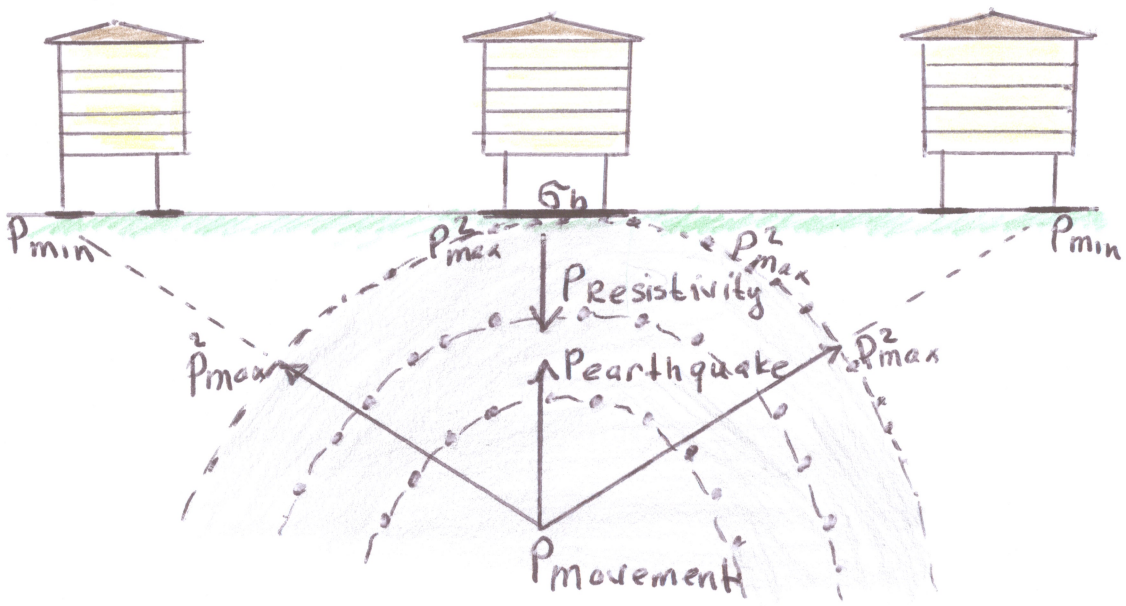
SECTION 2

MOTIONAL FORCE ON EARTHQUAKE AND FORCE AGAINST TO EARTHQUAKE



the deformation on the ground by the magmatic or tectonic forces and the demolish of the buildings are called as earthquake

P → x ← P

P earthquake X P resistivity = P^2

scalar multiplation

This event creates a tension at txv moment ;

so the 1st equation is as follows ;

$\sigma = P^2 / txv$

So we have created to the equation 1

Let's assume an equation as ;

$\sigma b = 600\ t/m^2$

$v = 0.7\ km/sec$

$t = 30\ sec$

what would be the force Per area ?

$$\sigma = P^2/txv\ ,\quad P = \sqrt{\sigma bxtxv}$$

$$P = \sqrt{600x30x07}\ ,\quad P = 112{,}25\ t/m.$$

This figure shows the force ,at 30 sec from 21 km, on the foundation of the construction.

So what the force will be 21 km under the ground ?

If we place the figures for t and v in the equation shown in the sample as ;

$$\sigma = P^2 \Big/ \frac{L}{V} \times \frac{L}{t} = \sigma = P^2 \Big/ \frac{L^2}{v \times t}$$

In this equation, t value should be 1 second (t=1 sec) as sinking or displacement period is very short. However timing is made during the movement up to the surface.

For t = 1 sec ;

the equation shall be formed as ;

the 2 nd equation is : $\sigma = P^2 / L^2 / v$,

Lets calculate this for an earthquake ; In this case ;

$\sigma b = 600\ t/m^2$

v = 0.7 km/sec

L= 21 km

What would be the force Per area ?

let's put the figures in place for the 2. eq.

from $\sigma = P^2 / L^2 / v \rightarrow$

$$P = \sqrt{\sigma b \times L^2 / v}$$

$$P = \sqrt{600x21^2x07} \quad , \quad P = 614{,}82 \text{ tsec/m.}$$

This figure shows the force

,at 1 sec from 21 km,

So what the force will be on the foundation of the construction at 30 seconds ?

