

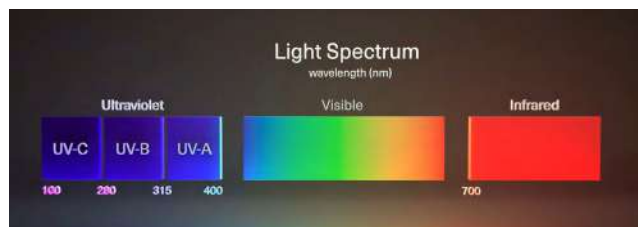


AIR CLEANING

WITH UV TECHNOLOGY

1 What is air cleaning using UV light disinfection* technology?

UV light disinfection technology is a method of incorporating ultraviolet UVC wavelengths into light fixtures to inactivate pathogens¹. Pathogens that can be inactivated may include both viruses and bacteria. Reduction of the level of pathogens can be achieved both in the air and on surfaces depending on the type of technology.



2 What does UV light disinfection technology target in a space?

UV light disinfection technology from Acuity Brands can target pathogens¹ on both surfaces and air. Care222[®] technology targets surfaces and air. EvolAIR UV[™] with UV Angel Clean Air[™] technology treats the air. Studies² show that when EvolAIR UV fixtures treat the air in a space, both pathogens¹ in the air and on surfaces are affected. While not for use in occupied space, PulseX[™] with Violet Defense[®] technology treats pathogens on surfaces and will also treat the air during a treatment cycle.

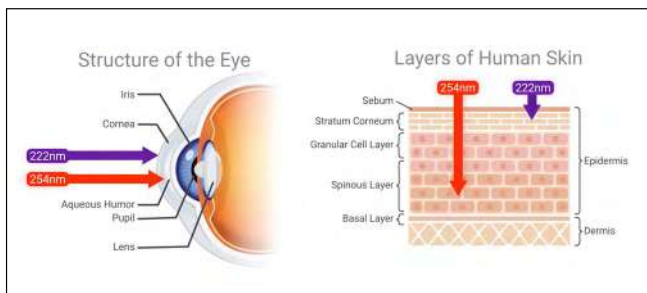
3 Why is UV technology needed for air treatment in a space?

Reducing the level of pathogens¹ in the air is not just about bringing in clean air from an HVAC system. UV light disinfection technology focuses on inactivating the pathogens already in the space regardless of the amount of ventilation or filtration provided by the HVAC system.

What UV technology can be used in certain occupied spaces while people are present?

The wavelengths emitted from Care222 technology do not penetrate the living tissue of the skin or beyond the top layer of the cornea in the eyes and the Care222 filtered far-UVC module with patent-pending dosing electronics is UL Certified for use in lighting products and classified as Risk Group Exempt for photobiological risk. The Risk Group Exempt classification issued by UL means that there is no photobiological hazard, as described in IEC 62471, for the module when installed and used according to written instructions.

EvoAIR UV™ is designed not to emit any UV wavelengths into the space and includes multiple fail-safes designed to ensure no one is accidentally exposed to UV from the 254nm chamber, when installed and used in accordance with written instructions.



Can UV disinfection technology replace a mechanical HVAC system?

UV disinfection technology will not replace a mechanical HVAC system because HVAC is needed for thermal comfort and to meet minimum indoor air quality requirements. UV disinfection technology is an additional layer of treatment to an HVAC system.

How is air treatment measured through an HVAC system?

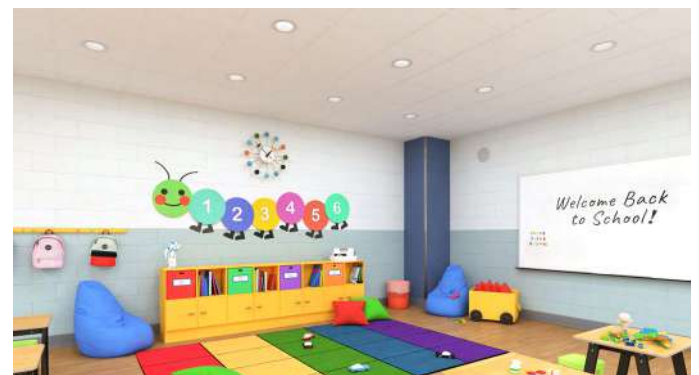
An HVAC system is a mechanical ventilation system, which, by supplying clean air, will reduce the concentration of pathogens. Mechanical ventilation rates are expressed in air changes per hour (ACH) and refer to the number of times the volume of room air is exchanged in one hour. Higher air exchange rates correspond to cleaner air and greater rates of pathogen concentration reduction. Calculations and experimental measures show that a single ACH results in a 63% reduction in aerosol droplet concentration in the air assuming no new source of contaminants.

How is air treatment evaluated for products using Care222 technology?

Using Visual® Lighting software, a UV dose is calculated over a set duration and defined volume of room air. The level of air pathogen inactivation¹ is then projected for that volume assuming perfect air mixing. Projected inactivation is specific to a given pathogen³.

How is air treatment evaluated for EvoAir UV™ products?

