

2-05-09

Overview:

Alaska

Housing

Finance

Corporation

<target><bill></bill><subject>2-05-09 Overview Alaska Housing
Finance Corporation</subject><comm>HENE26</comm></target>



Housing for Alaskans.

Energy-Efficiency Programs

Progress Update for Alaska Legislature 2.2.2009



Weatherization PROGRAM

Home Energy Rebate PROGRAM

Overview

- \$200 million for **weatherization**
(income-based, no-cost program)
- \$100 million for **rebates**
(for those NOT qualifying for weatherization program:
rebates for eligible improvements - ratings required)
- \$60 million additional for rebates 9/2008
(to carry program into 2009 calendar year)
- Large training component for both programs



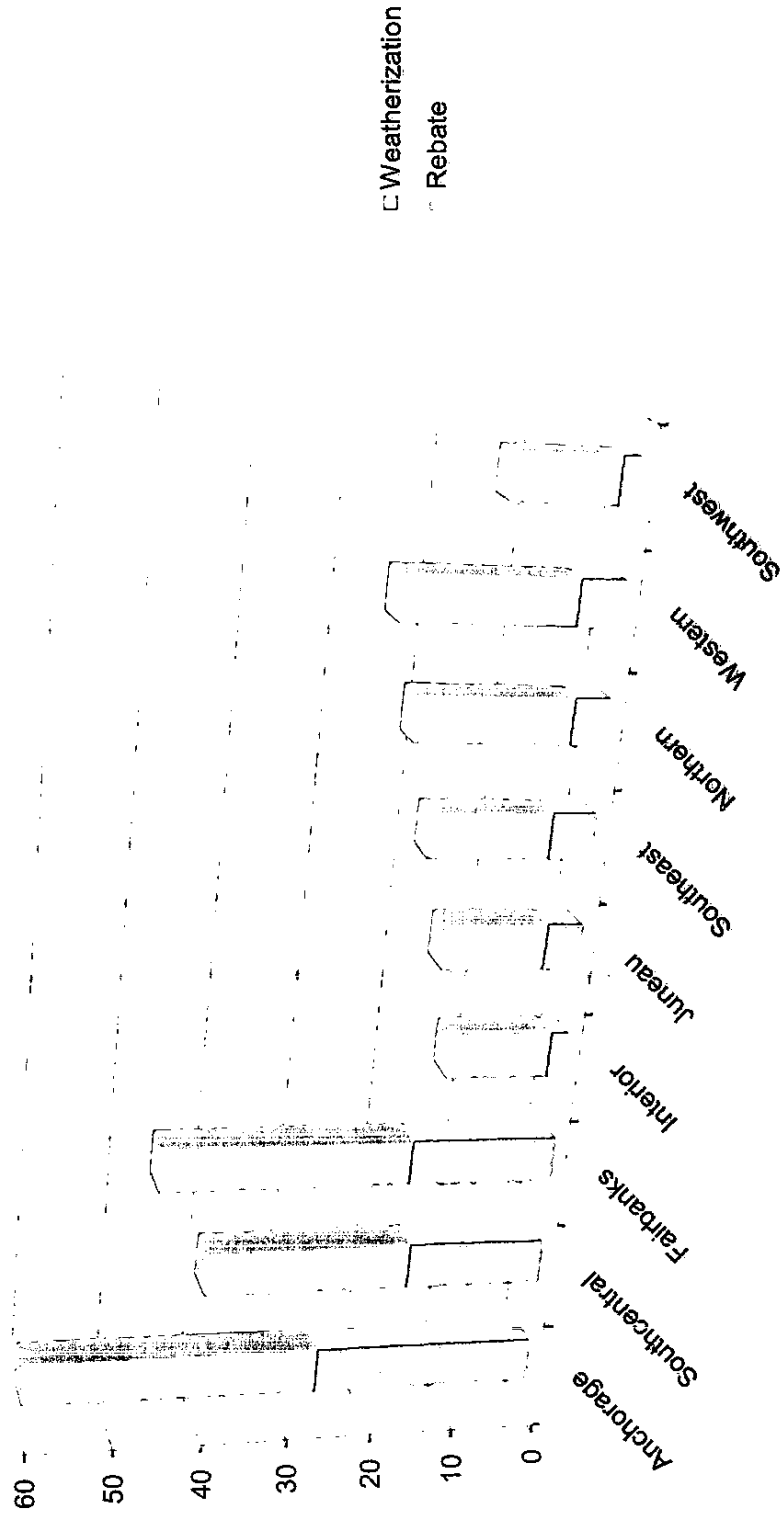
Allocations

	Rebate	Weatherization
Anchorage Region	\$26 million	• \$34 million
Southcentral Region	\$16 million	• \$24 million
Fairbanks Region	\$17 million	• \$29 million
Interior Region	\$2 million	• \$12 million
Juneau Region	\$4 million	• \$12 million
Southeast Region	\$5 million	• \$14 million
Northern Region	\$4 million	• \$18 million
Western Region	\$5 million	• \$20 million
Southwest Region	\$2 million	• \$12 million

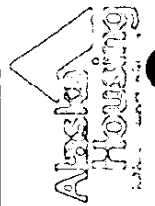


Rebate & Weatherization Allocations

\$300 million



□ Weatherization
▨ Rebate



www.state.ak.us/housing

2.2.2009

Program Start-Up

- April 2008: Programs approved
 - AHFC operates under emergency regulations
 - Training & personnel ramp-up started
- May 2008: Programs launched
- July 2008: Public hearing & final regulations adopted
- Summer 2008: Continued ramp-up & training

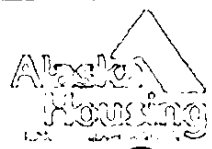
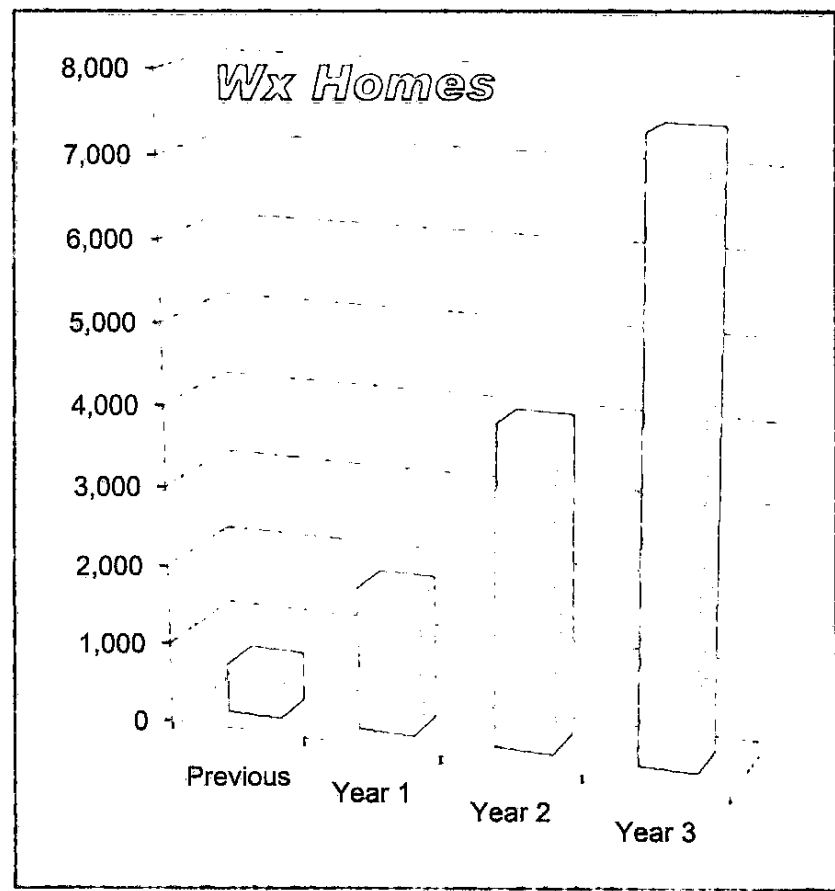
Weatherization PROGRAM

