Design Report

KD-VGM2500 MILL ASSEMBLY

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Project Name: VGM2500

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1.0 INTRODUCTION

1.1 Introduction

This document forms the Engineering Analysis and Design basis for Structural Works of proposed Assembly. The contents of these documents form the guideline for engineering and to provide information to the other disciplines concerned.
This technical specification summarizes the concept and detailed engineering analysis / design report prepared on basis of codes to be followed.

1.2 Scope of Analysis and Design

The scope of this structural analysis and design is to check the assembly for better performance and provide enough protection against adverse natural loadings like Wind and Seismic activity. Structure is designed to safeguard the equipments.

1.3 Overview of loading and Combinations

The following loads were considered in the analysis and design of structure:

- Dead weight of the assembly.
- Live load applicable as per mentioned by client.
- Wind and seismic loads as per mentioned in codes.

1.4 Overview of structural Analysis and Design

Structural analysis and design is done using hi-end FE software called STAAD-Pro. All elements are modelled as beam elements with six degree of freedom at each end. Synchronized structural model has been created as a rigid portal frame with hinge supports at bottom. All structural elements are modelled as per actual shapes and inbuilt library is used to create realistic model. Load has been applied as per relevant AISC Code and Static FE analysis and design is done as per code specifications.

1.5 Abbreviations

- v = Seismic Base Shear
- m = Total mass of the building above the foundation
- Sd(T1) = Ordinate of the design spectrum at period T1
- H= Height of the building

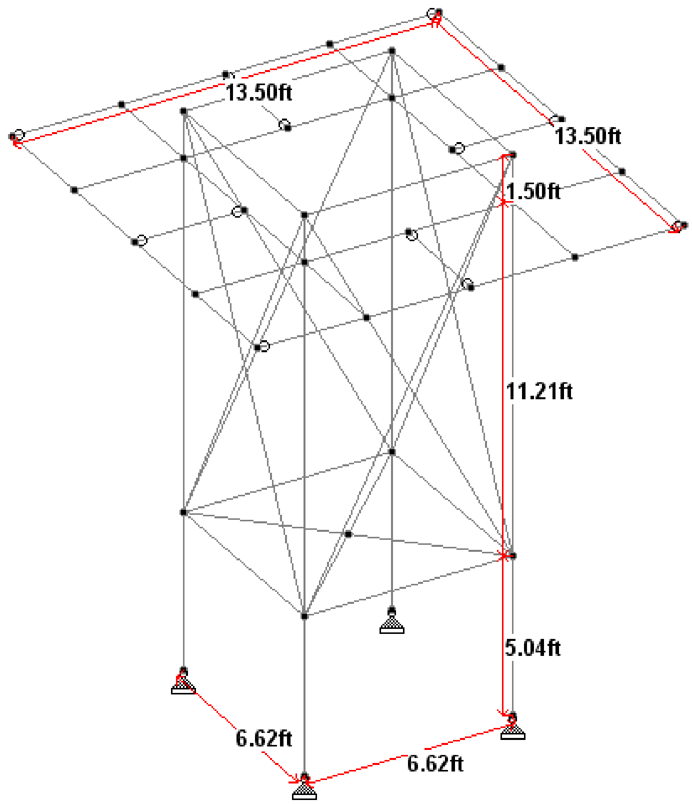
- Vbo = Fundamental Basic Wind Velocity
- Vb = Basic Wind Velocity
- Ze = Reference Height
- Zo = Roughness Length
- Zmin = Minimum Height
- Zmax = Maximum Height
- qp(z) = Peak Velocity Pressure
- Co = Orography factor
- ρ = Air Density
- Cr(z) = Roughness factor
- Kr = Terrain factor
- Vm(z) = Mean Wind Velocity
- We = Wind Pressure on External Surface
- Wi = Wind Pressure on Internal Surface
- Cpe = External pressure coefficients
- Cpi = Internal pressure coefficients
- Ce = Exposure Coefficient
- Ct = Thermal Coefficient

2.0 GEO-TECHNICAL EXPLORATORY SURVEY

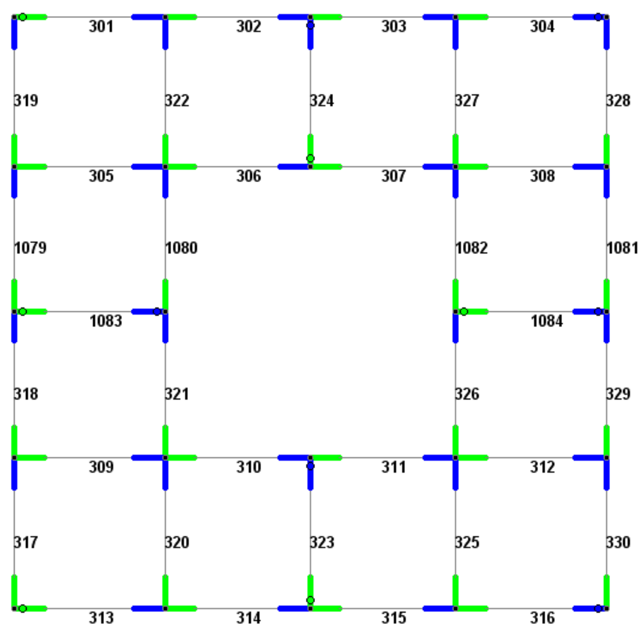
The GEO technical investigation Engineer is responsible for the acquisition of a geo-technical exploratory survey to obtain accurate information about the soil conditions at the site. The depth, thickness, extent, composition of each stratum, and the depth of ground water shall be determined. Provide a geo-technical report based on survey data, which includes boring logs, field and laboratory test results, interpretation of data, building foundation and earthwork recommendations.

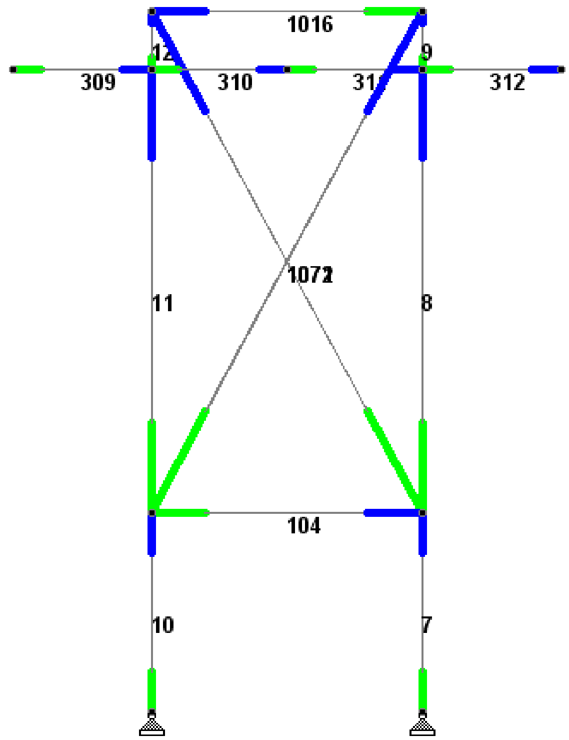
3.0 LAYOUTS AND 3D ANALYSIS MODELS

3.1 Geometry Data



3.2 Member Numbers

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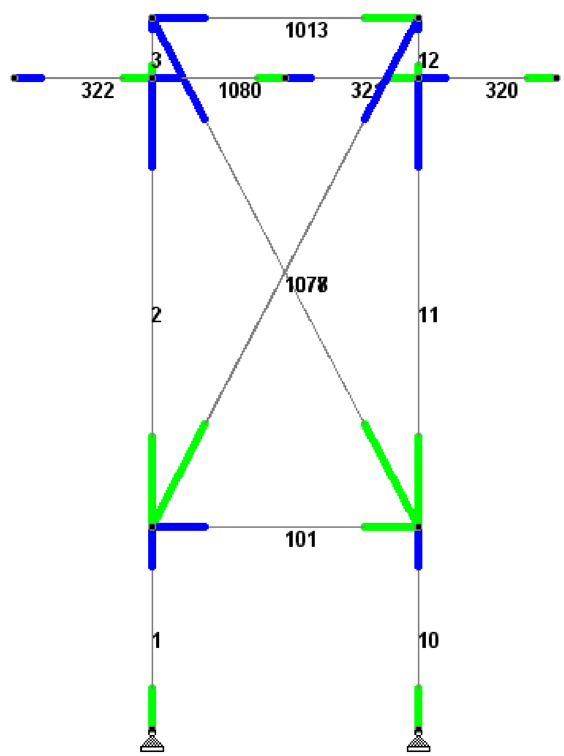
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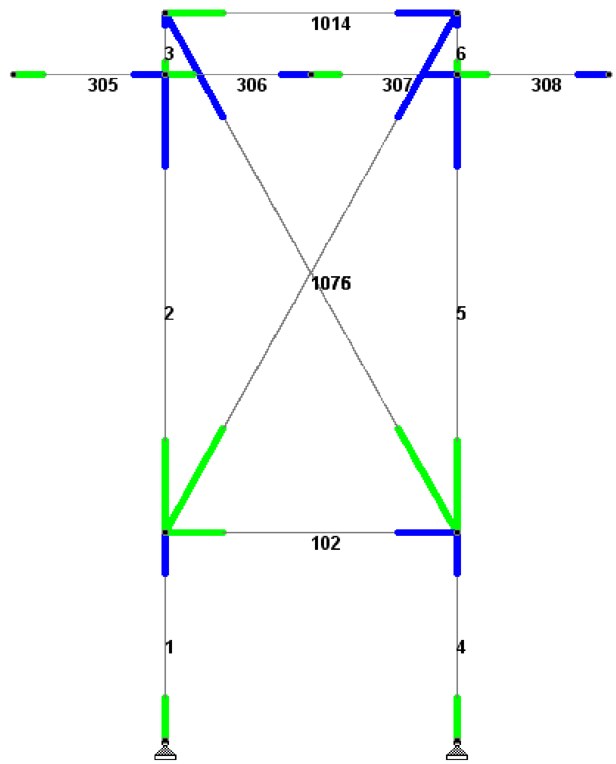
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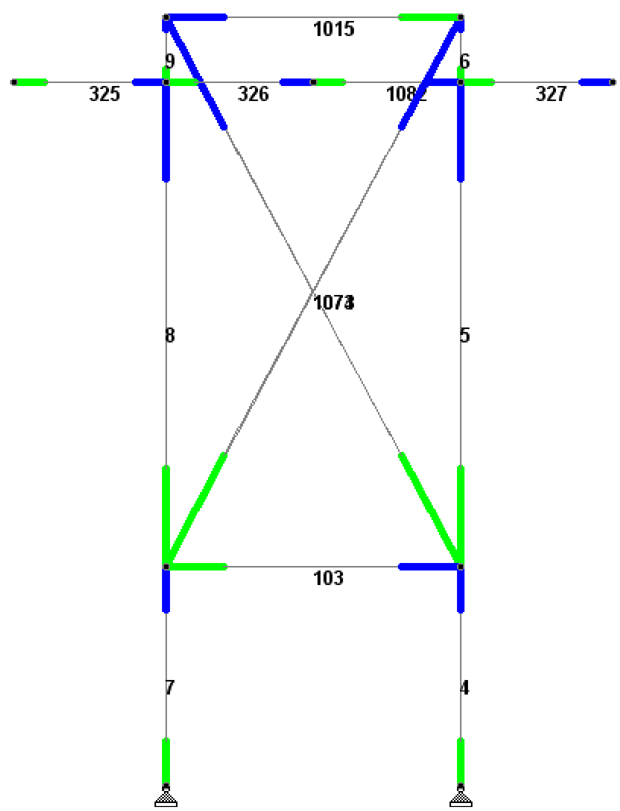
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103
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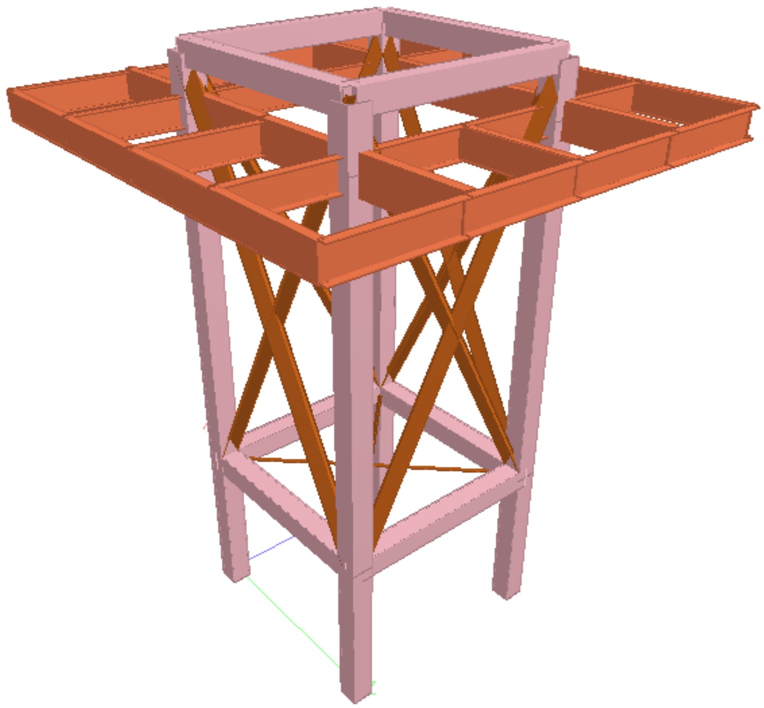
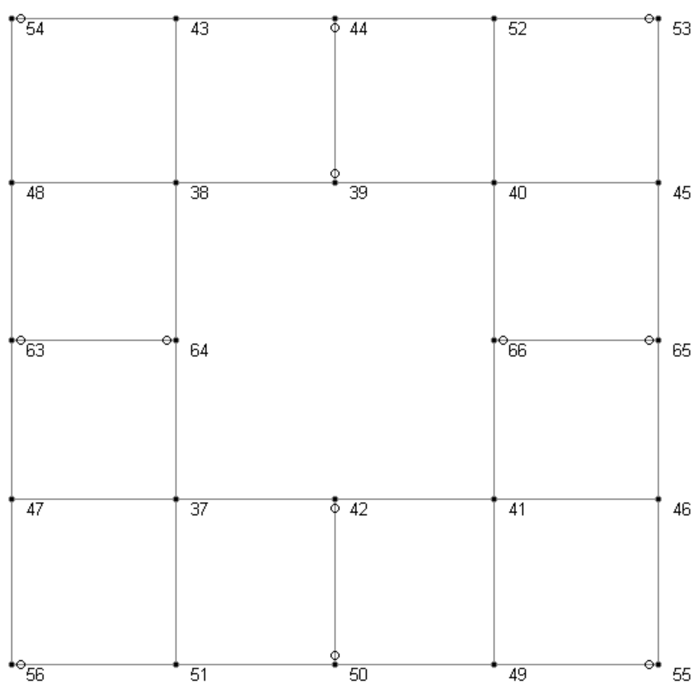
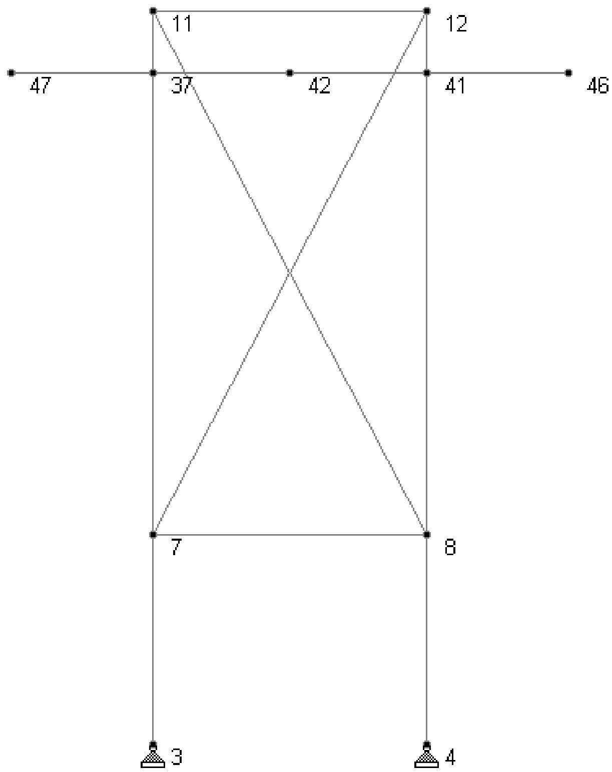
Isometric:



