45	280.92	306.46
99	M21	Y	-1.45	-2.04	306.46	332
100	M22	Y	-.62	-.45	0	25.54
101	M22	Y	-.45	-.45	25.54	51.08
102	M22	Y	-.45	-.54	51.08	76.62
103	M22	Y	-.54	-1.75	76.62	102.15
104	M22	Y	-1.75	-2.59	102.15	127.69
105	M22	Y	-2.59	-2.4	127.69	153.23
106	M22	Y	-2.4	-2.26	153.23	178.77
107	M22	Y	-2.26	-2.47	178.77	204.31







**Member Distributed Loads (BLC 6 : BLC 2 Transient Area Loads) (Continued)**

Member Label	Direction	Start Magnitude[lb/ft,F.psf]	End Magnitude[lb/ft,F.p...	Start Location[in,%]	End Location[in,%]	
29	M6	Y	-109.55	-113.55	76.2	101.6
30	M6	Y	-113.55	-75.87	101.6	127
31	M7	Y	-3.52	-35.08	0	9.6
32	M7	Y	-35.08	-89.92	9.6	19.2
33	M7	Y	-89.92	-105.53	19.2	28.8
34	M7	Y	-105.53	-53.44	28.8	38.4
35	M7	Y	-53.44	-3.52	38.4	48
36	M8	Y	-27.8	-50.39	4.8	17.6
37	M8	Y	-50.39	-45.79	17.6	30.4
38	M8	Y	-45.79	-14	30.4	43.2
39	M9	Y	-14.58	-44.84	0	12
40	M9	Y	-44.84	-90.23	12	24
41	M9	Y	-90.23	-77.29	24	36
42	M9	Y	-77.29	-5.47	36	48
43	M10	Y	-14	-45.79	5.2	19.07
44	M10	Y	-45.79	-50.37	19.07	32.93
45	M10	Y	-50.37	-27.75	32.93	46.8
46	M11	Y	-6.65	-71.04	0	13
47	M11	Y	-71.04	-98.52	13	26
48	M11	Y	-98.52	-60.72	26	39
49	M11	Y	-60.72	-6.65	39	52
50	M12	Y	-26.4	-26.4		24
51	M13	Y	-51.02	-51.02	.0004422	24
52	M14	Y	-6.73	-53.74	0	10.4
53	M14	Y	-53.74	-83.48	10.4	20.8
54	M14	Y	-83.48	-83.2	20.8	31.2
55	M14	Y	-83.2	-55.2	31.2	41.6
56	M14	Y	-55.2	-12.25	41.6	52
57	M15	Y	-69.92	-37.17	5.2	14.56
58	M15	Y	-37.17	-40.98	14.56	23.92
59	M15	Y	-40.98	-58.84	23.92	33.28
60	M15	Y	-58.84	-33.59	33.28	42.64
61	M15	Y	-33.59	.52	42.64	52
62	M16	Y	-2.24	-35.91	0	8.64
63	M16	Y	-35.91	-58.21	8.64	17.28
64	M16	Y	-58.21	-62.27	17.28	25.92
65	M16	Y	-62.27	-55.34	25.92	34.56
66	M16	Y	-55.34	-30.01	34.56	43.2
67	M17	Y	-6.95	-44.3	.02	10.01
68	M17	Y	-44.3	-63.07	10.01	20.01
69	M17	Y	-63.07	-63.15	20.01	30
70	M17	Y	-63.15	-63.06	30	39.99
71	M17	Y	-63.06	-44.29	39.99	49.99
72	M17	Y	-44.29	-6.96	49.99	59.98
73	M18	Y	-1.6	-41.04	0	8.64
74	M18	Y	-41.04	-71.35	8.64	17.28
75	M18	Y	-71.35	-105.08	17.28	25.92
76	M18	Y	-105.08	-66.79	25.92	34.56
77	M18	Y	-66.79	-1.6	34.56	43.2
78	M19	Y	-48.39	-74.88	6	18
79	M19	Y	-74.88	-88.49	18	30
80	M19	Y	-88.49	-75.58	30	42
81	M19	Y	-75.58	-49.05	42	54
82	M20	Y	-15.21	-25.96	0	9.6
83	M20	Y	-25.96	-44.53	9.6	19.2
84	M20	Y	-44.53	-47.51	19.2	28.8
85	M20	Y	-47.51	-27.08	28.8	38.4



**Member Distributed Loads (BLC 6 : BLC 2 Transient Area Loads) (Continued)**

Member Label	Direction	Start Magnitude[lb/ft.F.psf]	End Magnitude[lb/ft.F.p...	Start Location[in.%]	End Location[in.%]	
86	M20	Y	-27.08	-6.64	38.4	48
87	M21	Y	-45.43	-38.61	0	25.54
88	M21	Y	-38.61	-28.02	25.54	51.08
89	M21	Y	-28.02	-13.8	51.08	76.62
90	M21	Y	-13.8	-14.68	76.62	102.15
91	M21	Y	-14.68	-14.97	102.15	127.69
92	M21	Y	-14.97	-14.09	127.69	153.23
93	M21	Y	-14.09	-21.8	153.23	178.77
94	M21	Y	-21.8	-15.04	178.77	204.31
95	M21	Y	-15.04	-14.11	204.31	229.85
96	M21	Y	-14.11	-18.26	229.85	255.38
97	M21	Y	-18.26	-16.47	255.38	280.92
98	M21	Y	-16.47	-21.72	280.92	306.46
99	M21	Y	-21.72	-30.54	306.46	332
100	M22	Y	-9.37	-6.73	0	25.54
101	M22	Y	-6.73	-6.73	25.54	51.08
102	M22	Y	-6.73	-8.08	51.08	76.62
103	M22	Y	-8.08	-26.32	76.62	102.15
104	M22	Y	-26.32	-38.79	102.15	127.69
105	M22	Y	-38.79	-36	127.69	153.23
106	M22	Y	-36	-33.92	153.23	178.77
107	M22	Y	-33.92	-37.02	178.77	204.31
108	M22	Y	-37.02	-37.35	204.31	229.85
109	M22	Y	-37.35	-14.83	229.85	255.38
110	M22	Y	-14.83	-23.22	255.38	280.92
111	M22	Y	-23.22	-41.78	280.92	306.46
112	M22	Y	-41.78	-32.72	306.46	332
113	M23	Y	-2.24	-40.63	0	25.4
114	M23	Y	-40.63	-58.46	25.4	50.8
115	M23	Y	-58.46	-42.67	50.8	76.2
116	M23	Y	-42.67	-25	76.2	101.6
117	M23	Y	-25	-9.25	101.6	127
118	M24	Y	-19.86	-21.61	12.7	33.02
119	M24	Y	-21.61	-37.43	33.02	53.34
120	M24	Y	-37.43	-78.06	53.34	73.66
121	M24	Y	-78.06	-73.47	73.66	93.98
122	M24	Y	-73.47	-12.92	93.98	114.3
123	M41	Y	-4.69	-51.25	0	9.6
124	M41	Y	-51.25	-74.79	9.6	19.2
125	M41	Y	-74.79	-90.68	19.2	28.8
126	M41	Y	-90.68	-67.5	28.8	38.4
127	M41	Y	-67.5	-4.69	38.4	48
128	M42	Y	-10.87	-26.97	0	9.6
129	M42	Y	-26.97	-38.32	9.6	19.2
130	M42	Y	-38.32	-38.43	19.2	28.8
131	M42	Y	-38.43	-26.87	28.8	38.4
132	M42	Y	-26.87	-10.15	38.4	48

**Load Combinations**

Description	S...P...	S...	BLC	Fa...	BLC	Fa...	BLC	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1 Seismic Mass	Y...	Y	DL	1														
2 IBC 16-5 (a)	Y...	Y	DL	1.2	Sds*	.2	SZ*SF	1	LL	.5	L...	1	SL	.2	S...	.7		
3 IBC 16-5 (b)	Y...	Y	DL	1.2	Sds*	.2	SZ*SF	1	LL	.5	L...	1	SL	.2	S...	.7		
4 IBC 16-5 (c)	Y...	Y	DL	1.2	Sds*	.2	SX*	-1	LL	.5	L...	1	SL	.2	S...	.7		
5 IBC 16-5 (d)	Y...	Y	DL	1.2	Sds*	.2	SZ*SF	-1	LL	.5	L...	1	SL	.2	S...	.7		



