



Investigative Energy Audit  
For  
Seldovia Village Tribe Visitor Center



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Prepared For  
**Seldovia Village Tribe (SVT)**

Prepared By  
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**April 3, 2017**

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## PREFACE

The purpose of this report is to provide guidance in reducing facility operating costs and enhance the sustainability of this community. The report assess 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 Energy Projects Group gratefully acknowledges the assistance of the Seldovia Village Tribe’s Facility Director, Bob Wabach, and Maintenance Technician, Juan Botero.

# OVERVIEW

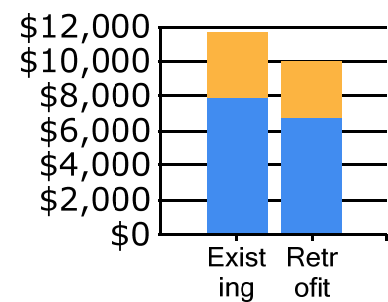
This report was prepared for the Seldovia Village Tribe. The scope of the audit focused on the Administration Building and includes an analysis of building occupancy schedules, building shell, heating systems, heating and ventilations systems, domestic hot water, lighting, and other electrical loads. The Administration Building was constructed around 2004 and is approximately 6,932 square feet. The building houses administrative offices, a medical clinic, a gift shop and a local museum. Data was based on a site survey and interviews with the building manager and maintenance staff.

## ENERGY BASELINE

Based on unsubsidized electricity and fuel oil prices in effect at the time of the audit, the total predicted energy costs are approximately \$12,116 per year. This includes approximately \$7,871 for electricity and \$4,245 for #1 fuel oil.

Table 1 lists the predicted annual energy usage before and after the proposed retrofits.

**Annual Energy Costs by Fuel Type**



**Table 1: Predicted Annual Energy Use for the Building**

Predicted Annual Energy Use				
Fuel Use	Existing Building	With Proposed Retrofits	Total Energy Savings	Total Cost Savings
Electricity	33,303 kWh	27,378 kWh	5,925 kWh	\$1,359
#1 Oil	1,241 gallons	1,055 gallons	186 gallons	\$636

## PROPOSED ENERGY EFFICIENCY MEASURES (EEM)

Table 2 below summarizes the energy efficiency measures analyzed for the Building. Listed are the estimates of the annual savings, installed costs, and two different financial measures of investment return.

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

Priority	Feature	Improvement Description	Cost Estimate	Annual Energy Savings	Installed Cost	Savings to Investment Ratio, SIR <sup>1</sup>	Simple Payback (Years) <sup>2</sup>
1	Install programmable thermostats	Program Thermostats to turn building temperature down to 60 deg F after-hours	Materials: \$50/thermostat Labor: \$50/thermostat Contingency: 10% Quantity: 22 thermostats	\$694	\$2,500	3.76	3.6
2	Retrofit LED bulbs in 2-bulb T8 light fixtures	Replace fluorescent bulbs with LED and remove ballasts in all 2-bulb t8 fixtures	Materials: \$12/bulb Labor: \$20/fixture Contingency: 10% Quantity: 62 fixtures	\$749	\$3,000	1.54	4.0
3	Retrofit LED bulbs in 3-bulb T8 light fixtures	Replace fluorescent bulbs with LED and remove ballasts	Materials: \$12/bulb Labor: \$20/fixture Contingency: 10% Quantity: 30 fixtures	\$456	\$1,900	1.48	4.2
4	Seal around exterior doors	Install weather stripping around exterior doors to reduce air leakage by 10%	Material 1: \$12 door sweep Material 2: \$30 gasket Labor: Maintenance Staff Contingency: 10% Quantity: 5 doors	\$57	\$250	2.10	4.4
5	Retrofit LED bulbs in track/can light fixtures	Replace bulbs in track/can lights with LED bulbs	Materials: \$10/bulb Labor: \$10/bulb Contingency: 10% Quantity: 9 bulbs	\$39	\$200	1.29	5.1
<b>TOTAL</b>				<b>\$1,995</b>	<b>\$7,850</b>	<b>2.24</b>	<b>3.9</b>

**Table Notes:**

<sup>1</sup> Savings to Investment Ratio (SIR) is a life-cycle cost measure calculated by dividing the total savings over the life of a project (expressed in today's dollars) by its investment costs. The SIR is an indication of the profitability of a measure; the higher the SIR, the more profitable the project. An SIR greater than 1.0 indicates a cost-effective project (i.e. more savings than cost). Remember that this profitability is based on the position of that Energy Efficiency Measure (EEM) in the overall list and assumes that the measures above it are implemented first.

