



# Comprehensive Energy Audit For

## Mountain Village Boys & Girls Club



---

Prepared For  
**City of Mountain Village**

**August 11, 2017**

**Prepared By: Kevin Ulrich**

**ANTHC-DEHE  
4500 Diplomacy Dr.  
Anchorage, AK 99508**

## Table of Contents

PREFACE .....	2
ACKNOWLEDGMENTS .....	2
OVERVIEW .....	3
ENERGY BASELINE .....	3
PROPOSED ENERGY EFFICIENCY MEASURES (EEM) .....	3
FACILITY DESCRIPTION .....	4
PROJECT FINANCING .....	5
MEASUREMENT AND VERIFICATION .....	6
Appendix A –Energy Billing Data .....	7
Appendix B – Energy Audit Report – Project Summary .....	8
Appendix C – Actual Fuel Use versus Modeled Fuel Use .....	9
Appendix D - EUI Calculation Details .....	10
Appendix E – Materials List and Labor Estimation.....	11
Appendix F – Materials Specifications .....	12

## PREFACE

The purpose of this report is to provide guidance in reducing facility operating costs and enhance the sustainability of this community. The report assesses the current energy usage of the facility, provide options for reducing the amount of energy used, and evaluate the cost vs. benefit of each option.

Discussions of site specific concerns, financing options, general facility information, and an Energy Efficiency Action Plan are also included in this report.

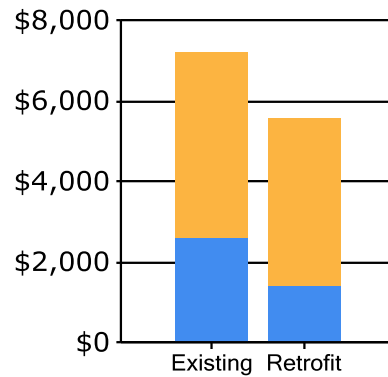
## ACKNOWLEDGMENTS

The Rural Energy Initiative gratefully acknowledges the assistance of Mountain Village City Manager Robert Joe and City Clerk Janelle Amos.

## OVERVIEW

This report was prepared for the City of Mountain Village. The scope of the audit focused on the Mountain Village Boys & Girls Club and includes an analysis of building occupancy schedules, building shell, heating systems, heating and ventilations systems, domestic hot water, lighting, and other electrical loads. The Mountain Village Boys & Girls Club is approximately 2,800 square feet and houses a recreational center for children after school. The building is owned by the City of Mountain Village.

**Annual Energy Costs by Fuel Type**



#1 Oil  
Electricity

## ENERGY BASELINE

Based on unsubsidized electricity and fuel oil prices in effect at the time of the audit, the total predicted energy costs are \$7,197 per year. This includes \$2,608 for unsubsidized electricity and \$4,589 for #1 fuel oil.

The State of Alaska Power Cost Equalization (PCE) program provides a subsidy to rural communities across the state to lower electricity costs and make energy affordable in rural Alaska. In Mountain Village, the cost of electricity without PCE is \$0.49/kWh and the cost of electricity with PCE is \$0.28/kWh. With the PCE subsidy, the electric utility cost to the City of Mountain Village is \$3,821 and the cost to the State of Alaska is \$2,875.

Table 1 lists the predicted annual energy usage before and after the proposed retrofits for the Mountain Village Boys & Girls Club.

**Table 1: Predicted Annual Energy Use for the Mountain Village Boys & Girls Club**

Predicted Annual Fuel Use				
Fuel Use	Existing Building	With Proposed Retrofits	Total Energy Savings	Total Cost Savings (Subsidized)
Electricity	6,686 kWh	3,686 kWh	3,000 kWh	\$840
#1 Oil	725 gallons	656 gallons	69 gallons	\$393

## PROPOSED ENERGY EFFICIENCY MEASURES (EEM)

Table 2 below summarizes the energy efficiency measures analyzed for the Mountain Village Boys & Girls Club. Listed are the estimates of the annual savings, installed costs, and two different financial measures of investment return. All costs assume that local labor will be used with no additional cost associated for travel or administrative tasks.

