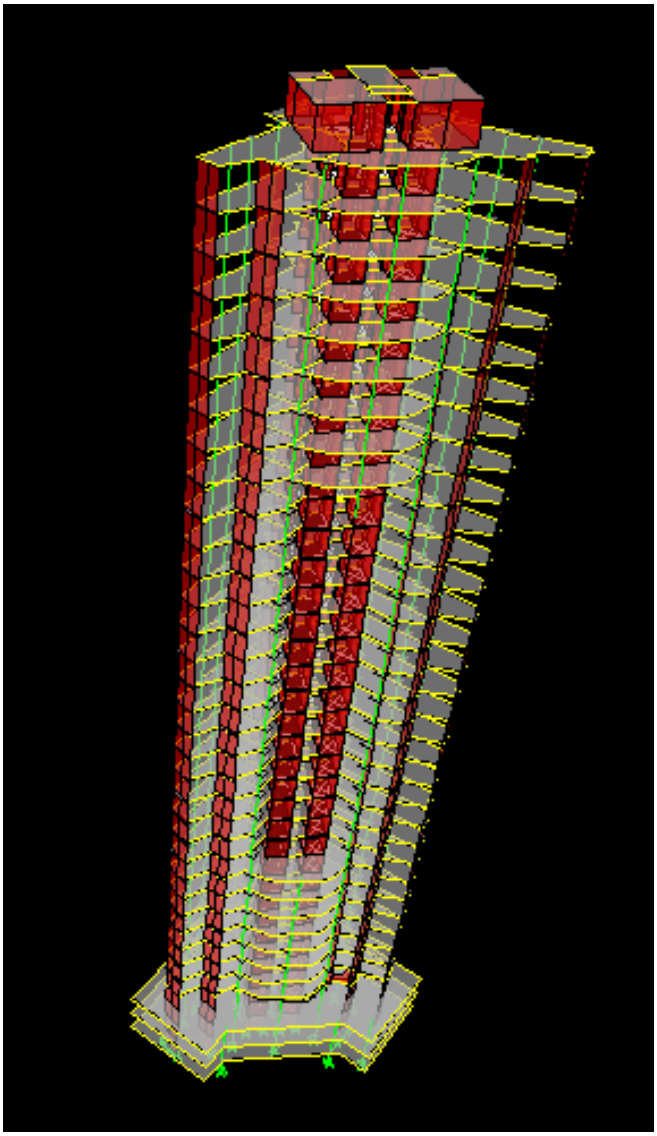
Calculation notes for 35 story tower

Kuwait

7-12-2010



Designed and revision by:

Eng:ayman kandeel

General notes:

- Foundation designed to resist 2 base story and ground and 32 repeated floor .
-Bearing capacity of the soil is 1.5 kg/cm2
-The statical system of the building is shear wall and columns