<sup>2</sup> Simple Payback (SP) is a measure of the length of time required for the savings from an EEM to payback the investment cost, not counting interest on the investment and any future changes in energy prices. It is calculated by dividing the investment cost by the expected first-year savings of the EEM.

# FACILITY DESCRIPTION

## Building Occupancy Schedules

The building is occupied year-round from 8:00am-5:00pm every day by approximately 6 office staff. The medical exam rooms on the lower floor are utilized approximately 6 hours a day, 3 days per week. There are typically 3 medical staff members who see an average of 1-2 patients at a time. The lower floor contains a gift shop and museum and sees a broad fluctuation of visitors during the summer months.

## Building Shell

The exterior walls are 2x6 wood-framed construction.

The roof of the building is a structural truss with a cold attic space.

The building is constructed on a concrete slab foundation.

There are approximately 34 total windows in the building, all of which have operable openings and double-pane glass.

There are 3 entrances into the building, 2 of the entrances have doors comprised mainly of glass.

## Heating Systems

The heating systems used in the building are:

### **Boiler 1**

Fuel Type:	#1 Oil
Input Rating:	115,000 BTU/hr
Steady State Efficiency:	85 %
Idle Loss:	2 %
Heat Distribution Type:	Water
Boiler Operation:	10 Months/Year

### **Boiler 2**

Fuel Type:	#1 Oil
Input Rating:	115,000 BTU/hr
Steady State Efficiency:	85 %
Idle Loss:	2 %
Heat Distribution Type:	Water
Boiler Operation:	10 Months/Year

### **Space Heating Distribution Systems**

The building is heated by a fin-tube baseboard heating system that circulates hot water around the building. The building has several heating zones that are controlled by individual thermostats.

### **Building Ventilation Systems**

The only sources of ventilation in the facility are exhaust fans and operable windows.

### **Domestic Hot Water System**

There is a 40-gallon electric hot water heater that supplies all domestic hot water for the building.

### **Lighting**

There are approximately 101 light fixtures in the facility. 62 of the fixtures contain two T8 light bulbs, 30 fixtures contain three T8 light bulbs, and 9 fixtures are track/can lights. The lights use an estimated 16,000 kWh annually.

### **Other Electrical Loads**

There is a variety of office and medical equipment that contribute to the electrical load.

### **Major Equipment**

**Table 3: Major Electrical Equipment**

<b>Equipment</b>	<b>Rating (Watts)</b>	<b>Annual Usage (kWh)</b>
Fridge	~725	291
Desktop Computers (9 each)	~125 each	2,935
Coffee Pot	1,000	9,204
Medication Dispenser	540	4,734

## PROJECT FINANCING

The total estimated cost of the recommended energy improvements is \$6,510. The payback for the improvements is approximately 3.4 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 – Scanned Energy Billing Data

### 1. Electricity Billing Data

Electric	ID:	Notes:	Rate Schedule Type:									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Qty	3,746	2,474	3,033	3,159	2,901	2,636	3,446	2,605	2,881	2,843	2,620	2,968
kW Demand	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cost	797	526	677	705	680	618	803	611	677	669	616	660
Year	2015	2015	2015	2015	2015	2015	2015	2015	2015	2015	2015	2015

### 2. #1 Fuel Oil Billing Data

#1 Fuel Oil	ID:	Notes:	Rate Schedule Type:									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Qty	99	167	183	100	37	12	3	0	43	58	146	186
kW Demand	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cost	375	638	696	382	140	47	12	0	148	200	505	645
Year	2016	2016	2016	2016	2016	2016	2016	2016	2016	2016	2016	2016



