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Design of RCC Well Using StaadPro Software

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Abstract: ***Water is human basic needs for daily life. Sufficient water distribution depends on design of a water tank in certain area. Many new ideas and innovation have been made for the storage of water and other liquid materials in different forms and fashions. Water retention structures, often known as water storage tanks, are an essential component of any distribution system. During periods of low demand, water is pumped into the storage tank, and during periods of high demand, water is pushed out of the storage tank and into the distribution system. STAADpro is a popular structural analysis application known for analysis, diverse applications of use, interoperability, and time-saving capabilities. STAADpro helps structural engineers perform 3D structural analysis and design for both steel and concrete structures.***
Keywords: STAADpro Software, RCC Well, Analysis and Design, Well Design, Software Analysis, Manual Analysis

I. INTRODUCTION

Humans require water to survive on a daily basis. The layout of a water well in a particular area determines how much water is distributed there. Water and other liquid materials can now be stored in a variety of ways using a variety of new concepts and innovations. After water, concrete is the material that is utilized the most all across the world. Since cement concrete has greater engineering features and is also more environmentally friendly, it has been widely employed in building around the world. Water is pumped into the storage well during periods of low demand, and during times of high demand, water is forced out of the storage well and into the distribution system. Concrete is the second most widely used material after water in all over the world. Cement concrete has very well used in construction globally because of its better engineering properties and also on accounts of its better ecology and environmental acceptance. When especially considering constructions that store liquids, the most important factor to consider is the imperviousness of concrete. This concrete should be abundant in cement, extremely highly graded, and minutely compacted in order to achieve high tensile strength and low porosity. High-strength precast cement is unrivalled for consumption obstruction, imperviousness to fire, and durable low upkeep. Precast tanks dispense with the requirement for enormous on location work, quicker development plans, low continuous upkeep expenses and longer life.

The impermeable quality of concrete is the most crucial feature to take into account, especially when thinking about structures that retain liquids. Water is piped to above tanks from underground wells, which are used as reservoirs. It will assist us in storing and using water when it is not readily available. One of the most crucial kinds of soil holding structures is a retaining wall. Retaining the earth in a position that is close to vertical is the main goal of retaining walls. Facilities with a pump and other tools for moving fluids from one location to another are known as pump houses or pumping stations. They serve a range of infrastructural systems, including those for home use, irrigation, and water delivery. When calculating such structures, rotational symmetry can be taken into account because they are typically loaded by dead weight and pressure from fluid or soil on the foundation plate and well wall.

II. OBJECTIVES OF THE STUDY

1) To conduct research on water well analysis and design.
2) To design the water-retaining structure in accordance with the IS code.
3) To comprehend regulating loads such as soil pressure and water pressure and to conduct research on the underground water well.
4) To create a water well programme to prevent laborious calculations.
5) A water well's cost-effective design knowledge.
6) The purpose of this report is to offer recommendations for the well's design and construction.
7) Analyze the circular UG water well's 1004.8 cubic meter capacity first (10lakh liter).
8) The UG well's diameter and height are 8 meters (22m). (2 m) Suction Height, Diameter (1.5m). Height of the tank above ground (20m).

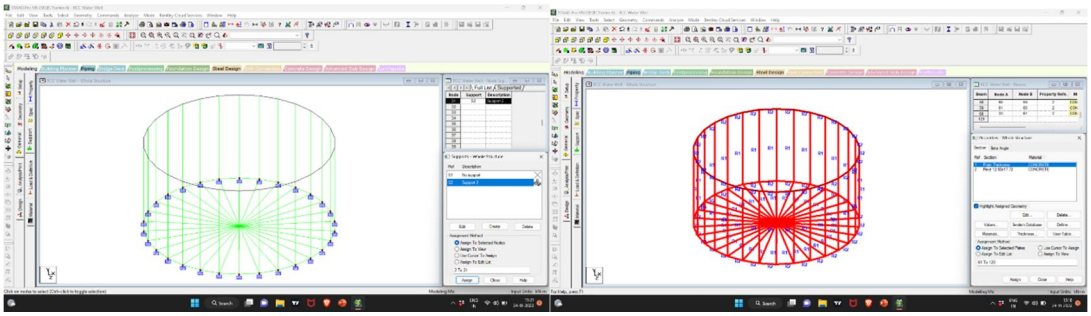
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9) Overhead Pump House height (5m), diameter (8m)
10) StaadPro software is used to aid in analysis.
11) Analysis of forces acting on RCC well by the surrounding soil and water present in the well as per IS:3370 (part II and IV).

