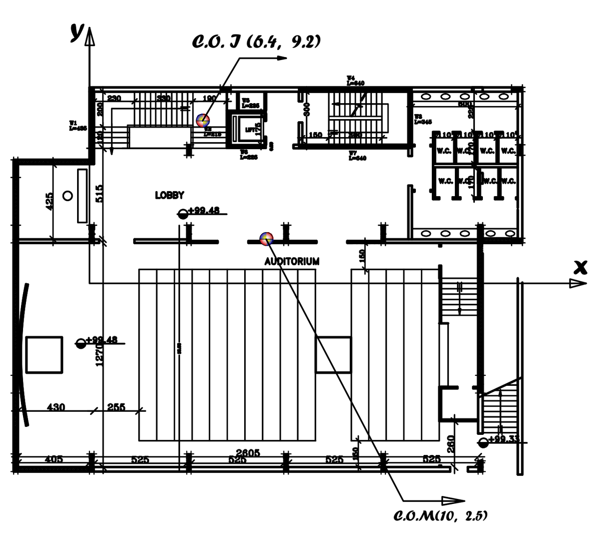
BLOCK -B-

SEISMIC REPORT



Seismic Design Building

block A

having2 basement floors One ground floor and two floors.
with a structurall walls resisting system.

story weight is w = 645T W =2946Tonns

story height is h1=3.0m. h2=3.1m. h3=3.2m. h4=3.2m.

h5=4.49m.

Height of the building H=16.57m

Inertia of walls:
$Ix1=1.23M^4$; $Ix2=0.133M^4$. $Ix3=0.65M^4$.
$Iy4=4.36M^4$; $Iy5=0.177M^4$. $Iy6=0.177M$. $Iy7=4.36M^4$

1-Definitions

Seismic / earthquake Zone : earthquake zones are defined as zones expected to experience in the coming 100 years earthquake.In Lebanon we consider the zone factor Z=0.3

Center of Mass C.O.M : A point in the plan of a floor where the resultant of gravity loading passes as well as the earthquake forces.

Center of Inertia C.O.M : A point in the plan of a floor at which the resultant of resisting forces passes. The location of C.O.I. in a wall resisting system , is given by:

$X = \Sigma (Ix,i*Xi) / \Sigma Ix$; $Y = \Sigma (Iy,i*yi) / \Sigma Iy$

2-Definitions of the type of resisting element:

Shear wall system: A structural system with an essentially complete space fram providing support for vertical loads . Seismic forces resisted by structural walls .

Building frame system: A structural system with an essentially complete space frame providing support for vertical loads . Seismic forces resisted by columns & braced frames.

Core system: A structural system with an essentially complete space fram providing support for vertical loads . Seismic forces resisted bycores (closed structural walls with or without openings) .

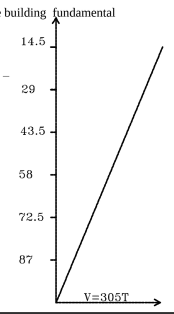
Dual system: A structural system with an essentially complete space frame providing support for vertical loads . Seismic forces resisted by (structural walls, cores&columns).

3-Determnations of the Total Earthquake load (Basee Shear):

V = Z*I*Ds*B*S*W

Z=0.3 Zone factor

I = 1 Importance factor given in table -1
Ds = 0.15 Dynamic coefficient given by table -2
S = 1.4 Soil coefficient given by table -3
B = Spectral coefficient , function of the building fundamental period (T).
$B = 1.23/T^{0.7}$
$T = \alpha*H^{3/4}$
H =16.57m is the height of the building
α = 0.05 for our building
T = 0.05*16.57 = 0.82 = 1.23/0.82= 1.5
Conditions: S * B $\leq$ 2.5
Ds*S*B > 0.07
Weconsider B = 2
W =2946T
V = 0.30 *0.15 *2*0.15 *2946= 305T.



4-Distributions of Base Shear:

the base shear is distributed over the height of the building by a series of concentrated horizontal forces given by :
$Fi = V*wi*(hi)^k / \Sigma wx*(hx)^k$
Wher $1\leq K= T/2+3/4\leq 2$
wi the floor weight considered as lumped at the C.O.M. of the floor
i.hi & hx represent the story (i) or (x) height above the fixity level .

we consider K = 1:

F1 = 14.5T
F2 = 29T
F3 = 43.5T
F4 = 58T
F5 = 72.5T
F6 = 87T

5-Distribution of the lateral forces Fi :

the lateral force Fi obtained by the previous formula , causes a movment of the floor slab (translantion and rotation) , that is resissted by walls , cores & columns In our building. Eachb of them receive a part of Fi that correspond to its rigidity as follows:

-Force in wall(j)parallel to Fi:

$Qj = (Fi*Ixj)/\Sigma Ix + (Fi*ex*Ixj*cj / \Sigma Ix*c^2+\Sigma Iy*c^2$

Due to translation Due to rotation

-Force in wall(j)perpendicular to Fi:

$Qj = (Fi*ex*Iyj*cj / \Sigma Ix*c^2+\Sigma Iy*c^2$

Due to rotation

where:
-(ex,ey)represent the eccentricity between C.O.M.&C.O.I. these values are increased (or decreased) by an accidental eccentricity of 5% of the largest plan length perpendicular to the direction of applied lateral load.
-Cj &cj represent x&y distance from the wall (j) to the C.O.I.
In figure shown the distribution of walls W1,W2,W3,W4,W5,W6,W7.in the floors the C.O.M. & C.O.I. of the reference systeme (X,Y)
The Coodination of C.O.M.(10,2.5) These Coordinates For All Floors Because They are Typicals
To calculate the coordinates of C.O.I. we have to now the moment of inertia of each wall
The moment of inertia of a rectangular section is given by $I = bh^3 /12$

By calculation we get :

$Ix1 = 1.23M^4$; $Iy4 = 4.36M^4$;
$Ix2 = 0.133M^4$. $Iy5 = 0.177M^4$.
$Ix3 = 0.65M.^4$ $Iy6 = 0.177M^4$.
$Iy7 = 4.36M^4$.

