

Start with the Envelope:
Home Insulation Is Easy and Affordable With Mass Save
A First Hand Account of a Mass Save Energy Audit



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By Brice Hereford

Since the 1980s, Massachusetts utility companies have levied a monthly one- to two-dollar “energy conservation charge,” also sometimes referred as “system benefits charge.” This money goes into a pool that helps the state’s home owners improve the energy efficiency of their homes at little to no charge. Why do this? It is less expensive for us to reduce our energy usage than it is to build new power plants. The utility company saves on overhead, and we enjoy all the benefits of reduced fossil fuel consumption.

As the price of home heating fuels continued its slow, relentless climb last winter, I, like others, paid much more attention to my monthly utility statements. A flyer inside my bill from Western Massachusetts Electric (WMECO) invited—no, exhorted—me to take advantage of their free [Mass Save Home Energy Assessment](#), aka an energy audit. I have been audited before and have a healthy dislike for any sort of “audit,” but I can now say that this one was like winning the lottery!

The Mass Save program is a great way to save energy and money. It addresses the first steps you should take to insulate your home. While sexy, expensive stuff like photovoltaic cells, geothermal heat pumps, and new windows are important, you should wait on those until you have upgraded the building envelope. It is the best return for your investment and by doing it first, you will probably reduce the size of your next heating unit thereby saving even more money.

So how does Mass Save work?

Audit Day

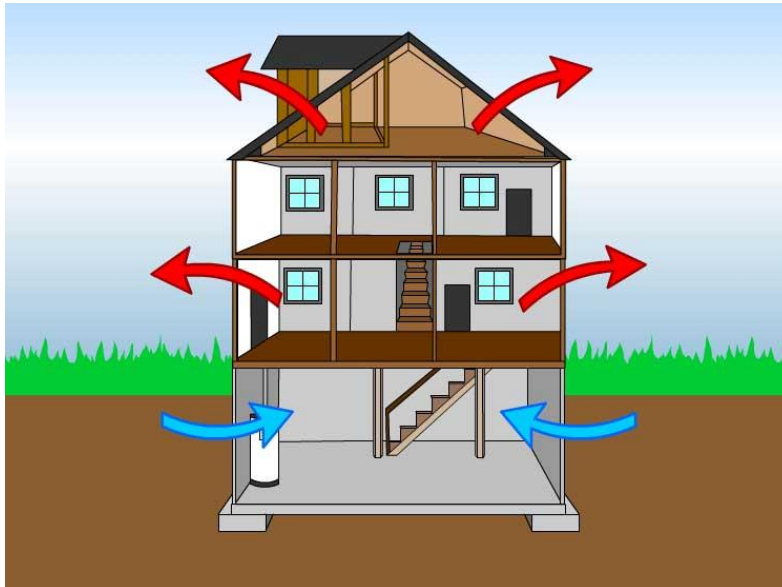
I started by calling to schedule the energy audit. Two weeks later, a technician named Joe came by to do it. Joe has been in the building trades for over 30 years and really knew his stuff. We began with a questionnaire about the house. Joe needed to know its age (built in 1956 with at least three subsequent additions), square footage (too big), type of heating, etc. When he was satisfied, we started the audit, beginning with the attic.

Climbing around the trusses, Joe poked and pulled at the insulation and examined areas he thought would allow air to leak into the attic from the house. He certainly found plenty. Under the insulation were cracks, gaps, and holes galore from where the recessed cans, exhaust fans, electrical wires, and pipes came through the ceiling.



Joe asked lots of questions and took copious notes as we moved through the rest of the house. He examined the walls to see how thick they were—2x4 or 2x6—and whether they were insulated (and if so, what with). If your home was built before the 1970s, there is a good chance the walls are 2x4 and uninsulated. In the 1970s, with the Oil Crisis for motivation, house framing switched from 2x4 to 2x6 construction to leave more space for energy-saving insulation. To check my insulation, Joe removed several switch plates on the outside walls and poked a bamboo barbecue skewer (I kid you not!) in there to determine whether insulation was present and how thick.

Next, we investigated the basement and the crawl space. There were plenty of cracks, gaps, and holes to be found along the top of the foundation wall, rim board, and anywhere wires or pipes penetrated. Joe told me about the “stack effect,” which causes air to suck upward from the basement, through the first and second floors, and then out the attic: great in the summer, but terrible for heat retention in the winter.



The stack effect in action!

An energy audit also includes furnace and lighting system checkups. While Joe was unable to assist me with my furnace, he did hand out all the free compact fluorescent lightbulbs (CFL) he had to replace my incandescent bulbs.

The inspection concluded with measurements and sketches of the building’s exterior.

After crunching some numbers, Joe gave me the verdict. He was putting my home in for free air sealing and a 75 percent subsidy on 6 inches of insulation (R-22) in the attic. My wood-framed, double-paned windows passed muster. With that, Joe left, telling me that a Mass Save office would be in touch to schedule the air sealing and insulation. I couldn’t wait!

