



Welcome to AEROSEAL® training for the SmartSeal equipment. We will now go into an in depth presentation on the equipment, duct seal preparation, sealing and completion.

We have now divided the AeroSeal® training manual into seven segments so that the technician who needs to review a specific area of the training can find it easily. The seven segments are the Introduction, the Equipment, the Equipment Setup, Duct Sealing Process, System Preparation, Running AeroSeal® and Maintaining the Equipment.

Introduction is an overview of the AeroSeal® process. The Equipment segment is information about the pieces of equipment that make up the AeroSeal® system. Equipment Setup shows the way the equipment is powered, connected together and connected to the duct system to be sealed. Ready for sealing describes different applications of duct systems and some of the criteria that needs to be addressed for sealing. Running AeroSeal® describes operation of the computer control with the fan box air intake with the sealant injection rate. Maintaining the Equipment discusses and places emphasis on the injection nozzle, cleaning the nozzle as well as disassembly and replacing the nozzle components.

This segment is the first of the series, the Introduction to the AeroSeal® process.

Clean-Up

This is the end of this slide module. Do you have any questions?

Clean-Up



- Contain sealant in lay-flat tubing
- Remove plugs from registers
- Replace grilles on registers
- Remove Duct Mask™ from inside ducts
- Patch injection hole(s)
- Reset duct dampers
- Remove duct mask from any sensors
- Reconnect any disconnected ducts
- Replace air filter
- Re-install accessories
- Perform final walk-through
- Start HVAC to assure proper operation

Disconnect lay flat tubing from the duct injection flange and the heater cylinder. Tie the heater cylinder end in a knot and then roll the tubing, being sure not to leak any sealant material that may have collected in the tubing. With the knot in the end, this tubing can be used as a trash bag.

Inspect supply and return plenums to be certain that coil/fan plugs have been removed. Remove Duct Mask™ from the inside of the duct where the sealant was injected.

Re-install grilles and vacuum any debris that falls.

For sheet metal systems, repair the injection flange connection by installing a sheet metal patching plate over the injection hole using an adhesive backed closed cell rubber seal strip and self-tapping screws. In the event that the adhesive backed seal strip is not used, apply silicone caulking or water-based mastic to the back of patch before installing it with self-tapping screws. For internally lined ductwork, glue a round section of duct insulation of the same size as the hole onto the patch before screwing it over the injection hole (if you are careful, you can often reuse the original insulation that was in that place. For duct board systems, cover the hole with the round pumpkin-cut plug that was removed prior to sealing. Once the plug is in place, seal it on the outside with metal-foil tape or water-based mastic. Reconnect any ducts that were disconnected.

Set any duct dampers that were adjusted to their original positions. Remember that this is the damper shaft location not the damper arm. Re-install any duct accessories that were removed and remove any material that was placed on accessories to prevent sealant from adhering to them.

Perform a walk-through to insure that everything was returned to its original condition, all dirt and dust has been swept up or vacuumed, and all supplies and tools have been picked up and properly stored in their containers in the truck. Make sure that all trash has been taken away and not left at the residence.

Start the HVAC system and assure that it is operating properly.

Prevention and Clean-Up



Take care to cover computer and electronic equipment with plastic sheeting or drop cloths, static cling attracts sealant particles. In instances with high fogging, pause the sealing process and let your scrubbers catch up.

The installer must always take precautions to prevent spillage on carpets, furniture, and other personal property, as Duct Seal can be difficult to remove. Once dried, Duct Seal can be very difficult to totally remove without damaging the surface being cleaned. In case of accidental spillage, soak up excess liquid with absorbent materials such as disposal towels, paper towels, etc. Place absorbent materials in plastic bags or other suitable containers for later disposal. Residual material may be removed by wiping with water-dampened rags or by flushing with a water spray. Remove as much as possible, repeating as necessary and for as long as the residue will continue to be removed. Non-absorbent surfaces can be cleaned using adherent remover which has been developed and manufactured specifically to remove set Duct Seal. Adherent remover should be used sparingly and carefully, as it leaves an odor, and is flammable. Place all clean up materials in a suitable container for later disposal.

