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Seismic Behaviour of Elevated RCC Water Tank Having Different H/D Ratio and Shape

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***Abstract*:- In pass few decades, the construction can done in faster way such as high rise building, dams, bridges, water tank, etc. are mainly formed. These all have their own importance. But in view of public health engineering, that is supply of water on daily basis the municipality need the elevated water tank. So the importance of elevated water is increases. When seismic waves can attack to the elevated water the huge amount of economical as well as lives loss is occurs. It is important to built the earth quake resisting structure of elevated water tank and also important to study the H/D ratio and different types of shape of the tank. the study of these parameter concluded that the circular shape of the elevated water tank having more resisting than the rectangular shape.**

Keywords:- MERCALLI intensity scale, Richter scale, IS Code, H/D ratio (height to depth ratio)

I. INTRODUCTION:

The earthquake is mainly occurs due to the moving of the tectonic plates. As we all know these tectonic plates are moving in very slow manner but continually. These tectonic plates can change their position from very far years. Such as the Indian plate can moving towards the Himalayan region with few centimeters. The tectonic plate boundaries rubbed each other and then friction is formed known as frictional stress. this frictional stress create failure. Failure with tectonic plate form a fault plate. Fault plate with displacement causes the earth quake. The India is the country were the natural calamities are comes in every year in form of flood, heavy rainfall, tsunami, landslide, earthquake, etc. So it is important to built the structure which having strength to resist this natural calamities. The earth quake generally measuring in magnitude scale known as 'Richter scale' and intensity measured is known as 'MERCALLI Scale' .

The elevated water tank plays important role in water supply system. That way the location of the elevated water tank is important for regulating the supply purpose. Topography is also important factor in distribution system. The elevated storage tank is place higher point as well as most probably at the center of the distribution system. The elevated water tank is supported on staging. The staging mainly consist of RCC tower or RCC column with various types of bracings.

In the project the study of different shape and different H/D ratio can be considered. Study is to know which shape of elevated storage tank is more resistance to the earthquake than other. The different H/D ratio is to know the resisting strength when seismic waves comes.

The elevated water tank Supported on four number of column in both rectangular tank as well as the circular tank. The height to depth ratio should not be exceed than 0.7. The two parameter considered first one is height to depth ratio or height to length ratio in circular water tank and in rectangular water tank respectively is 0.87> 0.7 and 0.6< 0.7. To know which is better.

II. LITERATURE SURVEY:

Using information concluded that 1]Using bracing system lateral seismic forces can be reduced. X-bracing gives more resistance to the seismic wave than any other type of bracing. 2] The bracings gives stability to the structure and reduce seismic load of the structure during and after earthquake. 3] In the tank full condition the total base shear and base moment are much higher than the empty condition. 4] comparison of static and dynamic response with respect to elevated water tank, Static response shows high scale values that of the Dynamic response. 5] The base shear increases the value from zone to zone i.e., zone II to zone V. 6] For both circular and rectangular water tanks the increasing staging height the value of base shear decreases for all the earthquake zones.

III. EXPERIMENTAL DATA COLLECTION:

Type: - 1 – Elevated Tank Supported on 4 Column RC Staging with H/D ratio 0.87.

Problem Statement: (For Rectangular Water Tank

1. RC rectangular water container of 100 m3 2. H/L =0.87
3. capacity has L x H of (5.5 x 4.8) m2
4. Height= 4.8 m (including freeboard 0.3 m).
5. 4 columns of 600 mm diameter
6.horizontal bracings of 300 x 450 mm.
7. concrete = M25
8. Steel = Fe415
9. Density of concrete = 25 KN/M3.
10. Analyze the tank for seismic loads.

Problem Statement: (For Circular Water Tank)

1. RC circular water container of 100 m3
2. H/D =0.87
3. Capacity has internal diameter of 5.5 m
4. Height= 4.8 m (including freeboard 0.3 m)
5. 4 columns of 600 mm diameter
6.horizontal bracings of 300 x 450 mm.
7. concrete = M25
8. Steel = Fe415
9. Density of concrete = 25 KN/M3.
10. Analyze the tank for seismic loads.

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TYPE II-Tank must be analyzed for tank full conditions with H/D ratio 0.6.

Problem Statement: (For Rectangular Water Tank

1. RC rectangular water container of 50m3
2. H/L =0.6
3. capacity has L x H of (5.5x 3.3) m2
4. Height= 3.3m (including freeboard 0.3 m).
5. 4 columns of 600 mm diameter
6.horizontal bracings of 300 x 450 mm.
7. concrete = M25
8. Steel = Fe415
9. Density of concrete = 25 KN/M3.
10. Analyze the tank for seismic loads.

Problem Statement: (For Circular Water Tank)

1. RC circular water container of 50 m3
2. H/D =0.6
3. Capacity has internal diameter of 5.5 m
4. Height= 3.3 m (including freeboard 0.3 m)
5. 4 columns of 600 mm diameter
6.horizontal bracings of 300 x 450 mm.
7. concrete = M25
8. Steel = Fe415
9. Density of concrete = 25 KN/M3.
10. Analyze the tank for seismic loads.

IV. PARAMETER COMPARED:

* Node Displacement for All Zone For different H/D and H/L ratio and for different shape.
* Base Shear And Base Moments for All Zone For H/D and H/L ratio and for different shape.
* Shear Force And Shear Moments for All Zone For H/D and H/L ratio and for different shape.
* Which shape is more efficient to resist earthquake force.

V. RESULT AND CONCLUSION:

a. Effect of Seismic Zone on nodal displacement for H/D OR H/L ratio (0.87 >0.75)

1. The maximum nodal displacement in seismic zone II having same magnitude for both shape such as circular and rectangular tank.
2. Nodal displacement increases with increase in zone factor and H/L or H/D ratio.
3. Base shear increases with increase in zone to zone.

b. Effect of Seismic Zone on nodal displacement for H/D OR H/L ratio (0.6 < 0.75)

1. The nodal displacement increases with zone to zone.
2. Base shear increases with increase in zone to zone.

c. Circular elevated water tank shows the more resistance against seismic waves than rectangular elevated water tank.

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