ANALYSIS OF INTZE TANK USING STEEL JACKETING

Dr Vivek Soni[1]

[1]Assistant Professor Madhyanchal Professional University, Faculty of engineering and Technology, School of Civil Engineering, Bhopal, M. P, India.

ABSTRACT

Overhead tanks and capacity supplies are utilized to store water, fluid oil and comparable fluids. Repository is a general term used to fluid stockpiling structure and it very well may be underneath or over the ground level. Supplies underneath the ground level are ordinarily worked to store expansive amounts of water. The overhead tanks are upheld by the section which goes about as stage. This Overhead sort of water tanks are worked for direct dissemination of water by gravity stream and are more often than not of littler limit.

Capacity overhead tanks are utilized to store water. These overhead water tanks are planned by utilizing of IS: 3370. BIS has drawn out the modified variant of IS: 3370 (section 1& 2) after quite a while from its 1965 form in year 2009.

The target of this exposition is to reveal insight into the distinction in the structure parameters of Intze water tanks without considering seismic tremor powers. What's more, Intze water tanks structured with quake powers. First plan depends on Indian standard code: 3370-1965 and second structure depends on Indian standard code: 3370-2009 and draft code 1893-Part 2, (2005).Design of water tank in present days following every one of the criteria of new IS Code: 3370-2009 and new Draft IS Code: 1893-2005 (section 2) at that point I will discover that Weather the water tanks is sheltered or not which were configuration by utilizing IS: 3370-1965 without considering tremor forces.After getting the data which is-climate safe-"it's sound" Or not reasonable retrofitting strategy will be contemplated and wherever required will be connected.

Keywords: Overhead tanks,IS: 3370,IS Code: 1893-2005,Indian standard code: 3370-2009

1. INTRODUCTION

The water stockpiling tanks are especially exposed to the danger of harm because of seismic-incited vibrations. Countless fluid holding tanks harmed amid past seismic tremors. Dominant parts of them were shaft organizing while couples were on casing arranging tanks. As of late the Muzaffarabad (J&K) seismic tremor 2005, Bhuj (Gujarat) quakes 2001and Jabalpur (M.P.) tremor additionally spoken to comparable harm. The vast majority of the harm was caused in light of the tanks were either planned without considering the quake powers or deficient seismic structure contemplations. To adapt to this need the seismic structure codes for overhead water tanks have been modified and redesigned.

2. OBJECTIVE OF THE THESIS WORK

➢ To comparative study between the IS: 3370-1965 and IS: 3370-2009.

➢ Comparisons of the diverse structure parameters (like band pressure, size of individuals and fortification) difference in intze water tank upheld on edge arranging planned according to Seems to be: 3370-1965 (without considering tremor powers) and IS: 3370-2009 (considering seismic tremor powers).

➢ In this work we are endeavoring to establish the intze water tanks which was structured by utilizing IS: 3370-1965 without considering tremor powers safe or not in a present days.

DESCIRPTION OF INTZE WATER TANK

Generally water tanks are classified in three categories:

1. Under ground water tank
2. Water tank resting on the ground
3. Elevated water tank

These tanks may have rectangular or round fit as a fiddle. Under ground water tanks and water tank laying on the ground have just level base chunk while raised water tanks may have conelike vault or level base section. In past most raised round water tanks are built with level base piece in light of the fact that these tanks are effectively developed however they are uneconomical. Level base chunk required greater support and expanded thickness. In such cases intze water tanks are utilized. At the point when raised round water tanks are developed with funnel shaped vault that raised roundabout water tank is called intze water tank. In an intze water tanks conelike arch required least support and less thickness henceforth intze water tank is progressively efficient. For extensive limit of over head water tanks Intze water tanks are generally developed in India on account of economical. Thesis of my work has accentuations just

on raised intze water tank. Plan of fluid holding structure must be founded on the shirking of splitting in the solid having respect to its rigidity. It must be guaranteed that no breaks in the solid ought to be framed on the water face.

3. METHODOLOGY

➢ To study the comparison of changing parameters of IS: 3370-1965 and IS: 3370-2009.

➢ Conventional design of intze water tank as per IS CODE: 3370-1965 without consideringearthquake.

