

TYPES OF LAMPS

GERMICIDAL LAMPS: Constructed from high-purity quartz or sodium-barium silicate glass for maximum UV-C transmittance at 253.7 nm, effectively disrupting microbial DNA.

FLUORESCENT LAMPS: Limited germicidal application due to phosphor coatings and impure glass, reducing UV-C output efficiency.

AMALGAM LAMPS: Advanced design for consistent UV-C output across variable temperatures, ideal for high-demand HVAC systems.

HOT CATHODE LAMPS: Feature tungsten filaments that heat to release electrons, igniting the mercury.

COLD CATHODE LAMPS: Unheated electrodes for lower power consumption, extended lifespan in smaller or intermittent applications.

UV-C

- Germicidal Lamps
- Disrupts DNA to inactivate microorganisms
- Mostly blocked by atmosphere

UV-B

- Fluorescence & Black Lights
- Limited sterilization potential
- Large amounts in natural daylight

UV-A

VISIBLE SPECTRUM

- Visible light from natural and artificial light sources
- Allows us to see everyday objects
- No germicidal

200 NM

300 NM

400 NM

500 NM

SHORTER WAVELENGTHS - HIGHER ENERGY

LONGER WAVELENGTHS - LOWER ENERGY

UV-C BAND (UVGI)

The UV Light Spectrum

- 1nm = 1/1000 micron
- **UV-A** (315nm - 400nm) - Black lights and Sun tanning lamps, harmful to eyes
- **UV-B** (280nm - 315nm) Causes sunburn and Skin cancer
- **UV-C** (200nm - 280nm) Germicidal & Degrades Structures
- Sun irradiates all 3, but only UV-A and UV-B make It through the earth's atmosphere. UV-C is filtered out
- The UV-C band width is invisible- the color seen in a UV-C lamp is "visible light" not UV-C.

Issues When Exposed to UV-C

- UV-C, while not causing "permanent" damage in small doses can cause **temporary corneal discomfort**
- The cornea is like the skin in that it can be "sunburned" by exposure to too much UV radiation. This is called keratoconjunctivitis (snow blindness or welders flash)
- This condition usually **does not present until 6 to 12 hours following the UV exposure**
- Although very painful (often described as having sand in the eyes) this condition is usually temporary (a few days) because the corneal cells will grow back
- UV radiation is a known carcinogen for human skin
- Because the biological effects are dependent on the time of exposure and the susceptibility of the individual exposed, it is considered prudent to prevent unnecessary skin exposure to UV sources

Exposure Limits

Ultraviolet Radiation Guide

Published by
Navy Environmental Health Center
2510 Walmer Avenue
Norfolk, Virginia 23513-2617

April 1992

Wavelength (nm)	J m ⁻²	mJ cm ⁻²	Relative Spectral Effectiveness (S _λ)
240	1.0 10 ²	1.0 10 ¹	0.300
245	8.3 10 ¹	8.3	0.360
250	7.0 10 ¹	7.0 10 ¹	0.430
254*	6.0 10 ¹	6.0 10 ¹	0.500
255	5.8 10 ¹	5.8 10 ¹	0.520
260	4.6 10 ¹	4.6 10 ¹	0.650
265	3.7 10 ¹	3.7 10 ¹	0.810
270	3.0 10 ¹	3.0 10 ¹	1.000

*Emission lines of a mercury discharge spectrum

The limiting value of 3.0 mJ cm⁻² (30 J m⁻²) is based on 270 nm wavelength, where the eye appears to show the maximum sensitivity for acute effects on the cornea. A safety factor of 1.5 to 2 is applied for acute photokeratitis.

Duration of Exposure Per Day	Effective Irradiance E _{eff} (uW cm ⁻²)**	Effective Irradiance E _{eff} (254uW cm ⁻²)***
8 hours	0.1	0.2
4 hours	0.2	0.4
2 hours	0.4	0.8
1 hour	0.8	1.6
30 minutes	1.7	3.4
15 minutes	3.3	6.6
10 minutes	5	10
5 minutes	10	20
1 minutes	50	100
30 seconds	100	200
10 seconds	300	600
1 second	3,000	6,000
0.5 second	6,000	12,000
0.1 second	30,000	60,000

**Source: "Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices", the American Conference of Governmental Industrial Hygienists (ACGIH), 1991, reproduced with permission.

***Calculated based on the TLV at 254nm.

SAFETY CONSIDERATIONS

ENGINEERING CONTROLS

All access panels or doors to the UV-C lamp installations, and panels or doors to adjacent AHU sections where UV radiation may penetrate or be reflected should have warning labels posted.



WARNING



UV LIGHT HAZARD: EYE & SKIN DAMAGE MAY RESULT FROM DIRECT EXPOSURE TO THE LIGHT PRODUCED BY THESE LAMPS. NEVER LOOK AT LAMPS WHILE THEY ARE ON, LIT OR ILLUMINATED. TO ELIMINATE ALL EXPOSURE TO UV-C LIGHT, TURN OFF ALL SWITCHES AND DISCONNECT POWER TO ALL UV-C DEVICES BEFORE SERVICING.

UV-C INSTALLATION DATE: _____

UV-C LAMPS SHOULD BE REPLACED ANNUALLY: CALL 877-884-4822 or CONTACT YOUR LOCAL REP.