- Story height is 3.6m

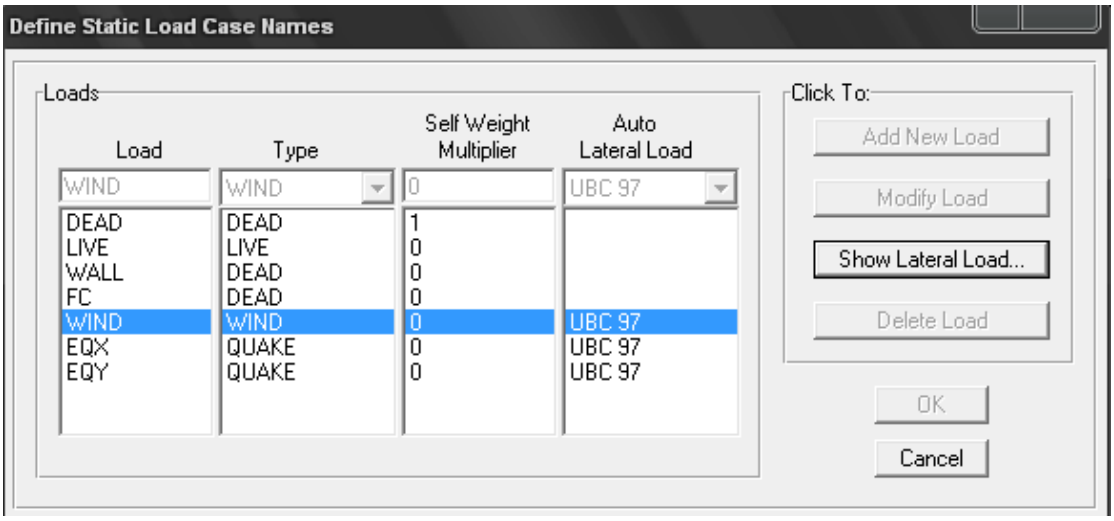
Wind load calculation

By etabs 9.6

Code:UBC 1997

This resultant wind force effect on the center of the side of the tower.

First we add the case of wind load to the program and choose the code ubc 97 as shown :



Then enter the parameters of the wind load :

Win speed:

سرعة الرياح =100mph

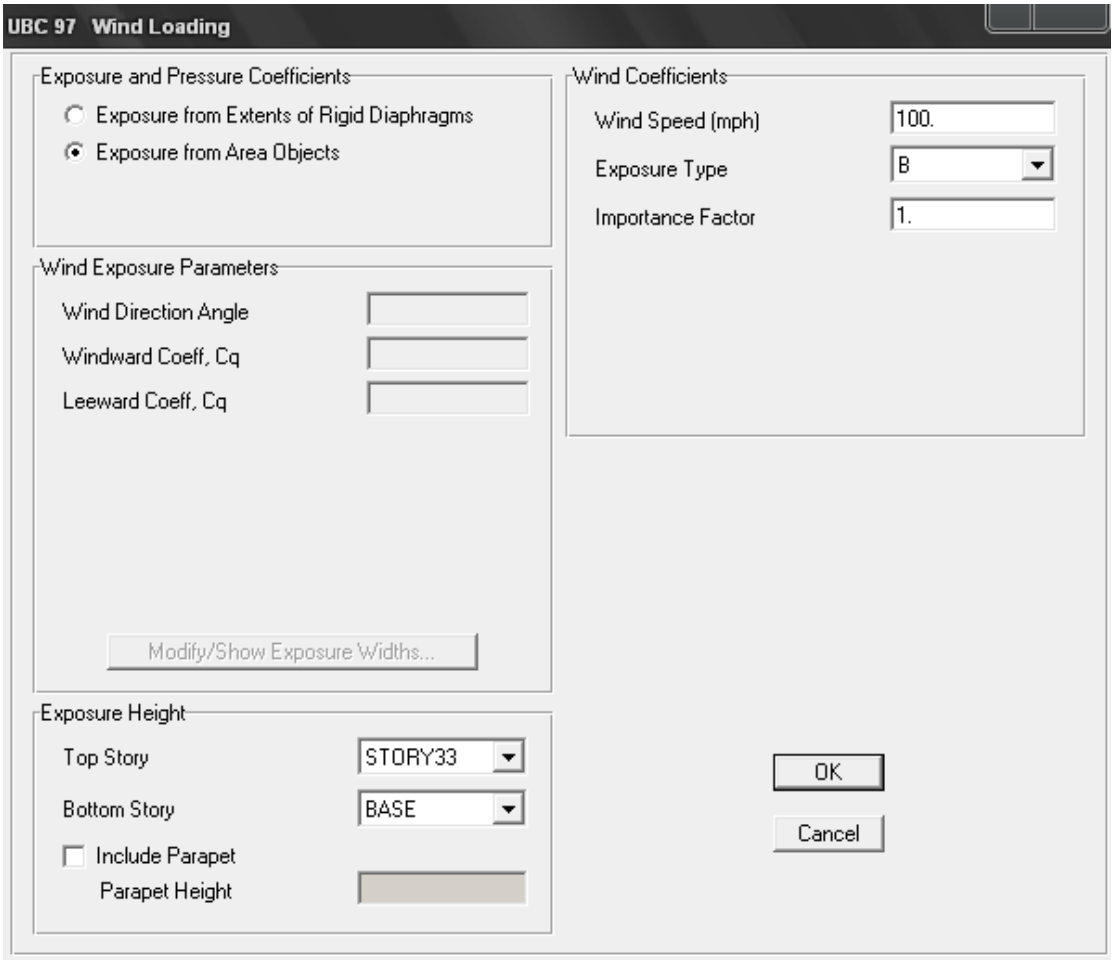
Exposure type:

