

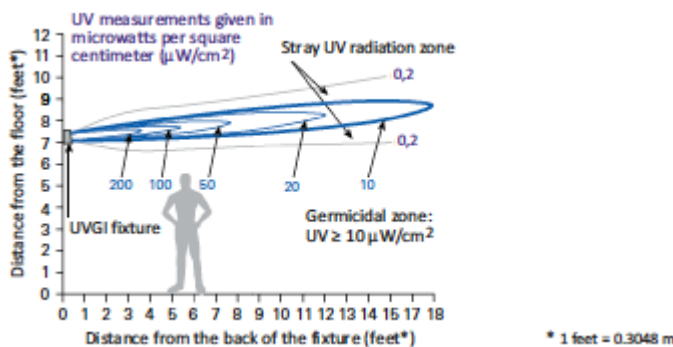
Mechanism of Operation for Upper Room Ultraviolet Germicidal Irradiation (UVGI) Systems

The use of UVGI in the upper part of rooms can be effective in killing or inactivating various pathogens generated by infected persons

Mechanism of action

UV lamps are installed into fixtures suspended from a ceiling or mounted on a wall. Fixtures are shielded with louvers or bafflers in order to block radiation below the horizontal plane of the fixtures. UV lights create in the upper portion of the room a germicidal zone where the viruses and bacilli are killed (Figure 1). Patients in the lower portion of the room are not exposed to UVGI lights. Good air mixing is needed to transport the air (and thereby the pathogens) to the upper portion of the room. Disinfection is achieved through the rapid dilution of contaminated lower room air with clean irradiated upper room air.

Figure 1

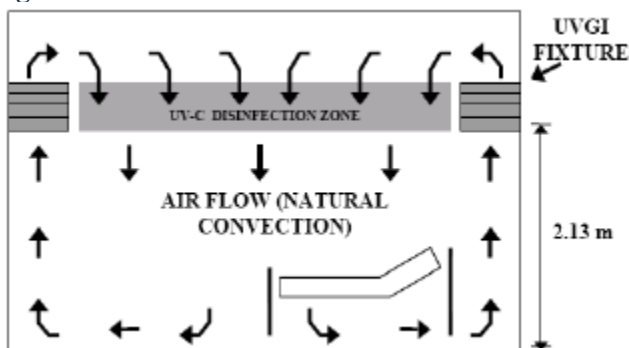


From the WHO, Implementing the WHO Policy on TB Infection Control in Health-Care Facilities, Congregate Settings and Households

The lamps should irradiate the entire surface of the upper part of the room (Figure 2), in order to disinfect the largest possible volume of air mixed at a low speed between the upper and lower part of the room.

UVGI Upper-room Irradiation

Figure 2



From Guidelines for the Utilization of Ultraviolet Germicidal Irradiation technology in controlling transmission of tuberculosis in health care facilities in South Africa



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Several factors influence the efficiency of UVGI systems:

- Ventilation rate: in controlled environment, at rates up to 6 air change per hour (ACH), UVGI systems increase the effect of air cleaning to > 12 ACH. But when ventilation rates are increased above 6 ACH, UVGI system effectiveness could be reduced because the time for bacteria irradiation is shorter.
- Effective mixing within the room may be provided by natural convection currents or fans, preferably, ceiling ones. Low velocity ceiling fans boosted UVGI system's effectiveness up to 33% when ACH was below 6.
- Relative humidity: studies have reported rapidly decreasing air cleaning effectiveness in UVGI systems when the relative humidity goes above 70%.
- Installation: the height of the room should be minimum 2.5 m and UVGI fixtures should be installed at the minimum height of 2.1 m. As a thumb rule, a 30W lamp should be sufficient for 18 m² of surface, but room shape and type of fixture should be taken into consideration when calculating the needs. For instance, wall-mounted lamps would have a smaller germicidal area than ceiling-mounted ones. Lamps should be on whenever there is a risk of TB transmission. For example, in rooms with hospitalized patients, the lamps should be turned on 24 hours a day.



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