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A Case Study of Different types of Water Tanks.

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Abstract – *The water needed for everyday needs is kept in reserve in a water tank. An overhead water tank is a civil structure typically constructed using reinforced concrete. Its design incorporates a unique feature of a curved dome shaped roof, which helps distribute the load of the stored water evenly across the tanks wall. This design minimizes stress concentration points, making the tank more structurally stable. One of the main advantages of Intze type water tank is their efficient use of space. The cylindrical shape of water tank allows for maximum storage capacity while occupying minimum ground area, making it ideal for urban environment with limited space. Additionally, the curved roof design eliminates the need for internal supports, further optimizing the available storage space. The hydrostatic water pressure in a circular tank filled with water will attempt to expand its diameter at any point. However, this crease in the diameter all along the height of the tank will depend upon the nature of the joint at the junction of the wall and bottom slab.*

The imperviousness of concrete is crucial for building structures made of it to store liquids, such as water. Any homogeneous and well-compacted concrete with specified mix proportions will have permeability, mostly due to the water-to-cement ratio. Design of liquid retaining structure has to be based on the avoidance of cracking in the concrete having regards to its tensile strength. The design of the concrete must guarantee that it does not fracture along its water face. The Intze type water tanks are also known for their cost-effectiveness. The use of locally available materials, such as concrete and reinforcement bars help to reduce construction cost. Moreover, the durability and low maintenance requirements, resulting long term cost saving. The Intze tank is widely used for storing the water for various applications as residential, commercial, and industrial purposes.

Key Words*: *Concrete, classification of water tank.

1.INTRODUCTION:

The water tank is a container designed to store water and supply it for various purposes. It comes in different shapes and sizes and is made of different kinds of materials. A water tank is constructed for use for residential, commercial, and industrial purposes. A water tank typically comprises various components and uses different types of materials for construction. The dimensions of water tanks depend on the capacity of tanks. In the case of elevated water tanks, the height of the staging of the tank also depends on how much height water is to be pumped with the self-watering head of the tank. As per the shape, size, situations, location, and material to be used for construction, it can be classified into different types.

A water tank is a water storage reinforcement concrete structure used to store water for different purposes. It is typically constructed of structures of concrete, sand, cement, and steel reinforcement, generally to tide over the daily requirements. An overhead Intze type water tank is a cylindrical structure typically constructed using reinforced concrete. Its design incorporates a unique feature of a curved dome-shaped roof, which helps distribute the load of the stored water evenly across the tank wall. This design minimizes stress concentration points, making the tank more structurally stable. One of the main advantages of Intze-type water tanks is their efficient use of space. The cylindrical shape of the water tank allows for maximum storage capacity while occupying a minimum ground area, making it ideal for urban environments with limited space. Additionally, the curved roof design eliminates the need for internal supports, further optimizing the available storage space.

The Intze-type water tanks are cost-effective, and they are built all over the country. In the construction of water tanks, locally available materials are generally used. The concrete and reinforcement bar help to reduce construction costs. Moreover, the durability and low maintenance requirements result in long-term cost savings. The Intze tank is used to fulfill the requirement of water for residential, commercial, and industrial purposes. When water is filled in a circular tank, due to hydrostatic water pressure, the diameter of the tank tries to increase. The water and other liquid storage concrete structures, the concrete should be impervious. The permeability of any uniform ability of compacted concrete mix is mainly dependent on the water-cement ratio. The design of the liquid-retaining structure should be free from cracks. The Intze type water tank is an elevated tank, and wind and earthquake forces are most dangerous for it. It should be a designed earthquake-resistant water tank. At the time of design of such a type of water tank, wind forces should be considered so that it becomes wind force resistance.

The various types of water tanks are built in different parts of the country. The water tanks may be circular, rectangular, or square in shape. The typical shape of tank is being

designed as an Intze tank, and it is widely used all over the country and abroad. As per their situation, it may be underground, on the ground, or overhead. Generally, two kinds of water tanks, reinforced concrete and pressed steel water tanks, are built. Now a days, mostly cylindrical and Intze types of overhead reinforcement are being constructed. The water tank is a container designed to store water and supply it for various purposes. It comes in different shapes and sizes and is made of different kinds of materials. A water tank is constructed for use for residential, commercial, and industrial purposes. A water tank typically comprises various components and uses different types of materials for construction. The dimensions of water tanks depend on the capacity of tanks. In the case of elevated water tanks, the height of the staging of the tank also depends on how much height water is to be pumped with the self-watering head of the tank. As per the shape, size, situations, location, and material to be used for construction, it can be classified into different types.

