QUALIFICATION OF COOLING TOWER FOR CHILLER

(Eq. ID: ……)

DOCUMENT PREPARATION AND APPROVAL:

Preparation and Approval of this Qualification document will be joint responsibility of the following functional area. Any modification in this document shall be documented and approved.

Prepared By

Name	Designation	Department	Signature	Date

Reviewed By

Name	Designation	Department	Signature	Date

Approved By

Name	Designation	Department	Signature	Date

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2.0 OBJECTIVE:

The objective of developing and executing this protocol is to

- Document the verification of all aspects of the equipment that can affect product quality.
- To make an impact assessment of the critical components of the equipment's on the material.
- To establish, check and document the performance of equipment in the established / predetermined operating ranges.

3.0 PURPOSE & SCOPE:

The purpose of this protocol is to demonstrate that equipment/system will perform reproducibly and consistently within its full dynamic range of operation according to manufactures specification.

Document the initial performance of the equipment/system for future reference.

Assure that the equipment/system performance is adequate to support the process for which the system is intended.

4.0 RESPONSIBILITY:

Quality assurance officer/Executive – Preparation of Protocol
Engineering manager or designee – Execution of Qualification activities.

Quality Head or designee –Approval of Protocol and review of summary of Qualification activity.

5.0 REASON FOR QUALIFICATION:

To study and verify the equipment (Cooling tower) that meets the production need and to establish the operating range.

6.0 VALIDATION TEAM:

Team member: Validation team is formed under the guidance of Head Quality having qualified and trained persons from Quality Assurance, and Engineering.

Name	Department	Responsibility
	Quality Assurance	Preparation of protocol and execution of the qualification activity.
	Engineering	Ensure to provide the utility during qualification activity.
	Engineering	Ensure to provide the utility during qualification activity.
	Quality Assurance	To Check the protocol and monitor the qualification activity.
	Quality Assurance	To approve the protocol & to review the summary of activity.

7.0 TRAINING:

Training is required for all the personnel, who are directly or indirectly involved in the overall requalification operations.

8.0 GENERAL CONSIDERATION / PREREQUISITE:

8.1 Approved Standard operating procedure of the Cooling tower shall be available.

8.2 Duly signed & approved qualification protocol shall be available.

8.3 The Installation and Operational qualification verification of the equipment shall be successfully completed before the execution of the performance qualification.

8.4 All the deficiencies and discrepancies related to the equipment which affect the product quality and corrective action taken shall be recorded in the appropriate section of the protocol.

9.0 INSTALLATION QUALIFICATION CHECK LIST:

S.No.	DESCRIPTION	OBSERVATION (Yes/No)	CHECKED BY
1.	**Make:** **Model No.:** **Serial No.** **Capacity:**		
2.	**Verify that there is sufficient room for servicing provided.**		
3.	**Verify that all piping and electrical connections have been done according to the drawings.**		
4.	**All access ports are examined and cleared of any.**		
5.	**Walking access to roof mounted equipment provided.**		
6.	**Required electric connectors are light, weather proofed and grounded.**		
7.	**All require certificate should be verified.**		
8.	**Verify that the "As built" drawings are complete and represent the design concept.**		
9.	**All top up part verified.**		
10.	**Verify that major components are securely anchored and protected from shock.**		
11.	**Equipment identification name plate visible.**		

S.No.	Items	Specification	Observation (Compliance/Variance)	Checked by
1.	**Foundation**	R.C.C. Plat form Dimension: 7.5" L x 6.4"W x 1.3" Height		
2.	**Electric Supply**	440Volt. 3 Phase.		
3.	**Inlet Water GI Pipe Line**	Size: 1 "Diameter x 15 Ft.		
4.	**Float Valve**	Size 1" Qty. 2 Nos.		
5.	**Inlet Water Wheel Valve**	Size 3/4" B.S.P. Qty. 1 Nos.		
6.	**Water Spray Nozzle**	Size 3" Qty. 4 Nos.		

10.0 OPERATIONAL QUALIFICATION CHECK LIST:

S.No.	Items	Requirement	Observation (Compliance/Variance)	Checked by
1.	**Condenser water recirculation pumps**	To stop the condenser water recirculation pumps, shift the lever to OFF position & then pressing the red button		
2.	**Cooling tower fan motor**	To stop the Cooling tower fan motor, press the red button		
3.	**Supply of water**	To shut OFF the supply of water, close the valves (02 Nos.) of makeup water piping.		
4.	**Drain valves**	To drain the water from cooling tower basin, open the drain valves (02 Nos.)		

