

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

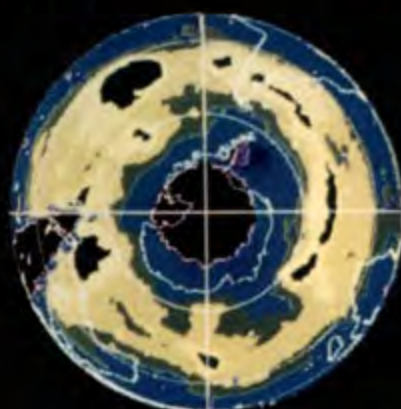
Facilities Manager

Volume 6 Number 2

Summer 1990

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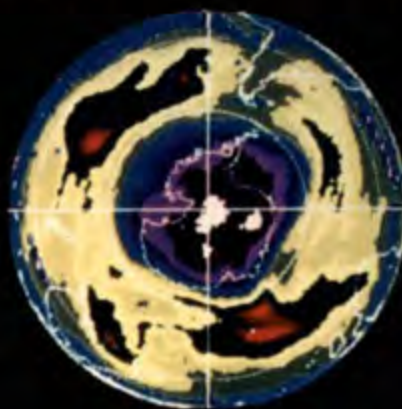


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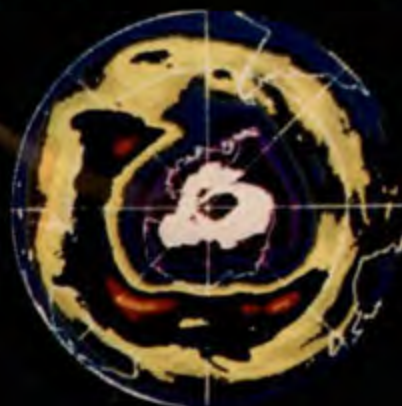
Diminishing the Threat of CFCs

Also in this issue:

- Asbestos in the Classroom
- Selecting a Roofing Contractor
- Coping With Natural Disasters

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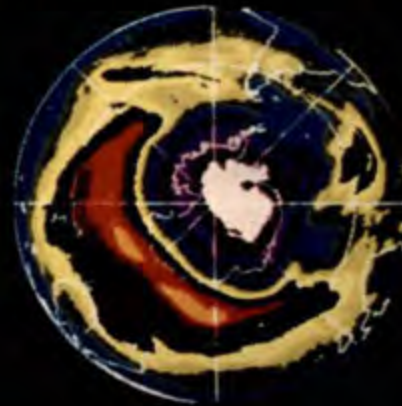


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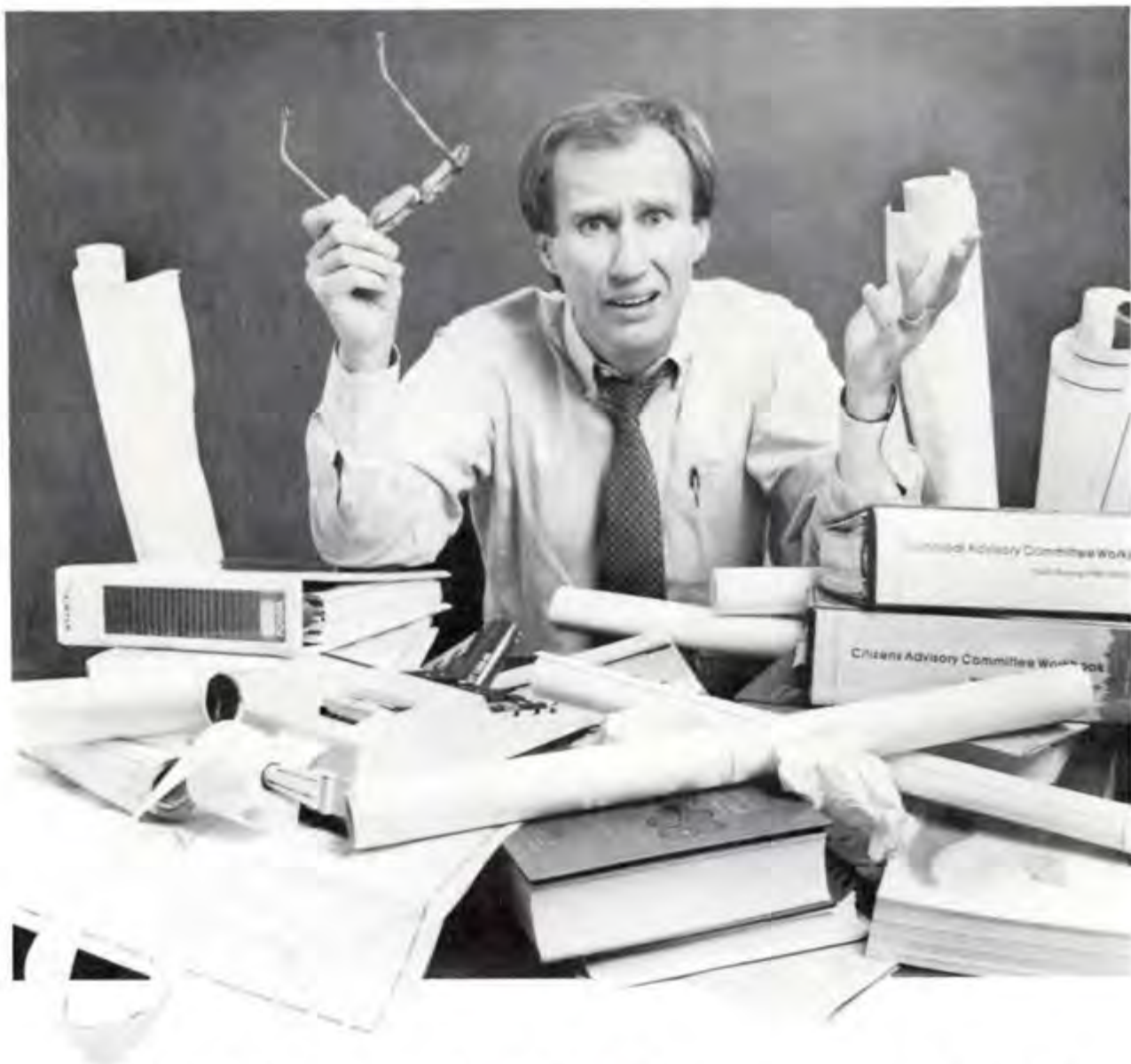
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For information on rates and deadlines for display and classified advertising, telephone 703/684-1446.

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APPA UPDATE

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

Texas Tech University, United States Military Academy Win Award for Excellence in Facilities Management

Texas Tech University and the United States Military Academy were selected as the international winners of the 1990 Award for Excellence in Facilities Management. This award is the highest institutional honor given by APPA.

Texas Tech University located in Lubbock, Texas, won the third annual Award for Excellence in the large campus category (5,000 and above FTE student enrollment). United States Military Academy, West Point, New York, won in the small campus category (under 5,000 FTE student enrollment). The presidents of the two institutions accepted the engraved crystal obelisk at the July 3 Awards Banquet at APPA's 77th Annual Meeting in Ottawa, Canada.

The winners of the regional Awards for Excellence in the small campus category are Eastern, **United States Military Academy**; Southeastern, **Southern College of Technology (GA)**; Central, **University of Tulsa (OK)**; Rocky Mountain, **New Mexico Military Institute**; and Pacific Coast, **University of Puget Sound (WA)**.

The regional award winners in the large campus category are Eastern, **Rutgers University (NJ)**; Southeastern, **Virginia Polytechnic Institute and State University**; Central, **Texas Tech University**; Rocky Mountain, **University of Utah**; and Pacific Coast, **University of California/Riverside**.

The Award for Excellence has been developed to increase the recognition of outstanding achievement in facilities management on college and university campuses. The award provides an equal

opportunity for regional, national, and international recognition of physical plant departments, not just of a single individual or specific unit.

APPA's Professional Affairs Committee made the selections based upon the following criteria: purpose and goals; organization and resources; policies, procedures, and processes; personnel training and development; fiscal planning and management; campus condition and appearance; communications and quality of relationships; campus planning; and other considerations. To ensure objectivity, each member of the committee is responsible for rating one criterion throughout all the applications. The separate ratings are tallied after all applications have been reviewed.

The international awards were selected



United States Military Academy

from the regional winners chosen by the APPA regions in each of the two categories. The six APPA regions are responsible for selecting the regional award winners, which are chosen based upon a written self-evaluation. All colleges and universities that are members of APPA are eligible to participate.

Application booklets for the 1991 Award for Excellence program were mailed to APPA members in June. The deadline for the regional awards applications is **August 31, 1990**. Contact the APPA office for more information or to receive an application booklet.

Timetable for 1991 Program

- **August 31, 1990** School submits application (written self-evaluation) to APPA; APPA distributes to regional presidents.
- **Fall 1990** Regions select winners at their annual meeting.
- **November 1, 1990** Regions inform APPA of regional winners.
- **December 3, 1990** APPA notifies regional winners and other applicants.
- **April 1, 1991** Regional winners submit final applications to APPA.
- **April 1991** Professional Affairs Committee selects international winners in small and large campus categories.
- **July 23, 1991** Awards presented at APPA's 78th Annual Meeting in Orlando, Florida.



Texas Tech University

Inside APPA



Hargett and Osborn Win Rex Dillow Award

Teresa Hargett, senior administrator in the office of the senior vice president, and Robert Osborn, acting superintendent for the department of buildings care, both of Cornell University (NY), are the recipients of the fourth annual Rex Dillow Award for Outstanding Article in *Facilities Manager*. The award was given at the 77th Annual Meeting in Ottawa, Canada.

Hargett and Osborn cowrote "Cornell Recycles: A Major University Commitment," which appeared in the summer 1989 issue of *Facilities Manager*, and was selected by APPA's Professional Affairs Committee from among nine eligible articles. Only articles written by staff members at APPA member institutions are eligible for the award.

"Cornell Recycles" addresses Cornell University's commitment to recycling and shows how a large university develops a campus-wide recycling program.

The Rex Dillow Award was named for member emeritus Rex O. Dillow, who has made valuable contributions to APPA publications. Dillow was editor-in-chief of APPA's two editions of *Facilities Management: A Manual for Plant Administration*. He was also newsletter editor for APPA's Central region for many years and received APPA's Meritorious Service Award in 1983 and the President's Award in 1989.

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**.

Executive Training Programs

Executive Development Institute Graduates 38

APPA held its fourth Executive Development Institute in late April and graduated 38 participants (see photo above). This highly successful program is held in cooperation with the University of Notre Dame College of Business Administration. The program is designed for senior facilities managers. Areas stressed are accounting, organizational behavior, marketing, leadership, and strategic planning skills—all areas necessary for successful leadership and administration on campus.

The next Institute will be held April 28-May 3, 1991. Applications for the program are available from the APPA office. Enrollment is limited to 35 participants.

First Institute Set for Facilities Finance

APPA is pleased to announce a new program for senior facilities officers—*The Institute for Facilities Finance in*

Higher Education. The first offering of this program will be November 5-8, 1990 in Washington, DC.

This program will focus on needs for financing facilities in the years to come. Designed for senior facilities managers, business officers, and other institutional policymakers, the three-day program covers the following topics:

- Facilities as a capital asset.
- Capital facilities planning.
- Budgeting and cost accounting for operations and capital effects.
- Requirements and options for capital improvement.
- Issues in capital management.
- Funding sources.
- Successful strategies in utilizing facilities as a capital asset.

Brochures with more details on course work and faculty will be available in August. Enrollment is limited, so watch your mail for the registration materials.



Participants in the 1990 Executive Development Institute: Standing (left to right) Diane Kerby, Berea College; Sam Barron, University of California/San Francisco; William McGinnis, California State University/Chico; Bryan Bealzer, Carleton University; Michael Stevenson, Columbus State Community College; Roy Allen, University of Texas/MO Anderson; Ronald Maassen, Waukesha County Technical College; Jerry Lonergan, University of Michigan/Ann Arbor; Duane Hickling, University of Southern California; James Joyner, University of Arkansas/Little Rock; Michael Sherrell, University of Tennessee/Knoxville; John Rishling, University of Texas/Austin; Ronald Beckert, Anne Arundel County Public Schools; John Schenk, University of Iowa; Charles Fountain, Embury-Riddle Aeronautical University; Michael Sotfield, Smithsonian Institution; Robert Kerr, Northern Alberta Institute of Technology; Thomas Summers, Aquinas College; Adolph Hight, Howard University; Thomas Nelson, Purdue University/N. Central; M. Peters, coordinator, Executive Development Institute Program.

