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paper introduction to earthquake.

Section No B.

Semester 8th.

Q NO (2)

Ans:- Figure NO (1) :-

① Configuaration ①.

Figure NO 1 Shows irregular verticale configuaration shape.

② Seismic Performance ①.

A building's Seismic behavior is strongly influenced by the nature of the perimeter design. If there is wide variation in strength & stiffness around the perimeter, the center of mass will not coincide with the center of resistance, & torsional forces will tend to cause the building to rotate around the center of resistance.

② A common instance of an unbalanced perimeter is that of open -front design in buildings, such as fire

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Station & motor maintenance Shops in Which it is necessary to provide large doors for the passage of vehicles.

(3). The large imbalance in perimeter strength & stiffeness results in large torsional forces. In large buildings, such as departments stores, that have umbalanced resistance on a number of floors to provide large window areas for display are also common.

(1) Solution (1).

(1) Solution to this problems is to reduce the possibility of torsion by endeavoring to balance the resistance around the perimeter.

(2) The first strategy is to design a frame structure of approximately

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equal strength & stiffeness & for the entire perimeter.

(1). A second approaches is to increase the stiffeness of the open space by adding shear walls.

A third solution is to used strong moments resisting & braced frame & the open spaces.

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QNo (2)

Solution:-

① Figure (2):①.

① Configuration ①.

Figure two configuration shows soft story building.

Soft story building:-

Soft story building is one in which the first story is 70% or less stiffeness than the second story or 80% less stiffeness than the average stiffeness of the three stories above it.

OR

A building that has an open ground level, with fewer walls than the floors above. The soft story buildings easiest to identify are the apartments with parking on the ground level.

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① Seismic Performance. ①.

~~We~~ During the earthquake ~~the~~ when the building sways, the first story does not remains stiff & strong enough to support the levels above it.
So the first story "pancake" (collaps) or has the potential to ~~coll~~ pancake.

① Solution ①.

A soft story retrofit involves strengthening & stiffening the first story, so it does not "pancake" or collapse.
The retrofit might involves the addition of steel moment frames, shear walls, diagonal bracing, & external buttresses.

① Shear Wall ①.

Shear wall retrofits usually required walls in two perpendicul

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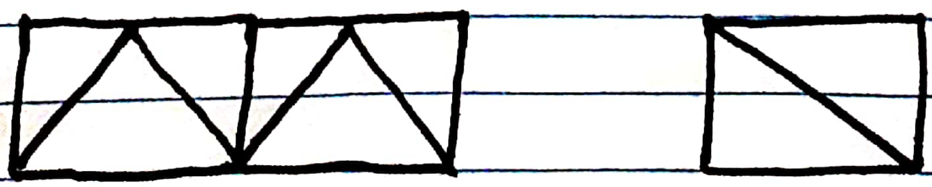
directions. because each wall counteracts earthquake forces only in one direction. This, plus the fact that walls take up a lot of space, means a shear wall retrofit could interfere with the building's use.

③ Diagonal bracing ①.

Diagonal bracing adds additional stiffness. Braces are added b/w the existing columns, spanning from the bottom of one column to the top of adjacent column or beam to creat rigid triangles. diagonal bracing does not interfering with existing openings.

(Diagram)



Q No (1)

Figure No (03):

Configuration:

Figure No 3 configuration shows L-shape re-entrant corners plane.

Seismic performance:

There are two problems which are created by these shapes.

(1) Differential motion.
(2) Torsion.

Differential motion:

The first step is that they tend to produce differential motions b/w different wings of the buildings b/c of stiff elements that tend to be located in this region, result in local stress concentrations at the re-entrant corner.

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(2) Torsion:

The torsion is second problem of this form. They are caused b/c the center of mass & 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 & predict.

