



JOEGREEN ROADMAP TO ENERGY EFFICIENCY™

JOEGREEN Audit Team: Chris Henson

Audit Date: August 12th, 2010

Building: Steward Elementary School



GOODNEWS:

We were able to diagnose the problem areas in 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 in the building.

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

There is some air leakage coming from the base of almost all of the windows on the south side of the building. This can be fixed very easily by applying some caulk along the leakage points. It is also important to note that the temporary A/C units in the windows are not sealed very well, and are reduced in efficiency because of this.

CEILING

There is some leakage coming along the band joist piece above the ceiling tiles around the outer edge of the building. Sealing and insulating this area will greatly aid in efficiency.

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.



BASEMENT

The ventilation system in the mechanical room needs to be addressed, but no other actions are recommended for the basement at this time.

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

No issues were found on the outside of the building.

SOLAR

Large sections of the roof face in a south-westerly direction, and will be adequate to provide sufficient solar gain for photovoltaic systems. Also, the pitched roof areas around the front of the building face due south and are optimal for a solar system. The flat roof arrays can be further optimized by facing them directly to the south and raising them to a 40 degree angle.

GEOHERMAL

Geothermal is not recommended 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 throughout the buildings.

WATER USAGE

No significant issues were found with water usage. Some options to reduce include 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.



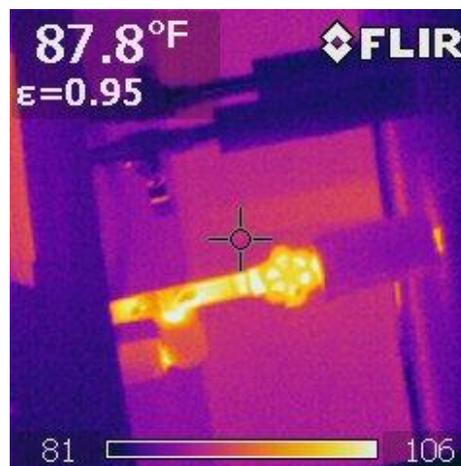
YOUR PROBLEMS:

The Heating And Cooling Systems Are Not Optimized For Usage
Reduced Efficiency From Kitchen And "Custodian Storage Area" Air Handler Units Due To Solar Heat Gain
Missing Pipe Insulation Causing Thermal Leakage
Thermal Leakage Along The Top Edge Of Building, Above The Ceiling Tiles
Excessive Thermal Leakage In Gym Area
Thermal Leakage From Single Pane Windows In The Cafeteria And Next To Several Doors
Gym Storage Area Shows Signs Of Excessive Thermal Leakage
Thermal Leakage From Cafeteria Roofline
Exhaust Vent In Mechanical Room Allowing Excessive Air Leakage Into Area
Air Leakage From Several Exit Doors
Air And Thermal Leakage From The Bottom Edge Of Some Classroom Windows



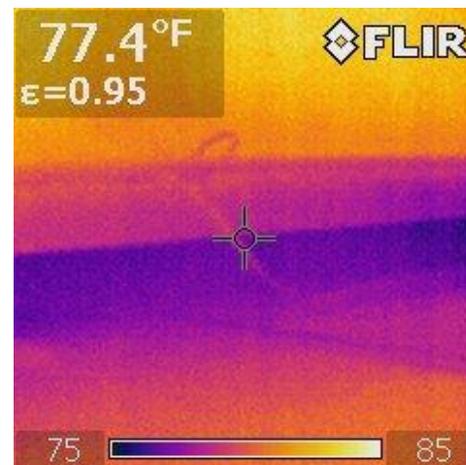
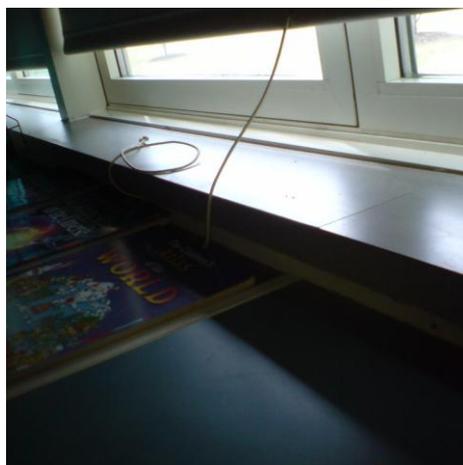
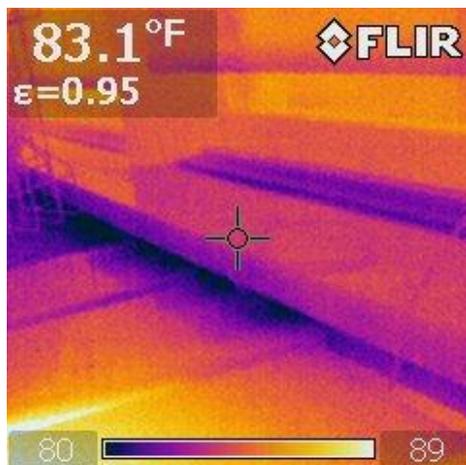
INFRARED DIAGNOSTIC

