TRANE®

Engineering Bulletin

Using Ultraviolet Light

to Control Microbial Growth in Buildings

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February 2004 **CLCH-PRB014-EN**

Preface

With ongoing media attention raising public awareness of the possible health risks of microbial growth (mold and bacteria) in buildings,[1] indoor air quality (IAQ) remains a prominent industry issue. This concern has prompted HVAC manufacturers to explore various technologies to improve the indoor environment by discouraging mold growth. One popularly espoused technology is *ultraviolet germicidal irradiation* (UVGI) using UV-C light.

Trane/American Standard has carefully evaluated the efficacy, safety, practicality, and environmental considerations of UVGI. This engineering bulletin presents our findings and states our position relative to the use of UV-C technology to improve indoor air quality.

[1] U.S. Environmental Protection Agency. 2003. *A Brief Guide to Mold, Moisture, and Your Home,* EPA 402-K-02-003 (Washington, DC: U.S. EPA), pp. 2–3. [online; cited 19 Jan 2004] <http://www.epa.gov/iaq/molds/images/moldguide.pdf>

Trane, in proposing these system design and application concepts, assumes no responsibility for the performance or desirability of any resulting system design. Design of the HVAC system is the prerogative and responsibility of the engineering professional.

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Trane's Position on UV-C Lights

Note: The following Trane/American Standard corporate position statement was issued on August 5, 2003.

Trane/American Standard has been studying the potential effectiveness of UV-C ultraviolet light technology for the purpose of improving indoor air quality ("IAQ"). Experts involved in the study of IAQ agree that it is a complex, multifaceted issue. As such, no single "silver bullet" solution exists capable of resolving every IAQ problem.

Some equipment manufacturers, dealers, and suppliers in the HVAC industry have adopted the use of UV-C lights as a proposed solution to microbial growth issues related to IAQ in buildings. Trane/American Standard has reviewed the available technical data and a limited number of independent studies conducted to date to determine its practicality and effectiveness to prevent or inhibit microbial growth in buildings. While science supports the fact that with sufficient time and intensity (dose), UV-C light can harm microbes, Trane/American Standard has concluded that:

- UV-C light is effective in reducing microbial growth on stationary surfaces given sufficient dose;
- UV-C light has little effect on reducing many airborne microbes in ducted systems, particularly with respect to the spore forms of microorganisms;
- UV-C light has no effect on microbial growth in areas of a building not directly illuminated by UV-C lights.
- Claims that UV-C lights keep the interior surfaces of equipment and duct systems clean are anecdotal and not supported by qualified, third-party research at this time.

Consequently, Trane/American Standard does not recommend the use of UV-C lights in HVAC systems as a remedy or a means of preventing microbial growth in buildings.

In addition, exposure to high-intensity UV-C light can seriously damage polymeric materials (e.g., electrical insulation) commonly found in HVAC air distribution systems. Users of this technology must also be aware that exposure to high-intensity UV-C light poses a personal danger to installers and maintenance personnel. Environmentally responsible disposition of mercury-containing UV-C bulbs is required.

For commercial customers who, despite Trane/American Standard's recommendation and after considering the risks and limited benefits, insist on including UV-C lights, Trane/American Standard will offer UV-C lights as a factory-engineered and installed option in some commercial equipment. Only in this manner can Trane/American Standard ensure that the UV-C lights are properly applied and installed to prevent potential damage to the equipment and injury to users. Improperly installed UV-C lights in Trane/American Standard equipment may adversely affect the equipment's

performance and pose a hazard to the user. Currently, Trane does not plan to offer UV-C lights for residential applications.

Trane/American Standard continues to advise that the best method to inhibit microbial growth in HVAC equipment is to *keep the air conveyance path clean, and to prevent standing water*. Regular service and maintenance will serve to inhibit microbial growth within equipment and maintain system performance.

Trane/American Standard encourages and supports further research and study on the efficacy of UV-C light and other technologies intended to improve IAQ and system performance. Trane/American Standard will continue to be an industry leader on IAQ issues and invites its customers, business partners, and associates to learn more about IAQ issues at www.trane.com.

