

Duct Insulation and Installation: A Quick Guide for Contractors

What is the role of the duct system?

Duct systems are used to deliver and remove conditioned and unconditioned air from a building or home. A proper duct installation can improve the indoor quality of a home and increase thermal comfort. To install ductwork properly and effectively, it must be properly designed.

How do you right size the ducts?

To calculate the amount of air needed to cool or heat each room, the contractor uses special software that models options using ACCA protocols Manual D to right size the duct and Manual J to identify the size of the load system.

What is the best design for your duct system?

Using Manual D, the contractor balances the delivery of air against the friction rate of the ducts and the static pressure in the system. To do so, the contractor examines the location of the air handler, the distance to the duct, the number of turns the duct makes, and the amount of air needed. The duct material greatly impacts the results of this calculation (for example, sheet metal ducts have a lower friction rate than flex ducts or rigid fiberglass duct board).

Where are ducts usually located?

Ductwork is usually installed in unconditioned spaces (for instance, attic or crawlspace). Exposure to the temperature fluctuations in unconditioned spaces can significantly increase heating/cooling losses because of heat transfer, in addition to air leaks in the ductwork. Energy losses in the ducts can range from 10% to 45%.

What is the best way to improve performance when ducts are located in an unconditioned space?

The SMUD program requires R-8 duct insulation and highly recommends locating ducts on the attic floor and deep burying them under loose-fill insulation. Deep burying is a cost-effective way to ensure air moving through the ducts remains at the desired temperature. Deep burying ducts is considered best practice in home performance.

For example, during the summer, Sacramento attics routinely reach 140 degrees. The upper portion of an attic can be 20°F hotter than the attic floor, so ducts located on the attic floor are exposed to less ambient heat, and ducts buried in loose-fill insulation are further protected from temperature changes in the attic.

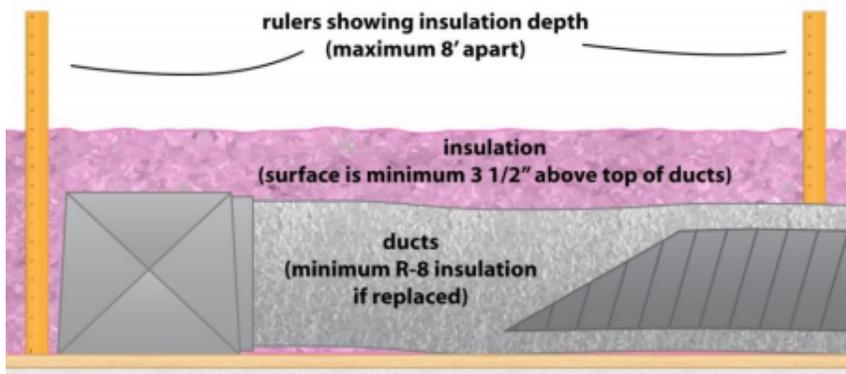
What is the best way to deep bury ducts?

The ducts should be positioned on the attic floor. The top of the duct should be at least 3.5" below the surface of the loose-fill insulation level. Each individual section of ductwork must be buried at the same depth. During installation, vertical indicators (rulers) must be placed on buried trunk and branch ducts at a minimum spacing of every eight feet.

The rulers serve two purposes: (1) to indicate the insulation level above the attic floor, and (2) to indicate the location of the deep buried ducts.

When ducts are found hanging from the attic ceiling, SMUD highly recommends relocating the ducts to the attic floor and covering the ducts with insulation until they meet the deep buried protocols.

When installing flex duct, you need to pull the inner liner tight to reduce friction and provide optimum airflow.



Requirements for a deep buried duct rebate in the SMUD HPP:

- Insulation surface is a minimum of 3 ½-inches above the top of the ducts
- Rulers showing insulation depth are a maximum of 8 feet apart
- "Caution: Buried ducts" sign posted prominently
- Contractor submits photographs showing the above criteria have been met

If the duct has 15% longitudinal compression (see below), the friction rate doubles; with 30% longitudinal compression, the friction rate quadruples.

