

The official publication  
of the Association  
of Physical Plant  
Administrators of  
Universities and Colleges

# Facilities Manager

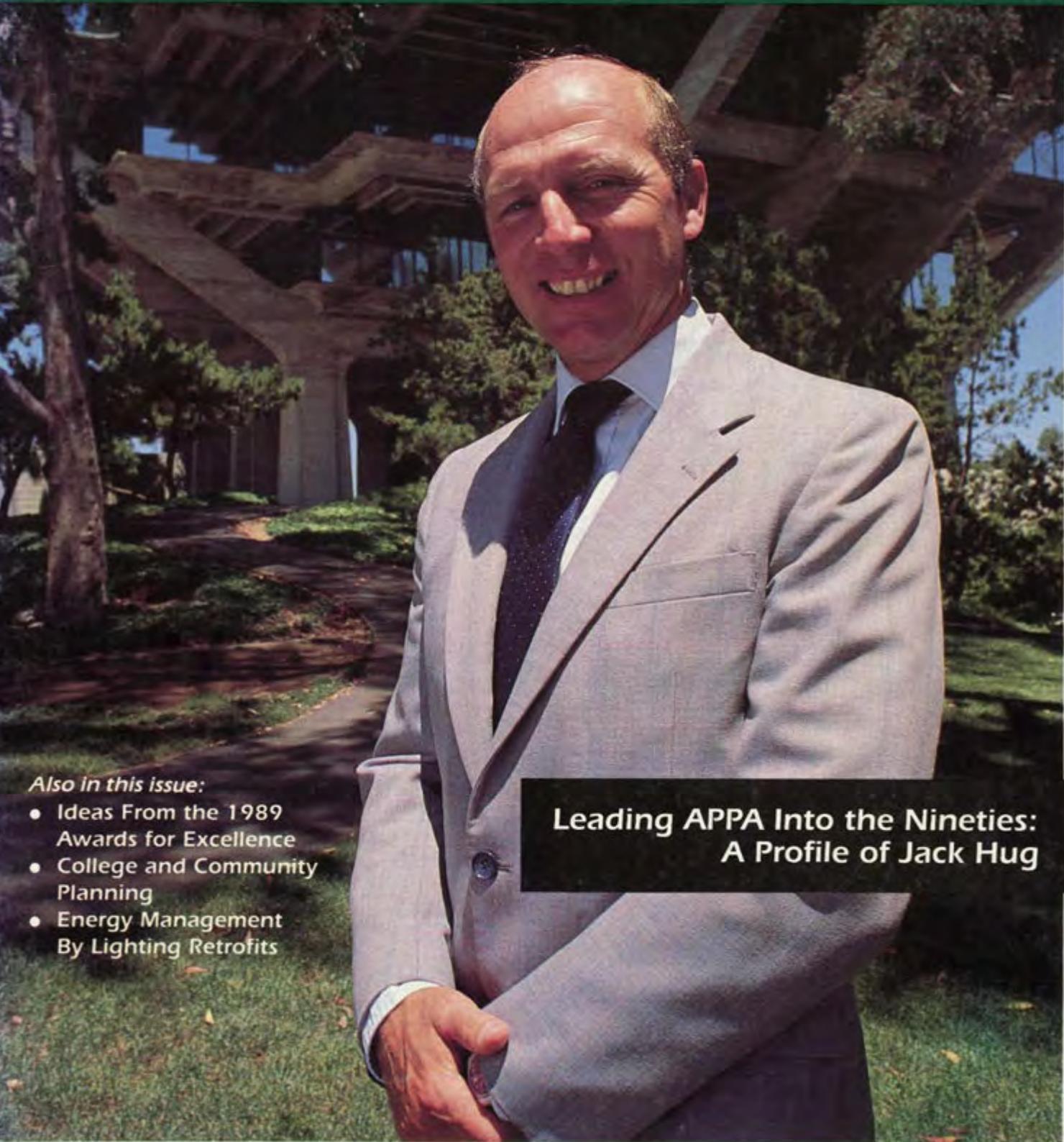
Volume 5 Number 3

Fall 1989

*Also in this issue:*

- Ideas From the 1989 Awards for Excellence
- College and Community Planning
- Energy Management By Lighting Retrofits

**Leading APPA Into the Nineties:  
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# Facilities Manager

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For information on rates and deadlines for display and classified advertising, telephone 703/684-1446.

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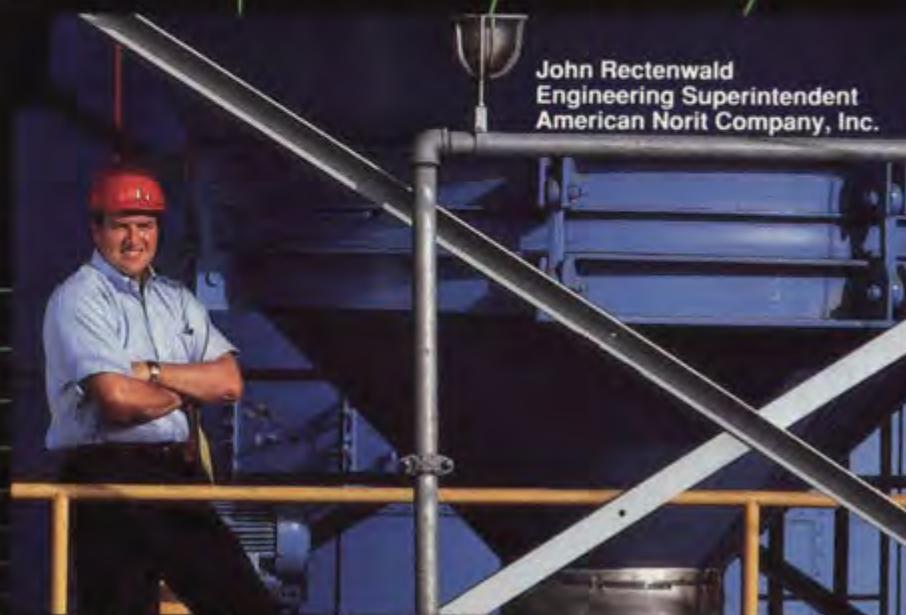
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DFM Business Systems, Inc.  
1776-22nd Street  
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# APPA UPDATE

NEWS FROM THE ASSOCIATION OF PHYSICAL PLANT ADMINISTRATORS OF UNIVERSITIES AND COLLEGES

## August Institute Sets New Attendance Record

More than 265 professionals attended the August Institute for Facilities Management held in Baltimore, Maryland. This was a record for attendance at the August sessions of the Institute, and it nearly reached the all-time attendance record of 279.

In addition to the regular Institute program, this one featured two special offerings. Health Science, Research, and Medical Facilities Management was held for the second time and drew a wide range of medical and research institution personnel.

The other program was the premier of Maintenance Management, which received extremely positive feedback from its 40 attendees. This program was developed in response to the 1988 Educational Survey that expressed the need for educational programming in the maintenance management area. We plan to offer this program in August 1991.

The steady increases in enrollment for both the January and August Institutes have resulted in some changes. In order to limit classroom size to 40-50 attendees, three sections of Program 1 and two sections of Program 2 will be offered in January. This is an effort to maintain quality in the program and provide the means for classroom interaction.

This plan for managing the continued growth has also allowed us to expand the number of faculty teaching at the Institute. APPA is continuing to look for faculty candidates for upcoming programs. If you are interested, please contact the APPA office or a member of the Educational Programs Committee.

The next Institute will be held January 7-12, 1990 in Tempe, Arizona. Details and registration will be available in October.

## Reader Survey Results Show CRDM Tops List

Thank you to all the people who participated in the *APPA Newsletter* and *Facilities Manager* survey. We appreciate the feedback we get from our members because it helps us to meet your needs more

efficiently and more consistently.

Through the surveys we found that most respondents give their publications to two to four other people. With this information we estimated a pass-along rate that triples our readership to more than 11,400 facilities professionals.

The surveys indicated that the topics people are most interested in are deferred maintenance—a decisive first place—preventive maintenance, asbestos, safety, training, recycling, space planning, and personnel. The publications department is working to bring you more information in

these areas.

Job Corner, Inside APPA, and the magazine's features generated the most interest among respondents.

Although most members were reluctant to admit they are ever too busy to read *APPA Newsletter* or *Facilities Manager*, the survey indicated that summer is the busiest time of year.

Surveys are not the only time for members to tell the publications department what they are thinking. Feel free to call or write to us with any ideas or comments.

## August 1989 Institute Graduates

Congratulations to the graduates of the APPA 1989 Institute for Facilities Management. These individuals have completed the coursework in Programs 1, 2, and 3 of the regular Institute program.

**Larry Buss**, University of California/Irvine  
**Michael C. Byers**, The Graduate School of the City University of New York  
**Gregory L. Carr**, University of California  
**Virgil Jay Coleman**, University of Virginia  
**Jerry C. Condra**, University of California/San Diego  
**D. Jerry Ferrell**, Georgia State University  
**John M. Fields**, University of South Florida  
**Charles C. Fusco**, Rutgers, The State University of New Jersey  
**Patrick A. Griffin**, University of North Carolina/Chapel Hill  
**James Hay**, University of California/Irvine  
**Eugene Herring**, University of Florida  
**Matilda B. Hunter**, Randolph-Macon Womens College  
**Nicholas Ivanovsky**, Old Dominion University  
**M. Reza Karkia**, California State University  
**Donald R. Katter**, Indiana University-Purdue University at Ft. Wayne  
**Donald W. Keller**, Purdue University  
**Richard Lair**, Rutgers, The State University of New Jersey  
**Jeffrey R. Leverenz**, Waukesha County Technical College  
**Diane K. McGee**, University of California/San Francisco  
**Richard J. Mahoney**, Johnson State College  
**Philip E. Martin**, Chambersburg Area School District  
**Henry Martinez**, University of California/San Diego  
**William K. Mohlenhoff**, East Stroudsburg University  
**John M. Pappas**, Utah State University  
**William Reese**, University of Florida  
**Coral Rice**, Southern Illinois University at Edwardsville  
**Frank H. Schambach**, University of New Orleans  
**Robert Shaw**, University of Mississippi  
**Michael Smith**, Indiana State University  
**Michael J. Sofield**, Smithsonian Institution  
**Thomas Stanley**, Rutgers, The State University of New Jersey  
**Robert T. Stumpf**, University of Maryland/College Park  
**Max Williams**, Walters State Community College  
**Charles T. Wray**, Georgia Southern College

# Inside APPA

## A New Visibility For Facilities



**By Walter A. Schaw**  
 APPA Executive Vice President

The September 6 issue of the *Chronicle of Higher Education* (page 24) reflected facilities concerns as a new priority among senior administrators of 459 colleges and universities. Facilities and technology ranked second overall as a top challenge for institutions (42 percent), only 2 percent behind the top concern, maintaining enrollment. The survey is sponsored annually by the American Council on Education.

Last year the survey results indicated that only 14 percent of administrators thought facilities was one of the important challenges for the upcoming five years.

The dimensions of the challenge were reinforced as 32 percent of the survey respondents rated physical plant adequate for current needs, and only 21 percent said they were adequate for needs over the next 10 years. At doctoral institutions, ratings fell to 22 percent as adequate for the present and 9 percent for the next 10 years.

The ratings reflect a new consciousness of facilities needs, particularly capital renewal and deferred maintenance, since the onset of APPA's CRDM campaign nearly one year ago. "Your issue came out of nowhere," commented an opinion researcher at Coopers & Lybrand.

How long will this level of awareness remain? In a society characterized by change and shifting opportunities, that is difficult to predict. If you have been waiting for an opportunity to interest your trustees in an inspection of typical problems or, at a minimum, special funding for facilities audits as an "opening gun," the climate may not be better than right now.

And, do not overlook APPA's new 13-minute film. It is designed as a brief, hand-hitting film to set the stage for your campus presentation or simply to provide an overview to the problem. Take advantage of another APPA opportunity.

## Regions Announce Institute Scholarships

The following individuals were awarded scholarships for the August 1989 Institute. The scholarship, funded by HEFT, covers the registration fee for the conference. Each region awards one scholarship for each session of the Institute. In addition, several regions and chapters also support scholarships to give more individuals the opportunity to attend the Institute.

### Eastern

Philip Voorhees, Ryder College (NJ)

### Southeastern

Judith A. Morgan, Murray State University (KY)

### Midwestern

Nathaniel Taylor, Ohio State University

### Central

Paul Clark, University of North Dakota

### Rocky Mountain

Lawrence Schuster, University of New Mexico

### Pacific

Peter A. Hansen, Santa Monica College (CA)

### SRAPPA Regional Scholarship

Charles Wray, Georgia Southern College

### ERAPPA Regional Scholarship

Thomas Stapleton, Pennsylvania State University, Berks Campus

### MD/DC Chapter Scholarship

Jonathan Herrin, Prince George's Community College (MD)

## Energy Management Conference Planned



The Colonial Williamsburg Foundation is holding an Energy Management Conference in historic Williamsburg, Virginia, January 15-16, 1990. The conference sessions will cover a wide range of energy topics including cooling towers, DDC, HVAC preventive maintenance, ice thermal storage systems, cogeneration, centrifugal chiller, direct purchase of natural gas, energy auditing, and air systems. Representatives from Virginia Power Company, Cornell University School of Hotel Administration, Walt Disney World, WESCO, and CONERGY will be speaking or holding workshops. Attendance is limited to 450 people each day, and there will be 65 exhibit booths. For more information contact Larry R. Rowland, Energy Manager, The Colonial Williamsburg Foundation, P.O. Box C, Williamsburg, VA 23187.



*Is your institution experiencing major personnel changes or undertaking special activities? If so, please send them to us for possible inclusion in the newsletter. Send all items to Stephanie Gretchen, Editor, APPA Newsletter, 1446 Duke Street, Alexandria, VA 22314-3492; 703/684-1446, fax 703/549-2772.*

**APPA Update** appears in each issue of *Facilities Manager* and features news from the Association of Physical Plant Administrators of Universities and Colleges. APPA is an international association, founded in 1914, whose purpose is to promote excellence in the administration, care, operation, planning, and development of higher education facilities. **APPA Update** is compiled and edited by **Stephanie Gretchen**.

# 1989-90 Education Calendar

Separate brochures with details on the program and registration information will be mailed for each conference. Watch for updates in future issues of *APPA Newsletter* and *Facilities Manager*.

November 1989						
S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	1	

## NOVEMBER

6-7  
Custodial Staffing & Standards  
Radisson Hotel—Atlanta, Georgia

13-14  
Hazardous Waste Management  
Clarion Hotel—Cincinnati, Ohio  
Cosponsored with NACUBO

16-17  
Accounting for Planned Property and Equipment  
Radisson Hotel—Atlanta, Georgia  
Cosponsored with NACUBO

30-December 1  
Capital Renewal/Deferred Maintenance Workshop  
San Francisco Airport Hilton—San Francisco, California

January 1990						
S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

## JANUARY

7-12  
APPA Institute for Facilities Management  
Sheraton Tempe Mission Palms Hotel—Tempe, Arizona  
Three-track regular Institute program and a special program on facilities management for housing administrators.

February 1990						
S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28			

## FEBRUARY

26-27  
Capital Renewal/Deferred Maintenance Workshop  
St. Louis Airport Hilton—St. Louis, Missouri

26-27  
Hazardous Waste Management  
Cambridge Marriott—Cambridge, Massachusetts  
Cosponsored with NACUBO

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*A Data Base  
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Association of Physical Plant Administrators of Universities and Colleges  
1446 Duke Street  
Alexandria, Virginia 22314-3492

**F**or more than five years APPA has provided information and "networking" assistance through our **International Experience Exchange** data base. The data base contains a wide variety of information from more than 600 institutions of higher education. The APPA office has responded to more than 2,000 requests for information and materials.

Because of the flexibility of the data base, we are able to provide a printout listing the colleges and universities that have similar concerns or that have previous experience in a project or activity on which you would like more information or assistance. For instance, if you wanted a list of public institutions that used contract custodial services, simply call *APPA Information Services*. If you need a list of schools with cogeneration plants, or custom-designed preventive maintenance software, or that have built or renovated a library or sports facility, the **International Experience Exchange** is here to assist.

Information can be selected by a number of different criteria, including:

- Carnegie classification of institutions.
- Size of physical plant or number of full- or part-time employees.
- Type of program or number of FTE students served.
- Physical plant responsibilities.
- Construction and planning responsibilities.
- Classification of buildings.
- Utilities sources.
- Activities in employee training or employee morale/recognition.
- Computerization.

The **International Experience Exchange** is a free service to APPA member institutions. All you need to do is call or write us with your request, and we will respond as quickly and completely as possible. If we cannot answer your question, we will refer you to other resources or organizations. If your institution is not on the data base, please complete the survey form and return it to APPA for inclusion. The more schools we have on the data base, the more comprehensive the data will be.

For more information about the **International Experience Exchange**, call *APPA Information Services* at 703/684-4338. With all this information only a telephone call away, we encourage you to use this valuable APPA program.

**APPA Information Services**

Telephone: 703/684-4338

Fax: 703/549-2772

# Job Corner

## Job Corner Deadlines

Job Corner classified advertisements cost \$20 per column inch; display ads cost \$25 per column inch. There is a two-inch minimum charge on all ads and no agency discounts are available.

Upcoming Job Corner deadlines are **November 10** for the December edition, **December 8** for January, and **January 10** for February. Closing deadlines for job announcements are posted at the request of each institution. In some cases, deadlines may be extended by an institution. APPA encourages all individuals interested in a position to inquire at the institution regarding its closing/filing date.

Send all ads, typed and double-spaced, with an official purchase order to Diana Tringali, Job Corner Advertising, APPA, 1446 Duke Street, Alexandria, VA 22314-3492. Or send your ad via fax 703/549-APP A (703/549-2772). Call 703/684-1446 for more information.



