

PART 1 - GENERAL

- 1.1 REFERENCES      .1    Definitions:
- .1    HVAC System: complete air duct system from outside air intake/exhaust louvers to farthest air supply/exhaust hood terminal unit and including:
- .1    Rigid supply and return ductwork;
- .2    Flexible ductwork;
- .3    Mixing plenum boxes;
- .4    Diffusers, registers and terminal units;
- .5    Dampers and controls;
- .6    Kitchen exhaust ducting.
- .2    Reference Standards:
- .1    National Air Duct Cleaners Association (NADCA)
- .1    ACR Standard: Assessment, Cleaning and Restoration of HVAC Systems.
- .2    North American Insulation Manufacturers Association (NAIMA)
- .1    Cleaning Fibrous Glass Insulated Duct Systems - Recommended Practices.
- 1.2 ADMINISTRATIVE REQUIREMENTS      .1    Site Evaluation: conduct site visit 2 weeks before start of work to establish specific co-ordinated video survey and cleaning plan to establish specific co-ordinated video survey and cleaning plan determining how areas of facility and HVAC systems will be protected during cleaning operations.
- .1    Organize and lay out plan for video survey and identify camera and cleaning apparatus insertion points.
- .2    Ensure plan identifies sequence and schedule of survey and cleaning operations for each individual HVAC system and for complete facility.
- .1    Take account of elbows, bends, turning vanes, dampers, transitions, take-offs, and other internal features.
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- 1.2 ADMINISTRATIVE .1 (Cont'd)  
REQUIREMENTS  
(Cont'd)
- .3 Departmental Representative to review video survey and cleaning plan 1 week minimum prior to start of work.
    - .1 Proceed with survey and cleaning work only after receiving written approval from Departmental Representative.
  - .2 Scheduling: Hours of Operation: complete work during non-business hours as follows:
    - .1 Monday to Thursday between 18:00 hours and 07:00 hours.
    - .2 Friday from 18:00hours to Monday at 07:00 hours.
    - .3 Hours of operation are subject to change with 12 hours notice.
  - .3 Project Co-ordination: assign Project Co-ordinator to oversee air duct cleaning processes.
    - .1 Provide Departmental Representative with contact information of Project Co-ordinator including: name, telephone number, cell phone number.
  - .4 Security: Departmental Representative will pay costs and provide security escort at times requested on Contractor's submitted work schedule.
    - .1 Cancellation of security escort requires 72 hours minimum written notice.
    - .2 Failure to cancel security escort requirements 72 hours minimum before scheduled event will result in Contractor paying for security costs.
  - .5 Damaged or broken equipment and components found during initial testing and inspection will be repaired or replaced by Departmental Representative.
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1.3 ACTION AND  
INFORMATIONAL  
SUBMITTALS

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- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit video survey and cleaning plan developed during site evaluation.
  - .1 Ensure plan includes sequence of operation, identification of camera and cleaning apparatus insertion points and schedule for work.
- .3 Product Data:
  - .1 Submit manufacturer's printed product literature and data sheets for antimicrobial agents and include product characteristics, performance criteria and limitations.
  - .2 Provide two copies of WHMIS and MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements for antimicrobial agents or coatings.

1.4 CLOSEOUT  
SUBMITTALS

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- .1 Provide submittals in accordance with Section 01 78 00 - Closeout Submittals.
  - .2 Post Cleaning Inspection Report: submit 4 copies of Final Inspection Report, including data collected, observations and recommendations as well as following information:
    - .1 Name and address of facility;
    - .2 Name and address of HVAC cleaning contractor;
    - .3 Description of HVAC systems with drawings identifying systems cleaned;
    - .4 Identification scheme for location points in systems that were inspected with accompanying notes describing methods of inspection or tests used;
    - .5 Identification of points where samples were collected and type of analysis used for each collection;
    - .6 Comments complete with photographs of other observed system features;
    - .7 Identify systems tested, observations, actions taken and recommendations for future maintenance.
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| 1.4 CLOSEOUT<br>SUBMITTALS<br>(Cont'd) | .3 | Record post cleaning video survey: submit 2 copies of video survey USB Drive media, and include on video survey following:<br>.1 Areas tested for particulate analysis or microbial growth evaluation;<br>.2 Areas of special interest and location;<br>.3 Special internal features;<br>.4 Problems such as broken or damaged controls or components;<br>.5 Ensure system tested, locations, observations, actions taken and recommendations are clearly identified in English on video using text or voice over. |
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| 1.5 QUALITY<br>ASSURANCE | .1 | Contractor: verification of membership in NADCA verification of 5 years minimum experience in work similar to or exceeding work of this Section.   |
|                          | .2 | Project Co-ordinator: Air System Cleaning Specialist (ASCS) certified by NADCA on full time basis verification of 5 years minimum experience in work similar to or exceeding work of this Section. |