 **Alaska Housing Finance Corporation**
www.alhfc.state.ak.us/energy

Weatherization PROGRAM

Progress Report

- Previous program weatherized 600 homes.
- This year that number will triple to 1800.
- Year 2: 4000
- Year 3: 7500

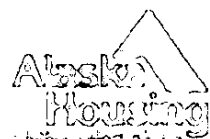
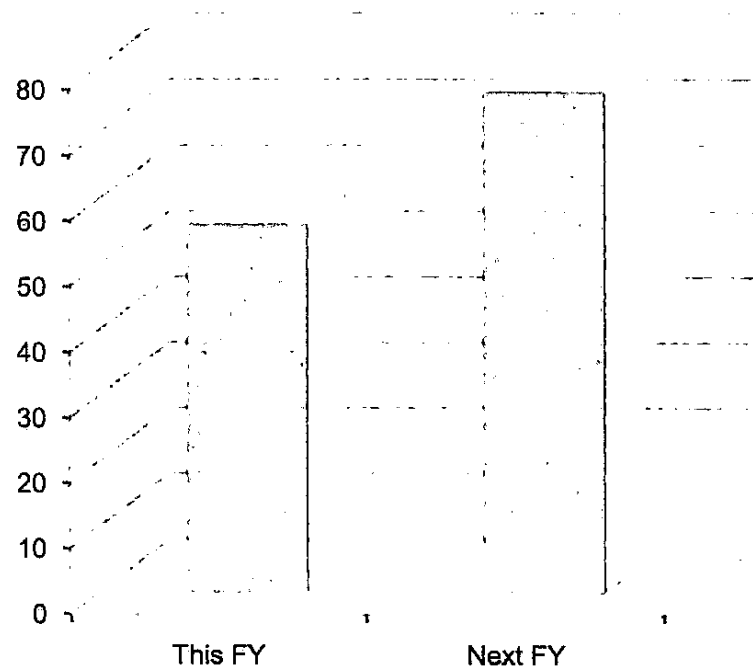


Weatherization PROGRAM

Progress Report

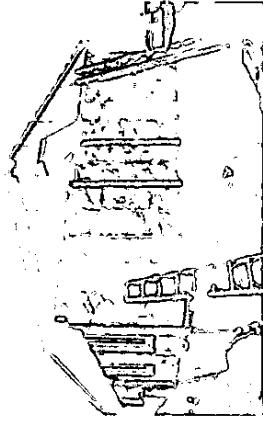
- \$30 million currently on the street.
- \$59.9 million projected for next fiscal year.
- Communities and surrounding areas served: 56 this year and 76 next year.
- Statewide weatherization providers & housing authorities continue ramping up.

Wx Communities/Areas Served



Weatherization PROGRAM

Program Snapshot
Weatherization homes this fiscal year

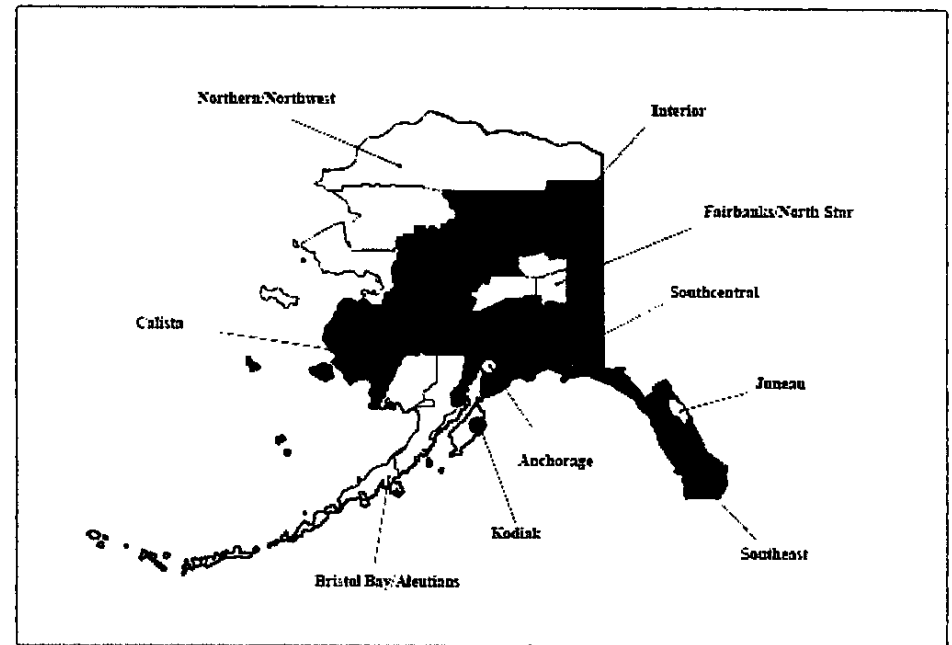


Current Status of Wx Homes

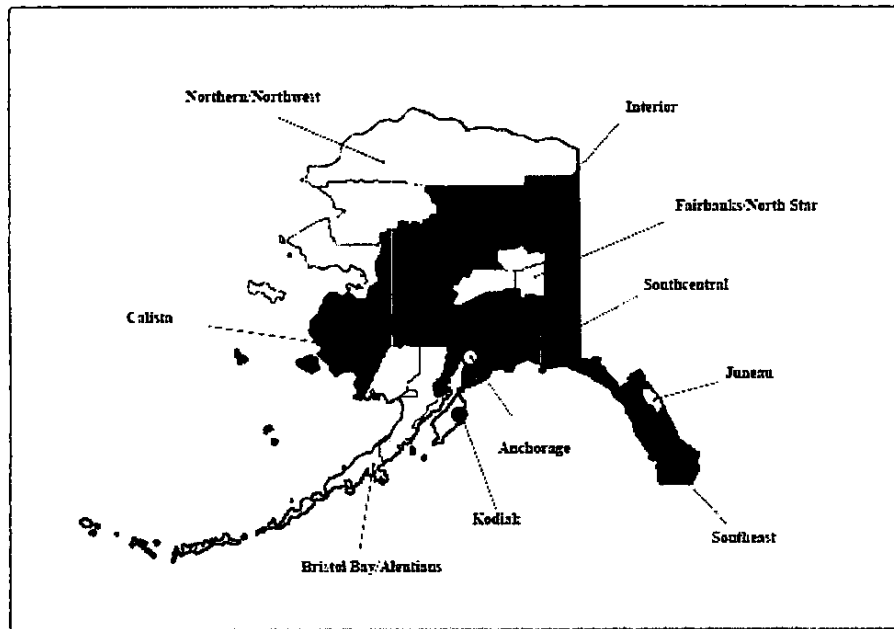
700	Completed
500	Near Completion
600	Assessment/Early Construction

Statewide Weatherization Providers

- Alaska Community Development Corporation
- Interior Weatherization
- Municipality of Anchorage
- Rural Community Action Program
- RuralCap-Juneau
- Tanana Chiefs Conference



Alaska Housing Authorities Weatherization



- **Aleutian Housing Authority**
- **AVCP Regional Housing Authority**
- **Baranof Island Housing Authority**
- **Bering Straits Regional Housing Authority**
- **Bristol Bay Housing Authority**
- **Cook Inlet Housing Authority**
- **Copper River Basin Reg. Housing**
- **Interior Regional Housing Authority**
- **Kodiak Island Housing Authority**
- **North Pacific Rim Housing Authority**
- **Northwest Inupiat Housing Authority**
- **Tagiugmiullu Nunamiullu (TNHA) through North Slope Borough**
- **Tlingit-Haida Regional Housing Authority**
- **Ketchikan Indian Community**
- **Metlakatla Housing Authority**

