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# DESIGN AND ANALYSIS OF GROUND WATERSTORAGE TANK.

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**Abstract:**
Water tanks are very helpful for storing water since we need to preserve as much of the available water's capacity as possible when we are using it. The storage tanks we have now are as old as civilization and ideal for all types of en Water is typically kept in tanks, and pipelines are used to supply it to every faction. We have planned and developed a circular water tank out of reinforced cement concrete for the project. A spherical tank is manually created. Using the newly released analytic programmed STAADPRO, it is further examined Environments. All living things require water in some form in order to survive. Portable water is essential for maintaining human health. Water storage is essential because it is crucial to provide portable water to every

**keywords** - water storage tanks and reservoirs, and their operation stress solutions Compressive strength, cement, concrete, & water hyacinth.

## I. INTRODUCTION:

The building that houses drinking water tanks is used to store drinkable water. The globe over, there is currently a lot of attention being placed on water storage projects. Water is essential to daily living, thus storing it is necessary even though it is not a need. The design of a water tank must adhere to all applicable codes, and loads must be applied properly. Based on the location and shape of the tank, water tanks are divided into two types.

The water tanks can be classified into three categories based on their location:

1. Underground water tanks
2. A tank lying on the ground water tanks that are
3. elevated or suspended,

The shape of the water tanks is another way to classify them:

1. Round tanks
2. Tanks in a rectangle
3. Intze-tanks
4. Round tank with conical bottom
5. Round tanks

The application parameters determined the shape of the water tank, hence these variables controlled the material choice and design of the water tank.

1. The water tank's location.
2. The capacity of the water tank.
3. How will the water be used?
4. The location's temperature, which has to do with freezing, is important.
5. The amount of pressure needed to furnish water.
6. Describe the process for delivering water to the water tank
7. Water tanks can resist seismic wind accidents thanks to design considerations for wind and earthquakes

Water tanks have been made out of wood, ceramic, and stone throughout history; some of these tanks are still in use today. There are many custom configurations available, such as different rectangular cube-shaped tanks, cone bottom tanks, and special forms for particular design requirements. A functional water container should not hurt the water, which is susceptible to a variety of environmental factors such as bacteria, viruses, algae, a change in pH, and a buildup of minerals. Systems for holding water that are properly built help to mitigate these effects of refusal.

**MISSION AND GOALS:**

A. Create a model of the water tank using the STADDPROV8i programme.
B. Include the water tank's features.
C. Enter the various load combinations in accordance with I.S. code
D. Study on-site under the Chhattisgraph conditions.
E. To compare the software and manual designs.

**GOAL OF FUTURE WORK:**

The design of a water tank is a highly challenging process. It makes extensive use of arithmetic calculations and algorithms to create an interestingly designed overhead water tank. This procedure will take a lot of time. Thus, the foregoing issues have a remedy provided by works of art. The design values of works and those determined manually differ by a tiny amount. The least valuable job for the design is this one. As a result, the designer should not offer anything less than the benefits of the works. To be on the safe side, the designer first added some extra values to the results of theoretical calculations.

**Problem statement**:

to examine the allocation in IS 3370(2009) in order to analyse the circular water tank. The limit state method was then used to manually calculate the results. After using STAAD Pro to compare designs and build more efficient structures using challenging dimensions for tanks with the same capacity, this study evaluates the cost effectiveness of the materials used and the structure's design to make it easier to anticipate tank costs. Because the intended structure has no cracks, spot structures are used for working stress methods.

