***a compilation from blogs by* Interstate AC Service**

Over the years, we've posted lots of great tips and answers to customers' questions on our blog. Now, we've compiled and edited all the posts dealing with fall maintenance into a single resource. We've even included links to the videos (see icons) that first appeared with these articles. Enjoy!

TABLE OF CONTENTS

LANCE WATERBARGER'S FALL MAINTENANCE SERIES

Five Outside Unit Fall Maintenance Secrets

Nashville Interstate AC Service's technician, Lance Waterbarger, reveals five secrets as he performs a fall maintenance check on an 11-year-old York HVAC unit. It is comprised of a heat pump coupled to a gas furnace in the basement. In this video, Lance demonstrates the five checks (listed below) he performed on the outside unit.

1) Check the voltage across the capacitor(s). This is a dual capacitor unit: It's rated for 40 plus 5. The 40 microfarad (µF) capacitor is used to start the compressor. The 5 microfarad (µF) capacitor is used to start the fan motor. They share a common ground. Using a meter, we can see that the 40 and 5 are each reading very slightly low, but neither is weak enough to merit changing out.
2) Make sure all the connections are tight. Squeeze them a little bit.
3) Check the defrost control board. Make sure all the connections are tight and none of the little resistors are burnt out on the board. Then put it through the defrost test to be sure it is working properly.
4) Check the contacts to the fan and the compressor and be sure they look good, and that the fan and compressor come on as they should.
5) While the unit is running, check the pressures to be sure they look good.

Everything checked out OK, so the homeowner is good to go!

Fall Maintenance Secrets
COIL CLEANING

PLAY VIDEO

Nashville Interstate AC Service's technician, Lance Waterbarger, reveals six secrets as he completes a fall maintenance check on an 11-year-old York HVAC unit. In this video, Lance demonstrates the six steps (listed below) he performed on the outside unit while cleaning the coils. "If it was easy, everybody would be doing it," he says!

1) First, remove the screws holding the fan and fan guard assembly.
2) Rest the fan guard with fan attached on the side of the unit out of the way so the coils can be reached from the inside. Remove any large debris like twigs and branches that may have gotten in the unit.
3) Check all the wiring to make sure there aren't any wires that touch the copper tubes. Make sure that anything that touches copper – like foam insulation or a wire strap – is secured out of the way. Over the life of the unit, the vibration from the unit will cause anything resting or hitting the copper to pop a hole in the copper pipe and cause a leak.
4) Mix coil cleaner and water in a sprayer. If you're doing the routine maintenance every six months as you should, you don't need to make the coil cleaner mixture very strong.
5) Spray the coil cleaner mixture onto the coils in the inside and wait for it to foam up. Then spray it on the outside of the coils.
6) Using a garden hose, flush the coils from the inside to the outside with water.

Other preventive maintenance service checks include:

- Inspecting all air filters.
- Checking whether the blower belts are worn out.
- Checking the thermostat for proper operation and settings.
- Checking and cleaning the condensate drain.
- Checking all safeties on the unit.

Fall Maintenance Secrets
HEATERS

PLAY VIDEO

Nashville Interstate AC Service's technician, Lance Waterbarger, reveals his secrets as he performs a fall maintenance check on a 19-year-old Ruud air handler installed in a customer's attic. The air handler uses both a heat pump and a bank of two electric heaters. Lance explains how ice forming on the outside coils is removed by reversing the heat pump and using the electric heaters to keep the room air warm. Below are the checks Lance performs.

1) The voltage across the capacitor is checked to see if the capacitor is good.
2) All wiring connections are checked to be sure they are tight.
3) The blower motor bearings are checked for play, to see if the bearings have worn out.
4) Turn on the heat and put it in emergency heat mode to test the heat banks. The amperage draw is checked for each heater. Check there is a short time delay between the first and second heat bank coming on, to avoid dimming the house lights.
5) Check the heat bank sequencer. The two heaters should come on in staggered fashion. Generally, you'll have a 3- to 5-degree swing between first and second stage heat. When the first stage comes on, it goes into defrost mode in order to melt the ice on the outside coils.
6) Check that the heaters come on during the outside unit defrost mode.
7) Check that the outside unit reversing valve works in defrost mode. The outdoor coil freezes up in heat mode and there is a sensor that indicates when the coil needs to be thawed. A timer or demand control board will switch the reversing valve, turn the heaters on and turn off the outdoor condensing fan. This melts the ice off the coil. When the sensor senses that the coil is approximately 50-55 degrees, it will kick in automatically back to your regular heat cycle.

