SECTION 230130.52 - EXISTING HVAC AIR DISTRIBUTION SYSTEM CLEANING

Revise this Section by deleting and inserting text to meet Project-specific requirements.

1. GENERAL
   * + 1. RELATED DOCUMENTS
          1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
       2. SUMMARY
          1. Section includes cleaning existing HVAC air-distribution equipment, ducts, plenums, and system components.
       3. DEFINITIONS

Retain definition(s) remaining after this Section has been edited.

* + - * 1. ACAC: American Council for Accredited Certification.
        2. AIHA-LAP: American Industrial Hygiene Association Lab Accreditation Program
        3. ASCS: Air systems cleaning specialist.
        4. CESB: Council of Engineering and Scientific Specialty Boards.
        5. CMI: Certified Microbial Investigator.
        6. CMC: Certified Microbial Consultant.
        7. CMR: Certified Microbial Remediator.
        8. CMRS: Certified Microbial Remediation Supervisor.
        9. EMLAP: Environmental Microbiology Laboratory Accreditation Program.
        10. IEP: Indoor Environmental Professional.
        11. IICRC: Institute of Inspection, Cleaning, and Restoration Certification.
        12. NADCA: National Air Duct Cleaners Association.
      1. ACTION SUBMITTALS

Retain optional text under "Product Data" pParagraph below if sustainability is applicable to the project.

* + - * 1. Product Data: Manufacturer’s catalog cuts, specifications, and MSDS sheets for cleaning chemicals and treatments.
        2. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions
        3. Manufacturer’s installation instructions shall be provided along with product data.
        4. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
        5. Product Data: Manufacturer’s catalog cuts, specifications, and MSDS sheets for cleaning chemicals and treatments.
        6. Quality Control Submittals

Project Assessment Report and Work Plan:

Detailed step-by-step procedure for ACS cleaning.

Include locations and method of accessing ductwork; cleaning methods; vacuum equipment specifications, including particulate collection efficiency; intended cleaning sequence; methods of testing; method of resealing ductwork; and disposal of debris.

Phasing plan showing sequencing of work and approximate days of work for each building.

Duct Cleaning Procedure:

Detailed step-by-step procedure for duct and coil cleaning.

Include locations and method of accessing ductwork; cleaning methods; vacuum equipment specifications, including particulate collection efficiency; intended cleaning sequence; methods of testing; method of resealing ductwork; and disposal of debris.

Duct Cleaning Contractor Qualifications Data:

Names and addresses of 5 similar projects that the firm has worked on during the past 10 years.

Copy of firm’s NADCA certification.

Supervisor's Qualifications Data.

Name of the person who will be supervising the Work and their employer’s name, business address and telephone number.

Names and addresses of 3 similar projects that the supervisor has worked on during the past 5 years.

Copy of supervisor’s NADCA certification.

Duct Cleaner's Qualifications Data.

Name of the person who will be performing the Work and their employer’s name, business address and telephone number.

Names and addresses of 3 similar projects that each person has worked on during the past 5 years.

* + - 1. INFORMATIONAL SUBMITTALS

Coordinate "Qualification Data" Paragraph below with qualification requirements in Section 014000 "Quality Requirements" and as may be supplemented in "Quality Assurance" Article.

* + - * 1. Qualification Data:

For an ASCS.

For an IEP.

For a CMR and a CMRS.

* + - * 1. Field Quality-Control Reports:

Project's existing conditions.

Evaluations and recommendations, including cleanliness verification.

Strategies and procedures plan.

* + - 1. CLOSEOUT SUBMITTALS
         1. Contract Closeout Submittals

Final Report consisting of the following information:

List locations of ACS components cleaned.

Report general conditions of the ducts (rusting steel, fiber delaminating, duct air leakage areas, duct sagging areas,etc.).

Visual verification report indicating inspection locations and conditions for complete ACS analysis with the Director's Representative signature.

Post-Cleaning Sample Analysis Report taken to verify that duct is clean per NADCA.

List locations of ACS components cleaned.

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Visual verification report indicating inspection locations and conditions for complete ACS analysis with the Director's Representative signature.

Post-Cleaning Sample Analysis Report taken to verify that duct is clean per NADCA.

