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Presenter: Brooks Ingrassia, ASCS, CVI



Managing Partner of True Cleaning Solutions. I reside about 60 miles south of Kansas City, MO however My company is in Denver, CO. When I'm not on a duct cleaning project or in the Office you can find me at one of my three kiddos sporting events.

- Joined NADCA in 2013
- 2013 Earned my ASCS /VSMR
- 2017 Earned CVI
- Voted NADCA 30 Under 40 in 2019
- Board of Directors Member 2021 -2023
- Co-chair of the Fall Technical Committee
- Member of the Annual Meeting Committee
- SME on CVI Rewrite
- SME on Job Task Analysis
- Website Analysis Taskforce
- NADCA Fall Tech. Conf. Trainer / Presenter
- Chair of the Hygiene Maintenance Taskforce
- My Company secured a 5Y / 7M maintenance project with DEN

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✓This presentation is not intended to be a comprehensive program covering all aspects of this topic.

✓All participants are encouraged to read and follow applicable standards, codes and regulations related to this topic.

✓The views and opinions following are the presenter's opinions and not necessarily the official position of the National Air Duct Cleaners Association.



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CLEANING AND RESTORING AHUS





- **Why are you cleaning the AHU?**
 - Maintenance
 - Internal Complaints
 - Fire / Water / Mold
 - Loss of Efficiency
- **Who wrote the Scope your following?**
 - CIEC / CIH
 - Facilities Team
 - Restoration or Insurance Contractor
 - In-house scope
- **What are the external factors you must factor in?**
 - Location
 - Time / Temp
 - What does the AHU Feed?
 - What happens to the building pressures if this AHU is powered off?
- **What resource are you referencing for your work?**
 - NADCA ACR 2021
 - NADCA CVI Manual
 - S-590
 - ASHRAE 62.2 / ASHRAE 241
- **Who is determining it's Clean?**
 - CIEC / CIH
 - Facilities Team
 - Restoration or Insurance Contractor
 - You
- **What to look for to determine restorative measures**
 - Deteriorating Linear
 - Active or dominant Microbial Growth
 - Excessive Rusting
 - Performance issues

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- Cleaning and restoring each of these units comes with their own challenges and risks.
- Determining the impact on the facility?
- Performing a Job Hazard Analysis
- Performing the inspection and proposal
- Are you being paid for the inspection or is this a quick site walk?

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CLEANING AND RESTORING AHUS


Cleaning the Roof Top in Midwest Winter School Fire and is trying to Reopen

- Getting on the Roof
- Negative Temp Weather
- Snow / Ice
- Skin Exposure
- Hurts to just Breathe
- Employee Exposure
- Working in Layers
- Wetness / Dampness
- Chemicals Freezing
- Potential Frost Bite
- Hypothermia
- Electrical and Equipment concerns



Cleaning the AHU as part of a routine Hospital maintenance contract


- Confined Spaces
- Steam or Heat Coil
- Head Hazards
- Applying Chemicals
- Rinsing Chemicals
- Employee Exposure
- Getting Equipment in/out
- LOTO



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CLEANING AND RESTORING AHUS

- NADCA ACR 2021 Inspection of the Air Handling Unit based on building classification is annually for every classification.
 - As a contractor this could be a routine annual maintenance inspection for many of your commercial, healthcare, and industrial clients.
 - The decreasing maintenance staffs across the country makes this an appealing option for continued services.
- Multiple standards and publication across the industry similarly state: *the need for cleaning may arise in the event there is a build up of contaminants or debris in the system, that has led to a negative impact on indoor air quality and/or performance.*
- What determines the need for cleaning and restoration...? NADCA helped take the guessing out?



