DOMINION

October 30, 2012

Mr. Jeff Gregorich
Hayden-Winkelman USD
824 Thorne Avenue
Winkelman, AZ 85292

Re: Hayden-Winkelman School District –Building 800
824 Thorne Avenue
Winkelman, AZ 85292

Dominion Project Number: 9508.09

Dear Mr. Gregorich,

Pursuant to your request, Dominion Environmental Consultants, Inc. (Dominion) conducted a limited visual inspection at the above referenced address on October 25, 2012.

BACKGROUND

Dominion was informed by District personnel that there had been a rodent infestation in Building 800.

SCOPE OF WORK

- When arriving on-site Dominion was requested to conduct a visual inspection of the infested building including the ceiling plenum.
- Dominion was requested to provide a report of findings with recommendations to the client.

VISUAL OBSERVATIONS

Dominion inspected all of the classrooms, storage and office spaces in the building where the infestation was reported to have occurred. Signs of rodent activity including feces, urine stains, nests, and damaged insulation were observed above the drop ceiling panels, on the floors and on contents in all of the classrooms that were inspected.

CONCLUSIONS

Based on the visual inspection there is evidence of widespread rodent urine and feces contamination in the ceiling plenum and inside the classrooms. Therefore, Dominion recommends that remediation be conducted prior to occupancy of the rooms.

CLEANING RECOMMENDATIONS

All recommended cleaning procedures should include, at a minimum, state of the art remediation containment requirements to prevent the spreading of contaminants during the remediation activities: Negative pressure containments, professional removal techniques and limits, along with personnel protection equipment, any disposal requirements, and final sampling criteria. The remediation, or cleaning

Contractor, shall comply with all EPA, NESHAP, OSHA, County or other governing regulatory agency regulations. All materials impacted by the remediation activities should be tested for asbestos fibers prior to their disturbance. After the initial asbestos inspection has been completed, if any additional suspect asbestos-containing building materials are encountered during the remediation activities that have not been previously tested, those materials should be sampled by a certified asbestos inspector and analyzed by a qualified laboratory prior to any disturbance. All remediation activities should be performed by a qualified remediation professional.

Rodent Prevention Plan

- The District should ensure that an active rodent prevention plan is in place prior to remediation. This plan should include, at a minimum:
    - Active removal of the rodents from inside and around the building.
    - Identifying and sealing all penetrations that could allow the rodents to re-enter the building.

Containment Provisions and Personal Protective Equipment

- Each area should be adequately sealed from occupied areas with polyethylene (poly) sheeting.
- All HVAC systems servicing the 800 building should be thoroughly inspected, including the AHU, supply ducts, return ducts and associated registers. If the system is found to be contaminated it should be cleaned by a qualified duct cleaning professional following the National Air Duct Cleaning Association (NADCA) guidelines (See Exhibit 1). and then tested prior to re-use. If the system does not have obvious signs of contamination but has been activated during the period of time that the building has been contaminated, the system(s) should be thoroughly cleaned by a qualified duct cleaning professional following the National Air Duct Cleaning Association (NADCA) guidelines (See Exhibit 1). After the inspection had been completed if the HVAC system is not found to be contaminated and has not been activated during the time the building has been contaminated, the system(s) inside Building 800 should be deactivated and the associated ducts and registers inside the building should be isolated and sealed with two layers of "critical barrier" 16 mil poly sheeting.
- The contained work area should be adequately marked with the appropriate signage and monitored to prevent entry from unauthorized persons.
- The contained work area should be placed under negative pressure differential to prevent migration of dust and contaminants outside of the work areas.
- Workers entering contained work areas should have appropriate personal protective equipment (PPE). The proper level of PPE for contractor workers is to be determined by contractor.

Building Material Removal

- Dominion recommends that all drop in ceiling tiles and batt insulation in building 800 be removed and disposed of. Once this has been accomplished, the glued on ceiling system above the drop ceiling should be evaluated for contamination. If contamination is identified this ceiling system should also be removed, however it appears that this system is attached to the roof deck which should not allow access for the rodents.