UV-C Light and Its Effect on IAQ

It is important for potential specifiers and users of UVGI technology to be fully aware of the effectiveness, safety, maintenance, and disposal issues related to its use. The following compilation of information provides valuable insights for users of this technology.

What is UV-C light?

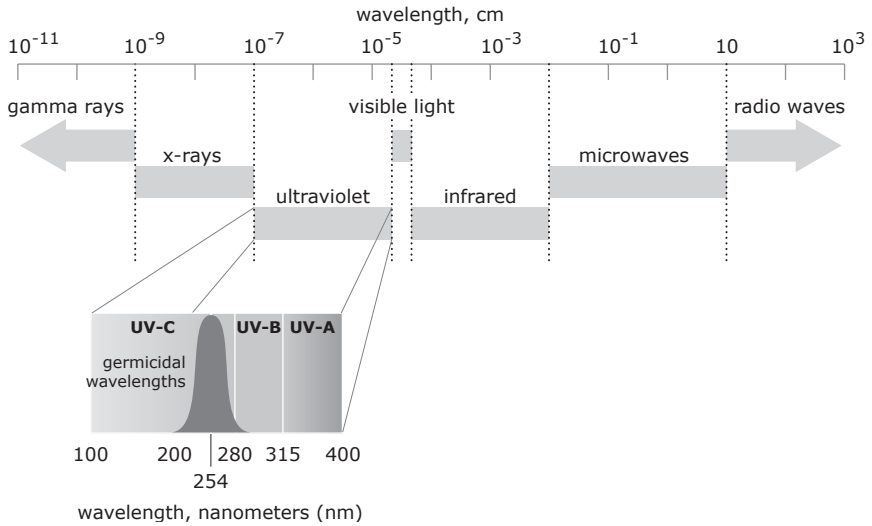
Ultraviolet (UV) energy, an invisible form of light, generally is divided into three categories based on wavelength: UV-A (long), UV-B (medium), and UV-C (short). All three UV wavelengths are generated by the sun. The Earth's atmosphere blocks most of the UV-C energy but allows the UV-A and UV-B wavelengths to pass through. Although UV-C light does not occur *naturally* within the Earth's atmosphere, it can be generated artificially using mercury-vapor lamps.

How does UV-C light affect IAQ?

Ultraviolet germicidal irradiation, or UVGI, prevents mold, bacteria, and viruses from reproducing by penetrating their cell walls and damaging their DNA. The most effective wavelength for UVGI, 254 nanometers, lies in the UV-C range of the spectrum (Figure 1); however, the required dose — intensity and exposure — of UVGI varies by species. Generally, lower doses of UV light can be harmful to vegetative forms of microorganisms and some viruses, while much higher doses are required to affect bacterial or fungal spores.

Technically, microorganisms exposed to a "kill" dosage of UVGI remain alive; however, they are considered "dead" because their life spans are so short (a matter of days in most cases) and they can no longer reproduce. It is important to note that *irradiated microorganisms retain their allergenic*

Figure 1. Electromagnetic spectrum



properties. These allergenic properties are alleged to cause adverse reactions in sensitive individuals.[2]

How is UV-C light applied in HVAC systems?

- **Stationary "kill."** In this application, UV-C lamps are sized and positioned inside HVAC equipment to irradiate interior surfaces and components (typically the cooling coil and condensate drain pan) to control fungal and bacterial growth on those surfaces.
- **Airborne or fly-by "kill."** UV-C lamps are sized and positioned in the air stream within HVAC equipment to expose and "kill" susceptible microbial particles flowing through the building's air distribution system.
- **Maintain or improve HVAC system efficiency.** In this application, UV-C lamps are positioned inside HVAC equipment to keep interior components (primarily cooling coils and drain pans) clean, and thereby reduce both routine HVAC-system maintenance and the energy costs of operating the HVAC system.
- **"Catch and kill."** UV-C lamps are positioned inside an air handler to irradiate the upstream side of the filter media, "killing" the microbial matter caught there.

The purported ability of UV-C light to keep the interior components of air-handling equipment "clean" and "in like-new condition" is largely anecdotal and unproven. Reported improvements in system efficiency and reduced equipment maintenance are subjective and highly dependent on the age, current condition, and past maintenance history of the system. Further study is required to quantify the specific benefits before UV-C light can be reliably used for this purpose.