III. PARAMETERS

1) Capacity Of water tank
2) Shape of water tank
3) Forces acting on tank by the surround soil
4) Angle of internal friction
5) Bearing capacity of soil
6) Width of column
7) Size of tank
8) Grade of Concrete & Steel

IV. STRUCTURAL COMPONENT



Well Model in StaadPro

V. LITRETURE REVIEW

1) *Komal K Wagh, Akshay K Ghule, Deepak N Gaidhane (2021):* They published an article on Design and Analysis of underground water tank by using StaadPro. They designed underground water tank of rectangular shape and analyzed using Staad pro. Underground water tank faces different type of loads compared to other structures, they mainly face Horizontal or lateral loads due to earth pressure and water pressure or any liquid pressure which is been stored in the tank. The side walls of the underground water tank will face greater load at the bottom and the load linearly decreases towards the top. Staad Pro analysis and design is always beneficial over the conventional method of analysis and design of water tank. By Using Staad Pro software there is saving of 15% to 20% of total steel in the whole structure.

2) *Zora Mistrikova, Norbert Jendzelovsky (2011):* They published an article on Static analysis of cylindrical tank resting on various types of sub soil. This paper present analysis of deformations and stress of the circular rotationally symmetric tanks. The reinforced concrete tanks water reservoir resting on elastic subsoil have been analyzed. Cylindrical concrete tank was modelled by shell square finite elements with six degrees of freedom in a node. It was mentioned above, numerical calculations of the interaction between the structure and the subgrade were modelled using FEM. The tank structure, where heavy ring load occurs along the circumference of the circular foundation plate, it is necessary during the calculation to consider the acting of the surrounding subsoil near the foundation plate.

3) *Ms. Pranjali N. Dhage, Mr. Mandar M. Joshi (2017):* They published an article on dynamic analysis of elevated RCC circular liquid storage tank in its entirety would be difficult to address. This literature review focuses on recent contributions related to dynamic analysis of liquid storage tanks, past efforts most closely related to the needs of the present work. Earthquakes represent an external hazard for industrial plants and may trigger accidents, i.e. fire and explosions resulting in injury to people and to near field equipment's or constructions, if structural failures result in release of hazardous material. Normally, they are constructed of reinforced concrete in the form of rectangular or circular configurations. Currently there are few codes and standards available for seismic design of LCS in North America.

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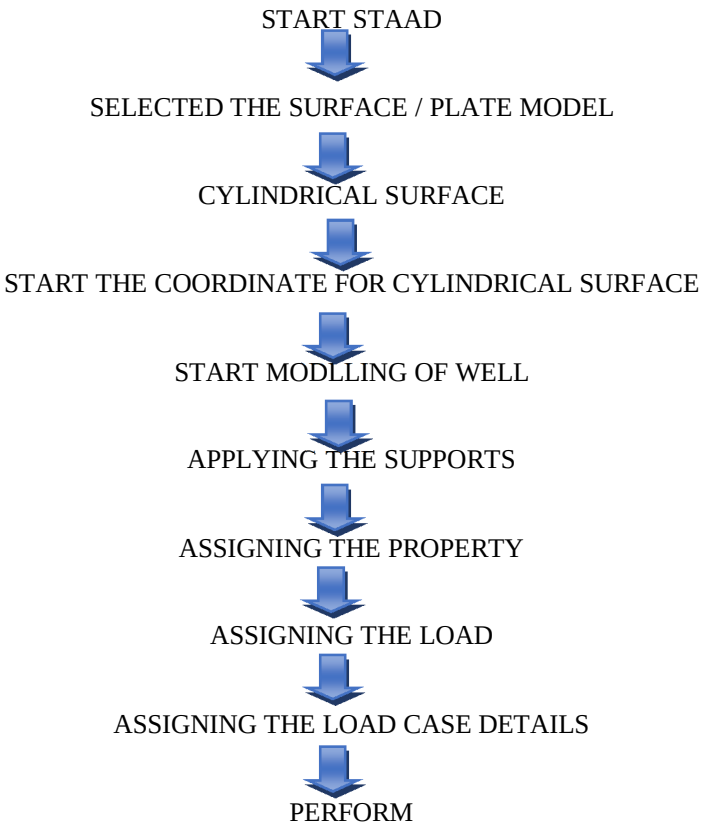
4) *Mahesh Kumar Pal, Nitesh Kushwaha (2019):* They published an article on Study on Overhead Circular Water Tank using StaadPro. The columns are taken circular for both tanks and diameter are 300 mm and height is 15 meters. The height of water tank is 4.3 meter and diameter are 8 meters for circular water tanks. Capacity of water stored is 2,00,000 liters. These models are analyzed for dead load, water load and seismic load. Dead load was designed according to IS: 875-1987(Part 1) and Seismic load was designed using response spectrum method for earthquake zone III of India using IS: 1903-2002. Study of capacity in overhead circular tank without center column and circular tank with center column it is clear that the seismic hazard and water pressure are the measure component for the analysis of the tank. Water pressure is not same in all places of the tank.

5) Vaishnavi S. Sarode, Prof. Ms. A. A. Yadav (2020): They published an article on analysis and design of Jackwell structures. Intake structures are used for collecting water from the sources like river, lake, and reservoir and transfer it further to the water treatment plant. The paper highlights the work administered on construction of Jackwell with Overhead Pump House. The main reason for that is rising in demand for water and poor distribution of water. The Paper includes the provision of Design of a water treatment scheme for the area in order to supply the treated water to the houses. Jackwell and Pump House has been analyzed by using STAAD PRO vi8 software under seismic condition.