## Appendix B – Energy Audit Report – Project Summary

ENERGY AUDIT REPORT – PROJECT SUMMARY – Created 5/3/2017 9:05 AM	
General Project Information	
PROJECT INFORMATION	AUDITOR INFORMATION
<b>Building:</b> SVT Administration Building	<b>Auditor Company:</b> ANTHC
<b>Address:</b> 328 Main Street	<b>Auditor Name:</b> Curtis Boudreau
<b>City:</b> Seldovia	<b>Auditor Address:</b>
<b>Client Name:</b> Connie Pavalof	
<b>Client Address:</b>	<b>Auditor Phone:</b> (907) 729-3528
	<b>Auditor FAX:</b>
<b>Client Phone:</b> (907) 435-3293	<b>Auditor Comment:</b>
<b>Client FAX:</b>	
Design Data	
<b>Building Area:</b> 6,932 square feet	<b>Design Space Heating Load:</b> Design Loss at Space: 17,541 Btu/hour with Distribution Losses: 17,541 Btu/hour Plant Input Rating assuming 82.0% Plant Efficiency and 25% Safety Margin: 26,740 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> 70 deg F (building average)
<b>Actual City:</b> Seldovia	<b>Design Outdoor Temperature:</b> 4.8 deg F
<b>Weather/Fuel City:</b> Seldovia	<b>Heating Degree Days:</b> 9,588 deg F-days
Utility Information	
<b>Electric Utility:</b> Homer Electric Assn - Commercial - Sm	<b>Fuel Oil Provider:</b> Seldovia Fuel and Lube
<b>Average Annual Cost/kWh:</b> \$0.2363/kWh	<b>Average Annual Cost/gal:</b> \$3.42/gal

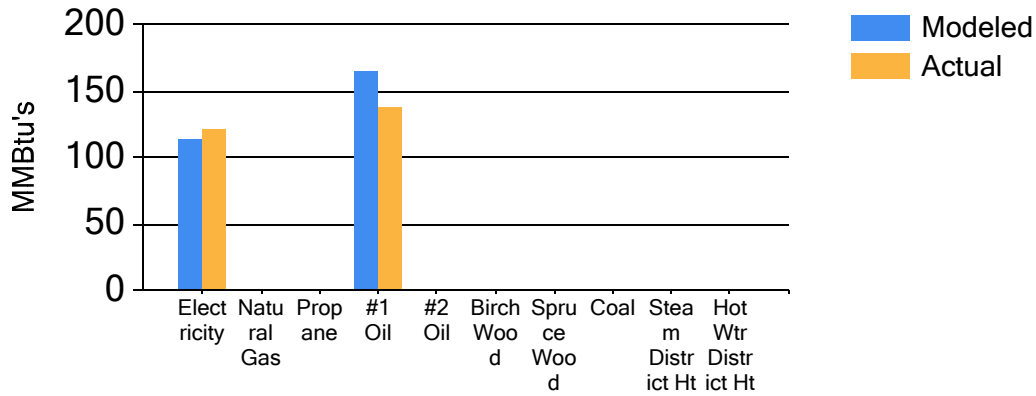
Annual Energy Cost Estimate							
Description	Space Heating	Water Heating	Lighting	Refrigeration	Other Electrical	Service Fees	Total Cost
<b>Existing Building</b>	\$2,961	\$1,000	\$3,603	\$67	\$3,866	\$240	<b>\$11,737</b>
<b>With Proposed Retrofits</b>	\$2,203	\$1,074	\$2,531	\$67	\$3,866	\$240	<b>\$9,981</b>
<b>Savings</b>	\$758	-\$75	\$1,072	\$0	\$0	\$0	<b>\$1,756</b>

Annual Energy Cost Estimate						
Description	Space Heating	Water Heating	Lighting	Refrigeration	Other Electrical	Total Cost
<b>Existing Building</b>	\$2,961	\$1,000	\$3,603	\$67	\$3,695	<b>\$12,512</b>
<b>With Proposed Retrofits</b>	\$2,203	\$1,074	\$2,531	\$67	\$3,695	<b>\$10,583</b>
<b>Savings</b>	\$758	-\$75	\$1,072	\$0	\$0	<b>\$1,929</b>

