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SURVEYING AND DESIGNING OF WATER DISTRIBUTION LINE AND ESR

Mr. PRAFUL KESHAO JADHAO, Mr. HEMANT DAHAKE

[1]PG Student, Department of Civil Engineering
G H Raisoni university, Amravati 444-701, India
[2]Professor, Department of Civil Engineering
G H Raisoni university, Amravati 444-701, India

Abstract - Surveying is defined as the profession or work of examining and recording the area and features of a piece of land so as to construct a map, plan, or detailed description of it. The planning and design of all Civil Engineering projects such as construction of highways, bridges, tunnels, dams etc., are based upon surveying measurements.

The basic function of a water distribution system is to transport the water from the treatment facility to the customer. In addition, distribution systems may also provide storage, as well as provide flow and pressure adequate for fire protection and for that we have to do survey. With the help of the data, we get from surveying we can determine the diameter of pipe line, amount of power needed to supply the water and storage capacity of ESR (Elevated Surface Reservoir).

1. INTRODUCTION

Civil surveying is an engineering operation that involves assessing and recording details about an area of land. These observations can then be used to help plan construction projects. The knowledge of surveying is advantageous in many phases of engineering. Surveying is of vital importance in any engineering project. And survey plays a role to decide the capacity of ESR, with the help of this information we can design the structure on the software.

