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AerisGUARD™ Bioactive Surface Treatment SOP004

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==== Instructions begin on following page ====

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AERIS ENVIRONMENTAL LTD			
AerisGuard™ Bioactive Surface Treatment. EPA Reg. No. 82523-3			SOP NO 004
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STANDARD OPERATING PROCEDURE			

1. SCOPE AND PURPOSE

This SOP outlines the application procedure for AerisGuard™ Bioactive Surface Treatment (AerisGuard™ BAST) on bare metal, semi porous (concrete or plaster) internal HVAC surfaces of Air Handling Units: air distribution components (air handlers, mixing boxes, transfer boxes, transitions, turning vanes, dampers, fans, and fan housings and associated components), condensate drain pans and air handling room floors, walls and ceiling.

AerisGuard™ BAST is designed to be used as one component of a comprehensive HVAC maintenance program. The purpose of such a program is to assure that the HVAC system functions as designed, remain free from mold and other microbial growth and other contamination, and continue in that condition. AerisGuard™ BAST is to be used only in systems where visible microbial growth has been detected and then only after removing the growth and identifying and correcting the conditions that led to that growth.

2. DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner that is inconsistent with its labeling.

- **For application ONLY by professional applicators certified by the Aeris Accredited Applicator Training Program**
- Read and understand the precautionary statements located on the product container label.
- Read and understand this Standard Operating Procedure
- The applicator is responsible for following both state and federal laws when applying this product
- For use in unlined ductwork only

If you need help in understanding any part of this SOP or have additional questions after reading this SOP or the product container label, **DO NOT APPLY THIS PRODUCT**. Contact your Aeris Distributor for help and proceed only after all of your questions have been answered.

The system must be "off line" during the entire inspection, cleaning, repairing and treating process. This must be done by arrangement with the engineering staff at the site if necessary. When isolating HVAC electrical energy systems adhere strictly to requirements of Occupational Safety and Health Standard 1910.147, entitled "The Control of Hazardous Energy (lockout/tagout)."

DANGER: Corrosive. Causes irreversible eye damage. Do not get in eyes or on clothing. Wear chemical resistant gloves, safety goggles or face shield and full-body overalls. Wash thoroughly with soap and water after handling and before eating,

drinking, chewing gum, using tobacco, or using the toilet. Avoid breathing spray mist. Remove contaminated clothing and wash clothing before reuse.

Additional safety equipment may be required to comply with state and local regulations or the particular nature of the project.

UNDER NO CIRCUMSTANCES IS SMOKING PERMITTED IN OR WITHIN 100 FEET OF THE HVAC FACILITY BEING TREATED.

3. INSPECTING AND IDENTIFYING CONTAMINATED SURFACES

Prior to application of this product, the system must be inspected for cleanliness and mechanical condition. When initiating any measure to repair, clean or treat ducts and associated HVAC system components, industry standards from the National Air Duct Cleaners Association (NADCA) and other organizations must be followed. According to NADCA Standards, HVAC system cleaning must be performed when any of the following conditions are found in the cleanliness inspection. If any of these deficiencies are found during inspection, cleaning in accordance with the industry standards must be performed prior to the application of this product.

HVAC systems operate more efficiently when they are in a clean condition. When significant amounts of contaminants, debris, or microbial growth are evident, then those contaminated areas must be cleaned as described below.

If significant accumulation of contaminants or debris are visually observed within the HVAC system then cleaning is necessary. Likewise if evidence of microbial growth is visually observed or confirmed by analytical methods, then cleaning is required.

If the HVAC system discharges visible particulate into the occupied space, or significant contribution of airborne particles from the HVAC system into the indoor ambient air is confirmed, then cleaning is necessary.

Air flow control devices, filtration devices, and air-handling equipment determined to have restrictions; blockages or contamination deposits that may cause system performance inefficiencies, air flow degradation, or that may significantly affect the design intent of the HVAC require cleaning.

Drain pans must be free from slime and sludge or other contamination. Badly rusted or corroded drain pans must either be repaired or replaced.

Fans and fan housings must be free from accumulations of microbial growth and particulate matter.

Filters must be in good condition and cleaned or replaced as needed to avoid exceeding the allowable pressure drop for the equipment.