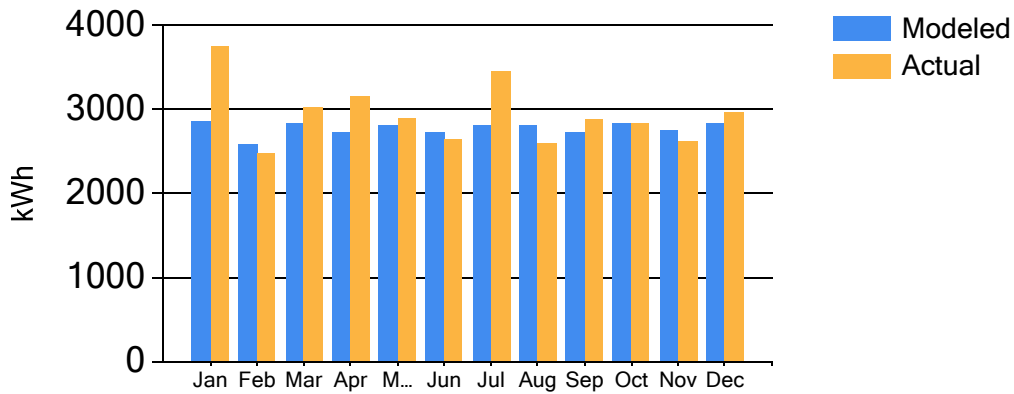
## Appendix C – Actual Fuel Use versus Modeled Fuel Use

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.

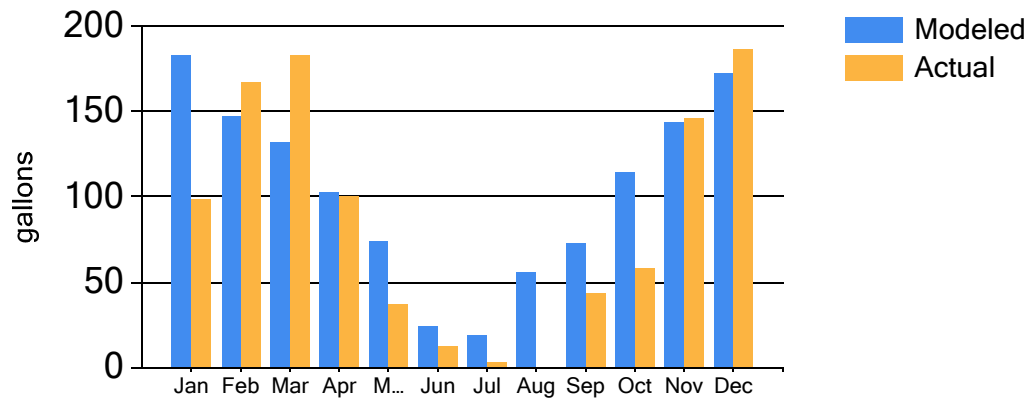
### Annual Energy Use



### Electricity Use



### #1 Fuel Oil Use



## Appendix D - EUI Calculation Details

The Homer Electric Association provides electricity to the residents of Seldovia as well as to all commercial and public facilities.

The average cost for each type of fuel used in this building is shown below in Table 4. This figure includes all surcharges, subsidies, and utility customer charges:

**Table 4: Energy Cost Rates for each Fuel Type.**

Average Energy Cost	
Description	Average Energy Cost
Electricity	\$ 0.2363/kWh
#1 Oil	\$ 3.42/gallons

Table 5 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 5: EUI Building Calculations**

Energy Type	Building Fuel Use per Year	Site Energy Use per Year, kBTU	Source/Site Ratio	Source Energy Use per Year, kBTU
Electricity	33,303 kWh	113,664	3.340	379,638
#1 Oil	1,241 gallons	163,835	1.010	165,473
<b>Total</b>		<b>277,499</b>		<b>545,111</b>
BUILDING AREA		6,932	Square Feet	
BUILDING SITE EUI		40	kBTU/Ft <sup>2</sup> /Yr	
<b>BUILDING SOURCE EUI</b>		<b>79</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 6 shows information on common energy use benchmarks used to characterize the efficiency of a building.

**Table 6: Building Energy Efficiency Benchmarks**

Building Benchmarks			
Description	EUI (kBtu/Sq.Ft.)	EUI/HDD (Btu/Sq.Ft./HDD)	ECI (\$/Sq.Ft.)
<b>Existing Building</b>	40.0	4.18	\$1.75
<b>With Proposed Retrofits</b>	33.6	3.50	\$1.46
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 6 & 7: Materials List and Cost Estimation Energy Improvements**

