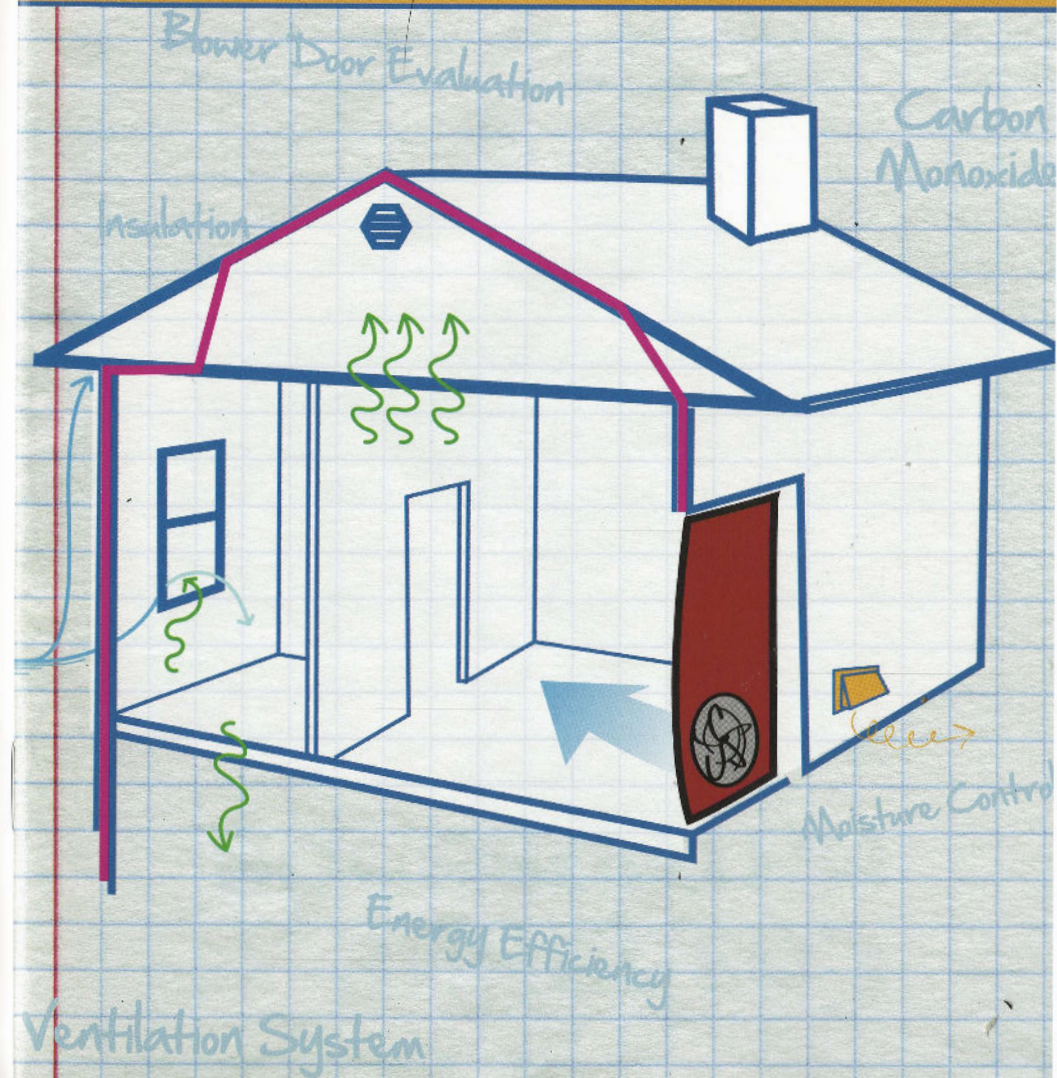
