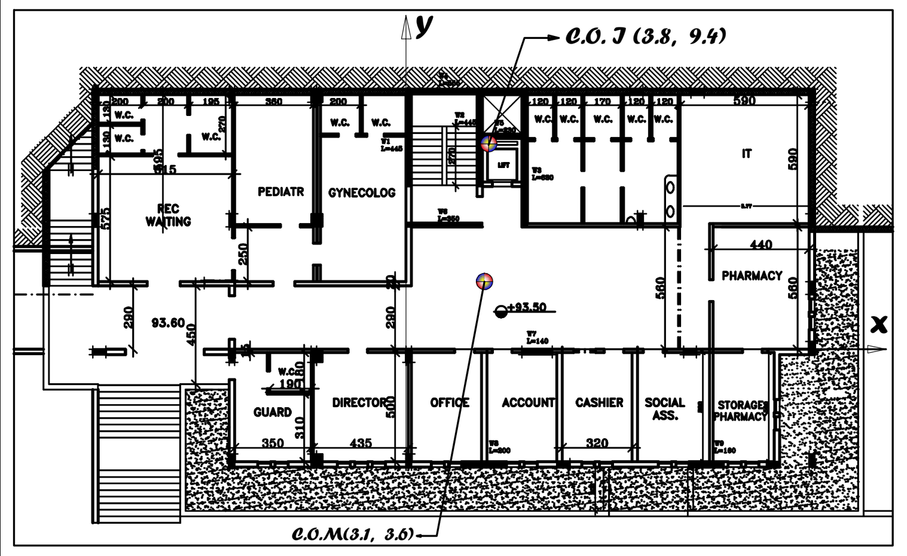
BLOCK -A-

SEISMIC REPORT



Seismic Design Building

seimic design for Building Of Al BAROUK. Area number .....,the building consisted of 2 blocks
block A
having2 basement floors One ground floor and two floors.
with a structurall walls resisting system.

story weight is w = 645T W =3225Tonns

story height is h1=3.3m. h2=3.6m. h3=3.3m. h4=3.6m.

h5=3.1m.

Height of the building H=16.9m

Inertia of walls:
$Ix1=1.42M^4$; $Ix2=1.42M^4$ $Ix3=3.97M^4$
$Iy4=2.77M^4$; $Iy5=0.177M^4$ $Iy6=0.71M^4$ $Iy7=0.045M^4$
$Iy8=0.133M^4$ $Iy9=0.068M^4$

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:

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

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) .

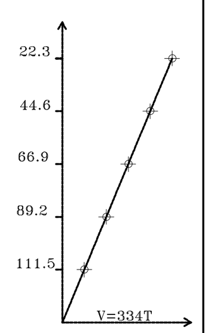
Dual system: A structural system with an essentially complete space frame providing support for vertical loads . Seismic forces resisted by (structural walls, cores&columns).

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).
$B = 1.23/T^{0.7}$
$T = \propto * H^{3/4}$
H =16.9m is the height of the building
$\propto$ = 0.05 for our building
T = 0.05*16.9 = 8.4 = 1.23/8.4= 0.14
Conditions: S * B $\leq$ 2.5
Ds*S*B > 0.07
Weconsider B = 2
W =3225T
V = 0.30 *0.15 *2*0.15 *3225= 334T.



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 = 22.3T
F2 = 44.6T
F3 = 66.9T
F4 = 89.2T
F5 = 111.5T

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:

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

Due to translation Due to rotation

-Force in wall(j)perpendicular to Fi:

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

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,W8,W9.in the floors the C.O.M. & C.O.I. of the reference systeme (X,Y)
The Coodination of C.O.M.(3.1,3.6) 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 :

$Ix1 = 1.42M^4$
$Ix2 = 1.42M^4$
$Ix3 = 3.97M^4$
$Ix4 = 2.77M^4$
$Ix5 = 0.177M^4$
$Ix6 = 0.71M^4$
$Ix7 = 0.045M^4$
$Iy8 = 0.133M^4$
$Iy9 = 0.068M^4$

	$Ix*(m^4)$	C(m)	$Ix*(c^2)$
W1	1.42	3.6	18.4
W2	1.42	0.4	0.3
W3	3.97	3.8	3.3
W3	0.23	1.6	10.1
$\sum Ix$ =	6.81	$\sum Ix*(c)^2$	28.8

We neglect the inertia of columns
By calculation We get : C.O.I (3.8,9.4)
X = 3.8
Y = 9.4

ex = 0.8
ey = 5.8
ex accidental = 0.9
ey accidental = 0.6
ex design = 1.7
ey design = 6.4

	$I*yc(m^4)$	C(m)	$Iy*(c^2)$
W4	2.77	2.5	17.3
W5	0.6	0.7	0.3
W6	0.71	3.5	8.7
W7	0.045	9.1	3.73
W8	0.133	14.4	27.58
W9	0.068	14.4	13.52
$\sum Iy$ =	3.903	$\sum Iy*(c)^2$	70.9
$\sum Ix (c)^2 + \sum Iy (c)^2$ =99.7			