Node Numbers

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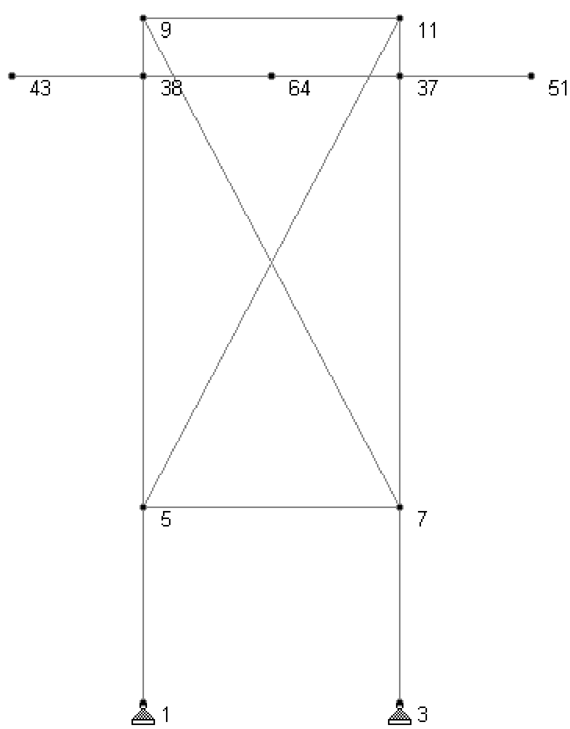
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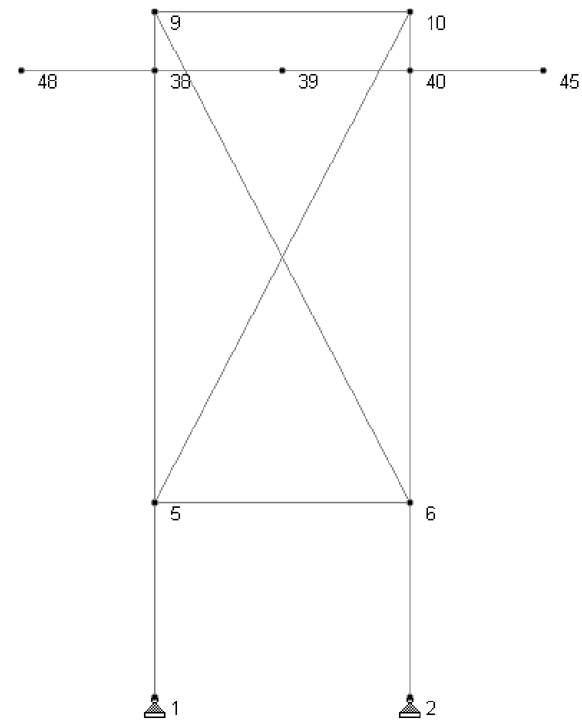
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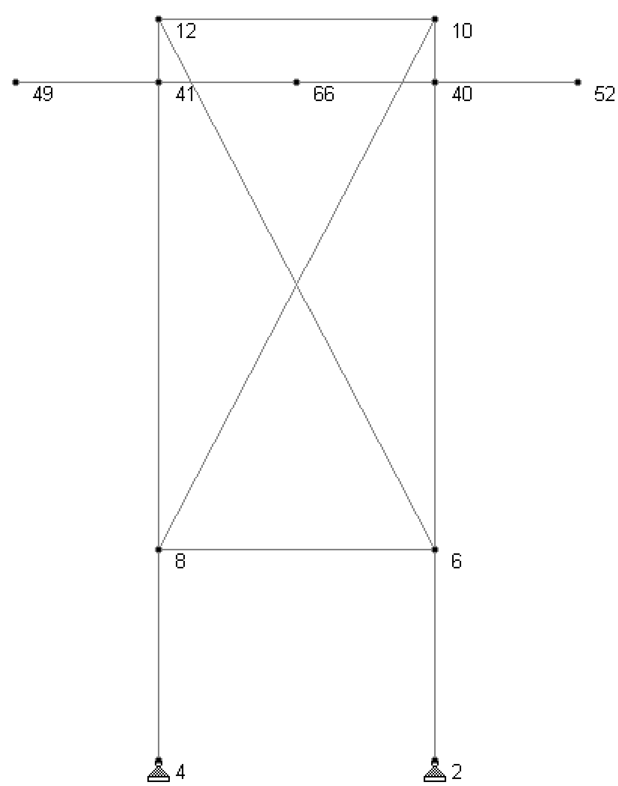
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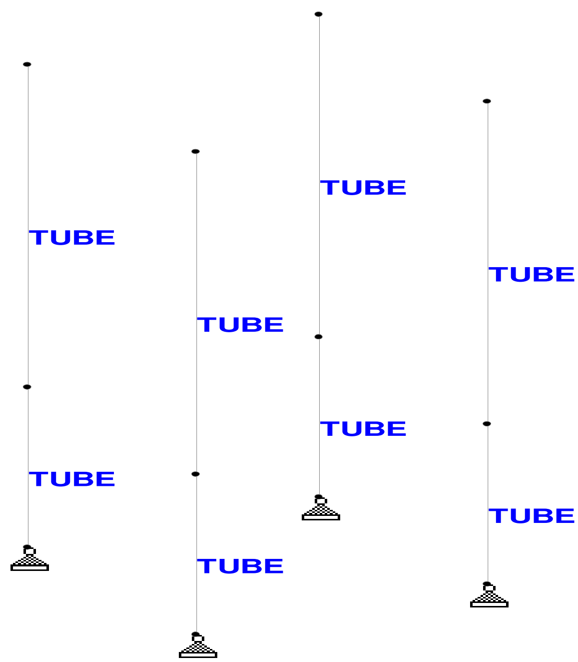
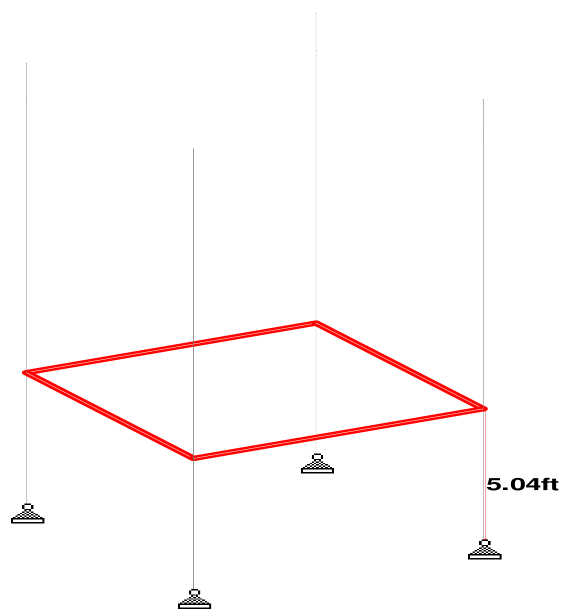
Member Sizes:

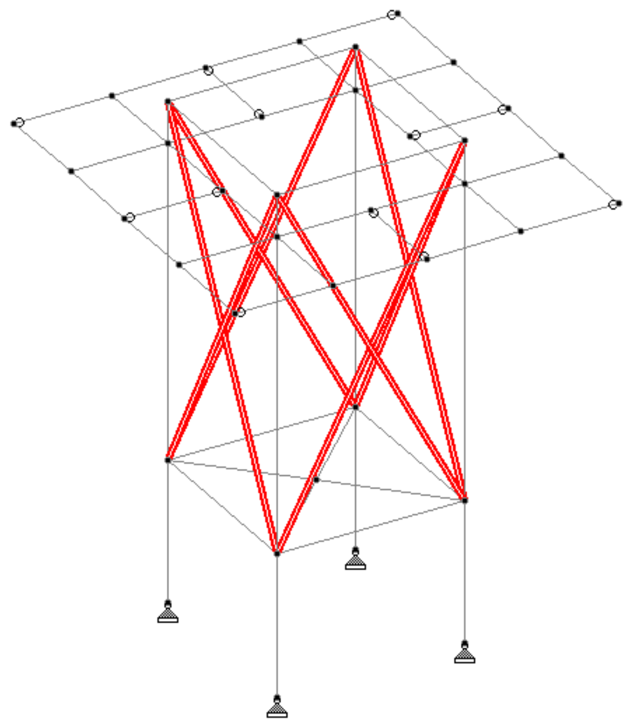
Column Sizes are HSS: 8" x 8" x 1/2"



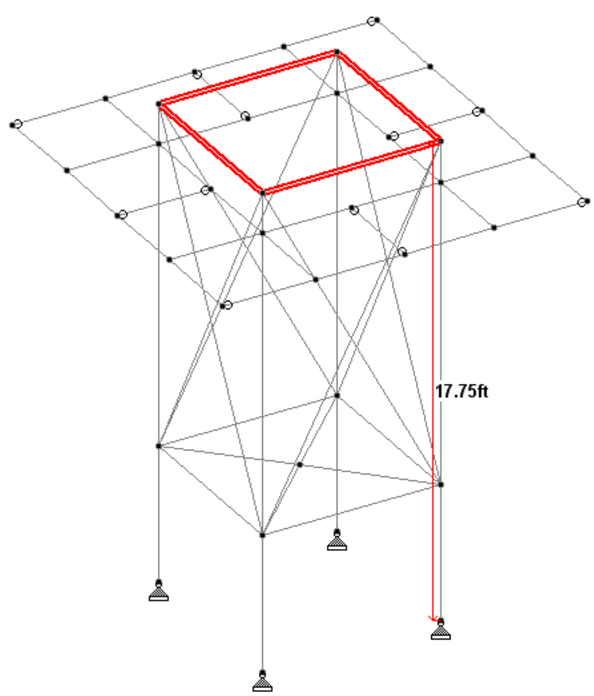
Beam Sizes are HSS: 8" x 8" x 1/2" at 5.04 ft level



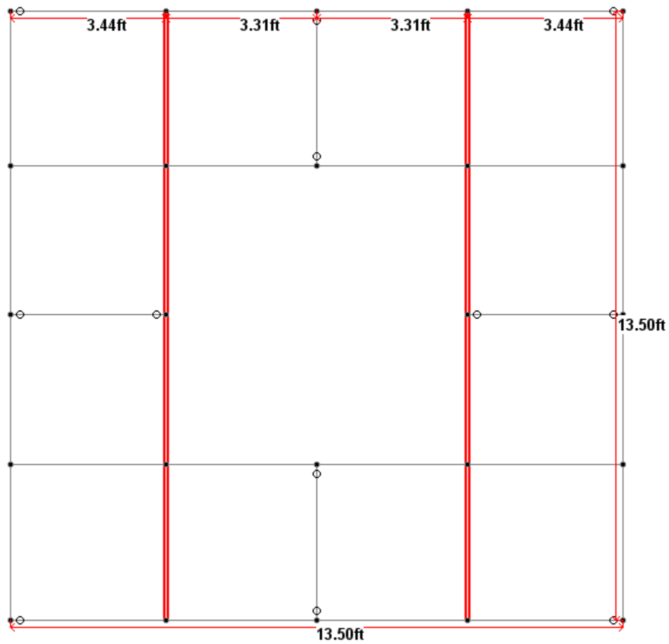
All elevation Bracing Sizes are L5 " x 5" x 0.31"



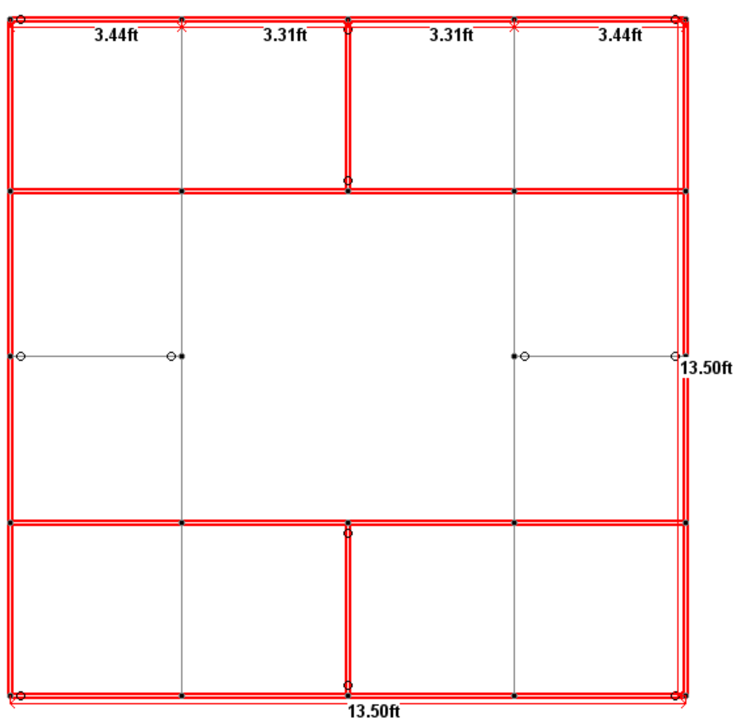
Beam Sizes are HSS: 8" x 6" x 1/2" at 17.75 ft level



Beam Sizes are C12x30 at 15.59 ft height Access Platform



Beam Sizes are C10x15.3 at 15.59 ft height Access Platform



4.0 DESCRIPTION OF STAAD Pro ANALYSIS

4.1 Software package

For analysis and Design high end Finite Element based software called "STAAD Pro" is being used to analyze and design the structure. Structural framing members are modeled as a beam element with six degree of freedom at each end. Space frame has been generated as per approved General arrangement drawing and finalized column position. All loads have been simulated in the model to analyse the structure for stability. Unic feature of optimization available in software package has been used to optimize the structure.

4.2 Units

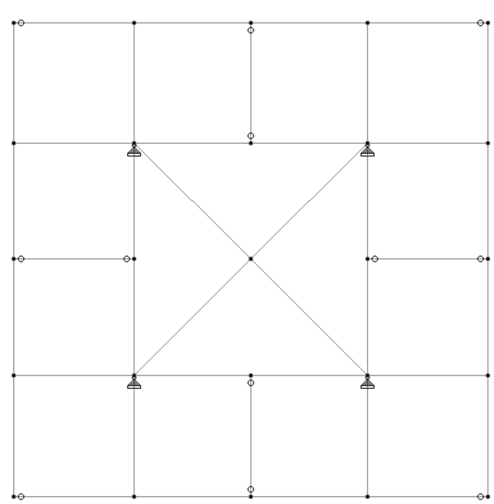
S.I. units were used in this analysis, see table below:

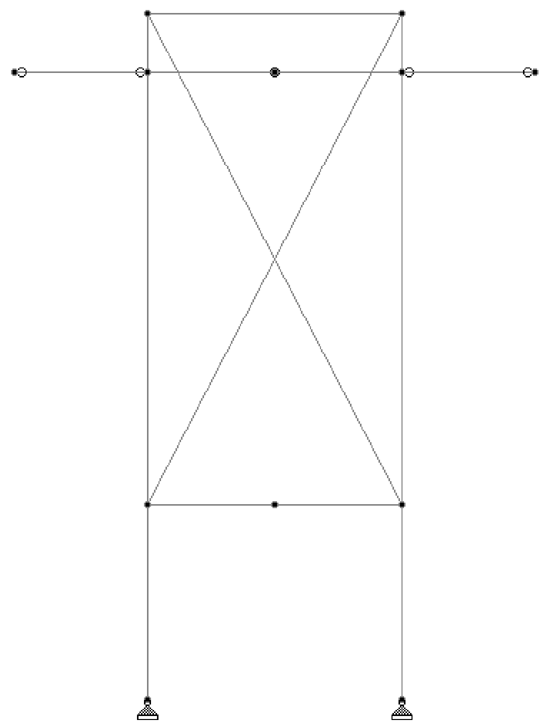
Quantity	Name	Unit	
Length	Feet	ft	
Mass	Pound	lb	
Load	Kilo Pound	kip	-
Density	--	--	Lb/ft3
Force	Pound	lb	-
Area	Sqrare inches	---	in^2

4.3 Coordinate System

The FE model was built in the Global Coordinate System whose origin is at the (0,0,0). The Y-axis points vertically upward. The X-axis points in the direction parallel to longer side of building. Z-axis points in the direction parallel to width of the building.

4.4 Geometry





4.5 Support Condition/boundary condition

All supports have been considered as pinned with restrain of forces in all three directions (Fx, Fy, Fz). Moments are released in all three directions (Mx, My, Mz)

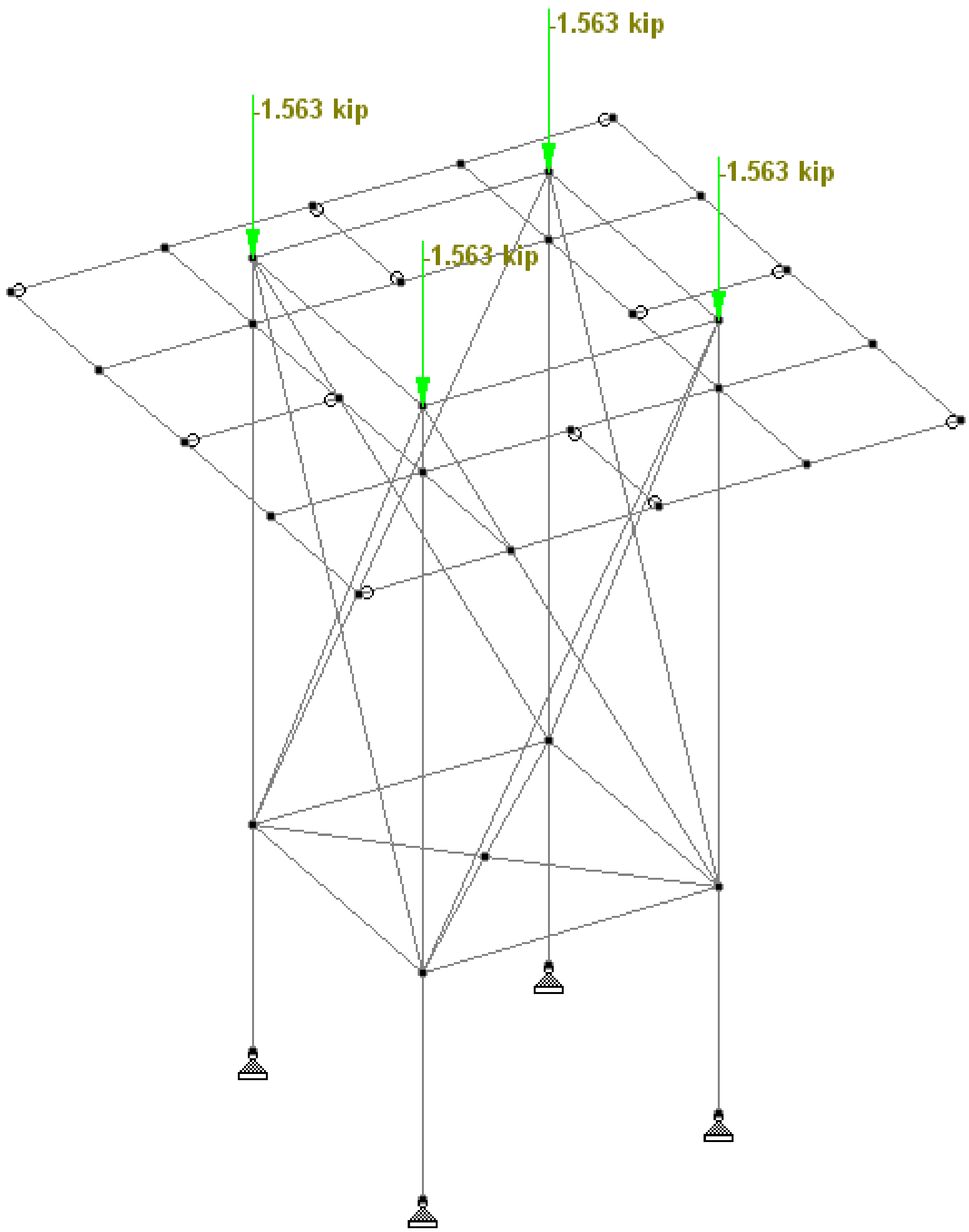
4.6 Loading Data

Design Loads: Building Design Loads will be in accordance with the more stringent of either the following criteria or as set forth by governing local and national codes. Structural design is based on coordinated loads supplied from client of different equipments, self weight, seismic and wind. Wind and seismic loads are considered as the most critical one to design the structure.

