NAME:

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SUBJECT:

INTRO TO EARTHQUAKE & STRUCTURAL DYNAMICS.

INSTRUCTOR:

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Question No 1:

Fig #1:

Ans Avoid Discontinuous Shear Walls:

If the shear walls are made of main lateral resistant elements of a structure, the load is not uniformly distributed from roof to the foundation leading to over-stressing at the point of dis-continuation makes the 'soft' first story problem.

The purpose of shear walls is to collect the load at each other and transmit it directly to the foundation.

Solutions:

1) Discontinuous shear walls is a problem and can be solved by eliminating the shear walls.
2) Proper architectural and engineering co-ordination and recognizing the schematic design should be initially done Before take a decision to put a shear walls

Figure # 2:

Soft & Weak Stories:

1) They are the most prominant problem as the ground level string is less stiff than those above.

2) The difference between soft and work stories is that soft stories are less stiff and more flexible whereas, weak stories have less strength.

3) Both stories create problems but as the load is tend to be great towards the base of building, first and second floor causes a more serious condition.

FIGURE # 3:

→ RE-ENTRANT CORNERS:

When the buildings are formed in shape L, T, H etc or a combination, this is known as re-entrant corners.

→ The first problem with re-entrant corners is that they cause different motion on different wings of a building leading to find local stress concentration at the re-entrant corners.

→ The other problem is Torsion. The rotation or torsion is caused by Earthquakes as the centre of Mass and centre of rigidity or not coincide geometrically.

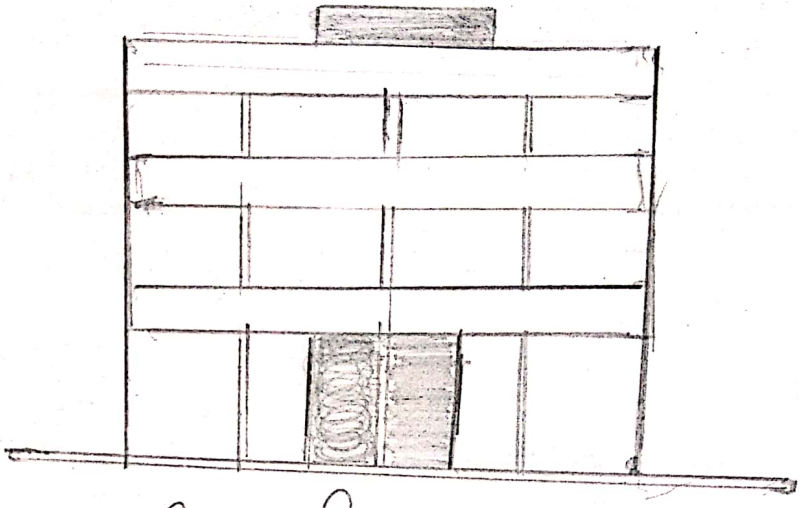
SOLUTIONS:

1) Either the structure should be tied more strongly to provide a balanced resistance.

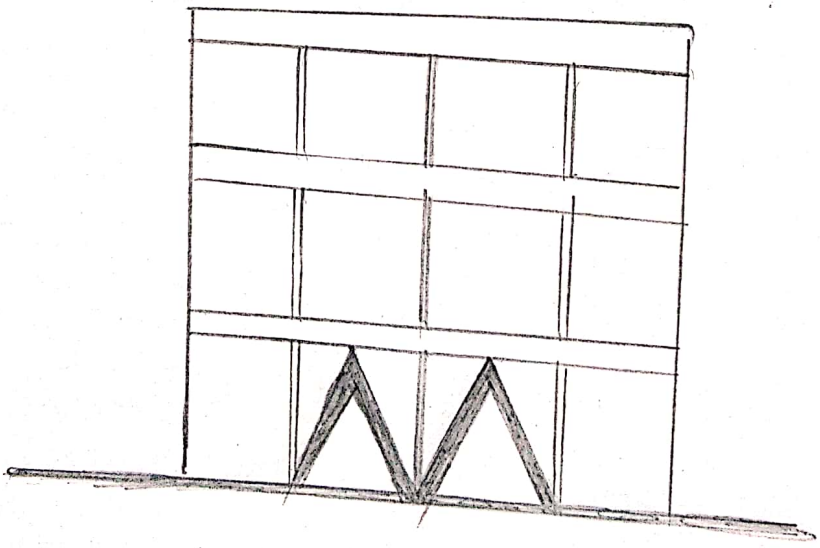
2) ~~If~~ The building should be tied more strongly to provide a balanced resistance.