- All dust and debris should be treated with a disinfectant prior to removal. The CDC recommends that urine, droppings, dust and debris <u>should not</u> be disturbed by sweeping or vacuuming. The debris should be treated with an appropriate biocide following the manufacturer's instructions on the label for dilution and disinfection time.

- Dominion recommends that after the bulk debris and droppings have been removed, all remaining building materials should cleaned and then final wet wiped with an appropriate biocide. It is important that the contractor be aware of factory recommended contact time for the disinfectant product and that contractor ensures the District that proper contact time for the disinfectant product will be observed during the cleaning activities.

- Dominion recommends that the cabinets be detached and the area under the cabinets be cleaned using the above referenced recommended cleaning procedures. Once the cleaning procedures are completed and the area has cleared the cabinets can be reinstalled.

Flooring

- If the carpeting is in good condition and can with stand steam cleaning and wet extraction, Dominion recommends that all of the carpeting in the rooms be treated with an appropriate biocide followed by steam cleaning and extraction. It the carpeting is not in good condition Dominion recommends that the carpeting be removed by the remediation contractor and disposed of. The substrate should then be cleaned and sanitized.

- Tile and other non-porous hard flooring surfaces can first be cleaned using a wet extraction floor machine and then wet wiped with an appropriate biocide.

Contents

- Dominion recommends that all porous contents such as papers, posters, cardboard boxes be disposed of.

- Non-porous items such as desks and shelving should be cleaned and then final wet wiped with an appropriate biocide.

- Porous contents that cannot be disposed (e.g., text books) of should be wet wiped with an appropriate biocide. It is recommended that random sampling of salvaged porous items be conducted prior to releasing the items for use.

Final Inspection

Following the removal of the identified contaminants, all of the remaining building materials above the ceiling grid should be evaluated visually to determine that they are clean prior to any final sampling and restoration.

Final Sampling

After all the contaminated building materials have either been removed and/or properly cleaned, all exposed surfaces in the work area should be visually inspected to determine if the space is clean.

- Once the work space has passed final visual inspection it is recommended that final surface swab sampling be conducted as an added precaution to evaluate the surfaces inside the affected areas for the elevated presence of fecal bacteria.
- After passing the final round of sampling the work space can be restored with new building materials and re-occupied.

LIMITATIONS

The conclusions and results contained herein are based solely on the information presented in this report. The observations described in the report represent conditions only at the specified times and locations. Additional contamination or information which was not readily available, hidden, undiscovered, inaccessible, or are not part of the finding presented herein, would result in the modification of the conclusions and recommendations made herein.

Dominion's scope of service for this report did not include the inspection for, or identification of, lead-based paint, asbestos-containing materials, or any other hazardous or controlled substances not specifically identified herein.

Dominion is not responsible for the accuracy of information provided by others, or for conditions or consequences arising from relevant facts that were withheld, concealed, undiscovered or not fully disclosed. Dominion is not a law firm, and therefore, makes no representations regarding any potential liability of any person or entity for site conditions. Further, Dominion is not qualified to present medical advice. If any present or future health issues are in question, it is recommended that the findings of any written report be presented to a qualified medical professional for evaluation.

If you should have any questions or would like to discuss the contents of this report, please do not hesitate to contact me at any time.

Sincerely,

Dominion Environmental Consultants, Inc.

Dr. Ryan Kuhn, Ph.D., CIH
Corporate Director of Industrial Hygiene Services

Enclosure:
Exhibit 1 – NADCA Guidelines

EXHIBIT 1

This General Specification describes the minimum requirements necessary for commercial HVAC system cleaning. This document must be modified to accurately account for the unique system variations within an individual building.

NADCA GENERAL SPECIFICATIONS FOR THE CLEANING OF COMMERCIAL HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS

National Air Duct Cleaners Association
1518 K Street, N.W.
Suite 503
Washington, DC 20005
(202) 737-2926 · Fax (202) 347-8847
info@nadca.com · www.nadca.com

This General Specification describes the minimum requirements necessary for commercial HVAC system cleaning. This document must be modified to accurately account for the unique system variations within an individual building.

INTRODUCTION

This recommended General Specification was prepared by the National Air Duct Cleaners Association (NADCA). It describes the **minimum** requirements necessary to coordinate a successful commercial HVAC system-cleaning project.

