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ABSTRACT

Because today's schools consume large amounts of energy and, consequently, pay high energy bills, the term "energy cirsis" is no exaggeration to describe the situation facing educators and school administrators. Schools everywhere are under pressure to use less electricity, natural gas, heating oil, and gasoline. While energy conservation techniques may not be the total solution to the energy crisis, they are certainly part of the answer and they are a large part of the answer to the energy cost crisis. The articles and documents abstracted here show how schools can save significant amounts of energy in a surprising number of ways. Some of these ways have to do with maintaining, servicing, and setting equipment properly. Some depend on changing the wasteful habits that are products of a time when both energy and money were more plentiful. Some (and these are perhaps the best hope for the future) can only be put into effect by those designing future facilities. Some of the best energy saving design ideas are neither new nor complex. Builders and architects are returning to natural rather than mechanical answers to the energy crisis. (Author/IRT)

ENERGY CONSERVATION 9

SEPTEMBER 1976

EDUCATIONAL FACILITIES DIGEST

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EA

ENERGY CONSERVATION

The energy crisis no longer rates banner headlines, the lines at gasoline stations have disappeared, and it is no longer considered unpatriotic to turn the heat up to 70 degrees or the air conditioning down to 65 degrees; yet there are still urgent and compelling reasons for Americans to be concerned about energy waste. Those who are concerned about the future quality of life on our planet and the survival of its inhabitants are acutely aware that we are running out of energy. Those who are concerned about balancing budgets realize that energy costs are skyrocketing.

Because today's schools consume large amounts of energy, and consequently pay high energy bills, the term "energy crisis" is no exaggeration to describe the situation even now facing educators and school administrators. Schools everywhere are under pressure to use less electricity, natural gas, heating oil, and gasoline.

While energy conservation techniques may not be the total solution to the energy crisis, they are certainly part of the answer, and they are a large part of the answer to the energy *cost* crisis. Monitoring energy use and curbing waste can make an enormous difference in energy consumption.

Schools can save significant amounts of energy in a surprising number of ways. Some of these ways have to do with maintaining, servicing, and setting equipment properly. Some depend on changing the wasteful habits that are products of a time when both energy and money were more plentiful. Some (and these are perhaps the best hope for the future) can only be put into effect by those designing future facilities.

Rebelling against our Puritan heritage, many of us balk at simple energy-saving techniques like shutting off unnecessary lights and turning down the heat an hour before time to go home. It is hard

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to believe that such penny-pinching can have significant effect. Yet the truth is that the energy many schools waste is not measured in pennies but in thousands of dollars. One California school discovered it was wasting $14,000 annually just by neglecting to service timers that reduce heating and ventilating when school is not in session. Another school cut electrical energy consumption by 20 percent merely by having custodians turn off lights and heating, ventilating, and air conditioning (HVAC) systems in each room as they finish work.

There is an enormous amount of current literature on the subject of school energy conservation. Magazines aimed at school administrators are filled with articles and series of articles on the subject, and several periodicals have instituted regular monthly features on energy conservation. A number of articles take the form of checklists for administrators—things schools are doing or can do to save energy. Here the reader must be cautious because many suggestions are offered without any proof of real effectiveness. Some that intuitively sound like good ideas may not save money or energy at all. Others may bring significant savings in some schools but not in others.

Eliminating warmup times for a school bus may save fuel but drastically shorten the life of the vehicle. Reducing the amount of windows in a school may save heating energy but use more lighting energy—a trade-off that sounds suspiciously unprofitable in view of the findings that approximately 60 percent of an average-sized school's electricity goes for lighting. Most valuable are the studies, like those described by Stein and Stein and by Stephan, that don't merely guess how energy might be saved but carefully measure actual energy use or utilize computer simulations to test the results of conservation techniques.

One effective way schools may be able to stop energy waste is by developing more realistic standards for both lighting and ventilating levels. Over and over again, authors on the subject contend that such standards are set arbitrarily and much too high.

