PLANNING, DESIGNING OF CIRCULAR OVERHEAD WATER TANK IN KHANDERAJURI USING STAAD PRO

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Abstract: The overhead water tanks are used to store the water at certain elevation so that water can be distributed under the gravity flow. The khanderajuri village is in Sangli district, where leaked old overhead tank having less capacity is unable to accomplish water need of village.so we are going to construct new overhead water at khanderajuri so that water problem of village peoples can be solved. This paper gives staad pro design of overhead water tank ,which is planned to construct at khanderajuri village

Keywords **–** Overhead water tank, Staad pro.

I. INTRODUCTION

The water tanks are used to storage of liquids, in which mostly they are preferred to store water. Generally, there are mainly 3 types of water tanks based on the position, which are overhead water tank, ground water tank and underground water tank .in above 3 types, overhead water tank is mostly preferred.

The overhead tank is preferred because they prove economical in design .as distribution of water can done under the gravity so no pumps are required because due to elevation difference sufficient pressure gets created.so this results in saving the cost of pumping and this tank becomes economical in long run.

The khanderajuri village have sloping ground so due to elevation difference sufficient pressure created and water distribution can be under gravity so that's why overhead water tank is preferred.

II. LITERATURE REVIEW

1)B.V. Ramana Murthy and M. Chiranjeevi they had done "Design of rectangular water tank using staad pro software." in this they have discussed various aspects related to the design, construction and formwork

2) Thalapathy M.had done, "Analysis and Economic design of water tanks." in this paper they have given analysis of design of liquid retaining structures by using working stress method

3)W.B. Ajagbe had examined the cost estimation of rectangular and circular overhead water tank, in this paper he had mentioned suitability's of different shapes of water tanks according to their capacities

III. METHODOLOGY

A. SOURCE OF WATER SUPPLY

The village has main source of water supply is well. near to well there is one lake, the water from lake gets stored in well. this water from lake passes from naturally available sand filters before coming into well, so naturally pure water is abundantly available in well to fulfill water requirements of the village.

B. POPULATION FORECASTING

The Geometrical increase method is used to compute forecasted population at end of 2050, which comes out to be 9340 persons

C. WATER QUANTITY ESTIMATION

The percapita per day demand is considered as 270 lpcd which includes all demands like domestic, industrial, institutional etc and losses .so total water demand for forecasted population is found out by considering fire demand and maximum daily demand .so total water demand for forecasted population is 4.548 MLD

D.CAPACITY OF WATER TANK

The capacity of water tank is computed by using mass curve method and this capacity comes out to be 216 m^3

IV. STAAD PRO DESIGN AND ANALYSIS:

Firstly, from computed capacity determined diameter of water tank by assuming height of tank wall as 4m, so by calculation this diameter comes out as 8.29m

The flat bottom top dome circular overhead tank is designed and analyzed in staad pro software:

A) MODEL PREPARATION

Firstly, open the staadpro software and create new space structure by selecting appropriate units. then take the structure in front view ,go in the geometry option and click on Run structure wizard and select frame model, in that select reversed cylinder and apply the suitable parameters.so it will create frame model then click on close button ,click on yes button then delete all bottom beams and select all top beams and go to transitional repeat in y direction now to add slab portion to tank click on add 4 nodded plates then select one plate and make circular repeat of it.so slab portion for all tank will get added .then base plate is added to tank for that click on generate surface meshing and select all node points and click ok it will generate surfaces. Then we have to add cap to the structure.

For that go in geometry select run structure wizard and select surface plates in which take spherical surface plate and apply meshing parameters. Then this spherical cap is moved and copied to our structure. This will complete modelling of structure

B) ASSIGNING SUPPORTS

Firstly, supports are created then by selecting required node points these supports are assigned.

