

Analysis of Overhead Water Tank Using Base Isolation

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ABSTRACT

The seismic response of an overhead water tank, cylindrical, extra-large water storage tank by using triple friction pendulum system is analyzed.. However, it is problematic to implement in preparation with common isolation bearings due to problems such as low temperature, soft site and other severe environment factors. The water tank isolated by a triple pendulum friction system obtainable in this study to address these problems. A triple friction pendulum system is suitable for excessive displacements persuaded by earthquakes with extensive predominant periods.

The research is directed with study of existing studies in the field of seismic behavior of intz water tank. Base isolation is one of the technologies applied to decrease the consequence of earthquake effect. The principle is to separate the base of the overhead water tank from footing ground. The problematic is taken as Intz water tank design to survive water tank against seismic accomplishment. three categories of base are used to analyses and compare overhead first is manual design of intz water tank with fixed base + response by SRSS and second case is intz water tank with fixed base by sap2000 and Third case with is intz water tank with triple friction pendulum on sap2000. The software SAP 2000 are used to assessment fixed and triple friction pendulum base intz water tank. It is primary period in India when overhead water tank is tested with triple friction pendulum isolation are verified and analyzed for seismic zone V. It is initiate from results that deflection and base shear analyzed with triple friction pendulum are lesser than fixed base with outstanding margin and it is determined that study endorses use of triple friction pendulum base isolation for seismic zone V in India.

Keywords: intz water tank, Seismic zone V, triple pendulum friction isolator, SAP2000, Deflection, base shear

INTRODUCTION

A water tank is used to keep water to tide over the everyday requirement. Inside the creation of concrete shape for the storage of water and different liquids the imperviousness of concrete is maximum critical. The permeability of any uniform and thoroughly compacted concrete of given mix proportions is in particular depending on water cement ratio. The growth in water cement ratio results in boom within the permeability. The decrease in water cement ratio will therefore be ideal to lower the permeability, but very an awful lot reduced water cement ratio can also cause compaction problems and prove to be harmful additionally.

Design of liquid maintaining shape must be primarily based on the avoidance of cracking in the concrete having regard to its tensile energy. Cracks can be averted by way of warding off using thick wood shuttering which save you the clean escape of warmth of hydration from the concrete mass. The threat of cracking can also be minimized by means of decreasing the restraints on free enlargement or contraction of the structure.

Elevated Water tanks are salvation developments which are being constructed in growing numbers to store water for drinking purpose. The capacities of these containers are huge and have capacities of around 1800 m³ or it may be large depends on the population of that area. Elevated water tank consists of an RCC container or it may be made up of steel tank, which contains the large amount of water, the seismic study of these structures is a difficult and thought-provoking task because the construction of the tank based on the with a smaller number of footing and column as compare to building and the soil erection contact must be considered. Water tanks present an excessive risk if they were failed during an earthquake.

Base isolation is a demonstrated knowledge for the seismic strategy of structures. The system diminishes the probability of structural and non-structural damage to a water tank exposed to seismic forces. By using base isolation, we can reduce the lateral forces and displacement of the

structure which can damage the structure through earthquake. Due to which we can save the government property and water which get distributed to people.

However, in spite of base isolation's verified benefits, the technology is under operated. Although tall, flexible, and non-critical facilities such as office buildings are not the most ideal candidates for base isolation, they may still achieve an optimal seismic design by using the technology. Therefore, in order to increase the quality and prevalence of base isolated structures, there is a need to study the technology's seismic performance enhancements and cost effectiveness for projects on which the system is infrequently used. IS 1893:2002 is the code to design structures under earthquake zones. There are two major methods of seismic analysis which are

OBJECTIVE OF THE WORK

1. Base isolation technique is newly isolated structure which is provided at the base of structure. It is only performed on building and hospital etc. None of the research is done on base isolation on elevated water tank.
2. The approach is done on Base isolation for Elevated water tank or manual and software comparison.
3. As there is need to save water so it is essential to save elevated water. As water is a very Important for human life.

