HOSPITALITY / INSTITUTIONAL

BLASTEXX

803 DODGE AVE, JEFFERSON, LA 70121, DOUG@BLASTEXX.COM

Whether your facility is a five star hotel, a budget motel, a college dorm, or an assisted living center, your residents expect a clean, healthy, and comfortable indoor environment. Fresh-Aire UV offers a complete selection of germicidal UV light systems that sterilize biological contaminants such as mold, bacteria, viruses, and allergens in the air and on HVAC system surfaces. The result is reduced maintenance costs and improved experiences for residents.

Medical facilities benefit from this technology in several ways:

- Small HVAC Airborne Disinfection
- HVAC Coil Disinfection
- Ice Machine Disinfection

Small HVAC Systems

Many residence facilities use small HVAC systems such as mini-splits, PTACs, and fan coil units to heat and cool individual living areas. Like all such systems they are prone to internal biological fouling which reduces efficiency, shortens the life of the system, and degrades indoor air quality. Fortunately, Fresh-Aire UV offers disinfection solutions for HVAC systems of all sizes.

Mini-Splits:
Mini UV LED
PTACs & Fan Coils:
Tight-Fit-Kit
Air Handlers & Furnaces under ten tons:
Blue-Tube
Fresh-Aire UV Series 1
APCO-X
APCO-Mag

HVAC Coil Disinfection

Biological fouling (usually caused by mold) is a common problem in commercial air handlers. The cool, moist interior of the air system is an ideal breeding-ground for mold. A biofilm of only 0.002" can reduce efficiency by 37%. UV-C light kills mold on coils safely and continuously and is significantly more cost-effective and environmentally friendly than conventional cleaning procedures.

Coil disinfection systems:
Blue-Tube XL (BTXL)
Standard Commercial UV System (TUVC)
Tubular Rack System (TRS)

Ice Machine Disinfection

Ice machines and countertop ice & water dispensers are prone to both mold and bacterial contamination. The cool, moist interior of the machines is a perfect breeding-ground for mold. Even worse, it only takes one pair of unwashed hands for dangerous bacteria such as E. coli to contaminate the ice. Conventional cleaning methods are expensive and lobar-intensive and are only done periodically.

Ice machine disinfection:
Ice UV
Ice & water dispenser disinfection:
Ice UV Mini

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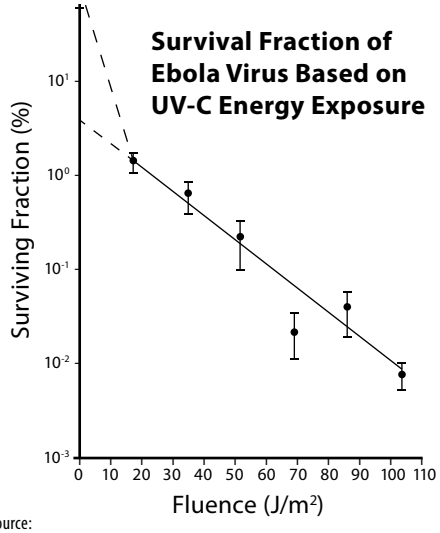
Fighting Infectious Diseases with UVGI Disinfection of HVAC Systems

Airborne Infectious Diseases

Infectious diseases such as Ebola, SARS, and MRSA, are a growing concern for medical facilities. According to the *CDC*, UVGI (Ultraviolet Germicidal Irradiation) is an effective tool in reducing the transmission of airborne bacterial and viral infections in hospitals, military housing, and classrooms as a supplemental air cleaning measure along with HEPA filters.

Sterilize Airborne Pathogens with UVGI

An Ultraviolet Germicidal Irradiation or UVGI system (UV-C lights installed inside a building's air handler and/or ducts) offers a proven and cost-effective method of sterilizing airborne pathogens. UVGI systems can also often pay for themselves by improving air system efficiency and reducing the costs of maintenance. They also generally improve indoor air quality for building occupants.

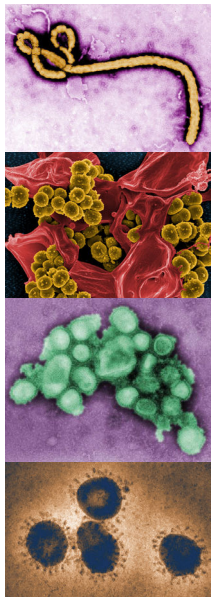


Source:
Arch Virol. 2011 Mar;156(3):489-94. doi: 10.1007/s00705-010-0847-1. Epub 2010 Nov 23.

UV-C Germicidal Applications

The germicidal properties of UV-C light have been known for over a century. UVGI has been used for photo-therapy, in the food industry, and in water purification. In recent years there has been a tremendous growth in the number of UV-C lights installed in HVAC systems of all sizes as a means of mold disinfection and to provide healthier indoor air quality for occupants.

