A review Paper on Design on RCC ESR using ETABS and Comparing with Conventional Method

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Abstract **- Elevated water tank is a water storage facility supported by a tower and constructed at an elevation to provide useful storage and pressure for a water distribution system. Due to post earthquake functional needs, seismic safety of water tanks is of most important. These structures have large mass concentrated at the top with a supporting structure of beams and columns (staging).**

Index Terms **- RCC ESR, Circular Water Tank, ETABS, Stagging, Earthquake Analysis.**

1.INTRODUCTION

Elevated water tanks are commonly used in public water distribution system. Being an important part of lifeline system and due to post earthquake functional needs, seismic safety of water tanks is of considerable importance, Elevated water tanks also called as elevated service reservoirs (ESRs) typically comprises of a container and a supporting tower (also called as staging). Staging in the form of reinforced concrete shaft and in the form of reinforced concrete column-brace frame are commonly . The column-brace frame type of staging is essentially a 3D reinforced concrete frame which supports the container and resists the lateral loads induced due to earthquake or wind. In public water distribution system, Elevated water tanks are generally used being an important part of a lifeline system. Due to post earthquake these structures are dangerous.

functional needs, seismic safety of water tanks is of most important. Elevated water tanks also called as elevated service reservoirs (ESRs) typically consists of a container and a supporting tower. In major cities and also in rural areas elevated water tanks forms an Integral part of water supply system. The elevated water tanks must remain functional even after the earthquakes as water tanks are most essential to provide water for drinking purpose. These structures has large mass concentrated at the top of slender which have Supporting structure and

1.1 Earthquake and its effects on structure

Earthquake is the sudden release of accumulated energy in the tectonic plates of the earth crust and resulting in the propagation of the seismic waves; P waves, S waves and surface waves. Most earthquakes occur due to compression or tensional stresses built up at margins of huge moving lithosphere plates that make up the earth's surface. The movements of plates such as plate collision, separation and slide results in the tremors and huge vibrations. The earthquake also occurs because of the volcanic eruptions that is sudden violent displacement of lava within or beneath the earth core. Due to earthquake, building resting on the ground will experience motion at its base. From Newton's First Law of Motion, even though the base of the building moves with the ground, the roof has a tendency to stay in its original position. But since the walls and columns are connected to it, they drag the roof along with them. The tendency to continue to remain in the previous position is known as inertia. In the building, since the walls or columns are flexible, the motion of the roof is different from that of the ground.

2.LITERATURE REVIEW

2.1 SEISMIC ANALYSIS OF RC ELEVATED RECTANGULAR WATER TANK USING IS 1893 (PART2):2006 DRAFT CODE The elevated water tank has 300 m 3 capacity, various staging height such as (6m, 9m, 12m, 15m, 18m and 21m) and also considered in different seismic zones such as II, III, IV

& V were studied in STAADPRO analysis package and Excel sheet developed program. The spring mass model was subjected to two degrees of freedom system as per IS 1893 (part 2):2006 draft code. The conclusions were made as per comparing of the results: 1. Base shear, overturning moment and displacement were increased with increasing staging height and seismic zones because when the structure height is increased the mass and distance between the center of gravity and ground level is increased as per IS 1893 (part 2) :2006.

2.2 Necessity of Dynamic Analysis of Elevated Water Storage Structure Using Different Bracing in Staging
For basic staging overturning moment is highest as compare to the other staging pattern. The slender staging that results from the low design forces is a very unfavourable feature for seismic areas for elevated water tanks .The current designs of RC shaft type circular staging for elevated water tanks are extremely vulnerable to lateral loads caused by earthquakes. It is evident from the damages sustained to staging as far as 125km away from the epicentral tract of the Bhuj earthquake.

2.3 Seismic Analysis of RC Elevated Water Tank Using Different Staging Pattern
It concludes that for 0.7 h/d ratio cross staging type gives best result as compared to other staging patterns for lateral displacement, axial force, moment-y, moment-z and moment-x

2.4 Seismic Analysis of Overhead Water Tank Using Indian, American and British Codal Provisions Compared among the three standards, ACI proves to be more economical.
In terms of economic value, the codal provisions are as ACI, IS and BS. All the three codes follow working stress method and results in higher stability.