Dried (set) Duct Seal on AEROSEAL® sealing equipment and accessories can be removed with adherent remover by soaking small parts in a container with a tight fitting lid, or by wiping, brushing or spraying larger parts with adherent remover and wiping dry with rags. Remove Duct Seal and adherent remover from skin immediately by washing affected areas with soap and water as soon as possible after contact. For emergency and other first aid procedures, refer to the MSDS sheets (these sheets are available on the AEROSEAL® laptop computer).

Duct Seal on clothing can be very difficult to remove. Keep the affected area wet with water and wash immediately.

Carpets that feel tacky due to extended exposure to sealant particles are cleaned most efficiently and cost-effectively by professional carpet cleaning services. Bedding comforters have been successfully dry-cleaned after being exposed to particle fogging.

Each municipality has their own regulations and restrictions related to the disposal of materials in sanitary trash landfills and the sanitary sewer systems. The local regulatory agency should

be contacted for their requirements for disposing of Duct Seal from clean-up operations. Duct Seal, as with any chemical product, must not be disposed of into Storm Sewers or onto open land.

Maintenance



Maintain your AEROSEAL® equipment in a manner that presents a clean, professional image to the customer. This includes, but is not limited to stickiness or sealant deposits on the exterior of the equipment, no broken switches, controls and the like, no obvious scratches or dents, and all AEROSEAL® logos should be clean and scratch free. The water bottle, which is used over and over, tends to get dirty. When and if this occurs, clean or replace the water bottle with a clean water bottle.

Always use a clean tarp under the equipment. A dirty tarp on the building floor does not make for a good professional appearance.

Flush plug



If for some reason you selected a flush time that was too short and there is still sealant or milky water in the clear tubing, you can perform a manual flush with the Flush Plug that was provided in the Spare-Parts/Maintenance Kit. The Flush Plug connects to the Fan Box where the grey communications cable from the 10/50-ft Umbilical Cord normally connects (the side with the blue label). Locate the communication connection at the blue end of the 10/50 foot Umbilical Cord, disconnect it from the Fan Box, and then connect the Flush Plug onto the Fan Box.

After assuring that the AEROSEAL® program is **NOT** running you may proceed with the manual flush process.

BEFORE STARTING THE MANUAL FLUSH NOTE THAT the compressed air injection will not operate during this process, so sealant exiting the nozzle must be contained and captured. Disconnect the lay flat tubing from the outlet of the heater cylinder and hold a container, such as a plastic soda bottle, over the nozzle tip to catch the remaining fluid in the sealant lines during this flush process.

The flush plug will also come in handy for troubleshooting pump problems, it will bypass the safety pressure switch to operate the pump.

Flushing

- Mandatory flush process
- Still sealing during flushing for 3 to 6 minutes
- Set sealant pump to highest speed possible

As mentioned earlier, flushing the equipment after each use is MANDATORY. When the sealant bottle is replaced with a bottle of clean water, it will take about 3 to 9 minutes for the sealant to be flushed from the system depending upon the pump speed during the flushing process. This means that you will be actually sealing for roughly 4 minutes after you terminate the sealing and start the flushing process. Continue flushing for a few minutes even after the sealant tube goes clear, the reservoir/cleanout in the liquid side of the wand takes at least two minutes to clear out completely.

Air Compressor

AEROSEAL



Drain the compressor tank regularly always wearing safety glasses. There is a petcock (a valve) located at the bottom of the air tank where the water condenses. Turn the petcock to open the valve. Please note, this petcock is under high pressure and when opened will discharge a spray of air and water. After draining the tank, turn the petcock back to its original position to close the valve. Keep the petcock lubricated with oil or WD40 to prevent seizure of the valve. Regularly, remove the belt guard and check the belt for wear and tears. Also, after each duct seal, check the oil level in the oil sight glass to insure that it is in the center of the glass eye.

