

Flexible ductwork installation

PULLOUT

This month HVAC&R Nation's Skills Workshop examines the complexities of poorly installed flexible ductwork. What effect does poor installation have on the HVAC system and how can you avoid the pitfalls?

Flexible HVAC duct is the most commonly used material in modern residential HVAC duct systems. The advantages of this material have made it a popular choice for installers and homeowners, but what happens when it is incorrectly installed?

Ultimately, the goal of a low-pressure, forced-air HVAC system is to move air effectively and efficiently.

Effectiveness can be measured by occupant comfort and by maintaining reasonably consistent temperature, humidity and pressure throughout the house while efficiency can be measured by total operating cost, which includes costs for utilities, maintenance and replacement at the end of the equipment's design life.

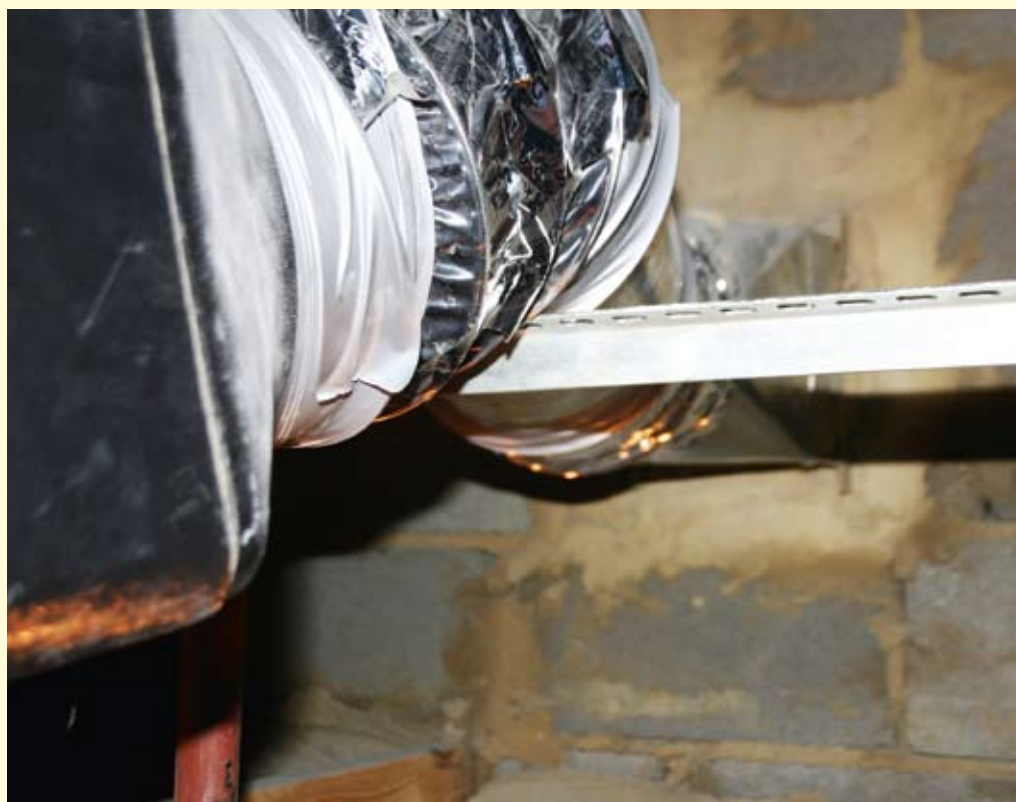
Poorly installed ductwork causes reductions in system efficiency and can lead to financial waste through the operation of an inefficient system, increased system maintenance and a reduced system life. Add to that the environmental impact of the inefficient system, and poorly installed ductwork can have considerable impact.

How to install flexible ductwork

Flexible ductwork should be installed according to manufacturer's instructions. The following guidelines apply to most flexible duct systems.

Bending the flexible ductwork

Avoid bending flexible ductwork across or around framing members, pipes and other objects. Such bends can decrease the size of the duct at the bend point, restricting airflow and increasing air friction. Over time, the inner core of the duct can continue to collapse at the bend point, further restricting



Duct too close to sharp objects.

airflow. Bending flexible ductwork around framing members, pipes and other objects is one of the more common installation errors.

Installers should also avoid bending flexible ductwork so that the radius at the centreline is less than one duct diameter. Such bends also restrict airflow and increase air friction. This is another of the more common installation errors.

Compressing flexible ductwork

Flexible ductwork should be run through spaces at least as large as the diameter of the duct inner core. While this tip may be obvious to some, compressing flexible ductwork is a common installation error. Ducts are often compressed to fit into small space, such as the areas between truss webs and truss braces in floors and in the roof space. This installation error is also frequently found when ducts are run between different areas, such as between the garage roof space and the roof space over the conditioned area. Minor compression of the duct is acceptable; however, the inner core should not be compressed.