Promised benefits

UV-lamp suppliers make various claims about the performance of UV-C light, ranging from "kills mold and mildew in HVAC systems" to "sanitizes the building air as it flows through the light field." Most of these claims are overstatements and are unsubstantiated by qualified, independent testing. It is important for building professionals and owners to carefully analyze the life-cycle cost and safety risks of owning and operating HVAC systems equipped with UV-C lamps … *and* to assess the likelihood of realizing the promised benefits.

[2] U.S. Environmental Protection Agency. 2003. *A Brief Guide to Mold, Moisture, and Your Home,* EPA 402-K-02-003 (Washington, DC: U.S. EPA), pp. 2–3. [online; cited 19 Jan 2004] <http://www.epa.gov/iaq/molds/images/moldguide.pdf>

Results of Independent Tests

Surprisingly little peer-reviewed, independent research has been conducted on the impact of UVGI on indoor air quality. Although many studies and tests tout the benefits of UV-C light for improving IAQ, much of that information is anecdotal and (in many cases) funded and published by the UV light industry.

After a thorough search of the existing data on HVAC applications of UVGI, we based our corporate position statement (pp. 4–5) on four studies, which were performed by credible, independent researchers. A brief overview of each of these studies follows.

Effect of UV-C light on contaminated stationary surfaces

Study: Effectiveness of germicidal UV radiation for reducing fungal contamination within air-handling units (E. Levetin, R. Shaughnessy, C.A. Rogers, and R. Sheir; Applied and Environmental Microbiology, *August 2001, pp. 3712-3715)*

This study was conducted in a 286,000 ft², four-story office building located in Tulsa, Oklahoma. The acoustical insulation and condensate drain pans in the air handlers had a history of microbial growth. UV-C lamps were installed downstream of the cooling coils in the air handlers on two of the four floors. As a basis for comparison, no lamps were installed in the air handlers on the other two floors. Baseline microbial samples were collected in May before the lamps were turned on, and sampling was repeated at the end of August of the same year. The lamps operated 24 hours per day during the test period. Samples of the interior fiberglass insulation and of air within the air handlers were collected and analyzed. The air-handler fans were turned off during sampling.

Researchers' conclusions

- The researchers state "In summary, the study indicated that germicidal UV irradiation may be an effective approach for reducing fungal contamination in AHUs. The use of germicidal UV lamps in AHUs resulted in significantly lower levels of fungal contamination in the interior fiberglass insulation lining on the study floor AHUs than in the insulation of control floors."
- Airborne fungi also were found to be lower on the floors with lamps; however, the fans were not operating during the sampling. The researchers speculate that many of the airborne spores were from the insulation and became airborne from the disturbance of shutting off the fan. Therefore, the direct effect of UV light on airborne spores for this test was inconclusive.
- The researchers state "Further studies are needed to examine downstream effects and the resultant air quality in occupied spaces, especially in problem buildings."

For the complete report, visit http://aem.asm.org/cgi/reprint/67/8/3712.pdf.

Effect of irradiating air-filter media with UV-C light

This "catch-and-kill" approach to UVGI captures microorganisms in the air filters of the HVAC system and then "kills" them by exposing the filter media to UV-C light.

Holding the microorganisms stationary makes it easier to administer a "killing" dose of UVGI. However, this hypothetical benefit has yet to be validated by independent research.

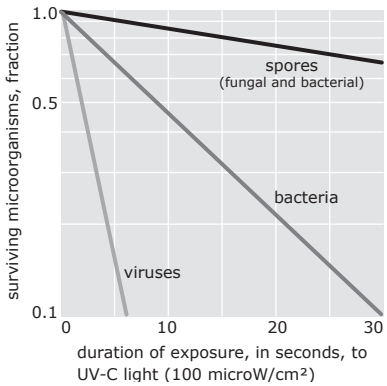
The effectiveness of this system depends on the location of the microbial contamination and the arrangement of the air-handling components. If the contamination exists in the outdoor-air intake and mixing box (upstream of the filters) of a draw-through air handler, then it is reasonable to expect that the microbial contaminants will become trapped in the filter media.