مقدار التعرض للرياح في المنشأ نظرا لوجود مباني محيطة يكون النوع b

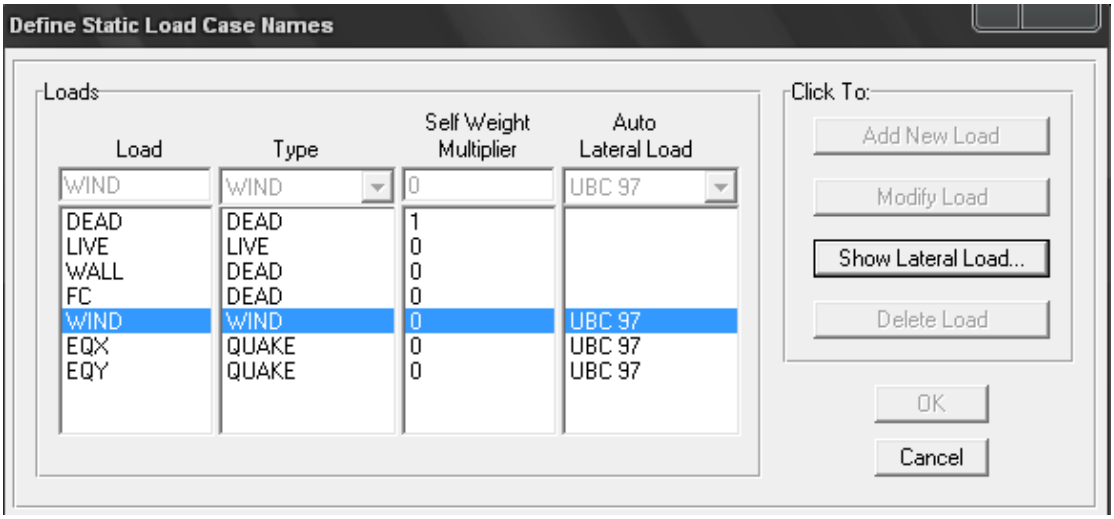
Importance factor:

معامل أهمية المنشأ منشأ عادي يكون المعامل =1

Set the parameters as shown :



Then click ok



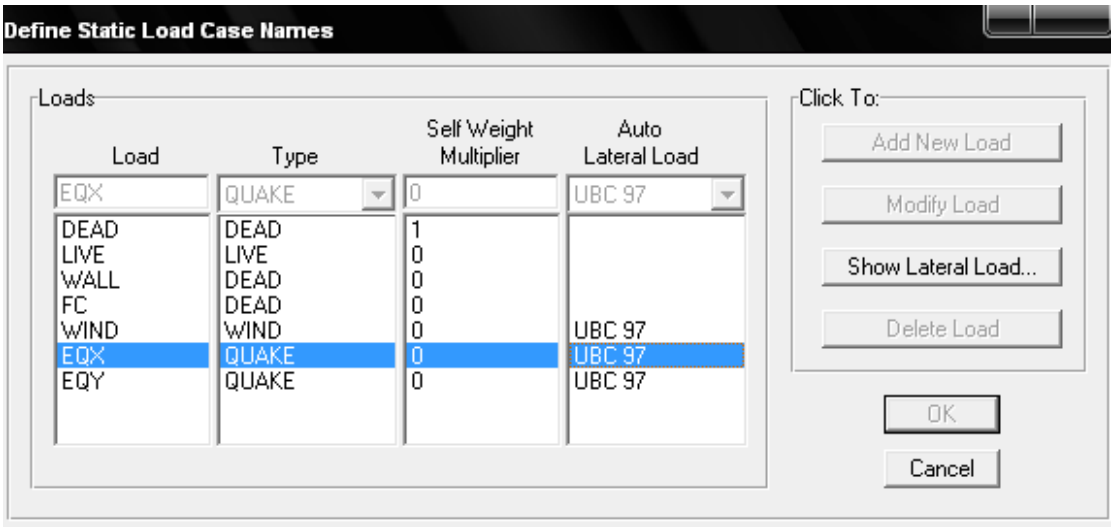
Earthquake load calculation

By etabs 9.6

Code:UBC 1997

The resultant force of the earthquake effect in the center of mass of the tower so we must but a minimum eccentricity