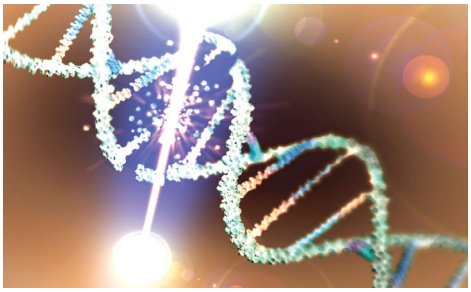
EBOLA
SARS
MRSA
SWINE FLU
ANTHRAX
SMALLPOX
TUBERCULOSIS
CHICKEN POX
MEASLES



A large Fresh-Aire UV surface UVGI installation

Microbes Have No Defense

These lights are effective because microbes have no defense against C-band ultraviolet light (UV-C) which is not present in daylight (it's filtered out by the atmosphere). UV-C light sterilizes germs by penetrating their cell walls and scrambling the DNA inside leaving them incapable of reproduction.



UV-C light sterilizes microbes by scrambling their DNA

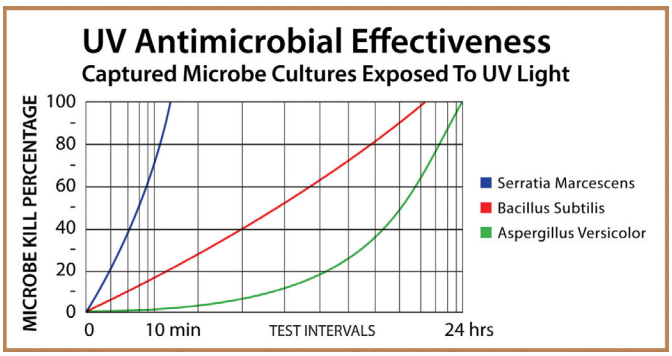
According to Peter Gordon a leader of the *International Ultraviolet Association* Health Care Working Group, "Ultraviolet-C technology is an excellent germicidal agent in health care settings. It is a great agent for protecting patients and health care workers from a variety of pathogens, including the Ebola virus."

Proven Effective

In the past UV light has been shown to be effective against influenza strains (including 'bird' flu and H1N1 'swine' flu) as well as SARS, legionella, TB, pneumonia, German measles, and many other airborne infectious diseases.

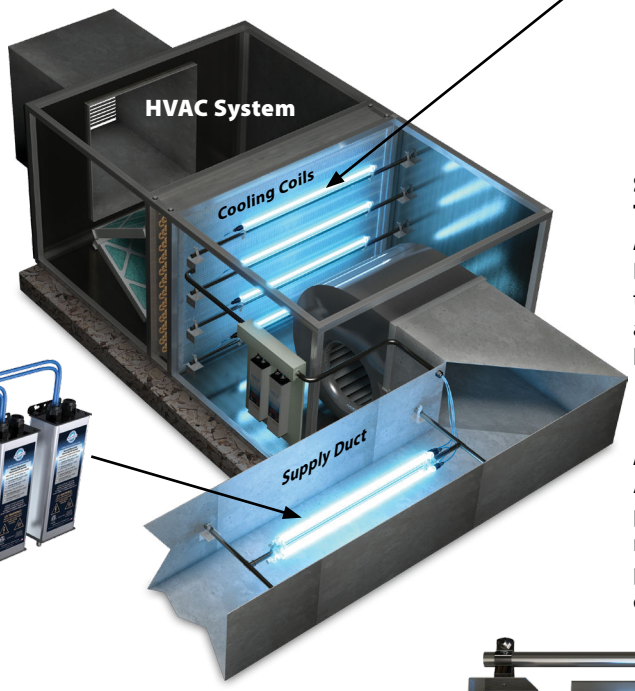
ASHRAE Recommendations

ASHRAE now recommends the use of UV-C lights within HVAC systems as a supplemental technology to reduce airborne infectious diseases. A single pass through the air system can sterilize a substantial fraction of airborne contaminants and a typical air handler will change the air four to five time an hour significantly reducing the risk of airborne microbial infection. For more information refer to *www.ashrae.org* ASHRAE Position Document on Airborne Infectious Diseases and *www.epa.gov* Swine H1NI Influenza A: Transmission of Viruses in Indoor Air: HVAC System Protection Options.

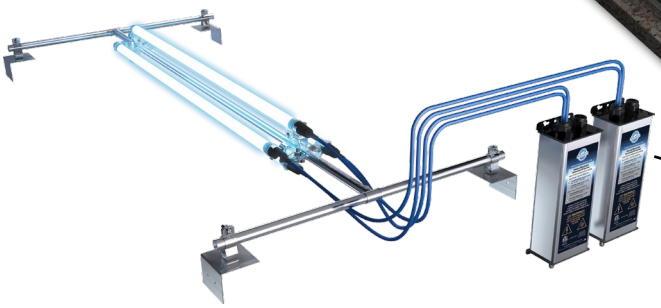


FRESH-AIRE UV® COMMERCIAL SERIES

The Fresh-Aire UV Commercial Series of UV-C light disinfection products includes a variety of devices that will reduce the risk of airborne transmission of infectious diseases through a medical facility's HVAC system.

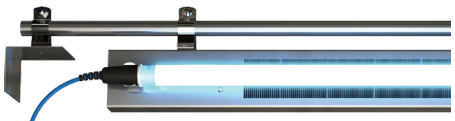


Airborne Duct System (ADS)
An array of high-output UVC lamps kills airborne pathogens as they pass through the duct. 32" or 46" lamps, axial or grid configuration.