This document was created for use by building owners, managers and engineers in the development of cleaning specifications applicable to a certain building or group of buildings. Therefore, this document **must** be modified to accurately account for the unique system variations within an individual building.

This specification is written as an owner's specification, however, substitutions may be made by inserting "mechanical contractor," "general contractor," or "architect," where designated in **boldface** type.

The use of this specification in and of itself is no guarantee of a successful project. Sufficient coordination by the owner, including the selection of a qualified contractor, is as equally important as a good specification.

This document was created for projects performed in the United States of America. For projects outside of the U.S.A., users of this specification are advised to consult applicable laws, standards and regulations of their country to ensure that the contents of this specification do not conflict with such statutes.

For more information about HVAC system cleaning, please contact:

National Air Duct Cleaners Association
1518 K Street, N.W.
Suite 503
Washington, DC 20005
(202) 737-2926
Fax (202) 347-8847
info@nadca.com
www.nadca.com

This General Specification describes the minimum requirements necessary for commercial HVAC system cleaning. This document must be modified to accurately account for the unique system variations within an individual building.

DISCLAIMER

This sample specification was developed by the National Air Duct Cleaners Association (NADCA) and is intended to provide information and general guidance regarding the acceptable criteria for performing commercial HVAC system cleaning. The guidelines are based on standard industry practices, but are not intended to be either exhaustive or inclusive of all pertinent requirements. The provisions included are not intended to be directed to any particular industry segment, product, method or contractor; nor do they purport to address or satisfy all possible legal requirements. The sample specification is offered WITHOUT WARRANTY, EITHER EXPRESSED OR IMPLIED, AS TO THE MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR ANY OTHER MATTER. Following the specification does not ensure compliance with any federal, state or local regulations, nor safe, satisfactory, or complete performance of HVAC system cleaning.

The specification is not intended to provide specific advice, legal or otherwise, on particular methods or agreements between contractors and owners of buildings. Users are cautioned that the information upon which this specification is based is subject to change, which may invalidate any or all of the comments contained herein. In preparing project specifications, NADCA strongly recommends that users of this specification consult with their own legal and technical advisors, their suppliers, and other appropriate sources (including but not limited to technical standards on duct cleaning and related activities, product technical bulletins or sales literature, and government building codes and standards) which contain information about performance criteria for duct work and associated building systems, and modify the sample specification accordingly. NADCA, its members, and contributors assume no responsibility for the user's compliance with any applicable laws and regulations, nor for any persons relying on the information contained in this sample specification.

© Copyright by NADCA 2004, Washington, D.C. No part of this document may be reproduced, electronically or in paper copy, for commercial sale without the express written permission of NADCA. Users are welcome to reproduce and modify this document to suit their own purposes for use on specific projects. All other rights reserved.

This General Specification describes the minimum requirements necessary for commercial HVAC system cleaning. This document must be modified to accurately account for the unique system variations within an individual building.

NADCA General Specifications

Contents

Part 1 -- Special Provisions

1.01 Qualification of the HVAC System Cleaning Contractor
- (A) Membership
- (B) Certification
- (C) Supervisor Qualifications
- (D) Experience
- (E) Equipment, Materials and Labor
- (F) Licensing

1.02 Standards
- (A) NADCA Standards

1.03 Documents
- (A) Mechanical Drawings

Part 2 -- HVAC System Cleaning Specifications and Requirements

2.01 Scope of Work
- (A) Scope

2.02 HVAC System Inspections and Site Preparations
- (A) HVAC System Evaluation
- (B) Site Evaluation and Preparations
- (C) Inspector Qualifications

2.03 General HVAC System Cleaning Requirements
- (A) Containment
- (B) Particulate Collection
- (C) Controlling Odors
- (D) Component Cleaning
- (E) Air-Volume Control Devices
- (F) Service Openings
- (G) Ceiling sections (tile)
- (H) Air distribution devices (registers, grilles & diffusers)
- (I) Air handling units, terminal units, blowers and exhaust fans
- (J) Duct Systems

