

## Best Practice – Mobile Home Scope of Work

**Date:** March 2018

**Subject:** Scope of Work for Mobile Homes (MH)

**Problem or Question:** We struggle with improving energy efficiency in mobile homes. What are some tips for having a more positive impact on a mobile home when weatherizing it?

**Discussion:** Mobile homes are a unique building structure, but regardless, Subrecipients are required to follow all the normal program rules, processes, and requirements.

**ASSESSMENT:** Just like with a site built home, Subrecipients must conduct a whole house assessment of the MH. Assess each and every aspect of the MH to determine what that particular MH needs. Do NOT assume that certain aspects of a MH are there and existing. For example: In order to see if insulation is present, one must drill test holes to verify. One must verify if insulation is present, has lost its integrity, or if there is significant space in the ceiling or wall cavity. Subrecipients must check on the quality of floor insulation existing underneath the MH. If the floor insulation is in poor condition, falling down, or missing, then that needs to be documented and assessed. Smaller areas can be properly re-insulated and re-secured underneath the MH.

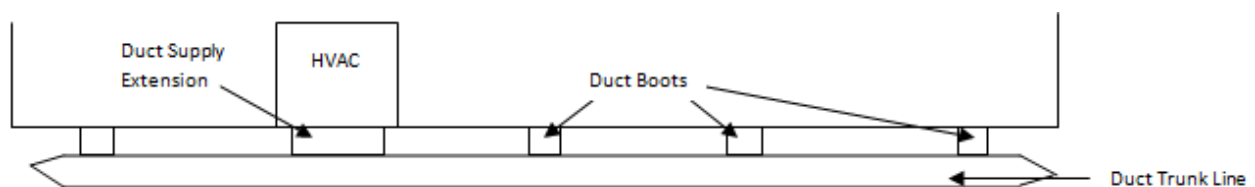
Assessing the thermal boundary of the MH is a high priority. Insulation, air sealing, and duct sealing are areas that need to be thoroughly assessed. Follow the same guidance in the “Principles of CFM Reduction” Best Practice to properly quantify and prioritize where air and duct sealing needs to be done based on your blower door, duct blaster, zonal pressure diagnostic, and pressure pan test results. Proper alignment of the thermal boundary is a top objective, both in site built houses as well as MHs. With the information gathered during a thorough assessment of the MH (equipment, appliances, baseload measures, windows/solar screens, etc), Subrecipients should be able to write up a comprehensive work order that results in maximum energy savings for the client.

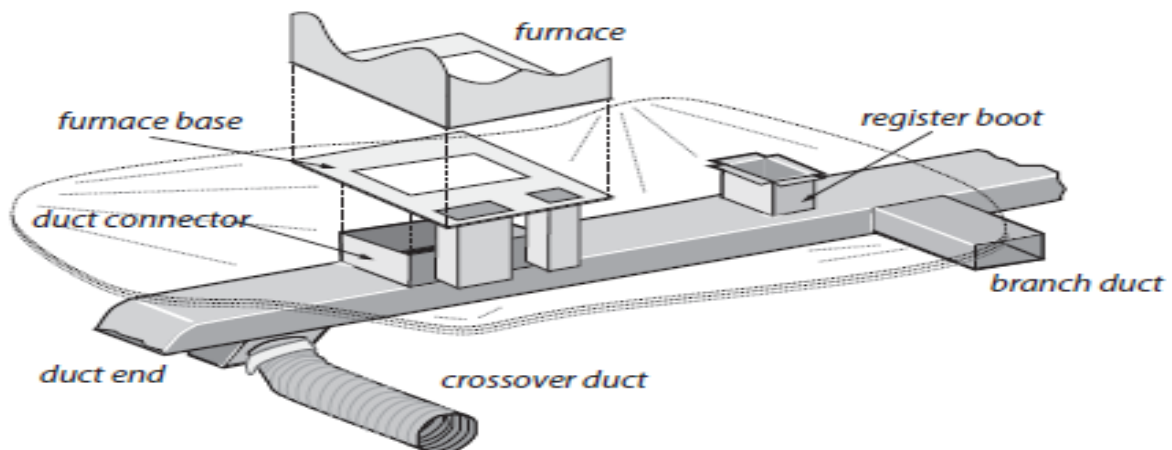
**MEASURES INSTALLED:** Make sure to install all measures in accordance with standard installation practices (SWS). Any equipment/appliances installed in a MH must be rated for use in a MH.

**Air Sealing:** Always maximize air sealing. Use the diagnostic tests to prioritize your air sealing efforts. Pay attention to your common air leakage areas: under sinks, around doors/windows, holes in the floor. Also pay attention to less common areas like bypasses from DWH closet into the house, or holes in the walls behind the shower valve.