Standard "L" System, Tubular Rack System, APCO Rack System
For surface disinfection at the coils. 32", 46", 60" lamps and a variety of mounting hardware options.

APCO Cells
Activated carbon photocatalytic (PCO) cells remove odor-causing and potentially toxic VOC contaminants from the air.



INDOOR AIR QUALITY FRESH-AIRE UV® INNOVATION

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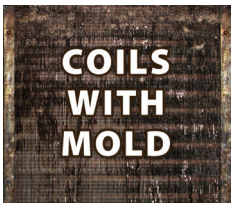
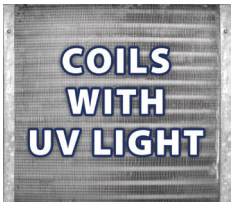
UV Light Disinfection for Healthcare Applications

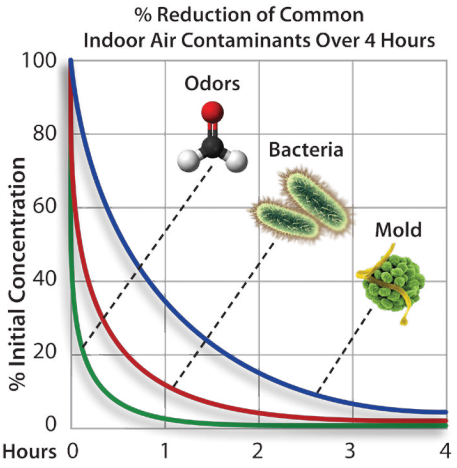
Fresh-Aire UV is recognized the world over as a leader in the areas of UV light disinfection for HVAC and ice machine applications.

HVAC & Surface Disinfection

- Highly effective at reducing HAIs
- 99.9% disinfection of Cooling Coils and Drain Pans, Airborne Virus and Bacteria disinfection
- Dramatic maintenance savings by reducing need for coil and drain pan cleaning
- Guaranteed Energy Savings by keeping coil clean
- Improves Indoor Air Quality
- Proven Return on Investment of 1 year or less
- Healthier patients and employees
- Reduce odor-causing VOCs



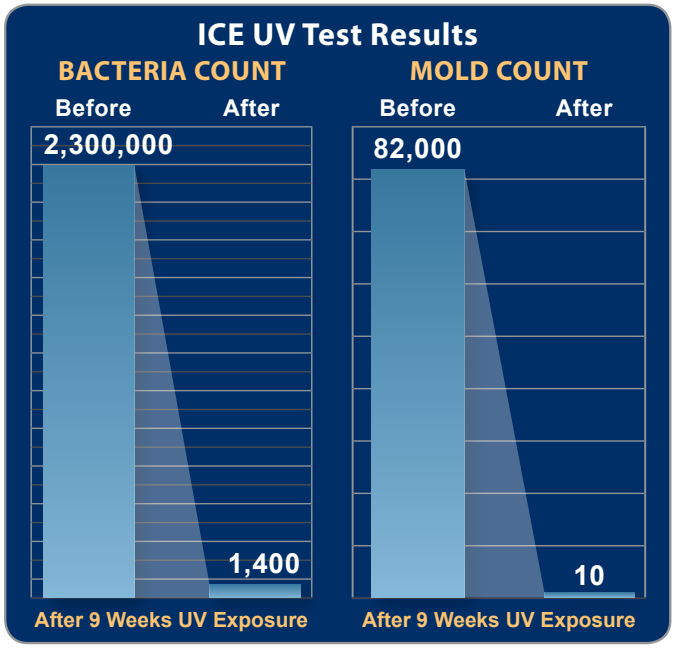




ICE Machines

The Original Germicidal UV Light for Ice Machines

- Saves money on ice machine maintenance
- Reduces microbial contamination 99.9%
- Reduces health risks from dirty ice
- Kills Mold, E. Coli, Legionella, etc.
- Cost of ICE UV = 1 Cleaning
- Guaranteed ROI less than 1 year



UV Replacement Lamps

For all manufacturers lengths from 6" to 60"

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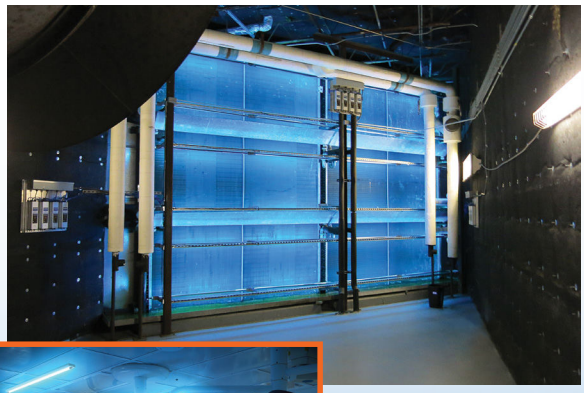
Commercial HVAC Products

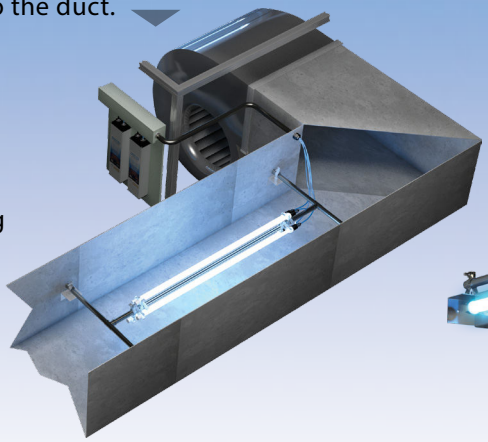


Standard UVLight System (TUVC)
L-brackets or panel mount for easy installation.

