STEP 5

Steps in the Mobile Home Series

E3A-MH.5
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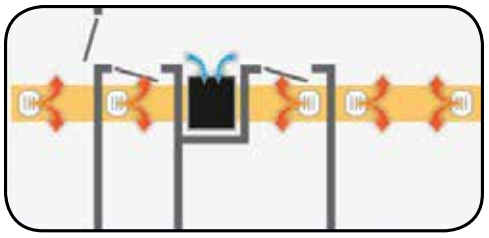
E3A: Duct Sealing Techniques

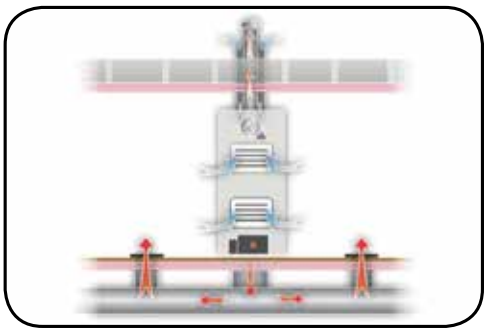
Duct sealing is easy for the mobile home do-it-yourselfer to handle

Once you commit to improving the energy performance of your mobile home, fixing up the ductwork becomes one of the first priorities. In almost all cases, the ducts were poorly made at the factory with lots of leaks at the joints. Moving the home to the site location loosens those joints and normal vibration also contributes to leakage. Fortunately, sealing the leaks is relatively easy, quite inexpensive and pays big dividends.



Floor plan showing furnace and duct location

Newer manufactured homes are more efficient than the mobile homes built in the 1960's and 1970's. Furnaces are also better, with sealed combustion now standard. The duct systems however have not evolved. Down draft furnaces, coupled to under-floor trunk lines and risers is still the standard installation method and the workmanship is often inferior. The techniques for duct sealing described below are relevant even in newer manufactured homes. Sealing the ductwork may reduce heating bills by 15-17%.



Downdraft furnace with supply air ductwork. Air returns to the furnace through the hallway.

Most mobile homes have a main trunk line (duct) that runs down the middle of the structure, just under the floor. Each room has at least one supply register. Most often, the air that returns from the room to the furnace just flows out the doorway and down the hall to the grills on the furnace. These systems are called "Open Return" systems.

When the supply ducts leak, that warmed up, expensive air is pushed into the belly and lost to the outside environment. You lose as much as 32% of the heat produced in the furnace through these leaks. That's expensive and means that your furnace is working overtime, trying to heat the house. Leaky supply ducts also result in negative pressure inside the house as the furnace takes indoor air and sends it outside. Cold, outside air is pulled into the home because of this pressure imbalance.

In a few homes, there are additional registers along the outside walls of each room, and a large, screened hole in the floor adjacent to the furnace. In this type of duct system, the cooler, returning air is pulled back to the furnace through the outside wall floor registers, down the floor joist cavity and then uses the belly wrap as the return plenum. This is a "*Ducted* Cold Air Return" system. Often, it is extremely leaky.

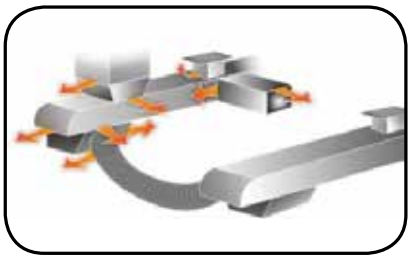
If your home has return air ducts, and they are leaky, your house will have positive pressure, forcing warm, moist air from inside the house out through leaks in the walls and roof. Over time, this can rot out the framing, not an uncommon occurrence in older homes. These duct systems usually have huge leaks and should be converted to an *Open Return* system.

Converting to an *Open Return* system is a project you can do yourself. First, the return registers, which are usually located along the outside walls, are removed. The holes in the floor are plugged with plywood, caulked and the large hole next to the furnace is also permanently sealed.

Make sure that a sufficiently large pathway to the hallway is available. A furnace technician can check to see if there is less than a 3 Pascal pressure difference between the room and the hallway when the furnace fan is running. If not, then interior doors will need to be undercut to allow air movement or grills placed in the wall. If the furnace is in a closet with a door, the door must have grills top and bottom to allow the heated air to return to the furnace. In general, the size of these openings corresponds to the opening size of the supply registers.