* + - 1. QUALITY ASSURANCE

Retain one or more of first six paragraphs below. Coordinate paragraphs with Section 014000 "Quality Requirements" for the term "specialists" if Contractor is required to engage a qualified ASCS, IEP, CMR, or CMRS.

* + - * 1. A Duct Cleaning Contractor Qualifications: The firm performing the Work of this Section shall have been regularly engaged in duct cleaning for a minimum of 10 years, shall have completed 5 similar projects, and shall be a certified member of the National Air Duct Cleaners Association (NADCA).

B Qualifications of Duct Cleaning Supervisor: The person supervising the Work of this Section shall be personally experienced in this type of Work and shall have been regularly employed by a company engaged in ACS cleaning for a minimum of 2 years, and shall be a certified Air System Cleaning Specialist by the National Air Duct Cleaners Association (NADCA).

* + - * 1. Duct Cleaner Qualifications:  The persons performing the Work shall be personally experienced in duct cleaning and shall have been regularly employed by a Company performing duct cleaning for a minimum of 2 year.
        2. Pre-Cleaning Conference:

C Duct Cleaner Qualifications:  The persons performing the Work shall be personally experienced in duct cleaning and shall have been regularly employed by a Company performing duct cleaning for a minimum of 2 year

Retain "Cleaning Conference" Paragraph below if Work of this Section is extensive or complex enough to justify a cleaning conference.

D Pre-Cleaning Conference:

Retain subparagraph below if additional requirements are necessary; include information about conference.

Review methods and procedures related to HVAC air-distribution system cleaning, including, but not limited to, review of the cleaning strategies and procedures plan.

Before commencement of the duct cleaning Work, a conference will be held for the purpose of reviewing the Contract Documents and discussing existing conditions of ductwork and equipment to be cleaned, equipment to be used for the Work, impact on building and personnel during cleaning process, and requirements for the Work.  The conference shall be attended by the Director’s Representative, Facility Representatives, and Duct Cleaning Supervisor.

At the conclusion of the pre-cleaning conference, before the cleaning Work begins, prepare a detailed work plan.  The work plan shall include, but not be limited to, work procedures, types of equipment to be used, and crew size.

* + - 1. SCOPE OF WORK
         1. The cleaning work for each building is for the complete Air Conveyance System including, but not limited to the following components:

Air Handling Unit(s)Air Handling Unit(s).

Unit enclosure

Coils

Fan assembly

Dampers.

Condensate pan

Replacement of existing filters (furnished by facility)

Outside air plenum(s)

Outside air intake(s)

All supply ductwork, lined and unlined, including ductwork plenums, branches, risers, turning vanes, and accessories.

All associated air terminal devices, to include supply diffusers, dampeners and duct security devices.

Sound attenuators.

Exhaust/Return duct system and all associated registers.

Exhaust/Return fans.

Fire and fire/smoke dampers.

Control system sensors and airflow stations.

Unit enclosure

Coils

Fan assembly

Dampers.

Condensate pan

Replacement of existing filters (furnished by facility)

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Exhaust/Return fans.

Fire and fire/smoke dampers.

Control system sensors and airflow stations.

* + - * 1. Verify field conditions before start of work.
        2. Repair and replace to match existing materials where access to walls or ceilings is made, or damage occurs, including but not limited for access to:

Ductwork and components.

Insulation.

Pneumatic and electric control components.

Air handling equipment panels.

* + - * 1. On the basis of field inspections and review, determine the method of cleaning the HVAC systems and its components, to prevent any damage to the system and its operation. Proposed methods and their effects on the system shall be included in submittal.
        2. Mark original position so that during the final inspection original settings can be field verified.
        3. Report to Director’s Representative any system defects discovered during the cleaning operation that will require repair to HVAC system (equipment, ductwork, dampers, registers, and other components).
        4. Report to Director’s Representative any system defects discovered during the cleaning operation that will require repair to HVAC system (equipment, ductwork, dampers, registers, and other components).

