



JOEGREEN ROADMAP TO ENERGY EFFICIENCY™

JOEGREEN Audit Team: Chris Henson

Audit Date: August 5th, 2010

Building: Proctor Elementary School

GOODNEWS:

We were able to diagnose the problem areas in your building during the Audit. We have listed the specific problems responsible for your energy efficiency issues as well as solutions targeted at reducing your energy bills and increasing comfort.



EFFICIENCY SUMMARY

WALLS

The insulation in the walls of the school appears to be in good condition. No action needs to be taken for improvement.

WINDOWS

Many of the “Pella” windows that have been installed are difficult to latch, and it is hard to tell if they have been latched properly without close inspection. Particular care should be taken that these windows are latched, as this is a very cost effective way to reduce potential heat loss.

CEILING

There are some areas for improvement on the ceiling, especially on the third floor roofline where there is little insulation in some large areas.

FURNACE

A mechanical optimization is needed for the entire heating system, including multi-zone control optimization, boiler reset devices, control mapping and scheduling, as well as the use of occupancy sensors. We at JOEGREEN will be happy to work with this engineer at no additional cost.



EFFICIENCY SUMMARY

BASEMENT

Because of the access available to the under section of the main building, there is a great opportunity to insulate this area relatively easy, making it a cost-effective measure.

DOORS

Several of the doors are in need of weatherstripping, which will aid in reducing air infiltration into the building, thus reducing heating costs.

OUTSIDE

The only significant finding outside was the missing fascia and gutter piece on the front of the building. This should be replaced to avoid any potential moisture issues around this area.

SOLAR

Large sections of the roof face in a south-easterly direction, and will be adequate to provide sufficient solar gain for photovoltaic systems. These arrays can also be further optimized by facing them directly to the south and tilting them to a 40 degree angle.

GEOHERMAL

Geothermal is not recommended for at this time due to a low cost to benefit ratio.

WIND

Wind applications are not ideal for this location due to the proximity of the tree line. A ground-based wind system that is able to reach above the trees would be ideal, but depending on the cost of installation may not be cost effective.

APPLIANCES

No significant issues were found with the appliances in the cafeteria or throughout the buildings.

WATER USAGE

No significant issues were found with water usage. Some options to reduce usage could be products such as tankless urinals, but these are not cost effective at this time.

LIGHTING SYSTEM

Most of the light fixtures have been converted to a "T-8" system, so much of the savings for lighting has already been realized. The next step for lighting would be automatic sensor controls and auto-shutoff systems.



YOUR PROBLEMS:

The Heating And Cooling Systems Are Not Optimized For Usage.

Insulation Is Needed Underneath Building (Where Accessible).

Single Paned Windows On The Sides Of The Cafeteria.

No Insulation On Some Of The Hot Water Pipes From The Hot Water System.

Some Of The Windows Are Unlatched, And It Is Difficult To Tell Whether They Are Latched Properly Without Checking Carefully.

Manual Thermostats Found In The Kitchen And Throughout The Building.

Both Wings On The Sides Of The Gym Need More Insulation. They Have Single Pane Windows And Direct Sun Exposure To The Air Handlers Stored There, Meaning Reduced Efficiency.

Single Paned Windows In The Rear Of The Cafeteria, In The Kitchen Area.

Conditioned Space Behind The Elevator On The 2nd Floor With No Insulation And Has A Manual Thermostat And A Radiator.

