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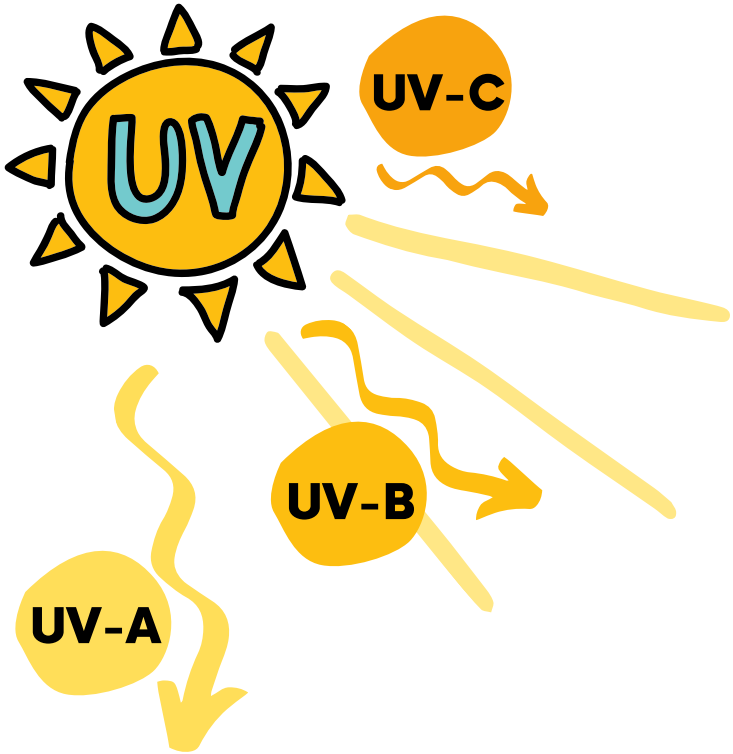
UV-C Disinfection Lamps

What you need to know

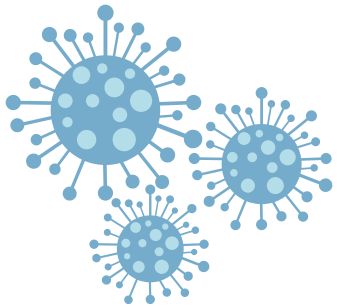


What is UV radiation?

Ultra violet radiation (UV) is a range of electromagnetic radiation with a wavelength immediately below the light visible by the human eye and immediately above that of X-rays. The most common source of UV radiation is sunlight producing three main types of UV rays: UV-A, UV-B, and UV-C.

UV-A rays have the longest wavelengths and it accounts for 95% of the UV radiation that reaches the earth. It is followed by UV-B, which is known to be the cause of sunburn.

UV-C radiation is the shortest of all UV rays and does not reach the earth's atmosphere. The UV-C used for disinfection is produced from artificial sources like lamps and/or equipment designed to provide UV-C radiation.



UV-C Disinfection Against COVID-19

According to the *Lighting Europe Position Paper on the Benefits of Using UV-C Disinfection to Combat COVID-19*, UV-C disinfection technology has been proven to be an effective tool in combating micro-organisms and viruses, including SaRS-CoV-2.

The position paper further states that UV-C is an established technology for disinfection, and has been applied extensively since 1910 when it was found to be an effective tool in preventing the spread of disease.

Today, UV-C is used to disinfect water, air, and surfaces in industrial, commercial, medical, public and residential environments.

How it works?

UV-C inactivates viruses and microorganisms such as bacteria, molds, spore, fungi and yeasts, by destroying their DNA/RNA. Recent studies confirm that UV-C light is effective in inactivating and inhibiting the SARS-CoV-2 virus. *(Bianco et al, 2020, as cited in the Lighting Europe Position Paper)*

Disinfecting Surfaces

UV-C lamps SHOULD NOT be used to disinfect your hands or any other part of your skin.

Look for technical specifications of the UV-C device and the specifications on how and how long you should use it to maximize its efficiency in disinfection.