Fall Maintenance Secrets
CONDENSATE DRAINAGE

PLAY VIDEO

Nashville Interstate AC Service's technician, Lance Waterbarger, reveals two secrets as he completes a fall maintenance check on an 11-year-old York HVAC dual-fuel furnace in the basement of a customer's home. The unit is high efficiency and uses a heat pump and a gas furnace.

1) Check the condensate pump

Water that condenses during the operation of a heat pump or furnace needs to be pumped away, into a drain line. The higher the efficiency of the unit, the more water will need to be pumped. Check the pump to make sure it is working. Make sure you have clean water and a clean reservoir in the pump. If it is dirty, disassemble it and clean it. Bacteria and algae can build up and prevent the condensate from draining.

2) Check the condensate drain line

Check to see where the condensate drain line goes. The drain will freeze up if it goes out a window or is exposed in unprotected space. If the line freezes, the water cannot drain out and the pump will back up and shut your unit off. If your furnace quits during freezing weather, pipes in the house could freeze, causing them to burst, resulting in extensive water damage to your home.

Fall Maintenance Secrets
FURNACE BURNER

PLAY VIDEO

Nashville Interstate AC Service's technician, Lance Waterbarger, reveals three secrets as he completes a fall maintenance check on an 11-year-old York HVAC dual-fuel furnace in the basement of a customer's home. The unit is high efficiency and uses a heat pump and a gas furnace. This video describes the maintenance checks Lance does on the burners for the gas furnace.

1) Check the burners

Remove the cover from the metal housing around the burners. There is a hot surface igniter on the left side and a flame sensor on the right side. Fuel is ignited on the left and the flame will roll down the line towards the right. If the flame sensor doesn't sense a flame on the last burner, the burner will shut off as a safety and try again.

2) Check the inducer motor and associated switches

Check the inducer motor and associated switches. The inducer motor gets the air moving throughout the system, causing a "draft" (positive pressure), so that the combustion gases will travel up the flue. If the inducer motor does not come on, the furnace will shut down as a safety mechanism. There is a vacuum hose connected to a pressure switch or fan proofing switch to ensure that there is a draft for the flue. The pressure switch sends a signal through two wires and tells the circuit board to initiate the heat sequence. Check that the hose is not clogged up, and that the switch is closing. Make sure the switch is sending a signal back to the main circuit board.

3) Check the air supply and flue

Be sure the air input pipe is not capped off or plugged up. It needs to be pulling fresh air into the combustion chamber. Check that the flue is exhausted to the outside. If there are any breaks in either of these, or if they are plugged up, this would be a serious safety concern.

Fall Maintenance Secrets
HEAT EXCHANGER

Lance Waterbarger, reveals how he checks the heat exchanger in an 11-year-old York HVAC dual-fuel furnace in the basement of a customer's home. There is much talk these days about stainless steel heat exchangers and the customer was interested in knowing the type and condition of the heat exchanger.

Lance described ways to peer in to check. With the HVAC turned off, move the wires to get to the high limit sensor, and remove it, leaving a small hole. Using a camera, take a picture through the hole. Check to see if there are any cracks in the coils or signs of rust. If so, pull out the blower motor and look up into the heat exchanger. Lance pulled out the high limit switch revealing a slot large enough to insert his iPhone. He took a photo which showed the heat exchanger is galvanized steel and is in good condition.

Why Checking the Heat Exchanger is so Important

Cool air from the return air ducts is forced by the blower to go past the heat exchanger where the air is heated up. The heat exchanger is the transfer point where heat from hot flue gases - but not the gasses themselves - warm your indoor air supply. The furnace's metal heat exchanger expands as it heats up and contracts as it cools down throughout each use. Over time, this can cause splits or cracks in the unit due to metal fatigue. If the heat exchanger is cracked, deadly combustion gasses, such as carbon monoxide, can leak into the house. Carbon monoxide is odorless and colorless, and its accumulation inside the house could cause death to all occupants. Just one more reason why fall maintenance checks are so important.