**Duct Sealing:** This is a major opportunity for improvement in CFM reduction for both the blower door and duct blaster. The duct system on most mobile homes is typically not a very tight system. There are some relatively simple ways to seal the system. In contrast to sealing ducts in an attic of a site built home, you can typically seal ducts in a MH from inside the house in the conditioned space.

Below are 2 diagrams of the duct system in a typical mobile home:



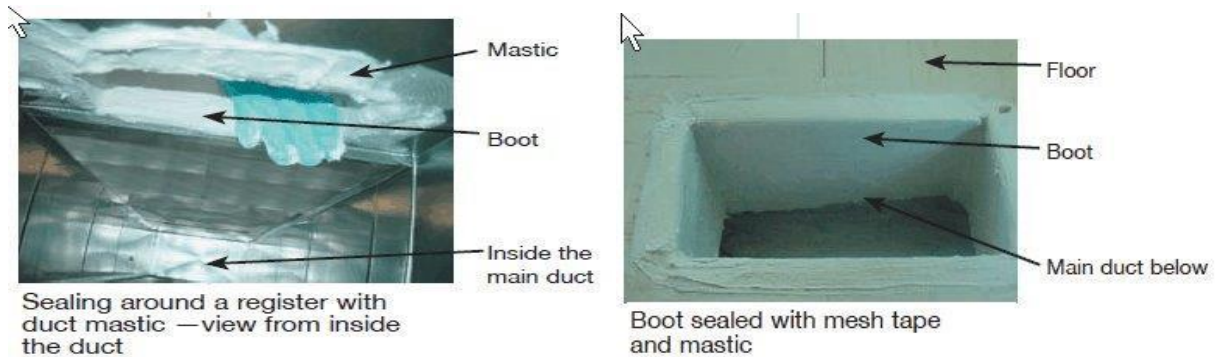


Common areas for leakage are: (1) the boots: both (a) the boot connection to the floor, and (b) the boot connection into the trunk line, (2) around the duct supply extension (which is comparable to a normal HVAC supply plenum), and (3) out the end of the trunk line where the ends aren't properly sealed. These are areas to thoroughly investigate for sealing. Addressing these three areas will dramatically reduce CFM leakage in the duct system.

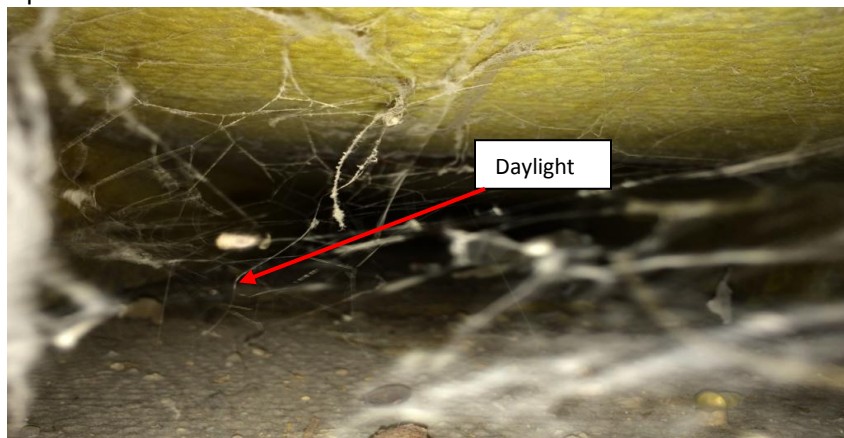
Below is a sample photo of a typical duct boot found during a pre-weatherization assessment. You can see the boot is disconnected from the trunk line. A disconnected boot means that the conditioned air running through the trunk line will leak out under the MH. This is duct leakage to the outside. When the HVAC unit isn't running the unconditioned air from under the MH will be leaking into the house, causing the HVAC system to run more frequently.



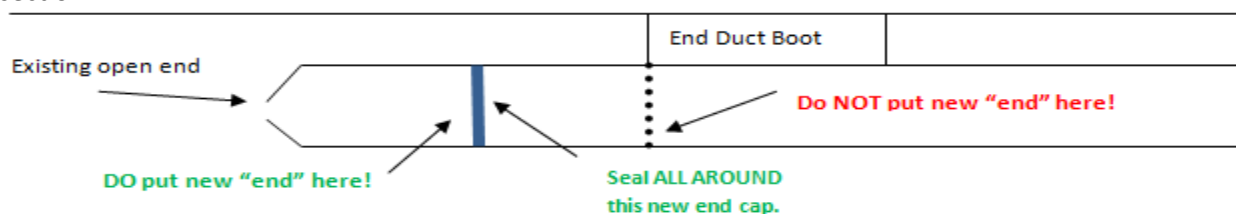
Below are examples of how to properly seal duct boots to the trunk line. Seal all around the boot, to the floor, and into the trunk line. Follow this same process for sealing the duct supply extension boot into the trunk line, as well. The goal is to insure all duct boots and duct supply extensions joints are sealed.