3.METHODOLOGY AND PURPOSE

3.1Methodology
The main objective of this study is to examine the behaviour of elevated water tank supported on frame staging. The various cases are analysed for five different earthquake records using time history analysis method. The analysis is carried out using ETABS software.

3.2 DESIGN OF WATER TANKS
Design Aspects to Be Followed:
1. Location of the water tank (overhead or underground).
2. Purpose of water storage
3. Volume of water tank need based on usage of water by the people in that area.
4. Dimensions of the tanks is to be calculated.
5. Loads and loading combinations are to be applied according to code books.
6. Is pressure required for delivering water?
7. Hydraulic loads imposed by water on the inner surface is to be determined for fully and partially - filled tank conditions.
8. Wind and earthquake design considerations.

3.3 Parameters for selecting Materials
1. Materials selected for construction should be impervious.
2. If iron/steel materials are taken, it should not be rusted.
3. Materials should be highly resistant to fire or frost conditions.
4. It can be easily repairable.
5. Cost of materials should be economical.

3.4 Purpose
The present study focuses on the response of the elevated circular water tanks to dynamic forces. Tanks of various bracing system viz. without bracing, with alternate single bracing, with alternate double bracing, with single bracing and with double bracing with different shapes i.e., circular, rectangular and square having staging height of 15m are considered. The material used is M 25 grade of concrete and Fe 415 grade of steel are used for analysis with density of concrete is 25kN/m3. The Response spectrum analysis is carried out from the recorded ground motion of ZONE III earthquakes.

4.MODELLING AND ANALYSIS

4.1General
This chapter presents brief introduction ETABS software and procedure for modelling of formulated problem

4.2Introduction to ETABS

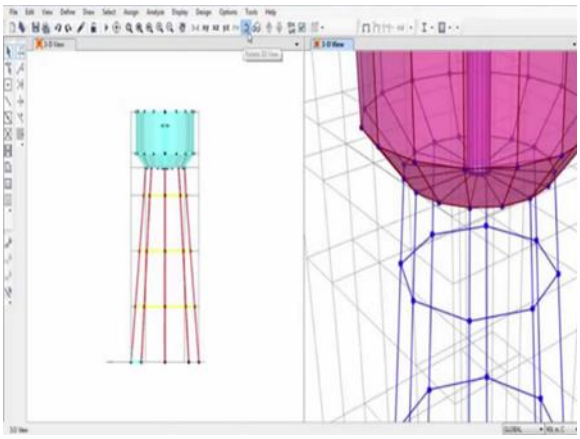
ETABS which stands Extended Three-Dimensional Analysis of Building System is used for the simplest problems or the most complex projects.

4.3Modelling in ETABS

-It is time-consuming to model a proposed project in ETABS. You have to consider all the aspects in modelling from DXF importing to the definition of materials and properties to assigning the load and load combinations. We have to spend a significant amount of our time doing this stuff depending on how large the project is. It is always okay doing the modelling if you don't have a schedule to follow and you have an unlimited time.

-When you are starting the model, we can save our time by using the definitions from the existing model, the program will import all the data from the existing file except the grid lines, story data, objects, assignment to objects and the information on the number of windows. Settings include units, options, preferences properties and the definition will be imported.

-On ETABS interface, click the on the File menu then New model and tick Use Settings from a model file. The Model Initialization form will display as shown in below image:



5.CONCLUSION

The available literature review shows that performance of elevated water tank with seismic control systems is better than without control techniques. We observe that ETABS is suitable software for analysis. To model the water and check its appropriateness in ETABS. Hence, in this dissertation model checks its appropriateness in ETABS, further, to carry out experimental investigation of elevated water tank on shake table for the validation of results. The study of behaviour of elevated water tank is carried out using time history analysis method for seismic control using structural software ETABS. Response quantities such as time period, acceleration, displacement and base shear are obtained after response spectrum analysis.

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