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Review on Comparative Analysis of Water Tank Rest on Ground

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Abstract: ***Water is the basic need of all living organisms for survival. Portable water is essential for good human health. It is important to provide portable water to every individual and every community; therefore it is very important to save water. Usually, water is stored in tanks and then the stored water is delivered through pipelines to each location. Usually, a water tank resting on the ground is a tank for storing water. This case study gives an idea of a safer and more economical design with greater reliability and simplicity. This article helps to understand the philosophy of safe tank optimization. For the safe and economical design of the tank, this study provides various design requirements that affect the strength and support of the structure. This case study is conducted on a reinforced concrete liquid containment structure resting on the ground.***
Keywords: water tank, economic design, reinforcement, optimization, analysis etc.

I. INTRODUCTION

Storage tanks are used to store water, liquid oil, petroleum products, etc. The strength analysis of tanks or containers is approximately the same regardless of the chemical nature of the product. All tanks are designed with a slotless construction to eliminate leaks. The slab and walls holding water or oil can be reinforced concrete with adequate reinforcement cover [1].

A Water container is a container for storing liquid. The need for a water reservoir is as old as civilization to provide water storage for many applications, drinking water, irrigation, agriculture, firefighting, agriculture, for both plants and livestock, chemical production, food preparation and many other purposes [2].

Water tank parameters include general tank design, choice of construction materials, coatings. The design depends on the location of the tank, ie. above, underground or in underground water tanks, partly underground. Ground-based tanks include clean water tanks, sediment tanks, air tanks, etc., which rest directly on the ground. Pressure is exerted on the walls of these tanks and the weight of the water sinks to the bottom [3]

The usual types of water tanks are the following:

1) Tanks situated on the ground.
2) Tanks situated underground.
3) Tanks situated above the ground level.

II. PROBLEM DEFINITION

Undervoltage occurs when the average voltage of a three-phase power system drops below a certain level, and is sometimes called a blackout. Electromechanical devices, including three-phase motors and pumps, are designed to operate well on certain voltage levels. When these devices are allowed to operate at low voltage, they consume more current.

An increase in current causes the windings and coils of the equipment to heat up, damaging the critical insulation that protects them. Operating at low voltage can significantly shorten the service life of electromechanical equipment and cause premature failure. The purpose of this project is to affect the water supply of the proposed building and to improve all views that are stable to receive water supply.

III. PROPOSED SYSTEM

Water tanks are used to store water for use in a variety of applications including gutters, irrigated agriculture, firefighting, agriculture, and crop and livestock production, chemical production, cooking and many other uses. Water is mostly stored in concrete water tanks and then pumped to different areas to serve the community. Water tank design analysis using software helps to get accurate results in less time. Staad pro is one of the most important programs used to analyze and design water tanks. The analysis of this comparative study is performed using Staad software.

Analyzing each mold separately, keeping the capacity the same, the results are considered and thus comparisons are made to achieve the best possible result. The report includes a study of water tanks based on their classification, an investigation of the various supports and loads affecting the water tank, and an analysis of different shapes of the water tank with Staad-Pro.

IV. PROBLEM STATEMENTS

Following are the identified problems of the project,

1) Feasibility and durability of the tank
2) Effect of different loads due to the change in the reverse level of the water tank on the sizes of the parts
3) Economically a better place to complete the reverse level water tank in case of water supply project.
4) Minimum sizes of water tanks.
5) Comparative analysis of various parameters and other conditions of ground water tanks will definitely help to find the ideal type of water tank that can withstand most forces compared to others.

V. OBJECTIVE

The objectives of the proposed work are as follows:

1) Study of structural parameters – Terrain class, seismic parameter, fundamental condition, type and shape, etc.
2) Analysis and design of water tanks.
3) Economic water tank structure.
4) Using Staad Pro for analysis and design.

VI. LITERATURE REVIEW

For all this comparative literature based on the location and shape of the water tank, various literatures related to this subject were studied. The reference section lists the various literature cited.

Thalopathy .M et al. (2016) [1], conducted "Analysis and Economic Design of Water Reservoirs". In this article, he said that this project provides a detailed analysis of the design of a fluid retaining structure using the applied stress method. This paper gives an idea of a safe design with minimum tank cost and gives a design relationship between curve design variables. This article will help you understand the design philosophy behind a safe and economical water tank.

Dhritiman Mondal et al. (2018) [2], this paper presents R.C.C. a comparative study. underground and lives in waters of various shapes (round and rectangular) with a volume of 500,000 liters or 130,000 gallons (United States). The work includes circular and rectangular R.C.C. design and estimates. underground and above ground water reservoirs. More than one choice for building types sometimes causes confusion. The best way is to choose the type of building according to the conditions and the type of structure. The purpose of this work is to design large capacity R.C.C water tanks of different shapes and then compare the results. For both water tanks, the analysis is performed using STAAD PRO software. The idea is to make a clear conclusion about the superiority of two technologies over each other for a given power.