Mechanical Inspection

AerisGuard BAST must be used only on HVAC system components and air ducts in sound mechanical condition. The HVAC system components must be designed and installed in conformance with industry standards and guidelines. Prior to using the

product, inspect the HVAC system and ducts and assure that they are in sound mechanical condition. Follow the general guidelines below supplemented with industry standards from SMACNA, NAIMA, ASHRAE, ACCA and other organizations.

3.1 Air Leaks and Defects

The equipment housing, cabinets and ducts must be free from air leaks and other mechanical defects. Air leaks will promote condensation of water that might cause microbial growth and might lead to failure of this product to protect the system adequately.

Design and Installation

ASHRAE, SMACNA, NAIMA and other industry organizations have established guidelines and standards for the design and installation of HVAC and duct systems. You should determine that the system components you wish to treat conform to industry practice. If you are not knowledgeable of industry guidelines and standards, consult a qualified professional or contact your Aeris distributor for assistance.

In some situations, the inspection may reveal that a component of the HVAC or duct system is badly damaged or in such poor operating condition that it cannot be corrected through cleaning and/or minor repair. In these situations, the system should be replaced or rebuilt in conformity to the applicable industry standards prior to using AerisGuard BAST. Some (but not all) of the conditions that would indicate the need for major repairs or replacement of the system include:

Improper size of system or component – The system and all components must be sized to achieve correct airflow and be of the proper capacity for the load. When air handling equipment is changed or new inlets or outlets added, the size of all components in the system should be recalculated and replacements made as needed.

Physical damage – Crushed or physically damaged equipment may leak or fail to perform as designed. Deformed air ducts will restrict airflow and may leak (especially at joint areas). Damaged equipment must be repaired or replaced or if there is extensive damage, the entire system should be replaced.

Badly corroded metal components including duct sections, housings and cabinets, coil assemblies, drain pans, fans and their housings and heat exchange surfaces.

Loose, damaged, friable or missing insulation - Insulation is important in preventing moisture condensation and subsequent growth of mold and other organisms. If insulation (either interior or exterior) is damaged, missing or not properly fastened it must be repaired or replaced or the associated duct sections replaced. Air handler, mixing, and VAV box housings are also normally insulated and this insulation should be checked for damage in a like manner.

Removed components that are contaminated with mold and other microbial growth may spread contamination while being removed from the building. To prevent this, smaller items should be placed in plastic bags that should then be sealed before being removed. To prevent this, smaller items should be placed in plastic bags that should then be sealed before being removed. Larger items that cannot be safely packaged should be treated before being moved

through occupied spaces. An appropriately labeled disinfectant can be used during treatment. Care must be used during treatment to assure that fumes from the agent being used are not released into occupied spaces. Products must be used according to their label directions. Please contact your Aeris distributor for guidance on the appropriate disinfectant to use for treatment.

4. Air Ducts

4.1. General Air Duct Directions

This product effectively controls by inhibiting growth of odor causing bacteria, fungi, and other odor, stain or damage causing organisms in air ducts in residential, commercial, institutional and industrial buildings. AerisGuard BAST also eliminates odors associated with bacteria, mold, mildew, smoke, animals, cooking, spoilage, musty and other odors removes odor-causing organisms when used as part of such a comprehensive preventative maintenance program in air ducts and other HVAC system components.

AerisGuard BAST is a bacteriostat, fungistat (mold and mildew), mildewstat and deodorizer for use in residential, commercial and industrial settings. It will not stain or bleach materials or fabrics and will not harm or damage HVAC system components.

AerisGuard BAST is formulated for use in ducts and HVAC components including:

- Unlined sheet metal

- Air supply and return ducts and plenums fabricated with plywood, OSB or other wood-like material.

- Flexible air ducts fabricated of metal or plastics

- Air distribution components, such as air-handlers, mixing boxes, transfer boxes, transistors, turning vanes, dampers, fans and fan housings and associated components

- Condensate drain pans

Follow the directions below for the specific type of duct or components being treated. It is vital that the following directions are carefully read and understood prior to using this product.

