



Home Performance



Home Energy Performance Report

Property Owner: Mrs. Homeowner
 Property Address: 1234 W Energy Street
 Anytown AZ 85000
 Email: homeowner@email.com
 Phone Number(s): 480-555-1000 480-555-1200

Evaluation Date: May 1 2007
 Builder: Construct, Inc. Year Built: 1972
 Community/Subdivision: Tuscan Hills
 Construction type: wood frame Sq. Ft.: 2480
 Evaluator: DRW
 Evaluator phone: 602-123-4567

I. General Building Information

- energy:**
- rate plan: Utilities offer "time-of-use" rate plans which save money for those who can schedule most of their electricity usage for the late evening and early morning hours. This type of plan is especially suited for households in which no one is home during the day. We recommend looking into the different plans your utility offers.
 - heating: Air is heated by a gas furnace.
 - cooling: Air is cooled by an air conditioner.
 - water heating: Water is heated by a storage gas heater.
- homeowner concerns:**
- bills: Homeowner indicated that the utility bills do not seem particularly high.
 - comfort: Homeowner indicated that there are noticeable comfort problems in some parts of the house.
 - dust: Homeowner indicated that there appears to be an abnormally high amount of dust collecting on surfaces through the house and would like this investigated.
 - combustion: Homeowner indicated that they are not concerned about the back drafting of combustion appliances.

II. Building Envelope

- windows:**
- Windows are the weak point in your thermal envelope, but are obviously necessary as aesthetic and design elements, to provide natural light and ventilation, and to bring the outside in and provide a connection to the outside and natural environment. Therefore, it is important that the insulating properties and the shading of windows in your home are considered in any evaluation of the performance and comfort of your home as a system. Poorly performing windows can be improved through a variety of methods, from complete replacement to exterior shading with landscaping and architectural details. Special attention should be paid to walls with a large percentage of glass, glass that faces south or west, and any glass that receives direct sunlight. Dual pane windows are usually improved by exterior shading or addition of a solar film, while single pane windows are good candidates for replacement though shading from direct sunlight is always a good option. Reasons of aesthetics and sound reduction are also considered in addition to energy concerns when evaluating window improvement options.*
- overall: Most or all of the windows are single pane and none of the windows are low-e. Improvement to windows will provide a substantial impact overall, especially in specific areas.
 - replacement: Window performance would be greatly improved by replacement with new energy efficient windows. Replace one or more windows with dual-pane, low-e window.
 - shade screens: Exterior shade screens are not recommended for any of the windows in this house.
 - solar film: Solar film is not recommended for the windows in this house.
 - low-e window: None of the windows in the house currently have a factory low-e coating.
- infrared:**
- A thermal scan with an infrared camera allows the temperature difference between inside conditioned surfaces and the outside ambient temperature to be used to detect areas of poor performance in your home's thermal envelope. This tool allows us to see how your insulation is actually performing and to diagnose areas that are not adequately or properly insulated, or not insulated at all. Areas of poor performance are further investigated to determine the extent, cause and remedy of the problem.*

An infrared scan was conducted to diagnose the thermal performance of specific areas of the building envelope.

wall insulation:

When properly constructed to resist heat flow, the walls of a home will protect against differences in temperature between inside conditioned space and the outside ambient temperature. Walls are insulated in order to work with your heating and cooling systems to maintain a constant indoor temperature of your choosing, and your heating and cooling systems are designed based on the thermal properties of your walls. If your walls are performing poorly due to inadequately or improperly installed insulation, the system that is your house will be out of balance. Insulation must not only be installed, but be installed properly to resist heat flow at its rated capacity (r-value). Insulation must be installed at its appropriate thickness and density, with a minimum of compressions and gaps, and must be in full contact with the surface it is intended to insulate (the air barrier). Wall insulation most commonly is installed in the form of fiberglass batts or sprayed cellulose, though other methods include sprayed or injected foam, rigid foam board, and even batts made of recycled cotton from the manufacture of clothing.

wall area 1: Wall insulation is performing well and there are no major voids or gaps detected.

wall area 2:

wall area 3:

attic insulation:

