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Research Article

An Analytical Approach to find out the Efficient Design of Intz Water Tank as per Different Breeze Speed of India

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Abstract

Because of colossal need by the general population, water must be put away and provided by their necessities. Water request isn't steady for the duration of the day. It changes hour to hour. To supply steady measure of water, we must store water. So, to full fill the open water need, water tank should be developed. Limit storehouses and overhead tanks are used to store water, liquid oil, oil-based merchandise and relative liquids. The power assessment of the store or tanks is about the comparable free of the substance thought of the thing. All tanks are arranged as split free structures to discard any spillage. This undertaking gives more or less, the speculation behind the arrangement of liquid holding structure (Elevated roundabout water tank with domed rooftop and cone shaped base) utilizing working stress strategy method. Components are configured in working pressure technique. Breeze speed from 33m/sec to 55 m/s has used in this work along with Fani cyclone effect of 52 m/sec for some areas.

Keywords: *Area of Steel, Breeze Speed, Fani, Foundation, Intz Water Tank, Moment, Raft Slab.*

1. Introduction

[1]Limit annals have shown that water tanks are used to store water, oil-based supplies, liquid oil, and different liquids. The analysis of the cisterns is regarding the freedom of the contrived item's concept. Fracture/rupture free structure to evade leakage are the characteristics of tanks. A well-defined analysis of the arrangement of fluid containers by means of working weight system is attempted here.

This attempt cogitates, for the going with cases, the structure of tanks:

1) Tanks that is underground,
2) Tank resting on the surface of floor and
3) Tanks that is above or overhead.

An indicative procedure has been set up in a spread sheet. The work deliberates the tank's safety at minimum expenditure while permitting the engineer/designer the ability to correlate structure variables. This tank's plan is therefore, constantly cautious, robust and major tank. This paper explains and defines the water tank's arrangement rationale for it's:

a) Safety and
b) Expert structure.

2. Objectives of the Current Study

The purpose of this thesis is:

1) Using Staad pro for the static analysis of retaining wall and to define failure cases.
2) To study the performance with changing height and thickness of the member parts.
3) To analyze the different types of tanks and its behavior of structure.
4) Study of the best type keeping other parameters unchanged.

3. Modeling Approach

A potential way of obtaining satisfying results concerning any kind of analysis done on any structure is known as the methodology. Analysis is undertaken to compare pervious situations of a structure and by formulating new result to change it accordingly. If while comparing the results are found unsatisfactory in a methodology, a new analysis is employed to find the correct approach. Modeling approach is prepared in accord with the methodology. This is undertaken in such a manner that a slight change in the model affects the result. Similarly, if the method is changed, a different model under several conditions is established.

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The structural descriptions of Intz water tank are as under:

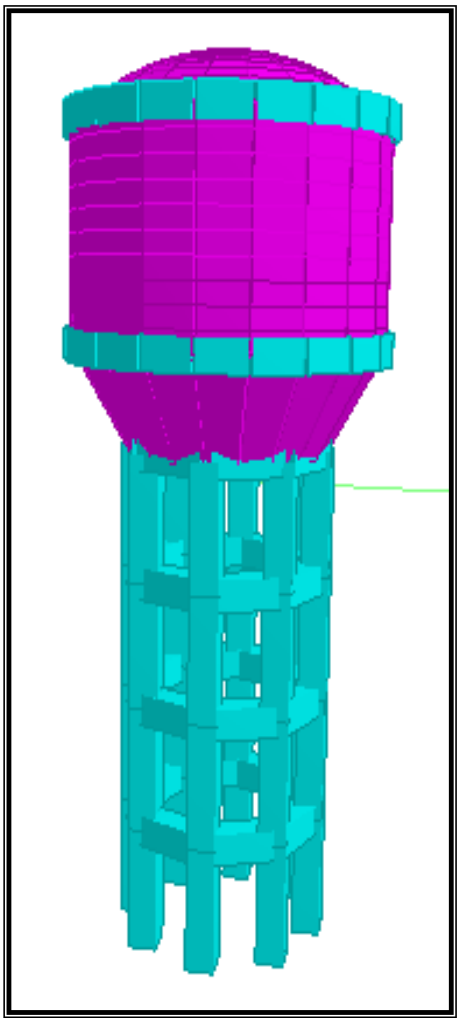


Fig.1 Over Head Tank Modeling

Table 1: Tank Components Description

S. No.	Component Name
1	Dome at the top
2	Ring Beam B1 at the top
3	Cylindrical Wall
4	Ring Beam B2 in the middle
5	Conical Wall
6	Dome at the bottom
7	Ring Beam B3 at the bottom
8	Bracing B4
9	Column C
10	Plinth Ring Beam B4
11	Raft footing

4. Method of Analysis: Manual Approach

1. Study of Shell Structure: - Making an imaginary cut on the joint and undertaking the imaginary is the main step to support conditions consistence with the membrane analogy. Due to this distinct loading condition, the hypothesis approvals the commitment of membrane forces and deformation.

