

## **BASICS**

### **Overview**

- \$ Having an environmentally-friendly practice does not require sacrificing comfort or beauty; instead, a greener business will reduce monthly bills, conserve natural resources, and create less pollution.
- \$ A common misconception is that a green practice costs more money. When done right, however, green methods will end up saving money. Although they might have a higher initial cost, in the long run they pay for themselves.
- \$ As Americans, we currently live in a mixed fuel economy, and we consume these fuels at relatively low costs. According to both oil companies and environmentalists, many of our sources of energy (such as oil and natural gas) are expected to peak within the next ten to thirty years, which means that we can expect prices to dramatically increase after that as supply decreases.
- \$ There are many ways to design facilities to lower the monetary and environmental costs: think about the location’s resources, consider the effects of chosen building materials, use solar and/or wind power, install insulation, minimize common energy losses from windows and heating/cooling vents, and buy and dispose of products in a thoughtful manner.

### **Terms Defined**

- \$ Conduction. The measure of heat transfer through physical contact.
- \$ Convection. The movement of heat through air or fluids.
- \$ Embodied energy. The amount of energy that is required to manufacture, produce, and transport a product to your doorstep.
- \$ Infiltration. The movement of air through cracks and gaps.
- \$ Greening. The implementation of sustainable practices to reduce the impact of our lives on the environment. Similarly, when “green” is used as an adjective, it implies an environmental awareness. “Green” methods, then, are environmentally sound methods.
- \$ Rate of return. An economical term used to help to determine how many years it will take for the product to “pay off”: in other words, how many years it will take until the product’s savings have paid for the initial cost of the product. If the internal rate of return exceeds the cost of financing the project, then the project is viable.
- \$ Sustainability. A concept or attitude that works to meet the needs of the present without compromising the ability of future generations to meet their needs.
- \$ U-Value (or U-Factor). The amount of heat that can be transmitted through a material due to temperature difference. The lower the U-value rating is, the less heat there is that is transmitted.

## **OPTIONS AND ISSUES**

### **Location**

- \$ The location of a practice determines what resources and options are available. When making decisions, you want to take advantage of the resources that are plentiful in your area. For example, those in the Southwest will want to make use of their high exposure to sunlight and chose products that use little or no water.
- \$ Energy Auditors are professionals who can help you decide which measures to take that will provide the best return on investment.
- \$ An energy audit will assess a business as an energy system. The auditor will test the building for air leakage and flow while assessing the building's insulation, windows, space, and water heating. The auditor can then advise the owner on what products and services are best for that building.
- \$ Over time, the savings gained will usually more then pay for the cost of the audit.

### **Building Materials**

- \$ When deciding which materials to use in the construction of a building, it is good to consider the materials' embodied energy. For example, if lumber has an embodied energy of 1, then brick and cement both have embodied energies of 2, while glass is 3, fiberglass 7, steel 8, plastic 30, and aluminum 80. Generally, materials with a lower embodied energy are better for the environment.
- \$ Buying recycled materials ensures a lower embodied energy.
- \$ When purchasing your materials, it is also important to consider how they will eventually be disposed of and what effect that will have on the environment in the future.

### **Solar and Wind Power**

- \$ New technologies are making photovoltaic panels and wind turbines more efficient and more cost effective.
- \$ Most states have the potential for wind and solar power.
- \$ When designing a building, consider maximizing the exposure to the sun, and use the sun's energy to heat and light the facility. One can reduce an energy bill by 15% if the length of the building faces south.
- \$ One can also buy wind power from wind farms across the United States in order to support a green form of energy creation.

### **Insulation and Weatherization**

- \$ Energy, in the form of heat, is transferred by conduction and infiltration.
- \$ To prevent heat loss in winter and heat gain in summer, it is important to have an adequate amount of insulation. It doesn't matter whether a business is located in a hot or cold climate: insulation is equally effective.
- \$ Insulation is cost-effective.

- \$ When choosing a type of insulation, think about the embodied energy. Also, it is easy to find insulation made from recycled materials. Cocoon insulation, made by Greenstone, is made from 100% recycled newspaper products and is non-toxic.
- \$ Weatherizing is sealing up air leaks, a practice that can save up to 10% on energy bills.
- \$ To test for leaks, hire an energy auditor to conduct a “blower door” test. Or you can do it yourself by turning on ventilation fans, which will depressurize the building and allow you to feel where air is entering.