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



Location: Custodian's Closet across from "Mrs. Mulloy's" Classroom

Observation: These pictures demonstrate the heat loss from even a small area of heated pipe being uninsulated. Several of the pipes in the basement, especially the bonnets and connections, need to be insulated.



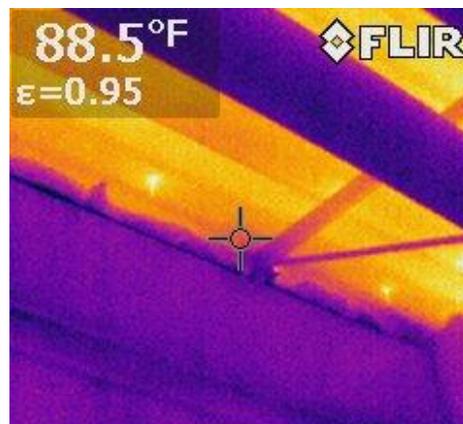
Location: Classroom Windows

Observation: These pictures are an example of the air infiltration from underneath the windows in many of the classrooms. This can be easily remedied by caulking the bottom edge underneath the "lip" formed by the window ledge.



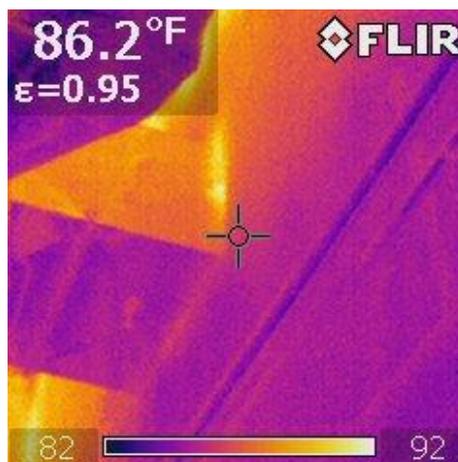
INFRAREDDIAGNOSTIC

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



Location: Gym storage area

Observation: The infrared picture demonstrates the heat loss/gain shown by the lack of insulation across the roofline. Note the bags of fiberglass stuffed along the edge. These are not an effective air barrier.



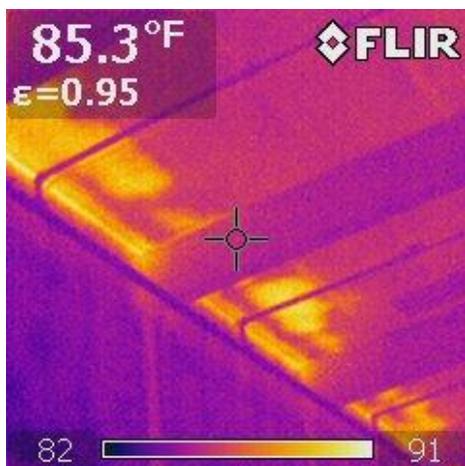
Location: Custodian's Closet

Observation: These air handlers, as well as those found behind the kitchen in the mechanical area, are being exposed to excessive solar heat gain, and are not sealed properly along the edges, as shown in the pictures above.



INFRAREDDIAGNOSTIC

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



Location: Gym

Observation: An example of the solar heat gain across the roofline of both the cafeteria and the gym. A solar reflector is recommended in these areas.