Cleaning the Nozzle



Maintenance to the equipment, especially to the nozzle is critical to achieving quality duct sealing. The nozzle should be inspected and cleaned after every duct system that is sealed. **FLUSHING WITH WATER AFTER EACH USE IS MANDATORY.**

After every sealing job, the nozzle must be soaked in adherent remover or Buckeye Workout cleaner for 10-20 minutes, and then blown out with compressed air on both the air and liquid sides. Should a nozzle become excessively dirty due to inadequate maintenance, a small brass wire brush can be used to remove baked-on sealant from the nozzle. Baked-on sealant can also be removed by soaking in Buckeye Workout cleaner overnight. A spare-parts/maintenance kit supplied with the AEROSEAL® equipment includes a drill bit that is specifically sized for cleaning the inside of the 1/16th inch diameter liquid line, and a small section of stainless tubing that fits in the gap between the liquid line and the compressed air tubing. This tubing tool is used to clean out any sealant in the cooling pocket of the nozzle. If the drill bit is not available, a small paper clip will perform the same work.

Do not immerse any portion of the wand above the nozzle into the adherent remover because this could damage the heater or wiring inside of the wand tube.

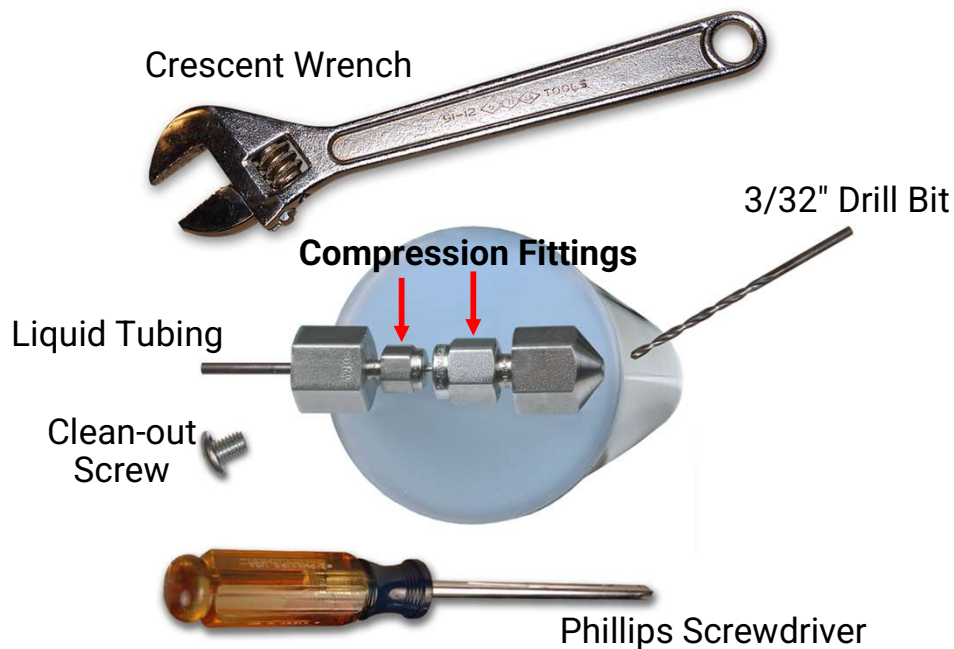
Cleaning the Wand



It is recommended that you soak the nozzle tip in Buckeye Workout cleaner for 10-20 minutes after each use. (some dealers soak it overnight after each use and it remains clean for longer periods of time) Then rinse in water and blow out the liquid and air lines with compressed air. The compressed air hose can be attached directly to the top of the wand using the pencil air gun to blow out the air side of the nozzle. The Pencil air gun is supplied in the Spare-Parts/Maintenance Kit. To blow out the sealant side use the pencil air gun and blow compressed air directly into the liquid line within the wand.