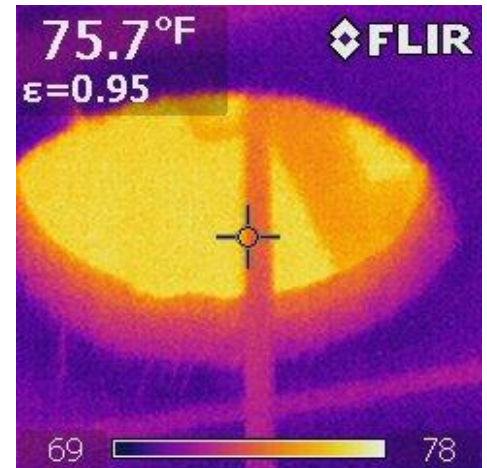
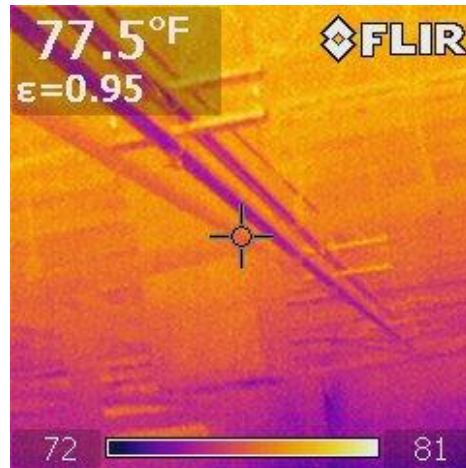
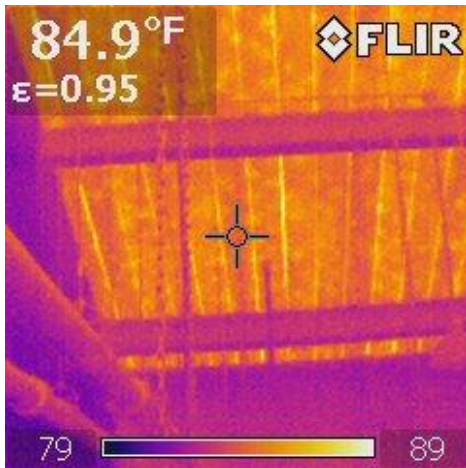
3rd Floor Needs Additional Insulation And Air Sealing Along Roofline.

Main Front Doors Need Weatherstripping.



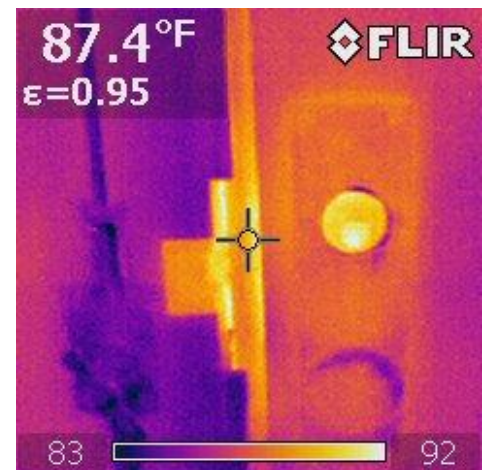
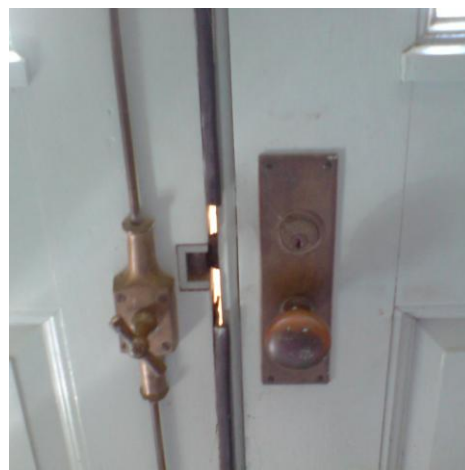
INFRARED DIAGNOSTIC

CAMERA USED: Flir 8-68 Thermal Imaging Device *Note that darker colors = cooler areas



Location: Basement

Observation: These pictures show the significant heat leakage through the floor above into the basement. These areas have decent access in most areas and can be insulated.



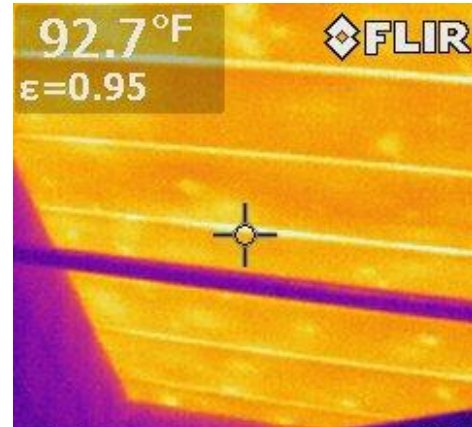
Location: Main Entrance and side entrance

Observation: These are pictures of the doors that need weatherstripping to reduce air infiltration. Note the daylight shown in between the doors.