However, if the contamination originates *downstream* of the filters (in the fan, coils, supply ductwork, and/or occupied space), then many of the airborne microorganisms may settle on surfaces in the space and not return to the air handler.

A study by Dick Menzies, et al (p. 10), seemingly confirms this supposition. High levels of airborne bacteria were measured in the workspace, compared with very low levels of airborne bacteria—and zero fungi—in the supply and return ductwork.

Further research is needed to determine the effectiveness of "catch-and-kill" UVGI.

Figure 2. Comparative susceptibility of microorganisms to UVGI[3]



Trane/American Standard's evaluation
Based on the findings of this study, we are reasonably confident that a sufficient dose of UV-C light can reduce microbial growth on stationary surfaces.

Effect of UV-C light on airborne microbial contamination

Study: Defining the effectiveness of UV lamps installed in circulating air ductwork (D. VanOsdell and K. Foarde, RTI International; November 2002)

This study, which was sponsored by the Air-Conditioning and Refrigeration Technology Institute (ARTI), focused on the ability of UVGI to reduce airborne microbial aerosols in the ventilation ducts of commercial buildings. UV-C lights were installed in a 24-by-24-inch test duct. Samples were taken upstream and downstream of the lamps at air velocities of 250 ft/min and 500 ft/min; air temperatures ranged from 55°F to 85°F at relative humidities between 55 percent and 85 percent.

Researchers' conclusions
- Airflow rate and operating temperature significantly affected UV-C lamp output, while changes in relative humidity had little effect.
- Definitions of "high output" lamps varies widely among suppliers, making independent analytical verification difficult.
- The lamps did not create measurable ozone.
- Airborne vegetative bacteria evidenced susceptibility to the effects of UVGI.
- Airborne fungal and bacterial spores were more resistant to UVGI effects and required significantly higher doses of UV-C energy to be inactivated.
- Dirt buildup on the surfaces of the UV-C lamps significantly reduced the energy output of the lamps, indicating the need for periodic cleaning to maintain the desired output.

For the complete report, visit the "Building and Facility System Integration" section at http://www.arti-21cr.org/research/completed/finalreports/40030-final.pdf.

Trane/American Standard's evaluation
Consistent application of this technology is challenging due to the lack of a standardized rating system for UV-C lamps, the significant effect of air velocity and temperature on lamp intensity, *and* the uncertain dose requirements for various organisms. Given the comparative susceptibilities of viruses, bacteria, and spores to UVGI (Figure 2),[3] the findings in this study give us little confidence that UVGI can be practically and effectively applied in air-handling equipment to control airborne microbial particles flowing through an HVAC system at 450–550 ft/min.

[3] The illustration of comparative susceptibility to UVGI in Figure 2 is based on average UVGI rate constants. SOURCE: W.J. Kowalski, MS, P.E., and W.P. Bahnfleth, PhD, P.E., "Effective UVGI System Design through Improved Modeling," ASHRAE Transactions: Research 2000, v106(2):4–13.

Effect of UV-C light on the health of building occupants

Study: Effect of ultraviolet germicidal lights installed in office ventilation systems on workers' health and well-being (D. Menzies, J. Popa, J. Hanley, T. Rand, and D. Milton; The Lancet, *volume 362, 29 November 2003)*

Conducted in 2000 and published in late 2003, this study attempted to determine if UV germicidal irradiation of drip pans and cooling coils in HVAC systems could affect the work-related health symptoms of 771 occupants in three Montreal office buildings. All three buildings were mechanically ventilated, had sealed windows, and had no historical problems with building-related illnesses. UVGI lamps with parabolic reflectors were positioned downstream of the filters, heating coil, and humidifier, and upstream of the cooling coil and condensate drain pan, in each air handler. The lamps for each test group were alternately turned on and off at four-month intervals.

Participants were informed of the study objectives, but did not know when the lamps were on or off in their work areas. Multiple times throughout the study, participants reported how they felt, relative to ten specific symptoms, before and after arrival at work. Symptoms included: headache; fatigue; concentration difficulties; irritation of the eyes, skin, nose, and throat; nasal congestion; and musculoskeletal and respiratory difficulties.