**Table 2: Priority List – Energy Efficiency Measures**

Priority	Feature	Improvement Description	Annual Energy Savings	Installed Cost	Savings to Investment Ratio, SIR <sup>1</sup>	Simple Payback (Years) <sup>2</sup>	CO <sub>2</sub> Savings
High	Setback Thermostat: Teen Center	Program an unoccupied setback of 50.0 deg. F into the Toyo oil heater.	\$395	\$500	10.70	1.3	1,322.1
High	Lighting: Exteriors	Replace with new direct-wire, LED equivalent light bulbs.	\$118	\$200	4.96	1.7	544.0
Medium	Lighting: Fluorescent T12	Replace with new direct-wire, LED equivalent light bulbs.	\$316	\$1,600	2.12	5.1	1,681.3
Medium	Lighting: Fluorescent T8	Replace with new direct-wire, LED equivalent light bulbs.	\$340	\$2,560	1.41	7.5	1,835.4
Medium	Air Tightening: Front Entry	Add weather stripping around the front door, caulk the windows, add insulation to the walls, and replace the door locking mechanism.	\$424	\$3,000	1.31	7.1	1,418.9
Low	Lighting: Closet Incandescent	Replace with new direct-wire, LED equivalent light bulbs.	\$3	\$50	0.55	19.5	13.8
Low	Exterior Door: Front Entry	Remove existing door and install standard insulated door.	\$15	\$1,442	0.24	98.4	49.1
<b>TOTAL</b>			<b>\$1,609</b>	<b>\$9,352</b>	<b>1.89</b>	<b>5.8</b>	<b>6,864.5</b>

## FACILITY DESCRIPTION

### Building Occupancy Schedules

The building is occupied from 2:00 – 5:00 PM for five days per week with approximately 12 elementary-aged children and from 6:00 – 9:00 PM for five days per week with approximately 6 teenage children. There are also two workers present during these times.

### Building Shell

The building is a wood-framed lumber construction with fiberglass batt insulation. The building is built on an elevated pile foundation. The roof has 2x6 lumber construction with attic space available.

There are two total windows in the building. Each window has double-pane glass with vinyl framing. Both windows were measured to be 46" x 29" and are south-facing.

There are two total entrances to the building. Both of the entrances are single insulated metal doors with no windows. The front entrance has an arctic entry and the side entrance has been blocked from use with furniture.

### Heating Systems

The heating systems used in the building are:

## Toyo Laser 73

Fuel Type: #1 Oil  
Input Rating: 40,000 BTU/hr  
Steady State Efficiency: 90 %  
Idle Loss: 0 %  
Heat Distribution Type: Air

### Space Heating Distribution Systems

All space heat comes from the Toyotomi Laser 73 oil-fired heater.

### Lighting

**Table 3: Lighting Information in the Mountain Village Boys & Girls Club**

Room	Bulb Type	Fixtures	Bulbs per Fixture	Annual Usage (kWh)
Main Hall	Fluorescent 4ft. T12	20	4	1,762
Main Hall/Office	Fluorescent 4ft. T8	32	4	2,211
Closet	Incandescent A Lamp 60W	1	1	14
Exterior	Incandescent A Lamp 60W	2	1	408

### Major Equipment

**Table 4: Major Electrical Equipment in the Mountain Village Boys & Girls Club**

Equipment	Rating (Watts)	Annual Usage (kWh)
Desktop Computer	75	117
Printer	75	8
Microwave	1,200	122
Television	96	75
Panasonic Stereo	225	352
Panasonic Stereo 2	270	423
Panasonic CD Changer	11	17
Panasonic Stereo Speakers (2)	130	407

## PROJECT FINANCING

The total estimated cost of the recommended EEM's \$9,532. The payback for the implemented EEM's is approximately 5.8 years. ANTHC is willing to assist the community with acquiring funds to complete the scope of work recommended in this energy audit.

There are several options for financing energy efficiency projects within the State of Alaska. These include the use of grants, loans, and other funding opportunities. Below is some information on potential funding opportunities.

**Energy Efficiency Revolving Loan Program** – This is a loan administered by the Alaska Housing Finance Corporation (AHFC) for use by any applicant who is also the owner of the building where the work will take place. It provides a loan for permanent energy-efficiency projects with a completion window of one year.

**Sustainable Energy Transmission and Supply Program** – This is a loan administered by the Alaska Energy Authority (AEA) for a government, business, or other organized body of people. It provides a loan for energy-efficiency or power transmission or distribution projects.