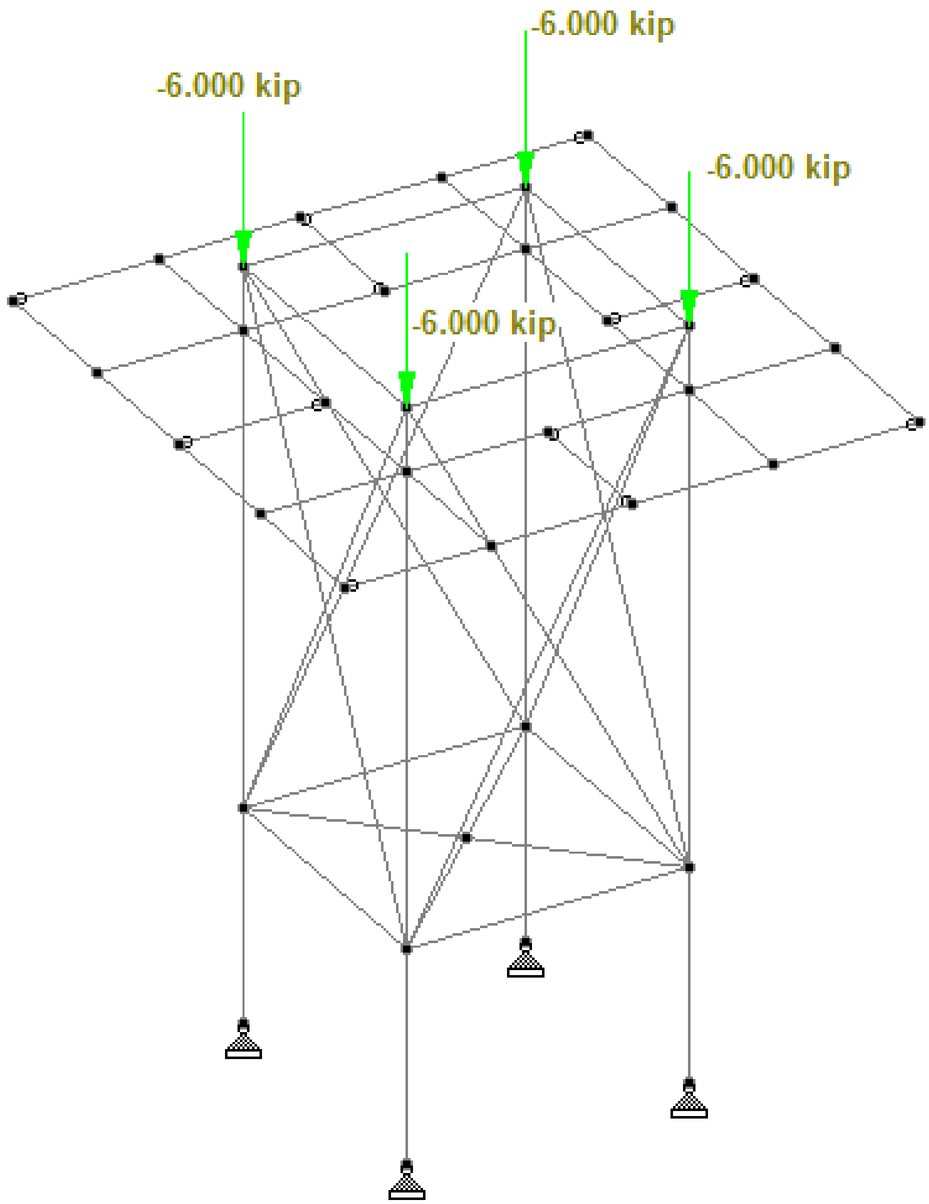
4.6.1 Dead load:

Load data
Dead Load

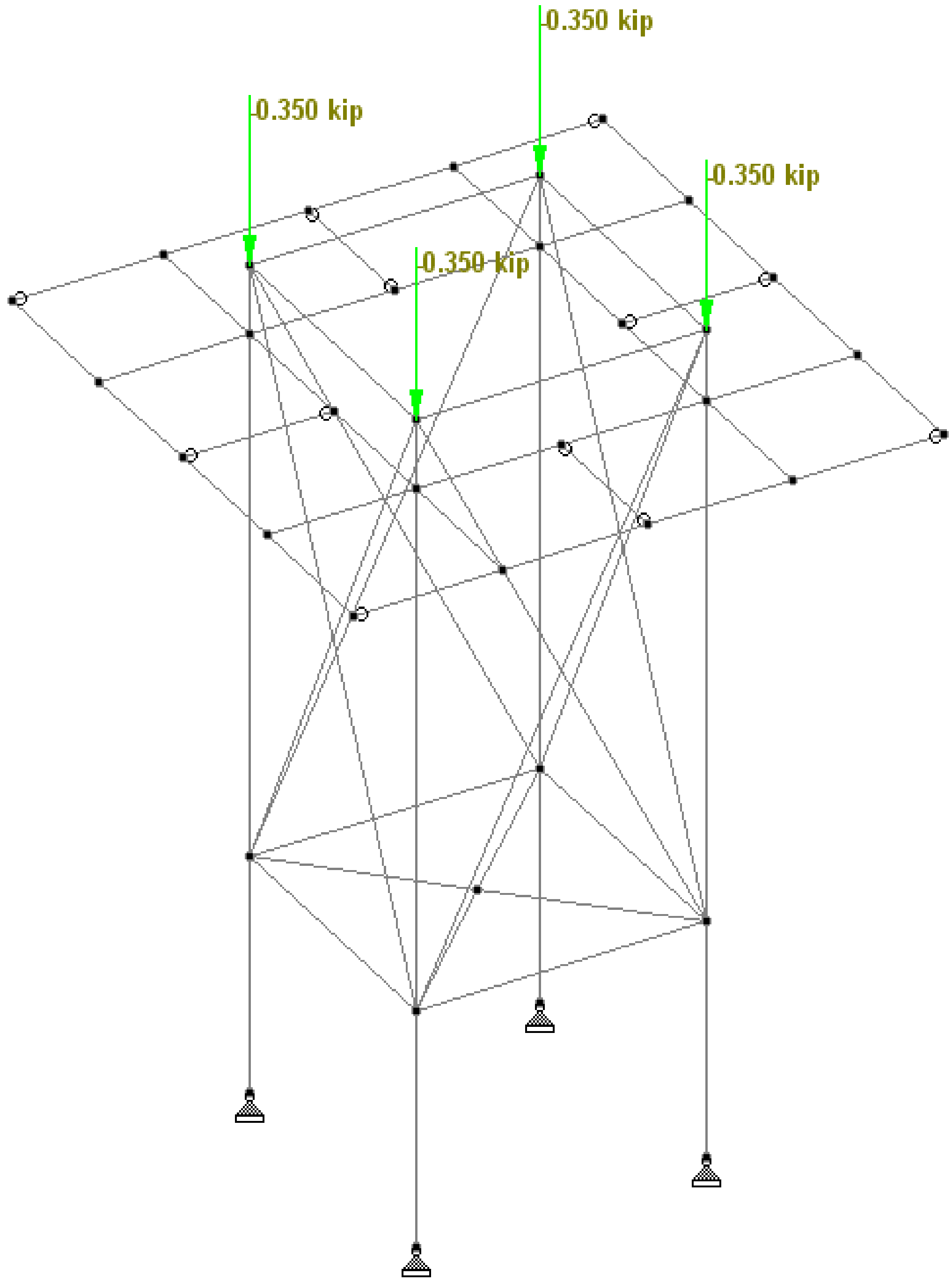
****Upper frame weight 6253/4=1563lb**



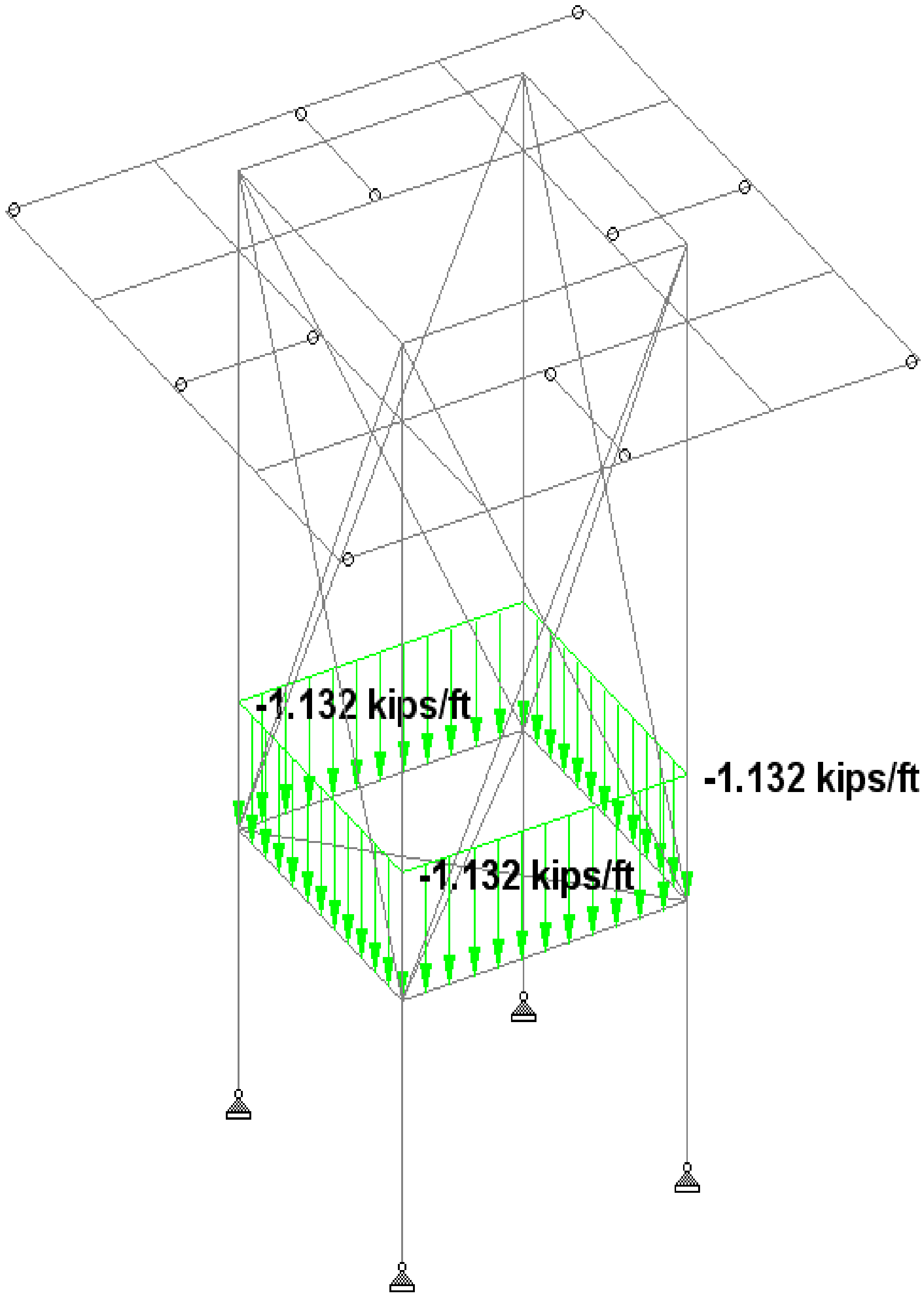
****motor weight 24000/4=6000lb**



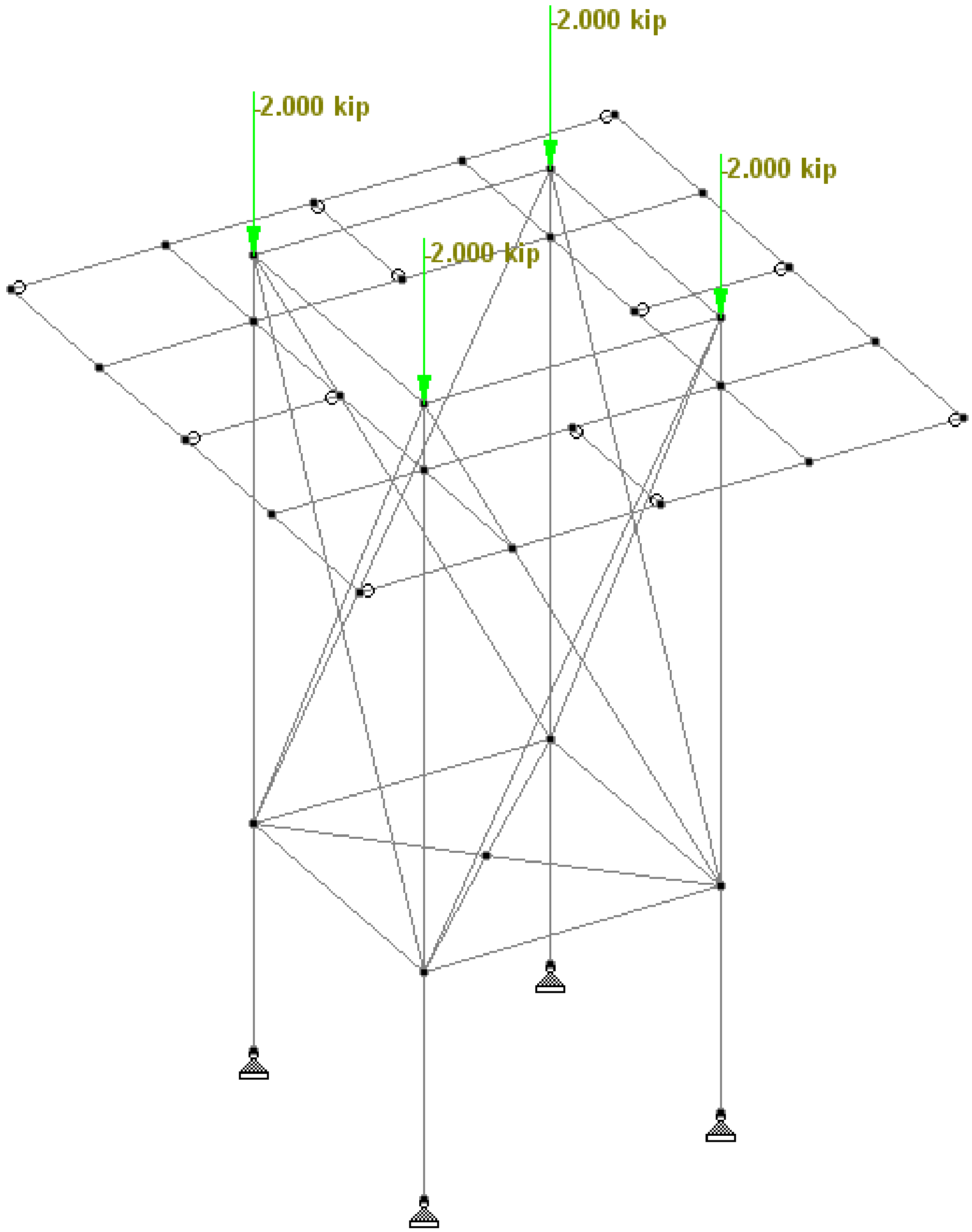
**bearing assembly 1400/4=350lb



***full barrel weight 30000lb/(6.625*4)=1132lb/ft**



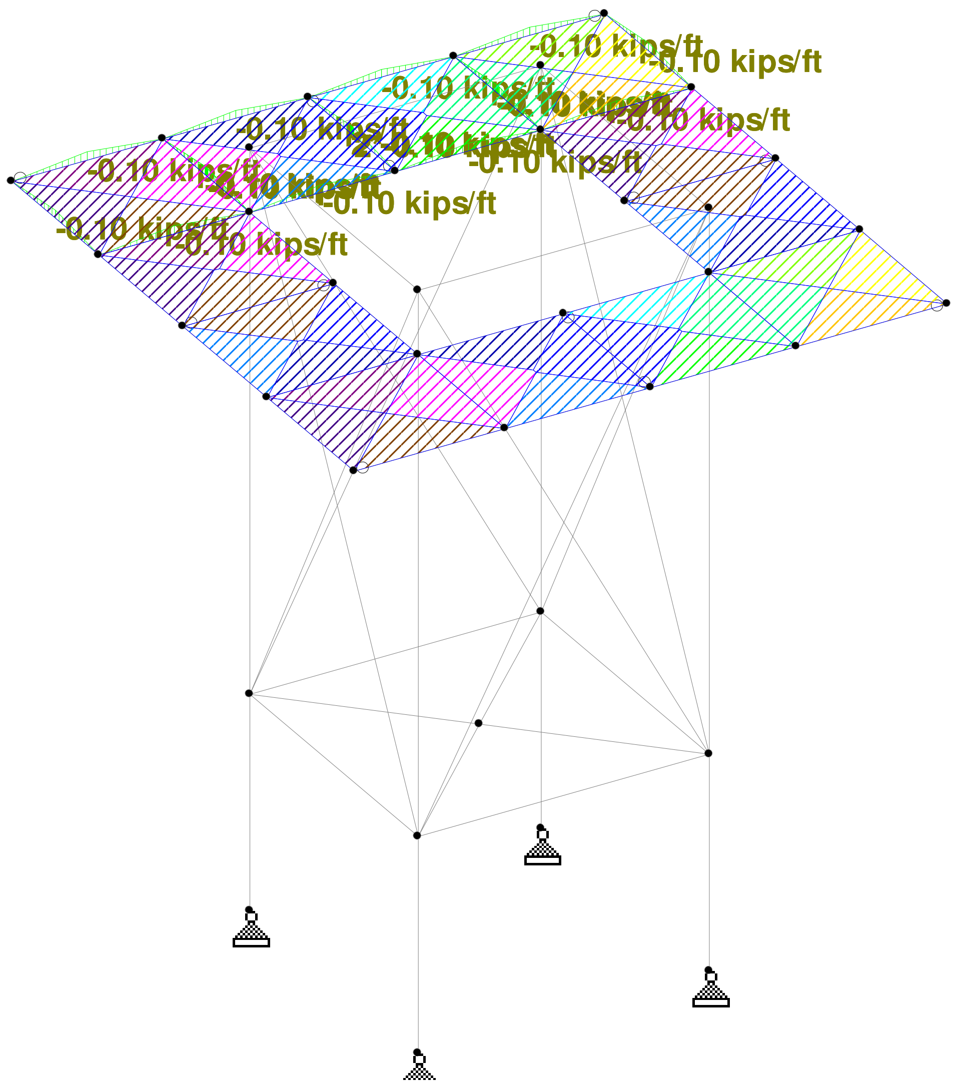
****grinding assembly weight 8000lb*/4=2000lb**



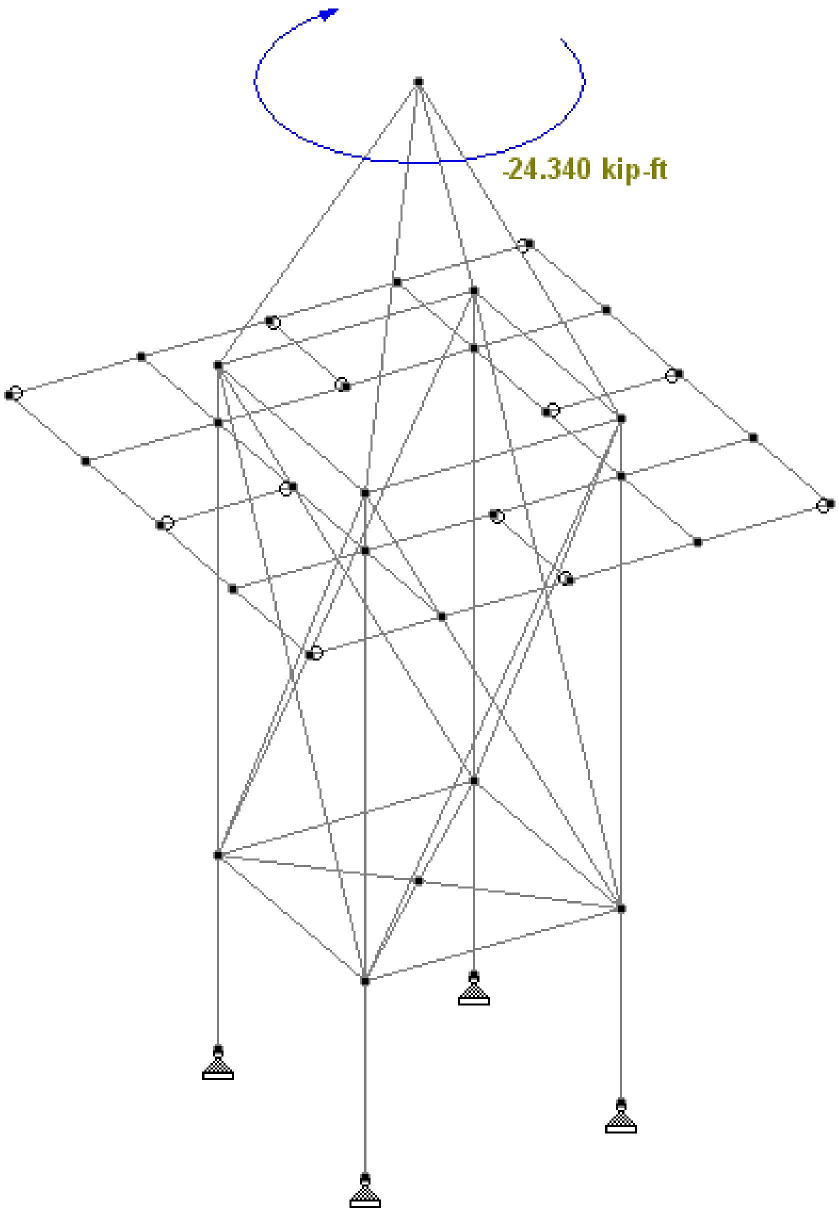
Live Load

Main Plate form Live Load

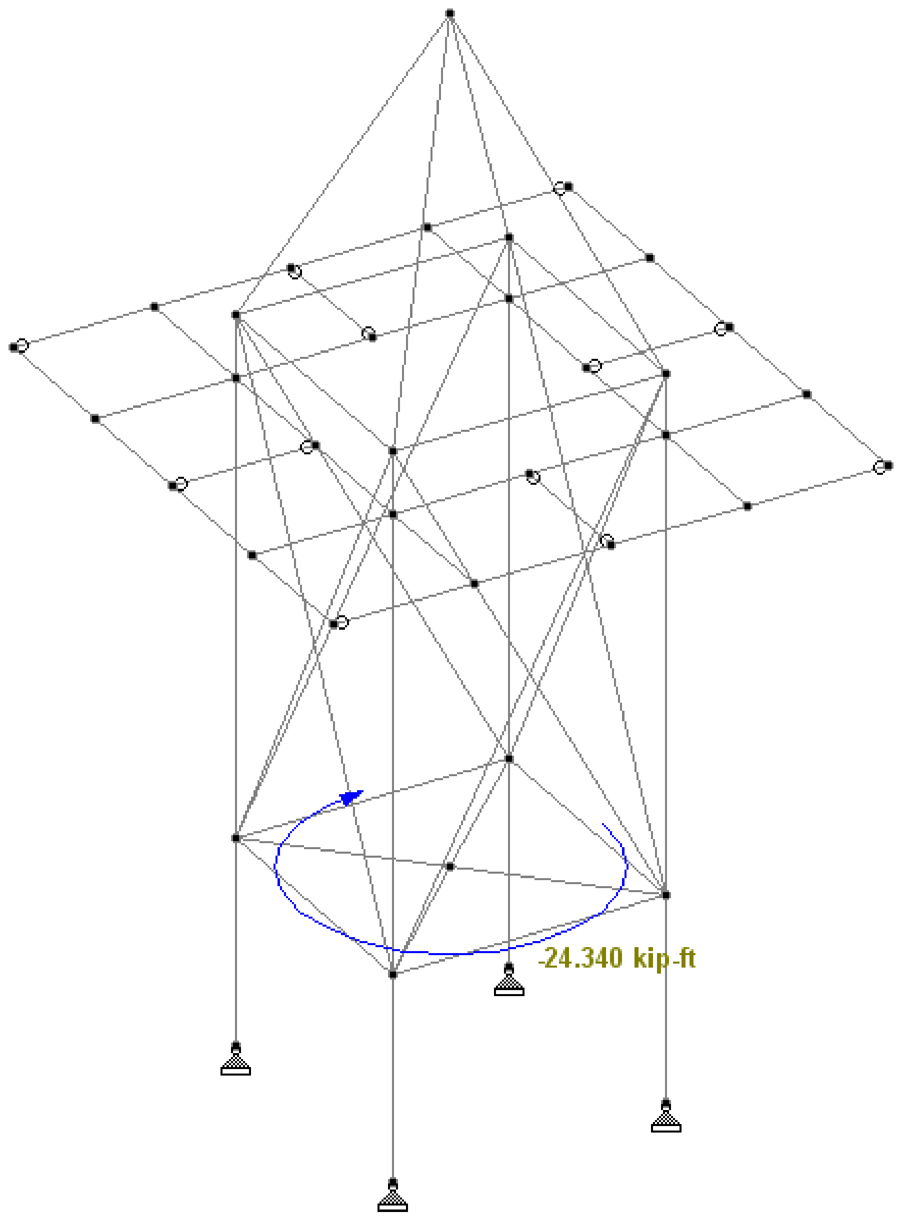
60lb/sq.ft as per ASCE 7-05 Table no 4.1 page no 12