Fungal, bacterial, and endotoxin surface and airborne samples were collected from the cooling coils and drain pans (exposed to UVGI), filters (not exposed to UVGI), and various other areas within the mechanical system.

Researchers' conclusions

- The surfaces of the cooling coils and drain pans, which were irradiated by the lamps, showed a significant reduction of fungal and bacterial contamination.
- Data collected from the study participants regarding the ten specific symptoms does not indicate how many, if any, of the reported ailments resulted in absences from work.
- Airborne fungi measured in the supply and return ducts and in the workspace were zero, and the airborne bacteria levels were at very low levels, whether the lamps were on or off. However, the airborne bacteria count was considerably higher in the workspace than in the supply or return air. The report states that "The remaining airbourne bacteria might have been from local sources, including the workers themselves; these would not be altered by the study intervention."
- Self-reported ailments reported *during work* varied by 14 percent with the lamps on and 18 percent with the lamps off. This variation is considered to be statistically insignificant and represent normal statistical variation.
- The authors of the study acknowledge that there was "... little understanding of the possible mechanisms for the apparent health effects."

The report by Menzies, et al, does not define "normal statistical variation." However, the researchers' conclusion that the reports of during-work ailments are "statistically insignificant" is supported by the fact that workers with symptoms *before* arriving at work were lower with the lamps on (16 percent) than with the lamps off (13 percent). If we assume that UVGI in the workplace has no effect on worker health before arrival at work, then this data suggests that the 3-to-4-percent difference represents "normal statistical variation."

Trane/American Standard's evaluation
The ability of UV lamps to significantly reduce microbial contamination on irradiated interior surfaces correlates with other studies. The low microbial growth findings (zero for fungi) in the supply, return, and outdoor air compared to the significantly higher levels measured in the workspace seemingly eliminates the HVAC system as a source of contamination.

Effect of UV-C light on overall indoor air quality

Study: Installation of an ultraviolet irradiation system, Type C, plant and its influence on indoor air quality (H. Pettersen, B. Hannevold, and L. Oie; presented at the 4th International Conference on Cold Climate Heating, Ventilation, and Air Conditioning, June 2003, Trondheim, Norway)

Conducted in 2001, this study focused on health complaints that were attributed to microbial growth in the HVAC system of a typical office building in Oslo, Norway. Two similar HVAC systems were chosen for the study. UV-C lamps were installed upstream and downstream of the filters, fan, and coil in one of the systems; lights were not installed in, nor were other modifications made to, the other system. Airborne and surface sampling for fungal spores and microbial volatile organic compounds (MVOC) was conducted at multiple locations in both systems.

Researchers' conclusions
- Samples obtained from both systems revealed lower concentrations of airborne mold spores in the indoor air than the outdoor air. This suggests that the particle filters captured many of the incoming spores.
- Overall, the comparative samples indicated that the presence of UV-C lamps yielded no significant difference in the amount of airborne microbial spores in the ventilation system.
- UV-C irradiation had no discernible effect on MVOCs.
- The researchers summarized the study, saying: "Our investigation shows that the UV-C irradiation has no detectable effect on IAQ ... Hence, general recommendations to install UV-C systems in HVAC plants are not justified."

Trane/American Standard's evaluation
This study reinforces our belief that UV-C light has little effect on *airborne* microbial spores. The study also corroborates other research, which showed a reduction of spores on *stationary* surfaces. Of particular significance is the researchers' observation that although UV-C light offers benefits in certain applications, it is not justified for all HVAC systems.

Our Concerns about UV-C Light in HVAC Systems

Damage to polymeric materials

The destructive effect of ultraviolet light on polymeric (plastic) materials is well-known. The selection of polymer materials specifically formulated to tolerate direct exposure to sunlight (that is, UV-A and UV-B radiation) becomes an important design requirement for products destined for outdoor applications. Conversely, the ability to withstand UV radiation is seldom a requirement of materials and products intended for indoor application, because exposure to direct sunlight or other forms of UV light is not expected.