**USDA-RD Communities Facilities Direct Loan & Grant Program** - This is a loan or grant provided by the US Department of Agriculture – Rural Development (USDA-RD) for any essential community facility in a rural area. It provides a loan or grant to develop essential community facilities with upgrades or equipment for improvement.

## **MEASUREMENT AND VERIFICATION**

The results of these recommended measures can be measured through the collection of energy use data through the monthly bills provided by the local electric utility and the local fuel oil supplier. Collecting data and performing a historical comparison is the simplest method of validating the energy and cost savings seen by the measures. Additionally, active remote monitoring systems are available that can collect and store data regarding energy and fuel usage. These systems allow the user to track the usage in real time and can be shared more easily with partners across the state.

# APPENDICES

## Appendix A –Energy Billing Data

The table below shows the fuel and electricity data used during the energy modeling process to confirm the accuracy of the energy distribution. The fuel use distribution was estimated based on the times of each fuel delivery, which were not in a precisely monthly basis.

<b>Month</b>	<b>Fuel Oil Use (gallons)</b>	<b>Electricity Use (kWh)</b>
January	130	748
February	100	714
March	80	599
April	40	371
May	25	333
June	0	525
July	0	377
August	0	379
September	19	412
October	55	587
November	100	718
December	130	765

# Appendix B – Energy Audit Report – Project Summary

ENERGY AUDIT REPORT – PROJECT SUMMARY	
General Project Information	
PROJECT INFORMATION	AUDITOR INFORMATION
<b>Building:</b> Mountain Village Boys & Girls Club	<b>Auditor Company:</b> ANTHC-DEHE
<b>Address:</b> PO Box 32085	<b>Auditor Name:</b> Kevin Ulrich & Bailey Gamble
<b>City:</b> Mountain Village	<b>Auditor Address:</b> 4500 Diplomacy Dr.
<b>Client Name:</b> Robert Joe	Anchorage, AK 99508
<b>Client Address:</b> PO Box 32085 Mountain Village, AK 99632	<b>Auditor Phone:</b> (907) 729-3237
<b>Client Phone:</b> (907) 591-2929	<b>Auditor FAX:</b>
<b>Client FAX:</b>	<b>Auditor Comment:</b>
Design Data	
<b>Building Area:</b> 2,800 square feet	<b>Design Space Heating Load:</b> Design Loss at Space: 30,299 Btu/hour with Distribution Losses: 30,299 Btu/hour Plant Input Rating assuming 82.0% Plant Efficiency and 25% Safety Margin: 46,187 Btu/hour Note: Additional Capacity should be added for DHW and other plant loads, if served.
<b>Typical Occupancy:</b> 12 people	<b>Design Indoor Temperature:</b> 65 deg F (building average)
<b>Actual City:</b> Mountain Village	<b>Design Outdoor Temperature:</b> -24.3 deg F
<b>Weather/Fuel City:</b> Mountain Village	<b>Heating Degree Days:</b> 12,947 deg F-days
Utility Information	
<b>Electric Utility:</b> Alaska Village Electric Cooperative	<b>Average Annual Cost/kWh:</b> \$0.49/kWh

Annual Energy Cost Estimate					
Description	Space Heating	Lighting	Refrigeration	Other Electrical	Total Cost
<b>Existing Building</b>	\$4,636	\$1,714	\$253	\$593	<b>\$7,197</b>
<b>With Proposed Retrofits</b>	\$4,192	\$548	\$253	\$593	<b>\$5,588</b>
<b>Savings</b>	\$443	\$1,165	\$0	\$0	<b>\$1,609</b>