## PART 2 - PRODUCTS

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| 2.1 ACCESS DOORS<br>AND PANELS | .1 | Equipment Access Doors and Panels: construct from same materials as equipment panelling complete with sealing gasket and positive locking device.<br>.1 Size access doors and panels in equipment to allow for inspection and cleaning.<br>.2 Kitchen exhaust duct is not to be cut for access doors. Access shall be through duct openings. |
|                                | .2 | Ductwork Access Doors: manufactured access doors from 1.27 mm minimum galvanized sheet steel with gasketed seal.<br>.1 Ensure access door is 25 mm greater in every dimension than access opening.   |
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| <u>2.1 ACCESS DOORS<br/>AND PANELS<br/>(Cont'd)</u>              | .2 | Ductwork Access Doors: (Cont'd)<br>.2 Access door size 200mm x 200 mm minimum.<br>.3 Secure access doors with sheet metal screws on 75 mm centres minimum. Ensure 3 screws per side minimum.  |
| <u>2.2 SYSTEM FILTERS</u>  | .1 | Supply and install new filters for each HVAC System cleaned.  |
| <u>2.3 AIR DUCT<br/>CLEANING EQUIPMENT</u>                       | .1 | Manually propelled full contact brushes:<br>.1 Ensure brushes are specifically manufactured and shaped to fit individual ducts, equipment and components of HVAC system.<br>.1 Ensure brushes are sized to fit various duct sizes in HVAC and kitchen exhaust systems.<br>.2 Ensure brushes make scrubbing motion and full contact with HVAC system interior surfaces to be cleaned.  |
| <u>2.4 MULTI-<br/>FUNCTIONAL<br/>ROBOTIC CLEANING<br/>SYSTEM</u> | .1 | Self-propelled remote controlled, wheeled drive equipped with: camera halogen lights: rotating reciprocating brushes, air supply nozzle, vacuum and spraying system attachment.<br>.1 Ensure brushes are specifically manufactured and shaped to fit individual ducts equipment and components of HVAC system.<br>.2 Ensure brushes make scrubbing motion and full contact with HVAC and kitchen exhaust systems interior surfaces.<br>.3 Replace worn and ineffective brushes when required. |
|  | .2 | Camera: fully rotational or pivotal remote control focus and dustproof digital with 480 lines of resolution, capable of storing 4 hours of recorded media.<br>.1 Camera Light: 2 x 20 watt Halogen with dimmer or equal.  |
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2.5 HEPA FILTER  
EVACUATION FAN .1 Evacuation Fan: includes fan, HEPA filter,  
flexible hose and motor capable of maintaining  
debris and particulates airborne in airstream  
until they reach evacuation fan and  
maintaining system under negative pressure.  
.1 Ensure HEPA filters are clean and  
maintain evacuation fan and HEPA filter to run  
efficiently.

2.6 HEPA VACUUM  
UNIT .1 Vacuum Unit: includes vacuum fan, integral  
HEPA filter, suction hose and vacuum head,  
capable of maintaining HVAC System debris and  
particulates airborne in air stream until they  
reach vacuum unit and maintaining system under  
negative pressure.  
.1 Ensure HEPA filters are clean and  
maintain vacuum unit and HEPA filter to run  
efficiently.

### PART 3 - EXECUTION

3.1 PREPARATION .1 Close down HVAC system and kitchen exhaust.  
.2 Locate and identify externally visible HVAC  
system features which may affect cleaning  
process including:  
.1 Control devices;  
.2 Fire and smoke control dampers;  
.3 Balancing dampers: indicate and record  
positions for resetting;  
.4 Air volume control boxes: indicate and  
record positions for resetting;  
.5 Fire alarm devices;  
.6 Monitoring devices and controls;  
.3 Cut openings in equipment panels and ductwork  
for access to system interior.  
.1 Square or rectangular opening sizes: 200  
mm minimum each side.  
.2 Circular opening sizes: 200 mm minimum  
diameter.