Tubular Rack System (TUVC-TRS)
Mounts using 1/2" EMT tubing for cost-effective, flexible installations.

Airborne Duct System (TUVC ADS)
High output lamps for maximum airborne kill. Mounts In-line with, or perpendicular to the duct.

Room Surfaces (TUVC-ESDS)
A convenient fixture featuring one or two 32" high output lamps for sterilizing unoccupied spaces like ORs. Safety interlock switch prevents accidental exposure.



APCO® Rack System (TUVC-APCO)
Our most advanced system. Award-winning APCO® technology fights odors and VOCs. Normal or high output lamps (for duct mounting).

AHR EXPO INNOVATION AWARD

UV for Ice Machines

FRESH-AIRE UV ICE UV™
TUV-ICE

ICE UV works around the clock, killing germs and saving money on ice machine maintenance. Ice UV is easy to install and fits in nearly all ice makers. Multiple lamps and larger sizes are available.

- Saves money on maintenance
- Cleans ice machine 24/7
- Effective for mold, bacteria & viruses
- Reduces health risks from dirty ice
- Cleaner, clearer ice

FRESH-AIRE UV ICE UV MINI™
TUV-ICE-MINI

OTHER APPLICATIONS

Fresh-Aire UV® offers UV light disinfection products for all types of HVAC systems including furnaces, air handlers, package units, PTACS, Fancoils, & Minisplits

FRESH-AIRE UV®

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TUVC-MM-MED 7.8.16

New Scientific Validation of UV Disinfection for HVAC

International Research Team Proves UVGI Effectiveness

A new scientific study (part of a collaborative research project between National University of Singapore and Pennsylvania State University) has confirmed that ultraviolet germicidal irradiation (UVGI) benefits buildings by improving HVAC system efficiency in addition to improving indoor air quality.

The study took place over fourteen months and was conducted using a well-maintained HVAC coil located in a laboratory building in a warm climate. Initially biofouling and system efficiency were monitored for a four month "before UV" period. A commercially available UVGI system was installed and operational for ten months allowing for a direct comparison between the "before UV" and "after UV" periods. The results showed significant improvements in both HVAC system efficiency and energy savings.

Summary of Findings

- The application of a coil irradiation system for a period of ten months increases coil overall enthalpy-based thermal conductance by 10% and reduces pressure drop by 13%.
- Improvement in coil performance is most rapid initially and may continue for several months.
- Fan energy use reduces by 9% over a period of ten months with UV irradiation. Savings in fan energy are 39% greater than the energy used by the UV lamps; there can be a net reduction in energy cost after applying a coil irradiation system.
- The Inverse Energy Plus method is a promising method to investigate coil heat transfer performance at a reference condition when there is lack of control over coil inlet conditions.

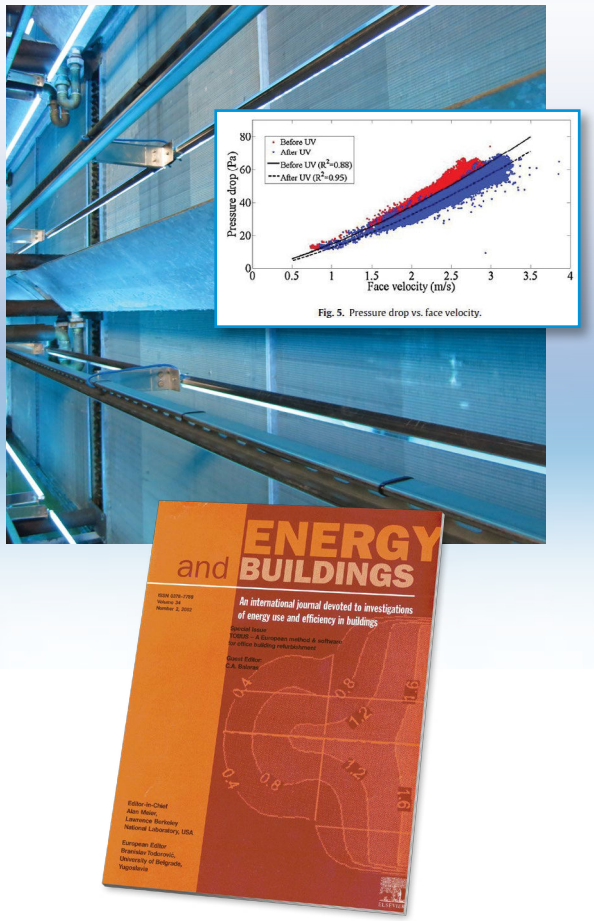

Fig. 5. Pressure drop vs. face velocity.

