CHAPTER 10
BUILDINGS

Ski area buildings such as lodges, rental shops, administrative buildings, restaurants, ticket sales, and retail shops consume significant energy for illumination, heating, and ventilation. Although energy consumption in ski area buildings may vary according to function, the same pollution and conservation measures apply to all building types.

The U.S. Environmental Protection Agency (EPA) Energy Star® program developed a voluntary program to assist businesses in implementing pollution prevention (P2) and energy efficiency (E2) opportunities. Section 10.1 details the Energy Star® program. This chapter also discusses P2 and E2 opportunities for ski area buildings in the following areas:

- Lighting
- Heating
- Ventilation
- Air conditioning
- Cleaning products
- Paint
- Carpet
- Electronic Equipment Recycling
- Water Conservation

Additional information resources (vendors, documents, and web sites) for each topic discussed in this chapter are listed in Section 10.7.

10.1 ENERGY STAR® PROGAM

The EPA (in partnership with DOE) Energy Star® program is an energy efficiency program that focuses on three main areas: products, business, and home. By the end of 1999, total program membership exceeded 5,500 organizations and 10 billion square feet of building space. Although they represented only 15 percent of the commercial, public, and industrial markets, participants in the Energy Star® program managed to save 22 billion kilowatts of energy in 1999 alone.[1]

A primary Energy Star® goal is to recognize "labeled" products, businesses, and homes for their successes in becoming energy efficient. This chapter focuses on the Energy Star® program for business (referred to hereafter as Energy Star) and the readily available resources provided by Energy Star.

Accessible from the Energy Star website (www.energystar.gov), business is the most applicable section of the program to ski areas. However, due to the number of business types such as restaurants, retail shops, or offices that may be located within a single ski area building, the business section of the Energy Star program may not be completely encompassing.

[1] EPA. "The Power to Make a Difference, Energy Star® and Other Partnership Programs, 1999 Annual Report." Climate Protection Division. EPA/430/R/00/006. July 2000.

Ski areas should consider becoming an official Energy Star participant by reviewing the Energy Star Buildings Manual found in the Business section of Energy Star (this manual can be found in the Resources section, under Building Manual at: http://yosemite1.epa.gov/estar/business.nsf/content/business_resources_upgradebuilding.htm). After reading through the available web resources, a follow-up call to the Energy Star Hotline (1-888-STAR-YES) will identify a regional Energy Star contact who will discuss particular details about the program, including potential benefits. Most participating companies undergo an assessment and benchmarking process that will establish a baseline condition of the building(s), and identify E2 opportunities. Furthermore, Energy Star offers a free software application online called Portfolio Manager that helps an individual or company benchmark its energy efficiency and track the energy performance of a building.

The Energy Star program is described in five stages, that when completed in succession, will maximize E2 and cost savings. The five stages include:

- Recommissioning
- Lighting
- Supplemental Load Reductions
- Fan Systems
- Heating and Cooling

For more information about the Energy Star program for businesses, see http://yosemite1.epa.gov/estar/business.nsf/webmenus/Business.

10.1.1 Recommissioning

The first stage of the Energy Star program for businesses is recommissioning. This stage is designed to develop a comprehensive understanding of a building and recognize how each system operates. Recommissioning typically involves few expenses other than labor costs. Most of the tune-ups are calibrations, leak checks, and operation schedule adjustments performed to ensure that equipment is operating efficiently and only when needed.

Building systems, especially HVAC systems, run most efficiently with infrequent disruption of thermostats and sensors. When employees disturb system settings, thermostats and sensors may need to be recalibrated, and the HVAC system will gradually become out of tune. To address this issue, recommissioning focuses on testing, adjusting, and balancing the HVAC system and fine-tuning the heating and cooling systems. Recommissioning also includes scheduling group relamping and fixture cleaning, calibrating controls, and evaluating the building framework, such as insulation, drafts, and windows.

For more information regarding the Energy Star Recommissioning stage, refer to yosemite1.epa.gov/estar/business.nsf/attachments/Recommissioning.pdf/$File/Recommissioning.pdf?OpenElement.

CASE STUDY: HEATING CONTROLS AT ASPEN SKIING COMPANY (ASC)

The Colorado State University Industrial Assessment Center (IAC) performed an energy audit of heaters in Buttermilk Mountain vehicle maintenance buildings for ASC. On average, IAC found that

the temperature set points on the boiler thermostats were set at 72°F, or 4°F higher than the recommended temperature set point for efficient heating. IAC recommended that better controls be placed on the boilers to conserve energy and save money. These controls would allow maintenance personnel to lower the temperature of the unoccupied buildings in the evening and to program the thermostats to slightly raise the temperature in the morning before occupancy. Implementation of these controls requires programmable thermostats that would allow the buildings to preheat 2 to 4 hours before occupancy. IAC estimated that 50 percent of the total energy expended in the vehicle maintenance buildings was used for space heating, followed by water heating at 33 percent of the total. Based on 6,000 heating degree-days per year (a heating degree-day is the difference between 65°F and the average temperature on a given day - the greater the difference, the more energy used to heat the building), setting back the thermostats from 72°F to 68°F should result in a 13 percent heating energy savings.