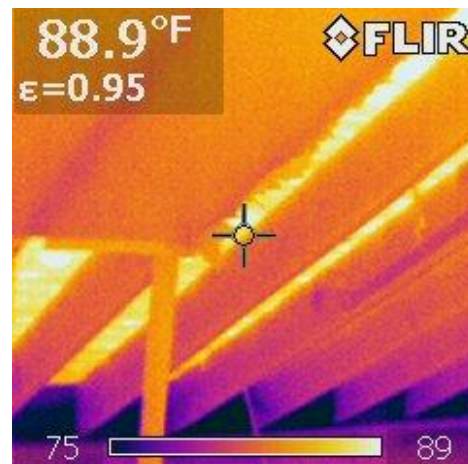
INFRAREDDIAGNOSTIC

CAMERA USED: Flir 8-68 Thermal Imaging Device *Note that darker colors = cooler areas



Location: Above the stage, on each side upstairs.

Observation: This wood is the only thing acting as insulation toward the air handlers stored in this space. This coupled with the single pane windows with excessive sunlight entering cause a large reduction in efficiency of the air conditioning.



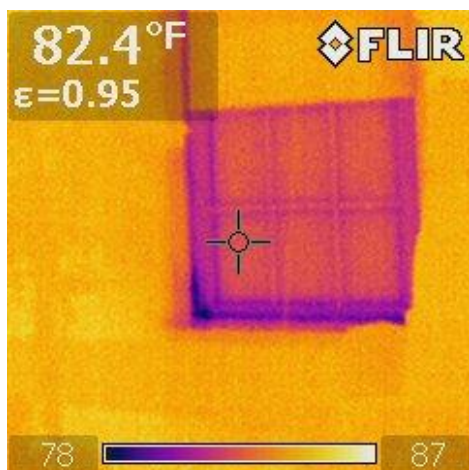
Location: 3rd Floor

Observation: These are the areas along the roofline that have little to no insulation, and are connected directly to the conditioned spaces on this floor.



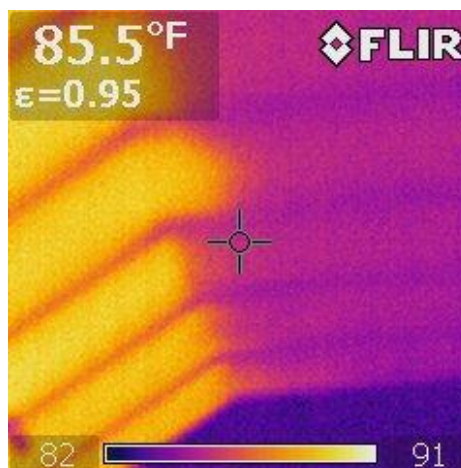
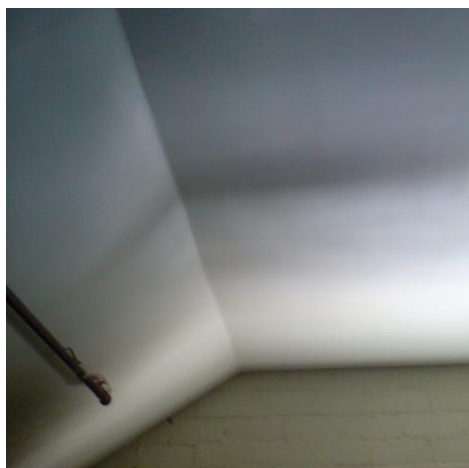
INFRAREDDIAGNOSTIC

CAMERA USED: Flir 8-68 Thermal Imaging Device *Note that darker colors = cooler areas



Location: Throughout building

Observation: These air leakages on the corners of the windows are caused by not properly shutting and latching the windows. More leakage can be felt along the top of the sash as well.



Location: 3rd Floor Roofline

Observation: Another example of inadequate insulation along the roofline of the building.