VI. METHODOLOGY

A flow chart is produced as the overarching research methodology for this project

VII. SCHEMATIC DIAGRAM OF METHODOLOGY



VIII. ACKNOWLEDGMENT

Firstly, we are profoundly grateful to Prof. Swapnil Bijwe for him expert guidance and continuous encouragement throughout to see that this project rights its target since its commencement to present. I would like to thanks Prof. Lt. Col. Sanjay Karodpati Head of Civil Engineering Department of Dr. D. Y. Patil School of Engineering Lohegaon, Pune and Prof. Uzma Shaikh Project Coordinator whose invaluable guidance supported us in this project.

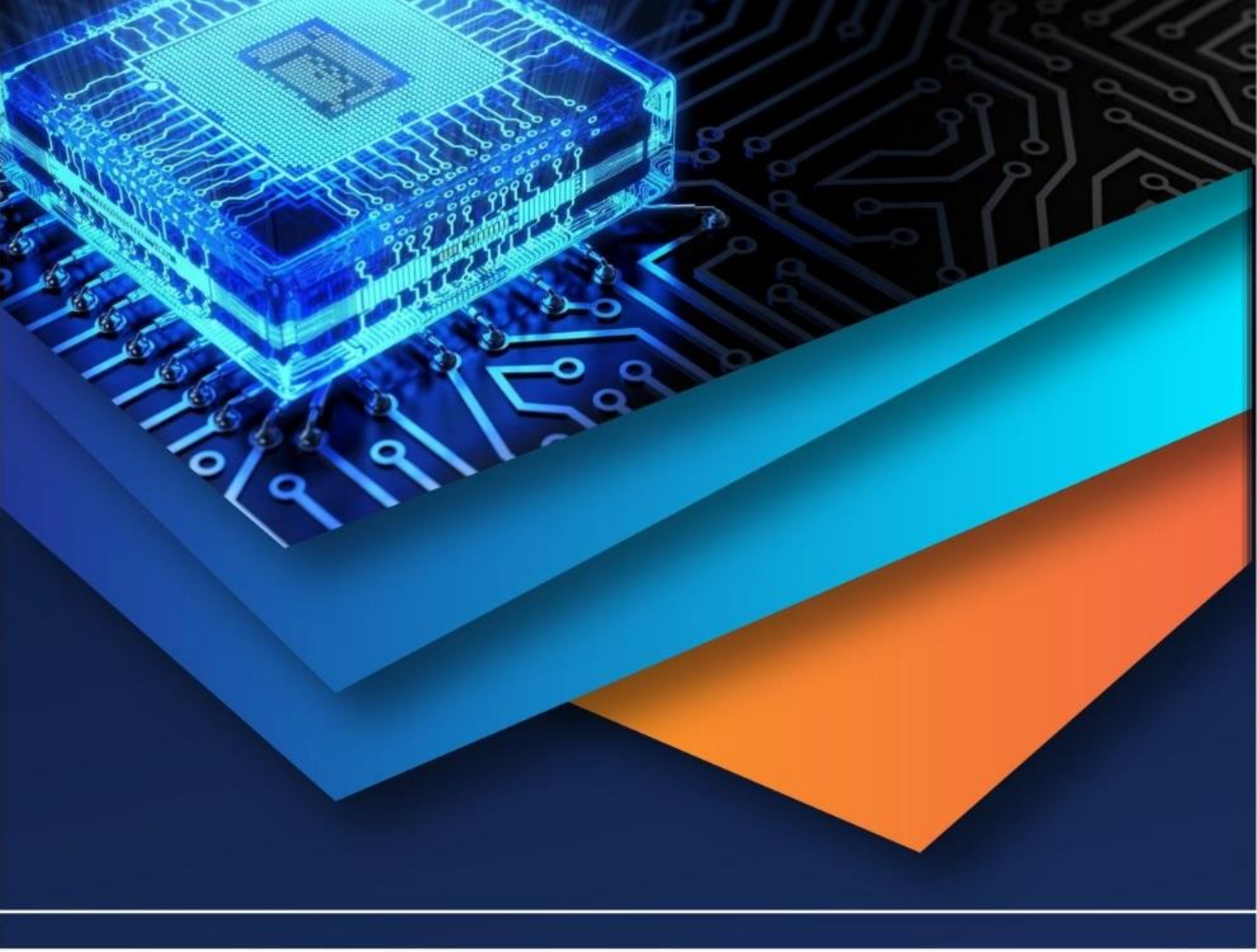
IX. CONCLUSION

1) We'll create a circular subterranean water well shape.
2) We will make use of StaadPro, which has proven to be excellent software with significant promise in the building industry's analytical and design sectors.
3) M25 grade concrete and Fe 500 steel will be used as design components.
4) Water pressure, earth pressure, surcharge, and saturated soil pressure will all be studied.
5) We'll do some research on the manual check well design.

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