Fall Maintenance for Heating Systems

PLAY VIDEO

For residential heating the most common types in the Nashville area are heat pump, natural gas and straight electric. Since a heat pump doesn't work with temperatures below 40 degrees such systems need to have auxiliary or emergency heat sources. These sources are normally either natural gas or straight electric. Technically, it's not "emergency" electric heat but rather "auxiliary" heat.

The fall preventative maintenance steps for heat pumps with electric auxiliary heat are as follows:

- Check that the amp draw on the electric heat is per specifications.
- Check that all safety devices are working properly.
- Check the refrigerant charge level is per specifications.
- Check that the amp draw for the compressor is per specifications.
- Check the amp draw on the blower and the condenser fan.
- Wash the coil if necessary.
- Check the filter and replace it if it is dirty.

The steps for heat pumps with gas auxiliary heat are:

- Measure the amp draw on the induction motor.
- Measure the gas pressure and check it against specifications.
- Check the heat exchanger for any holes or cracks
- Check all safety devices for proper operation.
- Check that the refrigerant charge level is per specifications.
- Check that the amp draw for the compressor is per specifications.
- Check the amp draw on the blower and the condenser fan.
- Wash the coil if necessary.
- Check the filter and replace it if it is dirty.

HOMEOWNER QUESTIONS, ANSWERS, & TIPS

How Do I Know Something Is Wrong?

There are several indicators that a system needs attention. Using your own senses, here are some examples:

1) **Sight:** The appearance of your outdoor system is a good indicator of how well the unit is working. Heat pump units will ice up, but the unit should go into a defrost mode and the ice should go away... this is true for both summer and winter operation. If the ice doesn't go away, or if it has dirty coils, get it serviced promptly.
2) **Sound:** If you hear the unit come on and it makes a noise that you normally do not hear, pay special attention to it and if the noise continues call us. Also, if the outside unit sounds rough while it's running, that could be a sign it needs service.

3) **Smell:** Smells are a good indicator that something is going wrong. If you smell gas or a burning smell, turn the system off immediately. Call the gas company and/or emergency services. Get out of the building.

4) **Feel/Comfort:** One clue that your HVAC is not working properly is when it will not reach the heating or cooling set point on your thermostat. Also, if the blower is not producing the airflow that you are accustomed to, or if it is blowing cold air while in heat mode, or blowing warm air while in air conditioning mode, that means it needs servicing.

5) **Other Anomalies:** Here's a short list of other symptoms that typically signify something is wrong:

- Water leak near the indoor unit
- Unit won't come on
- Circuit breaker keeps tripping
- Pilot light (on an older gas unit) keeps going out

A wise basketball coach once said the best offense is a good defense. A fall and spring maintenance visit can help prevent many of these problems.

Do You Need a Stainless Steel Heat Exchanger?

Today, there seems to be a lot of chatter about the new crop of HVAC units made with stainless steel. Although stainless steel can be used for the frame, fan plate, blowers and burners to increase their durability and strength (as compared to other metals), we'd like to focus on the heat exchanger, because that's where the main "business" of heating forced air happens and where the materials and construction can most affect the efficiency and safety of the unit.

Today's high-efficiency furnace units have heat exchangers made with aluminum, steel, iron alloys, or stainless steel. If a steel or iron alloy is used, it is typically galvanized, which means it has a zinc coating in order to make the metal resistant to rust and corrosion. Stainless steel has a chromium-rich film on a steel alloy containing 10.5% or more chromium, which makes it very resistant to rust and corrosion and is more durable (lasts longer) than galvanization. But it's not just the coatings on the metal, but the properties of the underlying metal that matter, too.

Performance: The most important properties for performance are:

- Thermal conductivity – a measure of how easily heat can be transferred (higher numbers are better).
- Tensile strength – how strong or durable the metal is when subjected to high pressures or stress (higher numbers are better).

Thermal Conductivity: Aluminum's thermal conductivity is at least 4½ times greater than that of steel in any form, whether galvanized, stainless, or uncoated. For relative comparison, the thermal conductivity of aluminum is 1536, while steel is 314, and stainless steel is 108. Thermal conductivity affects the speed and the amount of energy required to heat up the heat exchanger. Additionally, aluminum is much lighter weight and far cheaper than stainless steel. So, why

spend the extra money on stainless steel? Aluminum will warp over time and can corrode.