Although the nozzle was specifically designed to avoid clogging, it is important to keep the liquid line and air cap clean and free of clogs

Disassembling the Nozzle



Be sure to assemble the Wand and secure the nozzle-mounting-block before making any nozzle adjustments. When pushing the assembly back into the wand cylinder, be sure to line up the hole in the mounting block with the hole in the wand cylinder, as any twisting of the wand cylinder relative to the block can throw off your nozzle adjustments. Also remember that only the liquid fitting needs to be adjusted up or down. The nozzle tip (heated-air cap) remains stationary.

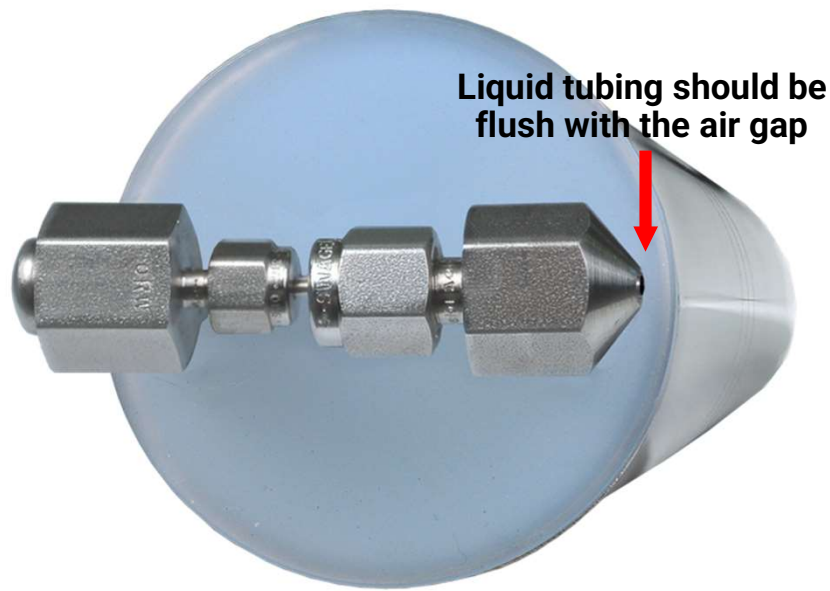
Disassembling the nozzle or changing the liquid tubing in the nozzle section can seem complicated so some special tools have been provided to simplify this task. The tools that you will need to replace the tubing are an adjustable wrench, 3/32" drill bit and a Phillips screwdriver.

Nozzle Disassembly



The first step is to clamp both pieces with the supplied duck bills if you need to release the lock nut. Then remove the clean-out screw on the back of the liquid fitting and loosen the compression fitting on the liquid tubing. Drill bit is in position for pushing, adjustable wrench is on compression fitting, and clean-out screw is on the end of the Phillips screwdriver. Remove the liquid tubing by using the 3/32" drill bit pushing it out the back side of the fitting from the front side. Once the tubing has been pushed past the nozzle tip, the nozzle tip can be removed for servicing, or if the tubing is to be replaced, it can be pulled out the back with pliers.