**Physical Plant Director.** Responsible for planning, budgeting, and overall management of maintenance, repair, renovation of campus facilities, custodial services, and ground maintenance for college campus comprising of 200 acres and 20 buildings. Manage plant departments with 60 employees including maintenance, grounds, custodial, preventive maintenance, and engineering. Provide direction for significant renovation and construction projects requiring public bidding and on-site management. Master's degree in area related to facilities management and five to seven years prior experience in facilities management in educational setting required. Professional engineer certification, prior experience in preparing project bid specifications, and higher education work experience preferred. Competitive salary and liberal fringe benefits. Send resume, three references, and salary requirements to: D-229, Bucks County Community College, Newtown, PA 18940 by **October 15, 1989**.

**Director of Physical Plant and Engineering.** Shepherd College is looking for a director to report to the dean of finance and facilities and is responsible for physical plant administration of a facility including 165 acres and 33 buildings; utility services and energy conservation; fleet vehicle maintenance and operation; in-house

remodeling and renovation; and administration of contracts. The director supervises approximately 50 employees and manages a \$2 million operating budget. Required qualifications include the minimum of a degree in engineering, building construction, or a related field, plus experience in the management and maintenance of a multi-building complex or a related area. Experience in higher education plant administration, professional registration, knowledge of building construction and building trade skills, and experience in computer applications for plant operations are desirable. Excellent fringe benefits plus salary commensurate with qualifications and experience. Send application letter, vita, and the names, addresses, and telephone numbers of three references to the Personnel Office, Shepherd College, Shepherdstown, WV 25443. Applications accepted until filled. *Affirmative action/equal opportunity employer.*

**Maintenance, Assistant Director of Operations.** This position assists the director of maintenance operations in maintaining the physical plant of the district in a condition of operating excellence, cleanliness, and safety through effective planning, assignment, and supervision of custodial/maintenance personnel. Suburban, Main Line Philadelphia school district with five elementary, one middle, and one senior high buildings, plus other facilities in addition to outdoor areas. College degree with specific emphasis in areas such as institutional management, engineering,

and environmental systems. Salary commensurate with education and experience. Please send letter of interest and resume to Richard G. Garger, Supervisor of Personnel, 1801 Darby Road, Havertown, PA 19083. Deadline is **October 15, 1989**.

**Plant Engineer.** Responsible for operations, maintenance, and minor modifications of all mechanical, electrical, and domestic water systems, building envelopes/structures, and energy management. Major responsibilities: supervise mechanical maintenance and building trades personnel; monitor modifications to existing or new mechanical and HVAC systems; review mechanical and electrical portions of construction plans and specifications. Requires mechanical engineering degree, demonstrated management/supervisory abilities in directly related areas. Registered professional engineer and three years management/supervisory experience preferred. Salary \$33,000-\$35,000 plus fringe benefits. Begin November 1, 1989, or mutually agreed upon date. Apply with application letter, resume, and three references to Michael Daniel, Physical Plant Director, University of Wisconsin-La Crosse, La Crosse, WI 54601. Materials must be postmarked no later than **October 15, 1989**. AA/EOE.

**Electronic Controls Engineer.** The University of Iowa physical plant department's engineering division is looking for an individual whose primary responsibility will be to supervise and coordinate the

(cont. on p. 8)

## DIRECTOR OF FACILITIES MANAGEMENT AND PLANNING

Shippensburg University, a member of the Pennsylvania State System of Higher Education, is seeking a director of facilities management and planning to begin January 1990.

The director will be responsible for the management, planning, operation, and maintenance of university facilities totaling 1.5 million square feet of building space and 200 acres. Responsibilities include development of a facilities master plan and establishment of priorities and plans for maintenance, renovation, and repair projects. The director will prepare and manage budgets in excess of \$8 million annually for operations, deferred maintenance, auxiliary facilities, and capital programs, and supervise a staff of more than 130.

Other responsibilities include administration of space utilization, development of specifications, and drawing for renovation, repair, and construction projects, groundskeeping, housekeeping, vehicle fleet administration, and heating plant operation.

A bachelor's degree in architectural or engineering sciences, or related fields, and five years of senior managerial experience in facilities management, administration, and planning is required. Preference will be given to candidates with a professional engineering license or ability to be licensed and additional education in business or public administration. Salary: commensurate with qualifications and experience.

Qualified candidates should send letter of application, resume, and names and telephone numbers of three references to Donald Klinedinst, Director of Personnel, Shippensburg University, Shippensburg, PA 17257 by **October 20, 1989**.

*Shippensburg University is an Affirmative Action/Equal Opportunity Employer. Women and minorities are encouraged to apply.*

(cont. from p. 7)

planning and designing of complex electronic and electrical control systems; direct the preparation of plans, designs, and specifications by lower-grade engineers and technicians; prepare extensive and complex engineering studies; and initiate alterations and corrections. This position requires strong electronic controls skills, with experience in the areas of HVAC and other building control systems and metering, and control of campus high voltage distribution systems. Applicants must possess a master's degree in engineering or a equivalent combination of education and experience which provide a comparable level of knowledge; extensive engineering experience (five to eight years) in designated areas; registration as a professional engineer is desirable. The University of Iowa is a nationally recognized learning and research center with an enrollment of 30,000. This Big Ten University, with over 11 million GSF of buildings and an extensive utilities infrastructure, is located along the Iowa River in an attractive community. Interested candidates should send a letter of application and resume to: Jon H. MacLeod, P.E., Associate Director of Engineering, Uni-

versity of Iowa Physical Plant, 103 West Burlington, Iowa City, IA 52242. The screening process will begin on October 16, 1989. Applications will be accepted until position is filled. *Women and minorities are encouraged to apply. The University of Iowa is an equal opportunity/affirmative action employer.*

**Associate Director of Student Housing/Facilities Management and Administrative Services.** The University of California at Davis is currently recruiting for an associate director of student housing/facilities management and administrative services to provide leadership and coordination for facilities in a student housing system with more than 4,600 units and 130 separate structures. Administrative services directed by this position include bookkeeping, purchasing, daily management of an annual budget of over \$15 million as well as inventory, energy management in a unit of more than 100 professional and 150 student employees, reporting to the director of residence halls, and implementing overall goals, operational objectives, and policies and proce-

dures for maintenance and improvement of all residence halls, apartments, and other campus housing facilities. This individual will be heavily involved in all phases of planning and implementation of construction of new residential facilities, including undergraduate and family apartments and dining commons facilities. The department is also planning major facility renovations projects in the near future that will require significant attention of the associate director in all aspects of the project. The position requires knowledge of organizational development, decision making, budget administration, labor and business contracts, and policy development. Knowledge of facilities management procedures, custodial maintenance operations, facilities renovation and repair, and the requisite planning and implementation is essential. Knowledge of college housing facilities and the impact of residential environments on student development is critical. Applicants must be able to communicate ideas clearly, both verbally and in written form, and possess tact and diplomacy to work effectively within the university and when representing the university to outside agencies. Apply to UC Davis, Employment Office, Davis, CA 95616 by **November 1, 1989**. All application materials must be received on or before. Postmarks are not acceptable. Please include up to three letters of recommendation with resume and a single page summary of abilities. Letters of recommendation must include position title and vacancy listing number. The vacancy number has not been established at the time this ad is being placed, but can be obtained before the deadline by contacting Joan Learned at 916/752-2034 or Chris Thomas at 916/752-2491. For required application materials, please call 916/752-0530, Monday through Friday, between 10 am and 2 pm. *UC Davis is an equal opportunity/affirmative action employer.*

**Wanted: Management Position in Facilities Maintenance/Physical Plant Operations.** Twenty years experience including director of 400-person organization responsible for physical plant operations/management. Experience also includes engineering, operations, housing, contract management, fire department operations, industrial engineer, financial/administration management. Also has experience in hazardous materials, energy conservation, and asbestos. For more information contact: R. H. Nall, 915/691-9122.

## FACILITIES

## Manager of Operations

Reporting to the Director of Operations & Maintenance, you will manage the overall operation of building environmental and utilities distribution systems; ensure that the utilities distribution and building control systems are designed, built, maintained and operated in an efficient and safe manner; administer the University's contract with a private contractor for the production of electricity, steam and chilled water; direct the activities of 37 personnel; and manage an annual operating budget of \$2.8 million and purchased utilities of \$20 million.

Requires a degree in Engineering or equivalent and ten years of applicable experience, two years of experience in a management/supervisory role. Experience must include a strong technical background in systems engineering and operations of central steam, chilled water and electricity production type facilities (hands-on field experience desirable). Salary to \$70,000/yr (depending on applicable experience).

TO APPLY: Send resume and cover letter highlighting qualifications to **Sheri Renison, #60651-AP, HR Services, 855 Serra St., Stanford, CA 94305-6110**. An equal opportunity employer through affirmative action.

**STANFORD  
UNIVERSITY**



## Job Corner

### ASSOCIATE DIRECTOR PLANT OPERATIONS

Challenging position for professional to assist in managing a large workforce of building, engineering, and maintenance trade workers. Successful candidate will have substantive administrative experience including utilities management, preventive maintenance programming, contract administration, building inspection, fiscal planning/control, plus any combination of related coursework equivalent to graduation from a four-year college. Annual salary \$48,000-\$50,000. Send resume to:

California State University  
Employee Services  
5151 State University Drive  
Los Angeles, California 90032  
EO/AA/Handicapped/Title IX  
Employees.

## Resource Bank

### Publications

The Bureau of National Affairs Communications' (BNAC) *Communicator* covers topics and resources for training. The publication offers information, help, and video training on such topics as safety (in English and Spanish), drug-free workplace, helping employees with chemical dependencies, sexual harassment, OSHA Hazard Communication requirements, and more. For more information contact BNA Communications, Inc., Department ZBTL192, 9439 Key West Avenue, Rockville, MD, 20850; 800/233-6067, in MD 301/948-0540.

American Association of University Attorneys wrote a 30-page pamphlet, "Complying with Drug-Free Workplace Laws on College and University Campuses," which examines implementing regulations to comply with the Drug Free Workplace Act of 1988. The publication is \$6.50 and also discusses the DOD rule and its impact on employers. For more

information or a copy contact NACUA, Suite 620, One Dupont Circle, Washington, DC 20036; 202/833-8390.

### Videos

BNA Communications has produced a video on hazardous waste which will help you prevent accidents, keep workers safe and healthy, meet EPA, DOT, and OSHA regulations, and save time and money. For more information contact BNA Communications Inc., 9439 Key West Avenue, Rockville, MD, 20850; 800/233-6067, in MD 301/948-0540.

### Software

ST Publications Inc. recently published the first issue of *IDENTITY*, a quarterly magazine that helps readers implement or use signage and graphics programs. *IDENTITY* is free to and written for the purchaser, designer, or the person who recommends signs and graphics for facilities.

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## APPA INSTITUTE FOR FACILITIES MANAGEMENT

January 7-12, 1990

Sheraton Tempe Mission Palms Hotel  
Tempe, Arizona



### Offerings:

- The regular three-track Institute program (completion of Programs 1, 2, and 3 are necessary to graduate).
- Special Program on Facilities Management for Housing Administrators.

### Registration Fees:

- \$575 for APPA Members
- Additional registrants from the same institution receive 10% discount

Registration materials and program information will be mailed to all APPA Members and past Institute attendees in October. *Watch your mail!*

# Resource Bank

(cont. from p. 9)

ties. The magazine discusses the best ways to use signage systems to provide information, give directions, or build public awareness. For a copy or more information contact Roben Dixon, Identity, 407 Gilbert Avenue, Cincinnati, OH 45202; 513/421-2050, fax 513/421-5144.

ASHRAE has updated its bibliography

of computer programs in heating, refrigeration, air conditioning, and ventilation for computers of all sizes. For more information contact W.S. Comstock, ASHRAE, 1791 Tullie Circle, N.E., Atlanta, GA 30329; fax 404/321-5478.

The National Safety Council has released software for hazardous waste tracking and record keeping. *Hazardous*

*Waste Computer System (HWCS)* enables the user to track waste from collection, to treatment, to packing or combining with other wastes. The system can handle quantities from a few milligrams to 55-gallon barrels. The system operates from menus and required minimal training. The system also gives EPA numbers for each of 2,600 common chemicals, DOT classifications for hazardous waste transportation, permit information, and more. For more information contact the National Safety Council, P.O. Box 11933, Chicago, IL 60611; 800/621-7619, in IL 312/527-4800. Ask for the customer service department.

The Vermont Department of Public Service, Conservation, and Renewable Energy Unit, under a Tier 1 grant from the Department of Energy, has designed a new software tool to assist schools with energy accounting and O&M scheduling. The Energy Manager System is available for use on IBM-PC with Lotus 1-2-3 or Macintosh with Excel. The Energy Manager System can track up to 15 buildings' energy for three years and up to six energy types per buildings. The system is a public domain program that other state energy offices are free to distribute. For a sample copy, send three IBM disks or two Macintosh disks to Conservation and Renewable Energy Unit, State Office Building, Montpelier, VT 05602. For more information call Diana Peduzzi at 802/828-2393.

## Asbestos

Sourcefinders is offering an asbestos test kit that includes analysis at a reputable laboratory. The lab uses U.S. EPA-recommended polarized light microscopy method to determine the percentage and type of asbestos found in the sample and then mails the results back to the sender. This enables people to find out if insulation or other materials contain asbestos, and to assess their asbestos situation. A 16-page booklet explains how to safely collect, package, and document an asbestos bulk sample. The kit contains a special sealed container, labeling and documentation materials, and a pre-addressed, pre-paid mailing box. For information contact Sourcefinders Information Corporation, P.O. Box 758, Mt. Laurel, NJ 08054; 609/482-1151.

# Energy Savings To A Higher Degree.

Even if you're not an expert on energy management, you know one important fact — energy costs take a big bite out of your operating budget. But you can control the high cost of heating, cooling and lighting while improving your facility's comfort and indoor air quality. The first step? A free energy performance analysis from the National Energy Management Institute.

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## Products

The American Roofing Corporation has released a new brochure for Solar Cap, a modified bitumen roofing material. Solar Cap is a granular surface SBS roofing material reinforced with a fiberglass mat. For information contact Gene Scott, President, American Roofing Corporation, 5401 Dansher Road, Country-side, IL 60525; 312/352-4800.

Firestone Building Products Company is offering a 16-page brochure describing their new Firestone APP2 Modified Bitumen Roofing Membrane. The brochure illustrates application procedures and information about typical flashing details, physical properties, and code compliances. APP1 is composed of asphalt specially modified with atactic polypropylene (APP) to provide flexibility, and is reinforced with polyester fabric for added strength and stability. Firestone also offers other roofing systems and components and other accessories.

MagneTeck Universal Manufacturing is offering a selection of potted quieter and cooler operating core and coil ballasts for high intensity discharge lighting applications. The sand-filled polyester potting material provides sound deadening and heat transfer characteristics. All ballasts are Underwriters' Laboratories, Inc. component recognized. For more information contact Department PCC, MagneTeck Universal Manufacturing, P.O. Box 3028, Paterson, NJ 07509; 201/967-7939.

Construction Specifications Institute (CSI) and CADIS, Inc. have produced CONI, a new electronic data base designed to aid in construction planning, management, and maintenance. Using diskettes and CD-ROM, CONI serves as a source of construction information including guide specifications, cost-estimating data, industry standards, and more. CONI has a system of selector grids that allow users to compare and evaluate products on a line-by-line basis. For more information, contact CSI, 601 Madison Street, Alexandria, VA 22314-1791; 703/684-0300.

## Coming Events

### APPA Events

Contact the APPA Educational Programs Department at 703/684-1446.

Nov. 6-7—Custodial Staffing Standards. Radisson Hotel, Atlanta, GA.

Nov. 13-14—Hazardous Waste Management. Clarion Hotel, Cincinnati, OH.

Nov. 16-17—Accounting for Planned Property and Equipment. Radisson Hotel, Atlanta, GA.

Nov. 30-Dec. 1—Capital Renewal/Deferred Maintenance Workshop. San Francisco Airport Hilton, San Francisco, CA.

Jan. 7-12—APPA Institute for Facilities Management. Tempe, AZ.

Feb. 26-27—Capital Renewal/Deferred Maintenance Workshop. St. Louis Airport Hilton, St. Louis, MO.

Feb. 26-27—Hazardous Waste Management. Cambridge Marriott, Cambridge, MA.

### Regional Meetings

Oct. 7-11—Southeastern. Berea College, Lexington, KY. Contact: Diane Kerby, 606/986-9341.

Oct. 14-17—Eastern. Technical University of Nova Scotia, Halifax, NS, Canada. Contact: Carl Day, 902/420-7646.

Oct. 15-18—Midwestern. Chicago, IL. Contact: George Preston, Art Institute of Chicago, 312/443-3940; or Bob Getz, University of Illinois/Chicago, 312/996-2837.

### Other Events

Oct. 23-24—Negotiating with the EPA. Sheraton National Hotel, Arlington, VA. Contact: Conference Administrator, Institute for Interational Research, Inc., 331 Madison Avenue, 6th Floor, New York, NY 10017; 212/883-1770, fax 212/370-0257.

Oct. 23-24—1989 Elevator Seminar. San Francisco, CA. Contact: Linda Williams, Elevator World, P.O. Box 6507, Mobile, AL 36606; 205/479-4514.

Oct. 24-26—Plant Engineering & Maintenance Show and Conference/South. Atlanta, GA. Contact: Rob Ingraham, Plant/South, 999 Sommer Street, Stamford, CT 06905; 203/352-8417.

Oct. 29-Nov. 1—Annual Educational Conference and Show of the National Institute on Park and Grounds Management. Minneapolis, MN. Contact: National Institute, P.O. Box 1936, Appleton, WI 54913; 414/733-2301.

Nov. 9-12—Green Team Conference & Trade Show. St. Louis, MO. Contact: William Davids, Chairman, ALCA Landscape Management Division, 405 North Washington Street, Falls Church, VA 22046; 703/241-4004.



(cont. on p. 12)

## "ELEVATORING" '89



### Vertical Transportation Seminars On:

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October 23 . . . . . San Francisco, CA  
Embassy Suites Hotel (Gateway Center)

December 4 . . . . . Los Angeles, CA  
Embassy Suites Hotel (Airport)

Cost: \$365.00 Credit: 0.8 CEU's

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December 5 . . . . . Los Angeles, CA  
Embassy Suites Hotel (Airport)

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For registration or additional information contact: Linda Williams, (205) 479-4514.

