

Simple Strategies for Effective Ductwork

The design and installation of a duct system plays a significant role in its overall performance

BY MARK JUSSAUME, P.E.

In a central-air HVAC system, ductwork circulates air to and from the central unit where it's cooled or heated. How a duct system is designed and installed plays a role in whether it functions well. Duct systems should be designed using the ACCA (Air Conditioning Contractors of America) Manuals J, S, and D, with input from a qualified engineer or HVAC contractor. Once the system is installed, it should be fine-tuned in a process called commissioning. Here are a few basic guidelines for a system that meets expectations for comfort and performance. □

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PLAN OUTLET LOCATIONS

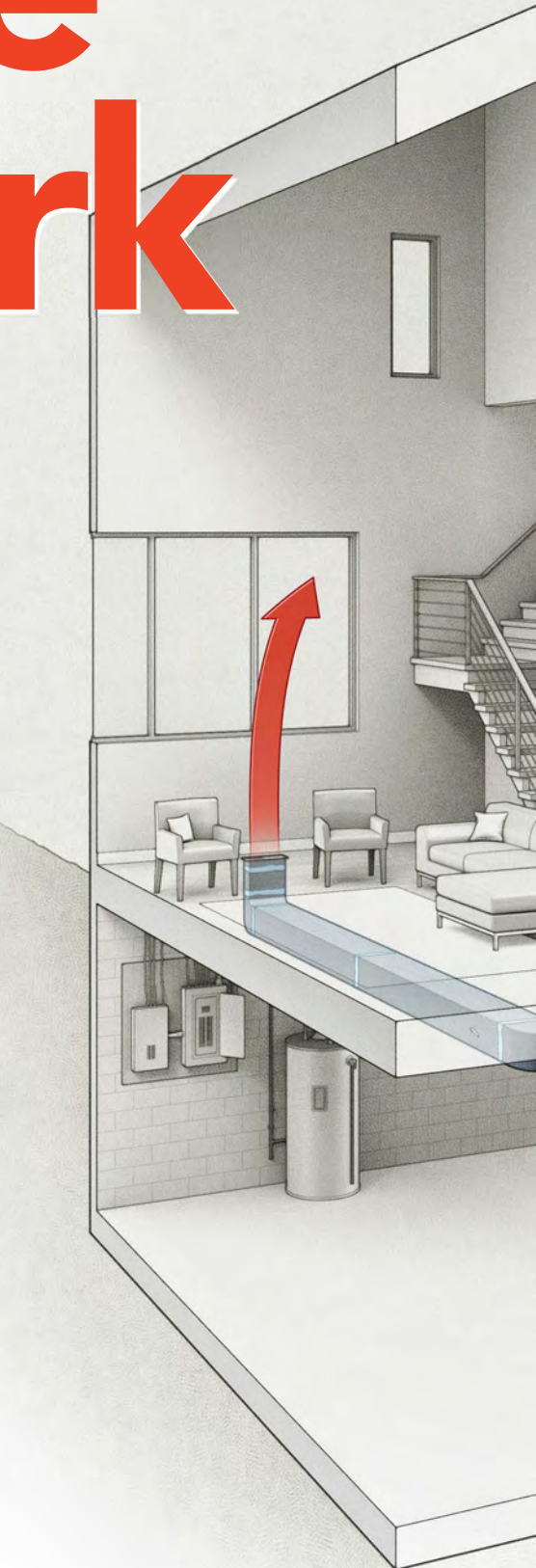
Supply outlets should be located so they aren't blocked by furniture, which can hinder air distribution, resulting in comfort complaints. It's also best to avoid blowing conditioned air directly at occupants. Registers should be placed high on the wall in cooling-dominated climates and low on the wall in heating-dominated climates. Mixed climates may have pairs of high and low registers that are opened and closed with the seasons.

