

PROFESSIONAL ENERGY AUDIT REPORT



Subject Property: ,

Client:
Report #:
Audit Date

Auditor: **Bruce Czech**
ENERGY STAR® partner
RESNET® Certified Energy Rater
ASHI® Certified Inspector # 207435

Audit Company: **Colorado Professional Inspections/ECO-SPECT**



AUDIT SUMMARY

At your request, a Diagnostic Home Energy Survey was conducted on (Left blank). This report summary reflects the key findings and visual conditions at , (left blank). This summary is not the complete Diagnostic Home Energy Survey report. There may be additional issues listed in the report that are not in this summary. The items are listed numerically in the order that they appear in the report and by priority. If you have any questions regarding your Diagnostic Home Energy Survey, please call us and we will gladly answer your questions. Thank you for choosing Colorado Professional Inspections/ECO-SPECT.

Recommendations

The following is a list of energy high priority energy efficiency improvement suggestions:

HEATING AND COOLING ASSESSMENT

Thermostat

Recommendations:

Set the programmable thermostat to reduce the temperature of the home at times when optimum comfort is not needed- like when you are sleeping or not at home.

Furnace

Recommendations:

Your home has a large volume of conditioned space and high utility bills. Your main source of heating fuel is expensive propane (usually 2x more than natural gas). You live in a high altitude area which has more heating days than other areas in Colorado. Because of esthetic and comfort concerns with other energy conservation and efficiency measures, I recommend that you upgrade to a geothermal heat pump system to replace your existing heating and domestic hot water systems. Since geothermal systems are electric, I recommend that you power all or a portion of it with photo voltaic solar panels.

Follow this link for more information:

http://www.consumerenergycenter.org/home/heating_cooling/geothermal.html

Ductwork

Recommendations:

There are no visible return vents at the lowest level of the house. This causes the heated air to be cycled up to the returns on the main floor instead of being pulled down to the floor level. Recommend installing return vents at floor level in the basement.

Renewable Energy

Xcel energy and the IRS are offering significant incentives for installing solar voltaic systems. Solar photovoltaic or PV electricity generation is a clean and sustainable source of renewable energy. Xcel's solar program allows you to receive cash back for installing a PV system at your home. The Solar*Rewards program provides incentives based on the size of the system you install.

APPLIANCE, LIGHTING, & WATER USE REVIEW

Water Heater

Recommendations:

Recommend replace with a system that piggy backs onto a geothermal heating system. See heating system section for further info.

DIAGNOSTICS

Blower Door Testing

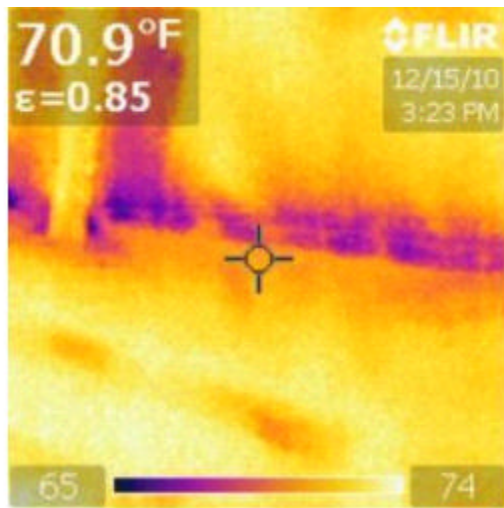
Efficiency Assessment:

Poor performance or condition. This item is a priority upgrade. See Air Sealing recommendations

Thermal Imaging- Interior

Image 6:

There is a lot of air leakage around the beams. The beams are not caulked and sealed adequately.



The following is a list of energy medium priority energy efficiency improvement suggestions:

BUILDING SHELL- THERMAL ENVELOPE REVIEW

Skylights

Recommendations:

Consider installing shades or blinds on the skylights. This will provide you with the ability to close off the skylights to prevent solar heat gains in the summer months and prevent heat loss in the winter night time hours. Caulk the jamb to drywall joint to reduce air leakage.