Air Sealing

Why [air-seal](#)? Tomasin at Mass Save explained it to me this way: You insulate a house much like you dress yourself in the winter. Insulation is the down vest that keeps you warm, and air sealing is the windbreaker that keeps the cold air from penetrating. The Second Law of Thermodynamics states that energy goes from hot to cold and high to low. So in the winter, air sealing prevents cold penetration and heat escape. That is all the physics you need to know! Proper air sealing can reduce your heating bill by 20 to 40 percent. It can also reduce the chance of mold in attics, basements, and crawl spaces.

To follow up on my audit, first came a call from Quinn at the local Mass Save affiliate, the [Center for Ecological Technology](#) (CET), to explain the process and set a schedule. I was pleased to learn that they were upgrading my package to include free air sealing of the basement, the crawl space, and the garage as well as the attic!



A week after everything was scheduled and signed for, the sealing crew arrived. The crew, Jesse and Collins, did a walk-through of the areas to be sealed and then got to work. They closed all the doors and windows and placed a large fan known as a blower door in the front door opening. The [blower door](#) forces a lot of air out of the house (15 to 20 times the normal rate,). This allows you to really feel where the air is leaking from. The crew walks around checking for air currents throughout the house, which, when combined with the fan's readouts, gives them a baseline for comparison once the air sealing is completed.

When the measurements were done, the team suited up in Tyvek suits and air masks and headed for the attic. They applied orange sealing foam to every applicable surface; anywhere they saw a crack or gap, they sprayed. They were up there for about three hours, and they found way more gaps than I would have thought possible! They even sprayed around the recessed lights and bathroom fans. They used a special fireproof foam/caulk around the chimney. Collins and Jesse were also careful to replace the insulation so that it was fluffed up and working effectively. They then started in on the basement, crawl space, and garage, spraying the orange foam along and around the rim joists (where the house meets the foundation)s well as any opening or crack where pipes or wires went through the floor.

Once they finished all the air sealing, it was time to start up the blower door again and see what effect they'd had. We walked around the house feeling to see what the drafts were like in various areas, such as around the windows (not bad), the doors, and the crawl spaces under the eaves (bad!). They pointed out areas to focus on and what to do to stop the drafts. Jesse and Collins determined that their efforts that afternoon had reduced the airflow by 12 to 15 percent, which was a good start. Depending upon the age of the house and the quality of the construction, they can tighten up your home anywhere from 10 to 30 percent. My house was now at a .59 air change per hour, or about one air exchange every 2 hours—12 every 24 hours!

Clearly, I had more to do. That's where the insulation came in.

Blowing-In Insulation

A few days after the air-sealing, Paul from [Co-op Power](#) arrived to add 6 inches of cellulose insulation to my attic. Paul informed me of two very interesting aspects of this insulation, called Cel-Pak. The first was that it was made primarily from newsprint and had an R-value of about 21, which when added to my existing R-30 fiberglass would bring my total insulation rating to R-50. The second was that it was manufactured locally, by National Fiber in Belchertown, and that much of the newsprint came from local recycling center certainly an added benefit. Paul and his crew wasted no time getting my attic ready to receive its local insulation. They started by placing proper-vents between the rafters so the cellulose wouldn't fall down into the soffit and clog it. Most roofs are vented, meaning that air flows in from the eaves, up through the soffit vents and out the top of the roof through a ridge vent. This keeps the attic cold in the winter to avoid ice dams.

The Cel-Pak insulation came in 40 big plastic-wrapped bales, which Paul and his crew broke apart and fed into a large blower that pushed the insulation through a big, long tube up into the attic at a rate of about one bale a minute. They spread it evenly with the hose and a rake, having tacked up tape measures to make sure they got the right depth.

Through Mass Save, all this was done for about the same cost I would have incurred to rent a blower and buy the supplies.

Next Steps

So what do I do next? This summer I intend to replace my front door with one of those super-insulated polyisocyanurate core doors, taking the [30 percent tax credit](#). I will also insulate the crawl spaces under the eaves. At some point, while replacing the siding, I'll add rigid foam insulation to the exterior. Eventually, I hope to meet Affordable Comfort Inc.'s [Thousand Home Challenge](#), which aims to reduce the energy use of a thousand homes in North America by at least 70 percent. This will take some major efforts, but it is an investment that I know will pay off, because energy prices are only going down, not up.

Learn more about **Mass Save** at www.masssave.com or call toll-free: 866-527-7283. If you are in another state, check out our website, www.360chestnut.com/mass_save

Brice Hereford is a graduate of Boston Architectural College's Sustainable Design Certificate program. His interest in energy efficiency goes back to the energy crisis of the 1970s; his focus is on the building envelope. He is continually upgrading his skill set in building science and how best to integrate code requirements with contractors' abilities. He lives in western Massachusetts.

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