Home Energy Rebate PROGRAM

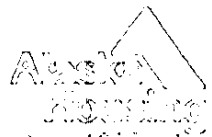
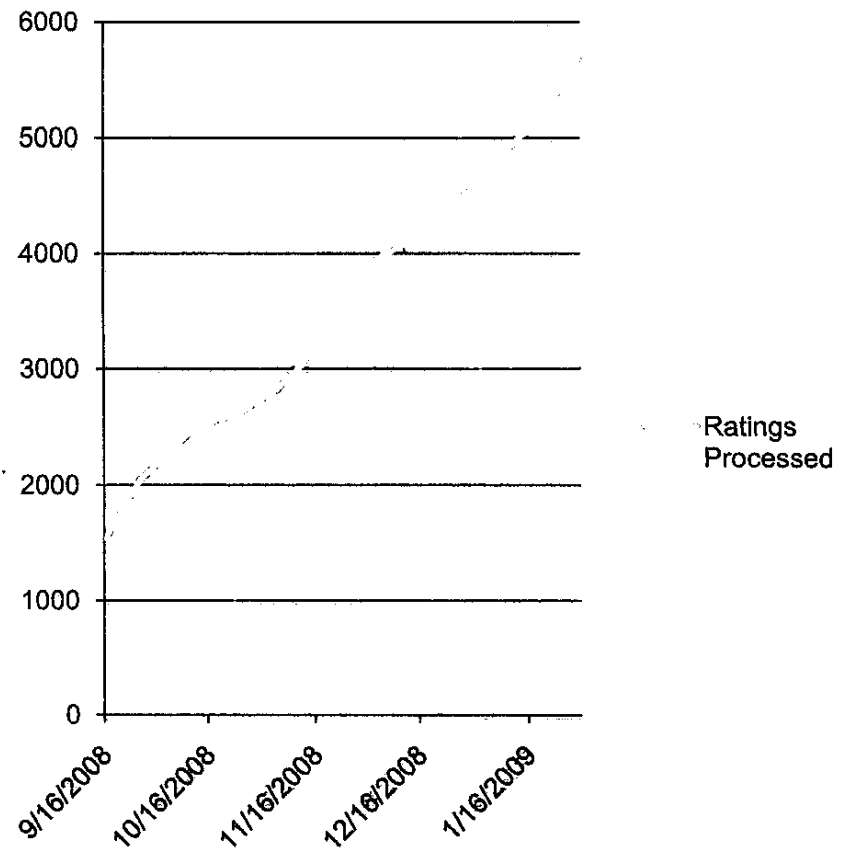


www.shfc.state.ak.us/energy

Home Energy Rebate PROGRAM

Ratings Processed

- *Estimate: Over 8000 ratings performed by raters*
- 5681 ratings processed
- Approximately \$53.8 million committed
- 100-150 applications received per day
- Over 200 inquiries per day
- 329 Post-Improvement rebates paid average: \$5907
- 162 New 5 Star Plus rebates paid totaling \$1.2 million



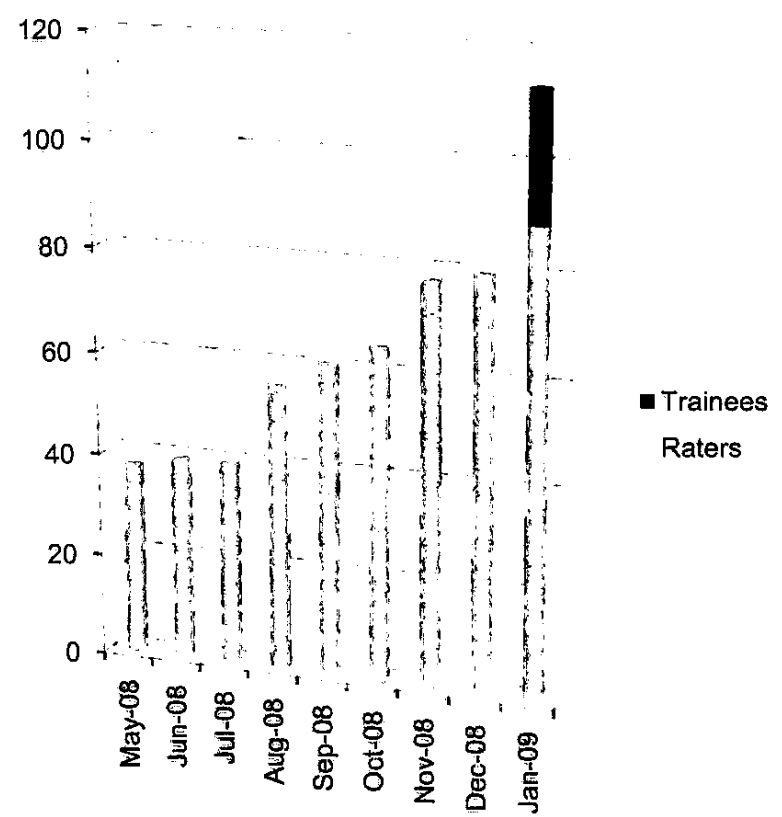
www.alaskaenergyservice.com

1/30/2009

Home Energy Rebate PROGRAM

Rater Availability

- Raters
 - 38 at program start
 - 89 at present
 - 24 in training status
- Roving rater program
- Centralized sign-up list
 - www.akrebate.com or call 1-877-AK-REBATE
 - Ability to check place on waiting list



www.akrc.state.ak.us/energy

1/26/2009

Home Energy Rebate PROGRAM

Wait List

Statewide: 8380

Sample Communities

Anchorage-5882

Kodiak-181

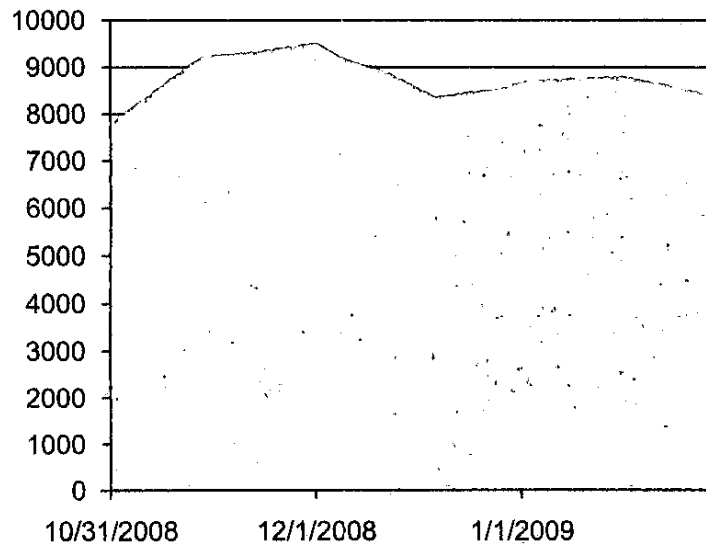
Juneau-96

Fairbanks-40

Bethel-3

Dillingham-4

Wait List



Total Dispatched: 6441



www.akfc.state.ak.us/energy

1/30/2009

Home Energy Rebate PROGRAM

Program Snapshot

Rebates vs. Amount Spent by Sampled Homeowners

AHFC Rebate Amount

\$1,782,664

divided by 300 rebates

= **\$5942** average rebate

Homeowner Paid Costs



= **\$9,470** average spent

- \$5942 average rebate

= **\$3528** homeowner investment



www.ahfc.state.ak.us/energy

Home Energy Rebate PROGRAM

Program Snapshot

Energy & CO2 Impacts from Sampled Homes

HOMES	Before	After	Total Savings	Per Home
Energy Cost	\$1,211,080	\$941,242	\$269,837	\$1355/year
CO2 lbs/year	9,627,880	7,194,342	2,433,538	12,228 lbs/yr
Rating Stars	2.8	4.1		1.21 increase

Total energy saved in BTUs = 17.2 billion



www.alaskaelectricity.com/energy

1.26.2009

Home Energy Rebate PROGRAM

Original Allocation* vs Encumbrances by Region (millions \$)