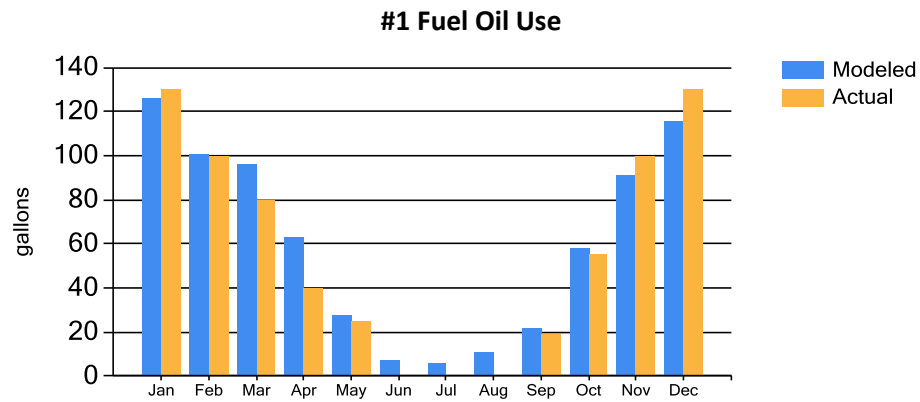
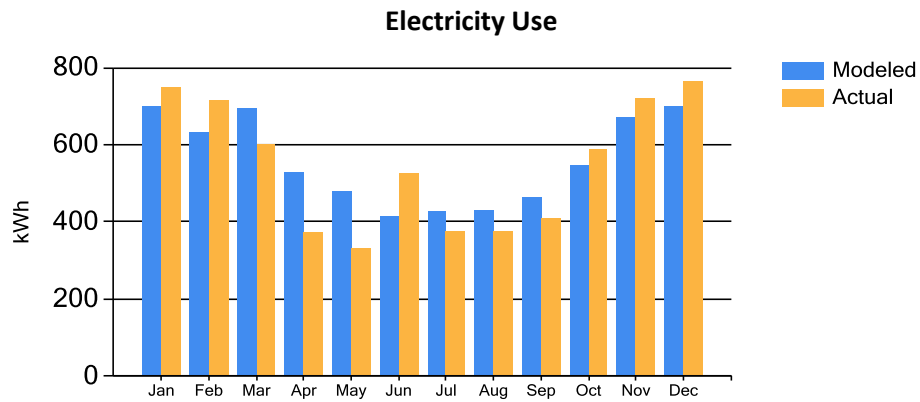
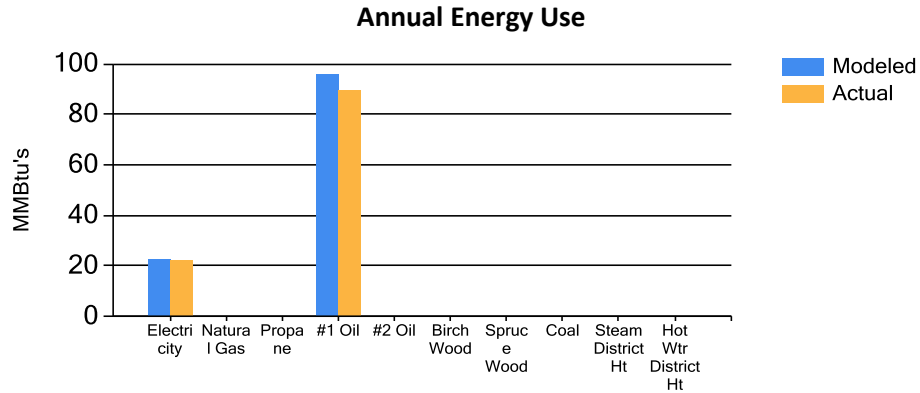
Building Benchmarks			
Description	EUI (kBtu/Sq.Ft.)	EUI/HDD (Btu/Sq.Ft./HDD)	ECI (\$/Sq.Ft.)
<b>Existing Building</b>	42.3	3.27	\$2.57
<b>With Proposed Retrofits</b>	35.4	2.73	\$2.00

EUI: Energy Use Intensity - The annual site energy consumption divided by the structure's conditioned area.  
 EUI/HDD: Energy Use Intensity per Heating Degree Day.  
 ECI: Energy Cost Index - The total annual cost of energy divided by the square footage of the conditioned space in the building.



# Appendix C – Actual Fuel Use versus Modeled Fuel Use

The graphs below show the modeled energy usage results of the energy audit process compared to the actual energy usage report data. The model was completed using AkWarm modeling software. The orange bars show actual fuel use, and the blue bars are AkWarm’s prediction of fuel use.



## Appendix D - EUI Calculation Details

The Alaska Village Electric Cooperative owns and operates the utility that provides electricity to the residents of the community as well as to all the commercial and public facilities.

The average cost for each type of fuel used in this building is shown below in Table 5. This figure includes all surcharges, subsidies, and utility customer charges:

**Table 5: Energy Cost Rates for each Fuel Type.**

Average Energy Cost	
Description	Average Energy Cost
Electricity	\$ 0.49/kWh
#1 Oil	\$ 6.33/gallons

Table 6 shows the calculated results for the building Energy Use Index (EUI), which determines the total energy usage for a type of building for comparison with other buildings of the same type. This allows the user to determine the relative energy use of a building in relation to others of the same type or use.

