

Another Successful Energy Upgrade

Kings Street Alexandria Home Receives Deep Energy Upgrade

Overview

Local family purchases an estate property dating back to 1937. Its prominence had long passed as the family who had occupied the home since the 1960s had grown and moved away and the last surviving members passed the property to another generation of homeowners.

The existing home was approximately 3,200 square feet and was heated by a 175,000 BTU gas furnace. The home had no air conditioning, original windows and doors, only smatterings of insulation, and gardens that had seen time pass them by.

The new family focused on the charm of the property, a fenced in yard, all brick siding, double wide garage, fish pond, slate roof, second floor deck overlooking Alexandria and DC in the distance. The home has three bedrooms, a third floor area for their girls to play, a family room in the basement, and three bathrooms. Most importantly to this family with fixer-up experience, was a property that they could upgrade, design, and make a home of their own.

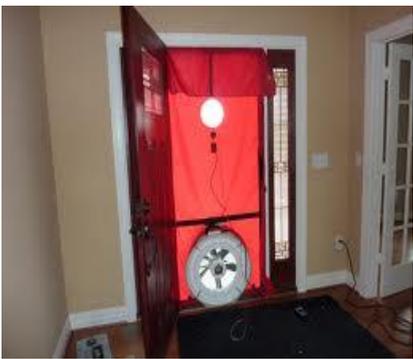
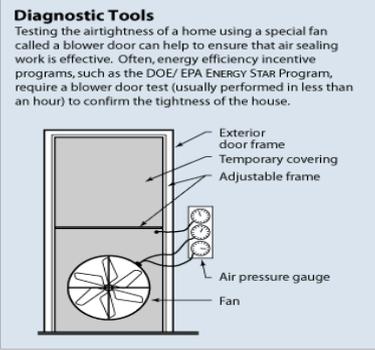


The Process Begins - 10 Steps to Energy Reduction

#1 Contact Energy House – a member of the Energy House team who happens to be the family’s neighbor is asked to create a path to make the home more comfortable, reduce the operating costs by reducing energy consumption, and lessen the family’s carbon footprint all the while preparing the home for a planned design makeover. Energy House is chosen based on a review of its website and an excellent track record of success.

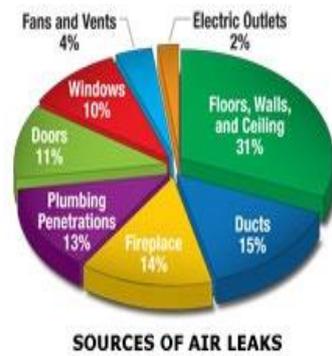
#2 Free Energy House Review – provided by the Energy House team outlining the options for accomplishing the family’s goals. This is a service that is provided by the Energy House to provide homeowners with an overview of the issues facing their home. See an example of an Energy Review - <http://www.energyhouse.us/free-energy-review>

#3 Energy Evaluation (Audit) – as suggested in the Energy Review, the family hired Green Nation Energy to provide a full BPI certified Energy Evaluation. This analysis considered the health and safety of the home, diagnostic testing of the air leakage in the home, insulation, and current energy use.



Findings

- “ Numerous gas leaks around the existing gas furnace and hot water heater
- “ Limited insulation only in the attic and the ceiling of the study
- “ Very high air infiltration coming into the home
- “ Equivalent to a 2 foot wide widow open more than 2 feet 24 hours per day 365 days per year
- “ Original windows throughout the home
- “ 11 tons of heating and cooling required for the home due to limited insulation and air infiltration



#4 Whole House Energy Modeling – Energy House takes a number of alternatives being considered by the family to conserve energy and applies them in their modeling software to provide choices with projected savings numbers that help make decisions more obvious. Applying costs to those alternatives is also part of the considerations being done by the family. “With the numbers, the choices are much more obvious to us,” stated one family member.

Modeling Considerations provided by Energy House

- “ Type of framing to be used in basement – 2 x 4 vs. 2 x 6
- “ Insulation to be used in basement – foam vs. fiberglass
- “ Attic insulation – closed cell foam vs. fiberglass
- “ Study Ceiling Insulation – blown-in cellulose vs. fiberglass
- “ Door Weatherization – front door, side door, roof deck door, garage door
- “ Garage Ceiling Insulation – fiberglass vs. dense packed cellulose
- “ Windows – new ENERGY STAR vs. existing
- “ Heating & Cooling – geothermal vs. high efficiency electric heat pump
- “ Hot Water – gas direct vent vs. electric vs. solar



#5 Energy Design – Energy House team produces an upgraded energy design for the home to cut the property’s energy usage in half. Prices are supplied to the family for the following upgrades to the home.