4.2. Application Instructions

Spray areas until thoroughly moist, giving special attention to cracks and crevices. Allow 30 to 60 minutes for drying. It is not necessary to wipe the sprayed surfaces. AerisGuard BAST should not stain those materials not stained by water.

4.3. Application Equipment and Surfaces

Refer to Section 2 for protective clothing and other special instructions that must be followed.

4.3.1.Brush, Mop, or Wipe Application

This application method may be specified by some facility maintenance or remediation plans. These techniques are generally more labor intensive than

other methods and are normally used only when specifications require. These methods are suitable only for smooth uniform surfaces. Do not use on porous or non-uniform surfaces. When using brush or mop applications, tools and materials used should be reserved only for applications of this product, kept clean and protected between uses and replaced when worn or visibly soiled. Natural fiber brushes are preferred although any quality brush is acceptable. Mop types should be those that leave minimal lint behind. Micro-fiber or other non-linting cloths are preferable. When other types of cloths are used, they must be soft enough that they absorb a sufficient quantity of liquid to provide uniform applications.

During application, the applicator must have access to the surface being treated. Usually this will require entering the ducts. In such cases, application must start from a point most distant from the point of entry into the duct. The applicator will then work from that point back to the entry point covering a 3 foot length of duct at a time. Apply to the top of the duct first, followed by the sides then the floor of the duct. Overlap applications to assure complete coverage. Cover completely while avoiding runs and pooling.

4.3.2. **Spray Applicators**

Spray application is preferred on large surfaces that are easily accessible (such as in long runs of large diameter ducts, coil assemblies and the interior of cabinets and housings with removable access panels). The spray equipment chosen should provide a consistent fine particle size and uniform spray pattern. Electric type airless sprayers are preferred.

Where airless sprayers are used, the most satisfactory spray pattern will be achieved using the finest particle size possible.

Avoid excessive wetting and do not allow spray to run or pool

4.3.3. **ULV or Mist Generating Sprayers**

ULV or mist or other wet small particle applications is preferable where surfaces are irregular or less accessible. Equipment capable of generating particles in the 15 to 60 micron range is most satisfactory. Avoid use of thermal type fog generators.

Generally a fog will carry and provide adequate coverage up to 8 feet from the point of applications so adequate penetrations must be cut in the duct to assure complete coverage without wetting. SMACNA, NADCA and NAIMA have established standards and guidelines for making and sealing openings in ducts. Operators should be trained on proper applications techniques as well as correct duct penetration and sealing procedures using these standards and guidelines. Operators should also carefully read and follow directions for the brand of equipment used. Duct penetration should properly closed following applications, in accordance with industry standards.

4.3.4. **Automated Atomizing or Spray System**

There are a number of automated spraying systems on the market including those that are carried by a "robot" through air ducts. These may provide an excellent option for application of AerisGuard BAST in parts of air ducts that are difficult to access if they produce the correct spray pattern and application quantity. These devices must be visually monitored using video or other means while applying spray so proper applications rate will be maintained.

4.4. Application Techniques

AerisGuard BAST must be applied evenly throughout duct system and over other surfaces that are being treated. Even and uniform application is essential for satisfactory results. The procedures, equipment and techniques described below have been tested and provide the desired results. Other procedures, equipment and techniques also achieve satisfactory results but should not be used without discussing the specific situation and equipment with your AerisGuard distributor.

4.4.1. Application from Exterior of the HVAC System

AerisGuard BAST may be sprayed into openings at intervals throughout the duct system or on components that are accessible through removable panels or access doors.

Spray into openings every 8 feet at a minimum: Existing supply openings can be used where they will provide clear view of the surfaces being sprayed so that uniform application can be achieved. However, additional penetrations will have to be made as needed, so enough openings will be available to achieve total and uniform coverage.

Spray application is not an acceptable technique where openings are greater than 8 feet apart, additional openings cannot be made and properly sealed and/or the duct geometry does not allow for uniform coverage. In such cases, application from within the HVAC system is necessary (See 4.4.2)

4.4.2. Application from Within the HVAC System

When AerisGuard BAST cannot be sprayed into openings at intervals throughout the duct system, you must gain entry into the system and spray the product onto interior duct and other surfaces until they are thoroughly and uniformly covered using hand or powered spray equipment. This is the most frequently used technique and is the technique of choice for air-handlers, other components with access panels or doors and large diameter (generally 20" X 20" minimum) ducts where direct access can be gained to surfaces being treated.