Attic insulation is usually installed at the ceiling line or at the underside of the roof. In flat roof construction, a layer of foam insulation may be installed on the top of the roof deck. Like wall insulation, the insulation at your attic or roof helps maintain your desired interior temperature and protect against large fluctuations in interior temperature by slowing heat loss and heat gain. In the winter, attic insulation slows the loss of heat from the home and in the summer it protects from the intense heat of the sun by slowing the heat gain to your interior conditioned space from the roof and the attic (heat moves from warm to cool). We consider a minimum insulation level in the attic to be R-30, which is equivalent to 8 inches of loose fill cellulose or a 9 inch fiberglass batt (the two most common attic insulation methods). Attic insulation must also be installed properly to perform as designed. Because most common attic insulation materials do not stop air, the insulation must also be installed in complete contact with the air barrier that it is intended to insulate (in most cases the ceiling) in order to be effective against heat flow.

attic area 1: The attic is under-insulated. Add 6 inches of loose-fill cellulose insulation to attic where needed in order to bring the entire attic up to the desired level and to ensure consistent performance.

attic area 2:

attic area 3:

attic knee walls:

Knee walls are vertical walls between interior conditioned space and the attic. Knee walls are critical areas in your thermal barrier because they protect against differences in temperature between the interior and your attic, which is even hotter than the outside air in the summer, and because they are often insulated less than your horizontal attic insulation because the framing of the wall will only allow at most R-19 insulation (your horizontal attic insulation should be at least R-30). This makes it important that what insulation you do have in your knee walls is installed properly, in full contact with the air barrier it is intended to insulate (drywall), and without any gaps.

knee wall area 1: Repair and secure existing insulation batts in attic knee wall that are not performing to ensure continuous thermal and air barrier alignment and to eliminate gaps.

knee wall area 2:

insulation baffles:

Baffles at lower attic vents (eve vents and lower o'hagen vents) allow attic insulation to be installed to the edge of the house and protect the insulation from wind through the vents. Wind through these lower vents can diminish the performance of the insulation in those areas and can actually push loose fill cellulose insulation back from the edge of the house, leaving under- or un-insulated ceiling between the interior and the attic. Baffles direct the air over the insulation and into the upper part of the attic where it can vent out, exhausting heat from the attic.

Baffles at lower attic vents must be repaired in order to effectively prevent wind from disrupting the attic insulation and diminishing its performance.

attic access:

The access between the interior of the house and the attic is often a weak point in the thermal barrier. The door or hatch should shut snugly, with a gasket to prevent air leakage and insulation to slow heat flow. Insulation should be attached to the hatch so that it remains in place when the access is used. Additionally, insulation dams should be installed at each attic access, especially when the attic is insulated with loose fill, to prevent insulation from falling into the house and to ensure that insulation can be installed right up to the access at full depth. Insulation dams should also be constructed at any area where the ceiling height varies to ensure loose fill insulation can be installed to full depth over the entire attic.

access: Attic access lid(s) are not insulated and/or air sealed. Insulation and/or sealing of attic access lid(s) must be installed in order to eliminate this area as a weak spot in the thermal/air barrier.

insulation dam: Rigid insulation dam must be installed to contain loose-fill attic insulation and to ensure proper insulation levels at interfaces of varying ceiling levels.

air barrier: *A continuous air barrier is critical to the performance of your home and its resistance to heat flow. The air barrier stops air movement and is required for the insulation to perform properly. Because common insulation materials like fiberglass and cellulose do not stop air flow (though they may filter the air moving through) and because they are only effective against one type of heat flow--conduction--insulation must be installed in conjunction with and in contact with an air barrier. In the walls, the air barrier is the interior drywall or sheeting. In the attic, it is usually the ceiling drywall. Problems occur when architectural and framing details are added, such as double-framed walls, drop ceilings or soffits, utility chases, arches and other details. Similarly, areas where garage attics meet second story floor systems and where porch attics meet exterior walls are problems. Every square foot of the boundary between conditioned interior space and unconditioned space must be intact and consist of insulation and air barrier in order for your house to perform as designed.*

soffits, chases, double walls: Air barrier and thermal barrier are misaligned at the attic. To perform as designed, insulation must be in continuous contact with a rigid air barrier (usually drywall). There are areas where a rigid air barrier must be installed in the attic to allow for the proper alignment of air barrier and thermal barrier. Ensure proper alignment with insulation to separate conditioned space from unconditioned attic space.