First we add the case of EQ at x-dir load to the program and choose the code ubc 97 as shown :



Then enter the parameters of the EQ-X load :

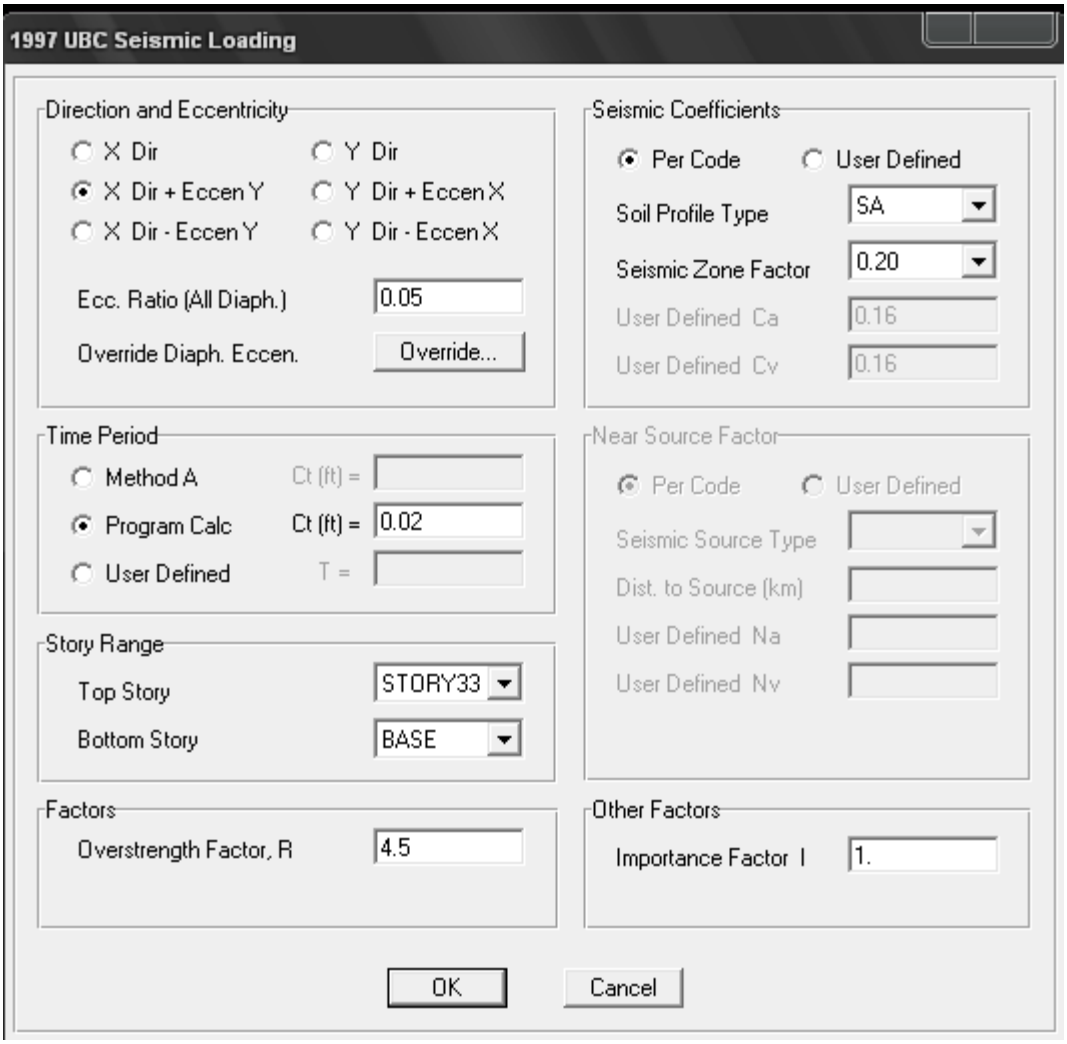
- ECC ratio = 0.05

- Over strength ratio is a ratio to put the building on the yield stage to resist the EQ for longer time so we take it= 4.5