## ELEVATOR WORLD

EDUCATIONAL DIVISION

# Coming Events

(cont. from p. 11)

**Nov. 13-15—Making Sense of Environmental Regulations.** Kansas City, KS. Contact: Lani Himegarner, University of Kansas, 6600 College Boulevard, Suite 315, Overland Park, KS 66211; 913/491-0221.

**Nov. 14-15—Community Emergency Planning and Community Right-to-Know, Worker OSHA Hazard Communication Standard.** Tampa, FL. Contact: Environmental Programs, University of Kansas, 6600 College Boulevard, Suite 315,

Overland Park, KS 66211-1522; 913/491-0221, fax 913/491-0509.

**Nov. 14-15—Fourth Annual District Cooling Conference.** Philadelphia, PA. Contact: IDHCA, Ray Luxton, 609/396-1892.

**Nov. 28-Dec. 1—Protection of Industrial and Commercial Electric Power Distribution Systems.** University of Wisconsin-Madison. Contact: Dr. E.K. Greenwald, Department of Engineering Professional Development, University of Wisconsin-

Madison, 432 North Lake Street, Madison, WI 53706; 800/262-6243, in WI 800/362-3020.

**Nov. 29-Dec. 1—The 1990 National Electrical Code.** University of Wisconsin-Madison. Contact: Dr. E.K. Greenwald, Department of Engineering Professional Development, University of Wisconsin-Madison, 432 North Lake Street, Madison, WI 53706; 800/262-6243, in WI 800/362-3020.

**Dec. 4-5—1989 Elevator Seminar.** Los Angeles, CA. Contact: Linda Williams, Elevator World, P.O. Box 6507, Mobile, AL 36606; 205/479-4514.

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**Dec. 4-6—The 1990 National Electrical Code.** Virginia Beach, Virginia. Contact: Dr. E.K. Greenwald, Department of Engineering Professional Development, University of Wisconsin-Madison, 432 North Lake Street, Madison, WI 53706; 800/262-6243, in WI 800/362-3020.

**Dec. 4-7—Thermal Performance of the Exterior Envelopes of Buildings.** Hyatt Orlando Hotel, Orlando, FL. Contact: Gabrielle Coleman, Oak Ridge National Laboratory, P.O. Box 2008, Building 4508, Oak Ridge, TN 37831-6092; 615/576-0875.

**Jan. 10-12—Cooling Systems and Cooling Water Treatment.** University of Wisconsin-Madison. Contact: Dr. E.K. Greenwald, Department of Engineering Professional Development, University of Wisconsin-Madison, 432 North Lake Street, Madison, WI 53706; 800/262-6243, in WI 800/362-3020.

**Jan. 15-16—1990 Colonial Williamsburg Management Conference.** Williamsburg, VA. Contact: Larry R. Rowland, Energy Manager, The Colonial Williamsburg Foundation, P.O. Box C, Williamsburg, VA 23187.

**Jan. 19-21—1990 Sports Turf Manager's Convention.** Wyndham Greenspoint Hotel, Houston, TX. Contact: Sports Turf Manager's Association, c/o R/K Communications Group, Inc., 3376 South Eastern Avenue, Suite 148, Las Vegas, NV 89109; 702/735-0000.

**Jan. 22-24—Boiler Plant Operation and Orientation.** University of Wisconsin-Madison. Contact: Dr. E.K. Greenwald, Department of Engineering Professional Development, University of Wisconsin-Madison, 432 North Lake Street, Madison, WI 53706; 800/262-6243, in WI 800/362-3020.

**Feb.—Third Annual College/University Conference.** Penn State University, University Park, PA. Contact: IDHCA, Bob Camperlino, 615/322-2622.

**Feb. 19-23—The 1990 International Symposium on Radon and Radon Reduction Technology.** Stouffer Waverly Hotel, Atlanta, GA. Contact: Robert Page, Radian Corporation, P.O. Box 13000, Research Triangle Park, NC 27709; 919/541-9100.

# The Environment

Ignorance is no excuse for not complying with **Resource Conservation and Recovery Act**. The July 21 *Environmental Reporter* said knowledge of a violation is not "required to convict a public official of dumping hazardous waste without a permit, a federal appeals court rules."

The EPA **Radon** Division announced grants that over three years will total \$1.5 million. According to Lawrence Pratt, EPA environmental protection specialist and coordinator of the regional training program, this money is being used to establish regional radon training centers for state and local federal officials and people in private industry. Such courses would include a radon contractor proficiency program focusing on remediating radon problems. The U.S. EPA will help coordinate quality control and determine curriculum, but the frequency of courses and where they will be held will be up to the regional centers. The training centers will be at three consortia of universities within a geographic area. They are Colorado State University (consortium of colleges and universities across the west), University of Michigan/University of Minnesota (consortium of midwest and plains states with Kansas State University), and Rutgers University (consortium from Maine to West Virginia). For more information contact your local EPA office.



Ohio is the first state to implement mandatory registration of all **hazardous materials shippers and carriers**, according to the August 11 *Chemical Regulations Reporter*. They must also report, once a year, the quantity and class of hazardous materials carried within the state. The state requires transporters to pay a fee based on the amount of hazardous materials they haul; the money is used to fund local emergency response training, the publication said.

According to the EPA's **pesticide** and toxic substances office eventually all pesticides will be tested for neurotoxicity. New EPA assistant administrator for pesticides and toxic substances, Linda J. Fisher, said the EPA is revising its neurotoxicity guidelines and new testing requirements should be proposed by the end

of the year, according to the August 11 *Chemical Regulations Reporter*.



## CASSETTE TAPES

The following sessions at the 76th APPA Annual Meeting have been taped and the cassettes are available for purchase through the APPA office. (Note: Please allow 2-4 weeks for delivery.)

- Tape #1 Keynote Address — Monday**  
**Merging Your Goals for Excellence with the Institution's Mission**  
 Dr. William P. Sexton  
 Vice President, University Relations, University of Notre Dame
- Tape #2 Critical Issues in Higher Education**  
**Capital Renewal/Deferred Maintenance**  
 Jon Gullette, Vanderbilt University  
 Sean Rush, Coopers & Lybrand  
 Walter Schaw, APPA  
 Henry Shelby, Tennessee Technological University  
 Carson Smith, Kentucky State University
- Tape #3 Keynote Address — Wednesday**  
**Facilities Role for Excellence in Higher Education**  
 Dr. Robert M. O'Neil  
 President, University of Virginia

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# APPA Committees 1989-90

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Mike Renfrow	Georgia State University	404/651-2350
Russ Gonder, <i>ex officio</i>	University of Western Ontario	519/661-3310

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## PUBLICATIONS ORDER FORM

Qty.	Publication	Member Price	Nonmember Price	Amount
—	<b>Facilities Management: A Manual for Plant Administration</b> (2nd ed.), Rex O. Dillow, editor-in-chief; foreword by Ernest L. Boyer	\$ 75	\$109	_____
—	<b>Electrical Maintenance &amp; Distribution</b> , by Mohammad H. Qayoumi	\$ 25	\$ 40	_____
—	<b>The Decaying American Campus: A Ticking Time Bomb</b> , by Sean C. Rush & Sandra L. Johnson; foreword by Harvey H. Kaiser	\$ 25	\$ 50	_____
—	<b>1987-88 Comparative Costs and Staffing Report for College and University Facilities</b>	\$ 25	\$ 50	_____
—	<b>Proceedings of the 76th Annual Meeting</b> (Reno 1989)	\$ 25	\$ 35	_____
—	<b>Proceedings of the 75th Annual Meeting</b>	\$ 15	\$ 21	_____
—	<b>Facilities Audit Workbook: A Self-Evaluation Process for Higher Education</b> , by Harvey H. Kaiser	\$ 25	\$ 35	_____
—	<b>Management of Professionals: Insights for Maximizing Cooperation</b> , by Desmond D. Martin & Richard L. Shell	\$ 35	\$ 40	_____
—	<b>Manual of Roof Maintenance and Repair</b> , by NRCA & ARMA	\$ 17	\$ 25	_____
—	<b>Modifying the Existing Campus Building for Accessibility: Construction Guidelines and Specifications</b> , by Stephen R. Cotler	\$ 15	\$ 21	_____
<b>Critical Issues in Facilities Management</b>				
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# Membership

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**Missouri Southern State College**, Newman and Dequesne Roads, Joplin, MO 64801; 417/625-9387. Representative: John W. Tiede, vice president for business affairs.

**Pitzer College**, 1050 North Mills Avenue, Claremont, CA 91711; 714/621-8000 extension 2226. Representative: David F. Maurer, director of maintenance.

**West Valley-Mission Community College District**, 14000 Fruitvale Avenue, Saratoga, CA 95070; 408/867-2200. Representative: Joan Reitz, manager, plant operations.

## New Institutional Representatives

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**rome E. Meyer**, director of physical plant.

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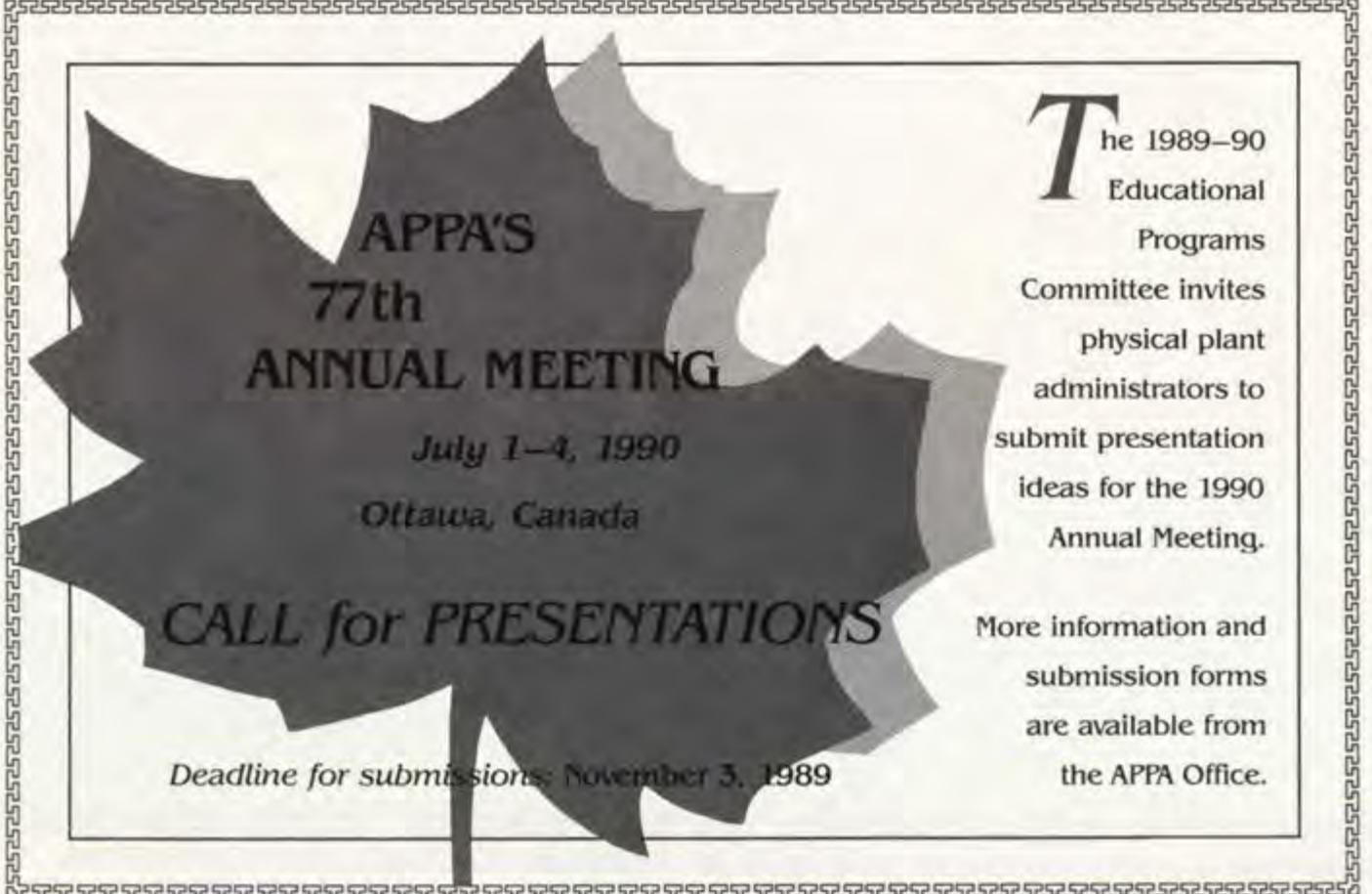
University of South Dakota, Vermillion, SD: **Todd Brevik**.

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**Associated Builders and Contractors**, 729 15th Street, Washington, DC 20005; 202/637-8800. Representative: John N. Pannullo, national director, business development.

**The County of Loudoun**, 18 North King Street, Leesburg, VA 22075; 703/771-5200. Representatives: Paul G. Biggers, chief of facilities; James M. Koenig, general maintenance supervisor.

**Spokane School District #81**, East 2815 Garland Avenue, Spokane, WA 99207; 509/353-3780. Representative: Clarence R. Seely.



## APPA'S 77th ANNUAL MEETING

July 1-4, 1990

Ottawa, Canada

## CALL for PRESENTATIONS

Deadline for submissions: November 3, 1989

**T**he 1989-90  
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# The **DECAYING AMERICAN CAMPUS**



## **A TICKING TIME BOMB**

by Sean C. Rush  
Coopers & Lybrand

A recent nationwide survey has found that there exists a potential price tag of between \$60 and \$70 billion in capital renewal and replacement costs for decaying college and university facilities. Consistent policies of deferring expenditures for maintenance and repair have created an immediate need of \$20 billion for renewal and repair of campus buildings, equipment, and utilities.

These and other startling findings are included in a new report, *The Decaying American Campus: A Ticking Time Bomb*. The report provides full analysis and comparison of data collected in the first comprehensive survey since 1974 of the condition of our nation's college and university facilities. The report includes narrative detail, charts and graphs comparing aggregate findings by institution type, and a bibliography of additional resources.

*A joint report of*  
**Association of  
Physical Plant Administrators  
of Universities and Colleges**  
*and*  
**National Association of  
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## FACILITIES ROLE FOR EXCELLENCE IN HIGHER EDUCATION

University faculty and administrators have tended for too long to take our facilities almost for granted. We have assumed they would be there when we needed them, would be in sound condition and good repair, and that as needs changed they would somehow miraculously change to meet those needs.

This time of complacency has about come to an end for reasons with which APPA is especially familiar. It will be useful to recount some of the factors in transition.

First, the urgency of the facilities problem has now been brought to the attention of the academic community in unprecedented measure. The collaboration of two major national higher education groups, APPA and NACUBO, produced a report of singular importance under the now familiar title *The Decaying American Campus*.

Many of us were not only startled by some of the statistics and conclusions, but equally surprised by the degree to which the report gained the attention of the higher education community and the national media. Its publication was followed closely by an important special issue of *Educational Record*, with contributions from some of the most eminent national higher education leaders and spokespersons. Increasingly, the agendas of higher education meetings and conferences devote significant time to these issues—and they do not permit the participants to return to their campuses without some renewed attention to this critical national need.

The second factor is, at most, indirectly related. For the past three or four years, the national higher education groups in which I have been most active—the Association of American Universities and the National Association of State Universities and Land-Grant Colleges—have given unprecedented attention to facilities. We have done so for two distinct reasons. One is the growing worry about "earmarking," or bypassing the normal peer review process for congressional funding of science and research facilities. Both organizations have strongly and

*Robert O'Neil is president of the University of Virginia, Charlottesville, Virginia. This article was taken from Dr. O'Neil's keynote address presented at APPA's 76th Annual Meeting last July.*

## Perspective

Robert M. O'Neil



consistently opposed such practices, even though we are realistic enough to know that some institutions, even among our own members, will seek to advance their own cause through special pleading.

Such efforts have had their ups and downs. From the early 1980s the number of specially sought and treated projects had increased by a few each year. Then last year a funny thing happened on the way to the trough: a substantial package of earmarked projects about to be funded was derailed by the leadership of the Senate Armed Services Committee. Just this summer that committee held a hearing on the whole process, leaving the future of earmarking somewhat in doubt—even as AAU and NASULGC struggle with the dilemma of defections among their own members and the uncertainty of alternative sources of facility support.

It is precisely that issue of alternatives that poses the other federal interest. As the space needs of scientific research have become greater in scope, as well as infinitely more complex and thus more costly, the ability of Congress to respond has become attenuated by deficits, Gramm-Rudman, and other pressing needs. The research university community has thus come together to an excep-

tional degree in support of a possible National Science Foundation facilities package that would go far toward meeting these needs—and would also, not incidentally, reduce the incentive for earmarking and bypassing. The degree to which we are able to hold the line on special pleading depends heavily on the fate of an NSF facilities bill. There have also been discussions about a similar approach through the National Institutes of Health to support new facilities for medical research. Here too the stakes are so high that it behooves us to keep the academic community united in pursuit of a legitimate base of federal support for the facilities we need so urgently to house our best researchers and scientists.

A third factor has quite a different origin. As president of a university whose historic buildings and grounds probably attract more visitors than any other in the nation, I am keenly aware of what facilities mean to the image of an institution. But, I also realize that the appeal of Mr. Jefferson's Academical Village is matched at many other campuses. As a trustee of the Carnegie Foundation for the Advancement of Teaching, I was struck by the prominence of facilities among the factors we discovered were important to prospective college students. In a national survey of about 1,000 high school seniors and recent graduates, more than 60 percent of them identified campus appearance as the single most important factor in their judgment about choosing a college or university. Thus, as Ernest Boyer recently observed, "We concluded that, when it comes to recruiting students, the director of facilities is more important to the survival of the institution than the academic dean." While we at Virginia value highly our academic deans, we know that the impression created by that first visit to the Lawn and the historic structures that physical plant assiduously maintains may be the single key factor in shaping that critical decision about where to study.

