

CHIHA .

111

TTT



Facilities and the Academic Mission

Also in this Issue: • Spill Detection • Choosing the Team • New Products



PCPLUSYSTEMS SOLVE THREE REROOF PROBLEMS

Tapered FOAMGLAS® Roof Insulation, featured in PC PLUSYSTEMS,® provides a unique and desirable combination of long-term operating efficiency, reduced maintenance costs, and safety.



Kenwood High School, Baltimore County School District



Hertz Hall, Central Washington University

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.

Since PC PLUSYSTEMS[™] had previously proved successful in other Baltimore Schools, PC PLUSYSTEM 1, the AII-FOAMGLAS[®] system — the only insulation on the market resistant to moisture in both liquid and vapor forms was selected for Kenwood.

The over-110,000 ft² 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 PLUSYSTEMS^{**} are "literally troubleand maintenance-free."

Hertz Hall, Central Washington University, Ellenburg, 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.



Physical Education Building, Westchester Community College

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 PLUSYSTEM 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 nontapered, All-FOAMGLAS® PC PLUSYSTEM 1 was selected because of its high compressive strength and it's 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 severe ponding and leaking were occurring.

Anthony Loscri specified guaranteed, totally moisture-resistant, All-FOAMGLAS* PC PLUSYSTEM 1 over the humid natatorium; and guaranteed, high R-value, PC PLUSYSTEM 2 — FOAMGLAS* with Phenolic Foam underlayment — over the gymnasium.

"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."

For roof insulation on your facility... where reliability, efficiency and safety are "required subjects," a PC PLUSYSTEM can meet all of your demands.

For copies of Case Studies on the three facilities, or more information, call (412) 327-6100, Extension 356. Or write Pittsburgh Corning Corporation, Marketing Department FB-8, 800 Presque Isle Drive, Pittsburgh, PA 15239. In Canada, 106-6 Lansing Square, Willowdale, Ontario M2J 1T5, Tel: (416) 222-8084.

PITTSBURGH



Volume 4 Number 4 Winter 1988

Facilities Manager (ISSN 0882-7249) is published quarterly (Spring, Summer, Fall, Winter) by the Association of Physical Plant Administrators of Universities and Colleges, 1446 Duke Street, Alexandria, Virginia 22314-3492. Editorial contributions are welcome and should be sent with SASE to this address

Of APPA's annual membership dues, \$30 pays for the subscription to Facilities Manager and APPA Newsletter. Additional annual subscriptions for both periodicals cost \$40 (\$50 for non-U.S. addresses).

For information on rates and deadlines for display and classified advertising, telephone 703/684-1446. Copyright © 1988 by the Association of Physical

Plant Administrators of Universities and Colleges. Contents may not be reprinted or reproduced in any form without written permission. The opinions expressed are those of the authors and do not necessarily reflect the views of APPA. Editorial mention. of companies or products is for informational pur-poses only and should not be construed as an endorsement, actual or implied, by the Association.

POSTMASTER: Send address changes to Facilities Manager, 1446 Duke Street, Alexandria, VA 22314-3492

1988-89 Professional Affairs Committee

Alan D. Lewis, Colby College, Chair Charles C. Beaswell, North Carolina State University Nicholas Cimino, Truckee Meadows Community College

Fred Giles, Northern Arizona University Russ A. Gonder, University of Western Ontario Arthur B. Jones, Black Hills State College Philip G. Rector, University of Arizona Roger E. Rowe, Miami University

APPA President Dorsey D. Jacobs, West Virginia University

Executive Vice President Walter A Schaw, CAE

Editor Steve Glazner

Assistant Editor Stephanie Gretchen

Advertising Diana L. Tringali

Subscriptions Maxine Mauldin

Design Sans Serif Graphics, Ltd.

Typography Unicom Graphics

Printing Hundley Lithograph, Incorporated

Editorial Office 703/684-1446

FAX 703/549-APPA (2772)

Facilities Manager

Table of Contents

Features

Facilities and the Academic Mission
by Ernest L. Boyer
Preventable Disasters: Spill Detection at Stanford's Center for Integrated Systems
by Renew Olivier Oleen 18
Chapping the Team for Major Physical Development Projects
choosing the ream for Major Physical Development Projects
by E.A. Dews

Departments

Cover illustration by Steve Clements.

APPA Update
Inside APPA
1989 APPA Educational Programs
Membership
Resource Bank
Job Corner
Coming Events
Perspective 1
Higher Education's Ticking Time Bomb
by Walter A. Schaw
New Products
Resource Management
by Beth A. Rosenfeld
Data Base Update
by Howard Millman
The Bookshelf
Reviewed in this issue
 Mechanical and Electrical Equipment for Buildings
 Professionalizing the Organization
 Integration of Efficient Design Technologies
 Financial Management
Index of Advertisers

The DECAYING AMERICAN CAMPUS

A TICKING TIME BOMB

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.

Coopers & Lybrand

by Sean C. Rush

A joint report of Association of Physical Plant Administrators of Universities and Colleges

and

National Association of College and University Business Officers with the assistance of Coopers & Lybrand

Published by the Association of Physical Plant Administrators of Universities and Colleges

\$ 8 shipping handling

and the second	colors or a second self-providence of the	nes au quo cacin (ci	ourges and aniirersities only) o		
50 each (all others). Add \$	8 for shipping and handling. My total is	\$			Who should order The Decaying
Check Enclosed	P.O. Enclosed (APPA members only)	Send Memi	vership Information		 American Campus College presidents and universit
lame		Title		- /	chancellors Funding sources such as state
natitution		Phone	1		legislatures and boards of truste Business officiens
treet Address (No P.O. Bax p	lease				 Facilities managers Architects and planners
	0.	te	7.m		 Suberts of business and educa administration

3

APPA UPDATE

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

Custodial Staffing Guidelines

by Robert Getz, Jack Dudley, and Kirk Campbell

H ave you ever been asked to justify your staff? Has anyone ever asked why there are eight custodians assigned to the administrative building? Have you ever been challenged to explain why you require six custodians to staff the newly constructed addition? Is there any logic to the 5 percent or 10 percent cutbacks you have been required to absorb over the past five years?

These questions have become a nemesis over the past ten to fifteen years. Where do you turn for support? We have gone to our industry associations and conferences. At the Midwest Association of Physical Plant Administrators' (MAPPA) 1986 annual meeting in Grand Rapids, we brought those questions to the fore at our experience exchange. We met with APPA's Executive Director, Walter Schaw, and said we needed answers. He promised support!

The quest for help in answering these questions on custodial staffing was brought to the 1987 annual spring meeting of Big Ten and other midwest university physical plant directors. Fred Garcia, of the University of Illinois at Chicago, asked for support. The conference attendees agreed to establish an ad hoc committee to study the subject.

During the summer and fall we held a series of meetings at which a direction evolved. The concept of staffing guidelines began to be fleshed with ideas. Words such as service levels, types of buildings, expectations, and first class began to jell into a direction. We formed a matrix that combined service levels with types of buildings, which raised our expectations for a solution.

The fall of 1987 was pivotal. We took our concept and direction to the Big Ten Conference on Custodial Care at Iowa State University. It was enthusiastically received and supported. We also presented our ideas to MAPPA at Indianapolis. It was not only received well by the membership, but also by APPA's leadership. H.C. Lott, APPA's 1987-88 President, suggested a research study on the subject be developed, and support was promised by the new APPA President-Elect Dorsey Jacobs. We provided that research study to the APPA Board of Directors in Jaunuary 1988, where it was approved for funding.

A historic occasion took place on May 16, 1988. Twenty-four APPA institutions and six national associations met as an advisory committee to our Operations Committee, with the specific purpose of developing custodial staffing guidelines. Our purpose was to answer those questions concerning staff sizing.

That initial meeting was not just a rubber stamp of the Operations Committee's proposal. Long, hard, and sometimes heated discussions took place. The Advisory Committee's willingness to agree to reasonable concessions and equal tradeoffs resulted in not a watered-down direction, but a powerful statement.

The concept of service levels was approved. It was agreed those levels would vary, depending upon the types of areas to be serviced and the degree of effort expended. Two goals received unanimous votes: An APPA recommended standard would be developed.

Campus customers would be provided with expectations against which they may measure service.

During the next few months, our Operations Committee will be quantifying the deliberations of the Advisory Committee. We will be putting those discussions, directions, and goals into a quantified format which may be developed into a data base.

Now is the time for involvement. Do you have responsibilities which include the custodial care of offices, laboratories, classrooms, clinics, hospitals, or the like? If your reply is affirmative, get involved. Join us on the cutting edge of the industry. Help the effort through participation in the development of our data base. The larger the number of institutions involved, the more accurate our data base and analysis will be.

In order to become a participating institution in this study, you need only contact a member of the Operations Committee by phone or letter. Robert A. Getz, Associate Director of Physical Plant, University of Illinois at Chicago, Physical Plant (M/C 270), P.O. Box 4348, Chicago, IL 60680; 312/996-2837. Jack Dudley, Director of Facilities Management, University of Wisconsin-Parkside, Box Number 2000, Kenosha, WI 53141; 414/553-2001. John Kirk Campbell, Assistant Director of Physical Plant, University of Minnesota, 307 Shops Building, 319 15th Avenue S.E., Minneapolis, MN 55455; 612/624-9855. Your support is required to ensure a successful conclusion to this research study.

	C	USTODIAL	STAFFING GU	IDELINES		
THE REAL PROPERTY AND			TYPES O	FAREAS		
SERVICE	HOSPITAL	HEALTH	LABORATORY	CLASSROOM	OFFICE	PHYSICAL
1						
2 APPA RECOMMENDED STANDARD						
3						
4						
5						

Inside APPA

APPA Member Coauthors Article on Planning

APPA member Jon H. Larson, dean of institutional services at Frederick Community College in Frederick, Maryland, cowrote an article on higher education planning perspectives published in the summer 1988 issue of CUPA Journal. "Higher Education Planning Perspectives: An Historical Overview, the Administrators' Perspectives, and the View from Two-Year Colleges" highlights findings from the initial phases of the Institutional Planning Project. The project is a threeyear study of campus-wide planning initiated in November 1985 by the National Center for Postsecondary Governance and Finance, a federally funded research consortium headquartered at the University of Maryland/College Park.

The Institutional Planning Project addresses the need for planning guidelines and recommendations based on information about conditions and constraints affecting planning in institutions of higher education. Information is being gathered through a literature review, a survey of administrators' planning attitudes and perceptions, and detailed case studies of campus planning activities and experiences.

The article presents a brief review and analysis of higher education planning efforts, selected findings from two empirical studies, and preliminary conclusions and implications concerning the consistency of current planning approaches with the actual perspectives and behaviors of campus staff.

The two studies showed the project survey of planning attitudes of administrators in 256 colleges and universities and a pilot study of the fit between community college division heads' planning perspectives and the assumptions underlying strategic planning.

Historic Preservation Awards Presented

Twenty-eight historic preservation awards, sponsored by the Advisory Council on Historic Preservation and the Department of Interior, were presented on November 18 in Washington, D.C. Ten President's Historic Preservation Awards for excellence in privately-funded historic preservation were given by President Reagan; eighteen National Historic Preservation Awards in federally-assisted preservation were presented by ACHP chairman John F.W. Rogers.

The two-part awards program honors historic preservation accomplishments since passage of the National Historic Preservation Act of 1966 (NHPA). The winners have demonstrated the enormous range of preservation accomplishments since NHPA established the nation's first comprehensive, government-wide policy to support historic preservation.

Award categories include adaptive reuse of historic buildings, corporate-sponsored preservation, urban planning, rehabilitation of public buildings, archeology, and continuous use of historic properties. Other categories are maritime, rural, bridge preservation, and innovative programs.

To be eligible for consideration, a project or program must have resulted in the preservation of a specific historic property that is listed in, or eligible for, the National Register of Historic Places; preservation must have been completed within the past ten years, and the building must currently exist or be in use. For more information, contact the Advisory Council on Historic Preservation, 1100 Pennsylvania Avenue, NW, Suite 809, Washington, DC 20004; 202/786-0503.

New Book Advises Engineering Students to Study Liberal Arts

Unfinished Design: The Humanities and Social Sciences in Undergraduate Engineering Education, published in August by the Association of American Colleges, recommends that engineering students include a well-conceived program of humanities and social sciences (H&SS) courses in their undergraduate studies. The book presents results of a survey on H&SS course work at 280 institutions with accredited engineering programs.

The survey reveals that "although a broad foundation in the liberal arts is essential for engineering students, no group of undergraduates seems less likely to encounter liberal arts disciplines." The findings indicate that more extensive, comprehensive, and detailed H&SS requirements are needed at the Accreditation Board for Engineering and Technology and program levels. Unfinished Design may be obtained from Publications Desk, AAC, 1818 R Street, NW, Washington, DC 20009. Cost is \$9; all orders must be prepaid.

CUPA Publishes Higher Education Job Listing

For facilities managers interested in posting a job opening or finding a new position, *The Insider* is a new avenue of opportunity.

The Insider is a biweekly publication of both positions wanted and help wanted advertisements of nonfaculty, administrative, professional, and technical positions in higher education.

The Insider's circulation of 65,000 consists of such professional associations as AACRAO, NAWDAC, AAAA, and NACUBO. The magazine is produced by Professional Networking, a subsidiary of the College and University Personnel Association, and is cosponsored by APPA and other associations.

For advertising or subscription information, please contact Joan Knoerdel at 800/444-7650; in the Washington area call 251-5356, or write to PO. Box 6095, Rockville, MD 20850.

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, Newsletter Editor, 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 APPA Educational Programs

APPA 76th Annual Meeting

A unique blend of programming for facilities management professionals focusing on critical issues in higher education, technical papers and keynote addresses. More than 150 companies exhibit their products and services at the show. Program also features the Awards for Excellence, Meritorious Service Award and other highlights of the association's efforts.

July 16-19 Bally's Hotel Reno, Nevada

APPA Executive Development Institute

A program for senior facilities managers that provides the skills necessary to play an effective role in facilitiesrelated institutional policymaking, financial management, and strategic planning, and to assure a more productive, service-oriented facilities support organization.

April 9-14 University of Notre Dame South Bend, Indiana

APPA Institute for Facilities Management

Three track regular program with special small college section covering basic physical plant management issues through contemporary issues facing today's managers. Each institute also features special programs which cover a specific area of facilities management in depth.

January 15-20 Austin, Texas Personnel Management Capital Project Planning and Construction

August 20-25 Baltimore, Maryland Special Programs: Maintenance Management Management of Medical Reseach, and Health Science Institutions

January 7-12, 1990 Tempe, Arizona Management of Residence Halls To Be Announced

Capital Renewal/Deferred Maintenance Workshops

To preserve the facilities of higher education is a



For more information on these APPA programs, please contact the APPA Education Department, 1446 Duke Street, Alexandria, Virginia 22314; 703/684-1446.

primary objective of facilities management. This program focuses on the size of the problem and the need for teamwork to solve it. Examine issues of audit/ evaluations, funding alternatives, strategies for developing and implementing a CRDM plan, review FASB/GASB financial concepts.

Late April/Early May-3 workshop offerings-Washington, DC/Central/West Coast

Custodial Staffing and Standards Seminar

Learn how to develop guidelines for custodial and building maintenance that will enable you to judge how much manpower is necessary and how to coordinate scheduling. Also, learn techniques to motivate staff members and improve performance standards.

