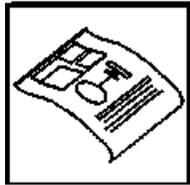


# Improve Energy Efficiency with Duct Insulation

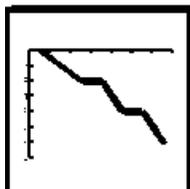
## Builder Guide



### DESCRIPTION

Typical residential heating and cooling systems lose 10-30% of heating and cooling energy as a result of conduction between distribution ducts and the unconditioned spaces, such as attics, crawl spaces, garages or unheated basements. In winter, the difference in temperature between heated air in the ducts and the cold air surrounding them results in much heat being lost through conduction on the way to the registers. In summer, air-conditioning effectiveness can be seriously reduced when cool air in the ducts is exposed to very hot temperatures, especially in an attic. Energy loss through conduction occurs even when the air-handler fan is off.

Ducts located in unconditioned spaces must be insulated because of their exposure to extreme temperatures. However, these ducts are usually only insulated to R-4 - compared to R-30 for the ceiling and R-19 in the walls. Studies have shown that insulating attic supply ducts from R-8 (in most climates) to R-11, and basement or crawl space supply ducts from R-4 to R-11 (depending on climate) cost-effectively reduces energy bills, while also improving comfort. (See Table.)



### BENEFITS

#### Duct insulation can lower utility bills.

The energy saved by not losing heat and "coolth" through conduction significantly reduces heating and cooling costs.

### Cost Effective Duct Insulation Levels

Climate (HDD)	Attic/Outside		Uninsulated Basement/Crawl	
	Supply	Return	Supply	Return
< 1500	R-8	R-4	R-4	none
< 3500	R-8	R-4	R-6	R-2
< 7500	R-8	R-4	R-8	R-2
> 7500	R-11	R-6	R-11	R-2

#### Insulated ducts can improve comfort.

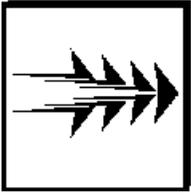
Occupants are more comfortable in houses with insulated ducts because heated or cooled air reaches the registers at higher or lower temperatures, respectively. Improved duct insulation increases comfort especially in rooms supplied by long duct runs, and reduces "cold blow" from heat pumps. In addition, homes with well-insulated ducts recover more quickly from night-time temperature setback.

#### Insulated ducts can reduce callbacks.

Better duct insulation, especially when combined with effective duct sealing, can reduce builder costs associated with HVAC system performance callbacks because homeowners are less likely to complain about heating or cooling problems.

#### Insulated ducts can reduce HVAC system costs.

Duct insulation reduces the HVAC system load, which means that right-sized HVAC equipment can be smaller units. This saves money that can be applied to the purchase of high-efficiency equipment (see the fact sheets on "Right-sizing HVAC Equipment" and "High Efficiency HVAC Equipment").



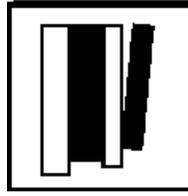
## INTEGRATION

- Duct insulation, HVAC system sizing, and duct sizing should be integrated to achieve high efficiency and low cost.**

Improved duct insulation combined with duct sealing provides economic benefits over and above those associated with either individual measure - the combined increase in system capacity can lead not only to equipment right-sizing, but also to a reduction of the size - and cost - of ductwork. Your HVAC contractor should use industry standard load calculation (ACCA Manual J), and HVAC equipment and duct sizing procedures (ACCA Manuals S and D.) See factsheet on *Right Sizing HVAC Systems*.

- Duct insulation values should be determined based on duct location.**

If ducts are located within conditioned space (instead of the attic, crawl space, garage or basement), less insulation is needed and the size and cost of ductwork can be further reduced (see the builder fact sheet on Locating Ducts Within Conditioned Space).



## RESOURCES

- 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.
- "Ducts Rediscovered", *Home Energy Magazine*, Sep/Oct 1993. Available at 510-524-5405.
- Keep Your Cool*, by Michael Uniacke, in *Building Ideas for Your New Home, Better Homes and Gardens Special Interest Publications*, Winter 1995. Available from Better Homes & Gardens S.I.P., (800) 678-2872.
- "Getting Your Ducts in a Row", *Good Cents Building News for a Better Environment*, Sep/Oct 199. Available at 1-800-653-3445.
- "Air Distribution for the Exemplary Home" (an excerpt from *The Exemplary Home Builders Field Guide*). Available at 919-857-9000, FAX orders to 919-832-2696.
- Impact of Residential Duct Insulation on HVAC Energy Use and Life-Cycle Costs to Consumers*, by B. Treidler et al, ASHRAE Transactions, 1996, V102, Part 1. Available from the American Society of Heating, Refrigeration and Air-conditioning Engineers, Atlanta GA, (404) 636-8400.
- Air Conditioning Contractors of America *Manual D: Residential Duct Systems*, 1995, 2nd printing. Available from the ACCA, Washington DC, (202) 483-9370.
- Airtight Ducts in New Construction* - a 3-day course on quality duct systems, offered by Alternative Energy Corporation (AEC), Raleigh NC. For information, call 919-857-9000.