# Design The Circular Water Tank by Using the STAAD Pro Software 

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#### Abstract

Water tank are very useful for storage of water to involve the consumption of water we need to hold on to the capacity of water as much required. Now a day's storage tank are suitable for all types of environment we live as old a civilized technique. Water is the common need for all the living organisms to survive. Portable water is imperative for good health of human beings. It is most important to supply portable water to every individual and every faction; hence it is very requisite to store water. Water is generally stored in the tanks the stored water is supplied to every faction through pipelines. In the project, we have planned and designed a circular reinforced cement concrete water tank. A circular tank is manually designed. It is further analyzed using the debut analysis software STAADPRO.


## I. INTRODUCTION

The form of water tanks initiate with the application parameters, hence the type of materials used and the design of water tank was control by these wavering:

1) Locale of the water tank.
2) Volume of tank to hold water.
3) What purpose the water to be used?
4) Temperature of locale where are the stored, have to do with for freezing.
5) Pressure required for the supplying water.
6) How con it water to be delivered to the water tank.
7) Wind and earthquake design considerations allow water tanks to survive seismic and high wind incidents

For the duration of history, wood, ceramic and stone has been used for the water tanks. These were all naturally eventuate and manufactured and some tanks are however in service. There are manly custom configurations that include various rectangular cubes form tanks, cone bottom and special form for specific design requirements. A functional water container should do no harm to the water is at risk of to a number of environs negative influences, as well as bacteria, viruses, algae, replace in pH , and collection of minerals. Correctly designed water tank systems work to alleviate these refusal effects.

## II. DESIGN PHILOSOPHIES

This is the philosophies for the design of Structures:
Working stress method
Ultimate load method
Limit state method.
A. Stages in Structural Design

1) Planning of Structure
2) Drawing Study
3) Load Combinations
4) Analysis of Structures
5) Structural Design

## III. OBJECTIVE FOR STUDY

A. Create Modeling of the Water Tank by using the software STADDPROV8I.
B. Put in the properties of water tank.
C. Put in the different load combinations as per I.S. code
D. Put in and designing of Water Tank.
E. Study in location under the condition of Chhattisgarh.

## IV. LITERATURE REVIEW

Water supply system is mainly based on network of pipes by joining other components to provide a stability \& balanced service. These connections networks are sometimes used underground and ground to surface. Due to the destruction of pipes constantly the soil; pipes are used manmade on the availability at the time. Failure in water supply may eventuate to surrounding soil, it increase in internal water pressure, surface traffic, Which disturbed to water supply to consumers and these cause reduction in responsibility of the system.
S.K. Khariya,(2019) 75 K.L. capacity overhead tank at village Bargaon, Block Pathatiya on 12 M. staging use the different portion are different concrete mix for economical design Water tank is the most important container to store water therefore, Crack width calculation of water tank is also necessary.
M. V. Waghmare and S.N.Madhekar, (2013) to studied conduct of tank under sloshing effect. Different specification has been considered such as height of container, bottom of water in $\operatorname{tank}(30 \%, 50 \%, 70 \%$ and full) and height of staging etc. It is notice that Sloshing of water in tank depends not only on the volume of water in tank but also on staging height and facett ratio (h/D).

## V. PROBLEM IDENTIFICATION

To analyze the circular over head water tank by study of allocation in IS 3370 (2009), Double dome model of over head water tank was taken. Then it was calculating by manually through the Limit State Method. After that STAAD. Pro is used to compares the design and create the structure boost and economical by tough different dimension for same capacity tank. For easy cost prediction of tanks, this study therefore examines the cost effectiveness in terms of amount of materials and design of structure. In case of spot structure are used for working stress method because the designed structure is crack free.

## VI. METHODOLOGY

To reach the objectives of the study that is to calculate and design of over head water tank using STADD PRO method, which needs the basic requirements such as safety, durability, it antiquated proposed to follow the following methodology.

1) Locale survey.
2) Geotechnical investigation.
3) Structural planning.
4) Analysis and design in STADDPRO
5) Detailing of the design.

## VII. DESIGN COMPONENTS OF TANK

The components of R.C. Cover head circular tank. The various components of elevated tank are as follows.