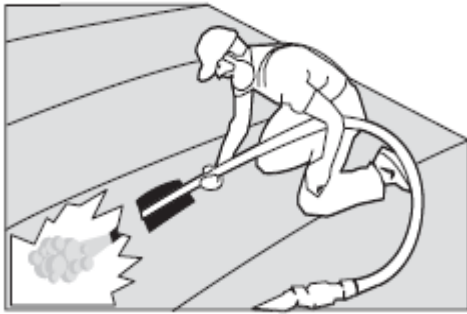
Below is a sample photo of a typical duct trunk line end found during a pre-weatherization assessment. You can see daylight at the end of the trunk line. This indicates that the trunk line is exposed to the outside. An open ended, or unsealed trunk line has the same impact as any other duct leakage. When the HVAC is running, conditioned air blows out underneath the MH. When the HVAC unit isn't running unconditioned air from under the MH leaks into the house, causing increased running of the HVAC unit. To identify this issue: (1) open the duct registers at the end of the trunk line (on both ends), (2) shine a light down the trunk line and use a mirror to look at the end, or (3) use a camera/phone, with a flash option, and take a photo.



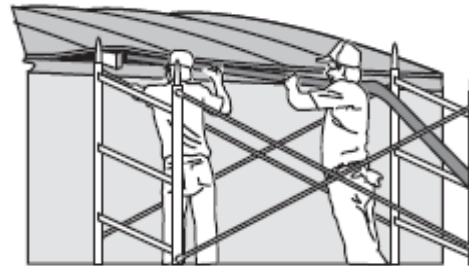
Address this issue by properly sealing the ends of the trunk line. First measure the inside size of the trunk line and cut a piece of duct board to fit. Insert the duct board into the end of the trunk line. Once the duct board is in place, seal all around it with spray foam or mastic, creating a truly sealed trunk line. This creates a pillow effect, allowing the conditioned air to bounce back off the end and be redistributed throughout the duct trunk line. Be careful NOT to install the duct board piece right at the boot. This will cause pressurize imbalances throughout the MH. Below is a diagram of the situation described in this section.



**Insulation:** Missing insulation or cavity spaces that permit additional insulation are to be addressed. **Attic insulation** can be blown into the open spaces of the cavities. Work to achieve a quality dense-pack finish. Make sure the ceiling of the MH can sustain the added weight of the insulation prior to installation. Installation can be performed by (1) creating/using gable vents as access from both sides, (2) coring holes from the interior of the home, (3) coring holes from on top of the roof, or (4) blowing insulation from the edge of the mobile home. In 2017-2018, the Department provided regional trainings to the entire network on these techniques. Subrecipients should use whichever method is best for achieving the required finished product specific for each individual MH.



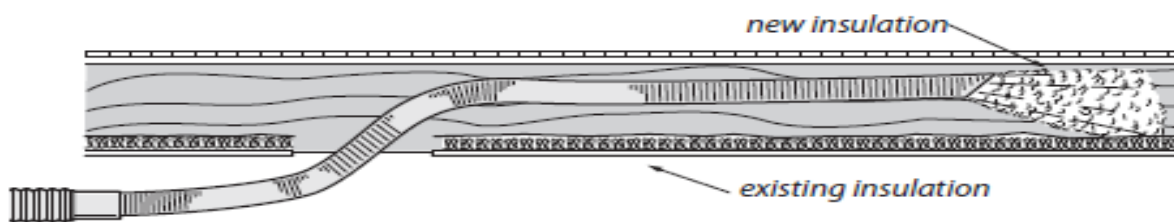
**Roof-top insulation:** Blowing fiberglass insulation through the roof top is effective at achieving good coverage and density on almost any metal roof.