➢ Seismic analysis of intze water tank considering two mass modal method as per draft codeIS: 1893 Part- II (2005).

➢ Redesign of intze water tanks as per IS CODE: 3370-2009 by considering earthquakeforces.

➢ Comparative study of designs of Intze water tanks between IS CODE: 3370-1965 (not considering earthquake forces) and IS CODE: 3370-2009   (considering earthquake forces).

Parameters of intze water tank

The capacity of intze water tank is given by the summation of volume of cylindrical portion and conical portion which is given below:

V= Volume of cylindrical portion + Volume of conical dome -Volume of Bottom dome

$$V = \frac{\pi}{4}D^2h + \frac{\pi h_0}{12}(D^2 + D^2{}_0 + DD_0) - \frac{\pi D^2{}_0}{3}(3R_2 - h_2)$$

CODAL PROVISIONS

S. No.	Type of Stress in Steel Reinforcement	Plain Round Mild Steel Bars (kg/cm^2)	High Yield Strength Deformed Bars (kg/cm^2)
1	Tensile stress in members under direct tension	1150	1500
2	Tensile stress in members in bending: a)On liquid retaining face of members b)On face away from liquid for members less than 225 mm c) On face away from liquid for members 225 mm or more in thickness	1150 1150 1250	1500 1500 1900
3	Tensile stress in shear reinforcement: a) For members less than 225 mm thickness b) For members 225 mm or more in thickness	1150 1250	1500 1750
4	Compressive stress in columns subjected to direct load	1250	1750

4. DESIGNE INTZE WATER TANK

BASIC REQUIRED DATA:

Capacity of water tank = 1000 KL

Height of staging =16 m (up to the bottom of tank)

Bearing Capacity of soil = 150 KN/m^2

Use – M30 conc. & HYSD Bars

4.2 DIMENSIONS OF INTZE WATER TANK:

• Assume Dia. of cylindrical portion (D) = 14m.

• Assume Dia. Of circular (Ring) beam (B$_2$) = D$_0$ = $\frac{5}{8}$D = 10 m

• Height of conical Dome = h$_0$ = $\frac{3}{16}$D = 2 m

• Assume height of Rise in Top Dome = h$_1$ = $\frac{D}{5}$ to $\frac{D}{7}$ = 2m

- Assume Rise of Bottom Dome = $h_2 = \frac{D}{8} \approx 1.6$ m

- Radius of Bottom Dome $(R_2) = h_2 (2R_2 - h_2) = 5 \times 5$

$1.6(2R_2 - 1.6) = 5 \times 5$

$R_2 = 8.61$ m

$\sin \emptyset_2 = \frac{5}{R_2} = \frac{5}{8.16}$

$\emptyset_2 = 35.5$

$\therefore \cos \emptyset_2 = 0.8141$

$\tan \emptyset_2 = 0.7133$

TABLE.1 - S.F and B.M

S. No.	level	V_{max}	S_{max}	B.M.
1	O_4	37435.5	20025.5	40051
2	O_3	47761.4	24295.75	48591.5
3	O_2	67198	28566	57132
4	O_1	96750.66	32836.25	82090.6

5. RESULT

In India diverse kinds of water tanks are accessible for capacity of water. The vast majority of them are RCC and truth be told, not many are basic steel. Water tank is a thin best substantial structure and its normal time of vibration is very high. Consequently, it is important to think about the hydrodynamic conduct while planning such structures.

The present examination investigates the likelihood of evolving powers, size of individuals and support by receiving new IS code of water tank and furthermore embraced new draft IS code of fluid holding tanks. In this postulation examined just intze tank upheld on casing arranging. This tank is likewise being planned by considering with and without seismic tremor powers. The seismic examination of these tanks has been finished by two mass modular techniques. The distinctive parameters of edge arranging have likewise been assessed by considering with and without seismic tremor powers. The result of this examination can be quickly condensed as pursues.

6. CONCLUSIONS

By investigation of the codal arrangements of IS: 3370-1965 and IS: 3370-2009, found allowable cutoff of worry in steel is diminished 150 N/mm2 to 130 N/mm2.