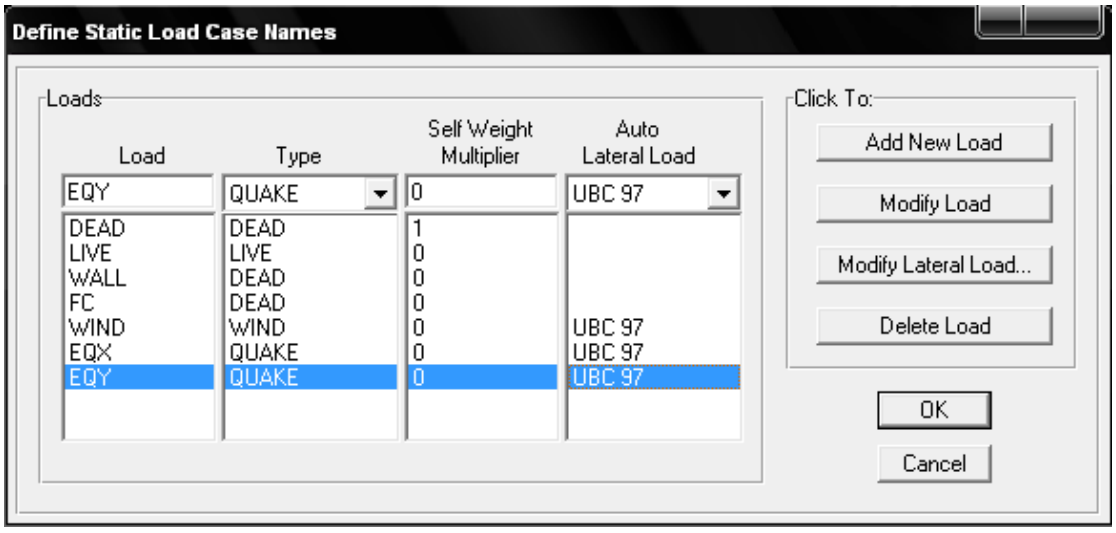
- soil profile hard rock = sa

- seismic zone z=0.2

Set the parameters as shown :