2. CLASSIFICATION AS PER SITUATIONS:

2.1 Underground water tank

It is constructed below the ground or partially below the ground. Such a water tank is also known as a sump well. The swimming pool is one kind of underground water tank, generally constructed partially on the ground and partially below the ground. In shape, it may be circular, rectangular, or square. Underground water tanks are generally storage tanks, and this storage water is being used as per emergency requirements. The underground tank is constructed with cement concrete and reinforcement, and it is reinforced concrete structures. The bottom slab of the underground water tank is designed for both down wad load due to water head and uplift water pressure. The walls of the tank are also designed for water pressure outward and soil and water table pressure in wards.

2.2 tanks resting on ground

This kind of water tank is constructed on the ground. The resting on the ground may be in three shapes: circular, rectangular, and square. Some of the swimming pool is also constructed fully on the ground. The water tanks constructed for use in water treatment plants are generally resting on the ground. For irrigation purposes, small water tanks are generally constructed on the form of houses. The small, rectangular water tanks are constructed at individual houses for domestic purposes. The water tank resting on the ground may be constructed with cement concrete and reinforcement and brick mortar with or without reinforcement. The bottom slab and walls of the tank are designed for water pressure outwards.

2.3 Elevated tanks supported on staging

For domestic and industrial purposes, the water required a high-pressure head so the water could be rich in multi-story buildings. It is only possible that either water should be pumped out with a high-capacity water pump or supplied with a high-water head. The elevated water tank is the most suitable way to supply the water to a high-rise building with suitable water pressure. The different kind of elevated water tank is being constructed now a days. This kind of water tank is constructed on the staging of different heights as per requirement. The water tank and staging both may be in shapes of circular, rectangular, or square. The elevated water tanks constructed for use for domestic and industrial purposes are resting on staging with different numbers in the columns as size, shape, and capacity of the water tank. The staging may consist of a minimum 4 columns. Some columns rest on circular RCC wall staging. The circular elevated water tanks are being constructed with a dome at the bottom and at the top of the tank. Some elevated water tanks are constructed with a flat bottom slab and domical top. Some circular water tanks are constructed with top and bottom both flat slabs. Oil storage is generally made of circular in shape with top and bottom slabs flat, and pressed steel is generally used.

3. CLASSIFICATION BASED ON SHAPED:

3.1 Circular water tank

The water tank is designed to store water and supply it for various purposes. The water tanks are constructed in different shapes and sizes. The stored water is being used for residential, commercial, and industrial purposes. Looking at the population of a particular area, the capacity of the water tank is decided. For highly populated areas, more capacity of water tanks is required. When the water is in the containers, the outward forces are induced as per the height of the tank wall. Similarly, high pressures are built up at the bottom of the slab also. The circular water tanks are most effective against such kinds of forces and stresses. The circular water tanks, either Intze type or circular with domical top and domical bottom, are economical. As compared to other kinds of tank components, the components of a circular water tank are thinner, and at the at the same time, reinforcement required is also very less. Looking above benefits, the circular water tanks are constructed all over the world frequently.

3.2 Rectangular water tank

The water tank is typically comprised of various components and also uses different types of materials for its construction. The dimensions of water tanks are also dependent on the capacity requirements of the tanks. Since rectangular water tanks are costliest as compared to circular water tanks, they are not preferred to construct. The elevated rectangular is

not being constructed, but the rectangular water tank is still constructed, resting on the ground and below the ground. A small rectangular water tank is preferably constructed resting on the ground and under. A popular type of rectangular water tank is a swimming pool, which is constructed all over the world in very large, high capacity resting on the ground or partially on the ground and partially below the ground.

3.3 Spherical water tank

The water tank is designed to store water. It is constructed in different shapes and sizes. Generally, the water is stored for supply for residential, commercial, and industrial purposes. A spherical water tank is not a popular type of water tank; it is constructed for specific purposes, wherever it is required. The dimension of the water tank is calculated as per the capacity of tanks. To store a large amount of water, a large water tank is to be constructed. In a small-sized Gobar gas plant, small-sized spherical water tanks are constructed, showing that gas could be stored in a spherical shape. The spherical shape is safe to store the gases without leakages.