*Does not include additional \$60 million

1.29.2009

Alaska Housing Finance Authority

Home Energy Rebate PROGRAM

	Allocated	Encumbered
Anchorage Region	\$26 million	• \$16.6 million
Southcentral Region	\$16 million	• \$11 million
Fairbanks Region	\$17 million	• \$16.9 million
Interior Region	\$2 million	• \$0.36 million
Juneau Region	\$4 million	• \$3.6 million
Southeast Region	\$5 million	• \$3.2 million
Northern Region	\$4 million	• \$0.36 million
Western Region	\$5 million	• \$0.25 million
Southwest Region	\$2 million	• \$0.19 million

Allocations do not include additional \$60 million



www.shfc.state.ak.us/energy

1.29.2009

Training



 **Weatherization**
PROGRAM

 **Home Energy Rebate**
PROGRAM


**Alaska
Housing**
FINANCE CORPORATION

www.akfc.state.ak.us/energy

Training

Classes for:

- Weatherization Service Providers
- Housing Authorities
- Energy Raters
- Contractors
- General Public



www.ahfc.state.ak.us/energy

Weatherization
PROGRAM
Home Energy Rebate
PROGRAM

Training Progress Report

April-December 2008

Professional Classes: 121

Professional Students: 2615

Consumer Classes: 13

Consumer Students: 464

TOTAL Classes: 134

TOTAL Students: 3079

Training provided in 14 regional communities



www.shfc.state.ak.us/energy

Weatherization
PROGRAM
Home Energy Rebate
PROGRAM

Training Partners

- Alaska Building Science Network
- Alaska Works
- Alaska Craftsman Home Program
- Northern Building Science Group
- UAF Cooperative Extension
- UAS Building Science Program
- Wisdom & Associates
- Cold Climate Housing Research Center
- Opportunity Council
- Building Performance Institute



www.shtc.state.ak.us/energy

 **Weatherization**
PROGRAM
 **Home Energy Rebate**
PROGRAM



Housing for Alaskans.

Energy-Efficiency Programs



Weatherization PROGRAM

Home Energy Rebate PROGRAM

WITH HEATED GARAGE INCLUDED



HOME ENERGY RATING CERTIFICATE

The Home Located At:

XXX N Douglas HWY
Juneau, Alaska

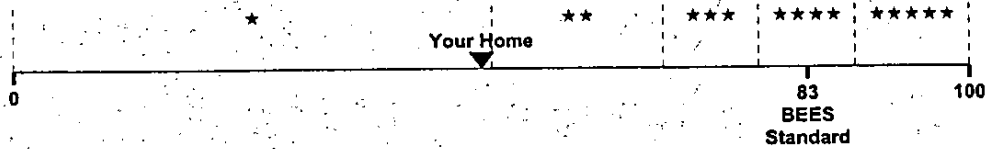
Has Been Energy-Rated As:

★ +

One Star Plus

Overall Efficiency of Home

48.9 points



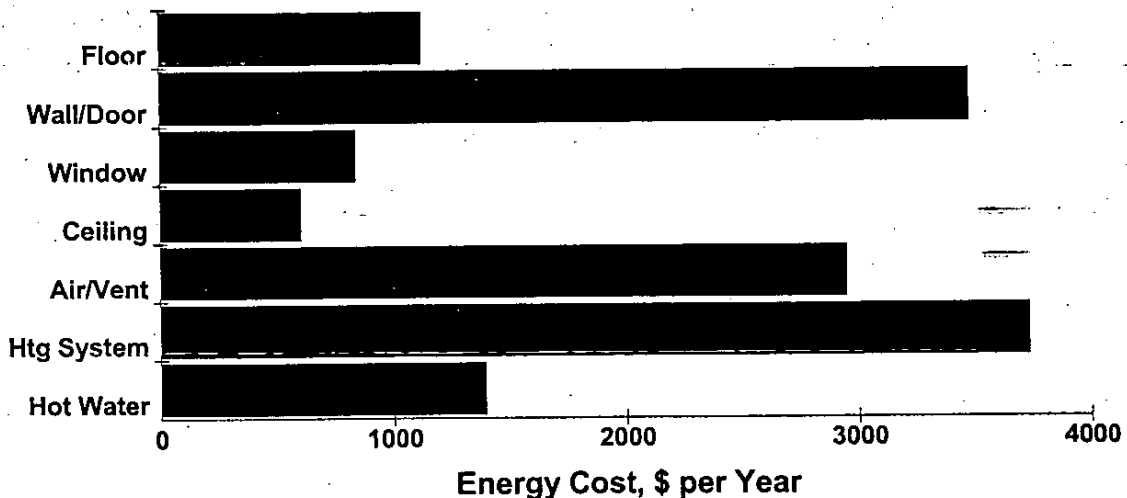
Projected Annual Energy Costs

\$15,435 per year

Amount of CO2 Produced by the Home

54,382 pounds per year

BREAKDOWN OF HEATING COSTS



Client: Rating Sample

Rater: Marquam George

Date: 1/2/09

Rater's City: ~b Juneau, AK 99801
ver. 1.03d, library: 11/8/2008

Phone: 907 209 4444

FAX:

ENERGY COST AND FEATURES REPORT

Property: Rating Sample
XXX N Douglas HWY
Juneau, Alaska

Rater: Marquam George
Juneau, AK 99801

House: Single Family
Living Floor Area: 3,043 square feet
No Attached Garage

Rating: As Is

ENERGY FEATURES

Envelope Efficiency

Floor Insulation	R-11.3 *
Wall/Door Insulation	R-5.5 *
Ceiling Insulation	R-21
Window R-Value	R-1.51
Window to Wall Ratio, Living Space	11.6%
South Facing Window Area	114 square feet
Air Leakage	12.8 Air Changes per Hour at 50 Pascals 0.86 Air Changes per Hour Natural

* Includes the insulating value of the ground in contact with these envelope components.

Space Heating System

System Efficiency	85%
Fuel Type	#2 Oil
Supplemental Fuel	Spruce Wood
Thermostat Setting	70.0 degrees F
Setback Thermostat	None

Water Heater

Efficiency	61%
Location	Semi-Conditioned Space
Fuel Type	#2 Oil

Ventilation

System Type	None
-------------	------

Other

Number of Occupants	5
Clothes Dryer Fuel	Electricity
Cooking Range Fuel	Propane
Miscellaneous Lights/Appliances Use	Average

ESTIMATED ENERGY USE

Space Heating		\$12,740
Water Heating		\$1,396
Lights and Appliances		\$1,299

Space Heating	742 kWh of Electricity, 2,136 gallons of #2 Oil, 15.54 cords of Spruce Wood
Water Heating	289 gallons of #2 Oil
Lights and Appliances	8,741 kWh of Electricity, 56 gallons of Propane

Actual use and costs may vary from these estimates depending upon weather conditions, occupant life styles and utility rates currently in effect.

ver. 1.03d, library: 11/8/2008

Economics of Energy Efficiency

This calculator determines the rate of return (interest earned) and the net present value of an energy-saving investment. Fill out the 'Inputs' section below and click the 'Calculate' button to complete the calculation.

Inputs

Description

You can enter a description of this calculation in the box below.

02/05/2009 Sample Rating w/Garage

Investment Cost of Measure

Enter the up-front cost of the efficiency measure and the number of years that the measure will produce savings.

Cost of Measure: \$ 25000

Life of Measure: 25 years

Annual Energy Savings

Enter the dollars of energy savings that will be realized from the measure in the first year. Also, select how fast you think energy prices will increase in the future.

First Year Savings: \$ 9803

Energy Price Inflation: 3% per year

Annual Operating Cost Impact

Enter any operating and maintenance cost impact caused by the efficiency measure (not counting energy savings). If operating and maintenance costs go up due to the measure, enter a positive number below. If operating costs decrease due to the measure, enter a negative number. Also, enter your estimate of how fast the impact will increase in future years due to price inflation.