Repeat the same in y-direction to complete earthquake cases

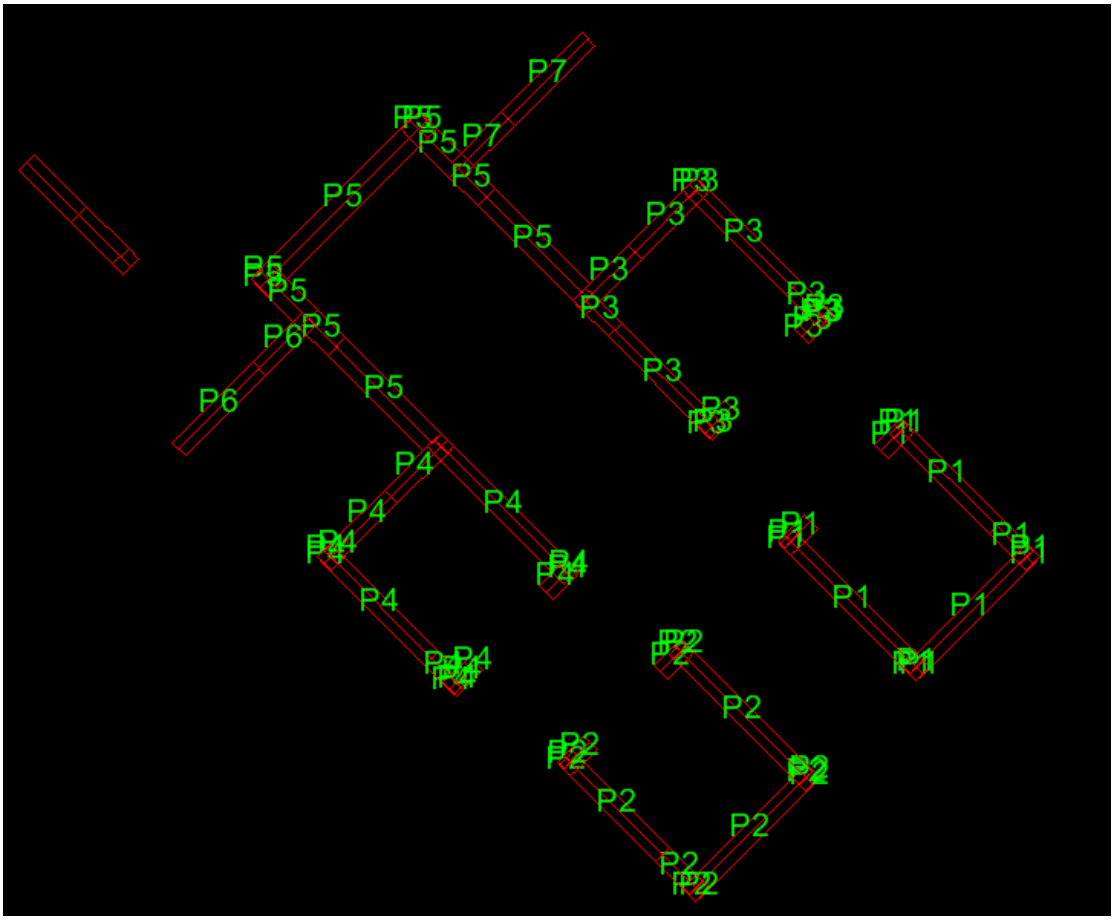


Design and reaction of shear wall

By ACI-318-99

There are 5 mainly shear wall that resists the total horizontal force which produced from lateral loads like earthquake and wind

Layout of walls:



We will design the walls on the following by csi col program

For the wall layout in the following pic

For wall w1:

We will design the wall for the maximum vertical force that in the case without any horizontal force that may reduce the total vertical force fz

The value of max vertical force from etabs FZ= 6009.49 TON

load case ultimate =1.4 DL+1.6 LL

Story	Point	Load	FX	FY	FZ	MX	MY	MZ
BASE	87	ULTIMATE	-87.14	-87.53	177.01	-0.213	0.33	0.048
BASE	88	ULTIMATE	87.17	87.53	177.8	0.278	-0.229	-0.028
BASE	89	ULTIMATE	-90.45	90.13	911.36	-7.304	-7.292	0.018
BASE	90	ULTIMATE	90.79	-90.41	915.64	7.497	7.865	0.06
BASE	91	ULTIMATE	-89.78	-90.08	825.6	6.174	-6.201	0.033
BASE	92	ULTIMATE	86.1	86.53	810.4	-4.531	4.186	0.065
BASE	93	ULTIMATE	93.25	-92.77	930.86	9.136	9.196	0.04
BASE	94	ULTIMATE	-88.54	87.93	899.85	-5.615	-6.088	0.071
BASE	95	ULTIMATE	88.7	89.24	180.89	0.309	-0.205	-0.05
BASE	96	ULTIMATE	-88.66	-89.25	180.08	-0.197	0.355	0.079
				total fz =	6009.49			

We will design the wall for the maximum vertical force that in the case without any horizontal force that may reduce the total vertical force fz

The value of max vertical force from etabs FZ= 6009.49 TON

load case MAX HORIZONTAL FORCE = max of wind, earth quake indirection x and earth quake in direction y