1) Top Roof Dome The dome at top usually 100 mm to 150 mm thick with reinforcement along the meridian and latitudes. The rise is usually $1 / 5$ th of the span.
2) Ring Beam The ring beam is necessary to resist the horizontal component to the thrust of the dome. The ring beam will be designed for hoop tension induced.
3) Circular Wall this has to be designed for hoop tension caused due to horizontal water pressure and to resist bending moment induced to wall by liquid load.
4) Bottom Slab this will be designed for total load above it. The slab will also be designed for the total load above it. The slab will also be designed as a slab spanning in both directions.
5) Bottom Beams the bottom beam will be designed as continuous beam to transfer the entire load above it to the columns

## A. Staging Portion

## Columns \& Braces

1) Columns: These are to be designed for the total load transferred to them. The columns will be braced at intervals and have to be designed for wind pressure and seismic loads which ever govern.
2) Braces: The braces are the members connecting the columns at intermediate height to columns. It is provided in slender columns to increase the column's load carrying capacity
3) Foundation: As per IS: 11682-1985, a combined footing or raft footing with or without tie beam or raft foundation should be provided for all supporting columns
B. Design Data Using In Water Tank

Assuming Data

1) Capacity of water tank 1.50 Lakhs Liters
2) Staging of height in water tank 15.00 M .
3) Size of water tank $\emptyset 7.00 \mathrm{M}$. Height 4.00 M .
4) Free Board 0.10M.
5) Rise of Top Dom 30*
6) 1 person is use water 135 LPCD
7) Design for 1000 Person
8) Thickness of Bottom slab 0.18M.
9) Thickness of Top Dom 0.10M.
10) Thickness of Cylindrical wall 0.15 M .
11) Top Ring beam $0.23 \times 0.23 \mathrm{M}$.
12) Bottom Ring beam $0.30 \times 0.60 \mathrm{M}$.
13) Column size $0.35 \times 0.35 \mathrm{M}$.
14) Braising size $0.23 \times 0.30 \mathrm{M}$.
15) Parapet wall thickness 0.125 M . x height 1.2 M .

## VIII. MANUAL DESIGN OF ELEVATED CIRCULAR WATER TANK

1) Step-1. Basic dimensions of tank:-
1. Assume diameter of tank $=7 \mathrm{~m}$.
2. Rise of top dome $\left(h_{1}\right)=D / 7=7 / 7=1 \mathrm{~m}$.
3. Height of cylindrical wall $\left(\mathrm{h}_{2}\right)=2 \mathrm{D} / 5=2 \times 7 / 5=2.8 \mathrm{~m} . \sim 4 \mathrm{~m}$.
4. Height of conical dome $\left(h_{3}\right)=D / 7=7 / 7=1 \mathrm{~m}$.
2) Step-2. Calculate the volume of tank:

Volume of circle $=\pi r^{2} h$
$150=\pi \times 3.5^{2} \times \mathrm{h}$
$\mathrm{h}=150 /\left(\pi \times 3.5^{2}\right)=3.89 \mathrm{~m}$.
add free bord $=1.1 \mathrm{~m}$.
total height $=4 \mathrm{~m}$.
3) Step-3. Design of top Dome

1. Meridional force: -
$\mathrm{T}_{1}=\mathrm{WR}_{1} /(1+\cos \Theta)$
$\mathrm{R}_{1}=\left\{(\mathrm{D} / 2)^{2}+\mathrm{h}_{1}{ }^{2}\right\} / 2 \times \mathrm{h}_{1}=\left\{(7 / 2)^{2}+1^{2}\right\} / 2 \times 1$
$=6.625 \sim 7 \mathrm{~m}$.
$\operatorname{Sin} \Theta=B / H=D / 2 / R_{1}=7 / 2 / 7=0.5$
$\theta=30^{*}$
$\operatorname{Sin} \Theta=0.5$
$\cos \Theta=0.866$
thickness of top dome is assumed 0.1 m
Dead load $=2.5 \mathrm{KN} / \mathrm{M}^{2}$
Live load $=1.5 \mathrm{KN} / \mathrm{M}^{2}$
Total load $=4 \mathrm{KN} / \mathrm{M}^{2}$
$\mathrm{T}_{1}=4 \times 7 /(1+0.866)=15 \mathrm{KN} / \mathrm{M}$.
Meridional stress $=\mathrm{P} / \mathrm{A}=15 /(1000 \times 100)=0.15 \mathrm{KN} / \mathrm{MM}^{2}$
2. Hoop Tension:-
a. $\quad \mathrm{T}_{2}=\mathrm{WR}_{1}[\operatorname{COS} \Theta-(1 /(1+\operatorname{COS} \Theta))]=4 \times 7[0.866-(1 / 1+0.866)]=-8.08 \mathrm{KN} / \mathrm{M}$