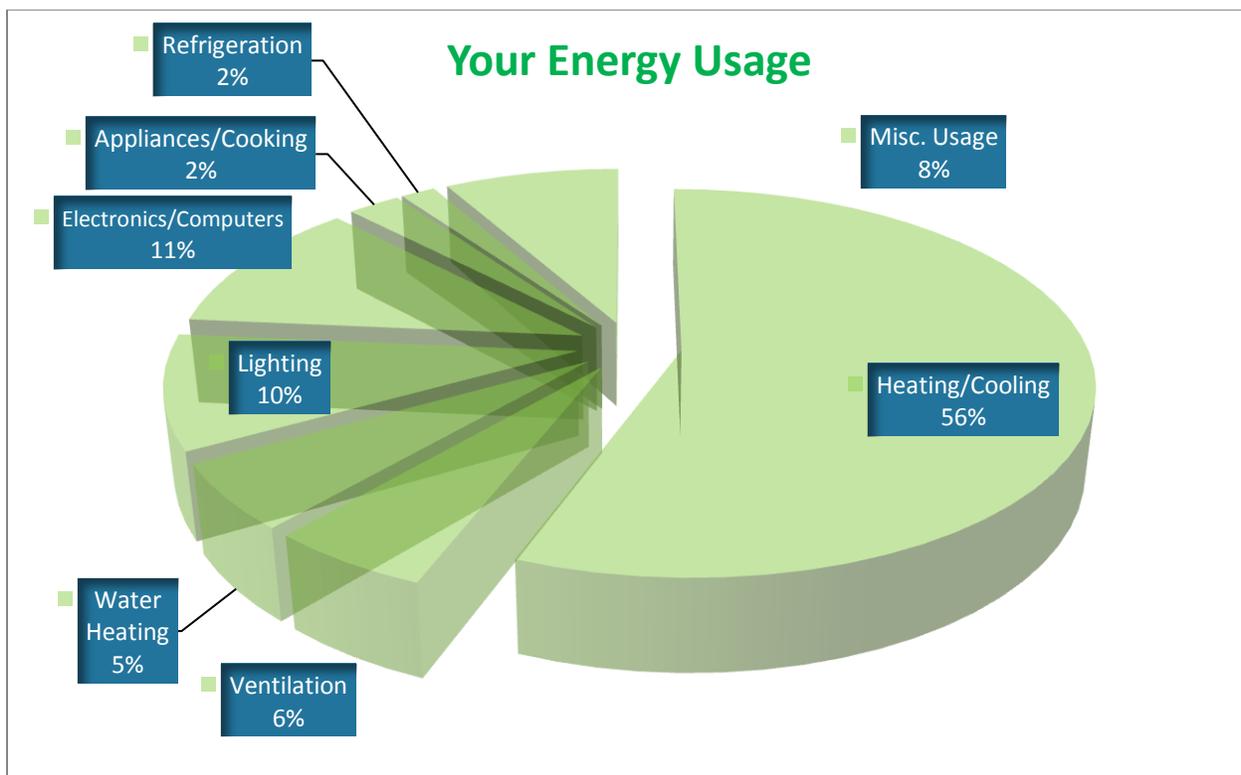
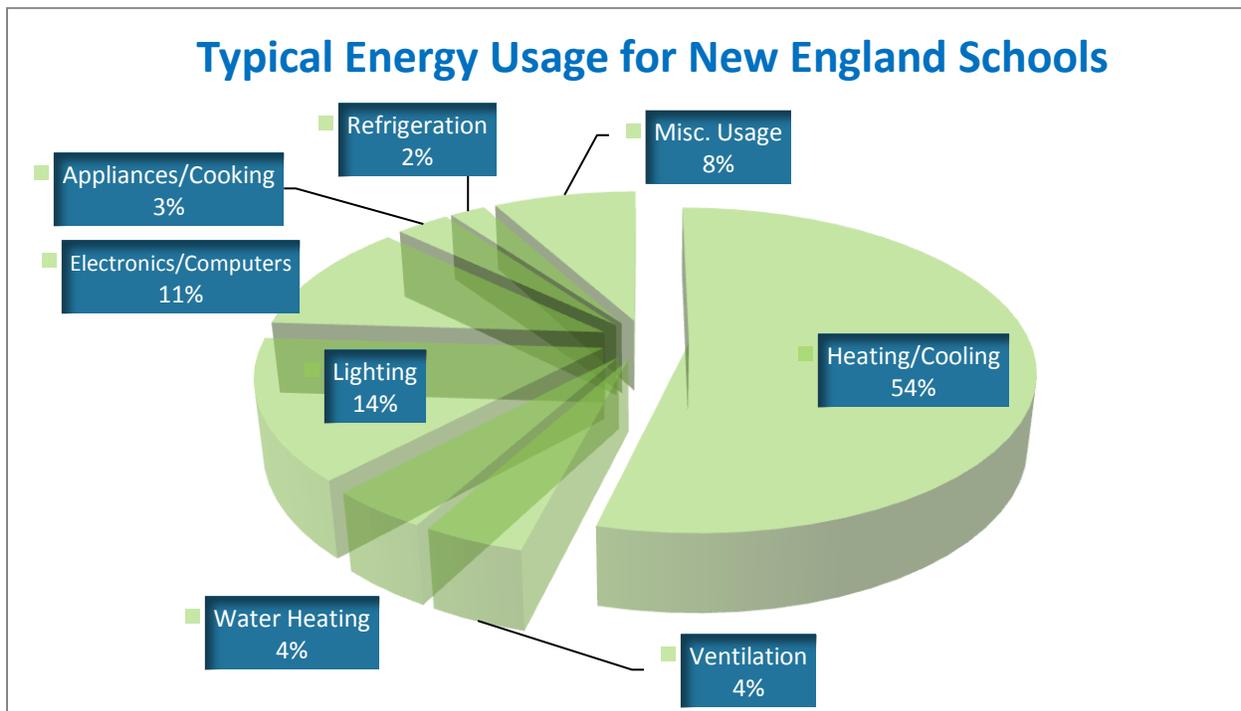
Location: Mechanical room behind the kitchen