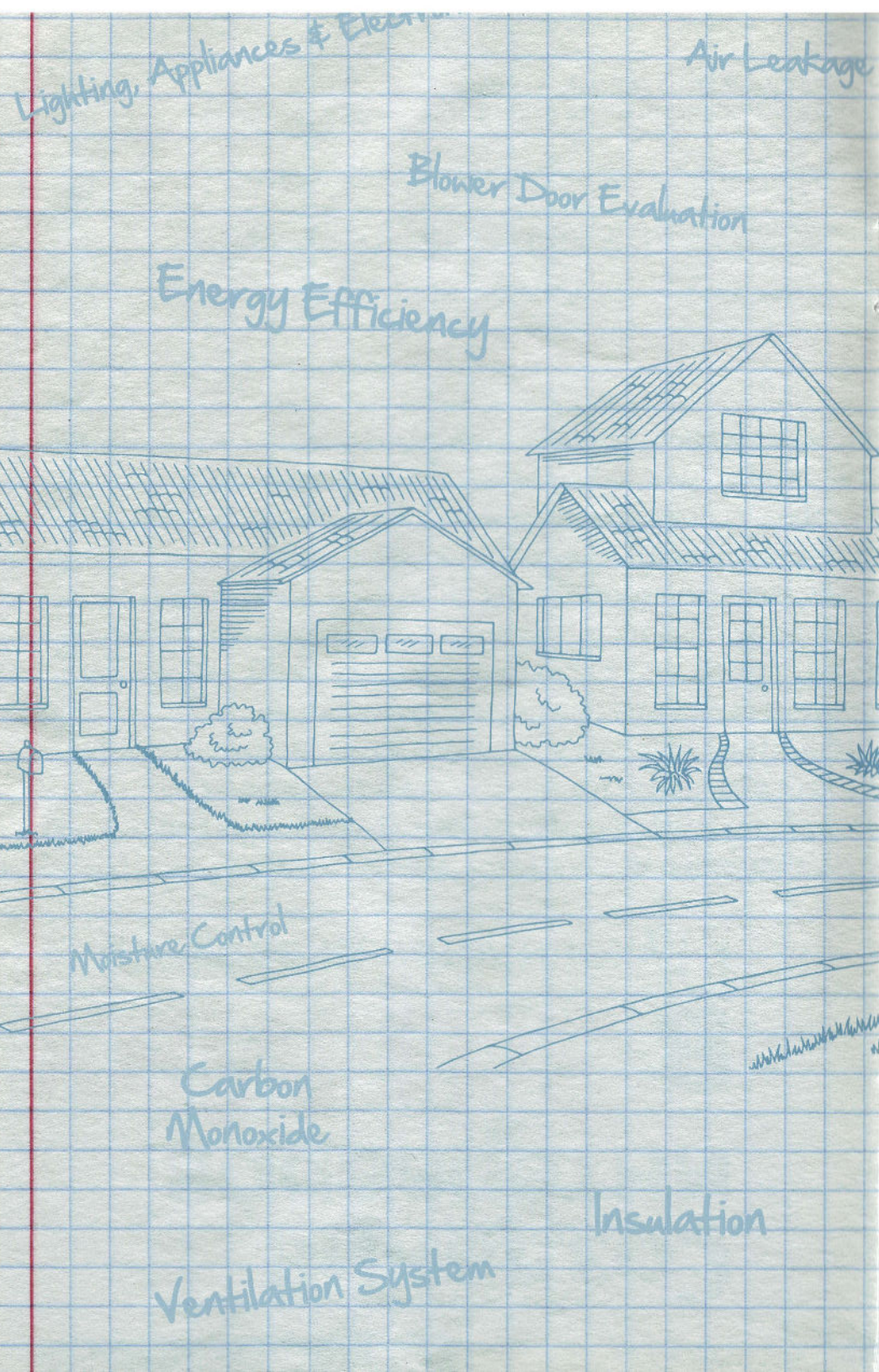