Flexible ductwork should be supported horizontally at intervals of not more than 1.5 metres and vertically at intervals of not more than 1.8 metres. The maximum amount of sag between supports is 2.5cm per 30cm of horizontal run. Support plenums

and distribution junctions independently of the flex duct. Support straps or other support material should be at least 3.8 cm wide.

Installers should avoid using flexible ductwork to support other flexible ductwork or construction materials such as wires or coolant lines. Over time, the weight of these materials can constrict the duct inner core.

Flexible ductwork should be extended to its full length as excess duct material increases air friction in the HVAC system. Excess duct material in a run should be less than 5 per cent. Flexible ductwork should be run out of plenums, distribution junctions and boots at least 30 centimetres before making a



Duct constricted by bend leaving plenum.



Duct compressed by wires.

bend in the duct. Tight bends near plenums also increase air friction and decrease duct size.

Providing space for the ductwork

Air space should be provided on all sides of flexible ductwork run through unconditioned spaces, such as roofs and crawl spaces.

Installers should avoid fully or even partially covering flexible ductwork with insulation. This is more important in humid climates (E.g. Far North Tropical Queensland) than in dryer climates. Moisture can condense on flexible ductwork that is not surrounded by adequate airflow. This moisture can damage surrounding materials and also contribute to fungal growth.

Protect flexible ductwork from moisture during and after construction. Once the flexible ductwork becomes wet, the insulation can remain wet for years, and create a breeding ground for fungal growth. Duct boots also, particularly floor ducts; should be protected from contamination during and after construction.

Clearance should also be provided between flexible ductwork and a furnace or water heater vent flues – as required by the flue type. Flexible ductwork can become a combustible material around appliance flues. Similarly, avoid running flexible ductwork over steam pipes and other heat sources.

Flexible ductwork should be installed at least 10 centimetres above ground level and above the design flood elevation. It should not be installed in tile, metal pipe or within masonry or concrete.

Avoid installing flexible ductwork where it will be subjected to direct sunlight, such as under turbine vents. Sunlight can degrade the ductwork's vapour



Duct clashing with other services.

barrier. Tears in the vapour barrier should be repaired using the recommended material.

Protect flexible ductwork from damage caused by sharp objects such as truss gusset plates; and support straps and nails. These objects can puncture the ductwork.

Attaching flexible ductwork to plenums or distribution junctions

Flexible ductwork should be attached at plenums and distribution junctions to sheet metal collars that are at least 5 centimetres long. Use metal sleeves at least 10 centimetres long to splice two lengths of flexible ductwork. Make joints substantially airtight and use at least two wraps of approved metal tape to attach the duct inner core at collars and distribution junctions. A clamp is recommended, though not always required. Use both tape and clamps to splice two lengths of flexible ductwork.

Install fire-blocking where flexible ductwork penetrates floor and ceiling assemblies, and where it penetrates concealed connections between vertical and horizontal spaces such as soffits and other dropped ceilings. Un-faced batt mineral wool or fibreglass insulation is usually



Duct constricted by bend over truss web.



Duct constricted by two bends leaving plenum.



Inappropriate support and restricted bend.

acceptable fire-blocking material. Avoid installing flexible ductwork that penetrates a fire-rated assembly unless approved by the authority having jurisdiction. This includes flexible ductwork connected to boots located in a garage.



Radius of bend less than one-duct diameter.

Common installation errors

- Trunk supply ducts (those that serve more than one branch duct) and central return ducts that bend across an obstruction or a support at more than a 45-degree angle. These ducts are often constricted, and those that make a vertical bend over an obstruction may become more constricted over time.
- Trunk supply ducts and central return ducts whose inner core is constricted in size by more than 20 per cent. More constriction may be reasonable for a duct serving a single boot because only one boot is affected.
- Duct bends that do not comply with the one duct diameter bend guideline.
- Ducts that run horizontally out of a plenum or into a boot.



Improper duct support and excess duct sag.



Ducts compressed into small space.



Duct constricted by bend into boot.

- Ducts that are loose at a collar or do not have a metal sleeve at a splice.
- Ducts with a punctured inner core.
- Ducts in direct contact with a heat-generating appliance vent.
- Ducts that leak a "significant" amount of conditioned air at a plenum collar or at a splice or junction.
- Ducts that touch the ground and ducts buried in insulation if there is evidence of condensation on or near the duct.
- Ducts that breach a fire-rated assembly, unless the local authority having jurisdiction accepts the practice.
- Ducts that have wet insulation from sources such as rain or plumbing leaks. ▲

The information provided in this article is intended as a guide only.