**Design requirement of water tank:**

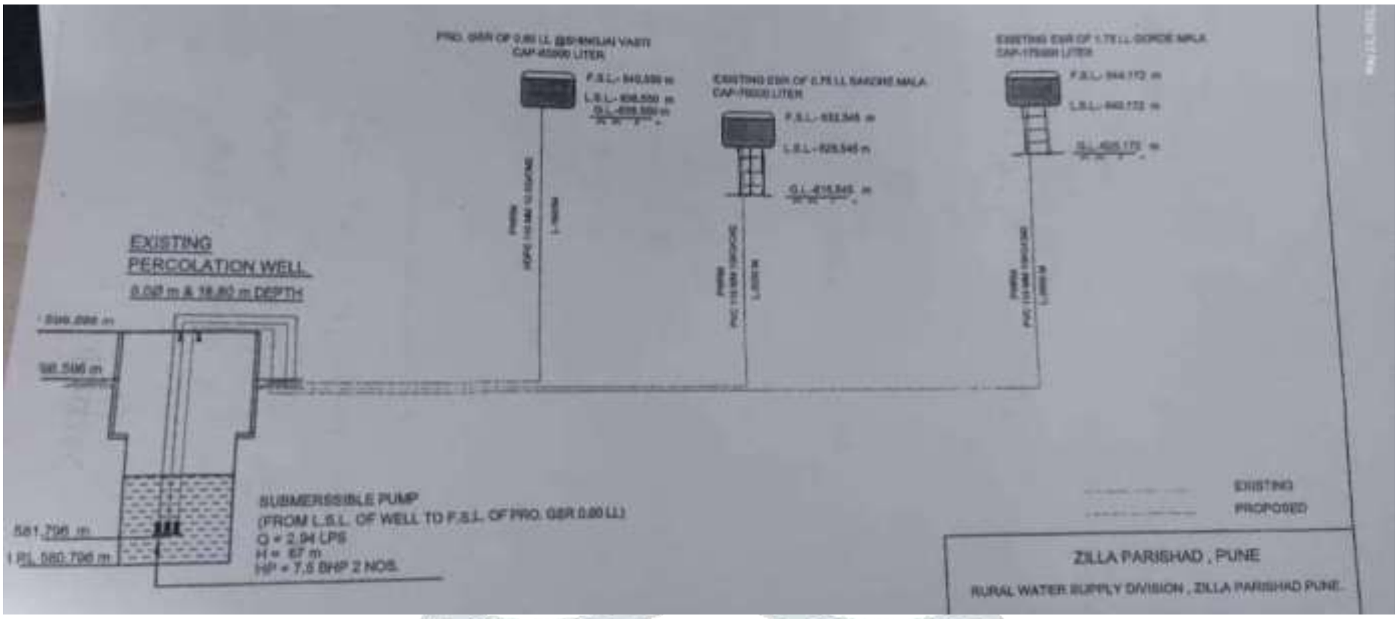
| SR. NO | PARTICULAR | DETAILS | |
|---|---|---|---|
| 1 | Name of the scheme | Shingave Rural Water Supply Scheme | |
| | | Tal. Ambgon Dist. pune | |
| 2 | population | 1981 | 2292 |
| | | 1991 | 2811 |
| | | 2001 | 3556 |
| | | 2011 | 4083 |
| | | 2021 | 5500 |
| 3 | Water supply presently available from various sources. | Ghod river | |
| 4 | Ownership of scheme and the existing scheme run by | Zhillha Parishad, pune | |
| 5 | Details of new scheme being proposed | Percolation Well | |
| 6 | Name of the scheme | Shingave Rural Water Supply Scheme | |
| 7 | Rate of water supply | 55 LPCD+15% losses | |
| 8 | Design year and population | Immediate Stage year 2038 & population | Ultimate Stage Year 2053 & population |
| | | 6946 | 8503 |
| 9 | Demand | Immediate [Year-2038]MLD | Ultimate [Year -2053]MLD |
| | | 0.449 | 0.550 |
| 10 | D.S.R. year used for estimates. | M.J.P. DSR for Year 2021-22, pune Region & PWD CSR 2021-22 Pune Region | |