Appliances & Electrical

Air Leakage

A GUIDE TO THE WEATHERIZATION ASSISTANCE PROGRAM





The Weatherization Assistance Program (WAP) makes energy-related improvements on the homes of low-income households using the most advanced technologies and testing protocols available in the residential energy-efficiency industry. The WAP works on all types of housing, including single-family homes, multi-family units, and mobile homes. Program services are free of charge to qualified applicants, providing both short and long-term energy savings, as well as increased comfort in the weatherized homes.

The WAP has been weatherizing homes since the late 1970s, having made energy-efficiency improvements to more than 7.4 million homes nationwide. Workers receive thorough and ongoing training on state-of-the-art diagnostic tools and installation techniques utilized by the program to maximize the benefits to program recipients.

The health and safety of each family is a priority. The energy auditor and the work crew do various tests to ensure that any combustion appliances, like furnaces and hot water heaters, are operating safely and that the energy repairs will not cause any potential health or safety problems.

This guide will help you understand what you can expect when getting your home weatherized.

FOCUS AREAS: ENERGY AUDIT INSPECTION

The first step in the weatherization process is to understand what improvements need to be completed to make a home more efficient. The energy audit is a computerized analysis of the home's energy use that includes the most cost-effective measures to address the identified energy-efficiency issues. This will be undertaken by an energy auditor, a highly trained professional who will analyze your utility bills, conduct diagnostic tests, and visually inspect the obvious and not-so-obvious places in your home where energy is being wasted. Here are a few key areas that the energy auditor will focus on.

Legend

- Insulation
- eee Ventilation System
- ~ Escaping Air & Energy

Air Leakage

Home energy efficiency suffers the most when outside air enters a house unintentionally through cracks and openings. Sealing these areas can significantly reduce heating and cooling costs, improve building durability, and create a healthier indoor environment.

Condition of Heating & Air Conditioning Units

Boilers, furnaces, water heaters, and other heating/cooling appliances are at the heart of a comfortable, energy-efficient home. Old, outdated, or inefficient equipment will not only cost you money but can pose health and safety issues. Your auditor will perform all the standard tests to make sure your equipment is safe, up-to-date, and functioning properly.

Proper Insulation

Since much of your home's wasted energy escapes through the floors, walls, and ceiling, proper insulation is crucial. The auditor will check these areas to make sure you have the right levels of coverage and the correct type of insulation.

