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Slide 2

Robert Rizen is VP of GC Industrial. He has been involved with air conveyance cleaning since 1989 as well as full service restoration operations.
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Robert Rizen

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This presentation is not intended to be a comprehensive program covering all aspects of this topic. All technicians are encouraged to read and follow all applicable standards, codes and regulations related to this topic.

- ✓ It is the responsibility of each individual contractor to follow local building codes and licensing requirements and to work safely in accordance with OSHA guidelines.
- ✓ It is the contractor's responsibility to take proper precautions on each project to prevent cross contamination. Always take the health and safety of the building occupants into consideration before you conduct any cleaning procedures.
- ✓ All of the following tips are only general tips. They do not cover every situation, and it is your responsibility to adapt these tips to the individual system you are working on.
- ✓ The Instructor is not responsible in any way for the work you perform after viewing this slide show. You are responsible for your own work.
- ✓ The views and opinions following are the instructor's opinions and not necessarily the official position of the National Air Duct Cleaners Association.


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 Residential HVAC 101


Supplemental Materials

This session covers key points but not every detail. The tips & techniques presented are for cleaning & restoration procedures. For a full understanding of this topic, attendees are encouraged to review additional materials including:

ACR, The NADCA Standard – 2021 Edition




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 What We'll Learn

- Types of HVAC Systems
- Typical Components
- Tips for Cleaning These Systems
- Cleaning Requirements

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Section 1
Types of HVAC systems


- Up Flow System
- Down Flow System
- Ductless
- Geothermal
- Multi Zone

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System Types & Locations



The diagram shows a cross-section of a two-story house. A furnace is located in the basement. Blue arrows indicate the supply of air from the furnace to the second floor. Red arrows indicate the return of air from the second floor back to the furnace. Labels include 'Supply', 'Return', and 'Furnace'.

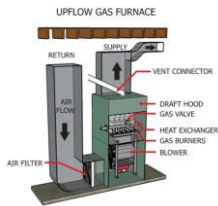
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Up Flow System

UPFLOW GAS FURNACE



The diagram shows a vertical furnace with air entering from the bottom through an air filter and being pushed up through a heat exchanger, gas burners, and a draft hood. A vent connector leads to the roof. Labels include: RETURN, SUPPLY, VENT CONNECTOR, DRAFT HOOD, GAS VALVE, HEAT EXCHANGER, GAS BURNERS, BLOWER, and AIR FILTER.

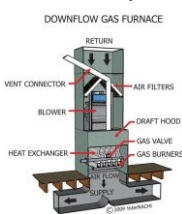
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Down Flow System

DOWNFLOW GAS FURNACE



The diagram shows a vertical furnace with air entering from the top through return air filters and being pushed down through a heat exchanger, gas burners, and a draft hood. A vent connector leads to the roof. Labels include: RETURN, VENT CONNECTOR, AIR FILTERS, BLOWER, DRAFT HOOD, GAS VALVE, GAS BURNERS, HEAT EXCHANGER, and GAS BURNERS.

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Ductless Mini System




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Ductless Mini System




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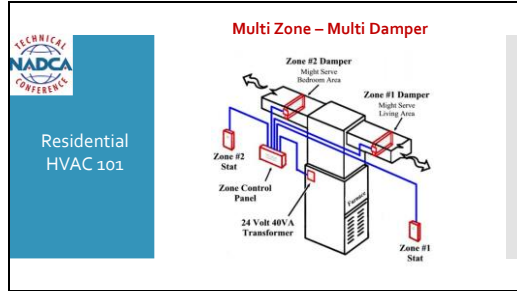
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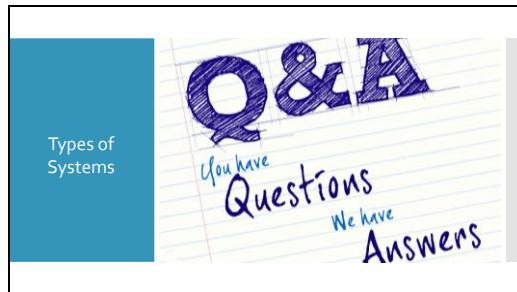
Geothermal System



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-
- Section 2
Typical Components of Residential Systems
- Duct Work
 - Registers
 - Furnace Fan
 - Evaporator Coils & Drain
 - Humidifier
 - Washable Air Filter

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Typical Components:
Supply & Return Air Duct Work



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Typical Components:
Registers & Vent Covers




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Typical Components:
Furnace Fan



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Typical Components:
Evaporator Coil & Drain pan




The image shows two HVAC components. On the left is an evaporator coil, a metal frame with copper tubing. On the right is a drain pan, a rectangular metal tray with a drain hole and electrical wiring.