APPLIANCE, LIGHTING, & WATER USE REVIEW

Lighting

Recommendations:

Consider installing more Compact Florescent Lamps in non-dimmed light fixtures and dimmable CFL's in dimmable fixtures. Replace the recessed light fixtures with sealed cans, upgrade the fixtures to LED type or install air tight trim kits.

Hot Tub/Pool

Recommendations:

Turn down or drain The hot tub when you are not using it regularly Your home has an exterior hot tub. Hot tubs are significant energy users. I recommend that you use them sparingly or not at all. When you are not using your tub for an extended period, you should winterize it and disconnect the power. I recommend that you offset this usage with solar voltaic panels or purchase wind power.



DIAGNOSTICS

Air Leakage and Sealing

Building Tightness:

Your home has an NACH above .50. It would benefit from significant economic savings with general air sealing. See air sealing section for details.

The following is a list of energy lower priority energy efficiency improvement suggestions:

BUILDING SHELL- THERMAL ENVELOPE REVIEW

Exterior Doors

Recommendations:

Improve the weather stripping on the exterior doors to prevent air leakage. Installation of storm doors is an excellent idea, both for summer cooling and winter comfort.

Ceiling Insulation

Recommendations:

Recommend additional insulation in the ceiling for better energy efficiency. Although the ceiling insulation levels in the visible areas appear to meet minimum requirements of R-30., I recommend increasing insulation levels to R-54 in your area.

Basement Foundation Insulation:

Recommendations:

Insulate the unfinished parts of the basement foundation.

HEATING AND COOLING ASSESSMENT

Fireplace/Wood Stove

Recommendations:

Close the damper on the wood burning fireplace when it is not in use- to reduce air leakage in the home.



APPLIANCE, LIGHTING, & WATER USE REVIEW

Exterior Energy Use

Outdoor Lighting:

There is a significant amount of outdoor lighting on the property. Try to limit the on times for this type of lighting. Convert to LED bulbs where practical. Transformers and wiring for low voltage lighting waste energy. Convert low voltage to line voltage lighting where practical. Adjust timers seasonally to reduce on times. Make use of motion sensors and light sensors where practical.



Outdoor Combustion:

Have gas burning appliances and piping checked for leaks. Be sure that appliance are shut off and consider shutting valves off when not in use.



GENERAL INFORMATION

The purpose of a Diagnostic Home Energy Survey is to determine the general condition of the home with respect to energy performance and the homeowners potential willingness to improve the homes energy performance.

Energy auditors visit residential buildings and talk to owners and residents. They inspect and test to decide what energy-efficient retrofits are practical. Specific purposes of an energy audit are to:

- Identify the type, size, and condition for each major energy using device.
- Recommend appropriate energy conservation, operation, and maintenance procedures.
- Note current and potential health and safety problems and how they may be affected by proposed changes.
- Explain behavioral changes that will reduce energy waste.
- Identify "low hanging fruit".
- Help homeowners comply with Remodel and Addition Energy Code requirements.

This energy audit is designed to meet the standards of the RESNET (Residential Energy Services Network) Diagnostic Home Energy Survey. The standard can be found at: <http://www.resnet.us/standards/mortgage/amendments/2008/Audit.pdf>. A Diagnostic Home Energy survey includes sections 704.1 and 704.2 of the standard

Energy Auditor:

Auditor: Bruce Czech Email: Brucec@coloradoprofessionalinspections.com.

Audit Company: Colorado Professional Inspections

Property Information

Building Type: Single family detached.

Age: 10

Number of inhabitants: 2

Ambient Temp: 45

Audit Time: 01:00 PM

Audit Date: 12/15/2010

Energy Usage

Annual KW/Year: Use more than \$200 worth of electricity a month.

Annual Therms/Year: Use more than \$800 worth of propane a month.

Client Comments

Comfort Complaints: None.

Improvement Commitment: Would consider investing in improvements to lower utility bills.

Energy Goals: Reduce energy consumption

BUILDING SHELL- THERMAL ENVELOPE REVIEW

Windows

Type: The predominate window type is wood framed with double pane glass.

Efficiency Assessment: Adequate performance. Not a priority upgrade.

Skylights

Type: The predominate skylight type is wood framed with double pane glass.

Efficiency Assessment: Adequate performance. Not a priority upgrade.