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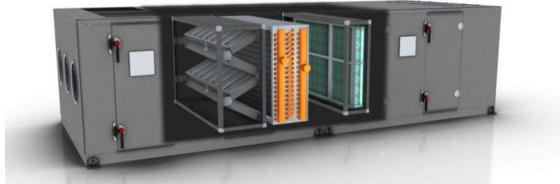
CLEANING AND RESTORING AHUS

- It is recommended that any HVAC system component or components be cleaned when a proper HVAC cleanliness inspection or building history indicates one or more of the following conditions exist:
 - The HVAC system components are contaminated with an accumulation of particulate;
 - The HVAC system components' performance is compromised due to contamination build-up;
 - The HVAC system components have been determined to be a source of unacceptable odors;
 - The HVAC system components are discharging visible dirt or debris into the conditioned space;
 - The HVAC system components have been contaminated as a result of fire, smoke, and/or water damage;
 - The HVAC system components have been infested with birds, rodents, insects, or their byproducts;
 - The HVAC system components have been determined to be at risk for fire
- The HVAC system components have become contaminated with construction particulate or debris;
- Mold contamination conditions have reached either Condition 2 or Condition 3;
- Deterioration of fibrous glass duct liner, duct board, or other porous components;
- As part of an HVAC maintenance program as defined in ANSI/ASHRAE/ACCA Standard 180;
- As part of the HVAC equipment manufacturers recommended maintenance practices;
- As part of a proactive energy management program;
- As part of a proactive indoor air quality management program;
- As a component to achieve LEED Certification;
- When a newly installed component or duct has been contaminated with construction and/or other dust and debris

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CLEANING AND RESTORING AHUS

1.7.1 Air-Handling Unit Inspections: The air-handling unit (AHU) cleanliness inspection shall include, but is not limited to, the following components within the unit: filters and air bypass; heating and cooling coils; condensate pans; condensate drain lines; humidification systems; acoustic insulation; fans and fan compartments; dampers; door gaskets; and general unit integrity. This would also include components such as fan coil units, evaporative coolers, etc.



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-  Laundry Space AHU for Major Hotel Brand
-  Humidity Control is out of control
-  CW Coil isn't producing the thermal change needed, causing thermal discomfort
-  CW Coil Needs Cleaned and both sides need to be accessed

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CLEANING AND RESTORING AHUS

Per NADCA CVI Inspection Manual:

- Malfunctioning coils, including dirty coils, can waste energy and cause thermal discomfort.
- Duct linings should not be allowed to become moist from humidification or mist sprays.
- Filters should fit tightly in the filter housing to avoid blow-by.
- If dirt accumulates in the ductwork, and if the RH matches the dew point (so that condensation occurs), the available nutrients and moisture may support the microbial growth.
- Check that pans are clean, with no residue, standing water, or leaks.
- Check fan blades for cleanliness and any signs of corrosion problems.
- Air handlers that are located in difficult-to-access places (e.g. in places that require ladders for access, have inconvenient access doors to unbolt, or are located on roofs with no roof hatch access) will be more likely to suffer from poor air filtration and lack of overall maintenance.

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AHUS LOCATED IN HARD TO GET PLACES!



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LOOKS, SMELLS, AND SOUNDS LIKE MONEY!

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- 1.10 System Component Assessment: Information collected from the HVAC inspection shall be documented and evaluated to assess the condition of the HVAC system components at the time of the inspection. The assessment shall include a recommendation on the need for cleaning, a clearly defined scope of work for the cleaning and restoration project, recommended cleaning techniques, a determination of the environmental engineering controls required for the workspace, and any unique requirements.
- 2.0 Overview: Prior to the commencement of any cleaning work, the HVAC system cleaning contractor shall provide a written work plan. A written work plan is a document that communicates responsibilities and specific tasks associated with the cleaning and restoration project. The work plan is based upon information gathered from the HVAC inspection and system assessment.
 - Scope
 - Purpose
 - Means and Methods
 - Other Trades and Tasks (Electrical Contractor, Mechanical Contractor, etc.)
 - Project Schedule
 - Work Site Communication Plan
 - Product Submittals & SDS Data Sheets

There are GREAT Project Management Programs to utilize and make this process simpler!

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CLEANING AND RESTORING AHUS

- 2.8 Safety Plan & Safety Concerns: When life safety detection equipment (e.g., air duct sensors and smoke detectors) needs to be off-line or disabled, the work plan shall address life safety concerns, which will likely require the input of others. It is recommended that the written work plan define the responsibilities of each organization's designated representative involved with executing the plan for the duration of the HVAC system cleaning and restoration project.