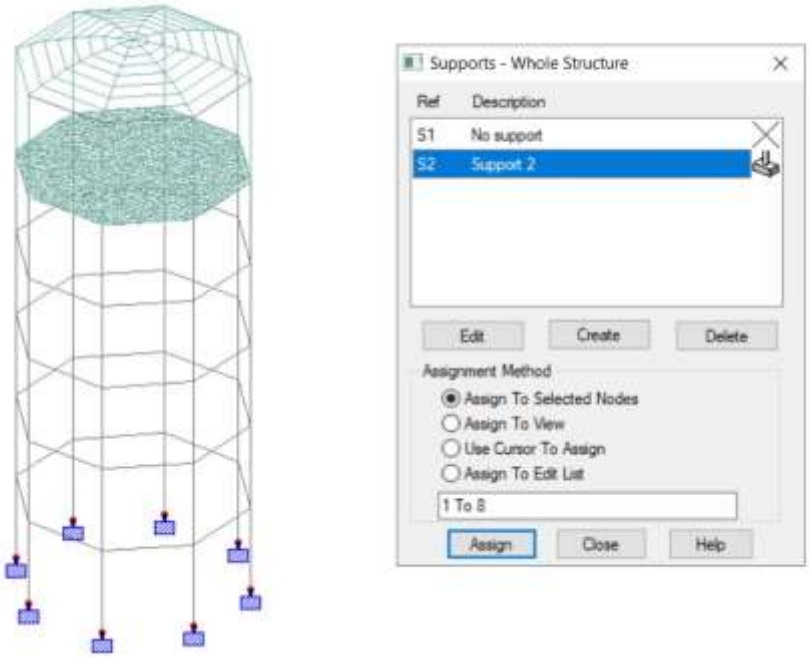


Fig 1

C) DEFINING PROPERTIES

Under this property for beams, columns and slab thickness are defined and subsequently assigned.

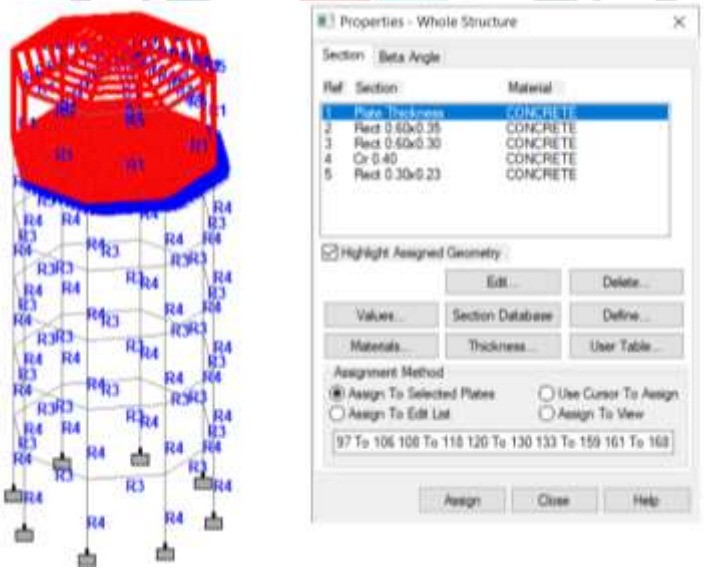


Fig 2

D) ASSIGNING LOADS

In general option click on loads and definitions .in that firstly seismic load is defined and assigned. then wind load, dead load, water pressure loads are defined and assigned respectively. following images shows earthquake load in x direction, wind load in x direction, dead load and water pressure respectively