- “ Insulation – in the basement, attic, garage ceiling, study ceiling
- “ Weatherization – the existing doors including the garage door
- “ Chimney Balloon – in the fireplace to stop air leakage up the chimney
- “ Windows – new ENERGY STAR windows proposed
- “ HVAC – adding new high efficiency electric heat pumps to the system with a new gas boiler for the heating backup
- “ Energy Monitoring System – to help the family watch their consumption and conserve

#6 Work Begins

- “ Demo of the existing systems, and old insulation and drywall removed in key parts of the house
- “ Basement walls are removed for new insulation
- “ Attic walls and drywall removed to enable insulation and open floor plan
- “ New electrical panel and all new lighting and wiring



#7 Framing – In basement area remove plaster and old wood siding in order to install framing for insulation and remodeled family room. Decision has to been made to frame with 2 x 4 rather than 2 x 6 as a means of saving money based on the limited additional energy savings with the added insulation in the basement area.

#8 Insulation – Making the home tighter with insulation and foam, decisions are made from energy modeling and pricing, open cell foam in the attic, fiberglass insulation in the basement, closed cell foam around basement rim joints, blown-in cellulose into the study ceiling and fiberglass bats in the ceiling of the garage.



Fiberglass is chosen in the basement over foam based on cost and the fact that while fiberglass shards will be introduced into the air from installation of this product it was used based on the fact that the house would be aired out thoroughly, the family would not be moving in for more than a month and the fiberglass itself would be sealed on six sides once the finish is applied to the walls. While not ideal for sustainable living, the mitigation of the fiberglass through the construction process and the cost savings it was the decision of the family to move ahead with this type of insulation in this area of the home.

Cellulose was chosen for the attic ceiling in the study as it sits below the second floor deck and is a source of significant heat loss as very little insulation existed in that area of the house. In the study, holes were drilled in the ceiling from the inside the space. These 4 inch holes in the ceiling allowed cellulose insulation to be blown in to provide an estimated R38 level of insulation in this area.

The garage ceiling that is below the study was also not insulated and with the study located between the unconditioned garage space and the second floor deck the study was in dire need of insulation assistance. Fiberglass ceiling batts were chosen for all the same reasons as it was chosen in the basement.

Open cell foam was used in the ceiling of the attic to provide the best possible air sealing and insulation alternative for this property. Given the 2 x 10 framing of the roof with the open cell foam in the attic an R30 can be accomplished for the structure. While not ideal — Energy House would recommend a minimum of an R38 to an R49 level of insulation but without decreasing the ceiling heights by adding insulation on top of the roof framing the R30 is determined to be acceptable.



In the garage before the fiberglass insulation is installed, the entire rim of the garage was sealed with foam to reduce air leakage into the space as well as the study above.



#9 High Efficiency Heating and Cooling Installed – The decision was made to install high efficiency electric heat pumps over geothermal. While geothermal was possible for the site and the energy efficiency was substantial the upfront cost was outside the budget for the family. Therefore, the high efficiency heat pump was chosen for the heating and cooling for this home. The one advantage that this property had was its existing radiator heating system that can be used to provide the more affordable gas heat to meet the family’s needs. To maximize the opportunity of the gas system a new high efficiency gas boiler has been added to the mechanical upgrade.

#10 Energy Efficiency Accomplished

- “ Insulation added – attic, study, garage, basement
- “ Weatherization added – front door, side door, deck door, basement door
- “ Air sealing improvement – to be determined when drywall is added to renovated spaces
- “ Heating and cooling – air conditioning added, high efficiency electric heat pumps added, two zones, gas boiler backup added to mechanical system
- “ Mechanical demand – reduced 50%, from 8 tons to 4 tons. (A ton is the amount of heat removed by an air conditioning system that would melt 1 ton [2000 lbs.] of ice in 24 hours)

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Additional Updates on this King Street Energy Upgrade will follow as the project progresses.