A fourth factor that has made us all more keenly aware of facilities is increased sensitivity to the needs of the handicapped. Most of our campuses, especially the older ones, were built with little regard to the special condition of less mobile people. The very selection of hilltops and bluffs as campus sites took little note of the needs of those who could not easily traverse vales and gullies in moving from the

dormitory to Old Main and back again. But our outlook has markedly changed in the last several years, not only because of mounting pressure from federal and state governments and handicapped access groups, but quite as much from a greater sensitivity on the part of most administrators whose outlook will never be the same after spending a day or even an hour trying to navigate the grounds seated in a wheelchair or wearing a blindfold. Our heightened concern for the quality of facilities may derive as much from greater awareness of their accessibility as from almost any other factor.

The final element is one to which I would like to devote major attention—that of assessment and accreditation as a means of promoting and ensuring quality in facilities. We often overlook the degree to which assessment is a peculiar feature of our system of higher education. When a group of us were in Beijing four years ago this summer—ten American university presidents meeting with a like number of Chinese counterparts—we were struck by what was uppermost in the minds of our hosts. There was relatively little talk of international exchanges and much talk of the newly created need for evaluation and assessment—the keys to unlock the heavily regulated Chinese higher education bureaucracy.

Our hosts' eyes widened as we told them about accreditation. I had just chaired the Western Association visit to UCLA and, with Chancellor Chuck Young as one of my U.S. colleagues, I described for the Chinese how I had guided a team around his campus and then rendered a report that evaluated the whole institution. Such a procedure was unknown to the Chinese, as were peer reviews of research proposals, state-mandated assessment of undergraduate experiences, visiting teams to evaluate doctoral programs, and numerous other forms of assessment well known to us. That summer, and again the following summer when the group met in this country, our central emphasis was on sharing (exporting, you might say) our system of evaluation and assessment.

With such a strong and deep tradition, it is hardly surprising that we use accreditation and evaluation for the qualitative purposes that have become increasingly important. About three years ago, during my second term as a member of the Board of the Council

on Postsecondary Accreditation (COPA), I agreed to chair a small committee on accreditation and its contribution to educational quality. We planned a series of conferences at which the central focus was that elusive but vital relationship between systematic assessment through accreditation and the improvement of institutional quality.

Our last such effort was a Wingspread Conference about a year ago. The forty of us who gathered there concluded that the potential for qualitative improvement through accreditation was substantial, if largely untapped, and also somewhat problematic because of the historic notion that accreditation measured only minimal compliance with quantitative standards. The traditional view has been that accreditation simply counted the beans but made no attempt to determine whether anyone could cook them, or whether next year's crop might yield more and better beans at lower cost.

The experience of the COPA qualitative review process is germane to the current work of APPA in at least two ways. One of those ways struck me as I read through a recent accreditation report of a major university in another region. Instead of a perfunctory few paragraphs, the section dealing with facilities occupied a major and prominent part of the final report. It described the whole physical plant, with pros and cons in terms both of structure and aesthetics. It then gauged the current maintenance and repair budget against the norms for a campus of such size, scale, and use. The conclusion that emerged was quite specific, and it gave the institution a clear goal by which to fashion future requests for state support of facility needs.

The accreditation process can do no less in the future. Indeed, were I still in a position to do so, I would urge COPA to standardize the facilities evaluation process not only across regional associations but, to the degree appropriate, among the specialized agencies as well—some, but not all, of which review separately housed professional programs for which a facilities component is essential. Of course, there are and will always be some differences among regions in regard to coverage: some require an athletic director on the team and give major attention to the athletic program, while others do not even mention sports as a part of the self-study or the visit. But

in regard to facilities, a high degree of uniformity is desirable, and reference should be made to a set of reasonably objective standards that have acceptance and credibility within the facilities profession as well as the accrediting community.

That is just where APPA and its new emphasis on assessment come in. Let me now describe one other role I played that contributes to this equation. Starting in the late 1970s, I chaired for its first five years the American Council on Education Committee on Self-Regulation. Our task was to review a number of areas in which self-regulation seemed preferable to external control—especially those areas in which we felt getting our own house in order might forestall or prevent governmental intervention. We studied many and diverse areas: affirmative action, tuition and fee refunds, accounting standards for private gifts, and recruitment of foreign students, among others. In each case we insisted that the judgments about actual standards were for the experts, which we were not; what we had to offer was a sense of whether the field was suitable for self-regulation, how the content and even the terminology might affect the academic community, and whether changes might enhance the impact of a proposed set of guidelines. We cautioned repeatedly against the natural temptation to self-regulate more than the regulators would do or demand—and to that extent we had a specter to be avoided. It was a paraphrase of the old Pogo cartoon in which our character was seen lamenting to his colleagues, "We have met the regulators, and they are us."

Were I still involved in self-regulation, I would find the APPA approach—the Facilities Management Evaluation Program—to be a most fitting and timely use of this technique. I would commend the efforts APPA has made to gain broader acceptance of the principles of assessment, and I would especially acclaim the program of sponsoring visits to institutions to conduct facilities audits. Such a program is in keeping with our hopes for the self-regulation effort. It seems also to draw the best from a national organization such as this one for the benefit of the institutions that need such consultation. This is, in short, self-regulation at its best. The area is one where the need could hardly be

*Continued on page 52*

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## Leading APPA Into the Nineties: A Profile of Jack Hug

by Ruth E. Thaler-Carter

**A**PPA's new president brings a special sensitivity to the needs of physical plant administrators in both large and small institutions, because he has worked on both types of campuses. That sensitivity is an important factor for Jack Hug, 48, assistant vice chancellor for physical plant services at the University of California-San Diego and president of APPA as of July 18.

"The role of the physical plant administrator is the same whether you're at a large or a small institution," Hug told *Facilities Manager*. "I have a unique perspective on the whole profession because I did come from a small college—I've worked on campuses with fewer than 1,000 full-time enrollment. This is important for APPA, because there is a group within our membership that feels they are different because they represent smaller colleges and universities and that APPA does not serve them enough. That's wrong—I want to stress that APPA services benefit small institutions as well as large ones. In fact, smaller schools are in the majority in

*Ruth E. Thaler-Carter, a Washington, D.C.-based freelance writer/editor, interviewed Dorsey Jacobs for the Fall 1988 Facilities Manager. She won a 1989 EFfe award from Editor's Forum for her article on campus physical plant administrators who have reached the vice presidential level [Spring 1988 Facilities Manager].*



PHOTO BY KEVIN WALSH/EXEPT WARRER INC/STED

our membership—about 62 percent of our members fall into the small-school category."

### The Making of a Leader

Hug's career in physical plant management began with his first professional position as chief engineer at the University of Nebraska at Omaha, a position he held from 1962 to 1965. A move to Alabama took Hug to the directorship of the St. Bernard College physical plant from 1965 to 1973 (where "I believe I was the youngest director of physical plant in the country, at age 23," said Hug), and a B.S. degree in business administration in 1975. That led to a three-year slot, 1975 to 1978, at the University of Wisconsin/Parkside as assistant director of physical plant; three years at Agnes Scott College in Decatur, Georgia, as director of physical plant; and his 1978 appointment as director of plant operations at California State University, Northridge. He was named assistant vice chancellor for physical plant services at the University of California-San Diego in 1983.

In his APPA affiliation, Hug's involvement took a similar route from the small to the large pond; he served on various committees before moving to increasingly responsible levels of service to the profession in four APPA regions: Central, Southeast, Midwest, and Pacific Coast.

Hug's involvement in APPA began in 1965, when "I was a brand-new, 23-year-old physical plant director with a background limited to engineering portions of a university operation," he said. He had supervised engineering and mechanical shops in his previous position at the University of Nebraska, but "I was ripe and open to the resources of a group such as APPA. I was looking for information and APPA provided it," Hug said. His introduction to the association was through Clarence Lefler (now at the University of Miami, Florida), who became Hug's mentor; Hug's first APPA event was the annual workshop, the program that eventually developed into today's Institute for Facilities Management.

"I was impressed and encouraged by the fellowship I found at that program and the examples of people like George Moore, Roger Allen, and Jim Murphy. They were open with sharing information, wanting to help, lending a hand, and representing a great deal of confidence in what they were do-

ing," Hug said. "I was able to start networking, gathering information, and meeting colleagues from other institutions who were helpful. From there, I got involved at the regional level."

Hug served the Pacific Coast Association of Physical Plant Administrators (PCAPPA) for four years as Education Committee chair, leading the way to establishing a video library of training materials for the region. He headed the PCAPPA Awards and Rec-



*Hug received the Meritorious Service Award, APPA's highest individual honor, from President Will Whitman in 1986.*

ognition committee and hosted the annual Buildings and Grounds Workshop for seven years while at CSU-Northridge.

Once he got involved at the national level, Hug became a key player in APPA's major committees and programs. He served for a year on the Professional Affairs Committee, for three years on the Education Committee, and for two years as director of the Institute for Facilities Management. Those activities led Hug to move up to a higher level, serving three terms as the association's vice president for educational programs, overseeing all education services including the annual meeting, seminars, and the Institute for Facilities Management. Hug has been a member of the Board of Directors for four years, and he has been an instructor in the Insti-

tute for seven years.

Hug also has published widely in the field. He is the author of the "Training and Development" chapter in the just-published second edition of APPA's *Facilities Management: A Manual for Plant Administration*, and he has published articles in education publications such as the American Council on Education's *Educational Record*, as well as *Facilities Manager*.

### The Value of APPA

Hug values his APPA involvement highly, seeing it as vital to his professional advancement in general and professionalism in particular. "APPA occupies a special place for a lot of us," said Hug shortly before being elected APPA president. "The story of APPA is a story of friendship, a friendship between physical plant people, a friendship necessary to improve how the role of the physical plant department is perceived in its importance and its value on campus."

Hug sees the profession at a "most positive point" today, but expressed a concern for the future that APPA must meet. "Where are tomorrow's physical plant leaders going to come from? We are seeing higher salaries and higher expectations by our administrations. This is due in part to how our profession has changed—physical plant departments being involved as major players in administrations, new responsibilities and duties being assigned," he said. "The expectation from the campus community for quality delivery of physical plant services is higher than ever."

Among the APPA programs that Hug sees as vital to members and the profession are HEFT (Higher Education Facilities Trust) and continuing attention to capital renewal/deferred maintenance issues.

"HEFT was a good idea when it started, and all the projects supported by it have been successful," Hug said. "A high percentage of our goals in the initial menu have been accomplished. Now, however, we need to look at where we're headed, as outlined in part in the 1989-90 Operating Plan. It's time to review activities, assess what has been done, and work together on recommendations for future action. The concept of HEFT is still a good one, but we are recognizing that physical plant administrators are not—and should not be—fund raisers."

Equally important to Hug is vigi-

lance and continued energy devoted to the capital renewal/deferred maintenance issue, as spelled out in APPA's research report, *The Decaying American Campus: A Ticking Time Bomb*. "Most physical plant directors know their deferred maintenance needs," Hug said. "The challenge now is to have successful programs to fund those needs. In the last two years, APPA really has taken this on as an issue. Our mission now is to continue to send a wake-up call to university administrators, governing boards, state legislatures, philanthropists, and the business community to tell this story. The issue must be recognized as a problem for higher education in general, and not one simply for physical plant administrators."

In his contacts with other APPA members, Hug said he has seen that "the trends indicate there are good programs out there in this area, but that we will start slipping backward if we don't keep the effort going at high intensity toward where the money is to fund these needs."

This mission faces special challenges, Hug noted. "The funds necessary to this challenge are competing with other major funding requirements—environmental, quality of work and life needs," he said. "The only way we can develop a recognized, acceptable method of funding for effective renewal and replacement of physical facilities is by continuing to educate our members and, equally important, other groups in education—trustees, governing boards, business, industry, and state legislators."

### Large and Small Share Roles

Greater expectations lead to a need to recognize the commonalities among physical plant administration in all campus environments, creating another area where APPA programs can serve any and all members, Hug said. "The areas of responsibility are the same, whether in a large or a small institution," he said. "You need to be involved, to have people who are trained and responsible. It's still very much a leadership role. You may not have a large amount of dollars to work with, big budgets, a large staff, but you have the responsibility to get the job done and help fulfill the aspirations and mission of the institution."

In fact, small schools may offer "more advantages in how you are perceived," Hug noted. "With a smaller

administration to work with, you tend to be recognized more as a major player—the physical plant director is a large fish in the leadership pond. You can lose that role—and visibility—in larger campuses."

### The Changing Role

The role of the physical plant administrator is changing, Hug noted. "I would characterize our role as 'intense' today," he said. "It covers the entire campus and every aspect of



Bill Daigneau, left, and Hug at APPA's recent annual meeting in Reno.

what goes on. In particular, it requires leadership. Our profession is in a position to establish a leadership role and improve our situation in the university—but only if we are alert and on top of what's going on. We have to be knowledgeable to be effective."

That role "has always been there for our profession, but today it is more appreciated," Hug said. He credits APPA with contributing to the growing respect and leadership niche for

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PHOTO BY VALGINS HARTZ INC.

Hug addressed the membership and spoke on APPA's future at the 76th Annual Meeting.

## APPA's NEW PRESIDENT FACES "EXPLODING GROWTH" ON CAMPUS

With his 1,800-acre, 17,000-student, 8-million-square-foot, 400-plus-building campus in the midst of constructing more than twelve new buildings valued at \$140 million and planning and designing another \$600 million in upcoming physical plant projects, new APPA President Jack Hug is in the midst of a classic dilemma for physical plant administrators. He must maintain the existing fabric of the campus while accepting "a steady diet of growth and construction over the next several years."



nation's top institutions in research also contributes to its growth patterns, said Hug. "UCSD is ranked first in the United States in the dollar value of funds received from the National Science Foundation and fifth in the nation in the dollar value of total federal research and development. We compare as a campus to the University of Washington, Johns Hopkins University, University of California-Los Angeles, MIT, and Stanford," he said.



The University of California-San Diego (UCSD), where Hug is assistant vice chancellor for physical plant services, is "growing very fast," said Hug. "In fact, our campus is in a period of exploding development. It's very exciting, but it creates a number of challenges as well."

Growth at UCSD is the result of a number of factors, according to Hug. The population of the state of California is booming, with the San Diego area population increasing by more than 80,000 people a year in each of the past two years alone. Fortunately, the campus has land available for expansion and development. The main campus at La Jolla is in a growth-oriented area and functions as "the engine driving development in the area of science, engineering, and health care," Hug said. Joint educational programs with local business and industry encourage expansion and provide some funding for new projects.

The university's status as one of the

"We have a number of unique facilities on campus that are expanding constantly—the Scripps Institution of Oceanography, which was the foundation of UCSD in 1903; one of only four or five supercomputer facilities in the country; a molecular genetics research program; the Center for Study of Magnetic Recording; and the Powell Structures Lab, one of only two structural laboratories in the nation."

Location plays a part in campus growth in other ways, Hug said. Among the projects currently under construction are three buildings that will house a new graduate school of international relations, focusing specifically on Pacific Rim countries and issues, Hug said. "This program was commissioned a year ago. We have faculty and students already in temporary quarters until the buildings are finished. We are ideally placed to be a strong link, through this program, to what is going on in the world—an increasingly interrelated world."



This explosive growth creates intense responsibility for the physical plant department at UCSD, according to Hug. "There is something going on at every corner of the campus," he said. "To handle the volume of work demands constant attention. This year alone, the physical plant department had to organize and orchestrate more than 150 utility shutdowns to accommodate the planning and construction process."

With a campus involved in delicate research and medical care—the La Jolla campus will be the site of a new hospital in the near future—handling such events is complicated, to say the least. The key to managing the process is "a lot of coordination, hand-holding, and money," Hug noted. "It intensifies the need to coordinate work around campus and to keep people informed throughout the campus community on what is being done when and where."

There is, of course, more to the process than coordinating and communi-

cating about utility shutdowns—no matter how many or how major. "As busy as we are, all other areas of the campus are affected by the growth of the physical plant," Hug said. "I constantly remind our people that it is important to recognize that everybody is working hard on these issues. Things are extremely busy here, and everyone has to cope with tremendous growth. The academic side is growing along with the physical plant—we will have to hire fifty plus additional faculty people each year through the year 2000."

Compounding the issue is the need to fund not just new construction, but ongoing and preventive maintenance as well, Hug said. "We have inadequate levels of funding to support operations and maintenance," he said. "What really comes to the surface now is how to maintain the existing facilities without sufficient funds, not to mention the new projects once they are complete. While the new construction does bring in new funds, those

new funds are only at the same level as funds for existing buildings. We are experiencing a requirement for a significant amount of start-up funds for new buildings. The newer technology and sophistication incorporated into the newer buildings requires more money earlier and on a continuing basis."

Funding issues demand that the physical plant administrator and department "temper the excitement of new growth with the reality that we have an aging physical plant and cannot afford to put our entire focus on the new side of things," said Hug.

It also is important to remember that new buildings demand new infrastructure. "It's not just a matter of roadways, parking, and related needs to support new construction," Hug said. "All the major utilities are critical as well. You have to have those utilities in place, but planning cannot always keep up with construction, so meeting growth becomes an operational capacity issue."

The pace of expansion and the nature of today's educational process affect all of these concerns, according to Hug, and place unprecedented demands on physical plant departments. "We no longer have the luxury of a summer break, when the campus is quiet and we can shut things down for major or routine maintenance. Today's campus is a round-the-clock operation as activities extend into evenings and weekends," he said.

Although the vision of a constantly expanding physical plant served by a constantly decreasing capacity and funding base "keeps me and other members of our physical plant awake at night," Hug sees the future of the physical plant department as becoming more and more crucial to the university. To respond, he said, physical plant administrators at UCSD and other campuses will rely heavily on the expertise and collegial resources available through APPA.