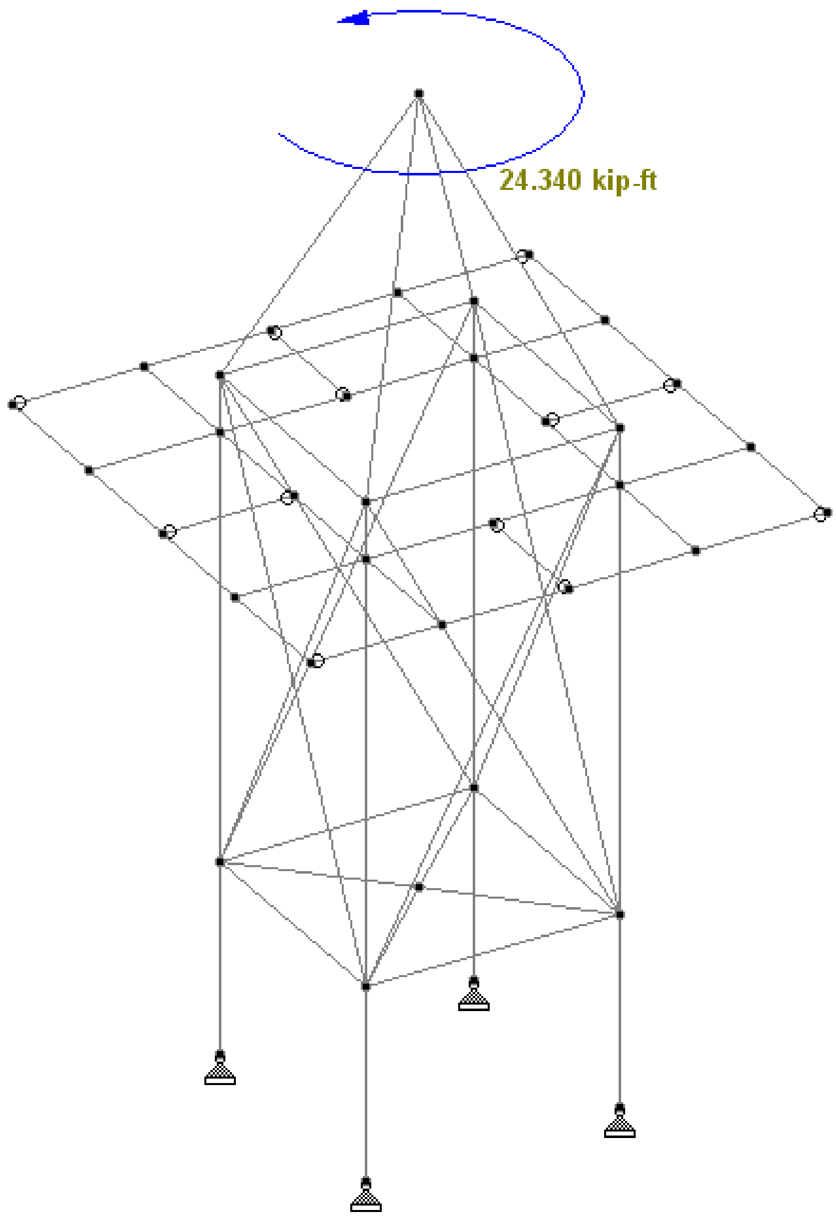
MOTOR TORQUE 24,340 FT*LB OPERATING LOAD 1 & 3



MOTOR TORQUE: 24,340 FT*LB APPLIED TO BASE OF BARREL IN SANDED OUT CONDITION. OPERATING LOAD 2 & 4 IN ADDITION TO MOTOR TORQUE ABOVE



MOTOR TORQUE: 24,340 FT*LB APPLIED TO BASE OF BARREL IN SANDED OUT CONDITION. OPERATING LOAD 2 & 4 IN ADDITION TO MOTOR TORQUE ABOVE



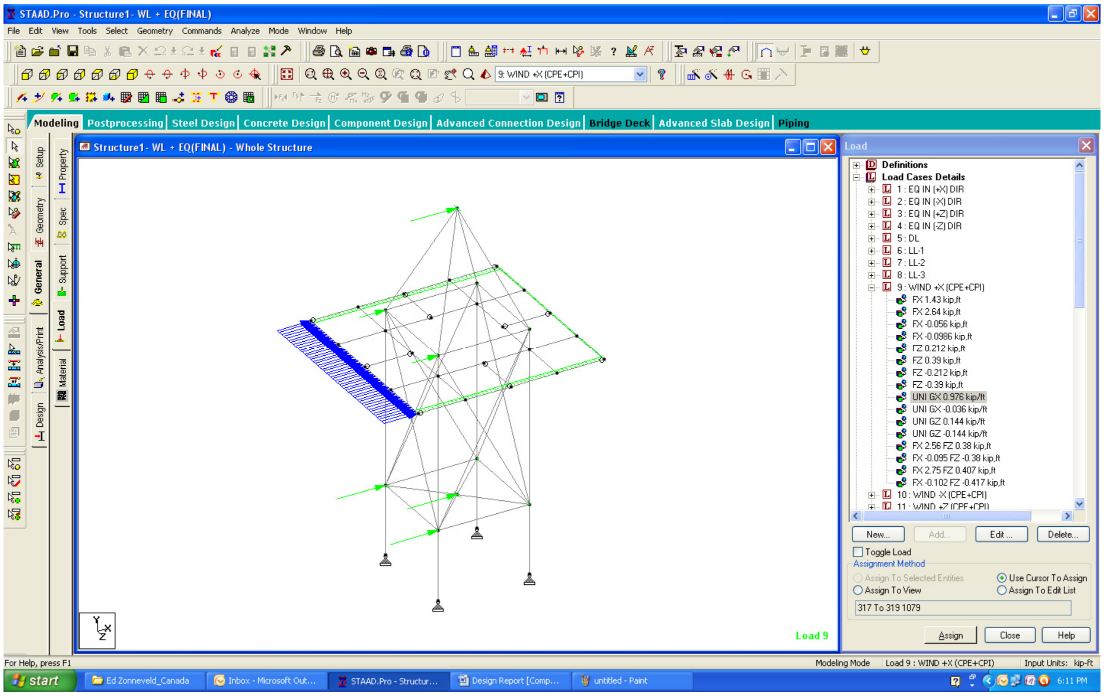
Wind Load Calculation

Wind load calculation as per ASCE								
Height of building (H)	=	17	ft		open buildir	±0		
Building type	=	Partially enclosed building			Partially ope	±0.55		
Category	=	3		(table-1.1 , pg-3)	Enclosed Bu	0.18		
Basic wind speed(V_{3s})	=	170	mph					
Importance factor(I)	=	1.15		(table-6.1 , pg-77)				
Exposure condition	=	B		(Cl-6.5.6.3)				
Wind directionality factor(K_d)	=	0.9		(Table-6.4 , pg-80)				
Topography factor(K_{zt})	=	1		(Cl-6.5.7.2)				
Velocity Pressure coefficient (K_z)	=	0.7		(table-6.3)				
$Qh = (0.00256 \times K_z \times K_{zt} \times K_d \times (V_{3s})^2 \times I)$								
Qh	=	53.60	psf					
Internal Pressure co-efficient (Cpi)	=	0.55						
					(+VE) SIGN	-	TOWARD THE STRUCTURE	
		W.W.	L.W.		(-VE) SIGN	-	AWAY FROM THE STRUCTURE	
External Pressure Coefficient	=	0.8	-0.5					
Design wing pressure								
P1	=	Qh[Cp(w.w.) - Cpi]		13.40				
P2	=	Qh[Cp(w.w.) + Cpi]		72.36				
P3	=	Qh[Cp(l.w.) - Cpi]		-56.28				
P4	=	Qh[Cp(l.w) + Cpi]		2.68				

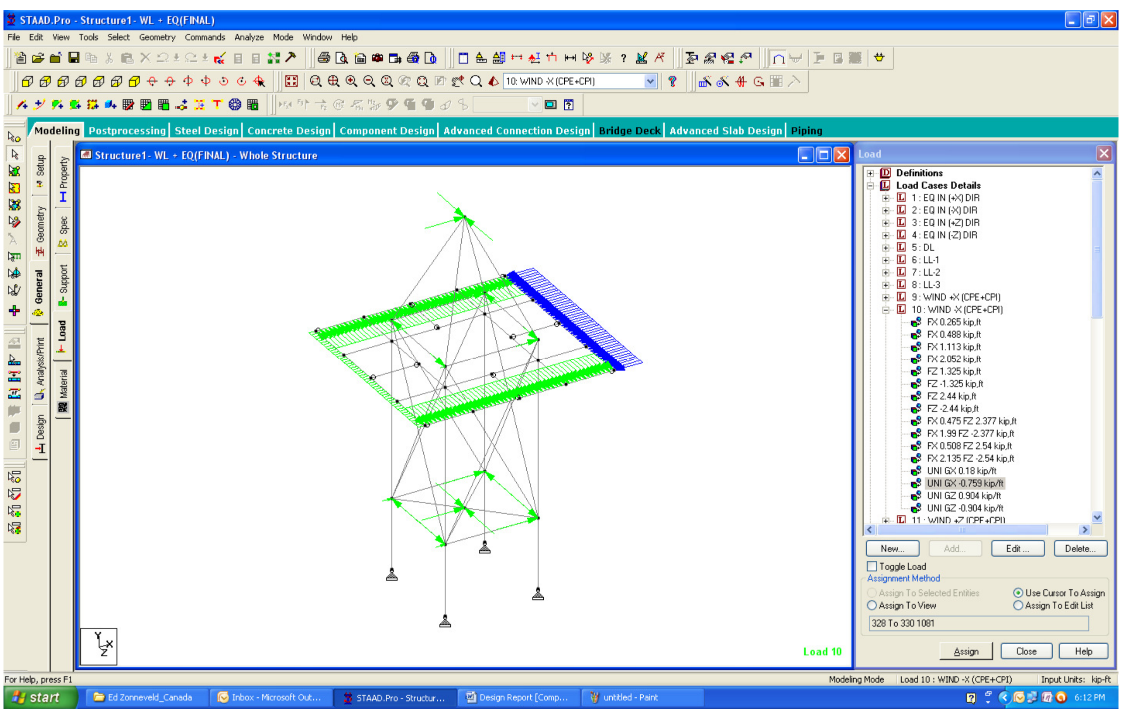
]