BALANCE AIRFLOW BY DESIGN

Use restrictive fittings and reduced duct sizes on branches close to the fan to reduce excess pressure at those supply outlets. Test and balance room-by-room airflow during the commissioning process once the system is up and running.

USE SHORT, STRAIGHT RUNS

An important consideration in duct design is total effective length, which combines the length of straight ducts with the equivalent lengths of elbows and fittings. Keep supply runs as short and straight as possible and use fittings with low resistance to airflow. This makes the system easier to balance, less noisy, and more energy efficient.

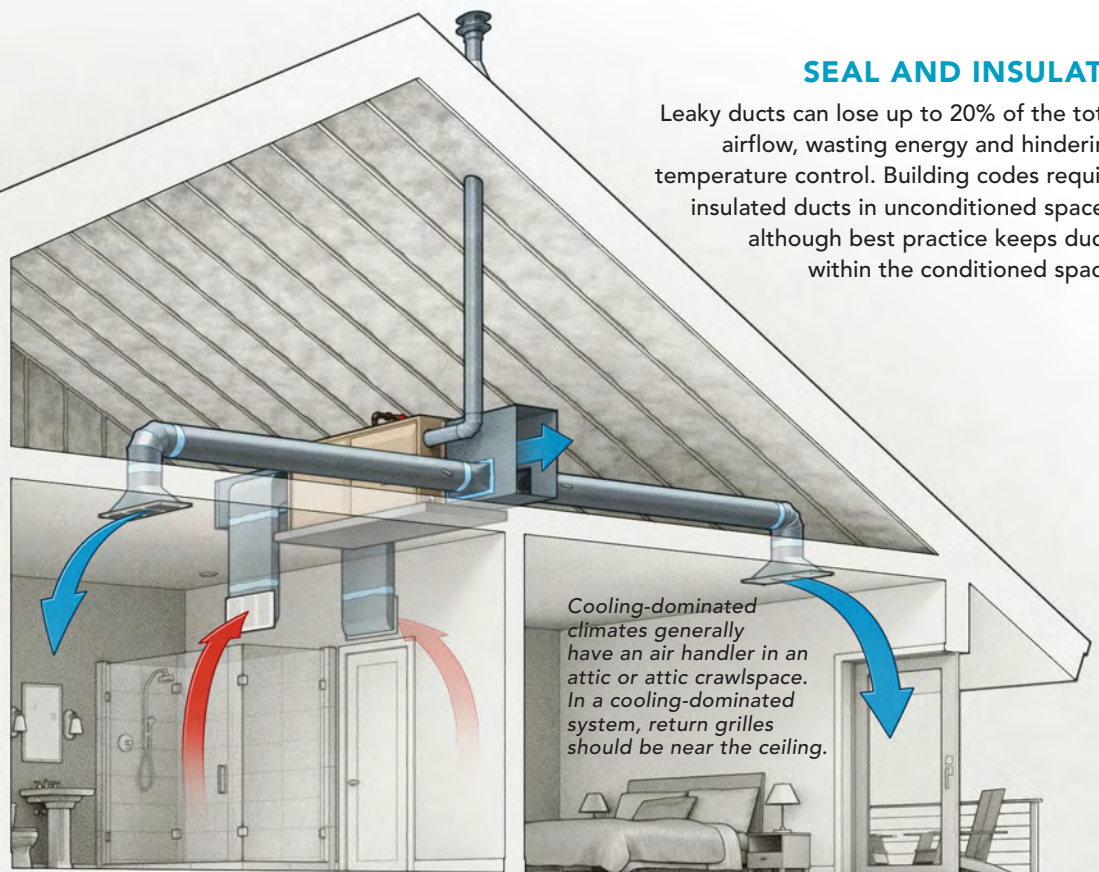


SEAL AND INSULATE

Leaky ducts can lose up to 20% of the total airflow, wasting energy and hindering temperature control. Building codes require insulated ducts in unconditioned spaces, although best practice keeps ducts within the conditioned space.