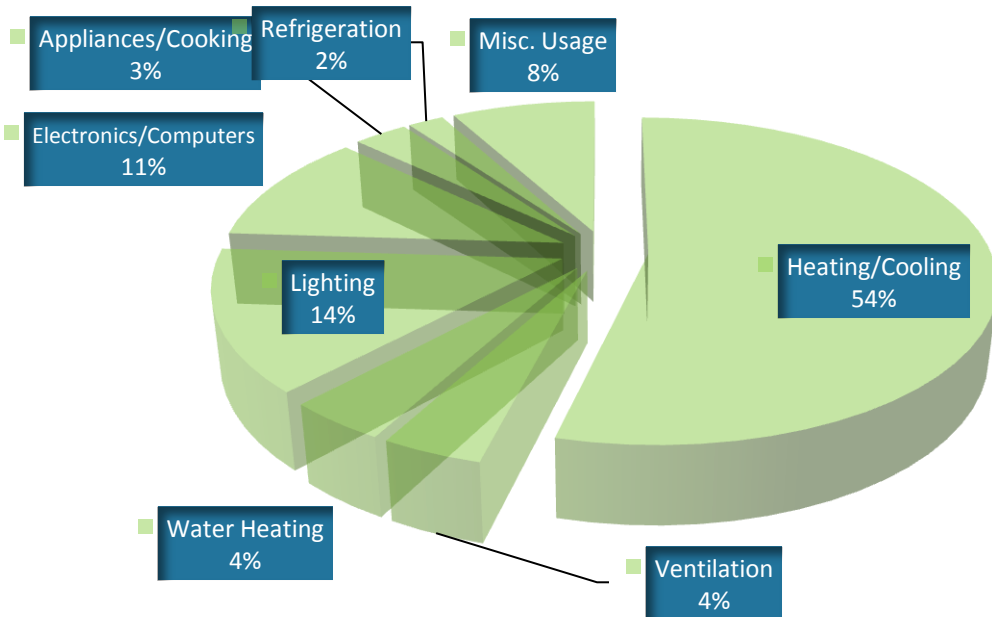
Additional Pictures can be found at www.photobucket.com/joegreenhome-TopsfieldProctor