**Load Combinations (Continued)**

Description	S...	P...	S...	BLC	Fa...	BLC	Fa...	BLC	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
6	IBC 16-7 (a)	Y	Y	DL	.9	Sds*	-.2	SZ*SF	1										
7	IBC 16-7 (b)	Y	Y	DL	.9	Sds*	-.2	SZ*SF	1										
8	IBC 16-7 (c)	Y	Y	DL	.9	Sds*	-.2	SX*	-1										
9	IBC 16-7 (d)	Y	Y	DL	.9	Sds*	-.2	SZ*SF	-1										
10	IBC 16-5 (os-a)	Y	Y	DL	1.2	Sds*	.2	Om*	1	LL	.5	L...	1	SL	.2	S...	.7		
11	IBC 16-5 (os-b)	Y	Y	DL	1.2	Sds*	.2	Om*	1	LL	.5	L...	1	SL	.2	S...	.7		
12	IBC 16-5 (os-c)	Y	Y	DL	1.2	Sds*	.2	Om*	-1	LL	.5	L...	1	SL	.2	S...	.7		
13	IBC 16-5 (os-d)	Y	Y	DL	1.2	Sds*	.2	Om*	-1	LL	.5	L...	1	SL	.2	S...	.7		
14	IBC 16-7 (os-a)	Y	Y	DL	.9	Sds*	-.2	Om*	1										
15	IBC 16-7 (os-b)	Y	Y	DL	.9	Sds*	-.2	Om*	1										
16	IBC 16-7 (os-c)	Y	Y	DL	.9	Sds*	-.2	Om*	-1										
17	IBC 16-7 (os-d)	Y	Y	DL	.9	Sds*	-.2	Om*	-1										

**Envelope Joint Reactions**

Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC	
1	N5	max	1065.136	4	6796.959	5	1207.649	9	0	9	0	9	0	9
2		min	-121.567	6	2891.015	6	-1207.657	2	0	1	0	1	0	1
3	N7	max	1027.863	8	6393.724	5	1207.65	9	0	9	0	9	0	9
4		min	-162.584	2	2670.109	6	-1207.655	2	0	1	0	1	0	1
5	N6	max	1065.124	4	5887.39	5	861.389	5	0	9	0	9	0	9
6		min	-121.572	6	2391.949	6	-861.383	6	0	1	0	1	0	1
7	N8	max	1027.857	8	5465.924	5	861.389	5	0	9	0	9	0	9
8		min	-162.595	2	2181.465	6	-861.381	6	0	1	0	1	0	1
9	Totals:	max	4185.969	8	24543.997	5	4138.073	5						
10		min	-568.309	2	10134.538	6	-4138.073	6						

**Envelope AISC 15th(360-16): LRFD Steel Code Checks**

Member	Shape	Code Che...	Loc[in]	LC	Shear Check	Loc[in]	Dir	LC	phi*Pn...	phi*...	phi*...	phi*...	Eqn	
1	M1	W8X13	.142	96.573	3	.044	127	y	5	38237...	172...	806...	269...	H1...
2	M2	W8X13	.123	0	3	.019	121.708	z	3	38237...	172...	806...	233...	H1...
3	M3	W8X13	.232	42.333	3	.050	0	y	3	38237...	172...	806...	284...	H1...
4	M4	W8X13	.219	42.333	4	.050	0	y	3	38237...	172...	806...	285...	H1...
5	M5	W8X13	.094	0	3	.014	47.625	z	4	38237...	172...	806...	250...	H1...
6	M6	W8X13	.097	48.948	3	.018	0	y	3	38237...	172...	806...	271...	H1...
7	M7	W8X13	.012	21.5	4	.013	48	y	5	13634...	172...	806...	410...	H1...
8	M8	W8X13	.002	23.5	3	.002	0	y	5	13634...	172...	806...	42750...	H1...
9	M9	W8X13	.002	24.5	3	.002	48	y	5	13634...	172...	806...	42750...	H1...
10	M10	W8X13	.005	0	7	.005	52	y	3	13084...	172...	806...	42750...	H1...
11	M11	W8X13	.002	26	3	.003	0	y	3	13084...	172...	806...	42750...	H1...
12	M12	W8X13	.002	12	4	.001	24	y	5	16286...	172...	806...	42750...	H1...
13	M13	W8X13	.008	0	3	.001	24	y	5	16286...	172...	806...	42750...	H1...
14	M14	W8X13	.005	26	4	.003	52	y	5	13084...	172...	806...	42750...	H1...
15	M15	W8X13	.007	0	7	.005	0	y	5	13084...	172...	806...	42750...	H1...
16	M16	W8X13	.004	0	7	.002	0	y	3	13634...	172...	806...	42750...	H1...
17	M17	W8X13	.011	30	4	.010	0	y	5	11932...	172...	806...	386...	H1...
18	M18	W8X13	.004	24	4	.002	0	y	3	13634...	172...	806...	42750...	H1...
19	M19	W8X13	.014	30	4	.010	60	y	5	11932...	172...	806...	388...	H1...
20	M20	W8X13	.013	19.5	3	.015	48	y	5	13634...	172...	806...	408...	H1...
21	M21	W16X26	.144	166	3	.112	166	y	3	78609.9	345...	20550	165...	H1...
22	M22	W16X26	.140	166	3	.084	166	y	5	78609.9	345...	20550	165...	H1...
23	M23	W10X15	.057	63.5	4	.011	127	y	5	10533...	198...	8625	60000...	H1...
24	M24	W10X15	.103	63.5	4	.016	48.948	z	4	10533...	198...	8625	60000...	H1...
25	M25	HSS4.000X0.226	.228	18	3	.043	0		5	93461...	94500	9513	9513	H1...
26	M26	HSS4.000X0.226	.226	18	3	.043	0		5	93461...	94500	9513	9513	H1...



**Envelope AISC 15th(360-16): LRFD Steel Code Checks (Continued)**

Member	Shape	Code Che...	Loc[in]	LC	Shear Check	Loc[in]	Dir	LC	phi*Pn...	phi*...	phi*...	phi*...	Eqn
27	M27	HSS4.000X0.226	.198	18	4	.038	0	4	93461...	94500	9513	9513	...H1-...
28	M28	HSS4.000X0.226	.189	18	4	.036	0	8	93461...	94500	9513	9513	...H1-...
29	M41	C6X8.2	.025	24	3	.010	48	y	59853...	107...	292...	19350...	H1-...
30	M42	C6X8.2	.031	24	3	.011	0	y	59853...	107...	292...	19350...	H1-...

**Mode Shape 1**

Joint Label	X Translation	Y Translation	Z Translation	X Rotation	Y Rotation	Z Rotation
N1	.137	-.005	1.454	0	.002	0
N2	.137	-.005	.682	0	.002	0
N3	-.158	.005	1.454	0	.002	0
N4	-.158	.005	.682	0	.002	0
N5	0.000	0.000	0.000	.112	.002	-.011
N6	0.000	0.000	0.000	.053	.002	-.011
N7	0.000	0.000	0.000	.112	.002	.012
N8	0.000	0.000	0.000	.053	.002	.012
N9	.142	-.005	10.603	0	-.09	0
N10	-.16	.005	10.641	0	-.09	0
N11	.149	-.005	9.447	0	.099	0
N12	-.171	.005	9.461	0	.1	0
N13	.143	-.005	2.088	0	.091	0
N14	-.162	.005	2.093	0	.098	0
N15	.136	-.005	1.059	0	.003	0
N16	-.158	.005	1.064	0	0	0
N17	.13	-.005	1.357	0	0	0
N18	-.158	.005	1.357	0	-.005	0
N19	.131	-.005	1.351	0	.01	0
N20	-.158	.005	1.353	0	.006	0
N21	-.218	-.004	.682	0	.012	0
N22	-.307	-.003	10.612	0	.013	0
N23	-.313	-.004	9.451	0	-.005	0
N24	-.291	-.004	2.092	0	-.003	0
N25	-.268	-.004	1.062	0	.018	0
N26	-.236	-.004	1.357	0	.018	0
N27	-.223	-.004	1.352	0	.015	0
N28	-.153	-.001	.682	0	-.012	0
N29	-.21	-.001	10.623	0	-.015	0
N30	-.208	-.002	9.455	0	-.009	0
N31	-.21	-.003	2.094	0	-.014	0
N32	-.213	-.003	1.064	0	-.009	0
N33	-.162	-.001	1.358	0	-.007	0
N34	-.159	-.002	1.353	0	-.008	0
N35	-.214	-.002	1.358	0	-.009	0
N36	.608	.002	1.454	0	-.019	0
N37	.614	.003	10.644	0	-.012	0
N38	.137	-.005	1.459	0	.002	0
N39	.137	-.005	.688	0	.002	0
N40	-.158	.005	1.459	0	.002	0
N41	-.158	.005	.688	0	.002	0
N42	.137	-.005	1.074	0	.002	0
N43	.137	-.005	1.456	0	.002	0
N44	.137	-.005	1.071	0	.002	0
N45	.137	-.005	.685	0	.002	0
N46	.137	-.005	1.07	0	.002	0
N47	-.01	0	1.459	0	.002	0
N48	-.01	0	1.456	0	.002	0
N49	-.158	.005	1.456	0	.002	0

