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Spelunking:

When is Entry the Right Choice?



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Presenters



David Monson
Armstrong Duct & Vent

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Disclaimer

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 instructors opinions and not necessarily the official position of the National Air Duct Cleaners Association.

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What We'll Learn

- What is Strength?
- Why Would We Crawl Into Ducts?
- When Can We Go Into Ducts?
- When Can't We Go Into Ducts?

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- This presentation isn't really about crawling ductwork. We will get to plenty of that later on.
- This presentation is about strength, and understanding it.
- "A threefold cord is not quickly broken." Ecclesiastes 4:12

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An illustration from my house



- The pole on the right is being replaced by the pole on the left.
- The Comm Wires that are still on the pole on the right need to be transferred to the pole on the left before the pole can be removed.
- When this temporary fix was done, the pole on the right was resting on wood blocks on the sidewalk.
- A lumber tie at the top is lag bolted in place to stop swing.

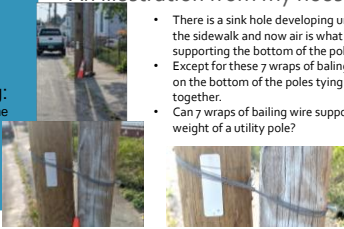
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An illustration from my house

- There is a sink hole developing under the sidewalk and now air is what is supporting the bottom of the pole.
- Except for these 7 wraps of baling wire on the bottom of the poles tying them together.
- Can 7 wraps of baling wire support the weight of a utility pole?



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An illustration from my house

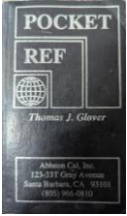
- How much does a utility pole weigh?
 - A southern yellow pine utility pole that length weighs about 500#.
- What is the breaking strength of 3/16" steel wire?
 - Breaking strength is 1,200#, safe working load is 240# (20%).
- 14 strands of 3/16" steel wire (7 on each side of the pole) have a combined safe working load of 3,360#.
- Can 3,360# of strength support 500# of load?

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An illustration from my house



- How can I know about strength? Where can I get good facts so that I don't get in trouble?
- Everyone should have one of these in their truck or on their desk.
- Obtain at Harbor Freight, Amazon, other online services.
- Chapter after chapter of construction engineering data, tables, and formulas.

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From the Illustration to the Real World



- This is the duct I was in when I took the selfie at the beginning of the presentation.
- That duct is 26' above the gym floor.
- The reality of the matter is that a person is more at risk of injury from a fall standing on the floor looking up at that duct, than they are being inside that duct.

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From the Illustration to the Real World



- There is steel support underneath that duct in many, many locations.
- To begin with, spiral duct is inherently stronger than rectangular duct.
- There are 3/8" threaded rod hangers to welded steel under-saddles.
- Then there are all the pieces of steel between the bar joists under the duct.
- This duct isn't going to fall down.

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From the Illustration to the Real World



- Why would you have to go inside that duct anyway?
- Because, when the RTU heat exchanger ruptured and the unit caught on fire, the flames shot down the duct about 25'.
- And don't ya know that duct was lined with a combination of duct liner and ductboard.
- That stuff all had to go if you wanted the smoke odor gone.

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Are All Situations the Same?



- Above this HS auditorium ceiling is ductwork that is spec'd to be cleaned.
- It was suggested to us that the ductwork was large enough to be crawled through.
- Hmmmm

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Are All Situations the Same?



- This is what the ductwork looks like from the service catwalk.
- That is the top of sheetrock ceiling that is fastened to metal hat sections screwed to sheet metal C channels suspended with ceiling grid wire.
- That ceiling support can support the weight of the ceiling only, no more.

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Are All Situations the Same?



- The duct is supported with 1" sheet metal hanging strap. That's pretty substantial stuff...
- If the end is supported well.
- How well are the ends of those straps fastened?

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Are All Situations the Same?



- The auditorium duct system cleaning was excluded from the project so the school could contemplate how OSHA compliance was going to be achieved.

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Another Real Life Application Example



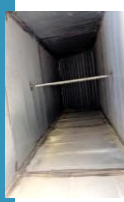
- I'm standing on a catwalk. The big duct in the background is a 40" diameter spiral duct for Outside Air Intake for a dormitory ventilation system.
- The ceiling assembly is another variety of sheetrock screwed to metal hat sections.
- The duct is supported by 3/8" threaded rod from steel roof rafters to steel undersaddles. The duct is installed through the open webs of the steel truss frames.

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Another Real Life Application Example



- The dorm building was surrounded by towering white pines, mast trees that New Hampshire is known for....
- That release scads of pastel yellow pine pollen every spring that is extremely obnoxious to anyone with respiratory weakness. That is what the outside air intake duct delivering "fresh" outside air to the building ventilation system looked like.
- The pollen release only happens over a couple of weeks in the spring, but in an outside air intake duct the effect continues on through out the year.
- We made access from the catwalk into this section of duct and where the other end connected to the air handling unit in the mechanical room.