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Typical Components:
Humidifier



The image shows a white, cylindrical humidifier installed in a furnace or air handler. It is connected to a silver flexible duct.

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Typical Components:
Washable Media Air Filters



The image shows a person's hands installing a rectangular, pleated washable media air filter into a furnace or air handler. The filter is being held in place by a metal frame.

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**Typical Components:
Real Life Install**




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Typical Components



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**Section 3
Cleaning Methods**


- NADCA does not endorse or recommend any single method of cleaning or type of equipment.
- NADCA recommends the use of source removal methods and equipment designed to clean HVAC systems to the cleanliness levels specified in NADCA Standard ACR.
- Each different cleaning method has its advantages and disadvantages.

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Section 3
Cleaning Methods: Vacuum Collection
Good negative air (suction) is a must for capturing the particulate.

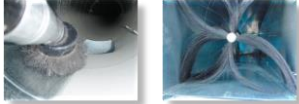


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Section 3
Cleaning Methods: Vacuum Collection
A vacuum collection device alone will not get an HVAC system clean.
Methods and tools designed to agitate debris adhered to surfaces along with use of vacuum collection device(s), is required.

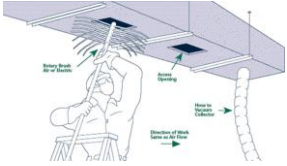


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Section 3
Cleaning Methods: Brushing

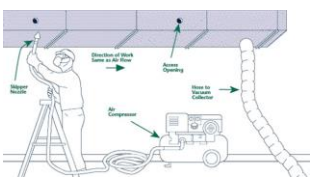


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Section 3
Cleaning Methods: Air Washing



The diagram illustrates the air washing process. A technician on a ladder uses a blast nozzle to clean the interior of a duct. A large air compressor is connected to the duct system. Labels include: 'Blast Nozzle' pointing to the technician's tool, 'Direction of Blast' showing air flow from the nozzle, 'Access Opening' at the duct entrance, 'Blow Up' indicating air being pushed into the duct, and 'Blow Down' indicating air being pulled out. A 'Compressor' is also labeled.


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Section 3
Cleaning Methods: Air Washing

Whips, Rods, Blast Nozzles



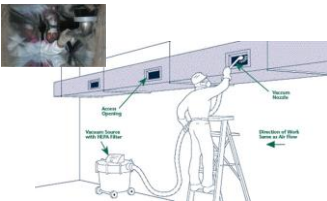
Two photographs show cleaning tools. The left photo shows a blue whip with a nozzle attached to a duct. The right photo shows a blue rod with a nozzle attached to a duct.

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Section 3
Cleaning Methods: Contact Vacuuming



The diagram illustrates the contact vacuuming process. A technician on a ladder uses a vacuum nozzle to clean the interior of a duct. A vacuum unit is connected to the duct system. Labels include: 'Access Opening' at the duct entrance, 'Vacuum Nozzle' pointing to the technician's tool, 'Vacuum Nozzle with 1/4" Filter' pointing to the vacuum unit, and 'Direction of Blast' showing air flow from the nozzle.




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Section 3
Cleaning Methods: Hand Washing


This procedure is just what its name implies—washing components by hand. Involves hand tools such as brushes, sponges or damp cloths to wipe clean a designated area.



Liquids cannot be applied to porous components such as fibrous glass. Make sure that no chemical residues are left in the system during hand washing.

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Cleaning
Methods



Q&A
You have Questions
We have Answers

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Section 3
Component Cleaning - Fans




Fan Compartment
Fan Housing
Fan Blades or Vanes
Motor/ Drive Assemblies

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Section 3
Component Cleaning - Fans



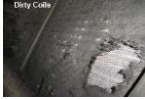
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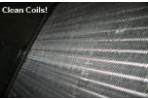
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Section 3
Component Cleaning – Evaporator Coils


Dirty Coils



Clean Coils!



