STANDARD OPERATING PROCEDURE

Department: Engineering			
Title: UV Intensity measurement and calculation of dose			
SOP No.		Revision No.	
Effective Date		Supersedes No.	
Review Date		Page No.	1 of 6

1.0 OBJECTIVE:

The Objective of this SOP is:

1.1 To describe the procedure for checking the Intensity of UV (Ultra Violate) lamps and calculating the dose of UV radiation.

2.0 SCOPE:

2.1 This SOP is applicable for the checking the Intensity of UV (Ultra Violate) lamps and calculating the dose of UV radiation.

3.0 RESPONSIBILITY:

3.1 The Maintenance Engineer shall be:

3.1.1 Responsible for procedure for checking the Intensity of UV lamps and calculating the dose of UV radiation.

4.0 ACCOUNTABILITY:

Head –Engineering Services

5.0 PROCEDURE:

5.1 Check the flow rate of water at the outlet of the plant.

5.2 Switch `OFF' the UV lamps. Remove UV lamps from the Stainless Steel (SS) housing.

5.3 Check the no. Of UV tubes/ housing.

5.4 Check the following dimensions of individual UV tube housing.

5.4.1 Inner diameter (D) of SS housing.

5.4.2 Outlet diameter (d) of quartz tube.

5.4.3 Length (L) of quartz tube and SS housing.

STANDARD OPERATING PROCEDURE

Department: Engineering			
Title: UV Intensity measurement and calculation of dose			
SOP No.		**Revision No.**	
Effective Date		**Supersedes No.**	
Review Date		**Page No.**	2 of 6

5.5 Calculate the volume (V1) of SS housing as per following formula.

$$V1 = \frac{\pi \, (\text{Inner Diameter of SS housing})''}{04} \cdot \text{Length of SS housing}$$

5.6 Calculate the volume (V2) of quartz tube as per following formula.

$$V2 = \frac{\pi \cdot (\text{Outer Diameter of quartz tube})''}{04} \cdot \text{Length of quartz tube}$$

5.7 Calculate the working volume (V) of SS housing as per following formula.

V = Volume of SS housing (V1) – [N x Volume of quartz tube (V2)]

    Where   N= No. of UV Lamps.

5.8 Calculate the resident time by using the following formula.

$$\text{Resident time} = \frac{\text{Working volume of SS housing (V)}}{\text{Flow rate (Liters/Hr.)}}$$

5.9 Check the UV intensity of UV lamps as follows.

    5.9.1 Insert individual UV lamp into the separate SS housing designed for measurement of UV intensity.

    5.10.2 Switch `ON' the lamps and measure the intensity at 5 different points through holes provided in the housing using a UV intensity meter. Record the observation in format.

    5.10.3 Follow the same procedure for each individual lamp

    5.10.4 Calculate the average UV intensity in mw/cm''

5.11 Calculate the dose of UV radiation as per following formula.

    Dose of UV radiation = 1,000 · Average Intensity · Resident time

5.12 Maintain the record of measurement of UV intensity and calculation of Dose of UV radiation in format, once in six months or earlier as and when replacement of UV lamps. (Annexure-1).

5.13 NOTE:

5.13.1 Life of UV lamps having wavelength 253.7 nm (Nanometer) is 6,000 burning hours.

5.13.2 Limit of dose of UV radiation is Not Less Than (NLT) 16,000 ∝w. second /cm'' (Microwatt

	PHARMA DEVILS	
	ENGINEERING DEPARTMENT	

STANDARD OPERATING PROCEDURE

Department: Engineering			
Title: UV Intensity measurement and calculation of dose			
SOP No.		Revision No.	
Effective Date		Supersedes No.	
Review Date		Page No.	3 of 6

per Centimeter square).

6.0 ANNEXURES:

Annexure-I : UV Intensity Checking and Calculation of Doses.

Annexure-II : UV Lamp monitoring record.

7.0 REFERENCES (S):

Nil

8.0 GLOSSARY:

SOP : Standard Operating procedure

No. : Number

SS : Stainless Steel

NLT : Not Less Than

UV : Ultra Violate

STANDARD OPERATING PROCEDURE

Department: Engineering			
TITLE: UV Intensity measurement and calculation of dose			
SOP No.		Revision No.	
Effective Date		Supersedes No.	
Review Date		Page No.	4 of 6

ANNEXURE-I

MEASUREMENT OF INTENSITY OF ULTRA VIOLET LAMPS AND CALCULATION OF DOSE

DATE	
Location / ID No.	
Date of installation / replacement of UV lamps	
No. of UV lamps per housing	
Flow rate (Liters/Hr.)	
Wattage of UV tubes	
Wavelength of Radiation	

1.WORKING VOLUME OF SS HOUSING AND RESIDENT TIME CALCULATIONS:

Inner Diameter of SS Housing in cms. (D)	
Outer Diameter of Quartz Tube in cms. (d)	
Length of the Quartz Tube and SS housing in cms. (L)	

VOLUME OF SS HOUSING $V1 = \dfrac{\pi \times D^2}{4} \times L$	$= \dfrac{\pi \times}{4} \times \quad = \qquad$ Liters.
VOLUME OF QUARTZ TUBE $V2 = \dfrac{\pi \times d^2}{4} \times L$	$= \dfrac{\pi \times}{4} \times \quad = \qquad$ Liters.
WORKING VOLUME OF SS HOUSING $V = V1 - (\text{No. Of UV Lamps} \times V2)$	$=$ $= \qquad$ Liters.
RESIDENT TIME $= \dfrac{60 \times 60 \times V}{\text{Flow rate}}$	$= \qquad = \qquad$ Seconds

STANDARD OPERATING PROCEDURE

Department: Engineering			
TITLE: UV Intensity measurement and calculation of dose			
SOP No.		Revision No.	
Effective Date		Supersedes No.	
Review Date		Page No.	5 of 6

WORKING VOLUME OF SS HOUSING AND RESIDENT TIME CALCULATIONS:

2.0 INTENSITY MEASUREMENTS AND DOSE CALCULATIONS:

Done On _____   **Next Due On** _____

UV TUBE/ LAMP No.	Intensity of UV Lamps measured at various points (mw/cm^2)					
	Point-1	Point-2	Point-3	Point-4	Point-5	Average
Total average:						

Dose of UV radiation = 1,000 × Intensity × Resident Time

                         =

                         =   **µw Second/cm²**

Note: Dose of UV radiation should not be less than 16,000 µw Second/cm².

Frequency of measurement:- The time of installation/replacement and then every   six month.

Measurement and Calculation Done By: _____   **Checked By:** _____

STANDARD OPERATING PROCEDURE

Department: Engineering			
TITLE: UV Intensity measurement and calculation of dose			
SOP No.		**Revision No.**	
Effective Date		**Supersedes No.**	
Review Date		**Page No.**	6 of 6

ANEXURE II

UV LAMP MONITORING RECORD

MONTH	DEPARTMENT	LOCATION

Date	Hour Meter Reading	Signature
Total burning hours:		

Summary Report

Burning hours up to last month		Recommendation	
Burning hours of current month			
Total burning hours			

Checked by: _____

(Department Head)