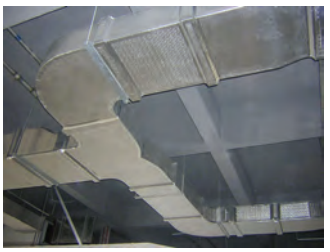
MECHANICAL CODE



Duct Systems

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As building construction materials, practices, efficiencies, and codes continue in the direction of reducing energy consumption, the HVAC systems installed within a building must be considered a major component in this effort. To maximize the efficiency in the HVAC duct systems many consider insulation the only factor that leads to reduction in energy consumption. How and where we install HVAC duct systems has a major impact on the efficient operation of a forced air system. Locating ducts within the building thermal envelope rather than in a 150°F attic and sealing all ducts, even those located in the envelope will reduce the energy consumed and often reduce the size of the equipment required.

The International Residential Code (IRC) and the International Mechanical Code (IMC) both include similar requirements for duct sealing. The 2009 International Energy Conservation Code (IECC) contains a requirement to pressure test for leakage, any residential duct systems and air handlers located outside the building envelope. (Reminder- the State of Utah has not adopted the residential requirements of the 2009 IECC at this time- this may change next year.) Those familiar with Manual J or ASHRAE load calculation procedures know there is a substantial amount of heat gain and loss from ducts located in unconditioned spaces. When we add in the additional gains and losses due to duct leakage, it is common to find systems where 30 to 40% of the capacity of the HVAC system is wasted, simply because of the leaky duct in a harsh environment.

A leaking duct system in an attic or crawlspace creates a number of energy wasting conditions:

First, a leaky supply duct is simply exhausting air out of the building, air someone just spent money to condition. Any air exhausted out of the building must simultaneously be replaced with outside air 'leaking' into the building, which must be heated or cooled.

Second, on the other side of the system, the leaking return duct brings air into the system from that harsh environment. The leaking return pressurizes the home, forcing conditioned air outside, compounding the problem created by the leaking supply.

Let's consider a too typical situation every experienced technician has encountered while servicing an A/C system with an attic duct system. The technician measures the following air temperatures:

- Return Air at the grill: 77°F
- Return Air at the air-handler/furnace (entering air): 83°F
- Supply Air: 63°F
- Resulting difference across evaporator coil (ΔT): 20°F

The 20°F ΔT shows the unit is probably operating correctly if airflow is correct; however we should consider the impact of the 6□F temperature rise between the return grill and the evaporator coil. The ret-urn air temperature rise is often due to:

1. Air leakage—drawing a portion of the return from the hot attic
2. Poorly insulated duct
3. Heat gain through code compliant R-8 insulation on the duct—150°F attic, 77°F inside the duct

In our climate where virtually the entire load is sensible, the 6°F rise in the return air temperature accounts for 30% of the cooling load. (6°F is 30% of temperature drop of 20°F) Add to the 30%, the impact on the load due to supply air duct system leakage and heat gain into the just cooled supply air. Sealing the ducts or even better, take them out of the attic may reduce your equipment sizing and power bill by 40-50% or more! There's a reason the

DISCUSSION

energy code is moving this direction.

Are there reasons to seal ducts with in the thermal envelope—yes there are. How many basements are cold in the summer because there is considerable duct leakage dumping cold air into the basement ceiling duct drops? Have you ever tried to balance a leaky duct system? A sealed system provides airflow to the locations selected in the duct design. Leaks in return air systems may result in drawing air down B-vents, from outside or other undesirable locations.

Finally, how should you seal ducts? Duct sealers and tapes must be listed products; approved for the purpose they are manufactured. UL 181A is the standard for tapes on rigid fibrous duct (duct board) and UL181B is the standard for tapes used with flexible duct systems. The same standards apply to duct sealing mastics; they must bear the listing for the duct material to be sealed. There has been a lot of debate on the code interpretation. Many code officials have maintained that 181B is made for flex duct and can't be used for metal to metal connection. others—including me—maintain if the 181B tape is approved to seal the flexible core to a metal collar, it surely will work sealing metal to metal. Most manufactures are now including "suitable for use on rigid sheet metal duct" in their specifications. Caution! Unlisted tapes are not approved for use to seal any type of duct. Remember each product; whether it's a tape or mastic must be installed per the manufacturer's installation instructions, i.e. mastics may require tape with the mastic for larger gaps! ✪

I understand this is a subject that has been and continues to be a challenge in the industry. Please feel free to contact me with comments or suggestions. Thanks again for your input.—Brent

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