Operating Cost Impact: \$ 0

Op. Cost Inflation: 3% per year

Financing Interest Rate

Enter the interest rate of the money that will be used to finance this efficiency measure. *NOTE: This input is only used in the net present value calculation, not in the internal rate of return calculation.*

Financing Interest Rate: 7% per year

Click Here to Calculate the Results: [Calculate](#)

Results

Internal Rate of Return: 42.2% per year

This rate of return can be compared against the rates of returns or interest rates of alternative investments, such as stocks, bonds, certificates of deposit, etc. If energy costs are not tax deductible, which is the case with residential energy costs, the rate of return of the efficiency measure is an *after-tax* return. It should be compared against *tax-free* investments (e.g. tax-free municipal bonds) or against the after-tax rate of return of taxable investments.

Net Present Value: \$ 125531

If the Net Present Value (NPV) is greater than \$0, then the energy efficiency measure provides a better return than the alternative investment. The NPV is calculated by adding together all the benefits of the efficiency measure over its life and subtracting out the costs. Benefits and costs are "discounted" to account for the time-value of money (the ability of money to earn interest).

The Net Present Value is a better measure to use than Internal Rate of Return when comparing a number of possible efficiency measures that are "mutually exclusive", meaning only *one* can be implemented. For example, NPV is a

good measure to use when trying to determine what level of insulation to add to an attic. Only one level of insulation can be chosen, i.e. they are mutually exclusive. Analyze each level of insulation as a separate calculation in the above calculator. Choose the level that produces the highest NPV.

If you have questions or comments, please send mail to info@energytools.com.

AkWarm Energy Efficiency Improvement Options

Property: **Sample Rating**
 XXXX N Douglas Hwy.
 Juneau, AK 99801

House: Single Family
 Heated Floor Area: 3,043 sq.ft

As-Is Rating: One Stars Plus, 48.9 points
Additional Rating Points needed to reach higher Rating Levels:

Rater: Marquam George
 Juneau, AK 99801
 907 209 4444

- 1.1** more points needed to reach **2 Stars** (a minimum 5 point increase is required to receive an AHFC rebate)
- 11.1** more points needed to reach **2+ Stars**
- 19.1** more points needed to reach **3 Stars**
- 24.1** more points needed to reach **3+ Stars**
- 29.1** more points needed to reach **4 Stars**
- 34.1** more points needed to reach **4+ Stars**
- 39.1** more points needed to reach **5 Stars**
- 43.1** more points needed to reach **5+ Stars**

ID:

The following are possible energy-saving improvements for your home.

Note: The "Ballpark Cost" column gives a very approximate cost of the improvement assuming a typical situation. You should only rely on an actual contractor quote or a more refined cost estimate. The "Break-Even Cost" column provides a useful figure to compare with a more accurate cost estimate. The Break-Even cost is the *most* you could pay for the improvement and still have it be cost-effective based on energy savings over the life of the measure.

Improvement Description / Location	Cost-Effective? ¹	Annual Savings ²	Ballpark Cost ³	Break-Even Cost ⁴	Rating Points Gained ⁵	Rating, after all Improvements thru this one ⁶
Add R-14 rigid foam to interior or exterior of existing wall; cost does not include wall coverings. Location - Above-Grade Wall: House/lower	Yes	\$559	\$148	\$7,331	2.3	51.2 points 2 Stars Increase: 2.3 pts, 1 step
Install a Programmable Thermostat; zone controls extra	Yes	\$779	\$250	\$7,651	1.6	52.8 points 2 Stars Increase: 3.9 pts, 1 step
Install R-14 rigid foam board to interior or exterior side of wall. Does not include coverings or excavation costs. Location - Below- (part or all) Grade Wall: House/second/crawl	Yes	\$439	\$278	\$5,756	1.9	54.7 points 2 Stars Increase: 5.8 pts, 1 step
Install R-21 insulation on basement wall Location - Below- (part or all) Grade Wall: House	Yes	\$1,620	\$1,344	\$21,233	7.1	61.8 points 2+ Stars Increase: 12.9 pts, 2 steps
Install 4' of R-10 rigid board insulation on Perimeter of Crawl Space Floor. Location - On- or Below-Grade Floor, Perimeter: House/second/crawl	Yes	\$84	\$195	\$1,105	0.3	62.1 points 2+ Stars Increase: 13.2 pts, 2 steps
Install 2' of R-14 rigid board insulation around perimeter of Slab (vertical or horizontal). Location - On- or Below-Grade Floor, Perimeter: House/garage	Yes	\$202	\$499	\$2,648	0.9	63.0 points 2+ Stars Increase: 14.1 pts, 2 steps

Improvement Description / Location	Cost - Effective ¹	Annual Savings ²	Ballpark Cost ³	Break-Even Cost ⁴	Rating Points Gained ⁵	Rating, after all Improvements thru this one ⁶
Install 2' of R-14 rigid board insulation around perimeter of Slab (vertical or horizontal). Location - On- or Below-Grade Floor, Perimeter: House/lower	Yes	\$313	\$774	\$4,102	1.4	64.4 points 2+ Stars Increase: 15.5 pts, 2 steps
Caulk and Seal so that Home Air Leakage is Reduced by 4000 CFM at 50 Pascals.	Yes	\$3,016	\$4,000	\$20,126	11.8	76.2 points 3+ Stars Increase: 27.3 pts, 4 steps
Remove existing glass and install triple lowE arg glass. Location - Window/Skylight: House/sp	Yes	\$417	\$1,223	\$5,469	1.8	78.0 points 4 Stars Increase: 29.1 pts, 5 steps
Remove existing door and install standard pre-hung R-14 insulated door, including hardware. Location - Exterior Door: House/garage/man	Yes	\$135	\$404	\$1,774	0.6	78.6 points 4 Stars Increase: 29.7 pts, 5 steps
Remove existing glass and install triple lowE arg glass. Location - Window/Skylight: House/garage	Yes	\$119	\$376	\$1,564	0.5	79.1 points 4 Stars Increase: 30.2 pts, 5 steps
Add R-14 rigid foam to interior or exterior of existing wall; cost does not include wall coverings. Location - Above-Grade Wall: House/wood/lower	Yes	\$100	\$444	\$1,309	0.4	79.5 points 4 Stars Increase: 30.6 pts, 5 steps
Add R-14 rigid foam to interior or exterior of existing wall; cost does not include wall coverings. Location - Above-Grade Wall: House/garage	Yes	\$255	\$1,135	\$3,342	1.1	80.6 points 4 Stars Increase: 31.7 pts, 5 steps
Add R-14 rigid foam to interior or exterior of existing wall; cost does not include wall coverings. Location - Above-Grade Wall: House	Yes	\$489	\$2,420	\$6,405	2.1	82.7 points 4 Stars Increase: 33.8 pts, 5 steps
Add R-30 fiberglass batts to attic Location - Ceiling w/ Attic: House/garage	Yes	\$158	\$943	\$2,077	0.7	83.4 points 4+ Stars Increase: 34.5 pts, 6 steps
Add R-30 fiberglass batts to attic Location - Ceiling w/ Attic: House	Yes	\$363	\$2,171	\$4,757	1.6	85.0 points 4+ Stars Increase: 36.1 pts, 6 steps
Remove existing glass and install triple low E argon glass. Location - Window/Skylight: House/other	Yes	\$148	\$956	\$1,935	0.7	85.7 points 4+ Stars Increase: 36.8 pts, 6 steps
Remove existing glass and install triple low E argon glass. Location - Window/Skylight: House/south	Yes	\$56	\$392	\$739	0.2	85.9 points 4+ Stars Increase: 37.0 pts, 6 steps
Remove existing glass and install triple low E argon glass. Location - Window/Skylight: House/d/.5	Yes	\$124	\$972	\$1,625	0.6	86.5 points 4+ Stars Increase: 37.6 pts, 6 steps