Sitting (left to right): Richard MacKorie, New Mexico State University; Richard Hendrickson, San Jose State University; Jack Watson, Kansas State University; Kenneth Hall, University of Idaho; Joseph Hack, University of North Carolina; Jack Billinton, University of Saskatchewan; Eva Myking, University of California/San Diego; Harold Schaeffer, University of Rochester; David Turnquist, Baylor College of Medicine; Lander Medlin, University of Maryland/College Park; Melvyn Remin, Central Michigan University; David Girardot, Old Dominion University.



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Colleges and universities throughout the United States have been wrestling with the issues of deferred maintenance and facility renewal. Many institutions require specialized assistance which combines comprehensive analysis with practical knowledge and focused task specific execution in the evaluation of facility conditions.

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FALL 1990

Inside APPA

Information Exchange

Polly Pinney at Arizona State University is looking for information on implementing a drug testing program at a college or university. If anyone has information on this subject, please contact Polly Pinney, Assistant to the Director of Physical Plant, Arizona State University, Tempe, AZ 85287; 602/965-6109.

SCAPPA News

The First Annual Meeting and Trade Show of SCAPPA (South Carolina Association of Physical Plant Administrators) was hosted by Clemson University's facilities maintenance and operations division, April 29-May 1, at Myrtle Beach, South Carolina. Mike Faïres, assistant vice president for Clemson University's facilities maintenance and operations, is the 1990-91 SCAPPA president. Michael Renfrow, director of physical plant at Georgia State University and president-elect of SRAPPA, began the meeting with a speech on "Ethical Management—A Foundation for Success."

Educational program speakers were Robert C. Lowrey, data base adminis-

trator, College of Architecture, Clemson University, "Facilities Management Through Computer Graphics"; Richard Canon, P.E., Canon Consulting Company, "The Effects of Hurricane Hugo on Roofing"; Robert King, assistant deputy commissioner of Columbia, South Carolina, "DHEC Update and What We Can Plan for the Future"; and Robert Miller, director of public safety, Furman University, "Campus Security for the '90s."

SCAPPA's vendor space sold out with 42 vendors. Twenty-four member institutions attended with approximately 60 administrators registered. The golf, weather, seafood, and opportunity to discuss facilities management experiences with peers all added up to a "great first meeting." Jimmy Cooper, director, operational services, University of South Carolina/Columbia and vice president of SCAPPA, volunteered to host SCAPPA 91.

Access Case Reaches Settlement

Washington University and Cynthia L. Brown have agreed to settle a lawsuit brought by Brown against the university over handicapped accessibility on its main campus.

The suit was filed in September 1988 and settlement was reached after several

months of negotiation.

Brown, a wheelchair user who was a Washington University law student at the time the suit was filed, alleged that many of the university's programs, activities, and facilities were not accessible to mobility-impaired persons. She claimed that the university was in violation of the federal Rehabilitation Act of 1973. The lawsuit requested injunctive relief to remedy the inaccessible conditions and payment of Brown's attorney's fees and expenses. Brown sought no monetary damages.

The university will make numerous physical modifications to its campus to make it more accessible to wheelchair users. The work to be done includes the construction of ramps, installation of elevators, and renovation of restrooms. All work is to be completed by June 30, 1992. More than 35 buildings will be affected by the construction.

The university will also make its shuttle transportation system accessible to wheelchair users, will eliminate nonphysical obstacles to accessibility, and will designate a high level administrator to oversee implementation of the remedial measures.

National authorities on disability law believe this action to be the first of its kind directed at a private college or university.

Energy Award Received

ASHRAE awarded APPA subscribing member HEC Energy Corporation for its excellence in energy conservation. HEC projects recognized by ASHRAE are at the University of Chicago Hospitals, Lutheran General Hospital, and the University of Chicago. These three projects will save the facilities more than \$1 million annually on utility costs.

First place went to the project at the University of Chicago Hospitals for its innovative approach to modifications of control systems, steam systems efficiency, air supply and exhaust system modifications, and lighting efficiency. The savings from this project were \$700,000.

HEC designed and installed combustion control improvements and a blowdown heat recovery system and renovated a steam turbine system at the University of Chicago central steam plant. This project saved \$100,000 in natural gas and electricity costs.

Emeritus Member Dies

Meritorious Service Award winner and member of the Board of Directors, Nester Hannibar Gurley, died in December 1989. Gurley was a former director of physical plant at the University of North Carolina at Greensboro and retired from that position in March 1976.

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The Environment

The National Institute of Building Sciences (NIBS) is making available the first federal guidelines providing technical protocols, practices, and procedures on testing, abatement, worker protection, clean-up, and the disposal of lead-based paint in residential structures. The guidelines were published by the U.S. Department of Housing and Urban Development (HUD). The 650-page report, *Lead-Based Paint: Interim Guidelines for Hazard Identification and Abatement in Public and Indian Housing*, is available for \$45 from NIBS, Publications Department, 1201 L Street, N.W., Suite 400, Washington, DC 20005; 202/289-7800.

International District Heating and Cooling Association published a new IDHCA Environmental Brochure, "We've Got the Energy to Help Clear the Air." This brochure covers various energy sources and describes how pollution can be decreased. Copies are \$2.50 for contributing IDHCA members, \$3.75 for other members, and \$5 for non-IDHCA members. For more information contact Carolyn Millunzi, IDHCA, 1101 Connecticut Avenue, N.W., Suite 700, Washington, DC 20036; 202/429-5111, fax 202/223-4579.

Government Institutes has released the EPA's *Industrial User Permitting Guidance Manual*, which is designed to shed light on publicly owned treatment works (POTWs) permit process, applying for effluent limits, and monitoring and reporting requirements. The 292-page book is \$49.

The same company is offering two courses on toxic substances for environmental engineers. Toxicology for Nontoxicologists will be held October 10, and Compliance with TSCA Regulations will be held October 11-12. Both will be in Arlington, Virginia. For more information contact Government Institutes, Inc., 966 Hungerford Drive, #24, Rockville, MD 20850-1714; 301/251-9250.

The revised "Polychlorinated Biphenyls (PCB) Penalty Policy" was issued by the EPA in the *Federal Register* on April 30, 1990 (vol. 55 no. 72 pg. 13955). This policy provides specific information about penalties for violations of PCB regulations pertaining to areas such as electrical equipment, closed and controlled waste manufacturing processes, in-

cident generation, and the new notification and manifesting of PCB waste activities. Copies of the penalty policy are available at no charge by contacting the TSCA hotline at 202/554-1404.

The EPA imposed a three-month extension on May 8 on the land disposal ban for more than 350 untreated hazardous

wastes in the final version of a rule setting treatment standards for the wastes. The land-ban, known as the "third-third," prohibits the disposal of untreated hazardous waste in landfills and surface impoundments. The extension was put into effect so that the numerous industries affected by the 900-page rule will have a chance to read it and get ready to comply with the new regulations. The third-third sets levels for wastes to be treated before they will be allowed to be placed in landfills. For more information call the RCRA hotline 800/424-9346 or 202/382-3000.



Why re-invent the wheel when it's already been done for you!

Over the years the Physical Plant Department at Virginia Tech has developed a unique series of contract documents which have helped procure high quality and cost effective construction, services, and materials critical to the care, maintenance, repair, and renovation of the university.

These complete contracts are now available in a spiral bound format for adaptation and use by the Physical Plants of other colleges and universities.

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Available both individually or as a set:

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- **Equipment Maintenance Contracts** (includes Elevator Maintenance, Elevator Inspection, Furnace and Boiler Maintenance, HVAC&R Maintenance, Mechanical Services, and Electrical Services)
- **Building Services Contracts** (includes Custodial Services, Pest Control, Carpet Cleaning, and Window Cleaning)
- **Construction Services Contracts** (includes Concrete, Masonry, Carpentry, Drywall, Ceiling Tile, and Floor Tile)
- **Materials Procurement Contracts** (includes General Building Materials & Hardware, Plumbing & Heating, Electrical, Ready-Mix Concrete, Crushed Stone, and Masonry Supplies)

These contract documents are *complete!* They include the technical specifications, terms and conditions, contractor qualifications, personnel requirements, quality of materials, and standards of workmanship as required for each contract.

FOR ADDITIONAL INFORMATION OR TO ORDER:
Physical Plant Publications, 64 Maintenance Bldg.,
Virginia Tech, Blacksburg, VA 24061

(703)231-7536

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 **August 10** for the September issue, **September 10** for October, and **October 10** for November. Closing deadlines for job announcements are posted at the request of each institution. In some cases, deadlines may be extended by an institution. APPA encourages all individuals interested in a position to inquire at the institution regarding its closing/filing date.

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

• • •

PHYSICAL PLANT DIRECTOR EASTERN NEW MEXICO UNIVERSITY ROSWELL CAMPUS

The Roswell Campus of Eastern New Mexico University is seeking a physical plant director. The director reports directly to the dean of administrative services and will be responsible for the management, planning, operation, and maintenance of campus facilities and grounds totalling approximately 425,000 square feet in 30 buildings and 150 acres.

Nominees and applicants are required to have a bachelor's degree in engineering or a closely related field and five years managerial experience in comprehensive physical plant management. Those with demonstrated success in preventive maintenance programs and resource utilization will have a decided advantage. Salary is \$30,000+ depending upon qualifications and experience.

Applicants are to provide a letter of application, a resume, and the names and phone numbers of at least three references, preferably from current or former employers. Application materials, postmarked by **July 15, 1990** should be directed to:

The Physical Plant Director Search Committee
Eastern New Mexico University
P.O. Box 6000
Roswell, NM 88202-6000

DIRECTOR OF FACILITIES AND PLANNING

Slippery Rock University is seeking a director of facilities planning.

Slippery Rock University is one of the 14 public-owned universities comprising the Pennsylvania State System of Higher Education. Located one hour north of Pittsburgh, the university serves more than 7,000 undergraduate and graduate students. The campus includes more than 600 acres and 35 major buildings.

The director will be responsible for the management of the university's physical plant totaling 1.6 million square feet of building space, a work force of more than 100 employees, management of departmental, deferred maintenance and capital program budgets.

Coordination of all renovations, repair, and new construction projects that includes the following: specification writing, bidding process, selection and evaluation of construction professionals, and projects inspection.

Other duties include: development of a campus master plan and formulation of a short- and long-range preventive maintenance program for buildings and grounds, knowledge of HVAC and electrical systems, campus utilities and distribution systems, grounds maintenance, custodial services and vehicle pool.

Qualifications: a bachelor's degree in architecture or engineering with professional registration (P.E., R.A.) and five years of senior-level managerial experience in physical plant or construction management is required. Strong written and verbal communication skills with an ability to maintain effective working relations are highly desirable. Minorities and women are especially encouraged to apply.

Salary range: \$40,384-\$60,576.

Qualified candidates should send a letter of application, resume, names and telephone numbers of three references, and salary history (official transcripts will be required after initial screening) to

Office of Finance and Administrative Affairs
Director of Facilities and Planning Committee
301 Old Main
Slippery Rock University
Slippery Rock, PA 16057

To ensure consideration, application materials should be received by **July 27, 1990**.

Slippery Rock University is an affirmative action/equal opportunity employer.

GRANT ADMINISTRATOR

F.W. Olin Foundation, Inc., seeks an individual to work out of its New York City office to assist in administering the foundation's multi-million dollar grants to independent colleges and universities for the construction of academic buildings. Through its first 50 years, the foundation has made grants for 54 buildings at 41 institutions, representing more than 3 million square feet of space.

This is a unique career opportunity. Minimum qualifications include a bachelor's degree in architecture, engineering, or a related field and at least eight years experience in design and/or construction management. Experience with educational facilities at the college or university level is highly desirable. Good communication and interpersonal skills are important. Regular travel is required. This is offered as a full-time position, but applicants for part-time work will also be considered.

Send resume, references, and salary requirements to:

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A good benefits package is offered for the full-time position. No phone calls please.

Job Corner

Stockroom Coordinator/Facilities Management Buyer (reports to purchasing department)—University of Maine. Responsibilities: purchase MRO materi-

als for the department of facilities management and inventory for central stockroom; supervise management and performance of central supply (stockroom has a manager, assistant manager and seven plus support staff); maintain a computerized records systems for central supply and campus community. Qualifications: bachelor's degree in business

administration, purchasing, or related field. A combination of experience and/or education in a related field equal to four years can be substituted for education. Excellent verbal and written communication skills are required. Knowledge of personal computers, word processing, and a background in computerized inventory management is essential. Product knowledge a definite advantage. Salary range: \$23,000-\$28,000. Application deadline: **July 31, 1990**. Position start date: September 3, 1990 or when suitable applicant is found. Send letter of interest, resume, and references to Search Committee, Stockroom Coordinator/Facilities Management Buyer, Purchasing Department, 101 Service Building, University of Maine, Orono, Maine 04469. EEO/AA.