Those planning new schools or remodeling old schools will do well to consider the many suggestions concerning building designs and systems that use energy more efficiently. One such method is solar heating, an option whose immediate availability is closer to fact than to science fiction—especially when heat from the sun is used to supplement a more traditional heating system. Another energy saving product of our most recent technology is a heat recovery system that utilizes wasted heat from light fixtures and ventilating exhaust.

But some of the best energy-saving design ideas are neither new nor complex. Builders and architects are returning to natural rather than mechanical answers to the energy crisis. Greater use of natural lighting is encouraged by experts in the field. Use of cross-ventilation for cooling, while less chilling than air conditioning, is, after all, free. When a new building is designed, consideration of building shape, site orientation, and natural features like trees and wind patterns can result in significant energy savings.

American Association of School Administrators, and ERIC Clearinghouse on Educational Management. *ERIC Abstracts: ERIC Document Resumes on Energy Conservation and the Schools. ERIC Abstract Series, Number Thirty-five.* Washington, D.C., and Eugene, Oregon: 1976. 18 pages. ED 120 894.

This 24-item bibliography is a compilation of documents concerning energy conservation listed in ERIC's monthly catalog, *Resources in Education (RIE).* Complete for all issues of *RIE* through September 1975, the documents deal with energy conservation and the energy crisis and their implications for public schools and colleges.

Included are practical checklists for reducing energy consumption, examinations of the efficiency of several energy systems (from traditional HVAC systems to solar heating and cooling), and energy-saving building design tips. Abstracts of each document are included.

Order copies from American Association of School Administrators, 1801 North Moore Street, Arlington, Virginia 22209. Stock No. 021-00448, $2.00, plus $1.00 handling charge for each order. Quantity discounts, orders under $15.00 must be prepaid!
Also available from EDRS. MF $0.83 HC $1.67. Specify ED number.

Anderson, Calvin E. "The Impact of the Energy Crisis on School Finance." *Phi Delta Kappan,* 57, 3 (November 1975), pp. 193-196. EJ 125 815.

Anderson, in this thorough article on the energy crisis, notes that "it is only a matter of time before the inflationary costs of energy will begin to eat into the quality of our educational curricula and into the teacher's paycheck."

In such a context, his list of practical suggestions for school energy savings assumes considerable importance. Each district, for example, should "initiate a comprehensive energy audit to determine patterns of energy use." Such an audit provides a basis for monthly energy cost comparisons and thus highlights areas for possible savings.

TITLES IN THIS SERIES

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Anderson also underscores the need for a school's maintenance personnel to be skilled in the proper operation of today's complex HVAC systems. Their attention to simple energy-saving techniques (such as switching off lights and the HVAC system in each room as they finish cleaning) can result in daily power savings of 20 percent or more.

Building Systems Information Clearinghouse. *Case Studies of Energy Use: Elementary and Secondary Schools. BSIC/EFL Energy Workbook No. 1.* Menlo Park, California: 1974. 24 pages. ED 096 733.

Because they contain actual figures (both in energy units and dollars and cents) concerning the efficacy of energy-saving methods, these five short studies are especially useful.

One study summarizes an unusual building program in Fairfax County, Virginia, where the school board, instead of awarding the construction contract to the lowest bidder, set a fixed cost for the new building at the outset, then used energy consumption as a major element in evaluating the proposed plans.

Each plan submitted was run through the Meriwether package of computer simulation to estimate probable energy use. A chart, containing each plan's estimated number of kilowatt hours per square foot, summarizes the results.

The report concludes that "the incorporation of energy conservation criteria into the program had no major inhibiting impact on either the design or cost of the facilities and will result in substantial energy and energy cost savings in the future."

The workbook has come to some thoughtful conclusions concerning research on energy use. One is that many energy studies are "weak in direction and objectives" and that suggestions generated by these studies "have not been tested in life situations." These are telling criticisms, unfortunately applicable to many energy studies.