Learn More

If you'd like to learn more the study is available for download at www.sciencedirect.com/science/journal/03787788/130/supp/C a $36 fee is required for the PDF.

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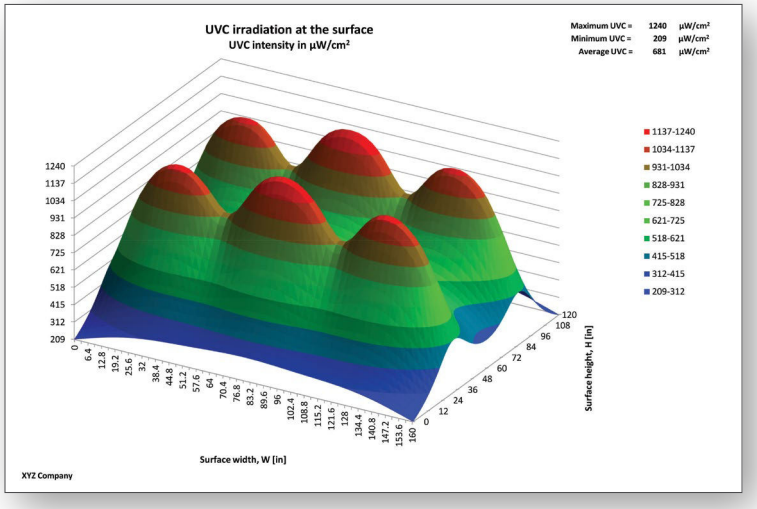
BlueCalc™ Surface & Air Software-based UVGI System Configuration Sizing Programs

The key to the successful application of UVGI technology to any commercial project is determining the correct number, size and placement of UV-C lamps within the HVAC system for optimum effectiveness. To streamline this process Fresh-Aire UV® has introduced ***BlueCalc™***, a suite of software applications that use advanced lighting algorithms to determine optimal UV-C coverage based on the project's specific HVAC system design parameters.



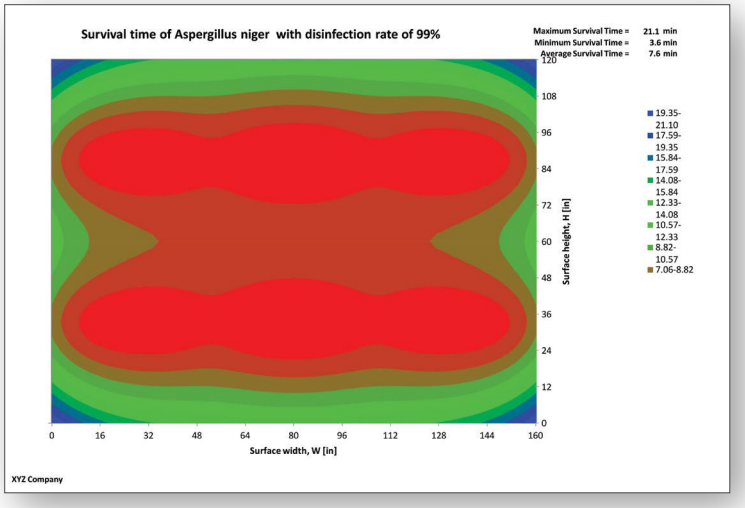
BlueCalc™ Advantages

- Accurately models UV-C Irradiation on coils, in air ducts and other surfaces
- Calculates airborne & surface microbe inactivation rates
- Includes Fresh-Aire UV proprietary UV-C Factor
- Easy to use online form
- Results based on specific HVAC system parameters
- Report includes charts suitable for presentations
- Comprehensive analysis unique in the UVGI industry
- Accounts for duct material reflectivity, air velocity, remaining lamp life, supply or return side coil placement, duct shape, and other parameters.
- Cost savings and ROI calculations available

Comprehensive & Easy To Use

Fresh-AireUV® provides a convenient and free online interface which building managers, engineers and consultants can use to input information about the size, dimensions, capacity and other parameters of the HVAC system. Fresh-AireUV® technicians then use this information as the basis for sizing simulations using ***BlueCalc™ Surface*** and ***BlueCalc™ Air*** UVGI sizing programs.

The analysis ensures that an engineer's UV fixture configuration will be effective for optimum microbe disinfection and operate and will meet the requirements of proposed ASHRAE SPC 185.1 and 185.2 standards. Once the size, number, and placement of UV-C lights is determined by BlueCalc™, it is a simple matter of quoting the number of UV systems required to complete the commercial UVGI project.

