

MECHANICAL CODE DISCUSSION

Ductwork in An Attic: Suspend or Bury in the Insulation?

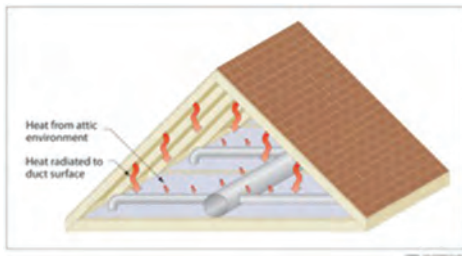


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Ductwork installed in unconditioned spaces such as attics, garage ceilings and crawlspaces can contribute significantly to the heating and cooling costs of a building. My observations, as well as numerous studies, show thermal heat loss and heat gain with ductwork installed in unconditioned spaces range from 10%-50%, and in some cases higher, especially in hotter climate.



These losses and gains are a component of the load calculation for the building, requiring additional capacity in the heating and cooling systems. Think about that for a minute. \$150 of a \$300 monthly cooling bill could be due to ducts (add furnaces) in an attic.

The obvious best location for ductwork is within the building thermal envelope; however suggestions to do so are often ignored. Where and how the ductwork is installed in an unconditioned attic space will have a significant impact the heating and

cooling system efficiencies.

Suspending Ductwork above the Insulation?

The question/comment I regularly receive on this subject is: *“I’m worried about maintaining a full R-38 level of attic insulation, so isn’t it best to raise the ductwork up out of the insulation?”*

NO! Do not suspend attic ductwork above the insulation!!

Suspending the ductwork above the attic insulation exposed the entire circumference of the duct the temperature extremes realized in an attic, with a relatively low R-8 insulation resisting heat transfer between the attic and the conditioned air inside the duct. Round ducts, partially or fully buried in the insulation realize an increase in the

effective R-value of the duct insulation, significantly reducing the duct losses and gains. A study commissioned by DOE quantifies the actual improvement in the following table:

The increased effective R-value of the buried round ducts will offset many times, any reduction in attic insulation. Also consider attic insulation is calculated based on the number of bags required to cover the entire attic to the desired level. The volume of ducts buried in the insulation will actually increase the insulation depth across the entire attic, raising the R-value in areas without ducts. If the ducts must be in the attic, place them low, then bury in the insulation. Add extra, inexpensive blown insulation to deeply bury ducts if possible.

In very moist climates such as the

Table 14. Effective R-Values of Buried Round Ducts

Burial Level	R-4.2 Flex Duct			R-6 Flex Duct			R-8 Flex Duct		
	Partially	Fully	Deeply	Partially	Fully	Deeply	Partially	Fully	Deeply
4-in. diameter	5.6	8.4	14.3	7.1	9.9	15.2	8.5	11.2	16.1
6-in. diameter	6.9	10.4	17.8	8.7	12.2	19.0	9.3	13.9	20.1
8-in. diameter	8.1	12.0	20.7	10.2	14.1	22.1	12.3	16.2	23.5
10-in. diameter	9.0	13.4	23.1	11.4	15.8	24.7	13.7	18.1	26.3
12-in. diameter	9.9	14.7	25.2	12.5	17.2	27.0	15.0	19.7	28.8
14-in. diameter	10.7	15.8	27.1	13.4	18.5	29.0	16.2	21.2	31.1
16-in. diameter	11.5	16.8	28.9	14.3	19.8	31.0	17.3	22.6	33.1

Source: Shapiro et al. (2012)

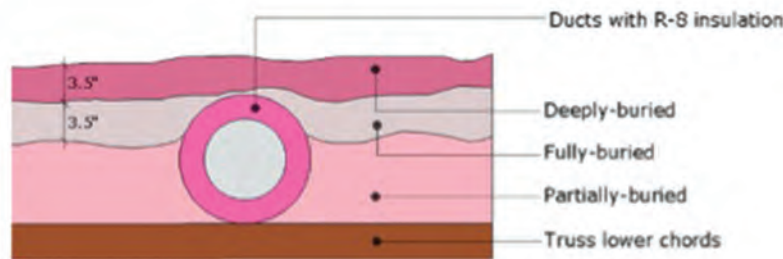
gulf coast, ducts buried in attic insulation may under summer heat and high humidity conditions, produce condensation on the vapor barrier of a duct buried in loose fill attic insulation. For those locations, building science experts recommend encapsulating the ductwork with closed cell foam, and then

bury in the attic insulation. We live and work in a dry climate; this will

never be an issue here.

Your questions are always

appreciated, as you provide subjects for discussion! Other comments are also welcome. Thanks — Brent



Ask the Expert?

RYAN SNOW

WESTERN HEATING & AIR CONDITIONING

Question:

Why did the cost of R-22 increase so much this year?

Answer:

In October 2014, the EPA announced its final phasedown schedule regarding the production and importation of HCFC-22. The order called for an immediate drop from 51 million pounds allowed in 2014 to 22 million pounds in 2015, 18 million pounds in 2016, 13 million pounds in 2017, 9 million pounds in 2018, and 4 million pounds in 2019.

No new or imported R-22 will be allowed in the U.S. on or after Jan. 1, 2020. (achrnews.com article 131698) The aggressive phase out has effected business and home owners the most. The small leaks that weren't much of a problem in years past are now becoming a major repair because of the increase

in cost. If a customer added refrigerant even a couple of years ago, they will get sticker shock now when presented with their options.

Question:

Is there a direct drop in replacement for R-22?

Answer:

In research that I have done regarding R-22 replacements: R422D, R290, Rs-44, MO-99 and others, not one is a direct drop in replacement. The oil contained in these refrigerants is compatible but the chemical makeup of them is not. If the owner of the equipment decides that they would like to use one of these refrigerants the technician would still need to do a recovery and flush of the system to make sure that there isn't any cross contamination. Failure to do so could cause problems with how the equipment will operate, and subject

the contractor to potential liability for mixing the refrigerants, leaving him exposed to extra restoring fees and possible fines.

Question:

Is it true that 410-A is going to be phased out as well?

Answer:

410A is NOT being phased out...yet. The only steps that have been taken are strictly voluntary. However, in 2014, the three North American countries lobbied for an amendment be added to the Montreal Protocol to phase out all HFCs across the world. This would include R-134a, R-404A, and R-410A. The amendment has not been approved yet but I feel that it will be just a matter of time before they will be able to push it through. So it looks like the refrigerant phase out rollercoaster is not done yet.