IAC found a White Rogers, heating-only, programmable thermostat in the Grainger 2000-2001 catalog (see www.grainger.com) that cost $116.70. IAC estimated that with a 20 percent discount plus $30 per hour labor for each unit, the implementation cost of purchasing and installing four units would be about $500. IAC calculated the total natural gas cost savings associated with implementing the new programmable controls to be $700 per year. Calculations show that the simple payback period of these four units would be in about 8 months.

10.1.2 Lighting

Lighting retrofits or use of energy efficient lighting alternatives in new fixtures are easy to do and are guaranteed to pay back quickly. The sooner you switch, the sooner you can start saving money.

Stage two of Energy Star for business focuses on lighting. Energy efficient lighting alternatives should be installed in a new building or as retrofits in an existing building. Installation and upgrades are relatively simple and result in lower energy use and cost savings. Lighting upgrades can be implemented in every area of a building and usually in every light fixture. Simple and quick upgrades of lighting systems include installing a new, energy-efficient lamp such as the compact fluorescent lamp or upgrading to electric ballasts in order to power and regulate fluorescent lamps.

Lighting consumes 20 to 25 percent of all electricity sold in the U.S..[2] Numerous energy-efficient alternatives exist for lighting that result in significant energy and cost savings. Table 10.1 illustrates potential lighting energy savings.

TABLE 10.1 POTENTIAL LIGHTING ENERGY SAVINGS

Lighting Element	Potential Energy Savings
Lamps and ballasts	20 to 40%
New fixtures	30 to 50%
Task and ambient lighting	40 to 60%
Outside lighting	30 to 50%

Source: EPA Energy Star® program

[2] See http://www.greenbuildingmaintenance.com/.

Energy Star describes five strategies for lighting that help maximize a building's energy efficiency. These strategies include:

- Designing light quality and quantity to accommodate tasks being performed
- Maximizing lamp and ballast efficiency
- Maximizing fixture efficiency
- Using automatic controls
- Establishing operation, maintenance, and disposal practices.[3]

For more information regarding the Energy Star® Lighting stage, visit the following web site: yosemite1.epa.gov/estar/business.nsf/attachments/Lighting.pdf/$File/Lighting.pdf?OpenElement.

Fluorescent tubes and mercury vapor lamps may need to be disposed of in accordance with Resource Conservation and Recovery Act (RCRA) regulations because of the presence of mercury in the tubes and lamps (see Chapter 4, Section 4.1). Contact your local waste recycler or health department for applicable regulations.

There are two common types of lighting in a commercial environment: fluorescent and high-intensity discharge (HID) lighting. Fluorescent lighting is typically used indoors for general-purpose diffuse lighting, whereas HID lighting is best used outdoors and in large areas requiring high levels of light. Both of these lamp types require a ballast to start up, control power, and control light quality of the lamp.

There are two common types of ballasts: magnetic and electronic. Magnetic ballasts are the most common but are the least efficient ballasts available. Electronic ballasts reduce wattage by 10 to 15 percent, operate at lower temperatures, and last longer than standard magnetic ballasts. In addition, electronic ballasts offer reduced flicker, lower weight, less noise, and a longer life than magnetic ballasts. Implementing electronic ballasts is relatively simple. Most electronic ballasts are of the same shape and size as magnetic ballasts and often have the same wire color-coding and number of wires. Ballasts that do not supply wires have color-coded "stab-in" connectors. A contractor simply needs 18 American Wire Gauge (AWG) solid copper wiring to insert wires into the "stab-in" connectors.[4]

Besides electronic ballasts, other E2 opportunities exist for lighting. The most efficient fluorescent lamp available is the T5 lamp, which can easily direct and distribute light. T5 lamps perform better in higher room temperatures and have lower system wattage. However, T5 lamps require electronic ballasts and are not meant to directly replace other types of fluorescent lighting. Currently, the best combination of lighting is either the T5 lamp with an electronic ballast (required) or the T8 lamp with an electronic ballast. T10 and T12 lamps with their respective ballasts should be phased out and replaced with the more efficient lamps and electronic ballasts. System efficiency can be improved up to 30 percent when T8 lamps with electronic ballasts are used instead of T12 lamps with magnetic ballasts.[4] Table 10.2 compares the different types of fluorescent lamps available, energy use, recommended replacement lamps, the available ballasts, and common potential implementation barriers. When switching to energy efficient lighting, ski areas should consult E2 lighting experts.