DIRECTOR, PHYSICAL PLANT OPERATIONS

The University of Virginia, Charlottesville, Virginia, invites applications for the position of director, physical plant operations. Reporting to the assistant vice president, this faculty position is responsible for managing and directing all technical and administrative aspects of the maintenance division, the utilities division, the renovation division, the landscape division, and the building services division; preparing budgets and controlling expenditures of funds allotted; and managing a comprehensive preventive maintenance program for all university facilities.

The operations department has over 400 people providing facility and utility services for the functioning of 500 buildings and approximately 900 acres of grounds.

Candidates should be registered professional engineers in civil, mechanical, or electrical engineering. Advanced degree in engineering or management fields is desirable. Must have extensive management skills in the fields of utilities plant and system operations, facilities management and/or construction; managing large organizations through intermediate supervisors; and preparing and managing numerous budgets. Must be able to communicate with all levels of trades and management personnel and to coordinate activities of a multifaceted operation.

Salary: \$50,000-\$60,000 depending upon qualifications, excellent fringe benefits. Deadline for applications: **August 1, 1990**. Letters of application should be accompanied by a resume and sent to:

William D. Middleton
Assistant Vice President, Physical Plant
575 Alderman Road
Charlottesville, Virginia 22903

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PHYSICAL PLANT DIRECTOR (reopened) LINCOLN UNIVERSITY OF MISSOURI

Lincoln University of Missouri, a land-grant institution with a student body of approximately 3,000, invites applications for the position of director of physical plant. The plant includes 33 buildings on 136.17 acres with 857,641 square feet of space.

The director of physical plant has primary responsibility for planning, coordinating, and directing all programs related to the maintenance of all campus buildings, grounds, and equipment. Areas of responsibility consist of building and mechanical maintenance that include carpentry, plumbing, electrical, HVAC, and power plant; grounds maintenance; custodial services; preventive maintenance; vehicle control (motor pool); and all budgetary aspects of physical plant.

Qualifications: a bachelor's degree is required (preferably in an engineering-related field) and at least five years of physical plant operations experience, three of which are required to be at the supervisory level. A viable candidate should possess technical expertise in at least one of the trades represented in the physical plant area.

Starting date: September 1990.

Closing Date: application materials must be postmarked by **July 16, 1990**. The position will remain open until a qualified applicant is selected.

Application process: send 1) letter of application, 2) current resume, and 3) names and addresses of three references to:

Personnel Office
Lincoln University
820 Chestnut Street
Jefferson City, MO 65101

Letters of recommendation and transcripts will be required of all finalists.
An equal opportunity institution.

ELECTRICAL ENGINEER, FACILITIES ENGINEERING

The University of Idaho is seeking an individual to join the facilities engineering staff as a board appointed, fiscal year-exempt electrical engineer. Responsibilities will include the design, cost estimation, and management of construction renovation projects for electrical power, lighting, fiber optic, signal, and communication systems. The individual will work closely with staff members in the design and planning for mechanical/electrical systems. Qualified candidates will have a bachelor's degree in electrical engineering or equivalent, plus approximately three years experience in renovation, project design, and general project administration. Strong written and verbal communications skills are essential, as are demonstrated design and drafting abilities, a working knowledge of the National Electrical Code, the ability to prepare bid documents and specifications, and the ability to obtain a PE license. Experience in high-voltage construction, mechanical building systems, and cogeneration is desirable. Salary will be commensurate with experience and qualifications. Closing date for the position will be **July 31, 1990** or until a suitable applicant is found. For consideration, send your resume and cover letter along with a copy of this ad to: University of Idaho, Human Resources Office, Moscow, ID 83843. For a copy of the job description, call Human Resources Office at 208/885-6496.

University of Idaho is an equal opportunity/affirmative action employer.

Job Corner

(cont. from p. 9)

DIRECTOR OF FACILITIES MANAGEMENT

Washington University School of Medicine—one of the foremost institutions of medical education and research in the world.

Candidates must be able to manage all facilities maintenance and support service activities, including general/preventive maintenance, systems monitoring, small construction, housekeeping, security, parking, and receiving. Responsibilities will include developing appropriate administrative and organizational support structures, developing and implementing policies and procedures, and supervising related personnel. Requirements: five to ten years senior facilities management experience in a university, teaching hospital, or large corporate/industrial complex (health service industry preferred) with line responsibilities for technical personnel and budget administration with a degree in business, engineering, health administration, or a related management field.

Send resume to:
Washington University School of Medicine
Attn: Lee F. Fetter
Box 8003, 660 South Euclid
St. Louis, Missouri 63110
EEO/AA Employer M/F/H/V.

DIRECTOR PHYSICAL PLANT OPERATIONS

Marist College is seeking an experienced Director of Physical Plant Operations to start October 1, 1990. Reporting to the Assistant Vice President, this individual will provide planning and leadership to a staff of 90 employees, prepare and administer a budget of \$3 million and oversee the daily operations of 31 buildings on 120 acres. All applicants must have a significant demonstrated record of success in the areas of management and supervision of mechanical services, custodial services and grounds maintenance.

Minimum qualifications include at least five to seven years of proven and progressively responsible management experience at a multi-unit complex. Experience in an educational facility and college degree strongly preferred, but not required. The ideal candidate should possess excellent interpersonal, analytical, labor/management, financial, and construction management skills.

Marist College offers competitive salary and benefits including tuition remission for employee and dependents. Candidates should submit a letter of application, resume, salary history and requirements, and names of three professional references by July 20, 1990 (or until a successful candidate is identified). Candidates who do not submit this information shall not be considered. Please address to: **Carol A. Coogan, Director of Personnel, Marist College, Poughkeepsie, NY 12601.** Marist College is an Equal Opportunity/Affirmative Action Employer.

MARIST
COLLEGE

approximately 60 professional and technical employees managing the statewide capital improvements program. The qualified candidate must be a dynamic leader and possess excellent technical, managerial, and administrative abilities, as well as good communications skills. This job involves contact with the general assembly and private consultants and contractors. Knowledge of capital improvements planning and budgeting is important. The successful candidate should possess at least six years of progressively responsible experience in the architectural or engineering field and must be able to become a registered professional architect or engineer in Missouri within six months of appointment. The monthly salary range is \$3,167 to \$4,318. Interested applicants should send resume and salary requirements to: Missouri Division of Design and Construction, Attn: Assistant Director for Administration, P.O. Box 809, Jefferson City, MO 65102 by **July 24**. No telephone calls, please. *The state is an affirmative action/equal opportunity employer. M/F/H.*

Associate Director Engineering and Maintenance, Campus Facility Services. Indiana University-Purdue University at Indianapolis is seeking candidates for the position of associate director engineering and maintenance. Position reports to the director of campus facility services. Duties include supervising and coordinating the work activities of the engineering and drafting staff; serve as technical liaison with university architect's office, local utility companies, and external contracting firms; develop and supervise the implementation of a preventive maintenance program; conduct periodic campus inspections and identify maintenance needs; and approve all calculations for the preparation of all cost estimates for internal renovation and maintenance-related projects. Qualifications: bachelor's degree in engineering, preferably mechanical, with advanced degree or professional engineering status; 8-10 years in administration, directing, and managing a facilities maintenance operation in an urban university environment. Demonstrated leadership ability, excellent oral and written communication skills required. To apply: application deadline, **July 27, 1990**. Send resume with cover letter to: Marcia Combs, Human Resources Administration, Indiana University-Purdue University at Indianapolis, Union Building, 620 Union Drive, Indianapolis, Indiana 46202.

Membership

New Institutional Members

Arizona State University/West Campus, Phoenix, AZ 85017; 602/246-6060. Representative: Steffany Knirsch, director, facilities management.

Charles R. Drew University of Medicine & Science, Los Angeles, CA 90059; 213/563-5823. Representative: John S. Sanyika, director of administrative services.

Henry Ford Community College, Dearborn, MI 48128-1495; 313/845-9602. Representative: Terry Stollsteiner, director, buildings and grounds.

Lawson State Community College, Birmingham, AL 35221; 205/925-1666. Representative: Dr. J. Allen Smith II, administrative assistant to the president.

Madison Area Technical College, Madison, WI 53704; 608/246-6837. Representative: Daniel J. Seidl, facilities manager.

North Florida Junior College, Madison, FL 32340; 904/973-2288 ext. 228. Representative: Dale Hackle, acting director of physical plant.

Princeton Theological Seminary, Princeton, NJ 08542; 609/497-7730. Representative: David N. Poinsett, director of housing.

Rancho Santiago College, Santa Ana, CA 92706; 714/667-3341. Representative: Robert C. Partridge, administrative dean, facility planning.

SUNY/College at Brockport, Brockport, NY 14420; 716/395-2408. Representative: Donald L. Pickard, director of plant management.

SUNY/Health Science Center at Brooklyn, Brooklyn, NY 11203-2098; 718/270-2345. Representative: Ivan M. Lisnitzer, PE, deputy vice president for operations.

Victoria University, Toronto, Ontario, Canada M5S 1K7; 416/585-4583. Representative: D. Neil Patterson, manager, physical plant.

Yale University Medical School, New Haven, CT 06510; 203/785-4621. Representative: James R. Adams, director of physical plant operations.

New Affiliate Members

California State University, Chico/University Housing and Food Services, Chico, CA 95929-0707; 916/895-6325. Representative: Patricia A. Van Dyke, facilities operations manager.

Concord Academy, Concord, MA 01742; 508/369-6080 ext. 166. Representative: William A. Stuessy, director of facilities/engineering.

Convalescent Hospital for Children, Rochester, NY 14623. Representative: Joseph W. Pickard, director of operations.

Dormitory Authority, New York, Scarsdale, NY 10583-3961; 212/356-0640. Representative: Raymond L. Barsa, director, rehabilitation unit.

Heidelberg, FRG, APO, New York 09102; 011/49-6221-761-697. Representative: Robert A. Adams, director of engineering and housing.

Illinois Community College Board, Springfield, IL 62701; 217/785-0171. Representative: Greg Florian, associate director for fiscal affairs.

Logistics Management Institute, Bethesda, MD 20817-5886; 301/320-7301. Representative: Jeffrey Hawkins, research fellow/facilities management consultant.

Masters School, Dobbs Ferry, NY 10522; 914/693-1400. Representative: C. Ronald Hummel, business manager.

Missouri Department of Elementary and Secondary Education, Jefferson City, MO 65102; 314/751-2586. Representative: Gary W. Jones, director, school building services.

Paramount Pictures Center, Hollywood, CA 90038-3197; 213/468-5896. Representative: Brad Nelson, manager, maintenance.

Portland Public Schools, Portland, OR 97227; 503/249-2000. Representative: David L. Nollette, plant operations manager.

St. Louis Public Library, St. Louis, MO 63101; 314/241-0610. Representative: Charles O. Hoehn, director of facilities.

Saratoga-Warren County B.O.C.E.S., Saratoga Springs, NY 12866; 518/584-3239 ext. 281. Representative: Peter V. Riggi, superintendent of buildings and grounds.

The Shipley School, Bryn Mawr, PA 19010; 215/525-8250. Representative: B. Kent Donley, director of physical plant.

Spokane Public Schools, Spokane, WA 99207; 509/353-3777. Representative: Richard W. Laughon, director, maintenance and operations.

University of Texas MD Anderson Cancer Center, Houston, TX 77030; 713/792-3024. Representative: Howard W. Stanford, assistant director, physical plant.

University of Wisconsin/Whitewater, Office of Residential Life, Whitewater, WI 53190; 414/472-1157. Representative: Carl A. Jardine, director of residential life.

New Subscribing Members

Anixter Bros., Inc., 4711 Golf Road, Skokie, IL 60076; 708/677-2600 ext. 2315. Representative: David A. Stanley, vice president, sales-universities/hospitals.

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Bell Atlantic Tricon Government Finance, Inc., Bloomington, MN 55435; 612/897-1540. Representative: Christopher J. Mason, vice president/national sales manager.

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Dominion Energy, Inc., Richmond, VA 23219. Representative: John Frank, manager, marketing.

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DuPont Flooring Systems, San Francisco, CA 94133; 415/434-2482. Representative: Rhoda Parks, design consultant.

