Top 10 biggest mistakes contractors make when installing a furnace.

BY BRIAN VINSANT
Images courtesy of Rheem Manufacturing.

Let’s face it, we are humans and humans make mistakes. This holds true when installing any type of appliance, including furnaces. Those mistakes are often not caught until after the installation is done. It is very easy to get caught up in how much time it takes to complete a job, but if we prepare ahead of time, it will help prevent the vast majority of common installation mistakes. This article lists the top 10 mistakes contractors make when installing a furnace.

1. Not sizing it up—As older furnaces get replaced by newer models, the size of the ductwork needs an upgrade too. Many furnaces today operate and provide optimal heating at high statics, so duct systems of yesteryear are often not sized correctly and can be quite restrictive.

An incorrectly sized duct system that is out of the specified static range, can adversely affect the performance of the system. This will affect the electrical efficiency and the comfort of the homeowner. No contractor wants their customers complaining about higher utility bills, premature blower motor failures, decreased comfort or evaporator coils freezing. These are just some of the issues that can occur when the duct system is not examined and retrofitted for the newly installed system.

So, on the next furnace installation, take a look at the ductwork and make adjustments to allow the system to work within its designed parameters.

2. Ignoring the invisible—Before even thinking about installing a new furnace, first take a close look at the supply gas line. Inappropriate sizing of the supply gas line can lead to the worst problem of all—the furnace will not light due to insufficient gas flow.

Most manufacturing companies include gas capacity tables in their installation manuals (See Table 12 on page 31). These charts provide the diameter of the gas line as it compares to the length of the gas line. This information can also be located in a current copy of the National Fuel Gas Code.

3. Over- or under-doing it—Residential gas meters are installed in every home that has gas equipment. They are there to measure the amount of gas that is consumed by the customer, so it is extremely beneficial that gas-fired equipment is configured correctly and not overfired or underfired.
The benefits of proper rate may include, but are not limited to:

- No condensation in the flue (80% furnace).
- Extended heat exchanger life.
- Reduced main limit trips.
- Prevent rollout limit trips due to over firing.
- Increased customer comfort.
- Optimal efficiency and reduced utility bills.
- Furnace delivers rated capacity.
- Regional heating values can vary by as much as 20%.

The formula is a simple calculation consisting of the local heating value of the gas and the number of seconds it takes to use 1 cu ft of gas (heating value can be found online or by contacting a natural gas distributor and the time is clocked at the meter).

**Rate Calculation Formula:**

\[
\text{Rate (BTU/H)} = \frac{\text{Heating Value (3600)}}{\text{Time in Seconds for one cu ft of gas}}
\]

4. **Not letting it vent**—Manufacturers get a lot of questions about creative ways contractors want to vent a furnace, but veering away from the installation manual can prove to be a big problem. Furnaces go through extensive testing to find the perfect vent and termination match. If a contractor deviates from the proven venting installation, it can adversely affect the operation of the furnace and could cause nuisance or safety issues.

5. **Failure to read the fine print**—The installation instructions were written for a reason: to be read. A new furnace installation can almost always be resolved with proper planning, which should start by reviewing installation instructions. Every Original Equipment Manufacturer (OEM) is a little bit different and requires certain steps be taken to ensure a successful installation. This is especially true when it comes to correctly placing combustion air/venting and fuel requirements. By not reading the instructions, it could turn an installation into a nightmare compromising both time and safety.

6. **Forgetting to be grounded to get a good flame**—Many times, the most common issues in the field that inhibit flame rectification, causing a low flame sense or a marginal flame sense are due to grounding issues. If there is a weak, faulty or no ground at all, it will lead to the furnace not sustaining a flame for more than a few seconds. On top of correctly grounding the furnace, in order to sustain ignition, check for the cleanliness of the flame sense.

**WARNING**

**THESE INSTRUCTIONS ARE INTENDED AS AN AID TO QUALIFIED SERVICE PERSONNEL FOR PROPER INSTALLATION, ADJUSTMENT AND OPERATION OF THIS UNIT. READ THESE INSTRUCTIONS THOROUGHLY BEFORE ATTEMPTING INSTALLATION OR OPERATION. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN IMPROPER INSTALLATION, ADJUSTMENT, SERVICE OR MAINTENANCE, POSSIBLY RESULTING IN FIRE, ELECTRICAL SHOCK, CARBON MONOXIDE POISONING, EXPLOSION, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.**

**ELECTRICAL**

- 115 V.A.C. supply (Dedicated Circuit) (record voltage)
- Polarity observed
- **Furnace properly grounded**
- Correct wire size (record type and gauge)

**An improperly grounded furnace will not sustain a flame very long.**
A furnace should always have a good earth ground and always follow all local and national codes when supplying a ground.