[3] EPA. Energy Star® Building Manual. Lighting. 2001. See yosemite1.epa.gov/estar/business.nsf/attachments/Lighting.pdf/$File/Lighting.pdf?OpenElement.
[4] National Lighting Product Information Program (NLPIP). "Electronic Ballasts." May 2000.

TABLE 10.2 FLUORESCENT LAMP COMPARISON TABLE

Lamp	Energy Use (watts)	Replacement	Ballast Selection	Implementation Issues
T5	28	No direct replacement	Electronic only	Higher initial cost, cannot directly replace other fluorescent lamps
T8	32	No direct replacement; however, T5 is more efficient	Electronic or magnetic	Few magnetic ballasts available
T10	40	T8	Electronic or magnetic	Ballasts may require replacement depending on current set up
T12	34	T8	Electronic or magnetic	Not recommended for use with dimming ballasts or ballasts with reduced light output

Commercial areas also use incandescent lamps. The incandescent lamp is the least expensive lamp to purchase, install, and power; however, it is much less efficient than fluorescent and HID lamps. Compact fluorescent lamps (CFL) offer an alternative to incandescent lamps. CFLs initially cost 10 to 20 times more than incandescent lamps, but the life span is 10 to 15 times longer. Furthermore, CFLs use up to 75 percent less electricity because they have a lower wattage. Table 10.3 compares energy efficient CFLs to incandescent lamps with respect to performance, maintenance requirements, and cost.

Compact fluorescent lamp

TABLE 10.3 CFL AND INCANDESCENT LAMP COMPARISON TABLE

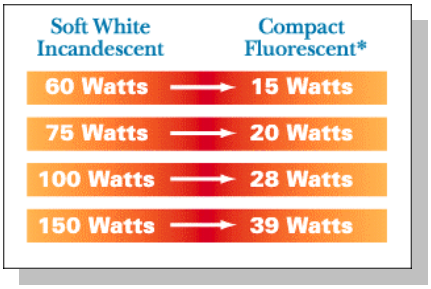
Lamp Type	Approximate Life (hours)	Capital Investment	Typical Investment Over 10-Year period	Energy Use (watts)	Electricity cost @ $0.07/Kwh
CFL	10,000	$4.50	$4.50	28	$19.6
Incandescent Lamp	1,000	$0.40	$4.00	100	$70

Maintenance time varies depending on annual hours of operation. CFLs typically need to be replaced every 10 years, whereas incandescent lamps are changed about every 10 to 12 months (depending on use). CFLs also should be cleaned about three or four times over the life of the lamps. Although the initial capital investment for a CFL is greater than for an incandescent lamp, the CFL will pay for itself with an extended life, decreased energy use, and decreased maintenance costs.

One issue to consider with long-life bulbs is that the amount of light emitted from the lamps will diminish over time (called lumen depreciation), not only because of age, but because of dirt on the

fixtures, lamps, and room surfaces. These factors can lead to a 60 percent reduction in illumination even though a fixture is drawing full power. [5]

Facilities should implement a scheduled maintenance program to ensure that fixtures are routinely cleaned and maintained properly throughout the life of the lamp. Such a maintenance program typically involves the creation of an operation and maintenance (O&M) manual available to all building management and maintenance staff. The O&M manual should include:[5]



- Facility blueprints
- Fixture and controls schedule
- Equipment specifications, including product cut sheets
- Equipment and service providers and contacts (including utility contacts)
- Fixture cleaning and relamping schedule with service tracking log
- Procedures for relamping, reballasting, and cleaning fixtures
- Procedures for adjustment of photosensors and occupancy sensors
- Procedures for proper lamp and ballast disposal

Energy Star claims that implementing a planned maintenance program as part of a lighting upgrade project can save money in two ways: (1) installing a lower-wattage lamp will use less energy and money, and (2) group relamping will decrease the amount of time spent replacing each lamp and responding to service calls. The Energy Star lighting stage educates consumers about the levels of light, lamps, and fixtures required to meet building occupant requirements.

Energy Star encourages group relamping when lamps reach 70 percent of their projected life span, when the lamps begin to decrease in efficiency and output. Therefore, although a lamp is replaced before it is completely burned out, the money and energy spent during the last months of the lamp are best used on a replacement lamp. In addition, group relamping allows bulk purchases with possible discounts and can ultimately reduce the overall lighting maintenance budget by 25 percent.[5]

Exit sign light bulbs can also be replaced with energy-efficient lighting alternatives. Most exit signs have one and often two incandescent lamps. A substitute is a light-emitting diode (LED) exit sign. A LED uses less energy than an incandescent lamp and has a longer life. A new LED exit sign can be purchased for about $30. Energy Star has an interactive calculator that helps calculate the amount of money and energy that can be saved with the purchase of an Energy Star-rated exit sign; see the Energy Star Exit Sign Savings Calculator at www.epa.gov/nrgystar/purchasing/calculators/exit-main.html. Table 10.4 details and compares the energy use, extended life, capital investment, and annual energy operating costs associated with the CFL, LED, and incandescent lamp.