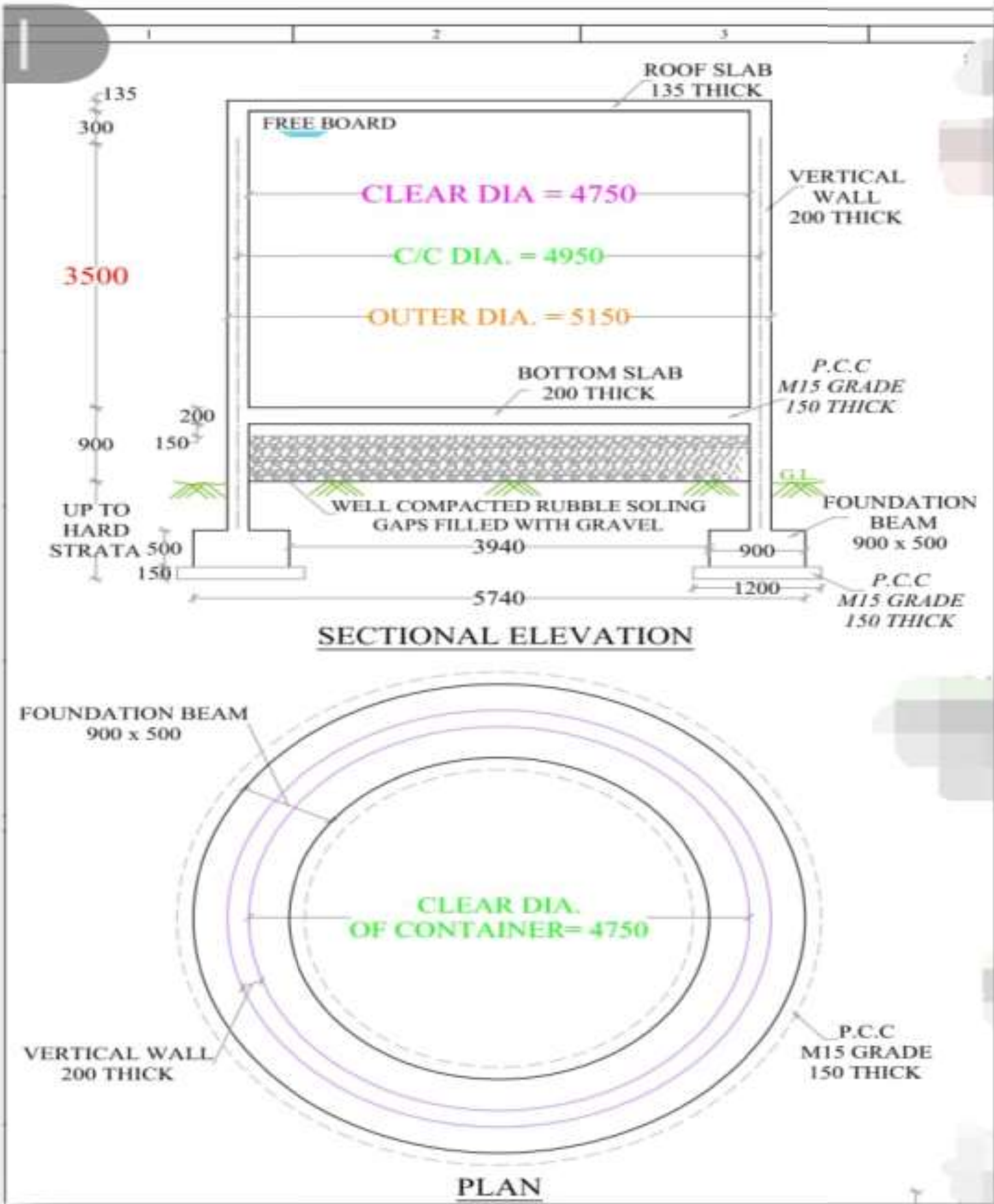
**Water sypply Scheme plan:**

**Design component of tank:**

The elements of a circular tank with a R.C. cover head. The following list includes the different parts of an elevated tank.

1. The typical thickness of the roof slab is 135 mm, with reinforcement at 8 and 10 mm in diameter.
2. The ring beam is required to resist the slab's thrust's horizontal component. The ring beam will be constructed with generated hoop tension.
3. A circular wall must be built to withstand bending moments caused by liquid loads as well as hoop tension brought on by horizontal water pressure.
4. The bottom slab will be built to support the entire load above it. The entire load above the slab will also be considered when designing it. Additionally, the slab will be constructed as a slab that spans both directions.
5. The bottom beam will be created as a continuous beam to transfer the entire load above it to the column.


EXISTING
PERCOLATION WELL
SUBMERSSIBLE PUMP
ZILLA PARISHAD , PUNE
EXISTING
PROPOSED


ROOF SLAB
135 THICK
FREE BOARD
CLEAR DIA = 4750
C/C DIA. = 4950
OUTER DIA. = 5150
VERTICAL
WALL
200 THICK
3500
135
300
BOTTOM SLAB
200 THICK
P.C.C
M15 GRADE
150 THICK
200
150
900
WELL COMPACTED RUBBLE SOLING
GAPS FILLED WITH GRAVEL
UP TO
HARD
STRATA
500
150
3940
900
1200
5740
FOUNDATION
BEAM
900 x 500
P.C.C
M15 GRADE
150 THICK
SECTIONAL ELEVATION
FOUNDATION BEAM
900 x 500
CLEAR DIA.
OF CONTAINER= 4750
VERTICAL WALL
200 THICK
P.C.C
M15 GRADE
150 THICK
PLAN

