

Saving Energy—and Money—in Schools

By Clyde R. Raffety

In this age of skyrocketing energy costs many Americans are searching for ways to reduce energy consumption. Others are looking to alternative forms of energy that are less costly and more abundant. School systems throughout the United States are making headway in the struggle to lower their energy costs in order to allocate more funds for upgrading curriculum, et cetera. Seventh-day Adventist schools are no exception. We are, and should be, concerned about the energy crunch. Energy conservation in our schools is every teacher's responsibility.

Volumes have been written concerning energy conservation in the past few years alone. Techniques on how to convert to alternative sources of energy (such as wind and solar energy) are discussed in many of these writings. It is not the intent of this writer to encourage our schools to convert to these alternatives. Rather, I would like to focus on ways we can conserve the sources of energy we are presently using. It would be unrealistic to assume that our schools possess the financial investment necessary to convert to other forms of energy.

Figure 1 presents the annual energy consumption of an



FIGURE 1*
Average energy consumption of a school.

average school in the northern United States.¹ With a breakdown of this type, it is easy to see where we should begin in an energy conservation program. Since lighting consumes a major portion of the energy in a school system, let us consider ways to conserve energy in this area.

Proper lighting is of major importance in any building, especially in classrooms or work places. The eye must receive certain wave lengths in order to maintain proper levels of the chemicals necessary for vision. Studies have shown that lighting can have psychological effects on a person's mood, attitude, and his efficiency.

Much research has been done concerning the introduction of daylight through windows,

especially on industrial applications where light is needed for critical tasks inside factories. In fact, before the introduction of fluorescent lighting in the late 1930's and 1940's, daylight was a normal design requirement in most buildings. Since then, however, due to the proficiency of artificial lighting, industry has come to rely on it more than daylight. Nevertheless, studies have continued on the use of daylight, particularly in relation to classrooms because of their predominant occupancy during daylight hours.

Turn Off the Lights!

A recent article in *Educators School Business Report* discusses how one man reduced his school district's energy consumption by 20 percent.² This was no easy task. First he had to educate both teachers and students to become involved in energy conservation. Emphasis was placed on the simple task of turning off lights when they were not in use. Inevitably teachers enter the classroom and flip on all the light switches when perhaps only the row of lights farthest from the windows is necessary for proper lighting. If all lights are on one switch, it might prove worthwhile to add additional switches to take advantage of natural lighting. On some days you might not need the electrical lighting at all.

*From SUN/EARTH: HOW TO USE SOLAR AND CLIMATIC ENERGIES TODAY by Richard L. Crowther. Copyright © 1976 by Richard L. Crowther. Reprinted by permission of Charles Scribner's Sons.

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If your school is not presently using long-life lamps, it would be wise to install them as replacements for burned-out lamps. Although the initial cost is slightly higher, the overall saving is approximately 15 percent. Also, with some of the newer-type lamps on the market it is possible to replace old lamps with a fixture of less wattage and still receive an equal amount of light.

Fluorescent fixtures should be used where possible rather than incandescent lamps, since they produce more lumens per watt and have a longer life than incandescent lamps.

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In contrast to incandescent lighting, it may not pay to turn off fluorescent lighting each time you leave the room. Fluorescent lamps are "ignited" by bursts of extremely high voltage, which affect lamp and ballast life according to the number of starts. Incandescent lamps, on the other hand, deteriorate according to the total hours of operation, with the number of starts being of little concern. As a rule, a fluorescent lamp that will be needed two or more times during a fifteen-minute period should not be turned off. The shortened lamp life caused by switching will more than offset electricity saved in this manner.

Skylights Provide Free Lighting

One way to provide free lighting in dark areas is through the use of skylights, which can be purchased and installed at a modest cost. Even attic spaces pose no problem. The skylight is installed on the roof over the desired location, and then one

or more translucent panels of plastic are installed in the ceiling. In the past, skylights presented a problem of heat loss. However, with recent developments in double and triple layers of glass and plastic with insulating air spaces between the layers, the heat-loss problem has decreased.

Sodium-Vapor Lights for Exterior Use

Sodium-vapor lights give considerably more light with less wattage than regular incandescent lamps and are much more suitable for outdoor lighting. This type of lighting should be considered for parking lots as well as for security lighting. The primary advantage of using sodium-vapor lamps is the decrease in energy consumption, which results in lower electric bills. Another advantage of using this type of lighting is that it tends to deter vandalism. Further savings can be realized with sodium-vapor lighting if photoelectric cells are used to automatically switch the lights on and off.