Observation: This picture shows the thermal leakage across the single pane windows found in the building, as well as the solar gain to the air handler directly to the right.

Additional Pictures can be found at www.photobucket.com/joegreenhome-TopsfieldSteward
Password: JOEGREEN



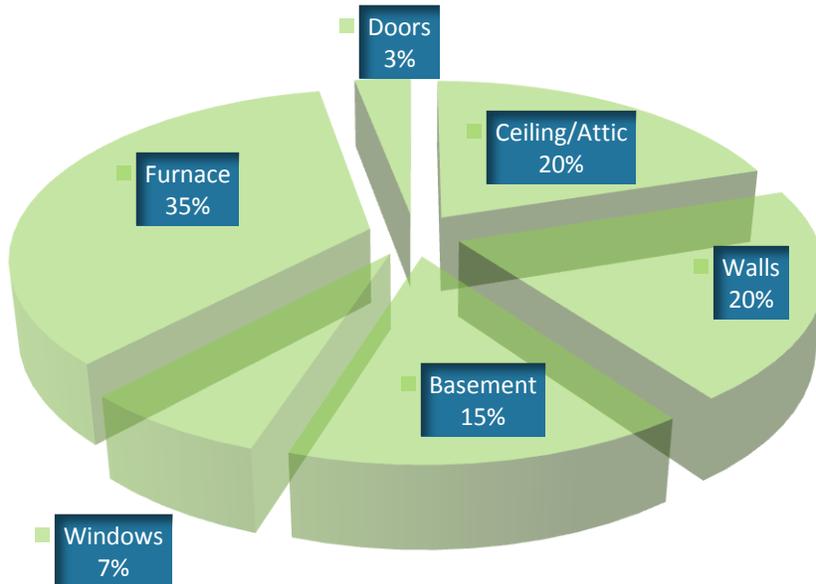
ENERGY USAGE COMPARISONS



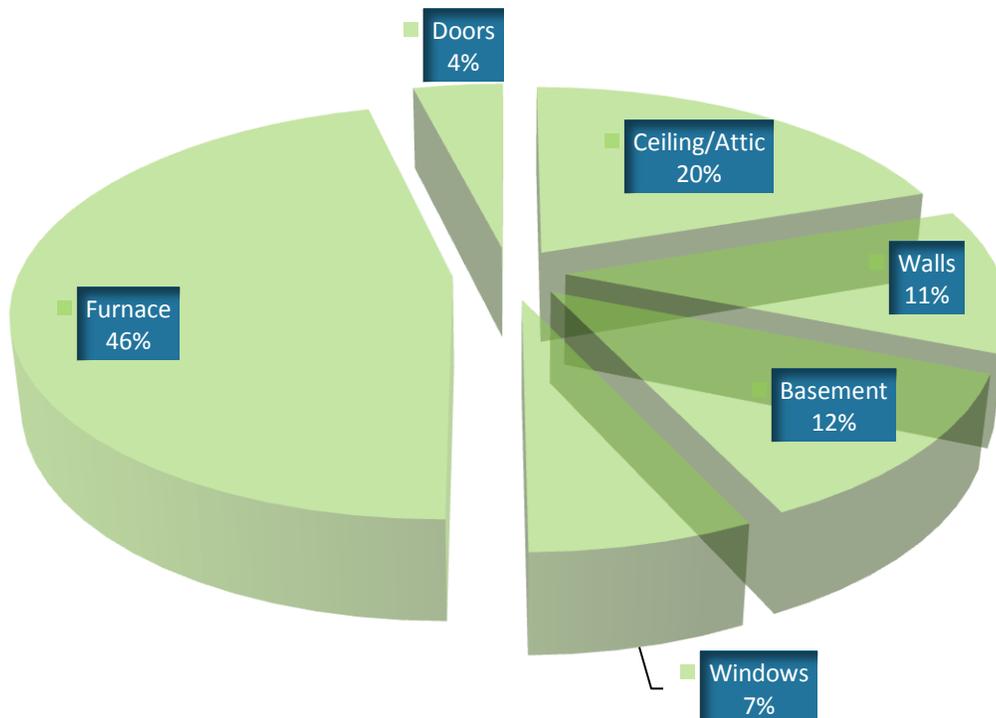


ENERGY USAGE COMPARISONS

Typical Heating and Cooling Loss Distribution for New England Schools



Your Heating and Cooling Loss Distribution





YOURSOLUTIONS:

	<i>Initial Investment</i>	<i>Per Year Savings</i>	<i>% of Energy Savings</i>
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.	\$8500.00	\$11691.04-\$20041.78	7.00%-12.00%
Install A Storm Window System On Windows. Install Solar Reflective Material To Reduce Solar Heat Gain On The System. Seal Ducting Pieces	\$3187.50	\$835.07-\$2087.69	0.50%-1.25%
Add Pipe Insulation To Missing Sections As Noted, Include Bonnet Covers Near The Boiler System To Increase Efficiency Of The Distribution System.	\$812.50	\$1336.12-\$1670.15	0.80%-1.00%
Insulate And Seal Along The Top Band Joist Piece Above Ceiling Tiles	\$5312.50	\$1252.61-\$1670.15	0.75%-1.00%
Install A Storm Window System That Will Add An Extra Layer Of Thermal Insulation. Add Solar Reflecting Shades Along The Windows And Roofline.	\$3718.75	\$835.07-\$1336.12	0.50%-0.80%
Install A Storm Window System That Will Add An Extra Layer Of Thermal Insulation.	\$2656.25	\$668.06-\$1252.61	0.40%-0.75%
This Area Needs More Insulation And Air Sealing Along The Outer Edge Of The Room.	\$1150.00	\$835.07-\$1252.61	0.50%-0.75%
Install A Solar Reflective System To Reduce Thermal Leakage.	\$1062.50	\$417.54-\$835.07	0.25%-0.50%
Either Adjust Or Replace This Vent To Seal Properly.	\$318.75	\$417.54-\$835.07	0.25%-0.50%
Weatherstrip Doors.	\$406.25	\$417.54-\$835.07	0.25%-0.50%
Caulk Specified Areas With Clear Caulking.	\$706.25	\$334.03-\$835.07	0.20%-0.50%

*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.*