General Specifications for HVAC System


1.01 Qualification of the HVAC System Cleaning Contractor

(A) Membership: The HVAC system cleaning contractor shall be a member of the National Air Duct Cleaners Association (NADCA).

(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.

(C) 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 that are regularly engaged in commercial HVAC system maintenance with the emphasis on commercial HVAC system cleaning and decontamination.

(D) 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.

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.

(E) Materials

1. Pre-manufactured sheet metal service panels that are cross broke, hemmed, pre-drilled and gasketed.

2. Pre-manufactured service panels (same as above) with liner.

3. Pre-manufactured access door with locking seal.


5. Chemicals for cleaning coils, dampers and fans.

6. Chemicals for biocide/sanitizing treatments.
7. Repair coating designed specifically for mechanical insulation. This repair coating shall not affect thermal or acoustical properties of the insulation, must meet NFPA Std. 90A and 90B, must meet State of Washington’s TVOC requirements, must have anti-microbial agent that meets the microbiological testing standards of UL181, ASTM C1071, ASTM G21, ASTM G22.

8. IMCOA—an expanded, closed cell, polyolefin type liner used to replace damaged mechanical insulation in Air-handling units, Rooftop units and other areas.

(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 and/or cities. 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 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, 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.

Scope of work for this project includes: See Section III. Vendor Requirement in Request for Proposal # 80722 Performing Arts Supply & Return Ventilation Cleaning Project.

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. For projects that include multiple air handling units, a representative sample of the units should be inspected.

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 that details how each area of the building will be protected during the various phases of the project.

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 match existing installations and 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 using cleaning solutions and water.

(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. Fans, coils and condensate pans shall be chemically cleaned and pressure washed. Other non porous surfaces can be pressure washed as well. Protect insulation from becoming wet.
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 ACR 2005 NADCA Standard).

(K) When specified, remove mechanical insulation in Air handling unit, Rooftop unit and other areas and install IMCOA, a closed cell (waterproof) liner following the procedures as outlined by the manufacturer or methods approved by the Engineer. At the completion of the installation, notify the Engineer’s on-site Representative for final visual inspection.

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 that 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 matter 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 ACR 2005 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.

(D) Process for installing IMCOA (a replacement liner for insulation removed from AHU’s, Rooftop’s etc.)

1. Make sure surface is clean and dry.

2. Pre-cut and ensure the cut is accurate.

3. Apply approved adhesive to AHU Panel and one side of IMCOA. Spray on surface North/South and one surface East/West.

4. Set IMCOA in place immediately before adhesive dries.
5. Measure and mark location for 3” fasteners.

6. Pre-drill holes for pop rivets from the inside, ensuring no electrical, pneumatic or other lines on the outside of the Unit are drilled.

7. Use a rivet gun (pneumatic for best results).

8. Install 3” fasteners with rivets – 1” from side and 18” on center.

9. Seal all butt joints and outside edges with approved caulking.

(E) Cleaning of Coils

1. Any cleaning method may be used that will render the Coil Visible Clean and capable of passing Coil Cleaning Verification (see applicable ACR 2005 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.

(F) Biocidal Agents and Coatings

1. Biocidal 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 biocidal 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, chemical biocides and coatings shall be applied in strict accordance with manufacturer recommendations and EPA registration listing.

4. Biocidal coatings shall be applied according to manufacturer’s instructions. Coatings shall be sprayed directly onto interior ductwork surfaces, rather than “fogged” downstream onto surfaces. A continuous film must be achieved on the surface to be treated by the coating application. Application of any biocidal coatings shall be in strict accordance with manufacturer’s minimum millage surface application rate standards for effectiveness.

(G) Cleaning of Perimeter Radiation

1. When requested by owner, the radiation covers shall be removed and any dry cleaning method shall be used which will render the fin tube visibly clean. Any cleaning method may be used to clean the inner surface of the cover before it is reinstalled.
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, the NADCA vacuum test specified in the ACR 2005 NADCA standards, or wipe testing analysis testing as specified herein.

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 to be analyzed by an independent lab. (Non porous surfaces only.)

4. Cleanliness verification shall be performed immediately after mechanical cleaning and before the HVAC system is restored to normal operation or the starting of the fan.

(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 ACR 2005 NADCA Standards).

(D) Wipe Testing Analysis

1. MSU shall randomly take swipe samples from ductwork and heating/cooling systems which will be analyzed by an independent lab. Results with less than 100 Colony Forming Units (CFU) per square inch will be considered clean. Areas where samples come back with 100 CFU or more per square inch will be re-cleaned at the expense of the contractor.

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:


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