Order copies from Educational Facilities Laboratories, 3000 Sand Hill Road, Menlo Park, California 94025. $2.00.
Also available from EDRS. MF $0.83 HC $1.67. Specify ED number.

Building Systems Information Clearinghouse. *Energy Conservation and the Building Shell. BSIC/EFL Energy Workbook: Section I.* Menlo Park, California: 1974. 34 pages. ED 094 477.

"Technological man in his attempt to provide the ideal environment has paid little heed to the present and future consequences of his acts—until the present scarcities forced him to count the cost and reexamine how he builds and lives." So begins this booklet summarizing how the design of the building shell—the roof, walls, glazing, and floor—can have an enormous effect on the energy consumption of a building.

Using thick walls, roof, and floor can help a building store heat and slow heat transfer. Providing a double roof can do the same. The use of outside or inside shading devices can cut the amount of mechanical cooling necessary in summer. Using light paint on walls and roofs in areas having long hot summers can reduce cooling costs. In the same way, dark paint can reduce heating needs in cold northern areas.

As an illustration of these and other design considerations, the article presents two typical design projects—one a modernization project, the other a new school design.

Order copies from Educational Facilities Laboratories, 3000 Sand Hill Road, Menlo Park, California 94025. $3.00.
Also available from EDRS. MF $0.83 HC $2.06. Specify ED number.

Crouch, C. L. "Effective Seeing in an Era of Energy Conservation. CEFP Special Report No. 9. Energy Conservation: A New Challenge for Education." *CEFP Journal*, 11, 4 (July/August 1973), pp. 12-14. EJ 082 626.

Crouch explains several ways schools can use less electricity and at the same time improve illumination. If there is too great a difference between the amount of lighting on a task and the lighting of the surrounding area, the contrast can prevent the eye from being able to see details clearly. Reducing dramatic contrasts can improve visibility without increasing electricity used. Overhead lighting, because it causes reflections, is less efficient than side lighting. Merely moving the lighting source to the side can increase illumination 90 to 100 percent.

Crouch recommends the use of new kinds of light sources that use less energy, and he advocates, too, a greater use of daylight to supplement artificial sources.

This article is one of six in this issue on energy conservation.

Davis, Kathy Eggers. *Methods of Conserving Heating Energy Utilized in Thirty-One Public School Systems.* Memphis: Memphis City School System, 1976. 32 pages. ED number will be available from the Clearinghouse when assigned.

In December 1975, 31 large (enrollments of 50,000 to 140,000) United States school systems listed their methods of conserving heating energy, then rated each one as to perceived effectiveness.

Davis states that the most frequently utilized methods of heating energy conservation were (1) reduce building temperature during holiday periods, (2) place stronger emphasis on proper maintenance of heating equipment, and (3) reduce building temperature.

Four energy-saving methods were rated by the schools as highly successful: (1) reduce building temperature during holiday periods, (2) switch to night heating cycle before school closes for the day, (3) schedule custodial care during the day instead of night, and (4) place stronger emphasis on proper maintenance of heating equipment.

All schools responding reported natural gas or fuel oil as their primary source of heating energy, but most suggestions are equally applicable to electrical heating systems.

A table lists 22 documents concerning energy conservation in public school systems and how to order them.

Order from EDRS. MF $0.83 HC $2.06. Specify ED number.

Educational Facilities Laboratories. *The Economy of Energy Conservation in Educational Facilities. A Report.* New York: 1973. 85 pages. ED 082 321.

This report contains energy-saving recommendations from several leading experts in the field of energy conservation. "Energy waste springs from two basic sources—lethargy and ignorance", the report contains suggestions designed to curtail both.

Many buildings are overilluminated to allow for infrequent bulb replacement. Energy can be saved by lowering initial lighting levels and replacing bulbs more frequently.

