

Smart Technique Of Removal Of Heavy Leakage From Elevated Storage Reservoir At Majgaon, Tal-Panhala, Dist-Kolhapur

By – **Er. Rutuja Ravikant Patil.**

B.E. (Civil, Pursuing M. Tech in Structural engineering)
Lecturer in Civil Engineering Department, New Polytechnic, Kolhapur - 416001.
State-Maharashtra, India. (Email- rutujap27898@gmail.com)

Abstract:

Elevated water tanks are most common and efficient way for the water distribution purpose. Elevated water tanks provide proper water supply without consuming much electricity with the help of gravitational force. Elevated water tanks are constructed at a certain height and having a certain capacity. In such cases, large amount of water pressure is generated on the walls and bottom slab of water tank due to stored water. Strict supervision of such types of structure is necessary. But sometimes, the lack of proper supervision or unskilled labours results into improper structure. Leakage of water starts due to cracks generated in the wall and bottom slab of the water tank. Much quantity of water may waste due to such kind of improper practices. This paper is based on the live case study of waterproofing of an Elevated Storage Reservoir with easy and economical method. It results into 100 % waterproofing of water tank in easy way and it is beneficial for all types of water storage structures. It can sustain against the huge amount of water pressure imposed on the walls of storage tanks.

Keywords- concrete, waterproofing, cold joint, leakage.

1. Introduction:

Water is essential for daily life of every human being and all living things. Water sources are limited in the nature hence it should be used judiciously. In India, monsoon is limited for 4 months only. For the remaining period of entire year, it is necessary to store the water properly. Stored water can be used for domestic, commercial, industrial, cleaning and agricultural purpose. Water tanks are constructed to store and distribute the water for daily purposes.

Construction of any type of structure is the time investing and sequential procedure. There are many steps involved in construction on which strength of structure is depends. Many a times, to complete the construction early, the contractor removes the shuttering of the structural components before the specified time prescribed by the Indian Standards. This weakens the structure due to lack of development of required strength. Sometimes due to lack of proper planning, the sequence of construction activities gets disrupted which affects the durability of structure. It is very important to make the concrete homogenous with proper proportion of cement sand and aggregates. But when the concreting is carried out in multiple phases, it may not become homogenous, but & may have cracks due to improper workmanship.

Most of the time crack generated in a structure is the major cause of water leakage. There are various methods and materials of water proofing as per the type of structure and area of application are as following:

1. Waterproofing by Indian Patent Stone [IPS]
2. Water proofing by Injection Grouting
3. Lining with the help of water proofing chemical, paint or mortar
4. Rigid Material or filler
5. Coating by waterproof paint or similar material
6. Waterproof plaster

2. Objectives:

1. To find out root cause of leakage.
2. To overcome the leakage problem and prevent loss of water.
3. Finding a sure solution to stop leakage in the future and extend the life of water tank.

3. Theoretical Background:

Sometimes while doing the concrete work it is not possible to place all required quantity of concrete at the same time. In such kind of cases placing of concrete is done in multiple phases. But due to multiple phase concrete work, first layer of concrete is hardened before placing of second layer because of greater time lapse between the works. It creates a gap between the two layers of concrete. Such type of concrete joint called as a cold joint. It makes two separate layers of concrete and do not form a homogeneous structure. But strength of concrete is all depends on the homogeneous nature of concrete. As good as the concrete is homogeneous it will be the best quality concrete. Many times such kind of cold joints are main cause of water leakage. Also if there is a heavy load on the structure, there are more chances to fail the structure near the cracks or cold joint. Refer (Fig.No.5).

4. Causes of water leakage:

1. In government works, many a times, low quality raw materials are used due to insufficient funds or to maximize profit, this affects the quality of work.
2. Lack of skilled labours, negligence in supervision also lack of proper management skills results into low quality work.

5. Methodology:

1. Statement of the Problem:

There was an elevated water tank at Majgaon, Taluka – Panhala, Dist. - Kolhapur which is constructed for the purpose of domestic water supply to the village recently. It was constructed at 12 m height from ground level in circular shape of 3.2 m internal diameter with flat slab at top and bottom. The storage capacity of water tank was 15000 litres. An outlet has to be provided to distribute water from the centre of bottom slab of the elevated water tank. Pipes for outlets have to be provided during or before the shuttering of the slab. But time for procurement of cast iron pipe was delayed, the RCC contractor was not willing to wait till then, shuttering & casting had been done for bottom slab. After casting of the slab, cast iron pipes about 900 mm dia. [3ft.] in length was delivered to the site. There was a cast iron flange present at both the ends of pipe also at the mid of the pipe. Refer (Fig.No.1). To fix the pipe, the hole of approximate 20 cm. diameter i.e. greater than outer diameter of the collar was drilled and the pipes were fixed in the slab after setting & hardening of RCC slab. The remaining gap was filled with concrete around cast iron pipe for outlet.