| TABLE NO.01 DESIGN DATA | |
|---|---|
| 1. BEARING CAPACITY | 200KN/m^2 |
| 2. EARTH QUAKE ZONE | III |
| 3. MAX. WIND SPEED | 140Km/Hr. |

| TABLE NO.02 SCHEDULE OF DIMENSIONS | | |
|---|---|---|
| DESIGNATION | SIZE IN mm | CONCRETE GRADE |
| FOUNDATION BEAM | 900X500 | M30 |
| BOTTOM SLAB | 200 THICK | M30 |
| VERTICAL WALL | 200 THICK | M30 |
| ROOF SLAB | 135 THICK | M30 |

| TABLE NO .3 CLEAR COVER | | |
|---|---|---|
| SR.NO. | PARTICULAR | CLEAR COVER IN MM |
| 1 | BOTTOM SLAB | 50 |
| 2 | VERTICAL WALL | 30/35 |
| 3 | ROOF SLAB | 30 |

| TABLE NO.4 LAP LENGTH | | | |
|---|---|---|---|
| SR NO | PARTICULAR | LAP LENGTH IN MM | |
| | | 8MMΦ | 10MMΦ |
| 1. | BOTTOM SLAB | 400 | 500 |
| 2. | VERTICAL WALL | 530 | 660 |
| 3. | ROOF SLAB | 400 | 500 |

1. All dimensionin mm
2. O.P.C. 43 Grade cement shall be used.
3. Design is prepared for fe500 can be used without changing bar Dia. and spacing.

**Manual design of water tank**

1] Basic dimension of tank

1. Diameter of tank=4.75m
2. Height of wall=3.5m
3. Free board=0.30m

2] Volume of tank=62.02m62^2 (60000 lit.)

3] Design of slab

Total load=4KN/M^2

Meridional stress=0.06KN/MM^2

4] Hoop tension

hoop stress =0.06 --------------------0.06<8 [ok]

Ast =405mm^2

spacing =124.11=120mm

[Providing 8m Dia @120mmc/c Ast=405mm^2

5] Design of top ring beam

Main steel

Ast = 58.16mm^2

Spacing=300mm

[Provide 8mm Dia @300mm c/c

Stirrups

Ast=100.53mm^2

Spacing =300mm

[Providing 8mm Dia 2 leg stirrups @300mm c/c]

6]Design of cylindrical wal

Ast=356.61mm^2

spacing=300mm

[providing 8mm Dia @300mm c/c]

7]Design of bottom slab

Total load=39.335KN/m^2

Meridional stress=2.21 -------------------- [2.21<8 ok]

[Providing 8mm Dia @80mm c/c]

8]Design of hoop stress=5.26 --------------------[5.52<8 ok]

Total UDL =228.09KN/m

Maximum bending moment at support=+30.31KN.m

Maximum torsional moment at support=5.05KN.m

9]Column

Providing 200m Dia @150mm c/c

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## III. CONCLUSION

It is concluded that the software's effectiveness and dependability in the field of designing are significantly greater than those of their yearly labour. It has been observed that these software-generated outcomes were more effective and cost-effective since they took into account a variety of factors under the designing conditions that are challenging to take into account when done manually.

1) The water tank's structural components are secure and free from leaks, flexure, and shear.

2) The amount of steel given for the structure is reasonable and sufficient.

3) The water tank can be employed with the structural parts in the proposed sizes.

4) Beam, slab, column, footing, and stairway designs are safe from risk in deflection, bending, shear, and other aspects.

Although water tanks are thought to be extravagant, they are built to serve both the population of today and tomorrow. They are seen as being extremely irrational and unsafely storing the portable water. Many houses, businesses, and public spaces can receive water through a network of water distribution systems. Water tanks are therefore viewed as supportive structures that serve the community. In circular tanks, the side walls' thickness should grow as height does, but the depth of the roof slab and floor slab should decrease. For ordinary capacities, circular water tanks are cost-effective. Water tank design is a really annoying technique. Many mathematical calculations and formulas are used, particularly in the design of subterranean water tanks. Additionally, it takes extra time.

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