Energy Star developed a software program called ProjectKalc that assists businesses in performing a full analysis of potential lighting upgrades. This program provides comprehensive energy and economic analysis of upgrades involving controls, relamping, delamping, and includes a user-modifiable database of costs, labor time, and performance for over 8,000 common hardware applications. To download the ProjectKalc program and user's manual, refer to http://yosemite1.epa.gov/estar/business.nsf/content/multiarea_tools_softwaretools_main.htm#Project

[5] National Lighting Product Information Program (NLPIP). "Electronic Ballasts." May 2000.

TABLE 10.4 EXIT SIGN LIGHTING COMPARISON TABLE

Factor	LED	Incandescent Lamp
Energy use (watts)	0.7 to 6.4	23 to 40
Extended life (hours)	218,000	1,000
Capital investment (prices are approximate and subject to change)	$30 to $100	$ 40 to $175
Annual energy operating costs	$1.00 to $3.50	$14.00 to $24.50

CASE STUDY: LIGHTING RETROFITS AT ASC

The Colorado State University IAC performed an E2 audit at High Alpine/George's Restaurant on Snowmass Mountain for ASC. IAC recommended that existing incandescent lamps be replaced with energy-efficient CFLs with built-in ballasts or with low-wattage, long-life GE® Genura lamps. High Alpine/George's Restaurant has approximately 100 incandescent lamps, which are mainly 100- and 75-watt lamps. IAC recommended that Genura lamps replace 75-watt incandescent bulbs in areas where customer perception of food or retail products would be improved (in the cafeteria line and the sport shop) and that CFLs replace the remaining incandescent lamps. The combined implementation of Genura lamps and CFLs would have an average payback period of about 3 years.

IAC determined that labor costs associated with replacement of the incandescent lamps are negligible when spread over 10 or more years. The long life of the Genura lamp (15,000 hours) and the CFL (10,000 hours) leaves the only implementation cost to be the initial capital purchase cost of the lamps. Based on further calculations, IAC determined that the total energy used for restaurant lighting would be reduced by 8,300 kilowatt-hours per year (approximately 74 percent) by replacing the incandescent lamps. In addition, annual recurring costs associated with lamp replacement and replacement labor would decrease by 13 percent. The total implementation cost would be $1,860 and would be paid back in 2.8 years.

ASC motivation to pursue energy efficient lighting was drive largely by its climate change policy (see www.aspensnowmass.com/environment) and an understanding that unnecessary energy use associated with conventional lighting can be linked to CO_2 emissions (a greenhouse gas). Of course, ASC was also aware of the cost savings and maintenance labor savings to justify lighting changes. In 2000, ASC started a lighting retrofit program. The first targeted area was the garage of an ASC-owned hotel, The Little Nell. In this garage, ASC replaced 110 metal halide lamps with T-8 fluorescent fixtures. ASC estimates the retrofit will prevent the emission of 300,000 pounds of CO_2 annually, and saves ASC $10,600 per year in reduced electricity bill and maintenance costs. In 2002, ASC plans to replace 500 conventional bulbs in The Little Nell "back of house." The table on the following page summarizes other ASC lighting retrofits.

Retrofit Location	Conversion	Estimated CO_2 Reduction (pounds/year)
Spider Sabich Restaurant	T-12 to T-8	3,502
Ski School Administration	Halogen to CFL	27,648
Grizzlies Ski School	Incandescent to CFL	9,136
Two Creeks Lodge	Halogen to Genura CFLs	11,215
Sam's Knob	T-12 to T-8	2,189
Bumps Building	T-12 to T-8	11,482
Administrative Building Basement	T-12 to T-8	1,533

10.1.3 Supplemental Load Reductions

The third stage of the Energy Star program for businesses focuses on reducing three types of loads within a building: heating, cooling, and electrical. This is the last stage focused on reducing loads, a process that reduces the initial cost of upgrading systems and reduces the actual size of the heating and cooling equipment in the final two stages. By the Supplemental Load Reductions stage, lamp replacement, checks for outside air leaks, and calibration of the equipment should have reduced a significant amount of load on the HVAC system.

For more information regarding the Energy Star® Supplemental Load Reductions stage, visit the following web site:
http://yosemite1.epa.gov/estar/business.nsf/attachments/SupplementalLoad.pdf/$File/SupplementalLoad.pdf?OpenElement.
E2 opportunities that reduce loads on heating and cooling systems of a building are briefly summarized below.

