



STEP 2

Steps in the Mobile Home Series

1. Should I Weatherize My Mobile Home?
- 2. Auditing Your Mobile Home and Hiring a Contractor**
3. The Blower Door Test
4. Furnaces and Hot Water Heaters
5. Duct Sealing Techniques
6. Repairing the Belly
7. Insulating Bellies
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E³A: Auditing your Mobile Home and Hiring a Contractor

Inspect and Analyze your Home

An audit is the first crucial step in making your home more efficient. An energy audit determines how much energy you are using, how and where you are using energy and what measures are cost effective for reducing your energy costs. From the audit, a plan can be made to correct many of the energy problems that have been exposed. An experienced auditor can also identify any building problems and health and safety issues that need resolving.

Energy audits are available from a number of sources. Many low-income housing assistance programs offer audits. Utility companies in your area may provide free audits. Commercial audits are also available in larger towns. Be aware that not all energy auditors have experience in mobile homes – ask potential auditors about their experience in mobile home weatherization.

An experienced auditor understands your home as a whole system. They act as a building inspector, as well as a number cruncher. They will systematically examine your home by making a close visual inspection, opening up cavities to check insulation levels, measuring the building, and testing for air leakage. With this information they then can “crunch the numbers.”

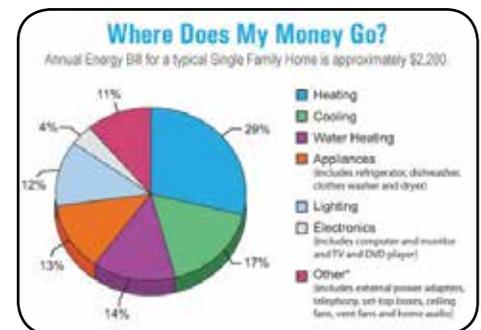
All of this information goes into specific recommendations that guide your overall plan.

Recommendations are prioritized by comparing construction costs to energy savings.

The following list provides the tasks an experienced mobile home auditor should be prepared to perform:

1. Home owner interview and education
2. Measurement of the home for dimensions and insulation levels
3. Blower door test and pressure pan test to find overall leakage and duct leakage
4. Furnace inspection and combustion gas analysis for efficiency and safety
5. Calculation of energy use, comparison to utility bills
6. Identification of problem areas and proposed fixes
7. Assembling the cost to complete each measure
8. Comparison of the cost to the energy savings
9. Establishment of priorities
10. Recommendations presented to the occupant
11. Decisions made on what measures will be undertaken based on safety, energy priority, comfort, and budget

 This fact sheet is labeled as a level (2) as a full audit requires specialized equipment. However, recommendations are provided if an auditor is not available in your area.



The Energy Audit

During the first phase of an audit, the auditor measures the house and checks insulation levels. Windows and doors are measured and evaluated.



Source: MHEA software

Hot water heaters, furnaces, air conditioners and wood stoves are evaluated for efficiency and safety. A blower door test measures air leakage rates and an inventory of lights and appliances identifies how much “demand load” (usually electricity) is used in your home. A visual inspection helps the auditor understand the construction of the building and to identify likely problem areas.

A software program then calculates current heat loss through the building shell, loss through air leakage, energy use for hot water, electrical lighting and appliance consumption. These amounts should be compared against long term utility bills.

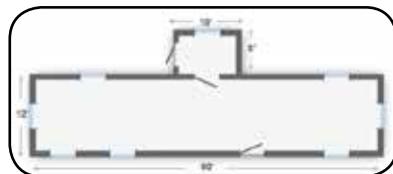
Using these energy figures and the field observations, the auditor makes preliminary decisions about new insulation R-values, air leakage rates and other usage numbers. The software program is then re-run with these new factors to calculate future energy savings. The calculated changes in energy use are based on many assumptions and the quality of the results is determined by the quality of the inputs. Software analysis is fairly accurate for calculating the heat loss from your building, but is less successful predicting or documenting human behavior. The length of showers, whether lights are turned off, and if the thermostat is turned down at night can affect energy use. Long-term average weather data is used in most audit programs, so the calculated result may be different than your current energy bills. As long as these assumptions are used in both calculations, the relative improvement in energy use should be realistic.

Typically, a good audit program will also collect the following information:

- Client information (including number of occupants, health issues, smokers, and large pets) to determine safe levels of ventilation
- Age of the home
- Check the general condition and identify obvious deficiencies



Source: DOE



An auditor performs tests related to:

- General air leakiness using a blower door test (see the Blower Door Test Fact Sheet)
- Duct leakage rates using pressure pans
- Pressure differences between rooms
- Furnace safety and carbon monoxide (CO) levels

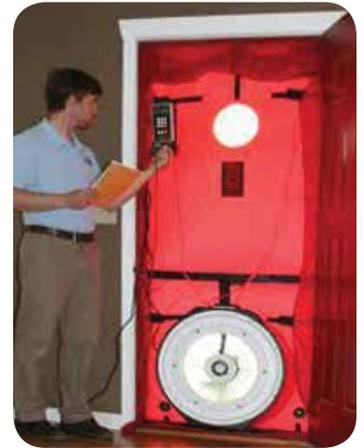
The auditor will also:

