Verifying System Cleanliness
A Guide for Commissioning Providers

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Sources of Contamination
Performing Inspections
Industry Standards
Cleanliness Verification
Special Consideration
Sources of Contamination
Sources of Contamination

Construction Defects

- Water Intrusion
- Improper Insulation
- Drain Pan Issues
- Air Leakage
- Improperly Sized HVAC System
Sources of Contamination

Fire Damage
Sources of Contamination

Water Damage
Sources of Contamination

Microbial
Sources of Contamination

Fire Extinguisher
Sources of Contamination

Wind Driven
Sources of Contamination

Elevated humidity
Sources of Contamination

Poor Preventative Maintenance
Performing Inspections
Performing Inspections

NADCA’s HVAC Inspection Manual provides procedures for assessing the cleanliness of commercial HVAC systems.
Performing Inspections

Common types of Inspection Equipment:

- Borescope
- Inspection Mirror
- Robotic Cameras
- Naked Eye
- Digital Camera
- Video Camera
Performing Inspections
Performing Inspections

The cleanliness inspection should include air-handling units and representative areas of the HVAC systems components and ductwork.
Performing Inspections

The inspection must be conducted without negatively impacting the indoor environment through excessive disruption of settled dust, microbial growth or other debris.
Performing Inspections

Most likely places to find contamination:

- Coils
- Blowers
- VAV & Mixing Boxes
- Turning Vanes
- Dampers
- Duct Transitions
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Industry Standards
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NADCA
ACR 2006 - The Assessment, Cleaning and Restoration of HVAC Systems
ASHRAE/ACCA

Standard 180-2008 - The Standard Practice for Inspection and Maintenance of Commercial Building HVAC Systems
This publication also describes investigative strategies to identify causes of IAQ problems.
NFPA
Standard for the Installation of
Air-Conditioning and Ventilation Systems

Standard states the importance of regular system inspections and cleaning when contamination is present.
The IICRC S520 states that after assessing the HVAC system’s condition (cleanliness), it should be cleaned according to NADCA Standard.
Cleanliness Verification
Three methods of cleanliness verification are widely recognized.

- Visual Inspection
- Surface Comparison Test
- NADCA Vacuum Test

These methods do not measure or confirm microbiological contamination.
Cleanliness Verification

Visual Inspection - The first and most common inspection method.

The key is to insure that you and your customer agree that a surface is clean.
Cleanliness Verification

Visual inspections can be used to determine if a system requires cleaning and to verify the effectiveness of cleaning.

If suspect microbial growth is present, sampling is required to confirm findings.

If visible particulate is being discharged into occupied spaces, then cleaning is highly recommended.
Cleanliness Verification

Surface Comparison Test - Used to determine cleanliness of both non-porous and porous HVAC component surfaces.
Cleanliness Verification

Contact Vacuum Equipment Criteria

The testing contact vacuum must be HEPA filtered and capable of achieving a minimum of -40 inches of water gauge. The contact vacuum should be fitted with a 2.5” round nylon brush attached to a 1.5” diameter vacuum hose.
Cleanliness Verification

Test Method

The brush must be passed over the surface test area four (4) times, with the brush depressed against the surface being tested using light to moderate pressure (as used in routine cleaning).
Cleanliness Verification

NADCA Vacuum Test - Used for scientifically evaluating remaining particulate levels of cleaned, non-porous HVAC component surfaces.
Cleanliness Verification

Equipment Criteria

An air sampling pump capable of drawing 15 liters per minute calibrated using a calibration device that is accurate to ±5% at 15 liters.

A 15 mil thick (0.381 mm) template consisting of two 2 cm x 25 cm slots at least 2.5 cm apart.
Cleanliness Verification

Acceptable Cleanliness Level

To be considered clean by the NADCA Vacuum Test, the net weight of the debris collected on the filter media must not exceed 0.75 mg/100 cm².
Cleanliness Verification

Visual observations of coil surfaces can be misleading. Therefore a static pressure drop should be obtained before and after the cleaning process.
Cleanliness Verification

Cleaning efforts should result in a static pressure drop sufficient to allow the HVAC system to operate within 10% of its nominal, and/or design (if known) volumetric flow.

Other factors such as air leakage, fan blade condition, compromised duct, permanently impacted coils and other factors, can have an effect on the overall static capability of the HVAC system.
Special Considerations
Other Areas of Concern

- Return Ductwork
- Structure Utilization
- Inaccessible Components
- Mechanical Rooms
- Kitchen Hoods
- Dryer Vents
- Building Exhaust
- Fresh Air Intakes
- Industrial/Lab Exhaust
Building Use Classification

- Industrial
- Residential
- Light Commercial
- Commercial
- Healthcare
Contractor Requirements

- Adequate GL Insurance
- Pollution Liability Insurance
- Proper State Licensing
- Familiar with OSHA Regulations
- Air System Cleaning Specialist (ASCS)
- Certified Ventilation Inspector (CVI)
- Provide Detailed Scope of Work
- Provide MSDS
- Photo Documentation, if Needed
QUESTIONS
Thank You

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