Hoop stress $=\mathrm{P} / \mathrm{A}=8.08 \times 10^{3} / 1000 \times 100=0.0808 \mathrm{~N} / \mathrm{MM}$
$0.0808<8$

Hence the design is ok.
Providing minimum reinforcement $0.3 \%$ in circumferential and radial direction.
$\mathrm{A}_{\mathrm{st}}=0.3 \times 1000 \times 100 / 100=300 \mathrm{~mm}^{2}$
Providing $8 \mathrm{~mm} \Phi$ bar
Spacing $=(\pi / 4) \mathrm{d}^{2} \times 1000 / \mathrm{A}_{\mathrm{st}}=(\pi / 4) 8^{2} \times 1000 / 300=167.55 \mathrm{~mm}$
Providing ${ }_{8} \mathrm{~mm} \Phi$ bar @ $160 \mathrm{~mm} \mathrm{c} / \mathrm{c}\left(\mathrm{A}_{\mathrm{st}}=314.15 \mathrm{~mm}^{2}\right)$
4) Step -4. Design of top ring beam ( $B_{I}$ )

Horizontal component of meridional force (T):
$\mathrm{W}_{1}=\mathrm{T}_{1} \cos \Theta=15 \times 0.866=12.99 \mathrm{KN} / \mathrm{M} \sim 13 \mathrm{KN} / \mathrm{M}$
Total hoop tension on beam $(\mathrm{T})=\mathrm{W} \times \mathrm{D} / 2=13 \times 7 / 2=45.5 \mathrm{KN}$
$\mathrm{A}_{\text {st }}$ for hoop tension $=T / \sigma_{\text {st }}=45.5 \times 10^{3} / 130=350 \mathrm{~mm}^{2}$
Providing $12 \mathrm{~mm} \Phi$ bar
Spacing $=(\pi / 4) \mathrm{d}^{2} \times 1000 / \mathrm{A}_{\mathrm{st}}=(\pi / 4) 12^{2} \times 1000 / 350=323.13 \mathrm{~mm}$
Providing ${ }_{12} \mathrm{~mm} \Phi$ bar @ $200 \mathrm{~mm} \mathrm{c} / \mathrm{c}\left(\mathrm{A}_{\mathrm{st}}=565 \mathrm{~mm}^{2}\right)$

## Stress at comprasion zone:

$\sigma_{\mathrm{ct}}=\frac{T}{A g+(m-1) A s t}$
let width assume 230 mm
$1.3=\frac{45.5 \times 1000}{230 \times D+(10-1) 350}$
$\mathrm{D}=138.47 \mathrm{~mm}$
Providing size of the top ring beam is $230 \times 230 \mathrm{~mm}$
Double shear providing $8 \mathrm{~mm} \Phi$ bar two legged stirrups
$\mathrm{S}_{\text {vertical }}=\frac{0.87 \text { fyAsv }}{0.4 \mathrm{~b}}$
Asv (area of vertical stirrups) $=2 \times \frac{\pi}{4} \times 8^{2}=100 \mathrm{~mm}^{2}$
$\mathrm{S}_{\mathrm{v}}=\frac{0.87 \times 415 \times 100}{0.4 \times 230}=392.59 \mathrm{~mm}$
Providing $8 \mathrm{~mm} \Phi$ bar two legged stirrups @ $161 \mathrm{~mm} \mathrm{c} / \mathrm{c}$
5) Step-5. Design of Cylindrical Wall