- Check the hot water heater for efficiency and safety
- Note the model and efficiency of the refrigerator
- Inventory the number and type of lights

The calculations use:

- Local, long term weather, including temperatures and solar irradiation

After completing these tests and checking the utility bills, the auditor will identify the most appropriate energy improvements, get prices for those measures and calculate the payback using the computer software. Based on the analysis, the auditor will prepare a list of recommended energy improvement and



Source: DOE

safety measures appropriate to your home and climate for you to consider. Most of the measures we'll describe in the factsheets are used around the country. A well insulated home performs better in the north and in the south. Southern homes usually have air conditioners to evaluate. Some areas have high levels of moisture to contend with.

There is No Auditor in My Area. What Can I Do?

If you cannot find an energy auditor experienced in mobile home analysis or do not have funds to hire an auditor, you can try an online audit. Here are two to try:

- The Department of Energy has a mobile home audit. You can download it at <http://waptac.org/Weatherization-Assistant/Weatherization-Assistant-8002E9.aspx>. This audit is very good at analyzing mobile homes but can only calculate paybacks after you have gathered construction cost data.
- The second option is at <http://homeenergysaver.lbl.gov/consumer/>. This program is user friendly, but is designed for stick-framed houses. You will have to modify your inputs until the calculated results approach your actual utility costs. Recommended measures focus on replacing

equipment and appliances rather than increasing insulation levels, so use with caution.

Using these computer audits is a way to learn more about your energy expenses and help you make decisions. You can then undertake many of the measures described in these fact sheets. Here are some common actions you might take:

- **Replace** all light bulbs with CFLs (compact fluorescent lights), LED, or Halogen lamps.
- **Install** power strips to turn off your entertainment center and computer. Wash dishes and clothes with full loads. Wash clothes with cold water.
- **Seal** the ducts (an inexpensive measure that pays big dividends. (See **Factsheet #6**). Watch the WxTV episode on your computer at <http://wxtvonline.org/2010/06/ductsealing/>)
- **Seal** plumbing penetrations from the underside or inside the cabinets.
- **Repair** the belly (a two-person job, and often nasty, but worth it! (See **Factsheet #7**)).
- **Undercut** the interior doors or install door grills (if you have some carpentry experience) using a pressure diagnostic test after duct sealing.
- **Install** plastic storm windows and **weather strip** the doors.

Without an audit, you do have to guess at the most cost effective actions and hope that you are not missing crucial measures. Using these fact sheets, you can assess whether you might safely undertake some of this work, or whether you need to hire help.

Hiring a Contractor

Once you have established the work that needs to be done on your home, your next step is determining who will do the work. If you are not able to do the work yourself and cannot find capable (and willing) family or friends to help, you will need to hire a contractor. Some measures (those labeled  (2) and  (3) in this series) require special skills and equipment to perform. For those tasks, hiring a contractor is important.

Mobiles are rarely upgraded and are constructed differently than stick-build homes. Therefore, it is important that you find contractors experienced working on mobiles. Contact your local HRDC office (CAP agency) and talk to the weatherization manager. They may have lists of auditors and contractors with mobile home experience.

If you cannot find experienced contractors, you will have to educate yourself so that you can be clear about the work to be done and how it should be done. Mobile

homes are durable because of their aluminum skin, but easily damaged by over-zealous insulation installers.

If possible, interview several contractors. Ask them about their experience and availability. Schedule a walk-through of your house so that you can discuss your needs and they can make proposals for the work. Discuss your concerns and ideas during the walk-through, and ask the contractor for their recommendations. Ask if they can complete all of the work on the audit list. If they are specialists, such as insulators or furnace technicians, they may not be able to do every task. Ask them for recommendations of other contractors or handymen to do the other measures. Ask each contractor for a bid for the work that they propose.

Ask the contractor for a list of 3-4 past mobile home-clients and call those references to rate their experiences. Were they satisfied with the work? How long did it take?

After assembling the bids and calling references, make a final decision on who you will work with and what work they will do. Ask the contractor to provide a detailed contract or written estimate for the work. This contract should list all work that will be completed and any exceptions to that list that must be done by others. The agreement should also include a timeframe for the work to be completed and a payment schedule. Some contractors will ask for a partial down payment. Limit the down-payment to 25 percent of the total price.

During the work period, make sure the contractor has access to the house, that possessions are cleared away so the work can be done efficiently, there is adequate parking, and all pets are under control. Discuss the specifics of your project and any concerns you may have about work details when the crew first arrives. Let them know that you are knowledgeable and watchful. It is perfectly okay for you to ask a few questions while the work is proceeding, but do not hover around the workers. Let them do their jobs. Do not ask for additional work to be done unless you are prepared to pay extra.

The last step in the process is to get the final job inspection which should include air tightness (blower door) testing and a homeowner interview by the auditor. Do not pay your final bill to the contractor until their work has been inspected and approved. If an inspector is not available, you will have to go over the work to see that all details have been completed to your satisfaction.