Password: JOEGREEN

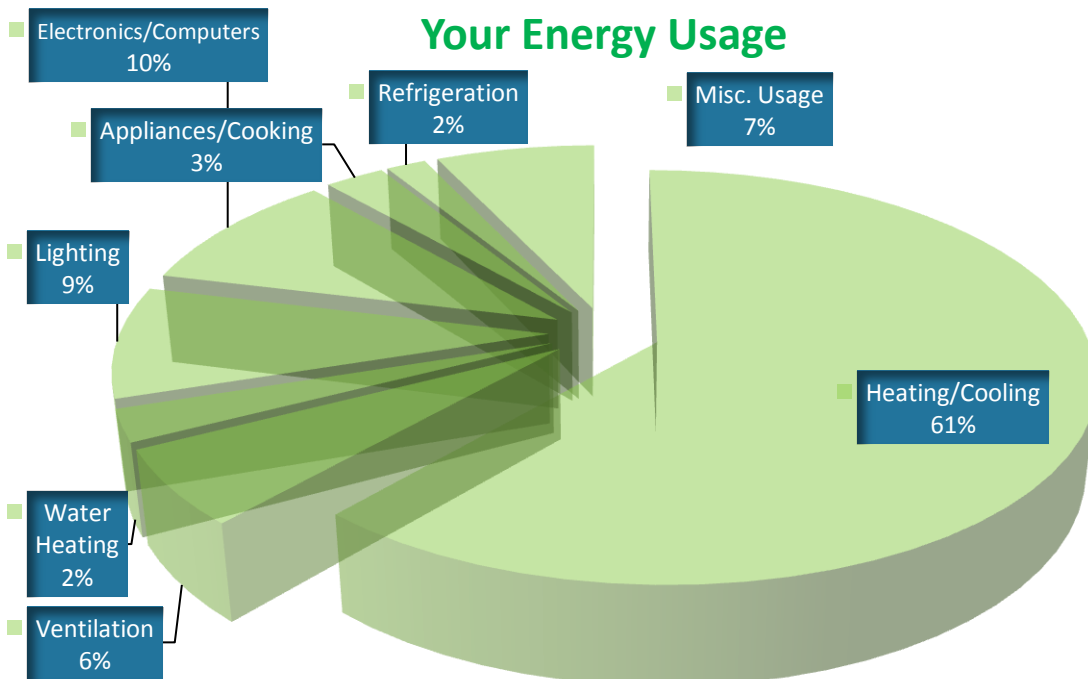


ENERGY USAGE COMPARISONS

Typical Energy Usage for New England Schools



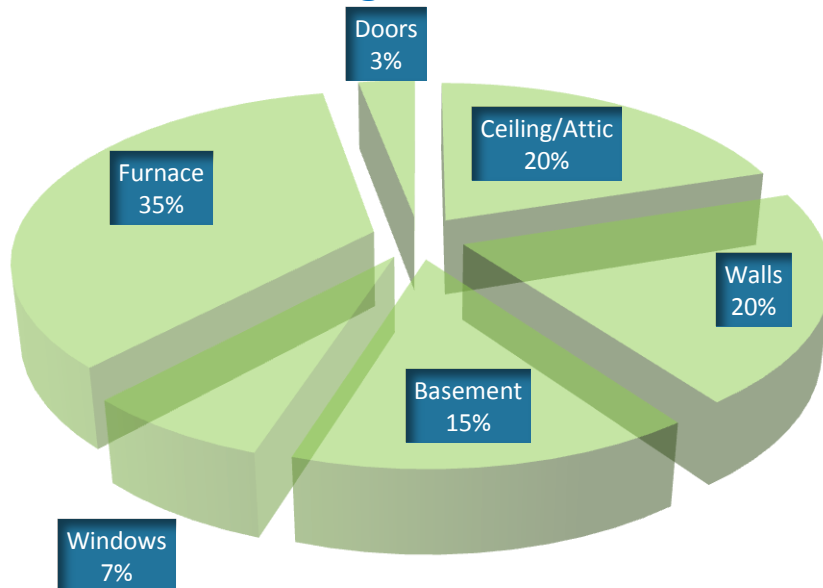
Your Energy Usage



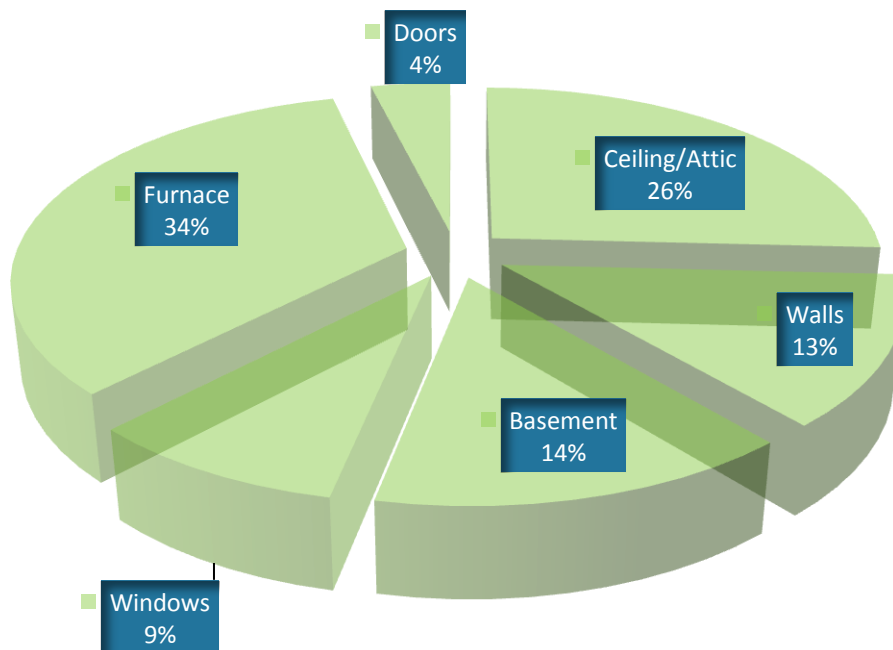


ENERGY USAGE COMPARISONS

Typical Heating and Cooling Loss Distribution for New England Schools



Your Heating and Cooling Loss Distribution





YOURSOLUTIONS:

