

SOUTH FORK FIRE RESCUE



According to research a dose of 9540 J/m^2 achieved a $3 \log_{10}$ reduction in Adenovirus and a dose of 19080 J/m^2 achieved a $6 \log_{10}$ reduction in Adenovirus. The Adenovirus was not directly tested for and polymerase chain reaction (PCR) was used to test for the presence of its DNA. The $6 \log_{10}$ reduction was measured by how much whole DNA was present with the PCR test. Because the PCR test may detect both viable and non-viable virus DNA there may be a loss of viability before the loss of detectable DNA by PCR.

The proposed cabinet would have two 13-watt medium pressure UVC bulbs located at the top and bottom of the cabinet and the mask would be suspended between the bulbs with a maximum distance from each bulb being 4 inches. The bulbs convert 40% of the electrical energy to UVC energy

$$13\text{w} * 0.4 = 5.2\text{w}$$

Assuming the bulbs are a point source with a radius of 1 inch the radiant intensity would be:

$$4\pi r^2 = 12.56$$

$$5.2\text{w} / 12.56 = 0.414 \text{ radiant intensity}$$

$$\text{Irradiance} = \text{W/m}^2$$

Mask is 4 inches from UV source 4 inches = 0.1016 meters

$$0.1016^2 = 0.01032$$

$$0.414 \text{ radiant intensity} / 0.01032 = 40.11 \text{ W/m}^2$$

$6 \log_{10}$ reduction of Adenovirus = 19080 J/m^2

1 Watt = 1 Joule per second

$$19080 \text{ J/m}^2 / 40.11 \text{ W/m}^2 = 475.69 \text{ seconds}$$

20% safety factor $475.69 * 1.2 = 570.8 \text{ seconds} = 9.5 \text{ minutes}$

30 second bulb warm up time

10 min cook time for 6 log reduction, 5.7 min for 3 log reduction