Using high-intensity UV-C lamps inside HVAC equipment necessitates UV-tolerance for all materials exposed to it. Because UV-C light does not occur naturally on Earth, limited research and information about material compatibility is available for even the most common polymeric compounds. Of greatest concern is the effect of UV-C light on electrical wiring insulation.

Trane contacted wire manufacturers and learned that they have little or no data about the performance of their products when exposed to UV-C light. To quantify the risk to materials, Trane and a UV light supplier cooperatively conducted tests that exposed 19 polymeric materials commonly found in air-handling systems to UV-C light. Tested components included gaskets, bushings, vibration isolators, drive belts, electrical wire, thermal insulation, and miscellaneous fasteners, ties, and grommets.

Thirteen of the 19 materials tested failed to meet Trane performance standards after as little as 12 months of exposure to UV-C irradiation. Failure modes included discoloration, odor, reduced elasticity, and in some cases, complete breakdown of the material. Although some of the material/component failures may not immediately or seriously affect equipment operation, others — such as the embrittlement of electrical and thermal insulation — carry grave consequences for safety and reliability.

Based on these findings, *we require that all polymeric materials that may be exposed to direct or reflected UV-C light are either qualified for use in that environment or are physically shielded from the light using metal or some other UV-C-resistant material*.

Health effects

The need to protect our bodies from the effects of the sun's UV-A and UV-B energy is widely accepted. However, because UV-C energy does not exist naturally on Earth, its effects on human health are not as well understood and documented. One of the challenges of working with UV radiation is that the symptoms of overexposure typically are not felt immediately, so persons exposed to it are not aware of the hazard until after the damage is done.[4]

We believe that education is a vital prerequisite for installers, servicers, and maintenance personnel to safely work with or near UV-C lamps. An excellent

resource is the material safety data sheet (MSDS) for mercury-vapor UV-C lamps, which employers are obligated to keep on file for employees who work with or near UV-C lamps. The following information is excerpted from the "Germicidal/HOK 25/120 High-Pressure Mercury Vapor UV Lamp" MSDS that Philips Lighting Company (a major manufacturer of germicidal UV lamps) published in August 2003. For the complete MSDS, visit http://www.lighting.philips.com/nam/products/msds/pdf/s06-94008.pdf.

> **Health Effects**
> DANGER: These lamps emit ULTRAVIOLET RADIATION ... Avoid exposure. Ultraviolet radiation is harmful to the skin and the eyes and can cause serious skin burns and eye injury either from direct or reflected radiation. [These] lamps emit short-wave radiation and produce ozone. Therefore, they must be screened by means of suitable filters to protect eyes and skin. To reduce the risk of personal injury, install only in a fixture which provides adequate protection to area occupants. Should not be used for illumination purposes.
>
> **Precautions for Safe Handling and Use**
> ... Operate with proper auxiliary equipment. Turn off lamps before installing, replacing, cleaning or performing any maintenance work near these fixtures.
>
> **Control Measures**
> Do not operate under these lamps without personal protective equipment. (Goggles, gloves, skin protection)
>
> Respiratory protection: If large numbers of these lamps are being broken, [an] appropriate respirator should be considered ...

To help those who install, operate, and/or maintain HVAC systems avoid unintentional exposure to UV-C light, we recommend installation of disconnect switches at all access points to areas of equipment where UV-C lamps are located.

Lamp maintenance

Dirt that accumulates on the surface of UV-C lamps can significantly reduce their emission of ultraviolet energy. The potential for dirt buildup on lamps that are installed within air handlers depends on the overall hygiene of the building and the degree of filtration in the HVAC system.

Lamp manufacturers recommend cleaning the lamps with alcohol periodically (at least every six months) to maintain UV output. To slow the rate of fouling, they also advise wearing clean cloth gloves when handling the lamps to prevent oils from the skin from depositing on the bulbs.

[4] University of Washington–Environmental Health and Safety Department. *Lab Safety Update* [online; cited 19 Jan 2004] <http://www.ehs.washington.edu/updates/lsu-ja99.htm>

Lamp replacement

The output from mercury-vapor lamps degrades over time. For HVAC applications, most lamp manufacturers recommend replacement after 9000 hours of operation, or annually if the lamp operates continuously, to maintain intensity.