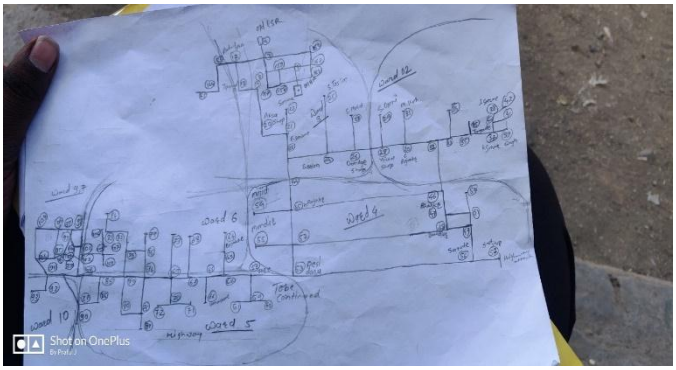


Figure 1.1 Survey Map

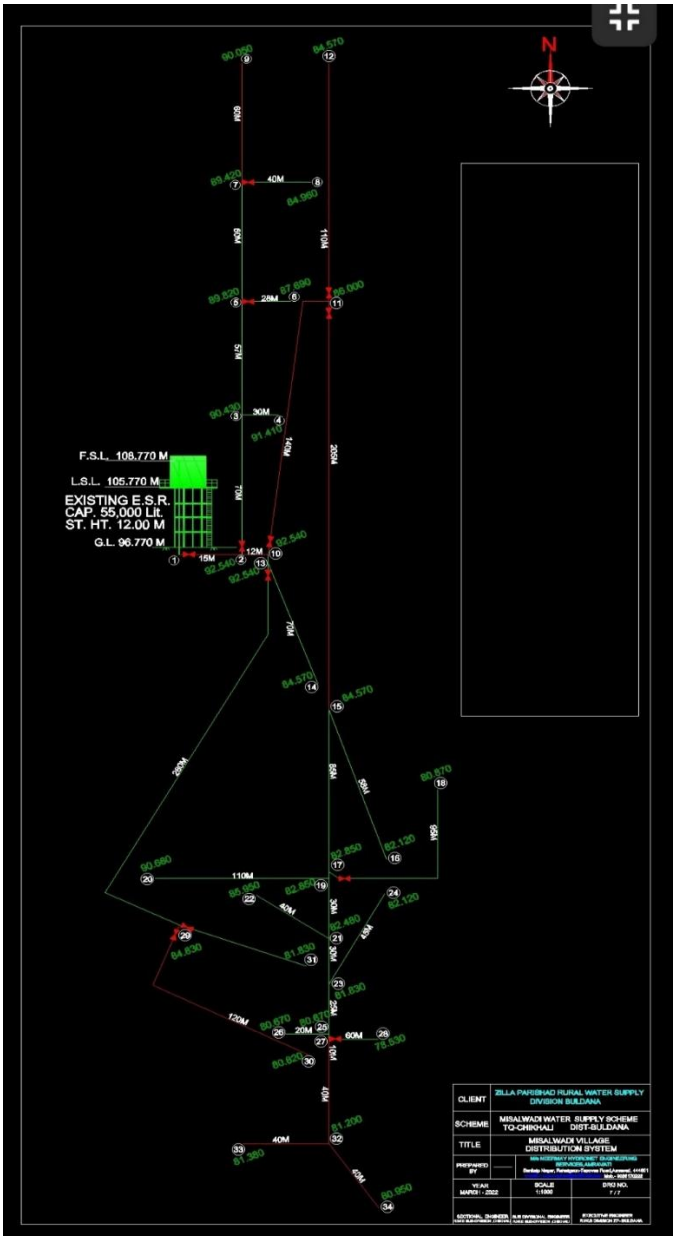


Figure 1.2 Water distribution network

1.1 Aim: - To design the water distribution line And E.S.R. with the help of the data acquired from survey.

1.2 Methodology: -

At first, we have to collect some information of the town/village, like the population, cattle count, schools and other facilities which requires water, because this information will be used to understand the water demand of town/village.

$$\text{Per capita water demand} = \frac{\text{Annual average water consumption of a community}}{\text{Population} \times 365}$$

- Proponents must provide the city with the expected average day, maximum day, and peak hour water demand for the proposed development.
- All assumptions must be explicitly stated and properly documented.
- Water demand calculations must be stamped and signed by a Professional Engineer licensed to practice in the Province of Manitoba.
- All units must be in metric; water flows must be in L/s.

1. With the help of levels, we can determine the ground projection and that will be also used to design the height of E.S.R will be placed.
2. Here we will take an example of ESR which can be designed with the help of STAAD-PRO.
3. Designing as follows: -
    - If 1 person uses 100 lit. water per day,

      There are 2000 people in the village.
    - So, the water requirement is 2,00,000 lit. per day.
    - We will design the ESR which has capacity of 2,00,000 lit.
    - Volume of water tank $= \pi r^2 h$ = 3.14*4*4*4 = 200.96 Cum

      Where,

      Radius of water tank = 4m

      h = 4m.