From $\sigma = P^2 / L^2 / v \times t \rightarrow$

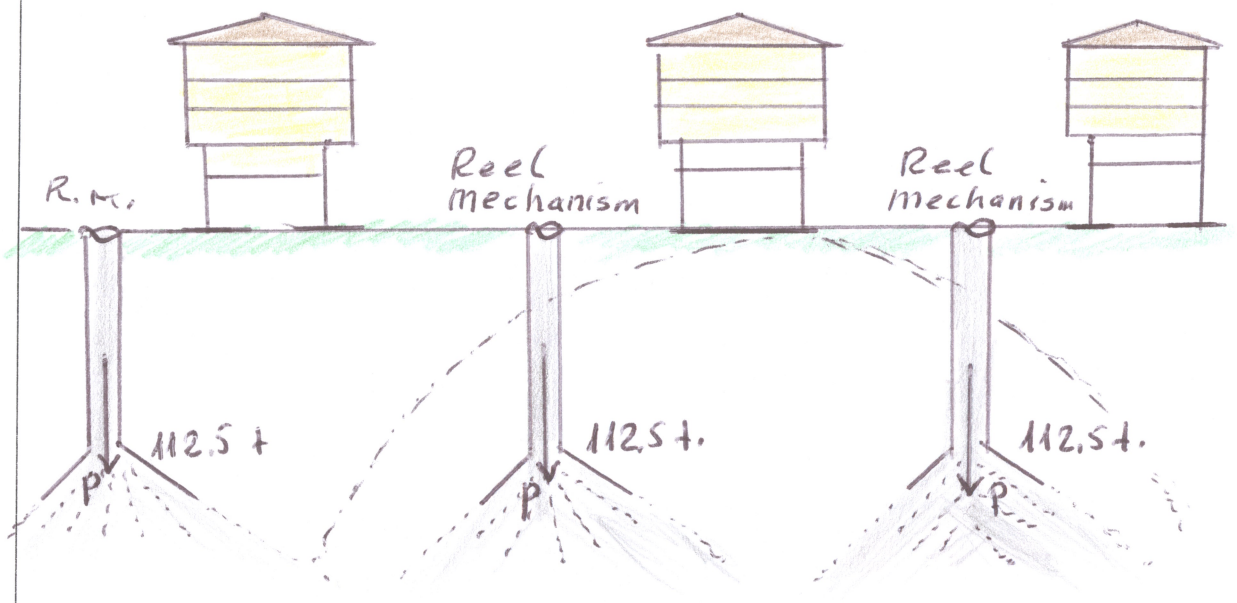
$$P = \sqrt{\sigma b \times L^2 / v \times t}$$

$$P = \sqrt{600x21^2x07x30} \ , \ P = 112{,}25$$

so it can been that;

$\sigma = P^2 / t \times v \ = \sigma = P^2 / L^2 / v \times t$

FORCE AGAINST TO EARTHQUAKE

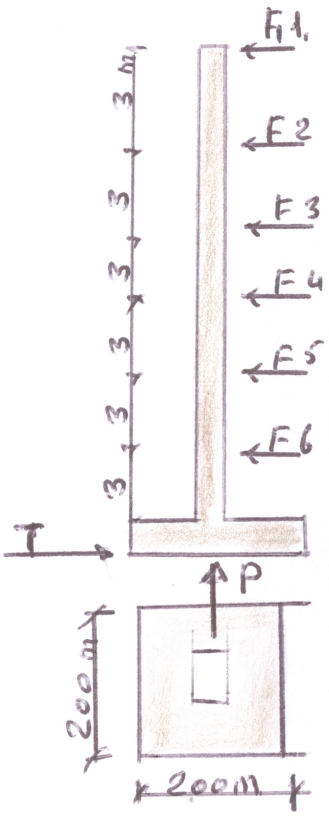


1. Force against to Earthquake
2. break and spread the force
3. continues operation of the mechanism
4. create a tight and compassed ground
5. mechanism force may be sound or shock/stroke
6. the distance between the mechanism may be 3-4 km

application depth should be far from the foundation

April 17, 1992
Naşit Yılmaztürk, Civil Eng.

THE MOTIONAL FORCE ON EARTHQUAKE AND IT'S APPLICATION ON THE CONSTRUCTIONS



floor load on each column

N^2 .....N^6 = 15 t. N1 = 5 t.

Σ N = 80 t

$\sigma z = 20\ t/m^2$

$\sigma b = 600\ t/m^2 \approx {}^{700}\ t/m^2$

Required Foundation Area

σ = N/A ; A = N/ z

$A = 80/20 = 4\ m^2$

seismic force for 30 seconds is 112.25 t

seismic force Per foundation area

P = 112,25 x 4 = 449 t.

