

**IQRA NATIONAL
UNIVERSITY**

**WASTEWATER
ENGINEERING**

MID TERM EXAM

ID : 7724

SECTION : A

MODULE : 8th SEMESTER

Q1 Ans

In fig No 1 the building is collapsed due to soft story effect. And it is due to change in stiffness of lower story. The rest of story the more the stiff the more it take load.

- In fig 2 the configuration is not good because that there are alot of corner or alot of structure member attached so there should be building separator joint.

In fig 3 it has the same case of figure 02. It also have reentrant corners which is critical during earth quake and also the column are shortened due to the presence of wall which has made it more stiffer. Thus it take more load and hence collapse.

Solution for These Problem.

Restraint corner should not be present in a building should be modelled as rectangular & square arrangements also columns should be continued continued from bottom to top or vice versa & stiffness of all stories should be equal to minimize soft story effect.

Figure : 2

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

The building code distinguishes between "soft" and "weak" stories. Soft stories are less stiff, or more flexible, than the story above; weak stories have less strength.

Bracing is important in earthquake resistance building, because it helps keep a structure standing.

Figure : 3

There are two problems created by these shapes. First is they tend to produce differential motion between different wings of the building. Because of stiff elements that tend to be located in this region. Result in stress concentration at the re-entrant corner.

The second problem is torsion which is caused because the centre of mass \bar{x}_1

load directly and efficiently as possible to the foundation to interrupt this load path is undesirable.

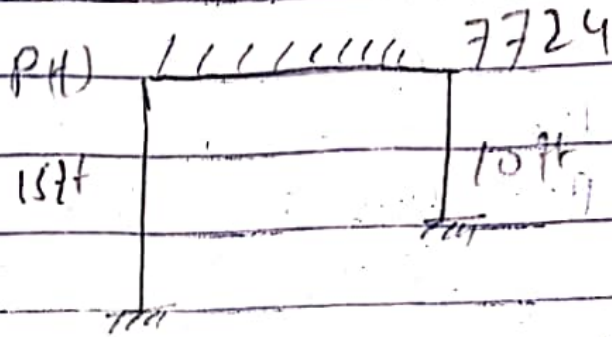
Possible Solution :-

The solution of the discontinuous shear wall is to eliminate the shear walls.

At 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 of subject of careful architectural and engineering coordination early.

In case of separation building must be sufficiently away to ensure they do not pound together and damages each other in an earthquake.

The use of splayed rather than right angle re-entrant corner lessen the stress concentration.



Eg - of Motion

(General form)

$$m\ddot{u} + c\dot{u} + ku = P(t)$$

$$\text{At } \Sigma F = m\ddot{u}$$

$$P(t) - F_{s1} - F_{s2} = m\ddot{u}$$

$$m\ddot{u} + F_{s1} + F_{s2} = P(t) \quad \text{--- (1)}$$

$$F_{s1} = \frac{12EI}{L^3} = \frac{12EI}{15^3} \quad \text{--- (2)}$$

$$m = \frac{7724 \times 20}{32.2} = 4797.51 \text{ lbs} \quad \text{--- (3)}$$

Put (1) & (2) in (3)

$$4797.51\ddot{u} + 12EI \left[\frac{1}{15^3} + \frac{1}{10^3} \right] u = P(t)$$

$$4797.51\ddot{u} + (0.0156EI)u = P(t) \text{ required.}$$