—Ruth E. Thaler-Carter



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directors of physical plants, but warned against complacency. "The importance of the role of the physical plant administrator is more recognized today than ever before—but we have to continue to reach out and develop our skills," Hug said. "APPA is part of the reason for our recognition in the higher education community. Administrators, teachers, even students realize that they need physical facilities and that those facilities need to work, and work well. Higher education is prized highly by our society and people recognize that they have to have quality facilities to support their efforts in education."

The profession is changing with the world around it, Hug said, again with much credit due to APPA and its strong emphasis on training, ongoing skill development, professional integrity, and continuing education. "Physical plant directors have caused some changes and adapted to others as the world has changed—new technologies, how we do business, looking at the bottom line."

There is no one key to taking the lead as physical plant director, but there are certain essentials, said Hug. "What it takes to lead as physical plant director is a strong knowledge of managing relationships," he said. "There is a keener awareness today among physical plant leaders that our services must be effective. The departments that are doing well are those that are service-oriented. The reality now is that the physical plant department is responsible for the quality of the work life, from all perspectives."

#### Learning To Be Leaders

Helping colleagues fulfill that responsibility will be Hug's main goal in his tenure as APPA president. "Our job has become increasingly complex. There are demands to be creative and innovative, for understanding a multicultural work force and providing leadership responsibility for the environment," he said. "The challenge to the APPA leadership is to help each and every one of us meet those diverse campus-wide needs."

According to Hug, the association is especially well placed to meet that challenge. "APPA stands at the top of its success or power curve now," he said. "Our education and training programs and our publications are professional and top quality. New members are getting involved in APPA earlier—I have seen new faces come through

the Institute or becoming involved in committees and the regional associations. They are part of the human relations factor and one of APPA's greatest strengths, carrying major responsibilities at their institutions. Financially, the association never has been better managed, even though we're on a tight operating margin. All programs are doing well. These are important elements to the success of APPA and the profession, because, in reality, our business is like any other—unless the financial base is in place and well managed, we aren't going to go forward."

#### Continuing To Succeed

To maintain this cycle at a level of success and effectiveness, Hug said, the APPA Board of Directors has approved a 10 percent dues increase, effective in January or February of 1990, and the Membership and Finance committees will look at the dues structure for the future. "There are new and improved services that we want to offer," said Hug. These include:

- Legislative—"We want to expand information on regulatory issues and have a voice and presence [on Capitol Hill and at the state and regional legislative levels] when things change in the legislative arena."
- Educational—"We will continue to develop, and yet reduce the cost of, the Executive Development Institute so it will be more accessible to more of our members, perhaps through scholarships and other means. We will work to strengthen the ties between the regions and the education programs."
- International—"We've had a tremendous response from physical plant administrators in the Australasian area. Now we need to reach out, maintain, and expand that success. We have a model for reaching out to Great Britain and Europe in the future."
- Planning for the future—"We must look ahead with a studied and informed view of the future, beyond one year. Too often, we have had to react in response to a problem rather than act in accordance with a foreseen need."

Keeping the goals of the association and profession in mind has benefits beyond simply accomplishing them. "Our profession is a highly rewarding one," Hug declared. "It will continue to be so, thanks to the commitment of both individual members and the association as a whole." ■



Hug and his assistant, Norma McKimmon.

# Award for Excellence in Facilities Management



**Ideas and Innovations:  
The Best From the  
1989 Awards for Excellence**

by Stephanie Gretchen

PHOTOS THIS PAGE BY VOLGENAU IMAGING

The Award for Excellence in Facilities Management, sponsored by APPA, recognizes outstanding achievement in facilities management at college and university campuses and emphasizes the vital services provided by physical plant departments and their impact on the institution's educational mission.

The 1989 international winner of the second annual Award for Excellence in the large campus category (5,000 and above FTE student enrollment) is **Vanderbilt University**, Nashville, Tennessee. **Waukesha County Technical College**, Pewaukee, Wisconsin, won the small campus category (under 5,000 FTE student enrollment). The awards were presented last July at APPA's 76th Annual Meeting in Reno, Nevada.

The winners of the 1989 regional Awards for Excellence in the large campus category are: Eastern, **University of Vermont**; Southeast, **Vanderbilt University**; Midwest, **The Ohio State University**; Central, **Texas Tech University**; Rocky Mountain, **University of Colorado/Boulder**; and Pacific Coast, **California State University/Sacramento**.

The regional award winners in the small campus category are: Eastern, **Fitchburg State College (MA)**; Southeast, **Mercer University/Atlanta (GA)**; Midwest, **Waukesha County Technical College**; Central, **Saint Mary's University (TX)**; Rocky Mountain, **The Colorado College**; and Pacific Coast, **University of California/San Francisco**.

Following are examples of the winning institutions' excellence in facilities management.

#### Cooperation

Cooperation seems to be the key to **Waukesha County Technical College's (WCTC)** success. The college incorporates efforts and suggestions from many different areas into its plans and procedures.

WCTC's physical plant's creative efforts and thorough analysis support the goals and objectives of the master maintenance plan through such programs as an incentive and reward system for new ideas. Two of these innovations help conserve energy.

One idea was the automatic make-

up water system that improved the operation of hot and chilled water system loops. It provides a warning system for problems, removes bacterial growth in the old open tank, and quantifies water addition to the system.

The physical plant department purchased and installed a water back-flow preventer and installed a line for the boiler make-up water, a line for the chilled water, and a two-inch fast fill line that covered both systems. Water pressure regulators and water meters were also installed in each of the system make-up water lines. Finally, a flow meter was placed in the system to sound an alarm if water additions exceeded eight gallons per minute. With these corrections all the mechanical problems as well as the bacterial problem were eliminated.

Because of the length of time required and the problems with flying particulate, dust, and injuries, the WCTC maintenance staff brainstormed for a way to clean the institution's boilers in a more efficient manner.

The staff designed a boiler brush and a sleeve to fit inside the 24-inch fire tube. A snow removal brush used by the department is the same size as the fire tube, so staff attached segments of the brush to a shaft that was powered by a drill motor to clean the boiler.

To control the particulate and dust, a canvas boot that closes down from 24 inches to one-and-a-half inches to fit a standard vacuum hose was fitted to the fire tube. This alone has re-

duced the cleanup time and the problems associated with heavy dust in electrical gear. This containment system can be produced for other sizes of boiler fire tubes, and the cost of the boiler brush was \$91.57. The cleaning time with the new brush and sleeve is four hours, as opposed to the 24 hours it took with a hand grinder.

Other examples of WCTC's cooperative efforts are its heavy use of quality circles, which have identified problems and developed such solutions as improved outdoor lighting, instituting the campus-wide Stash Your Trash program, and developing a detailed policies and procedures manual for third-shift personnel. The quality circles evolved out of the physical plant department's desire to continuously improve its services. The rest of the campus followed physical plant's model and began to use the quality circles.

The department also incorporates students in some of their activities. The position of student draftsman is open to students interested in gaining drafting experience while helping the department keep drawings up to date.

WCTC also works with and for the surrounding community. The physical plant department has been involved with such projects as building wooden playground equipment on campus for the daycare center, which is used by employees and community members, to preparing and organizing the Harley-Davidson 85th anniversary rendezvous point, during which 30,000 bikers from the West Coast met in Pewaukee and then rode on to their



COURTESY PHOTO PROVIDED BY THE COLLEGE



main homecoming point.

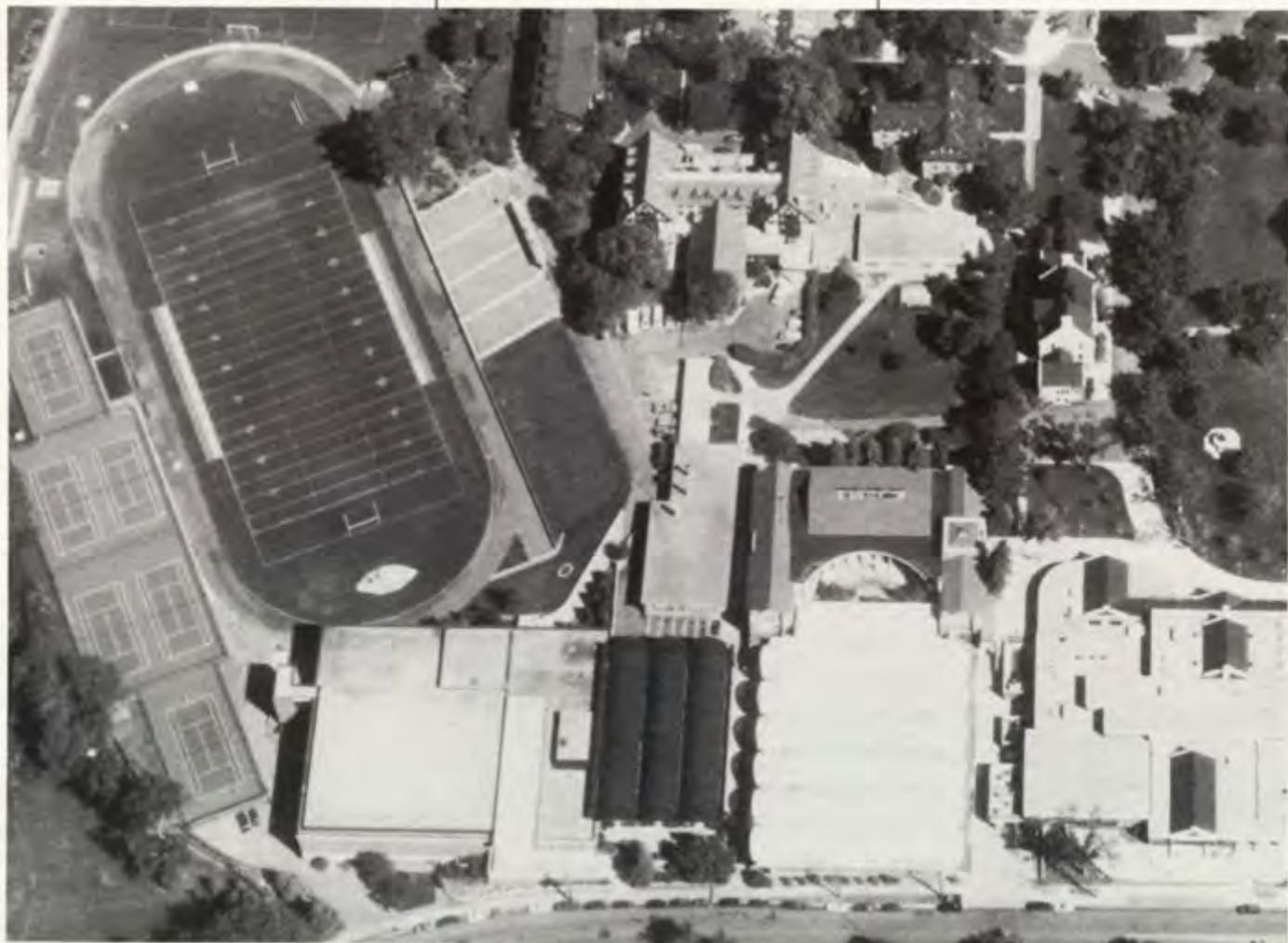
Ronald Maassen, physical plant director, said, "We think the Award for Excellence is a great experience. The

effort we put into it would have been worth it even if we didn't win. It was the greatest self evaluation—a real positive experience."

### Energy Conservation

Large and small efforts have been made at **The Colorado College** in the name of saving energy. George Eckhardt, assistant director of physical plant and mechanical engineer, explained that Colorado College has been energy conscious for many years, starting with sealing windows and doors to including energy conservation in all building projects in order to keep electrical and natural gas costs down.

One innovation was having "Low E" glass installed in some campus buildings. This glass increases occupant comfort by reducing heat loss in winter and heat gain in the summer. The glass also eliminates the need for some shading blinds. "We had crank windows that had become obsolete, and we were receiving complaints about people on the shady side of the building being too cool and the people on the sunny side being too hot. After putting the Low E windows in we have no more complaints. We see a



*The Colorado College*

definite improvement in comfort level," said Eckhardt.

The school also used this glass in their new student center and science building and realized cost savings even at the building stage. Because they had decided to use this glass, they could downsize their fan and air conditioning size, and they have realized operating benefits over the years.

A larger project was undertaken when physical plant purchased an electric power/demand analyzer to record power and provide measurements, calculations, and analysis to aid in electrical energy conservation and usage efficiency. Capacitors were installed on motors to improve power factor and reduce penalties. Once demand peaks are realized, equipment operation can be scheduled to reduce peaks.

#### Taking Care of Details

SWAT teams and random inspections are two methods **Fitchburg State College** uses to keep on top of physical plant repairs and maintenance.

Fitchburg has renovated their work request system so that all requests go directly through the supervisor, instead of interrupting a worker already

on the job. The supervisor contacts the technician by pocket beeper or radio. The supervisor also prioritizes the work requests by building and task. According to Arthur Trenoweth, associate director of facilities, this improvement has been extremely successful within the department as well as for the faculty and administration.

Every Wednesday afternoon a "SWAT team" attacks all the nagging, little tasks that never seem to get done because other, bigger jobs call for attention. SWAT (special work assignment team) was created when physical plant staff found themselves getting many calls of five- or ten-minute jobs in different buildings. These jobs would sometimes be put off for weeks, but now there is usually a two-day turnaround.

Another way the physical plant department keeps on top of maintenance is when the departmental supervisors make routine random inspections of the work accomplished by departmental technicians. "At first everyone was a little antsy to have people with clipboards walking around, but they got used to it. It has really helped out quality control and we are finding fewer things that are wrong," said Trenoweth. Also, custodians fill out



Fitchburg State College

work requests for any item they observe while working that needs repair or replacement.

The combination of these efforts helps Fitchburg diminish its deferred maintenance problem while making students and staff happy.

As for the Awards for Excellence, Trenoweth said, "Receiving the award absolutely helped our morale. Getting the letter that we had been accepted was a big deal. It gave us a lot of good exposure and good press. I'll do it again, and I'd recommend it to others. It is a great way to do a self evaluation."

#### Customer Feedback

The importance of customer feedback is well understood at **Mercer University/Atlanta's** physical plant. The department solicits feedback from customers through comment cards. These followup procedures are a part of its service management system. The department solicits comments from anyone who has received any service or is affected by any policy, procedure, or function of the department.

Comment cards have been devel-

*Mercer University*

oped that question physical plant's delivery service's courtesy, professionalism, and timeliness. It allows space for extra comments and explains, "We appreciate you filling out our appraisal. This will help us in our effort to serve you better. If you have any questions please call the physical plant." Similar cards review custodial services daily cleaning, courtesy, professionalism, and handling of special requests. The maintenance card rates courtesy and professionalism, response time to work order, service provided, and performance of workers. The comment cards have enabled the physical plant department to realize where its problems are and what it is doing right. "We received a lot of good comments, more than we expected. About 80 to 85 percent of the comments are positive," said David Sims, director of physical plant.

Another way Mercer has worked to become more efficient is the development of managing energy. A new emphasis has been placed on turning off unused lights, shutting windows if air conditioning or heat is on, checking thermostats, and reporting any maintenance problems.

Sims found the Award for Excellence program to be an extremely

worthwhile program. "Before we even heard we won [the regional award], we had learned a lot while putting it together," he said. "Our notebook is a recognition of what everyone in the department does every day. It was a very positive learning experience. We plan to submit next year."

**Emergency Preparedness**

Imagine that an explosion resulting in a fire is on the eighth floor of your campus hospital. Patients and staff have been critically injured. Unknown chemicals were spilled. There is no electricity, phone, or water services.

Or an 8.6 earthquake occurs. There is no phone or water service, and the only electricity comes from an emergency generator. Structural damage is severe; the death toll is high.

These are two of the disaster drills the **University of California/San Francisco (UCSF)** has experienced. The drills are conducted every year on the anniversary of the April 18, 1906 San Francisco earthquake in preparation for "the big one." The emergency operations plan is intended to "provide a system that meets emergencies that are of a magnitude to cause significant disruption to the functioning of the campus." UCSF wrote up a di-

*University of California/San Francisco*

saster drill procedure that covers various responsibilities, earthquake instructions, campus emergency communication system, and special procedures for bomb threats and fire.

The physical plant, police, environmental health and safety departments and the medical center work together in the drills to restore service or respond to damage.

The consensus: "We always make some mistakes, but we get better every time. We are good. During the drills there needs to be lots of quick thinking. Regardless of how good the emergency plan is, things never go totally according to plan. This helps us prepare for The Big One," said Jerry Teague, assistant to the director, physical plant.

### Employee Recognition

**Saint Mary's University** strongly promotes employee recognition programs that enhance morale, and in turn, improve services, customer relations, and departmental image.

Physical plant welcomes each employee with an in-processing program that culminates in a 25-minute slide briefing by the director, Charles Jenkins. During the briefing Jenkins explains the department's structure and how physical plant fits into the university structure, how different modes of communication work and their importance, the importance of safety, and that "You are part of a proud organization, and you are expected to do your part to keep it that way."



*St. Mary's University*

Spending time on employees and recognizing them for jobs well done is continued through such programs as the Employee of the Year, who gets a \$100 bonus check, an individual plaque, and his or her name is inscribed on a permanent plaque in the departmental office. Craftsman of the Month is chosen from his or her peers for job performance, attendance, and attitude. The important role physical plant staff play in the university mission is stressed.

Champions of the Month are chosen purely by the discretion of the di-

rector, and their names are placed on a permanent plaque in the front office. Perfect attendance is also recognized by an individualized wall plaque. Pats on the back are not only given on a monthly or yearly basis; spur-of-the-moment congratulations are rewarded by a "You Did Good When" certificate, which is given within 24 to 48 hours of the deed being recognized. Jenkins recalled when he awarded one of these certificates. "It was over Christmas break when the only people on campus are from physical plant. We got a call from one of the campus priests saying he needed help fixing his flat tire. A couple of people went down to help him. That was above and beyond the call of duty, so I gave them certificates."

Communication is enhanced at short monthly meetings where employees honor attendance records, birthdays, etc. The benefits of increasing employee recognition are evidenced in lower turnover, increased productivity, and less frequent absenteeism.