2.04 Health and Safety
- (A) Safety Standards
- (B) Occupant Safety
- (C) Disposal of Debris

2.05 Mechanical Cleaning Methodology
- (A) Source Removal Cleaning Methods
- (B) Methods of Cleaning Fibrous Glass Insulated Components
- (C) Damaged Fibrous Glass Material
- (D) Cleaning of coils
- (E) Biocidal Agents and Coatings

2.06 Cleanliness Verification
- (A) General
- (B) Visual Inspection
- (C) Verification of Coil Cleaning

2.07 Pre-existing System Damage

2.08 Post-project Report

2.09 Applicable Standards and Publications

This General Specification describes the minimum requirements necessary for commercial HVAC system cleaning. This document must be modified to accurately account for the unique system variations within an individual building.

NADCA General Specifications

Part 1 -- Special Provisions

1.01 Qualification of the HVAC System Cleaning Contractor

(A) Membership: The HVAC system cleaning contractor shall be a certified member of the National Air Duct Cleaners Association (NADCA), or shall maintain membership in a nationally recognized non-profit industry organization dedicated to the cleaning of HVAC systems.

(B) Certification: The HVAC system cleaning contractor shall have a minimum of one (1) Air System Cleaning Specialist (ASCS) certified by NADCA on a full time basis, or shall have staff certified by a nationally recognized certification program and organization dedicated to the cleaning of HVAC systems.

(C) Supervisor Qualifications: A person certified as an ASCS by NADCA, or maintaining an equivalent certification by a nationally recognized program and organization, shall be responsible for the total work herein specified.

(D) Experience: The HVAC system cleaning contractor shall submit records of experience in the field of HVAC system cleaning as requested by the **owner**. Bids shall only be considered from firms which are regularly engaged in HVAC system maintenance with an emphasis on HVAC system cleaning and decontamination.

(E) Equipment, Materials and Labor: The HVAC system cleaning contractor shall possess and furnish all necessary equipment, materials and labor to adequately perform the specified services.

1. The contractor shall assure that its employees have received safety equipment training, medical surveillance programs, individual health protection measures, and manufacturer's product and material safety data sheets (MSDS) as required for the work by the U.S. Occupational Safety and Health Administration, and as described by this specification. For work performed in countries outside of the U.S.A., contractors should comply with applicable national safety codes and standards.

2. The contractor shall maintain a copy of all current MSDS documentation and safety certifications at the site at all times, as well as comply with all other site documentation requirements of applicable OSHA programs and this specification

3. Contractor shall submit to the **owner** all Material Safety Data Sheets (MSDS) for all chemical products proposed to be used in the cleaning

process.

(F) Licensing: The HVAC system cleaning contractor shall provide proof of maintaining the proper license(s), if any, as required to do work in this state. Contractor shall comply with all Federal, state and local rules, regulations, and licensing requirements.

1.02 Standards

(A) NADCA Standards: The HVAC system cleaning contractor shall perform the services specified here in accordance with the current published standards of the National Air Duct Cleaners Association (NADCA).

1. All terms in this specification shall have their meaning defined as stated in the NADCA Standards.

2. NADCA Standards must be followed with no modifications or deviations being allowed.

1.03 Documents

(A) Mechanical Drawings: The **owner** shall provide the HVAC system cleaning contractor with one copy of the following documents:

1. Project drawings and specifications.

2. Approved construction revisions pertaining to the HVAC system.

3. Any existing indoor air quality (IAQ) assessments or environmental reports prepared for the facility.

Part 2 -- HVAC System Cleaning Specifications and Requirements

2.01 Scope of Work

(A) Scope: This section defines the ***minimum*** requirements necessary to render HVAC components clean, and to verify the cleanliness through inspection and/or testing in accordance with items specified herein and applicable NADCA Standards.

The Contractor shall be responsible for the removal of visible surface contaminants and deposits from within the HVAC system in strict accordance with these specifications.

The HVAC system includes any interior surface of the facility's air distribution system for conditioned spaces and/or occupied zones. This includes the entire heating, air-conditioning and ventilation system from the points where

the air enters the system to the points where the air is discharged from the system. The return air grilles, return air ducts to the air handling unit (AHU), the interior surfaces of the AHU, mixing box, coil compartment, condensate drain pans, humidifiers and dehumidifiers, supply air ducts, fans, fan housing, fan blades, air wash systems, spray eliminators, turning vanes, filters, filter housings, reheat coils, and supply diffusers are all considered part of the HVAC system. The HVAC system may also include other components such as dedicated exhaust and ventilation components and make-up air systems.