1.3 Designing the structure of ESR on Staad-Pro software: -

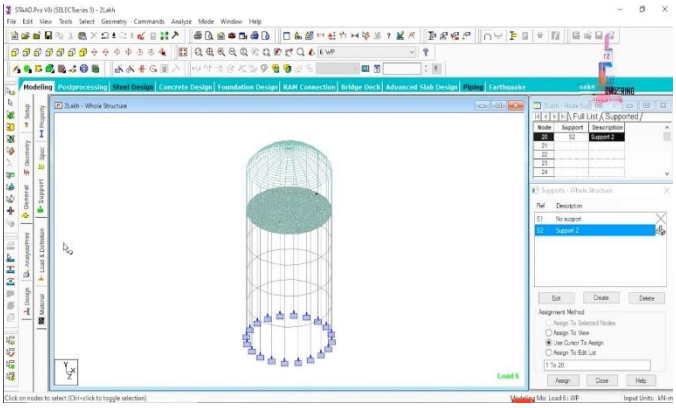


Fig. 1.3 Provide fixed support

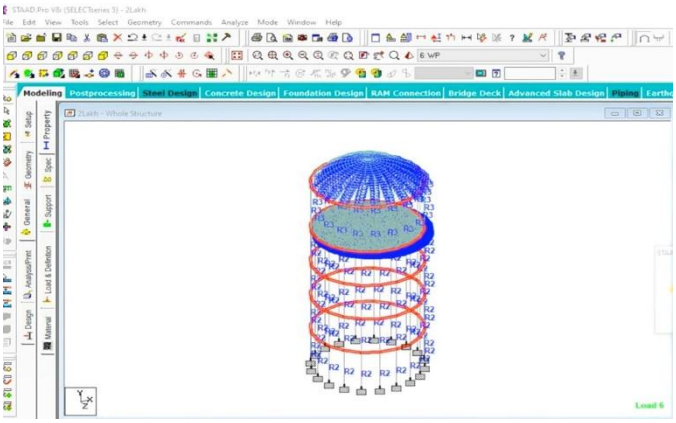


Fig. 1.4 Provide thickness to the members

1.4 Now we have to apply the load cases which will be acting on the structure. The number of loads is as follows:

- Dead load
- Hydrostatic load
- Seismic load
- Wind load

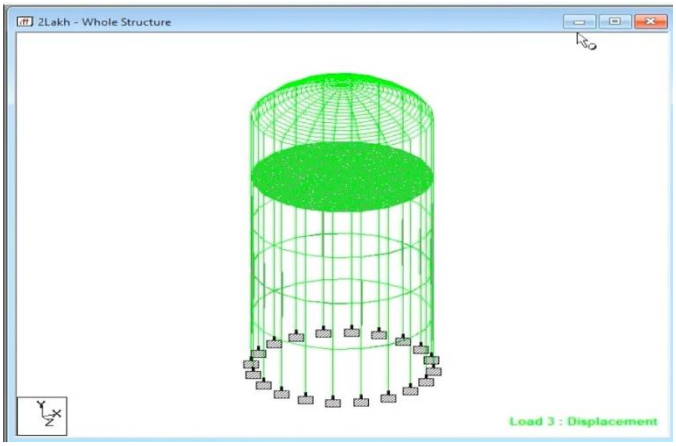
1.5 Now we will define the seismic load as per IS 1983 – 2002/2005, then wind load should be considered and the intensity can be provided.

1.6 Then we shall consider dead load, which are self-weight, member load and fluid load or water pressure.

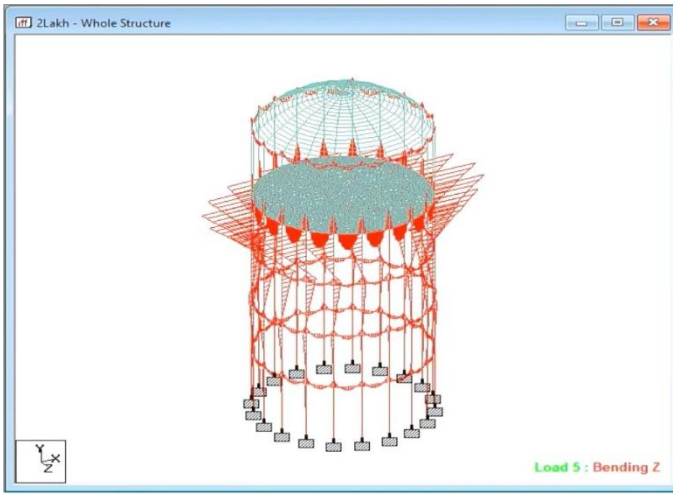
1.7 The water pressure will be acting on the plates of the structure so, we will provide minimum and maximum water pressure on it.

1.8 Providing minimum and maximum water pressure on it.

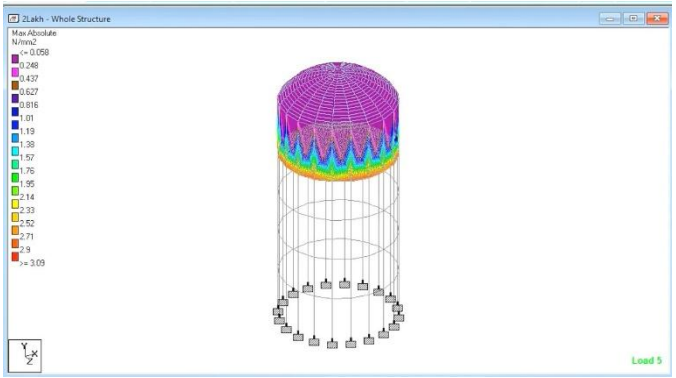
1.9 Deflection can be shown due to the wind load.



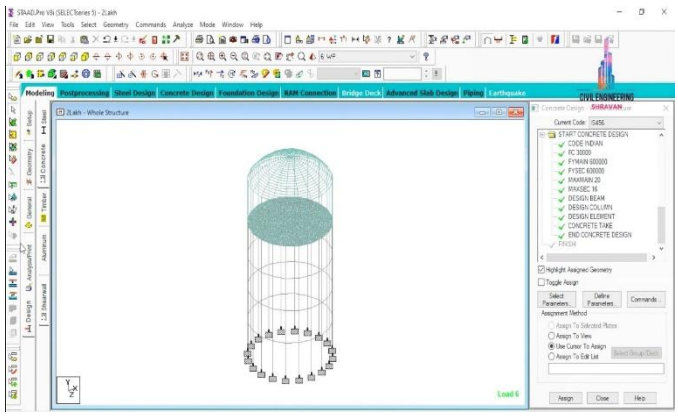
1.10 Bending moment diagram as well as shear force diagram.



