

ENVIRONMENTAL
SERVICES AND
PRODUCTS INC.

**Ultra Germicidal Air Probe Sanitizer
A Professional Evaluation**

1. Introduction

While the environmental advocacy and regulatory movements have alerted us to the deterioration of our biosphere and its impact on human health, relatively little attention has focused on the significance of our indoor environments. Recent evidence suggests that physical symptoms such as headaches, fatigue, and shortness of breath, sinus congestion, coughing, sneezing, skin irritation, watery eyes, dizziness, nausea and a host of other ailments may all be associated with a number of problems caused by poor building ventilation. Collectively the building induced ailments have given rise to what is known as "Sick Building Syndrome" or "building related illness". These physical ailments are the result of unhealthy indoor air.

Unlike the outdoor or ambient environment, the indoor air environment is easily contaminated by individuals who suffer from respiratory disease or disorders, indoor blooming plants, damp cooling coils that provide an excellent medium for growing molds, bacteria, fungi, and protozoa, germ-carrying pets, and decaying organic matter. Once the indoor air quality is contaminated by these agents in a building with "Sick Building Syndrome" the poor ventilation coupled with faults in the building's design create a very unhealthy indoor environment for people. This is particularly a serious health problem if the building is a home or multiple housing units.

Housing is, in fact, part of our living environment, emphasizing the need to design and develop healthy and sustainable living environments. The U.S. Environmental Protection Agency (EPA) has taken up the issues related to indoor air quality and "Sick Building Syndrome" over the past five years with proposed regulations coupled with extensive research seeking solutions and other remedies.

It is in response to this situation that Clean Air Concepts developed and patented a low cost Ultraviolet System designed to dramatically improve indoor air quality and eliminate Sick Building Syndrome. The Ultraviolet system developed by Clean Air Concepts is trademarked ULTRA GERMICIDAL AIR PROBE SANITIZER.

The Air Probe Sanitizer must be placed in the heating air conditioning ductwork of a building. In the duct work it concentrates powerful Ultraviolet light upon all biological agents suspended in the indoor air as it flows through the heating or air conditioning system. In addition, large macromolecules bound dust particles, spores, pollen and cysts are irradiated continuously due to the air flow carrying them past the Ultraviolet Probes. These molecules are destroyed from the irradiation subsequent ionization that occurs continuously over the course of a twenty-four hour day. Microbial units in the air are reduced by over 90% and macromolecules carrying odor and respiratory irritants are completely destroyed in the first twenty-four hours of operation.

2. Air Handlers Unique, Patented, Ultraviolet Air Probe Sanitizer for Indoor Air Sanitation.

A. What is the Ultra Germicidal Air Probe Sanitizer?

The Ultra Germicidal Air Probe Sanitizer is a self-contained Underwriters Laboratory (U.L.) Approved ultraviolet light generator designed to sanitize the air flow through the ductwork of the heating and air conditioning systems of buildings. The design and other features of this generator are patented.

B. How it achieves its 95% effectiveness in destroying airborne biological agents.

The key to the effectiveness of the Ultra Germicidal Air Probe Sanitizer is the powerful ultraviolet light it generates and maintains while it is on. The Ultraviolet field is powerful enough to denature all of the proteins and nucleic acid macromolecules found in bacteria, fungi, viruses, molds and airborne cysts of protozoa. After several passes through the ultraviolet light field around the probes, nearly all of the biological agents are destroyed. The proteins and nucleic acids absorb large amounts of radiant energy in a very short time because they pass unshielded through the ultraviolet field. Their molecular contents undergo almost immediate ionization. When this occurs they are killed instantly. These populations never recover. Organisms that enter the building through doorways, windows, and through people carrying cold viruses, bacteria, ECT. are quickly picked up in the indoor air flow and subsequently carried into the ductwork to be destroyed by the Ultraviolet light field. This is all accomplished over and over again without any chemicals biocides.

C. Destruction of macromolecules by Ultraviolet Irradiation.

Large high molecular weight molecules such as proteins, fatty acids, and nucleic acids are destroyed by the ionization caused by ultraviolet irradiation. These molecules are found in pollen, spores, and many other byproducts. Odor causing molecules that are emitted from molds and mildew cultures growing on heat and cooling systems coils are destroyed when passed through the Ultraviolet light field. The microbial cultures growing on the coils are destroyed and prevented from re-establishment when the Ultra Germicidal Air Probe Sanitizer is installed to specifically irradiate the coils.

