PHARMA DEVILS

ENGINEERING DEPARTMENT

STANDARD OPERATING PROCEDURE

Department: Engineering	**SOP No.:**
Title: Checking For Particulate Matter Count	**Effective Date:**
Supersedes: Nil	**Review Date:**
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1.0 PURPOSE

1.1 To define a procedure for the Checking of Particulate matter count.

2.0 SCOPE

2.1 This SOP is applicable for the Checking of Particulate matter count at.

3.0 REFERENCE(S) & ATTACHMENTS

3.1 References

3.1.1 ISO 14644 - 1, ISO 14644 - 2 and ISO 14644 - 3.

3.1.2 HAS (Health Sciences Authority) 2013.

3.1.3 EU GMP Annex 1.

3.1.4 WHO technical report series no. 961, 2011 Annex 5.

3.1.5 WHO technical report series no. 961, 2011 Annex 6.

3.2 Attachments

3.2.1 Nil.

4.0 DEFINITION & ABBREVIATION(S)

4.1 Definitions

4.1.1 **Operational condition**: Agreed condition where the lean room or clean zone is functioning in the specified manner, with equipment operating and with the specified number of personnel present.

4.1.2 **Isokinetic sampling**: Sampling condition in which mean velocity of air entering into the sampling probe inlet is same as the mean velocity of the unidirectional air flow at that location.

4.1.3 **Acceptance criteria**: Measurable terms under which a test results will be considered acceptable.

4.1.4 **At-rest**: Condition where the clean room or clean zone is complete with equipment installed and operating in a manner agreed upon, but with no personnel present.

4.1.5 **Unidirectional airflow**: Controlled airflow through the entire cross-section of a clean room or clean zone with a study velocity and air streams that are considered to be parallel.

4.1.6 **Clean area / Clean room**: An area or Room or Zone with defined environmental control of particulate and microbial contamination, constructed and used in such a way as to reduce the introduction, generation and retention of contaminants within the area.

4.1.7 **Controlled area**: An area within the facility in which specific environmental conditions and procedures are defined, controlled and monitor to prevent degradation or cross contamination of the product.

4.2 Abbreviations

4.2.1 CC : Change Control.

4.2.2 QA : Quality Assurance.

4.2.3 SOP : Standard Operating Procedure.

4.2.4 Sl. No. : Serial No.

4.2.5 UDAF : Unidirectional Airflow.

4.2.6 ISO : International organization for standardization.

4.2.7 AHU : Air Handling Unit.

4.2.8 WHO : World Health Organization.

4.2.9 HVAC : Heating Ventilation and Air Conditioning.

4.2.10 µm : Micrometer.

5.0 RESPONSIBILITY:

5.1 Engineering Person:

5.1.1 To inform quality assurance and concerned department.

5.1.2 To follow the procedure defined in the SOP for the Checking of Particulate matter count.

5.2 Engineering Head:

5.2.1 To ensure that the Checking of Particulate matter count is done according to the procedure defined in the SOP.

5.3 Quality Assurance Head:

5.3.1 To ensure implementation of the defined procedure.

5.4 Plant Head:

5.4.1 To ensure implementation of the defined procedure.

6.0 Distribution:

I. Quality Assurance

II. Engineering

7.0 PROCEDURE:

7.1 Equipment used: Discrete particle counter (DPC) and or Light Scattering particle counter(LSAPC)only for macro particle concentration(Particle size greater than 5 micron) with sampling tube as short as possible (preferably not more than one meter**).**

7.2 Pre checks:

7.2.1 Ensure that the area is cleaned and HVAC / UDAF/ Clean air devices are operational.

7.1.1 Ensure the air borne particle counter is in calibrated state and calibration certificate is available with traceability.

7.1.1 A sampling probe shall be selected to permit Isokinetic sampling in the area.

7.1.2 Non-viable particle count shall be carried out in "At rest" and in "Operational" condition or as per the client requirement.

7.2 Selection of sampling location:

7.2.1 Total sampling locations shall be identified as per the below table.

Number of sample locations required with respect to cleanroom area.

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7.3 All the identified locations shall be located on the room / UDAF / Clean air device diagram.