Observations: Functional. but leaky.

Recommendations: Consider installing shades or blinds on the skylights. This will provide you with the ability to close off the skylights to prevent solar heat gains in the summer months and prevent heat loss in the winter night time hours. Caulk the jamb to drywall joint to reduce air leakage.

Exterior Doors

Type: Wood, uninsulated.

Efficiency Assessment: Adequate performance. Not a priority upgrade.

Recommendations: Improve the weather stripping on the exterior doors to prevent air leakage. Installation of storm doors is an excellent idea, both for summer cooling and winter comfort.

Wall Insulation

Material: The predominate insulation is fiberglass or cellulose cavity insulation.

Thickness: 5 3/8"

Approximate R-Value: The insulation was inspected visually and it is assumed that there is approximately 5 3/8" of insulation in the walls for an approximate value of R19.

Efficiency Assessment: **Excellent! High performance.**

Ceiling Insulation

Predominate Insulation Type: Fiberglass batts

Thickness: 10".

Approx. R-Value: 30.

Efficiency Assessment: **This item could be improved. Recommend upgrading.**

Comments: Some areas of the ceiling have poorly installed insulation.

Recommendations: Recommend additional insulation in the ceiling for better energy efficiency. Although the ceiling insulation levels in the visible areas appear to meet minimum requirements of R-30., I recommend increasing insulation levels to R-54 in your area.

Basement Foundation Insulation:

Type: The visible parts of the basement foundation are not insulated.

Efficiency Assessment: **Poor performance or condition.**

Recommendations: Insulate the unfinished parts of the basement foundation.

Crawlspace Foundation Insulation:

Type: Fiberglass.

Efficiency Assessment: Adequate performance. Not a priority upgrade.

Rim Joist Insulation and Sealing

Material: Fiberglass.

Thickness: 5 3/8"

Approximate R-Value: 19.

Efficiency Assessment: Adequate performance. Not a priority upgrade.

Framed Floor Insulation

Location: Cantilever floor extension located at the front and back of the house.

Efficiency Assessment: Adequate performance. Not a priority upgrade.

HEATING AND COOLING ASSESSMENT

Thermostat

Type: Programmable.



Night Time Setpoints: The thermostats are set a steady temperature day and night.

Efficiency Assessment: **This item could be improved. Recommend upgrading.**

Recommendations: Set the programmable thermostat to reduce the temperature of the home at times when optimum comfort is not needed- like when you are sleeping or not at home.

Mechanical Room

Condition: There are combustion air vents

Furnace

System Type: Twin Forced Air, Mid efficiency (79-83%).



Location: Basement. Closet.

Fuel: Propane

Size of Furnace: 120000, 140000

Approx. Age: 5-10

Efficiency Assessment: **This item could be improved. Recommend upgrading.**

Recommendations: Your home has a large volume of conditioned space and high utility bills. Your main source of heating fuel is expensive propane (usually 2x more than natural gas). You live in a high altitude area which has more heating days than other areas in Colorado. Because of esthetic and comfort concerns with other energy conservation and efficiency measures, I recommend that you upgrade to a geothermal heat pump system to replace your existing heating and domestic hot water systems. Since geothermal systems are electric, I recommend that you power all or a portion of it with photo voltaic solar panels.

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Ductwork

Recommendations: There are no visible return vents at the lowest level of the house. This causes the heated air to be cycled up to the returns on the main floor instead of being pulled down to the floor level. Recommend installing return vents at floor level in the basement.

Fireplace/Wood Stove

- Type: Gas fired, sealed combustion. Prefabricated, gas log type.
- Efficiency Assessment: Adequate performance. Not a priority upgrade.
- Recommendations: Close the damper on the wood burning fireplace when it is not in use- to reduce air leakage in the home.



Renewable Energy

Xcel energy and the IRS are offering significant incentives for installing solar voltaic systems. Solar photovoltaic or PV electricity generation is a clean and sustainable source of renewable energy. Excel' s solar program allows you to receive cash back for installing a PV system at your home. The Solar*Rewards program provides incentives based on the size of the system you install.

APPLIANCE, LIGHTING, & WATER USE REVIEW

Water Heater

- Type: 2xGas, atmospherically vented tank type.