Cutting Down Heat Loss or Gain

Looking again at Figure 1 we see that heating consumes the next largest amount of energy in a school, and that cooling takes another good-sized portion of the energy dollar. Since both heating and cooling are concerned with conditioning the inside air and with keeping this air inside, we will consider them jointly.

Insulation is the single most important way to save energy in any building. A fully insulated building requires about 40 percent less energy to heat and cool. Most school buildings are inadequately insulated. The most common excuse for inade-

quate insulation is that there is "no money in the budget" for that type of expense. However, money spent to increase energy efficiency will soon be recouped many times, especially considering today's high energy costs.

Two Types of Heat Loss

Heat always has a tendency to flow from an area of higher temperature to an area of lower temperature. Therefore, summer heat tries to flow into your cooled classroom, and in winter, heated air inside the building automatically seeks the colder air outside. The purpose of insulation and weatherstripping is to reduce this flow of heat.

Skylights can provide free lighting in dark areas.

Heat escapes or enters a building in two basic ways: by conduction and by infiltration. Conduction heat loss is through the exterior surface of the building. The different types of construction material used determine the amount of heat loss due to conduction. Some materials reduce heat flow much better than others and are thus used as insulation.

Infiltration is the replacement of inside air with outside air. Every building is constantly exchanging air with its environment. As outside air leaks in, inside air is leaking out. Although a certain amount of this air exchange is necessary for ventilation, most buildings have much more air exchange than is needed. Because of this constant exchange of air, extra fuel is consumed to maintain the desired room temperature.

There are several types of insulation on the market, but all

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baked beans, still bubbling with onion and tomato. Maggie McDonald had made a roast out of something made in Battle Creek that tasted a little like meat.

The children looked back on that day with pleasure. And there were other days of outings and picnics.

"It doesn't seem possible that school could be so much fun," Chester confided to Jennifer, one day after he had gotten a hundred in arithmetic. "I am not scared anymore. Seems like I can think better."

"Course you can," Jennifer agreed. "No one can think when you are afraid. Miss Murphy doesn't get mad. She talks kind even when kids are bad."

"I know. Ain't no fun bein' bad when it makes Miss Murphy look at you kind of sad-like. I sure was mad at Rakie when he sassed her the other day."

"Yeah. An' Bill told him at recess he'd better cut it out if he knowed what was good for him."

And such was a slice of life from our family, after our father and mother decided to send us to church school. No wonder we decided to go all the way with Jesus, for we learned that happiness is found in kindness, and obedience, and love.

Descriptive articles and poetry that illustrate principles of Christian education are welcome from time to time. We invite our readers to submit such materials.

Those Terrible "Turned-Off" Teens

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energies and a source of fulfillment in this new, more diversified program. Though this type of student could not excel in English or math, he found his outlet in bell choir or student aiding.

Seeing the Teacher in a New Way

Often a school program provides only one picture of the teacher—that of science or history instructor—but with a greater variety of experiences, opportunity for the integration of faith and learning is increased. The informal atmosphere of these minicourses helped the students to see their teachers in a new light. These courses provided an excellent milieu for the student to see the teacher as a Christian in ordinary, everyday experiences. Here was the English teacher learning macramé from a seventh-grade student who had been taught the craft by the math teacher. The English teacher's Christianity was displayed in the manner with which she coped with the same frustrations the student had met.

Due to an improvement in school spirit which resulted from the changed school program, there was a dramatic reduction in vandalism. A student who formerly had vented his frustrations with failure by smashing classroom windows now was unwilling to mar or deface the place where he found fulfilling enjoyment.

Typically, this age level is indifferent to the challenge of learning. However, the minicourses aroused the adolescents' potential for self-motivation. Not only was their enthusiasm for the minicourses obvious, but the carryover was evident in improved school attendance, better home relations, enthusiasm for academic subjects, personality development, and tolerance for the individuality of fellow students as each person found his unique skill in a variety of projects. The girl who in the past had delighted in leading her group in degrading and shaming her fellow students now found happiness in bring-

ing joy to the sick and the disadvantaged. She has even decided to pursue a career in which she can serve the unfortunate and the handicapped.

Encouraging Self-Confidence

Generally speaking, an early adolescent's self-concept is not easily reinforced within the scope of the typical school curriculum. Many students lacked self-worth and were a heartache to the teacher, particularly in Bible class. The student-aiding minicourse, which helped the older student value himself as a teacher of younger students, encouraged the development of a new self-perspective. Students participating in this area subsequently felt self-confident enough to share constructive thoughts and valuable contributions in Bible class.