Lighting, Appliances & Electronics

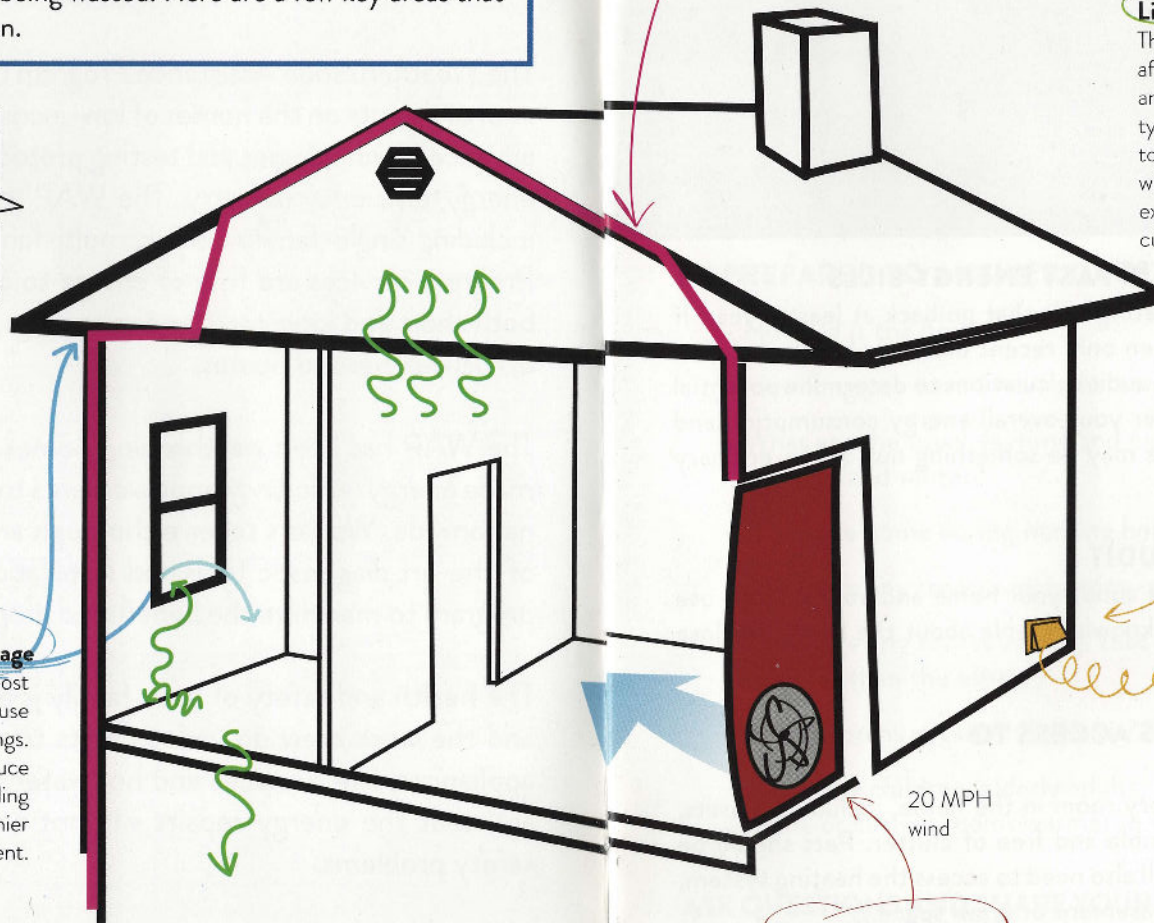
The right lighting, appliances, and electronics affect productivity, health, safety, morale, and comfort. They also account for 29% of a typical home's energy use. So it's important to get the most out of every plug and bulb without wasting a watt. Your auditor will examine what you currently use and help you cut back and save money.

Moisture Control

Properly controlling moisture in your home will improve the effectiveness of your air-sealing and insulation efforts. This is especially true in humid climates. The auditor will make sure your home is properly venting and controlling moisture. They'll also look for any leaking or buildup that may cause potential safety and health issues.

Blower Door Evaluation

A blower door is a powerful fan mounted in the frame of your main doorway that checks for air leaks by creating a wind current in the house.



PREPARING YOUR HOME FOR THE AUDIT

An effective energy audit begins before the auditor arrives. The local weatherization agency will contact you to schedule the audit. It's strongly recommended that you do some initial preparation work to help ensure the auditor can do the most thorough job possible.



COLLECT AND ORGANIZE YOUR PAST ENERGY BILLS

Have copies of your electric and heating bills that go back at least a year. If your utility bills show past usage, then only recent bills may be needed. The energy usage can be entered into the audit calculations to determine potential savings. The auditor can also consider your overall energy consumption and usage patterns to determine if there may be something out of the ordinary causing higher than expected bills.

BE AVAILABLE DURING THE AUDIT

The auditor will have some questions about your home and your energy-use habits. It is important that a person knowledgeable about the home be close by to answer any questions.

MAKE SURE THE AUDITOR HAS ACCESS TO EVERY AREA OF THE HOME

The auditor will need to examine every room in the home, including closets. Make sure all areas are easily accessible and free of clutter. Pets should be restrained or removed. The auditor will also need to access the heating system, the water heater, the attic, and the basement or crawl space.

THINGS TO CONSIDER IF YOU HAVE A FIREPLACE OR WOOD STOVE

If you heat with a wood stove, it may be necessary to have the fire not burning when the auditor comes. It is also best to clean out ashes in a stove or fireplace, as the blower door test may scatter loose ashes and make a mess.