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Environmental Service and Technology, Inc., Tucker, GA 30084; 404/934-5560. Representative: David A. Miller, president.

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Howard Sommer Company, 483 Sutton Place, Memphis, TN 38119; 800/533-5172. Representative: Howard Sommer.

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ISS International Service System, Inc., 586 Middletown Boulevard, Suite C18, Langhorne, PA 19047; 215/741-4270. Representative: Myron D. Portnoy, vice president.

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Nicholson and Galloway, Inc., 261 Glen Head Road, Glen Head, NY 11545; 516/671-3900. Representative: Angelo De Filippo, president.

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Challenge and Change in the Facilities Profession

Editorial writers, columnists, and cartoonists across the country had a field day with their reflections on 1989 and on the decade just completed. Yet the start of a new decade, especially this last one before the start of a new century, should be a time to think about our future rather than to assess our past.

Experts agree that the 1990s will provide higher education with its stiffest challenges yet. Today many of us are unsure how to prepare ourselves to meet the needs and requirement of our institutions, partly because the requirements are changing so greatly.

Some of our institutions are faced with level or declining enrollments, while others are racing to keep ahead of increasing enrollments. There are faculty shortages and concern for the number of PhD candidates, especially in science and engineering. The National Science Foundation projects a shortfall of 360,000 scientists and engineers by the year 2010. There are facility investment needs (new construction and campus renewal). There are funding limitations for both public and independent institutions. The high cost of higher education is a worry on the minds of every parent.

Suddenly, fueled by global competition, our colleges and universities have been thrust into a new limelight—a renewal of the importance of education's role. Many believe that this role is the common link or "strategic bridge" between where we are and where we need to be in order to meet the needs of science and technology, business and industry, and the expectations of the world's customers.

A vital component of this is APPA, through its member institutions and their facility managers. Let's consider what is involved in managing a physical plant today.

We are characterized by activities that reach out to every corner of the institution. We provide many different services to many diverse groups. We must be innovative and deal with rapidly changing technology. In addition, we must deal with change and uncertainty and are expected to manage relationships with faculty, staff, students, the university administration, trustees, and governing boards. Also important are our relationships with the community, contractors, suppliers, personnel, and labor organizations. There are demands for managing information and the information workers, and for understanding a multi-cultural bureau staff. Recent studies have stated that 85 percent of the new workers in the year 2000 will be women and minorities, one-third of the nation's population by 2010.

There is an increasing responsibility for the caring and feeding of what has become known as the "quality of work life." Facilities managers are expected to make decisions in an environment that requires ef-

Perspective

Jack Hug

fective delivery of physical plant services that truly allow the institution to get on with what it is intended to be. All of this increases the complexity of the job and raises the standards by which performance is measured.

The physical facilities at our colleges and universities represent a substantial investment of \$300 billion in replacement cost. Cost for operation and maintenance of the plant represents a sizable part of the annual operating budget, \$10 billion. Some of our institutions are moving toward an increasingly comprehensive form of facilities management to ensure that the investment in facilities is adequately preserved and effectively utilized.

APPA President-Elect Bill Middleton has called our attention to three functional areas of facilities management.

1. Planning and acquisition (plan D + C),
2. Maintenance and operations, and
3. Assignment and use of space.

Many of our institutions function in these three broad areas in a loosely decentralized manner. Each are separate and, in some instances, report organizationally to a different vice president or vice chancellor. In whatever way these components are structured, one thing is certain: they must work together in acceptance and in cooperation with each others needs.

In recent years, there has been a detachable, though modest, movement in the direction of a more comprehensive approach to facility management. The full range of facilities management functions is carried out by a comprehensive organization headed by a broad based facilities management professional. Costs and complexity are two reasons forcing consideration of this approach.

Facilities management, more than ever before, has become a job of managing the assets. The three assets involved are the human resource asset, the physical asset, and the financial asset.

The Human Resource Asset

This is frequently described as our most valuable asset is a large and complex responsibility. Facilities managers are concerned about when we are going to get the skills and abilities we need. We are experiencing an ever-widening gap between the skills and knowledge available and the skills required to operate and maintain our campus facilities.

Obtaining, Training, and Retraining for the Manager

We are living in an era of consent. We need leaders who truly understand the ingredients of good communication and community. Much of what we do requires reading, writing, talking, listening, and making decisions in an environment that demands services that match needs of those affected.

Communication skills, marketing skills, customer service, teamwork, quality management, and planning skills are required.

We must be careful that we are not preparing ourselves for "irrelevance." We must recognize fundamental changes in the institutions that we are expected to lead effectively. We must look for people who can infuse new ideas, mobilize people, and change the face of the organization as required to make us more flexible and adaptable.

The Physical Asset—Our Institutions' Largest Endowment

Many of our institutions are in serious trouble. The \$60 billion to \$70 billion backlog of deferred maintenance identified by the APPA/NACUBO/Coopers & Lybrand research study, coupled with an estimated \$20 billion to \$25 billion requirement to comply with regulatory mandates should represent a "wake-up call" to higher education administration. Although much has been done to identify the need, we have just begun to address the cause. The degree of support for addressing the serious need varies greatly across the country.

We have the ingredients of an issue that will be forced onto the national agenda, in the true form of a crisis unless we make more progress in obtaining support from the "resource providers." We are all going to be spending a lot more time on these issues in the future.

The Financial Asset

All of the things that a great college or university physical plant is supposed to do cannot take place if we don't manage the financial issues.

Finances have always been important to facilities managers. We are continually expected to do more with less. The operation and maintenance costs of existing facilities and aging systems, the infrastructure, the

Continued on page 20

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high cost of constructing new facilities (especially research facilities), and the high cost of O&M of new facilities with high-tech components all keep this issue in high priority for our attention.

As we look ahead, we most certainly

can expect more change and many more challenges. How then are we to find a steady course? One way is by planning ahead with a bright light for opportunity—created by our bringing together and investing time and money to create with collective wisdom a clear view of where we

are headed. This is a prudent and most appropriate approach—one that will pay dividends to our profession, to our associations, and to all of higher education for many years to come. ■

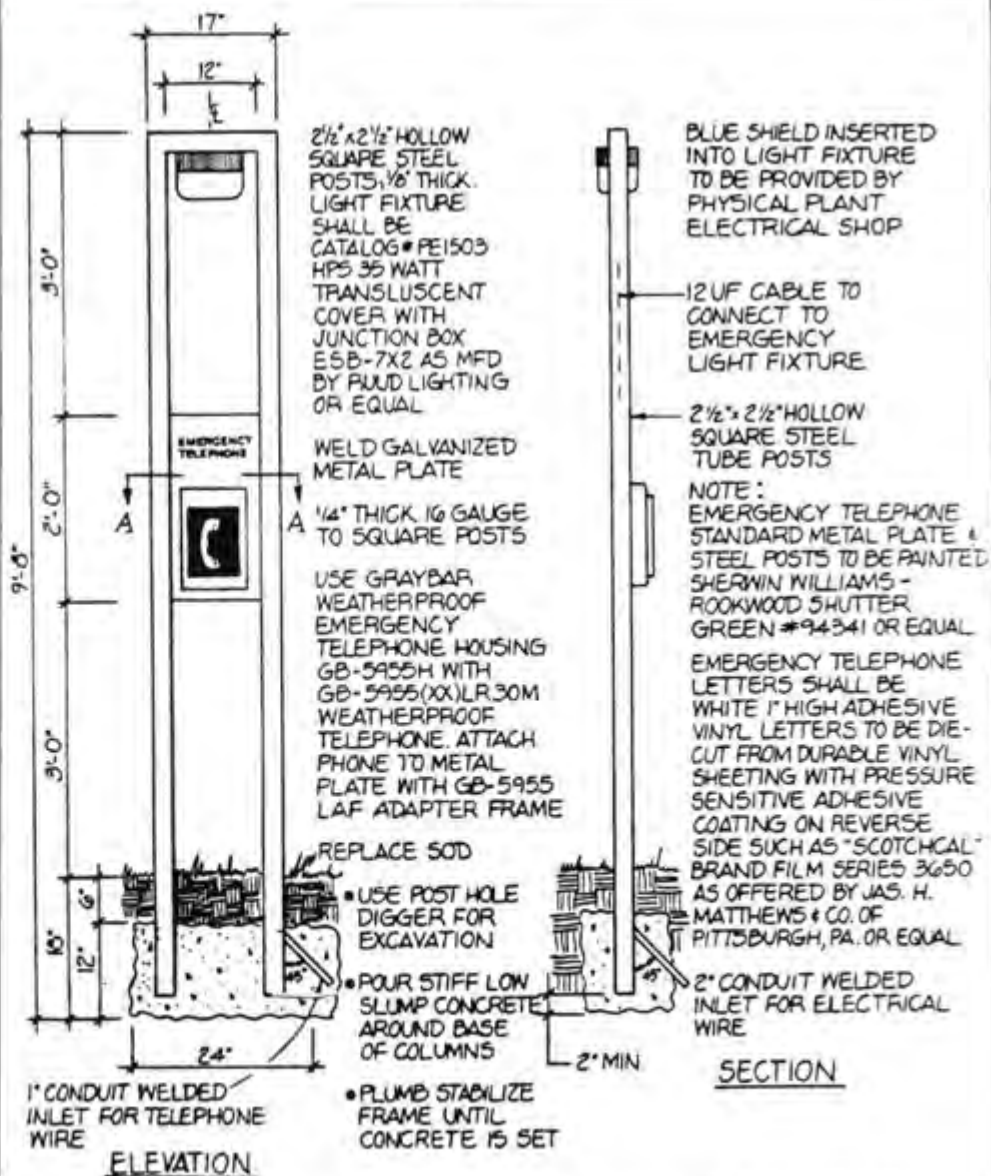
DESIGN SPECS FOR AN EMERGENCY TELEPHONE

Werner K. Sensbach's article, "Illuminating the University Campus: Aspects of Security, Aesthetics, and Efficiency," which appeared in the Spring 1990 issue of *Facilities Manager*, has generated numerous inquiries from campuses as far away as New Zealand on the design of an emergency telephone developed by the University of Virginia. The university has kindly permitted us to show



Editor's Note

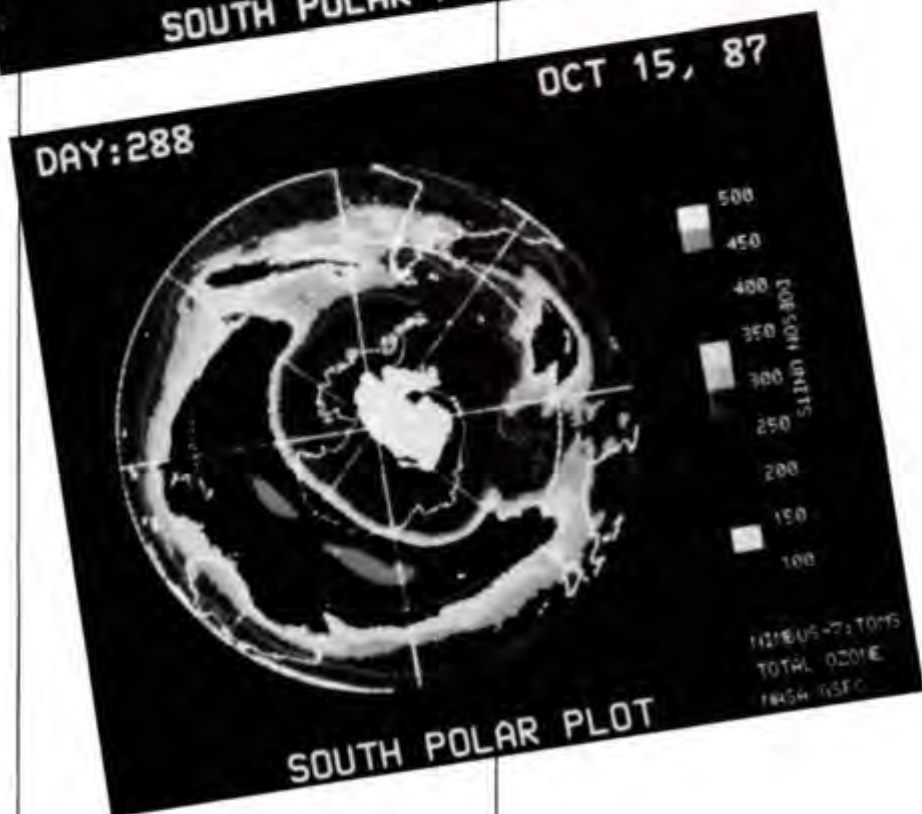
a photograph of the installation and to re-print design specifics from its *Construction Guidelines*. The specifications of the light fixture do not constitute endorsement of a product, as other commercial products may be equally suitable. All metal work was done in the university metal shops. The design is by Sensbach, director of facilities planning at the University of Virginia. ■



FREESTANDING EMERGENCY TELEPHONE STANDARD

Diminishing the Threat of CFCs

by Daniel P. Blank



Whether the sun shines through a clear blue sky or gathering rain clouds threaten a downpour, we tend to take the earth's atmosphere for granted. Only recently have we learned of the fragile nature of the gases encompassing our planet and humanity's ability to fundamentally affect this resource in potentially damaging ways. This article focuses on two chemical families—chlorofluorocarbons (CFCs) and halons—that are used in myriad applications, but are known to present a threat of stratospheric ozone depletion. Both CFCs and halons are the subject of an international treaty, and corresponding federal regulations from the Environmental Protection Agency (EPA). Congress has also recently passed legislation taxing CFCs and halons, and is considering additional restrictions.