RESULT PARAMETER FOR MANUAL APPROACH

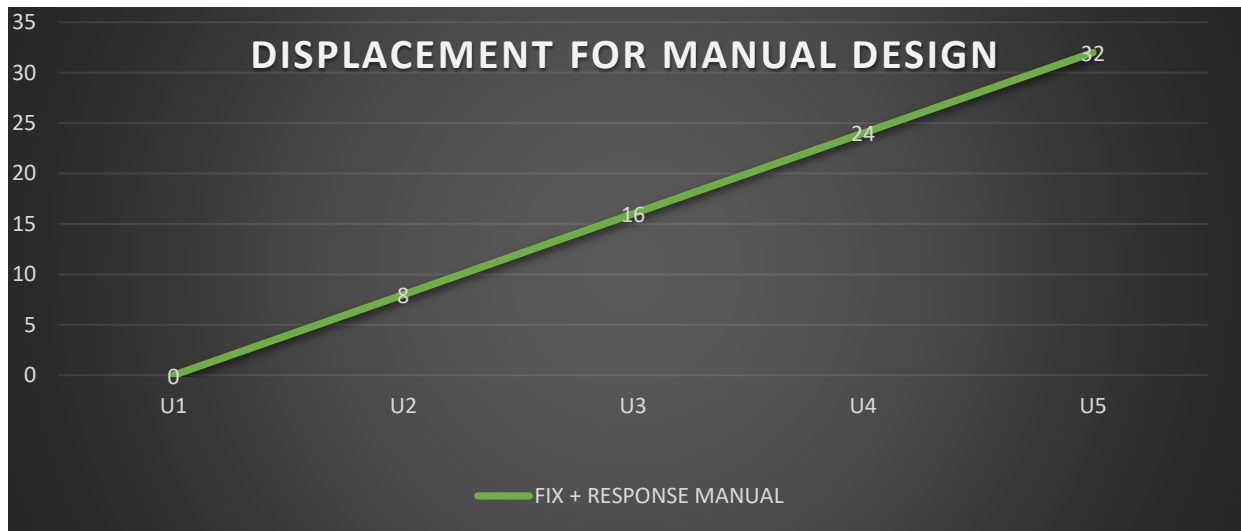
In this manual calculation of intz water tank with earthquake resistant parameter. We have Design the parameter of base shear and displacement are as follows

A) Base shear value with Response spectrum = 1016.16 kn

B) Displacement value with Response spectrum

Node	Displacement (mm)
U5	32
U4	24
U3	16
U2	8
U1	0

Table 8:- Displacement Manual



Graph 4:- Displacement With Manual Analysis

4.2 Result parameter for Fixed Base Using Sap2000 Software

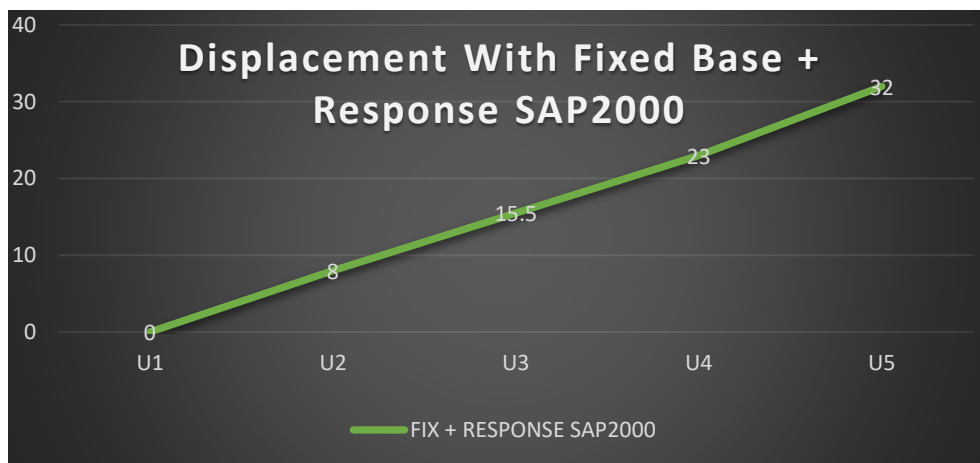
In the sap2000 with fixed base of intz water tank. We have compared the design with manual design. we have found Same base shear and displacement as compared to manual design of intz water tank.