1. Hoop tension $\left(\mathrm{T}_{2}\right)=\gamma_{\mathrm{w}} \times \mathrm{h}_{2} \times \frac{D}{2}=9.81 \times 4 \times \frac{7}{2}=137.34 \mathrm{KN}$
$\mathrm{A}_{\mathrm{st}}=\mathrm{T} / \mathrm{o}_{\mathrm{st}}=\frac{137.34 \times 1000}{130}=1056.461 \mathrm{~mm}^{2}$
Area of face $=\mathrm{A}_{\mathrm{st}} / 2=1056.461 / 2=528.23 \mathrm{~mm}^{2}$
Providing 12 mm Ф bar @ $120 \mathrm{~mm} \mathrm{c} / \mathrm{c}$
Thickness of wall: -
$\sigma_{\mathrm{ct}}=\frac{T}{A g+(m-1) A s t}$

$$
\text { a. }=\frac{137.34 \times 1000}{1000 X t+(10-1) 1056.46}
$$

$\mathrm{t}=94.97 \mathrm{~mm} \sim 100 \mathrm{~mm}$
Distribution steel: -
$\mathrm{A}_{\mathrm{st}}=\frac{0.3 \times 1000 \times 100}{100}=300 \mathrm{~mm}^{2}$
Providing $8 \mathrm{~mm} \Phi$ bar @ $160 \mathrm{~mm} \mathrm{c} / \mathrm{c}$
6) Step-6. Design of spherical bottom dome

Assume thickness of dome is 0.18 m
Meridional force $\mathrm{T}_{3}=\frac{W R}{1+\cos \theta}$
Weight of water $=\gamma_{w} \times \mathrm{h}=9.81 \times 4=40 \mathrm{KN} / \mathrm{M}^{2}$
Self-weight $=0.18 \times 25=4.5 \mathrm{KM} / \mathrm{M}^{2}$
Total loads $=44.5 \mathrm{KN} / \mathrm{M}^{2}$
$\mathrm{R}_{2}=\left(\frac{D^{\circ}}{2}\right)^{2}+\mathrm{h}_{2}{ }^{2} /\left(2 \times \mathrm{h}_{2}\right)=\left(\frac{6.8}{2}\right)^{2}+1^{2} /(2 \times 1)$
$=6.8 \mathrm{~m}$.
$\sin \theta=0.5$
$\Theta=30^{*}$
$\mathrm{T}_{3}=\frac{44.5 \times 6.8}{1+0.866}=162.165 \mathrm{KN} / \mathrm{M}$
Meridional stress $=\frac{P}{A}=\frac{162.165 \times 1000}{1000 \times 100}=0.9$
a. $\quad 0.9<8$ Hence the design is ok

Providing minimum \% of steel $0.3 \%$
$\mathrm{A}_{\mathrm{st}}=\frac{0.3 \times 1000 \times 180}{100}=540 \mathrm{~mm}^{2}$
Providing $10 \mathrm{~mm} \Phi$ bar @ 140 mm c/c $\left(\mathrm{A}_{\mathrm{st}}=560 \mathrm{~mm}^{2}\right)$
7) Step-7. Design of bottom ring beam

1. Out word thrust for bottom beam
$\mathrm{T}_{3} \cos \Theta=162.165 \times 0.866=140.434 \mathrm{KN} / \mathrm{M}$
2. Hoop tension on beam $=\frac{W X D}{2}=\frac{140.434 \times 7}{2}$
$=491.519 \mathrm{KN}$
3. Hoop stress $=\frac{P}{A}=\frac{491.519 \times 1000}{300600}=2.73 \mathrm{~N} / \mathrm{mm}^{2}$

$$
2.73<8
$$

Hence the structure is safe.

