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7758

Sec B  
BEC (civil)

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Sub:- Introduction to structural Dynamics and Earthquake Engineering

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## Question No 1

Answer:-

Figure - 1

Configuration Condition

-> Soft and weak stories  
Effect on seismic performance of a structure.

-> A soft or weak story at any height creates a problem, but since the cumulative loads are greatest towards the base of the building, a discontinuity between the first and second floor tends to result in the most serious condition.

Solution:-

Add columns  
Add bracing  
Add external buttresses

→ Figure 2

## Configuration Condition

→ Discontinuous shear walls

Effect on seismic performance of a structure

→ When shear walls form the main lateral resistance elements of a structure, and there is not a continuous load path through the walls from roof to foundation, the result can be serious overstraining at the point of discontinuity. The discontinuous shear wall condition represents a special, but common case of the soft first-story problem.

→ Solution: Avoid discontinuous shear walls.

→ The solution to the problem of the discontinuous shear wall is to eliminate the shear wall.

→ If ~~shear~~ the decision is made to use shear walls then their presence must be recognized from the beginning of schematic design, and their size and location made the subject of careful architectural and engineering coordination early.

## Figure 3

Configuration Condition  
→ Re-entrant Corners.

Effect on seismic performance of a structure.

→ There are two problems created by these shapes. The first is that they tend to produce differential motions between wings 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 corner.

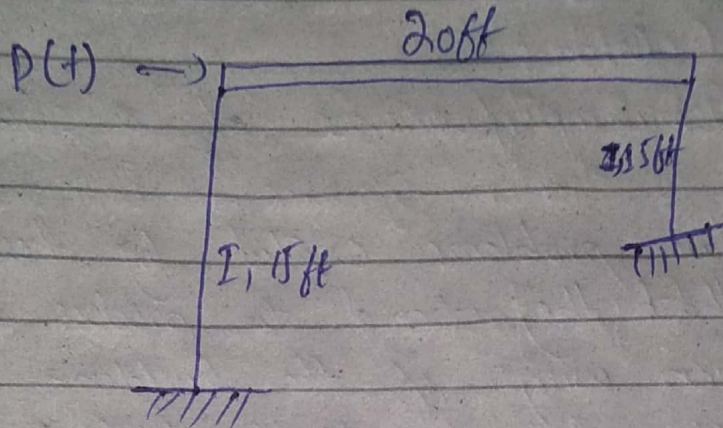
→ The second problem of this form is torsion which is caused because the center of mass and the center of rigidity in this form cannot geometrically coincide for all possible earthquake directions. The result is rotation. The resulting forces are very difficult to analyze and predict.

→ Solutions: There are two basic alternative approaches to the problem of re-entrant corner form structurally to separate the building into simpler shapes or to tie the building into simpler shapes together more strongly with elements positioned to provide a more balanced resistance. The latter solution applies only to smaller buildings.

The use of splayed rather than right angled re-entrant corner lessens the stress concentration. This is analogous to the way a tapered beam is structurally more desirable than a abruptly notched one.

## Question No 2

Sol:- Equation of motion for a Frame under lateral Dynamic Force.



$$m = \frac{W}{g} = \frac{7758 \times 20 \text{ k}}{32.2 \text{ ft/sec}^2}$$

$$= \frac{155.16}{32.2}$$

$$m = 4.81 \text{ k sec}^2/\text{ft}$$

$$m = 4818 \text{ lb sec}^2/\text{ft}$$

$$P(t) = ku + mu$$

$$= 4818 u + 3.75 \times 10^6$$

~~$$W = 7758 \text{ lb/ft}$$~~

~~$$W = 250000 \text{ lb/ft}$$~~

$$W = 7758 \text{ lb/ft}$$

$$W = 7.758 \text{ k/ft}$$