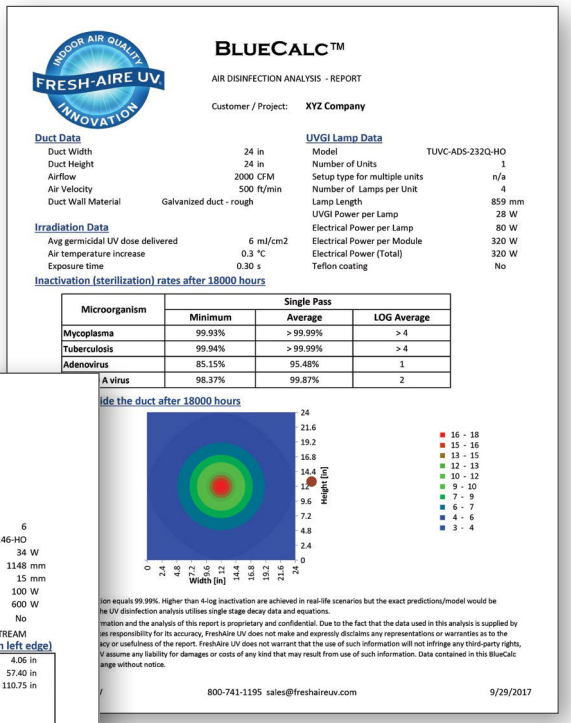


COMMERCIAL SERIES

BlueCalc™

Analysis & Report

The free analysis & report generated by our ***BlueCalc™*** Software shows the number and placement of UV-C lamps needed to achieve the results generated from the ***BlueCalc™*** Analysis & Report Request Form. It also contains charts and graphs representing data such as the estimated irradiation pattern, placement of UV lamps within the HVAC system, microbial inactivation rates, etc. which are suitable for engineers and consultants to include in project proposals.



BLUECALC™ AIR DISINFECTION ANALYSIS - REPORT

Customer / Project: XYZ Company

Duct Data

Duct Width	24 in
Duct Height	24 in
Airflow	2000 CFM
Air Velocity	500 ft/min
Duct Wall Material	Galvanized duct - rough

Irradiation Data

Avg germicidal UV dose delivered	6 mJ/cm2
Air temperature increase	0.3 °C
Exposure time	0.30 s

UVGI Lamp Data

Model	TUVC-ADS-232Q-HO
Number of Units	1
Setup type for multiple units	n/a
Number of Lamps per Unit	4
Lamp Length	859 mm
UVGI Power per Lamp	28 W
Electrical Power per Lamp	80 W
Electrical Power per Module	320 W
Electrical Power (Total)	320 W
Teflon coating	No

Inactivation (sterilization) rates after 18000 hours

Microorganism	Single Pass		
	Minimum	Average	LOG Average
Mycoplasma	99.93%	> 99.99%	> 4
Tuberculosis	99.94%	> 99.99%	> 4
Adenovirus	98.37%	95.48%	1
A virus	98.37%	99.87%	2

ide the duct after 18000 hours

ion equals 99.99%. Higher than 4-log inactivation are achieved in real-life scenarios but the exact predictions/model would be
he UV disinfection analysis utilises single stage decay data and equations.
rmation and the analysis of this report is proprietary and confidential. Due to the fact that the data used in this analysis is supplied by
es responsibility for its accuracy, FreshAire UV does not make and expressly disclaims any representations or warranties as to the
acy or usefulness of the report. FreshAire UV does not warrant that the use of such information will not infringe any third-party rights,
V assume any liability for damages or costs of any kind that may result from use of such information. Data contained in this BlueCalc
ange without notice.

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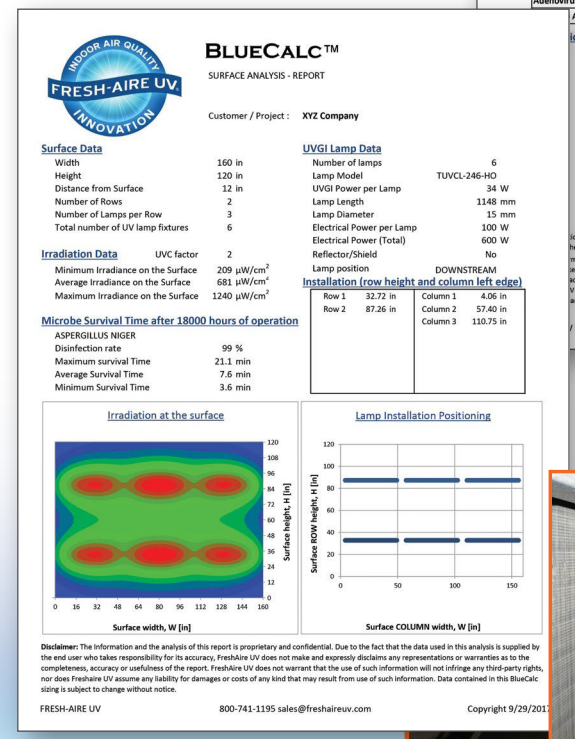
BlueCalc™ Air disinfection analysis report



BLUECALC™ SURFACE ANALYSIS - REPORT

Customer / Project : XYZ Company

Surface Data

Width	160 in
Height	120 in
Distance from Surface	12 in
Number of Rows	2
Number of Lamps per Row	3
Total number of UV lamp fixtures	6

Irradiation Data UVC factor 2

Minimum Irradiance on the Surface	209 μW/cm²
Average Irradiance on the Surface	681 μW/cm²
Maximum Irradiance on the Surface	1240 μW/cm²