Total load on beam: -
Vertical load on beam:
$=\mathrm{T}_{2} \sin \Theta_{1}+\mathrm{T}_{3} \sin \Theta_{2}$
$=137.34 \times 0.5+162.165 \times 0$.
$=135 \mathrm{~b} \mathrm{KN} / \mathrm{M}$
Self-weight of beam $=0.3 \times 0.6 \times 25=4.5 \mathrm{KN} / \mathrm{M}$
Load of bottom dome $=0.18 \times 25=4.5 \mathrm{KN} / \mathrm{M}$
Total UDL load $=135+4.5+4.5+144 \mathrm{KN} / \mathrm{M}$
Total load $=\frac{\pi}{D} X U D L=\frac{\pi}{7} X \quad 144=3166 \mathrm{KN}$
Maximum negative bending moment at support $=\mathrm{C}_{1} \mathrm{WR}^{2}(2 \Theta)$
Assumed Number of supports 8
$=0.066 \times 144 \times 3.5^{2} \times \frac{\pi}{4}=91.439 \mathrm{KN} . \mathrm{M}$
Maximum Positive bending moment at support $=\mathrm{C}_{2} \mathrm{WR}^{2}(2 \theta)$
$=0.03 \times 144 \times 3.5^{2} \times \frac{\pi}{4}=41.56 \mathrm{KN} . \mathrm{M}$
Maximum torsional moment at support $=\mathrm{C}_{3} \mathrm{WR}^{2}(2 \theta)$
$=0.005 \times 144 \times 3.5^{2} \times \frac{\pi}{4}=6.92 \mathrm{KN} . \mathrm{M}$
Maximum shear force at support $=\frac{W}{2 X N o . \text { columns }}=\frac{3166}{2 \times 8}=197.8 \mathrm{KN}$

Calculate Depth of beam
$\mathrm{M}=\mathrm{Qbd}^{2}$
$197.87=2.85 \times 300 \times \mathrm{d}^{2}$
$\mathrm{D}=468.91 \mathrm{~mm}$
Providing depth of beam 550 mm and 50 mm cover total depth 600 mm
$\mathrm{A}_{\mathrm{st}}=\frac{M}{\sigma s t X j X d}=\frac{197.87 \times 1000000}{130 \times 0.86 \times 550}=3217.92 \mathrm{~mm}^{2}$
Providing $28 \mathrm{~mm} \Phi$ bar 6 No. @ $158 \mathrm{~mm} \mathrm{c} / \mathrm{c}$
Check for shear (IS:2000 pg.No. 83 / IS 3370 part-2 table No. 3)
$\mathrm{T}_{\mathrm{v}}=\frac{M}{b \times d}=\frac{197.87 \times 1000}{300 \times 550}=1.19 \mathrm{~N} / \mathrm{mm}^{2}$
Percentage of steel (Pt) $=\frac{100 \times \text { Ast }}{b \times d}=\frac{100 \times 3217.92}{300 \times 600}=0.019$
$\mathrm{T}_{\mathrm{c}}=\frac{0.75-0.19}{0.75-100}=\frac{0.36-x}{0.36-0.4}$
$\mathrm{T}_{\mathrm{c}}=0.4$

$$
\mathrm{T}_{\mathrm{v}}>\mathrm{T}_{\mathrm{c}}
$$

It is design for shear
Shear taken by concrete $=0.35 \times 300 \times 550=57.75 \mathrm{KN}$
Net shear force $=197.87-57.75=140.06 \mathrm{KN}$
Provide $10 \mathrm{~mm} \Theta$ bar 4 legged vertical stirrups.
Area of vertical steel $\left(\mathrm{A}_{\mathrm{sv}}\right)=4 \times \frac{\pi}{4} \times \mathrm{d}^{2}=4 \times \frac{\pi}{4} \times 7^{2}=314.15 \mathrm{~mm}^{2}$
$\mathrm{S}_{\mathrm{v}}=\frac{A s v X \sigma s v \times d}{V s}=\frac{314.15 \times 175 \times 550}{140.06}=215.88 \mathrm{~mm}$
Provided 10 mm Ө Bar 4 legged vertical stirrups @ $200 \mathrm{~mm} \mathrm{c} / \mathrm{c}$
Column details:
Total bear load on column $=3166 \mathrm{KN}$
Dead load of the column $=0.35 \times 0.35 \times 25 \times 15$
$=45.93 \mathrm{KN}$
Total dead weight of the column $=45.93 \times 8$
$=367.5$
Total load on column $=3166+367.5=3533.5 \mathrm{KN}$
Load of 1 column $=3533.5 / 8=441.68 \mathrm{KN}$
Providing $20 \mathrm{~mm} \Phi$ bar $150 \mathrm{~mm} \mathrm{c} / \mathrm{c}$
( $\mathrm{A}_{\mathrm{st}}=47123.88 \mathrm{~mm}^{2}$ )