floor to attic interface:

house pressures: *Pressure imbalances in a house are the greatest driver of performance problems, even if they are the least known. Caused by a combination of natural forces like wind and stack effect (pressure difference caused by hot air rising), exhaust vents in the house, building tightness and duct leakage; high pressures can cause air leakage, degrade insulation performance, reduce the effectiveness and efficiency of your HVAC system, cause moisture and mold problems, and create unsafe situations by back drafting combustion gases and pulling in dangerous fumes from garages. Pressure testing of rooms, zones of the house envelope, and the entire building enables diagnosis of specific problems and is a great indicator of the performance of the house as a system because it takes into account the interaction between the HVAC system and the building envelope.*

operating pressure: The normal operating pressure (with reference to outside/ambient) of the building with the air handler running is outside of the normal range. A high negative pressure is indicative of a likely supply side leak in the HVAC system; a high positive pressure, of a likely return side leak in the HVAC system. High operating pressures with reference to outside can cause increased building envelope leakage, decreased HVAC efficiency, and internal pressure differences that can lead to comfort problems and potential health risks. HVAC sealing and addition of a passive fresh air intake to the return side of the system should be considered as possible solutions.

room pressures: The pressure (with reference to outside) of one or more rooms with the door closed and the air handler running is outside of the normal, acceptable range. High positive or negative pressures with reference to outside can cause increased building envelope leakage, decreased HVAC efficiency, and localized comfort problems and potential health risks. Install a return air pathway to each affected room in the form of a jump duct or a wall transfer grill to balance the pressure.

building air leakage: *High building leakage is a possible pathway for uncontrolled (or "natural") ventilation of a house and can adversely affect the overall performance by creating uncomfortable areas in the house, making the HVAC system less efficient, and allowing air containing unwanted fumes and particulate into the conditioned interior of the house. Especially when combined with pressure imbalances, high building leakage is a main contributor to poor performance and can be a good opportunity for improvement. Extremely low building leakage in absence of designed mechanical ventilation can also be a problem by contributing to poor indoor air quality, and leaks that do exist will be amplified by pressure imbalances, which is especially a concern when those leaks are in the area of dangerous or toxic fumes and particulate. While old windows and improperly installed or damaged windows and doors can be large leakage areas, newer windows are generally not very leaky. Special attention should be paid to leakage high and low in the building envelope, as well as leakage between the house and attached garage.*

natural ventilation: The rate of natural ventilation was calculated for this house and the rate is below industry standards. A passive fresh air intake duct should be installed on the return side of the duct system to add outside air to the building, especially if air sealing is performed.

zonal pressures (leakage): Pressure testing of various building cavities has indicated some connection between conditioned space and unconditioned space. This result points to specific areas of potential air leakage and diminished thermal performance of the building envelope. Air sealing is recommended.

III. HVAC

duct & HVAC leakage: *Leakage in the HVAC system is a main contributor to excessive pressure imbalances and thus poor building performance. Supply side leakage of a supply system located in unconditioned space, in addition to affecting pressure balance, also represents a direct loss of conditioned air and energy from the system. Likewise, return side leakage of a return system located in unconditioned space, in addition to pressure, affects the quality of the air in the system by drawing air from adjacent areas into the house and reduces the efficiency of the system by introducing air that must be cooled or heated to a greater degree than the system is designed. Air sealing to reduce HVAC leakage is a good first step to improved performance of the house as a system.*

duct blaster: Duct leakage testing using a Duct Blaster fan was conducted and tested duct leakage is acceptable.

return: Duct pressure was tested using a pressure pan at return register(s) to determine if a specific zone of the return duct system is connected to unconditioned space. The pressure measured indicated there is localized leakage in the return duct system. These areas may require sealing with duct mastic to reduce leakage and improve the performance and efficiency of the system.

supply: Duct pressure was tested using a pressure pan at supply register(s) to determine if a specific zone of the supply duct system is connected to unconditioned space. The pressure measured indicated there is localized leakage in the supply duct system. These areas may require sealing with duct mastic to reduce leakage and improve the performance and efficiency of the system.

duct inspection:

HVAC duct condition in a forced air system has a great impact on the performance of the heating and cooling system as well as the building as a whole. Damaged ducts can restrict air flow, reducing the efficiency of the system and shortening the life of the equipment. Disconnected ducts obviously will not deliver conditioned air to a part of the house, but will also cause pressure imbalances that further affect home performance negatively. Likewise, duct work that is not protected against heat gain or heat loss by being properly insulated, or duct work that is subject to excessive heat gain by being in contact with the roof deck in the attic or is subject to direct solar gain is an area of decreased performance and an opportunity for improvement.

leakage: Flex duct sealing is required to reduce leakage and improve the performance of the system, which will improve the energy efficiency of the home and increase comfort.

damage: Duct condition was found to be good with no areas of damage or restriction that require attention.

location: Duct work was inspected for areas of contact with roof deck and no contact was found.

insulation: Duct insulation was inspected and is found to be installed and in good condition.