Energy Retrofit	Required Materials	Quantity	Cost per Item	Total Materials Cost
Setback Thermostat	Programmable Thermostat	22	\$50	\$1,100
Exterior Door Weather Sealing	Door Sweep (3ft)	5	\$12	\$60
Exterior Door Weather Sealing	Perimeter Gasket (17ft)	5	\$30	\$150
LED T8 Lighting	T8 LED Equivalent 4 ft.	214	\$12	\$2,568
LED Can Lighting	Screw-in LED Bulb	9	\$10	\$90

# Appendix F – Materials Specifications



**4 FOOT**  
Fluorescent Replacement



**DIRECT WIRE**  
Ballast Bypass

**High Output**  
**LED**  
T8 | T12



## Performance Specifications

REPLACEMENT FOR:	T8 OR T12 4 FOOT FLUORESCENT TUBE
BRIGHTNESS (LUMENS):	2400
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 AVAIL

# Robertshaw®

## 9701i2



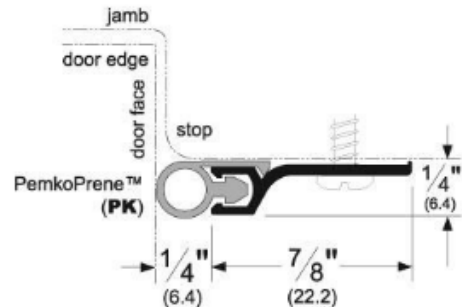
**Menu Driven Display**  
**7 Day Programmable with 2, 4 or 6 Events Per Day**  
**9701i2 - 1 Heat / 1 Cool**

**Worry-Free Memory Storage**  
Even during power outages, the thermostat maintains set point and programmed parameters.

## Door Jamb Perimeter Gasketing

### Pemko 303\_PK (PG) Standard Perimeter Gasketing

- Category J gaskets for use with listed steel frames and/or classified steel covered composite, hollow metal doors rated up to and including 3 hours; wood and plastic covered composite doors rated up to and including 1-1/2 hours; and wood core doors rated for 20 minutes.
- Rigid jamb weatherstrip is shown mounted on openings with 1/16" gaps; however, each weatherstrip can seal gaps up to the depth of its seal.
- Seal depth is provided on each illustration.
- Stainless Steel fasteners are standard.
- Other fasteners are available.
- Model 303\_ is available with self-adhesive, two-sided tape (TST) and tek screws (3 slotted holes per part) for easy installation.
- To obtain this option, add "TST" to the end of the part number when ordering (i.e. 303APK36TST).
- This perimeter gasketing is supplied with a PemkoPrene® ("PK") insert - item number PK47 (available in gray or black).



#### Ratings



Air Infiltration Tested



BHMA Certified



Smoke Tested - UL1784



Fire Rated - UL10C - Positive Pressure



Underwriters Laboratory 4L10



Environmental Product Declaration



Health Product Declaration

**Declare.** Declare



GREENGUARD Gold Certified

#### Finishes



**303APK:** A - Mill Finish Aluminum Aluminum with Gray PemkoPrene insert



**303BDGPK:** BDG - Bright Dip Gold Anodized Aluminum with Black PemkoPrene insert



**303CPK:** C - Clear Anodized Aluminum with Gray PemkoPrene insert



**303DPK:** D - Dark Bronze Anodized Aluminum with Black PemkoPrene insert



**303GPK:** G - Gold Anodized Aluminum with Black PemkoPrene insert



**303PWP:** PW - Painted White Aluminum with Black PemkoPrene insert



**303SNPK:** SN - Satin Nickel Anodized Aluminum with Black PemkoPrene insert

# Door Sweep

## Pemko 18062\_NB Brush Seal/180 Degree Aluminum Retainer

- This brush gasketing is supplied with a Nylon Brush ("NB") insert - item number P38062 (available in gray or black).
- Painted white insert is item number P516062W.

### Ratings

**BHMA** BHMA Certified  
CERTIFIED



Smoke Tested - UL1784



Fire Rated - UL10C - Positive Pressure



Underwriters Laboratory 4L10



GREENGUARD Gold Certified

### Finishes



**18062CNB:** C - Clear Anodized Aluminum with Gray Nylon Brush insert



**18062DNB:** D - Dark Bronze Anodized Aluminum with Black Nylon Brush insert



**18062GNB:** G - Gold Anodized Aluminum with Black Nylon Brush insert



**18062PWNB:** PW - Painted White Aluminum with White Nylon Brush insert

