



## Hazard Alert for Upper Room Ultraviolet Germicidal Lamps

FACT SHEET 24-016-0316

**Introduction:** Since the 1930s, upper room ultraviolet (UV) germicidal lamps have been used to help prevent the spread of contagious diseases.

These lamps emit high levels of short wavelength UV radiation in a plane, angled slightly upward. Ceiling fans draw airborne viruses and bacteria into the emission plane, where they are disinfected. These lamps have been used in hospitals, Army barracks; homeless shelters, classrooms, cafeterias, and prisons. A sample is shown in Figure 1.

Proper installation is the key to the safe use of these lamps. People can work safely in the lower rooms even though the UV radiation in the upper room is a significant hazard.

The warning labels on these lamps are not always easy to see at a glance, as shown in Figure 1, and are sometimes overlooked. More prominent labels and warning signs protect those who install and maintain the lamps, and reassure bystanders against needless worry. Figure 2 shows the lamp from Figure 1 with updated warning signs and labels.

**What is UV radiation?** UV radiation, like visible light, is a type of electromagnetic radiation. UV radiation is present in sunlight, in mercury vapor lamps, in welding and cutting arcs, in tanning lamps, and other types of lamps.

**How is the UV radiation in germicidal lamps different from the UV radiation in sunlight?** The solar UV radiation that reaches the Earth is mainly in the UV-A and UV-B range (UV-A: 315 nm – 400 nm, UV-B: 280 nm – 315 nm). UV germicidal lamps emit mainly at 254 nm in the UV-C range (UV-C: 100 nm – 280 nm), which is not visible, and also some visible blue and violet light. The most widely used upper room UV germicidal lamps are “ozone free” low pressure mercury vapor lamps.

**What is the hazard from the UV radiation in germicidal lamps?** The UV-C radiation from germicidal lamps can cause a corneal swelling (i.e., photokeratitis, also known as “welder’s flash”). The feeling can range from a minor “foreign body” sensation to significant pain.



**Figure 1.** Upper room UV germicidal lamp. The arrows and circles highlight the lamp’s UV safety warnings, which may be overlooked even by those who install and maintain the lamps.



**Figure 2.** The UV germicidal lamp from Figure 1 is shown with more prominent safety warnings. The sign posted below states when APHC’s Nonionizing Radiation Program (NRP) evaluated the room’s UV safety and confirmed that the lower room was safe for normal work activity. It also cautions workers to turn the lamp off before climbing up to the level of the emission plane.

*Photos in Figures 1 and 2 courtesy of APHC Nonionizing Radiation Program.*

It may also cause skin erythema, more commonly known as “sunburn.” Though painful, these symptoms are usually gone within 24-48 hours with no lasting effects afterward.

Safety limits can be exceeded with even a brief exposure. The fact that many UV germicidal lamps look like common fluorescent lamps, and are usually not visibly bright, tends to lull workers into complacency and increase the risk for injury. Again, the hazardous UV radiation is not visible.

**Can UV-C radiation increase my long-term risk for skin cancer or cataract?** In theory? Yes. But is it a realistic risk compared to the UV radiation from sunlight? No.

UV-C radiation is considered a cancer risk for the same reasons that it is an effective germicidal agent. But, UV-C radiation doesn’t penetrate the skin and eye tissues nearly as deeply as the UV-A and UV-B radiation in sunlight. Solar UV radiation is a source of much greater risk, and people are exposed to sunlight daily.

The International Agency for Research on Cancer and the International Commission on Illumination both maintain that the main source of UV-related risk for skin cancer and cataract is exposure to outdoor sunlight.

### **What control measures are recommended?**

Engineering controls. Workers installing and maintaining upper room UV germicidal lamps shall:

- (1) Ensure that only “ozone free” UV lamps are used.
- (2) Install the fixtures no less than 7 ft. above the floor.
- (3) Install the fixtures on separate circuits from the common lighting fixtures.
- (4) If practical, install on/off switches in another location than the on/off switches for general room lighting.
- (5) Label the on/off switches and incorporate a light switch guard to prevent accidental use. If necessary, use keyed switches.
- (6) Add prominent labels to the fixtures with the following warnings that can be easily read at a distance:
  - (a) CAUTION – UV HAZARD
  - (b) AVOID EMISSION PLANE
  - (c) TURN OFF BEFORE SERVICING.
- (7) Dispose of UV germicidal lamps in the same manner as workplace fluorescent lamps.

Administrative controls shall include:

- (1) Acceptance survey. Contact the APHC’s NRP to evaluate the UV safety of the room before the first general use of the germicidal lamps, and whenever the lamp system or upper room design is modified.
- (2) Standing operating procedures (SOPs). Develop SOPs that explain the hazards, outline the control measures, and provide methods to report accidents or defective equipment. Ensure that the SOP instructs workers to deactivate the lamp before any worker ascends into the area of the emission plane (e.g., for maintenance work, painting, lamp inspection or replacement).
- (3) Education and training. All persons who install and work in the vicinity of the lamps should be informed regarding the hazard and trained in the SOPs.

Personal protective equipment shall be used when exposures cannot be avoided:

- (1) To protect the eyes, use UV-protective face shields or wraparound goggles. Protective eyewear using common plastics and glass will provide adequate protection.
- (2) To protect the skin, use face shields, gloves (e.g., work gloves, nitrile gloves), and clothing with tightly-woven fabrics.

**Where can I get additional information, or report a suspected overexposure?** In the event of a known or suspected overexposure, contact the following as soon as possible after getting the accident victim immediate medical attention:

- (1) Your installation radiation safety officer.
- (2) The Army’s Nonionizing Radiation Program at DSN 584-3932; commercial (410) 436-3932.
- (3) The Army’s Tri-Service Vision Conservation and Readiness Program at DSN 584-2714; commercial (410) 436-2714.