Efficiency Factor: .56

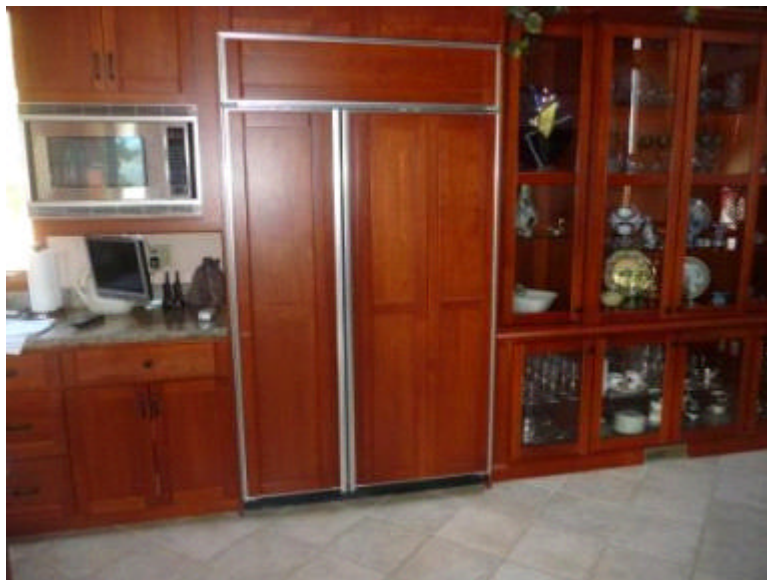
Tap Temperature: 110

Recommendations: Recommend replace with a system that piggy backs onto a geothermal heating system. See heating system section for further info.

Efficiency Assessment: **Poor performance or condition. This item is a priority upgrade.**

Refrigerator

Brand:



Estimated Age: 10

Efficiency Assessment: Adequate performance. Not a priority upgrade.

Range/Oven

Fuel: Gas. Electric.

Efficiency Assessment: Adequate performance. Not a priority upgrade.

Comments: Gas is a much more efficient fuel for cooking because there is a more efficient conversion of natural gas to BTU's than there is for Kilowatts.

Washing Machine

Type: Front Loader.



Efficiency Assessment: Excellent! High performance.

Lighting

Recessed light fixtures: The recessed lights are leaky.

% CFL use: Less than 25%

Efficiency Assessment: Poor performance or condition. This item is a priority upgrade.

Recommendations: Consider installing more Compact Florescent Lamps in non-dimmed light fixtures and dimmable CFL's in dimmable fixtures. Replace the recessed light fixtures with sealed cans, upgrade the fixtures to LED type or install air tight trim kits.

Exterior Energy Use

Outdoor Lighting:

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Have gas burning appliances and piping checked for leaks. Be sure that appliance are shut off and consider shutting valves off when not in use.



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Recommendations:

Turndown or drain The hot tub when you are not using it regularly Your home has an exterior hot tub. Hot tubs are significant energy users. I recommend that you use them sparingly or not at all. When you are not using your tub for an extended period, you should winterize it and disconnect the power. I recommend that you offset this usage with solar voltaic panels or purchase wind power.



Efficiency Assessment: **Poor performance or condition. This item is a priority upgrade.**

DIAGNOSTICS

Explanation of Air Leakage Testing

The home was de-pressurized with a blower door to CFM50 and the air flow was noted at the blower door. CFM50 is the airflow (in cubic feet per minute) from the Blower Door fan needed to create a change in building pressure of 50 Pascals (0.2 inches of water column). A 50 Pascal pressure is roughly equivalent to the pressure generated by a 20 mph wind blowing on the building from all directions. CFM50 is the most commonly used measure of building airtightness and gives a quick indication of the total air leakage in the building envelope. From the CFM50 number, the NACH can be determined. NACH (Natural Air Change per Hour) is the number of whole house air changes per hour modified by a factor that represents individual building characteristics and local weather characteristics.

Blower Door Testing

Wind Conditions:	Still
CFM@ 50 Pa:	9437



Notes: The house is so leaky and large that I couldn't reach a standard test pressure of -50p. The equipment reached its capacity at -22p. At that rate the "estimated" CFM/50 was: 9437.