Vacuum with brush
Blow out with air
Aerosol cleaner
Pump sprayer with chemical



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Section 3
Component Cleaning – Evaporator Coils

- Containment – separate coil from furnace with sheet metal or poly
- Capture water during cleaning with a wet vac, vacuum out the drain pan as needed
- Always verify drain line from the pan is actually operational before wet cleaning!
- Go slowly- the pan is small and only holds a small amount its easy to overflow.

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Section 3
Component Cleaning – Drain Lines

The condensate drain pan and line should be flushed
Verify operation before cleaning
Blow out with compressed air first to remove large buildup




Usually, a drain pan and line have the highest amounts of contamination when compared to all other system components.

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Section 3
Component Cleaning – Duct System Tips




Its faster to cut an access opening and vacuum large debris out of the ducts instead of trying to use air to push it towards the collection unit

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Section 3
Component Cleaning – Duct System Tips

- Standardize your access holes – Only stock 2 sizes of premade sheet metal patches on your truck.
- Try to minimize your trips to the truck – steps cost money, bring in your tools from the beginning.
- Establish negative air before you remove vent covers- this helps to minimize mess inside the home when covers are removed.

 Here's a Tip...

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**Component Cleaning:
Ductless Mini Split**



Same components of a standard furnace - just compact.
Contains a fan, filter, evaporator coil, and drain pan.

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**Component Cleaning:
Ductless Mini Split**



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**Component Cleaning:
Ductless Mini Split**



Remove covers, vacuum fan and coils.
Compressed air can be used to blow items out.

Purchase or create a containment to capture the water overflow to wet clean the coils.

Here's a Tip...

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**Component Cleaning:
Geothermal Air Handler**




Mysterious looking?

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Component Cleaning: Geothermal Air Handler



Same components as normal furnaces, fan, coils, drain pan.
Be aware of coil placement, usually on return air side of the system.
Tightly spaced coils, don't tolerate aggressive cleaning agents.

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**Component Cleaning:
Humidifiers**



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**Component Cleaning:
Humidifiers**

- Disassemble and wash components.
- Pad can be replaced and sometimes washed.
- Verify that drain is working.
- HVAC microbial issues often start with the humidifier and evaporator coils.

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**Component Cleaning:
Washable Media Air Filters**



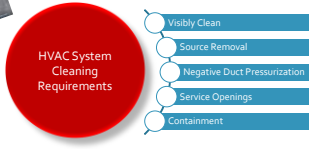
Wash with mild detergent, coil cleaner or degreaser

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**Section 4:
Cleaning Requirements & Standards**



HVAC System
Cleaning
Requirements

- Visibly Clean
- Source Removal
- Negative Duct Pressurization
- Service Openings
- Containment

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**Section 4:
Cleaning Requirements & Standards**

Negative Duct Pressurization

Key Terms
Negative Pressure
 Used to prevent debris from entering the occupied space or leaving the contained area.

Prior to and throughout the duration of the cleaning process, the HVAC system and associated air duct *shall* be kept at an appropriate negative pressure differential relative to the indoor non-work area.

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**Section 4:
Cleaning Requirements & Standards**

Effective negative pressure containment requires:

- Physical barrier around work area
- Sealing off HVAC return air grills
- Continuously pulling air through a HEPA filtration device to reduce airborne particles.
- Exhausting more cubic feet per minute of clean, HEPA-filtered air out of the space than is supplied into it.

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**Section 4:
Cleaning Requirements & Standards**

Participant Poll Question:

Has anyone experienced an HVAC System cleaning job where negative pressurization was not maintained properly?

If so, what was the result?

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**Section 4:
Cleaning Requirements & Standards**

Service Openings


Minimum Requirements for Service Openings

Service openings shall:

- not degrade the structural, thermal, or functional integrity of the system;
- not hinder, restrict, or alter the airflow within the air duct;
- not be made in flexible ductwork;
- be created in a manner that allows for proper closure;
- comply with applicable UL, SMACNA and NFPA standards, as well as local, regional, state and federal codes.