What is "Stratospheric Ozone Depletion"?

The stratospheric ozone layer is a thin blanket of three-bond oxygen molecules primarily in the upper atmosphere that prevent harmful ultraviolet (UV-B) radiation from penetrating to the surface. UV-B radiation can

Daniel P. Blank is an associate of the Bruce Company, an environmental consulting firm, and works on-site in EPA's Global Change Division in Washington, D.C.

cause skin cancer and cataracts, and it can suppress the human immune system. It can also damage crops and aquatic organisms, accelerate the weathering of certain synthetic materials, and increase the formation of ground-level pollution.

Scientific evidence has shown—and an international consensus has developed—that the ozone layer is thinning. Ozone levels over North America are believed to have dropped by 3 to 5 percent since 1969, particularly in winter months. A much larger seasonal "hole" in the ozone layer has been discovered over Antarctica. The EPA, in its 1988 Regulatory Impact Analysis, estimated that more than 3.14 million skin cancer deaths and 17.6 million cataracts due to predicted ozone depletion would occur by the year 2075 if no action were taken to limit the use of ozone-depleting chemicals.

Ozone depletion is caused by the presence of two elements in the stratosphere: chlorine and bromine. The two common chemical groups that are the chief human-made source of stratospheric chlorine and bromine are known as chlorofluorocarbons (CFCs) and halons.

What Are CFCs and Halons?

CFCs and halons are inexpensive, nontoxic, nonflammable chemicals that are widely produced and used in consumer and industrial applications throughout the world. CFCs are the chemical of choice for commercial and residential refrigerators and air conditioners, and are often used in foam insulation and packaging, aerosols, industrial solvents, and hospital sterilizers. Halons are widely used as effective fire extinguishing agents.

CFCs are commonly known by their brand names: Freon, Genetron, Genesolv, Isotron, Arcton, Arklone, Forane, Kaltron, and many others. CFCs used as refrigerants are also known as "R," as in R-11 or R-12.

How do the CFCs and halons harm the stratospheric ozone layer? When refrigerators or air conditioners are serviced or discarded, the coolant has been typically vented. Moreover, when used to blow foam or as an aerosol propellant, a fire extinguisher, or a metal-cleaning solvent, CFCs and halons are freely released into the air. These highly stable compounds remain intact until they reach the strato-

high energy radiation and release chlorine and/or bromine, which destroys the ozone molecules.

The same gases that deplete stratospheric ozone also contribute to the "greenhouse effect." Many studies have predicted that the build-up of certain gases in the atmosphere could warm the globe by two to five degrees centigrade by the middle of the next century, causing changes in precipitation, sea level, and storm patterns and frequency. The primary "greenhouse gas" is carbon dioxide (CO_2). Because the radiative forcing (the capacity to absorb radiation and release this energy in the form of heat) from each molecule of CFC is equivalent to 30,000 molecules of CO_2 , EPA estimates that CFCs currently account for 20 to 25 percent of the anticipated global warming.

Finally, the long atmospheric lifetimes of these gases (from 60 years for CFC-11 to 400 years for CFC-115) commit the earth to the ozone depletion and global warming effects of CFCs and halons far into the future, even if all current emissions immediately ceased.

An International Process

CFCs were first theoretically linked to ozone depletion in 1974, and were banned as aerosol propellants by many countries (including the United States) in all but essential uses in the late 1970s. As CFC use in other areas continued to grow, however, scientists and policy-makers became increasingly concerned that the ozone layer was not being adequately protected. Because releases of CFCs and halons from one nation mix in the atmosphere, destroying ozone and adding to the greenhouse effect around the world, it became clear that efforts to protect the ozone layer would only be effective if carried out on an international scale.

Recognizing the global nature of this issue, EPA and other the U.S. government agencies participated in negotiations organized by United Nations Environmental Program (UNEP) to develop an international agreement to protect the ozone layer. These negotiations successfully concluded with the Vienna Convention and, in September 1987, the signing of the Montreal Protocol on Substances that Deplete the Ozone Layer, which limits the production and consumption of CFCs and halons.

Currently, fifty-two countries—representing 85 percent of the world's CFC and halon production capacity—have ratified this treaty. These "Parties" to the Montreal Protocol have agreed to reduce their consumption of CFCs to 1986 levels starting in 1989, followed by a 20 percent reduction by 1994, and a 50 percent reduction by 1998. Halon levels are frozen at their 1986 levels beginning in 1992.

Domestic Implementation

As with most ideas that result from thinking globally, the results of stratospheric ozone protection depend upon acting locally. The Environmental Protection Agency has promulgated domestic regulations implementing the Montreal Protocol, worked with industry to develop substitute chemicals and alternative systems, and helped create standards for recycling refrigerants and eliminating unnecessary halon emissions.

On August 12, 1988, EPA promulgated a final rule implementing its Stratospheric Ozone Protection Program based on the restrictions contained in the Montreal Protocol. In the final rule, EPA adopted a permit allocation system and granted "allowances" to companies that either produced or imported these chemicals based on their 1986 levels. Allowances granted by EPA are used by industry to produce and import these controlled substances, and can be traded between companies to maximize economic efficiency. While industry has some freedom in deciding which uses of CFCs and halons are most important, the total supply is strictly limited by EPA and will be lowered as reductions required by the Montreal Protocol enter into effect.

As the supply of CFCs and halons shrinks, what alternatives will be used in refrigerators, air conditioners, and the other applications of these chemicals? Some uses will be easier to adapt to substitutes than others, but worldwide, industry is rising to the challenge. For example, although only two years ago no substitutes were in sight for the solvent CFC-113, AT&T and IBM in the U.S., Northern Telecom in Canada, Seiko-Epson in Japan, and Siemens in West Germany have all announced the corporate goal of phasing out this chemical by the early 1990s.

The food packaging industry, which used CFCs for container products (e.g.,

Continued on page 24

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Continued from page 22

styrofoam), has also voluntarily entered into an agreement to virtually eliminate CFC use in manufacturing foam products by shifting to alternative blowing agents. The fire protection industry has announced voluntary reductions in halon emissions during testing procedures, and is working toward other measures to reduce unnecessary use and emissions of halons. These eliminations represent immediate and effective responses by industry to protect the ozone layer.

Industry is working with EPA to develop substitutes for other uses of CFCs as well. Other chemicals, including hydrochlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs) are being tested as coolants for refrigerators and air conditioners. In addition to being less damaging to the ozone layer, EPA is working to ensure that substitutes are effectively reviewed to address any toxicity issues, are at least as energy efficient as CFCs, and represent a significant reduction in greenhouse impacts. Because substitutes for refrigerators and air conditioners may not be "drop in's" to existing equipment, EPA is promoting recycling as an interim way to protect the ozone layer while lengthening the useful life of current systems that require CFCs.

CFC Recycling

EPA studies suggest that over 60 percent of CFC use in the United States occurs in applications where re-

cycling is possible. The agency believes that recycling of ozone-depleting chemicals would provide an opportunity to limit the growth of chlorine levels in the stratosphere while allowing industry the time to move to ozone-safe chemicals and technologies without requiring costly retrofit or early retirement of CFC-using products.

Release of CFC-12 from mobile air conditioners is currently the single largest source of emissions in the United States. Standard practice for recharging air conditioners has been to vent the used refrigerant before adding more. EPA, automobile and recycling equipment manufacturers, and the automobile service industry recently announced a cooperative agreement that sets a standard of purity for recycled refrigerant in mobile air conditioners, and begins a program of certification for refrigerant recovery devices. The new machines will remove refrigerant gas from air conditioning systems without leakage, filter out excess water and oil, and feed the recycled gas back into the car. For example, General Motors Corporation is making compact recycling machines available to its dealers that service air conditioners for the 1990 model year, and they will be required service equipment for the 1991 model year.

Recycling appears to be feasible in many use sectors. The Whirlpool Corporation introduced a seven-layer plastic bag to catch and hold refrigerant during the servicing of household

refrigerators and freezers. Carrier Corporation has developed a refrigerant recovery and recycling system specifically designed to handle large-scale commercial chillers. The electronics industry is also expanding its recovery and reuse of CFCs used in solvent applications.

Dupont, the largest U.S. producer of CFCs and halons, recently announced that it is starting a program to buy back used CFCs from refrigerators and air conditioners. Allied Signal, another CFC producer, already reclaims CFCs used by electronics firms, and National Refrigerants, a CFC packager, began a similar reclamation program for all CFCs last fall.

Several states, including Hawaii, Iowa, and Vermont, have passed laws to mandate the recycling of CFCs. Many more states are considering such laws. EPA is encouraged by action on the state level and is considering regulations for a national recycling program. The agency will most likely issue regulations during 1990, with a likely implementation date of January 1, 1992, except for those sectors where earlier recycling may be possible. The goal of the recycling program would be to reduce or eliminate unnecessary emissions of CFCs and halons normally vented into the atmosphere. EPA will develop this program on a sector-by-sector basis focusing on those end uses in which recycling is already feasible and practical. The primary end-use sectors for the recycling program may include mobile air conditioners, chillers, and household and commercial refrigerators.

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Industrial Solvents	CFC-113
Hospital Sterilization	CFC-12

Halons - A Special Case

Halons are fire extinguishing chemicals that have extremely high ozone depleting potentials. Halon 1211 is presently believed to be at least three times as effective at depleting stratospheric ozone as CFC-11, and Halon 1301 is believed to be at least ten times as effective. Because they are so harmful to the ozone layer, halons are a special case that should be dealt with separately from CFCs.

Halons have excellent fire extinguishing capabilities as well as being non-conductive, non-corrosive, leaving no residue, having low space/weight requirements, and having low toxicity. Because of this combination of characteristics, halons have been used extensively for protection of computer, electronic, and telecommunication systems, in power generation facilities, on board both commercial and mili-

CFCs currently account for 20 to 25 percent of the...global warming.

tary ships and aircraft, and in museums.

No presently identified chemical possesses characteristics identical to halons. As a result, government and industry efforts have been directed toward limiting unnecessary halon emissions, determining areas where halon use is nonessential and exploring available fire protection alternatives in these areas.

Several methods to reduce unnecessary emissions are currently available. A study performed by the National Fire Protection Association (NFPA) indicated that virtually all discharge testing with Halon 1301 can be eliminated without degradation in system reliability through the use of compartment leakage testing, simulant test gases, and additional nondestructive testing procedures. Personnel training, manual override of automatic discharges, and improved detection and control devices are being implemented to reduce inadvertent discharges of halons.

To reduce emissions during original equipment manufacture, development, testing, or shipping, refillers of both Halon 1211 and 1301 are using recovery rigs for vapor capture and recovery. Finally, emissions from halons discharged during military training exercises can be lowered through the use of video simulators and through reduced scale and frequency of actual exercises.

Emissions are also being reduced through available alternatives to halon-use systems. A monitored early warning detection system with an external connection to a constantly staffed facility or fire department or fast-response sprinklers would reduce fire damage without reliance on halon systems. Watertight computer cabinets with sprinklers and a cooling system could be used to isolate an internal fire from other units, protect equipment in cabinets from water damage, and permit the use of any type of fire fighting agent without the risk of damage to electronic equipment or data.

A total flood carbon dioxide system with automatic or manual override switches and alarms to prevent discharge when people are in the room could be designed to provide an extinguishing concentration of carbon dioxide throughout a complete enclosure, in underfloor spaces or in equipment cabinets. Lastly, proper design of spaces can reduce and even eliminate

the risk of fire, and incorporate effective, non-damaging, non-halon fire extinguishing systems.