**Measuring the current:** The furnace control is the easiest way to determine if there is a good flame signal. Most furnaces have an indicator light that will provide this information. It is also important to note that some OEMs institute a LED fault code system that will indicate a low or marginal flame current.

Also, a multi-meter can be used to measure the microamps seen by the flame sense. Thus, based on the amount of micro-amps, it will show how well the flame sensor is sensing the flame. Micro-amp values should be attained from the specific OEM.

7. Lack of common sense with common drains and A/C coils—Many contractors have questions regarding connecting common drain lines to air conditioner coils. There are risks associated with joining condensate drain lines of a condensing gas furnace and an indoor cooling coil before entering an open drain or condensate pump. These risks are primarily linked to the lowest drain or auxiliary drain opening. If the common drain line becomes restricted or blocked, flooding will occur at the lowest opening, and depending on how fast the issue is detected could result in substantial damage and monetary forfeiture. The type of problem is determined by the position of unit whether it be upflow, downflow or horizontal and its cooling coil drain positions.

The resulting problem will depend on which mode (heating or cooling) of operation the furnace is in. The damage could be to either the equipment, the surrounding structure, or both.

Concerning the heating operation, furnace operation problems may occur, and if the cooling coil condensate drain becomes pressurized by a common drain arrangement this would not allow condensate to flow through the system even though no restriction exists. The bottom line is that by combining the furnace drain with the cooling coil drain, the technician creates a risk that could have been avoided by applying proper practices.
8. Depriving the orifice—This is a common issue: a contractor is putting the finishing touches on an installation that utilizes liquid propane and in their haste they neglect to install the proper orifice associated with that gas. The results are almost always detrimental to the success of the installation. Depending on how long it has been in operation it may result in a complete change out of the furnace due to sooting. This will infiltrate the entire heat exchanger (plug it up). It is also important to note that in this condition the furnace is no longer safe to operate.

It is recommended to review the furnace’s Gas Code and Liquid Propane Gas Conversion index for the correct orifice and spring kit.

9. Trying to cut ventilation corners—Being able to use an existing vent is a great advantage to contractors when it comes to time and money. However, it must be confirmed that the valve is the correct diameter and length as dictated by the installation instructions. If the length and diameter are not per design specifications, it could spell trouble for the installation.

A few reasons why the existing vent would be left in place instead of reinstalling new venting include:

→ Vent is incased in sheet rock.
→ The cost of the material.

No matter the reasoning behind using the existing vent, if the measurements are not correct, it needs to be redesigned. Although it is painful at times and may make installation tougher, it will be better off for the contractor and the homeowner in the long run.

10. Forgetting to take control of technology—The furnace industry has come a long way since the days of relays and fan control switches.

These days, all modern furnaces have incorporated simple-to-complex circuit or control boards that take the place of the furnace components of the past. With all of these advancements come an element of apprehension around troubleshooting a furnace that incorporates circuit board technology. Many cases end with the circuit board being replaced when in all actuality another issue persists. In some studies, the amount of “no fault found” field returned circuit boards are as high as 40%. This shows there are a lot of unnecessary expenses and time wasted.

We need not fear these vast improvements in HVAC technology, but simply need to understand them and let them do the work for us. Most control boards these days incorporate some sort of diagnostics (i.e. fault code lights or LED numbered fault code systems). If this still seems confusing, all OEMs have a flow chart that will help narrow down to the most reasonable possibility. It should also be mentioned that, when in doubt, call the OEM for any suggestions they might have.

There is an old saying: “An ounce of prevention is worth a pound of cure.” In other words, it is better to keep a bad thing from happening rather than fix a bad thing after it happens. As contractors, it is important to learn from mistakes. We have all been there, and done that when it comes to oversights or miscalculations, but the key is to learn and apply those lessons on the next job. After all, we are only human.

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