REPAIR, REHABILITATION AND RETROFITTING OF ELEVATED STORAGE RESERVOIR (ESR) SITUATEDAT THANE FOR THANE MUNICIPAL CORPORATION- A CASE STUDY

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Abstract

This technical paper deals with Major Repairs and Restoration of Elevated Storage Reservoirs (ESR) under Thane Municipal Corporation located at Gandhi Nagar, Thane. Being an old structure, the Elevated Storage Reservoirs faced major problems of structural distress which lead it to undergo Major repairs. Then Thane Municipal Corporation asked M/s. Supreme Engicons(India) Pvt Ltd., a leading Consulting Civil Engineering firm appointed as Structural Consultant to undertake the Major Repair and Restoration of Elevated Storage Reservoir at Thane. The structure was difficult to get accessed due to the distressed pathway to reach the area of inspection of the ESR. The condition of the structure was poor due to age factor. However, the major RCC structures were inspected with the method of visual inspection as well as Non-Destructive testing. The paper illustrates the unique methodology of Restoration on Elevated Storage Reservoirs such as Micro concreteing and Fibre Wrapping work for RCC members, Internal Waterproofing of ESR and Special anti Carbonation Treatment to the entire external surface and other remedial measures for its Major Repair and Rehabilitation.

Keywords: *ESR, Recommendations, Micro concreting, Waterproofing*

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1. WHAT IS ANESR?

ESRs(Elevated Storage Reservoirs) are the storage reservoirs which are required at the distribution areas which are not governed and controlled by the gravity system of distribution. When topography of a town is not suitable to be under gravity, the ESR is used. These are made in different shapes like rectangular, circular or elliptical. These are commonly made up of steel or RCC.

2. CASE STUDY

2.1 LOCATION OF THE ESR

The ESR is situated at Gandhi Nagar, Thane, Maharashtra. It is a RCC structure. There are 32 numbers of columns supporting the ESR and 51 beams connecting them.

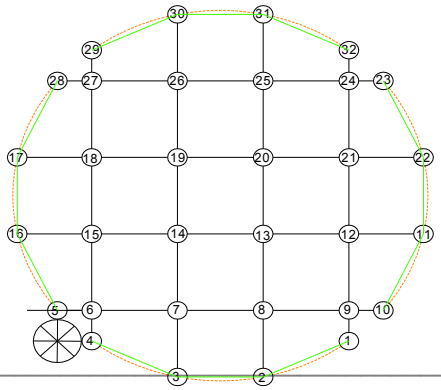

Fig.1: Representation of column supporting the ESR

It is under the jurisdiction of Thane Municipal Corporation. A sump house and an underground water tank are also present in the same premises.

2.2 OBSERVATIONS DURING THE SURVEY

During our survey, we have observed lot of cracks and crazing on the external plaster of the ESR. Heavy Leakages

Fig.2&3: Observations

were observed on the bottom of the tank. Steel exposure was observed on various RCC columns and beams indicating the severity. Reinforcement bars of certain Columns are found

exposed and even at some places found missing indicating the rate of corrosion is very high. The beams connected to the Service staircase also appeared with lot of major cracks. Cracks were observed on the staircase causing steel exposure. On the external surface of the sump house, lot of cracks and crazing was observed. The water proofing of the RCC Chhajjas was found to be failing gradually. The water proofing of the roof of the sump house is also found to be dilapidated. The overhead waterproofing of the underground water tank was observed to be in distress.

Fig. 3 Observations

ForAssessing the structural condition of the RCC members, extensive Non destructive testing has been conducted at the site on all the RCC structural members. Identification of distress RCC members were doneand quantified for major Repair. Accordingly a detailed planning for structural repair to be carried out was done.

3. METHODOLOGY OF RESTORATION ON ELEVATED STORAGE RESERVOIRS

A well planned methodology for restoration of the ESR was conducted.

