Energy Audit Report For:

Colby College
75 Mayflower Hill Drive
Waterville, ME. 04901
207-859-5008

4/21/10

Report Conducted by: Home Energy Evaluations
267 Skowhegan Road
Fairfield, Me. 04937

Energy Auditor: Gerry Smith
State of Maine certificate # RA1105

Home phone: (207) 453-6802
Cell phone: (207) 399-9145

Web: HomeEnergyEvaluations.com
Email: info@homeenergyevaluations.com

Experience:

- Over twenty years in conducting residential energy audits for Maine Utility Companies and Maine Housing Weatherization Programs.

- Former Community Action Weatherization Coordinator

- M.S.H.A. Certified Senior Residential Energy Auditor

- HUD Certified Section 8 Housing Inspector
**Introduction**

Creating an energy efficient home begins with the heated envelope of the building structure.

First, the heated envelope must have a continuous air barrier. Air barriers consist of walls, ceilings, floors, doors, windows, or any barrier that prevents warm heated interior air from escaping to the exterior, or from entering the unheated areas of your home. The blower door pressure test calculates the air inflation rate and reveals where the voids in the air barrier are the greatest.

Second, the heated envelope must have a continuous insulation or thermal barrier to prevent heat flow to the exterior. The rate that insulation slows heat flow is shown in R Values. The greater the “R” or resistance value is, the more heat that is contained within the heated envelope. The infrared thermal imaging camera reveals where there is little or no insulation in the thermal barrier, or where there is heat loss in general.

In order for the heated envelope to be energy efficient, and to prevent moisture problems, the air and thermal barriers must always be continuous and in contact with each other, having no voids between the two. A vapor retarder is placed on the warm side of the heated envelope whenever possible.

Insulating without proper air sealing first could lead to heat loss and possible structural damage from condensation. Once air sealing and insulation measures have been completed, the building will now be tighter and no longer capable of naturally venting excessive moist interior air to the exterior, raising the relative humidity. It is not uncommon to find condensation on windows or in attics, once insulation measures have been installed, if the walls or ceilings are not properly air sealed, or when ventilation codes are not followed.

**General building information:**

This one and a half story home, built in 1959, has a heated daylight basement. The house and domestic hot water supply is heated with 2007 Burnham Boiler. There are also two fireplaces, one in the basement, and one in the living room. Each fireplace, as well as the boiler, all have separate chimney flues. The house has a brick exterior, except for the back full dormer, which has aluminum siding. The roof is wood shingled. The basement is dry. The home was vacant at the time of the audit.

**Heating:**

The home and domestic hot water supply are heated with a 2007 Burnham Boiler and Amtrol hot water maker. This unit is in excellent condition and was recently cleaned and tuned.
Ventilation:

- Each bathroom that has a tub or a shower needs to have an exhaust system that is vented to the exterior to prevent moisture problems. Continuous ventilation will be needed to meet the ASHRAE standard 62.2 once the house has been weatherized. The ventilation rate is based on 15 CFM / occupant. Continuous ventilation can be provided by installing programmable switches to the new bathroom exhaust systems.

Health and Safety:

- Have the house tested for Radon prior to doing any air sealing.
- Keep humidity levels below 50% at all times.
- There is only one smoke detector in the home, and no CO, or Carbon Monoxide detectors existing. There should be one of each installed on each floor.
- The vinyl dryer vent hose should be replaced with metal flex hose.

Blower door pressure testing:

The blower door is a diagnostic tool designed to measure the tightness of the buildings air barrier and locate where the voids in the air barrier are the greatest. The blower door consists of a large fan, adjustable metal frame and nylon sheet that are installed into an exterior doorway. By bringing the house to a slight negative pressure, a manometer pressure gauge connected to the fan calibrates the homes air leakage rate.

The blower door reading for this building was 3978 CFM 50. In other words, with the building depressurized to 50 Pascals of negative pressure, it took 3978 cubic feet per minute of air going through the fan to bring the building to this pressure. By dividing this number by ten, we get a pretty good estimate of the sum of all infiltration holes throughout the building. In this building, there is approximately 398 sq. inches of hole between the interior and exterior. On average, a building this size and age should have a reading of approximately 2000 CFM 50. This is the targeted post weatherization CFM 50.

Areas of infiltration:

Fireplaces: The house was tested with both fireplaces closed off. The blower door reading does not reflect heat loss from the amount of heated air that escapes past each fireplace damper. Installing fireplace doors would help slow down the infiltration rate. Installing wood stove inserts would also be more energy efficient. Always make sure that the damper is completely closed when the fireplace is not in use.
**Recessed lights:** The existing recessed lights are not IC, or insulation contact rated. Replacing these lights with new IC rated units will slow heat loss into the attic and knee wall spaces, and allows more insulation to be added.

**Windows:** Most of the windows are single paned double hung Anderson windows with storms. These windows did leak when tested under pressure with the blower door. There is mold visible on the south side storm windows. Although window replacement would be a low priority, these windows should at least be considered for replacement. Please consider the following information:

- Windows are always a weak point in the thermal envelope. Even excellent quality Energy Star rated windows usually have an R value of around 4, versus a wall that is usually insulated to R-19 or so. This being the case, it will always feel cooler next to a window on a winter’s day. The larger the window area is, the more noticeable the temperature difference will be.

- East and South facing windows can add a tremendous amount of heat from solar gain.

- Unless a window is in poor condition, or, if the window has single paned glass and no storm window existing, replacing windows to save energy alone is not usually recommended as it is not always cost effective. On average, the cost of a new Energy Star rated window, including installation fees, is usually more than the dollar amount of energy saved over the lifetime of the window. Adding weather-stripping, caulking, sash locks, thermal shades, or storm windows is usually recommended over replacement.