## Seismic load from IS 1893:2002

Response spectrum method
For RC $\mathrm{T}_{\mathrm{u}}=0.75 \mathrm{~h}^{0.75}$
Horizontal seismic coefficient $\mathrm{A}_{\mathrm{n}}=\frac{Z I}{2} \times \mathrm{S}_{\mathrm{a}} / \mathrm{g}$
T<0.1S it is given from table No. 2
$\mathrm{Z}=$ zone factor $\mathrm{II}=0.1$
$\mathrm{R}=$ response factor $=3$ To $5=5$ from table No. 7
I = Impact factor $=1.5$ From Table No. 6
$\mathrm{S}_{\mathrm{a}} / \mathrm{g}=$ soil classification
Base shear $\left(\mathrm{V}_{\mathrm{b}}\right)=\mathrm{A}_{\mathrm{n}} \times \mathrm{W}$

## Wind load:

$\mathrm{P}_{\mathrm{z}}=0.6 \mathrm{~V}_{\mathrm{z}}{ }^{2}$
$\mathrm{V}_{\mathrm{z}}=\mathrm{V}_{\mathrm{b}} \times \mathrm{K}_{1} \times \mathrm{K}_{2} \times \mathrm{K}_{3} \times \mathrm{K}_{4}$
$\mathrm{V}_{\mathrm{b}}=$ basic wind speed $=39$ in Chhattisgarh from IS 875 part III
$\mathrm{K}_{1}=$ Probability factor $=1.06$ from table- 1
$\mathrm{K}_{2}=$ Terrain roughness and height factor $=0.97$ from table -2
$\mathrm{K}_{3}=$ Topography factor $=1$
$\mathrm{~K}_{4}=$ Importance factor $=1$
$\mathrm{~V}_{\mathrm{z}}=40.0998$
$\mathrm{P}_{\mathrm{z}}=24.059 \mathrm{~m} / \mathrm{s}$

## IX. DESIGNING OF CIRCULAR WATER TANK IN STAADPRO

## A. Procedure

Open STAAD.pro.
Click on new project > add file name>Select 'space'.
Length (in m), Force (in KN).
choose add beam choice and click on finish.
Go to Geometry>Run structure wizard > choose surface/plate model > cylindrical surface. shut it to transfer to modelling
Length :3
Division on length: one
Start radius: 3.5
Division on periphery: 8(column)
End radius: 3.5
victimisation Add beam choosing prime node and bottom node.
Repeat on outer boundary for needed variety of columns.
Copy all vertical members victimisation ctrl +C and paste aside victimisation ctrl +V .
Add intermediate nodes on length to feature required variety of beams in horizontal direction.
Connect all node in a very plane to make a circular beam.
Repeat an equivalent method at prime to urge circular beam.
Geometry>Run structure wizard> choose surface/plate model >Spherical cube choose spherical cap (Bottom dome).
shut it to transfer to modelling Diameter of sphere: Base Diameter:
Shift the obtained Spherical cap to prime beam Measure distance victimisation 'display node
to node distance' tool Select all plates > Right click mouse>Move > add (-) sign to \{above|higherthan|on prime of \} distance to rest on top beam.

- Geometry>Run structure wizard > choose surface/plate model > cylindrical surface Length: 19
Division on length: one
Start radius3.5
Division on periphery:
End radius: a pair of 3.5
- Shift the obtained conelike dome to prime beam Measure distance victimisation 'display node to node distance' tool

Select all plates > Right click mouse>Move > add
$(-)$ sign to $\{$ above|higherthan|on prime of \} distance to rest on top beam.