**Table 6: EUI Building Calculations for the Mountain Village Boys & Girls Club**

Energy Type	Building Fuel Use per Year	Site Energy Use per Year, kBTU	Source/Site Ratio	Source Energy Use per Year, kBTU
Electricity	6,686 kWh	22,819	3.340	76,215
#1 Oil	725 gallons	95,701	1.010	96,658
<b>Total</b>		<b>118,520</b>		<b>172,874</b>
BUILDING AREA		2,800	Square Feet	
BUILDING SITE EUI		42	kBTU/Ft <sup>2</sup> /Yr	
<b>BUILDING SOURCE EUI</b>		<b>62</b>	<b>kBTU/Ft<sup>2</sup>/Yr</b>	
* Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued March 2011.				

Table 7 shows information on common energy use benchmarks used to characterize the efficiency of a building.

**Table 7: Building Benchmarks for the Mountain Village Boys & Girls Club**

Building Benchmarks			
Description	EUI (kBtu/Sq.Ft.)	EUI/HDD (Btu/Sq.Ft./HDD)	ECI (\$/Sq.Ft.)
Existing Building	42.3	3.27	\$2.57
With Proposed Retrofits	35.4	2.73	\$2.00
EUI: Energy Use Intensity - The annual site energy consumption divided by the structure's conditioned area. EUI/HDD: Energy Use Intensity per Heating Degree Day. ECI: Energy Cost Index - The total annual cost of energy divided by the square footage of the conditioned space in the building.			

## Appendix E – Materials List and Labor Estimation

**Table 8 & 9: Materials List and Cost Estimation for Mountain Village Boys & Girls Club EEM’s**

Energy Retrofit	Required Materials	Quantity	Cost per Item	Total Materials Cost
LED Lighting	Incand. 60W Equivalent	3	25	150
LED Lighting	T8 LED Equivalent 4 ft.	104	15	1,560
Door Replacement	Door	1	500	500
Air Tightening	Weather Stripping, Caulking, Window Film	1	75	75

Category	Cost (\$)
Labor	3,542
Travel	2,500
Materials	2,285
Freight	343
Indirect	867
<b>Total</b>	<b>\$9,537</b>

This energy audit cost information assumes that all work will be completed by an employee from outside of the community. If local labor is used for the retrofits, the travel and indirect costs may be removed from the total estimated cost.

# Appendix F – Materials Specifications



# LED T8 | T12

Notify Me when Available

[Large Project? Click here to get a volume quote.](#)



## DESCRIPTION

## SPECIFICATIONS

## REVIEWS

### EarthLED Total Product Insight

#### PERFORMANCE SPECIFICATIONS

REPLACEMENT FOR:	T8 OR T12 4 FOOT FLUORESCENT TUBE
BRIGHTNESS (LUMENS):	2000
COLOR TEMPERATURE:	4000K   5000K
COLOR ACCURACY (CRI):	80
DIMENSIONS	1.02" X 47.2"
POWER CONSUMPTION:	18 WATTS
VOLTAGE:	120-277 VOLTS
DIMMABLE:	NO

