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An Air Conditioner Sizing Benchmark for High Performance Homes

Posted by Allison Bailes on Wed, Sep 21, 2011



One of the most frustrating parts of my job as a Home Energy Rating (HERS) provider is dealing with the size of air conditioners installed in ENERGY STAR homes. My frustration has spilled over here in the Energy Vanguard blog several times, and the topic in all its manifestations (HVAC sizing, Manual J load calculations, the HVAC industry...) has been one of my favorites to write about. I've got an idea of how to make things better now, though. Keep reading.

Today it happened again. I was checking HERS rating files, and, as I usually do, I applied my <u>AC sizing rule of thumb</u> to see if the HVAC contractors treated the homes as a true high performance homes. Turns out they didn't. For the three homes in question, the air conditioning capacity was one ton for each 529 square feet, 544 sf, and 781 sf. Those numbers are not good. The first two, actually, are terrible.

In case you're new to this subject, air conditioners should be sized to meet the cooling load of the house, and bigger is NOT better. If the AC is too big, it doesn't run long enough to dehumidify well, and the constant on-and-off cycles will shorten the life of the equipment. A Manual | load calculation is how you find out what size air conditioner the house needs.

So, here's my idea, and I'm starting a campaign for it. HVAC contractors like rules of thumb, so let's take that idea and adapt it. If you're a builder, home buyer, HVAC contractor, or real estate agent, here's a way that you can do a quick analysis to see if the air conditioner is oversized: Find the conditioned floor area. Find the air conditioner's capacity in tons. Divide the former by the latter. What you get is the number of square feet of conditioned floor area per ton of AC capacity.

I told you above that 529, 544, and 781 aren't good, so what is a good number? As a rough guide, you can use the following:

High Performance Home = 1000 sf/ton or more

We've done a lot of load calculations here at Energy Vanguard, and I don't think we've had a single new home come in lower than 1000 sf/ton. I built a house here in Georgia that came in at about 2000 square feet per ton, and we recently worked on another one that was higher than

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that. This number, 1000 sf/ton, should be your baseline. Nothing lower than that should be acceptable.

Where this rule of thumb could really shine is for these three things:

1. Helping home builders know if their HVAC contractor is in the ballpark of proper HVAC sizing

If a home builder is taking care of the building envelope, getting the ducts sealed, and doing all the things you have to do to build a high performance home, they can use this as a guide in negotiating with their HVAC contractor. When the HVAC contractor tells the builder what they want to install, the builder can quickly see how it compares to our benchmark. (Of course, if the builder uses a third party for HVAC design, then they don't need to use this benchmark because they'll have a better number.)

2. Helping home buyers know if they might be buying a home with an oversized air conditioner

Home buyers can get their calculators out and do this simple calculation. If they're buying what's supposed to be an energy efficient home and the number is far below 1000 sf/ton, then either the house isn't really so efficient or the system is oversized. In either case, they can steer clear of it and look for a real high performance home.

3. Simplifying programs like ENERGY STAR new homes

The ENERGY STAR new homes program has been great for moving the whole new homes market toward greater energy efficiency. If you've taken a look at the new Version 3 guidelines, however, you probably felt a bit woozy afterward. They've made the program too complex, especially for HVAC. A rule of thumb like this could reduce everyones' headaches.

Size Matters

You know what's really good about this new rule of thumb? It satisfies our natural urge to believe that bigger is better! No one wants to say to their neighbor:

"Hey, Bob, I bet mine's smaller than yours."

But they will say:

"Dude, you got only 529 square feet per ton. I've got 1500! BwaaHaaaHaaaa"

Because psychologically, size matters and bigger is better. So let's give 'em a way claim the numerical high ground with this new benchmark. (This use of the reciprocal function is a form of mathematical aikido.)

Now we just need a catchy name, a jingle, and some good PR for our new benchmark. Got any

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ideas?

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