To fight ignorance, the report recommends awarding promotions and raises to custodial staff who have completed night courses in such areas as boiler, HVAC, and lighting equipment maintenance.

A central HVAC system is 10 to 15 percent more efficient than small packaged units, because a central system can burn cheaper fuel and has greater overall operating efficiency. It is also more adaptable to automatic maintenance techniques—techniques presumably not affected by either lethargy or ignorance.

Order copies from Educational Facilities Laboratories, 850 Third Avenue, New York, New York 10022. $2.00.
Also available from EDRS. MF $0.83 HC $4.67. Specify ED number.

Electric Energy Association. *Cost and Energy Savings Opportunities with Heating, Air Conditioning and Lighting Systems in Schools.* New York: 1973. 12 pages. ED 083 674.

This article is a concise and easy-to-understand explanation of HVAC systems that recover and reuse heat usually wasted. These systems utilize two kinds of heat: that given off by light fixtures and that passed out of the building through ventilator exhaust.

The article briefly summarizes four types of heat exchange systems: heat wheels, runaround systems, air-to-air heat exchangers, and heat pipes.

Another type of system, designed to utilize heat from lighting fixtures, provides both summer and winter savings. In the winter the light fixtures give off heat that, useless at ceiling level, can be transferred to the heating ducts. In the summer, this heat is merely vented to the outside, thereby reducing the load on the air conditioning. This cooling of light fixtures has the added bonus of improving the efficiency of the lighting system itself.

Order copies from Electric Energy Association, 90 Park Avenue, New York, New York 10016. $0.60.
Also available from EDRS. MF $0.83 HC $1.67. Specify ED number.

"The Energy Advisor." *Modern Schools*, (January 1974), p. 9. EJ 092 615.

This article, the first in a series on energy conservation in schools, notes that the first basic reason for school administrators to stress energy savings is economy in plant operation. One issue cited often when energy conservation in construction is discussed is life-cycle costing.

Life-cycle costing is the calculation of how much it will cost to maintain and operate a building over its entire lifetime. Too often, when choosing new building or energy system options, administrators choose those with the least initial cost with little regard to total operating and maintenance costs. "Yet over a building's lifetime, ill-considered economies in construction cost almost always prove expensive in the long run." A school, with an average lifespan of 40 years, has operating and maintenance costs that are actually 50 percent greater than the initial cost.

"Energy Crisis: What Schools Are Doing about It." *American School and University*, 46, 6 (February 1974), pp. 53-57. EJ 092 648.

The results of a national survey, this article contains a sensible and complete checklist of ways to conserve energy in schools. Suggestions offered are actually in use in schools, colleges, and universities throughout the country.

One simple but effective tip is to turn heating controls down to night cycle an hour before school closes, relying on existing heat to keep the temperature at a reasonable level.

The article recommends insulating ducts and hot water pipes that extend through cold spaces. It also stresses keeping heating vents clear of furniture, draperies, bookcases, files, and so forth.

One simple but surprisingly effective recommendation is to clean lighting fixtures because "dirt can reduce output by up to 50 percent." Another is the reminder to cut off pumps, fans, and motors not needed during weekends, holidays, and nights.

"Energy-Saving Designs for Buildings." *American School and University*, 46, 11 (July 1974), pp. 27, 30-31. EJ 102 526.

Part of an entire issue devoted to energy, this article offers useful and unusual energy-saving building design ideas. The article is based on a "form follows function" philosophy of architecture, maintaining that "beauty is now found in logical solutions to the problems of conserving natural resources."

One extraordinary design idea is to bury part of a building that is built on a hillside. "What better insulation is

Williamstown Jr Sr H S Williamstown, Vermont, Sargent-Webster-Crenshaw & Folley, Architects Photo by J W. Molitor

there?" Another is the use of a sheltered courtyard to provide a pleasant windless gathering place that uses no energy.