11.0 PERFORMANCE QUALIFICATION PROCEDURE:

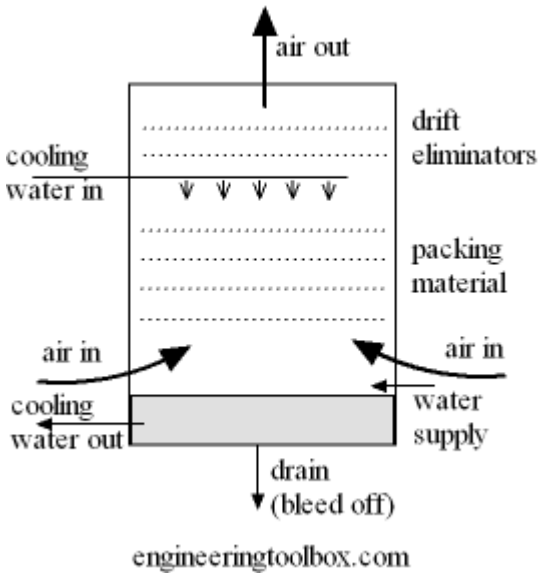
There are forced draught (using fans) types of cooling towers.

11.1

Note: Be aware that a medium temperature system - like cooling a tower - is a known source of pathogenic bacteria causing the Legionnaires disease. Good cleaning and maintenance of the systems are important to minimize the risk.

A cooling tower use evaporative cooling to reduce the temperature of circulated water, and

- they can achieve water temperatures below the dry bulb temperature - t_{db} - of the cooling air
- they are in general smaller and cheaper for the same cooling loads than other cooling systems



Cooling towers are rated in terms of approach and range**,** where

- the **approach** is the difference in temperature between the cooled water temperature and the entering air wet bulb temperature - t_{wb} -temperature
- the **range** is the temperature difference between the water inlet and water exit

Note! - for a cooling tower based on evaporative cooling the maximum cooling tower **efficiency** is limited by the wet bulb temperature of the cooling air.

Cooling Tower Efficiency

Cooling tower efficiency can be expressed as

$\mu = (t_i - t_o)\ 100 / (t_i - t_{wb})$

where

μ = cooling tower efficiency (%) - the common range is between 70 - 75%

t_i = inlet temperature of water to the tower (^oC, ^oF)

t_o = outlet temperature of water from the tower (^oC, ^oF)

t_{wb} = wet bulb temperature of air (^oC, ^oF)

The temperature difference between inlet and outlet water (t_i - t_o) is normally in the range 10 - 15 ^oF.

11.2

S. No.	Critical variables	Requirement	Actual observation	Checked by
1.	Delta T	Delta T obtained shall not be less than 3 ° C.		
2.	Cooling tower efficiency	Cooling tower efficacy should be range in between 70 - 75%		

12.0 ACCEPTANCE CRITERIA:

All parameter should be complies as per design.

15.0 QUALIFICATION CRITERIA:

Qualification shall be considered in the case of:

- Change in manufacturing site or location
- Change in location of the equipment.
- In case of any major maintenance or modification, this affects performance of the equipment.
- Periodic re-qualification as per VMP or company policy.

16.0 ANY CHANGES MADE AGAINST THE FORMALLY AGREED PARAMETERS:

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16.1 REVIEW (INCLUSIVE OF FOLLOW UP ACTION, IF ANY):

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16.2 RECOMMENDATIONS:

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16.3 CERTIFICATION:

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17.0 DOCUMENT CHECK – LIST:

Following documents related to Cooling tower are reviewed and listed below.

S.No.	Document Name	Checked By	Date

Comments:

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Inspected & Reviewed By: **Date:**

18.0 CHANGE CONTROL PROCEDURE:

Change in the agreed design shall be addressed through the well-defined change control procedure.

19.0 DEFICIENCY AND CORRECTIVE ACTION REPORT:

Following deficiency is observed and corrective action work allotted to responsible person.

20.1 Description of Deficiency and Date of Observation:

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20.2 Person responsible for corrective action and Date Assigned:

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20.3 Corrective action taken and Date Conducted:

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Comments:

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Reviewed By: **Date:**

21.0 CONCLUSION:

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22.0 SUMMARY:

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23.0 ABBREVIATIONS:

PQ : Performance Qualification

CTC: Cooling Tower

IQ : Installation Qualification

OQ : Operational Qualification

24.0 REFERENCES:

Equipment Manual

25.0 ANNEXURES:

26.0 REPORTAPPROVAL:

Name	Designation	Department	Signature	Date