7.4 All the identified locations shall be evenly distributed Locations for monitoring shall be defined on the risk based approach considering the worst case location which shall consists of the following

Area (m^2) Less than or equal to	**Min number of sample locations**	**Area (m^2) Less than or equal to**	**Min number of sample locations**
2	1	76	15
4	2	104	16
6	3	108	17
8	4	116	18
10	5	148	19
24	6	156	20
28	7	192	21
32	8	232	22
36	9	276	23
52	10	352	24
56	11	436	25
64	12	636	26
68	13	1000	27
72	14	>1000	N = 27X(area of clean room in m^2 / 1000
Note: If considered area falls in between the two values, then greater of the two values shall be selected In case of UDAF or Clean cabinet, the area shall be considered as cross section area of the moving air flow direction.			

but not limited to:

Monitoring locations	Justification
Near the door	**Maximum personnel / material movement**
Farthest point from the supply air	**Chances of dead zone / Improper circulation**
Near the operator working level	**Maximum operator interventions.**
Near the product processing	**Chances of maximum product risk**
Near the corner	**Dead zone formation / improper air circulation**
Near the return riser	**Chances of maximum unclean air**
Geometric center	**To cover maximum room area**

7.5 Selection of sampling volume:

Grade / Clean room class	Sampling volume
A / lSO	**Minimum 1m^3 (1000 liter) per location**
B / ISO	**Minimum 1m^3 (1000 liter) per location**
C / ISO	**Minimum 1 CFM sample per location (sample shall be taken for 1 minute per location irrespective of the particle counter**
D / ISO	

7.6 Monitoring procedure:

7.6.1 Set the particle counter as per desired sampling volume / sampling time and total sampling locations as per the clean room requirements given in the section 7.2.

7.6.2 Place the Non viable particle counter at the predefined monitoring location and start the particle counter.

7.6.3 Set the sampling probe inlet facing into the predominant direction of the air flow (Unidirectional air flow), in case where sampled air flow is not controlled or predominant (non-unidirectional), the inlet of sampling probe shall be directed vertically upward.

7.6.4 Take the printout, check for the acceptance criteria for particle size of 0.5 micro meter and 5.0 micrometer, sign and record the observations in the format provided. Also take a photocopy of the printout and attach with the report.

7.6.5 Calculate the 95% UCL by using formula:

Calculate the overall mean particle count concentration (P) as**:**

$$P = \frac{(X1 + X2 + \ldots\ldots\ldots\ldots\ldots\ldots + Xn}{n}$$

Where: X1, X2 ... are the particle concentration at individual location.

n = Total number of location.

7.7 Handling of outliers:

7.7.1 If OOS count observed at a location due to identified abnormal occurrence, count can be discarded and shall be noted on the test report followed by new sampling at the same location.

7.7.2 If OOS is due to some technical failure (attributed), remedial action shall be taken and Re-testing shall be performed at the same location along with surrounding nearby locations.

7.8 ACCEPTACNE CRITERIA

7.8.1 The clean room or clean zone is deemed to have met the specified air cleanliness classification if the averages of the particle concentrations measured at each of the locations do not exceed the concentration limits (for 0.5 and 5.0 µm) given below:

ISO Class	Maximum permitted number of particles/m^3 equal to or above			
	At Rest		In Operation	
	0.5µm	5 µm	0.5µm	5 µm
5	3,520	20	3 520	20[@]
6	3, 5200	293	352 000	2930
7	352, 000	2 930	3 520 000	29300
8	3, 520, 00	29 300	Not Defined	Not Defined
9[$]	Not Defined	Not Defined	3 520 0000	29 3000

[@]Particle concentration for 5µ is not considered as per ISO 14644-1 (2015) but shall be considered as per EU- Annex -1.

[$]ISO 9 shall be considered in "Operational Condition".

Note:

In case of tests not meeting the acceptance criteria's following actions shall be taken:

Stop further testing activities.

Immediately inform the client representative.

Re-start the testing activities after corrective actions taken by the client as per client's quality management system and get clearance.

7.14 REQUALIFICATION / REVALIDATION PERFORMANCE VERIFICATION

Grade/ Class of Area	Frequency	
	Re-Validation	**Scheduled**
A / ISO 5	In case of any major change / modification in the clean room design OR HVAC / UDAF / Clean air device	Once in every 6 month
B / ISO 6		Once in every 6 month
C / ISO 7		Once in every 6 month OR Once in every year OR based on the Client requirements but not more than one year
D / ISO 8		Once in every year

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8.0 REVISION HISTORY

Version No.	00	Effective Date	
Details of revision: New SOP Prepared			