



# *PERFORMANCE QUALIFICATION PROTOCOL FOR HVAC SYSTEM OF AHU-01*

**CUSTOMER:**

**PROJECT:**

**SUBMITTED BY:**

**PHARMA ENGINEERS**

PLOT NO. 113/A/1, LANE 8, PHASE II,  
IDA CHERLAPALLI, HYDERABAD- 500051.

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## PERFORMANCE QUALIFICATION PROTOCOL APPROVAL

This document is prepared by the documentation team of **M/S. PHARMA ENGINEERS** for

**AHU TAG Number** : \_\_\_\_\_

**PLANT /PROJECT** :

**CLIENT** :

Hence this document before being effective shall be approved by *Client / Customer*

**M/s. PHARMA ENGINEERS:**

	Name	Designation	Signature	Date
Prepared By				
Reviewed By				

**CLIENT / CUSTOMER:**

	Name	Designation	Signature	Date
Reviewed By				
Approved By				

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Equipment: HVAC SYSTEM FOR AHU-01

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## 1. OBJECTIVE

The objective of this document is to qualify and certify the performance of HVAC system (TAG NO) with due considerations as specified in DQ of HVAC System (TAG NO).

## 2. FUNCTIONAL TEST FOR PERFORMANCE - AIRCHANGES

### PURPOSE:

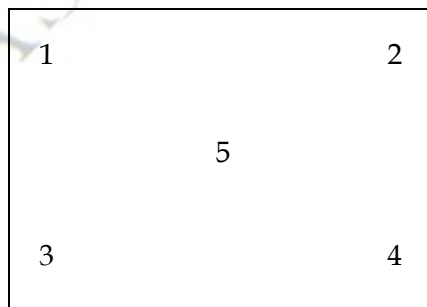
This test is to confirm that the air system is balanced and capable of delivering sufficient air volume to maintain minimum air changes per hour.

### PRE-REQUISITES:

1. Anemometer (or) Air Capture Hood
2. Calibration Certificates of Instrument

### PROCEDURE / TEST METHOD:

1. This test to be performed after preliminary air balancing is completed.
2. Make sure that the fresh air, exhaust air has been adjusted to their requirements.
3. Run the AHU and start measuring the velocity of air from each supply grill/ filter.
4. Reading must be of minimum of five as per the size of grill/ filter.



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5. Enter the velocity readings in the test data sheet and evaluate the number of air changes for every room.
6. In case of AIR CAPTURE HOOD, the same hood will give the total airflow in CFM/CMH.
7. Test Results are enclosed here.



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**ACCEPTANCE CRITERIA:**

AHU must deliver and maintain not less than 20 air changes per hour for ISO-8

However, the acceptance is up to the judgment of experts if any deviation in the readings.

**COMMENTS / DEVIATIONS (IF ANY):**



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### **3. FUNCTIONAL TEST FOR PERFORMANCE - DIFFERENTIAL PRESSURE ACROSS ROOM**

#### **PURPOSE:**

To ensure that Air handling unit is designed to maintain sufficient pressure differentials across the room.

#### **PRE-REQUISITES:**

1. Pressure differentials drawing
2. Manometer for cross verification of gauges.
3. Calibration Certificates of Instruments

#### **PROCEDURE / TEST METHOD:**

1. Before conducting test, make it sure all the Magnehelic gauges are duly calibrated.
2. The connections of the gauge are corrected for low and high pressure.
3. Make it sure that supply air adjustment is over /completed and required air changes are being maintained.
4. Make sure that, all the doors are getting closed properly and door closures are fitted
5. Physically check and confirm the leakages from the door frame and shutter is minimum, if required provide gasket to arrest.
6. Physically check and confirm the leakage from the door bottom is arrested with the help of door seal.
7. Adjust the positive corridor prior to negative room.
8. Restrict the man entry while performing the test to avoid surge effect in the air.
9. Physically check and confirm for any wall cutouts where excess air may bleed. keep the minimum opening required in case of conveyor transfer.
10. Gauge readings are not to be taken while the door is open or during traffic of man.
11. Differential Pressure readings shall be monitored for three consecutive days.
12. Test Results are enclosed here.



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**ACCEPTANCE CRITERIA:**

5 to 10 PA is acceptable between the same class of areas.

10 to 15 PA is acceptable between two different classes of rooms.

However, the acceptance is up to the judgment of experts if any deviation in the readings.

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#### **4. FILTER INTEGRITY TEST**

**PURPOSE:**

This test is to confirm that the terminal filter was installed with proper assembly and to ensure that no leakage of air across the filter gasket and to ensure that terminal filter is with stated rating.

**PRE-REQUISITES:**

1. Gas Generator (Leskin 6 nozzle)
2. Photometer (ATI-2I, ATI-2H & PH -5)
3. PAO (Poly-Alpha olefin) Oil.
4. Compressed air at a pressure of (20 PSI)

**PROCEEDURE / TEST METHOD:**

1. Percentage of leakage between upstream and downstream is to be confirmed across the filter.
2. Cold gas generator is to be selected to generate upstream concentration, for range 20 to 80 micro grams per liter which is equivalent to millions of particles.
3. Arrangements to be made to maintain consist quantity at the upstream side of the filter.
4. Downstream concentration to be measured with the help of photometer
5. The operation of the instrument is to be followed strictly as per the recommendations of the equipment.
6. Downstream concentration will be displayed in terms of the percentage of leakage, compared to upstream concentration.
7. The allowed percentage of leakage must not be more than filter efficiency.
8. This test is to be conducted for every terminal filter and results to be mentioned in the test data sheet.