**Mode Shape 1, (continued)**

Joint Label	X Translation	Y Translation	Z Translation	X Rotation	Y Rotation	Z Rotation
N50	-.01	0	1.454	0	.002	0
N51	-.158	.005	1.074	0	.002	0
N52	-.158	.005	1.071	0	.002	0
N53	-.158	.005	.685	0	.002	0
N54	-.158	.005	1.069	0	.002	0
N55	-.01	0	.688	0	.002	0
N56	-.01	0	.685	0	.002	0
N57	-.01	0	.682	0	.002	0
N58	-.01	0	1.071	0	0.000	0
N59	.137	-.005	1.148	0	.002	0
N60	.137	-.005	1.373	0	.002	0
N61	.137	-.005	1.206	0	.002	0
N62	.137	-.005	1.038	0	.002	0
N63	.137	-.005	.871	0	.002	0
N64	.137	-.005	.736	0	.002	0
N65	.019	-.001	.685	0	.002	0
N66	.054	-.002	.685	0	.002	0
N67	-.093	.003	.685	0	.002	0
N68	.626	.002	9.46	0	-.011	0
N69	.673	.003	10.645	0	-.005	0
N70	.678	.003	9.461	0	-.006	0
N71	.195	.005	10.644	0	.051	0
N72	.25	.005	9.461	0	.055	0
N73	.18	.005	1.454	0	.05	0

**Mode Shape 2**

Joint Label	X Translation	Y Translation	Z Translation	X Rotation	Y Rotation	Z Rotation
N1	.014	-.005	.585	0	-.003	0
N2	.014	-.006	1.694	0	-.003	0
N3	.438	.006	.585	0	-.003	0
N4	.438	.005	1.694	0	-.003	0
N5	0.000	0.000	0.000	.045	-.003	-.001
N6	0.000	0.000	0.000	.131	-.003	-.001
N7	0.000	0.000	0.000	.045	-.003	-.034
N8	0.000	0.000	0.000	.131	-.003	-.034
N9	.016	-.005	-1.574	0	.02	0
N10	.439	.007	-1.58	0	.018	0
N11	.017	-.006	-1.088	0	-.034	0
N12	.443	.007	-1.089	0	-.027	0
N13	.016	-.006	.877	0	-.027	0
N14	.439	.006	.874	0	-.025	0
N15	.012	-.006	1.344	0	-.058	0
N16	.438	.006	1.333	0	-.055	0
N17	.003	-.006	10.13	0	-.149	0
N18	.44	.005	10.145	0	-.177	0
N19	.015	-.006	14.634	0	.019	0
N20	.439	.005	14.621	0	.044	0
N21	.567	-.005	1.695	0	-.019	0
N22	.567	-.003	-1.575	0	-.019	0
N23	.573	-.004	-1.089	0	-.02	0
N24	.586	-.005	.879	0	-.022	0
N25	.596	-.005	1.346	0	-.015	0
N26	.61	-.005	10.135	0	.006	0
N27	.572	-.005	14.644	0	-.032	0
N28	.457	-.002	1.695	0	.02	0
N29	.649	0	-1.578	0	.006	0
N30	.648	-.001	-1.089	0	.006	0



**Mode Shape 2. (continued)**

Joint Label	X Translation	Y Translation	Z Translation	X Rotation	Y Rotation	Z Rotation
N31	.643	-.004	.88	0	.009	0
N32	.638	-.004	1.346	0	.011	0
N33	.466	-.002	10.14	0	.035	0
N34	.467	-.002	14.649	0	.009	0
N35	.626	-.002	10.139	0	.017	0
N36	.265	.003	.585	0	0	0
N37	.265	.004	-1.582	0	.004	0
N38	.014	-.005	.592	0	-.003	0
N39	.014	-.006	1.7	0	-.003	0
N40	.438	.006	.592	0	-.003	0
N41	.438	.005	1.7	0	-.003	0
N42	.014	-.006	1.146	0	-.003	0
N43	.014	-.005	.588	0	-.003	0
N44	.014	-.006	1.143	0	-.003	0
N45	.014	-.006	1.697	0	-.003	0
N46	.014	-.006	1.142	0	-.003	0
N47	.226	0	.592	0	-.003	0
N48	.226	0	.588	0	-.003	0
N49	.438	.006	.588	0	-.003	0
N50	.226	0	.585	0	-.003	0
N51	.438	.006	1.146	0	-.003	0
N52	.438	.006	1.143	0	-.003	0
N53	.438	.005	1.697	0	-.003	0
N54	.438	.006	1.141	0	-.003	0
N55	.226	0	1.7	0	-.003	0
N56	.226	0	1.697	0	-.003	0
N57	.226	0	1.694	0	-.003	0
N58	.226	0	1.143	0	0.000	0
N59	.014	-.006	1.032	0	-.003	0
N60	.014	-.005	.709	0	-.003	0
N61	.014	-.006	.949	0	-.003	0
N62	.014	-.006	1.19	0	-.003	0
N63	.014	-.006	1.43	0	-.003	0
N64	.014	-.006	1.624	0	-.003	0
N65	.183	-.002	1.697	0	-.003	0
N66	.134	-.003	1.697	0	-.003	0
N67	.344	.003	1.697	0	-.003	0
N68	.27	.003	-1.09	0	.005	0
N69	.246	.005	-1.582	0	.002	0
N70	.245	.004	-1.09	0	.003	0
N71	.354	.006	-1.581	0	-.012	0
N72	.335	.006	-1.09	0	-.014	0
N73	.361	.006	.585	0	-.011	0

**Mode Shape 3**

Joint Label	X Translation	Y Translation	Z Translation	X Rotation	Y Rotation	Z Rotation
N1	3.812	.009	.021	0	.001	0
N2	3.812	-.007	-.365	0	.001	0
N3	3.664	.007	.021	0	.001	0
N4	3.664	-.009	-.365	0	.001	0
N5	0.000	0.000	0.000	.002	.001	-.294
N6	0.000	0.000	0.000	-.028	.001	-.294
N7	0.000	0.000	0.000	.002	.001	-.282
N8	0.000	0.000	0.000	-.028	.001	-.282
N9	3.82	.007	.332	0	.006	0
N10	3.681	.006	.349	0	-.005	0
N11	3.827	.005	-.04	0	-.009	0



**Mode Shape 3, (continued)**

Joint Label	X Translation	Y Translation	Z Translation	X Rotation	Y Rotation	Z Rotation
N12	3.695	.004	-.035	0	.032	0
N13	3.819	.002	-.238	0	-.012	0
N14	3.673	0	-.235	0	-.004	0
N15	3.816	0	-.175	0	-.003	0
N16	3.665	-.001	-.198	0	.008	0
N17	3.829	-.003	-1	0	0	0
N18	3.669	-.005	-.997	0	.012	0
N19	3.829	-.005	-1.166	0	-.022	0
N20	3.669	-.007	-1.174	0	-.002	0
N21	5.055	-.007	-.365	0	-.071	0
N22	4.99	.009	.335	0	-.063	0
N23	4.986	.005	-.039	0	-.077	0
N24	5.008	.004	-.238	0	-.08	0
N25	5.013	0	-.179	0	-.082	0
N26	5.015	-.003	-1	0	-.093	0
N27	5.023	-.006	-1.169	0	-.066	0
N28	5.474	-.007	-.365	0	.107	0
N29	6.222	.01	.339	0	-.032	0
N30	6.223	.005	-.038	0	-.032	0
N31	6.217	.005	-.238	0	-.017	0
N32	6.194	0	-.184	0	-.017	0
N33	5.666	-.004	-.999	0	.072	0
N34	5.589	-.007	-1.171	0	.013	0
N35	6.102	-.003	-1	0	.045	0
N36	5.875	.007	.021	0	-.041	0
N37	5.906	.01	.346	0	.03	0
N38	3.815	.009	.02	0	.001	0
N39	3.815	-.007	-.366	0	.001	0
N40	3.668	.007	.02	0	.001	0
N41	3.668	-.009	-.366	0	.001	0
N42	3.815	0	-.173	0	.001	0
N43	3.814	.009	.021	0	.001	0
N44	3.814	0	-.172	0	.001	0
N45	3.814	-.007	-.365	0	.001	0
N46	3.812	0	-.172	0	.001	0
N47	3.742	.008	.02	0	.001	0
N48	3.74	.008	.021	0	.001	0
N49	3.666	.007	.021	0	.001	0
N50	3.739	.008	.021	0	.001	0
N51	3.668	0	-.173	0	.001	0
N52	3.666	0	-.172	0	.001	0
N53	3.666	-.009	-.365	0	.001	0
N54	3.665	0	-.172	0	.001	0
N55	3.742	-.008	-.366	0	.001	0
N56	3.74	-.008	-.365	0	.001	0
N57	3.74	-.008	-.365	0	.001	0
N58	3.74	0	-.172	0	0.000	0
N59	3.814	.002	-.134	0	.001	0
N60	3.814	.007	-.021	0	.001	0
N61	3.814	.004	-.105	0	.001	0
N62	3.814	0	-.189	0	.001	0
N63	3.814	-.003	-.272	0	.001	0
N64	3.814	-.006	-.34	0	.001	0
N65	3.755	-.007	-.365	0	.001	0
N66	3.772	-.007	-.365	0	.001	0
N67	3.699	-.008	-.365	0	.001	0
N68	6.027	.005	-.036	0	.046	0
N69	5.714	.01	.346	0	.04	0