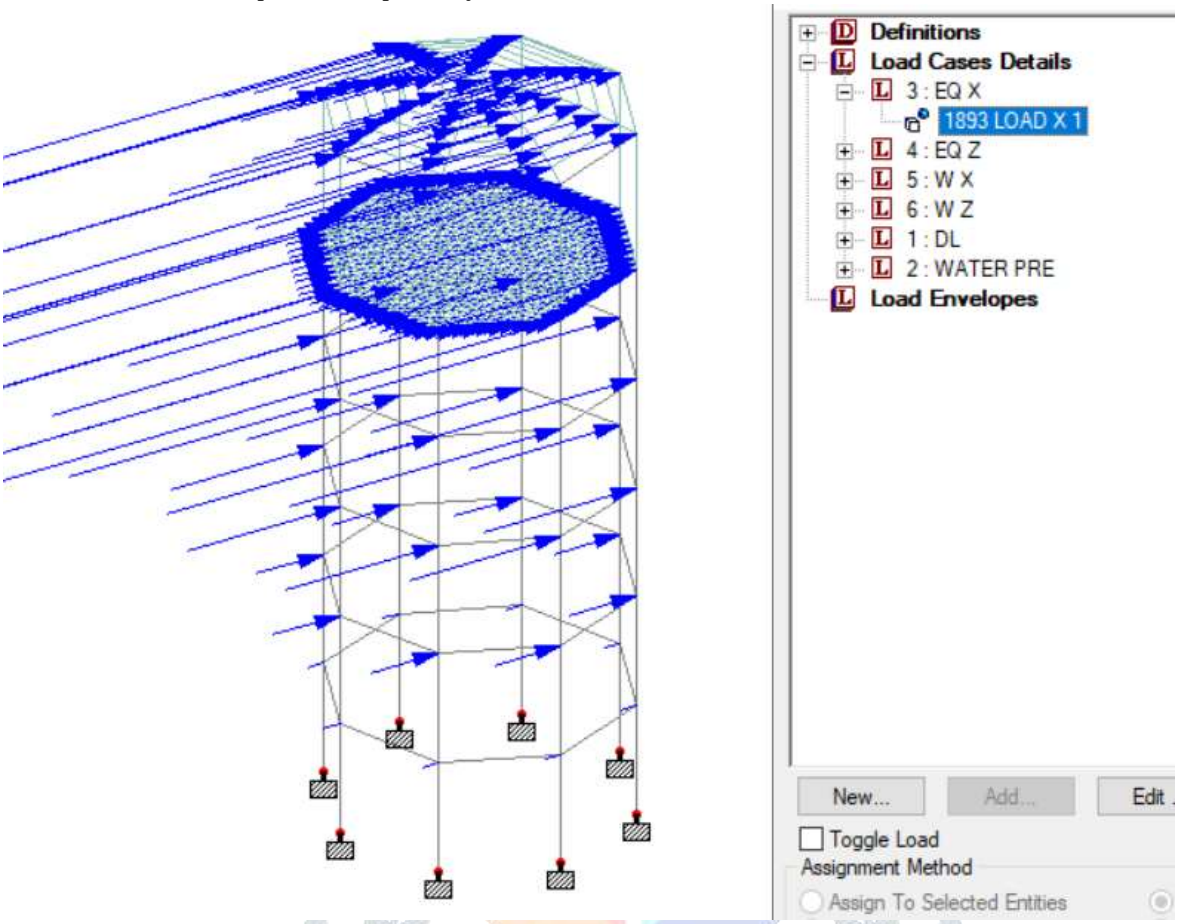


Fig 3

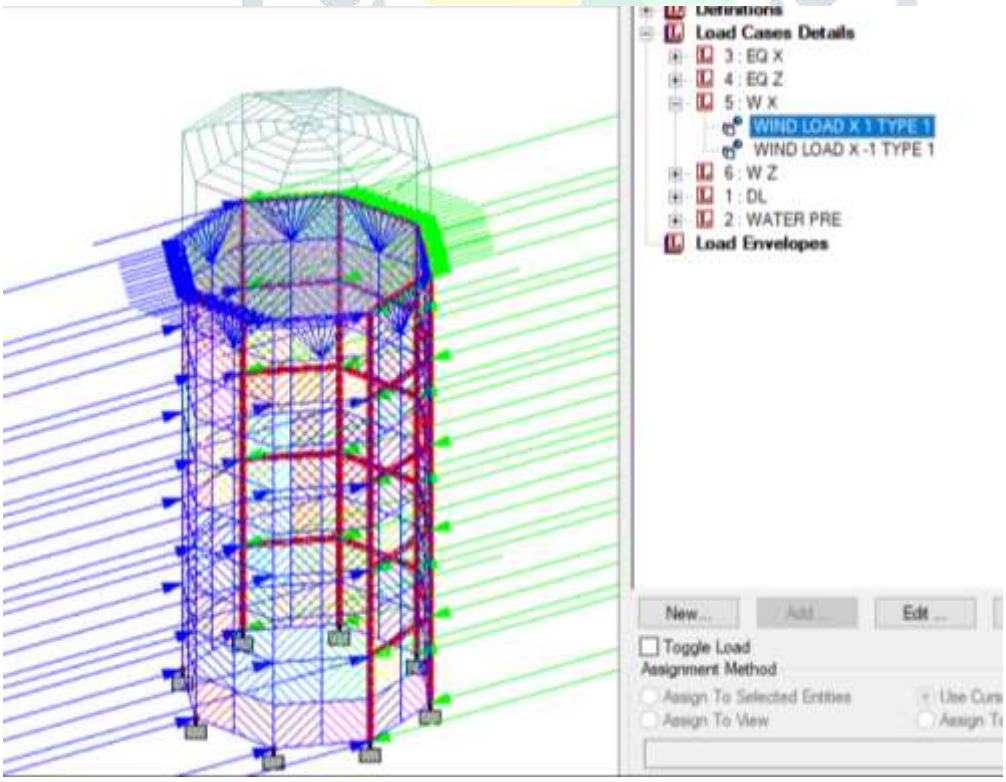