Force in wall "j" parallel to F5

	Due to translation	Due to rotation	Total
QJ	F5*Ixj /$\sum$Ix	F5*ex*Ixj*Cj / $\sum Ix*C^2 + \Sigma Iy*C^2$ ex =1.7	
Q1	111.5*1.42/6.81=23.3	111.5*1.7*1.42*3.6/99.7=9.7	33
Q2	111.5*1.42/6.81=23.3	111.5*1.7*1.42*0.4/99.7=1.1	24.4
Q3	111.5*3.97/6.81=65	111.5*1.7*3.97*1.6/99.7=12	77

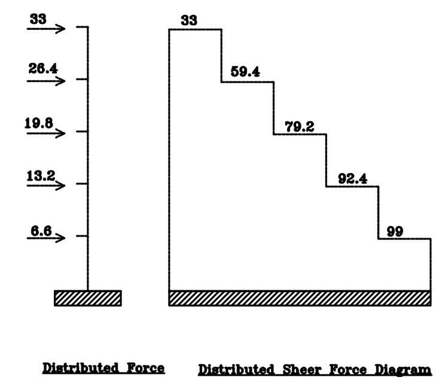
Force in wall 'fi' parallel to F5

	Due to translation	Due to rotation	Total
Qi=	F5*Iyi/$\sum$Iy	F5*ey*Iyi*Ci / $\sum Ix*C^2 + \Sigma Iy*C^2$ ey =2.9	
Q4	111.5*2.77/3.903=79.2	111.5*6.4*2.77*2.5/99.7=49.6	128.4
Q5	111.5*0.177/3.903=5	111.5*6.4*0.177*0.6/99.7=0.8	5.8
Q6	111.5*0.71/3.903=20.3	111.5*6.4*0.71*3.5/99.7=17.7	38
Q7	111.5*0.045/3.903=1.3	111.5*6.4*0.045*9.1/99.7=3	4.3
Q8	111.5*0.133/3.903=3.8	111.5*6.4*0.133*14.4/99.7=13.7	17.5
Q9	111.5*0.068/3.903=2	111.5*6.4*0.068*14.4/99.7=7	9

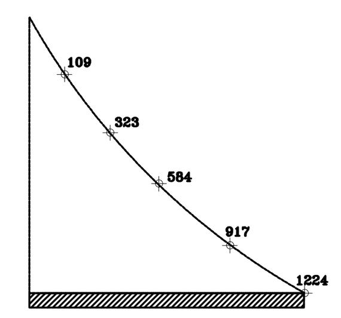
Using the same formula .the forces in the other can be written:

	5th	4th	3th	2th	1th
Q1	33	26.4	19.8	13.2	6.6
Q2	24.4	19.5	14.6	9.8	4.9
Q3	77	61.6	46.2	30.8	15.4
Q4	128.4	102.1	77	51.4	25.7
Q5	5.8	4.6	3.5	2.4	1.2
Q6	38	30.4	22.8	15.2	7.6
Q7	4.3	3.5	2.6	1.6	0.8
Q8	17.5	14	10.5	7	3.5
Q9	9	7.2	5.4	3.6	1.8

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



Distributed Force Distributed Sheer Force Diagram

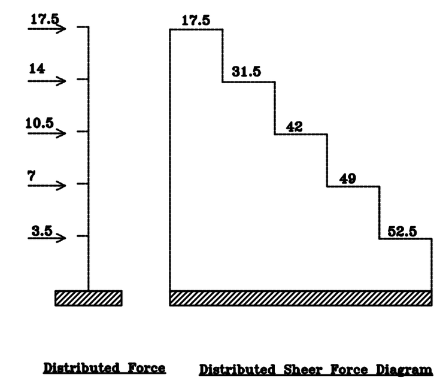


Moment Diagram

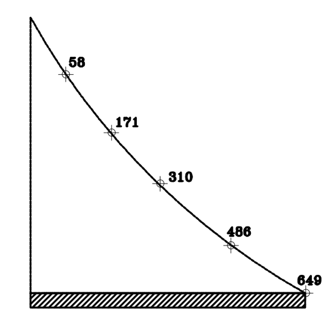
Fsteel = $65cm^2$

At the ALL Floors the Vertical steel 5ø14/M in two layers & the Horizontal steel 5ø14/M in two layers. With Column At The Begining At Every Wall.With Steel 4ø20mm

The force diagrams are then obtained for each wall, concidered as vertical cantilever, under the maximum distributed lateral forces .
For Walls: W4,W5,W6,W7,W8,W9.



Distributed Force Distributed Sheer Force Diagram



Moment Diagram

Fsteel = $72cm^2$

At the ALL Floors the Vertical steel 5ø16/M in two layers & the Horizontal steel 5ø14/M in two layers. With Column At The Begining At Every Wall.With Steel 6ø20mm