Heating

According to the U.S. Department of Energy, boilers and furnaces use about 30 percent of the energy expended in commercial buildings. Usually a boiler or furnace is set to maintain an entire building at a constant temperature; which is achieved only when the building is not heavily trafficked. However, most ski area buildings are in constant use, doors opening and closing frequently to accommodate customers. For this reason, a building may feel slightly cooler than the temperature to which the thermostat is set. The constant introduction of cool, outside air into ski area buildings causes furnaces to inefficiently cycle on and off. To address these issues and reduce the amount of energy used by boiler and furnace systems in ski area buildings, the following techniques should be considered:

- Set the thermostat as low as possible, around 70° F.
- Avoid adjusting the thermostat throughout the day. If adjustments are necessary, change the set point no more than two times per day.
- Lower the temperature at night while the building is unoccupied with a programmable thermostat.
- Clean or replace furnace filters at least monthly.
- Have oil-fired boilers professionally cleaned and tuned once a year. Check gas-fired boilers every other year.
- Keep warm-air registers, baseboard heaters, and radiators clean. Do not block them with furniture, carpeting, or drapes.
- Check air ducts regularly for leaks.

Although heating is a prime target for energy conservation in ski area buildings, upgrading a boiler or furnace may not be cost-effective if it is working properly. Energy efficient upgrade options for boilers include coal/oil/multifuel, electric, natural gas, and propane boilers. For more information regarding these energy-efficient boilers, other alternatives, and vendors located nationwide, visit the EPA Energy Star® Service and Product Provider Directory at http://yosemite1.epa.gov/estar/business.nsf/content/espdirectoryhome.htm.

To determine potential savings for boiler utilities and product prices, refer to Energy Star's Boiler Savings Calculator at www.epa.gov/nrgystar/purchasing/calculators/boil-main.html. To determine potential savings for furnace utilities and product prices, refer to Energy Star's Furnace Savings Calculator at www.epa.gov/nrgystar/purchasing/calculators/furn-main.html.

Cooling

Although there are few needs for cooling in most ski area buildings, coolers are an integral part of many HVAC systems. If coolers are used in ski area buildings, many energy-efficient and environmentally preferable coolers are available. Evaporative coolers and air conditioners are the two types of cooling commonly found in buildings. An evaporative cooler is different from an air conditioner because the cooler evaporates water into the air stream rather than using chlorofluorocarbons as an air conditioner does. Evaporative coolers are best suited for dry climates, such as Colorado's. Furthermore, evaporative coolers use up to 90 percent less energy than the common air conditioner. For more information regarding energy efficient coolers and vendors located nationwide, visit the EPA Energy Star® Service and Product Provider Directory at http://yosemite1.epa.gov/estar/business.nsf/content/espdirectoryhome.htm.

Evaporative cooler

10.1.4 Fan System Upgrades

The fourth stage of the Energy Star program for businesses offers the second largest opportunity for reducing energy consumption after installing energy efficient lighting. This stage focuses on sizing the ventilation system to match reduced loads; installing more efficient air handling equipment, such as constant-volume systems and variable air volume (VAV) systems; lowering the capital investment in the ventilation system; and lowering the maintenance costs associated with the system.

E2 opportunities involve using appropriately sized fan systems, variable-speed drives (VSDs), improved controls, energy-efficient motors, and energy-efficient belts. The potential savings associated with appropriate use of energy-efficient motors, and use of VSDs can be 50 to 85 percent.[6]

For more information regarding the Energy Star® Fan System Upgrades stage, refer to http://yosemite1.epa.gov/estar/business.nsf/attachments/FanSystems.pdf/$File/FanSystems.pdf?OpenElement.

10.1.5 Heating and Cooling System Upgrades

The fifth and final stage of the Energy Star program for businesses, Heating and Cooling System Upgrades, entails designing and installing the heating and cooling

[6] EPA. Energy Star® Buildings Manual. Fan System Upgrades. 2001. See http://yosemite1.epa.gov/estar/business.nsf/attachments/FanSystems.pdf/$File/FanSystems.pdf?OpenElement.

systems that are most energy-efficient and properly sized to accommodate reduced loads. The previous four stages of the Energy Star program achieve these reduced loads largely by maximizing the efficiency of each building system, such as lighting, cooling, and heating. The fifth stage primarily focuses on measuring heating and cooling loads and sizing the heating and cooling systems accordingly. In addition, Energy Star suggests replacing chillers with non-CFC models, upgrading the heating and cooling systems and installing VSDs on pumps and cooling tower fans.

For more information regarding Energy Star® Heating and Cooling System Upgrades stage, refer to http://yosemite1.epa.gov/estar/business.nsf/attachments/Heating.pdf/$File/Heating.pdf?OpenElement.

10.2 CLEANING PRODUCTS

Every day, ski area workers clean and prepare buildings for another day of business. Areas that typically need frequent cleaning include bathrooms, kitchens, windows, floors, and tables.

