

## Best Practice - Duct Sealing Overview:



### **IECC 2003 - 803.2.8** Duct and plenum insulation and sealing.

*All joints, longitudinal and transverse seams, and connections in ductwork, shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic-plus-embedded-fabric systems, or tapes. Tapes and mastics used to seal ductwork shall be listed and labeled in accordance with UL 181A or UL 181B. Duct connections to flanges of air distribution system equipment shall be sealed and mechanically fastened. ... duct tape is not permitted as a sealant on any metal ducts.*

Duct mastic, HVAC-rated aluminum tape, urethane caulk and silicone caulk are acceptable sealants. Duct mastic is generally the most reliable and requires the least surface preparation; however, aluminum furnace tape might be easier to use on flat running joints.

For worker safety in confined spaces, water-based duct mastic does not require as much ventilation as does solvent-based. Mastic can be applied with a brush, putty knife, or by hand but use cotton gloves to avoid sheet metal cuts.

Fiberglass mesh tape reinforcement makes it possible to mastic-seal gaps larger than 1/8 inch and to seal irregular joints.

Ductwork joints and gaps may be sealed on the inside or outside surface.

Sealing ductwork as it is assembled allows reliable sealing of joints and gaps that will be inaccessible once installed.

Sealing joints missed during installation is often impossible or cost-prohibitive because of the damage to surrounding structure to get working access.

Plenum and trunk registers significantly diminish system static pressure and air delivery to upper floors. If basement or crawl supply vents are specified, install a branch duct at least four feet long for each vent. Radiant heat from the furnace and ducts usually makes open basement diffusers unnecessary.

Seal all ducts that are in attics, outside walls and other unconditioned spaces very carefully.

Seal all ducts in spaces next to or above unconditioned space, such as cantilevers, ceilings or garage walls. Even small leaks in these ducts cause serious heat loss in winter and A/C inefficiency in the summer.

The biggest or most critical air leak in a house can be the duct system. Excess duct leakage wastes energy, performance, and comfort, compromises health, and can prevent a house from qualifying under the Energy Star Homes program.

## General Specifications – Air Sealing HVAC Ductwork

Optimum system installation/ sealing includes

- ❖ Keep all ducts inside the conditioned space of the house
- ❖ Seal *all* penetrations or openings in the duct system with mastic or an appropriate caulk
- ❖ Embed fiberglass drywall tape in the mastic bridging gaps wider than 1/8"
- ❖ Do not use frame cavities for the return duct system; install ducts.

Minimum system sealing includes

- ❖ Seal all duct system components that will be trapped in inaccessible frame cavities
- ❖ Seal all components in or adjacent to cold space (leaky duct systems easily connect to frame air leakage and to the outdoors)

Don Michael Jones, Residential Building Analysis, Columbus OH (614) 784-1959  
Robert Klahn, Yellow Springs Building Science, Yellow Springs, OH (937) 767-2091

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# Best Practice - Duct Sealing Details:

## Furnace and plenums:

- 1) Seal all joints between plenum and furnace housing
- 2) Form the filter housing to allow the filter to rest flush with the surface and provide a sealable cover for the filter slot

## Supply ducts:

- 1) Seal all metal ductwork joints.
- 2) Flex duct

Seal all joints between flex and metal duct:

- ❖ Coat the metal connector with an adhesive layer of duct mastic
- ❖ Slide the inner flex duct sleeve over the mastic onto the metal fitting and secure with a compression band
- ❖ Pull the flex duct insulation sleeve over the inner sleeve and metal fitting
- ❖ Pull the outer sleeve over the insulation, covering and trapping all insulation
- ❖ Secure the outer sleeve with a compression band

Installation tips

- ❖ Stretch flex duct from point to point to keep the minimum length feasible
- ❖ Keep bends wide enough to assure the duct is not pinched or restricted
- ❖ Install so there is no tension on the joints or connections with metal fittings
- ❖ Suspend carefully to prevent sags, pinch points or other compression
- ❖ Position duct runs so they can be covered by additional attic insulation

### 3) Supply Boots

- ❖ Seal all joints and seams of supply boots
- ❖ Secure all sides of duct boot openings to the surface they penetrate

## Return Ducts - framed cavities and panned joists:

To use framing for return ducts is problematic. Irregularities can cause cracks and gaps that connect the duct cavity to the overall house framing. Interstitial air leakage in most houses indicates a significant connection between framing and the *unconditioned* attic or outdoor air.