D. The Cleansing Action of the Ultra Germicidal Air Probe Sanitizer.

Just as the Ultra Germicidal Air Probe Sanitizer prevents the establishment of colonies of molds, fungi, and bacteria on the moist surface of the cooling coils of an air conditioning system, it destroys biological growth in the duct work. By causing ionization to occur in nearly all of the airborne dust particles that pass through the Ultraviolet light field the dust particles settle out of the air. When they are removed through household cleaning (dusting, vacuuming of carpets, ect.) the entire building takes on a dust-free status. Recontamination of the air is not possible as long as the Ultraviolet Germicidal Air Probe Units are operating. High purity air quality is guaranteed when the units are installed and operated by Air Handlers.

3. Cost and Safety Issues.

The cost of the double probe Ultra Germicidal Air Probe Sanitizer unit sufficient to sanitize the indoor air of a small two-bedroom apartment (approximately 1,500-3,000 square feet) is less than \$1000.00 installed. The cost of electricity to operate the unit is pennies per day even in high electricity cost areas. The Probes (Ultraviolet light bulbs) should be replaced annually to provide maximum Ultraviolet light at all times. There are also single probe units and customized multi-bulb units of up to twelve feet in length to sanitize large coils.

The Ultraviolet emitters are housed in a design that ensures the absolute safety of all people, pets and plants living in a building. In addition to the duct work, and out of direct view, the system emits Ultraviolet light in a shielded field where the rays cannot escape. Installation is done by professional electricians using safe procedures. The electrical integrity of the units is U.L. Approved.

4. US.EPA Regulatory Programs related to "Sick Building Syndrome".

The EPA's approach to addressing the "Sick Building Syndrome" has been largely through the use and advocacy of improved ventilation. In addition to the proposed "Standards For Indoor Air Quality" now under review and comment, the EPA has done very little to effectively address the direct problems caused by airborne biological agents.

The main focus of the EPA Indoor Air Quality Regulations addresses toxic and carcinogenic components such as asbestos, urethane fumes, and lead paint. While these are extremely important indoor air quality issues, comparable attention and regulatory controls are not provided for biological agents. There is no balance in the EPA regulations addressing both issues.

The U.S. government has supported the controlled use of Ultraviolet light to Sanitize rooms and special equipment. NASA used Ultraviolet light to irradiate space tools and the astronauts who landed on the moon in 1969. Moon rocks and all tools were sterilized with Ultraviolet. NASA has set up a Safety Commission on March 4, 1997 to advise technologies to control possible life that could be brought to Earth on returning space vehicles. Ultraviolet light treatment will surely be an option.

5. Conclusion

The Ultra Germicidal Air Probe Sanitizer is the most effective, lowest cost and most reliable indoor air purifier on the market today.

It is absolutely safe and presents no hazards to any occupant of the building where it is installed.

It provides a sanitized environment that removes dust, odors, and all pathogenic microbes and continually maintains this status.

It is the only laboratory proven non-chemical device on the market today that cleans cooling coils of all biological growth with no recurrence during constant use.

It is customer proven, with hundreds of very satisfied users.

6. References

1. American Lung Association, 1998. Health Effects and Sources of Indoor Air Pollution-Part 1 and 2. American Lung Association; New York, New York.
2. Brief, Richard S. Bernath, Tibar. 1998. Indoor Pollution; Guidelines for Prevention And Control of Microbiological Respiratory Hazards Associated with Air Conditioning and Ventilation Systems. Applied Industrial Hygiene. Volume 3, No.1 January 1988.
3. Crowther, Richard, 1989, Indoor Air-Risks and Remedies, Library of Congress Catalog Number 85742.
4. Dates et. al. 1991 Respiratory Health Effects of Home Dampness and Molds Among Canadian Children, American Journal of Epidemiology 134:196-203
5. Lippman, M et.al. 1985. Critical Issues In Air Pollution Epidemiology, Environmental Health Perspectives 62: 234-258.
6. US EPA 1990. Pilot Study on Indoor Air Quality-Managing Indoor Air Quality Risks, EPA Washington, D.C.
7. US EPA 1990, Residential Air Cleaning Devices. A Summary of Available Information. EPA. Washington, D.C.
8. US EPA 1992, Indoor Biological Pollutants, EPA, Washington D.C.
9. US EPA 1993, EPA Journal-Indoor Air, EPA Washington D.C. Vol. 19, Number 4.
10. US EPA 1996, Building Air Quality. EPA Washington, D.C.
11. US EPA 1995, Indoor Air Quality-Risks Characterization, EPA. Washington, D.C.

William L. Mills Ph. D. Consultant

Former Professor of Environmental Microbiology and Engineering, Center for Environmental Quality Management. School of Engineering, Vanderbilt University, Nashville, Tennessee, 1977-1989. Former member of the President's Council on Environmental Quality, Executive Office

March 5, 1997

ENVIRONMENTAL
SERVICES AND
PRODUCTS INC.

