

GEHMAN

CUSTOM REMODELING

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Date of inspection: 1.13.2010

Customer name(s): John & Eleanor Gallagher

Building Address: 352 Yoder Road Harleysville, PA 19438

Approximate building age: 40

List of customers concerns with respect to the building:

1. The kitchen is cold.
2. Family room sliding door and fireplace leak.
3. Powder Room fan leaks cold air into the attic.
4. Air leaks from under dining room window.
5. The foyer closet feels cold.
6. The laundry room doggie door leaks cold air.

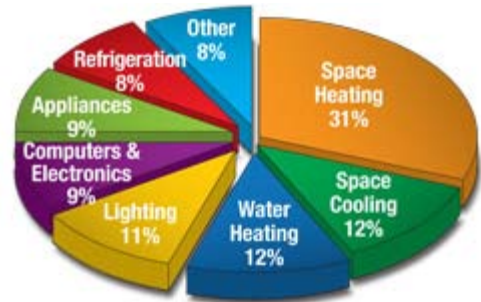
Introduction

With the onset of electric deregulation in Pennsylvania looming and the cost of fossil fuels volatile, Gehman Custom Remodeling has prepared this report in the hope of providing you with a practical approach to making your home more energy efficient and therefore saving significant future expenses. Before discussing the countless new products offered that increase efficiency, we suggest taking the obvious approach of assessing the basics of conservation.

Inasmuch as we take a "whole building" approach to the process, we've divided this analysis into three categories: thermal building & pressure envelope, mechanical systems and technology.

Heat is lost through conduction (moving through object from a hot surface to a cold one), convection (moving through a fluid like air or water from hot to cold), and radiation (transferred through space). How does this affect you?

Windows serve as a good example since approximately 30% of the energy lost within a building moves through the windows. Standing before a window on a



cold sunny day, you feel radiation as the sun warms your face, conduction as you touch the cold window frame transferring your heat into it and convection as the wind howls outside causing cold air to enter between the sash at the meeting rail giving you a chill as the air sinks past you toward a cold air return intake in the HVAC system.

Along with the pressure provided in the building by the wind pushing through the thermal barrier and the HVAC system; air, water vapor and heat rise through the building in what is often referred to "stack effect" wherein like a chimney, warm air rises looking for a way out.

So how can we make a difference?



- Improve the building's thermal & pressure barrier (and therefore resistance to heat loss or gain through conduction, convection and radiation) by adding insulation, replacing single pane windows with more efficient low emission argon gas filled thermopane units, replacing non-insulated doors with insulated ones, adding Tyvek building wrap to eaves, knee walls and crawl spaces to reduce air infiltration, etc.

- Reduce unwanted moisture and air leaks from the outside the pressure barrier and the leaks from inside into the attic: with caulk, foam, weather stripping, building wrap, sealed attic hatches, etc.

- Upgrade the efficiency of mechanical systems by sealing ductwork, cleaning ductwork, replacing filters, or replacing inefficient equipment.



- Reduce unwanted moisture inside the building and improve air quality by installing a heat recovery ventilator (HRV), exterior discharging kitchen and bath fans, etc.

- Adding new technology to increase the efficiency of appliances, lighting, heating, cooling or to even produce electricity with photo voltaic panels selling it back to the power company.

Executive Summary

Your home appears to have been built within the code requirements that were in effect at the time and has been reasonably well maintained since. That said, the insulation requirements under the code today well exceed the insulation that is present within the building. On the plus side, both the hot water heater and boiler have been replaced with more efficient models and a reasonably efficient air conditioning system has also been installed. Also the thermostatically controlled attic exhaust fan is an excellent addition to help maintain a cool home in the summer.

Along with the need to improve the insulation, especially within the attic and at the basement band joist, taking specific steps (set forth hereinbelow) to reduce air infiltration are also very important.

Safety

A safety inspection was conducted on the mechanical equipment within the basement mechanical room with excellent results.

**No ambient CO (carbon Monoxide) was detected.
No leaks were detected in the natural gas supply lines.**

We recommend the addition of an energy recovery ventilator (ERV) in addition to air sealing of the house to economically introduce fresh air into the building.

You should periodically test your home for radon gas.

And we also recommend the installation of a carbon monoxide detector on the sleeping level, even though no ambient CO was detected during our inspection.

The distinctive odor of mildew was present within the basement. It appears that the refrigerators have mold. No other water infiltration problems were noticed.

We recommend carefully cleaning the refrigerators.

Thermal Building & Pressure Envelope.

Blower door testing was performed on the building. Under the current recommended guidelines, the building airflow standard (BAS) should equal **1840 cubic feet per minute (cfm)** of leakage with the building depressurized to -50 Pascal's. The target reduction for optimal efficiency would be **1288 cfm**.

The actual amount of air leakage was 3940 cfm, more than double the standard and more than triple the target rate, and



equivalent to 236 complete air changes per hour during depressurization.