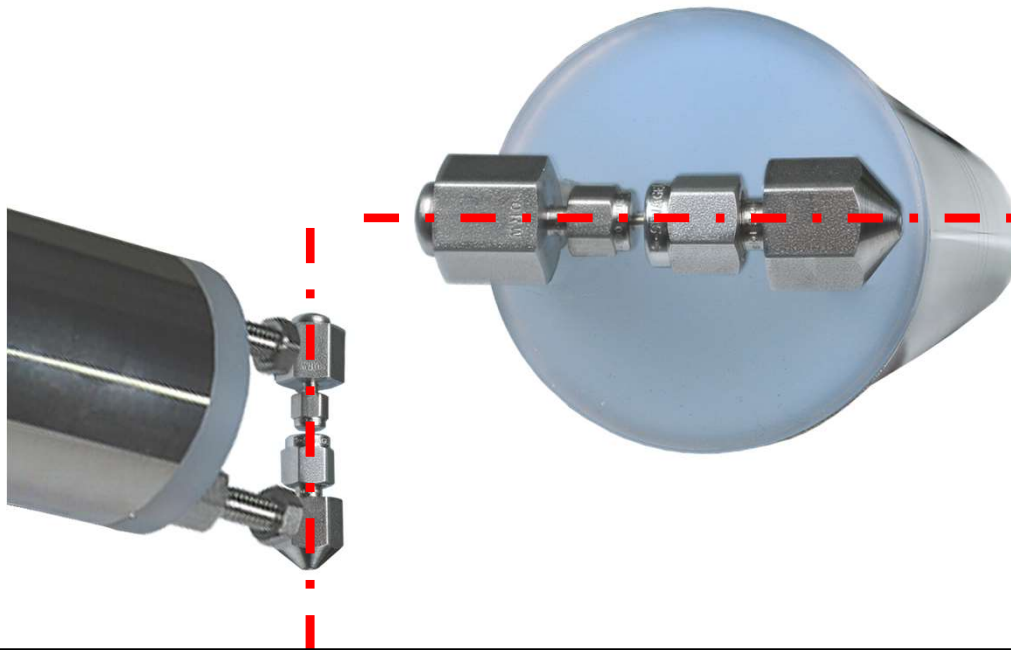
Nozzle Tip Detail



When reassembling the liquid tube and nozzle assembly, it is **VERY CRITICAL** that the liquid tube aligns with the nozzle and the hole for the clean out screw both vertically and horizontally.

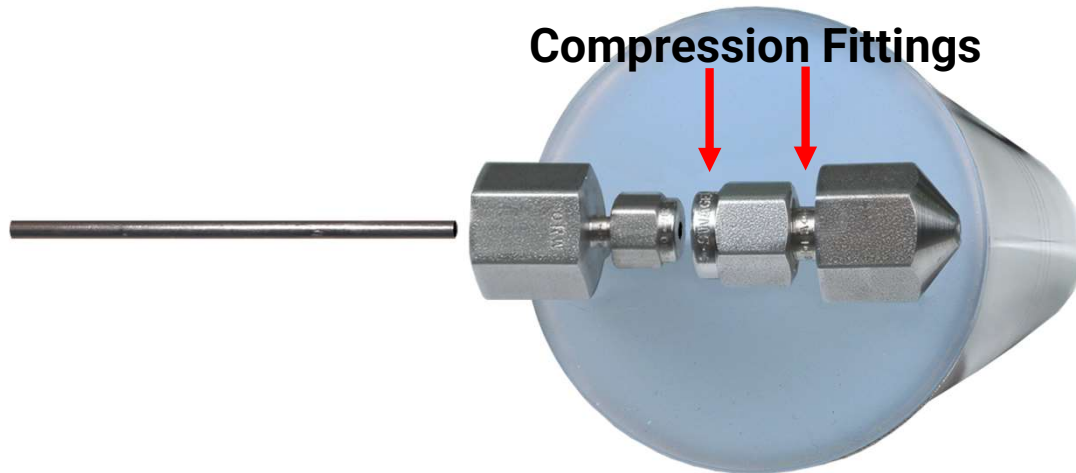
Upon reassembly the liquid tubing should be flush with the end of the air gap, but should never protrude out of the nozzle tip by no more than 0.004 inches (1 millimeter) for proper atomization to take place. If your tubes are protruding out of the end they will be damaged by the rubber seals in the control box and heater cylinder.

Aligning the Liquid Tube



Adjusting the liquid tubing to be perfectly centered within the nozzle tip takes some practice. In general, you should not have to adjust the positions of the nozzle tip or the liquid fitting unless they have been removed for servicing. Should you have to reassemble the nozzle, once the liquid-fitting and the nozzle-tip sections are lined up by sight, insert the liquid tubing into the liquid fitting along with new ferrules and then finger tighten the compression fitting. Make a note of the motion of the tubing when you finger tighten the compression fitting. If it moves upon tightening, adjust it so that it will be in the correct position when tightened. Note: Tighten and loosen lock nuts **ONLY** while the assembly is in a vise. If you cannot center the tubing in the cooling gap, the position of the liquid fitting may need to be adjusted. To do so, loosen the lock nut (while in a vise or duck bill pliers) and slide the liquid tubing back through the liquid fitting so it does not get damaged during the adjustment. Turn the fitting clockwise down the threaded connector to move the fitting down and counter clockwise to raise the fitting up. Once the fitting is at the desired position, you must turn the whole liquid line from the flat at the mounting block to line up the liquid fitting with the nozzle tip, and then tighten the locking nut. Teflon tape is required on the threads to avoid leaks. Securing the compression fitting should always be the last step, being sure not to over-tighten the fittings.