4.5. Rate of Application

The recommended rate of applications for this product varies depending on the surface being treated. Users of this product must carefully follow the rate of application instructions provided below.

4.5.1. Bare Metal and Flexible Ducts

Apply until surface is evenly wet. Wipe not recommended. Spray coverage using the electric type airless spray gun at a rate of 2 ounces [oz.] per 10ft² (60 ml per m²). If the above application rate result in surface runoff or liquid pooling on the bottom of the duct, lower the application rate until the surface is thoroughly and evenly wet without runoff or pooling.

4.5.2. **Semi Porous Surfaces such as Concrete or Plaster**

Apply until surface is evenly wet. Wipe not recommended. Spray coverage using the electric type airless spray gun at a rate of 2 ounces [oz.] per 10ft² (60 ml per m²). This product must penetrate into surface crevices and irregularities or it will not be effective. Inspect and assure that the penetration is satisfactory. It may be helpful to apply half of the quantity needed for full coverage spraying from side to side then repeat the applications moving the spray from top to bottom.

5. **HVAC/R EQUIPMENT**

This product is formulated use on a variety of HVAC components including:

Furnaces

Air Handlers

Packaged units including Rooftops and Packaged Terminal Air Conditioner (PTAC) units

Air distribution components such as air handlers, mixing boxes, transfer boxes, transitions, turning vanes, dampers, fans and fan housings and associated components

Condensate drain pans

Dehumidifiers, both desiccant and refrigerated

Registers, grills and other air intake and discharge devices

5.1. **PREPARATION OF SURFACES (Assurance of surface cleanliness)**

These surfaces must be cleaned prior to the application of AerisGuard BAST

Mechanically dislodge attached particulate and debris using vacuum units, mechanical and hand brushes, pressurized air sources and other tools as required. Collect using an HEPA filter equipped vacuum cleaner. This is followed by the complete cleaning of soil from all internal HVAC air handling surfaces using a special cleaner formulated to clean such soils but that will not damage any of the unit's surfaces or components.

All surfaces must be cleaned in accordance with NADCA standard ACR 2005.

Additional associations and society Internet sites that may be consulted for additional information and guidance include:

ACCA - www.acca.org

ASHRAE - www.ashrae.org

IAQA - www.iaqa.org

NADCA - www.nadca.com

NAIMA - www.naima.org

SMACNA - www.smacna.org

Dehumidifier

Due to the amount of water present, dehumidifiers are often sites especially prone to microbial growth. They also attract and hold soil as growth related contamination builds up over time. This accumulated material must be thoroughly removed prior to treatment with this product. For some units, cleaning may also signal the need to replace pads, belts wheels or service other components. The manufacturer of the unit being maintained should be consulted on the proper maintenance and cleaning procedure.

Air Handling Rooms

The methods of remediating walls, floors, doors, seals and ceilings made of bare metal or semi-porous concrete or plaster associated with commercial air handling units vary according to the degree of severity of the colonization. If the growth is very visible, with a furry surface and a very severe musty smell the surfaces must be scraped to remove the growth. Dispose of the biological soil as hazardous waste.

For surfaces with visible but not severe growth use a multi-enzyme product to remove the biological matter. This process is facilitated by hosing the surface. Plant rooms are traditionally built with sloping floors to facilitate water drainage. If no drainage exists then wet vacuum can be employed to remove excess water.

Sound Insulation

Many air handling units have some or all of their surfaces insulated against sound transmission. If this insulation is non-porous remediate the surface as described in the air handling section. If the surface is made of porous concrete or plaster then various alternative courses of action will need to be considered depending upon the degree of contamination within the porous surfaces.

If the porous surface has any areas of severe fungal colonization then the insulation must be stripped, disposed of as contaminated waste and replaced.

Drain Pans

These pans are situated beneath cooling coils to collect the large volumes of water within the air handler which collect on the cooling surfaces as humid air is cooled. A common problem encountered with these systems even without the incidence of storms and flooding is the blockage of drain lines, which leads to pans overflowing and causing water damage.