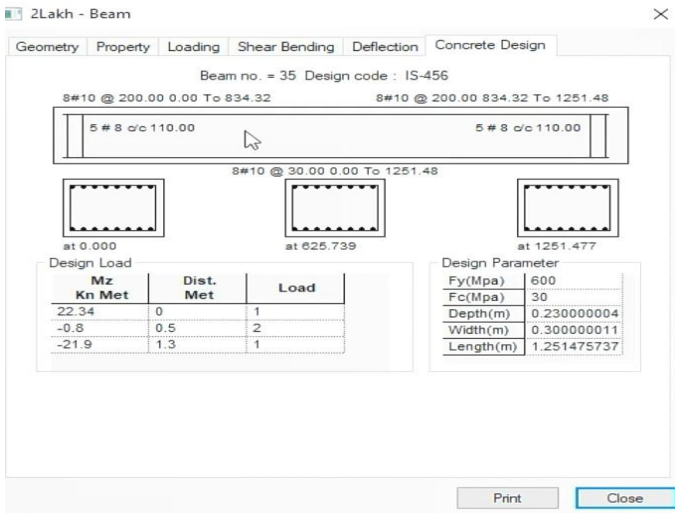
1.11 Absolute pressure for the tank in the presence of dead load.



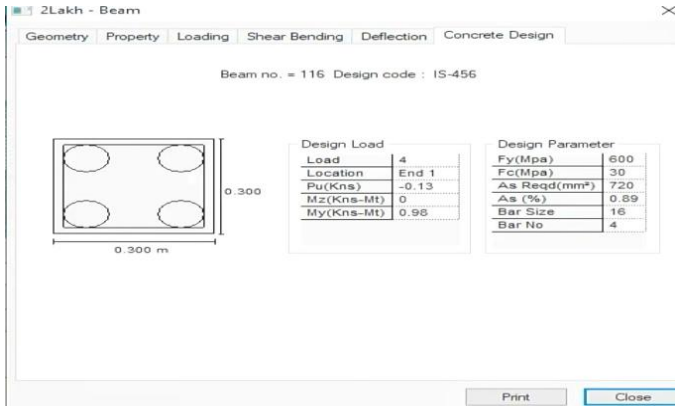
1.12 Design for the concrete model using IS 456.



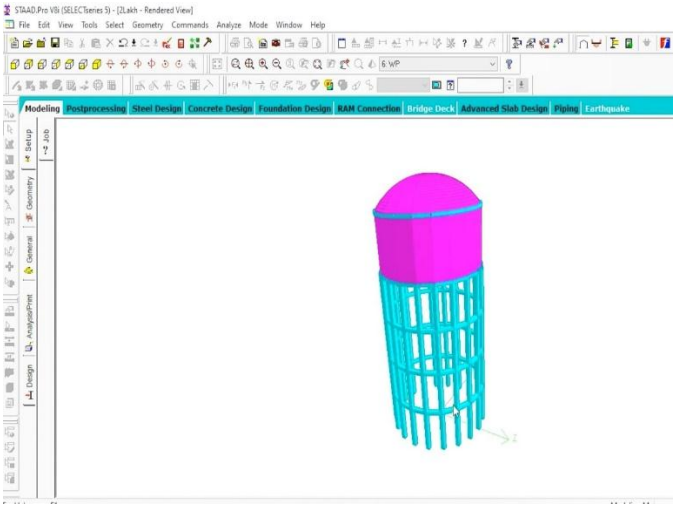
1.13 Concrete design of beam results.



1.14 Concrete design of column results.



1.15 The final rendered result of 2,00,00 lit capacity ESR.



1.16 Then we start taking levels of whole village with the noding technique, which covers the path of distribution line

5. RESULTS

- With the help of the information, we have got from surveying and designing of water distribution line, we are able to design a structure of ESR (Elevated Surface Reservoir).
- Branch software is very dependable when it comes to design and calculate water distribution line and ESR respectively.
- And AutoCAD can show the results which was calculated by the Branch software.
- At last, by using all the information we can design the structure of ESR.

CONCLUSION

1) Surveying play's important role in designing of water distribution line and ESR, as well as AutoCAD, STAAD-Pro and BRANCH software provides successful designs and solutions.

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