The CFC Tax

An excise tax on the sale of chlorofluorocarbons and other chemicals that deplete the ozone layer was passed by Congress on November 21, 1989 as part of its Omnibus Budget Reconciliation Act. Described by the *Washington Post* as a "little known environmental initiative of sweeping significance," the CFC tax represents an innovative approach to protecting the environment, one that provides an economic incentive to reduce consumption of CFCs, stimulate markets for alternatives, and increase recycling.

Beginning January 1990, the excise tax applies to the five CFCs (11, 12, 113, 114, and 115) and three halons (1211, 1301, and 2402) regulated by the Montreal Protocol: the sale or use of bulk chemicals by a manufacturer, producer, or importer; sale or use of imported products that contain or are produced with specified ozone-depleting chemicals; and ownership of floor stocks of specified ozone-depleting chemicals.

The rate of the tax for each pound of CFC or halon is calculated by multiplying a base tax amount for that year by the ozone-depleting potential (ODP) for each chemical as stated in the Montreal Protocol. The base tax for 1990 and 1991 is \$1.37. The base tax increases to \$1.67 in 1992, and to \$2.65 in 1993 and 1994. Each year after 1994, the base tax continues to increase by \$0.45.

Because of their special status, halons are exempt from the tax in 1990. From 1991 through 1993, the tax on the sale or use of halons is calculated as a small percentage of what the tax would have been, equaling approximately \$0.25 per pound for all halons each year. After 1993, halons are taxed at the full rate of base tax times ODP.

Special exemptions were included to promote recycling, the development of substitutes, and participation in the Montreal Protocol. Ozone-depleting chemicals that are recycled or entirely consumed or transformed in the man-

ufacture of any other chemical are exempted from the tax. Chemicals that are exported, or produced with additional production allowances granted by EPA for exports to certain developing countries, are exempt as well. Finally, taxes on CFCs used in the production of rigid insulating foams will be phased-in similarly to those on halons.

The new excise tax, combined with EPA's marketable permit system, promises to give industry an incentive to recycle and reduce its use of CFCs and halons while providing a market incentive for the development of substitutes and alternative technologies.

What's Ahead

In the short time since the signing of the Montreal Protocol, major scientific findings have heightened concerns that CFCs and halons may be depleting stratospheric ozone at an even greater rate than was previously believed. As a result of these findings, a widespread international agreement has developed on the need to completely phase-out CFCs and halons, and to consider the inclusion of other ozone-depleting chemicals in the list of substances regulated by the Protocol.

President Bush announced in March 1989 that the United States would seek, through the processes provided by the Montreal Protocol, a complete phase-out of all fully-halogenated CFCs and halons covered by the Protocol by the year 2000. The European Community, Japan, the Soviet Union, the Nordic nations, and others have taken similar positions. In May 1989, at their first meeting in Helsinki, the Parties to the Montreal Protocol agreed through a non-binding declaration to phase out the production and the consumption of CFCs controlled by the Montreal Protocol as soon as possible, but no later than the year 2000, to phase out halons, and to control and reduce other significant ozone-depleting substances as soon as possible. At their second meeting held June 1990, the Parties made these changes final.

A larger issue ahead is global warming. A full phase-out of CFCs would be a significant first step in reducing the emissions of greenhouse gases that could warm the earth. The Montreal Protocol could also serve as a model for an international agreement to ameliorate the greenhouse effect and prevent future global warming. ■

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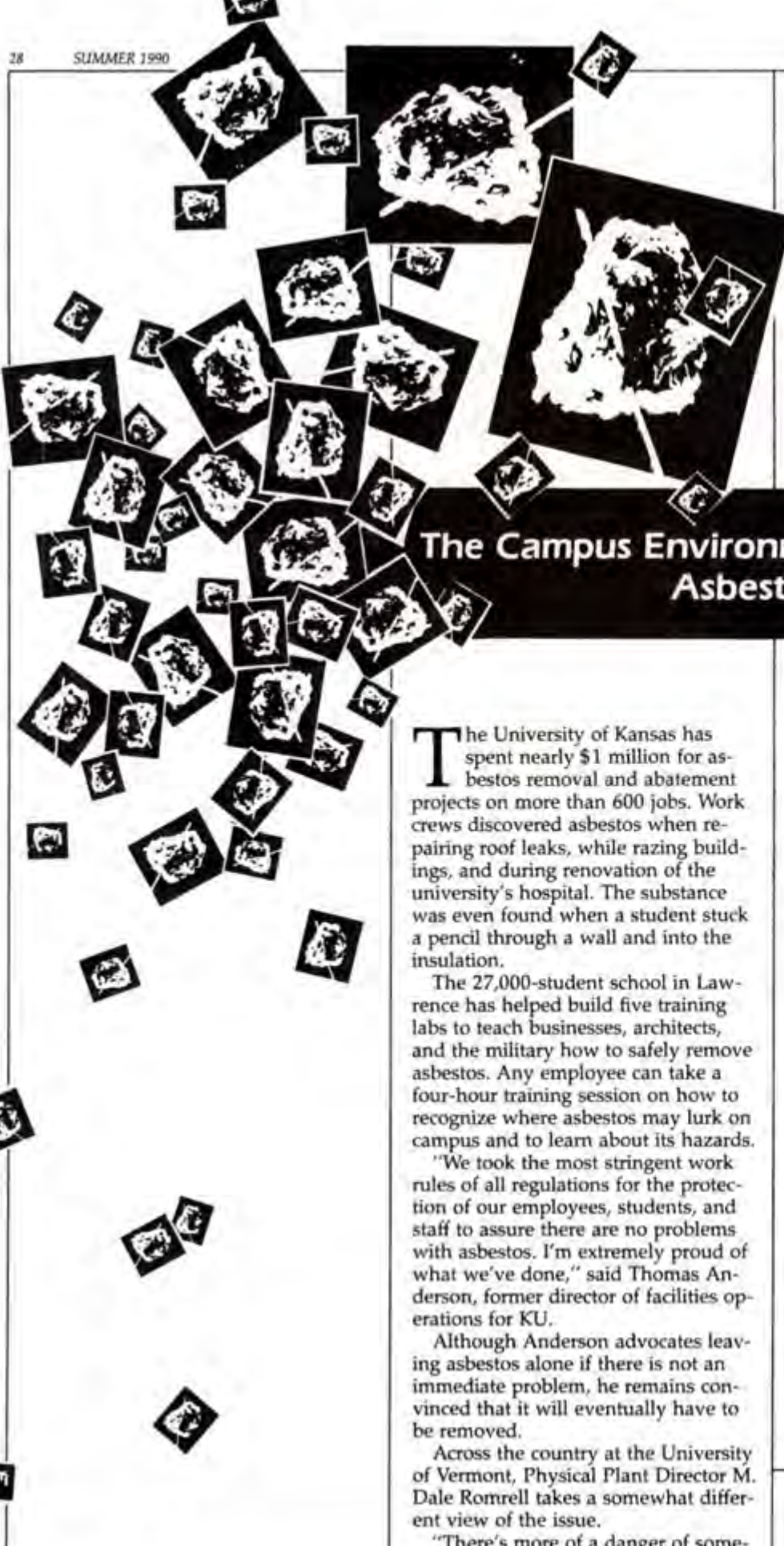


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The Campus Environmental Crisis: Part 2 Asbestos in the Classroom

by Barbara Ruben

The University of Kansas has spent nearly \$1 million for asbestos removal and abatement projects on more than 600 jobs. Work crews discovered asbestos when repairing roof leaks, while razing buildings, and during renovation of the university's hospital. The substance was even found when a student stuck a pencil through a wall and into the insulation.

The 27,000-student school in Lawrence has helped build five training labs to teach businesses, architects, and the military how to safely remove asbestos. Any employee can take a four-hour training session on how to recognize where asbestos may lurk on campus and to learn about its hazards.

"We took the most stringent work rules of all regulations for the protection of our employees, students, and staff to assure there are no problems with asbestos. I'm extremely proud of what we've done," said Thomas Anderson, former director of facilities operations for KU.

Although Anderson advocates leaving asbestos alone if there is not an immediate problem, he remains convinced that it will eventually have to be removed.

Across the country at the University of Vermont, Physical Plant Director M. Dale Romrell takes a somewhat different view of the issue.

"There's more of a danger of some-

one standing waiting for a bus in downtown Burlington than with asbestos on campus in any city or state in this country," he said. "I think there's a real hysteria among the public. Harvard University has called it fiber phobia. That hits the nail on the head."

Romrell is quick to caution, however, that the university follows all regulations to the letter and has served as a model for other schools in Vermont. Asbestos has been found in floor tiles and around heating lines, among other locations.

"Our philosophy is that if asbestos is in good condition, we leave it. We don't get rid of it just because it's there."

To Romrell's assertion of a fiber phobia, Anderson only has one word: baloney.

And it's not just facilities managers who are at odds over how to manage the substance. Scientists and policy makers are wrangling over balancing health risks with a mounting tab for abatement. And they are weighing just how effective the clean up may be.

Health Risks

There is a consensus that asbestos

Barbara Ruben is a freelance writer based in Chevy Chase, Maryland. She wrote on PCBs in the Spring 1990 Facilities Manager. Part 3 of this series will focus on recycling.

can pose a very real health problem. But there is little agreement on just how dangerous it is in the levels generally found in buildings. There are also a growing number of scientists who say that once asbestos is disturbed during removal, more fibers may end up in the air than if it was simply left alone.

Medical research has shown that the greatest health hazard associated with asbestos comes from the inhalation of airborne fibers. Once embedded in the lungs, they do not dissolve or wash out from normal lung-cleaning mechanisms. Asbestos has been linked to lung cancer; asbestosis, a fibrotic lung disease; and mesothelioma, cancer of the lining of the lung or abdominal cavity. Lung cancer risks are greatly increased among those who smoke, according to medical studies.

Diseases resulting from exposure have a latency period of twenty to forty years, which makes calculating risk difficult. The U.S. Environmental Protection Agency (EPA) estimates that more than 100,000 deaths in the United States have been attributed to asbestos inhalation, and that 3,300 to 12,000 deaths in the United States each year are asbestos-related.

A December 1988 Harvard University symposium on the health aspects of exposure to asbestos in buildings concluded that everyday risks have been blown out of proportion. Although people who work directly with asbestos can be seriously affected if correct safety procedures are not followed, building occupants are at little risk, university and government researchers concurred.

A summary of estimated risk presented at the symposium placed exposure to asbestos in school buildings at the bottom of a long list of hazards. In school buildings, the lifetime risk of premature death (before age 65) is one in 100,000, the report said. By comparison, a person faces a three out of 100,000 chance of dying early by being hit by lightning, and a 441 out of 100,000 chance of dying because of indoor radon.

The ABCs of Asbestos

Asbestos is a group of minerals found in rock formations throughout the world. Composed of long, silky fibers, asbestos has been lauded for its insulating and fire-retardant properties. It has been used in more than 3,000 products, including binders to

make adhesives, sealants, caulking compounds, insulating materials for steam and hot water pipes, cement products, and house shingles and siding. In a single building, asbestos might be found from the roofing material, and acoustic ceiling tiles, to curtains and vinyl floor tiles.

In 1989, EPA passed regulations that would phase out the manufacturing, importation and processing of almost all asbestos-containing products. Between 1990 and 1997, approximately 94 percent of U.S. production and imports of asbestos will be banned.

The first phase begins this August 31 and will ban production and import of products including clothing, floor tile, and roofing and flooring felts. The second phase will take effect August 31, 1993 and includes automobile automatic transmission components, brake pads, and linings and specific gaskets. The third phase begins August 31, 1996, and will include paper, piping and shingle products, roof coatings, and additional automotive products.

asbestos material in about 733,000 buildings, or about 20 percent of all public and commercial buildings. EPA defines friable asbestos as materials that can be crumbled, crushed, or pulverized with hand pressure. Asbestos-containing insulation is in most cases covered by a non-asbestos jacket of cloth, tape, metal, paper, or cement. If the jacket is undamaged, EPA classifies this asbestos as non-friable.

Regulatory Structure

Laws governing buildings that contain asbestos are in place on the federal, state, and local levels. Generally, the EPA regulates asbestos-containing material during building renovation and demolition. The Occupational Health and Safety Administration (OSHA) regulates all worker exposure to asbestos.