- On the other hand, replacing windows that have an average R value of 2 with Energy Star rated windows will often increase the comfort level in the home and may add to the value of the home, but doing so would be considered an investment in comfort, and would not be considered a good investment for energy efficiency alone.

**Doors:** The three exterior doors should have new weather-stripping and door sweeps installed.

The knee wall and attic access doors need to be insulated and weather-stripped.
Infrared thermal scan:

The infrared camera is used to locate voids in the thermal envelope, and can identify where there is heat loss in general. Since this inspection process is limited to a non-destructive energy evaluation of the home, we make no guarantee that anomalies detected with the Infrared Imaging Camera will offer conclusive evidence that there is, or is not, the presence of insulation in any wall or ceiling cavities. Please see the enclosed IR report for testing results.

Thermal barrier / existing insulation:

- The foundation walls and box sills are not insulated. An 8” thick concrete wall only has an R Value of about 1.5. Most of the foundation wall located in the front of the home is below grade, which is partially insulated from the earth. The sides and back foundation walls are exposed and account for a great deal of heat loss. The front wall should be insulated from the box sill, down to at least two feet below grade. The sides and back walls should be fully insulated to at least R 10. All of the box sills should be insulated to R-19.
- The exterior 2”X 4” walls are insulated with 2” fiberglass batts. Most of these walls have brick siding. There are very few practical options for increasing the R value of these walls.
- The second floor knee walls are insulated with 2” fiberglass batts also. As these walls are very accessible, I would suggest removing the existing insulation (which can be used in other locations, such as the basement box sills) and furring out the walls to accept 6” thick, or R 19 fiberglass. The existing insulation has the vapor barrier facing the cold side of the wall. The vapor barrier must always face the heated side of the wall.
- The knee wall access and the door to the attic space from the cedar closet needs to be insulated and weather-stripped.
- The knee wall / attic floors are 12”s deep and have different combinations of rock wool and fiberglass batts existing. These floors should be insulated with dense packed cellulose insulation.
- The attic flat needs to have a dam installed around the perimeter to allow for more insulation to be added. The attic flat should be insulated with approximately 15”s of cellulose insulation. Insulation over the back dormer should also be added as possible. This area should also be ventilated.
- The laundry chute perimeter needs to be insulated. The insulation removed from the knee walls can be used for this task.
Inspection Report

Report Date 4/21/2010

Company Home Energy Evaluations
Address 267 Skowhegan Road
Fairfield, ME. 04937
Thermographer Gerry Smith

Customer Colby College
Site Address 75 Mayflower Hill Drive
Waterville, ME. 04901
Contact Person Gus Libby 207-859-5008

Image and Object Parameters

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Text Comments

Description

This infrared picture is in the finished section of the basement. The picture shows a dark wall cavity between the studs. With IR, gold indicates heat, and the dark sections are cold, or un-insulated. This wall appears to have no insulation existing.
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**Text Comments**

**Description**

This is an IR picture of the living room wall. As the studs are darker than the wall cavity, the wall is partially insulated. The wall cavity is approximately 4"s thick, and the insulation is estimated to be 2"s thick.
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Contact Person: Gus Libby  207-859-5008

Image and Object Parameters

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Image Name: IR_0652.jpg
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Object Distance: 6.6 ft

Text Comments

Description

This infrared picture shows heat loss through the recessed lights. New recessed lights are sealed and rated for insulation contact, as these are not. All recessed lights that are connected to unheated areas should be replaced with IC rated units.
Image and Object Parameters

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Text Comments

Description

This is an IR picture of the second floor dormer wall. The gold color in between the darker studs shows at least some insulation existing.
FLIR SYSTEMS

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Text Comments

Description

This is an infrared picture of the small kneewall access door, located on the second floor, in the back right corner room. This door needs to be insulated and weather-stripped.
Suggested weatherization measures listed by priority:

The enclosed Efficiency Maine audit report lists recommended tasks in order of energy savings. More information about the Efficiency Maine Program can be found at the website listed below.

http://www.efficiencymaine.com/residential_programs_mhpRR.htm

Having your home retested with the Blower Door is required by the Efficiency Maine Weatherization Program once weatherization measures have been completed. Once your home has been weatherized, the home will be tighter which will affect the relative humidity and how the house works as a system. Please do not hesitate to call us if you have any questions.

Thank you for choosing Home Energy Evaluations to guide you to a more energy efficient and comfortable home.

Sincerely;

Gerry Smith @ Home Energy Evaluations
# Energy Audit

**Audited Site**
Colby College  
75 Mayflower Hill Dr  
WATERVILLE ME 04901 4718  
(207)859-5008  
Site ID: S00000001272

**Prepared by**
Energy Auditor: Smith, Gerry  
Home Energy Evaluations  
267 Skowhegan Rd  
Fairfield, ME 04937  
(207)453-6802

**Date**
4/23/2010

## Recommendations

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<tr>
<th>Description</th>
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<td>3&quot; fiberglass batting</td>
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<td>50</td>
<td>$0.00</td>
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<td>6&quot; fiberglass batting</td>
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<td>Hatch: Polyisocyanurate 2 inch</td>
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<td>$20.00</td>
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<td>6&quot; fiberglass batting</td>
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<td>6&quot; of cellulose</td>
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<td>13&quot; of cellulose</td>
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<td>12&quot; of dense pack cellulose</td>
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**Totals:**  
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