A UV lamp's characteristic blue glow, which remains long after its output drops below an effective level, is not a reliable indicator of the need for replacement.

Lamp disposal

Fluorescent and UV lamps contain mercury, which is a regulated hazardous waste. Therefore, disposal of these lamps is subject to state and federal regulations. Although regulations vary from state to state, disposal requirements for UV lamps typically conform to those for fluorescent bulbs.

The Association of Lighting and Mercury Recyclers (ALMR) is a nonprofit, educational, and informative resource on mercury recycling and disposal. To learn about individual state recycling programs, visit their Web site at http://www.almr.org/index.htm.

Trane's Approach to UV-C Light in HVAC Systems

The quest for ever-more comfortable, productive, and healthy indoor environments heavily influences the design of commercial buildings. During the past decade, we've been a leading advocate of equipment, systems, and controls that can help to improve indoor air quality. Examples of this approach include double-sloped condensate drain pans, cleanable surfaces inside equipment, and enhanced strategies for humidity control.

Existing research indicates that, *when properly engineered,* UV-C can reduce the growth of microbial contamination on stationary surfaces. However, we believe that claims positioning UVGI as a panacea for resolving various IAQ-related problems, are grossly overstated and unsubstantiated. Such claims will almost certainly result in HVAC applications of UV-C lamps that fall considerably short of their owners' expectations.

Application of UV-C light in commercial Trane equipment

As outlined in our official position statement (pp. 4–5), we are concerned about the effectiveness, safety, and practicality of using UV-C light to improve indoor air quality. Although we believe that we are obligated to study and voice our opinion about the value of this technology, we also recognize that the final decision to add or omit it from equipment lies with the customer. For that reason, we will *factory-engineer and factory-install* the lamps in situations where the customer specifically requests UV technology — but only if the customer is aware of the risks and believes that it is appropriate for the project. Engineering the application for specific commercial equipment and installing the lamps at the factory allows us to maximize the benefits of UV technology without jeopardizing the reliability and safety of the equipment.

Lamp placement
Study results to date indicate that the greatest benefit of UV-C light in HVAC applications is the reduction of microbial growth on interior surfaces of equipment. Therefore, UV-C lamps that we provide will be positioned *downstream* of the cooling coil and condensate drain pan. (That area of the air handler typically has the highest moisture content and, therefore, the highest potential for mold and bacterial growth.)

Performance and operation
Trane-installed UV-C lamps are positioned to optimally irradiate the leaving side of the cooling coil and as much of the condensate drain pan and other interior equipment surfaces as possible. The lights, their housings, and supporting framework are designed to minimize turbulence, regenerated sound, and pressure drop. Sufficient access is provided for lamp cleaning and replacement.

We also specify the provision of a separate power source for our factory-provided UV-C lamps. To maximize their effectiveness, we recommend that the lamps operate continuously — that is, even when the system is off.

Trane's Approach to UV-C Light in HVAC Systems

Precautions

Clearly visible warning and caution labels will be applied to the exterior of Trane equipment, alerting operators and service technicians that there is high-intensity UV light inside and of the related safety risks of working near or inside such equipment. Installation, operation, and maintenance literature for the equipment also will outline these safety risks, and will provide specific instructions for cleaning and replacing the lamps.

To reduce inadvertent exposure to UV-C light, all access points to equipment sections containing UV lamps will be equipped with safety switches that will disconnect power to the lights when the access door opens.

All polymeric (plastic) materials that will be exposed to the UV-C light will be tested and qualified to assure tolerance. Any components that are not qualified will be shielded from direct and indirect exposure.

Given the inherent challenges of applying UV-C lamps in a manner that does not compromise the reliability of the HVAC equipment and the inability to assure implementation of appropriate safety measures — *Trane does not support field installation of UV-C lamps in HVAC applications*.

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For more information, contact your local Trane office or e-mail us at comfort@trane.com

Literature Order Number	CLCH-PRB014-EN
Date	February 2004
Supersedes	New
Stocking Location	Electronic Only