Conditioned Square Footage: 5000

Average Ceiling Height: 14

Approximate Cubic Feet: 70000

Number of Stories: 2

N Factor: 14.8

ACH: 8.09

NACH: .55

Efficiency Assessment: **Poor performance or condition. This item is a priority upgrade.** See Air Sealing recommendations

Air Leakage and Sealing

Building Tightness: Your home has an NACH above .50. It would benefit from significant economic savings with general air sealing. See air sealing section for details.

General Recommendations: [Crawl Spaces and Basements](#)

Plumbing/Utility Penetrations: A variety of service penetrations occur at header and foundation walls from dryer vents, water and gas pipes to telephone and TV cables. These can be sealed using caulk or foam from the inside, being sure to seal from the outside when there is risk of water penetration. Electrical service entrances require special care. If the service entrance is accessible from the inside, the gap where it penetrates the wall should be caulked. If the conduit passes straight into the back of the service panel, the pipe should be sealed from the outside where it passes through the wall. Foam or sealant should never be

installed inside electrical conduit. Seal around the pipe with clamps and special neoprene collars designed for that purpose or use plastic sheeting mechanically fastened around pipe and sealed to ceiling with staples and caulk. Foam can be used, but first grease the area to be formed with vaseline to allow the pipe to move with changes in temperature. Other penetrations: Seal electrical and plumbing penetrations at the level of the attic insulation with caulk or urethane foam, but don't foam electrical boxes or recessed light fixtures.

Rim Joist: The intersection of the main floor and joist header area is particularly susceptible to air leakage at the framing intersections, around service penetrations in the header areas, and at the basement ceiling where penetrations lead to the upper floors of the house or attic. Air leakage should also be controlled at the joint of the foundation and the sill plate, between the exterior sheathing and the sill plate, at the joint of the header and each joist, between the top of the header and the subfloor, from the basement into the header cavity through the open-face of the header area, and through subfloor cracks from the header cavity. Polyurethane caulk is often appropriate for this joint unless it is larger than 1/4 inch, in which case urethane foam is a good choice. The entire length of the joint between the sill plate and the top of the foundation wall should be sealed.

The bath fans are leaky. Replace the bath fan with a newer style with a damper.

[Cantilever Overhangs](#)

Remove the soffit from all cantilever overhangs. Fill voids full with fiberglass insulation and cover insulation with sealed in place rigid foam insulation (sealed with spray foam). Alternatively, insulate and seal voids with spray foam insulation. Replace the soffit material and caulk all joints.

Chimney chases: Fire code calls for an air space between the chimney and any combustible building materials. Seal the opening in the attic with metal flashing caulked and nailed to the surrounding joists and seal the flashing to the chimney with high temperature caulk. Establish a barrier at least 2 inches from chimney to hold back any insulation.

[Add outlet and switch gaskets.](#)

Recessed Lighting - seal the recessed light fixtures in the home. Seal around the edges and any holes present when the trim and bulb are removed, with an appropriate fire rated caulking. For recessed lights that are accessible in the attic, build an insulating box using foil faced, rigid board insulation, place this over the can light, and caulk or seal the edges. Then you can move the insulation all around this box. Or install modern sealed recessed light cans.

There is air leakage around the window, baseboard and door trim. Applying a bead of matching caulk at the trim joints and where they meet jams and drywall, will

improve air leakage in these areas.

Outside Penetrations: Seal entry points on the exterior where the hose bibs and gas lines enter the home.

Thermal Imaging- Interior

IR Begin Time: Approx. 3pm

Indoor Temperature: 72

Outdoor Temperature: 45

Image 1: Air leakage from recessed lights in kitchen.