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Another Real Life Application Example



- The cleaning was standard techniques.
- Vacuum on the duct for containment and collection.
- Brushes and compressed air tools, only, the remote reaching components were not necessary. I was the remote reaching component.

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A Catastrophic Water Loss in a School for Autistic Children



- An upside down building built on a slab. All of the mechanicals were on the roof of the 3 story building.
- The boiler room was in the square penthouse and a 300PSI rated pressure tank ruptured.
- The 2 very large RTUs sent their supply and return verticals down through the core of the building underneath the boiler room.
- The water flowed for a long time before anyone could shut it off.
- The people who shut off the water were climbing up the stairs through the cascading waterfall to get to the shut off valves.
- Water flowed outside the duct and inside the duct.
- It was fall going into winter.
- Oh, and one more thing, the ducts were internally insulated.

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A Catastrophic Water Loss in a School for Autistic Children



- The air handling units were operating throughout this event.
- When the water went through the duct it peeled off the 35 year old duct liner like nothing.
- The saturated duct liner hit the next set of turning vanes with such force that it broke them out.
- The liner had to be removed and replaced, and the damaged turning vanes repaired. This could not be done from outside the ductwork.

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A Catastrophic Water Loss in a School for Autistic Children

- The problem was not the strength of ductwork and its ability to support someone inside.
- The horizontal ducts were heavily hung from steel structure and had load bearing walls underneath.
- The problem was the vertical shafts.

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A Catastrophic Water Loss in a School for Autistic Children



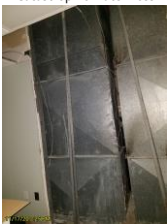
- The water didn't just affect the fiberglass duct liner in the horizontal runs. It effected the duct liner in the vertical shafts.
- The duct liner was peeling off of the duct walls.
- The duct dimensions were approximately 56" x 24" down through the building.
- The alternative to "spelunking" was demo the entire core, remove and replace the duct, and rebuild the core.
- Self-adhesive closed cell foam was the replacement option.

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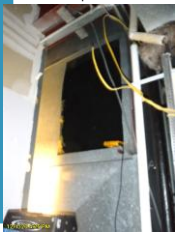


- The duct walls through the 3 stories had to be exposed. Once exposed there was no limitation on the size of access panel that could be installed.
- Oh, by the way, the building was built in the 1970s and the joint compound on the sheetrock was "hot" for asbestos.
- Asbestos Abatement Contractors were required for making openings in the walls.
- It sucks to own an older building.

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A Catastrophic Water Loss in a School for Autistic Children

- This is the size of access panels we used to gain access to the vertical shafts down through the 3 stories.
- If the access you need is bigger than the access panels you have, have a sheet metal shop make the access panels you need.
- This is the beauty of being a sheet metal worker. If a factory doesn't make what you need, then make it yourselves.

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A Catastrophic Water Loss in a School for Autistic Children

- Looking up the vertical shaft from the floor below at the staging inside the duct we fabricated.
- We drilled 1" holes from the inside of the duct to be later closed with 1" plastic hole plugs.
- We inserted 1/2" black iron pipe longer than the duct was wide and inserted it in the holes preventing it from sliding sideways with clips through predrilled holes.
- 2"x8" and 2"x6" lumber was trimmed so that it couldn't possibly slip off the pipes. That was our work platforms.

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A Catastrophic Water Loss in a School for Autistic Children

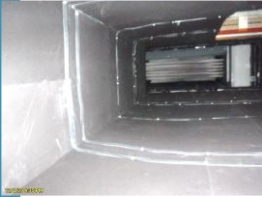
- View up the 3 story shaft after the duct liner was removed.
- The planks of each level of staging inside the duct was moved aside to take the picture of the completed insulation removal.
- There was never a fall hazard or a duct movement hazard for the entire time someone was in the duct.
- We could have done this for 15 floors if called upon to do so.

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A Catastrophic Water Loss in a School for Autistic Children



- As we worked our way down from top to bottom, we closed the 1" holes with cap plugs and applied the self-adhesive closed cell foam insulation.
- Once in place, we backed up the foam insulation with hanging strap screwed from inside to outside.
- We secured a batten at the leaking edge, the trailing edge, and the middle.

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Conclusion of the Matter

- Crawling duct is not for everyone. If it is not for you, don't do it.
- Crawling ductwork is being done by many contractors in some situations.
- Don't rely on others to tell you if crawling ductwork is safe or not. Do your own evaluation and make your own decisions.
- Learn and understand what strength is.

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Presenter Contact Information

- David Monson
- operations@armstrongne.com
- (603) 627-7016 ext 1003

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Thank you
for
Participating!