Chemicals commonly used for the cleaning and janitorial processes are listed below:

- Acids
- Ammonia
- Bleaches
- Carpet care products
- Sanitizers
- Descalers
- Disinfectants
- Dispenser soaps
- Floor cleaners
- Grease cutters
- Hand soaps
- Oven cleaners
- Polishes
- General-purpose powdered cleaners

Although most of these chemicals seem harmless, many cleaning chemicals may be hazardous to worker and customer health. Most chemicals are skin irritants or have harmful vapors, and some chemicals can cause cancer with prolonged use. Safer and more cost-effective alternatives are available. See Chapter 6 (Purchasing) or Chapter 12 (Lodging) for information on selecting environmentally preferable cleaning supplies.

CASE STUDY: ARAPAHOE BASIN (A-BASIN) ALTERNATIVE CLEANING SUPPLIES

A-Basin uses cleaning supplies in its kitchen and janitorial operations. The types of products that it uses include dishwashing detergents and sanitizers, oven cleaners, descalers, grease cutters, disinfectants, and glass cleaners. In February 2001, an expert in environmentally preferable janitorial products analyzed eight cleaning products used by A-Basin and three environmentally preferable products that it was considering using. Analytical results indicated that seven of the eight current products and two of the three proposed products should be used with extreme caution because they exhibited corrosivity (extremely acidic or basic). Furthermore, two current products contained ingredients that, in very large amounts, could damage blood, the liver, kidneys, and the fetus carried by a pregnant woman. One product contained an ingredient that affects the central nervous system and causes contact dermatitis.

"We have switched entirely to environmentally preferable cleaning supplies. They clean as well as our old products, and I don't have to worry any more about worker health and safety concerns."

Rusty Pawlikowski
A-Basin

Given the results of the analysis, A-Basin ordered 15 cleaning products from four vendors identified by the expert. After it received the products, A-Basin tried them side-by-side under normal cleaning conditions. Of the products that A-Basin tried, it found that products from the Naturally Yours line performed exceptionally well compared to the products that A-Basin had been using. A-Basin contacted Naturally Yours and requested for additional cleaning products for testing. After side-by-side

comparisons of all cleaning supplies, A-Basin decided to switch entirely to the Naturally Yours line of environmentally preferable cleaning supplies. The only product A-Basin uses that it has not been able to find an alternative for is dishwashing detergent. For more information about Naturally Yours products, call (888) 801-7347.

A-Basin compared the past cleaning supply costs to the cost for Naturally Yours cleaning supplies and found the cost difference to be negligible. The cleaning supply purchasing manager was pleased to switch to cleaning supplies that work as well as past products, are less harmful to worker health and safety and the environment, without spending any additional money.

10.3 PAINT

Paint is used everywhere inside and outside ski area buildings. Generally, two types of paint are used: water-based (latex) and oil-based paint. From an environmental perspective, latex paint is preferred over oil-based paint because oil-based paint contains solvents and requires solvents for cleanup. In contrast, latex paint does not contain solvents and can be cleaned up with water. Furthermore, disposal of latex paint is relatively simple: leftover paint that cannot be used can dry inside the paint bucket and be disposed of as a solid waste. Oil-based paint, however, is more harmful because it contains resins, solvents, and petroleum distillates, and it must often be disposed of as hazardous waste.

Except for some heavy-duty flooring finishes (which are not common in ski area buildings), all indoor painted surfaces should be painted with latex paint. Building exteriors sometimes have oil-based paint on their surfaces, but latex paint is preferred because of its ability to breathe, expand, and contract when water is present. Oil-based paint on wooden, exterior surfaces can warp and be "pushed" off the wooden surface by trapped water. Oil-based paints are preferable for ferrous metal (steel) surfaces because such paints lack a water base that can cause steel to rust; however, latex paint can also be used.

To paint over oil-based paint with latex paint, the surface must first be cleaned and primed or the latex paint will not adhere properly. The extra time required and cost for the primer may limit the cost-effectiveness of this option. However, future paint applications require only paint, not primer. Whenever building exteriors or outside structures such as railings, signs, and lift towers are being painted for the first time, latex paint should be used.

Historically, low overnight temperatures have been barriers to using latex paint on exterior surfaces of ski area buildings. Conventional latex paints must dry for 24 hours at a temperature greater than 50°F. Sherwin Williams (see www.sherwin-williams.com) has a paint called "Low Temp 35" that can cure at temperatures down to 35 °F. Many other paint manufacturers either already have a low-temperature latex paint or are in the process of creating one. Low Temp 35 can be used at any time of year; however, the low-temperature latex paint will dry too quickly and is harder to work with at higher temperatures. Most oil-based paints require a minimum temperature of 40 °F and more than 24 hours to cure.