February 21-22 Town and Country Hotel San Diego, California

Cosponsored Educational Programs:

Hazardous Waste Management

(Cosponsored with NACUBO) Focus on management of cost-effective programs to comply with governmental regulations. Examine insurance, liability exposure, consultant selection and many other topics.

January 12-13 Anaheim, California March 23-24 Kansas City, MO

Historic Preservation Workshop

(In Cooperation with the University of Virginia) Focus on specific issues like financing options involved in historic preservation and restoration work on campus. Workshop sessions cover masonry conservation, materials testing, paint analysis, and other techniques.

February 23-25 University of Virginia Charlottesville, Virginia

Membership

New Institutional Members

Chippewa Valley Technical College, 620 West Clairemont, Eau Claire, WI 54701; 715/833-6207. Representative: A. Jack Wilfong, facilities manager.

Multnomah School of the Bible, 8435 NE Glisan Street, Portland, OR 97220; 503/255-0332. Representative: Bob Lewis, director of physical plant.

Rappahannock Community College, Route 33, PO. Box 287, Glenns, VA 23149; 804/758-5324. Representative: Donald G. Blankenship, dean of financial and administrative services.

Santa Monica Community College, 1900 Pico Boulevard, Santa Monica, CA 90405; 213/452-9228. Representative: Peter A. Hansen, facilities services administrator.

University of Portland, 5000 North Willamette Boulevard, Portland, OR 97203: 503/283-7306. Representative: Eugene M. Trapp, director, physical plant.

New Institutional Representatives

Aquinas College, Grand Rapids, MI: R. Gregory Gordon, director of maintenance.

Albright College, Reading, PA: Edward B. Holtzman, director of physical plant.

Barnard College, New York, NY: Drew van Hook, director, physical plant.

Bergen Community College, Paramus, NJ: David T. Braddish, executive assistant to the president.

Catholic University, Washington, DC: Howard J. Levo, director of planning and construction.

Concordia Theological Seminary, Fort Wayne, IN: Gaylor L. Fisher.

CUNY Graduate School, New York, NY: Lou Vecchi, director of facilities.

Dickinson College, Carlisle, PA: Don Santostefano, director of physical plant.

George Brown College of Applied Art and Technology, Toronto, Ontario, Canada: James Graham, director, physical resources. Hutchinson Community College, Hutchinson, KS: Gene Allton, director of plant facilities.

Illinois State University, Normal, IL: James D. Demarest, director of physical facilities.

Immaculata College, Immaculata, PA: Sister Paula Marie, treasurer.

Jersey City State College, Jersey City, NJ: Lewis Brower, director of facilities.

Lehigh University, Bethlehem, PA: Gary A. Falaska, director of physical plant.

Muhlenberg College, Allentown, PA: Michael H. Brewer, director of plant operations.

Northeastern Illinois University, Chicago, IL: Joseph P. Kish, director, physical facilities.

Peralta Community College District, Oakland, CA: Arthur E. Sykes, director of physical plant.

Phillips University, Enid, OK: William C. Meyer, director of physical plant.

Post College, Waterbury, CT: James R. Roaix Sr., director of buildings and grounds.

San Diego State University, San Diego, CA: Charles A. Sippial, director of physical plant.

School of Hygiene and Public Health, Johns Hopkins University, Baltimore, MD: Michael Linchan, director of facility management.

Southern Baptist Theological Seminary, Louisville, KY: Michael Besspiata III, director of facilities management.

Springfield College, Springfield, MA: Stephen C. LaFever, director, physical plant.

Stevens Institute of Technology, Hoboken, NJ: Kiomars Sorooshyari, director of physical plant.

Texas A&M University/Galveston, Galveston, TX: Tommy Thurman, director of physical plant.

University of Montana, Missoula, MT: Hugh A. Jesse, director, facilities services.

University of Puerto Rico, San Juan, PR: Carlos R. Rodriguez, director of buildings and grounds. University of Washington, Seattle, WA: Jeraldine McCray, director, physical plant.

University of West Florida, Pensacola, FL: Samuel Earl Smith, director, physical plant.

Washington University School of Medicine, St. Louis, MO: Dr. Paul P. Hipps, director of physical plant.

Wheaton College, Wheaton, IL: Bruce Kastelic and Jim Johnson, directors of physical plant.

New Associate Members

American University, Washington, DC: Roosevelt Dailey, Dan Vershay.

Baylor University, Waco, TX: Donald Hubbard.

Clemson University, Clemson, SC: Adrienne G. Halfacre.

Colorado School of Mines, Golden, CO: Robert A. MacPherson.

CUNY/Brooklyn College, New York, NY: Rose C. Erwin.

Eastern Michigan University, Ypsilanti, MI: Robert Tutsock.

Essex Community College, Baltimore, MD: Alonzo Grover,

Florida State University, Tallahassee, FL: Stu Griffith.

Gallaudet University, Washington, DC: Mark Adams.

Harvard University, Cambridge, MA: Harold A. Hawkes.

Lamar University, Beaumont, TX: Will Cotton, Stanley C. Cromartie.

McMaster University, Hamilton, Ontario, Canada: R.H. Crook.

New York University Medical Center, New York, NY: Raymond Herman.

Northern Arizona University, Flagstaff, AZ: Mark Flynn.

Prince Georges Community College, Largo, MD: Frederick E. Nunley.

Rutgers University/Camden Campus, Camden, NJ: Martin M. Rogers.

San Jose State University, San Jose, CA: Reuben Sarkissian.

-

Santa Monica Community College, Santa Monica, CA: LeRoy M. Hoff.

School of Hygiene & Public Health, Johns Hopkins University, Baltimore, MD: Stephen Howard.

Southern Alberta Institute of Technology, Calgary, Alberta, Canada:L.E. Hutchison.

Suffolk County Community College, Selden, NY: Richard Glasheen, Harry E. Matthews.

SUNY/Buffalo, Buffalo, NY: Louis J. Schmitt.

The Citadel, Charleston, SC: Michael D. Groshon.

Union Theological Seminary, New York, NY: Pete Slivensky.

University of Arkansas/Fayetteville, Fayetteville, AR: Robert Washburn.

University of California/San Francisco, San Francisco, CA: Diane McGee, George Obana.

University of Cincinnati, Cincinnati, OH: Tony Balzano, Everett Wolverton.

University of Missouri/Kansas City, Kansas City, MO: Wade Elshire.

University of Montana, Missoula, MT: Kevin Krebsbach, Bill Queen.

University of New Mexico, Albuquerque, NM: Lawrence J. Schuster, William D. Tryens.

University of Northern Colorado, Greeley, CO: Norman D. Laurence.

University of Tennessee/Knoxville, Knoxville, TN: Leo R. Pedigo.

University of Texas Health Science Center/Houston, Houston, TX: John Michalec.

University of Washington, Seattle, WA: John Chapman, John A. Heinz.

University of Wisconsin/Madison, Madison, WI: Phillip H. Michałski.

University of Wyoming, Laramie, WY: Stanley P. Hobbs.

Virginia Polytechnic Institute & State University, Blacksburg, VA: James V. McCoy.

Wright State University, Dayton, OH: Larry J. Perdue.

Membership

New Affiliate Members

Metropolitan Board of Education, Nashville, TN: Bernard K. Locklear, director, operations and maintenance.

NPWC Pensacola, Pensacola, FI: Arthur R. Shaw, commanding officer.

US Department of Commerce, Washington, DC: Harry E. Bradley Jr., director, office of federal property programs.

New Affiliate Representatives

City of San Diego, San Diego, CA: Larry King, deputy director.

Kent Denver Country Day School, Englewood, CO: Robert K. Elisha, director, buildings and grounds. Tennessee Department of General Services, Nashville TN: W.B. Adams, director.

The Bolles School, Jacksonville, FL: Charles C. Swearingen, director, physical plant and support services.

New Subscribing Members

Danzinger-Byrd, Inc., 5600 National Turnpike, Louisville, KY 40214; 502/361-0171. Representative: H. Davis Byrd, vice president.

Provides campus planning, facility programming, architectural design, construction management.

GWSM, Inc., 1101 Greenfield Avenue, Pittsburgh, PA 15217; 412/ 521-3000. Representative: W. Thomas Borellis.

A landscape architecture and planning firm specializing in campus planning. Morgan Building Maintenance, 1120 Allen Street, Belvidere, IL 61008; 815/547-5858. Representative: Thomas R. Morgan, president.

Cleaning consultants with more than twenty years experience in the commercial, industrial, and institutional cleaning field.

New Subscribing Representatives

Firepro Inc., Wellesley Hills, MA: Michael Dimascio, senior associate.

Hillyard, Inc., St. Joseph, MO: William H. Vaughn, vice president.

Kenall Manufacturing Company, Chicago, IL: Robert C. Kolby, regional sales manager.

Medeco Security Locks, Inc., Salem, VA: Sharon Doyle, marketing department. Prosoco, Inc., Kansas City, KS: Nancy Litzau, director, marketing communications.

Southern Electric International, Atlanta, GA: Dr. Richard E. Mathisen, general manager, marketing/sales.

Unison, Charlotte, NC: W.H. Martin, director of marketing.

Name Changes

State Board for Higher Education is now Maryland Higher Education Commission (MHEC), Annapolis, MD.

Sun Environmental, Inc. is now ENSR Operations, Canton, OH.

Resource Bank

Software

ASEAM 2.1. A Simplified Energy Analysis Method is a revision of the ASEAM-2 energy analysis program for buildings at educational institutions. This latest version allows the user to conduct both residential and commercial building energy research studies and to demonstrate how energy strategies save money. It features quick input of key values, 3-D graphic plotting of output values, and onscreen system and plant diagrams. The program comes with life-cycle cost (LCC) calculation disks, weather data disks for 46 United States continental weather sites, source code disks for all executable files, and a comprehensive user's manual. Cost is \$125. Contact: American Consulting Engineers Council Research & Management Foundation, 1015 15th Street, NW, Suite 802, Washington, DC 20005; 202/347-7474.

AutoCAD AEC Mechanical adapts AutoCAD to the needs of mechanical engineers who design building systems. It allows engineers to create complete layouts for plumbing, HVAC, and fire protection systems. For use with AutoCAD version 2.5 or later. Contact: Autodesk, Inc., 2320 Marinship Way, Sausalito, CA 94965; 800/445-5415, 415/332-2344. AutoCAD Applications Catalog, the latest edition of Autodesk's popular guide to third-party application development was recently published. Products covering application categories such as architectural engineering and construction, civil and chemical engineering, computeraided manufacturing, and desktop publishing are included. Contact: Autodesk, Inc., 2320 Marinship Way, Sausalito, CA 94965; 800/445-5415, 415/332-2344.

Training

The summer 1988 edition of Landscape Quarterly, a catalog of training videos, is available. Subjects offered include turf management, landscaping, how to prevent on-the-job back injuries, working with pesticides, customer relations, and more. Contact: Idea Bank, P.O. Box 23994, Tempe, AZ 85282; 800/621-1136; in Arizona, 602/829-1233.

Custodial Tele-Training videos cover basic, school, medical, and industrial housekeeping. In addition, groundskeeping, supervisory, boiler room, and asbestos awareness training videos are available. Tapes may be purchased in a series or individually and may be previewed for ten days at no charge. Contact: AMS Distributors, Inc., P.O. Box 457, Roswell, GA 30077; 800/424-3464, 404/442-1945.

The National Safety Council's Audio Visual Materials Catalog contains films, videos, slides, and multimedia programs addressing safety as it relates to these areas: agriculture, alcohol and drugs, construction, crime and fire prevention, electricity, hazardous materials, hospital and health care, laboratories, lifting, motor vehicles, water, and more. Programs on general safety and accident prevention, home safety, communication, ergonomics, physical fitness, and management and supervisor training are also available. Contact: National Safety Council, 444 North Michigan Avenue, Chicago, IL 60611; 800/621-7619; in Illinios, 312/527-4800, 8:30 a.m. to 4:45 p.m., Central time, weekdays.

Association Training and Consulting, an educational service of TESCORP, Inc. is offering Achieve Peak Productivity by Improving Your Personal Power, a 12videotape series with home study workbook, lesson plans, and meeting leader's guide, designed to provide managers and

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 February 10 for the March issue, February 24 for April, and April 10 for May. 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 machine, 703/549-2772. Call 703/684-1446 for more information.

Plant Engineer. Superintendent of Construction and Maintenance Departments. Reports to the associate director for buildings and grounds. Overall management of maintenance, repair and renovation of 200 campus facilities. Experience conducting engineering/facility studies and preparing comprehensive written reports. Ability to develop budget requirements and manage resources. Graduation from a four-year college or university with a major in mechanical, electrical, or civil engineering and four years of experience in building construction, mechanical installation, or physical plant maintenance work. Salary \$35,484-\$55,224. Starting salary commensurate with education and experience. Comprehensive benefits package. Excellent work environment with rewarding and challenging work. For an application contact UNC Employment, CB# 1040, 111 Pettigrew Hall, Chapel Hill, NC 27599-1040, (919) 962-2991. Equal Opportunity/Affirmative Action Employer.

SUPERINTENDENT PLANT MAINTENANCE

Oakland University is seeking a Superintendent of Plant Maintenance for the Department of Campus Facilities & Operations. This person will direct the skilled trades personnel in the operation and maintenance of all campus structural, mechanical, electrical, and HVAC systems. QUALIFICATIONS: A bachelor's degree in engineering (preferably BSME) or an equivalent combination of education and experience; minimum of five years experience in maintaining large building systems, utility networks, supervising skilled trades, operation of automated work order system; knowledge of HVAC systems, preventive maintenance programming, and fiscal planning/control. Comprehensive benefits package and a salary in the upper \$30s. APPLICATION DEADLINE: January 20, 1989. Send letter of application, resume, salary history, and at least three professional references to: Oakland University, Employment and Staff Development Office, 140 North Foundation Hall, Rochester, MI 48309-4401. An affirmative action/equal opportunity employer.

SUPERVISOR CENTRAL HEATING PLANT AND CONSTRUCTION

Oakland University is seeking a Heating Plant Supervisor and Field Engineer to manage its central heating facility and HTHW distribution network. Individual will supervise boiler operator staff of central heating plant while maintaining cost controls and efficient operation of the plant. Individual will also supervise campus construction work to ensure specification compliance, use of proper materials and methods, workmanship, etc. QUALIFICATIONS: A bachelor's degree in engineering (preferably BSME) or an equivalent combination of education and experience in boiler operation, supervision of skilled trades, HVAC systems, and construction management principles. Comprehensive benefits package and a salary in the mid \$30s. APPLICATION DEADLINE: January 20, 1989. Send letter of application, resume, salary history, and at least three professional references to: Oakland University, Employment and Staff Development Office, 140 North Foundation Hall, Rochester, MI 48309-4401. An affirmative action/equal opportunity employer.

Associate Director of Facilities, Under the general direction of the director of facilities, the associate director of facilities will be responsible for the overall administration of capital projects. Responsibilities will also include the conceptual development of preliminary program reports/plans for construction projects and preparation of background materials for the presentation of proposals for projects. The associate director will assist the director in identifying, planning, and scheduling routine and major capital projects. The associate director will perform other duties as may be assigned by the director of facilities. Position available as soon as possible. Salary range \$33,743-\$47.245. Requires a bachelor's degree in an archi-(cont. on p. 10)

Manager of Architectural and Engineering Services The University of Texas at Austin

Requires a bachelor's degree in architecture or engineering plus ten years experience in facilities design, construction, and maintenance with two years of experience supervising such work, preferably in a university environment. Must be licensed by the Texas State Board of Registration for Professional Engineers or Architects, or eligible for registration. Prefer a master's degree in related area of specialization and experience with CAD systems.