According to the *Illuminating Engineering Society's Committee Report on GUV*, UV dose should correspond with exposure time. Meaning, waving a UV-C device over an object for one (1) second will not provide reliable disinfection.

Recommended exposures vary from 200 to 1,000 J/m2 (20 to 100 mJ/cm2 or as prescribed in CIE 155 (International Commission on Illumination).

UV-C Irradiance Hazards

Adverse Effects

UV radiation can damage your eyes and your skin.

The user may not immediately realize the danger since the onset of symptoms will appear in 4 to 24 hours.

The Philippine Dermatological Society (PDS) strongly advises not to look at the UV light or expose the skin from the UV side AT ANY DISTANCE.

Minimizing risk of exposure

- Follow UV-C warning labels, installation instructions, and operating manuals.
- Restrict access in areas being irradiated. Do not let people loiter around in these areas.
- Consider posting warning signs to areas being irradiated.
- Make sure that the UV-C devices are turned off before working or entering the irradiated area.

Use of PPE

Proper personal protective equipment (PPE) should be put on by the operator of the UV-C lamp while in the area being irradiated.

Goggles and Face Shield

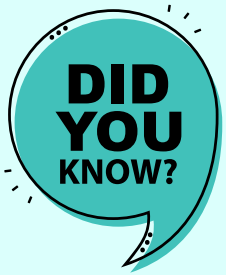
Goggles with UV protection should be used all the time and a face shield can be used to protect the whole face as sunburn reactions may occur while using the UV-C device.

Gloves

Nitrile, latex, or tightly woven fabric gloves are recommended to be used, as the transmission of UV light through these materials is low compared to vinyl gloves.

Isolation gown

Operator should wear long sleeves and high neck gown made with tightly woven fabric to prevent burns on wrist and neck.

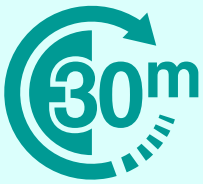


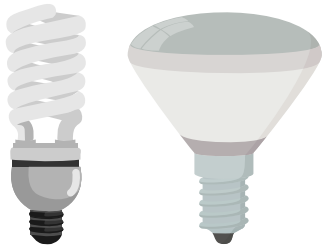
One of the UV-C irradiance hazards is the production of ozone.

- Ozone is a known human toxin and is harmful to breathe in, as it can reduce lung function and harm lung tissue.

- It can be produced in air due to exposure to optical radiation at wavelengths below 240 nanometers (nm).

- As cited by the PDS in their published guidelines on UV disinfection, it is recommended to allow 30 minutes of ventilation after irradiation before entering the treated area to get rid of the smell of ozone.





Testing

Although UV-C lamps may seem like a typical lighting fixture like CFLs and LEDs, which the DOE performs tests upon, these types of lamps are not regulated by the Department of Energy.

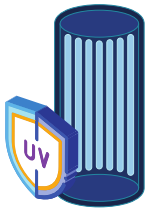
Standards

The Department of Trade and Industry (DTI) adopted and approved as Philippine National Standards (PNS) the following standards of the International Organization for Standardization (ISO) to promote common understanding among the UV-C system and devices industry and the stakeholders:

- **PNS ISO 15727:2020 UV-C Devices**
  Measurement of the output of a UV-C lamp (ISO published 2020) ICS 91.140.30

- **PNS ISO 15858:2020 UV-C Devices**
  Safety information — Permissible human exposure (ISO published 2016) ICS 91.140.30

According to DTI, the urgent need to adopt the Standards as PNS was identified to help address the outbreak of COVID 19 in the Philippines.



References:

- LightingEurope Position Paper on the benefits of using UV-C disinfection to combat COVID-19
- Global Lighting Association, Germicidal UV-C Irradiation: Sources, Products and Applications
- Illuminating Engineering Society. IES CR-2-20-V1, IES Committee Report: Germicidal Ultraviolet (GUV) – Frequently Asked Questions
- PH Department of Trade and Industry (DTI)
- Philippine Dermatological Society (PDS)
- US Food and Drug Administration, UV Radiation
- US Environmental Protection Agency