Issar Kapadia (2017) et al[3] conducted "Design, Analysis and Comparison of Rural Rectangular Water Tank Using Staad Provi8 Software". This article includes a study of a rectangular tank UG on how the shape deviates and what happens when the tank is empty or full using STAAD Pro software.

B.V. Ramana Murthy, M Chiranjeevi [4] made "Rectangular water tank design using Staad Pro software". In this article he said that this mini-project will be implemented for 15 days from 21-05-2010 to 07-06-2010 so that he has complete practical knowledge of various techniques and problems in the field. Various topics such as construction aspects, design parameters, shape details, reinforcement details, water treatment plant process and implementation were covered during our mini-project.

Badipatla Balaji Sai, P. Veerabhadra et al. to 2017 [5], this paper represents the arametric study of a structure is a process of analytical comparative structure that considers and modifies various parameters that affect the strength and support conditions of a structure. A structure that holds a liquid is nothing more than a liquid storage container. Which probably has water in it. Sometimes, however, liquids other than water are also stored, ie. oils, petroleum products, beverages, waste water. In this work, a parametric study of reinforced concrete fluid-retaining structures located above and below ground and subjected to both static and hydrodynamic forces was carried out. The research considered tanks that are rectangular and round. The parameters discussed in this document are shape and height. Analyzes were performed for static pressure, hydrodynamic pressure, earth pressure, vertical and horizontal moments, as well as ring tension, base moments, overhangs.

An investigation of the articles revealed that circular water tanks are more economical than rectangular water tanks. Previous studies have not investigated the comparison between a rectangular tank and a circular tank in milking, ie. above ground, underground and partial..

VII. BLOCK DIAGRAM

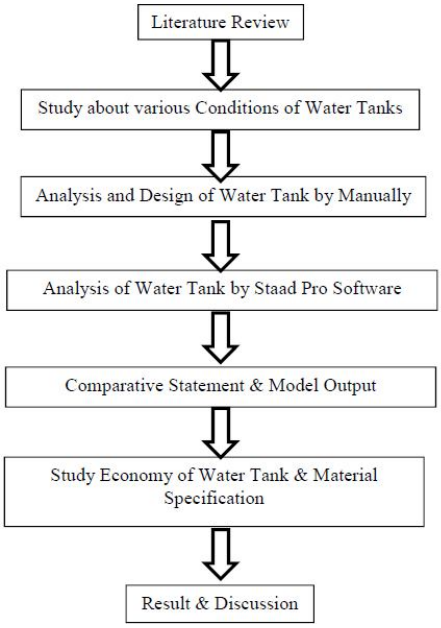


Fig.1. Working Methodology

VIII. METHODS OF ANALYSIS

Generally following three methods are used for structural design:

1) Working Stress Method (WSM)
2) Ultimate Load Method (ULM)
3) Limit State Method (LSM)

This design method which was considered as the previous method. tanks have several limitations. However, in a situation where the limit state method cannot be conveniently applied, the working stress method can be used as an alternative. In this design method, the serviceability of the structure must not be checked without exceeding the performance. Therefore, no significant crack occurs when designing a structure using the work stress method. Therefore, it is still recommended to design liquid retention structures using the work stress method, as liquid infiltration is also a key criterion. Narrow cracking in this structure designed by the work stress method was the main reason why IS: 3370 (1965) did not adopt the limit state design method even after the adoption of IS: 56 (1978).