This position manages a section of 37 employees consisting of architects, engineers, drafting technicians, construction inspectors, contract administrators, and administrative staff. The section is currently handling an annual volume of \$9 million in alterations, renovations, and maintenance projects. The section is equipped with a CAD system.

Annual salary \$38,124 or more depending upon qualifications. Excellent fringe benefits. Submit resume by January 31, 1989 to:

John Rishling Physical Plant Division PO Drawer 7580 Austin, TX 78713 An Equal Opportunity/Affirmative Action Employer

Job Corner

EQUIPMENT SUPERVISOR

Yale University seeks qualified individual for the position of Equipment Supervisor. This individual will coordinate and supervise provision of services in the equipment trade, supply cost estimates, develop work schedules, and establish daily assignments and priorities as well as administer the management/union agreement.

Candidates must be technical/trade school graduates with five years equipment maintenance experience, two to three of those years in a supervisory capacity or equivalent training and experience.

SUPERVISOR SHEETMETAL/ROOFING

Provide for maintenance and repair of general metal work and repair of all types of building roofs. Analyze job requirements, determine work methods, procedures, and quality of equipment and materials to be used; and interpret building specifications, as well as administer the management/union agreement. Candidates must be technical/trade school graduates with five years work experience in the sheetmetal/ roofing trades, two to three of those years in the capacity of assistant foreman or master mechanic or equivalent training and experience.

Liberal fringe benefits program includes 1 month vacation, 13 holiday/recess days, comprehensive group health and life insurance, pension plan, and tuition assistance.

Send resume and salary expectations to: P.A. Mack, Yale University Department of Human Resources, 155 Whitney Avenue, P.O. Box 1404, Yale Station, New Haven, CT 06520.

Yale University is an affirmative action, equal opportunity employer.

Texas A&I University Director of Physical Plant

Texas A&I University invites applications for the position of Director of Physical Plant. The director reports to the comptroller and is responsible for maintaining and servicing the physical plant of an urban campus of 5,500 students. The university consists of 250 acres and 46 major buildings on the main campus and 1,400 acres of agricultural lands. The director manages a \$3.8 million budget and a staff of approximately 120. Areas of responsibility include mechanical, electrical, utilities, custodial, grounds, motor pool, structural, and energy management.

Minimum requirements include a bachelor's degree and five years physical plant experience in an upper level management position at an educational institution. Candidates with other comparable experience may be considered.

The individual selected for this position must demonstrate detailed knowledge of the following: skilled trade practices and techniques, HVAC and utility systems operations and maintenance, occupational safety and health practices, building and construction standards, personnel, and budget management practices.

The successful applicant must demonstrate experience in the development and administration of management practices in a physical plant environment. Further, the applicant must show proven leadership capabilities and possess the ability to develop detailed plans, to communicate these effectively to the staff and to encourage attitudes which contribute to the educational mission of the university. Applicants should submit documentation of the achievements which demonstrate these characteristics.

Applications should be submitted by January 30, 1989, and include a resume, three letters of reference, and additional supporting materials. Salary competitive. Send to:

> Mr. Robert Hornsby Director of Personnel Texas A&I University Campus Box 107 Kingsville, TX 78363

Texas A&I University is an affirmative action, equal opportunity employer, and applications from minorities and women are encouraged.

ASSOCIATE DIRECTOR PHYSICAL PLANT DEPARTMENT

The University of Texas Medical Branch at Galveston is seeking an individual for the position of Associate Director of the Physical Plant Department. This position is responsible for all facets of Physical Plant Department administration in absence of director, supervises the administration of preventive maintenance programs, and responsible for operation of the department's computer operations. Requires a bachelor's degree in mechanical, civil, or electrical engineering, a Texas Professional Engineering License, or capable of becoming registered, ten years of experience in an industrial environment or hospital setting with at least five years experience in supervision of trade areas (air conditioning, electrical, plumbing, and construction). Prefer applicants with strong business background and general engineering experience.

UTMB employs over 8,000 people, occupies 70 major buildings on 64 acres of land, and is located on Galveston Island, approximately 40 miles from Houston on the Texas Gulf Coast. UTMB is a major health science center consisting of four schools, seven hospitals and two research institutes.

UTMB offers a wide variety of benefit plans that not only makes UTMB a great place to work, but also enhances your compensation package.

If interested and qualified please identify ad #316 in cover letter outlining your skills. Send with a resume and salary history by **February 1**, **1989** to the address below:

Department of Human Resources The University of Texas Medical Branch

Box 146, UTMB Substation 1 Galveston, Texas 77550.

UTMB IS AN EQUAL OPPORTU-NITY M/F/H/V AFFIRMATIVE AC-TION EMPLOYER. UTMB HIRES ONLY INDIVIDUALS AUTHO-RIZED TO WORK IN THE UNITED STATES.

Job Corner

Jobs (cont. from p. 8)

tectural discipline, plus a minimum of two years experience in architectural design involving a working knowledge of structural and mechanical systems. Professional architectural registration required. Supervisory level experience within the facilities management division of a multibuilding complex is desirable. Send resume and supportive materials by January 26, 1989 to Lawrence J. Reader, Vice President, Administration and Finance, Bole Administration Building, Glassboro State College, Glassboro, NJ 08028. Glassboro State college is an Affirmative Action/Equal Opportunity Employer. Applications from women, minorities, and the handicapped are encouraged.

Associate Director for Custodial Maintenance. Murray State University, Physical Plant Department, is seeking candidates for the position of associate director for custodial maintenance. This position reports to the director of physical plant. The primary responsibilities are to manage the overall operational, financial, and personnel activities of the custodial maintenance section. Responsible for the activities of three supervisory staff employees and 51 support staff employees. Minimum qualifications include five years of related supervisory experience and a fouryear college degree with appropriate courses of study or equivalent combination of experience and education. Ability to communicate orally and in writing with all levels of university personnel, student groups, and individuals. Ability to act independently with little direction. Must be familiar with current asbestos and hazardous materials/waste regulations and Haz-Communication Standard. ard Applicantswith experience in a university environment will be given preference. Salary is competitive based on education and experience. Closing date for applications is January 25, 1989. Send letter of application, resume, minimum salary requirement, and three professional references to: Director, Physical Plant Department,

Murray State University, Murray, KY 42071-3302. An Equal Opportunity Employer (M/F).

Position Wanted

Director of Physical Plant in a medium to large university. Candidate offers extensive knowledge, experience, and training in the area of facilities management including personnel services, budget and accounting, maintenance management, operations management and planning, design and construction. Candidate offers 18 years professional endeavor and achievement with 14 years in an educational environment, eight years at the university level. Interested parties are to call 612/481-9147.



Coming Events

APPA Events

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

Feb. 21-22—Custodial Staffing and Standards. San Diego, CA.

Feb. 22-Sucessfully Working with People. Video conference.

Feb. 23-25—Historic Places as Utilitarian Art. Thomas Jefferson's Academical Village, University of Virginia, Charlottesville, VA. Cosponsored by the University of Virginia, Association for the Preservation of Virginia Antiquities, and Association for Preservation Technology.

Mar. 23-24—Hazardous Waste Management. Kansas City, MO. Cosponsored by NACUBO.

Apr. 9-14—APPA Executive Development Institute for Facilities Managers. University of Notre Dame, South Bend, IN.

Jul. 16-19-APPA 76th Annual Meeting. Reno, NV.

Aug. 20-25-APPA Institute for Facilities Management. Baltimore, MD.

Other Events



11

Resource Bank

Resource Bank (cont. from p. 7)

their staffs with skills to improve communication, solve problems, and create profitable opportunities. Cost is \$495 per set, \$395 per set for orders of 25 sets or more. Contact: TESCORP, 25900 Greenfield Road, Suite 410, Oak Park, MI 48237; 800/322-6294, 313/968-1379.

Powers Educational Services 1988 Training Directory features training programs for operation of energy management and control system equipment. Training is offered in four formats: standard courses at the training center in Illinois, standard or customized courses at customer's location, field seminars on HVAC and automation presented locally, and self-instructional materials, textbooks, workbooks, and videotapes. Contact: Landis & Gyr Powers, Inc., 2942 MacArthur Boulevard, Northbrook, IL 60062.

Publications

Strategic Decision Making: Key Questions and Indicators for Trustees, published by the Association of Governing Boards of Universities and Colleges, is a handbook designed to help governing boards and key administrators identify their institution's critical decision areas and guide them through the decisionmaking process. Cost is \$24,95 for AGB members, \$34.95 for nonmembers. Contact: AGB, Publications Department, One Dupont Circle, Suite 400, Washington, DC 20036; 202/296-8400.

The 1988 ASHRAE Handbook. Equipment Volume, focuses on equipment components and assemblies that perform various HVAC&R functions. The book contains 45 chapters in six sections, covering principles of operation, types of construction, performance characteristics, methods for testing and rating, pertinent standards, factors for selection, inch-pound (I-P) units, and the International System (SI) units of measurement. Cost is \$100. Contact: American Society of Heating, Refrigerating and Air-Conditioning Engineers, 1791 Tullie Circle NE, Atlanta, GA 30329; 404/636-8400.



Birds had been messing up this building for 50 years. In 1983 Hot Foot was tested on roost/ledges upper right. Next day, pigeons crowded up on the untreated areas, upper left, with no birds at right. Hot Foot worked. The whole building was then treated. With a partial touch-up treatment in '86, still no birds after 5 years.



your property

Ask about our 2 year Guarantee HOT FOOT, the bird repellent that really works ... as it has for 6 years in a dozen countries around the world, and now all across the U.S.

HOT FOOT is non-toxic to birds and people. It is a unique, colorless, odorless sticky gel applied to bird perch/roost surfaces. It doesn't sting, burn or harm birds in any way. HOT FOOT'S stickiness simply bothers birds' comfort under foot, so they quickly flutter up and fly away-and remember to stay away. Handle your bird problem now.

CALL: 1-800-BIRDS NO HOT FOOT INTERNATIONAL Send literature only

Tell us which: I want a FREE quote





Our Z-253 pulse pump is protected under USA Patent Pending Laws Without it, copycat machines are useless because they can't get through tough traps to reach the blockage. The Mustang Units Jetter blasts through traps and beyond to jet through grease. sludge and ice, washing lines clean to stay clean.

No bulky, awkward, grease-packed cables Just tough, flyweight, flexible jetting line that propels itself around tight corners and delivers pulsing, blockbusting pressure at jet speed.

Want the best? Get the original! Mustang Units Company, Inc. PO Box 29 120 North Scott Road, Ektridge, JA 52748 1 (800) 624-5934 1 (319) 285-7022 Visa/AMX/MasterCard

American Made Parent Pending Copyright 1988

Just Published!

Proceedings of

The Seventy-Fifth Annual Meeting of The Association of Physical Plant Administrators of Universities and Colleges Order your copy today and receive more than two dozen papers presented at APPA's 75th Annual Meeting, held July 1988 in Washington, D.C.

Limited Supply!

Selected Contents

- · Negotiating the Labor Contract
- · Grounds Maintenance as a Recruiting Tool
- Improving Customer Relations, Even During Rough Times

Chiliating

A NAME AND ADDRESS OF A DOCUMENT

- Campus Lighting
- · Mandatory Recycling at a Major University
- · Superconductors: Hot Prospects in Cold Materials
- The Multi-Campus Long Range Master Plan
- · Planning and Implementing a Fiber Optic Local Area Network
- · Carpet: Its Problems and Solutions
- · Animal Care Issues for a Research Institution Plant Director
- State-of-the-Art Institutional Waste Incineration
- · The Relevance of Life Cycle Costs and Its Impact on Building Delivery
- · 14 more chapters, including a history of APPA

Ordering Information

\$25 per copy (\$35/APPA nonmember institutions). Add \$8 to each order for shipping/handling. Nonmembers must prepay; APPA members may use an institutional purchase order. No telephone orders accepted.

Special discount on quantity purchases. Order 5 or more copies and pay only \$20 each—a 20 percent discount off the regular price! Offer good only to APPA members.

Send orders to APPA Publications, 1446 Duke Street • Alexandria, Virginia 22314-3492. Allow 3-4 weeks for delivery.





Higher Education's Ticking Time Bomb

rumbling buildings, shabby classrooms, obsolete labora- tories, and aging libraries are all too common on American college campuses today. Years of deferred repairs and replacement have resulted in an enormous backlog of \$60 to \$70 billion, including an "urgent need" for \$20 billion to correct the most severe conditions. Only one dollar of every four dollars requested is being appropriated for immediate facilities needs. Unless this escalating backlog is reduced, the quality of higher education for future generations of Americans is at risk.

These striking findings were revealed by a nationwide survey of campus facility conditions jointly conducted by the Association of Physical Plant Administrators of Universities and Colleges, the National Association of College and University Business Officers, and the public accounting firm of Coopers & Lybrand. The yearlong effort was the first comprehensive study of higher education facilities since the 1974 research conducted by the federal government.

The survey report indicated a backlog on some campuses greater than 25 percent of the replacement value of their facilities—usually the largest capital asset of a college or university. (A national aggregate of three billion square feet of facilities reported by the survey represents a capital asset conservatively valued at more than \$300 billion!)

How did we get into this problem? Just as the government has deferred spending on our nation's roads and bridges, a decision to defer maintenance spending by colleges and universities was often the least controversial, least painful solution to serving too many worthwhile needs with too few resources. Repeated cuts or failures to compensate for these reductions inevitably leads to alternatives that are far more costly than the money originally "saved:"

The problem of college facilities maintenance and rehabilitation was exacerbated when high energy costs in the 1970s and government mandates such as PCB removal in the

Walter Schaw is executive vice president of APPA.

Perspective



Walter A. Schaw





1980s were absorbed in existing facilities operating budgets. Further compounding this burden at many institutions has been the addition of new campus buildings without providing for the full funding of their operation. Legislators and donors are understandably more attracted to new structures than spending on roofing, plumbing, wiring, and insulation. Examples of spanking new buildings side by side with deteriorating old ones have become too common on America's campuses.

Yet, with these added costs, the total share of funding for maintenance of facilities in higher education has been relatively constant since 1974 larger schools typically budget 7 to 9 percent of operating funds; smaller schools may budget up to 12 percent. Despite the tuition and other increases of recent years, these figures suggests the enterprise of higher education may be underfunded. How can the problem be solved? Any solution begins with the recognition of the condition of individual campus facilities by the institution's administrators and trustees. When the problem is recognized, we are encouraged by the result. Five states—California, Maine, New Jersey, New Mexico, and Rhode Island—had referenda before their voters on November 8th for one billion dollars in bonding authority for higher education facilities. These are small but important beginnings against the enormous need.

Without question, there are many pressing needs besides facilities before higher education in America. Facilities are but one, yet they are indispensable to the quality of higher education available to future generations of Americans.

If we continue to ignore the deterioration of our campus facilities we will face, just as when we ignore our health, an inevitable consequence.

13

FACILITIES MANAGER



by Ernest L. Boyer

I t was Chicago, I believe, where nine of your colleagues first joined together in a common cause. From that humble beginning, you now come to the center of the free world to celebrate seventy-five years of distinguished service to higher education.