Another step is at the junction to make the deformation is to apply limiting forces at the edges reliable with the specific aid circumstance.

2. Study of Roof Wall Joint: - A spherical or conical dome roof (round) may be designed.

3. Study of the Spherical Bottom Conical Wall Join: - Columns or on a circular shaft or both may also support joints. If the circular shaft supports the tank, threw shells may be jointed together without a hoop beam. However, if columns support the tank, a bottom ring beam is like to the two shells.

4. Membrane Study: - The member is hypothetical to act independent of the others in the membrane analysis. All structural components are designed independently. AS the joints are considered flexible i.e. all members act individual bending moment the member is therefore subjected to only direct stresses.

4.1 Breeze Analysis by IS: 875 (Part-3)

4.1 Basic Breeze Speed (Vb): The Indian map shows the basic Breeze speed, for the country's various zones. These apply to 10 m height above MSL. Basic Breeze speed is founded on high velocity. This is an average over intervals of about 3 seconds. In an open terrain (Category 2), it relates to the mean heights above GL.50-year return period of basic Breeze speeds. The basic breeze speeds of some major cities are given in the code.

4.2 Design Breeze Speed (Vz= Vb x k1 x k2 x k3) determine the basic breeze speed (Vz) for any site

It would be adapted to account for the effects to acquire the design Breeze velocity at any height Vz for the selected structure. These effects are given below:

A) Risk level

B) Environment height and magnitude of structure

C) Landscape of the area

4.3 Design Breeze Pressure (Pz= 0.6 x Vz x Vz)

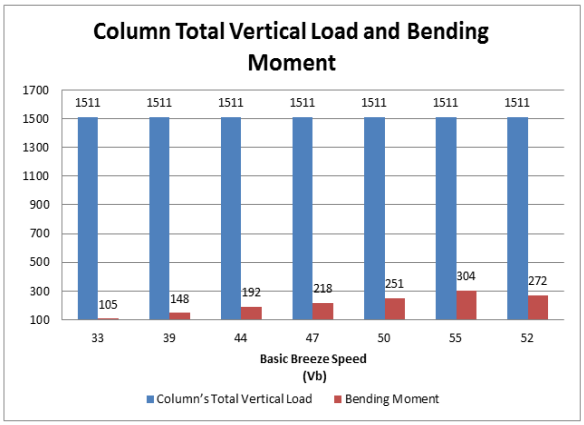
The subsequent relationship between breeze pressure and Breeze velocity defines the design breeze pressure at any height above mean ground level.

5. Results and Discussions

In this manual is the calculation of Intz water tank with Breeze resistant parameter. The design parameter of column and bracings in staging are included.

Table 2: Total Vertical Load on Columns and Bending Moment

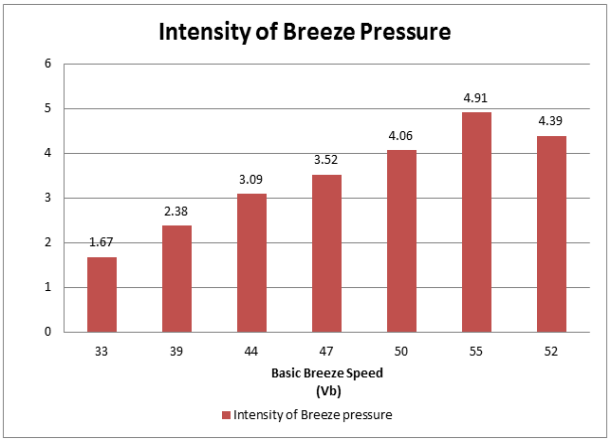
Basic Breeze Speed (Vb)	Zone	Column's Total Vertical Load	Bending Moment
33	1	1511	105
39	2	1511	148
44	3	1511	192
47	4	1511	218
50	5	1511	251
55	6	1511	304
52	Fani	1511	272



