1. **GENERAL**
   1. **SECTION INCLUDES**
      * + 1. This Section includes cleaning of the following existing air duct systems:
2. Supply system.
3. Return system.
4. Exhaust and Transfer system.
   * + - 1. Related Requirements:
   1. Division 01 - General Requirements.
   2. Section 23 3000 - Air Distribution.
   3. Section 23 0700 - HVAC Insulation.
   4. NADCA Standard ACR.
   5. NADCA General Specification for the Cleaning & Restoration of Commercial HVAC Systems.
   6. UL181 Standard for Factory-Made Air Ducts and Air Connectors.
   7. **DEFINITIONS**
      * + 1. ACR: Assessment, Cleaning, and Restoration of HVAC Systems.
          2. ASCS: Air systems cleaning specialist.
          3. HEPA: High Efficiency Particulate Arrestance.
          4. HVAC: Heating, Ventilation and Air Conditioning.
          5. NADCA: National Air Duct Cleaners Association.
          6. OEHS: Office of Environmental Health & Safety.
          7. SDS: Safety Data Sheet.
          8. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.
          9. UL: Underwriters Laboratories.
   8. **SUBMITTALS**
      * + 1. Qualification Data for ASCS as indicated on NADCA General Specification.
          2. Strategies and Procedures Plan before starting the work.
          3. Cleanliness Verification Report at the project completion.
   9. **QUALITY ASSURANCE**
      * + 1. ASCS Qualifications:
5. Certification: Employ an ASCS certified by NADCA on a full-time basis.
6. Supervisor Qualifications: Certified as an ASCS by NADCA.
   * + - 1. UL Compliance: Comply with UL 181 “Standard for Factory-Made Air Ducts and Air Connectors” requirement.
         2. Cleaning Conference: Conduct conference at Project site. Review methods and procedures related to HVAC air-distribution system cleaning including, but not limited to, review of the cleaning strategies and procedures plan.
7. **PRODUCTS (Not Used)**
8. **EXECUTION**
   1. **EXAMINATION**
9. Examine HVAC air-distribution equipment systems to determine appropriate methods, tools, and equipment required for performance of the Work.
10. Perform "Project Assessment and Recommendation" according to current NADCA ACR Standard.
11. Prepare written report listing conditions detrimental to performance of the Work.
12. Proceed with work only after unsatisfactory conditions have been corrected, and OAR’s approval has been obtained.
    1. **PREPARATION**
       * + 1. Prepare a written plan that includes strategies and step-by-step procedures. At a minimum, include the following:
13. Supervisor contact information.
14. Work schedule including location, times, and impact on occupied areas.
15. Methods and materials planned for each HVAC component type.
16. Required support from other trades.
17. Equipment and material storage requirements.
18. Exhaust equipment setup locations.
    * + - 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. Refer to Construction Documents for quantities.
          2. Comply with current NADCA ACR Standard, "Guidelines for Constructing Service Openings in HVAC Systems" Section.
    1. **CLEANING**
       * + 1. Comply with current NADCA ACR Standard Requirement.
           2. Do not use any chemicals in the process of cleaning unless there is a significant reason. Using any kind of chemicals is subject to the OAR’s approval. Prior to the application of any chemical, ASCS is required to submit SDS document of proposed cleaning materials to OAR in order to obtain product approval from OEHS. Do not apply any material unsafe for hard metal surfaces.
           3. Systems and Components to be Cleaned by a qualified ASCS:
19. Air devices for supply and return air.
20. Ductwork:

Supply-air ducts, including turning vanes and reheat coils, to the air-handling unit.

Return-air ducts to the air-handling unit.

Exhaust-air and Transfer-air ducts.

* + - * 1. Perform cleaning before air balancing or mark the position of manual volume dampers and air-directional mechanical devices inside the system prior to cleaning. Restore them to their marked position on completion of cleaning.
        2. Use duct-mounted access doors, as required, for physical and mechanical entry and for inspection.

1. Install additional duct-mounting access doors to comply with duct cleaning standards. Comply with requirements in Section 23 3000 "Air Distribution" for additional duct-mounting access doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection. Replace damaged and deteriorated flexible ducts. Comply with requirements in Section 23 3000 "Air Distribution" for flexible ducts.
3. Disconnect and reconnect flexible connectors as needed for cleaning and inspection. Replace damaged and deteriorated flexible connectors Comply with requirements in Section 23 3000 "Air Distribution" for flexible connectors.
4. Replace damaged fusible links on fire and smoke dampers. Replacement fusible links shall be same rating as those being replaced. Comply with requirements in Section 23 3000 "Air Distribution" for fusible links.
5. Remove and reinstall ceiling components to gain access for duct cleaning. Clean ceiling components after they have been removed and replaced.
   * + - 1. Particulate Collection and Odor Control:
6. Where venting vacuuming system inside building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron size or greater particles.
7. When venting vacuuming system outside building, use filtration to contain debris removed from the HVAC system and locate exhaust down wind and away from air intakes and other points of entry into building.
   * + - 1. Clean the following metal-duct system components by removing visible surface contaminants and deposits:
8. Air outlets and inlets: registers, grilles, and diffusers.
9. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
10. Air-handling-unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
11. Coils and related components.
12. Return-air ducts, dampers, and actuators, except in ceiling plenums and mechanical room.
13. Supply-air ducts, dampers, actuators, and turning vanes.
14. Dedicated exhaust and ventilation components.
    * + - 1. Mechanical Cleaning Methodology:
15. 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 to safely remove these contaminants from the facility. 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.