This meeting has been memorable in many ways. President Reagan paid you a well-deserved tribute, and you presented your first Awards for Excellence to Brigham Young University and the Medical College of Georgia. We learn by example, and to have several of your institutions commended for their administration of facilities is distinctive. I hope it sets a precedent for a ceremony that will continue for the next seventy-five years. Incidentally, I recently served as a visiting lecturer at Brigham Young University. It was an enriching experience to be on a campus that in its appearance, its management, and its intellectual vigor, makes a statement of quality every place you turn. And I know that commitment reflects the vision of those assembled at this meeting.

Several years ago the Carnegie Foundation completed a study of American higher education. We dis-

Ernest Boyer is president of the Carnegie Foundation for the Advancement of Teaching, Princeton, New Jersey, and the author of College: The Undergraduate Experience in America. This article was originally given as the closing address at APPA's 75th Annual Meeting last July in Washington, D.C. covered that colleges in America are still highly prized. Only in America is the decal from almost any college displayed proudly on the rear window of the family car, and the message is, "Here's a family on the move."

We talked to a student who said, "I want a better life for myself, and that means college." We have in this country the aspiration in the hearts of our citizens that we want our children to do better, and that means a college education. Today about 57 percent of all high school graduates go on to college. But when we interviewed the parents of 1,000 high school students, 95 percent said that they want their children to go to college some day. In this country higher education is the door of hope, the ladder to success. 1 think those of us who are engaged in this enterprise should understand that in a fundamental way we are contributing, not only to the quality of the nation's life, but also to the aspirations of almost every citizen.

During the past two-and-one-half years since our report on the American college was released, I've visited a hundred colleges or more and found four themes being discussed from coast to coast. First, in the search for excellence in higher education, almost all campuses are inquiring about what we should be teaching. That is, what is the best curriculum for the year 2000 and beyond?

Second, there's a great and renewed interest in the quality of instruction. We've had a long period in which faculty were rewarded primarily for research, but there's a growing interest in the matter of how we can increase the quality of teaching, too.

Third, there's a renewed interest in the quality of campus life, something I know touches the commitments of those assembled in this room. The truth is, students don't just learn in the classroom. They learn a great deal outside the classroom as well. I'm increasingly convinced that twenty or thirty years after students leave college, what they remember has less to do with the twelve or so hours every week they spend in classrooms, than with what happens in the dormitories and in the "rathskellers" late at night.

How to improve that quality outside the classroom will be one of the most important agenda items for higher learning in the days and years ahead. We've gone from the colonial parent-child model—in loco parentis when student life was tightly regulated, to in loco clinician, with students left largely on their own unless there's a crisis. Now we have to ask ourselves how we can develop a means of support for student life outside the classroom that is something other than low-grade decadence.

This leads me then to the fourth issue that's being discussed: how to measure the outcomes of higher education. What, in fact, does it all add up to? We've been having a big debate in the United States on the quality of



schools, and some gains indeed have been achieved since A Nation at Risk was first released in 1983. But now we're beginning to say that four years of college education—a huge investment—must be evaluated, too.

Those issues, then, are the ones that I hear debated: the curriculum, teaching, the quality of campus life, and how to measure the outcomes. But I should like to add issue number five. I am convinced that in the days ahead, the quality of education also must be measured by the quality of the facilities on the campus. Over 100 years ago, James Garfield during a speech at his alma mater, Williams College, said that the ideal college is Mark Hopkins on one end of the log and a student on the other. Well, as you know, James Garfield went on to become the twentieth President of the United States. He was soon shot, and nothing that he said in his short term of office was as well remembered as that statement.

There aren't many colleges today that could be conducted on a log. Twelve million students need much more than that. They need libraries, research facilities, residence halls, and classrooms. What we need today is not a log, but the equivalent of a modern city to carry on the enterprise of higher learning. Without a campus with facilities that are both adequate and aesthetic, we could not carry on this magnificent enterprise of higher education which is the envy of the world. I salute those of you assembled in this room for contributing so consequentially to collegiate education, and I thank you for performing functions every single day that all too often are taken casually for granted. The simple truth is that if we did not have facilities that functioned well, we would have loud complaints from one end of the campus to the other. But since they are available, somehow they're not noticed. It's time to recognize that facilities provide the centerpiece around which all other functions take place.

First, facilities are vitally important in the recruitment of students to the campus. During our study of higher education we surveyed a thousand high school graduates who planned to attend college, and we asked them what they considered most important in their choice. You may have seen the data: over 60 percent said the appearance of the campus most affected their decision. And that's why we said in our report that when it comes to recruiting students, the director of facilities is far more important that the academic dean.

I visit about thirty-five to forty colleges and universities every year, and the moment I step on campus I have a strong sense of the quality and the priorities of the institution. The president or chancellor may meet my plane and give me a speech about excellence in teaching and brag about the quality of research; the public relations director may hand me a nice brochure and show me the new videocassette they have prepared to recruit students. But in the end, if facilities are neglected and the campus is not well maintained, those actions speak much louder than words. You cannot have a core of excellence if you don't demonstrate a commitment to facilities.

We studied about thirty catalogs to see what colleges were promoting and we discovered that from that standpoint, about 60 percent of all classes in America are held outside, underneath a tree, usually with autumn leaves at their peak, and almost always by a lake. In fact, one of the public relations directors said to us, "Water's very big this year. You just can't recruit students without some water."

We saw one brochure that pictured the ocean and a beach, but when I checked the map, the beach was about 100 miles away. Then I read the fine print and it said you can get there in four hours Saturday morning, if you drive eighty miles an hour. No matter what presidents and administrators say on campus, when they want to present their image to the public and say something about quality, they turn to facilities. They want it understood that excellence has to touch every aspect of the institution.

What I've said about recruiting students applies to faculty, too. I've heard some stories about colleges and universities offering big salaries and lots of fringe benefits to top ranking scholars. All goes well until the future candidate comes to visit the campus and is turned off because the facilities are inadequate to the function.

I'm suggesting that the priorities of the university are dramatically revealed by the way facilities are maintained and the importance that is assigned to the plant itself. If the grounds and buildings are neglected, it suggests a carelessness in administration that cannot be concealed by glossy brochures or by the inspirational speeches that the president gives to the Rotary Club on Wednesday afternoon.

This leads me to priority number two. Not only are the facilities crucial to attracting and holding outstanding scholars and students, they're also critical because they relate to fiscal efficiency as well. I was at the State University of New York during the 1960s when we had perhaps one of the largest higher education construction programs in history. SUNY, as you may know, includes sixty-four separate institutions. During that period every campus was expanding and buildings were going up at the rate of one a week.

The construction costs approached \$3 billion. All of this was managed by a separate corporation in New York called the State University of New York Construction Fund. So we had to make decisions about facilities literally every single day. We had an "Edward Durrell Stone" Campus at Albany, and an "I.M. Pei" Campus at Fredonia. In Buffalo, we planned to build an entire new city for 30,000 students.

All of this, in my judgment, was a spectacular achievement, and what we did in New York in the 1960s occurred in many states from coast to coast. Towns and villages in New York State were enormously enriched. But it is much easier to erect buildings than to maintain them. When we had a deep recession in New York in the 1970s, it was the facilities budget that was hardest hit, and maintenance was endlessly postponed.

It has been estimated that if we were to add up all of the urgent deferred maintenance needs in higher education, it would total more than \$20 billion. By neglecting these precious resources, we are stacking up a staggering debt that will catch up with us later on. Several years ago I returned to one of the SUNY campuses and, quite frankly, was shocked to see the peeling paint, the tattered rugs, and the sidewalks that were already cracked and crumbling. The good news is that I returned to that very same campus not eight months ago and saw tremendous improvement. But the president told me that they were probably paying today double the amount for maintenance they would have paid if the projects had not been delayed.

I'm suggesting that maintenance, like health, cannot be deferred. We can pretend that we are saving money by delay, but that simply means that there will be a far greater investment later on. We must find a way to convince state governments that maintaining buildings not only makes sense for education; it reflects sound fiscal management as well.

Third, I'd like to say a word about how good facilities relate to good education. During one of my recent speeches it was discovered just as I was being introduced that the public address system was not working. Ten minutes later, after the makeshift PA podium had been brought hurriedly to the stage, the meeting was in shambles and several in the audience already had walked out. When I did begin, it was immediately clear that the acoustics in the room had been planned to muffle sound, not extend it. I have spoken in rooms that are far too hot or far too cold; where the lighting is distracting and the writing on the blackboard is not well-illuminated. Consider the impact of this neglect on the teaching and learning that is supposed to occur there every day.

Several months ago I had lunch with a professor who teaches at a distinguished Ivy League institution during the academic year. He also teaches for a Fortune 500 corporation in the summer. He told me that the difference in concern about facilities and teaching equipment between the two institutions is like night and day. He said that in the corporate classroom the technology is advanced and always ready when he arrives, with technicians available to assist him. They not only get the materials ready, they prepare overheads and ask him in the afternoon, "Now what do you need tomorrow morning?" Do you know of any university in the United States where support staff can be available full-time to instructors to see that the facilities are prepared and the visual aids in place? He said that very often at the institution where he teaches, it is scarcely possible to see the blackboard because the lighting is so poor.

The quality of education is related to the quality of the teaching materials and facilities on the campus. Those of you who maintain the plant, supply the equipment, and seek to keep the buildings working well are in my judgment educators, too. The physical plant administrators should not be the last to know the academic plans of the institution; they should be among the first to know. They should be involved intimately in helping to set priorities of the institution because, in the end, they must see that those priFACILITIES MANAGER

orities can be implemented every single day. While the facilities may be taken for granted, just try closing them for a day and you'll find out what faculty revolution is like.

This leads me then to priority four. I'm convinced that good facilities are needed to enrich the educational experience on the campus and help build a spirit of community as well. I mentioned in the beginning of my remarks that rebuilding community is perhaps one of our most important responsibilities in higher education, and that certainly has to do with the quality of the campus and how one feels about the place.

In the award-winning Broadway play Fiddler on the Roof, the peasant dairyman who has raised five daughters with considerable help from scriptural quotations—many of which he himself invented—says the old laws, the old customs, and the feasts and traditions handed down from one generation to another are what makes life tolerable to the hard-working Jewish families. Without them, the dairyman declared, life would be as shaky as a fiddler on the roof.





So it is with colleges. While professors do their research in isolation and students worry about their careers, and while administrators fight for budgets, I still believe that life is made tolerable by the shared rituals, remembrances, and sense of community on campus. Yet during our study of the undergraduate college, we found that this spirit is not very well sustained. Almost half of the students we surveved said that they feel like they are treated like a number in a book. We also found that only 20 percent of the faculty said they feel loyalty to their campus, while 70 percent said they feel more affinity for their academic discipline nationwide.

How can one not have a sense of allegiance to a place where one lives every day? We are close to our families, I assume. How can we not feel loyalty to the place that nurtures us, provides friendships, and gives us facilities for support, comfort, and protection from the wind?

One professor captured the spirit that prevails on many campuses when he said, "My community is the WATS line, not my colleagues down the hall." I don't wish to romanticize the notion of community in higher education, and yet we say in our book Callege that a university should be held together by something more than a common grievance over parking. There's a colleague of mine at Princeton, Carl Shorsky, who wrote a wonderful book about communities, among them nineteenth-century Basel, Switzerland. He said it was a place where the spirit of community was built, and that education was prized by the merchant families of Basel just as the priesthood was prized in Ireland.

If a city can be concerned about the quality of campus life, if the merchant families of Basel can celebrate and create a climate for learning, why can't we in higher education—a more intentional community—inspire faculty and students to join together in the pursuit of common goals?

I do believe that facilities are a part of affirming community on the campus. They give dignity and status to the institution and allow it to function. When we rebuild our cities, we rebuild our facilities. The building of community in the city means new banks, hotels, and shopping malls; but it also means new parks and pedestrian walkways. That's what we mean by rebuilding a sense of urban community.

We build facilities in order to make a statement about what we prize. And while the spirit of community in higher education is sustained by good teaching and good communication, it's also sustained by facilities of quality that are well-maintained and provide warmth and intimacy on the campus.

In 1967 I was asked to dedicate the new campus at the State University of New York at Albany. As I stated earlier, it was really quite striking, an Edward Durrell Stone creation. Some said it belonged more on the Mediterranean than in Albany. Mr. Stone's architecture is fascinating with striking towers, colonnades, and flowing arches. At the Albany campus there's an inner court that's reminiscent of an eighteenth-century formal garden. In my address I said that societies are remembered by the structures that they build, and by the monuments that they erect. The ancient Egyptians constructed pyramids to give dignity to their dead Pharaohs whom they worshipped. The Greeks erected temples to appease the gods and goddesses who hovered in the hillsides outside ancient Athens. The medieval artisans built cathedrals with soaring spirals that pointed to the heavens because they were more concerned about the hereafter than they were about life on earth.

As I looked at that wonderful new structure, a thought occurred to me. I told the audience that I hoped that when the archeologists study our nation, they would find our college campuses and see them as the shining lights of a civilization where learning was highly prized.

The buildings we erect reflect our priorities as a people because they define the functions that we carry on. The physical plant administrators of colleges and universities are, in my opinion, performing an essential function on behalf of education, not only for the students of today, but also for the coming generation. James Agee once wrote that every child born, under no matter what circumstance, reaffirms the future of the human race. I believe that as we invest in higher education, as we build our cathedrals of learning, we are, in fact, making a statement about the future generation and the potentiality of every student.

Preventable Disasters: Spill Detection at Stanford's Center for Integrated Systems

by Renee Olivier Olsen

E arly one morning in mid-1984, a security guard discovered a broken sink pipe in Stanford University's Center for Integrated Systems (CIS). No one had been around the night before, and water had flowed unchecked for several hours into a brand new laboratory.

Fortunately, because the building was under construction, the laboratory was still an empty shell. Cleanup uncovered minimal damage. Had the same accident occurred just a few weeks later, however, valuable hightech equipment that was to be installed in the lab and surrounding offices could have been damaged or destroyed.

The prospect of multimillion-dollar damage from a relatively minor breakdown underscores the need to protect university and college facilities with effective spill detection systems. Library administrators have always recognized the devastating potential of water damage. Yet computers and other sophisticated electronic equipment—which can be more susceptible than books to damage from even small amounts of water—are housed without adequate protection across today's campuses.

Monitoring Hazardous Fluids

Stanford's CIS is a state-of-the-art facility for designing and manufacturing the next generations of computer chips. The 75,000-square-foot building houses offices, laboratories, and the "clean-room" environment required for chip manufacture. People, computers, and high-voltage equipment are in close proximity to water as well as to corrosive, toxic, and flammable fluids.

Renee Olsen is a freelance writer residing in Watsonville, California.



Twenty high-tech companies sponsored the building of the \$14.7 million facility, which was completed in November 1984. The center's designers looked to the semiconductor industry for the most advanced and cost-effective designs, materials, and equipment. Among these was a spill detection system developed by Raychem Corporation, whose sensing cable system detects leaks of water and other fluids and pinpoints their exact location.

The cable, made of chemically-resistant fluoropolymers, continuously monitors for the presence of conductive fluids (acids, bases, and water) at all points along its length. It is connected to an electronic module that sounds an alarm as soon as a leak is detected and displays a digital readout indicating the leak's location. If the cable is accidentally cut or damaged, the alarm sounds to warn of the break in continuity. Maintenance personnel can quickly locate and respond to a leak by referring to a map showing the layout of the cable. The flexibility of the cable allows it to be installed in a variety of configurations-along pipes, around tanks, or in serpentine fashion under raised floors.