The article advocates the use of cross-ventilation, popular a decade ago, as a cheap method of "air conditioning." To make best use of cross-ventilation, the smallest openings should be on the windward side and the largest on the leeward. This actually increases air velocity.

Grossbach, Wilmar, and Shaffer, William. *The Energy Crisis in the Public Schools. Alternative Solutions.* Ventura, California. Ventura County Superintendent of Schools, 1974. 88 pages. ED 100 069.

The results of a problem-solving workshop for school personnel and representatives of the oil, natural gas, and electrical power industries, the recommendations in Grossbach and Shaffer's report concern saving energy in 15 different areas of school energy use.

Since the recommendations are products of the brainstorming technique, there is no way to gauge their effectiveness, yet the list is lengthy and contains some intriguing suggestions. One novel idea is to install warning alarms to signal when energy systems are improperly functioning or maintained. Another is to lengthen winter vacations and shorten spring vacations, thus saving on heating costs.

Grossbach and Shaffer include a substantial section on electricity and lighting that takes on added importance with their assertion that 60 percent of an average-sized school's electrical energy consumption is used for lighting.

Order copies from Ventura County Superintendent of Schools, Attention of Dr. Grossbach, County Office Building, Ventura, California 93001. $2.00.
Also available from EDRS. MF $0.83 HC $4.67. Specify ED number.

National Association of Secondary School Principals. *The Energy Crisis. A Legal Memorandum.* Washington, D.C.: 1973. 5 pages. ED 108 367.

This article begins with the contention that closing schools as a method of energy conservation ought to be adopted only as a last resort. The article maintains that there are other, better methods to save fuel that do not endanger the quality of education.

One such suggestion is to consolidate rather than shut down adult evening programs. Another is to utilize a heating or electrical engineer to supply hard facts about energy consumption in the school building. The article notes that these experts can supply such information as exactly how low a water heater can be set to conserve fuel during a weekend before expending all that was saved in the reheating process.

Order MF from EDRS. $0.83. Specify ED number. HC not available.

Ontario Department of Education. *Energy Conservation for Schools.* Toronto: 1975. 26 pages. ED 120 967.

"The less energy we use, the better our chance of finding new sources or additional supplies of existing sources before present supplies run out." So begins this complete and thoughtful booklet offering a number of sound energy conservation techniques for both existing and contemplated buildings.

A detailed section on calculating long-term building costs cites important yet easily overlooked considerations. One is that in determining whether an energy-saving initial cash investment will pay for itself in the long run, interest on the initial cash investment must be considered. "Interest

charges always apply, for the simple reason that borrowed money always carries a charge for its use, and unused or saved money always carries the potential of earning interest."

Architectural considerations that affect energy consumption are shape (especially surface area), site (including topography and trees), and orientation (east/west rather than north/south) asserts the booklet. An important design factor is minimization of floor-to-ceiling height.

Order copies from Ontario Ministry of Education, 21st floor, Mowat Block, Queen's Park, Toronto, Ontario, Canada M7A 1L2.
Also available from EDRS. MF $0.83 HC $2.06. Specify ED number.

Phipps, H. Harry. "New Schools Need New Energy Concepts." *American School and University*, 45, 5 (January 1973), pp. 34-36. EJ 070 758.

"Those involved with the selection of energy systems must demonstrate a concern for tomorrow—both from the standpoint of economy and ecology," declares Phipps in this article that concentrates more on the "why" than the "how" of energy conservation.

Modern schools require considerably more energy than those built 10 to 15 years ago. It has been suggested that, in the light of energy shortages, those consuming more energy should be penalized by paying a higher rate than those using less.

Statements like these bolster Phipps's conclusion that those planning new educational facilities must urge their architects and engineers to "recognize the vital importance of energy conservation" when designing future schools.

Platt, Frank K. "Energy Conservation. Major Issues for '75." *CEFP Journal*, 12, 4 (July/August 1974), pp. 6-7. EJ 102 571.