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**Section 4:
Cleaning Requirements & Standards**

Service Panels


- Shall be of an equivalent gauge or heavier
- Shall be mechanically fastened (screwed or riveted) at minimum every 4" on center.
- Shall overlap the ductwork surfaces by a minimum of 1" on all sides.
- Recommended to be sealed with gaskets, duct sealants, mastic or tape.

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**Section 4:
Cleaning Requirements & Standards**

Evaporator Coils

All portions of each coil assembly **must be cleaned.**

- Both upstream and downstream sides of each coil section shall be accessed for cleaning.
- When both sides of a coil are not accessible for cleaning then removal and/or replacement may be required.
- Visual inspection of the coil and drain pan will determine whether Type 1 or Type 2 cleaning is required.



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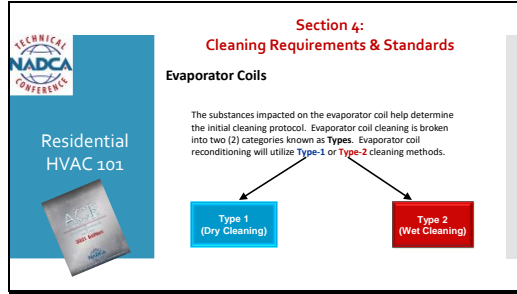
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**Section 4:
Cleaning Requirements & Standards**

Evaporator Coils

The substances impacted on the evaporator coil help determine the initial cleaning protocol. Evaporator coil cleaning is broken into two (2) categories known as **Types**. Evaporator coil reconditioning will utilize **Type-1** or **Type-2** cleaning methods.

Type 1 (Dry Cleaning) Type 2 (Wet Cleaning)




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**Section 4:
Cleaning Requirements & Standards**

Pop Quiz Does this coil require Type 1 or Type 2 cleaning?



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**Section 4:
Cleaning Requirements & Standards**

ANSWER:


Perform a Type 1 cleaning.
After performing Type 1 cleaning determine whether you need to proceed to Type 2 cleaning.

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**Section 4:
Cleaning Requirements & Standards**

Participant Poll Question:
Recommend Cleaning or Replacement?



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**Section 4:
Cleaning Requirements & Standards**

Containment



Be prepared to cover everything in your work area if needed.

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**Section 4:
Cleaning Requirements & Standards**

Containment



Simple critical barriers


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Section 4:
Cleaning Requirements & Standards

Containment



Coils covered by cardboard, keeps debris from damaging coils

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Section 4:
Cleaning Requirements & Standards


Containment



Replace filter with cardboard, sheet metal etc. to section furnace from duct system

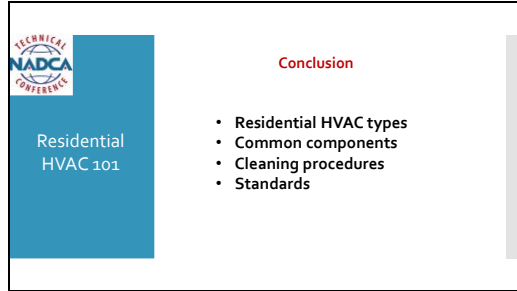
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Q&A
You have
Questions
We have
Answers

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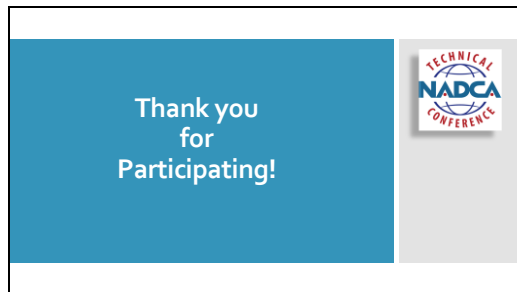
Slide 67 content: A blue vertical bar on the left contains the NADCA logo and the text "Residential HVAC 101". The main white area has the heading "Conclusion" in red, followed by a bulleted list: "Residential HVAC types", "Common components", "Cleaning procedures", and "Standards".

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Slide 68 content: A blue vertical bar on the left contains the NADCA logo and the text "Residential HVAC 101". The main white area has the heading "Presenter Contact Information" in red, followed by a blue-bordered box containing a bulleted list: "Robert Rizen", "Robert.rizen@gmail.com", and "314-393-1444".

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Slide 69 content: A large blue area on the left contains the text "Thank you for Participating!". On the right, there is a smaller NADCA logo.