Ultra Germicidal Air Probe Sanitizer
A Professional Evaluation

I. Introduction

While the environmental advocacy and regulatory movements have alerted us to the deterioration of our biosphere and its impact on human health, relatively little attention has focused on the significance of our indoor environments. Recent evidence suggests that physical symptoms such as headaches, fatigue, shortness of breath, sinus congestion, coughing, sneezing, skin irritation, watery eyes, dizziness, nausea and a host of other ailments may all be associated with a number of problems caused by poor building ventilation. Collectively the building induced ailments have given rise to what is known as "Sick Building Syndrome" or "building related illness." These physical ailments are all the result of unhealthy indoor air.

Unlike the outdoor or ambient environment, the indoor air environment is easily contaminated by individuals who suffer from respiratory disease or disorders, indoor blooming plants, damp cooling coils that provide an excellent medium for growing molds, bacteria, fungi, and protozoa, germ-carrying pets, and decaying organic matter. Once the indoor air quality is contaminated by these agents in a building with "Sick Building Syndrome" the poor ventilation coupled with faults in the building's design create a very unhealthy indoor environment for people. This is particularly a serious health problem if the building is a home or multiple housing unit.

Housing is, in fact, part of our living environment, emphasizing the need to design and develop healthy and sustainable living environments. The U.S. Environmental Protection Agency (EPA) has taken up the issues related to indoor air quality and "Sick Building Syndrome" over the past five years with proposed regulations coupled with extensive research seeking solutions and other remedies.

It is in response to this situation that Clean Air Concepts developed and patented a low cost Ultraviolet System designed to dramatically improve indoor air quality and eliminate Sick Building Syndrome. The Ultraviolet System developed by Clean Air Concepts is trademarked ULTRA GERMICIDAL AIR PROBE SANITIZER.

The Air Probe Sanitizer must be placed in the heating and air conditioning ductwork of a building. In the duct work it concentrates powerful Ultraviolet light upon all biological agents suspended in the indoor air as it flows through the heating or air conditioning system. In addition, large macromolecules bound dust particles, spores, pollen and cysts are irradiated continuously due to the air flow carrying them past the Ultraviolet Probes. These molecules are destroyed from the irradiation subsequent ionization, that occurs continuously over the course of a twenty-four hour day. Microbial units in the air are reduced by over 90% and macromolecules carrying odor and respiratory irritants are completely destroyed in the first twenty-four hours of operation.

123-60 83RD AVE SUITE 9F KEW GARDENS, NY 11415
TELEPHONE (718)575-0772-0773 FAX (718)575-9213

II. Air Handler's Unique, Patented, Ultraviolet Air Probe Sanitizer for Indoor Air Sanitation

A. What is the Ultra Germicidal Air Probe Sanitizer?

The Ultra Germicidal Air Probe Sanitizer is a self-contained Underwriters Laboratory (U.L.) Approved ultraviolet light generator designed to sanitize the air flow through the ductwork of the heating and air conditioning systems of buildings. The design and other features of this generator are patented.

B. How it achieves its 95% effectiveness in destroying airborne biological agents. The key to the effectiveness of the Ultra Germicidal Air Probe Sanitizer is the powerful ultraviolet light it generates and maintains while it is on. The Ultraviolet field is powerful enough to denature all of the proteins and nucleic acid macromolecules found in bacteria, fungi, viruses, molds and airborne cysts of protozoa. After several passes through the ultraviolet light field around the probes, nearly all of the biological agents are destroyed. The proteins and nucleic acids absorb large amounts of radiant energy in a very short time because they pass unshielded through the ultraviolet field. Their molecular contents undergo almost immediate ionization. When this occurs they are killed instantly. These populations never recover. Organisms that enter the building through doorways, windows, and through people carrying cold viruses, bacteria, etc. are quickly picked up in the indoor air flow and subsequently carried into the ductwork to be destroyed by the Ultraviolet light field. This is all accomplished over and over again without any chemicals biocides.

C. Destruction of macromolecules by Ultraviolet Irradiation. Large high molecular weight molecules such as proteins, fatty acids, and nucleic acids are destroyed by the ionization caused by ultraviolet irradiation. These molecules are found in pollen grains, spores, and many other bioproducts. Odor causing molecules that are emitted from molds and mildew cultures growing on heat and cooling system coils are destroyed when passed through the Ultraviolet light field. The microbial cultures growing on the coils are destroyed and prevented from re-establishment when the Ultra Germicidal Air Probe Sanitizer is installed to specifically irradiate the coils.