BE PREPARED TO ANSWER QUESTIONS SUCH AS:

- How old is the home?
- How long you have lived in the home?
- What are the usual daytime and nighttime thermostat settings in summer and winter?
- Is anyone home during working hours?
- Are there any records of heating-system repairs and maintenance?
- Are there any rooms or areas that are colder in winter or warmer in summer than the others?
- Which rooms get used the most? The least?
- Are there children, elderly adults, or anyone who may need to keep the home or certain rooms warmer in winter or cooler in summer?

ASK QUESTIONS AND SHARE YOUR KNOWLEDGE ABOUT THE HOME

The audit is a chance for you to get your questions answered by a weatherization professional. Consider making a list of questions and concerns. Give some thought to the energy issues you are aware of, such as drafty rooms, moisture problems, faulty heating equipment, structural issues, and anything else you think may be a problem regarding your energy use.

THE ENERGY AUDITOR'S DIAGNOSTIC TOOLS

BLOWER DOOR

The blower door is perhaps the one most essential diagnostic tool for all weatherization workers. It is a powerful fan mounted in the frame of your main doorway that will suck air out of the house, lowering the air pressure and pulling outside air into the home through any unsealed opening. The blower door serves two main purposes:

To measure the air leakage of the home

To exaggerate the air leakage for easier detection of the leaks

Measuring the air leakage of the home enables the auditor to know how much energy is being wasted due to excessive air infiltration and to specify the air leaks that need to be addressed by the crew. The auditor will also establish a minimum airtightness limit to help ensure indoor air quality and avoid moisture problems. The auditor will determine if any additional mechanical ventilation is needed.

The blower door amplifies the air leaks so they are easier to locate. The largest air leaks are not always apparent from a visual inspection. During the blower door test, the auditor can locate the areas that are causing the biggest problems, so the crews will be able to focus on those major areas first rather than chasing more minor air leaks.



INFRARED CAMERAS

Many auditors use infrared cameras to detect gaps in existing insulation, air leakage sites, and other thermal defects. The camera will scan an infrared image that will pinpoint exactly where a problem is located. The infrared-camera scans are often done in conjunction with the blower door fan running, exaggerating the air leaks.



DIGITAL COMBUSTION ANALYZER

A combustion analyzer is used to measure the performance of combustion appliances. The auditor will use the combustion analyzer to perform health and safety tests, including testing for carbon monoxide, on a gas or oil furnace. The equipment is also used to tune the furnace to its highest possible steady-state efficiency. The test results will be documented during the initial audit and at the completion of the job to ensure the furnace is operating safely and efficiently.

DUCT LEAKAGE DIAGNOSTIC TOOLS

In a forced-air heating or cooling system, an estimated 20-30% of air moving through the duct work is lost due to leaks in the system. Weatherization auditors often find large leaks caused by disconnected ducts, holes, and poorly fitted registers. Not only is this an obvious energy waste but can also create indoor air-quality issues. Most auditors will use either a duct blaster or pressure pan with a manometer to measure and detect leaks in duct work. The crew will later repair and seal any leaks.