Note: Users of this specification must modify the above paragraph to succinctly and specifically define those systems and components requiring cleaning.

2.02 HVAC System Component Inspections and Site Preparations

(A) HVAC System Component Inspections: Prior to the commencement of any cleaning work, the HVAC system cleaning contractor shall perform a visual inspection of the HVAC system to determine appropriate methods, tools, and equipment required to satisfactorily complete this project. The cleanliness inspection should include air handling units and representative areas of the HVAC system components and ductwork. In HVAC systems that include multiple air handling units, a representative sample of the units should be inspected.

The cleanliness inspection shall be conducted without negatively impacting the indoor environment through excessive disruption of settled dust, microbial amplification or other debris. In cases where contamination is suspected, and/or in sensitive environments where even small amounts of contaminant may be of concern, environmental engineering control measures should be implemented

1. Damaged system components found during the inspection shall be documented and brought to the attention of the **owner**.

(B) Site Evaluation and Preparations: Contractor shall conduct a site evaluation, and establish a specific, coordinated plan which details how each area of the building will be protected during the various phases of the project.

(C) Inspector Qualifications: Qualified personnel should perform the HVAC cleanliness inspection to determine the need for cleaning. At minimum, such personnel should have an understanding of HVAC system design, and experience in utilizing accepted indoor environmental sampling practices, current industry HVAC cleaning procedures, and applicable industry standards.

2.03 General HVAC System Cleaning Requirements

(A) Containment: Debris removed during cleaning shall be collected and precautions must be taken to ensure that Debris is not otherwise dispersed outside the HVAC system during the cleaning process.

(B) Particulate Collection: Where the Particulate Collection Equipment is exhausting inside the building, HEPA filtration with 99.97% collection efficiency for 0.3-micron size (or greater) particles shall be used. When the Particulate Collection Equipment is exhausting outside the building, Mechanical Cleaning operations shall be undertaken only with Particulate Collection Equipment in place, including adequate filtration to contain Debris removed from the HVAC system. When the Particulate Collection Equipment is exhausting outside the building, precautions shall be taken to locate the equipment down wind and away from all air intakes and other points of entry into the building.

(C) Controlling Odors: Measures shall be employed to control odors and/or mist vapors during the cleaning process.

(D) Component Cleaning: Cleaning methods shall be employed such that all HVAC system components must be Visibly Clean as defined in applicable standards (see NADCA Standards). Upon completion, all components must be returned to those settings recorded just prior to cleaning operations.

(E) Air-Volume Control Devices: Dampers and any air-directional mechanical devices inside the HVAC system must have their position marked prior to cleaning and, upon completion, must be restored to their marked position.

(F) Service Openings: The contractor shall utilize service openings, as required for proper cleaning, at various points of the HVAC system for physical and mechanical entry, and inspection.

1. Contractor shall utilize the existing service openings already installed in the HVAC system where possible.

2. Other openings shall be created where needed and they must be created so they can be sealed in accordance with industry codes and standards.

3. Closures must not significantly hinder, restrict, or alter the airflow within the system.

4. Closures must be properly insulated to prevent heat loss/gain or condensation on surfaces within the system.
5. Openings must not compromise the structural integrity of the system.

6. Construction techniques used in the creation of openings should

conform to requirements of applicable building and fire codes, and applicable NFPA, SMACNA and NADCA Standards.

7. Cutting service openings into flexible duct is not permitted. Flexible duct shall be disconnected at the ends as needed for proper cleaning and inspection.

8. Rigid fiber glass duct systems shall be resealed in accordance with NAIMA recommended practices. Only closure techniques that comply with UL Standard 181 or UL Standard 181a are suitable for fiber glass duct system closures.

9. All service openings capable of being re-opened for future inspection or remediation shall be clearly marked and shall have their location reported to the **owner** in project report documents.

(G) Ceiling sections (tile): The contractor may remove and reinstall ceiling sections to gain access to HVAC systems during the cleaning process.