3) Using splayed rather than complete right angle structure is also preferable.

Solutions:

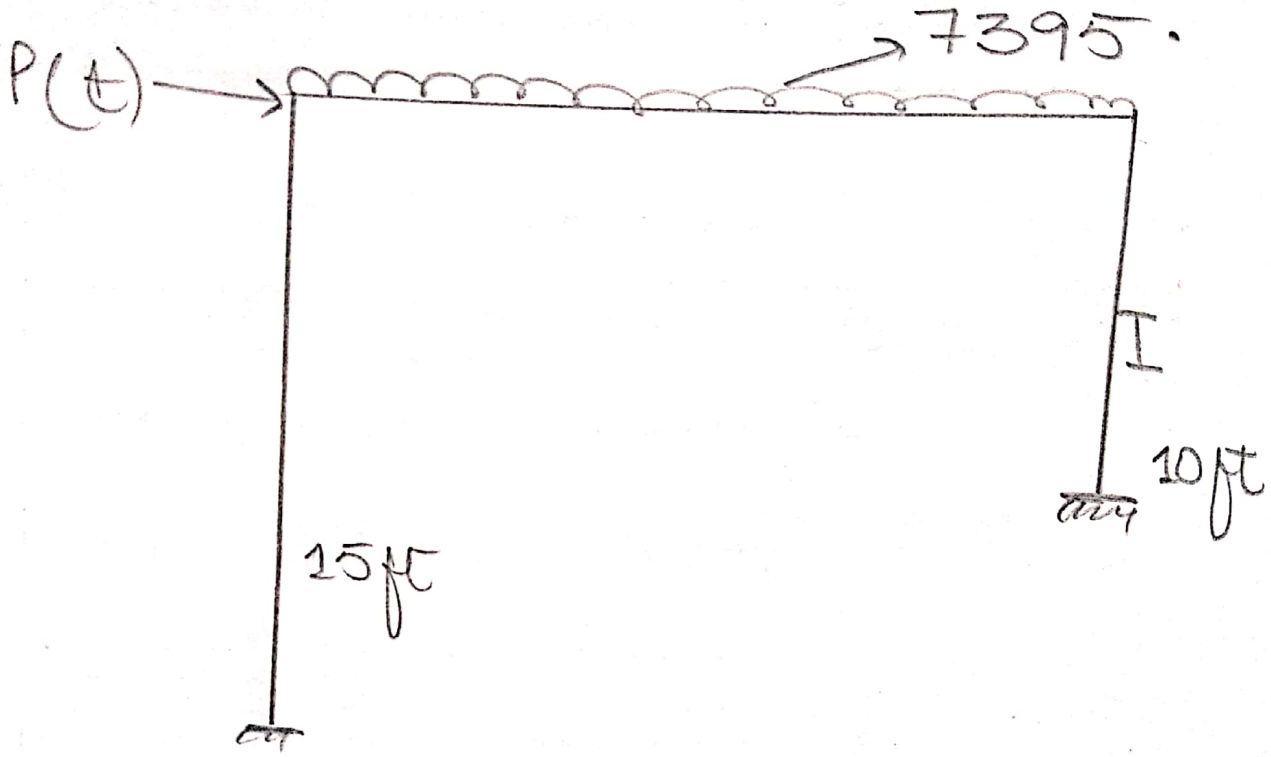


Soft Story.



Add Bracing.

Question No 2:



Equation of motion (EOM).

General form of EOM.

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

As $\Sigma F_x = m\ddot{u}$

$$P(t) - f_{s_1} - f_{s_2} = m\ddot{u}$$

$$m\ddot{u} + f_{s_1} + f_{s_2} = P(t) \quad \text{---(A)}$$

$$f_{s_1} = \frac{12EI}{L^3} = \frac{12EI}{15^3} \quad \text{---(1)}$$

$$f_{s_2} = \frac{12EI}{L^3} = \frac{12EI}{15^3} \quad \text{---(2)}$$

$$m = \frac{7395 \times 120}{9} = \frac{7395 \times 20}{32.2} = 4593.16\,kg \quad (3)$$

Put eq (1), (2) & (3) in A

$$4593\ddot{u} + 12EI\left[\frac{1}{15^3} + \frac{1}{10^3}\right]u = P(t)$$

$$4593.16\ddot{u} + (0.0156EI)u = P(t)$$

∴ Required equation :