EvoAir UV uses an enclosed system that processes air at a constant rate, taking advantage of both filtration removal and 254nm UV treatment in the product's enclosed air treatment chamber³. For a given room and layout, the Clean Air Delivery Rate (CADR) measures effectiveness of treatment, and is determined based on the volume of air being processed per fixture. The CADR is specific to a given pathogen⁴.



How is air treatment from a UV light disinfection product compared when different technologies are being considered?

Mechanical ventilation rates are expressed in air changes per hour (ACH) and refer to the number of times the volume of room air is exchanged in one hour. A single ACH results in a 63% reduction in aerosol droplet concentration⁵. The pathogen inactivation rate from UV treatment that is equivalent to the reduction in aerosol droplet concentration can be mathematically calculated and can be expressed in terms of equivalent air changes per hour (eACH) for comparison purposes across various methodologies. eACH is a straightforward mathematical computation derived from the projected inactivation for Care222 and the CADR for EvolAIR.^{3,4,5}

Why use local room treatment in addition to an HVAC mechanical system?

Strategies to increase ventilation or add filtration to an HVAC system will reduce the concentration of pathogens in a space, but ability to increase capabilities are often limited by the design of the HVAC system itself. With a local UV disinfection technology approach like EvolAir UV™ or Care222®, you do not have to rely solely on clean air being brought into the space. Local UV technology works to inactivate viruses and bacteria¹ in the existing air in a space. The UV technology, the projected

effectiveness of which can be calculated and expressed as equivalent air changes per hour (eACH) is in addition to the ventilation rates expressed as the ACH provided by the HVAC system. Typical mechanical HVAC system ACH design targets are represented in the table below.

How is total ventilation in a room calculated?

The total ventilation (ACH) can be achieved by combining what the HVAC mechanical system delivers plus the equivalent ACH delivered by the UV.

$$ACH^{TOT} = ACH^{HVAC} + eACH^{UV}$$

What factors influence the realized aerosolized pathogen inactivation included as a result of UV treatment?

Airflow patterns and airflow rate, reflectance characteristics, coatings on pathogens, relative humidity and continuing introduction of pathogens may influence the realized aerosolized pathogen inactivation, compared to projected values^{3,4}.



ACH	Time required for 90% removal of aerosol droplets (min)	Time required for 99.9% removal (min)
2	69	207
4	34	104
6	23	69
8	17	52
12	12	35

Adapted from Table B.1. Air changes per hour (ACH) and time required for airborne-contaminant removal by efficiency, [Guidelines for Environmental Infection Control in Healthcare Facilities, CDC 2003](#)

ACUITY BRANDS UV SOLUTIONS WITH AIR TREATMENT



BLT with Care222[®] technology

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Clean Air technology[™]

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*All references to “disinfection” are referring generally to bioburden reduction and are not intended to refer to any specific definition of the term as may be used for other purposes by the U.S. Food and Drug Administration or the U.S. Environmental Protection Agency. Bioburden reduction is a function of fixture run time and the distance to the UV light source, airflow, room size, shadow areas and/or other factors, and the level of reduction will vary within a specific space. These fixtures are not intended for use in the cure, mitigation or prevention of disease and are not certified or approved for use as medical devices by the FDA. It is the obligation of the end-user to consult with appropriately qualified Professional Engineer(s), a Certified Infection Control professional and a Certified Industrial Hygienist, as applicable, to determine whether these fixtures meet the applicable requirements for system performance, code compliance, safety (including safety and hazard alerting signs), suitability and effectiveness for use in a particular application design. In no event will Acuity Brands Lighting be responsible for any loss resulting from any use of these fixtures in an application design.

¹Refer to product specification sheets at [acuitybrands.com/UV-Products](https://www.acuitybrands.com/UV-Products) for efficacy claims and claim substantiation regarding specific products and pathogens.

²Please see our published research specifically studies 3.3 and 3.8.

³As a result of the computational limitations and simplifying modeling assumptions in Visual, variations in actual product performance from tested product samples and/or variation in field conditions from laboratory testing conditions, the accuracy of calculated output values identifying radiometric quantities and any resulting derived radiation dose predictions may be adversely affected. If actual air mixing conditions differ from the assumption of perfect air mixing, actual levels of pathogen inactivation may differ from projected levels. [See Complete Disclaimer](#)

⁴As a result of computational limitations and simplifying modeling assumptions, variations in actual product performance from tested product samples and/or variation in field conditions from laboratory testing conditions, the accuracy of projected pathogen reduction and other derived quantities such as equivalent air changes per hour may be adversely affected. See complete [EvolAIR[™] Application Methodology for Determining Projected Pathogen Inactivation](#).

⁵ Kevin Kahn, Ph.D., Richard M. Mariita, Ph.D; Quantifying the impact of UVC in reducing airborne pathogen transmission and improving energy efficiency for healthy buildings: Kahn-Mariita equivalent ventilation model; medRxiv 2021.05.04.21256604; doi: <https://doi.org/10.1101/2021.05.04.21256604>

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Contact an Acuity Brands UV Specialist for more information on air treatment with UV disinfection technology.

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