(H) Air distribution devices (registers, grilles & diffusers): The contractor shall clean all air distribution devices.

(I) Air handling units, terminal units (VAV, Dual duct boxes, etc.), blowers and exhaust fans: The contractor shall insure that supply, return, and exhaust fans and blowers are thoroughly cleaned. Areas to be cleaned include blowers, fan housings, plenums (except ceiling supply and return plenums), scrolls, blades, or vanes, shafts, baffles, dampers and drive assemblies. All visible surface contamination deposits shall be removed in accordance with NADCA Standards. Contractor shall:

1. Clean all air handling units (AHU) internal surfaces, components and condensate collectors and drains.

2. Assure that a suitable operative drainage system is in place prior to beginning wash down procedures.

3. Clean all coils and related components, including evaporator fins.

(J) Duct Systems. Contractor shall:

1. Create service openings in the system as necessary in order to accommodate cleaning of otherwise inaccessible areas.

2. Mechanically clean all duct systems to remove all visible contaminants, such that the systems are capable of passing Cleaning Verification Tests (see NADCA Standards).

2.04 Health and Safety

(A) Safety Standards: Cleaning contractors shall comply with applicable federal, state, and local requirements for protecting the safety of the contractor's employees, building occupants, and the environment. In particular, all applicable standards of the Occupational Safety and Health Administration (OSHA) shall be followed when working in accordance with this specification.

(B) Occupant Safety: No processes or materials shall be employed in such a manner that they will introduce additional hazards into occupied spaces.

(C) Disposal of Debris: All Debris removed from the HVAC System shall be disposed of in accordance with applicable federal, state and local requirements.

2.05 Mechanical Cleaning Methodology

(A) Source Removal Cleaning Methods: The HVAC system shall be cleaned using Source Removal mechanical cleaning methods designed to extract contaminants from within the HVAC system and safely remove contaminants from the facility. It is the contractor's responsibility to select Source Removal methods that will render the HVAC system Visibly Clean and capable of passing cleaning verification methods (See applicable NADCA Standards) and other specified tests, in accordance with all general requirements. No cleaning method, or combination of methods, shall be used which could potentially damage components of the HVAC system or negatively alter the integrity of the system.

1. All methods used shall incorporate the use of vacuum collection devices that are operated continuously during cleaning. A vacuum device shall be connected to the downstream end of the section being cleaned through a predetermined opening. The vacuum collection device must be of sufficient power to render all areas being cleaned under negative pressure, such that containment of debris and the protection of the indoor environment are assured.

2. All vacuum devices exhausting air inside the building shall be equipped with HEPA filters (minimum efficiency), including hand-held vacuums and wet-vacuums.

3. All vacuum devices exhausting air outside the facility shall be equipped with Particulate Collection including adequate filtration to contain Debris removed from the HVAC system. Such devices shall exhaust in a manner that will not allow contaminants to re-enter the facility. Release of debris outdoors must not violate any outdoor

environmental standards, codes or regulations.

4. All methods require mechanical agitation devices to dislodge debris adhered to interior HVAC system surfaces, such that debris may be safely conveyed to vacuum collection devices. Acceptable methods will include those, which will not potentially damage the integrity of the ductwork, nor damage porous surface materials such as liners inside the ductwork or system components.

(B) Methods of Cleaning Fibrous Glass Insulated Components

1. Fibrous glass thermal or acoustical insulation elements present in any equipment or ductwork shall be thoroughly cleaned with HEPA vacuuming equipment, while the HVAC system is under constant negative pressure, and not permitted to get wet in accordance with applicable NADCA and NAIMA standards and recommendations.

2. Cleaning methods used shall not cause damage to fibrous glass components and will render the system capable of passing Cleaning Verification Tests (see NADCA Standards).

(C) Damaged Fibrous Glass Material

1. Evidence of damage: If there is any evidence of damage, deterioration, delaminating, friable material, mold or fungus growth, or moisture such that fibrous glass materials cannot be restored by cleaning or resurfacing with an acceptable insulation repair coating, they shall be identified for replacement.

2. Replacement: When requested or specified, Contractor must be capable of remediating exposed damaged insulation in air handlers and/or ductwork requiring replacement.