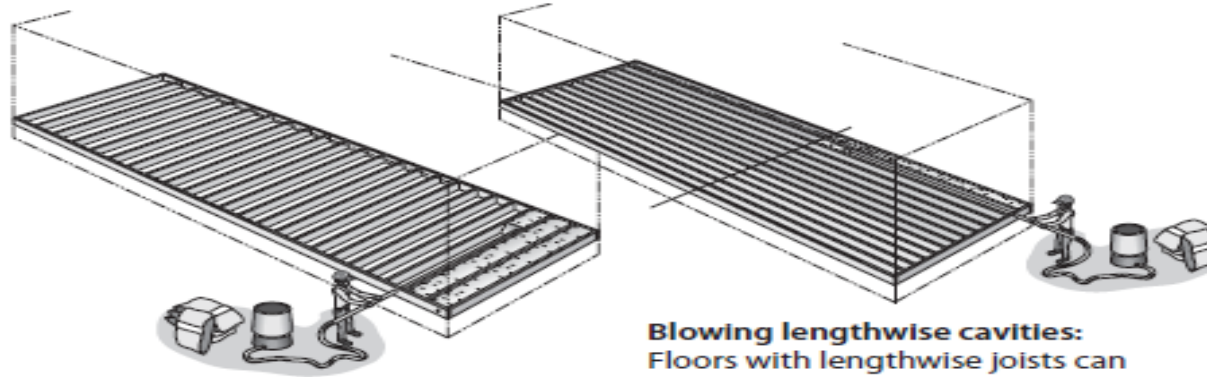
**Roof-edge blowing:** Use a rigid fill tube to blow insulation through the roof edge. This avoids making holes in the roof itself, though this process requires much care in refastening the roof edge.

**Wall insulation** is a similar process to site-built homes. Wall insulation can be dense packed by drilling holes. In some cases, you might be able to detach siding on the exterior and slide MH batt insulation into the wall cavities. YouTube has plenty of videos on how to insulate a MH. The Department recommends videos done by WXTV.

**Floor insulation** is key to a good complete thermal boundary. A thorough evaluation of the MH belly will reveal the extent of insulation needed to be replaced or installed to achieve the desired insulating effect. Make sure that you document sufficient justification for all measures. Insulation must rank in MHEA or have proper justification for replacement on Priority List.



**Blowing bellies:** A flexible fill-tube, which is significantly stiffer than the blower hose, blows fiberglass insulation through a hole in the belly from underneath the home.



**Blowing crosswise cavities:** Blowing insulation into belly is easy if the floor joists run crosswise. However, the dropped belly requires more insulation than a home with lengthwise joists.

**Blowing lengthwise cavities:** Floors with lengthwise joists can rarely be filled completely from the ends because of the long tubing needed. The middle can be filled from underneath.

Something to ALWAYS remember: if/when floor insulation is called for, this is a **great opportunity to do effective air/duct sealing from underneath the mobile home prior to re-insulating.** Taking advantage of this situation, when the floor and duct system are all exposed, should allow for even more effective, longer lasting measures to be installed. With an exposed belly, always perform these repairs as much as can be properly justified:

- repair plumbing leaks
- tightly seal all holes in the floor (air infiltration)
- inspect and seal duct system (paint the entire system with mastic if you can)
- repair the rodent barrier
- install a ground-moisture barrier in the crawl space if the site is wet
- make sure to install a vapor barrier at the completion of floor insulation to protect the new insulation

**Roof Coat:** Cool roof coatings reduce summer cooling costs and improve comfort by reflecting solar energy away from the home's roof and slowing the flow of heat into the home. They are shown to reduce overall cooling costs and are a good choice for mobile homes or site-built homes with low slope or flat roofs. Cool roof coatings are usually bright white, and must have a reflectivity of at least 60% to meet the ENERGY STAR requirement for cool roof coatings. Cool roof coatings are usually water-based acrylic elastomers, and are applied with a roller. They can be applied over most low-sloped roofing materials such as metal, built-up asphalt, bitumen, or single ply membranes. Some underlying materials require a primer to get proper adhesion-check the manufacturer's recommended over asphalt-shingle or rusted metal roofs. Surface preparation is critical when applying any coating. The underlying roofing materials must be clean so the coating will stick. Repairs should be performed if the existing roofing is cracked or blistered. Roof coating will not stick to dirty or greasy surfaces, and they cannot be used to repair roofs in poor conditions. Install at least two coats, with second coat applied in the opposite direction to the first to get more complete coverage. Allow a day for drying between coats.

Roof coating must rank properly on your MHEA audit. For Priority List houses, roof coating can be justified one of two ways: (1) considered a contributory item IF AND ONLY IF attic insulation was installed and the cost of the roof coat does not exceed the cost of the attic insulation; or (2) can be installed as a miscellaneous repair.

**Other Measures:** Other evaluated measures may include: window conditions (replacing pieces of glass), the need for solar screens, baseload measures, etc. For complete replacement of equipment – make sure the new equipment is rated for use in a MH.

**Recommendation Summary:** Assess, weatherize, and inspect MHs with the same goal and attitude taken towards a site built home. Spend time conducting a quality thorough initial assessment, specific to each individual MH. Energy savings are definitely attainable when weatherizing mobile homes; it just takes desire and attention to detail.

For MH, do not hesitate to contact Department program staff for assistance or guidance on how to proceed with certain situations. Contact the Department to request MH training, or work with the Department to get a referral to another location that can provide necessary training to help improve work on MHs.