Changing the Nozzle Tip



Changing the Air-Gap tubing is performed in a manner similar to that for the liquid tubing. Loosen the lock nut and rotate the nozzle tip on the threaded shaft. Loosen the compression fitting and remove the 1/8" diameter tubing and ferrule. Inspect the inside of the nozzle tip and tubing for any baked-on sealant and soak with Buckeye Workout cleaner if necessary. Change out the 1/8" tubing if it is damaged or out of round. When changing the tubing you will notice that when the compression fitting is finger tight the tubing is not locked down. To lock down the tubing you must first be sure it is recessed slightly from the nozzle tip, as it will drift in when you tighten the compression fitting. You also need to use your air gap tool to center the tubing in the tip while you tighten the compression fitting (This task is best accomplished in a vise). You will need to center the tubing in this manner whether you are putting in new tubing or using the tubing that was originally in the nozzle tip. Once the tubing is centered and the compression fitting tightened you are ready for installation. Use Teflon tape on the threads to avoid leaks. This side should be completed before the liquid side since it is stationary. The liquid side fitting gets adjusted up or down to line up with the heater side fitting.

The Fan Box



Both dust and aerosolized sealant suspended in the air can cause the fan box filter to load up. The filter must be checked regularly and changed if there is any sign of build-up of dirt or sealant. Never operate the equipment without the fan-box filter in place. Operation of the AEROSEAL® machine without the filter will cause damage to the fan by loading sealant particles onto the fan blades, and will produce incorrect airflow measurements. A scrubber fan should be used in the vicinity of the fan box air intake whenever the unit is located in a region with high particle concentrations containing exposed ductwork. The filter can be turned upside down once before having to replace it.

Inlet Gate



The inlet gate of the fan box should be inspected on a periodic basis. Care must be taken when making changes to the gate opening during sealing so that the gate does not get bent while making adjustments. Note that the gate is kept in place by two ball plungers that can come loose. These can be tightened with an small flat head screw driver, however care must be taken not to over tighten these plungers, and the gate should never be disassembled. Since the gate also serves as the outer side of the fan box, extreme care must be taken when handling, storing or placing other equipment next to it during transportation. Bending of the inlet gate will result in incorrect fan flow measurements, particularly on Gate 4.

Sealant and Sealant Tubing



Lubricate inside the pump head

The sealant pick-up tube on the sealant bottle in the fan box should also be inspected for sealant deposition regularly. The hose barb on the liquid sealant pickup cap on the bottle can be cleaned with a wire or drill bit.

Inspect the sealant pump tubing for wear and cracks at the pump head. If wear or cracks are detected, replace tubing with approved silicon tubing provided by AeroSeal LLC. Lubricate the rollers on the easy load pump head with silicone, this will help prevent tubing tears caused by sticky rollers.

Scrubber Fan*





Aeroseal provided scrubber

- Use at least Merv15 filters
- Particles will pass through all other filters



Pressure guage - Color Index

- | | |
|--|---|
|  | Time to change filters |
|  | Filters starting to get clogged
Plan for procuring new set |

For other brands of scrubbers please follow respective manufacturer recommendations on filter replacement.

Tip: Higher MERV rating filter = better scrubbing

* Is an accessory to be ordered separately

Scrubber fans used with the AEROSEAL® equipment must have the filters inspected on a regular basis, such as after sealing every duct system. Because of the small size of the particles produced by the high-pressure nozzle, Ultra Allergen pleated filters specifically designed to capture smaller particles are required. If you have a new Aeroseal mini high volume scrubber use only MERV15 filters.