That area of leakage within the house is 442 square inches equal to a hole in the pressure boundary of approximately 3'0" x 3'0".

Specific suggestions for increasing the effectiveness of the thermal and pressure boundary include:

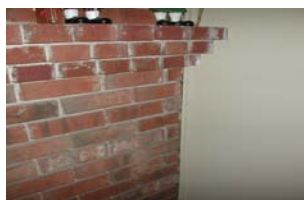
- The main attic above the house appears to have 6 inches +/- of insulation. Current building code requires approximately 12 inches or R-38. **We recommend installing an additional 12 inches of cellulose insulation over the existing insulation, mounding the insulation over the air conditioning ducts to prevent the cold air from migrating down through the registers during the winter.**
- Sealing all visible gaps in windows, doors and any other envelope penetration with weather stripping, caulking or foam especially:

- **Sealing the exterior penetration of condensation and freon pipes leading to the air conditioning condensers.**
- **Removing the failed copper weather stripping and installing new exterior mounted weather stripping and door sweeps on the front, side and garage doors.**



- **Installing ½ inch x 4 foot x 8 foot Thermax foil faced insulation board within the garage attic against the house wall, taping the joints to increase the wall insulation to prevent air leaks.**

- **Installing a locking mechanism on the family room sliding door and adjusting the door so that it closes tightly against the jamb.**
- **Caulking the exterior of the family room sliding door with clear silicone caulking.**



- **Caulking between the brick and gypsum wall board within the family room with matching colored caulking.**

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- **Repairing the broken basement window glazing.**
- **Caulk the gap between the wall and the kitchen backsplash.**
- **Removing the exterior outlet covers and switch plates, caulking between the plastic box and the gypsum wall board, purchasing and installing foam gaskets behind the plates and child-proof plugs.**
- **Caulking cracks around family room skylights.**



- **Insulating the top four feet of the exposed basement wall within the mechanical room with 2 inch x 4 foot x 8 foot Dow extruded polyurethane panels.**

- **Preventing air infiltration at grade (basement) by removing the existing fiberglass insulation, foam sealing the sill plate to the foundation wall, foam sealing the floor joists to the rim board then replacing the insulation.**
- **Purchasing a cover from battic.com for both the attic stairs and whole house louver.**
- **Replace the exterior laundry room door unit.**
- **Installing foam insulation within the exterior kitchen fan that is no longer in use.**



- **Installing foam insulation at the ceiling level beside the chimney within the mechanical room.**

Mechanical Systems.

Combustion gas testing was conducted on the hot water heater and boiler.

The flue gas from the hot water heater contained only 2 parts per million of CO and reported an 82% operating efficiency.

The flue gas from the boiler contained only 3 parts per million of CO and reported an 83% operating efficiency.

Both appliances were tested for spillage and draft under worst case depressurization and passed.

The supply and return pipes for the hydronic heating system and potable hot water have been partially insulated. **We recommend insulating the pipes completely.**

A gas insert has been installed within the masonry chimney. Since the flue is open, draft effect is drawing cold air down the chimney when the fireplace is not in use. **We recommend discussing methods of air sealing the fireplace frame with the fireplace manufacturer.**

Technology:

Fixtures, bulbs, appliances and equipment are now all manufactured to use less electricity. In many cases the home has been converted to CFL and LED bulbs. **We recommend continuing that process as incandescent bulbs blow out.**

Two set back thermostats have been installed. **We recommend a third be installed.**

When other appliances within the home require replacement, **we recommend Energy Star appliances be considered, especially the extra refrigerators within the basement. If and when the dishwasher is replaced, consider purchasing a model that heats the water above 160 degrees Fahrenheit. This will allow you to turn the set temperature within the domestic hot water heater to 120 degrees Fahrenheit while maintaining a sanitary kitchen.**

**Encl: Thermal images
Keystone Helps contact information**

More information is available from any number of sources on-line including:

www.energystar.gov Energy Star
www.bpi.org Building Performance Institute
www.usgbc.org United States Green Building Council
www.nahbgreen.org National Association of Home Builders
www.greenadvantage.org/ Green Advantage
www.nari.org National Association of the Remodeling Industry
www.greenandsave.com/ Online energy savings calculator
www.ecoaction.gc.ca Canadian Government savings calculator
www.keystonehelp.com

Thank You for allowing Gehman Custom Remodeling the opportunity to assist you in making your home more energy efficient. Please feel free to contact us for pricing to construct any of the suggested improvements. Gehman Custom Remodeling is Montgomery County's leading green designer and builder with 20 years of unparalleled success creating one of a kind sustainable solutions. We specialize in the design and management of complex construction projects including: home additions, new construction, whole house makeovers, kitchen, bath and weatherization.

Philip Barbay, Certified Professional, Building Performance Institute, Inc.

