

# UVR

UV RESOURCES

## Why Encapsulate UV-C Lamps?



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## UV-C Lamps

Modern UV-C lamps are similar to the fluorescent lamps typically found in ceiling fixtures. Both types of lamps are manufactured on fluorescent lamp machines in, essentially, the same lengths and diameters. Both lamps operate using an identical electrochemical processes: an electric discharge through argon gas strikes mercury vapor to generate a photon with a wavelength of 253.7 nm (typically called UV-C), which is invisible.

UV-C lamps differ slightly from their fluorescent counterparts in that the UV-C lamp's glass envelope is a highly engineered, UV-C transparent material (quartz or "soft glass"). This "glass" allows the 253.7 nm wavelength to transmit through the lamp envelope unfiltered. Fluorescent lamps, however, use ordinary glass that is coated with phosphors on its interior surface. The UV-C energy is contained to excite the phosphors to glow (fluoresce) in the visible light range.

### Protection Against Lamp Breakage

Fluorescent lamps became widely-used in multiple applications in the late 1930s and it was not long before testing was begun to find a way to protect against lamp breakage. Results of that testing for fluorescent lamps, including plastic sleeves, are still employed today and are commonly found in "big box" stores such as Home Depot, Lowes, etc.

Protecting against lamp breakage in food preparation was not only a key focus, but it became mandated. According to the FDA: "...light bulbs shall be shielded, coated, or otherwise shatter-resistant in areas where there is exposed food; clean equipment, utensils, and linens; or unwrapped single-service and single-use articles."

The use of ultraviolet disinfection, has a broad range

of applications and has seen strong growth in heating, ventilation, air conditioning and refrigeration (HVACR) systems in markets such as healthcare, pharmaceutical, food preparation/production and commercial buildings. Because UV-C lamps are fragile in nature and with ASHRAE's recommendation to shut down HVAC systems for 15 minutes should a lamp break occur (see side bar), there has been a growing interest to protect against the breakage of lamps in their HVACR equipment by building owners and managers.

However the common strategies used for fluorescent lamp, primarily plastic sleeves, won't work for UV-C lamps. The material that is used to protect fluorescent lamps blocks UV-C energy transmission.

For this reason, UV Resources offers EncapsuLamp™ technology. EncapsuLamp is a FEP encapsulation material that is a synthetic fluorinated ethylene propylene and its molecular structure is such that, like quartz and soft-glass, it allows the UV-C wavelength of 253.7 nanometers to pass through it. The UVR product and process allows for the FEP to be applied to the lamp creating an envelope that encapsulates the lamp and, in the process, adds to the lamp's overall strength.

The finished FEP encapsulation contains and, therefore, isolates lamp residues of glass, mercury, and other contaminants when lamp breakage occurs. This containment, along with the elimination of quartz glasses susceptibility to fingerprints, allows UV-C lamps to be used in critical applications where mercury may be a concern.

An additional benefit of the EncapsuLamp is its ability to insulate the lamp surface from air volume and temperature changes. This provides increased lamp output and performance in extreme operating conditions of low or high temperatures, and where high airflow velocities exist.

For more information on this and other technical information please visit the UV Resources website or contact your local UV Resources Distributor.

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*If a lamp breaks, all workers must exit the HVAC equipment area. Panels or doors should be left open and any additional lamp chamber access points should also be opened. Do not turn air-handling unit fans back on. After a period of 15 minutes, workers may reenter the HVAC equipment to begin bulb clean-up.*

*If a lamp breaks in a worker's hand, the worker should not exit the HVAC equipment with the broken bulb. Carefully set the broken bulb down, and exit the space. When possible, try not to set the broken lamp in any standing condensate water. Follow standard ventilation and reentry procedures.*

*Cleanup requires special care because mercury drop proliferation, and should be performed by trained workers. As a minimum, workers should wear cut-resistant gloves, as well as safety glasses to protect eyes from glass fragments. Large bulb pieces should be carefully picked up and placed in an impervious bag. HEPA-vacuum the remaining particles, or use other means to avoid dust generation. (Emphasis added)*

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2011/2015 ASHRAE Handbook – HVAC Applications 60.14

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