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- 3.1 PREPARATION  
(Cont'd)
- .4 Installation of Access Doors and Panels:  
install access doors and panels for equipment  
to facilitate system inspection and cleaning.  
.1 Install access doors and panels for  
inspection and cleaning of equipment as  
follows:  
.1 Fan units;  
.2 Filters;  
.3 Dampers;  
.4 Sensors;
- .5 Installation of Access Doors in Ductwork:  
install access doors in ductwork to facilitate  
system inspection and cleaning.  
.1 Access door installation is not  
permitted in flexible ductwork.  
.1 Inspect flexible ductwork only by  
disconnecting from main duct and  
inspecting from open end.
- .6 When acoustically lined duct is cut for  
access, repair cut edges of acoustic lining  
using self-adhesive fibre glass tape and water  
based duct sealer.  
.1 Adhere new acoustic lining to match  
existing to inside of access panel or door to  
ensure continuity of acoustic properties of  
system.
- .7 Remove and reinstall ceiling to gain access  
to HVAC system as required.  
.1 Replace ceiling damaged or soiled by air  
duct cleaning procedures.
- 3.2 EXAMINATION /  
PRE-CLEANING  
INSPECTION
- .1 Verification of Conditions:  
.1 Make visual inspection of interior of  
HVAC and kitchen exhaust systems using remote  
controlled robotic camera.  
.2 Insert camera at pre-established  
strategic locations to evaluate condition and  
cleanliness of HVAC and kitchen exhaust  
systems and components.
- .2 Evaluation and Assessment:  
.1 Identify location and type of internal  
components.
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- 3.2 EXAMINATION / .2 Evaluation and Assessment: (Cont'd)  
PRE-CLEANING .2 Identify extent of potential problems.  
INSPECTION .3 If toxic or hazardous materials or  
(Cont'd) deposits are suspected after initial  
inspection immediately stop work and inform  
Departmental Representative.  
.1 Do not proceed further with  
inspection operations until written  
approval from Departmental  
Representative.
- 3.3 DUCT CLEANING .1 Do duct cleaning in accordance with NADCA ACR  
Standard.  
.2 Isolate and clean sections in zones to ensure  
that dirt deposits and debris from zone being  
cleaned does not pass through another zones  
which has already been cleaned.  
.1 Isolate zone of duct using closed-cell  
polyurethane foam air inflated zone bag before  
cleaning.  
.3 Ensure vacuum units and evacuation fans are  
securely in place before starting cleaning  
operation of isolated section of HVAC air duct  
system.  
.4 Install HEPA filter evacuation fan at one end  
of zone section and insert full contact  
brushes at other end.  
.5 Clean HVAC supply air duct system and  
components where particulate sample collected  
from surfaces is greater than 75 mg of  
particulate per 0.01 square metres.  
.6 Clean exhaust, return, transfer ductwork and  
plenums, equipment and components where  
particulate sample collected from surfaces is  
greater than 75 mg of particulate per 0.01  
square metres.  
.7 Energize brushes to travel from insertion  
point to HEPA filter evacuation fan.  
.1 Pass brushes through sections as often  
as necessary to achieve required cleanliness.
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- 3.3 DUCT CLEANING .7 (Cont'd)  
(Cont'd)
- .2 Change brush sizes as required to ensure positive contact with duct and component interiors.
  - .3 Clean corners and pockets where dirt and debris can accumulate.
  - .8 Clean equipment, components and other features in isolated zone before moving to next zone of HVAC and kitchen exhaust air duct system.
  - .9 Clean diffusers, registers, louvers, and other terminal units.
  - .10 Advise Departmental Representative 72 hours minimum before deactivation of fire alarm and smoke detectors duct cleaning operations.
    - .1 Departmental Representative will pay for costs of deactivation of fire alarm and smoke detector system.
- 3.4 ACOUSTICALLY .1 Clean glass fibre acoustically insulated  
LINED DUCTWORK ducts to NAIMA recommended practices.  
CLEANING
- .1 Use specifically designed robotic apparatus that has been demonstrated not to damage acoustic glass fibre lining.
  - .2 Monitor cleaning process progress by onboard camera.
- 3.5 FIELD QUALITY .1 Post Cleaning Inspection: carry out final  
CONTROL/FINAL inspection using robotic camera and other  
INSPECTIONS visual inspection methods after final cleaning has been completed.
- .1 Carry out video survey as directed by Departmental Representative.
  - .2 Include in final survey areas inspected by Departmental Representative prior to cleaning.
  - .3 Identify on HVAC system record drawings access points used for inspection and cleaning.
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3.5 FIELD QUALITY .1 (Cont'd)  
CONTROL/FINAL .4 Reset components including dampers and  
INSPECTIONS sensors, which have been disturbed during  
(Cont'd) cleaning operations.

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3.6 SYSTEM STARTUP .1 Install new system filters after cleaning  
operations are completed.  
.2 Cover each inspection opening with access  
door or panel and secure in place after  
inspection and cleaning are completed.  
.3 Restart each cleaned system.

3.7 CLEANING .1 Clean in accordance with Section 01 74 11 -  
Cleaning.  
.2 Waste Management: separate waste materials  
for reuse and recycling.