**Mode Shape 3, (continued)**

Joint Label	X Translation	Y Translation	Z Translation	X Rotation	Y Rotation	Z Rotation
N70	5.719	.005	-.036	0	.057	0
N71	4.16	.007	.349	0	.079	0
N72	4.072	.004	-.035	0	.07	0
N73	4.193	.007	.021	0	.092	0

**Mode Shape 4**

Joint Label	X Translation	Y Translation	Z Translation	X Rotation	Y Rotation	Z Rotation
N1	.002	-.056	.01	0	0	0
N2	.002	-.04	.009	0	0	0
N3	.001	-.03	.01	0	0	0
N4	.001	-.014	.009	0	0	0
N5	0.000	0.000	0.000	0	0	0
N6	0.000	0.000	0.000	0	0	0
N7	0.000	0.000	0.000	0	0	0
N8	0.000	0.000	0.000	0	0	0
N9	.002	-.901	-.006	-.002	0	-.013
N10	.001	-.612	-.006	.006	0	-.008
N11	.002	-1.25	-.003	-.004	0	.001
N12	.001	-.743	-.003	.013	0	.003
N13	.002	-.669	.009	-.42	0	.023
N14	.001	-.324	.009	.32	0	.012
N15	.002	.095	.009	.04	0	.022
N16	.001	.05	.009	-.031	0	.011
N17	.002	.763	-.004	0	0	.005
N18	.001	.395	-.004	-.005	0	-.003
N19	.002	.67	-.012	.008	0	-.007
N20	.001	.349	-.012	-.011	0	-.004
N21	.003	-.037	.009	0	0	0
N22	.003	-1.224	-.006	-.016	0	-.012
N23	.003	-1.326	-.003	-.003	0	.001
N24	.003	-8.287	.009	-.362	0	.022
N25	.003	.831	.009	.035	0	.021
N26	.003	.761	-.004	0	0	.004
N27	.003	.817	-.012	.007	0	-.007
N28	.003	-.031	.009	0	0	0
N29	.004	-1.561	-.006	-.01	0	-.011
N30	.004	-1.371	-.003	0	0	.002
N31	.004	-14.943	.009	-.151	0	.02
N32	.004	1.472	.009	.014	0	.019
N33	.003	.723	-.004	-.002	0	.004
N34	.003	.931	-.012	0	0	-.006
N35	.004	.735	-.004	-.002	0	.004
N36	.001	-.038	.01	0	0	0
N37	.001	-1.512	-.006	.015	0	-.009
N38	-.002	-.056	.024	0	0	0
N39	-.002	-.04	.023	0	0	0
N40	-.002	-.03	.024	0	0	0
N41	-.002	-.014	.023	0	0	0
N42	-.002	-.048	.024	0	0	0
N43	0	-.056	.017	0	0	0
N44	0	-.048	.016	0	0	0
N45	0	-.04	.016	0	0	0
N46	.002	-.048	.009	0	0	.024
N47	-.002	-.043	.024	0	0	0
N48	0	-.043	.017	0	0	0
N49	0	-.03	.017	0	0	0
N50	.002	-.043	.01	0	0	0





**Mode Shape 4, (continued)**

Joint Label	X Translation	Y Translation	Z Translation	X Rotation	Y Rotation	Z Rotation
N51	-.002	-.022	.024	0	0	0
N52	0	-.022	.016	0	0	0
N53	0	-.014	.016	0	0	0
N54	.001	-.022	.009	0	0	.012
N55	-.002	-.027	.023	0	0	0
N56	0	-.027	.016	0	0	0
N57	.002	-.027	.009	0	0	0
N58	0	-.035	.016	0	0.000	0
N59	0	-.05	.016	0	0	0
N60	0	-.054	.017	0	0	0
N61	0	-.051	.017	0	0	0
N62	0	-.047	.016	0	0	0
N63	0	-.044	.016	0	0	0
N64	0	-.041	.016	0	0	0
N65	0	-.03	.016	0	0	0
N66	0	-.033	.016	0	0	0
N67	0	-.02	.016	0	0	0
N68	.001	-1.153	-.003	.009	0	.002
N69	0	-1.408	-.006	.019	0	-.009
N70	0	-1.098	-.003	.01	0	.002
N71	0	-.796	-.006	.028	0	-.008
N72	0	-.821	-.003	.012	0	.002
N73	.001	-.031	.01	0	0	0

**Mode Shape 5**

Joint Label	X Translation	Y Translation	Z Translation	X Rotation	Y Rotation	Z Rotation
N1	0	.06	-.016	0	0	0
N2	0	.063	-.015	0	0	0
N3	0	.02	-.016	0	0	0
N4	0	.024	-.015	0	0	0
N5	0.000	0.000	0.000	-.001	0	0
N6	0.000	0.000	0.000	-.001	0	0
N7	0.000	0.000	0.000	-.001	0	0
N8	0.000	0.000	0.000	-.001	0	0
N9	0	-.071	.011	0	0	-.002
N10	0	-.056	.011	0	0	-.001
N11	0	-.122	.004	0	0	0
N12	0	-.076	.004	0	0	0
N13	0	-.014	-.015	.046	0	.004
N14	0	-.014	-.015	-.034	0	.002
N15	0	.167	-.016	.439	0	.007
N16	0	.063	-.015	-.33	0	.003
N17	0	.38	.006	.001	0	.001
N18	0	.158	.006	-.004	0	0
N19	0	.337	.019	.004	0	-.003
N20	0	.142	.019	-.006	0	-.001
N21	0	.059	-.015	0	0	0
N22	-.001	-.104	.011	-.002	0	-.002
N23	-.001	-.126	.004	0	0	0
N24	-.001	.812	-.015	.039	0	.004
N25	-.001	8.138	-.016	.38	0	.006
N26	0	.398	.006	0	0	.001
N27	0	.41	.019	.003	0	-.003
N28	-.001	.049	-.015	0	0	0
N29	-.001	-.138	.011	-.001	0	-.002
N30	-.001	-.128	.004	0	0	0
N31	-.001	1.54	-.015	.017	0	.004







**Mode Shape 6, (continued)**

Joint Label	X Translation	Y Translation	Z Translation	X Rotation	Y Rotation	Z Rotation
N71	-.052	7.317	-.288	-.412	-.009	.047
N72	-.055	4.666	.056	-.016	-.009	-.035
N73	-.051	.118	.532	0	-.009	0

**Mode Shape 7**

Joint Label	X Translation	Y Translation	Z Translation	X Rotation	Y Rotation	Z Rotation
N1	.292	-.041	5.838	0	.002	0
N2	.292	-.035	5.221	0	.002	0
N3	.056	.027	5.838	0	.002	0
N4	.056	.033	5.221	0	.002	0
N5	0.000	0.000	0.000	.45	.002	-.023
N6	0.000	0.000	0.000	.402	.002	-.023
N7	0.000	0.000	0.000	.45	.002	-.004
N8	0.000	0.000	0.000	.402	.002	-.004
N9	.285	-.167	-3.06	-.002	.046	-.001
N10	.054	-.388	-3.13	.001	.05	-.004
N11	.278	-.161	.707	-.005	-.114	.001
N12	.061	-.379	.709	.002	-.132	.003
N13	.29	-.067	6.038	.007	-.003	.002
N14	.058	-.077	5.944	-.006	-.001	.006
N15	.295	-.03	5.534	.001	.017	.001
N16	.056	.059	5.493	0	.023	.005
N17	.311	.018	.027	.002	.102	0
N18	.055	.202	.024	.001	.127	.001
N19	.303	.017	-3.95	.004	-.012	0
N20	.056	.185	-3.942	0	-.017	-.001
N21	.51	-.026	5.229	0	-.013	0
N22	.621	-.768	-3.076	-.031	-.015	-.002
N23	.618	-.252	.708	-.005	.01	.001
N24	.564	.067	6.081	.006	-.015	.002
N25	.539	-.006	5.58	.001	-.019	.002
N26	.493	.053	.027	.002	-.04	0
N27	.502	.092	-3.96	.004	-.009	0
N28	.576	-.01	5.229	0	.024	0
N29	.635	-1.428	-3.096	-.021	.023	-.002
N30	.641	-.355	.709	-.003	.016	.002
N31	.661	.187	6.091	.003	.003	.003
N32	.665	.023	5.597	0	0	.002
N33	.62	.106	.026	.002	0	0
N34	.602	.184	-3.966	.002	.005	0
N35	.657	.096	.026	.002	.008	0
N36	-1.598	.008	5.849	0	.047	0
N37	-1.615	-1.62	-3.134	.018	.024	-.004
N38	.291	-.041	5.876	0	.002	0
N39	.291	-.035	5.26	0	.002	0
N40	.055	.027	5.876	0	.002	0
N41	.055	.033	5.26	0	.002	0
N42	.291	-.038	5.568	0	.002	0
N43	.292	-.041	5.857	0	.002	0
N44	.292	-.038	5.549	0	.002	0
N45	.292	-.035	5.241	0	.002	0
N46	.292	-.038	5.54	0	.002	.001
N47	.173	-.007	5.876	0	.002	0
N48	.174	-.007	5.857	0	.002	0
N49	.056	.027	5.857	0	.002	0
N50	.174	-.007	5.838	0	.002	0
N51	.055	.03	5.568	0	.002	0