	$Ix*(m^4)$	C(m)	$Ix*(c^2)$
W1	1.23	5.3	34.6
W2	0.133	2.3	0.7
W3	0.65	12.6	103.2
ΣIx =	2.013	$\Sigma Ix*(c)^2$	138.5

	$I*yc(m^4)$	C(m)	$Iy*(c^2)$
W4	4.36	1.5	9.8
W5	0.177	0.2	0
W6	0.177	1.7	0.5
W7	4.36	1.7	12.6
ΣIy =	9.074	$\Sigma Iy*(c)^2$	22.9
$\Sigma Ix (c)^2+\Sigma Iy (c)^2=161.4$			

We neglect the inertia of columns
By calculation We get : C.O.I (6.4,9.2)
X = 6.4
Y = 9.2

ex = 3.6
ey = 6.7
ex accidental = 1.1
ey accidental = 4.6
ex design = 1.7
ey design = 7.3

Force in wall "j" parallel to F6

	Due to translation	Due to rotation	Total
QJ	F6*Ixj /ΣIx	$F6*ex*Ixj*Cj / \Sigma Ix*C^2 + \Sigma Iy*C^2$ ex =4.7	
Q1	87*1.23/2.013=53.2	87*1.7*1.23*5.3/161.4=16.5	69.7
Q2	87*1.33/2.013=5.8	87*4.7*0.133*2.3/161.4=0.8	6.6
Q3	87*0.65/2.013=28.1	87*4.7*0.65*12.6/161.4=20.8	48.9

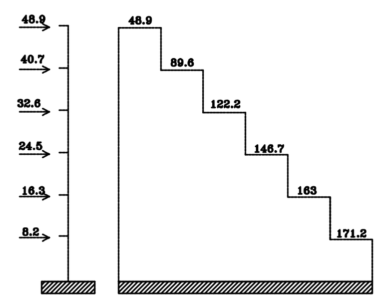
Force in wall 'fi' parallel to F6

	Due to translation	Due to rotation	Total
Qi=	F6*Iyi/ΣIy	$F6*ey*Iyi*Ci / \Sigma Ix*C^2 + \Sigma Iy*C^2$ ey =7.3	
Q4	87*4.36/9.074=42	87*7.3*4.36*1.5/161.4=25.8	67.8
Q5	87*0.177/9.074=1.7	87*7.3*0.133*0.2/161.4=0.1	1.8
Q6	87*0.177/9.074=1.7	87*7.3*0.133*1.7/161.4=0.9	2.6
Q7	87*4.36/9.074=42	87*7.3*4.36*1.7/161.4=29.2	71.2

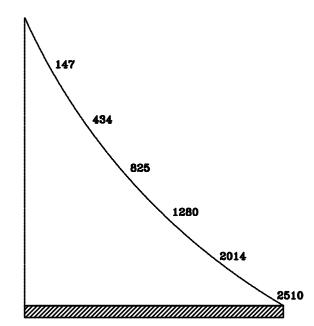
Using the same formula ,the forces in the other can be written

	6th	5th	4th	3th	2th	1th
Q1	69.7	58.1	46.5	34.8	23.2	11.6
Q2	6.6	5.5	4.4	3.3	2.2	1.1
Q3	48.9	40.7	32.6	24.5	16.3	8.2
Q4	67.8	56.5	45.2	33.9	22.6	11.3
Q5	1.8	1.5	1.2	0.9	0.6	0.3
Q6	2.6	2.2	1.7	1.3	0.9	0.5
Q7	71.2	59.4	47.5	35.6	23.8	11.9

The force diagrams are then obtained for each wall, considered as vertical cantilever, under the maximum distributed lateral forces .
For Walls: W1,W2,W3.



Distributed Force **Distributed Shear Force Diagram**

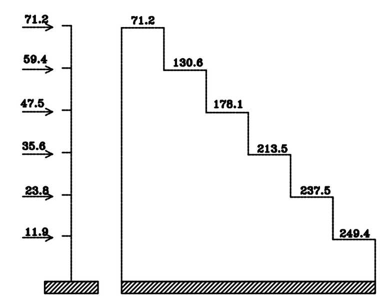


Moment Diagram

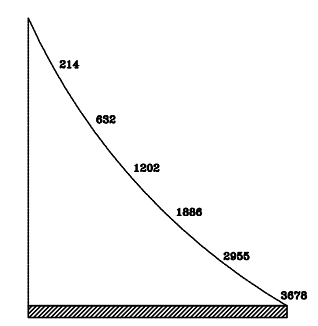
$Fsteel = 164cm^2$

At the ALL Floors the Vertical steel 5Φ14/M in two layers & the Horizontal steel 5Φ14/M in two layers. With Column At The Beginning At Every Wall.With Steel 6Φ20mm

The force diagrams are then obtained for each wall, considered as vertical cantilever, under the maximum distributed lateral forces .
For Walls: W4,W5,W6,W7.



Distributed Force **Distributed Shear Force Diagram**



Moment Diagram

$Fsteel = 128cm^2$

At the ALL Floors the Vertical steel 5Φ14/M in two layers & the Horizontal steel 5Φ12/M in two layers. With Column At The Beginning At Every Wall.With Steel 6Φ16mm