Microbe Survival Time after 18000 hours of operation

ASPERGILLUS NIGER

Disinfection rate	99 %
Maximum survival Time	21.1 min
Average Survival Time	7.6 min
Minimum Survival Time	3.6 min

UVGI Lamp Data

Number of lamps	6
Lamp Model	TUVCL-246-HO
UVGI Power per Lamp	34 W
Lamp Length	1148 mm
Lamp Diameter	15 mm
Electrical Power per Lamp	100 W
Electrical Power (Total)	600 W
Reflector/Shield	No
Lamp position	DOWNSTREAM

Installation (row height and column left edge)

Row 1	32.72 in	Column 1	4.06 in
Row 2	87.26 in	Column 2	57.40 in
		Column 3	110.75 in

Irradiation at the surface

Lamp Installation Positioning

Disclaimer: The information and the analysis of this report is proprietary and confidential. Due to the fact that the data used in this analysis is supplied by the end user who takes responsibility for its accuracy, FreshAire UV does not make and expressly disclaims any representations or warranties as to the completeness, accuracy or usefulness of the report. FreshAire UV does not warrant that the use of such information will not infringe any third-party rights, nor does Freshaire UV assume any liability for damages or costs of any kind that may result from use of such information. Data contained in this BlueCalc sizing is subject to change without notice.

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BlueCalc™ Surface analysis report

Help Throughout The Design & Installation Process

Fresh-Aire UV® consultants work with building managers and engineers throughout the design and installation of the commercial UV-C system. This will provide you with all the information necessary to configure the best possible UVGI solution for your project and help resolve any technical issues that may come up.

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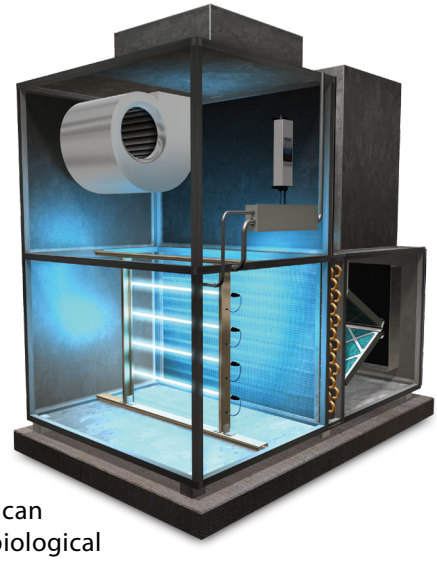
UV-C System Selection for Air Treatment

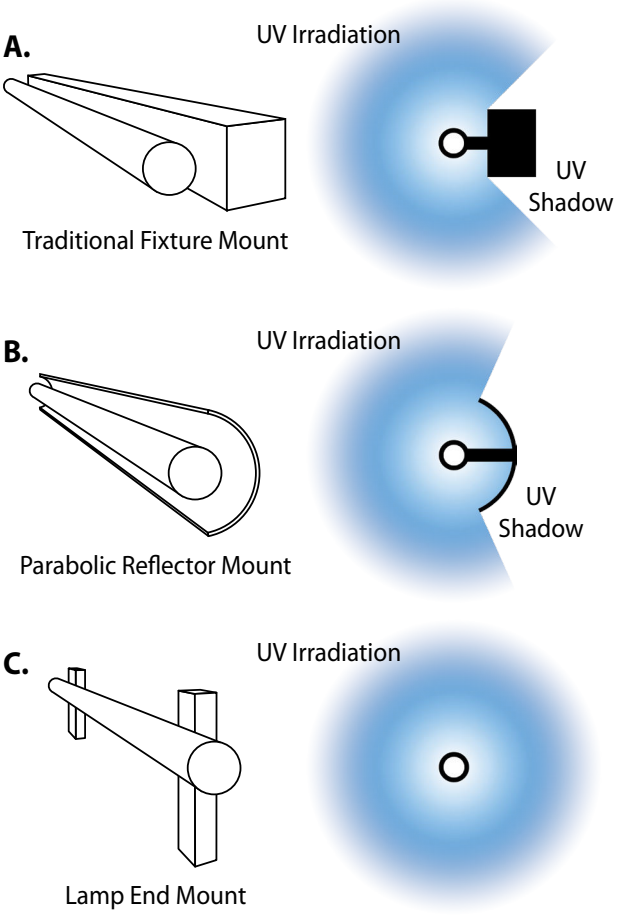
When selecting a UV systems for air treatment in recirculating air handling systems - it is important to consider the following aspects of the design of the UV System to ensure proper airborne irradiation.



Lamp Placement

For air treatment, the location of the uv lamps within the air handling system is of key importance. The lamps should be placed in an area of the air handling system that allows unobstructed irradiation of the UV such that the UV can come into contact effectively with all of the moving air of the air system.

An ideal location is to place the UV lamps in the downstream section of the cooling coil and before the blower. This area is preferred because this section of the air handling system typically has more room for the location of the lamps within the limitations of the air handler itself. Also it keeps the irradiation of the UV away from materials that may degrade from the UV light such as the air filter. As an added bonus, the UV lamps can provide the ancillary effect of keeping the drain pan and coiling coils free from any biological growth such as mold, algae or slime which often times can grow in this area.