### Caring for the Campus

Large-school winner **Vanderbilt University's** excellence is evidenced by their CARE Package (Campus Allocation of Resources for Excellence). This package is a utility expansion project that includes a high-pressure, high-temperature boiler plant; a 1,200-foot, rock-bored tunnel serving as a utility corridor ("the mole"); a 7-megawatt back pressure turbine-generator; and a central chilled water



*Vanderbilt University*



50 psig to 125 psig. This project alone generates enough savings to finance the debt required to capitalize the boiler plant, the Mole tunnel, and the generator itself from its first year of operation.

The final component of CARE is the chilled water plant, which consists of two 650-ton, single-stage lithium bromide absorption chillers. The plant includes variable speed distribution pumps, steam pumps for condensate pumping, and a positive balancing network throughout the building connections. The plant also cogenerates electricity from the air conditioning steam and saves \$118,000 per year.

Energy is not the only innovative area at Vanderbilt. The university has a PDQ (Pneumatic Dispenser Quick-Send) system. This system is an efficient and cost-effective method to send the medical center's lab samples, drugs, paperwork, and medical records in containers or "carriers" to different stations in the center. Fifty carriers are stored in the sixty-foot pneumatic storage tube. When a carrier is inserted into the tube, a manually cycled air blower forces the carrier into the tube as far as possible. Once fully loaded the system is ready for automatic operation any time of day or night without the need for personnel to tend the system. PDQ is set up so that when a carrier leaves one station, another one replaces it immediately; the inventory control system makes sure that any surplus carriers are sent back to the storage queue or

to the station with the smallest number of carriers; if problems occur or the carriers are depleted the system shuts itself off to alert operators. The system is remotely controlled from the building automation system control center, which is staffed twenty four hours a day, so the PDQ system itself does not need to be staffed. This project has realized a \$15,600-per-year savings.

### The Big Cleanup

Asbestos, recycling, and reducing the waste stream are words uttered with increasing frequency among facilities managers, and the **University of Vermont** is dealing with these issues head on. With a campus originally built in 1790, Milt Romrell Jr., director of physical plant, said he has every conceivable asbestos item made and that the substance is all over his campus—dorms, labs, library, physical plant, and even the performing arts building. He said the asbestos team has twenty-plus years of job security.

In order to tackle such an overwhelming task and avoid the exorbitant fees charged by asbestos abatement firms, Romrell started his own asbestos abatement shop. "We also felt we would have better control and better people if we had our own (asbestos abatement team)," he said. He hired a licensed industrial hygienist who prepares all the specifications and finds out where the asbestos is and what the standard procedures are. A supervisor and technicians were hired,

plant with two single-stage absorption machines. This system works to increase the school's power supply and efficiency, adds fuel flexibility, and pays for itself.

Vanderbilt replaced three sixty-year-old boilers with a three-unit, high-pressure, high-temperature boiler plant. Two of the three boilers are equipped with gas-oil burners for fuel flexibility. The boiler plant project replaced the ash removal system, coal handling system, and controls. This project saves the institution \$100,000 per year.

The Mole tunnel project is a rock-bored corridor 1,175 feet long and 8-1/2 feet in diameter that connects the main campus steam distribution tunnel to the Peabody campus boiler room. The tunnel was carved under campus buildings and major streets without disrupting traffic or utility services. The Mole enabled physical plant to retire the three gas-fired boilers and their equipment and use steam from the main campus system, thus lowering electrical costs. This tunnel can be used for telecommunications, electrical distribution improvements, local area networking, and future chilled water lines. The project saves Vanderbilt \$553,417 per year.

One of the biggest areas of savings, \$1 million a year, is the turbine generator. The prime feature of the turbine generator is its ability to transfer load in synchronous time during an interruption of service from the local utility system. The generator can also operate at varying back pressures from



University of Vermont.

equipment was purchased, and the team was trained. They started on small O&M projects and have increased their expertise to the point where they now work on major abatement projects.

The results: "Outstanding! We are ready to increase the size of the crew and take on larger projects. We have an excellent team. We were very selective about who we hired. These people have a commitment to what they're doing," said Romrell.

The university is cleaning up in other areas as well. When the state of Vermont let them know that eventually there was going to be a 40 percent reduction in the waste stream, physical plant decided to start moving. The university has already cut its waste stream by 10 percent by recycling various types of paper and composting its grounds materials. The paper is collected by janitors and student volunteers and taken to a central location where vendors pick the load up. The school is also looking into ways to recycle plastics and cafeteria food waste.

This commitment to recycling is not only on the output side. The university has been working with the purchasing department to buy as much recycled paper as possible and to buy biodegradable plastic, and they have queried vendors as to how they package their goods and the quantity of packaging they use. Dick Streeter, assistant director of services, said he has two student volunteers working with him on the school's recycling. Together they stress educating people on how to recycle and why it is so important. When the freshman students arrive on campus, the student volunteers work with the resident assistants in educating the incoming class about recycling. Starting this fall the recycling program will be effective campus-wide.

UVM physical plant is innovative in other areas as well; it won the NACUBO Cost Reduction Incentive Award for its elimination of its time clocks. The department has 216 employees in thirteen base locations on a large campus with many buildings. A good deal of employees' time was spent traveling to and from their base station to punch the time clock. The department decided that this time would be better spent going directly to a job site rather than traveling to and from the clock. According to Romrell, the elimination of the time clocks and switch over to time cards has been beneficial, reduc-



*Texas Tech University*

ing travel time, allowing employees to become more responsible for their actions, and offering them more productive time. One hour of a mechanic's time was used to remove the clock and handle details for its sale. Approximately \$149,000 was saved in travel time to and from the time clock, in addition to annual costs incurred for maintenance to the clock itself.

#### **Educational Development**

Texas Tech University physical plant management strongly believes in training and educational development. The department "expects professional performance from its employees and realizes these employees must be properly trained to meet these standards." To this end Tech has developed the Apprenticeship Training, Upgrade Training, and In-House Technical Training programs.

The Apprenticeship Training Program was developed to meet the department's need for highly skilled journeymen. The 6,000-hour, three-year program instructs both employer and employee and is registered with the U.S. Department of Labor Bureau of Apprenticeship and Training, and the Veterans Administration. Graduates receive a nationally recognized certificate of completion. The U.S. Department of Labor funds the school's Apprenticeship Training Program. The program has been well used; seven

employees completed apprenticeships during fiscal year 1988 and twenty-three are currently pursuing apprenticeships. One extra incentive to getting involved in the program is a pay raise upon completion of the certificate program.

The Upgrade Training Program covers individual courses, seminars, and supervisor training, and provides training for skills with no organized training program. Twelve employees were awarded certificates for courses completed in 1988.

The department takes advantage of courses and seminars offered by outside organizations. During 1988, 122 employees attended 805 hours of instruction involving twenty courses or seminars. The school brings in outside organizations to conduct the seminars, which are open to staff. Others are also welcome as a service to the community.

Physical plant has created a supervisor training program that evolved out of supervisor job standards. This three-phase program is used to satisfy step-increase requirements. The first phase constitutes completion of the first five volumes of the course; phase two requires the completion of the last five volumes; and phase three is accomplished by successfully completing a 100-question comprehensive supervisory test. Twelve foremen completed the program in 1988, and a total of

thirty-three employees have finished the program since its inception in October 1987.

The department's third educational development program, In-House Technical Training, serves the specific needs of the two central heating and cooling plant's employees. The program is self-paced and focuses on basic theory and actual installed systems. Upon completion of all four performance levels—maintenance mechanic, utility plant operator I, utility plant operator II, and shift supervisor—the employee is fully qualified to operate and maintain all the systems in his or her plant.

In addition to these programs, Texas Tech provides custodial services department supervisory personnel with first-aid training, and a forty-hour training program prior to being assigned to their area. Phase I of the forty hours covers responsibilities, relationships, personal appearance, equipment, and floor care during ten classroom lectures with ten written exams. Phase II is the hands-on portion consisting of eleven training lessons demonstrating performance ability. An apprenticeship or on-the-job training program is included in phase II. After ninety days the building supervisor writes an evaluation of the individual and either suggests further training or

that a training certificate and patches be awarded.

Gene West, director of building maintenance and utilities, said the Awards for Excellence is "a super program. I've been in this business all my life and you get very little recognition. (This program) gives you an opportunity to get some credit."

#### Zone Maintenance

The University of Colorado has polished its zone maintenance program into a fine art. About three years ago the facilities management department moved most of the tradespeople from a central shop into five zones with satellite shops. Each shop is staffed with a foreman, electrician, plumber, carpenter, painter, and helper. Kathy Messimer, director of facilities management, said the program was created for and devoted to preventive maintenance with every foreman making the rounds in different buildings in his or her zone to see what needs to be done. The program has been extremely successful.

"Rather than being reactionary, we are able to work in a preventive mode, not always putting out fires," said Messimer.

The clients love the idea. "We have received excellent feedback from the customers asking us never to go back

to the old system," said Messimer. "They feel they know the staff. The staff is more visible and able to form more personal relationships. The clients like knowing who they can call with a problem; it's not just some desk. Also, the foremen have been good about communicating (to customers and staff)." The staff says they feel closer to their customers, as well.

Messimer said there is also a sense of ownership of the zone, which builds pride. The result is that the department has made great strides in improving maintenance, the department's vehicle fleet has been reduced by half, travel time is reduced substantially, response time is greatly increased, the deferred maintenance backlog has been significantly reduced, service is better, and the department is getting more work done without increasing staff.

The university is also increasing the facilities management department's efficiency in other ways. The department is using an Information Network System for all records from work orders, lock shop system, and preventive maintenance to benefits, personnel records, and space management. The system consists of custom-designed system modules that give instant information at every stage of planning, scheduling, maintenance, project



University of Colorado



by Diane Kerby and Ken Brooks

*Left: Berea's Boone Tavern, one of Berea College's best-known facilities, is well known nationwide for its fine southern cuisine. The tavern was opened in the fall of 1909 and features college-made furniture and other fine crafts in its 57 rooms.*

*Right: Serving since 1855, Berea College was founded for the purpose of providing a high-quality liberal arts education at low cost. Students are charged no tuition and are from families with limited financial resources.*

*Diane Kerby is physical plant director at Berea College, Berea, Kentucky. She is beginning her term as SRAPPA president and is a member of APPA's Educational Programs Committee. Dr. Ken Brooks is vice president of Johnson/Romanowitz/Architects & Planners, Lexington, Kentucky.*

## College and Community Planning: Combining the Two

The literature relating to colleges consistently includes writings extolling the importance of comprehensive campus planning. Similarly, the writings related to community government describe a comprehensive plan for towns as essential. Both college planning and city planning scholars advise full consideration of each other's plans during any planning effort.

This article is a brief description of a planning project recently completed that carried this notion of consider-

ation one step further by essentially combining college campus planning and a city comprehensive plan update into a single effort. The institution was Berea College located in Berea, Kentucky.

### Overview of Berea College

Founded in 1855, Berea College serves about 1,500 students. The college grew out of the reform movements of the mid-nineteenth century, including strong antislavery sentiment. A strong liberal arts institution

offering the B.A. and B.S. degrees in twenty-nine areas of study, Berea College has always been coeducational and has admitted students without regard to race or creed.

The most unique feature of the college is that the student population by mission must include at least 80 percent of its members from Appalachia. Further, the institution charges students no tuition to attend but instead expects each student to participate in the student labor program. This program requires at least ten hours of work each week and has other goals in addition to contributing to the support of the student. Students gain an appreciation of the worth and dignity of performing labor toward a common enterprise, acquire some useful skills, and develop a sense of responsibility for a specific task.

The two most visible and best known student labor activities are student crafts and Boone Tavern. From the initiation of the labor program students have produced handmade, high-quality Appalachian craft items including woodcraft, weaving, broomcraft, needlecraft, wrought iron, and ceramics.

Boone Tavern is a hotel that has shared its southern hospitality with visitors and guests for decades. The hotel offers overnight accommodations as well as a dining room nationally known for regional dishes and courteous service provided by students.

The central campus includes 140 acres, but the college also owns 1,400 acres of farm land including fields, pastures, a piggery, and a poultry operation. In addition, the college holds title to about 7,000 acres that serve as the watershed for the water system that supplies the college and city. This planning project focused primarily on the central campus.

The campus buildings date from the late nineteenth century, including the first brick building in the region and a number of structures listed on the National Register of Historic Places. The college has continued to build needed facilities. A new married-student housing complex that grew out of the campus planning effort has just been completed. A major addition to the library and a multipurpose spectator facility are currently in the early planning stages.

#### Overview of the City of Berea

The city of Berea has a population of about 10,000 and is located on In-

terstate 75 in central Kentucky. In many ways it is a typical small southern town, but in other ways it is unique. The town has maintained a diverse economy, although the college has always been the most dominant employer. The community has a long-established and internationally known handcraft industry that continues to flourish.

#### Overview of the Planning Project

In 1986 Berea College decided to pursue a master plan with a major concern being a new interstate entrance planned for construction in the immediate future. The new entry route would bring at least half of the traffic onto the campus through what had been the rear of the campus. In addition, the college needed to determine the placement of three new or expanded structures, reconsider the commercial area around Boone Tavern, and generally review the college land holdings to determine any shortcomings or surpluses that might exist.

At the same time, the community was about to undertake an update of the comprehensive plan for the city. By Kentucky statute, each incorporated area in the state is required to have a development plan and to update it at five-year intervals. The plan typically includes goals and objectives, a development forecast (population and employment forecasts), a land use plan, and plans for other public concerns such as transportation and public facilities. The planning process required by the state legislation involves considerable public participation.

In updating the city comprehensive plan and the college's campus plan, two critical topics were prominent—the new interstate entry to the community and college and the redevelopment of the Boone Tavern commercial area. Once the two entities learned of each other's plans and the common concerns, a series of discussions were undertaken that resulted in the two planning efforts being conducted in concert.

For a variety of legal reasons and to aid in using the resulting plans, it was decided that the two planning documents would need to be produced simultaneously using the same external planning assistance. Further, some aspects of the two plans would be identical while other elements would only be relevant to one of the plans. In any case, all aspects of each plan were to complement the other.

Starting with these general agreements, an external planning team was selected to direct the planning effort. The team was led by an experienced college planning and architectural firm, which was assisted by a consulting engineering firm, an internationally known landscape architect and campus planner, and a traffic consulting firm. This external planning team had worked together on other campus planning projects and were all knowledgeable concerning comprehensive city planning.

Once the planning team was in place, it was possible to begin a series of work sessions to define the planning process. Time schedules, participants, and costs were all chosen. The result of these discussions was a clear-cut "plan for planning." With the formal approval of the two governance structures, the planning process could begin.

The planning process undertaken in this project was unique in one other way in addition to involving a college and community. The approach was one of self-study with external, professional guidance. The local planning committee essentially produced the plans at the direction and with the advice and counsel of planners. This approach has been used by the planning firm successfully on many projects involving colleges, universities, other institutions, and cities.

The total planning process took about two years from the time of initial discussions to formal adoption of both plans. The college plan was adopted first, mainly since once it was drafted it could be reviewed by the Board of Trustees and implemented; the review and approval process was straightforward. The city comprehensive plan update took much longer to be formally approved and put into effect. State regulations require an extensive hearing process that consumes considerable time. That process has now been completed and the new plan is in effect.

#### Implications of the Project

There are four major implications of this experience that have applicability for similar projects:

1. Significant cost savings;
  2. Conservation of staff time;
  3. Integration of planning decisions; and
  4. Understanding and cooperation among organizational entities.
- The combining of the projects re-



*Berea College's historic Boone Tavern is located on one end of Main Street in Berea, one of the city's busiest traffic areas and one of the key spots involved in the joint college-city planning project.*

sulted in a cost savings of notable proportions. While the cost of separate planning projects was not formally projected, experience on similar efforts that were not jointly pursued would indicate that the cost might be on the order of about two-thirds of the cost of separate projects. Given the reluctance of decision-making and especially political bodies to allocate scarce resources for planning, this reduction in costs is meaningful. It is also unusual to be able to reduce costs and at the same time increase the quality of the final product. A joint planning endeavor is one of those rare opportunities.

The joint planning project not only reduced costs, but it also minimized staff time required from both the city and the college. Any planning effort consumes significant staff time to gather background data, react to planning proposals, and participate in the review and approval processes. When the concerns are so interrelated the staff does not avoid all effort, but rather the effort is utilized twice. As with dollars, it is not possible to accurately document the staff time savings but it likely would be similar in scale, or about two-thirds of the time required for two separate planning endeavors.

In addition to simply reducing the financial and staff resources required,

a joint planning project results in an integrated approach to solving existing problems and creating an enhanced future. Such an integrated approach is extremely practical; it is unlikely that separate campus and community planning could have been as effective. The fate of each entity is simply tied too closely to the other to plan in isolation. Issues such as traffic, land use, and open space are too intertwined to be viewed as an isolated college or a city problem or concern.

The call for integration in Berea was even more dramatic than in many communities. Berea College is the largest landholder in the area: the main street of the town bisects the campus, and the college owns the city water and electric systems as well as a number of commercial properties that together form the major commercial area inside the city limits. While not a "downtown" in many ways, this commercial area—which includes Boone Tavern, restaurants, a bookstore, several craft stores, a clothing store, a laundry/dry cleaner, and even a few professional offices—is the closest element to a central business area in the community. In this situation integration was the only practical approach as it is in many similar towns in rural America.

A joint planning project certainly increases understanding and coopera-

tion. Just the process of sitting together and considering solutions of each other's problems and brainstorming about the future greatly increases mutual appreciation. Politicians from the city had to think about the realities of operating a college in the middle of a town, while the college leadership had to consider the difficulty of selling ideas to the public for approval. At the end of the planning process, all participants had greatly increased their compassion for others. In addition, the proposals generated were much more in touch with reality. The planning literature regularly notes that a key factor in the success of planning projects is the degree to which the plan produced is viewed as reasonable, positive, and supportive of all elements of the community or college. An integrated approach cannot guarantee such a result, but it clearly increases its likelihood.