Most of the cable installed at Stanford detects the presence of, but is resistant to, acids, bases, and other corrosive fluids typically found in semiconductor manufacturing environments. Cable that has contacted a corrosive liquid needs only to be cleaned and dried to be back in service.

Leak-Sensing Technologies

With its new sensing cables, Stanford's CIS was able to obtain distributed coverage throughout the building using a single type of monitoring system. The alternative was to rely upon a patchwork of other technologies such as point or tape sensors.

Point sensors contain two baremetal probes, which, when reached by a conductive fluid, make a complete electrical circuit that triggers an alarm. However, point sensors can be placed only at intervals, such as at low spots where fluids would be expected to drain. Thus, it takes longer to detect a leak or spill, and the overall likelihood of detection is diminished. In addition, bare metal can hinder the performance of the sensors because it easily corrodes, especially in the presence of chemicals common to such manufacturing environments.



19

Tape sensors, which function on an identical electrical principle, contain bare-metal wires embedded in cotton or nylon webbing. Although they provide the same unbroken line of defense as the cable, tape sensors are extremely susceptible to corrosion and cannot identify where on the tape the invading fluid has made contact.

The Raychem TraceTek cables used by the CIS contain sensor wires coated with a conductive polymer, so no bare metal is exposed to corrosive substances. A rugged fluoropolymer braid protects the sensor wires, creating a mechanically strong cable. Two additional wires, which monitor cable continuity and measure the distance to the leak, are also protected by polymer coatings.

The Stanford system includes approximately \$20,000 in materials. Installation required about 100 workhours, which translates to approximately \$5,000. Power consumption costs are negligible. Universities that install such systems may qualify for reduced insurance premiums, but Stanford's CIS did not investigate this possibility because the university is self-insured.

System Linked to Computer Network

Another key consideration for installing this spills detection system at the CIS was its ability to be tied in with Stanford's energy management control system (EMCS), which monitors campus facilities. Each alarm module is connected to the EMCS via a 4-20 milliamp current transmitter installed inside the modules' metal enclosures.

During the day, a member of the facilities staff tracks the status of the building's three modules from a single EMCS terminal. At night and on weekends, security personnel monitor the entire campus from a central building by way of the EMCS network. They can find out from the main computer if the spill detection system is in the alarm mode and where the spill is located. Personnel on duty are trained to contact the appropriate emergency crews.

Having a semiconductor manufacturing facility on a university campus is certainly rare, if not unique. However, most of Stanford's spill hazards can also occur, in a different context, on any campus with engineering, computer science, physics, or chemistry programs.







21

To minimize vibration and dust, the major mechanical systems in the CIS are located in either attic or basement areas. They are outboard wherever possible, rather than directly over or under the lab.

In the basement at Stanford's CIS, the sensing cable system begins near a double-contained waste tank for hydrofluoric acid. Cable runs between the 500-gallon primary tank and the secondary container; in the event of a leak or spill, an early alarm would allow personnel to remedy the problem quickly.

This same area contains other tanks for acids and is separated from the rest of the basement by a six-inch-high concrete berm designed to confine spills. The sump pump that serves these tanks does not have a separate high level alarm; instead, a sensing cable was simply run under the pump's cover plate.

The cable continues along overhead pipes that carry acid-laden rinse fluids, water, and sewage from the floor above. As added precautions, acid-carrying pipes are laid down over sloped trays. Floor drains for the entire area empty into the building's acid-neutralization system, where the waste is treated before being pumped into the sewer system.

Two 12.5 kv substations, each of which could supply total building power if one were incapacitated, sit on a raised concrete slab in another part of the basement. The sensing cable hugs the base of the four-inch-high slab, completely encircling it, in order to provide maximum response time in the event of a spill.

Two additional sump pumps, which serve the acid-neutralization system and an elevator shaft, are located far from the other areas equipped with sensing cable. Conventional jumper cable, which can be connected to the sensing cable with simple plugs, bridges such areas. A single alarm module can monitor up to 2,000 feet of cable with an unlimited number of alternating sensing and jumper cable sections.

Attic and Clean Room Installations

The CIS attic contains a forest of insulation-wrapped cooling and heating coils that condition the air in the lab below. Sensing cable is laid on the attic floor in a criss-cross pattern to detect water leaks from the cooling or heating systems.

Building Service Column Zone 3 Zone 2 Zone 1 Jumper cable Sensing cable Alarm and locator module

The layout of the center's HVAC system is particularly complex because air from certain sections of the lab must be pushed through a HEPA filtration system. The chips manufactured here consist of networks of submicron lines and features that are written upon silicon with an electron beam. A single speck of dust is an enormous blockade in such a tiny world. Therefore, one lab area must be maintained as a Class 10 clean room in which only 10 particles, 0.5 microns or smaller, can be tolerated per cubic foot. Other areas range up to Class 1000-still very clean compared to normal indoor air.

Areas in the lab that require cleaner air are isolated in part by fifteen "fingerwalls." These floor-to-ceiling walls built of glass and steel enclose narrow walkways that house electrical and process piping and also serve as return air plenums. Each fingerwall is protected by a length of sensing cable. Jumper cables run between fingerwalls to comprise a continuous circuit that can operate off a single alarm module.

The CIS computer room and an adjoining room full of terminals were also a logical location for spill detection. As in many such facilities, the computers' electrical cables are hidden under a raised floor. Two large air conditioners are needed to dissipate heat generated by the computers. To detect leaks or excess condensation from the cooling system, sensing cable was laid beneath the floor in a serpentine pattern and at the base of the cooling units.

The CIS has been able to install the spill detection system in stages as funds and project priorities have allowed. In most cases, because the sensing cable is simply affixed to surfaces with ties or clips, it is as easy to retrofit a building as it is to equip a new structure.

Since installing the system, the CIS facilities team has responded to an average of one alarm every three months. Fortunately, none of these has involved major spills—only small amounts of fluid were present, and repairs were confined to routine maintenance.

Sometimes, however, a small leak can indicate major equipment failure. The ability to detect leaks early gives Stanford's CIS a chance to prevent such failures—and to keep small leaks or spills from escalating into major hazards.

Choosing the Team for Major Physical Development Projects

There are many nonprofit organizations, supported by community funds, that are faced with problems arising from a decision to embark on a program of major capital expansion. Since their expertise and objectives rarely relate directly to capital works development, they are faced with the daunting task of modifying the administrative structure, setting up the necessary policy making and advisory mechanisms, and assessing the needs for various specialist services.

One complicating factor stems from the fact that the policy making and administrative structure is always tailored to meet the primary purposes of the institution-frequently education, health, or welfare-and the processes and procedures that are essential for these purposes dominate the management structure. It is obvious that the processes appropriate for academic decision making will frequently be unsuitable for efficient management of a capital works program, where quick business decisions are often needed, and where delay or uncertainty can cause a substantial waste of funds.

The amounts of money involved in construction programs are large, and the institutional management efficiency will determine whether or not they are used to the best advantage. The potential for delay at one of the many steps in the process of translat-

Ted Dews is controller, buildings and grounds, at James Cook University of North Queensland, Australia. He wrote about value analysis for competitive design-build in the Spring 1988 issue of Facilities Manager. ing a policy to a concrete reality on the ground is quite great. The process itself is complex and demands the coordination and harnessing of a wide range of skills, ranging from the initial assessment of need through to the final contractual accounting and commissioning into service.

Since capital development works for institutions involving large sums of money, usually raised from the community, it is essential that procedures for administering them are sound in terms of decision making authority and accountability. There is a natural tendency for organizations that are not truly geared to this type of operation, to assess the procedures adopted in terms of their capacity to provide the necessary safeguards without a true appreciation of the effects on total management efficiency.

I do not suggest that accountability and control should be eroded purely in the interests of speeding the processes. What is important is that when an organization has to undertake major works that do not form part of its fundamental role, when the procedures are set up for management of this secondary function, care should be taken to ensure that unnecessarily cumbersome approaches are not adopted simply because they fit the institutional patterns easily-even if they involve steps that are not truly necessary to the maintenance of sound overall management. For each procedural step, ask the question: "Does this step add a new and significant element to the soundness of the administration of the scheme?" If the answer is negative, the process should be changed.

Procedural requirements are frequently stipulated for such institutions by controlling authorities that set out by E.A. Dews

standards that must be met. These vary between institutions and can also add complexity to the process. Systems must therefore be adopted that meet all essential requirements and facilitate progress.

In times when there are intense financial pressures, the most vulnerable areas are the support functions, and the pressure to cut overhead costs in planning, design, and construction management can be intense. The consequences can be high operational costs for the rest of the life of the institution.

Planning Administration

When any institution decides to embark on a program of capital development work, it is faced with making a decision on the question of employment of administrators, planners, and designers. In this context, planning is defined as the process of determining, both in respect of the overall institution and its separate components, the best functional arrangements that will meet the requirement of the institution, having due regard for the amenity. Design is defined as the process of preparing the detailed information and proposals that can be used to implement the plan.

Planning must be carried out with a clear understanding of the objectives of the institution and of its component parts. Where uncertainties exist, these must be carefully identified and appropriate provisions made. The following discussion deals with the problems of institutions that do not have a demand for a series of identical units.

Most written information on the subject of institutional planning and design does not deal with the problem of selection of planners and designers. It usually assumes that such decisions

23

have been made and sometimes assumes also that there is no special distinction to be made at institutional scale between the skills and knowledge needed to fulfill the various roles. Institutions that are at an early stage of development are most vulnerable to this line of thought. Although most obtain advice on master planning, selection of planners/designers for particular components is frequently made on assessment of aesthetic performance without regard for planning ability. Since it is often that only one person or organization can be employed to undertake both functions. selection becomes of critical importance.

The institution is also faced with deciding how much of its planning and designing should be undertaken by staff of the institution, and the degree of administrative oversight needed. In part the decision will be affected by the financial arrangements. Funds may be available on a projectby-project basis that will enable retention of consultants, but not permanent staff. In this discussion we will assume that some permanent administrative staff can be justified and financed, and that there are restricted options for employment of designers and planners. This approximates the case in many institutions.

Occasionally it is believed that, provided consulting professional designers and planners report satisfactorily to the financial management of the institution, professional discipline will ensure that control can be delegated to project consultants. Although superficial examination of the conditions of engagement of professional consultants might lead the uninitiated to believe that this is the case, in fact, it is far from it. Most consultants would prefer to have as their contact point a person who has substantial technical knowledge of the problems involved in the task to be undertaken.

In a continuing program of works it is important to have a senior executive who can advise the institutional policy makers, has an understanding of the aims, policies, and philosophies of the organization, and can ensure that planners and designers are properly briefed. This person must also ensure that capital works budgeting is competently executed, user demands are kept within reasonable bounds, planning and design is carried out properly with all reasonable possibilities explored by persons with appropriate expertise, and that there is adequate supervision (in the broad sense) of all activities during all stages. It can be a formidable task, particularly as it involves reconciling the demands and views of persons who are usually dominant in their respective vocations.

These matters are raised to support the argument that the first step is for the institution itself to establish the necessary administrative structure, appoint a manager of the capital works division, and then take that person's advice. The task to be defined accurately and overall control should be assigned to one person. A division of responsibility in this area is fraught with peril and can be exceedingly expensive if it is not carefully contrived. It can be done, but liaison and unanimity of attitude between those involved is imperative to a degree that is unlikely to be achievable in practice.

It is frequently assumed that the first requirement is to have full-time architectural skills. What is most needed in the team leader, in fact, is not a design architect but a person who may be drawn from a range of disciplines, such as architecture, engineering, or planning. He or she should have a good knowledge of planning processes, the way in which the construction industry works, and an appreciation of the needs and aims of the institution. Whatever the basic discipline in which sound experience must have been gained, the person concerned should have substantial administrative experience and should be committed to project administration to the extent that he or she can no longer be identified closely with any of the three disciplines defined. In short, the basic requirement is for a specialist administrator. A person whose aptitudes and inclinations remain in one specific technical area

may well have difficulty in dealing objectively with all areas involved. He or she may well be inclined to apply undue emphasis to this particular field of interest, to the detriment of the others.

The capital works manager is unlikely to provide the master planning skills. On occasion these special abilities or interests will enable this individual to undertake a specialized role in addition to the general tasks previously defined. Most likely it will be his or her job to locate the necessary professional skills and harness them to provide the master plan. He or she must provide many of the detailed local inputs, as well as the continuity that will enable the plan to be modified as time goes by.

The capital works manager should control the master planning. Some authorities may argue that master planning and its control should be entirely in the hands of a specialist consultant. The popularity of this view is diminishing, and with good reason. The arguments for involvement of external master planners are sound. Ideas and experience from a wide range of sources can be tapped, provided no binding undertaking is given to use the services of a given firm for an extended period of time. The arrangement should be on a task-by-task basis. On the other hand, the external consultant, while usually capable of providing beneficial expertise, is rarely able to spend sufficient time on any site to gain the necessary detailed knowledge of its working. The combination of institutional control coupled with the external specialists is strong. The outside adviser has the advantage of not being restricted by issues that might have assumed unduly strong importance in the minds of permanent staff, yet he or she has the benefit of the detailed information that can be provided. Much of this detailed information cannot usually be transmitted at first in written form; it emerges from dialogue between the two parties.

The planning expertise needed to set up a scheme initially is not necessarily the same as that required to modify it at a later date. This not only gives weight to the arrangement advocated, but also gives emphasis to the need for a clear statement of philosophy to accompany each significant step.

Whatever policy is adopted in relation to master planning appointments and however far the planner's brief extends (e.g., into recommendations relating to building form or cutoff at plan layouts), he or she should be selected on the basis of assessment of ability in the following specific subject areas, with weighting to each in accordance with the needs of the employing institution.

 Demonstrated performance in planning, at a similar stage, for other institutions with similar missions and scale.

Experience of planning institutions in a comparable climactic region.

Total resources available within the organization.

 Ability to present proposals with competent documentation.

Ability to work in association with other consultants and administrators (sympathetic or resistant).

Office management and ability to work for a program.

For any institution with long term development aims, it is important to assign rational planning targets at any given stage. If the institution cannot be expected to predict accurately its rate of growth, the exact nature of the components that will be required, and its ultimate size, the plan must recognize these constraints.

Probably the most useful approach is to define a series of planning horizons. Set up definitive criteria for the period embracing the immediate future and guidelines for development beyond that which is reasonably predictable. Attempt at all stages to make provision for changes in attitudes, economics, and politics where they may affect the institution. In a real sense it is the planner's task to make provisions for future adaptation to meet the demands of the unpredictable.

It takes a great deal of restraint to hold planning to a realistic level. The temptation to present beautiful pictures of the finished product is enormous, but to do so is often simply expensive and valueless speculation. In certain instances fairly advanced development of some aspects may be necessary, but the development of detail should not be allowed to overtake that which can be forecast with a reasonable expectation of its achievement.

On occasion, institutional trustees become worried if someone suggests their master plan should be modified. Although changes must be assessed with care and not be implemented without a need being demonstrated, it is a healthy sign if the institution and the plan are capable of responding to changing needs and circumstances. Such changes are inevitable in an institution that continues to grow over a period of time, and it can be damaging to adhere blindly to a proposal that was designed to meet different circumstances.

