

Date: Fri, 03 Nov 2000 11:09:00 -0700  
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Subject: Yellow Alert: Employee's Eyes Burned by Ultraviolet Lamp

**Title: Yellow Alert- Employee's Eyes Burned by Ultraviolet Lamp**

Identifier: 2000-LA-LANL-ESH7-0010 Date: 11/03/2000

**LESSONS LEARNED:** After a technician injured his eyes by looking directly at an ultraviolet (UV) lamp, facility personnel realized that the hazard controls developed for lamp operations were overlooked during non-operational installation and maintenance activities. Additionally, workers did not appear to clearly understand the hazard posed by the UV lamp or recognize the symptoms of UV exposure, which in severe cases can result in blindness. DOE sites that use UV lamps should evaluate their current hazard controls to ensure that they are adequate for all types of work that could expose personnel to UV energy.

**DISCUSSION:** While a technician was making final adjustments on a power supply for a new low-pressure mercury arc lamp that was to be used as a UV radiation source, a second technician entered the laboratory to discuss the assembly he had fabricated to mount the UV lamp in a vacuum chamber. The second technician removed the cover from the energized lamp to inspect the assembly, exposing his unprotected eyes to UV radiation. The first technician, who was wearing protective eyeglasses while he observed the UV lamp through an opening in an opaque barrier, quickly instructed the second technician to replace the cover. The second technician was exposed to the UV lamp for 5 to 10 seconds at a distance of 24 inches. Although the second technician felt no ill effects immediate after the exposure, he began experiencing extreme discomfort later in the evening and went to the local emergency room very early the next morning. The technician was diagnosed with ocular photokeratitis (welder's burn). He missed one day of work while his eyes healed but was then able to return to work without any restrictions. UV-induced photokeratitis symptoms may not appear for up to 12 hours following exposure. Typically, the injured person will then develop conjunctivitis and experience a burning sensation around their eyelids. The injured person may also become light sensitive and experience a sandy feeling in their eyes. These acute symptoms last from 6 to 24 hours with nearly all discomfort disappearing within 48 hours. Eyes, unlike skin, do not develop tolerance to repeated UV exposure. Prolonged unprotected exposure to UV radiation can result in blindness, burns, and various forms of skin cancer.

**ANALYSIS:** Facility personnel concluded that although the UV exposure hazard was recognized and controlled (barriers, interlocks, signs, safety glasses, etc.) when the UV lamp is installed in the vacuum chamber, these same barriers were not used during modification and maintenance of the system. Although workers may understand the hazards associated with UV radiation from welding activities and take precautions to protect themselves against directly viewing a welding operation, they may not recognize the same hazard in a UV lamp or bulb. The manufacturer of the UV lamp provided little warning about the hazards of improperly handling and using the UV lamp because they assumed that anyone ordering a UV source would be aware of the proper handling and safe utilization of the product. Some of the factors that affect exposure are ultraviolet spectral region (wavelength), distance from source, type of source

(broad-band, narrow-band, or monochromatic), source intensity (joules/square centimeter), altitude; period of exposure, and reflected vs. direct exposure. Certain prescription drugs may also effect the tolerance of an individual worker to UV radiation. Because the hazard of overexposure to UV energy is so difficult to quantify, all UV sources should be considered dangerous.

**RECOMMENDATIONS:** To protect workers, the hazard control plan for the UV source vacuum chamber was modified to include the UV exposure controls for modification and maintenance activities. Other DOE sites that use UV lamps should evaluate their current hazard controls to ensure that they are adequate for all types of work that could expose personnel to UV energy. The Laboratory also recommends that each employee who may be exposed to high-intensity artificial sources of UV energy be apprised of all hazards, relevant symptoms, and precautions concerning exposure. Additionally, all UV radiation sources, work areas, and housings or chambers shall carry the following warning: CAUTION - HIGH INTENSITY ULTRAVIOLET ENERGY - PROTECT EYES AND SKIN.

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**DOE FUNCTIONAL CATEGORY:** Industrial Safety  
**WORK ACTIVITY:** Inspection and Testing  
**HAZARDS:** UV energy  
**KEYWORDS:** UV, burns, photokeratitis  
**REFERENCES:** Nonproliferation and International Security Division  
Ultraviolet Energy Lessons Learned

**FOLLOW-UP ACTIONS:** Information in this report is accurate to the best of our knowledge. As a means of measuring the effectiveness of this report, please contact the originator of significant action(s) taken as a result of this report or of any technical inaccuracies you find. Your feedback is appreciated.