

Common Structural Problems and Solutions

Cooling Tower Structure:

Cooling tower structure is a special kind of structure which is designed to undertake all kinds of loads that the cooling tower bears or may have to bear. It also has to withstand falling water in terms of strength and corrosion. Cooling tower structure consists of foundation (footings, raft foundation, pile foundations) and superstructure (columns, beams, slabs, walls etc.). Cooling tower structure has to take many loads and these different loads are taken for different periods. Loads on a concrete cooling tower may be grouped and listed as:

- **Dead Load:**

It comprises of weight of all components (structural and operational). This includes weight of fan deck, fanstack, ladder, fill, drift eliminators, water distribution piping etc.

- **Live Load:**

Weight of walking person, temporary service equipment on the structure as well as on decking or access walkways, ladders.

- **Wind Load:**

This is the force exerted by wind on the surface area, exposed shapes and elements.

- **Seismic Load:**

This is the load when earth quake vibrations move the structure. It is expressed in terms of zone area and intensity on mercalli scale or Richter scale.

There are various structural problems which are seen in the cooling tower. These problems arise because of ageing, corrosion, poor workmanship during construction, damages due to accidents, excessive loads on members etc. Some of them can be listed to give an idea what kind of problem a concrete cooling tower may suffer.

1. Vibration
2. Cracks
3. Corrosion of the wall, peeling of concrete
4. Corrosion of reinforcement
5. Corrosion of pipes, drive shaft etc

The nature of these structural problems suggest that they are very peculiar to a particular structure. These are such problems which can be solved only by experienced and trained services personnel. First various testing are done like Non Destructive Testing (NDT), Ultrasonic test, Rebar locator test etc. Based on the results a detailed report is generated and solutions are suggested.

Some of the methods or solutions that has been applied by services team of GTPL in various structural up gradation work are:

1. Protective coatings on Concrete and Mild Steel structure
2. Strengthening of load bearing members, foundations and superstructure by various means like grouting, fiber wrapping coating using Polymer Modified Concrete (PMC)/ Polymer Modified Mortar (PMM)
3. Reconstruction of damaged load bearing members
4. Providing additional members whenever required.
5. Providing acrylic/epoxy coatings for fresh water cooling tower and polyurethane/polyurea coating for sea water application.

The structural problems in various parts of the cooling tower can be inspected as follows:

S No	Cooling tower components	Look for	Solutions
1	Fan Stack	Fan tip clearance, cracks, vibration	Fiber wrapping, waterproofing and filling by special reconstruction chemicals
2	Access Door	General condition, hinges, latches	Removing jam and corroded elements, replacing hinges, latches
3	Fan Deck	Cracks, vibration	Waterproofing, grouting, applying reconstruction chemicals
4	Ladder	Broken rungs, cage, welding	Replace broken rungs, cage or hand railing, apply paint
5	Stairway	Rungs, handrails	Either replace by anti skid stair way, replace rungs, handrails, apply paint
6	Casing	Fastners, damage	Replace corroded fasteners, change damaged casing
7	Columns	Corrosion, damage	Strengthen, reconstruct, or provide additional load bearing columns