Public and private elementary and secondary schools are required to inspect for and address the presence of asbestos-containing materials in their buildings under the Asbestos Hazard Emergency Response Act of 1986

(ASHERA). Under EPA's Asbestos-Containing Materials in Schools Rule, these schools are required to inspect for friable and non-friable asbestos, develop asbestos management plans that address hazards in school buildings, and implement response actions in a timely manner. Schools must also use accredited workers to carry out asbestos-related activities such as inspection, management plan development, and response action. Training, examination, and other requirements for people involved in these activities were specified by the Model Accreditation Plan published by EPA in April 1987.

These rules do not apply to colleges and universities, but as part of ASHERA Congress directed EPA to report on asbestos in public and commercial buildings and to consider whether these buildings should be subject to the same requirements as schools. In March, EPA concluded a series of joint public and private-sector meetings about asbestos in public and commercial buildings. EPA may issue regulations from this information during the summer. It is possible that colleges and universities would be subject to ASHERA-like regulations at some point, said Tom Tillman, an environmental protection specialist in EPA's Office of Toxic Substances.

"We may want to pinpoint certain types of buildings, and conceivably these could include colleges and universities," Tillman said. "But those are just options, not anything in a decision-making mode."

This summer, EPA will also issue operations and maintenance guidelines for asbestos in buildings. The document, "Managing Asbestos in Place," focuses on ways to avoid removal of asbestos.

Although ASHERA does not now affect facilities managers, they must, however, adhere to the National Emission Standard for Hazardous Air Pollutants (NESHAP) under the Clean Air Act. The NESHAP Standard controls the emission of asbestos fibers into outdoor air.

NESHAP regulations require proper notifications for all demolition and renovation projects involving asbestos-containing materials. Additionally, it stipulates proper removal, transportation, and renovation practice. NESHAP holds both the owner and contractor liable for any violations.

EPA is currently in the process of

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revising NESHAP regulations. These revisions are intended to increase the level of compliance with the demolition and renovation provisions of NESHAP, according to EPA. In general, notification requirements are being revised for demolition and renovation, and record keeping would be required for asbestos waste disposal.

Fines authorized under the regulations can be up to \$25,000 per day. The EPA estimates that less than half of the approximately 100,000 asbestos-related projects each year are conducted safely and properly. Of 65,000 notices of asbestos work sent in to EPA, about 10 percent were in violation of NESHAP regulations, said Ken Malmberg, an environmental protection specialist with EPA's office of air programs.

"The violation rates are still very high. Either they don't know what they're doing or how to properly document it," Malmberg said. "We don't have records specifically broken down to colleges and universities, but I'd guess the same violation rate applies."

Over the last five years, NESHAP inspections and citations have increased dramatically. In 1985, there were 8,133 inspections, and in 1988 there were 20,275 inspections. EPA civil actions more than doubled, from 49 in 1985 to 106 in 1988.

On August 22, 1989, EPA filed thirteen suits in eleven states, including the New York Board of Education, for NESHAP violations. The violations included improper removal and improper notification. That round of lawsuits marks a new commitment to enforce its regulations, Malmberg said.

OSHA regulations are also being strictly enforced. The standards apply to people working in construction, repair, maintenance, and renovation of buildings with asbestos-containing materials, as well as disposal, removal, and other asbestos work. It also covers office workers.

Asbestos exposure of 0.1 fiber/cc of air triggers some OSHA requirements. At this point, called the action level, employers must comply with worker training, exposure monitoring, and medical surveillance requirements. These standards also set a permissible exposure limit, called a time weighted average, of 0.2 fibers/cc, averaged over eight hours.

Before building owners or managers start construction work, they must perform initial monitoring to determine the concentrations of asbestos in the air and demonstrate that work done will be below action levels. Employers are required to maintain records that show monitoring of worker exposures and medical surveillance of those workers.

To control airborne asbestos levels, OSHA regulations stipulate certain control methods, including use of wetting agents, removal encapsulants, isolation of asbestos dust-producing processes, special exhaust ventilation and prompt disposal of asbestos-containing wastes. If these controls are insufficient to reduce exposures to below the .2 fiber/cc level, respiratory protection must be used.

The Occupational Safety and Health Act of 1970 encourages states to develop their own job safety and health plans. There are currently twenty-five plans in place. These programs must have standards that are identical to or at least as effective as the federal standards. As of March 1990, the following states and territories had their own programs: Alaska, Arizona, California, Connecticut, Hawaii, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Nevada, New Mexico, New York, North Carolina, Oregon, Puerto Rico, South Carolina, Tennessee, Utah, Vermont, Virginia, Virgin Islands, Washington, and Wyoming.

Asbestos on Campuses

The debate over regulation and management of asbestos continues unabated across the country. Nearly every facility manager has encountered asbestos at some point and nearly all of them have strong opinions about the issues surrounding it.

"We've had all kinds of problems with every single area having to do with asbestos," said Kathy Messimer, director of facilities management at the University of Colorado in Boulder. "We've had to close buildings when contractors stirred things up. Once a

carpenter accidentally cut into an asbestos fire door in the carpenter shop. We can't even hang a picture in the wall without following stringent regulations."

In what she calls "bad years," the University of Colorado has spent \$600,000 in a single year on asbestos abatement. The school is now looking at replacing an asbestos roof on the heating plant at a cost of \$1 million. There is an asbestos team on campus to deal with smaller problems.

"The University of Colorado has very strict standards. There's been an overreaction to the problem. You get more exposure [to asbestos] down on a street corner than a project we just cleaned up for \$100,000 where exposure was less than in ambient air," Messimer said. "The money could be spent much more productively to truly affect the health and safety of the students."

In 1986, the University of Iowa's Environmental Safety and Health Department surveyed the campus to identify asbestos hot spots. This information was then put in a data base, costs for management were estimated, and removal priorities were established. Recently asbestos was found when remodeling the university's agronomy and chemistry buildings.

"We run a really tight ship. I don't have a problem with trying to protect our workers. These rules do have validity, but they are confusing because they change from state to state," said Lou Mitchell, IU's associate director of environmental health and safety.

OSHA cited the university for a misinterpretation of record keeping for thirty-minute exposure. Although the citation goes into the school's record, no fine was levied.

At the University of Calgary in Alberta, Canada, facilities managers learned the hard way about choosing a contractor to remove asbestos. In 1979, the school decided that removal of all insulation containing asbestos was the best way to protect the health of its staff and students. Today, 95 to 98 percent of all asbestos has been removed; the only asbestos remains in pipe elbows and other inaccessible places.

One project involved removal of asbestos in the school's engineering complex. A contractor improperly

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sealed off the mechanical room and airborne asbestos was drawn throughout the building. Readings as high as 37.59 fibers/cc of air were found, and the Alberta Occupational Health and Safety Administration ordered the building closed. The building remained closed for forty-four days, and the cost of asbestos removal, relocation of staff, and decontamination was \$346,000. During the clean-up period, the schools' safety office took 1,224 air samples.

As a result of the contamination incident, lawyers representing the university's insurance carriers filed a successful lawsuit against the contractor to reclaim insurance costs as well as \$59,499 of uninsured university costs.

In retrospect, the contractor should have been more closely scrutinized because he had a previous poor record, said Ken Fay, the manager of the university's safety office.

At smaller schools, such mistakes as well as routine abatement can eat a sizable chunk of the budget. California's Occidental College, with a student body of fewer than 2,000, embarked on a \$750,000 project to remove asbestos from its most critical areas, such as the tunnel system and boiler room.

"I believe we should remove any asbestos that poses a hazard and that we should spend money when necessary, although the removal industry has gotten expensive," said Larry Klumas, director of the physical plant.

To combat this expense, the school is training safety staff to encapsulate small areas and do less extensive jobs themselves. But many small schools don't have the luxury of having the resources to retain their own asbestos staff.

Washington College, a school with 850 students in Maryland, has spent more than \$1 million on asbestos projects, money that Director of Planning Clint Baer is convinced could have been better spent elsewhere.

"Essentially, the budgeted cost of a complete renovation of a building is just used up for asbestos removal," he said. "Probably the legislation was enacted for good reason, but it is not all that practical. Probably asbestos is just as well left alone."

Asbestos On Trial

If asbestos is a hot issue on campuses, it is no less controversial when put on trial in the legal system. The same questions over just how much of

a threat it poses and how to pay for abatement are shaping court cases around the country.

More than 350 colleges and universities have filed claims in an umbrella lawsuit in the bankruptcy of the Johns Manville Corporation, which was the largest producer of asbestos in the country. The company contributed \$600 million to several trusts for all claims, including those of educational institutions. The National Association of College and University Business Officers (NACUBO) filed a claim on behalf of its member institutions in 1985.

In a separate lawsuit, a voluntary class action was filed by Clemson University and the College of Charleston in 1986. The lawsuit was filed on behalf of all colleges and universities in the United States to recover costs of asbestos removal from asbestos miners, manufacturers, and millers other than Manville and five other asbestos manufacturers now in bankruptcy. The class action seeks to recover costs of finding, testing and abating asbestos products.

Both of these lawsuits remained unresolved as of April.

At the same time, lawsuits have been filed by the government and employees against colleges and universities. Two that have been in the filed since October 1988 may be the first asbestos litigation to name universities as defendants.

The University of Minnesota was sued in January 1990 by twenty construction workers who claim they were exposed to dangerous levels of asbestos when removing insulation from a dormitory. The workers are seeking damages of more than \$50,000 each and contend they were misled about the levels of asbestos. The workers had the asbestos tested and found higher levels that warrant special removal procedures under federal guidelines. The lawsuit alleges the university was aware of the asbestos levels. None of the workers has reported illnesses stemming from removal of the insulation.

In addition, the Minnesota Department of Labor and Industry has fined the university for about \$5,000 for what it calls serious safety violations involving asbestos in the dormitory.

In another lawsuit, the family of a University of Pennsylvania dental student claim their son died because of

exposure to asbestos found in dental supplies. Daniel Press, who was a student at Penn from 1969 to 1973, died of mesothelioma in 1988.

While a student, Press used an asbestos-containing material in learning to make crowns. The lawsuit contends the university should have known the material was "highly harmful" to students. The case was filed in October 1988, but it has been stalled due to procedural problems since then.

In February 1990, the EPA filed suit against George Fox College in Newberg, Oregon. The 950-student school could face millions of dollars in fines, possibly more than the net worth of the college, said George Fox President Edward Stevens. A maximum fine of \$25,000 a day is possible. EPA officials called it the first civil action filed in Oregon for asbestos violations under the Clean Air Act.

The suit alleges several violations, including failure to remove asbestos before beginning construction, to properly wet down the asbestos during renovation, to deposit it at an approved disposal site, and to prevent asbestos fibers from being released into the outside air. The contractor working on the job was also sued.

EPA claims that significant amounts of materials containing asbestos were disturbed while students used the library between November 1987 and March 1988. But Stevens says about sixty to 100 students were exposed for only three to four days.

Oregon's Department of Environmental Quality previously tried to impose a fine on the college. The school appealed the fine on basis of economic hardship, but the fine was overturned on a procedural technicality. The state department then referred the case to the EPA, Stevens said.

"Surprised and confused are the words that express my reaction the best. For some reason they've selected us out and made a big deal out of it," he said. "They're talking about fines greater than the total value of the school when all we were trying to do was remove asbestos to best protect and educate our students."

[Ed. Note—For more information on this topic, APPA has published Regulatory Compliance for Facilities Managers. APPA will soon publish Case Studies in Environmental Health and Safety.]

by Kevin Kennedy

Selecting a Roofing Contractor

When buying a roof, many physical plant administrators put much emphasis on the roof design and material. Yet the manner in which the roof is installed is equally important. If the roof application is done carelessly, or not according to design, then the integrity of the roof may be compromised, resulting in roof leaks or, worse, total failure.

Roofing systems for colleges and universities are usually complicated. Roof applications range from installing the most progressive modern design to preserving and replacing architectural/ornamental copper, slate, and tile systems. Many projects are conducted over occupied buildings requiring strict watertight integrity, safety, and housekeeping.

Selecting a qualified and professional roofing applicator is one way to influence the project's success. Since not all roofing contractors are equally qualified, it is important to determine which contractor is best for your specific needs and job. One way to do that is by examining the following criteria.

Experience

It is obviously important that the roofing contractor be well established and experienced. What is even more critical, however, is ensuring that the contractor is experienced in applications specific to your roof design. For instance, if your roofing system is an EPDM (ethylene propylene diene monomer) single-ply, then that applicator should have experience installing EPDM. If the roof requires hot-air welded seams, then make sure the roof contractor has experience in hot-air welding. The same applies to situa-

tions such as roof removals, replacement of decks or roofs over sensitive production facilities, and asbestos removal. If the contractor does not have experience in applications specific to your roof, then you may inadvertently be paying for that contractor's education in that area.