1. PRODUCTS
   * + 1. CLEANING METHODS
          1. Non-Porous Surfaces: Use various mechanical cleaning methods which shall render the ACS components visibly clean and capable of non-porous surface cleaning verification.
          2. Coils: Use mechanical cleaning methods complying with NADCA ACR Standard, Coil Surface Cleaning.
          3. Do not use cleaning methods which could potentially damage components of the ACS or negatively alter the integrity of the system.
          4. Do not use chemical cleaners that could potentially emit offensive odors and/or mist vapors.
       2. DEBRIS COLLECTION EQUIPMENT
          1. Equipment used shall be portable and sized to enter the areas easily. Electrical requirements shall be the responsibility of the Contractor and any costs incurred due to modifications to the electrical systems shall be at the Contractor’s expense.
          2. The collection systems shall be self-contained units, with the appropriate components to adequately collect dirt and debris loosened from the ductwork. Debris collection is to be performed by a high-powered vacuum system with three stages of filtration. The final stage shall be a HEPA filter. HEPA filter efficiency shall be 99.97% @ 0.3 micron.
          3. The collection system shall be capable of producing a minimum of 2,500 cfm, 0.42" water gauge negative static pressure and 0.25" water gauge velocity pressure in the area of ductwork to be cleaned.
          4. Where contact vacuuming is required, the equipment used shall be HEPA filtered vacuums. These vacuums shall be capable of at least 95 cfm at 88" water column. The vacuum shall have at least four (4) stages of filtration with the final stage being a HEPA filter.
       3. AGITATION SYSTEM
          1. Type: Collom Duct Cleaning System by Collum Enterprises, (716) 675-5144.,

The system is capable of thoroughly cleaning (and sanitizing) to a distance of 60 lineal feet from access point. Exceptions to this requirement will apply when the removal of debris requires more aggressive agitation.

A minimum of 85 cubic feet. per minute (cfm) of compressed air to 110 pounds per square inch. (psi) must be supplied to the air tool or nozzle in order to effectively dislodge the built-up debris.

The air tool or nozzle shall be able to follow the contours of the ductwork, i.e. the tool must be able to come in contact with all sides/surfaces of the interior of the duct.

The air tool or nozzle shall be capable of dispensing coatings and sanitizing solutions to cover the entire interior surface areas of the ductwork without creating additional access openings in order to maintain the integrity of the ductwork.

* + - 1. CLEANING AGENTS
         1. Cleaning agent equal to:

BBJ Environmental Solutions, https://www.bbjenviro.com/.

Goodway Technologies Corporation, https://www.goodway.com/

Nu-Calgon, https://www.nucalgon.com/

* + - * 1. Type: E.P.A. registered sanitizer that is specific for application inside HVAC/ductwork systems

Do not apply to porous surfaces.

* + - * 1. Description:

Formulated for each specific soiled coil condition that needs remedy.

Will not corrode or tarnish aluminum, copper, or other metals.

* + - 1. INSULATION REPAIR COATING
         1. Type: Coating containing an anti-microbial agent, shall not affect the thermal or acoustic properties of the insulation, and shall conform to NFPA Standards 90A and 90B.
         2. Acceptable Coating: Tough Coat by VAC Systems International, 1800 East Cliff Road, Burnsville, MN 55337, (952) 808-1616, www.vacsysint.com.
      2. ANTIMICROBIAL SURFACE TREATMENT
         1. [Surface](http://www.specagent.com/LookUp/?ulid=12840&mf=04&src=wd) Treatment equal to:

Bio-Cide International, Inc., https://www.bio-cide.com.

Contec, <https://www.contecprofessional.com>,

Ecolab, Inc., <https://www.ecolab.com/>

Approved equivalent.

* + - * 1. Description: Specific product selected shall be as recommended by the IEP based on the specific antimicrobial needs of the specific Project conditions.

Formulated to kill and inhibit growth of microorganisms.

EPA-registered for use in HVAC systems and for the specific application in which it will be used.

Have no residual action after drying, with zero VOC off-gassing.

OSHA compliant.

Treatment shall dry clear to allow continued visual observation of the treated surface.

1. EXECUTION
   * + 1. PREPARATION
          1. Inspect HVAC air-distribution equipment, ducts, plenums, and system components to determine appropriate methods, tools, and equipment required for performance of the Work.

Defects are to be reported in writing to the Director’s Representative and work will not proceed until all defects have been documented.

No cleaning is to be performed to ducts where the process has the capability of damaging the duct lining.

Include in documentation the location of all porous lining and porous duct lining material. If encapsulation or coating must be performed to protect these surfaces, an approved mechanical cleaning must be performed to these surfaces first. When using cleaning methods in areas adjacent to these surfaces that are potentially damaging to such, encapsulate these surfaces prior to cleaning.