Graph 1: Total Vertical Load on Columns and Bending Moment

Table 3: Intensity of Breeze Pressure

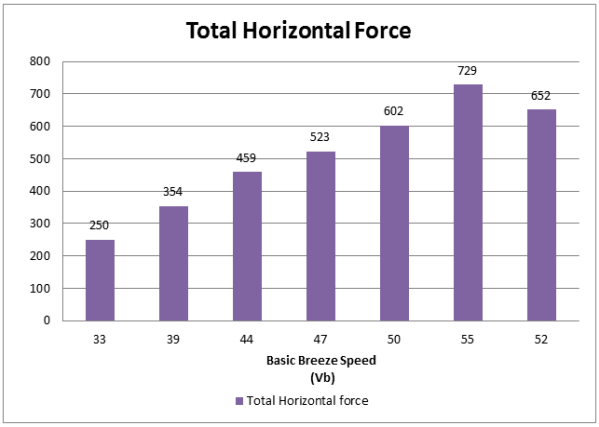
Basic Breeze Speed (Vb)	Zone	Intensity of Breeze pressure
33	1	1.67
39	2	2.38
44	3	3.09
47	4	3.52
50	5	4.06
55	6	4.91
52	Fani	4.39



Graph 2: Intensity of Breeze Pressure for different Zones

Table 4: Total Horizontal force

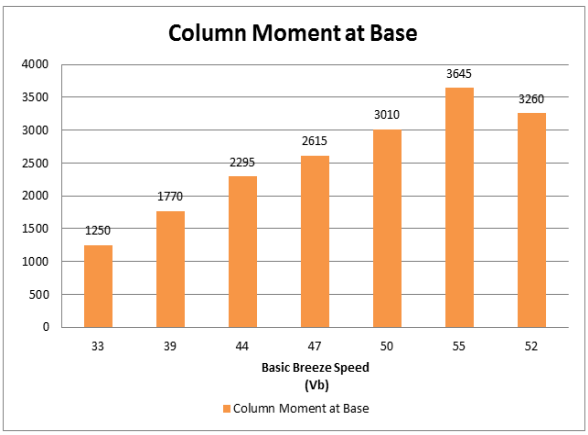
Basic Breeze Speed (Vb)	Zone	Total Horizontal force
33	1	250
39	2	354
44	3	459
47	4	523
50	5	602
55	6	729
52	Fani	652



Graph 3: Total Horizontal force

Table 5: Column Moment at Base

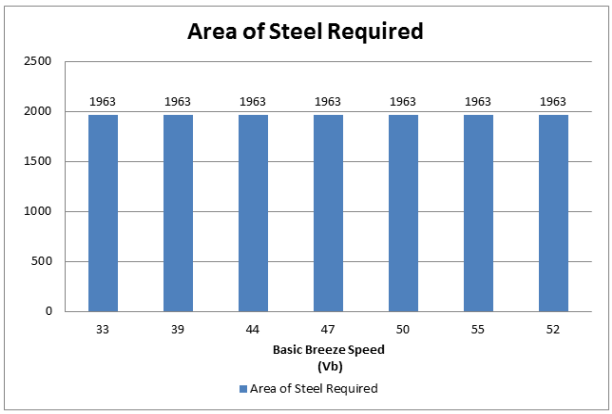
Basic Breeze Speed (Vb)	Zone	Column Moment at Base
33	1	1250
39	2	1770
44	3	2295
47	4	2615
50	5	3010
55	6	3645
52	Fani	3260



Graph 4: Column Moment at Base

Table 6: Area of Steel Required

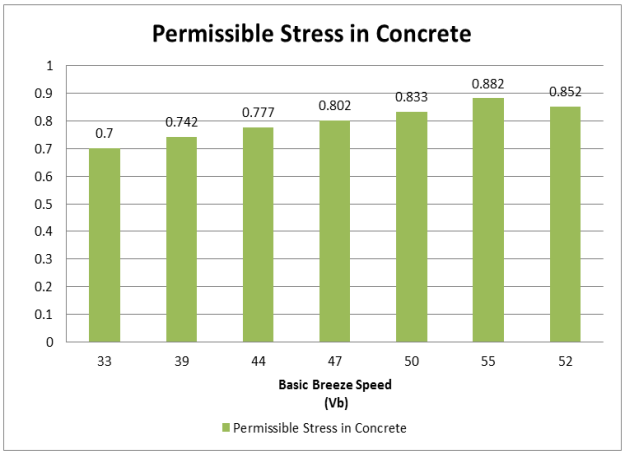
Basic Breeze Speed (Vb)	Zone	Area of Steel Required
33	1	1963
39	2	1963
44	3	1963
47	4	1963
50	5	1963
55	6	1963
52	Fani	1963