## **Heating and Cooling Systems**

- \$ Heating and cooling a practice will usually be the largest energy expense, and it has the largest impact on the environment.
- \$ Therefore, it is important to find the most efficient system for a building.
- \$ Systems that are too large are wasteful, and they will quickly wear out.
- \$ While the main plant is a large part of a heating/cooling system, don’t forget about the distribution and control systems.
- \$ Most buildings will leak 30-35% of the heated or cooled air. This percentage can be reduced by tightening the ductwork with commercial-grade butyl tape or aerosol-based duct sealants. (Don’t use duct tape.)
- \$ Programable thermostats can also reduce your energy bill and prevent unnecessary heating or cooling at night.
- \$ Solar water heaters allow for the heating of either water or a heat-transfer fluid in collectors that are mounted on the south-facing sections of roofs. These solar water heaters are cost competitive in many applications when the long-term costs are taken into account, thanks to the fact that the fuel (solar energy) is free.

## **Windows**

- \$ Windows can be responsible for tremendous heat gain and loss, and therefore must be well insulated.
- \$ Two panes of glass, with a gas like argon between the panes, is a great way to insulate windows. The gas prevents conduction and the flow of heat from hot to cold.
- \$ Wood and vinyl frames are recommended over aluminum frames, as the latter conduct heat.
- \$ The lower the U-Value, the more efficient the window.
- \$ Windows can also be covered with a low-emissivity coating (e-coating). This is a thin film of silver or tin oxide that lets all visible light in, while reflecting infrared radiation, which reduces unwanted heat loss and gain.
- \$ Be cautious of having west-facing windows, as they tend to cause overheating in the summer.
- \$ While skylights are attractive, they can cause overheating in the summer and, because heat rises, they allow a heat to escape in cooler months.
- \$ Roof overhangs will protect south-facing windows from getting direct sunlight during the summer months, when the sun is higher in the sky. This will keep cooling costs low.
- \$ Shades can also help insulate. In the winter shades should be drawn at night, while during the summer they should be drawn in the day.

## **Purchasing, Using, and Disposing of Products Efficiently**

- \$ While the most efficient products on the market have a high initial expense, it is important to consider the rate of return. For example, consider a halogen light bulb vs. a fluorescent light bulb. Suppose you use a light for 1,000 hours each year, and your electrical company charges you eight cents per kilowatt hour. While a 60-watt bulb costs only about a dollar per year, it would cost \$4.60 per year and would need to be replaced each year. In contrast, a halogen bulb may initially cost \$20; however, it will generally last 10 years and will only cost \$1.20 per year in electrical bills. So, after ten years, using 60-watt bulbs will cost about \$52, while using a halogen bulb will cost about \$32.
- \$ When looking for efficient products, watch for the “Energy Star” logo.
- \$ Most high-energy products now have power-saving devices. Be sure to read all manuals to find out about these options. For example, to improve your computer’s power consumption, all you have to do is go to the control panel and click on “Power Options” for PCs and “Energy Saver” for Macs.
- \$ Many of the products you purchase are made up of heavy metals and other toxic materials. Be sure to follow directions and dispose of these in a proper fashion. Many items, especially computers, can be donated or recycled to prolong their life span.

## **MISCELLANEOUS**

### **References**

- \$ Chiras, Dan. Lecture to Arica Crootof, February 2004. Colorado College, Colorado Springs, CO.
- \$ Colorado Energy Science Center. Consumer Guide to Energy Efficiency: Products and Services 2003-2004. August 2003, 1-47.

**I TOOK OUT A BUNCH TO GET IT DOWN TO FIVE, BUT THESE ARE STILL NOT IN THE CORRECT FORMAT.**

### **Recommended Reading**

- \$ The Architectural Resource Guide. David Kibbey.
- \$ The Fuel Savers: A Kit of Solar Ideas for Your Home. Bruce Anderson.
- \$ [www.energystar.gov](http://www.energystar.gov). Energy Star homepage.
- \$ [www.realgoods.com](http://www.realgoods.com). Environmentally friendly and efficient products.
- \$ [www.solardevelopment.com](http://www.solardevelopment.com). Design and consulting group for Commercial Renewable Energy.

### **Author**

Mark Crootof DVM  
608 Rt. 29  
Middle Grove, NY 12850