

If Someone Ask You, “How Do You Know Your Duct Designs Work”, What Would You Tell Them?

By Randal Ripley

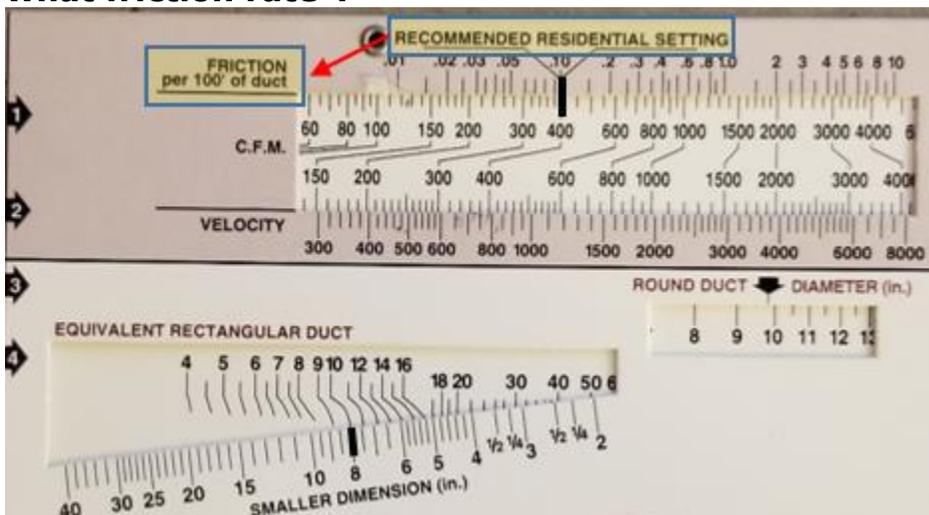
I recently read an article by David Richardson from the National Comfort Institute where he said, "If you want to start a fight among HVAC contractors, ask them how to design a duct system. On one side of the discussion, you'll have those who follow duct design rules of thumb that came from previous generations. Those "rules" probably came from their dad or someone else who taught them as they came up in the trade. To this group, disrespecting those rules is like spitting in the face of tradition and on the same level as insulting their mom...On the other side is the duct design die-hards who follow industry-approved standards."

I think many of us would agree there is a lot of undersized residential duct systems out there. If we concede that this is true, and it is, then the next logical question could be asked in one word, “Why”?

If I asked 100 people, I’d probably get many different answers but the biggest one that I’ve seen in my 19 years as the Technical Support guy for Total Air Supply is many techs and contractors misuse the duct calculator, aka duculator to many in the industry, and use rules of thumb that don’t account for things such as pressure drop, resistance, velocity, effective length, available pressure, equivalent length, etc., etc.

Pass an HVAC guy a duct calculator and ask them to size a rectangular piece of duct that can carry 400 cfm. Many slide the 400 cfm line to the .10 friction rate mark that many duct calculators clearly say is the “Recommended Residential Setting” and tell you it is 10 X 8.

The person who knows how to use a duct calculator will ask you, “at what friction rate”.



The Techs that used the .10 friction rate mark might say, "it says right there it is the Recommended setting". But it also states for 100' equivalent feet, the comparison "length" of a duct fitting to an equivalent length of straight pipe or duct. For example, a top take off is 60 equivalent feet of straight pipe or duct. There are very few, if any, residential duct systems that are 100 equivalent feet or less.

In the "**Equal Friction Method**" of duct sizing, the sum of all equivalent lengths of fittings used and the measured distances of all pipe and duct from room terminal fitting all the back to the air handler should be calculated to find the longest supply & return runs. This can get tricky because of equivalent length. What you may think is the longest run, may not be so pick a few runs on both the supply & returns you think could be the longest to assure you get the correct run for each side of the system.

Once you have determined the longest supply and the longest return runs, they are added together to create the "total effective length". The total effective length (TEL) **equals the measured length from the farthest supply outlet, through the equipment, and to the farthest return outlet—plus the equivalent lengths of all turns and fittings.**

This is your critical path, if you can get air through these runs, you can get air through the lesser ones.

The total effective length is then put into a formula with your available **static pressure**, the static pressure available AFTER you have subtracted all your pressure drops, to find your **design factor friction rate**. You can also plot the numbers on the friction rate chart in manual D. The design friction rate is then used to size each piece of duct in your supply and return with your duct calculator.

Of course, there is much more to a duct design than the correct use of a calculator, than can be covered in this short article. If you would like to learn why a room by room manual J is necessary for correct duct sizing, the do's and don'ts of duct fittings, the rules of duct design, etc., see our Winter Training Schedule and consider signing up for our "Duct Sizing & Design With Manual D" class.

By the time you finish this 4 evening seminar, you will not only see why installing duct work and knowing how to size a Duct System is two different things and requires two different knowledge bases, more importantly, you will have the knowledge and know the test necessary to answer the question, "How Do You Know Your Duct Designs Work".