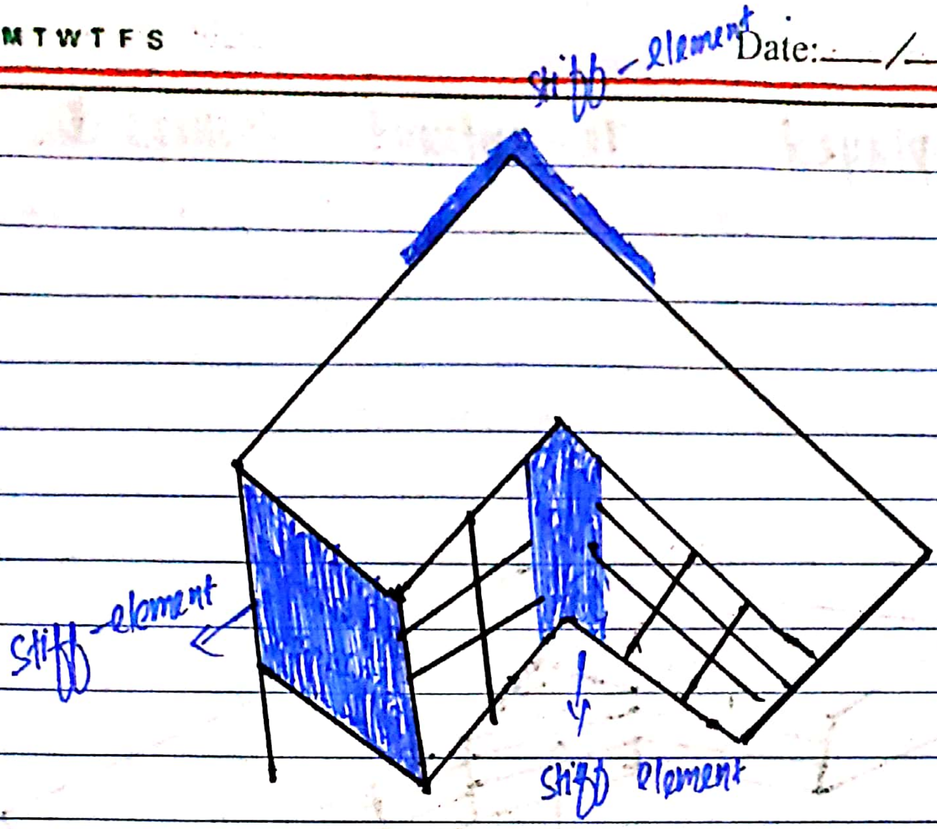
Solution:

There are three basic solution approaches to this buildings.

(1) Stiff Resistance elements
(2) Seperation
(3) Splayed re-entrant corners.

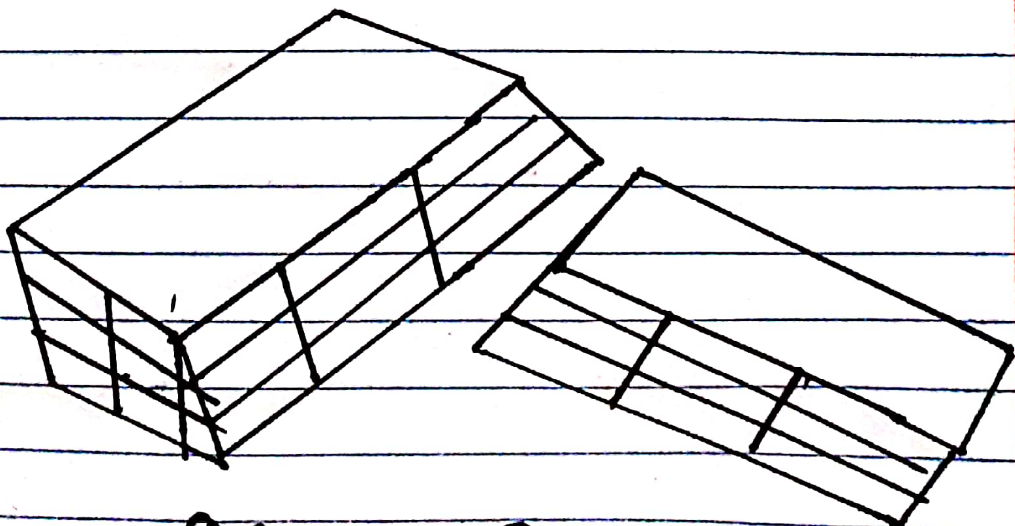
(1) Stiff Resistance elements:

This approaches applies on a smaller building.



③ Seperation ①.

During in earthquake, in case of seperation building must be sufficiently away to ensure they do not pound together & damage to each other.



① Seperation ②

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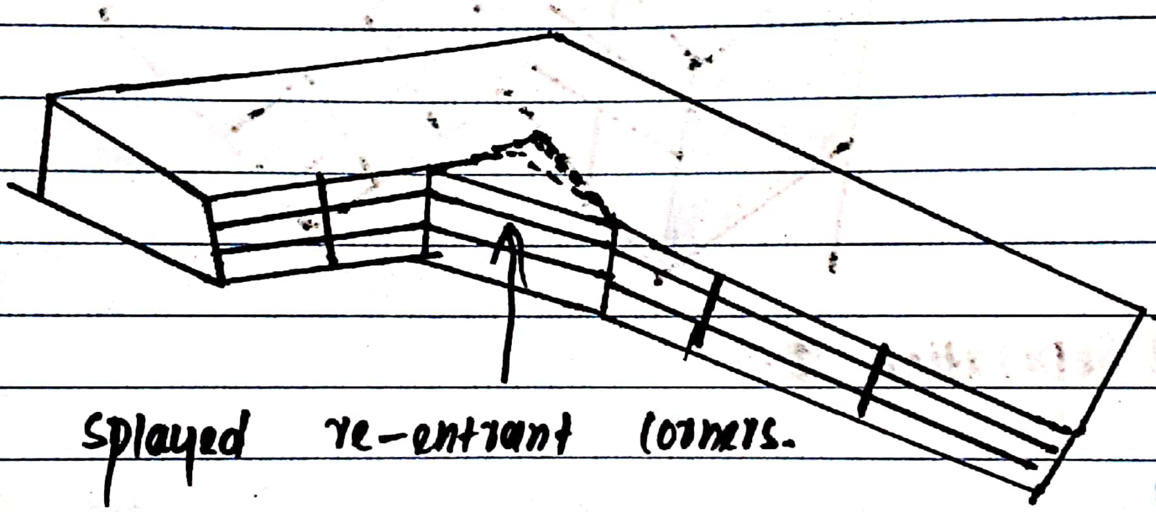
(3) Splayed re-entrant corners (8).