- **Figures**

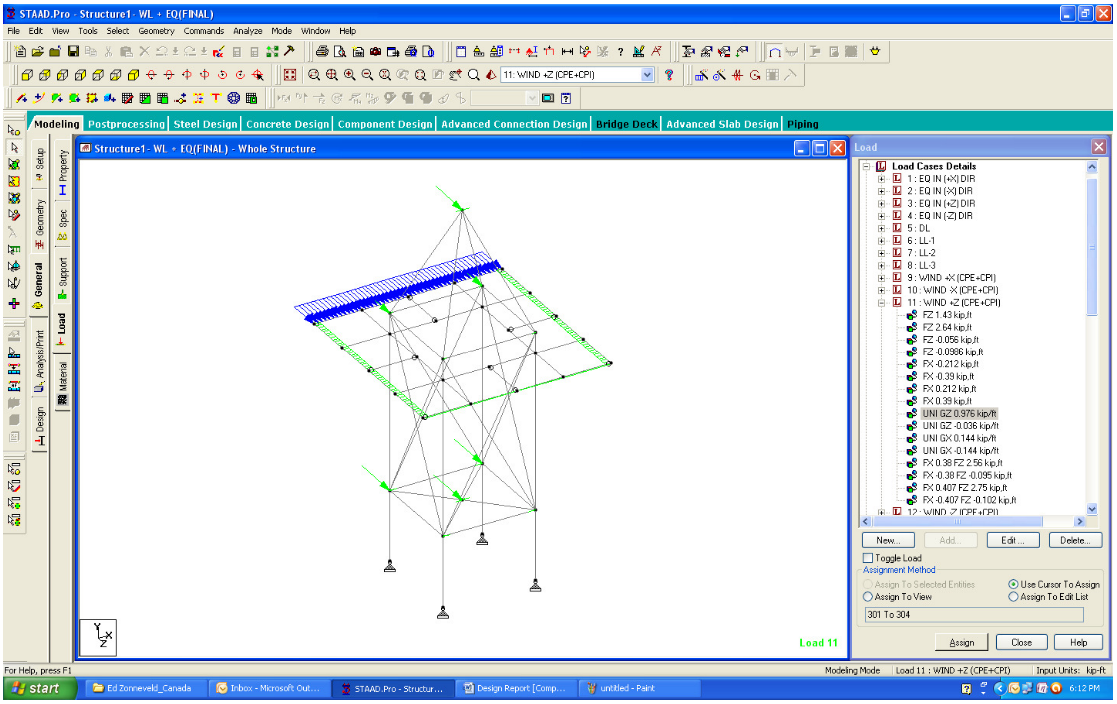
1. Wind 1 in +X direction



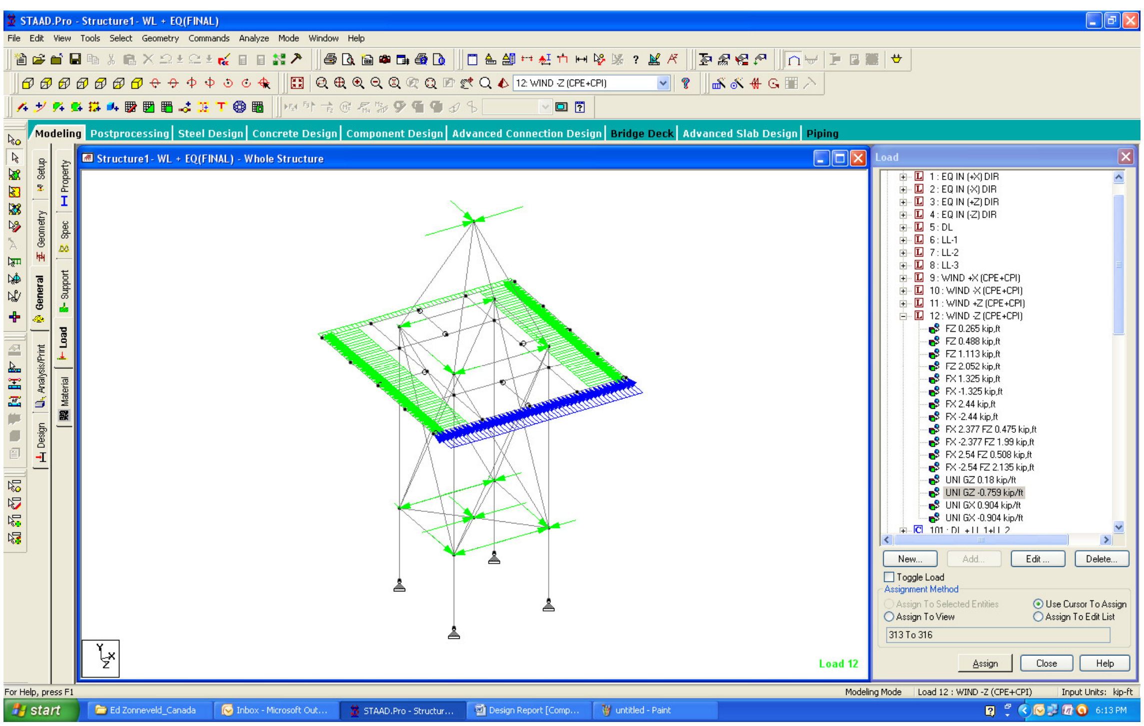
2. Wind 2 in -X direction



3. Wind 1 in +Z direction



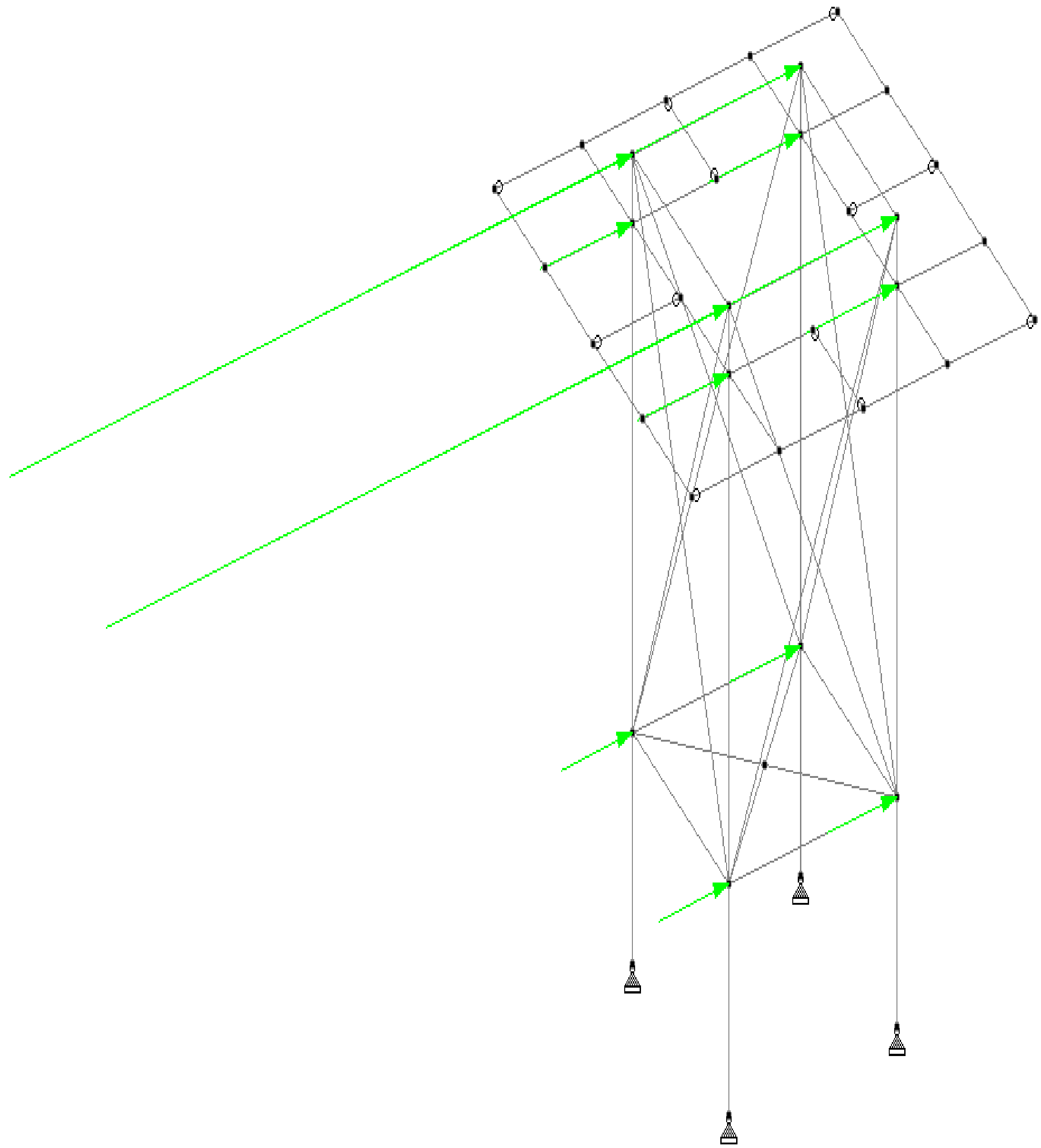
4. Wind 2 in -Z direction



Seismic Load Calculation

EARTHQUAKE (SEISMIC) LOAD CALCULATION for sructural member				
Building Height (Ht.)	=	17	ft	
Building category	=	3		(table-1.1 , pg-3)
Importance factor (I_p)	=	1.25		table- 11.5.1 , pg-116)
Response modification factor(R_p)	=	8		(table-12.2-1 , pg-121)
Spectral response acceleration parameter at short period (SDS)				
Site class	=	E		(table-20.3-1 , pg-205)
Mapped short period accelaration(S_s)	=	3	g	(fig.-22-1 , pg-211)
Site coefficient for Ss (F_a)	=	0.9		(table-11.4-1 , pg-115)
Mapped 1sec. Period accelaration (S1)	=	1	g	(fig.-22-2 , pg-213)
Site coefficient for S1 (Fv)	=	2.4		(table -11.4-1 , pg-115)
Maximum Spectral response (short period)				
$S_{MS} = F_a \times S_s$	=	2.7	g	
Design spectral response (short)				
$S_{DS} = 2/3 \times S_{MS}$	=	1.8		
Maximum Spectral response (1 sec. period)				
$S_{M1} = F_v \times S_1$	=	2.4	g	
Design spectral response (1 sec. period)				
$S_{D1} = 2/3 \, X \, S_{M1}$	=	1.6		
Seismin BASE SHEAR (V) (Eq. 12.8-2,pg - 129)				
$Cs = \frac{SDS}{(R/I)}$	=	0.281		
V	=	CS	x W	
	=	0.281W		

1. EQ in -X direction



4.7 Load Combinations

1) LOAD COMB 101 DL + LL 1+LL 2
2) LOAD COMB 102 DL + LL 1+LL 3
3) LOAD COMB 103 DL + 0.75 (LL 1 + LL 2)
4) LOAD COMB 104 DL + 0.75 (LL 1 + LL 3)
5) LOAD COMB 105 DL + WL+X(CPE + CPI)
6) LOAD COMB 106 DL + WL-X(CPE - CPI)
7) LOAD COMB 107 DL + WL+Z(CPE + CPI)
8) LOAD COMB 108 DL + WL-X(CPE - CPI)
9) LOAD COMB 109 DL +0.7 EQ +X
10) LOAD COMB 110 DL + 0.7 EQ -X
11) LOAD COMB 111 DL + 0.7 EQ +Z
12) LOAD COMB 112 DL + 0.7 EQ -Z
13) LOAD COMB 113 DL + 0.75 WL+X(CPE + CPI) + 0.75 LL 1 + 0.75 LL 2
14) LOAD COMB 114 DL + 0.75 WL-X(CPE - CPI) + 0.75 LL 1 + 0.75 LL 2
15) LOAD COMB 115 DL + 0.75 WL+Z(CPE + CPI) + 0.75 LL 1 + 0.75 LL 2
16) LOAD COMB 116 DL + 0.75 WL-X(CPE - CPI) + 0.75 LL 1 + 0.75 LL 2
17) LOAD COMB 117 DL + 0.75 WL+X(CPE + CPI) + 0.75 LL 1 + 0.75 LL 3
18) LOAD COMB 118 DL + 0.75 WL-X(CPE - CPI) + 0.75 LL 1 + 0.75 LL 3
19) LOAD COMB 119 DL + 0.75 WL+Z(CPE + CPI) + 0.75 LL 1 + 0.75 LL 3
20) LOAD COMB 120 DL + 0.75 WL-X(CPE - CPI) + 0.75 LL 1 + 0.75 LL 3
21) LOAD COMB 121 DL + 0.525 EQ +X + 0.75 LL 1 + 0.75 LL 2
22) LOAD COMB 122 DL + 0.525 EQ -X + 0.75 LL 1 + 0.75 LL 2
23) LOAD COMB 123 DL + 0.525 EQ +Z + 0.75 LL 1 + 0.75 LL 2
24) LOAD COMB 124 DL + 0.525 EQ -Z + 0.75 LL 1 + 0.75 LL 2
25) LOAD COMB 125 DL + 0.525 EQ +X + 0.75 LL 1 + 0.75 LL 3
26) LOAD COMB 126 DL + 0.525 EQ -X + 0.75 LL 1 + 0.75 LL 3
27) LOAD COMB 127 DL + 0.525 EQ +Z + 0.75 LL 1 + 0.75 LL 3
28) LOAD COMB 128 DL + 0.525 EQ -Z + 0.75 LL 1 + 0.75 LL 3
29) LOAD COMB 129 0.6 DL + WL+X (CPE + CPI)
30) LOAD COMB 130 0.6 DL + WL-X (CPE - CPI)
31) LOAD COMB 131 0.6 DL + WL+Z (CPE + CPI)
32) LOAD COMB 132 0.6 DL + WL-X(CPE - CPI)
33) LOAD COMB 133 0.6 DL +0.7 EQ +X
34) LOAD COMB 134 0.6 DL + 0.7 EQ -X
35) LOAD COMB 135 0.6 DL + 0.7 EQ +Z
36) LOAD COMB 136 0.6 DL + 0.7 EQ -Z

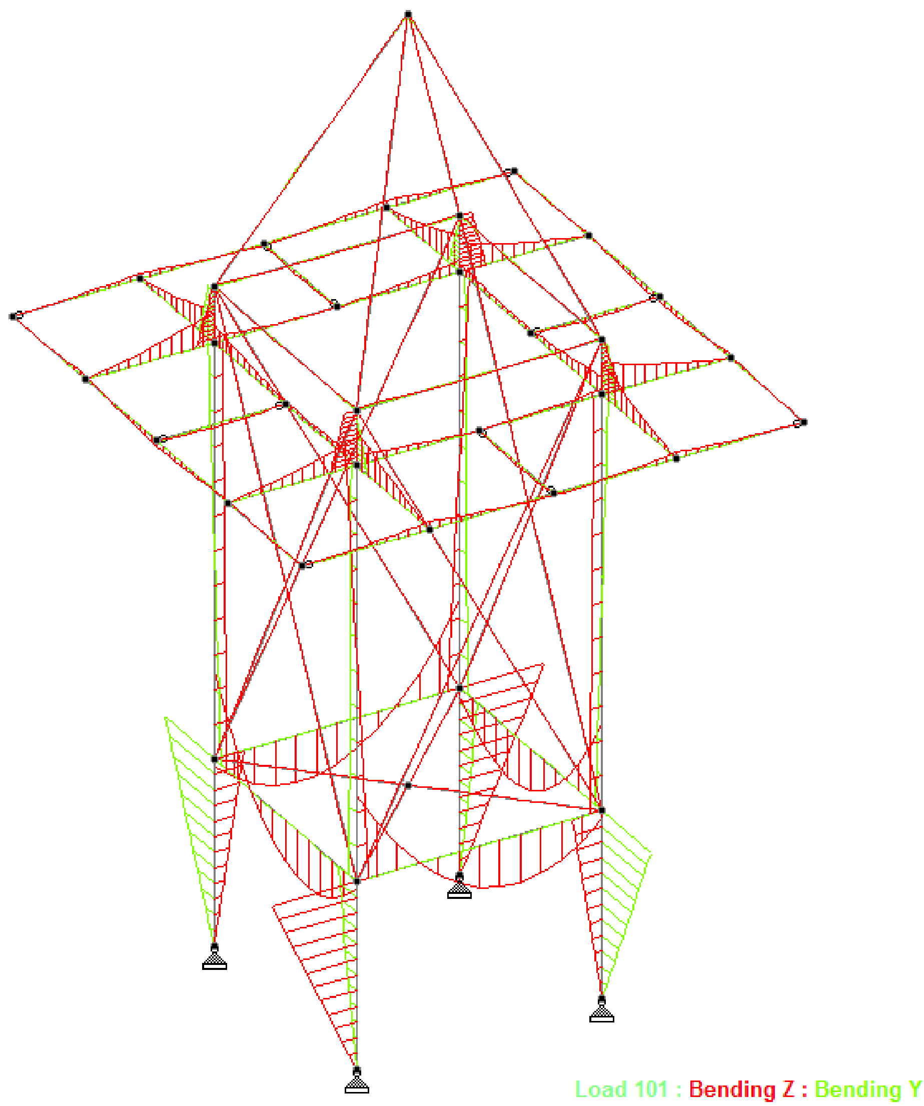
5.0 LIST OF DESIGN CODES AND STANDARDS

IS Code No.	Description
ASCE/SEI 7-05	Minimum design loads for buildings and other structures
IBC-2009	International building code
ASTM-A992	Material code

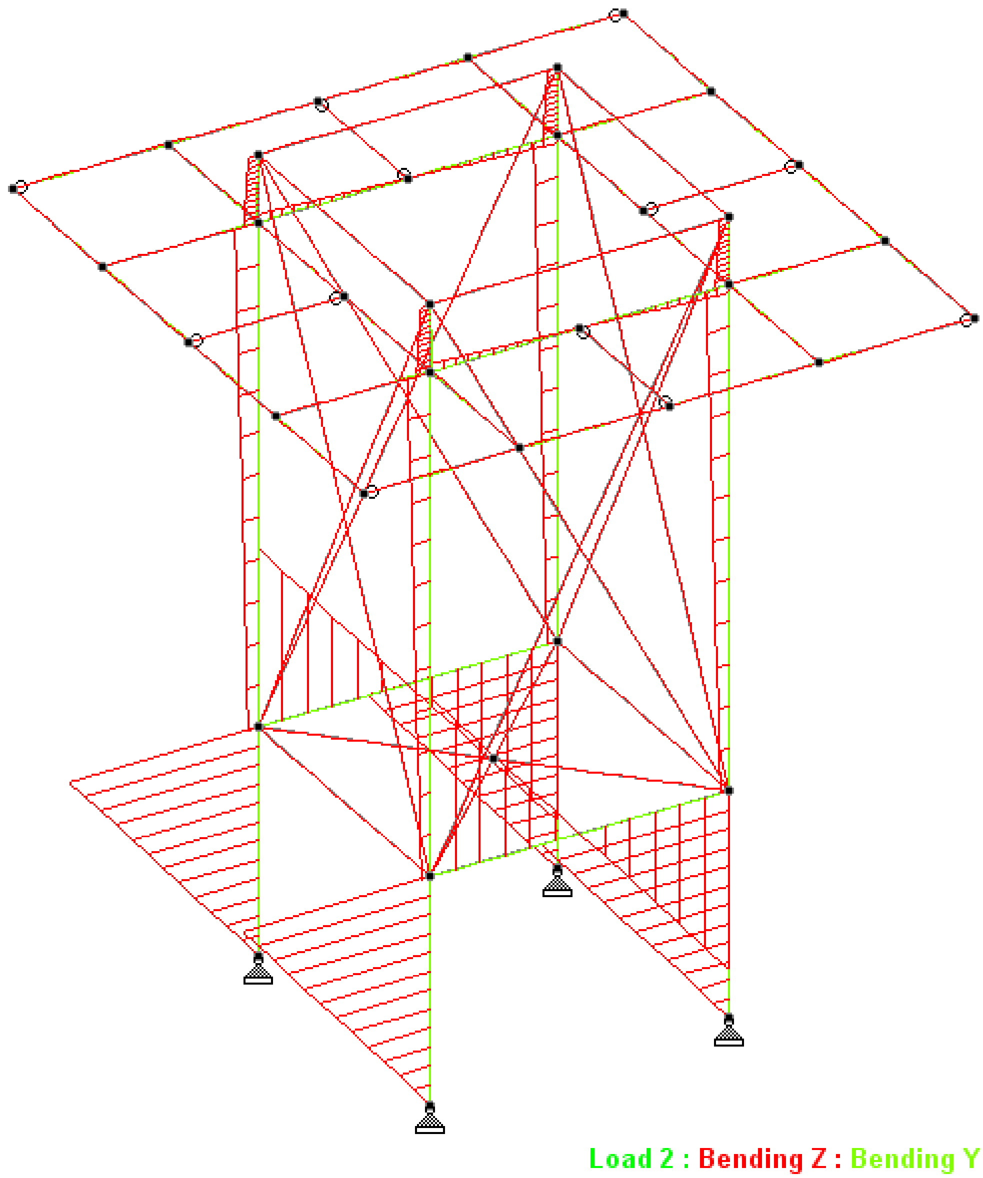
6.0 Analysis Results

➢ **Bending moment diagrams**

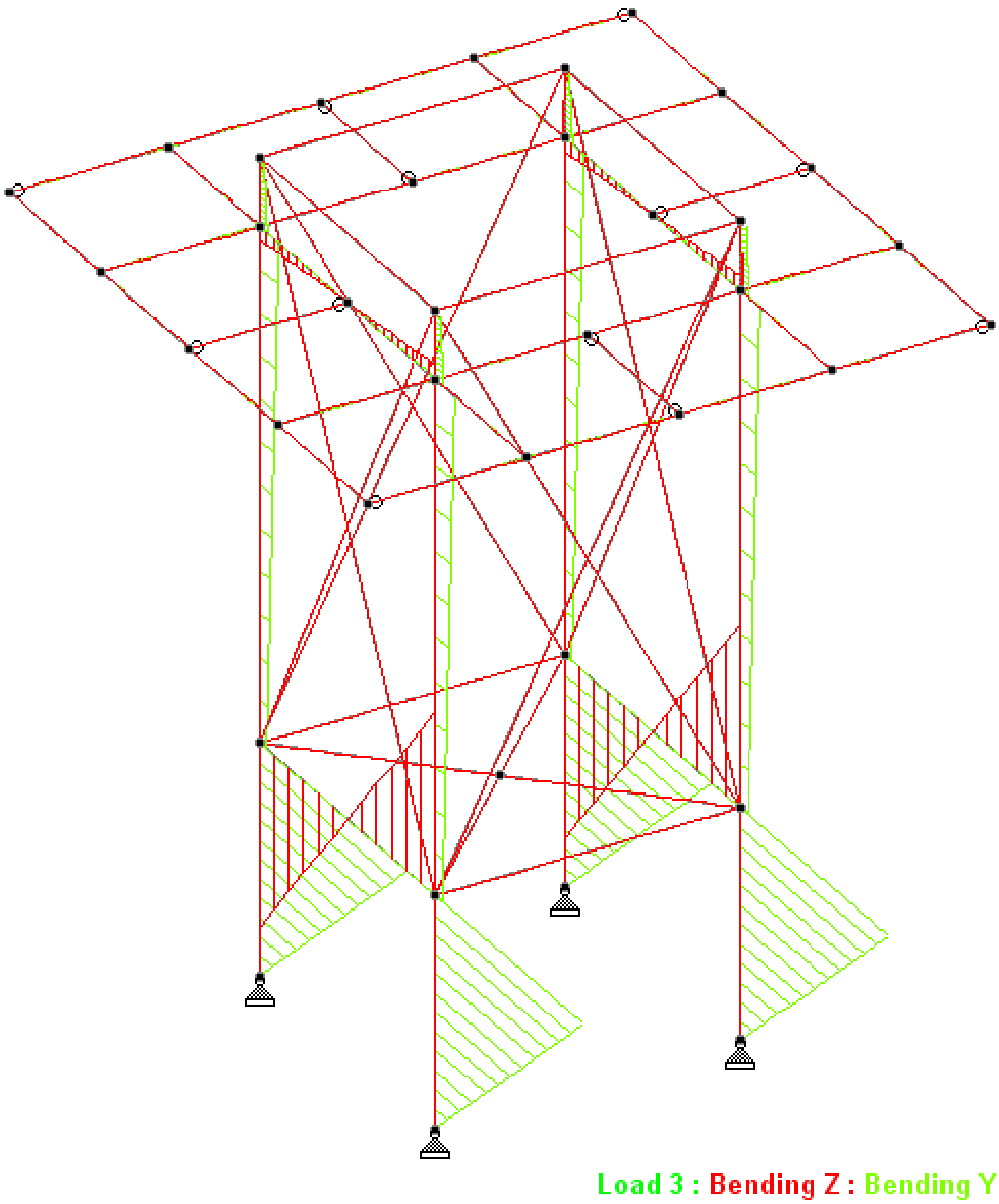
- **Bending Moment of whole assembly for DL + LL**