The price differences between latex and oil-based paints vary depending on the manufacturer and paint type (eggshell, semi-gloss, gloss, or epoxy). On average, oil-based paints are more costly (from $17 to $30 per gallon [gal]). For latex paints, the prices may range from about $7/gal for flat latex paint to $16/gal for gloss latex paint. Latex paint primers cost about $9/gal for interiors, and $14/gal for exteriors. Oil-based paint primers are slightly more expensive: interior primer costs $12/gal, and exterior primer cost $17/gal. Oil-based paint primers are not necessarily needed if latex paint is

already present; however, oil-based paint primer is required before raw and unfinished surfaces are painted with oil-based paint.

10.4 CARPET

Carpet in ski area buildings must be durable. If the carpet cannot hold up against everyday wear and tear from ski boots during the ski season, the carpet may last only one season. Depending on the amount of wear involved and the areas where the carpet is located, the entire carpet surface may need frequent replacement. Good carpet care techniques such as daily vacuuming and spot removal, weekly pile lifting (depending on the carpet type), and use of barrier mats work to prolong carpet life.

When carpet needs to be replaced, ski areas should consider alternative carpet types. Companies such as Milliken, Collins & Aikman Flooring, and Interface manufacture and sell modular carpet styles. Modular carpet can be replaced in sections, so only the areas that are affected by wear and tear have to be replaced. Such carpet is also well suited for areas or cubicles; furniture only needs to be lifted 0.25 inch off the floor, and the new carpet sections can be installed without having to move the surrounding furniture.

Some carpet manufacturers, like Interface (see www.interfaceinc.com/us), manufacture carpet tiles using 100 percent recycled backing such as bitumen, a by-product of the asphalt industry, or 100 percent recycled vinyl. Interface also offers a 25 percent hog hair "yarn" for some of its carpets along with the same bitumen backing. These carpet characteristics are preferred because they contain recycled materials that otherwise would have been sent to landfills. Ideally, the preferred carpet supplier will recycle used carpet and will use recycled materials in its products.
Numerous adhesives and plastics are used in carpet manufacturing; therefore, new carpet should be aired in a ventilated area before installation to avoid releasing volatile organic compounds (VOC) inside a building. These emissions can come from the carpet, carpet padding, or adhesives. Carpet manufacturers that cooperate with EPA and the Consumer Product Safety Commission produce new carpet does not exceed standards for low-level VOC emissions.

Before purchasing new carpet, contact a carpet manufacturer to determine whether it accepts used carpet for recycling. Carpet recycling typically includes reclaiming used carpet backing; thus reducing the amount of waste landfilled. Research is ongoing to determine ways of recycling the carpet fibers into useful products, including small-scale fiber attachment to areas of sparse thread. Recycling carpet reduces the amount of carpet landfilled and conserves energy used to create new carpet.

CASE STUDY: CARPET REPLACEMENT AT A-BASIN SKI AREA

The main lodge at A-Basin was carpeted with carpet tiles in 1996. By 2001, carpet in some heavily trafficked areas on the main floor was worn and required replacement. In less trafficked areas, the carpet was worn but not to the point that it required replacement. Carpet laid in 1991 in the less heavily trafficked upstairs and downstairs of the lodge was also in need of replacement in 2001. Instead of removing, disposing of, and replacing all the carpet in the building, A-Basin reused some of the main floor carpet. Carpet on the main floor that was less worn was reused in the upstairs and downstairs of the lodge. The upstairs and downstairs have much less carpeted area than the main floor, so enough reused carpet was available for the job.

The main floor was then carpeted with Lees Work Force. A-Basin selected this carpet because it is guaranteed to last under the wear of ski boots for 10 years. For more information about Lees Carpet visit www.leescarpet.com.

10.5 ELECTRONIC EQUIPMENT RECYCLING

Like almost every other business (and many households), ski areas generate a variety of broken or obsolete electronic equipment, particularly desktop computers, that are typically disposed of with trash in local landfills. The environmental consequences of computer equipment are emerging as a serious national concern. A May 1999 report by the National Safety Council Environmental Health Center, "Electronic Product Recovery and Recycling Baseline Report," estimates that in 1998 only 6 percent of old computers were recycled and that by 2004, in the U.S. over 315 million obsolete computers will be "junked". Computer junking is also happening at a faster rate – in 1997, the lifespan of a computer was 4 to 6 years; this will fall to 2 years by 2005.

Computer equipment is constructed from thousand of components that are primarily comprised of plastic, glass, and numerous metals. In 1996, a typical desktop computer was, by weight, about 23 percent plastic, 24 percent silica (primarily glass), 20 percent iron, 14 percent aluminum, 7 percent copper, 6 percent lead, 2 percent zinc, 1 percent tin and the remaining 3 percent contained at least 26 other metals including toxic ones such as cadmium and mercury. Thus, the environmental aspects of landfilling computers are more than impacts on landfill capacity and avoided resource conservation through recycling. Landfilled (and incinerated) computers introduce chemicals, particularly lead, cadmium, mercury, chromium and dioxins (if plastic components are burned) into the environment that may impact human and ecosystem health.