Obviously this curriculum change has provided an appropriate answer to our original question of the problem of the academically apathetic early adolescent. It has shown that

in the invigoration of mind and body, the fostering of an unselfish spirit, and the binding together of pupil and teacher by the ties of common interest and friendly association, the expenditure of time and effort will be repaid a hundredfold. A blessed outlet will be afforded for that restless energy which is so often a source of danger to the young. As a safeguard against evil, the preoccupation of the mind with good is worth more than unnumbered barriers of law and discipline."⁵

FOOTNOTES

¹ Ellen G. White, *Counsels to Parents, Teachers, and Students* (Mountain View, Calif.: Pacific Press Publishing Assn., 1913), p. 283.

² _____, *Education* (Mountain View, Calif.: Pacific Press Publishing Assn., 1903), pp. 212, 213.

³ *Counsels to Teachers*, p. 200.

⁴ *Ibid.*, pp. 545, 546.

⁵ *Education*, p. 213.

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work equally well as long as the "R" rating is maintained. (The "R" rating is a standard numbering system that rates the

efficiency of various insulations.) There are certain advantages and disadvantages to each type, but consultation with a reliable contractor can be helpful in determining which type would best suit your needs.

What Areas Should Be Insulated?

All areas exposed to outside air should be insulated. Following is a list of areas that should receive special attention.

- All outside walls
- Attic spaces and attic access panels
- Floors—especially in older schools with wood flooring
- Exposed air conditioning/heating ducts
- Roof surfaces

Insulation of exposed air ducts is included because much heat can be lost from this source, especially in well-insulated attic spaces. Remember, insulating is concerned with heat loss due to conduction. If the attic space is cold in the winter, the heat is going to seek the cold air. Thus you are heating the attic with the conducted heat from the ducting if the ducts are not insulated. Likewise, the opposite effect exists in the summer. Heat from the attic will be conducted through the ducting into the cold air, thus requiring more energy and money to keep the air cooled.

Lighting consumes a major portion of the energy used in a school.

There are several ways to cut down infiltration. The most obvious means of eliminating heat loss due to infiltration is by weatherstripping and caulking. All doors and windows should be weatherstripped. There are many different types of weatherstripping on the market, some better than others. It is

best to spend a little more initially and not have to redo the job the next season. The money you save in utility bills will more than pay for the materials. In addition to caulking and weatherstripping, the door should be adequately insulated. A good quality foam-core metal door is worth the money.

A few cracks around a door or window can disastrously reduce the energy efficiency of a building. The air can get into the side walls of the buildings and actually create a draft along the floor. All cracks around windows and doors, or where buildings join, or corners meet, or any other openings in outside walls should be caulked to prevent this means of infiltration. A few tubes of caulking could yield a larger dividend in energy saved per dollar of investment than any other single action that could be taken.

Infiltration can also be reduced through the use of vestibules to form an "air lock." Vestibules should be sufficiently long so that outside doors are closed before the inside door opens. These doors should be provided with automatic closers.

What Source of Energy Is Best?

It is not difficult to determine which source of energy is the best for heating buildings and hot water. However, schools usually have to take what is available. Where alternative fuel sources like natural gas are available, they should be used when replacing or installing new air handling units or water heaters. There may be an initial cost of running the gas line to the property, but in many cases the gas company will pay part of that cost. There are several advantages to using natural gas rather than other sources of energy. Appliances are cheaper; heat is generated faster and more efficiently (especially

advantageous where water heaters and boilers are used), and gas provides a lower monthly operating cost.

Gas space heaters, water heaters, and boilers can also be provided with electric igniters, which will eliminate the need for a continuous flow of gas for the pilot. In addition to conserving energy and money, electric igniters eliminate the possibility of blown-out pilots and leaking gas, which present explosion hazards.

Insulation is the single most important way to save energy in any building.

Help Is Available

In 1978 the National Energy Conservation Policy Act (NECPA) was passed (PL 95-619). This act contains major grant programs to promote energy conservation in public and private nonprofit buildings constructed prior to April 20, 1977. The grant programs can provide up to 50 percent matching Federal grants to assist institutions in identifying and implementing energy conservation measures. These programs are administered by energy offices in each of the 50 States, Puerto Rico, the Virgin Islands, the District of Columbia, Guam, and American Samoa.

For further information concerning available funds, contact your State energy office or write to:

Institutional Buildings Grants Programs

State and Local Programs, CS

U.S. Department of Energy
Room 2H-027

1000 Independence Ave. SW
Washington, D.C. 20585

FOOTNOTE

¹ "One Schoolman's War on Energy Wastefulness," *Educators School Business Report* (July, 1980).