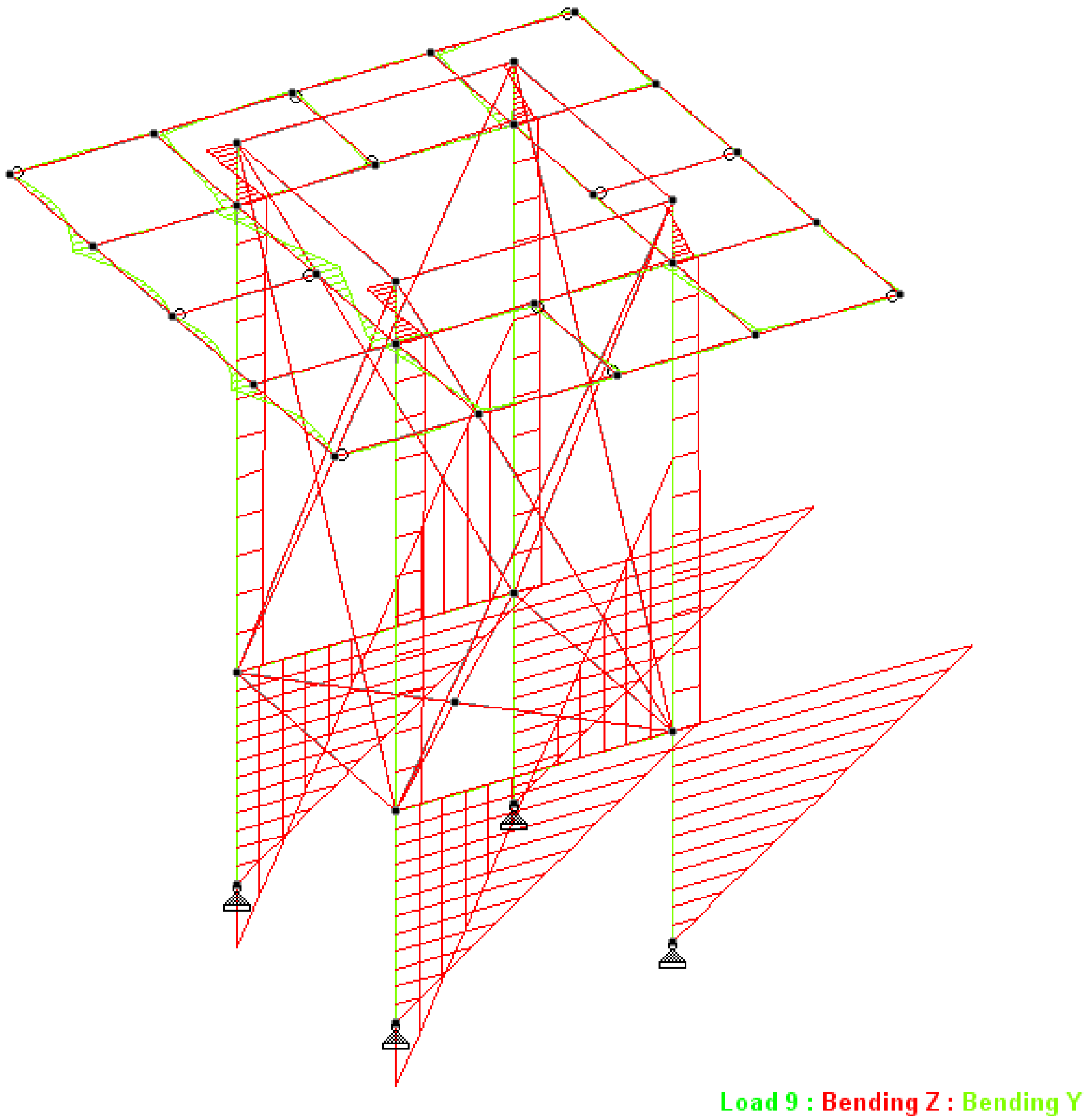
- **Bending Moment of whole assembly for EQ X**



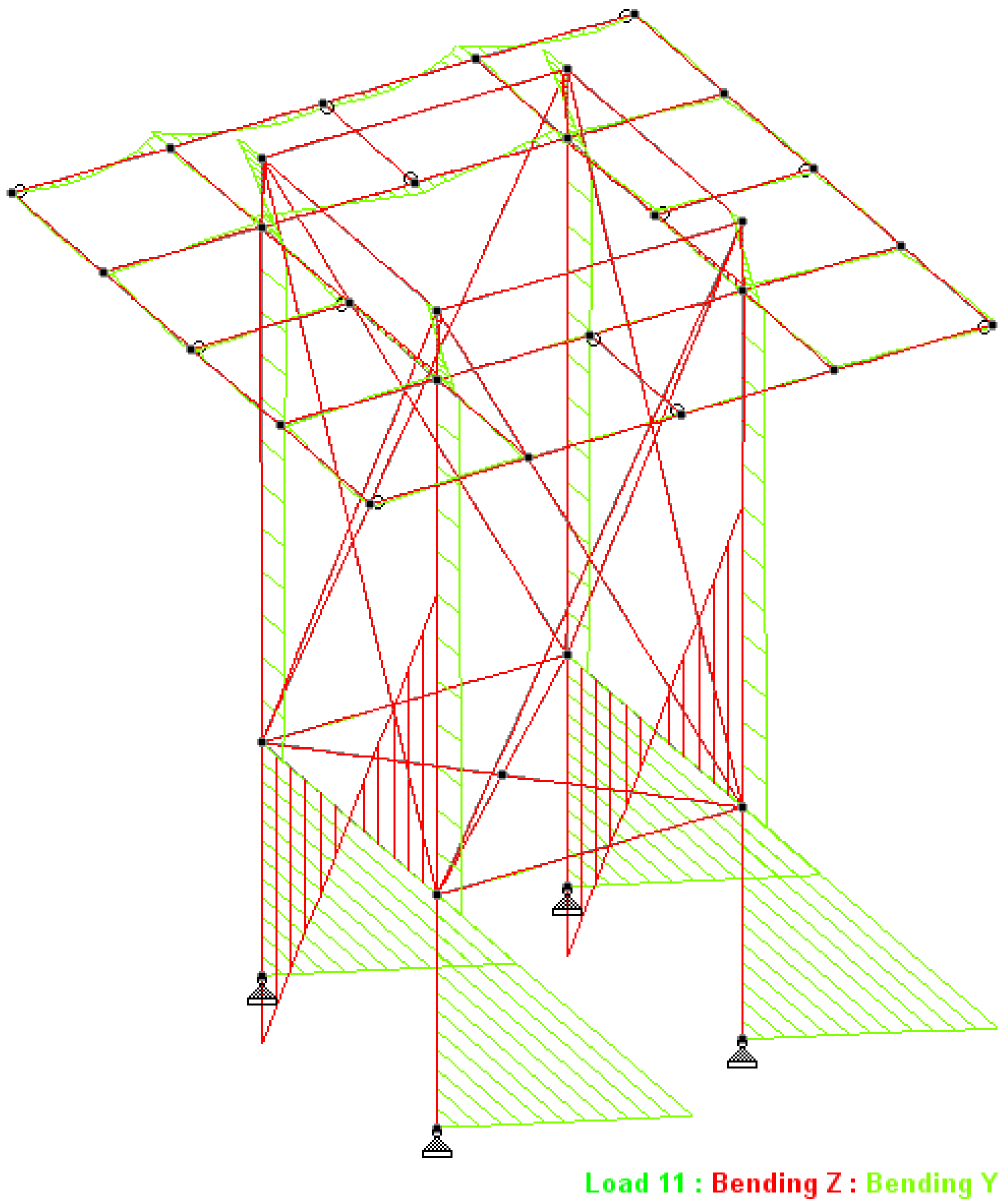
- **Bending Moment of whole assembly for EQ Z**



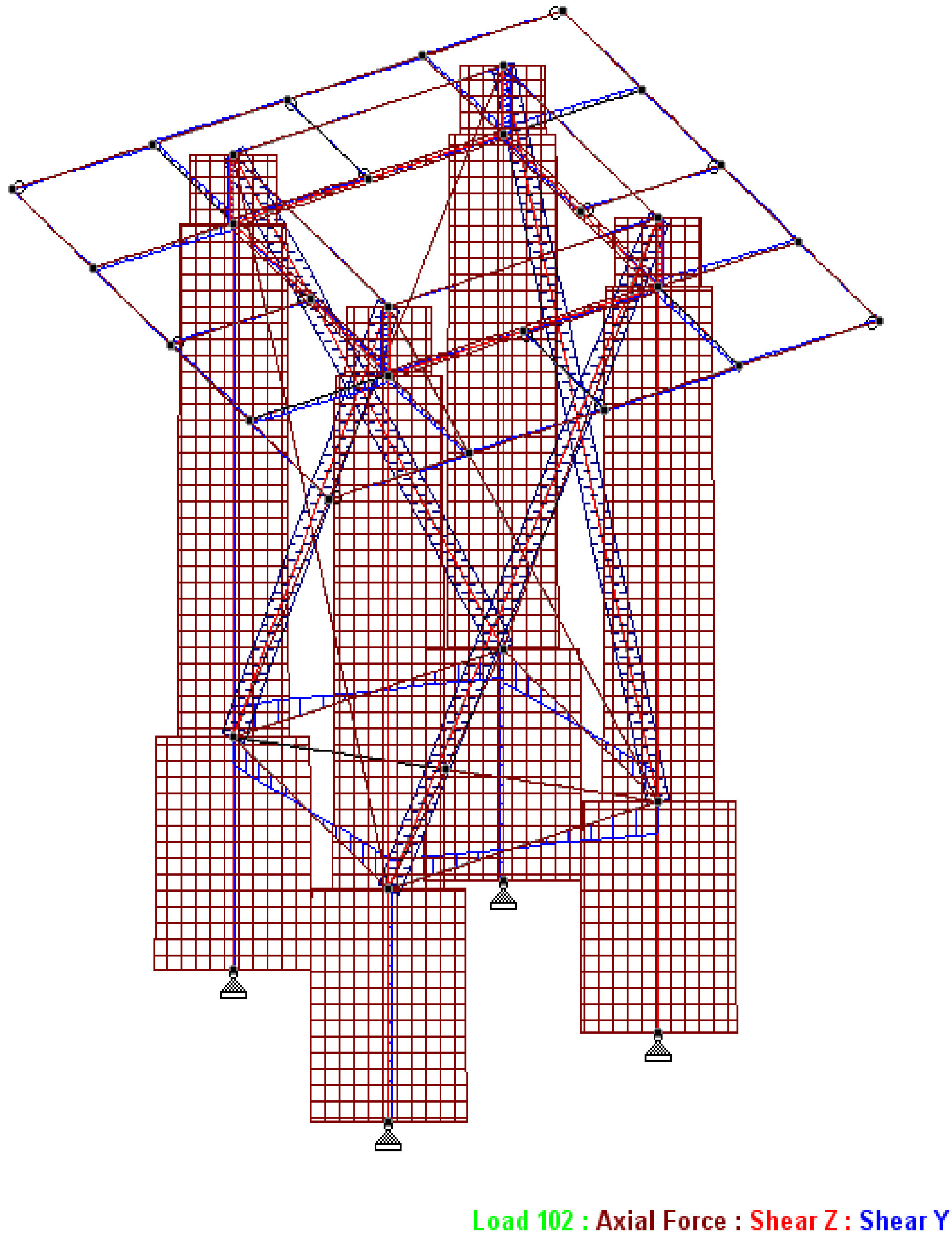
- **Bending Moment of whole assembly for WIND LOAD X Dir.**



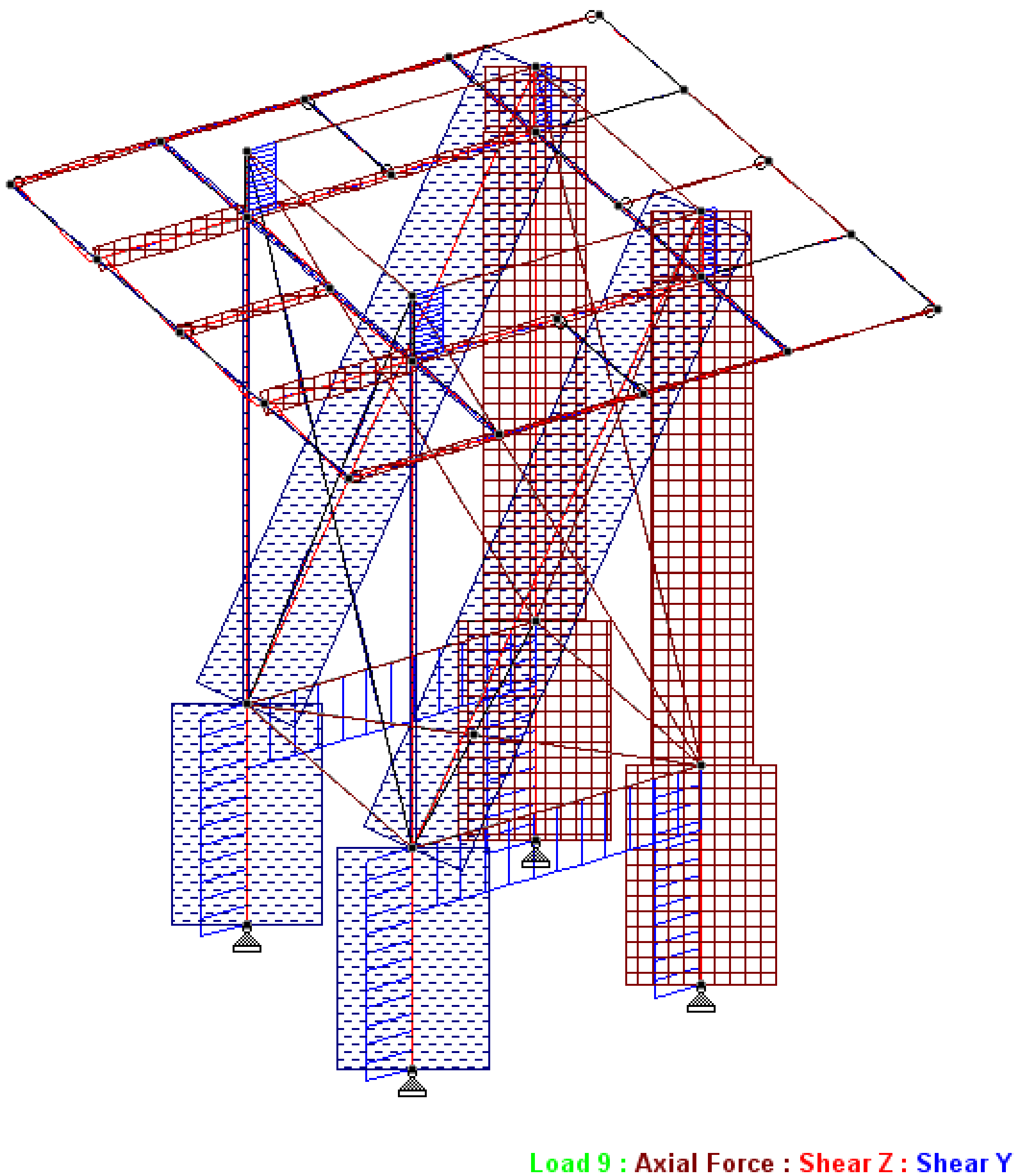
- **Bending Moment of whole assembly for WIND LOAD Z Dir.**



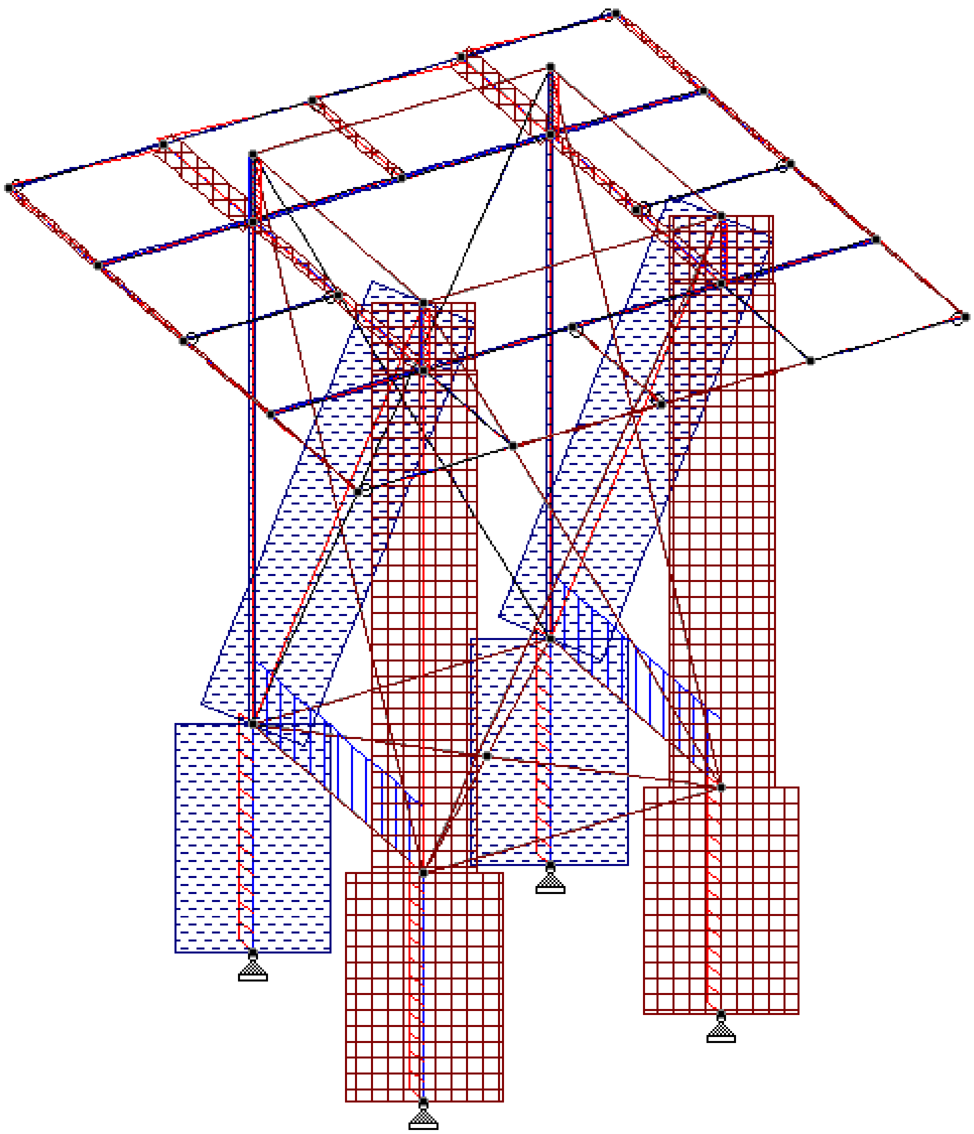
- **<u>Shear force Diagrams</u>**
- **Shear Force of whole assembly for DL + LL**