Graph 5: Area of Steel Required

Table 7: Permissible Stress in Concrete

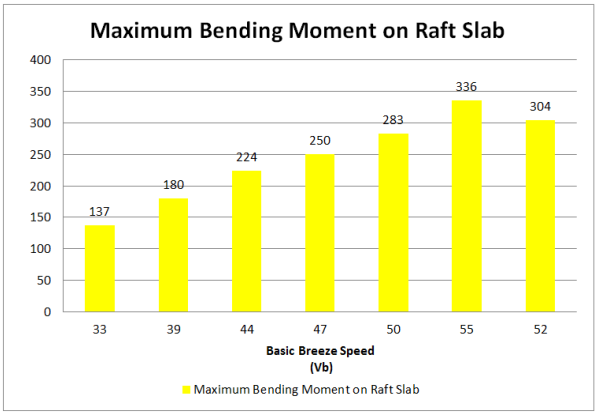
Basic Breeze Speed (Vb)	Zone	Permissible Stress in Concrete
33	1	0.700
39	2	0.742
44	3	0.777
47	4	0.802
50	5	0.833
55	6	0.882
52	Fani	0.852



Graph 6: Permissible Stress in Concrete

Table 8: Maximum Bending Moment on Raft Slab

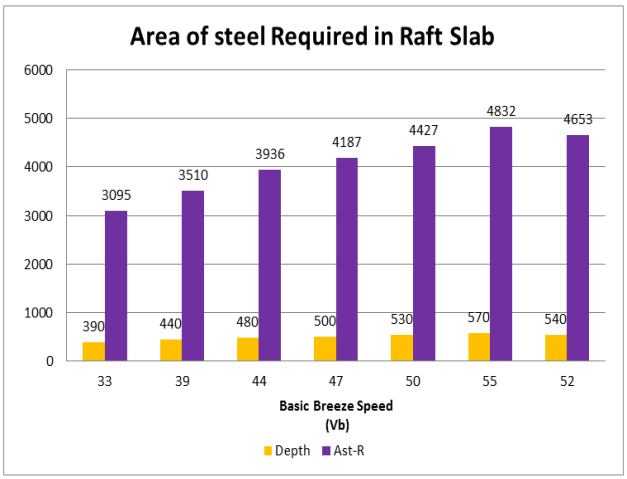
Basic Breeze Speed (Vb)	Zone	Maximum Bending Moment on Raft Slab
33	1	137
39	2	180
44	3	224
47	4	250
50	5	283
55	6	336
52	Fani	304



Graph 7: Maximum Bending Moment on Raft Slab

Table 9: Area of steel Required in Raft Slab

Basic Breeze Speed (Vb)	Zone	Raft Slab	
		Depth	Ast - R
33	1	390	3095
39	2	440	3510
44	3	480	3936
47	4	500	4187
50	5	530	4427
55	6	570	4832
52	Fani	540	4653



Graph 8: Area of steel Required in Raft Slab

Conclusions

Concluding the analysis of the above results, it is very essential to analyze the results of the Breeze speed first to get the exact effects on the Overhead Water Tank. The following points are used to get an efficient reservoir system:-

1) The Total vertical load on column is same but the Bending Moment keep on increasing on increasing with increase in breeze speeds.
2) Intensity of breeze pressure with total horizontal keeps on increase on increasing with increase in breeze speeds respectively.
3) Column Moment at Base again keep on increasing with increase in breeze speeds.
4) Area of steel required seems to be same at 1963 sq. mm.
5) Due to increase in breeze speeds, permissible stresses and Moment on raft slab keeps on increasing. The maximum value of moment observed 336 KNm.
6) Area of Steel required in Raft slab marked maximum on 55 m/sec speed.

As per above statistics, before the construction of Overhead Water Tank, the above results are very essential before the analysis work.

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