Platt suggests that energy conservation is nothing more than a newfangled term for the old-fashioned concept of "operating economy." He believes that one reason for excessive energy use in schools is that ventilation requirements are set too high in some states. "In these states, the percentage of outdoor air required for schools has been arbitrarily set with no basis for physiological or psychological need." He believes that reducing local code requirements for outdoor air to a minimum amount sufficient for health will result in "substantial savings" both in money and energy.

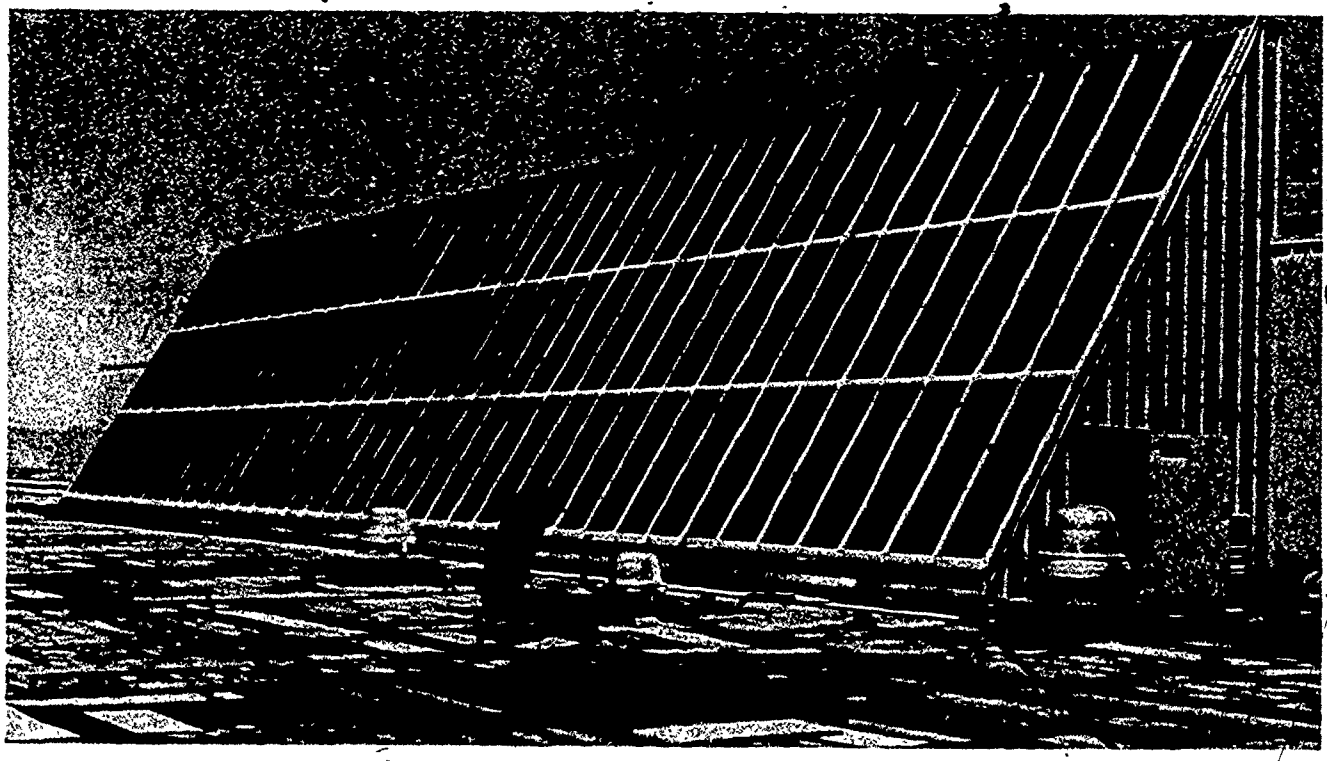
Platt recommends that ventilation systems should be versatile enough to allow 100 percent outside air when outside temperatures are comfortable and only 10 percent outside air when maximum heating or cooling is required.