Removal and replacement of duct lining or porous material are not included in contract unless damaged under this contract.

* + - * 1. Perform "Project Evaluation and Recommendation" according to NADCA ACR.
        2. Cleaning Plan: Prepare a written plan for air-distribution system cleaning that includes strategies and step-by-step procedures. At a minimum, include the following:

Supervisor contact information.

Work schedule, including location, times, and impact on occupied areas.

Methods and materials planned for each HVAC component type.

Required support from other trades.

Equipment and material storage requirements.

Exhaust equipment setup locations.

* + - * 1. Existing Conditions Report: Prepare a written report that documents existing conditions of the systems and equipment. Include documentation of existing conditions, including inspection results, photo images, laboratory results, and interpretations of the laboratory results by an IEP.

Prepare written report listing conditions detrimental to performance of the Work.

* + - * 1. Proceed with work only after conditions detrimental to performance of the Work have been corrected.

Commencement of work will constitute acceptance of the conditions of the area to which the cleaning work is to be performedperformed.

* + - * 1. Use the existing service openings, as required for proper cleaning, at various points of the HVAC system for physical and mechanical entry and for inspection.
        2. Comply with NADCA ACR, "Guidelines for Constructing Service Openings in HVAC Systems" Section.
        3. Disassemble all removable items as required for access to work area.

Store the removed items in an approved storage area as directed until the completion of the cleaning work.

* + - * 1. Provide temporary closures of metal or plastic sheeting where required to prevent dust from the cleaning process from dispersing throughout the Work area.
        2. Fire protection devices (such as smoke detectors, panel and sensors) shall be protected prior to cleaning procedures. They are to be cleaned and tested at the conclusion of work.
        3. Notify the Director’s Representative of any Fire System shutdown and reactivating of the fire alarm system in advance to avoid accidental alarms during the cleaning process and related work.
        4. Mark the position of manual volume dampers and air-directional mechanical devices inside the system prior to cleaning.
        5. Coordinate the shutdown of the air handling equipment with the Director’s Representative before starting work, and shall conform to OSHA requirements regarding fan motor disconnect lock-out/tag-outout.
      1. CONTAINMENT
         1. Provide containment per NADCA ACR - Assessment, Cleaning, and Restoration of HVAC Systems.

Collect debris removed during duct cleaning.

Take precautions to ensure that debris is not dispersed outside the ACS during the cleaning process.

Provide Barriers at all air outlet and inlet devices as required and directed.

After completion of ACS cleaning, restore areas affected by the cleaning work to a condition as clean or cleaner than their condition prior to the commencement of the cleaning operation.

* + - 1. CLEANING PROCEDURES
         1. Visibly clean non-porous ACS surfaces in accordance with NADCA ACR Standard.
         2. Particulate Collection:

Mechanical cleaning operations shall be undertaken only with Particulate Collection Equipment in place, including adequate filtration to control debris removed from the ductwork or ceiling plenum.

Where 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 ACS.

Provide adequate filtration to contain debris removed from the ACS.

Where the particulate collection equipment is exhausting outside the building, take precautions to ensure that exhausted air does not re-enter the building.

* + - * 1. Filtration Integrity:

Where particulate collection equipment is exhausting inside the building, certify that equipment effectiveness of 99.97 percent collection efficiency for 0.3 micron size particles through DOP test results, from an independent testing agency, for collection devices used on the Project.

Equipment shall have inspection tags showing results and dates of the DOP test and is required before bringing equipment to work site and after equipment is moved to new work location, at the start of work or when requested by the Director’s Representative. Include air monitoring at these locations.2.

* + - * 1. Agitation Equipment:

Remove all debris from the inside surface areas being the top, bottom and sides of rectangular duct and the entire inside circumference of round and flat oval ductwork by creating the least amount of access openings possible. The following restrictions for agitation tools shall be adhered to.

High power/volume vacuum alone is not an acceptable method of agitation.

* + - * 1. Controlling Odors: Take all measures to control offensive odors and/or mist vapors during the cleaning process.
        2. Components Cleaning: Employ cleaning methods to ensure that non-porous ACS surface components are visibly cleaned.