- The process of erecting of scaffolding is conducted by providing/Fixing and Erecting steel Scaffolding on the entire surface of the water tank structure etc. as per theConsultants instructions and as per Technical specification manual or as instructed by the Engineer. The scaffolding was also used inside the water tank.
- The defects in the RCC members are due to effect of Corrosion and continuous drying & wetting process in the vicinity of thin RCC section. Hence it was desirable to strengthen the RCC members wherever necessary.

Fig.4 Erection of scaffolding

- The RCC members with distress, Chhajas and fins need to be rehabilitated and restrengthening by Polymer Modified Mortar (PMM) technique. The above technique should be also applied for slab delamination observed.
- Highly damaged RCC members such as columns, beams, slabs, chhajas etc. shall be treated with Recasting or High performance Micro concrete after proper shuttering and fitting reinforcements.
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Fig.5Micro concreting

- Corrosion of the exposed and cleaned reinforced steel is treated with one-component mineral based corrosion inhibiting protection coating.
- As existing external plaster had failed due to delamination, crazing and cracks at most of the places, hence two coat of external plaster was required to the entire façade of the building wherever necessary.
- Voids and cracks in the RCC elements such as Slabs, water tanks, terrace slabs etc. is treated using cementious grout.
- Voids and cracks in the RCC elements are treated by sealing and repairing with epoxy resin.
- Separation gaps between brickwork and R.C.C members were found externally at many places. Hence polymer based sealant/ chemicals/chicken wire mesh needed to be filling after opening the crack properly or as instructed by the consultant's engineer.

Fig.6 Recasting

- Injection grouting can be treated to column wall delamination area, beam wall delamination area, near RCC members etc. as a multiple effective treatment.
- Damaged Chhajas on the pump house are needed to be treated by Polymer Modified Mortar method & finally it should be plastered from bottom and to be water proofed by brickbat coba method fromtop if required. Sufficient watta also needed to be prepared simultaneously. Highly damaged chhajas/pardisneeded to be recast with R.C.C to bring to its original condition.
- Paint peeling and cracks were observed on the external wall which was treated with crack bridging and anti carbonation treatment.

Fig.7Crack Bridging coating

4. TENDER APPROVAL

Tender approval is the second stage of the process. In this stage, the Consultant forwards the recommendations & Draft Tender documents after survey, to Thane Municipal Corporation for the approval of the tender. The Thane Municipal Corporation had finally approved the draft Tender Document and floated the tender through their official website portal for various Contractors to execute the said Major Repair work. Out of many applicants, M/s. K.A. PATIL was selected as "Contractor" for the execution of the said Repair work with a work order value of Rs.69, 67,000.

5. EXECUTION

The last and important stage is the execution stage. This stage begins with the scaffolding of the building followed by waterproofing and plastering and ends with painting work. The entire work was carried out as per the recommendations mentioned above, for example distress in RCC members were treated with Polymer Modified Mortar (PMM) and High performance Micro concrete.

Fig.8 Before execution

After Execution

The joint between the R.C.C members and brick work were treated with Chicken wire mesh and PMM at the external surface. Crack bridging and anti carbonation treatment was applied on the external part of the ESR.

Fig.6 Erection of scaffolding

Fig.7Repair work inside the ESR

Fig.8 Water proofing work inside the ESR

Fig.9 External repair work

6. CONCLUSION

The entire Repair and Rehabilitation is the said ESR was executed in 6months. Total cost of the project was Rs.69, 67,000. On Completion of the entire work, under strict super vision of Structural Engineer, the Consulting Engineer issued the Stability Certificate of the Building which is statutory requirement of the Thane Municipal Corporation (TMC), the local authority of Mumbai.

7.ACKNOWLEDGEMENT

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8. BIOGRAPHIES

B.E (Civil) from Bangalore University in 1995.
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Chartered Engineer from the Institute Of Engineers (India) (2014)
Registered Structural Engineer for approved panel of BMC. (1998) (Regd. No. STR/S/217)
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