#### DIMENSIONS / ADDITIONAL DATA

CERTIFICATIONS:	UL, DESIGNLIGHTS (DLC)
PRODUCT/ORDER CODE:	4000K - 18WT8P-4F-40K-BYP 5000K - 18WT8P-4F-50K-BYP

#### LIFESPAN / COST TO RUN

PROJECTED LIFE: @3 HRS/DAY	50,000 HRS
YEARLY ENERGY COST: 3 HRS/DAY @ .11 KWH	\$2.17

#### WARRANTY

5 YEAR THINKLUX LIGHTING LIMITED WARRANTY  
EARTHLED PRODUCT PROTECTION PLAN IS AVAILABLE

EarthLED Total Product Insight	
Performance Specifications	
REPLACEMENT FOR:	E12 CANDELABRA
BRIGHTNESS (LUMENS):	500
COLOR TEMPERATURE:	3000K   5000K
COLOR ACCURACY (CRI):	>80
TRADITIONAL WATTAGE EQUIVALENT:	60 WATTS
POWER CONSUMPTION:	7 WATTS
VOLTAGE:	120 VOLTS
DIMMABLE:	YES
MOISTURE RATING:	DAMP
FIXTURE RATING:	OPEN FIXTURES
BASE TYPE:	E12
ENERGYSTAR QUALIFIED:	YES (TKUCA38S01-7W-D-830-E12)
Dimensions / Additional Data	
BULB DIAMETER:	1.6 IN
MAXIMUM OVERALL LENGTH:	4.9 IN
PRODUCT WEIGHT:	6.7 OUNCES
CERTIFICATIONS:	UL
PRODUCT/ORDER CODE:	3000K - TKUCA38S01-7W-D-830-E12 5000K - TKUCA38S01-7W-D-850-E12
Lifespan / Cost To Run	
PROJECTED LIFE: @3 HRS/DAY	25,000 HRS
YEARLY ENERGY COST: 3 HRS/DAY @ .11 KWH	\$0.84
WARRANTY	3 YEAR THINKLUX LIMITED WARRANTY EARTHLED PRODUCT PROTECTION PLAN IS AVAILABLE



# Door Bottom Sweep

## (Replacement for Damaged Brush Sweep)

### Product Search

Search by name, model, or upc.



## **DB006 Commercial Grade Door Sweep - 1-1/4" EPDM - 36"**

This heavy duty commercial grade door sweep provides years of service in high traffic applications. Heavy rubber seal stands up to the elements. Fasteners are included.

SKU: 68247 CATEGORIES: [DOOR SEALS, WEATHERIZATION & THRESHOLDS](#)

**WHERE TO BUY**

# Door Bottom Sweep

(For Doors w/ Very Large Gaps and/or Damaged Bottom Edges)



Toll Free 1.800.654.8454

[Home](#) [Products](#) [How We Can Help](#) [About](#) [Contact Us](#)

## M-D BUILDING PRODUCTS

Interactive Product Catalog

M-D Building Products, Inc. > Products > DB054 Door Bottom - 1-3/4" Vinyl - 36"

Product Search

Search by name, model, or upc.

Chat ^



### DB054 Door Bottom - 1-3/4" Vinyl - 36"

Energy loss through the bottom of doors can be minimized with the installation of a door bottom in conjunction with your smooth top threshold. This combination provides a weatherproof seal between the bottom of the door and the top of the threshold. Drip caps also provide your exposed entry ways protection by diverting water away from the door bottom and thresholds. M-D Building Products offers multiple combinations of new and replacement door bottoms and drip caps that will fit most entry doors.

SKU: 68593 CATEGORIES: [DOOR SEALS, WEATHERIZATION &](#)



# Door Bottom Sweep (Lower Profile)



M-D BUILDING PRODUCTS

Toll Free 1.800.654.8454

[Home](#) [Products](#) [How We Can Help](#) [About](#) [Contact Us](#)

Interactive Product Catalog

M-D Building Products, Inc. > Products > DB002 U-Shaped Door Bottom w/Drip Cap - 1-3/8" x 36"

Product Search

Search by name, model, or upc.



## DB002 U-Shaped Door Bottom w/Drip Cap - 1-3/8" x 36"

Energy loss through the bottom of doors can be minimized with the installation of a door bottom in conjunction with your smooth top threshold. This combination provides a weatherproof seal between the bottom of the door and the top of the threshold. Drip caps also provide your exposed entry ways protection by diverting water away from the door bottom and thresholds. M-D Building Products offers multiple combinations of new and replacement door bottoms and drip caps that will fit most entry doors.

SKU: 80630 CATEGORIES: [DOOR SEALS, WEATHERIZATION & THRESHOLDS](#)

Chat ^

# Door Top and Side Jambs

### Product Search



## Cinch Door Seal Tops and Sides 42" Silver

Cinch™ Door Seal Top & Sides is a fast and easy way to save money by sealing your doors against drafts and leaks. Say goodbye to drills, screws, screwdrivers or pilot holes. Simply measure, trim, peel and stick your way to energy savings in any season. Specially developed with 3M™ Adhesive Technology, Cinch installs in mere minutes and lasts for years.

SKU: 43303 CATEGORIES: DOOR SEALS, WEATHERIZATION & THRESHOLDS TAGS: AIR-TIGHT, CINCH, ENERGY SAVINGS

**WHERE TO BUY**