Upon completion, all components must be returned to those settings recorded just prior to cleaning operations.

* + - * 1. Air-Volume Control Devices. Dampers and any air-directional mechanical devices inside the ductwork must have their position marked prior to cleaning, and upon completion, must be restored to their marked position.
        2. Access Holes:

Repair access holes cut for the cleaning process to ensure that no significant alteration of airflow occurs.

Seal openings made to facilitate the cleaning with materials and practices specified in SMACNA's HVAC Duct Construction Standards and NADCA Standard ACR

Closure Panels shall be permanent. Seal openings per NADCA ACR Standard

Any access holes larger than a three-inch diameter shall be enlarged and fitted with an access door.

Tape is not to be used.

* + - * 1. Coil and Fan Section of Air Handling Units:

Gently pressure wash and vacuum coils such that they are visibly clean and capable of passing Coil Cleaning Verification.

Subject coil drain pans to Non-Porous Surfaces Cleaning Certifications as per NADCA Standards.

The drain for the condensate drain pan shall be operational.

Cleaning methods shall not cause any appreciable damage to, displacement of, or erosion of the coil surface, and shall conform to coil manufacturer recommendations when available.

* + - * 1. Verification of ACS cleanliness will be determined after completion of mechanical cleaning, and before the application of treatments or introduction of treatment-related substances to the ACS.
      1. HEALTH AND SAFETY
         1. Comply with all applicable federal, state and local requirements for protecting the safety of the Contractors’ employees, building occupants, and the environment. In particular, all applicable standards of the Occupational Safety and Health Administration (OSHA) should be followed when working in accordance with this specification.
         2. No processes or materials shall be employed in such a manner that they will create adverse health effects to the building occupants, cleaning contractors, or general public.
         3. Disposal of Debris. All debris removed from the Air Conveyance System shall be disposed of in accordance with all applicable federal, state and local requirements.
      2. MECHANICAL CLEANING
         1. Interior Duct/Air Handling Unit Surfaces:

The interior of all ducts and air handling units shall be brushed, wiped, and mechanically vacuumed such that all metal surfaces are visibly clean and capable of Non-Porous Surfaces Cleaning Verification as described in the NADCA Standards.

Internally lined ductwork shall be visibly clean but will not be subject to testing as per NADCA Standards.

No cleaning method should be used which could potentially damage components of the ductwork or negatively alter the integrity of the system.

Air handling unit cleaning shall include plenums, filter section, coils, mixing boxes, return air fans, dampers and all other components within the airstream.

All air handling unit fiberglass lining shall be cleaned per NAIMA standards and recommendations.

* + - * 1. Ceiling Plenums and Mechanical Rooms:

Remove all loose debris from the entire ceiling plenum including but not limited to duct exterior, walls, deck, top of ceiling tiles, structural steel, piping, conduit, light fixtures shall be mechanically vacuumed.

The Plenum and Mechanical Room shall be visibly clean but will not be subject to verification as per NADCA Standards.

* + - * 1. Duct Reheat Coils:

Duct mounted coils shall be hand washed (air or water) on both coil faces.

Thoroughly clean coil faces insuring the removal of debris while avoiding damage to the fins.

Remove corrosion from around the coil frames, and paint all corroded metal surfaces.

Perform pressure differential readings across the coil to verify cleanliness.

Final pressure differentials across the coil shall be within 10% of manufacturer’s original ratings.

* + - * 1. Volume, Fire and Zone Dampers:

Duct mounted volume, fire and zone damper sets are to be marked to their current setting, then inspected and cleaned if necessary.

External moving parts are to be treated with an approved dry lubricant material.

After cleaning, the dampers shall be repaired as necessary to insure proper operation and returned to original settings.

Indicate locations of damaged and/or repaired dampers.

* + - * 1. Grilles, Registers and Diffusers and Linear Diffusers:

Whenever the grilles, registers and diffusers (GRD) are not welded or permanently fastened to façade, they shall be removed, washed, dried, sanitized and replaced.

When the GRD are restricted by a façade or welded in place, hand vacuuming and cleaning are acceptable.

Avoid disturbing the existing volume damper settings.

Cleaning the debris built-up on the ceiling is not required under this contract.

Linear Diffusers that have plenums and are considered part of the duct and shall be cleaned per Paragraph A. above.