Such a change does not imply criticism of those responsible for the earlier decisions. At any particular time decisions will be made on the basis of the best information available, but as the planning horizons unfold, new data comes to hand. To ignore them can be irresponsible. One frequently hears the argument that "they knew what they were doing when the decisions were made." No one should doubt that they did, but you should not assume that those same people would make the same decision again if conditions were different. It is curious that this type of argument is encountered most frequently when physical planning matters are considered. Perhaps it is a tribute to the personality and forcefulness of some master planners.

Physical planning is a discipline requiring careful collection of information and analysis of detail, as well as breaking down problems to essential basic components, assignment of priorities to aims, and finding rational solutions. It is the synthesis that accompanies the analytical work that, if imaginative, can lift a product from average to strikingly successful. Imaginative solutions need not be costly. Many plans that are striking in concept founder because of lack of attention to detail. This problem serves to illustrate the difficulties involved in selection of persons for planning and design. Frequently, the person capable of producing exciting concepts is not the person with the temperament or aptitude for attending to the details that determine if the finished product will provide an environment that meets the day-to-day needs of the users, free of obvious and unnecessary features.

The discussion thus far has dealt primarily with master planning, although many of the issues discussed apply with equal force to the preparation of proposals for components of a scheme. The range of planning skills required needs identification, although, depending upon circumstances relating to a particular institution, varying weight will be given to each. The checklist that follows is prepared on the assumption that the first task is to select a site, the policy decision that the project should proceed having been taken. It is assumed further that it will be a permanent institution, with a development program of indefinite duration, involving major buildings and a substantial population. Special market considerations that might apply to an industry are outside the scope of this assessment.

What are the principal features that require examination and assessment? These must be identified if the correct advice is to be obtained. Then where can the necessary advice be sought?

 identification of the demographic features that will influence the development of the institution.

demographic studies to assess compliance with desired conditions.

assessment of size and site required.

comparative studies of available sites assessing:

- · climate (including microclimate),
- topography,
- availability of engineering utility services and development cost,
- traffic access and internal development,
- engineering qualities of foundations for buildings,

25

26 WINTER 1988

- landscape development potential and problems,
- present and future relationship with surrounding community,
- residential accommodation needs,
- building construction constraints, and
- environmental impact, present and future.

Suitable investigation of these areas embraces a wide range of skills and may be beyond the resources of the institution. However, provided the needs are identified by the governing authority, priorities can be assigned and the best compromise reached. Unfortunately, all too often it is assumed that intuition will suffice, or that the conventional architect-engineer planning team can provide all that is necessary. But a careful appraisal will show that for a small additional expenditure, other information can be obtained that will lead to better decisions. The architect-engineer team can undoubtedly provide solutions that will suffice, and their work provides an essential core of knowledge. But much more effective answers should be obtained and future problems minimized if other disciplines are involved. The checklist embraces skills that are highly developed by engineers, architects, geographers, meteorologists, sociologists, and professional planners. Whoever is chosen to lead the planning work must have access to the desired experts.

Design Administration

The next phase of selection of design teams applies to the problem of preparing plans and specifications to permit construction to proceed.

The master plan provides a framework; detailed plans are required to allow the ideas expressed in the master plan to be translated into reality. A narrower range of skills is needed here, and although all the ones required are found within those disciplines encompassed by master planning, in application the requirements are usually quite different. Much more detail is involved, and whereas a master plan as an expression of ideas, may involve a number of generalizations, the construction plans must be quite specific and cover all detail with precision. A building will be used here as a working example, although other aspects of construction must be dealt with in a similar fashion.

Traditionally the planning and design team comprises the user; an architect responsible for both planning and design; foundation, structural, mechanical, and electrical engineers (sometimes an acoustics engineer); and interior decorators. Should the governing body aim to build up a permanent staff to do this work, or should it be contracted out to other agencies? There is no general answer to this question.

Staffing Requirements

The first factor that must be identified is the total amount of work to be done, and to decide if it can offer continuity of employment for the number and range of staff involved. Only when the project involves a series of large units, with well-spaced completion dates over a long period of time, or when the work is of a simple or highly repetitive nature, again over an extended period, is the continuity problem likely to be resolved satisfactorily. A characteristic of planning and design for major buildings is that it involves large numbers of highly specialized people for relatively short periods. The peak load effect can rarely be catered for in an organization that does not have design work as one of its major purposes.

The usual, most effective solution is to have permanent staff in a primarily administrative role for major projects; they may, as well, undertake minor planning and design work, and contract out major work to specialized agencies. In a program where the requirements of buildings are varied, this provides the added strength that agencies with the most appropriate expertise and experience can be retained for each project.

Arising from this is the clear implication that it is usually much better from the point of view of the institution to retain consultants for a specific project, or group of projects, rather than for a specific or indefinite period. It would not matter that consultants may use methods to make this latter course appear attractive, e.g., heavily discounted master planning services in return for a commitment to design the buildings involved. As with most cases, the client organization that cannot turn to other consultants for advice is in a weak business position. Even with the best of intentions on the part of the consultant concerned, the effort put into a non-competitive situation is unlikely to match that put into one that remains competitive throughout.

Selecting a Consultant

How then does one select a firm of consultants? Again, as with selection of master planners, it is highly desirable to maximize the objectivity of the process by identifying and rating the various characteristics required. They are usually:

- Experience of user requirements.
- Adequacy of staff resources.
- 3. Functional planning ability.
- 4. Design ability.
- conceptual
- detail

Planning and design management ability.

Efficiency in contract administration.

Appreciation of special local conditions.

8. Business attitude.

All of these items are important, and a serious weakness in any one of them can lead to major problems that can have severe implications for both capital and recurrent cost, and delays to the program.

It is rarely that a firm will score high ratings under all of these headings. What is important is that the client should be aware of likely weaknesses, and be confident that the administration can cope with those of the chosen consultant.

Reference was made previously to the engagement of professional staff by the institution. Given that it has been accepted that there should be no permanent senior administrator with a technical background, and who may supply some of the desired specialist

skills, what is the total range of skills that should be envisaged? Undoubtedly the range that can be supported on a permanent basis will depend on the size of the institution and its program. The best approach is to attempt to define the most important requirements first.

Since architectural skills are usually the first retained as project captains for each segment of the program, it is anomalous to attempt to duplicate them in the administration, provided clear appreciation of what should be expected from architectural and all other consultants is within the capacity of the senior administrator.

The next two roles rank almost equally in importance in the management team. They relate to advice on engineering services and supervision of construction standards.

The problem that might arise through insufficient knowledge to assess recommendations relating to engineering services, coupled with the extent to which the selection of a plan has major capital and recurrent cost implications, and the detailed technical considerations that must be examined when making selections makes this an area demanding special oversight. An enormous range of plant types is available for most purposes, each with its own strengths and weaknesses, there are servicing implications that frequently do not emerge during construction and warranty periods, and there are problems relating to the service life of components that are often obscured until it is too late. The nature of specification and contractual procedures adopted generally, wherein emphasis is likely to be on performance rather than the means of achieving it, fully justifies special attention to this matter. The information and knowledge needed by the institution far exceeds the amount usually offered by consultants, hence the institution must equip itself accordingly. The prime areas of difficulty are with mechanical and electrical plant.

The civil engineering services—water, drainage, and sewerage—are much more straightforward and do not pose the same problem.

Construction Oversight

Construction supervision, in all its aspects, is a matter that also requires close attention by the institution. It is frequently not appreciated that unless special arrangements are made, consultant supervision normally provided is not continuous. There are two procedures frequently used to maintain the necessary level of oversight. The first and most common, is for the architect to engage a clerk of works at the expense of the client. The function of the clerk of works, in broad terms, is to ensure that construction is precisely in terms of the drawings and specifications in every detail. This is a vital function, and it must be provided in any major program. However, this procedure does not provide the owner with any direct knowledge of the detail of his building, and does not provide any opportunity for detection of what are frequently matters of small concern to the consultant that might well develop into a perpetual irritant for the owner.

In the absence of a large and experienced team of design checkers that few institutions can afford, it is highly desirable that the owner should have full-time access to the site and the opportunity to observe in detail the construction procedure. The rectification of problems at this stage frequently does not involve any expense; often, they are matters of technique and determination of what in fact is good building practice. The project clerk of works has no particular concern for the owner's long-term interests, nor is he or she expected to in the terms of his or her employment.

This difficulty can be overcome, effectively, by the employment of a team of staff building supervisors who are seconded as appropriate to the project architects to act as clerk of works but at the same time having the responsibility of reporting to the owner on progress and problems. It is imperative that the two roles should be exercised with discretion, as the site operations, and all directions to the contractors must come solely from the project architects—this is almost invariably a condition of the building contract, and it should remain this way in the conventional system.

Any difficulties detected that are matters of design or that in any way are outside the scope of activities of a clerk of works must be handled through client consultation with the consultants. Although this method may initially be resisted by consultants, usually a good working relationship is achieved quickly to the benefit of all concerned-client, consultants, and contractors, as difficulties are overcome when they should be, i.e., before a permanent commitment is made. Although there will inevitably be periods of tension during the project, they are usually resolved speedily, and the end result is much more satisfying to all.

The positions so far described are those that are the most important. Beyond that point it becomes a question of response to particular needs, and any organization that has reached that stage is best equipped to assess its own requirements.

The other administrative component that should be mentioned is that of accounting and payment processing. The progress payment claims for any project should be checked by a person in the project administration who has an intimate knowledge of the job. The buildings supervisor employed by the administration is in an ideal position to do this. Progress payment vouchers variation and orders contract registers should be kept by one element of administration that should specialize in this work.

Ideally it should be part of the project administration, but if the scale of work does not warrant this, it can be a task specially assigned to one member of the institutional accounting staff. As soon as it becomes a fulltime occupation, that person should become part of the buildings administration, so that reporting and negotiations that may be required can be done in the most direct manner possible by those officers ultimately responsible for the project management.





FMS/AC® Facility Mapping System for AutoCAD®

Increase productivity, FMS/AC is a user aid template which transforms AutoCAD into a full function Automated Mapping/Land information System with the ability to track all street, parcel, utility and land use records. Runs on PC or SUN^{ose} Call for more information or a Demo Disk.

FACILITY MAPPING SYSTEMS, INC. 38 Miller Avenue, Suite 11, Mill Valley, California (415) 381-1750



Flexi-Wall ® Plaster In A Roll®

Flexi-Wall & Plaster In A Roll²⁶, a patented, gypsum-impregnated, flexable wallcovering manufactured specifically for concealing cracks and other wall problems, is suitable as a replacement for conventional plaster in new construction as well as remodeling and repair jobs.

The product hides patches, joints, holes and other irregularities on virtually any rigid surface and adheres directly to cement block, pre-cast concrete, tile, glass, wood and plaster. It is easier to install than plaster and is more economical.

Flexi-Wall is available in 48-inch-wide rolls of 40 square yards. It comes in three weaves and 50 decorative colors and has a class "A" rating. Also available is an anti-graffiti protective coating.

For more information, write to Henry Levy, president.

Flexi-Wall Systems, P.O. Box 88, Liberty, S.C. 29657; or call 803-855-0500.

Just Published!

1987-88 Comparative Costs and Staffing Report for College and University Facilities

- Index & Profiles of Reporting
 Cost and Staffing Data: Institutions
 Cost and Staffing Data:
- Cost and Staffing Data: Unit Cost Summary
- Energy Cost and Consumption
- Annual Wages for Standard Job Titles • Summary of Cost Information
- · Charts and Graphs
- ISBN 0-913359-48-3

S25/APPA member institutions, S50/all others, S8 shipping and handling To order, send check or purchase order (APPA members only) to APPA Publications, Dept. FM, 1446 Duke Street, Alexandria, VA 22314-3492. Allow 3-4 weeks for delivery. *Telephone orders not accepted*.



WINDFOIL Driftproof Spray Applicators

The WINDFOIL gives you 3 advantages; Firstly, wind and drift are no longer a problem—this allows you to apply chemical when you plan to and when it is most effective; Secondly, because drift is controlled, spray application is safer—chemical goes and stays where you want it and does not get on the operator or adjacent areas; Thirdly, more efficient application allows you to use less water and in some cases less chemical this reduces costs and environmental concerns.

Several models of turf equipment are available ranging from .75 M (30") to 6 M (20.5"). For more information please contact:

Innovative Equipment Inc., 240-103rd Street, Saskatoon, Saskatchewan Canada S7N 1X7, Telephone: (306) 477-2000 Fax: (306) 477-1913

Energy Savings

Washington State University in Pullman, Washington, was recognized for excellence in energy management with a Governor's Energy Award for 1988. WSU started a formal energy management program in the early 1970s at the onset of the first oil embargo.

Since 1973, WSU has saved more than \$30 million in heating costs alone and has reduced steam consumption by 35 percent per square foot over the last 15 years. These results were obtained through fuel switching, direct purchase of natural gas, cogeneration, preventive maintenance, heat recovery, computerized environmental control, tight construction standards, additional insulation, lighting modifications, and energy audits.

In 1975 WSU switched from natural gas to coal as its primary fuel; as a result, more than \$16 million has been saved in fuel costs. In 1983, WSU installed a Powers System 600 Computer Control and Monitoring System (CCMS). The system contains more than 5000 points attached to 78 remote cabinets in 52 buildings through 13 miles of local trunk lines plus automatic dialup phone modems to branch campuses in Spokane, Puyallup, Wenatchee, and Prosser. The system, one of the largest in the country, is expected to double in size over the next five years.

In addition, WSU staff are trained in every phase of the system operation. This in-house expertise has saved WSU \$1 million in installation costs; several WSU program concepts have been used by the manufacturer.

Other energy conservation measures used at WSU include: • For a two-year period, 1986-88, WSU contracted for direct purchase of natural gas thus saving the university more than \$500,000.

 Roofs are repaired and replaced as necessary. In spring and summer of 1988, WSU re-roofed approximately 150,000 square feet of roof.

 In the 1970s, WSU began a program to increase insulation thickness on steam and condensation piping. Two to six inches of insulation has been added to several miles of pipe.

 WSU has two full-time positions devoted to energy savings. The energy manager and research analyst perform

Beth Rosenfeld is former editor of APPA Newsletter.

Resource Management

Beth A. Rosenfeld

energy accounting and auditing, system analysis, fuel switching, fuel contracting, design, and plan review.
WSU has an extensive energy accounting system to track use in individual buildings as well as the entire campus. Increases and decreases in energy usage are identified and adjustments or repairs are made.

Coal Makes a Comeback

The heating plant at Kent State University has switched back to coal-fired boilers from gas-fired boilers. Last year coal heating saved the university approximately \$1.9 million after it upgraded two of its three coal-fired boilers. The university upgraded the coal boilers to comply with gaseous emissions standards imposed by the U.S. Environmental Protection Agency. The university expects to save an additional \$110,000 to \$130,000 when it revamps its remaining coal boiler and brings it online in 1989 or 1990.

Kent State converted to gas in 1971 because gas was only slightly more expensive than coal per mmBtu, but offered fewer boiler maintenance problems and no ash hauling costs. When the onset of the energy crisis in 1973 raised the possibility of a natural gas shortage and drove up the price of natural gas, the university considered changing fuel. The university switched to 90 percent coal fuel from 1976 to 1985. The university's fuel bill was \$968,000 last year; gas costs for the 21,000-student campus would have been \$3 million in 1987-88 according to Thomas Clapper, KSU's director of energy conservation.

In addition to fuel savings, the conversion back to coal has enabled Kent State to expand its heating plant. The university plans to keep its gas-fired boiler to help meet campus growth for 10 to 15 years and allow flexibility in meeting its heating load when a boiler needs to be taken off-line for maintnance.