Fig.No.1 – Cast iron pipe with flange (collar) at top, middle and bottom

2. Analysis of the problem:

It has created the cold joint between concrete of bottom slab of water tank and the concrete used for filling purpose of drilled hole. Also the joint between the cast iron pipe and the concrete was weak as it was not properly vibrated after casting. Because of the work done in multiple phases, it is not allowed the rest of the slab and the concrete filled near the drill to become a homogenous. Due to this, the problem of large scale water leakage started at the junction of pipe and bottom slab. As per villagers, approximately within 15 to 16 hrs the whole water tank was getting empty. Approximate rate of leakage was 2.77 litres/seconds] Also, small cracks were observed at some places in the wall of the water tank. That was an emergency to fill that cracks immediately to stop water leakage problem as the water tank is the main source of distribution of water at the village & also to avoid corrosion of reinforcement in the RCC slab at bottom from the safety & durability point of view.



Fig. No.2- Detection of cracks formed in the bottom slab and walls of water tank

3. Experimental Solution to the problem:

To stop the water leakage, we have used water proofing chemicals named PERMA BOND SBR & NEROLAC PERMA HYPERCRETE emulsion. PERMA BOND SBR is a high strength repair mortar and bonding agent which is formulated to mixed with cement. It is actually an emulsion of Styrene Butadiene Copolymer Latex. PERMA BOND SBR is mainly used for, to protect reinforcement steel from corrosion, water proofing purpose and to make firm connection between old concrete and new concrete. For waterproofing PERMA BOND SBR & NEROLAC PERMA HYPERCRETE are mixed with cement in the ratio by volume i. e. 1 litre of chemical for 1 bag of cement to make slurry. With the help of brush and roller applied it on the defective surface area. It can be mixed in the mortar also to make modified mortar. NEROLAC PERMA HYPERCRETE is used for specially bottom slab and PERMA BOND SBR is used for RCC wall of water tank. Refer (Fig.No.3 and 4).

To apply the water proofing chemical on structure some precautions are necessary to be taken. First clean the surface from dust and any rusting in case of reinforcement. Water proofing slurry is applied on the wet surface. Also it is applied as quickly as slurry is made because it has quick setting property.



Fig.No.3- Cracks formed at bottom bottom slab, walls and joint between them are filled with



Fig. No.4 - Holes drilled in the slab for pipes are filled with chemically treated mortar

1. Conclusion:

The study gives the analysis about the how water leakage affects the strength of water tank and results into wastage of water. Routine practice mistakes by labours and contractors also discussed. The main aim of the paper was to study and diagnose the exact location of crack generated in the slab, causes of crack formation and to find the long lasting solution to minimize the problem. Paper gives an idea about the financial loss and degradation of structure after the failure of such public properties as its costing is more and citizens are paying tax for it. Also it gives the look towards the mistakes done in the planning and management of any construction projects directly affects the durability of structure. Many times there are various problems regarding with water leakage on construction sites. But now-a-days with the help analysis, research and some new innovative construction materials, one can reduce and stop such kind of problems. In this case study the experimental solution mentioned above has worked successfully and has given

very good results. From the date of repairs till date, there is leakage at all or even any dampness observed on the wall and bottom slab of the water tank.