A joint planning project is not without pitfalls. Most of the traditional problems with city and college plans still exist, and an integrated approach may intensify some of them. A combined city-college planning endeavor is more complicated, for example. One cannot simply dismiss a concern as the purview of the other. In this planning project, Berea College could not be content to complain about community traffic through the campus, but had to acknowledge the difficulty of solving the problem and even conclude that an ideal solution was not likely. Further, any solution would have a major impact on the campus. Moving traffic away from the campus would help students in a traditional campus planning view, but it would also greatly reduce the visibility of college-owned commercial property, a concern of city planners. On many other issues both the college and the city found themselves unable to simply propose a solution; there seems to be no simple solution when it is necessary to address the interests of others.

In this effort not only was the planning more complicated, but it also was more political since it involved discussions between the city council, the mayor, and the college board of trustees. Each had their political agendas to address in addition to the planning problems themselves.

Based on the experience of Berea College and the city of Berea, even with the politics and other difficulties, it seems beneficial to encourage joint planning ventures. ■



## Energy Management By Lighting Retrofits

by Paul Black

**T**he University of California at Berkeley is involved in an extensive lighting modification program that will cut campus electrical use by 13 million kilowatt hours per year at a total projected savings of \$1 million per year.

The program is operated by the campus energy conservation office, a division of facilities management. The total project budget is \$6.5 million. Having entered the third year of this five-year program, we believe that other institutions can benefit from our experience.

### Overview

Berkeley's lighting modification program is comprehensive in scope. It uses many of the commercially avail-

able retrofit options. Within the five-year program we will modify more than 100,000 light fixtures in seventy state-funded campus buildings covering 6 million gross square feet. Classrooms, offices, laboratories, libraries, and hallways will be affected by the program, with an average lighting energy reduction of about 30 percent.

Key to the program's success is the use of combinations of modifications to realize the maximum possible energy reduction, while maintaining (and often improving) the quantity and quality of light in our campus buildings.

Many factors must be considered when deciding which modification option to use. Occupant task, existing natural lighting, the type of original fixtures, and other factors must be viewed together in order to devise an energy-saving solution. Several years ago all building spaces were surveyed by engineering students and the data was entered into a computerized data base. Software developed by the energy conservation office was used to

*Paul Black is senior engineer in the University of California at Berkeley's Energy Conservation Office. Additional contributions were made by Paul Abesamis, Tasha Dowdakin, Chester Johnston, and Jeffrey Kessel.*



make standard room cavity ratio calculations to predict maintained illumination. Depending on the recommended lighting for the task in the room, the space receives a retrofit package to bring its illumination close to the Illuminating Engineering Society (IES) recommendations.

The following are the types of modifications used in the program.

*Always used:*

- Replacement of core-and-coil ballasts with high-frequency electronic ballasts.
- White (3500° Kelvin) energy-saver lamps.
- Clean fixtures.

*Occasionally used:*

- The addition of specular reflectors combined with delamping.
- Delamping without reflectors in overlit spaces, accompanied by partial ballast removal.
- Replacement of translucent opal lenses with new, clear prismatic lenses.
- Replacement of incandescent fixtures with fluorescent fixtures.
- Occupancy sensors and daylight controls.

### Funding

This five-year, \$6.5 million project was funded with a state revenue bond for energy projects administered by the California State Assessments Office. These loans are available to any California state agency that can show a simple payback of no more than eight years. The loan has a 7.9 percent annual interest rate over fifteen years, repaid through energy savings.

### Why Lighting?

We estimate that a third of our \$48 million annual electric costs are spent on lighting. Reducing the electricity used for lighting is one way to reduce energy consumption without an exorbitant outlay of capital. The payback is relatively short and the program is not unduly disruptive to occupants. Despite an oversupply of oil in the last few years, conserving energy is still sound management policy. Conservation saves money and natural resources.

We are facing a new problem, one that is common to all campuses. During the last few years, many of the

gains made through our conservation programs in the 1970s are being offset by recent campus growth and an increased use of energy-intensive devices—computers, copiers, and laboratory equipment. As the use of energy-intensive equipment grows, so does the need to conserve. Lighting-related energy conservation has helped hold the Berkeley campus electrical growth to 11 percent over the last ten years.

Besides lighting modifications, our current conservation program includes installation of an energy management control system, installation of variable speed fans and pump drives, and thermal energy storage systems.

### Taking Advantage of New Technology

When the 1970s energy crisis hit, our campus like most others had to take a long look at our energy-inefficient buildings. Many of our buildings had been constructed or renovated when energy was inexpensive and were overlit by modern standards. Our first steps to reduce energy consumption were to remove obvious sources of wasted energy by delamping unnecessary fixtures, converting to low-wattage fluorescent lamps, and replacing incandescents with fluorescents.

Meanwhile, the lighting industry responded to the energy crisis and customer demand by developing energy-efficient lighting components. By the early 1980s it became technically feasible and economically advantageous to install these components throughout campus buildings. The development of electronic ballasts, optical reflectors, and advanced lighting controls made programs such as ours possible.

### Getting Started

The foundation of our program is the computer software we developed specifically to help us analyze lighting needs.

In 1984 our office sent teams of engineering students on a campus lighting survey. The students surveyed 100,000 fixtures in nearly 10,000 classrooms, offices, lounges, laboratories, and other work spaces. They recorded such data as room dimensions, room use, window location, and detailed information about existing light fixtures.

We then entered the information from the survey into a computer along with tables of fixture efficiencies (coefficients of utilization) and current light

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level recommendations for specific tasks. Using a commercial data base management system we developed programs that would analyze this data and recommend the best lighting modification system for each space. The computer also generates a list of rooms and retrofit instructions useful to the contractor.

As we begin the retrofit process for a building, we take the computer's recommendations and test several typical rooms to ensure that the program is predicting accurate light levels.

In 1983 we installed our first reflectors and electronic ballasts in a test room, a typical chemistry laboratory containing benches, sinks, chemical racks, and fume hoods. Fifteen three-tube fluorescent fixtures lit the room. We cleaned the fixtures and gave each fixture an energy-efficient, rapid-start ballast and two energy-saver lamps. One lamp was removed completely. Since the fixture's light output was now cut by one-third, we installed a silver-coated reflector behind the lamps to make up the difference.

The results were impressive: the fixtures used 57 percent less energy and gave 14 to 19 percent more light.

Since then we have installed reflectors and high frequency ballasts in more than 15,000 fixtures, with few problems. And our program has expanded to incorporate these efforts with other energy-saving measures, such as dimmers and occupancy sensors.

### About the Components

#### Ballasts

A high-frequency electronic ballast provides the same light output as a conventional ballast but uses 20 to 30 percent less energy. Electronic ballasts are quieter and have no observable flicker, and some evidence shows that they will increase lamp life. Most manufacturers now offer three-year parts and labor warranties for replacement of malfunctioning electronic ballasts.

Certain electronic ballasts can be field-adjusted or specially ordered to operate at partial power (with proportional reduction in light output). When certain portions of a space require less light than the remainder of the space, the ballasts in these areas may be set to operate at partial power. Many large campus rooms contain sufficient sub-zones to allow savings of 15 per-

cent by using this technique. There are different types of high-frequency ballasts:

1. Standard (full power).
2. Preset (fixed tuned). We order these dimmed at 70 or 85 percent of all light output. They are useful when lighting levels can be reduced by up to 30 percent.
3. Adjustable tuned. Purchase a resistor to wire into ballast and it can be changed to a different percentage. These ballasts can also be used with automatic dimming systems.

We use all three types of ballasts: 62 percent of the ballasts installed have been full power, 26 percent preset, and 12 percent adjustable tuned.

We have found the high-frequency ballasts to be extremely reliable; only about 1 percent have been defective. Vendors have honored their three-year warranty.

#### Reflectors

A mirror-like (specular) reflector placed behind the lamps in an ordinary fluorescent fixture increases illumination by one third. There are currently three types of reflectors on the market, silver laminate, anodized aluminum, and enhanced anodized aluminum.

To evaluate the different reflectors in the market and to get the best cost from our vendors, we devised a selection process for reflector bidders that allowed us to compare reflectors. The bid was based on price, performance, and a life cycle cost formula. We conducted a formal test under controlled conditions.

Based on these controlled experiments, a four-lamp fixture operating with two lamps and reflector provides the illuminance of a 2.6 lamp fixture, or about 65 percent of the original light. In places that are 30 percent overlit, the use of reflectors is an excellent solution.

#### Lamps

We replace all lamps with low-wattage lamps (the standard for the past ten years). Lamp color is plain white (3500° Kelvin), a compromise between warm and cool white.

#### Lenses

Our program includes replacing the old opal lenses with modern prismatic lenses. An opal (white) diffusing lens typically transmits only 75 percent of the light transmitted by a new prismatic (clear) lens. Substitution offers

the opportunity to decrease input power by as much as 25 percent when the resulting illuminance levels are higher than required. This power reduction may be accomplished by partial light output ballasts.

#### Daylight and Occupancy Sensors

Daylight provides a free source of interior illumination for the perimeter zones in many buildings. By sensing the level of light in a zone, a daylighting control system can dim or turn off lamps to maintain a set illumination level. The effectiveness of this strategy depends on many site-specific variables, but experience and theory indicate potential annual energy savings in the range of 10 to 30 percent. Additional savings accrue through dimming light when the place is overlit due to electric lighting alone, as might be the case shortly following lamp replacement. This latter strategy is referred to as "lumen maintenance."

Occupancy sensors utilize infrared or acoustic energy to determine if a space is empty. By switching off lights when a space is unoccupied, annual energy savings of 20 to 40 percent have been realized. To avoid having total darkness when rooms are supposedly unoccupied, one fixture is unaffected by the occupancy sensor but controlled by the light switch.

#### Results

Below is a list of buildings that we completed during the first two years of our program. The range of electrical savings varies and is not as high as we predicted. One reason the electric reduction rates are not as great as anticipated is because of the increased use in electronic office equipment and energy-intensive laboratory equipment. The two buildings with savings of more than 20 percent have had little growth in use of computers or other electronic equipment.

#### Savings ≥ 20%

Moffitt Library Kroeber Hall

#### 10 to 20%

Campbell Hall Morrison Hall  
Evans Hall Hildebrand Hall  
Latimer Hall Boalt Hall  
Tolman Hall Barrows Hall

#### ≤ 10%

Etcheverry Hall Davis Hall  
Dwinelle Hall Lewis Hall Barker Hall  
Birge Hall

## A Look at Two of the Buildings

### Moffitt Library

Moffitt Library is the undergraduate library. Built in 1970, it comprises 122,000 square feet with five floors containing open stack areas, offices, and classrooms. The building has approximately 3,400 fluorescent fixtures.

In 1978-79 half the light fixtures in the open stack areas were delamped. (By today's lighting standards, Moffitt was vastly overlit.) We estimate that 24 percent of the library consists of open stacks.

During our current program, we had electronic ballasts and reflectors installed in the fixtures that had been left on, as well as in the open reading areas and offices. In the classrooms we removed two lamps from 141 four-lamp fixtures.

Moffitt is open for use daily from 7:00 a.m. until 2:00 a.m. Custodians clean the building between 2:00 a.m. and 7:00 a.m., and turn the lights off when they leave. But lights in the building are generally on about twenty hours a day.

A graph of electric use for Moffitt Library shows a 25 percent reduction in overall electrical use since the installation of electronic ballasts and reflectors.

### Latimer Hall

Latimer Hall is a chemistry building with laboratories, offices, and classrooms. It was built in 1963 and comprises 175,000 square feet with eleven stories.

Our work in Latimer involved replacing all the core-and-coil ballasts with electronic ballasts and using partial-powered ballasts in overlit areas (typically 70 to 85 percent of light output.) We installed optical reflectors in some areas and at the same time delamped from two lamps to one. We replaced opal lenses with prismatic, acrylic lenses.

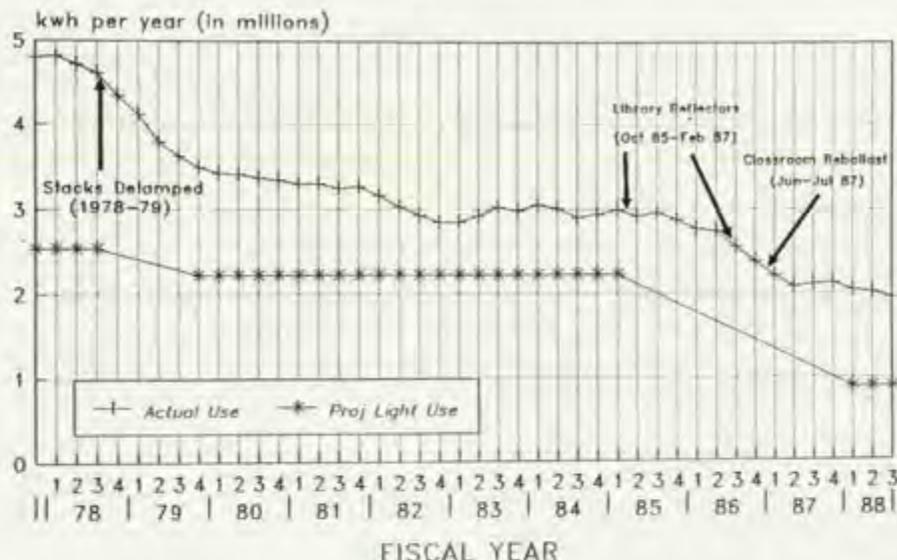
A graph of Latimer Hall shows a trend of increasing electrical use (1984 through 1987) was reversed as a result of our lighting program.

### Summary

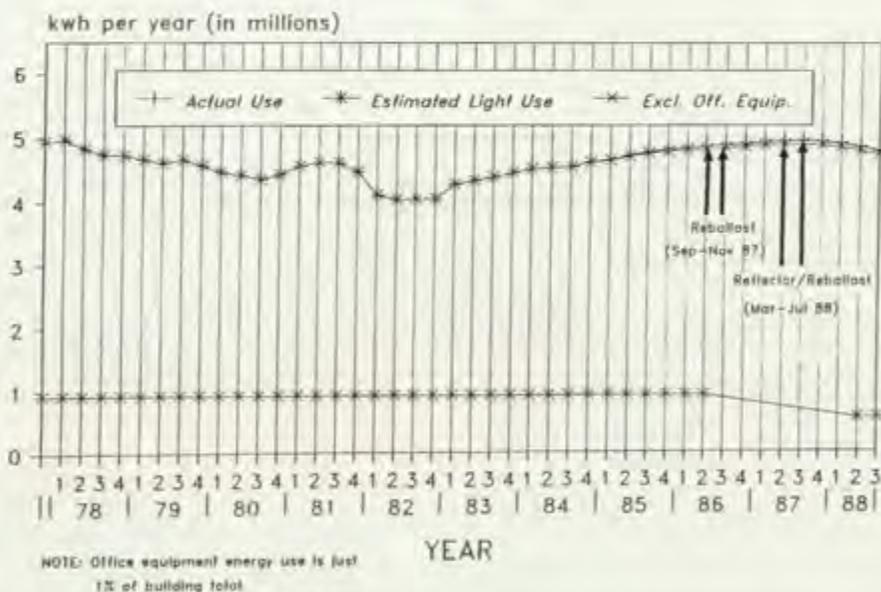
The success of our lighting retrofit program has proven the cost effectiveness of a variety of energy conservation measures. Facilities managers can reduce electrical use while providing adequate lighting for the building occupants. Our experience has shown:

- Electronic ballasts save energy

## Building Energy Use Moffitt Library and Classrooms



## Building Energy Use Latimer Hall



NOTE: Office equipment energy use is just 1% of building total

and are now highly reliable.

- Optical reflectors, if chosen properly, are effective and durable in many (but not all) applications; remember that in most situations you will have a more energy efficient fixture but lower light levels.

- Daylight and occupancy controls are reliable energy savers in many (but

not all) spaces; the most efficient light fixture is one that is off when not needed.

- Get rid of incandescent fixtures whenever possible; there is almost always a way to convert to fluorescent lighting and the benefits include reduced energy costs and reduced maintenance costs.

## Data Base Update

### IMPROVING THE ACCURACY OF YEAR-END FORECASTS

Since only the mediocre are always at their best we can all expect to make occasional mistakes (remember, even Noah took mosquitoes on the Ark). When it comes to mistakes it's how often and how big that really matters.

Accuracy comes easily enough when we have the right input, but what about when we are crystal ball gazing, trying to predict the future with only the past as guide. That's like trying to steer a ship by looking back at its wake. And that is what forecasting is like.

We all do forecasts. Sometimes it is to project labor, other times to restock inventory or gallons of oil for the upcoming heating season. Most often, and most important, we forecast budgets—money.

Typically, someone wants to know much we will spend by the end of the fiscal year? Crystal ball gazing is notoriously inaccurate, yet we are expected to end up reasonably within our prediction.

If you fully understood the science of forecasting you would probably be making considerably more money than you do now and spending your days at the track or the stock exchange. Or, of course, if you weren't embarrassed by it, you could become an economist and make a rather comfortable living.

While there are numerous statistical packages available to simplify using the esoteric tools of the forecaster's trade most of these software programs are as complex as the underlying techniques. In their attempts to gain an extra ounce of accuracy they require you to understand jargon and make decisions you are trying to avoid. So they add to the problem instead of the solution.

For those who use Lotus 1-2-3 to do their budgeting there is an add-in forecasting package that is easy to use, inexpensive, and can likely improve your marksmanship.

Isogon Corporation's Tomorrow arrives at its predictions by applying seven techniques of the economist's trade such as linear regression, Gardner's three parameter damped trend, and the ever popular Brown's one parameter triple exponential smoothing.

Since Tomorrow is an add-in utility it works from within Lotus. Exactly how you summon it depends on whether you are

*Howard Millman is assistant director of facilities at Columbia University's Lamont Doherty Geological Observatory in Palisades, New York, and Nevis Nuclear Laboratory in Irvington, New York. He is also a freelance technical writer and frequent contributor to several national computer magazines.*

Howard Millman

using 2.0, 2.01, 2.2 or 3.0. In any case it's not difficult. In fact, to be any easier the program would need training wheels. Once Tomorrow's five menu item replaces (temporarily) the Lotus menu, you select a range of cells that contain the historical data you want as the computational base. The larger the base the more meaningful the results will be. Next, you point to

where you want the forecast to appear on the spreadsheet.