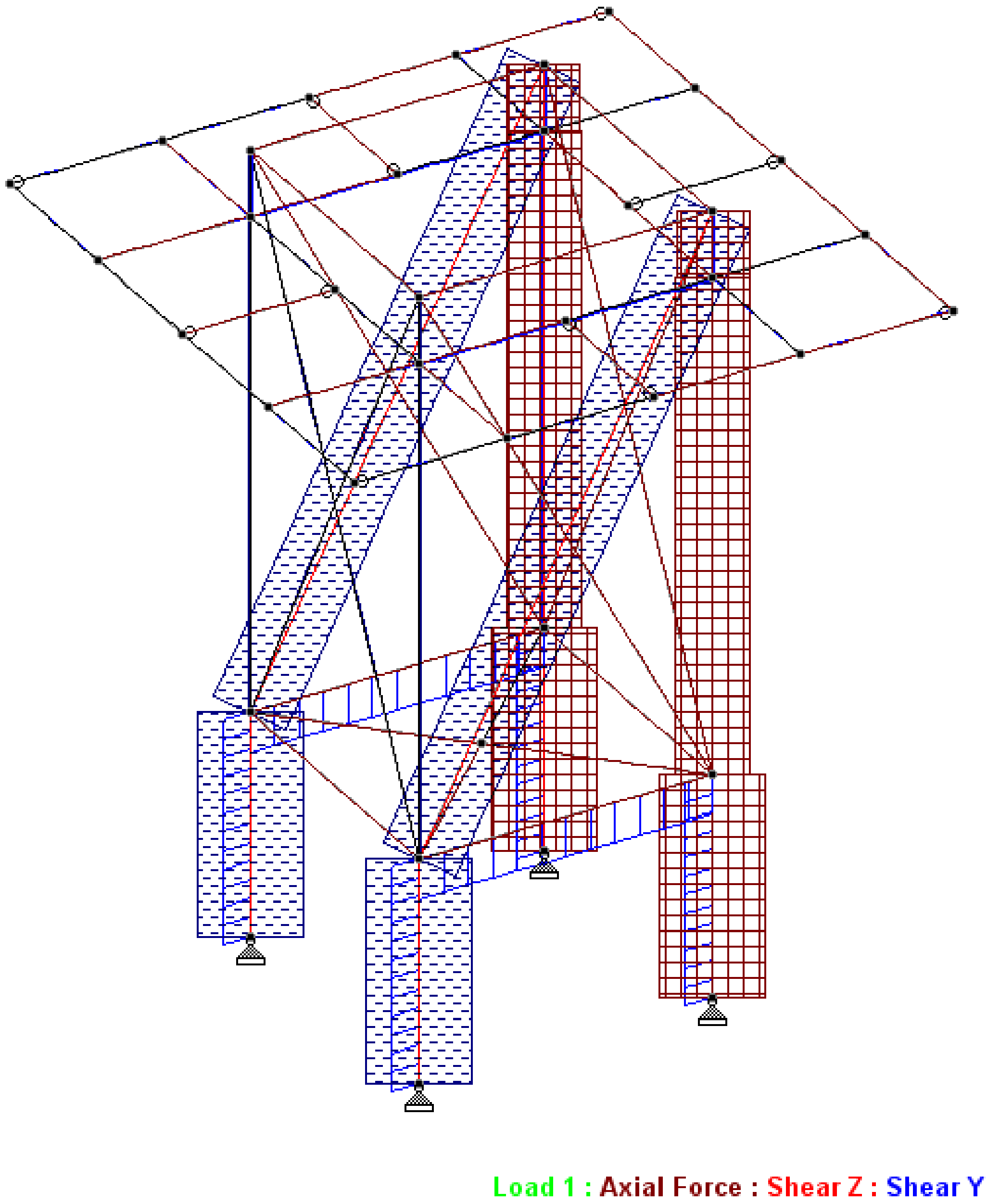
- **Shear Force of whole assembly for WIND LOAD in X dir.**



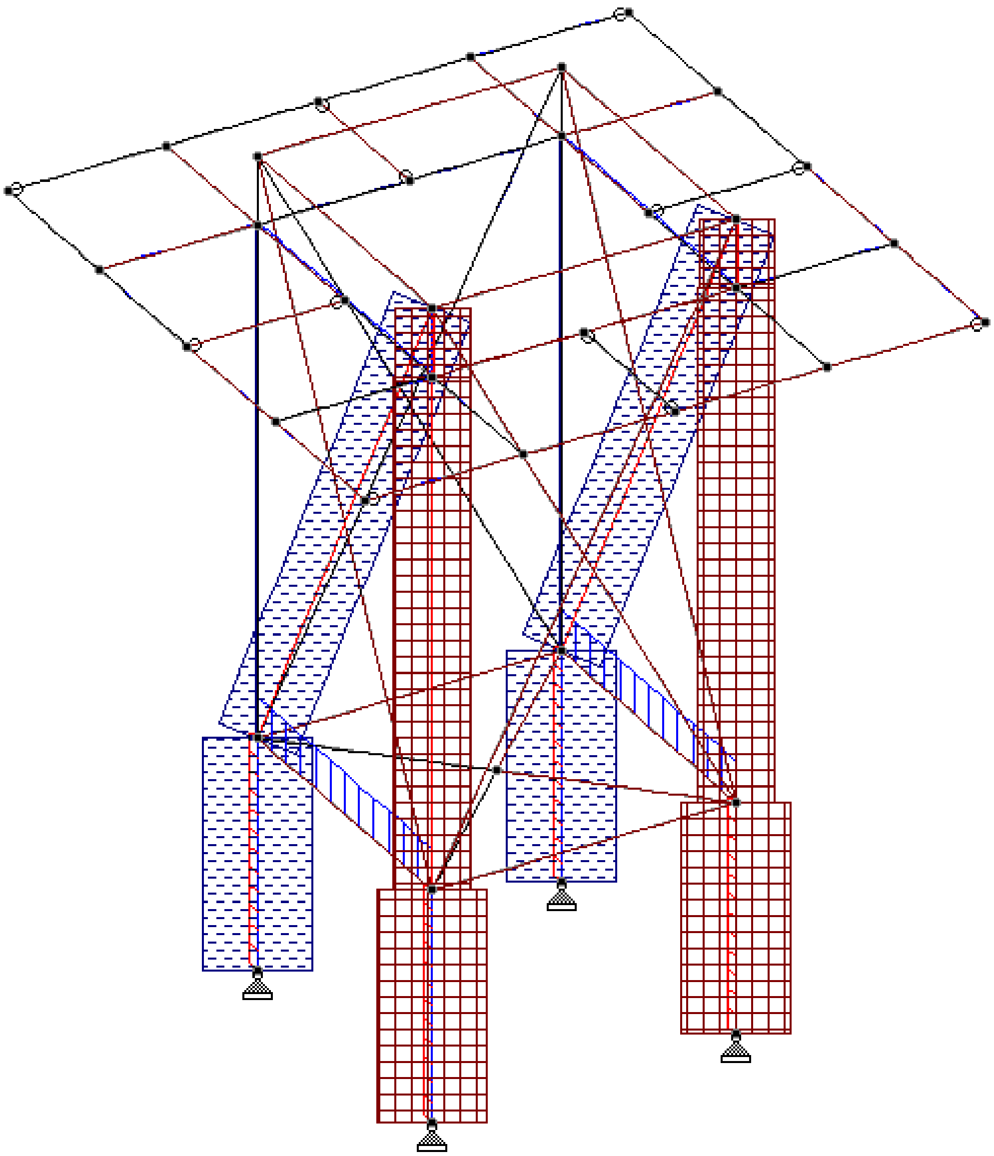
- **Shear Force of whole assembly for WIND LOAD in Z dir.**



- ***Shear Force of whole assembly for EQ in X dir.***

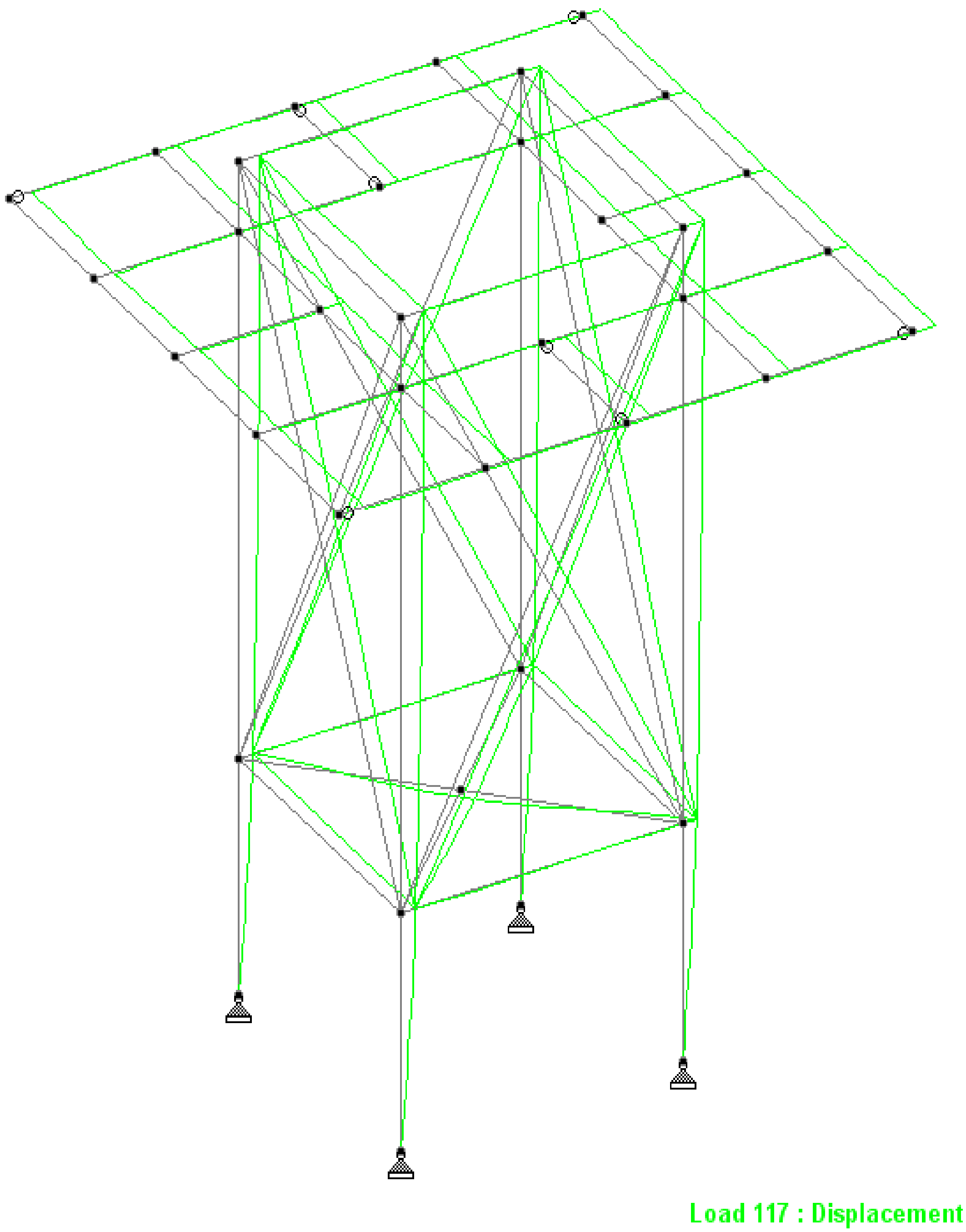


- **Shear Force of whole assembly for EQ in Z dir.**

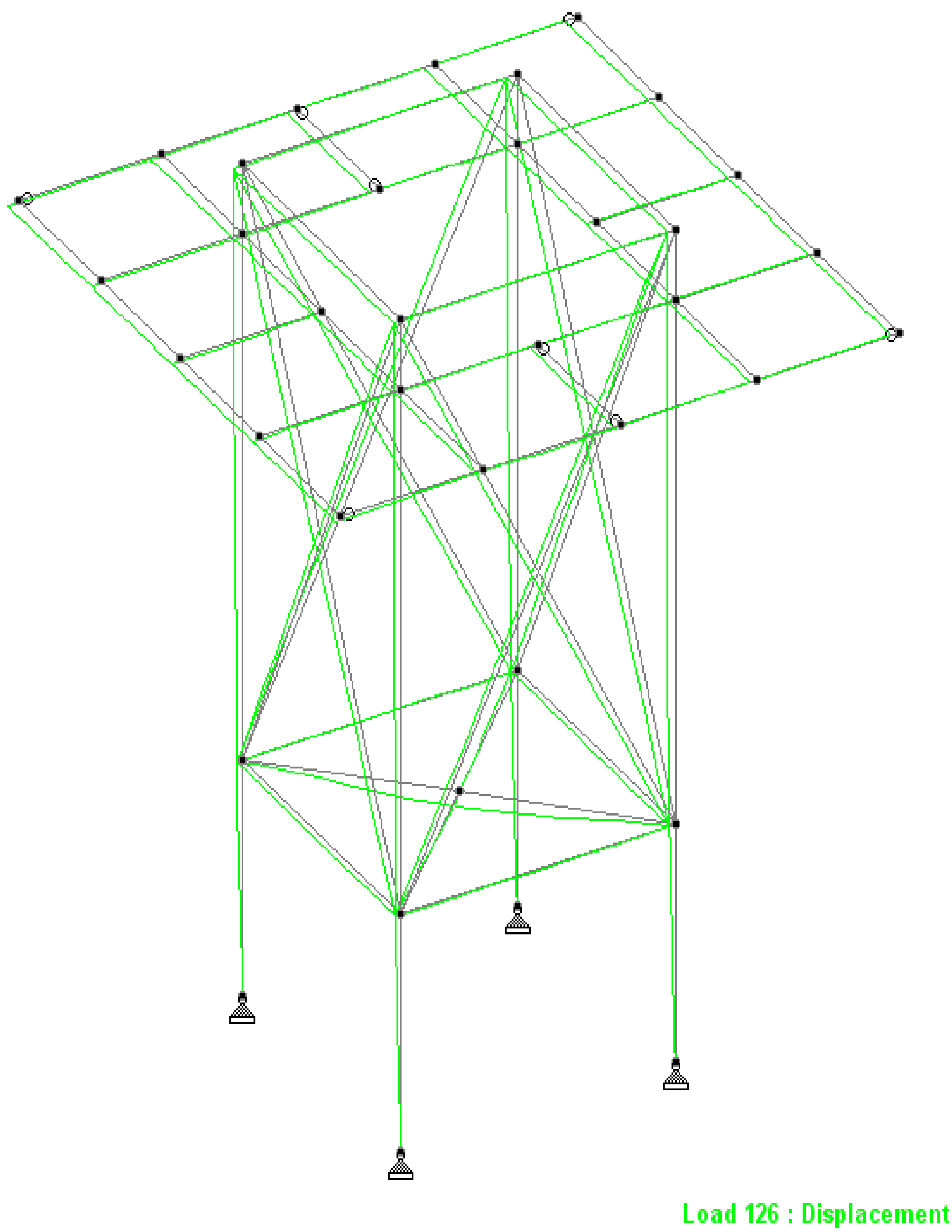


- **Displacement diagram**

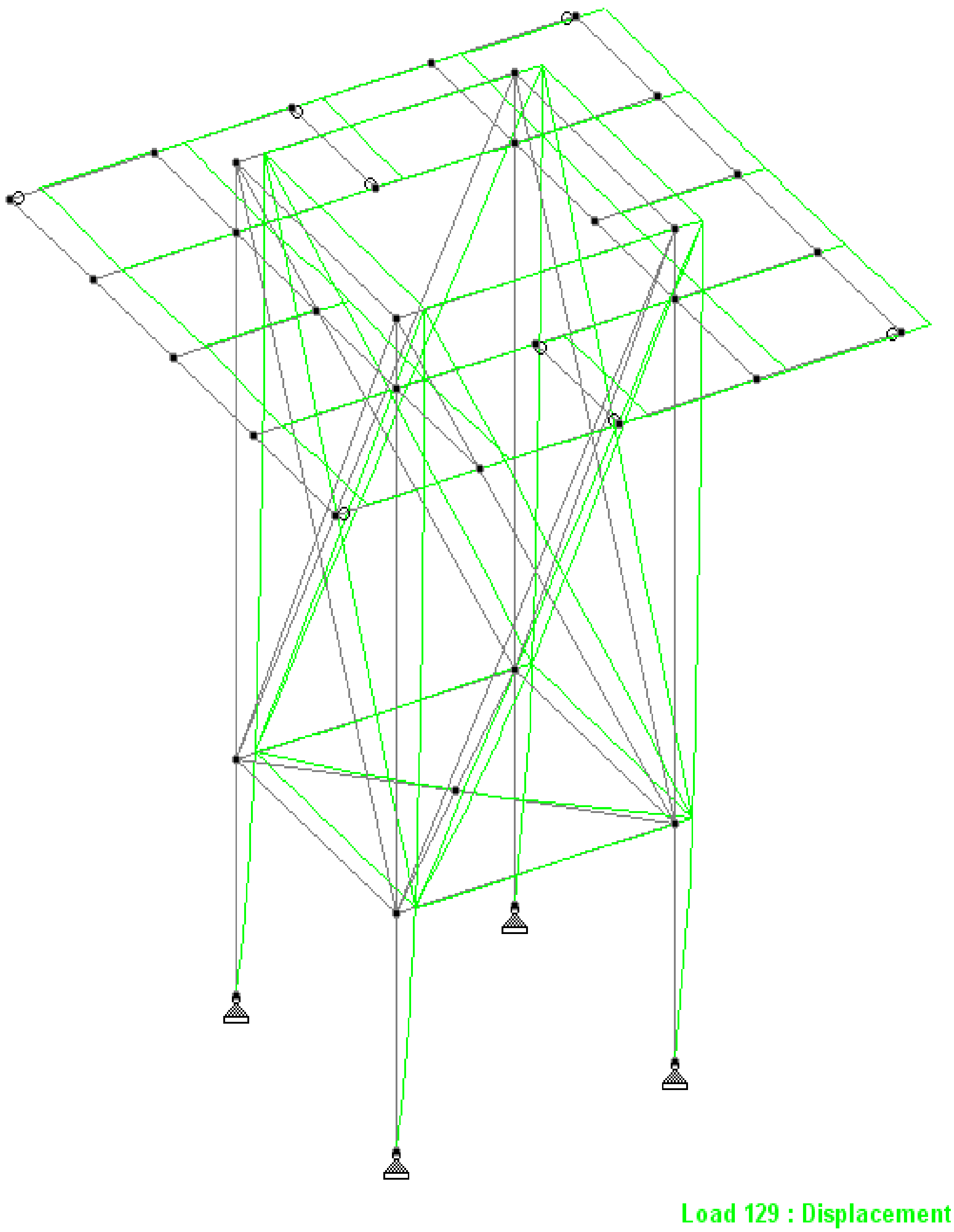
LOAD COMB 117 DL + 0.75 WL+X(CPE + CPI) + 0.75 LL 1 + 0.75 LL 3



LOAD COMB 126 DL + 0.525 EQ -X + 0.75 LL 1 + 0.75 LL 3

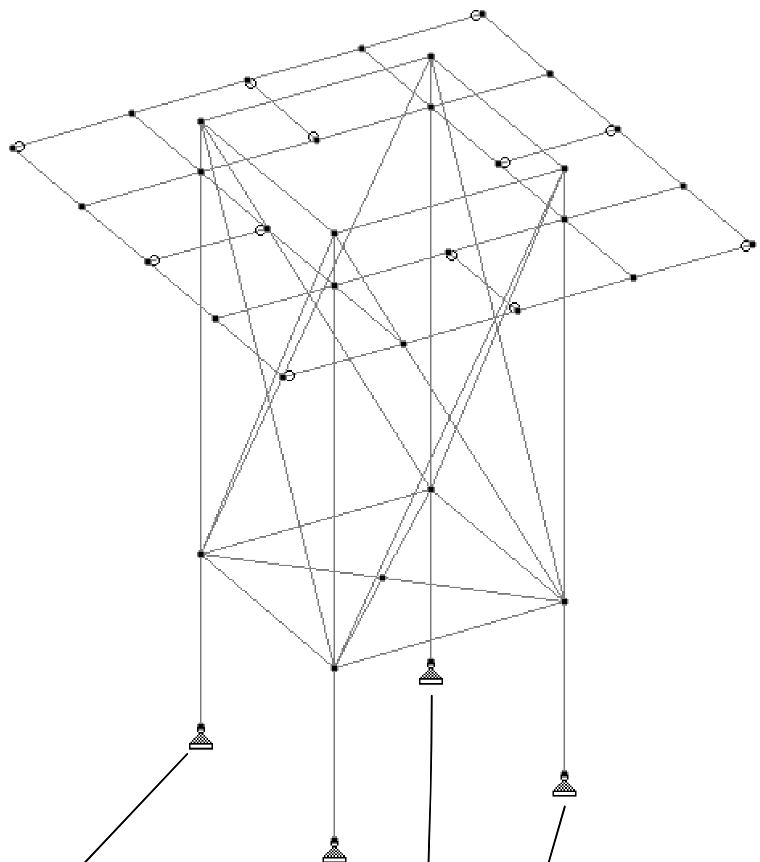


LOAD COMB 129 0.6 DL + WL+X(CPE + CPI)



6.4 Support Reactions

- **Support Reactions for Typical Frame**



L/C	Force-X kN	Force-Y kN	Force-Z kN
Dead	1.842	88.063	1.835
Live -1	0.080	9.223	0.075
Live -2	-4.090	0.031	4.081
Live -3	0.006`	-0.045	0.006
EQ - X	-25.416	-118.653	-0.008
EQ - Z	-0.006	-118.653	-25.416
-28.438	-28.438	-120.033	-0.002