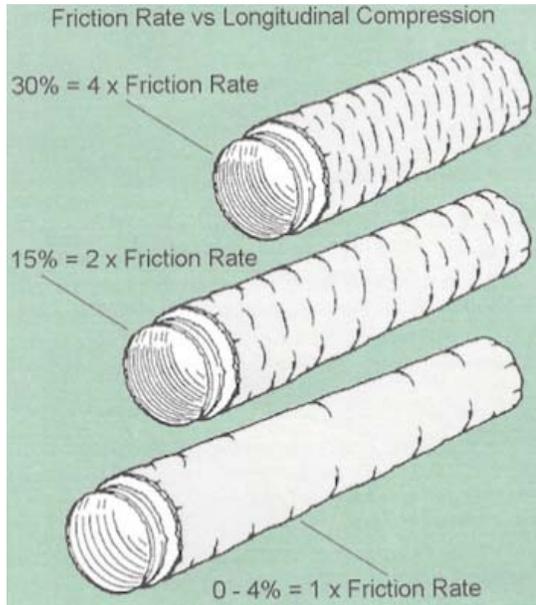


Diagram 1: Flexible Duct Performance & Installation Standards. Source: ADC Flexible Duct Performance & Installation Standards (MANUAL)

In order to prevent duct kinking, a 90-degree rigid elbow should be installed, which will allow the flex ducts to run straight and will reduce the static pressure.

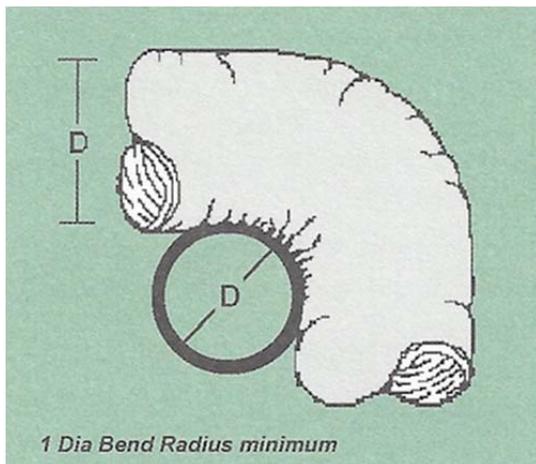


Diagram 2: Flexible Duct Performance & Installation Standards. Source: ADC Flexible Duct Performance & Installation Standards (MANUAL)

Does using 90-degree rigid elbows affect air flow?

Hard pipe 90-degree elbows enable attic floor duct installation while minimizing air flow impacts by providing a smooth inner surface. Combined with straight, tight flex ducts that are deep buried in insulation, the overall

efficiency benefits outweigh minor impacts to air flow resulting from strategic sharp turns in the duct work.

What is the best practice for hanging ducts?

Sagging ducts should also be avoided. According to *Air Diffusion Council*, the flex duct should not sag more than ½-inches per foot. The supports need to be at the manufacturer’s recommended spacing, but no longer than 4 feet. The straps holding up the flex duct need to be no less than 1½-inch wide (see below.)

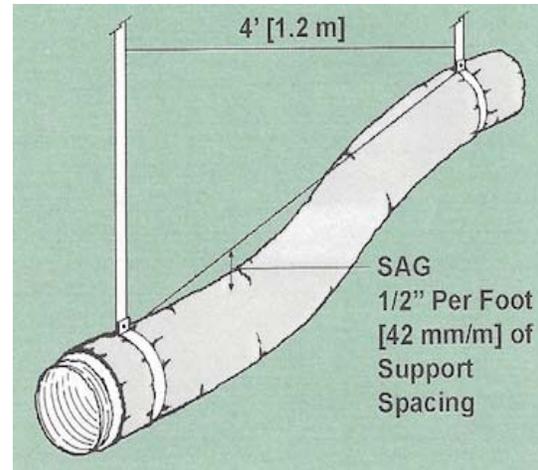


Diagram 3: Flexible Duct Performance & Installation Standards. Source: ADC Flexible Duct Performance & Installation Standards (MANUAL)

The bottom line

It is important to properly size the ductwork, to insulate it to R-8, to keep the ducts straight and tight, and to deep bury deep the ducts under insulation.

What rebates are available for duct systems?

Duct replacement. \$500 for R-8 insulated ducting. Final leakage to outside must be less than or equal to 6%.

Duct sealing. \$250 for reusing the existing ducting. Final leakage to outside must be less than or equal to 8%.

Reconfigure and deep bury ducts. \$200. Ducts in the attic must be straightened and shortened and deep buried under loose-fill attic insulation.

Rebates are doubled for electric heated homes.

FOR MORE INFORMATION

For more information about SMUD energy efficiency incentives: <http://hpp.smud.org/> and james.mills@smud.org For more information about duct installation: <http://www.eere.energy.gov/> <http://www.energystar.gov/>