



## Lower Your Firm's Operating Costs

Although *e-News* normally brings you energy efficient techniques and technologies you can design into future buildings, it's time to shift focus to the here and now—to what you and your design firm can do to save energy and money during the current energy situation.

### Focus on Energy Savings with the 20/20 Program

The **California 20/20** Program is a voluntary conservation program open to residential, commercial, and industrial customers that provides rebates to customers who reduce their Summer 2001 electricity usage versus last year. Customers will earn a credit on their bill worth 20 percent for each month they reduce electricity use by 20 percent or greater. For non-residential customers with time-of-use meters, the 20 percent rebate and reduction apply to the daily peak period, when electricity demand is greatest. SDG&E customers have a reduced conservation threshold of 15 percent because of their efforts at reducing electric usage last summer. This conservation program runs from June through September.

### Reduce Your Firm's Energy Usage with These Simple Steps

Energy conservation can save hundreds or even thousands of dollars every year. And in many cases, the things your company can do to save energy are very simple, take very little time and can be achieved at low or no cost. Here are some energy-saving ideas:

#### Lights

- Turn off lights when possible. Install occupancy sensors to turn lights off automatically in unoccupied areas.
- Remove unneeded lamps.
- When replacing lamps, use lower wattage or more efficient one, such as compact fluorescent lamps.
- Clean lamps, fixtures, diffusers, and reflectors on a regular basis.
- Paint walls and ceilings with lighter colors for improved lighting reflectance.

#### Heating, Ventilation and Air Conditioning

- Raise your air conditioning temperature settings. Consider setting thermostats at 78° F.
- Turn off heating and air conditioning at night and on weekends in unoccupied areas.

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Visit the EDR website at:  
[www.energydesignresources.com](http://www.energydesignresources.com)

## DESIGNING A SMALL COMMERCIAL BUILDING? MAKE SURE ALL YOUR DUCTS ARE IN ORDER

Annually, California commercial buildings use roughly 35 percent of the electricity and 16 percent of the gas consumed in the state.

Space conditioning in these buildings accounts for

about 18 percent of their electricity consumption and 34 percent of their natural gas consumption. An additional 10 percent of commercial-building electricity consumption is used to run the fans and pumps that help to transport heating and cooling through thermal distribution systems.

Most of California's light commercial buildings (less than 10,000 square feet) use air transported through ductwork for thermal distribution. The same air distribution systems often provide both thermal comfort and ventilation for these buildings. Energy Design Resources encourages the use of energy-efficient fans and pumps in the design of thermal distribution systems, but the most efficient technology will not overcome the losses that can happen in the ductwork.

Several years of research by Lawrence Berkeley National Laboratory (LBNL) have shown that the problems plaguing residential duct systems also are found in small commercial buildings. Researchers have confirmed that rooftop packaged heating and cooling equipment in small commercial buildings are installed with the same materials and techniques as residential systems: combinations of sheet metal, duct-board,

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Photo credit: Lawrence Berkeley National Laboratory

Research at Lawrence Berkeley National Laboratory has confirmed that the typical duct leakage area in light commercial buildings averages more than twice that for residential buildings.

- Delay turning on heating and air conditioning at the start of the day. Turn off heating and air conditioning sooner at the end of the day.
- Clean condenser coils on air conditioning units regularly.
- Have your heating, ventilating, and air conditioning systems serviced and adjusted regularly.
- Install and use programmable thermostats.
- Replace air conditioning units with new, more efficient models rated at 10.5 EER or higher.

#### Business Equipment and Computers

- Turn off computers and other equipment when not needed.
- Make sure all automatic controls are in good working condition and are set properly.

#### Building

- Make sure that windows and doors seal tightly when closed.
- Use shades and blinds on windows to keep out unwanted heat.

#### Hot Water

- Lower your hot water temperature. Consider changing the setting to 120° F.

### Get Help and Rebate Dollars from Your Utility

The energy concerns of small and mid-size businesses are often very different than those facing large companies and corporations. And with rates increasing by at least 40 percent this month, energy usage will claim a larger proportion of your firm's operating costs. With this in mind, the state's utility companies have developed a range of services and incentive programs to address the unique energy issues of their small and mid-size business customers. Explore the following Web sites for information about controlling your energy usage and getting rebates on energy-efficient equipment:

Los Angeles Department of Water & Power  
[www.ladwp.com/effisolu/effisolu.htm](http://www.ladwp.com/effisolu/effisolu.htm)

Pacific Gas and Electric  
[www.pge.com/003\\_save\\_energy/003b\\_bus/003b1a\\_equip\\_rebate.shtml](http://www.pge.com/003_save_energy/003b_bus/003b1a_equip_rebate.shtml)

San Diego Gas and Electric  
[www.sdge.com/efficiency/bus\\_rebates.html](http://www.sdge.com/efficiency/bus_rebates.html)

Southern California Edison  
[www.sce.com/002\\_save\\_energy/002c1c1\\_2001\\_exp\\_eff\\_rebs.shtml](http://www.sce.com/002_save_energy/002c1c1_2001_exp_eff_rebs.shtml)

Southern California Gas Company  
[www.socalgas.com/candi/business\\_index.shtml](http://www.socalgas.com/candi/business_index.shtml)

and flex-duct. They have also discovered the following traits in many of the buildings they examined:

- The typical duct leakage in light commercial buildings averages more than twice the amount in residential buildings. Average leakage from the supply ducts was 26 percent of the fan flow, which is nearly 50 percent higher than the average leakage of 17 percent found for residential duct systems.
- Approximately half of the ductwork in light commercial buildings is located outside the conditioned space, in buffer zones similar to residential attics. This means that ducts in many small commercial buildings are subject to the same harsh conditions as residential ducts located in attics, and conditioned air in the system leaks to unconditioned spaces.
- Most of the HVAC equipment was oversized, resulting in significant cycling losses from the duct systems.
- With the fan on and the compressor off, the system eventually acts as a heater to the conditioned space.