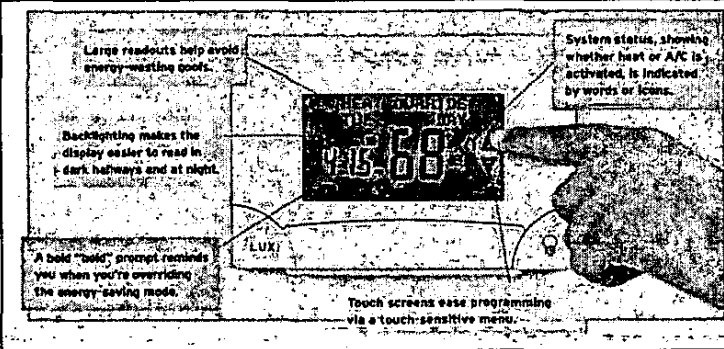
Improvement Description / Location	Cost - Effective?	Annual Savings ²	Ballpark Cost ³	Break-Even Cost ⁴	Rating Points Gained ⁵	Rating, after all Improvements thru this one ⁶
Remove existing door and install standard pre-hung R-14 insulated door, including hardware. Location - Exterior Door: House/garage/oh	Yes	\$307	\$2,514	\$4,025	1.3	87.8 points 4+ Stars Increase: 38.9 pts, 6 steps
Remove existing glass and install triple low E argon glass. Location - Window/Skylight: House/south/.5	Yes	\$118	\$1,019	\$1,551	0.5	88.3 points 5 Stars Increase: 39.4 pts, 7 steps
Replace Oil-fired tank-type water heater with efficient "side arm" to 40,000 Btu boiler	No	\$0	\$850	\$0	0.0	88.3 points 5 Stars Increase: 39.4 pts, 7 steps
Total All Measures		\$9,803	\$23,309	\$106,525	39.4	

Annual CO2 Reduction after all improvements: 36,293 pounds per year

Notes:

- 1. Cost-Effective** means that the energy savings that occur over the life of the improvement are sufficient to pay back the cost of the improvement including reasonable interest. This analysis does not consider additional benefits from the improvement unrelated to energy savings, such as increased comfort or additional longevity of the improved part of your home.
- 2. Annual Savings** is the potential savings in your home's energy cost per year.
- 3. The Ballpark Cost** is a very approximate estimate of the cost of the improvement measure. It does not substitute for an actual contractor quote or a more refined cost estimate.
- 4. Break-Even Cost** is the most you could pay for this improvement and still have it be cost-effective based on energy savings over the life of the measure.
- 5. Rating Points Gained** are the additional rating points that would be added to your As-Is Rating score if the measure were installed.
- 6. Rating, after all Improvements thru this one:** This column shows the energy rating that would result if all improvements prior to and including this one were done. As well as showing the final rating, the column shows how much the rating will improve in terms of rating points and in terms of rating steps. For example, an increase from a 2 star rating to a 2 star plus rating is one step.

Detailed Improvement Information

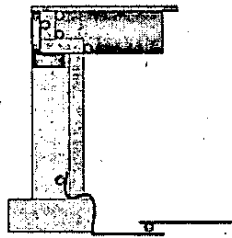
Improvement Description	Location in Home	Cost – Effective?¹	Annual Savings¹	Rating Points Gained²	Rating, after all Improvements thru this one³
Add R-14 rigid foam to interior or exterior of existing wall; cost does not include wall coverings.	Above-Grade Wall: House/lower floor/wood framed walls	Yes	\$559	2.3	51.2 points 2 Stars Increase: 2.3 pts, 1 step
<p>You may have several options for increasing the R-value of the walls. Proper air sealing will significantly improve the performance of the new insulation.</p> <p>Interior Retrofit. Any type of rigid foam can be used although the highest R-value per inch will be found with polyisocyanurate (such as Thermax or R-max). If the rigid insulation is foil-faced, the aluminum foil can serve as the vapor retarder. If used as the vapor retarder, all seams and fasteners need to be sealed with aluminum foil tape. Cover with gypsum board.</p> <p>Exterior Retrofit. For added heat loss protection, consider adding rigid insulation to the exterior walls. This provides more insulation as well as reducing outside air penetration and preventing wet siding from transmitting moisture into the wall cavity. Because rigid insulation is an excellent moisture retarder, and because it keeps the wall cavity warmer, walls with exterior insulating sheathing are significantly drier than walls without it. You should try for at least R20 which is 4" of blue/pink foam. More information on this system is available from the Cold Climate Housing Research Center website at www.cchrc.org. A DVD on the process is available for free from the Alaska Building Science Network (562-9927).</p>					
Install a Programmable Thermostat; zone controls extra		Yes	\$779	1.6	52.8 points 2 Stars Increase: 3.9 pts, 1 step
<p>A thermostat that adjusts the temperature at different times during the day saves energy, compared with a simple room thermostat. <i>Setback or programmable thermostats</i> can automatically reduce the house temperature for certain periods such as when the home is unoccupied or during sleeping hours. Thermostats generally have only two low-voltage wires and are easy to install. You will need one thermostat for each zone.</p> <p>Confusing controls on some programmable thermostats may make it difficult to save energy. When choosing a programmable thermostat look for one that is easily programmed with a display that is easy to read at arm's length. All programmable thermostats let you override their energy-saving modes. Some use bold letters or lights to tell you the override is on. Others have override prompts that are relatively easy to miss, and you may not realize you are not saving energy.</p>					
 <p>The diagram shows a thermostat control panel with several callouts: <ul style="list-style-type: none"> Large readouts help avoid energy-wasting goals. (Points to the large digital display showing '45.60') Backlighting makes the display easier to read in dark hallways and at night. (Points to the illuminated display area) A bold "bold" prompt reminds you when you're overriding the energy-saving mode. (Points to a small indicator light) System status, showing whether heat or A/C is activated, is indicated by words or icons. (Points to a small display area) Touch screens ease programming via a touch-sensitive menu. (Points to a touch-sensitive button) </p>					

Improvement Description	Location in Home	Cost - Effective?¹	Annual Savings¹	Rating Points Gained²	Rating, after all Improvements thru this one⁶
Install R-14 rigid foam board to interior or exterior side of wall. Does not include coverings or excavation costs.	Below- (part or all) Grade Wall: House/front section below kitchen/crawl space	Yes	\$439	1.9	54.7 points 2 Stars Increase: 5.8 pts, 1 step

Sealed, insulated and unvented crawl space retrofits provide a solution to comfort, energy and moisture concerns in homes. Extensive field experience indicates that it provides exceptional environmental control for a safe and healthy crawl space environment. Your best approach is to seal and insulate the foundation walls rather than the floor.

Before any efforts are made to control ground or airborne moisture, all bulk moisture entering the crawlspace (e.g., rainwater, subsurface) must be controlled. The following steps should be followed in their entirety or the desired results might not be achieved.

- Ensure exterior grade slopes away from the foundation at least 5% (6 inches per 10 feet) to direct rain and surface water away from the house. Empty downspouts 8 to 10 feet from the foundation.
- Maintain foundation drain system to control groundwater. If the outside grade is higher than the inside grade, a damp-proof coating on the exterior foundation wall is recommended. If the interior grade is higher than the exterior grade, damp proofing and foundation drains may be eliminated.
- A new vapor retarder should be installed sealing the ground from the building. Ideally this should be constructed as if it were to be a swimming pool liner. Lap seams and seal with acoustical sealant. Taping these sealed seams is not necessary but highly recommended; taping the seams will help compress the sealant bead. The vapor retarder should extend above the top of the footing roughly 6 inches. This termination should also be mechanically fastened sealing the sealant between the vapor retarder and the foundation wall.



- The rim joists (the perimeter joist cavities) should also be insulated with spray or extruded polystyrene (XPS) rigid foam insulation. One of the best retrofit methods is to cut blocks of 4 inch XPS rigid insulation to fit in the cavities and caulk or foam each block into place. This material should overlap with the inside of the foundation wall insulation. After the foam has been sealed to the rim joists, mudsill, and subfloor, fiberglass batt insulation can be added to the interior crawl space side of the rim joist to increase total R-value.

- Green dots indicate where air sealing is necessary.