Tensile Strength: Stainless steel, on the other hand, resists corrosion, but manufacturers still have to overcome the high costs and low thermal conductivity associated with stainless steel, as well as its considerable heavier weight. Thermal conductivity can be increased by making the walls of the heat exchanger thinner. A thinner-walled pipe is lighter as well. Because of stainless steel's high tensile strength, it can continue to withstand high pressures even at thin wall thicknesses – something most of other metals cannot do! Next, manufacturers experimented with using "fins" – L-shaped protrusions that stick out from the stainless steel pipes – and found that the performance of stainless steel pipes with aluminum fins was overall 10% greater than even galvanized steel. The new crop of high-efficiency furnaces move air across the heat exchanger much faster than the older style furnaces ever did. Plus, the amount of temperature rise is less in high-efficiency units (35-70 degrees vs. 70-100 degrees), so thinner steel materials can be used.

Multiple Heat Exchangers: Some high-efficiency units have two or more heat exchangers. The first may be made of something other than stainless steel – such as galvanized steel, aluminized steel or glass coating - because there is typically no condensation here (exhaust products are too hot). With sealed combustion chambers, it is often difficult to get a look at the heat exchanger(s) – whether one big long one, or multiple shorter ones – to check their condition. Our technician, Larry Waterbarger, found a simple way to take a photo, so he could observe the condition of the heat exchanger and check for cracks.

Warranty: The manufacturer's warranty says it all! Those made of copper alloys or are tin-plated, typically have warranties of no more than 5-10 years; an aluminized heat exchanger may have a warranty of 15 years, and those made of stainless steel typically carry a lifetime warranty.

Safety: Safety is a big concern. If a heat exchanger (made of any material) develops a crack, deadly carbon monoxide gas is released into your homes air ducts. You should have a carbon monoxide detector, but the first step is to check your heat exchanger and look for possible cracks.

It's Your Choice: So, is a stainless steel heat exchanger worth all the hoopla and extra cost? Now that you have this information, get quotes and you make the call.

Deadly Carbon Monoxide from Cracked Heat Exchangers

This photo shows a major safety issue that can occur from a cracked heat exchanger. The heat exchanger is where hot forced air warms the inside air that passes through your furnace unit. Tiny cracks can develop in your heat exchanger, causing carbon monoxide to leak out into your home. Carbon monoxide is a deadly, colorless, and odorless gas (it's not like having a gas leak which can smell like rotten eggs!). This poisonous gas can kill you, your family, and pets within hours. That's why it's so important to have your heat exchanger checked out in the fall just before the heating season starts.

In this photo, condensate from the coils above the heat exchanger has dripped down onto the galvanized heat exchanger coils resulting in the rust and cracks you see here… cracks which could have leaked carbon monoxide! This Maytag residential gas/electric package unit was still under warranty when this was found, just 8 years after installation. Lucky for the homeowners, they did not succumb to carbon monoxide poisoning, and the warranty paid for the replacement of the heat exchanger.

12 Ways to Help Your Home Survive Extreme Cold

It is not often that Nashville experiences extreme cold weather for several days in a row, but last year bucked the trend. In the wintertime, everyone is worried about staying warm and the increased energy costs associated with the extreme cold. Here are some tips that will ensure your home or business remains warm, and keeps your energy bills low, despite frigid cold temperatures.

1) **Get a tune up.** The best defense against heating problems is to make sure your system is maintained year-round. Having heating equipment serviced once before the heating season and once before the cooling season can reduce your heating bill and prevent costly repairs, breakdowns, and ensure your system is operating at peak efficiency.
2) **Clean/change the filters.** Dirty air filters reduce your system's efficiency and thus can cause your system to work harder. Replace air filters regularly – a minimum of every 3 months - and do not block air inlets or outlets with furniture or drapes that restrict proper airflow.
3) **Use a humidifier.** During cold weather, increased use of your heater causes the home and its interior air to become dryer than usual. A humidifier can help add needed moisture, and can also improve health issues like dry sinuses, while saving energy. Since moist air holds heat, you may feel more comfortable at a lower heat setting. Be sure you maintain the humidifier properly: clean or replace the filters regularly and wash the base and reservoir.
4) **Resist using the fireplace unless it's an emergency.** Fireplaces can waste a lot of energy, as they pull warm air out of the house and force it out through the chimney. Make sure the damper is closed when you're not using your fireplace. Installing glass doors can also help keep heat in your home when the fireplace is not in use.