Because of the risk of blockage of these drain lines by refuse blown into the building or

arising as a result of growth of slime in the drain line or in the pan the replacement of these drain lines is recommended.

The condensate pans themselves must be cleaned. This is best accomplished with a multi-enzyme cleaning product. It may be possible to avoid the replacement of the drain lines if the drains are able to effectively empty in the course of their cleaning.

Fans and fan housing

The high velocity of fans can lead to condensation of water that supports mold and other growth.

6. PROCEDURE

6.1. Set Up

Tarpaulin/plastic sheeting is used to protect the air filters from any deposits of cleaning solution, treating solution or water. Other parts of the system may need to be covered as well, i.e. fan motors, sensors, etc. in close proximity to work area.

If using diesel fueled hot water pressure cleaners or any other equipment that may potentially set off warning devices, do not place under any smoke or fire detectors as they could be set off. Isolation of these sensors should be arranged with the building/facility manager.

Ensure that the hoses for the pressure cleaner are all on securely to avoid any excess water on the floor. The use of door mats is advisable to stop any dirt being walked into other areas. All traces of dirt must be removed before leaving site.

6.2. AerisGuard BAST Application

Normally, infrequent application (6 months to every two years) will provide effective control. Reapply only when there is evidence of mold or other microbial re-growth. Prior to reapplication, investigate to determine the cause of re-growth and correct that problem prior to reapplications. If application is needed more than every six months contact your Aeris distributor or other qualified professional to discuss the specific application and situation. It is important to determine if the reoccurrence of microbial growth is due to persistently high humidity, standing water or hidden leaks.

General directions:

After ensuring that the surface is well cleaned and rinsed of any cleaning solutions, AerisGuard BAST is then applied using the electric type airless spray gun at a rate of 2

ounces [oz.] per 10ft² (60 ml per m²). Adjust spray mist to the finest particle size possible. Apply to only those surfaces identified on this label (do not apply to cooling coils) until surfaces are evenly wet. If pooling occurs, mop up excess solution.

Following completion of the treatment, do not restart the system until surfaces are dry. Then purge the system on full outside air overnight whenever possible. Adequate ventilation must be applied to ensure no aerosol residual of the treatment can be detected.

The AerisGuard BAST solution does not need to be rinsed off any of the surfaces.

When the directions for use are followed properly, this product will not be released to the spaces served by a system being treated. Affected areas of the building are not to be occupied during treatment. Do not reenter these areas until 1 hour after treatment.

Bare Metal (Fans, Fan Shrouds, Dampers and Drain Pans):

Spray surface until it is evenly wet to ensure adequate coverage. If the application results in surface runoff or liquid pooling, lower the application rate until the surface is thoroughly and evenly wet without runoff or pooling.

Semi Porous Surfaces (Concrete floors and walls or Plaster walls)

Apply to these internal surfaces of the air handling system using an electric type airless gun until surface is evenly wet. Inspect and assure that penetration is satisfactory. It may be helpful to apply spray initially from side to side and then repeat the application moving the spray from top to bottom to assure uniform coverage.

Drain Pans

Spray surface until it is evenly wet to ensure adequate coverage. If the application results in surface runoff or liquid pooling, lower the application rate until the surface is thoroughly and evenly wet without runoff or pooling.

6.3. Cleaning Up

Fill AerisGuard BAST spray apparatus with water and operate to ensure no traces of solution remain within the unit. Follow manufacturer's other maintenance procedures for the spray equipment.

Ensure no trace of work or cleaning related debris remains on completion of this process. The use of door mats and/or cardboard boxes at entry and exit points of the air handling unit helps to keep this cleaning to a minimum.

7. REFER TO PROFESSIONAL HVAC CLEANING STANDARDS AND REGULATION IN YOUR AREA

ALL HVAC CLEANING MUST CONFORM WITH ALL AIR SYSTEM CLEANING GUIDELINES SET OUT IN NADCA STANDARD, ASSESSMENT, CLEANING, AND RESTORATION OF HVAC SYSTEMS ACR 2005

An Industry Standard Developed by the National Air Duct Cleaners Association

Contact NADCA at

NADCA
National Air Duct Cleaners Association
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Washington, DC 20005
www.nadca.com

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