**Mode Shape 8, (continued)**

Joint Label	X Translation	Y Translation	Z Translation	X Rotation	Y Rotation	Z Rotation
N33	.013	4.362	.002	-.008	0	.039
N34	.012	24.599	-.005	.124	0	-.022
N35	.016	4.393	.002	-.003	0	.04
N36	-.026	.028	.017	0	0	0
N37	-.026	2.478	-.005	-.034	0	-.007
N38	-.011	.048	0	0	0	0
N39	-.011	.107	-.017	0	0	0
N40	-.018	.018	0	0	0	0
N41	-.018	.076	-.017	0	0	0
N42	-.011	.078	-.008	0	0	0
N43	-.005	.048	.009	0	0	0
N44	-.005	.078	0	0	0	0
N45	-.005	.107	-.008	0	0	0
N46	.002	.078	.009	0	0	.05
N47	-.014	.033	0	0	0	0
N48	-.008	.033	.009	0	0	0
N49	-.011	.018	.009	0	0	0
N50	-.002	.033	.017	0	0	0
N51	-.018	.047	-.008	0	0	0
N52	-.011	.047	0	0	0	0
N53	-.011	.076	-.008	0	0	0
N54	-.005	.047	.009	0	0	.019
N55	-.014	.092	-.017	0	0	0
N56	-.008	.092	-.008	0	0	0
N57	-.002	.092	0	0	0	0
N58	-.008	.062	0	0	0.000	0
N59	-.005	.072	.002	0	0	0
N60	-.005	.055	.007	0	0	0
N61	-.005	.067	.003	0	0	0
N62	-.005	.08	0	0	0	0
N63	-.005	.093	-.004	0	0	0
N64	-.005	.103	-.007	0	0	0
N65	-.007	.095	-.008	0	0	0
N66	-.007	.098	-.008	0	0	0
N67	-.01	.083	-.008	0	0	0
N68	-.026	-1.122	.008	.019	0	-.003
N69	-.027	2.226	-.005	-.047	0	-.006
N70	-.027	-1	.008	.021	0	-.003
N71	-.011	.559	-.005	-.078	0	-.004
N72	-.01	-.413	.008	.026	0	-.004
N73	-.011	.02	.017	0	-.001	0

**Mode Shape 9**

Joint Label	X Translation	Y Translation	Z Translation	X Rotation	Y Rotation	Z Rotation
N1	-.689	-.005	-2.383	0	-.019	0
N2	-.689	-.008	4.085	0	-.019	0
N3	1.786	.008	-2.383	0	-.019	0
N4	1.786	.005	4.085	0	-.019	0
N5	0.000	0.000	0.000	-.184	-.019	.053
N6	0.000	0.000	0.000	.315	-.019	.053
N7	0.000	0.000	0.000	-.184	-.019	-.138
N8	0.000	0.000	0.000	.315	-.019	-.138
N9	-.704	-.01	-1.033	0	-.037	0
N10	1.854	.005	-1.03	0	-.066	0
N11	-.718	-.012	.036	0	.02	0
N12	1.929	.004	.023	0	.127	0
N13	-.706	-.009	.576	0	.01	0



**Mode Shape 9, (continued)**

Joint Label	X Translation	Y Translation	Z Translation	X Rotation	Y Rotation	Z Rotation
N14	1.823	.006	.452	0	-.041	0
N15	-.696	-.006	.914	0	.009	0
N16	1.787	.008	.957	0	-.016	0
N17	-.723	.003	.279	0	.045	0
N18	1.794	.013	.269	0	.029	0
N19	-.726	.005	-.596	.002	.024	0
N20	1.793	.014	-.573	-.001	-.026	0
N21	-3.171	-.007	4.094	0	.123	0
N22	-3.229	-.013	-1.036	0	.137	0
N23	-3.195	-.011	.034	0	.17	0
N24	-3.173	-.001	.566	0	.146	0
N25	-3.161	-.002	.934	0	.147	0
N26	-3.132	.006	.278	0	.153	0
N27	-3.12	.034	-.596	.001	.125	0
N28	-3.016	-.003	4.094	0	-.23	0
N29	-4.26	-.015	-1.039	0	-.147	0
N30	-4.318	-.009	.032	0	-.158	0
N31	-4.436	.007	.547	0	-.014	0
N32	-4.431	.003	.948	0	-.017	0
N33	-3.339	.009	.276	0	-.16	0
N34	-3.218	.064	-.592	0	-.063	0
N35	-4.291	.009	.276	0	-.114	0
N36	11.304	.005	-2.39	0	-.23	0
N37	11.405	-.009	-1.043	0	-.092	0
N38	-.688	-.005	-2.376	0	-.019	0
N39	-.688	-.008	4.093	0	-.019	0
N40	1.786	.008	-2.376	0	-.019	0
N41	1.786	.005	4.093	0	-.019	0
N42	-.688	-.007	.859	0	-.019	0
N43	-.688	-.005	-2.379	0	-.019	0
N44	-.688	-.007	.855	0	-.019	0
N45	-.688	-.008	4.089	0	-.019	0
N46	-.689	-.007	.852	0	-.019	0
N47	.549	.002	-2.376	0	-.019	0
N48	.549	.002	-2.379	0	-.019	0
N49	1.786	.008	-2.379	0	-.019	0
N50	.551	.002	-2.383	0	-.02	0
N51	1.786	.007	.859	0	-.019	0
N52	1.786	.007	.855	0	-.019	0
N53	1.786	.005	4.089	0	-.019	0
N54	1.786	.007	.852	0	-.019	0
N55	.549	-.001	4.093	0	-.019	0
N56	.549	-.001	4.089	0	-.019	0
N57	.545	-.001	4.085	0	-.02	0
N58	.549	0	.855	0	0.000	0
N59	-.688	-.006	.208	0	-.019	0
N60	-.688	-.005	-1.678	0	-.019	0
N61	-.688	-.006	-.275	0	-.019	0
N62	-.688	-.007	1.127	0	-.019	0
N63	-.688	-.007	2.53	0	-.019	0
N64	-.688	-.008	3.66	0	-.019	0
N65	.301	-.003	4.089	0	-.019	0
N66	.013	-.004	4.089	0	-.019	0
N67	1.24	.002	4.089	0	-.019	0
N68	11.49	-.002	.027	0	-.072	0
N69	11.491	-.007	-1.042	0	.073	0
N70	11.428	0	.026	0	.102	0
N71	4.188	.003	-1.034	0	.396	0



**Mode Shape 9, (continued)**

Joint Label	X Translation	Y Translation	Z Translation	X Rotation	Y Rotation	Z Rotation
N72	3.77	.003	.024	0	.36	0
N73	4.308	.008	-2.386	0	.429	0

**Mode Shape 10**

Joint Label	X Translation	Y Translation	Z Translation	X Rotation	Y Rotation	Z Rotation
N1	.059	-.019	3.5	0	.01	0
N2	.059	-.015	.163	0	.01	0
N3	-1.217	.016	3.5	0	.01	0
N4	-1.217	.02	.163	0	.01	0
N5	0.000	0.000	0.000	.27	.01	-.005
N6	0.000	0.000	0.000	.012	.01	-.005
N7	0.000	0.000	0.000	.27	.01	.094
N8	0.000	0.000	0.000	.012	.01	.094
N9	.066	-.025	5.725	0	.322	0
N10	-1.221	.02	6.004	0	.317	0
N11	.07	-.024	-15.183	0	.091	0
N12	-1.227	.021	-15.402	0	.132	0
N13	.049	-.019	-1.342	0	-.26	0
N14	-1.22	.018	-1.37	0	-.3	0
N15	.061	-.017	1.856	0	-.005	0
N16	-1.219	.018	1.827	0	0	0
N17	.071	-.015	1.286	0	.026	0
N18	-1.226	.023	1.295	0	.034	0
N19	.07	-.014	-.849	0	.016	0
N20	-1.225	.025	-.846	0	.023	0
N21	.198	-.011	.164	0	.003	0
N22	.204	-.031	5.79	0	.008	0
N23	.216	-.017	-15.25	0	-.021	0
N24	.298	-.006	-1.374	0	.06	0
N25	.273	-.006	1.891	0	-.001	0
N26	.223	-.011	1.29	0	-.007	0
N27	.203	-.002	-.854	0	-.005	0
N28	-.333	-.002	.164	0	.021	0
N29	-.156	-.035	5.872	0	-.002	0
N30	-.169	-.007	-15.321	0	.007	0
N31	-.204	.009	-1.393	0	.04	0
N32	-.203	.008	1.903	0	.027	0
N33	-.33	-.002	1.294	0	.019	0
N34	-.331	.016	-.857	0	.022	0
N35	-.198	-.004	1.293	0	.024	0
N36	1.254	.006	3.515	0	-.037	0
N37	1.277	-.018	6.024	0	-.001	0
N38	.058	-.019	3.519	0	.01	0
N39	.058	-.015	.183	0	.01	0
N40	-1.218	.016	3.519	0	.01	0
N41	-1.218	.02	.183	0	.01	0
N42	.058	-.017	1.851	0	.01	0
N43	.059	-.019	3.51	0	.01	0
N44	.059	-.017	1.841	0	.01	0
N45	.059	-.015	.173	0	.01	0
N46	.059	-.017	1.827	0	.01	0
N47	-.58	-.002	3.519	0	.01	0
N48	-.579	-.002	3.51	0	.01	0
N49	-1.217	.016	3.51	0	.01	0
N50	-.578	-.002	3.5	0	.01	0
N51	-1.218	.018	1.851	0	.01	0
N52	-1.217	.018	1.841	0	.01	0