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9. Care to be taken while conducting the test for selection of oil to generate smoke, which must be non-carcinogenic.
10. During the above test, it's recommended to put off the control system of smoke detection.
11. Test Results are enclosed here.



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**ACCEPTANCE CRITERIA:**

Percentage of leakage must be less compared to filter efficiency.

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## **5. FUNCTIONAL TEST FOR PERFORMANCE - PARTICLE COUNTING**

### **PURPOSE:**

To check the correct functioning of the AHU with respect to filtration efficiency and area cleanliness, by measuring the particle concentration at 0.5 micron.

The result of particle count should comply with DESIGN QUALIFICATION.

### **PRE-REQUISITES:**

1. Particle counter
2. Calibration certificate of particle counter

### **PROCEDURE / TEST METHOD:**

1. Test to be conducted while the room is at rest condition i.e. no man power will be allowed, and equipment's are not in running condition.
2. Test to conduct by trained technical people.
3. Particle counter must be having valid calibration certificate.
4. Particle counter must have minimum of 1.7 Cfm capacity.
5. Number of locations and place of location to be decided before conducting the test.
6. Drawing shall be prepared showing the locations of the particle counting and same drawing is to be attached along with the particle count report.
7. Particle counting must be verified at 0.5 micron and also at 5.0 micron with two different WORKING DATA sheets.
8. Test is to repeat for three consecutive days for appropriate results.
9. Test Results are enclosed here.





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**ACCEPTANCE CRITERIA:**

Particle concentration should comply with ISO-14644-1(2015) standards.  
However, the acceptance is up to the judgment of experts if any deviation in the readings.

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## **6. PERFORMANCE TEST FOR - SYSTEM RECOVERY**

### **PURPOSE:**

To check how much time is required to bring back to normal condition from a worst condition i.e., from peak concentration of particles to normal concentration of particles

### **PRE-REQUISITES:**

1. Particle counter
2. Stop watch

### **PROCEDURE / TEST METHOD:**

1. Manipulate the worst condition, i.e. increase the particle concentration in the room by delivering the smoke in the room/ creating a nuisance.
2. Measure the peak concentration with the help of particle counter
3. Start the particle counter and run it continuously without time interval between the two readings.
4. Observe the particle count on the display of the equipment and stop the counter when the reading on the display gets stabilized to Acceptable condition.
5. Note down the time required to bring back to normal condition.
6. This time is dependent on how well the system is getting mixed and gives an estimate of time required to bring back to normal condition in case of any mal operation.
7. This test to be conducted only in the critical rooms.
8. Test Results are enclosed here.



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**ACCEPTANCE CRITERIA:**

The time required / system recovery time must be less than 15 minutes.

However, the acceptance is up to the judgment of experts if any deviation in the readings.

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## **7. FUNCTIONAL TEST FOR PERFORMANCE - AIR FLOW**

### **PURPOSE:**

To ensure that the movement of air in the clean room is not stagnant and flow is moderately conventional air flow.

### **PRE-REQUISITES:**

1. Smoke Generator
2. Video camera

### **PROCEDURE / TEST METHOD:**

1. This test is to be performed after completion of perfect air balancing.
2. Flow visualization must be checked by generating smoke near the supply grill.
3. Smoke movement to be recorded by video camera and the movement of smoke must be towards return grill, ensuring maximum sweep of the room.
4. This test also, confirms the pressure differentials across the room.
5. Attach the airflow visualization CD as Annexure.

<b>Instrument Used</b>			
Name		Make	
Model		Chemical	
Camera		Make	



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**ACCEPTANCE CRITERIA:**

The flow must be towards return air grill, ensuring maximum sweep of the room.

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## **8. FUNCTIONAL TEST FOR PERFORMANCE - TEMPERATURE & RH ACROSS THE ROOM**

### **PURPOSE:**

To check the correct functioning of the AHU capacity with respect to cooling coil/ heating coil and time required to bring down the temperature from ambient condition:

### **PRE-REQUISITES:**

1. Digital Thermometer/ Analog Thermometer / Data Loggers

### **PROCEDURE / TEST METHOD:**

1. Test to be conducted while the room is at rest condition i.e. no man power will be allowed, and equipment's are not in running condition.
2. Make sure that the chilled water and hot water is working as per the rated parameters.
3. Chilled water must be available at 7 to 8 deg. centigrade and hot water at not less than 50 deg. centigrade near the AHU.
4. Allow the chilled water and hot water to flow and start monitoring the temp and RH inside the room.
5. Observe the temperature and RH & monitor the time required to obtain a stabilized reading.
6. The stabilized reading must be within the range of design parameters.
7. Enter the temperature and RH readings on the working sheet at specified location.
8. Enter the ambient condition of the air for reference.
9. Test to be repeated for three consecutive days to obtain consistent readings.
10. Test Results are enclosed here.



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**ACCEPTANCE CRITERIA:**

Uniform temperature and RH is to be maintained across all the rooms, as per the designed parameters. However, the acceptance is up to the judgment of experts if any deviation in the readings.

**COMMENTS / DEVIATIONS (IF ANY):**



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