Story	Point	Load	FX	FY	FZ	MX	MY	MZ
BASE	87	HLF MAX	15.62	15.91	0	0	0.594	0
BASE	87	HLF MAX	0	0	-32.55	-1.929	0	-1.072
BASE	88	HLF MAX	0	0	6.17	0	0.638	1.059
BASE	88	HLF MAX	-6.5	-6.73	0	-1.886	0	0
BASE	89	HLF MAX	0	89.91	779.79	0	0	1.132
BASE	89	HLF MAX	-89.58	0	0	-20.068	-27.037	0
BASE	90	HLF MAX	70.74	0	198.11	0	0	0
BASE	90	HLF MAX	0	-71.05	0	-19.874	-27.051	-1.196
BASE	91	HLF MAX	0	0	1763.2	15.617	0	0
BASE	91	HLF MAX	-280.29	-279.64	0	0	-21.953	-1.118
BASE	92	HLF MAX	269.8	269.56	1259.32	15.542	0	1.059
BASE	92	HLF MAX	0	0	0	0	-21.688	0
BASE	93	HLF MAX	249.44	0	1276.36	0	0	0
BASE	93	HLF MAX	0	-250.02	0	-20.831	-28.183	-1.196
BASE	94	HLF MAX	0	270.03	1886.82	0	0	1.132
BASE	94	HLF MAX	-269.75	0	0	-21.25	-28.397	0
BASE	95	HLF MAX	136.19	135.85	152.36	0	0	1.105
BASE	95	HLF MAX	0	0	0	-0.64	-0.651	0
BASE	96	HLF MAX	0	0	166.67	0	0	0
BASE	96	HLF MAX	-134.87	-134.5	0	-0.679	-0.69	-1.118
						-55.998	-154.418	

So the wall w1 is designed for :

F z = 6009.49 ton

M x =-55.998 m.ton

M y = -154.418 m.ton

details of design for shear wall w1 and w2

by csi column

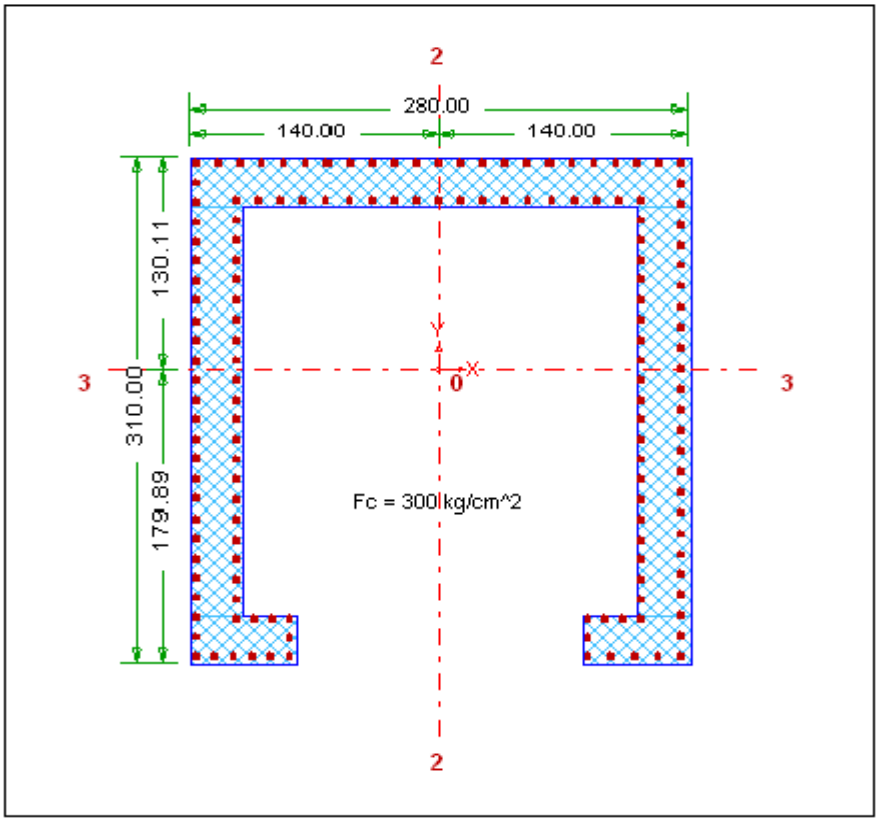
Column:Column1

Basic Design Parameters

Caption	= Column1	
Default Concrete Strength, Fc	= 300	kg/cm^2
Default Concrete Modulus, Ec	= 260000	kg/cm^2
Maximum Concrete Strain	= 0.003	in/in
Rebar Set	= ASTM	
Default Rebar Yeild Strength, Fy	= 3600	kg/cm^2
Default Rebar Modulus, Es	= 2000000	kg/cm^2
Default Cover to Rebars	= 3.82	cm
Maximum Steel Strain	= Infinity	
Transverse Rebar Type	= Ties	
Total Shapes in Section	= 1	
Consider Slenderness	= No	