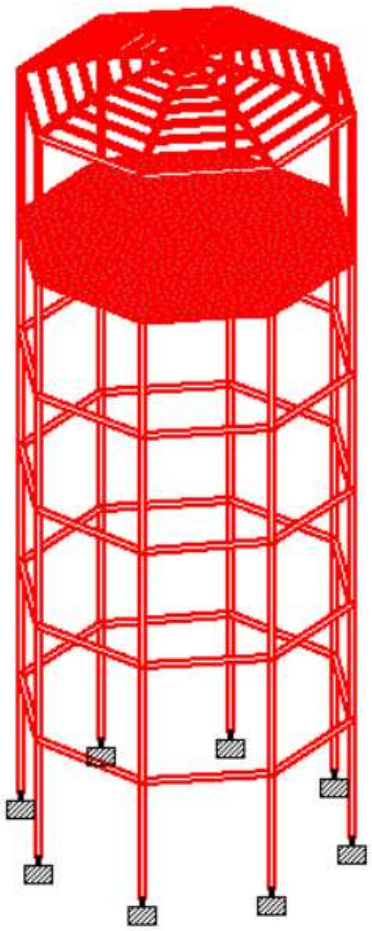
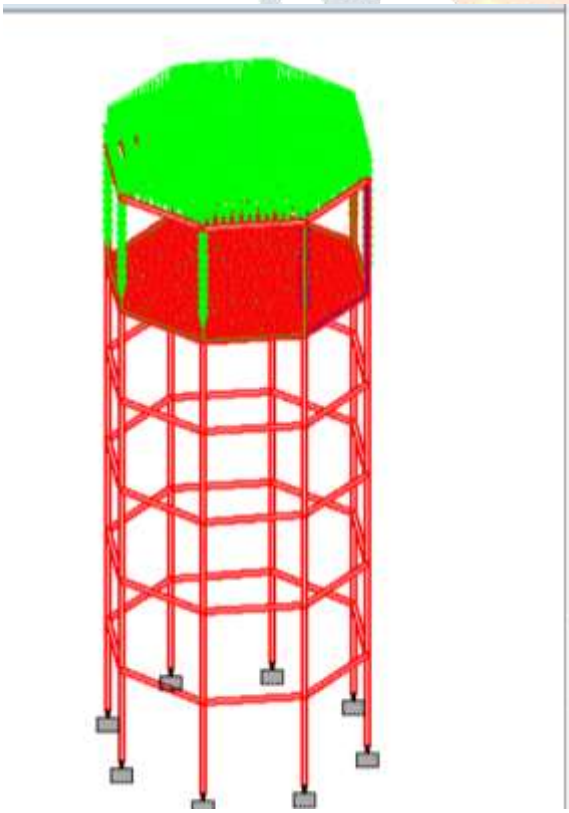