5) **Use exhaust fans sparingly.** You lose heated air through exhaust fans, so turn them off when not in use during colder weather. Not only do they pull heated air out of your house, but they can also cause negative pressure inside your home that can lead to back drafts from your fireplace and can cause drafts through the walls, windows and un-insulated outlets in your home.

6) **Prevent the drain line from freezing.** If you have a high efficiency furnace, there is a drain line that runs from the unit to the outside or into some kind of drain. Know where that line is and make sure it is protected from freezing. A frozen or plugged up drain line will cause your furnace to shut down. If it does freeze, thaw it out (use a hair dryer, never an open flame!), turn off the breaker to your furnace, and turn it back on again to reset it. It should fire back up. If you see water around your furnace, chances are the drain line is plugged up at some point, and must be cleared. Check out our previous post about condensate drainage here.

7) **Address non-HVAC-related air flow issues.** Close up any drafts, seal gaps and cracks around windows and doors (good weather-stripping or caulking usually does the trick), replace old windows or install window insulation kits, and look for places where heat may be escaping and/or cold air is rushing in. Lack of adequate attic insulation is the main reason heating bills can climb sky high, so extra attic insulation is a good investment.

8) **Take advantage of natural heating.** On sunny days, adjust blinds so they are open and tilted toward the ceiling, but be sure to close the blinds at sundown.

9) **Be prepared for power loss.** In extreme cold, the power grid can get overloaded, and winter weather (snow and ice) can bring down tree limbs and cut power lines. Keep candles, matches, blankets, flashlights, and a battery-powered radio handy. When utilizing alternate heating sources, such as your fireplace or wood stove, take the necessary safety precautions. Keep a fire extinguisher handy and test smoke alarms and carbon monoxide (CO) detectors. Never run the fireplace without first opening the damper!

10) **Give the HVAC unit breathing space.** Do not store anything too close to your indoor HVAC equipment, and definitely do not store anything flammable - paint, paint thinners, rags, glues, gasoline, cleaning solvents, and other chemicals - near your gas furnace or gas water heater. Not only is it a safety hazard, but HVAC systems need air in order to burn properly and to draft, or carry the harmful by-products of combustion out the flue. So, remove the clutter.

11) **If you are going away for an extended time, don't switch the heat off!** Leave it on a low setting to ensure nothing freezes. Water pipes that break from being frozen cause major damage. Have a neighbor check on your home while you're gone.

12) **Carbon monoxide is deadly.** One of the biggest threats from the cold is carbon monoxide poisoning. Carbon monoxide is an odorless, colorless gas that can kill quickly if it builds up in a home. Symptoms are nausea, headaches and disorientation. Carbon monoxide is produced by heating systems as a by-product of combustion. Make sure your heating system is properly ventilated. If you are heating up your car in the garage, make sure the garage door is open and close any access to your home. If you find yourself stranded in your car, make sure your tailpipe is clear of snow, or the carbon monoxide can flow back into your car.

Preventative Maintenance Contracts

Preventative maintenance will save you some aggravation for two reasons:

- Your unit won't break down as often and maybe won't break down on a hot or cold day.
- It will save you on operating costs. A clean unit operates like it rolled off the factory brand new. It operates clean and it saves you money.

With preventative maintenance you can find small problems before they become big problems. By cleaning the coils, you will get them back to some semblance of what they were when the unit rolled out of the factory. Just doing small things will save you not only dollars, but will save you aggravation on a really hot day or a really cold day… plus, the unit will be less likely to break down.

How often should preventative maintenance checks be performed?

We recommend two times per year: one heating check in the fall, one cooling check in the spring. This helps keep a check on the vital signs such as refrigerant charges, the amp draws, the electrical connections, lubricate motors, clean coils, temperatures, etc. It's like getting a physical twice a year.

Are repairs covered?

Maintenance contracts cover the equipment maintenance check and not any kind of repairs that may be needed.

Can you do preventative maintenance yourself?

Some maintenance check require expensive tools and a mechanical aptitude, but you can clean your coils on the outdoor units when you've got your garden hose out. Take a little 409 cleaner; squirt it on the coils and let it sit there for 30 to 45 seconds. Then just wash it down to get the oil, dirt, pollen, and out of the coils.