INCLUDE RETURN AIR VENTS

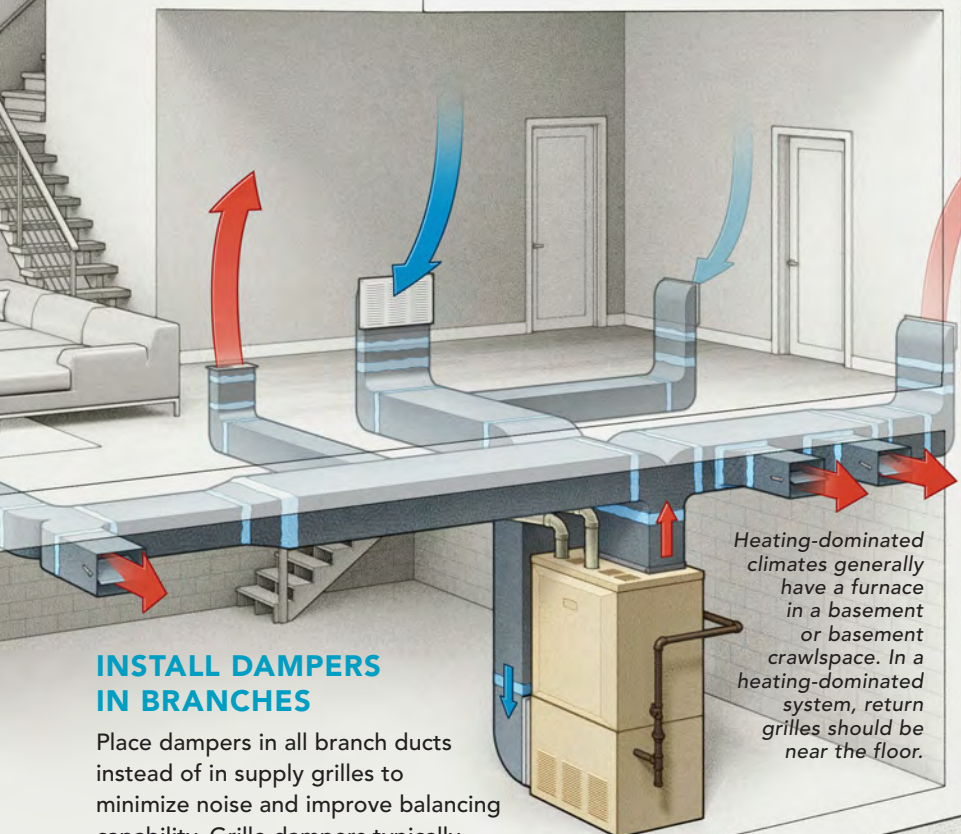
Locate return vents in any occupied rooms that have supply vents and doors—don't rely on central returns. Substituting undercut doors for ducted returns is only partially effective and often results in unbalanced air distribution and uneven room temperatures.



Cooling-dominated climates generally have an air handler in an attic or attic crawlspace. In a cooling-dominated system, return grilles should be near the ceiling.

INSTALL DAMPERS IN BRANCHES

Place dampers in all branch ducts instead of in supply grilles to minimize noise and improve balancing capability. Grille dampers typically rattle when partially closed and are difficult to fine-tune.



Heating-dominated climates generally have a furnace in a basement or basement crawlspace. In a heating-dominated system, return grilles should be near the floor.

KEEP DUCTWORK IN CONDITIONED SPACES

Locate ductwork in conditioned crawlspaces or basements instead of unconditioned attics and crawlspaces to conserve energy and improve performance. Equipment and ductwork in unconditioned, ventilated spaces negatively affects system performance and comfort.

PLAN FOR FILTRATION

A good filter protects HVAC equipment and reduces dust and particulates throughout the house, but it's often the highest-resistance component in the duct system. Choose pleated filters with a minimum MERV rating of 8 for the best filtration and airflow.