A) Base shear value Fixed Base with Response spectrum = 1016.08 kn

B) Displacement value in SAP2000 Fixed base with Response spectrum

Node	Displacement (mm)
U5	32
U4	23
U3	15
U2	8
U1	0

Table 9:- Displacement Value with Fixed Base + Response



Graph 5: - Displacement Fixed Base + Response Sap2000

4.3 Result parameter for Base Isolated + Response Using sap2000

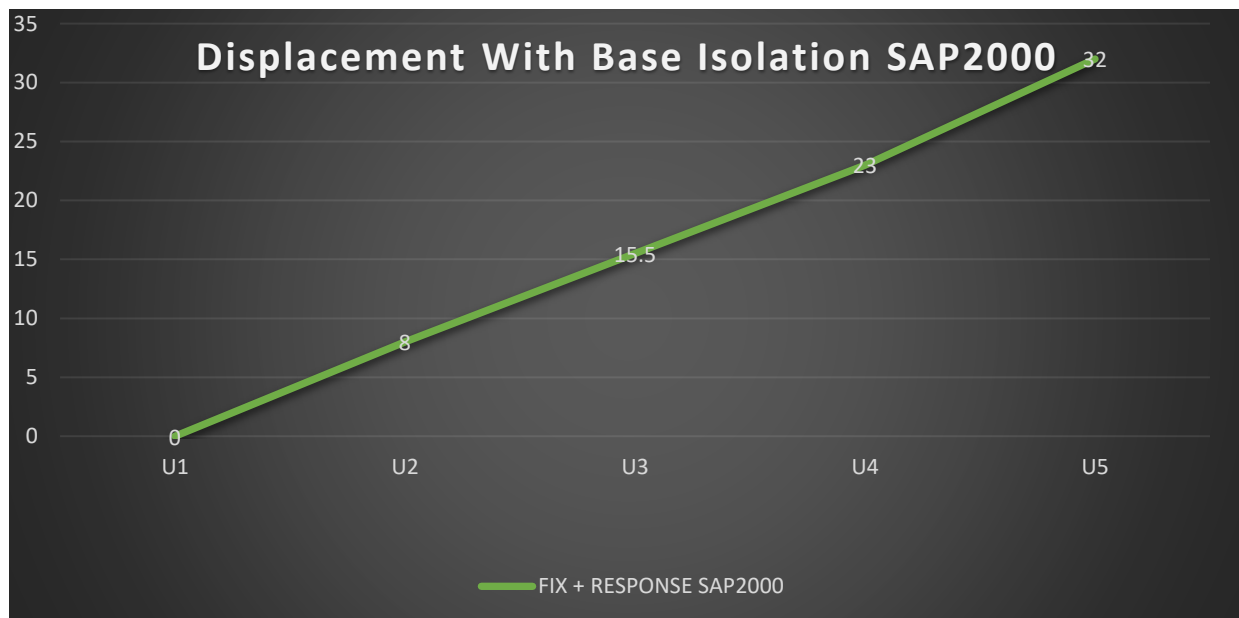
In the sap2000 with isolated base of intz water tank. We have found that base shear has been reduced to 12.00 % as compared to manual and base isolation. And also, we have found that there is less displacement as compared to manual with fixed base given below

