NAME

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ID

7782

Subject

Introduction to Earthquake and Structure Dynamic.

Submitted to

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Q#1 Describe types of the Configurations depicted in figure 1, 2 & 3. How they Can effect Seismic performance of a Struc & what are their possible solutions.

Ans:

FIGURE 1:

→ When Shear walls from the main lateral resistant elements of a Structure, and there is not a Continous load Path through the walls from roof to foundation, the result Can be Serious Overstressing at the Point of discontinuity. The discontinous Shear wall Condition represents a Special, but Common, Case of the "Soft" first Story Problem.

→ The discontinous shear wall is a fundamental design contradiction: the purpose of a shear wall is to collect diaphragm loads at each floor and transmit them as directly and efficiently as possible to the foundation. To interrupt this load path is undesirable.

Possible Solution:

The solution to the problem of the discontinous shear wall is to eliminate the shear walls.

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

Q#1

FIGURE 2:

The most Prominent of the Problems 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 those above.

→ The building Code distinguishes b/w "Soft" and "weak" Stories. Soft Stories are less Stiff, or more flexible, than the Story above; weak Stories have less Strength.

→ A Soft or weak Story at any height Creates a Problem, but Since the Cummulative loads are greatest towards the base of the building, a discontinuity b/w the first and Second floor tends to result in the most Serious Condition.

Possible Solutions:

→ We Can prevent the building as Soft Story by adding Columns, by adding bracess or by adding external buttresses.

-> In the figure we have some problem's like the soft story is damaged in bottom side so thats why it is a possible solution to add column's, add some bracess or external buttresses.

Q#1

FIGURE 3:

-> There are two problems created by these shapes. The first is that they tend to produce differential motions b/w different wings of the building that; because of stiff elements that tend to be located in this region, result in local stress concentrations at the re-entrant corner.

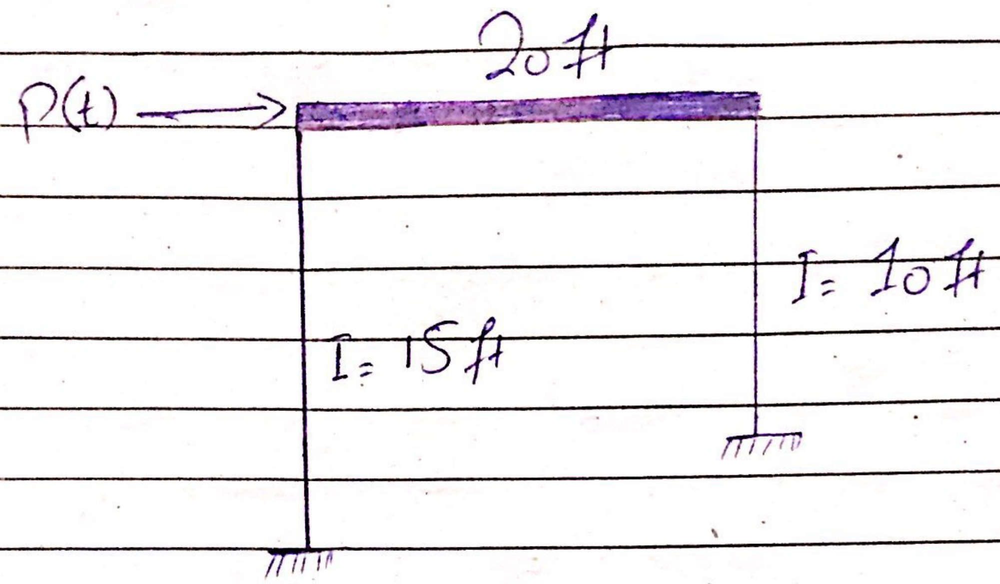
-> The second problem of this form is torsion. Which is caused because the center of mass and the center of rigidity in this form cannot geometrically coincide for all possible earthquake directions. The result is rotation. The resulting forces are very difficult to analyze and predict.

Possible Solutions:

There are two basic alternative approaches to the problem of re-entrant-corner forms: structurally to separate the building into simpler shapes, or to tie the building 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 angle re-entrant corners lessens the stress concentration.

Q11) Develop the equation of motion of the frame shown 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:

ID = 7782

Solution:

$$m = w/g$$

$$= \frac{7782\ lb/ft \times 20\ ft}{32.2\ ft/sec^2}$$

$$m = 4833.54\ lb\ sec^2/ft$$

Using D-Alembert's Principle of dynamic equillibrium

$p(t) - f_I - f_{S_1} - f_{S_2} = 0$

$p(t) - m\ddot{u} - (f_{S_1} + f_{S_2}) = 0$

$(K_1 u + K_2 u) + m\ddot{u} = p(t)$

$(Ku) + m\ddot{u} = p(t)$

As, K = 3759

$\Rightarrow m\ddot{u} + 3.76 \times 10^6 u = p(t)$

Where u & p(t) are in ft & lb.

$\Rightarrow 4833.54 \, \ddot{u} + 3.76 \times 10^6 u = p(t)$

lb sec²/ft