According to LBNL, the following factors affect the magnitude of thermal loss in a small commercial building's thermal distribution system:

- Leakage and quality of installation
- Conduction losses
- Direct solar radiation effects
- Solar reflection
- The temperature of air delivered to interior spaces at the registers
- Differences in the lengths of exterior ducts

When long duct runs are exposed to sunlight and high outdoor temperatures on roofs, the supply air can experience a significant temperature rise before reaching the registers. This has a direct impact on interior thermal comfort conditions and can cause uneven temperature distribution within the building.

To explore the thermal energy issues of exposed exterior ductwork, LBNL researchers conducted a case study at a building on a community college campus in Sacramento. Most of the building's ductwork was located on the roof, providing an opportunity to evaluate the effects of duct leakage, conduction losses, and other issues on the energy performance and efficiency of the duct system. At the outset of the project, they found that while ducts had a conduction efficiency of 97 percent, the delivery efficiency was, on average, only 73 percent. This is

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## Coming Soon

**August 20-24, 2001**

**Sustainable Development Short Course  
Chicago, Illinois**

This short course is offered through the Great Lakes Center for Occupational and Environmental Safety and Health, and instructed by Eugene Goldfarb, HUD Midwest Environmental Officer. Participants will learn about smart growth and sustainable development, engage in project simulation, and learn about federal technical assistance available.

[www.hud.gov/local/chi/chienv24.html](http://www.hud.gov/local/chi/chienv24.html)

**August 27-December 15, 2001**

**Total Immersion Program in Sustainable Design  
Prescott, Arizona**

The Ecosa Institute is holding this 16-week total immersion program in sustainable design for a select group of exceptional students. Guest speakers include Pliny Fisk, Will Bruder, Paolo Soleri, and Sim Van der Ryn.

<http://www.ecosainstitute.org/semester.html>

**September 24-26, 2001**

**Brownfields 2001  
Chicago, Illinois**

Brownfields 2001 is organized to provide information about brownfields redevelopment to all stakeholder groups. Learn about the “nuts and bolts” of brownfields redevelopment, leveraging resources through partnerships, making it happen with practical approaches, and optimizing the value of redevelopment. For more information, contact

[brownfields@eswp.com](mailto:brownfields@eswp.com)

[www.epa.gov/brownfields/bfconf.htm](http://www.epa.gov/brownfields/bfconf.htm)

**October 16-17, 2001**

**Energy & Environmental Technologies Conference  
Atlantic City, New Jersey**

Sessions will help participants learn how to harness the power of environmental technologies and shape the future of energy and environmental policy.

[www.eetech.org/](http://www.eetech.org/)

because the ducts were located on the roof, where they gained heat from the ambient environment.

The Sacramento Municipal Utility District then conducted a “cool-roof” retrofit of the building, which involved improving the roof-deck insulation and increasing the surface reflectivity of the building's roof. The retrofit increased the delivery efficiency to an average of 89 percent, reducing the average energy use for conditioning by 22 percent.

### IMPLICATIONS FOR NEW DESIGN

This case study and the other LBNL research have implications for the design of new small commercial buildings: They suggest that right-sizing HVAC equipment and specifying insulation and reflective coating for rooftop ductwork can have a significant impact on the building's energy usage. They also suggest that designers should avoid running ductwork across the rooftops and in unconditioned spaces wherever possible. Finally, a new aerosol sealing technique developed at LBNL (now commercially available) may be the answer to solving the leakage losses.

For more information on energy efficiency in thermal distribution systems for small commercial buildings, visit the Web page that formed the basis for this article: *Commercial Thermal Distribution Systems*, Mark Modera, principal researcher, at <http://ciece.ucop.edu/Modera1998/index.html>

Further information on this topic is available in the following reports from the Energy Performance of Buildings Group at LBNL:

“Exterior Exposed Ductwork: Delivery Effectiveness and Efficiency” by William Woody Delp, Nance E. Matson, and Mark P. Modera, Energy Performance of Buildings Group, Lawrence Berkeley National Laboratory  
[www-epb.lbl.gov/EPB/Publications/lbl-39083.pdf](http://www-epb.lbl.gov/EPB/Publications/lbl-39083.pdf)

“Field Investigation of Duct System Performance in California Light Commercial Buildings” by William Woody Delp et al, Energy Performance of Buildings Group, Lawrence Berkeley Laboratory <http://ducts.lbl.gov/Publications/lbl-40202.pdf>

**Coming in the June 22 issue of Energy Design Resources  
*e-News*: Ductwork Part Two: Large Commercial Buildings  
and New Strategies** 