L/C	Force-X kN	Force-Y kN	Force-Z kN
Dead	-1.842	88.063	-1.835
Live -1	-0.080	9.223	-0.075
Live -2	4.090	0.031	-4.081
Live -3	-0.006	-0.045	-0.006
EQ - X	-25.416	118.653	-0.008
EQ - Z	-0.006	118.653	-25.416
Wind	-28.564	120.036	0.017

L/C	Force-X kN	Force-Y kN	Force-Z kN
Dead	-1.842	88.063	1.835
Live -1	-0.080	9.223	0.075
Live -2	-4.090	-0.031	-4.081
Live -3	0.006	0.045	-0.006
EQ - X	-25.416	118.653	0.008
EQ - Z	0.006	-118.653	-25.416
Wind	-28.568	120.068	0.001

L/C	Force-X kN	Force-Y kN	Force-Z kN
Dead	1.842	88.063	-1.835
Live -1	0.080	9.223	-0.075
Live -2	4.090	-0.031	4.081
Live -3	-0.006	0.045	0.006
EQ - X	-25.416	-118.653	0.008
EQ - Z	0.006	118.653	-25.416
Wind	-28.438	-120.033	0.028

7.0 Design output

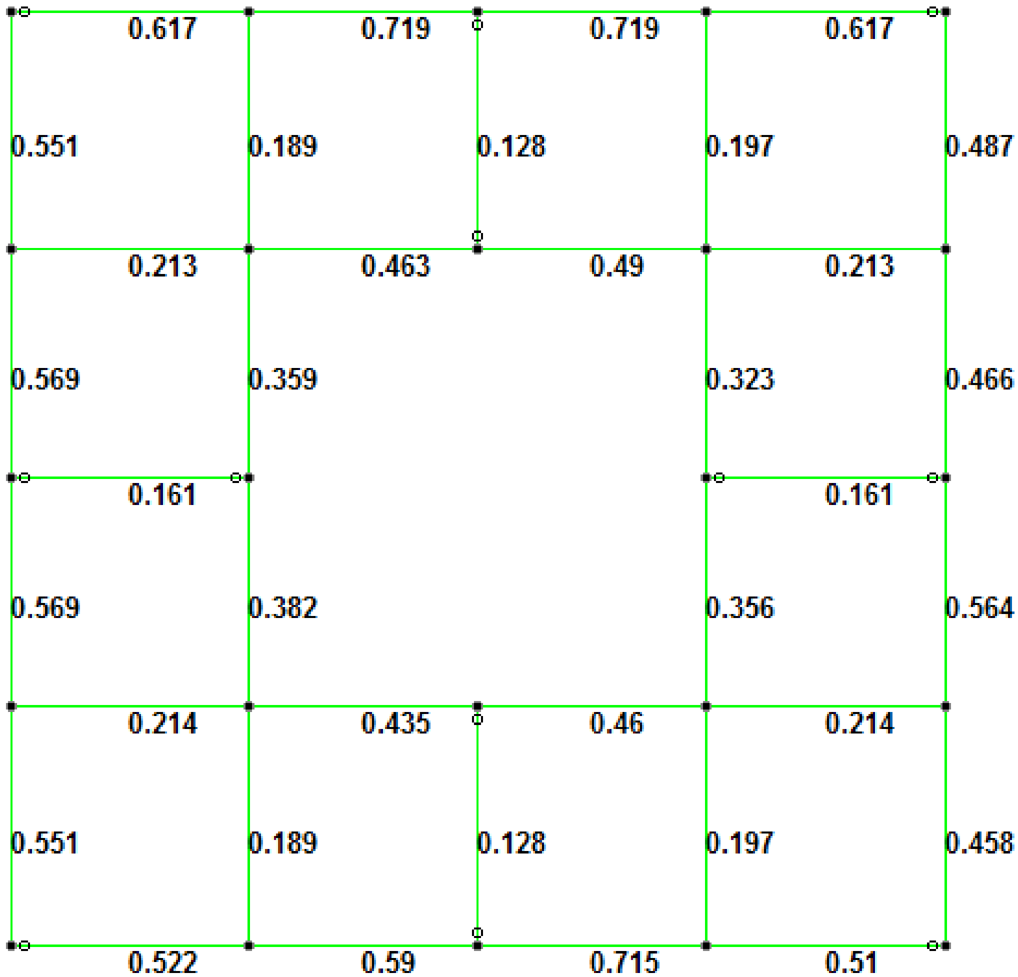
```
MEMBER     TABLE        RESULT/   CRITICAL COND/     RATIO/     LOADING/
                          FX            MY             MZ       LOCATION
=======================================================================


     1  ST   TUB E                     (CANADIAN SECTIONS)
                           PASS     AISC- H2-1          0.374       131
                   15262.67 T   -372217.22       14686.66       60.50
     2  ST   TUB E                     (CANADIAN SECTIONS)
                           PASS     AISC- H1-3          0.098       126
                   24214.42 C     -8132.31       29278.40      134.52
     3  ST   TUB E                     (CANADIAN SECTIONS)
                           PASS     AISC- H1-3          0.095       126
                   21972.22 C     17167.75       33462.89        0.00
     4  ST   TUB E                     (CANADIAN SECTIONS)
                           PASS     AISC- H1-3          0.496       105
                   46535.79 C     24972.15     -413630.75       60.50
     5  ST   TUB E                     (CANADIAN SECTIONS)
                           PASS     AISC- H1-3          0.116       117
                   28619.67 C    -21888.71      -22960.01        0.00
     6  ST   TUB E                     (CANADIAN SECTIONS)
                           PASS     AISC- H1-3          0.112       113
                   26198.70 C     17879.22      -41376.75        0.00
     7  ST   TUB E                     (CANADIAN SECTIONS)
                           PASS     AISC- H1-3          0.496       105
                   46528.86 C    -24727.92     -413572.09       60.50
     8  ST   TUB E                     (CANADIAN SECTIONS)
                           PASS     AISC- H1-3          0.117       119
                   28607.63 C    -22485.54       21495.36        0.00
     9  ST   TUB E                     (CANADIAN SECTIONS)
                           PASS     AISC- H1-3          0.112       117
                   25916.86 C    -17470.78      -42267.58        0.00
    10  ST   TUB E                     (CANADIAN SECTIONS)
                           PASS     AISC- H1-3          0.496       107
                   46532.62 C   -413155.56       24780.59       60.50
    11  ST   TUB E                     (CANADIAN SECTIONS)
                           PASS     AISC- H1-3          0.117       107
                   29086.98 C    -39332.47        5264.48      134.52
    12  ST   TUB E                     (CANADIAN SECTIONS)
                           PASS     AISC- H1-3          0.111       115
                   26151.52 C    -36893.27       22005.21        0.00
   101  ST   TUB E                     (CANADIAN SECTIONS)
                           PASS     AISC- H1-3          0.344       107
                       0.00 T         0.00      392152.91        0.00
   102  ST   TUB E                     (CANADIAN SECTIONS)
                           PASS     AISC- H1-3          0.344       105
                       0.00 T         0.00      391685.16       79.50
   103  ST   TUB E                     (CANADIAN SECTIONS)
                           PASS     AISC- H1-3          0.344       107
                       0.00 T         0.00      392108.50        0.00
   104  ST   TUB E                     (CANADIAN SECTIONS)
                           PASS     AISC- H1-3          0.344       105
                       0.00 T         0.00      391644.47       79.50
   301  ST   C10X15                    (AISC SECTIONS)
                           PASS     AISC- H2-1          0.617       107
                     229.72 T     22262.13        1359.44       41.22
   302  ST   C10X15                    (AISC SECTIONS)
                           PASS     AISC- H2-1          0.719       107
                      76.83 T     25984.66        1360.71        0.00
   303  ST   C10X15                    (AISC SECTIONS)
                           PASS     AISC- H2-1          0.719       107
                      77.95 T     25970.35        1361.31       39.72
   304  ST   C10X15                    (AISC SECTIONS)
                           PASS     AISC- H2-1          0.617       107
                     229.96 T     22265.35        1360.04        0.00
   305  ST   C10X15                    (AISC SECTIONS)
```

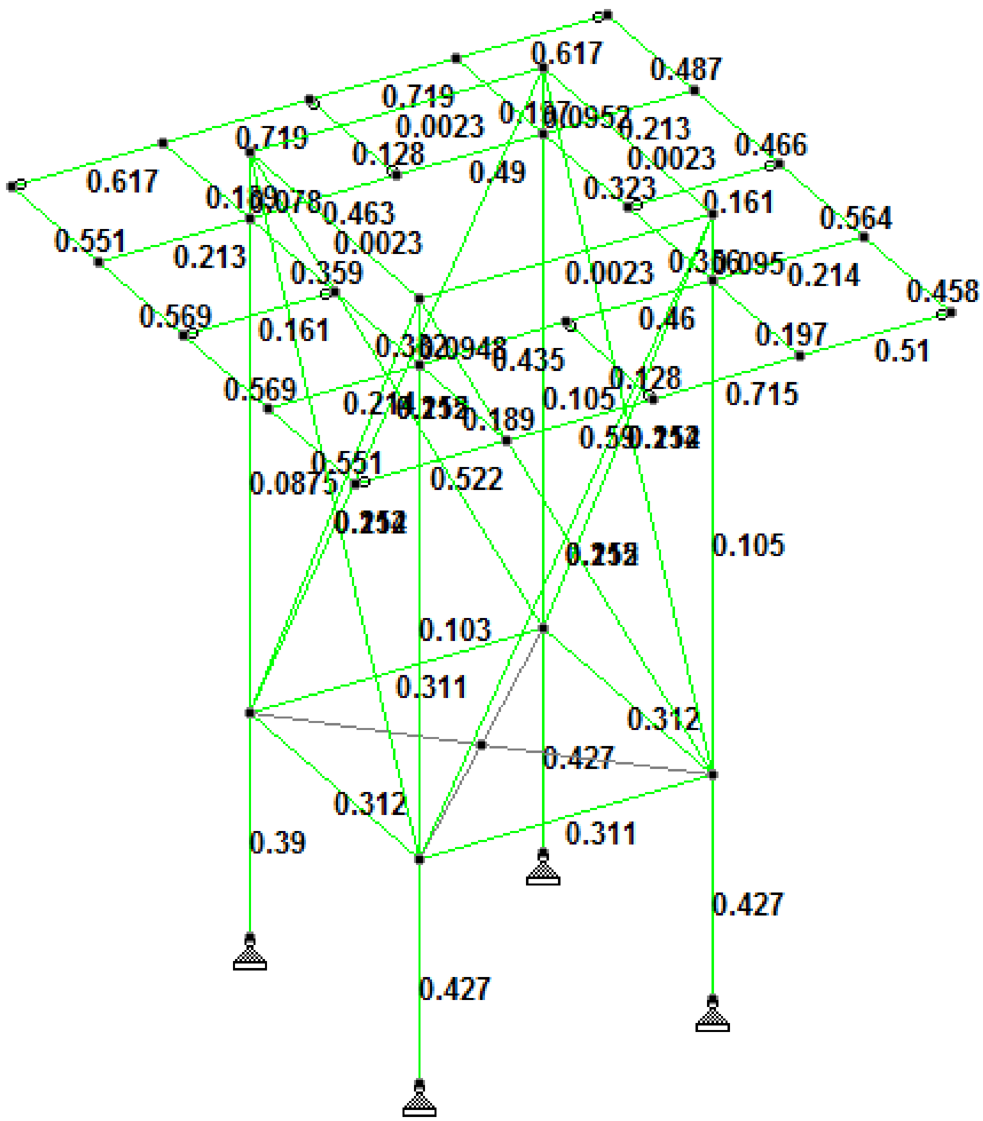
```
                   PASS     AISC- H2-1        0.213       107
                740.93 T     7240.11       5380.94      41.22
306  ST   C10X15                 (AISC SECTIONS)
                   PASS     AISC- H2-1        0.461       131
                473.35 T   -16588.45       -107.16      39.78
307  ST   C10X15                 (AISC SECTIONS)
                   PASS     AISC- H1-3        0.494       106
               2150.31 C    17030.28       1687.72       0.00
308  ST   C10X15                 (AISC SECTIONS)
                   PASS     AISC- H2-1        0.213       107
                740.59 T     7241.44       5380.68       0.00
309  ST   C10X15                 (AISC SECTIONS)
                   PASS     AISC- H2-1        0.213       108
               3846.46 T    -6125.14       6475.38      41.22
310  ST   C10X15                 (AISC SECTIONS)
                   PASS     AISC- H1-3        0.439       106
               2278.81 C    14766.75       4265.05       0.00
311  ST   C10X15                 (AISC SECTIONS)
                   PASS     AISC- H1-3        0.465       106
               2150.32 C    15931.58       2164.87      39.72
312  ST   C10X15                 (AISC SECTIONS)
                   PASS     AISC- H2-1        0.213       108
               3846.55 T    -6114.65       6588.49       0.00
313  ST   C10X15                 (AISC SECTIONS)
                   PASS     AISC- H1-3        0.522       106
                216.44 C    18672.55       2210.14      41.22
314  ST   C10X15                 (AISC SECTIONS)
                   PASS     AISC- H1-3        0.590       106
                202.51 C    21142.56       2216.18       0.00
315  ST   C10X15                 (AISC SECTIONS)
                   PASS     AISC- H1-3        0.715       106
                331.00 C    25655.85       2006.67      39.72
316  ST   C10X15                 (AISC SECTIONS)
                   PASS     AISC- H2-1        0.509       108
               1288.97 T   -18075.25        591.13       0.00
317  ST   C10X15                 (AISC SECTIONS)
                   PASS     AISC- H2-1        0.550       105
                204.47 T    19911.34        662.54      41.22
318  ST   C10X15                 (AISC SECTIONS)
                   PASS     AISC- H2-1        0.569       105
                170.07 T    20578.19        663.69       0.00
319  ST   C10X15                 (AISC SECTIONS)
                   PASS     AISC- H2-1        0.550       105
                204.47 T    19911.31        661.68       0.00
320  ST   C12X30                 (AISC SECTIONS)
                   PASS     AISC- H2-1        0.188       105
                805.87 T    11355.11       6962.86      41.22
321  ST   C12X30                 (AISC SECTIONS)
                   PASS     AISC- H1-3        0.385       108
               2474.06 C    23420.84       2910.52      39.75
322  ST   C12X30                 (AISC SECTIONS)
                   PASS     AISC- H2-1        0.188       105
                805.87 T    11355.20       6963.88       0.00
323  ST   C10X15                 (AISC SECTIONS)
                   PASS     AISC- H2-1        0.128       105
                223.08 T    -4588.28         -0.47       0.00
324  ST   C10X15                 (AISC SECTIONS)
                   PASS     AISC- H2-1        0.128       105
                223.08 T    -4588.23         -0.47      41.22
325  ST   C12X30                 (AISC SECTIONS)
                   PASS     AISC- H2-1        0.197       106
               4162.31 T   -10836.37       7709.69      41.22
326  ST   C12X30                 (AISC SECTIONS)
                   PASS     AISC- H1-3        0.359       108
               2487.27 C    21208.39       9899.06       0.00
327  ST   C12X30                 (AISC SECTIONS)
                   PASS     AISC- H2-1        0.197       106
               4162.31 T   -10836.19       7711.08       0.00
```

328	ST	C10X15		(AISC SECTIONS)		
			PASS	AISC- H1-3	0.488	108
			228.79 C	17512.41	1085.25	0.00
329	ST	C10X15		(AISC SECTIONS)		
			PASS	AISC- H1-3	0.564	108
			491.88 C	20136.10	1575.31	0.00
330	ST	C10X15		(AISC SECTIONS)		
			PASS	AISC- H2-1	0.458	130
			1246.14 T	-16261.86	-118.04	41.22
1013	ST	TUB E		(CANADIAN SECTIONS)		
			PASS	AISC- H1-3	0.002	101
			0.00 T	0.00	1897.29	0.00
1014	ST	TUB E		(CANADIAN SECTIONS)		
			PASS	AISC- H1-3	0.002	101
			0.00 T	0.00	1897.29	0.00
1015	ST	TUB E		(CANADIAN SECTIONS)		
			PASS	AISC- H1-3	0.002	101
			0.00 T	0.00	1897.29	0.00
1016	ST	TUB E		(CANADIAN SECTIONS)		
			PASS	AISC- H1-3	0.002	101
			0.00 T	0.00	1897.29	0.00
1071	ST	L50505		(AISC SECTIONS)		
			PASS	TENSION	0.155	110
			14071.89 T	0.00	0.00	0.00
1072	ST	L50505		(AISC SECTIONS)		
			PASS	TENSION	0.212	105
			19322.01 T	0.00	0.00	0.00
1073	ST	L50505		(AISC SECTIONS)		
			PASS	TENSION	0.212	107
			19292.62 T	0.00	0.00	0.00
1074	ST	L50505		(AISC SECTIONS)		
			PASS	TENSION	0.154	112
			13996.24 T	0.00	0.00	0.00
1075	ST	L50505		(AISC SECTIONS)		
			PASS	TENSION	0.212	105
			19323.15 T	0.00	0.00	0.00
1076	ST	L50505		(AISC SECTIONS)		
			PASS	TENSION	0.155	110
			14071.90 T	0.00	0.00	0.00
1077	ST	L50505		(AISC SECTIONS)		
			PASS	TENSION	0.154	112
			13996.25 T	0.00	0.00	0.00
1078	ST	L50505		(AISC SECTIONS)		
			PASS	TENSION	0.212	107
			19295.29 T	0.00	0.00	0.00
1079	ST	C10X15		(AISC SECTIONS)		
			PASS	AISC- H2-1	0.569	105
			170.07 T	20578.18	662.83	39.75
1080	ST	C12X30		(AISC SECTIONS)		
			PASS	AISC- H2-1	0.358	105
			286.89 T	-22488.07	1026.85	0.00
1081	ST	C10X15		(AISC SECTIONS)		
			PASS	AISC- H2-1	0.466	106
			1218.20 T	-16562.67	160.88	39.75
1082	ST	C12X30		(AISC SECTIONS)		
			PASS	AISC- H1-3	0.324	108
			2659.86 C	19621.49	1101.73	39.75
1083	ST	C10X15		(AISC SECTIONS)		
			PASS	AISC- H2-1	0.161	107
			304.80 T	5849.51	27.51	41.22
1084	ST	C10X15		(AISC SECTIONS)		
			PASS	AISC- H2-1	0.161	107
			304.84 T	5847.28	27.50	0.00

- **Utility stress ratio of Plateform**



- **Utility stress ratio of Whole assembly**



8.0 <u>CONCLUSION</u>

Analysis Methodology:

- Structure is being modelled with beam elements which is having six degree of freedom at each end.
- Member profiles are being taken as per provided by client. Orientation of members are also kept same as of provided drawing
- Geometrical dimensions are being kept exactly same as of provided.
- Gravity loads like equipment loading, selfweight of structure applied in vertical "Y" direction.
- Torsion load of the rotary equipment has been applied as per supplied data
- Lateral loads e.g wind and seismic loads are applied as per worst condition mentioned in International building Code 2006. Lateral loads are applied in +X, –X, +Z and –Z direction to check behaviour of structure in worst condition.
- Analysis of structure is done with Finite element method.

Design Methodology and outcome:

- Load combinations are applied as per International building Code-2006 to check the structure against worst loads.
- Permissible stresses in members are taken for design as per given grade of steel.
- "Allowable Stress Design (ASD)" has been used to check the structure for worst load combinations. All structural members are designed for worst loads
- **On basis of rigorous analysis done in STAAD pro structure is found SAFE to carry out Gravity, Dynamic and lateral loads.**