"Safety isn't a **priority** because priorities change! In this facility Safety is one of our most important **Core Values!**"
Facility Director

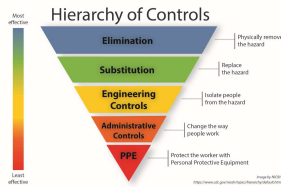
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3.0 Overview: Engineering controls shall be used to prevent cross-contamination. Engineering controls may include but are not limited to source control; isolation barriers; pressure differentials; dust suppression methods; HEPA vacuuming and filtration; detailed cleaning; temperature and humidity control; and a sanitary approach.

“Great Duct Cleaners are experts in Tape and Plastic”
R. Rizen



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Per the ACR NADCA STANDARD
Environmental Engineering Controls:

Modifications to the work environment to permit safe operations and to prevent the escape or transfer of contaminants

- 1. Protects the Employees
- 2. Protects the Facility
- 3. Protects the Occupants
- 4. Protects the Areas that have already been cleaned


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4.0 Overview: All cleaning and restoration procedures shall achieve the **minimum level of visibly clean or the specified level of cleanliness verification as defined in the contractual documents** for components within the project scope of work.

- How clean is clean?
- Can it be cleaned?
- Will clean solve the problem?
- Who's determining the level of cleanliness?
- Are the surfaces being sampled after?
- Is dry cleaning or wet cleaning sufficient?
- Do you need to pressure wash the fan?
- Do you need to steam the coils?
- Do you need to bring in a mechanical contractor to get to an area you otherwise wouldn't have access?



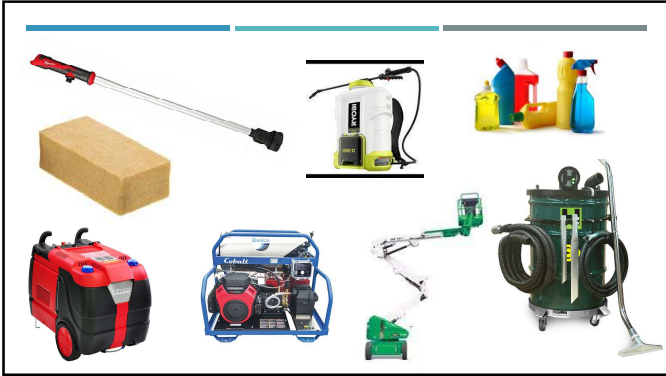
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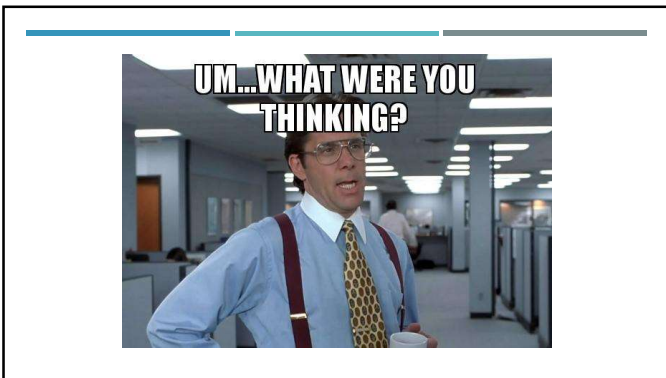
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- Night Shift Team never knew the duct cleaners were coming!
- Sorry our staff didn't know you were coming tonight... we'll have to reschedule for another date!
- You've made this request multiple times for weeks... you get on site and the smoke and duct detector system is online!
- They know your cleaning the air handler, you know your cleaning the air handler... get onsite and they are shocked you have to shut it down for 8 hours!
- Your alone in the building to do the duct cleaning... walk into an office where someone is sleeping!
- Your team gets onsite, is all set up for the duct cleaning... the power cord is still at the shop!
- Your team gets onsite, is all set up for the coil cleaning... the hose never made it to the truck!
- Your team calls you to let you know they relieved the system of refrigerant!
- I know something is wrong when the call starts with... " So, we were just moving the ladder..."
- You never want to hear... "Where's all that water coming from?"
- The facility tells you sorry you can't park there!
- You're in the middle of a duct cleaning project... It's a little after midnight and the police walk in!
- Customer got the closeout report and in one of the photos your employee is flipping someone off in the background!
- You're meeting with Suits way smarter than us... When they ask do you need a crane to get your equipment on the roof?
- You're cleaning the ducts when the fire system goes off... And it's your fault!... You just cleared out the facility!
- Your crew calls you to let you know the airless sprayer had a malfunction while they were coating


