

UV-C Science & Safety Explainer

How 275 nm germicidal UV-C inactivates airborne viruses, bacteria, mold, and fungal spores — and why a sealed-chamber light fixture can treat room air with people present.

What 275 nm UV-C does to pathogens

- UV-C photons are absorbed by nucleic acids and break the bonds a pathogen needs to replicate
- A virus that cannot replicate cannot cause infection — researchers call this inactivation
- Applies to airborne viruses (including SARS-CoV-2 and influenza), bacteria, mold, and fungal spores
- Required dose varies by organism; hardy fungal spores need the most

Why dose, not wattage, decides effectiveness

- Inactivation = intensity x exposure time
- An open UV source in a large room delivers a small dose to any given parcel of air
- A narrow sealed chamber delivers a large dose to every parcel that passes through it
- Fans hold air in the beam path, so performance does not depend on where occupants stand

Why a sealed chamber is safe in an occupied room

- Direct UV-C exposure is hazardous to skin and eyes — which is why the source is enclosed
- No germicidal light leaves the housing; only treated air does
- Operation is continuous, 24/7, with the room in use
- Contrast with UV robots, which require the room to be cleared for each cycle

Air changes per hour, in plain language

- ACH = how many times per hour a room's full air volume is treated
- Design target: 4-6 ACH, i.e. the full volume roughly every 10-15 minutes
- Planning rule of thumb: about one fixture per 100 sq ft, adjusted for occupancy and ceiling height
- Air that never enters the chamber is never treated, so fixture count and placement matter

Comparison: air-cleaning approaches

- Sealed-chamber UV-C fixture: room-level, occupied-safe, no consumables, retrofits the lighting grid
- Portable HEPA: captures particles; floor space, noise, recurring filter changes
- In-duct UV: treats only air reaching the air handler, not air recirculating in the room
- Upper-room UVGI: open field above head height; needs aiming, shielding, and commissioning
- UV robot: high-intensity surface treatment, empty room only, staff time per room

What UV-C air treatment does not do

- It does not replace ventilation, filtration, masking policy, or vaccination
- It does not disinfect surfaces
- It does not produce an infection-rate figure you can quote without measuring your own facility