A) Base shear value with Response spectrum = 898.34 kn

B) Displacement value in SAP2000 Fixed base with Response spectrum

Node	Displacement (mm)
U5	5
U4	4
U3	2
U2	1
U1	0

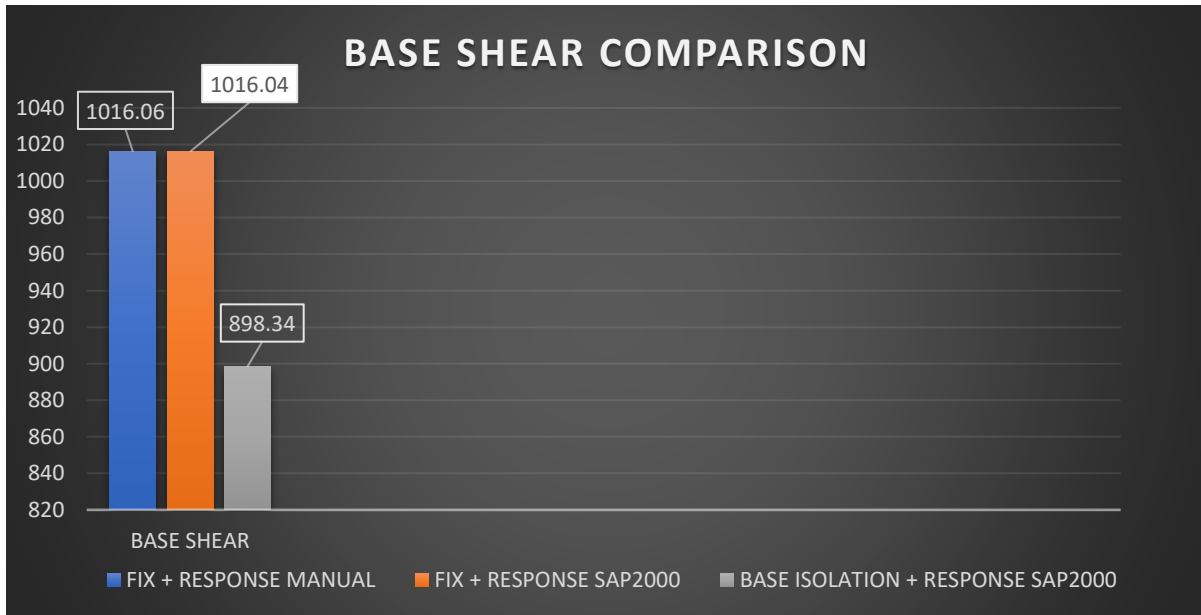
Table 10:- Displacement Value Base Isolation Sap2000



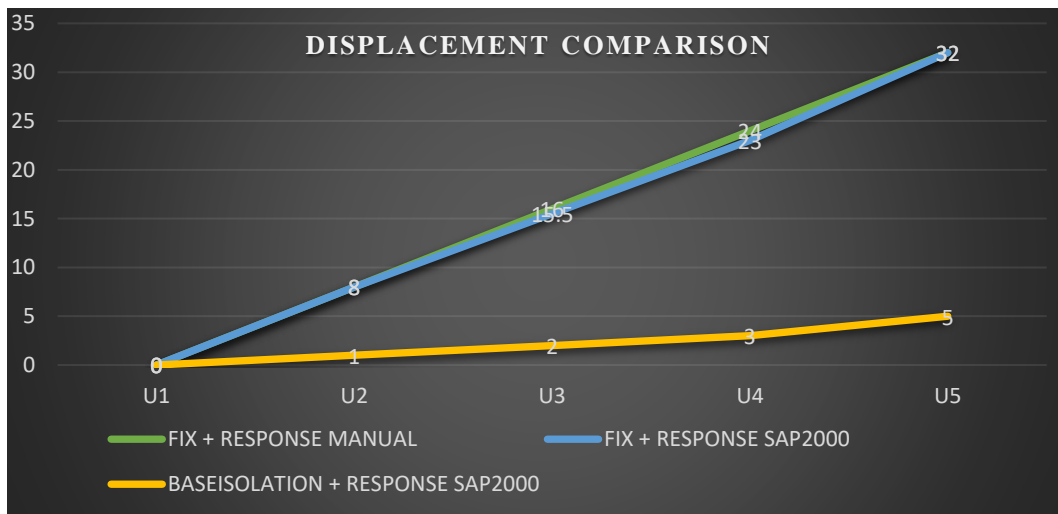
Graph 6:- Displacement Fixed Base Isolation Sap2000

4.4 Result parameter Comparison of all Three Analysis

Analysing the all three-design value we have obtained. It is recommended to use base isolation in zone V where maximum probability of earthquake going to happen and As water is essential part of life and also to safe guard public property and economy.



Graph 7:- Comparison of Base Shear



Graph 8:- Comparison of Displacement

Conclusion

The conclusion can be pointed out are as follows:-

Intz Water tank is never been considered under research by researchers with triple pendulum Friction isolator.

1. The result which we have obtained for manual fixed base are Base Shear =1016.08 Kn and Displacement are same as compare to Software Analysis in zone V.
2. For the base isolation Intz water tank we have found 12% decrease in base shear and in the displacement up to 90% is decrease with base isolator in Zone V.

Thus it is best to use base isolation in Intz water tank.

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