Proper disposal guidance and recycling options are increasingly available as more organizations and environmental agencies understand and address "e-junk". Resources for ski areas seeking to better understand computer (and other electronic equipment) issues and proper disposal are listed below.

- National Recycling Coalition Electronics Recycling Initiative (link from www.nrc-recycle.org)
- Silicon Valley Toxics Coalition Clean Computer Campaign (www.svtc.org/cleancc/index.html)
- Computer Recycling Center (www.crc.org)
- A national directory for computer donations to schools and community groups: http://www.microweb.com/pepsite/Recycle/recycle_index.html

In Colorado and many other states, regulations define waste electronic devices and components as a "universal waste," subject to specific management regulations. See Chapter 4, Section 4.1 for information about universal waste management. Regulations applicable to electronics waste are summarized in a CDPHE compliance bulletin, "Management of Electronics Waste," which can be found at: http://www.cdphe.state.co.us/hm/hmpubs.asp#rcrabulletins.

CASE STUDY: KEYSTONE INITIATES COMPUTER RECYCLING PROGRAM

In fall 1999, the Keystone Information Systems Department began the resort's first computer recycling program. Individuals from the department were responsible for taking all computers and

other high-metal components to Atlas Metals in Denver. Over 15 trips have been made to Atlas and over 15,000 pounds of material has been diverted from local landfills. In 2000, this program was expanded to include monitor recycling wherein used monitors are stored in Silverthorne until enough accumulate to necessitate a trip to Denver. To help offset the costs of this disposal program, a recycling/disposal fee was included in the cost of the monitors to ensure the program's future.

10.6 WATER CONSERVATION

Water Alliances For Voluntary Efficiency (WAVE) is a non-regulatory water-efficiency partnership created and supported by EPA. WAVE's mission is to encourage commercial businesses and institutions to reduce water consumption while increasing efficiency, profitability, and competitiveness. Initiated in 1992, over 115 WAVE participants have reduced water and sewer costs by up to 30 percent. Significant savings in energy, chemical, and maintenance expenses are also possible. The typical payback period is less than 3 years. Benefits include nationwide public service advertising, promotional materials, and press releases. Members also receive free software to analyze water use, technical support, and access to a nationwide help line. For more information about WAVE, call (202) 564-0623 or (202) 564-0624 or visit www.epa.gov/owm/genwave.htm. For more information on water conservation, visit the web sites of the Soil and Water Conservation Society at www.swcs.org and WaterWiser, a water efficiency information clearinghouse at www.waterwiser.org.

10.7 ADDITIONAL INFORMATION SOURCES

The following table summarizes resources and contacts for obtaining further information on topics discussed in this chapter.

Organization	Telephone Number	Web Site
Lighting		
Grainger	(888) 361-8649	www.grainger.com
Bulbs.com	(888) 455-2800	www.bulbs.com
Inter.Light, Inc.	(541) 344-1909	www.lightsearch.com
National Lighting Bureau	(301) 587-9572	www.nlb.org
Lighting Research Center	(518) 687-7100	www.lrc.rpi.edu/index.html
GE Lighting	(800) 327-0533	www.gelighting.com/na/business/energy.html
GE Ballasts	(888) GE BALLASTS	www.gelighting.com/na/business/products.html
1000 Bulbs.com	(800) 624-4488	www.1000bulbs.com
HVAC		
AdobeAir	Not Applicable	www.adobeair.com
EnergyOutlet.com	(541) 683-5060	energyoutlet.com/res/cooling/evap_coolers
Paint		
Benjamin Moore	(800) 344-0400	www.benjaminmoore.com
Sherwin Williams	(216) 566-2000	www.sherwinwilliams.com

Organization	Telephone Number	Web Site
Kwal-Howells Paint	(800) 383-8406	www.kwalhowells.com
Carpet		
Carpet and Rug Institute	(800) 882-8846	www.carpet-rug.com
Milliken	(800) 257-3987	www.milliken.com
Interface Flooring	(770) 437-6800	www.interfaceflooring.com
Collins & Aikman Coverings	(800) 248-2878	www.powerbond.com
Mohawk Industries, Inc.	(800) 2-MOHAWK	www.mohawkind.com
Lees Carpets	(800) 523-5647	www.leescarpets.com
Miscellaneous		
Energy Star	(888) 782-7937	www.energystar.gov
Energy Ideas	(360) 956-2237	www.energyideas.org
Advanced Buildings	Not Applicable	www.advancedbuildings.org