**Mode Shape 10, (continued)**

Joint Label	X Translation	Y Translation	Z Translation	X Rotation	Y Rotation	Z Rotation
N53	-1.217	.02	.173	0	.01	0
N54	-1.217	.018	1.829	0	.01	0
N55	-.58	.002	.183	0	.01	0
N56	-.579	.002	.173	0	.01	0
N57	-.579	.002	.163	0	.01	0
N58	-.579	0	1.841	0	0.000	0
N59	.059	-.018	2.175	0	.01	0
N60	.059	-.019	3.148	0	.01	0
N61	.059	-.018	2.424	0	.01	0
N62	.059	-.017	1.701	0	.01	0
N63	.059	-.016	.977	0	.01	0
N64	.059	-.016	.394	0	.01	0
N65	-.452	-.001	.173	0	.01	0
N66	-.303	-.005	.173	0	.01	0
N67	-.936	.012	.173	0	.01	0
N68	1.291	.012	-15.411	0	0	0
N69	1.219	-.012	6.033	0	.025	0
N70	1.217	.014	-15.42	0	.026	0
N71	-.551	.014	6.025	.001	.107	0
N72	-.523	.02	-15.414	0	.109	0
N73	-.55	.014	3.506	0	.11	0

**Response Spectra Data**

X Direction Spectra	ASCE 2010, Parametric Design Spectra
Modes Used	All 10 modes
Mode No. for Signs	
Modal Combination Method	CQC
Damping Ratio	5 Percent

Y Direction Spectra	ASCE 2010, Parametric Design Spectra
Modes Used	All 10 modes
Mode No. for Signs	
Modal Combination Method	CQC
Damping Ratio	5 Percent

Z Direction Spectra	ASCE 2010, Parametric Design Spectra
Modes Used	All 10 modes
Mode No. for Signs	
Modal Combination Method	CQC
Damping Ratio	5 Percent

**Frequencies / Participation**

Mode Number	Frequency (Hz)	Period (Sec)	Percent Modal Participation		
			X Spectra	Y Spectra	Z Spectra
1	7.09	.14			43.99
2	9.07	.11	.73		18.67
3	10.94	.09	95.21		.2
4	13.69	.07		14.31	
5	14.03	.07		18.55	
6	16.89	.06		10.31	.29
7	17.04	.06	.04	.07	35.25
8	20.52	.05		9.02	
9	21.13	.05	.15		.35



Company : Morrison Hershfield  
Designer : ML  
Job Number : GED-577R5 / 2000204  
Model Name : 75153-A /GOOD SAMARITAN

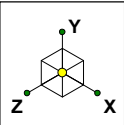
Dec 5, 2019  
3:00 PM  
Checked By: SWS

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**Frequencies / Participation, (continued)**

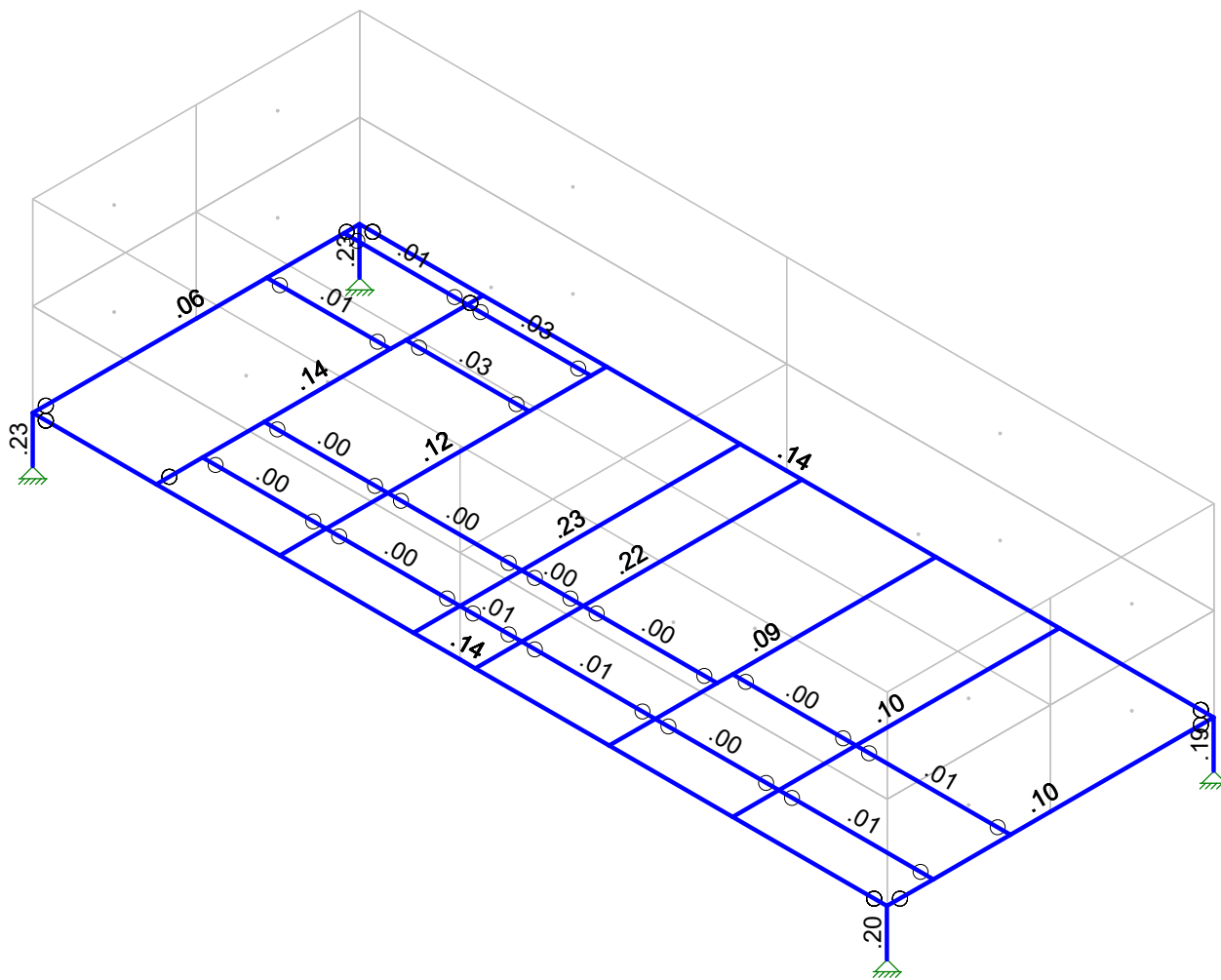
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Mode Number	Frequency (Hz)	Period (Sec)	Percent Modal Participation		
			X Spectra	Y Spectra	Z Spectra
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Totals :			96.22	52.26	99.58