Depending on your computer's horsepower and the size of the input data base, the answers will appear within a minute or two. Systems that have a math co-processor chip (8087, 80287, or 80387) produce results somewhat faster.

The forecast is perfectly formatted, text, labels, formulas, and constants are preserved. After exiting Tomorrow, these cells may be manipulated just as any other on your worksheet.

Tomorrow is designed to give you a slight additional edge in predicting variable numbers. Providing extraneous events do not skew the prediction, your forecast will be reasonably accurate. Additionally, by employing even abbreviated statistic generating software you introduce some readily defensible aspects into budget forecasting.

Tomorrow is not meant to replace your first hand knowledge but to augment it. It's another tool in your kit that is well matched to the task.

For more information contact the Isogon Corporation in New York at 212-967-2424. For orders only call 800-662-6036. Tomorrow retails for \$129.95 and operates on MS/PC DOS 2.0 or greater. ■

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## Training

**The Complete Guide to Supervisory Training and Development**, by Lester R. Bittel. Reading, Massachusetts: Addison-Wesley Publishing Co., 1987. 334 pp. \$32.95, hardcover.

*The Complete Guide to Supervisory Training and Development* is described by the publisher as "a comprehensive guide to the theory and practice of supervision, written from the point of view of the trainer and HRD professional." This statement partially conveys the utility of this book as a tool and a possible reference for the physical plant trainer or anyone responsible for supervisory training.

Bittel manages to initially explore the challenges faced by modern organizations in developing necessary skills and competency for supervisors. By systematic analysis the critical factors in supervisory development are examined in the context of the role of the supervisor "as a distinctive segment of management." Today's supervisors are then profiled by statistical information, general perceptions, and attitudes that are intuitive to the basic characteristics of this role.

The author progresses beyond traditional role concepts (illustrated by historic graphics promoting the supervisor as the "keystones in the organizational arch, link pins, and facilitator") to current definitions

# The Bookshelf

and viewpoints of the changing scope and nature of supervisory responsibilities. The segmentation of these responsibilities into essential categories and ranking competency may provide some readers with the necessary overview for meaningful training analyses. For others who may be preparing for a recruitment, the review of Chapter 4, Selection of Supervisors, may be beneficial.

The introduction's cliché, "you can't make a silk purse from a sow's ear," illustrates the importance of initial selection in the relation to ultimate development. Instructive observations on avoiding misfits and improving the selection process are presented, along with the four basic traditional phases or steps of supervisory selection. This and other suggestions as model supervisory selection program, assessment-center methods, and operational considerations possibly provide additional, although often short-supply, food for thought.

The book's strength does not fully materialize until the necessary tools for assessing supervisory-training needs are revealed. It is in these areas that the author diagnoses and elaborates on the guidelines for effective training and learning. Here, more than just general background and basic information on training are given. Beginning with "A Conceptual Framework for Supervisory Development," the author expands his narrative to provide more than a backdrop of material and specifically deals with issues that would serve the needs of a trainer for program planning and design. The trainer's role in ongoing management of programs and the need for continuing evaluation and follow-up are also addressed by the author's research and presentation.

The appendix provides a variety of material that can constructively assist trainers. It ranges from background on contemporary theory and research to model course outlines. In addition, sample forms, worksheets, and a bibliography are provided. Most organizations would find this information helpful and perhaps realize some favorable impact from its usage. You may find the guide, now and then, not simply resting on the shelf.

This book is available from Addison-Wesley Publishing Company, Route 128, Reading, Massachusetts 01867.

—Jim Burke

Assistant Director, Plant Operations  
Humboldt State University  
Arcata, California

## Sci-Tech Libraries

**Innovations in Planning Facilities for Sci-Tech Libraries**, ed. Ellis Mount. New York: The Haworth Press, Inc., 1986. 158 pp. \$22.95, hardcover.

Part one of this book is a description of five science and technologies libraries and their unique features. The establishment of a new library facility and the special problems related to a long distance move are covered. The other four chapters discuss the plans for moving other sci-tech libraries to new facilities. The authors are librarians with little or no background in any facilities areas. The chapters are presented in diary form listing events similar to buying a new house, with no technical information offered. The only part that relates to facilities planning is a floor plan of each library at the end of every chapter.

The second part of the book has two unrelated chapters. One of them discusses the impact of on-line search services on special libraries. This article concludes that although the availability of on-line data bases has influenced libraries' decisions to cancel publications, there is no evidence of wholesale migration.

The second chapter discusses information sources in laser technology. Here a brief introduction of laser technology is followed by a list of periodicals, research papers, monographs, patents, and bibliog-



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raphies on the topic. The end of the book contains an annotated bibliography of new reference works in science and technology.

After reading the book I began to wonder what the contents really had in common with the title. My conclusion was, very little at best. There is hardly anything innovative with what is presented in the book, and facilities planning is barely addressed. I cannot recommend the book for any of my colleagues.

This book is available from The Haworth Press, Inc., 12 West 32nd Street, New York, New York 10001.

—**Mohammad H. Qayoumi**

Associate Executive Vice President  
Facilities Development and Operations  
San Jose State University  
San Jose, California

### Cultural Significance in Facilities Managers

**The Invisible Tapestry: Culture in American Colleges and Universities**, by George D. Kuh & Elizabeth J. Whitt. Washington: Association for the Study of Higher Education, 1988. 144 pp. \$15, softcover.

The concept of corporate culture has become an important field of concentration in scholarly management literature during the past decade. Not surprisingly, the notion that culture also affects colleges and universities has invaded the higher education literature; *The Invisible Tapestry*, a report to the higher education community, analyzes this concept. This monograph is one of the prestigious ASHE-ERIC Higher Education Reports, and it represents significant research and review efforts by the authors and the editorial staff. The Association for the Study of Higher Education (ASHE) and the ERIC Clearinghouse on Higher Education of the George Washington University cosponsor these reports; topics are identified by a national survey, noted scholars and practitioners write the reports, and expert editors and advisors review the manuscript before publication. *The Invisible Tapestry* represents the first complete synthesis of the literature and experience concerning culture in higher education in the United States.

Kuh and Whitt have provided an excellent beginning at a formal attempt to understand the elusive notion called culture in our colleges and universities. The report examines how cultural perspectives can be used to describe, understand, and appreciate college and university life.

The book is divided into seven sections and includes an extensive bibliography. The first two sections of the book present definitions and descriptions of culture, and proposes a basic premise of the work: culture should be viewed as an interpreting framework for understanding events, rather than a mechanism to influence or control behavior in the academy.

The third section describes the intellec-

tual foundations of culture. Culture is shown to be so complex that no single academic discipline can adequately explain it; sociology, anthropology, and social psychology are at least three areas that can be used to study this subject.

In the fourth section the authors suggest a framework for analyzing culture in higher education, featuring the effect of the external environment, institutional factors, subcultures, and individual factors on culture. The roles of institutional subcultures, especially those of the faculty and the student body, are reviewed in this section.

Section five covers the lack of culturally significant details in most historical literature concerning higher education institutions, and also indicates that maintaining a coherent and distinctive culture may be difficult for larger institutions.

In the final section, the authors offer ten implications for the higher education community, based on the findings of their research for the book. They also conclude that each college and university should consider implementing a cultural audit, to understand and appreciate more completely the institution's evolution and direction.

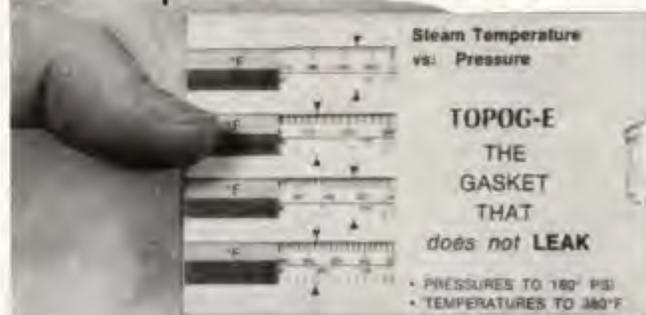
The report reaches several conclusions that are important for facility managers in higher education. One conclusion suggests

that the physical environment of an institution has important cultural significance since it directly reflects distinctive values and aspirations of those who live and work there. Physical plant personnel caught in the capital renewal/deferred maintenance dilemma must stress the value of maintaining the architecture and environment of the institution as an expression of the culture of the institution.

Another factor that affects not only facility managers, but also the entire institutional community, concerns the complexity of a modern college or university as an organization; viewed from a perspective of culture, the processes of decision making can become more deliberate and rational. Finally, the authors indicate that history and institutional culture are inextricably intertwined. Facility managers should consciously and aggressively promote the transfer of information, in the form of data, drawings, and related materials, to institutional historians and archivists to help preserve the complete history and culture of an institution.

The report is predicated on one concept that may not stand the test of time. Some management literature, especially Deal and Kennedy (*Corporate Culture: The Rites and Rituals of Corporate Life*) suggests that a corporate culture can be manipulated or controlled. The authors of the report reject

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this view, and suggest that, over time, substantive changes in an institution's culture are not necessarily predictable or controllable. Further research into culture manipulation and control may clarify this issue; for the present, however, the evidence is not strong enough to support the report's conclusion.

The report also fails to recognize the extent of the contribution staff members give to the culture of an institution. While the authors do recognize an administrative subculture, the role of staff members in helping mold and maintain the culture of an institution is given very little attention. This omission may be a direct result of the failure of institutional staff members to gain visibility and recognition commensurate with their contributions to the university or college. Facility managers should recognize that the higher education community in the United States is not aware of the significant impact that staff members have on the creation and maintenance of the culture of a higher education institution.

This book is an example of scholarly literature that has significant practical value for facilities managers. This book will undoubtedly become the basis of significant research regarding educational culture, a new area of focus in the study of higher

education programs. For these reasons, *The Invisible Tapestry* is highly recommended and should find wide acceptance in college and university communities throughout the country.

This book may be ordered from ASHE-ERIC Higher Education Reports, The George Washington University, One Dupont Circle, Suite 630, Washington, DC 20036-1183.

—John M. Casey, P.E.  
Manager, Engineering Department  
The University of Georgia  
Athens, Georgia

### Budgeting

**Operational Planning and Budgeting for Colleges**, by John Dozier, Sherwin Howard, Robin Jenkins, M.J. Williams Jr., & Philip J. Bossert. Washington: National Association of College and University Business Officers, 1988. 80 pp. softcover.

This book is a revised edition of a 1980 NACUBO publication entitled *A Planning Manual for Colleges*. The revisions to the original document have been made to relate this manual to and to be used in conjunction with several other NACUBO planning manuals.

NACUBO has been providing direction to the higher education community for decades concerning the need for and benefit derived from institutional planning and budgeting as an integrated process. This publication presents, in a straightforward style and format, the means to establish an operational and planning budget process. This book provides model planning/budgeting calendars, recommends who should participate in the process and what the basic roles of each might be, describes the basic information necessary to accomplish the process, and makes specific reference to other NACUBO publications. Also provided are sample planning forms and examples of how the process has been adapted by four different colleges. This publication is highly recommended to all for its potential usefulness for integrated planning and budgeting and its value in coalescing the other NACUBO publications into a comprehensive whole.

This publication is available from NACUBO, One Dupont Circle, Suite 500, Washington, DC 20036

—Gregory W. Bressler  
Associate Vice President  
Facilities Management and Planning  
Trenton State College  
Trenton, New Jersey

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Kenwood High School, Baltimore County School District



Hertz Hall, Central Washington University



Physical Education Building, Westchester Community College

### Kenwood High School, Baltimore County School District, MD

The fiberboard insulation in this school's original 1953 roof was completely saturated with water in some sections—a total reroofing was required.

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The over-110,000 ft<sup>2</sup> of FOAMGLAS® insulation is providing Baltimore school officials with energy savings, reduced maintenance costs, the security of total noncombustibility, and dimensional stability which will add years of efficient performance to the *entire* roof.

According to E. Joseph Martin, assistant supervisor of building inspection and major roof renovation for the Baltimore County Public Schools, the PC PLUS SYSTEMS are "literally trouble- and maintenance-free."

### Hertz Hall, Central Washington University, Ellensburg, WA

Severe water damage necessitated a total reroofing of Hertz Hall, which houses the music department, and the roof on the University's Central Boiler Building.

Considered but rejected were fiberglass... too cost prohibitive; EPS foam... highly flammable and too low in density; and perlite which is thermally inefficient and absorbs moisture.

Based on performance tests and building code drainage requirements, tapered PC PLUS SYSTEM 3 was specified for Hertz Hall. This system of FOAMGLAS® insulation with polyisocyanurate underlayment provided high R-value; noncombustibility; an ideal surface for the new single-ply, modified bitumen system; and economy.

For the Central Boiler Building, a non-tapered, All-FOAMGLAS® PC PLUS SYSTEM 1 was selected because of its high compressive strength and its ability to provide the total moisture resistance necessary to avoid vapor penetration and blistering problems.

### Physical Education Building, Westchester Community College, Valhalla, NY

"For this type of facility we wanted the best insulation we could get," says Anthony Loscri, Senior Civil Engineer, Westchester County Department of Public Works.

This State University of New York (SUNY) building required reroofing over both its gymnasium and natatorium. Membrane cracks had developed and se-

vere ponding and leaking were occurring.

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"It costs a little more," says Mr. Loscri, "but after seeing the results of other roof board insulations I was willing to spend more for a better insulation system."

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*Perspective continued from page 20*  
questioned, and where objective standards and criteria should abound.

Let me offer a few observations by way of conclusion.

First, I would applaud the heightened awareness of facilities needs that has gained the consciousness of higher education as a community. If we have tended to take our facilities for granted in the past, that is clearly no longer the case. The role of APPA is a major catalyst in this change, and the credit is due to its leadership.

Second, the relationship between facilities (especially research facilities) and the federal government is becoming increasingly complex, but it serves to draw attention to the urgent needs we share. The importance of maintaining the peer review process for scientific facilities seems clear to me, even if we acknowledge occasional defections in the ranks. The prospect of an NSF or NIH facilities package is the key not only to our success in this area, but also may be the key to maintaining ranks in the face of growing temptation to pursue separate facility funding.

Third, assessment is a key of a different sort, one to which APPA has re-

cently committed itself with special fervor. I applaud that commitment, and will do whatever I can to support it. The relationship between APPA's assessment and audit efforts and the world of accreditation should be clear and should reflect the convergence of values.

Fourth, I would hope that standards—and perhaps the process by which they are applied—would not only evolve with experience, but would also benefit from discussion with other higher education groups. The maturation of such standards often benefits from sharing with others, especially with groups that evince the keen interest that others have in the facilities assessment process.

Finally, I hope that facilities administrators will seek all the support possible from interested groups. It should be clear that physical plant departments do not themselves use the facilities they build, maintain, and remodel; they are rather the facilitators of the essential work of others who teach, study, and serve through those facilities. What is needed is the strong support and advocacy of the institution's principal clients, its faculty, and students. ■

## Congratulations! WILLIAM S. MUTCH University of Calgary

Recipient of the 1989 Rex Dillow Award for Outstanding Article "The 1988 Olympic Winter Games: The University of Calgary Involvement" Summer 1988 *Facilities Manager*



Mutch, left, was presented the award by Alan Lewis at APPA's 76th Annual Meeting.

PHOTO BY STEPHANE CROCIERON

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CHAPTER 5

## Protective Systems

Electric current always follows the path of least resistance. Electric current confined to a conductor by the dielectric around the conductor. If a conductor between two conductors or between a conductor and ground drops to zero, a large current is going to flow in the circuit. This is called short-circuit current because the current has found a shorter path to going through the load.

### Available Short-Circuit Current

The short-circuit current can be as high as 10,000 times the rated current. Fault currents can be very destructive, causing equipment damage, fire, and personal injury. The short-circuit current magnitude is not a function of the load, but of the capacity of the power source and the length and size of the conductors.

In an electrical system, the following are considered as fault currents: 1. Short-circuit current. 2. Ground fault current. 3. Overcurrent current. 4. Overvoltage current. 5. Undervoltage current. 6. Overfrequency current. 7. Underfrequency current. 8. Overcurrent current. 9. Overvoltage current. 10. Undervoltage current. 11. Overfrequency current. 12. Underfrequency current.

### Generators

Because of seasonal variations, electric loads in addition, space occupancy, plants, and other factors, the demand on the system varies. The demand on the system varies from the load to the degree of utilization. One of the most common causes of system failure is taking an unnecessary of major electrical loads and non-essential loads. Non-essential loads are those loads which are not essential to the operation of the system. The non-essential loads can be determined from long and low utilization factors. The next step is to program the system to such a way as to turn off the lower priority loads and continue to higher priority loads when the demand decreases beyond a certain point. It is important to make sure that the maximum frequency and length of downtime is not exceeded.

In cases in which some of the loads can be cycled, a peak shaving generator might be economically feasible. This will only be economical if high peak demands exist for less than a few hours a day and if more than 1,000 kilowatts can be shaved. It is important to remember that, because of economies of scale, on-site generation is more expensive on a kilowatt.

Figure 8-8  
 Saw-tooth Load Variation



150

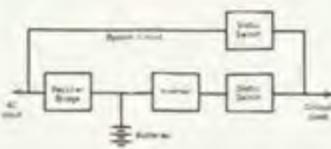
power and  
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### Peak Shaving

Electrical energy is needed to perform mechanical work. The rate at which electrical energy is used is referred to as power demand, and is measured in kilowatts. Normally, peak power demand is reported on a utility for a specified time period (monthly, bi-monthly, or daily intervals during a billing period).

The electric utility charges the customer based on the highest demand rate, unlike a telephone system, an electric utility must meet the peak power demand of its customers. The utility should have a distribution system large enough to meet peak demand even if it only occurs once a year for five minutes.

Figure 8-7  
 Schematic of an Uninterruptible Power Supply System



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