3.4 Circular water tank with conical bottom

The water tank is typically designed to fulfil the special requirements. The circular water tank with conical bottom is typically designed to store the water. It is not a common type of water tank being used in different parts of the country and abroad. On demand or requirement, such a type of circular water tank with a conical bottom is being constructed. To store the chemical, such a typical steel and RCC tank is constructed. Such types of circular water tanks are economical as compared to rectangular water tanks. A circular water tank with a conical bottom is an elevated water tank constructed with RCC or steel. This kind of water tank is constructed on the staging of different heights as per requirement. This type of circular elevated water tank is being constructed domical at top and conical at bottom.

3.5 Intze Type Water Tank

The Intze type water tank is a circular elevated water tank made of reinforced concrete. The shape of Intze is very typical, but it is economical. The top of the Intze type cylindrical wall is cylindrical; below the cylindrical wall it is made conical in shape. The bottom part is also domical in shape. Being typical shape and economical, this type of tank is constructed in large numbers all over the country and abroad. Intze tanks are constructed for both domestic and industrial purposes. The high-pressure water head is required so that water could be rich in multi-story buildings. It is only possible when a high-elevated water tank is constructed with high water head pressure. The elevated water tank is the most suitable way to supply the water to high-rise buildings. The different kinds of elevated water tanks are being constructed now a days, but the Intze type water tank is a popular type of water tank. The Intze-type water tanks are constructed on the staging of different heights as per requirement. The elevated water tanks constructed for use for domestic and industrial purposes are resting on staging with different numbers in columns as per the size and capacity of the Intze type water tank. The staging of an Intze-type water tank may consist of a minimum 4 columns. It is also resting on circular RCC wall staging.

4. CLASSIFICATION BASED ON MATERIALS:

4.1 R.C.C. water tank

The water tanks are constructed by using different types of materials. Generally, two types of materials are being used for construction water tanks: RCC (reinforcement concrete) and pressed steel sheets. The RCC (reinforcement concrete) water tanks are widely used all over the country and abroad. Reinforcement concrete water tank is a long-life water tank and also economical. All types of water tanks, viz., circular, rectangular, square, and spherical, are constructed by using reinforced concrete. The main ingredients, like coarse and fine aggregates, are locally available materials used in the construction of RCC water tanks. Cement and reinforcement—these two materials are also available in the nearby area, i.e., why RCC water tanks are financially cheaper. The small rectangular water tanks constructed at individual houses for domestic uses are RCC water tanks.

4.2 Pressed steel water tank

The elevated water tank is most suitable for the supply of water to high-rise buildings. The pressed steel elevated water tank is being constructed as required. The pressed steel water tank is very fast to construct. It may be constructed within two or three days. The components of pressed steel water tanks are readily available in the market. In case of any emergency where very fast construction of water is required, pressed steel water tanks are preferred. Since it is made of steel, regular maintenance is required. The steel tanks used for storage of different kinds of oil are constructed from pressed steel. This kind of water tank is constructed on the staging of different heights as per requirement. The pressed steel water tank and staging both may be in shapes of circular, rectangular, and square. The staging may consist of a minimum 4 columns, and the height may be kept as per demand.

4.3-brick water tank

The water tank resting on the ground and below the ground may be constructed with bricks using cement mortar. Water load is coming at the bottom brick slab, and on the walls of tanks, outward water pressure is induced. Small sizes of water tanks resting on the ground and below the ground are constructed with brick mortar. The septic tanks are one example of underground brick water tanks. The small-sized

brick water tanks are also constructed for irrigation purposes at agricultural land where cultivation is being done.

5. CONCLUSION:

The water tank is a water storage reservoir, where water is stored and supplied for various purposes. It comes in different shapes and sizes and is made of different kinds of materials. Stored water in the tank is used for residential, commercial, and industrial purposes. A water tank typically comprises various components and the use of different types of materials for construction. The dimensions of water tanks depend on the capacity of tanks. In the case of elevated water tanks, the height of the staging of the tank also depends on how much height water is to be pumped with the self-watering head of the tank. As per the shape, size, situations, location, and material to be used for construction, it has been classified into different types. Looking at the population of a particular area, the capacity of the water tank is decided. For highly populated areas, more capacity of water tank is required. When the water is in the containers, the outward forces are induced as per the height of the tank wall. Similarly, high pressures are built up at the bottom of the slab also. The circular water tanks are most effective against such kinds of forces and stresses. The circular water tanks, either Intze type or circular with domical top and domical bottom, are economical. As compared to other kinds of tank components, the components of a circular water tank are thinner, and at the at the same time, reinforcement required is also very less. Looking above, the circular water tanks are constructed all over the world frequently.

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