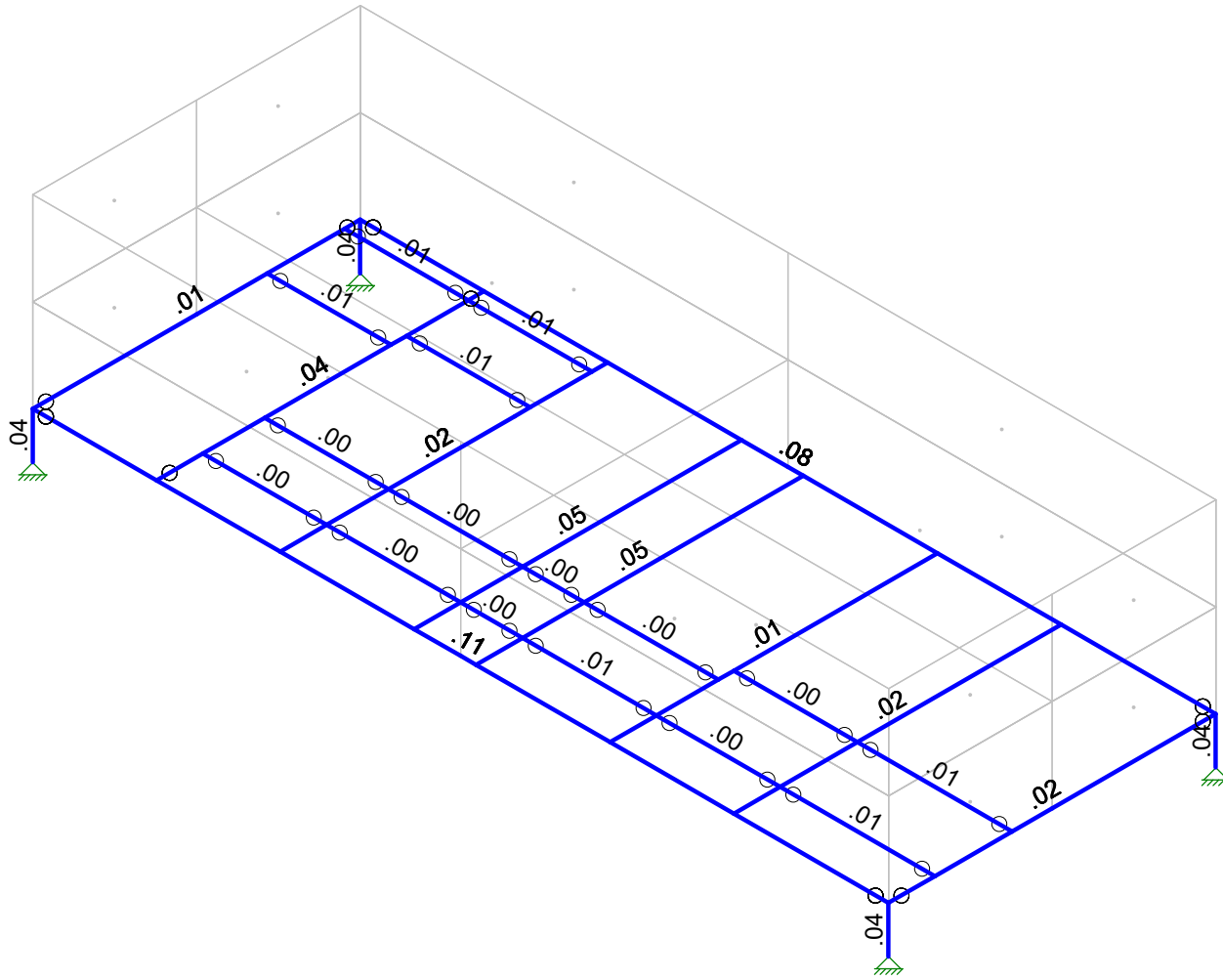
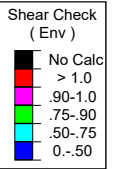
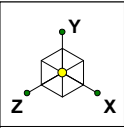
Code Check ( Env )

Black	No Calc
Red	> 1.0
Magenta	.90-1.0
Green	.75-.90
Cyan	.50-.75
Blue	0-.50



Member Code Checks Displayed (Enveloped)  
Envelope Only Solution

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GED-577R5 / 2000204		Platform Analysis_Seismic.r3d

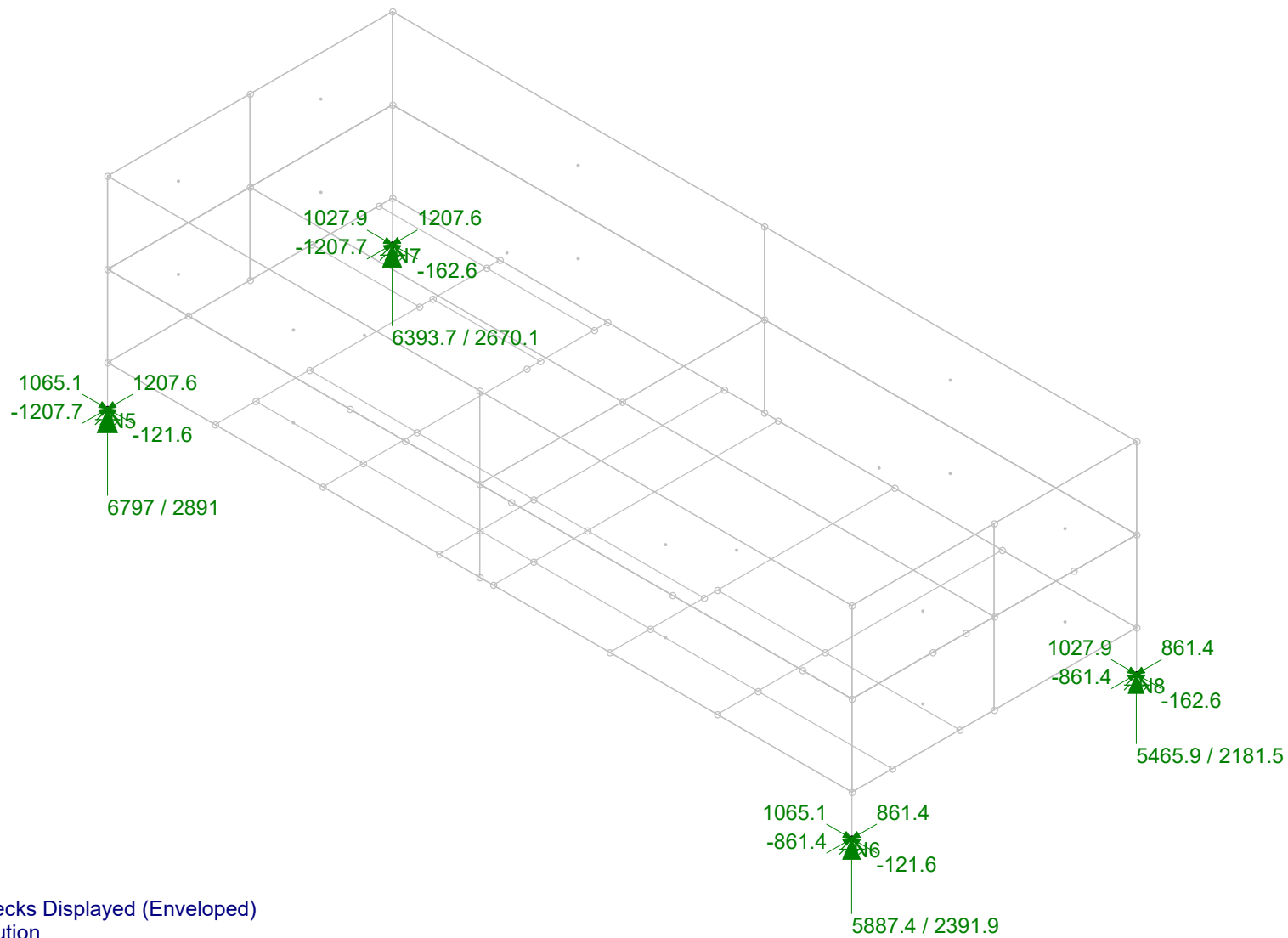
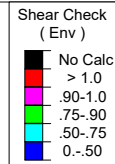
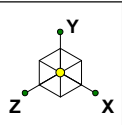


Member Shear Checks Displayed (Enveloped)  
Envelope Only Solution

Morrison Hershfield
ML
GED-577R5 / 2000204

75153-A /GOOD SAMARITAN
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SK - 2
Dec 5, 2019 at 3:01 PM
Platform Analysis_Seismic.r3d