HVAC equipment:

Not only does HVAC efficiency degrade over time to levels below the rated efficiency, HVAC efficiency has increased greatly in recent time. Just last year, the minimum efficiency of an installed A/C unit increased 30% from 10 SEER (seasonal energy efficiency ratio) to 13 SEER. Units that are 10 years old are good opportunities for replacement and overall improved performance. In order to minimize decreased efficiency, units should be serviced yearly and preferably twice--at the beginning of the cooling season and at the beginning of the heating season. Also, filters should be kept clean--a good rule of thumb is to replace or clean monthly, though each home is different. If the filter is excessively dirty, this is indication of another problem related to leakage and pressure imbalance.

leakage: HVAC units require air sealing to eliminate leakage points and to improve performance.

condition: Due to the age and condition of the HVAC equipment, it is recommended that replacement is considered. A new unit will be substantially more energy efficient and will result in lower utility bills, quieter operation, and greater comfort.

maintenance: Service has been performed on the HVAC equipment within the past 6 months. A maintenance visit should be scheduled twice a year.

filters: Air filter(s) at return air inlet are dirty and should be replaced. Filters should be replaced at least once a month or more frequently as necessary to ensure optimum system performance and efficiency.

fresh air:

An outside air intake (or fresh air) is installed on a house to ensure improved indoor air quality and to balance building pressure by bringing in a small, controlled, energy insignificant amount of outside air. This intake is especially important on houses that are very "tight" and do not have uncontrolled ventilation ("leakiness") to compensate. Fresh air is recommended on houses that lack uncontrolled ventilation and new houses that are built tighter due to the materials and methods now typically used. A house can only be too tight if it is not appropriately ventilated with fresh air. A fresh air system, in addition to an intake duct to outside, should consist of a filter for the introduced air and a special "fan cyclor" thermostat that ensures that the fan is bringing in the appropriate amount of air each hour, even on mild days when the system is not actively heating or cooling.

Fresh air intake should be installed on return side of HVAC system to bring required amount of outside air into house and normalize house pressure.

fan cyclor: An air cyclor switch should be installed in order to control operation of fan and ensure proper amount of outside air is being brought into house via fresh air intake on an hourly basis.

filter: Air filter(s) are missing from fresh air intake and should be installed.

t-stat:

Digital programmable thermostats save energy. They are especially effective when coupled with a time-of-use electric utility rate plan.

A digital, programmable thermostat should be installed. New programmable thermostats use less energy by allowing the system to be set so that it is running less when the house is unoccupied, reducing energy consumption.

water heater:

The water heater appears to be in good condition and operating properly. Any concerns about the condition or performance should be addressed with a licensed plumber.

IV. Miscellaneous

lighting:

Lighting represents an easy and effective way to improve energy performance. Compact fluorescent light (cfl) bulbs use 1/3rd the energy of a comparable incandescent bulb and give off much less heat, plus they last longer. Improvements in cfl bulbs has created light of a similar color temperature to incandescent bulbs and bulb shapes that mimic traditional shapes (you do not have to settle for the curly bulbs anymore). Timers on outdoor lights allow you to program them to automatically be on at night and off during the day, and are great for making your home appear occupied when you are away.

Installing compact fluorescent bulbs will save substantial energy compared to lighting with conventional incandescent bulbs.

V. Energy Saving Tips

Monitor your refrigerator and freezer temperature and keep the refrigerator between 38 and 42 degrees F and the freezer between 0 and 5 degrees F. This will ensure maximum performance and efficiency as well as food safety.

When buying a new refrigerator, look for the Energy Star label. If your refrigerator is 10 years old or more, you stand to gain considerably in energy efficiency by replacing with a new Energy Star labeled unit.

Running fans in the house during the summer will make you feel cooler at a higher indoor temperatures. Remember, though, that they do not cool the space so turn them off when you are not in the room.

Set your cooling thermostat at 78 degrees or higher when you are home and set it up 2-3 degrees when you are away.

Turn off lights, televisions, computers, and other electricity users when they are not in use. Turn off power strips when the devices are not in use.

Use exhaust fans to vent moisture created by showering and cooking. This will help indoor air quality and will reduce the cooling load by removing warm, moist air from the house.