Irradiation Effectiveness

It is also important is to place the lamps in a configuration that will eliminate or minimize the loss of UV irradiation from effects such as UV shadowing. UV shadowing occurs when a UV lamp is placed on a fixture or shield the prevents the UV irradiation from projecting out from the entire circumference of the lamp. In other words, the UV that is created by the lamp is irradiated out 360 degrees around the circumference of the lamp tube itself. If the lamp is placed onto a fixture **(A)** or reflector **(B)**, then a percentage of the UV radiation is "shadowed" by the support which results in a significant reduction in UV light efficiency. A ideal method of mounting the UV Lamps is to support them with end-mounted brackets **(C)** which allow full UV light distribution as is shown in the diagram.

Power Supply Output

The power supply for a UV system can be the driving or limiting factor in the overall lamp output capability of the UV lamps themselves. These power supplies can be supplied in two different output threshold types:

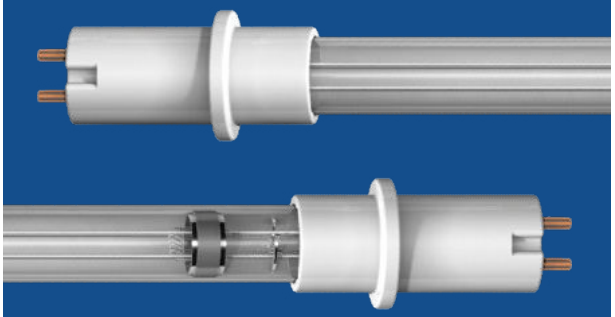
Standard Output

Drives the UV lamp at a standard current level of 425mA.

High Output

Drives the UV lamps at two different current range of 850mA and 1200mA. For air treatment it is suggested to use a power supply that has high output capabilities and is preferable to be in the upper range of 1200mA for optimum air treatment.

COMMERCIAL SERIES



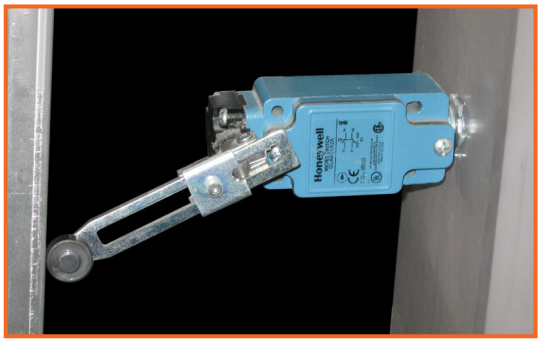
Lamp Design

The design and construction of UV lamps can be another critical limiting factor in the effectiveness of the system. With a high output power supply it is important to select a lamp that is designed for that current load. If the wrong lamp is selected then lamp longevity will suffer.

The best UV lamps are constructed to withstand the cold and wet climate found within the air handling system and incorporate water-resistant lamp connectors. For high output operations, the filament of the lamp should be of more robust construction to handle higher current loads.

Safety Considerations

When a high output UV lamp system is installed within an air handling system, it is imperative that proper safety interlock switches are utilized to prevent entry and accidental exposure to the high levels of UV. Exposure to UV light can cause severe eye damage therefore interlocking the entry ways into the areas where the UV light is installed can prevent this.

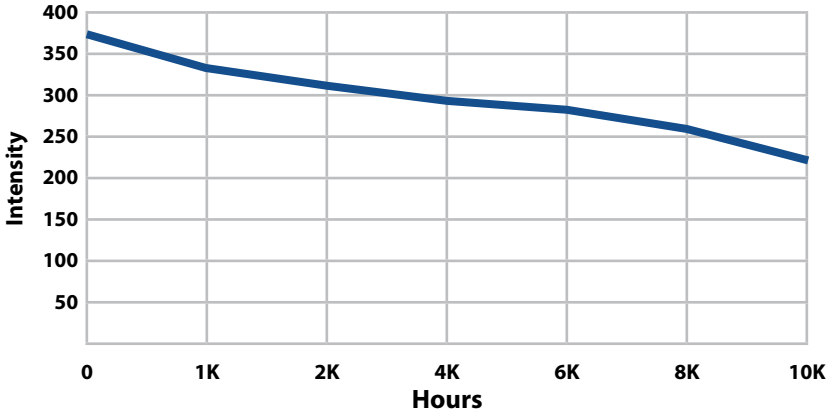


Commercial Grade Interlock Switch

UV Lamp Life

When UV systems are utilized for air treatment, it is important that the UV intensity of the system is closely monitored for the overall output of all the lamps of the entire system. UV lamps have a finite life and the UV intensity will decay over time therefore the total UV output of the system should be monitored and the lamps should be replaced in a timely fashion (presently High output UV lamps are limited to 9000 hours for air treatment). UV lamp output monitors are available for measuring and monitoring the lamp life of the UV system.

TUVCL-100HO Lamp Depreciation



Intensity (Microwatts Output at 1 Meter) 100% = 375mw

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