Install R-21 insulation on basement wall	Below- (part or all) Grade Wall: House/Block wall foundation/ lower floor	Yes	\$1,620	7.1	61.8 points 2+ Stars Increase: 12.9 pts, 2 steps
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Control moisture. Before insulating foundation walls, make sure they are in good repair and check site drainage. Be sure that the walls are properly sealed and that no moisture is getting in. If the basement is damp or the walls have wet spots after a rain, the foundation should be

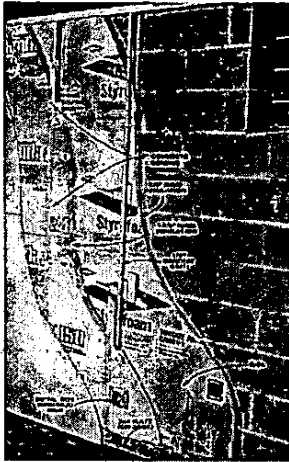
Improvement Description	Location in Home	Cost - Effective?¹	Annual Savings¹	Rating Points Gained²	Rating, after all Improvements thru this one³
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checked by a professional before beginning your project.

Use approved, rigid-board insulation thick enough to give R-13 and finish it with a fire-resistant material, for example, gypsum board;

Headers should have at least R-13 rigid foam, friction-fit into each cavity and sealed with caulking or foam-in insulation to reduce air leakage. Blown-in polyurethane foam can also be used.

The most convenient option may be installing several inches of rigid foam insulation using a foam-compatible adhesive and mechanical fasteners. Vertical wood strips spaced 24 inches apart allow drywall to be fastened to the walls.

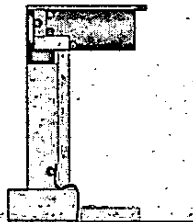


Insulating the basement walls could also be accomplished by installing rigid insulation on the exterior side.

In most areas, basement walls should be insulated to at least R-10 if they are more than fifty percent below the grade. If they are more than fifty percent above the grade, they should be insulated the same as above grade walls.

After the insulation is in place, a wall finish should be applied directly to the studs.

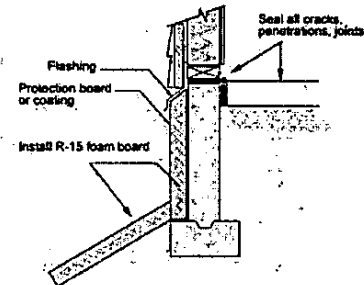
Install 4' of R-10 rigid board insulation on Perimeter of Crawl Space Floor:	On- or Below-Grade Floor, Perimeter: House/below kitchen/crawl space	Yes	\$84	0.3	62.1 points 2+ Stars Increase: 13.2 pts, 2 steps
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While not a common practice, this can help pick up rating points and will save energy. Simply lay 4' wide XPS foam insulation around the inside perimeter of the foundation footing. This insulation performs best below the vapor retarder, but will also be effective placed on top of the vapor retarder.

Improvement Description	Location in Home	Cost - Effective?	Annual Savings ¹	Rating Points Gained ²	Rating, after all Improvements thru this one ⁶
Install 2' of R-14 rigid board insulation around perimeter of Slab (vertical or horizontal).	On- or Below-Grade Floor, Perimeter: House/garage floor	Yes	\$202	0.9	63.0 points 2+ Stars Increase: 14.1 pts, 2 steps

With a slab foundation, the energy loss is greatest at the edge. Excavate to a depth of 2' around the slab and attach rigid insulation to the foundation wall. Make sure the insulation comes all up to the bottom of the siding. Cover the above grade portion of the insulation with flashing. Then backfill. You can stop more energy loss by adding 2' of insulation, extending out from the foundation wall.



Install 2' of R-14 rigid board insulation around perimeter of Slab (vertical or horizontal).	On- or Below-Grade Floor, Perimeter: House/lower floor/living space	Yes	\$313	1.4	64.4 points 2+ Stars Increase: 15.5 pts, 2 steps
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See above improvement measure

Caulk and Seal so that Home Air Leakage is Reduced by 4000 CFM at 50 Pascals.		Yes	\$3,016	11.8	76.2 points 3+ Stars Increase: 27.3 pts, 4 steps
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Air sealing tasks include:

- Seal joints and penetrations in the crawlspace rim joist.
- Remove baseboard trim and seal the wall/floor joints at the wood floors. Replace the baseboards.
- Seal wall/ceiling joints
- Seal window and door frame/wall joints if windows are not replaced. Remove trim and seal the gaps with caulk or low-expanding foam.
- Seal window sash/frame joints if the windows are not replaced.
- Seal around plumbing, mechanical, and electrical penetrations into the attics.
- Seal around the old fireplace flue at the ceiling level. If possible, remove the old chimney and seal up the hole. You may need to get access to this area from the outside.
- Outlet and switch plates. Use foam gaskets and child protector plugs to seal these items. If leakage is still a problem caulk the wiring penetrations through the box (turn off the breakers first!)
- Install brush quality weatherstripping on exterior doors if they are not replaced.
- Replace or seal around recessed lights. Optimally the lights could be removed, the penetrations sealed, and new, surface-mount lighting installed. The second option is to replace the existing unsealed recessed fixtures with air-tight, sealed recessed fixtures that are rated for insulation contact. Finally, the existing fixtures could be covered with insulated

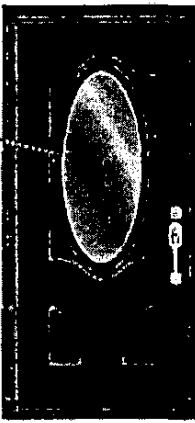
Improvement Description	Location in Home	Cost – Effecti ve?¹	Annual Savings²	Rating Points Gained⁵	Rating, after all Improvements thru this one⁶
<p>boxes. The boxes can be made with rigid insulation (Thermax, RMax, or extruded polystyrene) and the joints sealed with foil or plastic tape. Seal the box to the vapor retarder with an adhesive sealant. Caution: boxes must be large enough to allow heat dissipation from the fixture. Use CFL lights to reduce overheating risk.</p> <ul style="list-style-type: none"> • Seal over kitchen soffit. Use rigid insulation (same types as noted above) to create a vapor retarder at the top of the kitchen soffit. It should be in the same plane as the main ceiling and be sealed to the polyethylene vapor retarder and/or the bottom chord of the trusses. The existing fiberglass insulation can be placed on top of the rigid (not in the soffit). • The best material for sealing these hidden air leaks depends on the size of the gaps and where they are located. Caulk is best for cracks and gaps less than about 1/4" wide. • Expanding foam sealant is an excellent material to use for sealing larger cracks and holes that are protected from sunlight and moisture. Today's products are safe for atmospheric ozone. Backer rod or crack filler is a flexible foam material, usually round in cross-section (1/4" to 1" in diameter), and sold in long coils. Use it for sealing large cracks and to provide a backing in very deep cracks that are to be sealed with caulk. • Use rigid foam insulation for sealing very large openings such as plumbing chases and attic hatch covers. Fiberglass insulation can also be used for sealing large holes, but it will work better if wrapped in plastic or stuffed in plastic bags, because air can leak through exposed fiberglass. Specialized materials such as metal flashing and high-temperature silicone sealants may be required for sealing around chimneys and flue pipes. Check with your building inspector or fire marshal if unsure about fire-safe details in these locations. • Additional air sealing benefits will come from replacing the boiler and water heater with a sealed combustion system. This will eliminate both the need for a combustion air supply and the flues. 					
Remove existing glass and install triple low E argon glass.	Window/Skylight: House/single pane/non-south	Yes	\$417	1.8	78.0 points 4 Stars Increase: 29.1 pts, 5 steps
<p>The critical energy issue for new window is the U-factor. The lower the U-factor, the more efficient the product. For our area you should look for U-factors of .3 or lower. If large windows are replaced, consider reducing the area. For the short-term, consider the shrink wrap window film to reduce this winter's energy costs. In the cost/benefit analysis, the AKWarm software does not consider the additional savings gained from reduced window air leakage.</p>					
Remove existing door and install standard pre-hung R-14 insulated door, including hardware.	Exterior Door: House/garage/person door	Yes	\$135	0.6	78.6 points 4 Stars Increase: 29.7 pts, 5 steps
<p>Quality exterior doors are filled with foam insulation and have insulating values of about R-7 to R-14, compared to R-2.2 for conventional solid wood doors. They come in a variety of styles. Metal doors last longer than wood doors, do not warp easily, and provide greater security. Often, they cost no more than solid wood exterior doors. You may also consider a fiberglass replacement door. These provide energy efficiency and durability comparable to a metal door and have a wood grain appearance.</p> <p>The major drawback of metal and fiberglass doors is their inflexibility. They cannot be easily trimmed, so if the door frame is not square, it may have to be rebuilt.</p>					

Improvement Description	Location in Home	Cost - Effective? ¹	Annual Savings ¹	Rating Points Gained ⁵	Rating, after all Improvements thru this one ⁶
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Make sure the installer reads the directions that come with the door before beginning. Some adjustments can be made after the door is installed, but they will require extra time. A properly installed insulated door will seal tightly for years.