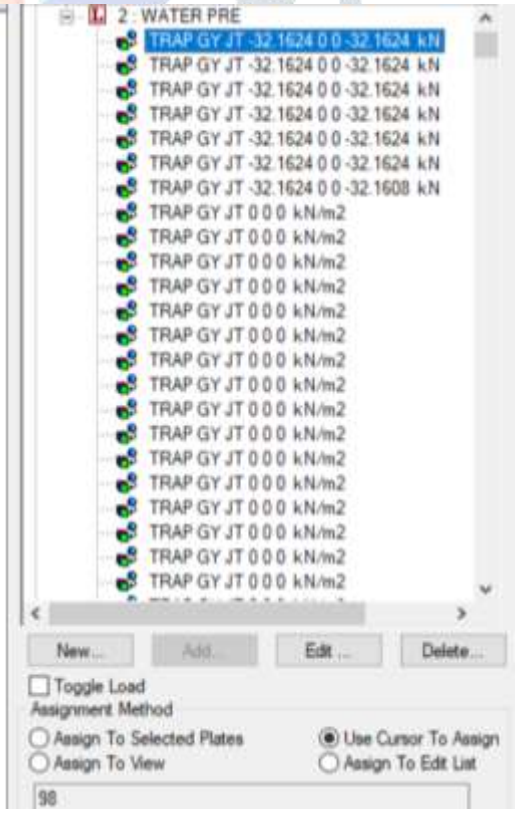
Fig 4




Load Cases Details
3 : EQ X
4 : EQ Z
5 : W X
6 : W Z
1 : DL
SELFWEIGHT Y -1
2 : WATER PRE
Load Envelopes
New...
Add...
Edit ...
Toggle Load
Assignment Method
Assign To Selected Beams/Plates
Assign To View
9 To 94 96 107 119 131 132 160 169 171

Fig 5




2 : WATER PRE
TRAP GY JT -32.1624 0 0 -32.1624 kN
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TRAP GY JT -32.1624 0 0 -32.1624 kN
TRAP GY JT -32.1624 0 0 -32.1608 kN
TRAP GY JT 0 0 0 kN/m2
New...
Add...
Edit ...
Delete...
Toggle Load
Assignment Method
Assign To Selected Plates
Use Cursor To Assign
Assign To View
Assign To Edit List
98

Fig 6

E) 3D RENDERING VIEW OF STRUCTURE

Fig 7

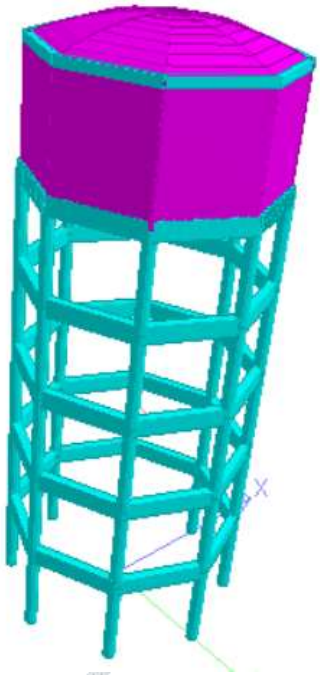

Fig 8

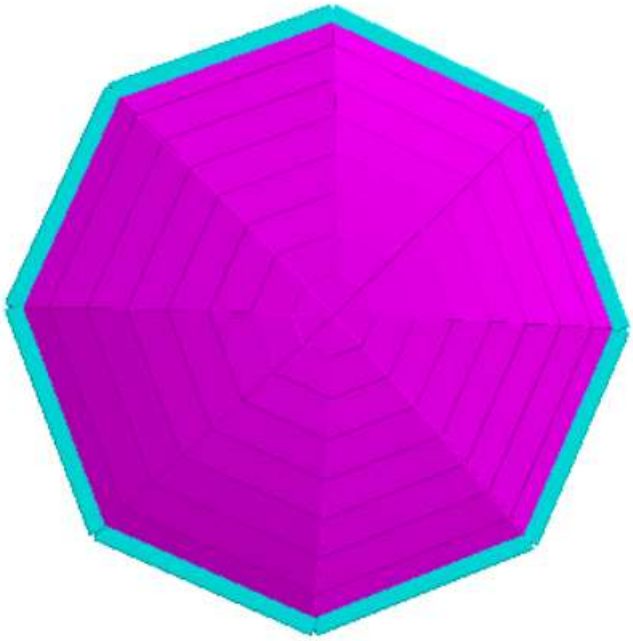

Fig 9

V.CONCLUSION

1) Proposed tank in khanderajuri village is designed in staad pro software
2) Staad pro design of tank is safe with respect to applied loads
3) As per IS 11682-1985 for capacity of tank ranging from 200 to 800 m^3 we have preferred circular overhead tank
4) Design of overhead tank in staad pro reduces time and gives accurate results

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