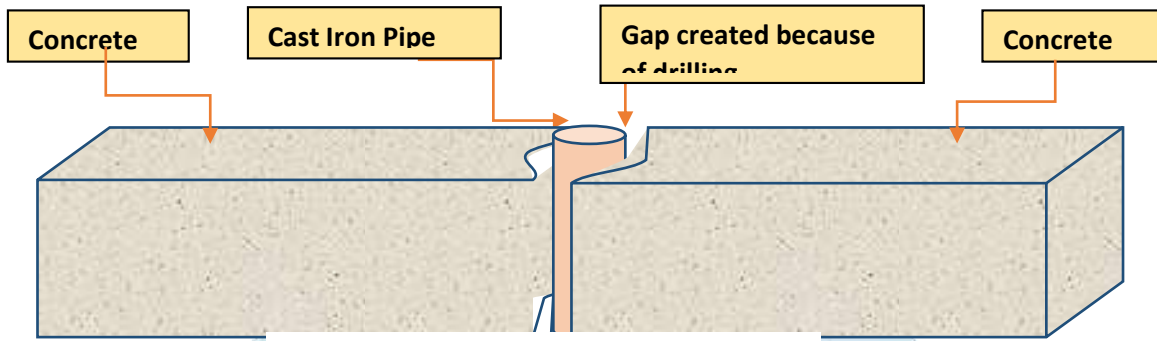


Fig.No.5 - Cold joint between concrete layers

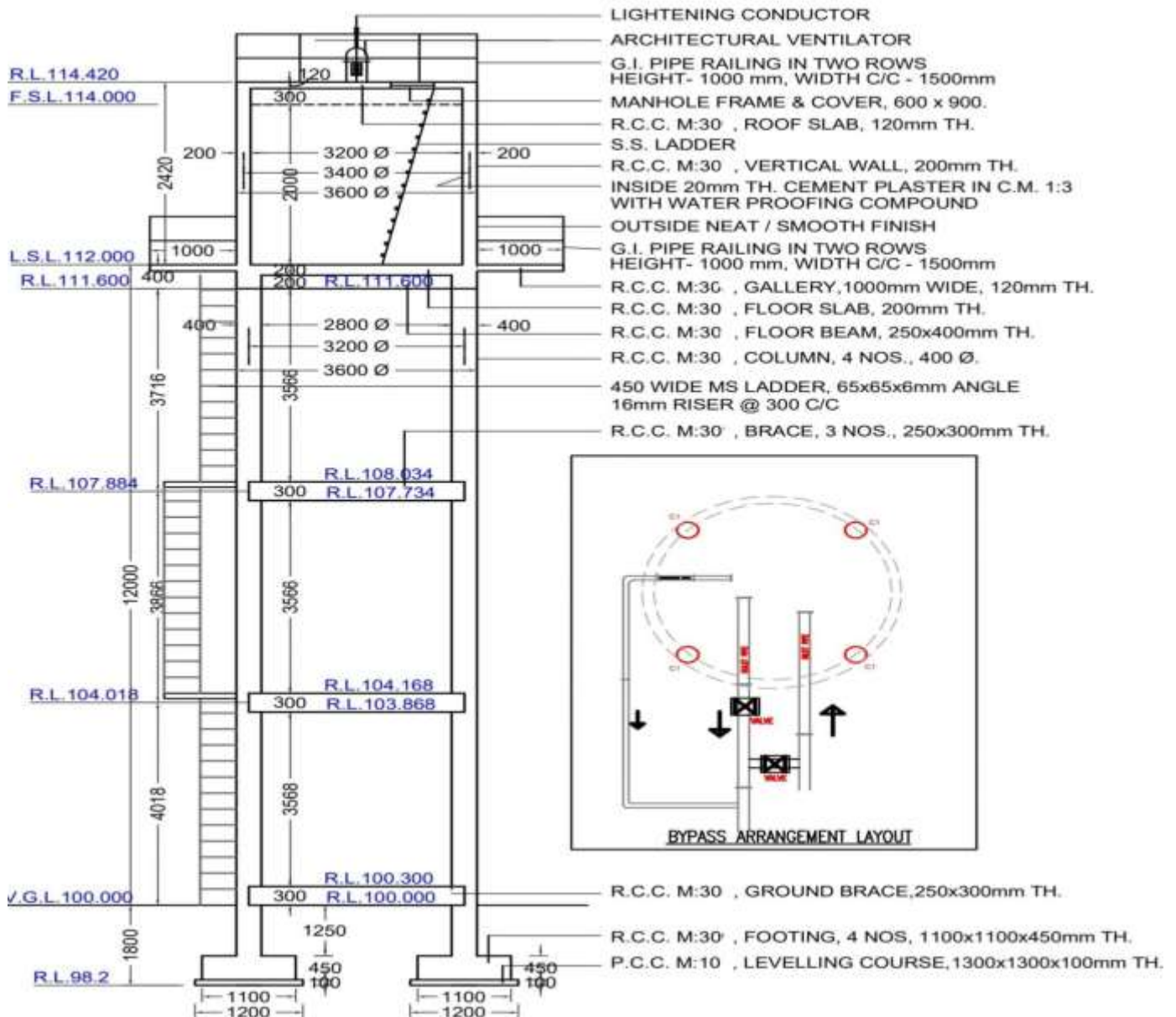


Fig.No.6- Elevation details of water tank constructed provided by structural designer

References:

1. Structural Audits by Dr. Vinayak. V. Diwan, (B. E. Civil, MBA, PHD), Associate Member of the Institution of Engineers(INDIA), Head of the civil department, New Polytechnic Kolhapur, Dist- Kolhapur, State- Maharashtra, India. Email- diwanvv@gmail.com