WHAT MAKES A DOOR ENERGY EFFICIENT?

MULTIPLE GLASS PANES
Double or triple-paned insulating glass is used to reduce heat flow.



TIGHTER FIT AND IMPROVED WEATHER STRIPPING
New frames may include a magnetic strip to create a tighter seal that reduces air leakage around the edges.

IMPROVED CORE MATERIALS
Fiberglass, wood cladding, and steel with polyurethane foam core are among the most energy-efficient door materials available today.

CHANGE FOR THE BETTER WITH ENERGY STAR

Remove existing glass and install triple low E argon glass.	Window/Skylight: House/garage windows	Yes	\$119	0.5	79.1 points 4 Stars Increase: 30.2 pts, 5 steps
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See earlier window note

Add R-14 rigid foam to interior or exterior of existing wall; cost does not include wall coverings.	Above-Grade Wall: House/wood framed walls/lower floor	Yes	\$100	0.4	79.5 points 4 Stars Increase: 30.6 pts, 5 steps
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You may have several options for increasing the R-value of the walls. Proper air sealing will significantly improve the performance of the new insulation. See earlier adding wall insulation note.

Add R-14 rigid foam to interior or exterior of existing wall; cost does not include wall coverings.	Above-Grade Wall: House/garage walls	Yes	\$255	1.1	80.6 points 4 Stars Increase: 31.7 pts, 5 steps
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See earlier note

Add R-14 rigid foam to interior or exterior of existing wall; cost does not include wall coverings.	Above-Grade Wall: House walls	Yes	\$489	2.1	82.7 points 4 Stars Increase: 33.8 pts, 5 steps
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See earlier note

Improvement Description	Location in Home	Cost - Effecti ve? ¹	Annual Savings ¹	Rating Points Gained ⁵	Rating, after all Improvements thru this one ⁶
Add R-30 fiberglass batts to attic	Ceiling w/ Attic House/garage attic	Yes	\$158	0.7	83.4 points 4+ Stars Increase: 34.5 pts, 6 steps
<ul style="list-style-type: none"> • Air seal ceiling plane. Air sealing should be performed as part of any attic or ceiling construction or retrofit, before any new or additional insulating is done. In many homes, more heat is lost by air leakage than by heat transfer through insulation. Air leakage can also reduce the ability of the insulation to perform its function, so that insulating without also air sealing results in effectively lower R-values. When air sealing, you should consider the cost and method(s), and be aware of impacts on ventilation and the behavior of naturally drafted "appliances" such as furnaces, water heaters, and fireplaces. • Check to verify dryer and bathroom fans are not exhausting into the attic. • Install additional insulation. You can use batts, blown fiberglass, or rigid sheathing. <ul style="list-style-type: none"> ○ Batt insulation. Laying fiberglass rolls is easiest for a DIY job. If you have any type of insulation between the rafters, install the second layer over and perpendicular to the first (again, the second layer of roll insulation should be unfaced- with no vapor retarder). This will help cover the tops of the joists and reduce heat loss or gain through the frame. Also, when laying down additional insulation, work from the perimeter toward the attic opening. Never lay insulation over recessed light fixtures or soffit vents. ○ Blown insulation - cellulose or fiberglass - must be carefully installed to assure even coverage, avoiding high and low areas with varying R-values, and avoiding blocking ventilation paths. Ask how the insulation contractor controls for the proper amount of insulation material and depth. Loose-fill cellulose or fiberglass insulation can be blown over existing loose-fill or over batts and blankets. To keep loose-fill from shifting into vents or eaves or from coming into contact with fan motors or other heat-producing equipment, place sheet metal flashing or other non-flammable material around these areas. Make sure you install baffles to keep eave openings clear for attic ventilation. Install the insulation from the outer edges inward. Dividing the attic into segments and installing the proportionate amount of insulation in each segment will help you cover the entire attic area evenly. At the eaves consider staggering rigid urethane board such as Thermax or R-max to increase the potential R-value in this area. ○ Keep all insulation at least 3 inches away from "can" lights, unless they are rated IC (Insulated Ceiling). If you are using loose fill insulation, use sheet metal to create barriers around the openings. If using fiberglass, wire mesh can be used to create a barrier. • Improve ventilation, preferably with continuous ridge and soffit vents • Insulate attic access hatches and stairways • Air seal attic access hatches and stairways • Air seal chases (shafts) and dropped soffits (bulkheads) 					
Add R-30 fiberglass batts to attic	Ceiling w/ Attic: House attic	Yes	\$363	1.6	85.0 points 4+ Stars Increase: 36.1 pts, 6 steps
See previous improvement note					
Remove existing glass and install triple low E argon glass.	Window/Skylight: House/non-south	Yes	\$148	0.7	85.7 points 4+ Stars Increase:

Improvement Description	Location in Home	Cost Effective?	Annual Savings ¹	Rating Points Gained ²	Rating, after all Improvements thru this one ⁶
					36.8 pts, 6 steps
Remove existing glass and install triple low E argon glass.	Window/Skylight: House/south	Yes	\$56	0.2	85.9 points 4+ Stars Increase: 37.0 pts, 6 steps
See earlier window note					
Remove existing glass and install triple low E argon glass.	Window/Skylight: House/double pane/.5" spacer	Yes	\$124	0.6	86.5 points 4+ Stars Increase: 37.6 pts, 6 steps
See earlier window note					
Remove existing door and install standard pre-hung R-14 insulated door, including hardware.	Exterior Door: House/garage/ over head door	Yes	\$307	1.3	87.8 points 4+ Stars Increase: 38.9 pts, 6 steps
Quality garage doors are filled with foam insulation and have insulating values of about R-7 to R-14, compared to R-2.2 for conventional solid wood doors.					
Remove existing glass and install triple low E argon glass.	Window/Skylight: House/south/double pane/.5" spacer	Yes	\$118	0.5	88.3 points 5 Stars Increase: 39.4 pts, 7 steps
See earlier window note					
Replace Oil-fired tank-type water heater with efficient "side arm" to 40,000 Btu boiler		No	\$0	0.0	88.3 points 5 Stars Increase: 39.4 pts, 7 steps
<p>If you use a boiler, ask your contractor about installing an indirect water heater, (sometimes called a "boiler mate", e.g. Amtrol Boilermate). These use your boiler as the heat source by circulating hot water from the boiler through a heat exchanger in a well-insulated water heater tank. It is more efficient than a stand-alone water heater and does not require combustion air. It may also have a higher recovery rate than a regular water heater. When used with a modern, high-efficiency boiler, with appropriate controls (cold boiler), these energy savings hold true even in the summer when your boiler isn't needed for heat.</p> <p>These systems can be purchased in an integrated form, incorporating the boiler or furnace and water heater with controls, or as separate components. Gas, oil, and propane-fired systems are available.</p> <p>The efficiency of a combination water and space heating system is indicated by its combined appliance efficiency rating (CAE). The higher the number, the more energy efficient. Combination appliance efficiency ratings vary from 0.59 to 0.90. Look for CAE of 0.85 or higher</p>					