3. Replacement material: In the event fiber glass materials must be replaced, all materials shall conform to applicable industry codes and standards, including those of UL and SMACNA.

Replacement of damaged insulation is **not** covered by this specification.

(D) Cleaning of coils

1. Any cleaning method may be used which will render the Coil Visibly Clean and capable of passing Coil Cleaning Verification (see applicable NADCA Standards). Coil drain pans shall be subject to Non-Porous Surfaces Cleaning Verification. The drain for the condensate drain pan shall be operational. Cleaning methods shall not

cause any appreciable damage to, displacement of, inhibit heat transfer, or erosion of the coil surface or fins, and shall conform to coil manufacturer recommendations when available. Coils shall be thoroughly rinsed with clean water to remove any latent residues.

(E) Antimicrobial Agents and Coatings

1. Antimicrobial agents shall only be applied if active fungal growth is reasonably suspected, or where unacceptable levels of fungal contamination have been verified through testing.

2. Application of any antimicrobial agents used to control the growth of fungal or bacteriological contaminants shall be performed after the removal of surface deposits and debris.

3. When used, antimicrobial treatments and coatings shall be applied in strict accordance with the manufacturer's written recommendations and EPA registration listing.

4. Antimicrobial coatings shall be applied according to the manufacturer's written instructions. Coatings shall be sprayed directly onto interior ductwork surfaces, rather than "fogged" downstream onto surfaces.

2.06 Cleanliness Verification

(A) General: Verification of HVAC System cleanliness will be determined after mechanical cleaning and before the application of any treatment or introduction of any treatment-related substance to the HVAC system, including biocidal agents and coatings.

(B) Visual Inspection: The HVAC system shall be inspected visually to ensure that no visible contaminants are present.

1. If no contaminants are evident through visual inspection, the HVAC system shall be considered clean; however, the **owner** reserves the right to further verify system cleanliness through Surface Comparison Testing or the NADCA vacuum test specified in the NADCA standards.

2. If visible contaminants are evident through visual inspection, those portions of the system where contaminants are visible shall be re-cleaned and subjected to re-inspection for cleanliness.

3. NADCA vacuum test analysis should be performed by a qualified third party experienced in testing of this nature.

(C) Verification of Coil Cleaning

1. Cleaning must restore the coil pressure drop to within 10 percent of the pressure drop measured when the coil was first installed. If the original pressure drop is not known, the coil will be considered clean only if the coil is free of foreign matter and chemical residue, based on a thorough visual inspection (see NADCA Standards).

2.07 Pre-existing System Damage

(A) Contractor is not responsible for problems resulting from prior inappropriate or careless cleaning techniques of others.

2.08 Post-project Report

(A) At the conclusion of the project, the Contractor shall provide a report to the **owner** indicating the following:

1. Success of the cleaning project, as verified through visual inspection and/or gravimetric analysis.

2. Areas of the system found to be damaged and/or in need of repair.

2.09 Applicable Standards and Publications: The following current standards and publications of the issues currently in effect form a part of this specification to the extent indicated by any reference thereto:

(A) National Air Duct Cleaners Association (NADCA): "Assessment, Cleaning & Restoration of HVAC Systems (ACR 2005)," 2004.

(B) National Air Duct Cleaners Association (NADCA): "Understanding Microbial Contamination in HVAC Systems," 1996.

(C) National Air Duct Cleaners Association (NADCA): "Introduction to HVAC System Cleaning Services," 2004.
(D) National Air Duct Cleaners Association (NADCA): Standard 05 "Requirements for the Installation of Service Openings in HVAC Systems," 2004.

(E) Underwriters' Laboratories (UL): UL Standard 181.

(F) American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE): Standard 62-89, "Ventilation for Acceptable Indoor Air Quality".

(G) Environmental Protection Agency (EPA): "Building Air Quality," December 1991.

(H) Sheet Metal and Air Conditioning Contractors' National Association (SMACNA): "HVAC Duct Construction Standards - Metal and Flexible," 1985.

(I) North American Insulation Manufacturers Association (NAIMA): "Cleaning Fibrous Glass Insulated Air Duct Systems," 1993.