Iqra National University

Name Waqar Ul Mulk

ID 7727

Subject Earthquake engineering

Department BE (civil)

Semester 8th

Submitted to Engr Yaseen

Date 18/4/2020

Question ;

Describe the types of the configuration depicted in figure 1, 2 & 3. How they can effect seismic performance of a structure and what are their possible solutions.

Answer ;

Figure # 1

Figure 1 shows us dis continuous Shear Walls.

If Seismic occur and there is not a continuous load path through which load transfer from roof to foundation and the result can be serious over stressing at point of discontinuous. Due to this Situation structure can be damage and collapes at critical point of the structure.

Solution ; Figure 1.

The solution of the discontinuous Shear Wall is to eliminate the Shear Wall.

If the decision is made to use Shear Wall then their presence must be recognized from the beganing of Schematic design and their size and location made the Subject of careful architecture and engineering coordination early.

Figure # 2

Figure 2 shows the soft and weak stories of the building, and less stiff at ground level.

The most prominent of the problem caused by several stress concentration is that of soft story. The term has commonly been applied to building whose ground level story is less stiff than those the above.

The building code distinguishes b/w the soft and weak stories.

Soft stories are less stiff and or more flexible then the above weak stories have less strength.

A soft or weak stories at any height creates a problem, but since the commulative load are greatest towards the base of the building, a discontinivity between first and second floor tends to result in the most serious condition.

Solution ; Figure 2 .

This type of problem in structure, we will add the following str-uctural elements.

(i) Add more column .

(ii) Add bracing .

(iii) Add external butresses .

Figure # 3

Figure 3 Shows us Re-entrant corners.

There are two problems created in this shape.

The first problem is that they tend to produce differential motion between different wing of the building, that because of stiff elements that tend to be located in this region result in local stress concentration at the re-entrant corners.

The second problem of this form is torsion, which is caused of because the center of mass and the center of rigidity. This form cannot geometrically concide for possible earthquake directions. The result is rotation and the resulting forces are very difficult to analyze and predicted.

Solution ; Figure 3.

There are three solution of this problem

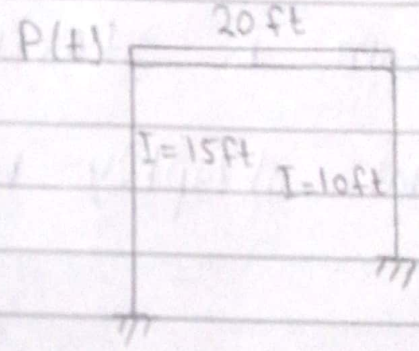
- Structurally to separat the building into simpler shape.
- The second solution to provide Tie to the building, together more strongly with elements positioned

to provide more balanced resistance. This solution is applied only to a smaller building.

→ The use of splayed rather than the right angle re-entrant corners less the stress concentration. This analogus to the way tapered beam is structurally more desirable than abruptly notched one.

Question ;

Develop the equation of the motion of frame shows in figure 4 under the action of a lateral dynamic force P(t). Consider a uniformly distributed gravity load of (registration number) lb/ft acting on the beam. Neglect damping effect.



Given data ;

I = 15 ft

I = 10 ft

P(t) = 7727

length of beam = 20 ft

Required ;

Equation of motion .

As We know ;

$E = 29000$ ksi
$I = 1200\ in^4$
$L = 7727\ lb/ft^2$

Solution ;

$$K = K_1 + K_2$$

$$k = 12EI\left[\frac{1}{(15\times12)^2} + \frac{1}{(10\times12)^2}\right]$$

$k = 313.29$ k/in

(OR)

$k = 3759$ k/ft

Mass ;

As; $m = W/g = \dfrac{7.727\times20}{32.2\ ft/sec^2}$

$m = 4.799\ k.sec^2/ft$

$m = 4799\ lb\ sec^2/ft$.

$W = 7727 \ lb/ft$

Using D-Alembert Principle of dynamic equilibrium.

$$P(t) - f_I - f_{s1} - f_{s2} = 0$$

$$P(t) - mu - (f_{s1} + f_{s2}) = 0$$

$$(k_1 u + k_2 u) + mu = P(t)$$

As, By Putting values;

$$P(t) = 4799u + 3759u$$

Where u and P(t) are in "ft" and "lb" respectively.