The column is loaded from the bottom to the top and ;

column A = 449/700 = 064 m^2 = 0.80x0.80 m

horizontal force from the 449 tones of vertical force is ;

τ = T/A ; T = τ x A = 60x0.64

T = 38,40 t

$Fi = T \times Wi\ hi / \Sigma Wi\ hi$

$W_1\ h_1 = 18 \times 5 = 90$

$W_2\ h_2 = 15 \times 15 = 225$

$W_3\ h_3 = 12 \times 15 = 180$

$W_4\ h_4 = 9 \times 15 = 135$

$W_5\ h_5 = 6 \times 15 = 90$

$W_6\ h_6 = 3 \times 15 = 45$

$\Sigma W_1\ h_1 = 765$

$F_1 = 38.40 \times 90 / 765 = 4.1\ t$

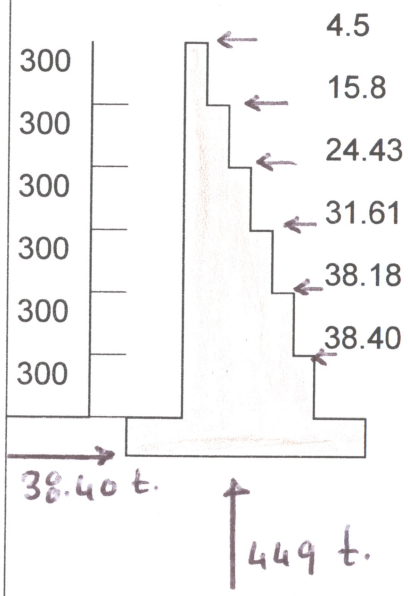
$F_2 = 38.40 \times 225 / 765 = 11.29$

$F_3 = 38.40 \times 180 / 765 = 9.03$

$F_4 = 38.40 \times 135 / 765 = 6.79$

$F_5 = 38.40 \times 90 / 765 = 4.51$

$F_6 = 38.40 \times 45 / 765 = 2.26\ t$



$Q_1 = 4.51$ t

$Q_2 = 15.80$ t

$Q_3 = 24.43$

$Q_4 = 31.61$

$Q_5 = 36.18$

$Q_6 = 38.40$ t

Sectional allocation for the floor columns

$S_1 = 4.51/60 = 0.075 = 028 \times 028$ $\quad A = T/\tau$

$S_2 = 15.80/60 = 026 = 052 \times 052$

$S_3 = 24.83/60 = 041 = 0.65 \times 0.65$

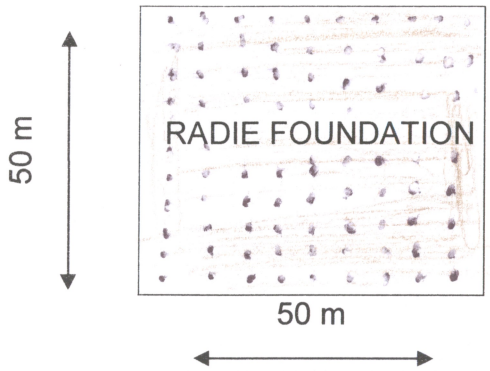
$S_4 = 31.61/60 = 0.53 = 074 \times 074$

$S_5 = 36.18/60 = 0.60 = 0.78 \times 0.78$

$S_6 = 38.40/60 = 0.64 = 0.80 \times 0.80$

Any type of foundation calculations can be made by this method.
Deviation of effectiveness can be measured by common methods.

FORCE AGAINST TO SEISMIC SHOCK

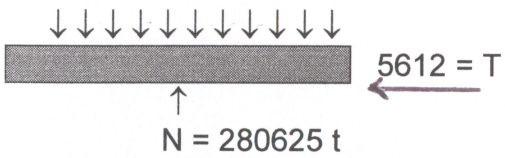


a seismic shock with severity 7,

time period 30 seconds

P = 112,25 t.

σb = 3000 t/m^2



ΣN = 50x50x112.25 = 280 625 t

required column or curtain wall area :

A = 280 625 / 3000 = 93,54 m^2

for a design 25 m^2 Per column ;

2500 / 25 = 100 columns and 100x100 m

resistant to horizontal force as ;

T = τ x A ; T = 60x93.54 = 5612 tones

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