Use continuously operating vacuum-collection devices to keep each section being cleaned under negative pressure.

Cleaning methods that require mechanical agitation devices to dislodge debris that is adhered to interior surfaces of HVAC system components shall be equipped to safely remove these devices. Cleaning methods shall not damage the integrity of HVAC system components or damage porous surface materials such as duct and plenum liners.

1. Cleaning Mineral-Fiber Insulation Components:

Fibrous-glass thermal or acoustical insulation elements present in equipment or ductwork shall be thoroughly cleaned with HEPA vacuuming equipment while the HVAC system is under constant negative pressure and shall not be permitted to get wet according to current NADCA ACR Standard. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.

Cleaning methods used shall not cause damage to fibrous-glass components and will render the system capable of passing the HVAC System Cleanliness Tests, refer to current NADCA ACR Standard.

Fibrous materials that become wet shall be discarded and replaced in-kind.

1. Clean coils and coil drain pans according to current NADCA ACR Standard. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
2. Provide operative drainage system for wash-down procedures.
3. Biocidal Agents and Coatings: Apply Biocidal agents and coatings if active fungal growth is reasonably suspected or where unacceptable levels of fungal contamination have been verified. Apply Biocidal agents and coatings according to manufacturer's written recommendations and OEHS registration listing after the removal of surface deposits and debris.
4. When used, Biocidal treatments and coatings shall be applied after the system is rendered clean.
5. Apply Biocidal agents and coatings directly onto surfaces of interior ductwork.
6. Sanitizing agent products shall be registered by the OEHS as specifically intended for use in HVAC systems and ductwork.
7. Debris removed from the HVAC system shall be disposed of according to applicable Federal, state, and local requirements.
   * + - 1. Cleanliness Verification:
8. Verify cleanliness according to current NADCA ACR Standard, "Verification of HVAC System Cleanliness" Section.
9. Verify cleanliness after mechanical cleaning and before application of treatment, including biocidal agents and protective coatings.
10. 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 re-inspected.
11. 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:
2. Written documentation of the success of the cleaning.
3. Site inspection reports, initialed by supervisor, including notation on areas of inspection, as verified through visual inspection.
4. Surface comparison test results if required.
5. Gravimetric analysis (nonporous surfaces only).
6. System areas found to be damaged.
   1. **CONNECTIONS**

Reconnect ducts to fans and air-handling units with existing flexible connectors after cleaning ducts and flexible connectors. Replace existing damaged and deteriorated flexible connectors.

For fans developing static pressures of 5-inch w.g. and higher, cover replacement flexible connectors with loaded vinyl sheet held in place with metal straps.

Reconnect terminal units to supply ducts with existing flexible ducts or replace damaged and deteriorated existing flexible ducts with maximum 12-inch lengths of new flexible duct.

Reconnect diffusers to low-pressure ducts with existing flexible ducts or replace damaged and deteriorated existing flexible ducts with maximum 60-inch lengths of flexible duct clamped or strapped in place.

Reconnect existing and new flexible ducts to metal ducts. Comply with requirements in Section 23 3000 "Air Distribution" for flexible ducts.

* 1. **RESTORATION**
     + - 1. Restore and repair HVAC air-distribution equipment, ducts, plenums, and components according to current NADCA ACR Standard, "Restoration and Repair of Mechanical Systems" Section.
         2. Restore service openings capable of future reopening. Comply with requirements in Section 23 3000 "Air Distribution" Include location of service openings in Project closeout report.
         3. Replace fibrous-glass materials that cannot be restored by cleaning or resurfacing. Comply with requirements in Section 23 3000 "Air Distribution".
         4. Replace damaged insulation according to Section 23 0700 "HVAC Insulation".
         5. Ensure that closures do not hinder or alter airflow.
         6. New closure materials, including insulation, shall match opened materials and shall have removable closure panels fitted with gaskets and fasteners.
         7. Reseal fibrous-glass ducts. Comply with requirements in Section 23 3000 "Air Distribution".
  2. **FIELD QUALITY CONTROL**
     + - 1. Gravimetric Analysis: Sections of metal-duct system, chosen randomly by OAR may be tested for cleanliness according to NADCA vacuum test gravimetric analysis.

1. If analysis determines that levels of debris are equal to or lower than suitable levels, system shall have passed cleanliness verification.
2. If analysis determines that levels of debris exceed suitable levels, system cleanliness verification will have failed and metal-duct system shall be re-cleaned and re-verified with no additional cost to OWNER.
   * + - 1. Verification of Coil Cleaning: Cleaning shall restore coil pressure drop to within 10 percent of pressure drop measured when coil was first installed. If original pressure drop is not known, coil will be considered clean only if it is free of foreign matter and chemical residue, based on thorough visual inspection.
         2. Report results of tests in writing.

**END OF SECTION**