Sealing the Ductwork

Understanding how the duct system is laid out and how the parts are connected together is a big help in identifying hidden leaks. Joints between sections of the duct system are the most common location of leaks.



Duct system for double wide trailer with cross-over duct, showing typical leakage points.

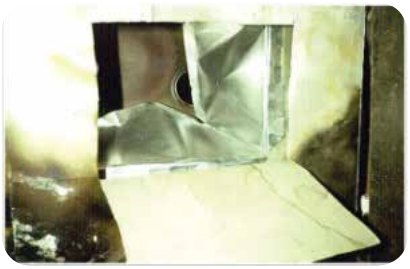
End of trunk line showing unsealed joints

Duct Inspection with mirror

First, if you are having a blower door test on your home, have the operator do a ***pressure pan*** test on all ducts while the blower door is operating. High pressure readings indicate big leaks. If they are over 1 Pascal, then they need to be sealed. Although we recommend that ***all*** register boots get sealed, it does make sense to locate the biggest leaks in the duct system. The furnace to main trunk connection is often the worst problem area. In homes with supply registers on the outside walls, the main trunk to lateral connection is especially hard to access. Step 2 is to visually inspect the interiors of the ducts with a flashlight and mirror. Remove the register cover and then lay a flashlight down in the duct facing one direction. Using a mirror, carefully inspect all surfaces of the ductwork. You will also be able to find and remove any obstructions that have fallen inside the ductwork from the register openings. Visual inspection is also useful to check on your sealing coverage.

Leaky trunk line to supply duct connection.

End of trunk line showing unsealed joints



Opened trunk line showing furnace connection.

Sometimes the ductwork is exposed under the trailer if the belly wrap is damaged. In this case, sealing up the ductwork might be easier from below, working on the outside of the duct.

The goal is to seal all leaks and open joints in the ductwork, and to seal the register boot to the wood floor. To seal the duct from above at the floor register, follow this procedure:

Inspect the interior of the duct and remove all objects that have fallen into the duct. Scrape and vacuum out the duct, then scrub it down thoroughly with rubbing alcohol and a rag. Use a good respirator when using the alcohol. Washing down the dirty metal insures that the sealing materials will adhere to the duct.

When the metal is clean and dry, tape all seams and joints with approved foil faced butyl tape. Do not use "duct tape" which is an inferior product and will fail over time. Tape all sides of the boot up and over the edge of the subfloor. Staple that tape to the subfloor. Then, use approved mastic to coat all seams and edges of the tape. Let the mastic dry and replace the register cover. If the register has movable dampers, remove them with a plier or replace the register with an open cover.

One especially leaky spot is at the end of the trunk line on both ends of the mobile home. To seal this off, roll up a 12 inch length of fiberglass batt and place in a kitchen sized

Duct sealing supplies; tape, mastic, gloves and brush.

garbage bag. Stuff this "poly bag" down the register boot and into the main trunk line just past the boot. Then use your butyl tape to create an airtight barrier. Coat this new duct barrier with mastic.

If the pressure pan indicates that the furnace to trunk line joint is leaky, then sealing is in order. On a few furnaces, this joint is accessible from above. Often, the only way to access this joint is to cut a hole in the belly wrap and then cut open the bottom of the main duct directly below the furnace. Once exposed, you can fold back any loose ends of duct metal, tape the joints and apply mastic. Then close up the bottom of the trunk, screw on a metal patch, and seal as above. Finally, close up the belly wrap. This procedure is more of a hassle, but essential. If your home has flexible crossovers or joist pan crossovers, a similar approach may be necessary.

Duct sealing

Once all the duct work is sealed up, check for pressure loss with the pressure pan while running the furnace fan. If the readings are within limits, then you can proceed to repair the rest of the belly wrap and have your floor insulated. Before you are totally finished make sure that bathroom and bedroom doors are undercut so that those rooms don't over pressurize.

Congratulations! You've completed a dirty, but essential first step in improving your home. Now, all that expensive heat you are paying for is heating your home instead of the great outdoors. You'll notice immediate improvement in your comfort and also have lower utility bills.

An excellent demonstration that shows how to seal ductwork can be seen at http://wxtvonline.org/2010/06/ductsealing/

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