* + - * 1. Visibly clean interior duct surfaces until capable of passing the NADCA Vacuum Test. Make visual inspections at each duct penetration. Use borescope, as required.
      1. CLEANLINESS VERIFICATION
         1. Verify cleanliness according to NADCA ACR, "Verification of HVAC System Cleanliness" Section.
         2. Verify HVAC system cleanliness after mechanical cleaning and before applying any treatment or introducing any treatment-related substance to the HVAC system, including biocidal agents and coatings.
         3. Surface-Cleaning Verification: Perform visual inspection for cleanliness. If no contaminants are evident through visual inspection, the HVAC system shall be considered clean. 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.

Retain one "Verification of Coil Cleaning" pParagraph below. Retain first paragraph if design pressure loss, for comparison purposes, is known; retain second paragraph if design pressure loss is unknown.

* + - * 1. Verification of Coil Cleaning:

Measure static-pressure differential across each coil.

Coil will be considered clean if cleaning restored the coil static-pressure differential within 10 percent of the differential measured when the coil was first installed.

* + - * 1. Verification of Coil Cleaning: Coil will be considered clean if the coil is free of foreign matter and chemical residue, based on a thorough visual inspection.

Retain "Additional Verification" pParagraph below as an alternative requirement when a high degree of cleanliness is required for Project, such as for hospital surgeries and clean rooms.

* + - * 1. Additional Verification:

Perform surface comparison testing or NADCA vacuum test.

Conduct NADCA vacuum gravimetric test analysis for nonporous surfaces.

* + - * 1. Prepare a written cleanliness verification report. At a minimum, include the following:

Written documentation of the success of the cleaning.

Site inspection reports, initialed by supervisor, including notation on areas of inspection, as verified through visual inspection.

Surface comparison test results if required.

Gravimetric analysis (nonporous surfaces only).

System areas found to be damaged.

* + - 1. SANITATION
         1. A sanitizing agent shall be applied to all supply and return air metal only ductwork cleaned as part of this project. Application and preparation shall be as per manufacturer’s recommendations.
         2. Demonstrate to the Director’s Representative how the application method is capable of dispensing the sanitizing solution to the entire surface areas of the ductwork.
      2. REPORT
         1. Submit three (3) copies of the final report to the Director’s Representative outlining the conditions and work completed on each HVAC system.
         2. The report shall contain a tabulation of the samples taken before and after the cleaning process.

Weight reported as (mg/100cm2) of debris per NADCA Vacuum Test 12.3 of ACR Standard.

* + - * 1. The report shall contain photographic or video documentation of representative areas of the ductwork systems cleaned as part of the project.

This photo documentation shall show both before and after pictures verifying visual inspection.

Require date stamped digital photo’s before and after at three locations per building. Director’s Representative will choose locations.

Bid to include three locations for each building.

* + - * 1. Submit report with results from each building, citing EPA/ASHRAE guidelines and standards, and any variances. Methods of testing must be consistent with applicable EPA methods.
      1. RESTORATION
         1. Reconnect ducts, replace straps or clamps and flexible duct. Replace flexible duct damaged during the cleaning process with matching material at no cost to the StateState.
         2. Restore and repair HVAC air-distribution equipment, ducts, plenums, and components according to NADCA ACR, "Restoration and Repair of Mechanical Systems" Section.
         3. Replace insulation damaged under this contract.
         4. Ensure that closures do not hinder or alter airflow.
         5. New closure materials, including insulation, shall match opened materials and shall have removable closure panels fitted with gaskets and fasteners.
         6. Restore manual volume dampers and air-directional mechanical devices inside the system to their marked position on completion of cleaning.
         7. Replace existing filters for each system with replacement filters furnished by the Facility.
         8. Measure air flows through air-distribution system.
         9. Measure static-pressure differential across each coil.
      2. PROJECT CLOSEOUT
         1. Perform final inspection in the presence of the Director’s Representative to ensure that no dust or debris remain on interior building furniture surfaces as a result of the cleaning and dismantling operations.
         2. Post-Project Report:

Post-cleaning laboratory results if any.

Post-cleaning photo images.

Post-cleaning verification summary.

* + - * 1. Drawings:

Deviations of existing system from Director’s Representative's record drawings.

Location of service openings.

END OF SECTION 230130.52