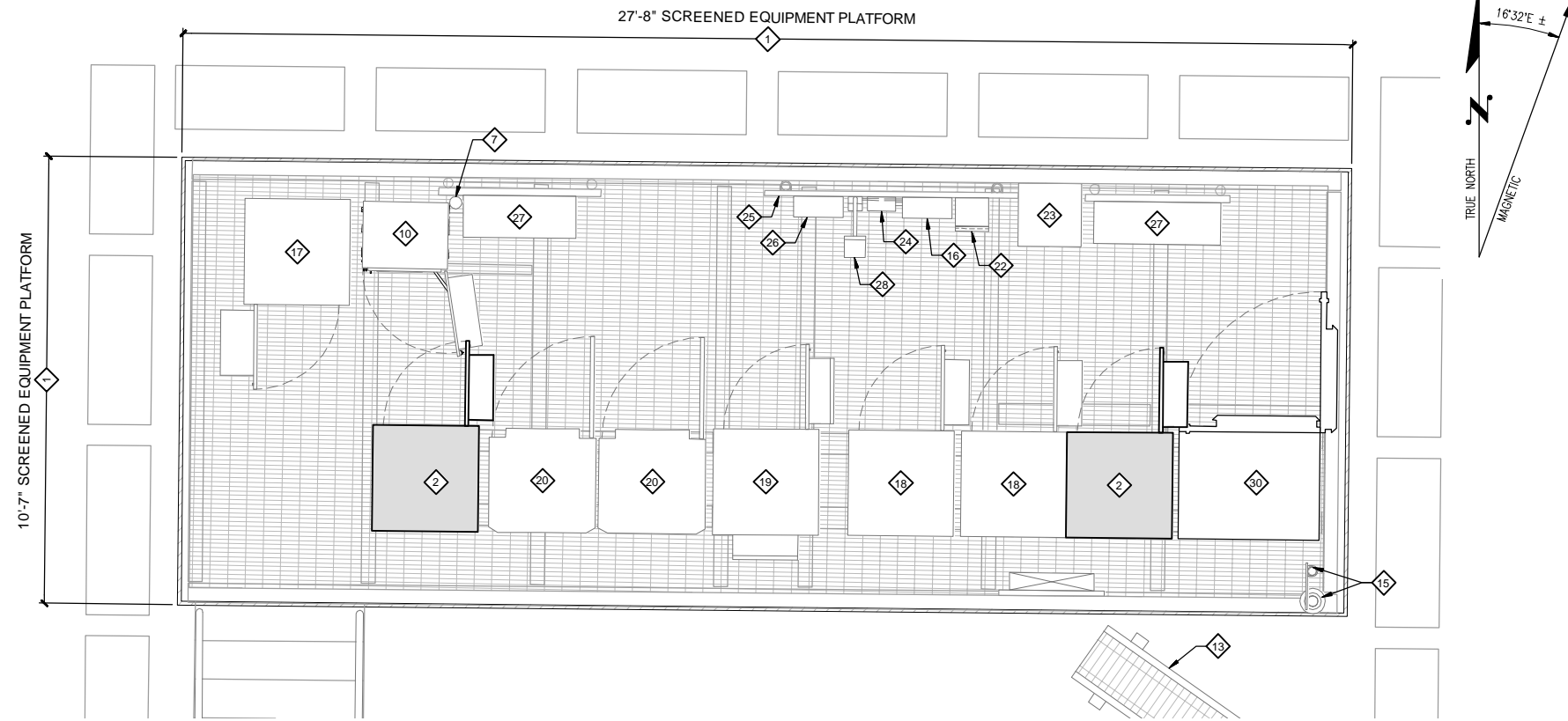


Member Shear Checks Displayed (Enveloped)  
 Envelope Only Solution  
 Reaction and Moment Units are lb and lb-ft (Enveloped)

Morrison Hershfield  
 ML  
 GED-577R5 / 2000204

75153-A /GOOD SAMARITAN

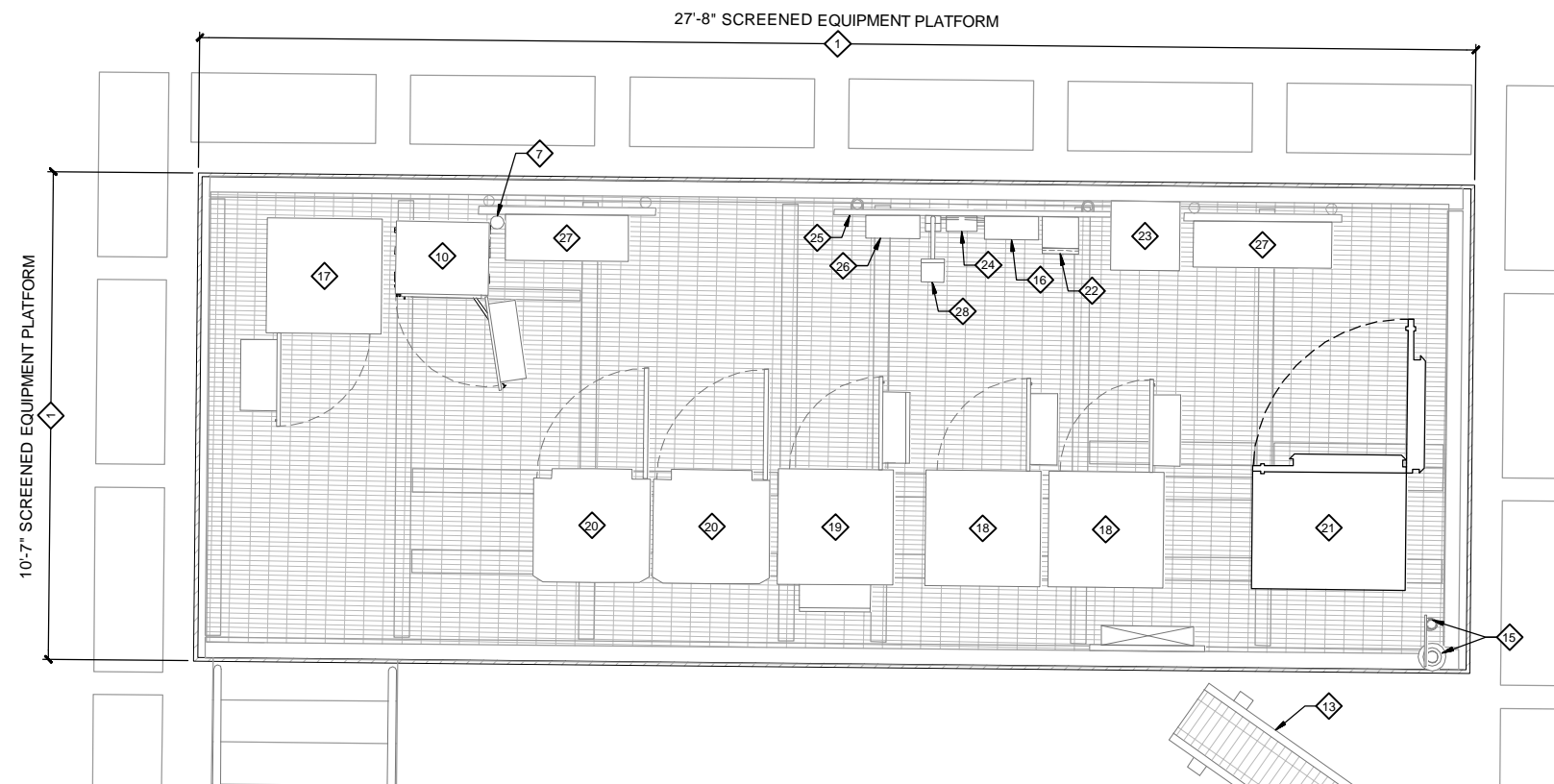
SK - 3  
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 Platform Analysis\_Seismic.r3d



**PROPOSED ENLARGED ANTENNA PLAN**

22"x34" SCALE: 1/2" = 1'-0"    11"x17" SCALE: 1/4" = 1'-0"

**2**



**EXISTING ENLARGED EQUIPMENT PLAN**

22"x34" SCALE: 1/2" = 1'-0"    11"x17" SCALE: 1/4" = 1'-0"

**1**

**CONSTRUCTION PLAN KEYED NOTES**

- 1 EXISTING AT&T SCREENED EQUIPMENT PLATFORM (27' x 10').
- 2 PROPOSED AT&T BBU CABINETS W/ (38) BATTERIES TO BE INSTALLED. (1/4)
- 7 EXISTING AT&T LTE GPS ANTENNA (TO REMAIN).
- 10 EXISTING AT&T LTE PURCELL CABINET (TO REMAIN).
- 13 EXISTING AT&T CABLE TRAY (TO REMAIN).
- 15 EXISTING AT&T GPS ANTENNAS (TO REMAIN).
- 16 EXISTING AT&T AC PANEL (TO REMAIN).
- 17 EXISTING AT&T ARGUS TE43 CABINET (TO REMAIN).
- 18 EXISTING AT&T BBU CABINET (TO REMAIN).
- 19 EXISTING AT&T ARGUS POWER CABINET (TO INSTALL (4) CORDEX RECTIFIERS) (TO REMAIN).
- 20 EXISTING AT&T GSM CABINET (TO REMAIN).
- 21 EXISTING AT&T UMTS CABINET (TO BE RELOCATED).
- 22 EXISTING AT&T GEN PLUG ENCLOSURE (TO REMAIN).
- 23 EXISTING AT&T TRANSFORMER (TO REMAIN).
- 24 EXISTING AT&T SURGE SUPPRESSION BOX (TO REMAIN).
- 25 EXISTING AT&T UTILITY H-FRAME (TO REMAIN).
- 26 EXISTING AT&T TELCO DEMARC (TO REMAIN).
- 27 EXISTING AT&T HOFFMAN BOX (TO REMAIN).
- 28 EXISTING AT&T WATERPROOF SERVICE LIGHT (TO REMAIN)
- 30 RELOCATED AT&T UMTS CABINET.

**SITE NOTES**

1. CONTRACTOR TO FIELD VERIFY SITE CONDITIONS DEPICTED IN THESE DRAWING AND NOTIFY THE ENGINEER OF RECORDED OF ANY DISCREPANCIES RELATED TO THE PROPOSED SCOPE OF WORK.
2. EXISTING UNDERGROUND UTILITY LOCATIONS ARE APPROXIMATE. CONTRACTOR SHALL CALL FOR LOCATES PRIOR TO DIGGING.

Plan 2012 equipment configuration showing many cabinets.



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THE CIVIL ENGINEERING GROUP  
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 www.LDCcorp.com

DATE:	10-19-12
DRAWN BY:	CAG
CHECKED BY:	MEV

REVISIONS			
REV	DATE	DESCRIPTION	BY
1	10-19-12	PRELIMINARY CONSTRUCTION	MEV
2	11-02-12	FINAL CONSTRUCTION	MEV



**SITE**  
 WA659  
 GOOD SAMARITAN  
 407 14TH AVE SE  
 PUYALLUP, WA 98372

**SHEET TITLE**  
 ENLARGED SITE PLAN

**SHEET NUMBER**  
**A-2**