Initial Investment *Per Year Savings* *% of Energy Savings*

Re-Design And Map The Heating System With A Mechanical Engineer Of The Town's Choosing. This Service Should Include Multi-Zone Control Optimization, Outside Temperature Reset, Zone Resets, And Occupancy Sensor Scheduling.	\$10200.00	\$10712.52-\$16068.78	10.00%-15.00%
Add Rigid Insulation And Spray Foam Applications To The Basement Ceiling. Add A Moisture Control Tarp On The Bare Floor Areas.	\$9600.00	\$1071.25-\$2678.13	1%-2.50%
Install A Storm Window System That Will Add An Extra Layer Of Thermal Insulation	\$2125.00	\$1071.25-\$2142.50	1%-2%
Add Pipe Insulation And Bonnet Caps Where Necessary To Better Insulate System	\$512.50	\$803.44-\$1071.25	.75%-1%
Train The Custodians On How To Properly Latch These Windows, And Have Them Check Each One Once Heating Season Arrives.	\$150.00	\$803.44-\$1071.25	.75%-1%
Install Programmable Thermostats	\$150.00	\$535.63-\$1071.25	.50%-1%
Install Solar Reflectors On The Windows With A Storm Window System, And Add Layers Of Rigid Insulation Along The Walls To Help Insulate The Air Handler System	\$2337.50	\$803.44-\$1017.69	.75%-.95%
Install A Storm Window System That Will Add An Extra Layer Of Thermal Insulation	\$1593.75	\$535.63-\$803.44	.50%-.75%
This Space Should Either Have The Heating System Here Disconnected And Sealed Off, Or Additional Insulation And Controls Should Be Added To This Area	\$850.00	\$353.51-\$707.03	.33%-.66%
Add A Layer Of Rigid Insulation Along The Roof Line (Behind The Ceiling Tiles) And Seal In Place With A Foam Application	\$1062.50	\$267.81-\$535.63	.25%-.50%
Weatherstrip Door To Reduce Air Infiltration	\$106.25	\$267.81-\$535.63	.25%-.50%



YOURSOLUTIONS cont'd:

Initial
Investment

Per Year Savings

% of Energy
Savings

	Initial Investment	Per Year Savings	% of Energy Savings
Add Solar Reflective Blinds To All Windows	\$5312.50	\$267.81-\$535.63	.25%-.50%
Add Rigid Insulation Along The Walls And Ceiling Of This Area To Add Efficiency To The Air Handling System	\$956.25	\$267.81-\$535.63	.25%-.50%
Install A Storm Window System That Will Add An Extra Layer Of Thermal Insulation	\$1593.75	\$214.25-\$321.38	.20%-.30%
Add Solar Reflective Material	\$796.88	\$107.13-\$321.38	.10%-.30%
Weatherstrip Door To Reduce Air Infiltration	\$106.25	\$214.25-\$321.38	.20%-.30%
Repair Gutter And Fascia Piece To Return Proper Water And Moisture Control Along The Front Of The Building	\$212.50	-	-

*These calculations are derived using proprietary software that models the energy usage of the building based on the conditions found at the time of the audit. Although behavioral variance has been accounted for, it cannot be fully predicted and may affect the actual savings achieved. **Please be aware that the percentage reductions achieved by each action are based upon that specific action alone. When multiple actions are taken the total percentage reductions achieved will be different from an arithmetic sum of the individual actions. Please be especially sensitive when adding projected dollar savings together as they are produced by multiplying the percentage savings by the historical dollar outlay resulting in a total that is only related to that one specific action and cannot be added to other projected dollar savings in a meaningful fashion. ***It is important to note that due to missing drawings for the building, all estimates are based on approximate values, and can only be used as a gauge of the level of work needed.***