The use of splayed rather then right angle re-entrant corners lessens the stres concenteration.

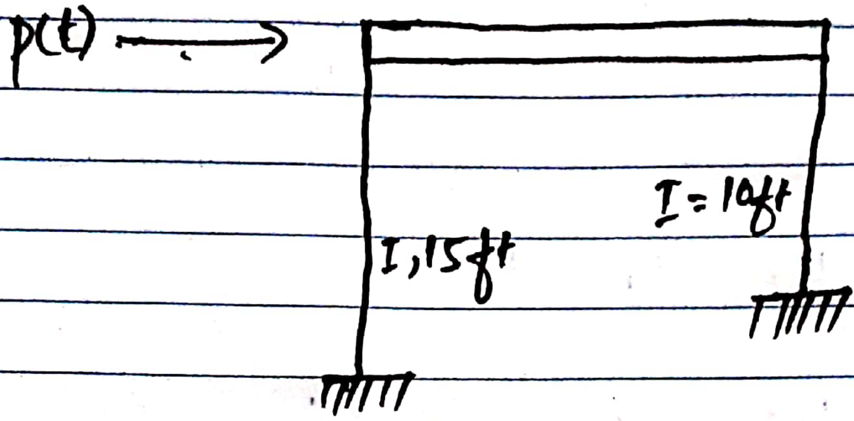


Splayed re-entrant corners.

QNO (2)

Given Data.

Gravity load = 6864 lb/ft.



Required Data.

Equation of motion.

Solution:- First convert gravity load into kps/ft.

$$\frac{6864}{1000} = 6.864 \, lb/ft.$$

We know that.

$$m = \frac{W}{g} = \frac{6.864 \times 20k}{32.2 \, ft/sec^2}$$

$$m = 4.26 \, k.sec^2/ft = 4260 \, lb.sec^2/ft$$

Using D-Alembert's principle of dynamic equilibrium.

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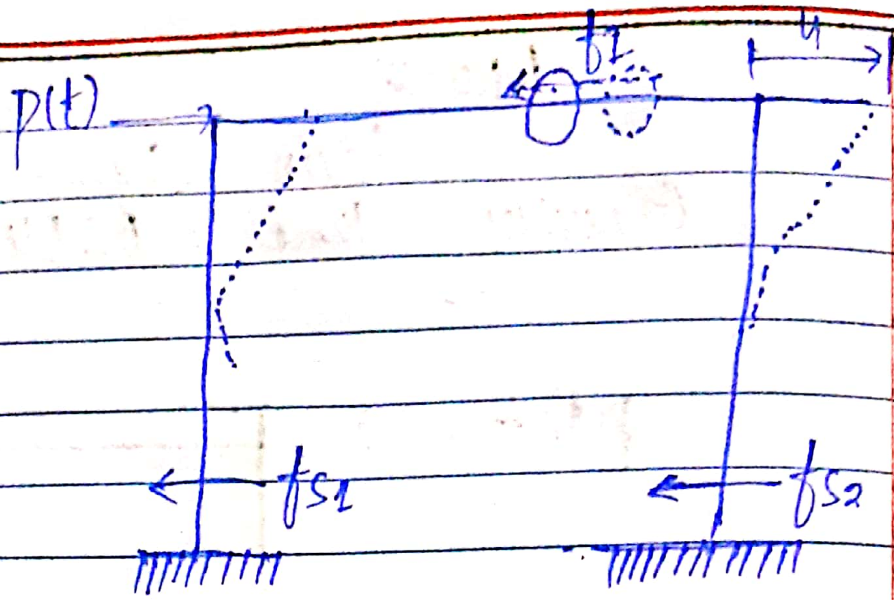

$p(t) - f_I - f_{s1} - f_{s2} = 0$

$p(t) - m\ddot{u} - (f_{s1} + f_{s2}) = 0$

$(k_1 u + k_2 u) + m\ddot{u} = p(t)$

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

As $k = 379$ k/ft.

~~4260$\ddot{u}$+3.~~

$4260\ddot{u} + 3.76 \times 10^6 u = p(t).$

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

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