- Geometry>Run structure wizard > choose surface/plate model > cylindrical surface

Length: 15
Division on length: one
Start radius: 3.5
Division on periphery:
End radius: a pair of. 5

- Shift the obtained cylindrical surface to prime beam live distance victimisation 'display node to node distance' tool Select all plates > Right click mouse>Move > add
(-) sign to \{above|higherthan|on prime of \} distance to rest on top beam.
- Geometry>Run structure wizard> choose surface/plate model >Spherical cube choose spherical cap (Top dome). shut it to transfer to modelling
Diameter of sphere:
Base Diameter:
- Shift the obtained conic dome to high beam live distance exploitation 'display node to node distance' tool choose all plates > Right click mouse>Move > add
$(-)$ sign to $\{$ above|higherthan|on high of \} distance to rest on top beam.
- Finally Check dimensions of tank exploitation 'display node to node distance' tool to verify.

Any corrections to be created area unit corrected.

## B. General Properties

Click 'property' at left of screen> outline needed dimensions for individual components. Assign the property for numerous components exploitation any of the options gift per your convenient.
Click 'Support' > produce >Select 'fixed' >click Add> assign inside a part of beam.
CLICK ‘LOAD AND DEFINITION’
To apply wind load initial, we've to outline it in initial section.
Enter your values. Keep exposure as -1 .
Click 'Load case details' to feature metric capacity unit, LL \& WL.
Add self-weight as metric capacity unit Add Water load as LL Add Wind Load Select material as concrete and assign for entire tank
C. Analysis

Click 'Analysis and print'> Run analysis >Check for Zero errors>Post process Apply given masses to ascertain deflected form of structure, beam moments and forces.

## X. DESIGN

Click on 'Design' >Select parameters to incorporate in our design.
Define parameters with various values Select the specified command to instruct software package to design in keeping with IS code. Detailing of reinforcement and amount of concrete is gift in computer file.

## A. Modeling Of The Tank



Figure
Molding Diagram
B. Assigning The Material

As after creating the beams and columns we will assign material to them as we require. Our design is concrete design hence we have assigned the concrete material to the beams and columns.


Figure
Properties Diagram

## C. Specifying Supports

The supports are first created (as we created fixed supports) and then these are assigned to all the lowermost nodes of structure where we are going to design the foundation.


Figure
Support Diagram

## XI. RESULTS

A. Bending Moment


Figure
B. Shear Force


Figure

1) Reports On Stadd Pro Job Information

2) Loads Acting On A Structure

3) Loas Case


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4) Displacement

5) Bending Moment

6) Shear Force

7) Reactions


## XII. CONCLUSION

It concludes that the efficiency and reliability of the software in the field of designing is much better to that of them annual work. It has been seen that these off ware generated results were more efficient and economical which included the various different conditions under the designing conditions which are difficult to consider when done manually

1) The structural elements of water tank are safe in leakage free, flexure and shear.
2) Quantity of steel provided for structure is economical and adequate.
3) Proposed sizes of structural elements can be used in water tank as it is.
4) The design of beam, slab, column, footing and stair case are out of danger in deflection, bending, shear and other aspects.

Water tanks are considered to be effusive; but they are constructed to reach present and coming time population. They are considered to highly unreasonable and safely store the portable water. Water can be distributed to number of homes, Industries and public places which means of a network of a water distribution system. Hence water tanks are considered to be supporting systems and useful for the community. In circular tanks, as height increases as side wall thickness are to be increases and roof slab and floor slab depth are decreases. The circular water tanks are economical for average capacities. Design of water tank is a very irksome method. Particularly design of underground water tanks are lots of mathematical formulae and calculation. It is also more time consuming.

## XIII. SCOPE OF FURTHERWORK

Design of water tank is a very difficult method. It uses for lots of mathematical calculation \& uses of formulas for unusually design of overhead water tank. It is to be time consuming method. Thus works arte gives a solution to the above problems. There is a small difference between the design values of works to that of manual calculation. This works gives the least value for the design. Thus the designer should not provide less than the values we get from the works. In case of theoretical calculation designer initially added some extra values to the obtained values tobe the safer side.

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