Safety



- Mechanical and electrical hazard
- Trained personnel
- Precautions on AeroSeal® equipment
- Codes: Local, National and Safety
- Safety protection
- HVAC equipment precautions

Installation and operation of this equipment can be hazardous due to mechanical and electrical components. Only trained personnel should install, operate and service this equipment. When working on this equipment, observe precautions in the Operations Manual, on tags, and on labels attached to or shipped with the equipment and other safety precautions that may apply. Follow all safety codes. Installation must be in compliance with all local and national codes.

Wear safety glasses and protective clothing.

When working on or around HVAC equipment, disconnect and lockout all electrical power to the equipment and any ancillary equipment. Observe all precautions in literature, on tags and on labels attached to or shipped with the HVAC equipment. If you are unsure about any HVAC equipment precautions, do not hesitate to contact the supplier of that equipment.

General Rules



- Ground fault circuit protection
- No sealant on electric heaters
- Bi-metal over-temperature protection
- Unplug cords if thermostats fail
- Keep power covered
- Duct inspection
- Minimal occupancy
- Use caution with pregnant women
- Use scrubbers
- MSDS sheets available

Although not every aspect of safety can be covered here, we will reinforce some general rules to follow when operating this equipment and performing the sealing process.

Use only grounded electrical circuits and cords and use cords with the wire gauge sufficient to handle loads for the compressor, fan motors and heaters. Unless they are plugged into GFCI (Ground Fault Circuit Interrupter) receptacles, cords should be fitted with GFCI pigtails.

The sealing machine should not be operated if there is sealant material on the heater-cylinder heaters or insulators.

The air heaters in the 14-inch diameter Heater Cylinder are wired through bi-metal snap-disk thermostats that cut power to the individual heater circuits if the temperature at the bi-metal disk reaches their target temperatures, 150° F with a 15° F reset value. The heater in the wand is fitted with a thermostat that cuts out at approximately 329° F. The software turns off all the heaters if the temperature of the air leaving the 14-inch cylinder (near the top next to the bi-metal snap disks) exceeds the value specified in AeroSeal.in file (default = 320° F).

Should ANY of these safety systems fail, unplug the A/C power cords connected to the Heater Cylinder and the Wand.

Do not open any electrical control panel or the heater cylinder while power is applied. Electric shock is possible.

The installer should perform a thorough inspection of the duct system to assure that it can be sealed with the AEROSEAL® system without damage to the duct system or the building occupants property.

Occupancy of the sealing area should be kept at a minimum during the injection process, so as to minimize the possibility of accidentally dislodging register seals, or of sensitive individuals being exposed to aerosol particles.

Pregnant women should not be present during the injection process. In addition, ask the customer if they have any respiratory or other health problems. If so, suggest that they leave the premises during the injection process.

AEROSEAL® scrubber fans or AEROSEAL® approved scrubber fans, must be on-site and employed at all sealing jobs. These fans are particularly critical in areas where exposed or partially exposed ductwork allows sealant particles to escape into the space. Scrubber fans are not necessary when sealing new construction at the rough-in stage.

The Right-to-Know Law and OSHA Regulations require that employers and employees be familiar with applicable Material Safety Data Sheets (MSDS) prior to using any chemical product. The MSDS on Duct Seal, available on most Computer Control Cases should be reviewed by installers prior to use. No adverse health effects are expected during normal application of Duct Seal; however, a dust mask should be worn if it is necessary to be in close contact with spray mist particles. This is to prevent unnecessary entry of sealant particles into the respiratory system.

The End



You have now gone through the training on sealing ducts using the AeroSeal® process and you should now be able to work with the AeroSeal SmartSeal® system.

You have now gone through the training on sealing ducts using the AeroSeal® process and you should now be able to work with the AeroSeal SmartSeal® and seal commercial applications.

Questions?

This is the end of this slide module. Do you have any questions?