REPLACEMENT SCHEDULE: USE PERMANENT MARKER

DATE: _____

DATE: _____

DATE: _____

DATE: _____

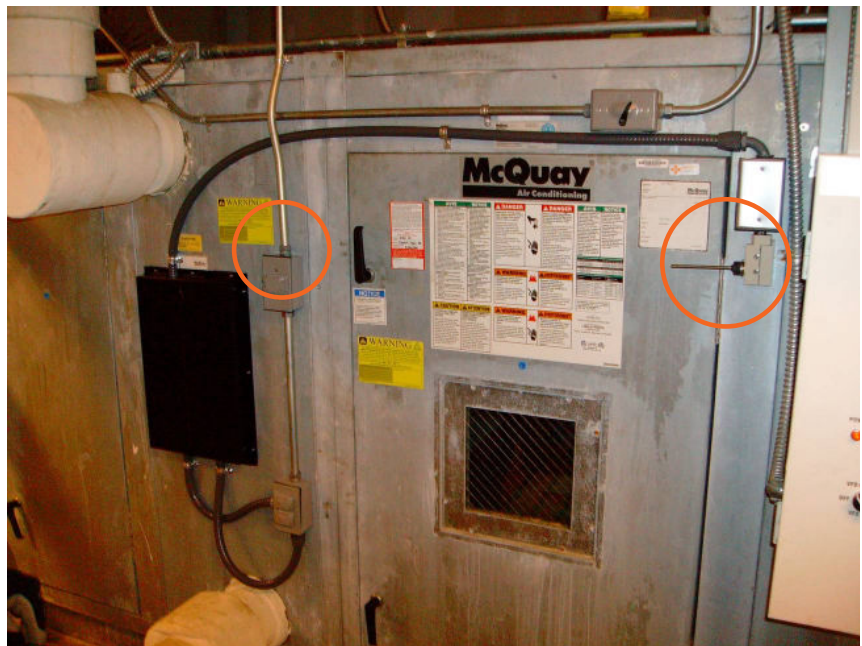
customerservice@uvresources.com
techsupport@uvresources.com



VALENCIA, CA 91355 877-884-4822
UVRESOURCES.COM

90007603 E

Lamp sections of an AHU should have **electrical disconnect devices**.



Switches should be wired in series so that opening any access de-energizes the system.



SAFETY CONSIDERATIONS

HOW TO VIEW A UV-C SYSTEM

UVR[x] view ports is the safest way to view UV-C.

Note: We recommend that UV-C safety glasses are worn prior to looking through the view port if you are unfamiliar with the view port manufacture.



**AVOID ENTERING A PLENUM
WITH THE UV-C LAMPS ON!
IF YOU HAVE TO WEAR PPE!**

PERSONAL PROTECTIVE EQUIPMENT (PPE) SHOULD ALWAYS BE USED:

- UV safety goggles
- UV face shields
- Long-sleeved, tightly-woven clothing that covers much of the body, and gloves

PLEASE BE AWARE:

1. UV-C exposure can damage eyes and can burn the skin
2. Access doors to plenums where UV-C is present should have an interlock safety switch & a toggle switch
 - Never override the safety switch
 - UVR[X] View ports can be used to view UV-C lamps
3. Do not ignore WARNING labels
4. Put lamps on re-lamp schedule to properly maintain the system



SYSTEM MAINTENANCE

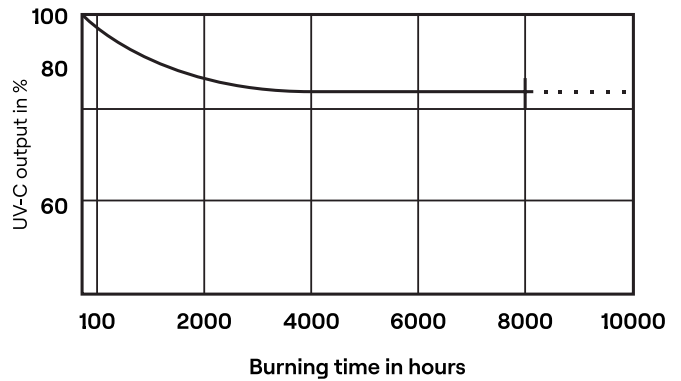
ANNUAL LAMP REPLACEMENT

Lamps are rated for 8760 hours (1 year)

Recommend lamps be replaced annually to ensure desired performance and to protect against equipment failure



Maintenance: Relation Between UV-C Output and Burning Time

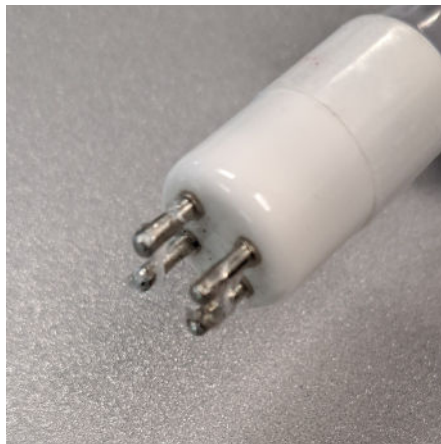


RE-LAMP

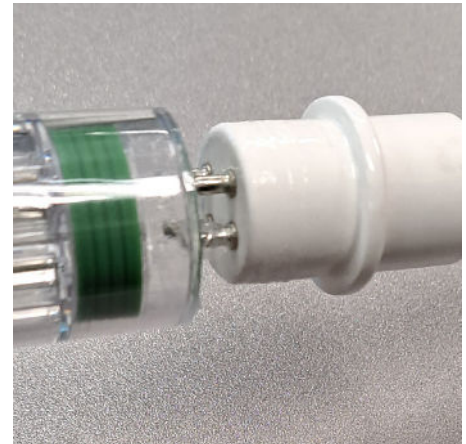
Make sure to add di-electric grease to pins, connector and fixture to the seat lamp properly



IP67 Connector



4 Pin Lamp Configurations



Gently insert lamp into connector

Special Notes:

- Use the same amount of grease for double-ended lamp pins and fixture
- Grease should only be applied to the lamp pins or the sockets, not the silicone gaskets in the IP67 connector.