All plan parameters of intze water tanks are changed because of the two fundamental reasons. First is the decreasing the allowable furthest reach of worry in steel in new IS Code: 3370-2009 and second is the considering seismic tremor constrain.

In this investigation we are seeing that the when intze water tank is planned by considering new IS Code: 3370-2009 and Draft IS Code: 1893-2005 (section 2) Hoop Tension in a tube shaped divider, center ring pillar, funnel shaped vault and base arch are expanded by huge sum. In this way we can dissect that old plan of tank according to Seems to be: 3370-1965 without tremor powers isn't sheltered in loop pressure.

Meridional push in a funnel shaped vault and base arch is expanded when water tank is structured according to May be: 3370-2009 considering quake powers.

The thickness of tube shaped divider, funnel shaped vault and base arch of intze water tanks are expanded because of the contemplations of new IS Code: 3370-2009 and quake powers.

When intze water tank is structured by utilizing new IS Code: 3370-2009 and furthermore considering impact of seismic powers which is determined by utilizing Draft IS Code: 1893-2005 (section 2) discovered more difference in fortification prerequisites.

The twisting minute and shear powers determined because of seismic burden are more than the bowing minute and shear powers because of wind load for casing arranging.

When section of water tank is intended to oppose the seismic tremor stacks then width of segment and support in segment is comes expanded as a result of more noteworthy toppling minute is prompted in a base of segment.

When section supporting of tank is planned according to new IS Code of fluid stockpiling tank thinking about seismic powers at that point twisting minute and fundamental fortification is increment.

If water tank is planned in present days then we are following every one of the criteria of new IS Code: 3370-2009 and new Draft IS Code: 1893-2005 (section 2) at that point we see that water tanks are not sheltered which were structured by utilizing IS: 3370-1965 without considering tremor powers.

7. FUTURE SCOPE

Retrofitting techniques can be financially savvy for old water tank as no compelling reason to destroy the entire structure while considering extra powers acting because of seismic tremor on water tank.

This theory will distinguish the reinforcing need of various segment of the structure exposed to seismic power.

By and by substantial quantities of intze water tanks are utilized for supply the water in common society or in businesses.

8. REFERENCES

[1] ACI 350.3-01 and Commentary ACI 350.3R-01.(2001) "Seismic Design of Liquid-Containing Concrete Structures" Reported by ACI Committee 350 Environmental Engineering Concrete Structures, 350.3/350.3R-1

[2] BIS Draft code on IS: 1893-part 2, "Criteria for Earthquake Resistant Design of Structure, Liquid Retaining Tanks Elevated and Ground Supported (fifth revision of IS: 1893)", Workshop on Revision of IS Codes on LRS.

[3] Dr. Shah H.J., (2012), "Reinforced Concrete Vol-II", Charotar Publishing House Pvt. Ltd., Anand, Gujarat, India.

[4] Dutta S.C., Jain, S.K. and Murty, C.V.R., (2001), "Inelastic Seismic Torsional Behavior of Elevated Tanks", Journal of Sound and Vibration 242(1), pp.167

[5] Dutta, S.C., Jain, S.K. and Murty, C.V.R., (2000). "Alternate Tank Staging Configurations with Reduced Torsional Vulnerability", Soil Dynamics and Earthquake Engineering 19, pp.199–215.

[6] Dutta, S.C., Jain, S.K. and Murty, C.V.R., (2000). "Assessing The Seismic Torsional Vulnerability of Elevated Tanks with RC Frame Type Staging", Soil 7.Dynamics and Earthquake Engineering 19, pp.183–197.

[7] Falguni, A., and Vanza, M.G., (2012). "Structural Control System for Elevated Water Tank", International Journal of Advanced Engineering Research and Studies.E-ISSN2249–8974.

[8] Federal Emergency Management Agency, FEMA 273, (1997),NEHRP Guidelines for the Seismic Rehabilitation of Buildings, Issued by FEMA in furtherance of the Decade for Natural Disaster Reduction.

[9] Housner, G. W., (1963), "The Dynamic Behavior of Water Tanks", Bulletin of The Seismological Society of American. Vol.53, No.2, pp.381-387.

[10] Indian Institute of Technology Kanpur, IITK GSDMA, (2005) "Guidelines for Seismic Design of Liquid Storage Tanks."