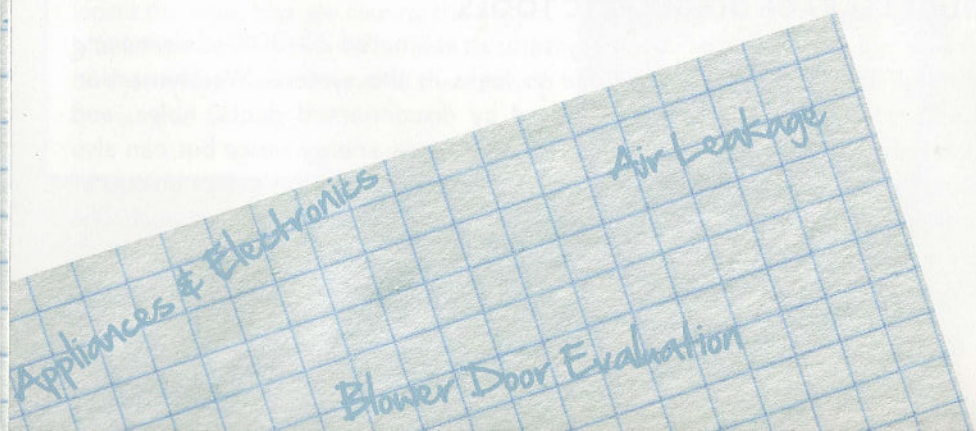
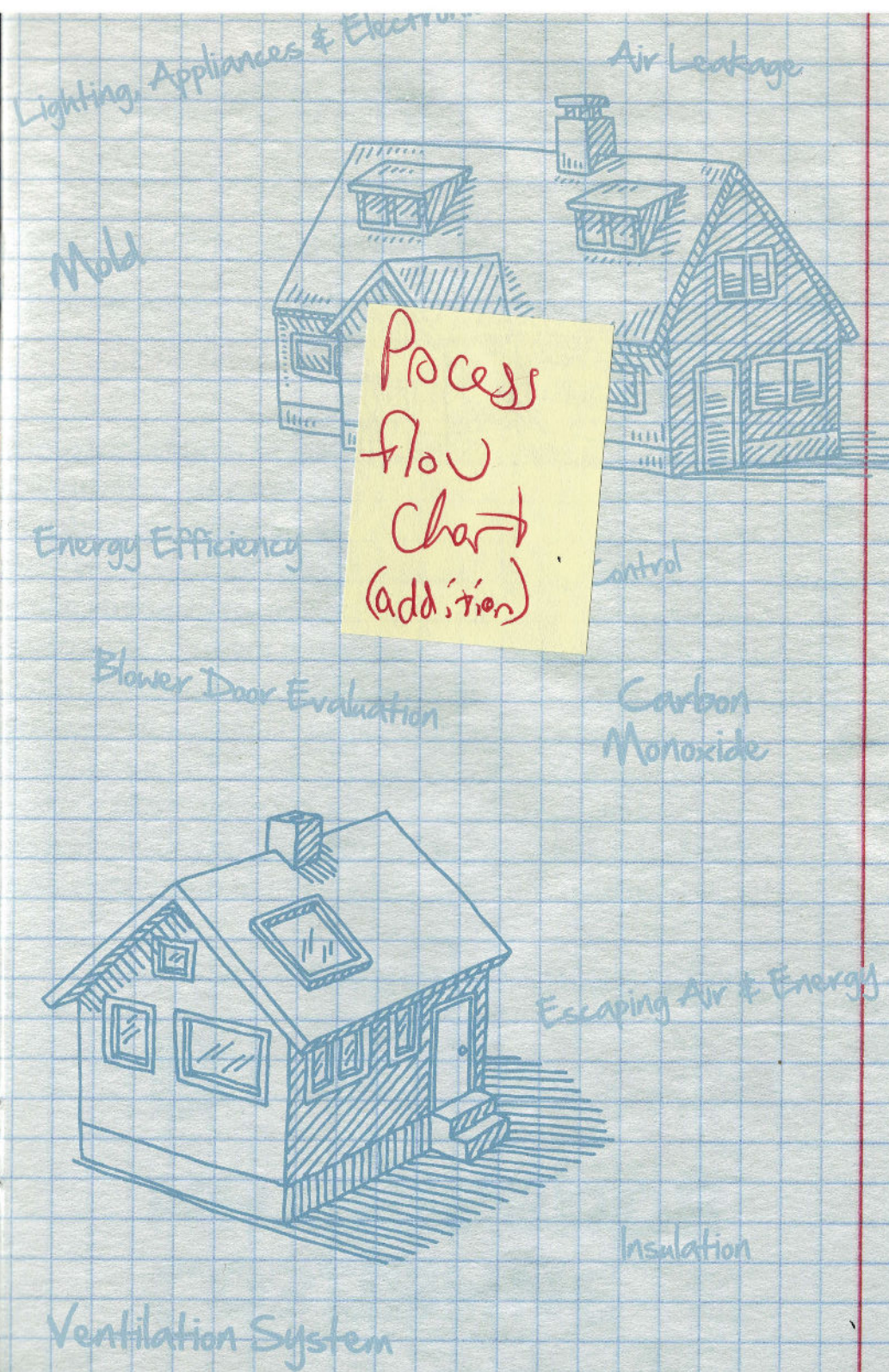
THE RESULTS OF THE AUDIT