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RESTORING AHUS

Would you clean and restore or recommend replacing?



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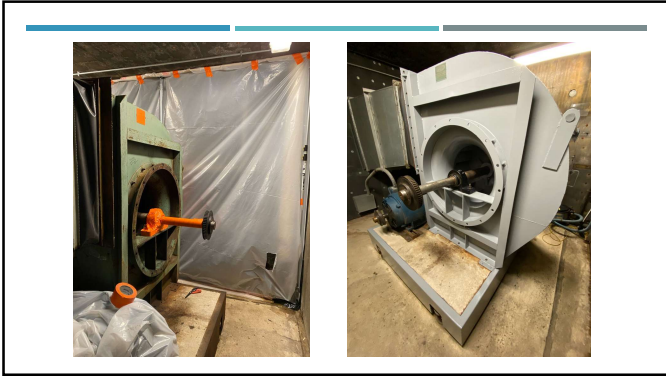


- There is no authority or industry standards on the practice of AHU Restoration
- There is no authority other than "Contractor" and "Client" to approve the work that is performed
- The "Contractor" is operating at their own **RISK** and taking on all the **RISK**
- You will get no help from the HVAC unit manufacturers.
- Restoration versus replacement... This becomes a budget and **MONEY** game
- Provide the knowledge to the client, discuss all possibilities, and come to a decision **YOU** and the **CLIENT** are comfortable with the **RISK!**

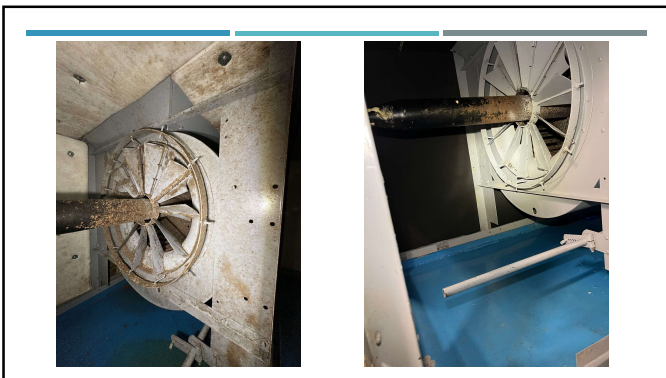
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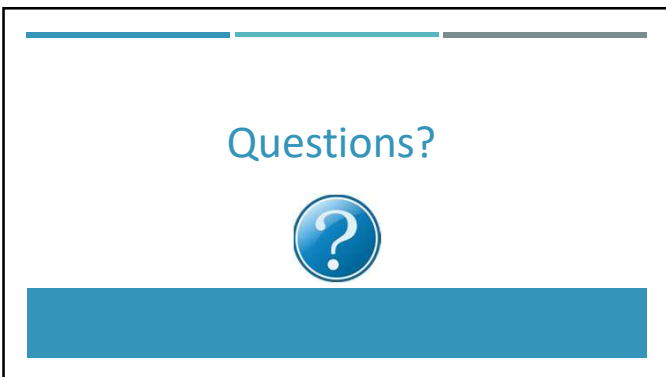
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PRESENTER CONTACT INFORMATION
Brooks M Ingrassia *ASCS/CVI/VSMR*
Truce Cleaning Solutions
Denver, Co
(816)699-1032
Brooks@TCSCleanAir.com



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**Thank You for
Participating!**



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