D. The Cleansing Action of the Ultra Germicidal Air Probe Sanitizer. Just as the Ultra Germicidal Air Probe Sanitizer prevents the establishment of colonies of molds, fungi, and bacteria on the moist surfaces of the cooling coils of an air conditioning system, it destroys biological growth in the duct work. By causing ionization to occur in nearly all of the airborne dust particles that pass through the Ultraviolet light field the dust particles settle out of the air. When they are removed through household cleaning (dusting, vacuuming, of carpets, etc.) the entire building takes on a dust-free, clean-air status. Recontamination of the air is not possible as long as the Ultra Germicidal Air Probe Units are operating. High purity air quality is guaranteed when the units are installed and operated as specified by Air Handlers.

III. Costs and Safety Issues

The cost of the double probe Ultra Germicidal Air Probe Sanitizer unit sufficient to sanitize the indoor air of a small two-bedroom apartment (approximately 1500-3000 square feet) is less than \$800.00 installed. The cost of electricity to operate the unit is pennies per day even in high electricity cost areas.

The Probes (Ultraviolet light bulbs) should be replaced annually to provide maximum Ultraviolet light at all times. There are also single probe units and customized multi-bulb units of up to twelve feet in length to sanitize large coils.

The Ultraviolet emitters are housed in a design that ensures the absolute safety of all people, pets and plants living in a building. In addition to the installation being in the duct work, and out of direct view, the system emits Ultraviolet light in a shielded field where the rays cannot escape. Installation is done by professional electricians using safe procedures. The electrical integrity of the units is U.L. Approved.

IV. US EPA Regulatory Programs related to "Sick Building Syndrome."

The EPA's approach to addressing the "Sick Building Syndrome" has been largely through the use and advocacy of improved ventilation. In addition to the proposed "Standards For Indoor Air Quality" now under review and comment, the EPA has done very little to effectively address the direct problems caused by airborne biological agents.

The main focus of the EPA Indoor Air Quality Regulations addresses toxic and carcinogenic components such as asbestos, urethane fumes, and lead paint. While these are extremely important indoor air quality issues, comparable attention and regulatory controls are not provided for biological agents. There is no balance in the EPA regulations addressing both issues.

The U.S. government has supported the controlled use of Ultraviolet light to Sanitize rooms and special equipment. NASA used Ultraviolet light to irradiate space tools and the astronauts who landed on the moon in 1969. Moon rocks and all tools were sterilized with Ultraviolet. NASA has set up a Safety Commission on March 4, 1997 to advise technologies to control possible life that could be brought to Earth on returning space vehicles. Ultraviolet light treatment will surely be an option.

V. Conclusions

The Ultra Germicidal Air Probe Sanitizer is the most effective, lowest cost, and most reliable indoor air purifier on the market today.

It is absolutely safe and presents no hazards or threat to any occupant of the building where it is installed.

It provides a sanitized environment that removes dust, odors, and all pathogenic microbes and continually maintains this status.

It is the only laboratory proven non-chemical device on the market today that cleans cooling coils of all biological growth with no recurrence during constant use.

It is customer proven, with hundreds of very satisfied users.

VI. References

1. American Lung Association. 1988. Health Effects and Sources of Indoor Air Pollution--Parts I and II. American Lung Association; New York, New York
2. Brief, Richard S. Bernath, Tibar. 1988. Indoor Pollution: Guidelines for Prevention and Control of Microbiological Respiratory Hazards Associated with Air Conditioning and Ventilation Systems. Applied Industrial Hygiene. Volume 3, No.1 January 1988.
3. Crowther, Richard, 1989. Indoor Air-Risks and Remedies. Library of Congress Catalog Number 85742.

- 4. Dates et. al. 1991. Respiratory Health Effects of Home Dampness and Molds Among Canadian Children. American Journal of Epidemiology 134:196-203
- 5. Lippman, M et. al. 1985. Critical Issues In Air Pollution Epidemiology, Environmental Health Perspectives 62: 243-258.
- 6. US EPA 1990. Pilot Study on Indoor Air Quality-Managing Indoor Air Quality Risks. EPA. Washington, D.C.
- 7. US EPA 1990. Residential Air Cleaning Devices. A Summary of Available Information. EPA. Washington, D.C.
- 8. US EPA 1992. Indoor Biological Pollutants. EPA. Washington D.C.
- 9. US EPA 1993. EPA Journal-Indoor Air. EPA Washington D.C. Vol 19, Number 4.
- 10. US EPA 1996. Building Air Quality. EPA. Washington, D.C.
- 11. US EPA 1995. Indoor Air Quality-Risks Characterization. EPA. Washington, D.C.

William L. Mills

William L. Mills Ph. D., Consultant
 Former Professor of Environmental Microbiology and Engineering, Center for Environmental Quality Management. School of Engineering, Vanderbilt University, Nashville, Tennessee, 1977-1989. Former member of the President's Council on Environmental Quality. Executive Office of the President, Washington, D.C. 1983-1989.

March 5, 1997