The auditor will input various measurements, test results, and inspection notes into specialized software. Sometimes this will be finalized at your home; other times the auditor will need to find some additional information in order to complete the audit. Either way, the auditor will be able to communicate the issues and likely retrofits needed. The auditor will also discuss the next steps and explain how the crews will do the work.

The auditor will typically meet with the crew chief to discuss the audit, review the work order, and give an overview of what needs to be done, including any specific problems or conditions that need attention.

The weatherization program does not address all homes the same way. Since program funds are limited, a home's energy-efficiency retrofit needs are prioritized. The audit will determine the most cost-effective measures in terms of energy payback for the cost of each measure. The weatherization work is energy related and does not include new roofs, siding, or structural repairs.

While the most cost-effective measures may vary some from home to home, WAP's energy audit analysis and priority list of retrofit measures are based on the whole-house weatherization approach. The whole-house approach refers to looking at the entire home as a system of interdependent and interacting parts. The various building components of the home, existing insulation, doors and windows, heating and cooling equipment, appliances, site conditions, local climate, and the occupants of the home all come into play. A simple example would be a decision that a new, energy-efficient furnace would not provide the maximum energy-saving benefits if there are duct leaks or if there is insufficient insulation in the attic. By using the whole-house approach, the WAP audit will consider all the above factors and their interaction to determine the best measures for that particular home.



INSTALLATION OF THE MEASURES

Someone from the local agency will contact you to schedule a day and time for the crew's arrival. Similar to the audit, it is strongly advised that someone familiar with the home be available when the crew comes, and that the home is uncluttered so the crew will have open access to all indoor areas. There should not be any problems if household members are home, but they need to realize that the crew members will be in various parts of the home and should make sure they do not hinder the crew's movement or work. Pets should also be restrained or removed. The crew has been trained in safety precautions and will work as quickly and safely as possible to ensure quality work.

A lot of jobs are done in one or two days, but others may take longer depending on the amount of work to be done and any unforeseen complications.

As mentioned above, the weatherization program does not address all homes the same way, and the measures to be carried out are determined by the audit calculations. While noting that, there are common measures that are completed on many weatherized homes.

TYPICAL MEASURES

- Heating and/or cooling system diagnostic testing, repair, and tune-ups
- Reducing air infiltration to acceptable levels
- Duct repair, sealing, and insulation
- Attic insulation
- Dense pack sidewall insulation
- Water heater insulation

ENERGY EDUCATION

A critical piece of having an energy-efficient home is educating the occupants. As part of the weatherization process, you will be provided some energy education to help ensure you get the best savings from the weatherization work. The energy education is divided into two categories:

1. Pointers for maintaining the weatherization measures completed on your home
2. Basic energy-saving tips

QUALITY CONTROL INSPECTION

The last part of your home's weatherization process is the final quality-control inspection. A specially trained and certified inspector will schedule a time for the inspection. The inspector will look at all the work done on your home to ensure that everything was done correctly and is consistent with the defined quality standards. The inspector will also make sure all diagnostic and safety tests were completed correctly and retest if there is anything questionable. The inspector—just like the auditor and crew—will need to access all areas of the home to ensure a thorough inspection.

