

Improve Energy Efficiency by Locating Ducts Within Conditioned Space

Builder Guide



DESCRIPTION

The overall efficiency of residential duct systems located outside conditioned spaces ranges between 65% and 80%. This means that heating and cooling energy bills could be reduced up to 20-35% if all ductwork energy losses were eliminated by installing the ductwork within conditioned space.

Ducts located within conditioned space must be within *insulated* space and the *effective air barrier* of a building. For example, ducts between first and second stories or in interior walls are probably within the insulated space. However, where holes in framing allow air to move freely between these spaces and unconditioned spaces (like the attic), these spaces are not within the air barrier!

It is important to note that ducts appearing to be within conditioned space on the plans are not necessarily so after construction. Testing is needed to determine the location of the air barrier (see the builder fact sheet on duct leakage testing).

Ducts within conditioned space do not need as much insulation, but should be sealed, because even if conditioned air is being lost only to conditioned spaces, it is not going where the duct system is supposed to deliver it.

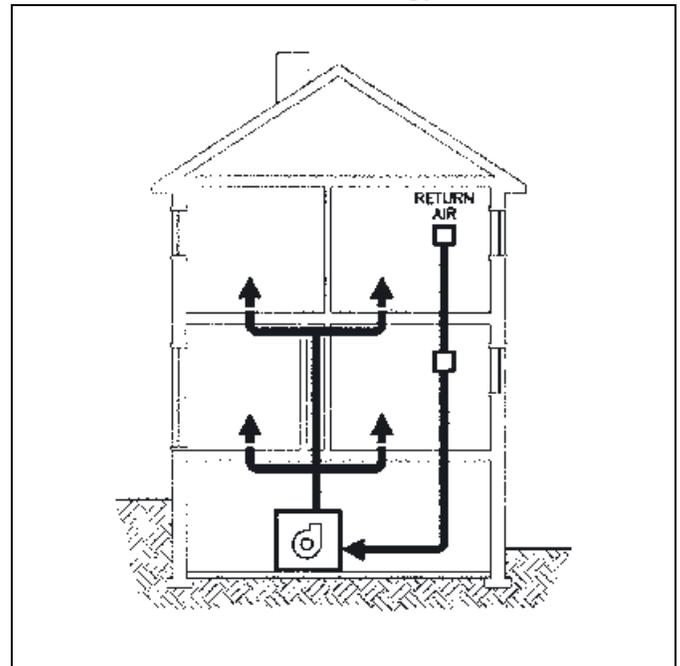


BENEFITS

- Ducts inside conditioned space can be smaller.**

Ducts located within conditioned space can be smaller, or 'right-sized' ducts. This makes them

Ducts Located Within Conditioned Space Save Energy



easier to fit within conditioned space, like between floors. They may also be shorter runs, which can reduce system pressure drop and improve efficiency.

- Ducts inside conditioned space can increase available storage space.**

If ducts are not placed in attics and basements, these spaces can more easily be used for storage or future living space.

- Ducts inside conditioned space can reduce HVAC system costs.**

Ducts inside conditioned spaces reduce system loads, which means HVAC equipment can be 'right-sized' (see the builder fact sheet on right-sizing HVAC equipment). This can significantly reduce equipment costs, especially for high-end equipment such as high efficiency air source, ground-source or gas-fired heat pumps.

Ducts inside conditioned space can lower utility bills.

Elimination of duct losses to unconditioned spaces can reduce heating and cooling bills up to 20-35% - particularly for air source heat pumps or variable-capacity air conditioners, which will spend less time in supplementary electric heat (low efficiency) operation.

Ducts inside conditioned space can improve comfort.

Occupants are more comfortable because heated or cooled air is delivered to the registers, not lost through conduction along the way. If properly sealed and insulated, the duct system in a house can significantly improve HVAC system efficiency. This leads to lower utility bills year round, and increased occupant comfort. Duct improvements are a highly cost effective way to improve the quality of the homes you build, increase customer satisfaction, increase customer referrals, and increase your sales.



INTEGRATION

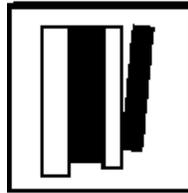
Placement of ducts inside conditioned space requires coordination of house and system design.

Placement of ducts inside conditioned space requires coordination between house designer and HVAC system designer. For instance, main ducts may need to be located perpendicular to joists, which often dictates joist material selection (i.e. truss joists or I-beam joists) or possibly dropped ceiling soffits. This coordination should occur early in the design process.

More coordination may be required during construction.

Before sealing, verify that all ducts are fastened, supported and insulated. This will typically require additional quality control measures. Duct leakage should be measured before and after sealing to ensure quality and effectiveness (see the builder fact sheet on Duct Leakage Testing). This is important

because internal duct leakage typically cannot be easily fixed once drywall is installed.



RESOURCES

- "Ducts Rediscovered"*, *Home Energy Magazine*, Sep/Oct 1993. Available at 510-524-5405.
- A Builder's Guide to Residential HVAC Systems*. Available in January 1997 from the National Association of Home Builders (NAHB) Press, 1-800-223-2665.
- "Getting Your Ducts in a Row"*, *Good Cents Building News for a Better Environment*, Sep/Oct 199. Available at 1-800-653-3445.
- Energy Efficient Ducts: How and Why*, Electric Power Research Institute, Report TR-106443. Available by January 1997 from the EPRI Distribution Center, Oakland CA, (510) 934-4212.
- Air Conditioning Contractors of America *Manual D: Residential Duct Systems*, 1995, 2nd printing. Available from the ACCA, Washington DC, (202) 483-9370.
- The Exemplary Home Builders Field Guide*, by Joe Lstiburek. Available for \$45 from the Alternative Energy Corporation (AEC), Raleigh NC (919) 857-9000, FAX orders to (919) 832-2696.