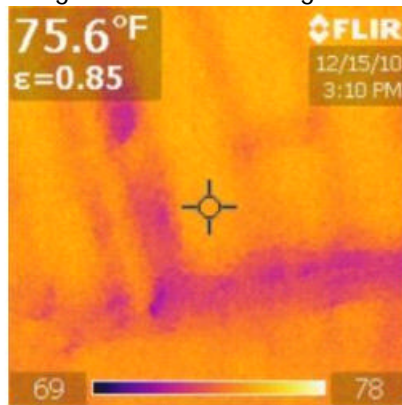


Image 2: Poorly installed insulation is allowing air leakage and heat loss below the kitchen skylight

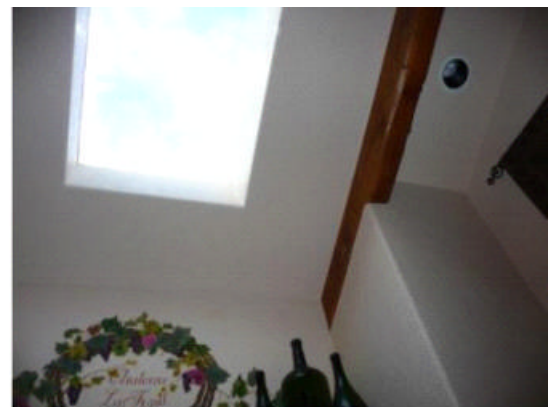
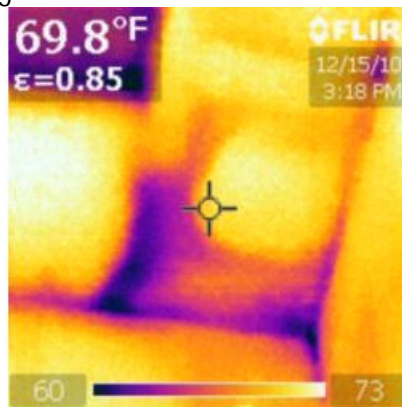


Image 3: Air leakage at skylight jambs.

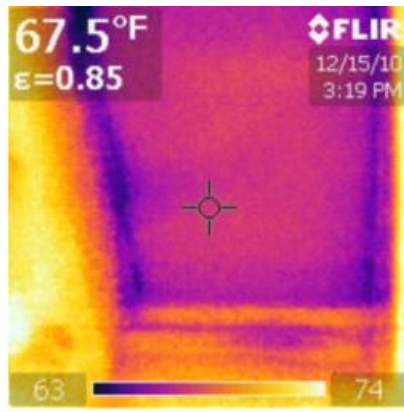


Image 4:

Rim joist air leakage , visible at baseboard trim in the dining area.

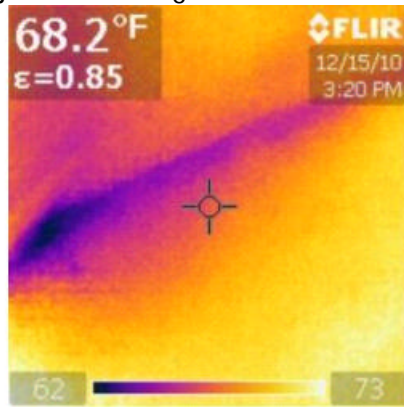


Image 5:

Thermal bypass in the ceiling of the dining area.

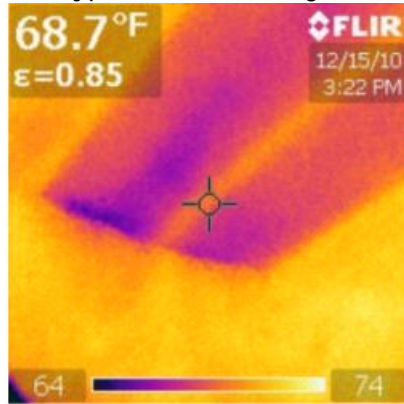


Image 6:

There is a lot of air leakage around the beams. The beams are not caulked and sealed adequately.

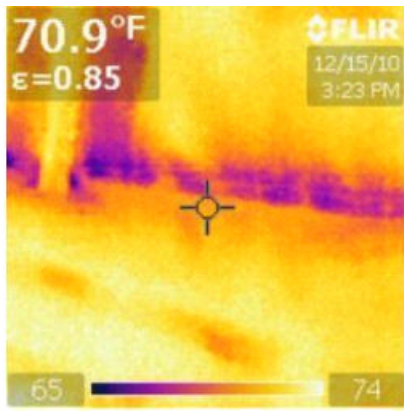


Image 7:

Well, you get the picture.