Basic Section Properties:

Total Width	= 280.00	cm
Total Height	= 310.00	cm
Center, Xo	= 0.00	cm
Center, Yo	= 0.00	cm
X-bar (Right)	= 140.00	cm
X-bar (Left)	= 140.00	cm
Y-bar (Top)	= 130.11	cm
Y-bar (Bot)	= 179.89	cm



Section Diagram

Transformed Properties:

Base Materail	= fc' = 300 kg/cm^2	
Area, A	= 2.70E+04	cm^2
Inertia, Ixx	= 2.97E+08	cm^4
Inertia, Iyy	= 3.35E+08	cm^4
Inertia, Ixy	= 0.00E+00	cm^4
Radius, rx	= 104.97	cm
Radius, ry	= 111.39	cm

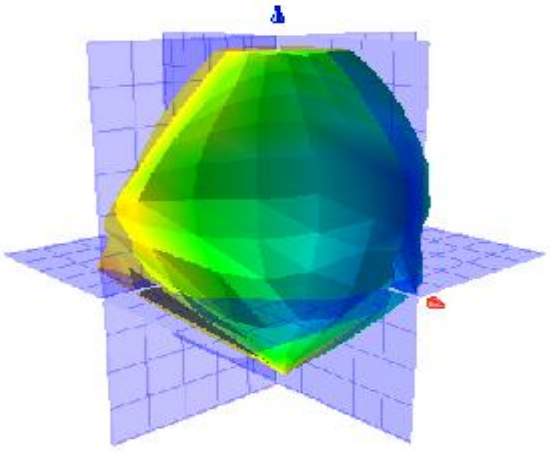
Final Design Loads

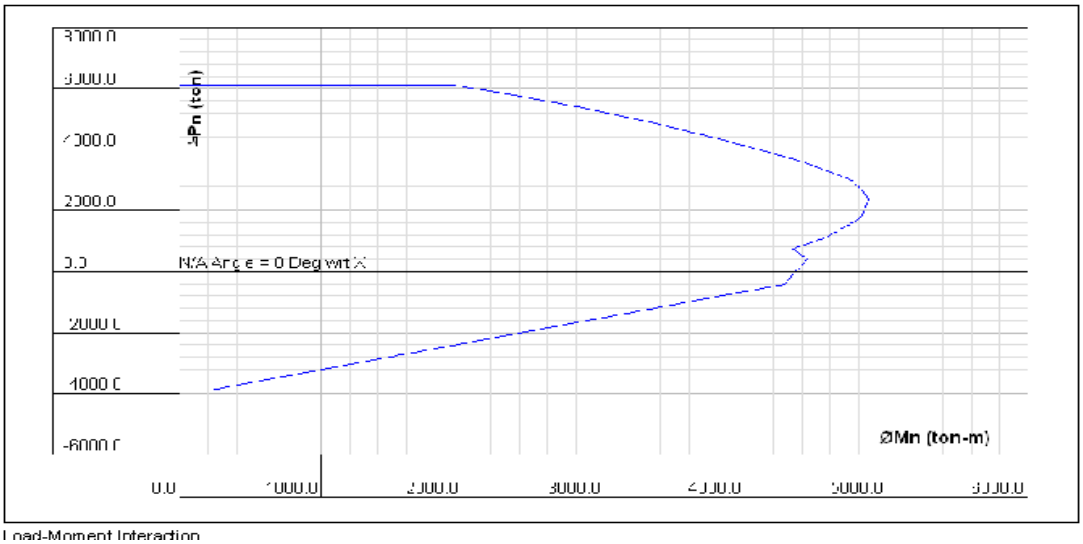
Sr.No	Combination	Load Pu ton	Mux-Bot ton-m	Muy-Bot ton-m	Mux-Top ton-m	Muy-Top ton-m
1	Combination1	6,009.5	-56.0	-154.4	0.0	0.0

Result Summary

Sr.No	Combination	Pu (ton)	Cap. Ratio-Bot	Cap. Ratio-Top	Remarks
1	Combination1	6,009.5	0.984	0.984	Capacity OK

interaction diagram





Load-Moment Interaction