This final inspection will likely be the last direct involvement you will have with the WAP agency. Don't be afraid to ask questions if anything is unclear.



Lighting, Appliances & Electronics

Air Leak

MAINTAINING WEATHERIZATION MEASURES

Please make sure you know what weatherization measures were completed on your home. Be prepared to ask questions if you do not understand what or why any work was done, and discuss your questions or concerns with the person providing the energy education.

HEATING AND/OR COOLING SYSTEM MEASURES

- Consider regular seasonal maintenance of your systems to help ensure proper working order by a professional HVAC contractor.
- Keep the areas around your heating and/or cooling equipment clean and dust free. Do not store anything against or within a few feet of the units.
- Do visual inspections of the equipment—if you see excessive soot or rust, get professional assistance.
- Learn how to change the furnace filters and do so regularly. The weatherization energy educator can show you how to do this and advise you of a schedule. Some filters can also be periodically cleaned, though they will still need to be replaced from time to time. Changing the filters will both allow for maximum efficiency of your system and ensure that the cleanest air possible is flowing through your duct work.
- If carbon monoxide detectors and/or smoke alarms were installed, learn how to operate and maintain them. They usually have testing buttons to test operation and warning lights to advise if batteries need to be replaced. The furnace technician or crew installed them in appropriate places in your home for best detection of problems. Keep them where they are and maintain them properly.

REDUCING AIR INFILTRATION TO ACCEPTABLE LEVELS

- Most air infiltration measures are permanent installations that require little maintenance. Check weather stripping to be sure it is not cracked and is making a continuous seal between the two surfaces. Any caulk or two-part foam should last for years.

DUCT REPAIR, SEALING, AND INSULATION

- Keep duct registers clean. Remove the registers and carefully vacuum inside the register. Clean the fins on the register of any dust, hair, or other accumulated dirt.

- Keep the duct register areas unrestricted. Do not place any furniture, carpeting, or curtains over them that will impede air flow.
- Treat any return registers the same as air supply registers—keep them clean and unobstructed.
- Do periodic visual inspections of any duct work you can see. Make sure there are no openings or small seams in the ducts. Pay particular attention to any joints in the duct work and notice where the duct work attaches to the floor at the registers. These are the most likely places for problems with bad connections or seals.
- If the duct work is insulated, keep anything that may tear or compress the insulation away from it.

ATTIC INSULATION

- Attic insulation should be a permanent improvement to your home with little or no maintenance. An occasional visual inspection, if the attic is easily accessible, may be beneficial to ensure there are no problems.
- Insulation should not be compressed or have anything stored on top of it. Resist any temptation to use your attic for storage or any other purpose after it has been insulated.
- Make sure your roof is maintained and does not leak, as this can obviously cause many problems, including damaging the attic insulation.

DENSE PACK SIDEWALL INSULATION

- Sidewall insulation is another measure that should not require any maintenance. The most important consideration is to not disturb it. If you do any remodeling or repairs on the exterior walls of your home, it is critical to make sure to reestablish a thorough and continuous thermal barrier with wall insulation during the remodel.

WATER HEATER INSULATION

- Again, the most important consideration is to not disturb the water heater tank wrap. Do a visual inspection from time to time to make sure none of the connectors holding the wrap in place have become loose or disconnected. If they have, try to refasten them without compressing the insulation.

SOURCES

The U.S. Department of Energy
www.energy.gov

American Council for an Energy-Efficient Economy
www.aceee.org

The U.S. Department of Energy's
Office of Energy Efficiency and Renewable Energy
www.eere.energy.gov

Energy Star®
www.energystar.gov

U.S. Consumer Product Safety Commission
www.cpsc.gov

For more information about Project Energy Savers, visit:
www.projectenergysavers.com

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