Platt explains that many power companies compute charges partially on the basis of "surge" or peak demand requirements. Staggering the morning startup times of electric heating systems, thereby reducing the surge, can result in sizable savings on the electric bill.

Although parts of this article sound suspiciously like an advertisement for the particular HVAC company with which Platt is associated, he nevertheless explains some important energy conservation considerations that ought not to be overlooked.

Rittlemann, P. Richard. "The Energy Crisis, How Schools Make It Worse, and Why Boards Must Help Put a Stop to Fuel Waste." *American School Board Journal*, 160, 2 (February 1973), pp. 49-52. EJ 073 062.

Parker Area Jr H S Douglas County Colorado More Combs Burch, Architects



Citing the somewhat alarming statistic that by 1984 the United States will be using twice as much energy as it did in 1970, Rittlemann makes a strong case for curbing fuel waste.

Rittlemann projects the yearly per-pupil energy expenditure at $106.80 by 1992 and contends that school board members and administrators are in a unique position to affect such expenditures by making sure new school buildings are designed to save energy.

Rittlemann gives a brief overview of fuel-saving school design considerations in the areas of lighting and heating and supplies a short glossary discussing each of our most important energy sources.

Schrader, Charles F. *You and Your Architect and Energy Conservation Savings for Educational Facilities.* n. p.: Educational Facilities Committee, Northern California Chapter American Institute of Architects, 1976. 8 pages. ED 120 904.

Schrader urges administrators to use architects to perform energy consumption analyses of their schools and show them how they can modify their facilities to conserve energy. Such modifications might include reglazing with heat reducing glass, adding ventilating sash to allow for the option of natural ventilation, or resetting thermostats so that such areas as corridors and storage rooms are at lower temperatures.

Many architects are also now experts in helping administrators design new buildings that will use the least possible amount of energy. They know how to situate glass in areas least prone to heat gain and loss, utilize more efficient plumbing fixtures, and design buildings that will have less roof and wall area where heat loss can take place.

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Ross, Doris M. *Education's Response to the Energy Crisis. A Survey of the States. Research Brief, Volume 2, Number 1.* Denver: Department of Research and Information Services, Education Commission of the States, 1974. 31 pages. ED 103 216.

In December 1973, a 50-state survey was conducted to determine how schools were affected by and responding to the energy crisis. Ross's unusually interesting summary of the results pinpoints important statewide and nationwide problems precipitated by the energy crisis.

More than half of the 48 states replying "reported transportation as the most serious short- and/or long-term energy crisis." This finding is noteworthy because very few articles on school energy conservation deal with gasoline savings. In response to this problem, many states described cutbacks of extracurricular activities and field trips.

Ross reports that drastic shortages of both fuel and money have caused many states to contemplate shortening the school year. Yet, "a majority of the 50 states have laws mandating a school year of from 172 to 184 days, with state financial aid to local school districts based on fulfillment of the time requirement," notes Ross. The report describes the efforts of nine states to change such regulations.

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Address requests to EDRS, P.O. Box 190, Arlington, Virginia 22210.

Stein, Richard G., and Stein, Carl. *Low Energy Utilization School: Research, Design, Construction, and Evaluation. Phase I: Interim Report.* New York: Richard G. Stein and Associates, Architects, 1974. 297 pages. ED 099 962.

This report summarizes energy studies conducted in almost 1,000 New York City schools. It is one of the most detailed and carefully researched discussions of school energy use. Perhaps its greatest strength is that findings were obtained by actually measuring classroom energy use—a method of data-gathering that the authors maintain is superior to even computer simulations or laboratory tests.

Even carefully monitored New York City schools are using 25 to 50 percent more energy than is really necessary, contend Stein and Stein. These findings can have tremendous impact on school energy use everywhere. Stein and Stein discovered that there is no dangerous change in air quality with ventilation levels less than one-third of those presently prescribed in New York City schools. The authors supply useful lists of actual ventilation requirements in cubic feet per minute per person in each kind of school area.