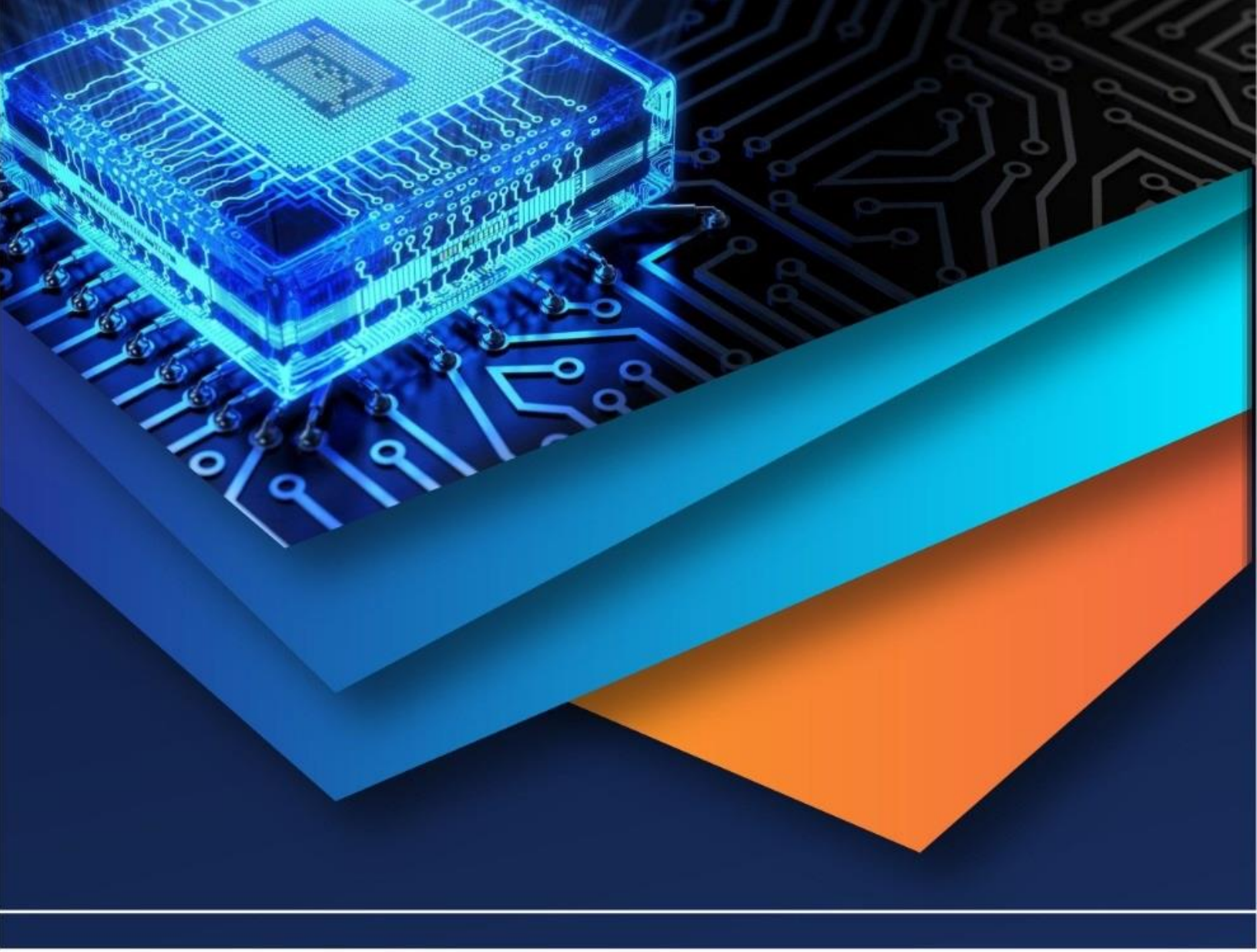
IX. CONCLUSION

Tanks resting on the ground are usually round or rectangular and are used in places where it is necessary to store a lot of water. The parameters of water tanks include the general design of the tank and the choice of construction materials and coatings. This study showed that the aforementioned design requirement plays an important role in the safe and economical design of different forms of above-ground water tanks, which provides insight into an accurate and convenient method for tank optimization.

REFERENCES

[1] Thalapathy.M, Vijaisarathi.R. P, Sudhakar.P, Sridharan.V, Satheesh.V. S (2016). “Analysis and Economical Design of Water Tanks”. International Journal of Innovative Science, Engineering & Technology, Vol. 3, Issue 3, ISSN 2348 – 7968.
[2] Dhritiman Mondal (2018), “Comparative Study on Various Shapes of RCC Underground & Rest on Ground Water Reservoir”. International Journal of Innovative Research & Studies Volume 8, Issue IV, ISSN No. : 2319-9725.
[3] Issar Kapadia, Purav Patel, Nilesh Dholiya and Nikunj Patel (2017). “Design, Analysis and Comparison of Underground Rectangular water tank by using STAAD Provi8 software”. International Journal of Scientific Development and Research (IJSDR), January 2017, Volume 2, Issue 1, ISSN: 2455-2631.

[4] B.V. Ramana Murthy, M Chiranjeevi. "Design of Rectangular Water Tank by Using Staad Pro Software". -International Journal of Computer Science information and Engg., Technologies, issue 6-volume 1, series 3, ISSN No : 2319-9725 2277-4408.
[5] Badipatla Balaji Sai, P. Veerabhadra rao (2017), "Parametric Study of Water Retaining RC Structures on Ground and Below Ground Subjected to Hydrodynamic Forces ".International Journal of Innovative Research in Science, Engineering and Technology, Vol. 6, Issue 8, ISSN No: 2347-6710.
[6] IS 456:2000 - Code of practice for plain and reinforced concrete
[7] IS 3370 : Part 1 : 2021 - Concrete Structures for Retaining Aqueous Liquids – Code of Practice : Part 1 General Requirements
[8] IS 3370 : Part 2 : 2021 - Concrete Structures for Retaining Aqueous Liquids – Code of Practice : Part 2 Plain and Reinforced Concrete Structures
[9] IS 3370 : Part 3 : 2021 - Concrete Structures for Retaining Aqueous Liquids – Code of Practice : Part 3 Pre stressed Concrete Structures
[10] IS 3370 : Part 4 : Sec 3 : 2021 - Concrete Structures for Retaining Aqueous Liquids - Code of Practice : Part 4 Design Tables : Sec 3 Circular Tanks
[11] IS 3370 : Part 4 : Sec 2 : 2021 - Concrete Structures for Retaining Aqueous Liquids - Code of Practice - Part 4 Design Tables - Section 2 Rectangular tanks.



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