Iowa State University has begun coal firing in one of two circulating fluidized-bed boilers. Two 170,000 lb/hr Pyropower fluidized-bed boilers will replace two 40-year-old spreaderstoker boilers. Burns & McDonnell of Kansas City, Missouri, has provided project management, permitting, design and procurement, and start-up for the facility.

The boilers will burn unwashed lowa coal to drive existing steam turbine generators and a steam turbinedriven chiller. Exhaust steam will be used for heating. The project includes coal and limestone systems, and each boiler is equiped with a baghouse for particulate emissions.

Racquetball Court Renovation

Clemson University was experiencing deterioration of the composite fiberboard front walls on its racquetball/handball courts that were constructed in the 1970s and early 1980s. When small pieces of fiberboard fell out of the walls, the physical plant department plastered and repainted. However, this was only a temporary solution; the walls gradually deteriorated to where it seemed the only solution was replacement.

Experts in racquetball/handball court construction recommended replacement or reconditioning of the walls—an expensive proposition. The total replacement cost of all 10 front wall surfaces was estimated at \$52,700.

The university needed to come up with a less costly solution. It was determined that most of the problem was in a 12-foot area where the wall was hit the most. University officials decided to use a restoration method used by physical plant personnel on concrete walls in campus classroom buildings. The walls were repaired for \$8,386.60—\$44,314 less than original estimate.

The first repaired court reopened in November 1986 and although it is used 10 to 12 hours a day, no deterioration has occurred. The other courts repaired since 1986 have also shown no deterioration.

Clemson's process for repairing racquetball/handball front walls and a breakdown of Clemson's repair costs appears in the October 1988 issue of Athletic Business magazine.

29

I thas been twelve years since the first Apple Computers were born and eight years since the first IBM PC was delivered. Why then, do you suppose, when APPA members discover 1 write articles about computers, they look at me like 1 just stepped off a spaceship? This happened twice at October's Eastern Regional APPA meeting in Pennsylvania.

Do you want to know what that feels like? Imagine for a moment that when

Data Base Update

Howard Millman



you're relating symptoms to your family doctor he blanches then flees the room in terror. That's kind of the feeling I'm left with.

Perhaps the topics of the last few articles were a bit heavy, and it's time to lighten up. Consequently, this issue's column focuses on two products to make living with your computer more pleasant and predictable. The third product, Resume Kit, can help you land your next job.

RESUME KIT: The Difference Between Looking Good and Looking Great

In as little as five seconds your resume's reader has formed a first impression about you. Within thirty seconds your resume has either sparked an interest or doused

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. the flame. Unless you personally know the individual doing the hiring or an angel who is championing your cause, your resume does the talking for you.

An innovative program, Spinnaker's Betterworking Resume Kit offers nine types of resumes geared to business, engineering, and professional occupations as well as to recent grads.

This inclusive program contains a surprisingly flexible word processor, 100,000word spell checker, appointment calendar, and a data base for maintaining names of contacts, comments, and strategies.

The program's word processor (alone worth the program's \$39.95 price) simplifies writing cover letters and the all important "Thank you for . . . " follow-up.

The resumes are basically fill-in-theblanks forms. The field titles are already in place, and you fill in the requested information. Field titles may be overwritten, rearranged, or deleted when necessary.

The resume preparation section is entirely menu driven with most menu choices leading to subsequent "dropdown" menus. FACILITIES MANAGER

After the resume is drafted another option, View, displays the resume as it will actually print. View offers a WYSIWYG (pronounced "Whizzywig," meaning "What you see is what you get") screen view, Resume Kit includes print drivers for more than 100 dot matrix, daisy wheel, and laser printers. Since print quality is important, Resume Kit offers three custom fonts (typestyles) for added polish, or you can use your printer's built-in fonts.

If the quality of your printer's output is borderline, Spinnaker will print your resume on a laser printer; the cost is about \$1.00 a copy, minimum fifty copies. Just send them a disk containing your completed resume.

The mail merge feature allows you to send personalized copies of the same letter to multiple recipients. The program automatically substitutes names and addresses drawn from the Contact data base.

The information-packed manual is an invaluable source of savvy tips and techniques on finding leads, handling interviews, following up, and (thankfully) sidestepping personnel. By referring to the manual's step-by-step instructions and occasionally referring to the online help screens, you can prepare an effective, eyecatching resume in about two hours.

In all respects, Resume Kit is a complete package. The only thing it omits is the stamp.

HARD DISK UTILITIES: Shedding Light on a Dark Subject

VOPT: Order from Chaos

Imagine you're reading a book in which the bindery made an error. So instead of reading pages one after the other you're forced to go from page one to page 12, then back to page three then to page 44. You would find this idiocy time consuming and irritating? Well computers don't experience irritation (at least not yet) but they sure can waste your valuable time if you mishandle them.

To keep the data flowing fast computers prefer their data stored in an uninterrupted chain. Well if that's the way they want it, why don't they store it that way? The answer is they do, at first.

When data is first written to a hard disk, it is stored in one continuous stream. As you use the computer you naturally add and delete files, increase or decrease their size and maybe move them around a bit. Consequently, "holes" appear in the script. So the drive has to jump around to different "pages" (except here it is called tracks) to hunt for the data. This extracts a penalty in time and wear. Fortunately, it's easy to correct.

Golden Bow Systems markets VOPT, a utility set that includes an easy to use hard disk organizer. It works quickly and automatically. When you turn it loose, it searches for fragmented files, carefully relocates the stranded segments and reunifes the file into one continuous data stream.

FACILITIES MANAGER

WINTER 1988

Depending on how much and often you use your computer you should run the program between once a day and once a week

VOPT also contains other easy to use utilities to monitor the performance of your system's hard or floppy disks. They check the RPM of the drives' motors as well as the read/write head's alignment. Typically, these specs are never crucial unless they get out of whack, then it's a disaster. Ideally, these utilities should be run once a month or so to be sure the drives' performance is up to specs.

SPINRITE: Who Knows What Evil Lurks in the Heart of Your Disk Drive?

Hard disks transfer data at a specified rate, according to a standard (one of the very few in desktop computing). To sidestep the jargon and complex descriptions, suffice to say someone has found a way to safely tweak your hard disk's data transfer rate and give you a noticeable increase in performance.

All PCs, XTs, and most ATs hard disks labor under something called an interleave factor, usually 3:1. That means, as dumb as it sounds, that for data to be read from a hard disk the disk must make three passes under the read head. Why? Simply because this 3:1 interleave predictably worked with

all hard disks and their controllers in all systems. So it became a sort of de facto standard.

In many cases, however, a hard disk may work fine with an interleave of 2:1, resulting in a 33 percent increase in data transfer or "throughput."

Spinrite elaborately and exhaustively tests your system's hard disk and controller to determine if it will reliably operate at a faster transfer rate. If it will, Spinrite (with your permission) will make the changes and you receive the benefit.

As part of the elaborate testing procedure, Spinrite also checks your hard disk for other potential faults and either corrects them or notifies you of the impending failure.

Two notes of caution. The first time you use Spinrite, it can easily consume hours to run its test. You might want to let it run overnight. If you have an enormous, datapacked hard disk then a weekend might be even better. Subsequent tests are only occasional and they are completed much faster.

The other problem is that Spinrite, inexplicably, is somewhat difficult to configure. It requires several blank floppies and some unnecessarily time consuming steps.

Nevertheless, it is well documented and once past the initial setup the program works automatically and smoothly.

One of Murphy's Law

observes that of two possible events. only the undesired one will occur. Whether we're talking about job hunting, computers, or training your Pit Bull, a bit more effort up front translates into far less effort later, more time saved, and maybe even a new job. The ball is in your court.

Betterworking Resume Kit Spinnaker Software 1 Kendall Square Cambridge, MA 02139 617/494-9384 \$39.95

VOPT Golden Bow Systems 2870 Fifth Avenue San Diego, CA 92103 800/284-3269 \$59.95

Spinrite

Gibson Research 22991 La Cadena Laguna Hills, CA 92653 714/830-2200 \$59.00

NCKERHOFF ate the condition of your buildings

- Identify & Prioritize deficiencies and provide cost estimates for corrective measures
- Formulate concept design plans
- Recommend phased renewal programs.

PBMS offers both Operations and Maintenance consulting and "hands-on" support for plant managers. Services are available from more than 40 PBMS offices in the U.S. and overseas. For information contact our corporate office at:

475 Spring Park Place Herndon, Virginia 22070 (703) 834-1717



This PAGE® ArmorLink® Aluminized fence was installed over 20 years ago. It remains strong, smooth and rust-free. Galvanized fence installed at the same location has deteriorated badly-85% of it has rusted.

Page's patented aluminizing process produces a smooth aluminum coating bonded to steel wire. ArmorLink® is sealed and protected from the corrosive effects of weather, pollution, and time.

To see a brief audio/visual presentation, or to receive ArmorLink® and Aluminized versus Galvanized ASTM test literature.

write or call today. For immediate information, refer to the Site Improvement sections of SWEET'S (General Building & Renovation) and SPEC-DATA



31

32

A Systems Handbook

Mechanical and Electrical Equipment for Buildings, seventh edition, by William J. McGuinness, Benjamin Stein, & John S. Reynolds, New York: John Wiley & Sons, 1986. 1488 pp. \$49,95, hardcover.

Mechanical and Electrical Equipment for Buildings is a colossal text covering all systems for which a physical plant administrator is typically responsible. The book is unique in that it not only deals with the standard engineering design and calculations of particular systems, but it also examines system components. Since publication of the book's first edition in 1937, it has been a mainstay in college engineering and architectural systems curricula.

Now in its seventh edition, the book has been revised and expanded to deal with problems of modern mechanical and electrical systems. The book contains nine sections: Energy and Environment, Indoor Climate Control, Water and Drainage, Fire Safety, Electricity, Illumination, Signal Equipment, Transportation, and Acoustics.

The opening sections should be of interest to physical plant administrators who are planning a new building or an addition to an existing one. Because site planning affects choices of mechanical and electrical equipment, designers should look at the energy sources available at the site and relate architectural design to the site and the climate before pursuing actual systems design. The resulting building design will therefore approach self-sufficiency in energy supply, without wasting resources.

The second section covers one of the mechanical engineer's bread and butter areas—indoor climate control. Standard step-by-step methods for calculating typical heat loss and gain are illustrated, all of the standard heating, cooling, and ventilation design procedures and system components are covered, and climate control systems in several well-known facilities are presented and analyzed.

Maintaining and rehabilitating plumbing systems is a major part of a physical plant's mechanical maintenance department. The plumbing section shows how to design interior plumbing supply and waste systems. Water reclamation, main distribution, and storm water drainage systems are covered as well.

Safety is an important concern of all facilities administrators. In the safety section, the authors emphasize that initial design is important in procuring a fire safety system, a major component of every safety program. In addition, the authors outline fire detection and fire fighting systems.

Electricity can be an expensive form of energy if innovative approaches are not utilized. Because the efficiency of heat-to-

The Bookshelf

electricity conversion on a commercial scale rarely exceeds 40 percent, the authors provide an in-depth examination of electrical design procedures. Basic principles of electricity, three major categories of building electrical power systems, wiring, power handling equipment, and control and utilization equipment, are addressed. The first category is typically comprised of raceways and conductors; the second category, power-handling equipment, including circuit breakers, major switches, panels, switchboards, and transformers; the final category consists of controls, motors, lighting, and wiring devices

Over the years, control of lighting levels has been one of the most popular energy conservation measures performed by many institutions of higher learning. These efforts are highly visible, and simple procedures can give a handsome return in savings of utility dollars. Typically 25 to 60 percent of all electrical energy utilized in commercial buildings is from lighting: therefore, the authors devote 287 pages to design work in illumination. The lighting section is treated in a similar manner as the electrical section in that fundamentals are presented. Later chapters in the section address light sources, design procedures, and application of lighting principles to specific environments.

The last three sections of the text deals with signal equipment, transportation, and acoustics. A variety of signal systems are covered, including surveillance equipment such as fire and interior alarms; time equipment such as clocks and programs; and communication equipment such as telephone, intercom, and television. The transportation section covers both passenger elevators and escalators. Finally, acoustics is not overlooked because even if all other building design criteria are in order, if acoustical design is not considered, a classroom can be rendered useless.

Mechanical and Electrical Equipment for Buildings is a good reference book for all upper-level physical plant administrative personnel. It is a must for all facility planning and design departments. Chief administrators with engineering backgrounds will find the book a good reference because it is well-illustrated and full of schematics, charts, tables, graphs, and examples. Most important, physical plant directors with primarily management backgrounds and little technical experience will find it an indispensable resource in familiarizing themselves with basic sysFACILITIES MANAGER

tems components and in communicating with their technical people.

Mechanical and Electrical Equipment for Buildings is available from John Wiley & Sons, Inc., One Wiley Drive, Somerset, New Jersey 08873.

> ---Rick J. Beal Architectural Superintendent Western Illinois University Macomb, Illinois

Professionalism

Professionalizing the Organization: Reducing Bureaucracy to Enhance Effectiveness, by Guy Benveniste. San Francisco: Jossey-Bass Inc., 1987, 298 pages, hardcover.

"The faculty think they run this place!" How many times have you heard this or have said it yourself in a momentary loss of patience? Well, maybe the faculty do run this place, or maybe they should. In this book, one of the Jossey-Bass Management Series, the author states, "... successful university administration has to rely heavily on faculty support... the administration may certainly lead, but it leads to where the faculty was going, clearing the underbrush as it goes along."

The author is a professor of policy planning at the University of California/Berkeley's Graduate School of Education and has served in a variety of other professional organizations. In this readable book, he draws examples from his broad experience to demonstrate management approaches that enable organizations with largely professional staff to realize the fullest potential of those professionals. Many of the examples reflect truths, or opportunities, that we see daily on our campuses. He tells us in his first sentence. "This is a book about professionals in organizations: why they are important, how they can be managed effectively, and how their effective management can contribute to increased productivity."

The author successfully pursues his intent in a well-organized manner. Along with extensive use of examples drawn from his experiences, the book is clearly footnoted with a comprehensive 21-page list of reference works. Because much of the discussion summarizes work of others, the footnoted references are especially valuable to the reader who wants further exploration of the topic.

The book begins by comparing two approaches to organizational design, bureaucratization and professionalization. The first chapter explores reasons for using routines and pitfalls when they are misused. Chapter two reviews the struggle to define what we consider a profession and presents the attitudes, behaviors, and values associated with professionals. Chapter three delves into the good part—conflicts

FACILITIES MANAGER 33

WINTER 1988

between professionals and managers, governance models, power and authority, and participation. Does that sound like a list of current concerns on your campus?

At this point the approach changes from descriptive to a more prescriptive mode as professed and operational goals, trust, consensus building, and types of planning suited to a profession-based organization are discussed. Chapter five presents traditional management tools of control and warns of the danger of using or overusing these tools with professionals. Chapter six offers guidance in selecting a governance structure and gaining acceptance and use of the structure by professionals in the organization.

Chapter seven deals with risk, responsibility, and conflict. Some interesting concepts emerge along with their associated terminology. If our organization were described using terms such as loose coupling, organizational slack, redundancy, and error management, we probably would be affronted; however, as it turns out, all these concepts can have positive benefits in professional organizations.

