

Why is HVAC Sizing Important?

by Geoff Hartman

Properly sizing mechanical systems just makes common sense if you think about it.

Consider if someone wants to build a racecar. It makes sense to design the most powerful and fastest engine that can beat all the competition. However, the same design standards would not apply to your family vehicle that just needs to keep up with routine driving and daily commutes. The large engine would use lots of gas, and cost more to maintain.

A home is a similar case. Air conditioning systems in particular perform best when properly matched to the demands of the home in which it is installed. Performance, comfort, and indoor air quality can quickly deteriorate if systems are oversized. Consider that the typical home has an installed cooling capacity of around one-ton (12,000 Btuh) per 400-500 square feet of conditioned space. On the other hand, many homes, particularly high performance ENERGY STAR homes, may only require about 1-ton per 1,000 feet - or less than half!

Consider also that research shows most residential air distribution (duct) systems can supply only 50 to 60 percent of the design airflow for these oversized cooling systems. The result is that the high efficiency (14+ SEER) air conditioner is actually operating at up to half the capacity and 15 to 25 percent lower efficiency than it is rated.

Oversized cooling systems provide less control of humidity and fluctuations in temperature within conditioned spaces. Over sizing can accentuate design flaws and duct leakage, and elevated humidity levels can reduce air quality or allow mildew to develop.

As the builder, extra cost is going into your product with little benefit. The homebuyers move in and experience higher energy costs, combined with less comfort – primarily moisture control – than they might experience with properly sized systems. At a minimum, this can lead to comfort complaints. In extreme cases, building deterioration can occur.

As the home owner, oversized cooling systems use more energy every month, which costs more. True, the larger unit will drop the temperature faster, but it will not lower the temperature below the setting on your thermostat. The unit short-cycles, on and off, more frequently and fails to control the humidity. Your family feels cool, but damp. Clothing, towels, carpet and furniture can become stale or sour and require frequent cleaning.

How do you avoid these problems?

- Make sure your HVAC contractor is calculating the required equipment design for each home. ACCA Manual J, D & S (www.acca.org) are the industry standards for proper sizing, design and installation of HVAC equipment and duct systems.

Simply moving a plan to a lot that faces a different direction can change the HVAC cooling loads significantly, especially for homes under 2,000 square feet, homes built on narrow lots, and for townhouses.

- Remember: Humidity control is equally important as temperature to your comfort.
- Make sure you are buying an ENERGY STAR Home. Your HERS Rater will inspect energy efficiency details and test the home and ducts for air tightness.
- Consider whether one single unit or two smaller units will be most effective in matching the design characteristics of the home, and the comfort conditioning needs of the owners. Lower and upper floors may have different cooling and use patterns.
- Request the HVAC system is “commissioned” after installation to confirm air flow, and cooling capacity matches manufacturer specifications and building requirements.