A finding with great repercussions for school construction is that "sealed, minimum window school buildings consume considerably more energy (up to three times the average) than buildings having open window air supply possibility." Stein and Stein maintain that natural means of controlling light, temperature, and ventilation are not being used to their full potential. "Mechanical systems have tended to dominate architectural design, have redundantly duplicated available natural conditions and have become overly complicated."

Order from EDRS. MF $0.83 HC $15.39. Specify ED number.

Stephan, Edward. "Energy Guidelines for Schools." *American School and University,* 47, 6 (February 1975), pp. 51-53. EJ 110 960.

In this article, the first in a series on energy management, Stephan describes the program used by the Educational

Facilities Laboratories (EFL) and the Fairfax County, Virginia, school system to determine how Fairfax schools could conserve energy. Unlike many such attempts, this program used more than good sound ordinary sense to determine effective ways of reducing fuel consumption. A detailed analysis was made of the HVAC, electrical, and plumbing systems in each school and fed into a computer programmed to simulate the effects of certain proposed "operational and physical changes in terms of energy consumption."

One revealing finding came from the computer analysis of the financial result of installing double glazing on all the windows—a measure frequently recommended for energy conservation. In one school analyzed, it was determined that the new glazing would lead to energy savings of $1,778 per year, but the modification would be so costly to initiate that it would take the school 62.4 years to break even.

This study clearly demonstrates that we must use more than common sense to predict which energy conservation measures will result in real financial savings for schools.

Stephan, Edward. "Public Schools Energy Conservation Service." *American School and University*, 48, 5 (January 1976), pp. 43-44. EJ 129 396.

In this second article in a series on energy management, Stephan explains the function of the Public Schools Energy Conservation Service (PSECS), a nonprofit service formed to help schools discover exactly how they are wasting energy and what to do about it.

A district that uses PSECS can receive five kinds of help: (1) instructions for determining energy usage in its schools, (2) a comparison of each school's energy use with that of other similar schools, (3) a computer-assisted audit with suggestions for ways to reduce energy use, (4) a cost/benefit analysis of proposed building modifications, and (5) guidelines for monitoring the results of modifications.

"Watts Happening with the Sun in Massachusetts, in Maryland, in Minnesota." *Modern Schools*, (September 1974), pp. 4-7. EJ 104 127.

An unprecedented experiment under the auspices of the National Science Foundation attempts to ascertain if solar energy systems can be economical as well as socially acceptable. In the spring of 1974, four schools began using solar energy to provide supplemental heat.

The article briefly describes the systems installed in the schools (in Massachusetts, Maryland, and Minnesota). All employ unbreakable plastic panels to collect the sun's rays. "For every two square feet of building interior to be heated, the collector equipment requires about one foot of roof or ground." For the administrator who wants to assess the aesthetic implications of such a system, there are excellent pictures of installed roof and ground panel systems.

These solar systems are designed to provide from 6 to 20 percent of the heat used by the buildings. Two of the systems have storage tanks to store excess heat for use on cloudy days. In the Maryland system the tank will store enough energy to heat the school for four to five days.

Although brief, this article is an excellent jumping-off point for those interested in the feasibility of installing solar heating in existing schools as an energy conservation measure.

"What Are You Doing about the Energy Crisis?" *School Business Affairs*, 40, 6 (June 1974), pp. 148-150. EJ 099 435.

A table presents the results of a survey of selected school districts on their methods of saving energy. A California district is holding committee and PTA meetings only during daytime hours and is limiting night use of gymnasiums and auditoriums. A Colorado district restricts use of air conditioning until the temperature is 86 degrees. Maintenance personnel clean all HVAC filters monthly in an Illinois district.

The table lists representative replies from seven school districts and supplies instructions for obtaining a complete copy of the survey.

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