Chapter eight describes the effects of external controls on organizations. This material is useful for managers in protecting the organization from external controls and is equally valuable as a guide for effective, nonrestrictive implementation by regulatory agencies and others who impose controls.

The final chapter summarizes and pulls together the entire book. The author provides a realistic forecast of the continuing trend toward bureaucratization by explaining, "Bureaucracy controls and protects at the same time." He ends with an optimistic point in favor of professionalizationas an alternative that will produce an adaptive, surviving organism.

This is a book about organizations that rely on professionals who are involved with the central purpose of the organization. The core of professionals in colleges and universities is the faculty. Individual faculty members may also consider themselves members of other professions such as medicine, management, engineering, and the like. However, in the context of our departments, we consider the professional core of faculty as faculty, not as a collection of members from other professions. For a facilities professional in a college it is especially difficult to understand and work with an administration and faculty who are still searching for a workable form of dual governance.

In those happy instances where administration and faculty mutually trust and cooperate, facilities workers are considered professionals within the organization, seeking the same sort of niche that all professionals seek; however, they exist outside the core occupation of the organization. This is the case for facilities professionals working anywhere, other than an organization existing for giving pure facilities service.

Given that we are professionals and that

the organizational structure in which we work must first nurture the core professional group of faculty, yet we still feel the need for the same recognition and stroking that faculty professionals need, what do we do? A good first step would be to read this book.

Then read any of the cited references that might fill the gaps in understanding organizational behavior and assess the vantage point of the facilities professional at colleges and universities. We are uniquely positioned as a part of the administration and as a professional group, albeit not the central core occupation of the institution. By understanding the concepts presented by the author and by evaluating the approach of our administration, we can become an integral part of the governance structure. If we fail to place ourselves in that process we are left in the role of an idler wheel on a machine: we have to be there or the machine won't work, but we really have no impact or involvement with production. Conversely, if we become part of the search for a workable governance structure, we will become an accepted, integral part of the organism.

Professionalizing the Organization is available from Jossey-Bass Publishers, 433 California Street, San Francisco, CA 94104.

> -Joe M. Cannon Physical Plant University of North Carolina Charlotte, North Carolina

Energy

Integration of Efficient Design Technologies, edited by F. William Payne. Lilburn, GA: The Fairmont Press, Inc., 1988. 591 pages, \$62.00, hardcover.

Integration of Efficient Design Technologies provides 93 chapters describing various perspectives on methods to improve energy efficiency in buildings and industry. This book is an edited version of 93 conference papers originally presented at the 1987 Tenth World Energy Engineering Congress, sponsored by the Association of Energy Engineers (AEE).

The intent of this book is to provide a status report as of 1987 on the broad subject area of energy as it affects facilities managers and to focus attention on efficiency of original facilities design, facilities renovation or equipment replacement, contract negotiation for utility services, and operating processes and procedures. A large portion of the information should not be new to APPA members who have attended annual national or regional meetings since 1974. Many of us have participated in numerous meetings and seminars on energy conservation and spent thousands of hours planning improvements to equipment and buildings and operational processes, and hundreds of thousands of dollars on energy improvements to realize greater energy efficiency.

This book is a useful, current reference guidebook on energy efficiency. As facilities managers whose physical plant operat-



Computer Applications, the first title in the series, includes chapters on making initial computer decisions and discussions of CAMM, CAD, DDC, LANs, expert systems, and bar coding. You'll also find case studies of specific applications of computer usage in facilities management surroundings.

Contains 12 chapters and a comprehensive bibliography. Introduction by Howard J. Cihak, computer consultant and faculty member, Institute for Facilities Management. Other books in the series include Work Control and Personnel Management and Development.

Published by Association of A Physical Plant A



Physical Plant Administrators of Universities and Colleges

\$25 (\$17/APPA members) + \$8 shipping. Send check (purchase orders from members only) to: APPA Publications, 1446 Duke Street, Alexandria, VA 22314. Allow 3-4 weeks for delivery.

FACILITIES MANAGER

34 WINTER 1988

ing costs are constantly being analyzed for ways to improve operating efficiency or furthering cost reduction, we all have considered, implemented, and reconsidered numerous energy-conserving modifications.

Some of the concepts and technical material presented by facilities managers and others marketing their products are: lighting system optimization including lamps, ballasts, fixture reflectors, spacing of fixtures, and use of natural lighting; cogeneration including federal tax law implications, status of implementing cogeneration as of 1987, equipment configurations for different applications and actual site applications of cogeneration; HVAC controls and automation technology including HVAC controls presently and in the near future, microcomputer applications and direct digital controls; energy audits and analysis; HVAC optimization; combustion technology assessment; chiller optimization; electrical system optimization; steam system optimization and waste heat recovery; load management; energy conservation in the Federal Department of Defense installations and in Westerm Europe; and energy education.

As with most conference presentations some chapters are full of new or expanded ideas, equipment performance data, and personal insight providing a potentially new resource for application at your campus. Some chapters provided little new information, but then haven't you ever attended an uninformative seminar presentation?

Most chapters include a summary statement and references. This makes browsing through the book for a particular topic of interest convenient and informative. If you find a particular chapter of interest, the references provide supplemental informational resources.

I recommend this book to all facilities managers for their reference. In my opinion, this book is not easy to read, because the type is small and presented in a twocolumn format. This book is not the type you read from cover to cover, becoming engrossed in subject matter. It is, however, replete with new ideas and some old ones, both of which may be considered when seeking energy efficiency.

Although I administer one of the most energy efficient college plants in New Jersey, I was extremely impressed with the energy conserving alternatives described in this book that we at Trenton State College have yet to seriously consider. One of the ideas presented in this book, if implemented with a cost savings, will return many times over, the book's cost. I seriously recommend this book to all APPA facilities managers.

Integration of Efficient Design Technologies is available from The Fairmont Press,

Would Your Campus Utility System Get a Passing Grade? Over 50 educational institutions have improved performance by using Sega's Engineering & Technical Services System Analysis Steam Energy Optimization Electrical Power Facility Planning Chilled Water Central Plant Design HVAC Distribution Design Fluidized-Bed Boilers Cogeneration For more information contact Dean Goeking at Sega Inc., P.O. Box 23266, Stanley, Kansas 66223 913-681-2881

Inc., 700 Indian Trail, Lilburn, GA 30247; 404/925-9388.

-Gregory W. Bressler

Associate Vice President for Facilities Management and Planning Trenton State College Trenton, New Jersey

Financial Management

Financial Management of Colleges and Universities. Washington, DC: National Association of College and University Business Officers, 1986. 98 pages, softcover.

In the forward to Financial Management of College and Universities, the late Robert L. Carr, noted that in 1979 NACUBO established the Financial Management Committee to promote understanding of college and university financial management. The committee proposed to develop an orientation and reference book to help new financial managers understand their duties and responsibilities, and also increase awareness of financial management among non-financial administrators. Financial Management of Colleges and Universities is the culmination of the committee's effort and accomplishes its purpose in a clear, concise manner by providing an overview of sound principles and practices of financial management that can be applied to any institution of higher education-large or small.

Chapter one defines the financial management process, identifies the major activities essential to the process, discusses various approaches to structuring an organization for financial management, and reviews the major responsibilities of financial management.

Chapter two describes the financial management process and four of its major aspects: (1) determining the need for funds, (2) generating funds, (3) use of funds, and (4) evaluation of the financial management process.

Chapter three discusses the principles of effective information collection and analysis and their role in the financial management process, and the importance of understanding an institution's infrastructure to the collection of information.

Chapter four is an in-depth look at the financial management planning process, including questions to assist in plan development, principles that govern the development of financial management plans, and the implementation and control of plans.

Chapter five concerns the role of the financial manager as it relates to recent developments in higher education management and the preparation for and recruitment into the financial management profession.

Facilities professionals will find this book useful and an informative resource. After instruction and departmental research, physical plant is probably the next largest budgetary component of higher education institutions. With resources be-





WINTER 1988

ing scarce, facilities professionals need to understand the financial management process, its role in their institution, and how it interrelates with their departmental and institutional goals if they are to compete effectively for funds. Further, once given funds, facilities professionals must demonstrate that they can exercise proper control over the money and be prepared to account for the use of funds in accomplishing their institution's goals.

Financial Management of Colleges and Universities can be utilized by anyone who is responsible either directly or indirectly for the management of higher education resources. It is clearly written, extremely readable and concise. I highly recommend this book to those who have limited time to learn about financial management in colleges and universities.

> -Charles C. Fusco Director, Facilities Financial Services Rutgers University New Brunswick, New Jersey

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 <u>can</u> 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.

Our energy analysis:

- Provides a thorough audit of energy use and costs from every area of your facility.
- Pinpoints energy use and costs for every month of the year for an accurate energy history and useful budget forecast.
- Identifies current and potential problem areas and cost-effective solutions.
- Is available at no cost or obligation.
- Can lead to an energy cost savings of 30% or more.

National Energy Management Institute. Call us today for more information about improving your grades — in efficient energy management.

> Nationwide, call us toll-free at 1-800-458-6525 9:00 a.m.-5:00 p.m. Eastern Standard Time



Energy and Indoor Air Quality Professionals.

FACILITIES MANAGER

35

A New Book Series From APPA!

Critical Issues in Facilities Management is a new book series that addresses today's key concerns in physical plant administration.

> Critical Issues in Facilities Management



/IPA

ISEN 0-913359-44-0

Work Control, the second title in the series, contains chapters on work control centers, setting up a zone maintenance system, selecting a maintenance management system, and computerized planned maintenance. Also included are chapters on custodial management, ground maintenance, and fleet management.

Contains 12 chapters and a comprehensive bibliography. Introduction by David R. Howard, executive director of facilities planning and operations, San Francisco State University. Other books in the series include Computer Applications and Personnel Management and Development.

Published by Association of Physical Plant Administrators of Universities and Colleges

\$25 (\$17/APPA members) + \$8 shipping. Send check (purchase orders from members only) to: APPA Publications, 1446 Duke Street, Alexandria, VA 22314. Allow 3-4 weeks for delivery. 36 WINTER 1988

Index of Advertisers

APPA 2, 12, 28, 33, 3	15
Facility Mapping Systems 2	8
Flexi-Wall	28
Harmsco, Inc	36
Heath Consultants 1	0
Hot Foot International	11
Innovative Equipment 2	28
Midland Engineering Company . 3	\$6
Mustang Units Company, Inc 1	11
National Energy Management	
Institute	5
Page Aluminized Steel	
Corporation	31
Parsons Brinckerhoff	
Maintenance Services	31
Pittsburgh Corning cover	2
Sega Inc	34
Servidyne Incorporated cover	4
Visual Aids Electronics	
Corporation cover	3



1988 Roofing Contractor of the Year Award Winner

OUR 67th YEAR OF SERVING THE ROOFING NEEDS OF THE FACILITIES MANAGEMENT PROFESSION

midland

ENGINEERING

Before your institution invests a considerable sum of money in a potentially unnecessary roof replacement or an incorrect repair, your institution may greatly benefit by an in depth evaluation of your institution's roofing system.

A good roof management program can reduce a substantial number of dollars from your institution's facilities management budget in future years.

For a free brochure explaining our comprehensive roof management program, please send your request on your letterhead to:

WILLIAM R. STEINMETZ, JR., Corporate Services Manager MIDLAND ENGINEERING COMPANY, INC. 52369 U.S. 33 North, P.O. Box 1019, South Bend, Indiana 46624 (219) 272-0200

The bigger the pool, the more Harmsco[®] shines.

Over 10,000 commercial and public pool owners with tough filtration requirements have Harmsco cartridge filters for some very bright reasons:

- Harmsco swimming pool filters are designed and built well enough to offer a 10-year warranty.
- Harmsco filters are compact, easy to install, and require no waste disposal systems.



The new heavy-duty flanged commercial filters save installation time.

 Harmsco's patented up-flow design, and Polyester-Plus media provide sparkling clean water.

- Harmsco filters save thousands of dollars per year in water, heat, chemicals and energy typically wasted with other filtration methods.
- Harmsco provides professional back-up to help you achieve maximum results.



Harmsco, Inc., P.O. Box 14066, North Palm Beach, FL 33408 Nationwide: Dial 800-327-3248 In Florida: Dial 800-432-5325. Fax: (407) 845-2474 Isn't it time you moved up to Harmsco?

Annual Meeting Audiocassettes

Capture the experience of APPA's 75th Annual Meeting through audiocassettes recorded at the conference. Share valuable ideas, expertise, and training with your colleagues. Beinforce concepts you wanted to carry home with you.

The Annual Meeting focuses on a variety of management and technical issues, as well as critical issues affecting the facilities management profession. The topics presented are designed to help administrators stay ahead of the issues and prepare to meet the challenges of the future.

KEYNOTE ADDRESSES

- Public Funding of Higher Education: Future Outlook for Facilities Dr. Linus Wright, Undersecretary of the U.S. Department of Education
- How Facilities Relate to a Successful Academic Mission

Dr. Ernest L. Boyer, President, The Carnegie Foundation for the Advancement of Teaching

CRITICAL ISSUES IN HIGHER EDUCATION SERIES

- Deferred Maintenance/Capital Renewal Randy Turpin. University of Utah, and Sean Rush. Coopers & Lybrand
- Energy Issues Frank Stewart, Director of State and Local Assistance, U.S. Department of Energy
- Hazardous Materials Robert J. Knox, Director, Office of Ombudsmen, U.S. Environmental Protection Agency, and John Molinaro, Director, Chemical Communications Systems

Low-Bid Purchasing

Dorsey Jacobs. West Virginia University, and APPA President: Tom Bostick. State of Georgia, and President, NASPO: and Earl Whitman. University of Oklahoma, and Past President, NAEB

EDUCATIONAL SESSIONS

- Improving Customer Relations. Even During Rough Times
 - Ronald Flinn, Michigan State University
- Relevance of Life Cycle Costs and Its Impact on Building Delivery Systems William J. Humble, University of Queensland, and Maurice R. Pawsey, University of Melbourne
- Practical Roof Management Programs for Colleges and Universities William R. Steinmetz Jr., Midland Engineering Company
- The Multi-Campus Long Range Master Plan Dr. Nathan Ivey, Dallas County Community College District
- Animal Care Issues & Operation and Maintenance of Animal Research Facilities Paul Barrett, Massachusetts Institute of Technology, and Nickolas Sojka, University of Virginia

ORDEI PRICE: \$8 per tape Add \$4 per or	RING INFORMATION . SPECIAL OFFER: 10 tapes for \$70. der for postage and bandling
Check the titles you wish to purchase, fill in th VISUAL AIDS 283	ELECTRONICS CORPORATION B1 15th Street, N.W.
Was	shington, DC 20009
Was Name: Company: Address:	shington, DC 20009 Check Enclosed—Make Payable to Visual Aids Electronics Corporation Credit Card— Visa MasterCard American Express

RENTAL CHILLERS



For your emergency cooling needs. Servidyne offers a fleet of trailer-mounted, chilled water systems.

- Includes towers, pumps, and flexible chilled water hose.
- Size range 50 to 400 tons.
- Based across the country.
- Quick and easy installation.

INCORPORATED

For additional information, contact Don Schrampfer, Servidyne Incorporated, 2120 Marietta Boulevard, N.W., P.O. Box 93846, Atlanta, Georgia 30377, (404) 352-2050



ATLANTA NEW ORLEANS CHICAGO NEW YORK MIAMI

LOS ANGELES WASHINGTON, D.C.



Nonprofit U.S. Post Paid Alexandria, VA Permit No. 653