Openings around ducts or other mechanical systems that enter the attic from a framed chase should be covered with a rigid air barrier material and the edges should be sealed. This is particularly critical when a dropped area is serving as a large single return for the second floor of the house. Gaps around the perimeter of the covering can add up to a large hole between the return side of the system and the attic. Observe the following details:

- 1) Seal all joints between metal or cardboard joist space end caps and the framing or floor
- 2) Seal all joints between studs, plates, and blocking that define the return cavities
- 3) Seal the drywall or surface material of return frame cavities to the framing
- 4) Seal all wiring or other penetrations of frame cavities used as returns
- 5) Seal all joints between panning sections and between panning and framing

The difference between homes that fail and homes that work is in the design *and in the attention paid to the details!* The duct system is one of those details.

Don Michael Jones, Residential Building Analysis, Columbus OH (614) 784-1959  
Robert Klahn, Yellow Springs Building Science, Yellow Springs, OH (937) 767-2091

## Examples:

Photos: Don Michael Jones

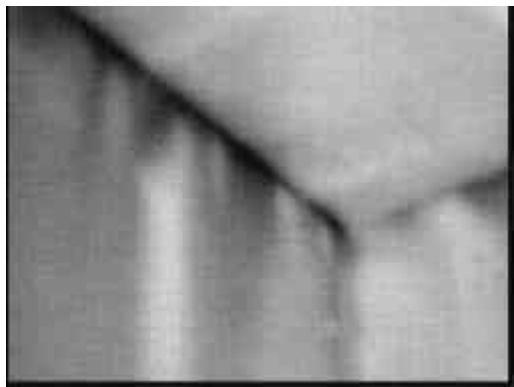
A jumper duct from return to return is a common type of attic mounted duct. The boot connections are usually very leaky. >>



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Large returns are sometimes mounted in framed in areas dropped below the attic. The framing and cap over the top must be carefully sealed. >>



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Infrared scan of an air leak between the return and the attic.



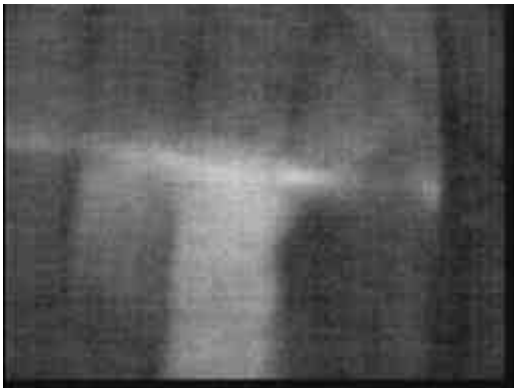
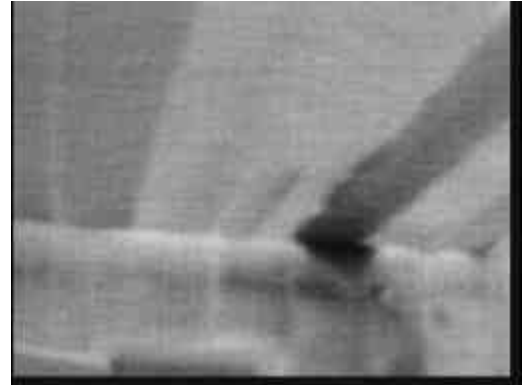
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Wiring and penetrations aren't the only leaks into the partition walls. Gaps between the top plate and drywall also allow return air to be drawn from the attic.

Returns using wall cavities as ducts pass through floor joist cavities. While blocked off with panning, the gaps around that panning are seldom sealed. If the joist connects to outside air at a cantilever or rim joist it will leak into the return side of the system. >>

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Infrared scan of an air leak from the outside (cantilever) to a return by way of a joist cavity. >>



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Two Infrared scan views of an air leak between a summer time temperature attic and the return system. The left view is the top of the wall and the right view is the register at the bottom. v v





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Two views of a leaky attic mounted return duct system. The left view is a panned interior partition wall top and the right is a set of duct/trunk connections.  
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The trunk/plenum/duct connection is a particularly critical joint for flex duct systems. Make sure that they are mechanically secured and sealed.  
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Whenever possible bury attic-mounted ducts (after sealing) under the loose fill insulation. >>



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Avoid or minimize restrictions, elbows, twists and turns in the ducts in order to assure adequate flow to the registers.

Latex mastic and mesh application on a leaky supply trunk. >>



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Garage walls and ceilings often have ducts located in them. In this case the ducts are usually touching an outside space and should be sealed.

Photos: Don Michael Jones