To make sure the contractor has experience installing the roof material chosen, have the contractor give you a copy of the roofing manufacturer's licensed applicator agreement. You can also ask the roofing system manufacturer for the applicator's record of experience and the year the license was issued. In addition, ask the manufacturer for the inspection history of the contractor you are considering. Does the firm consistently achieve high ratings for the quality of installations, or are extensive punch lists and reinspections required?

Financial Stability

Financial stability is important because contractors who are stable finan-

cially are likely to be around for quite a while—and thus can be contacted if any roof problems are discovered after the installation is completed. Ask the roof applicator for financial information about the company. This information should include a certified audited financial statement, Dun and Bradstreet reference number, as well as banking and creditor references. Determine whether the contractor can handle the cash requirements of a large project. Has the roofing company failed to complete a construction project in the past seven years? Has the parent company, affiliate, or its subsidiary ever been declared insolvent?


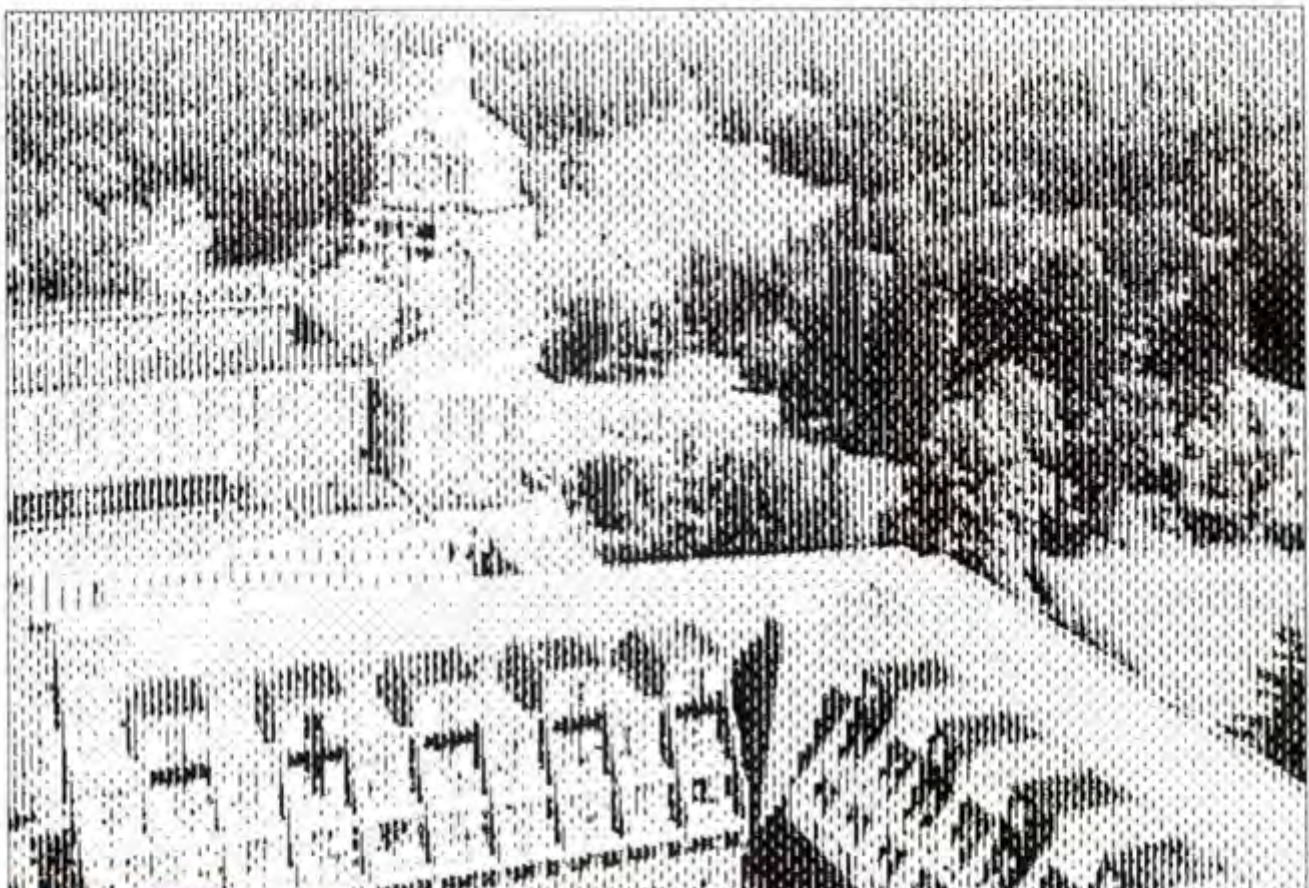
Another way to be assured of financial stability is by having a surety company issue a performance bond on the roof project. Surety companies will issue a performance bond giving owners a financial guarantee that the contractor will perform the work (or in the case of default, provide the nec-

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Kevin Kennedy is senior vice president of Charles F. Evans Co., Inc., Elmira, New York, and of CFE, Inc., Auburndale, Florida.

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essary financial resources to complete the job). As a result, surety companies tend to be conservative in selecting roofing companies to whom they will issue bonds. Requesting a bid bond along with a quotation on roofing projects serves as a way of qualifying the applicator.

Proper Insurance

Building owners also need to be concerned about the amount and type of liability and property damage insurance carried by the roofing contractor. The owner should verify workers compensation coverage. Does the insurance coverage adequately cover the risks? Does the insurance company have a satisfactory rating within the insurance industry? Roofing contractors with good financial stability will usually maintain an insurance program geared not only to protect their customers, but to protect their own net worth as well. We recommend basic coverage to include \$1 million per occurrence limit for general liability and property damage exposures. The contractor should also maintain an additional \$3 million excess umbrella liability coverage.

References

The roofing contractor should be able to supply a list of references, including phone numbers and addresses, of satisfied customers and installation sites. Ideally, the contractor should have a reference for a roof

project that parallels yours in material, design, scope of work, and type of facility.

Commitment to Education and Training

Each year the roofing industry becomes more complicated with new systems, materials, and designs. Insist on having trained, experienced roof applicators who are up-to-date on these issues. Have the installers attended recent National Roofing Contractor Association (NRCA), Roofing Industry Educational Institute (RIEI), or manufacturer classes? Is the contractor a member of NRCA's "Academy of Roofing Contractors" for contractors dedicated to educating their employees? Many manufacturers have applicator training schools that are also very helpful for contractors.

Supervision and Quality Control

Have the contractor clarify in writing how the project will be organized, supervised, and executed. Determine the number of workers that will be available so that the job is completed within your time requirements. In addition, it is important to determine the contractor's formal quality control procedures for material storage and application. For instance, does the contractor routinely probe seams or double check that the fastening patterns are in conformance with the manufacturer's specifications? Also, request a copy of the final inspection punch list from

the roofing manufacturer to insure that all punch list items have been properly corrected; otherwise the manufacturer may not honor the warranty.

Another important consideration is the contractor's safety program. Roofing is a dangerous occupation. Workers as well as your employees or customers could be injured during construction. Professional applicators take a proactive approach to safety programs. Ask the contractor for a copy of the firm's safety rules and an explanation of its safety training.

Maintenance Program

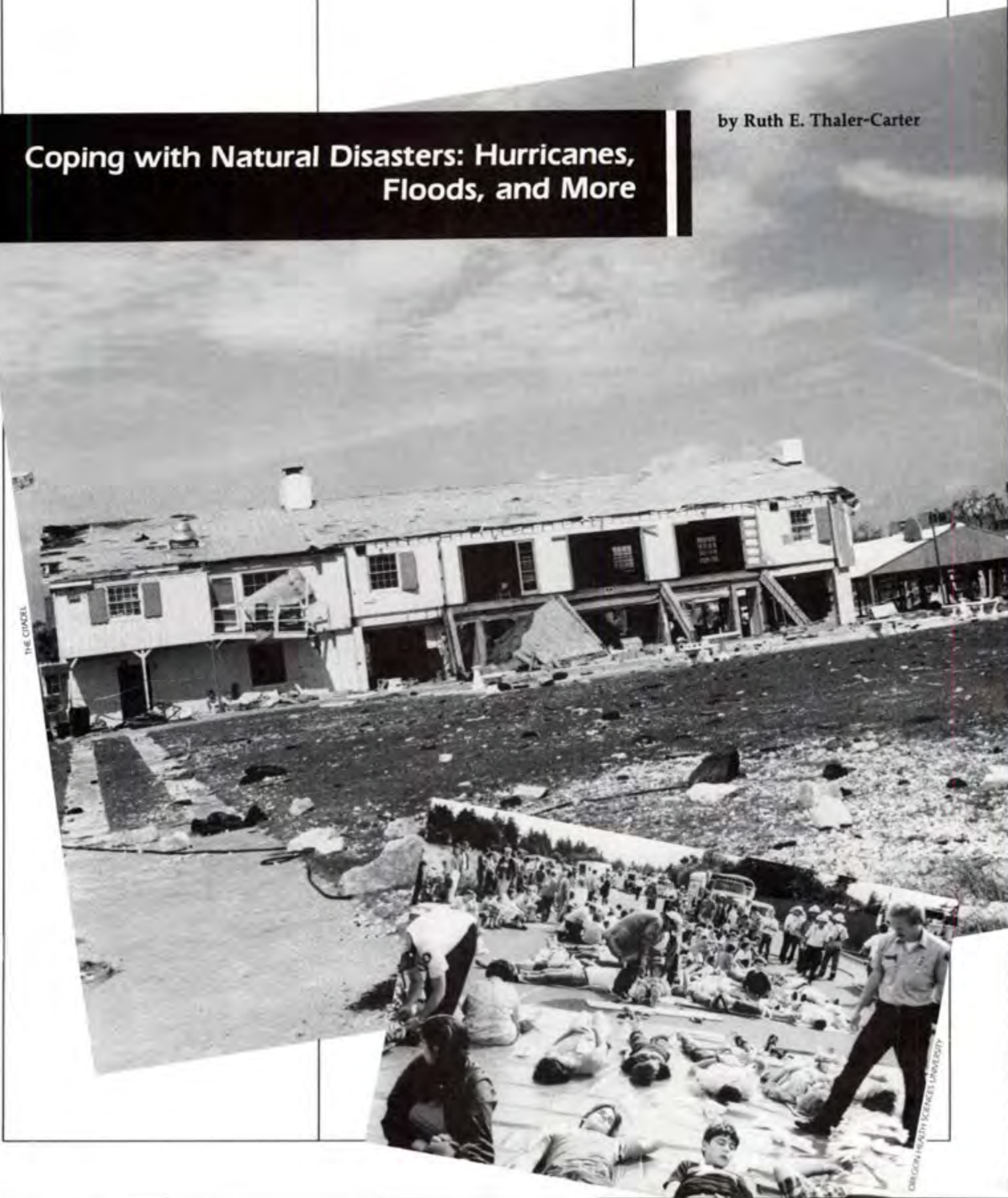
Finally, many professional contractors offer a free inspection program for two years on any warranted roof installation. Some offer a maintenance program after their two year obligation where, for a reasonable fee, the contractor will continue to identify and correct potential problems before they become costly. These maintenance programs can prove to be a valuable investment in extending the service life of the roofing system, as well as in avoiding serious problems.

While there is no perfect method for selecting a roof contractor, the above criteria should serve as a helpful guide in identifying and eliminating specific problem areas. Other resources that can make the process easier include publications by the American Institute of Architects (AIA) or the National Roofing Contractors Association. ■

Coping with Natural Disasters: Hurricanes, Floods, and More

by Ruth E. Thaler-Carter

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Violent natural disasters such as hurricanes and earthquakes make headlines as they test the resources of campus physical plant administrators and their emergency planning systems. And they often hit with little or no warning. More predictable or frequent emergencies, such as blizzards or floods in areas prone to such incidents, require equally efficient emergency preparedness plans.

The nature of "disaster" also changes constantly in this modern age of sophisticated weaponry and power-source development—a train wreck or building leak can have disastrous effects on a neighboring campus, particularly if the train was carrying hazardous waste or the building was a nuclear power plant. An emergency plan must respond to both natural and manmade crises.

In this second of two articles on the role of physical plant in emergency preparedness, *Facilities Manager* looks at how several campuses cope when nature gets nasty.

A common thread in all of the emergency plans discussed for this two-part series was an emphasis on good communication before and during a crisis. Importance was also placed on ongoing training and rehearsals or drills to familiarize all members of physical plant and other departments with what might really happen in an emergency. Bringing plans to life through drills, physical plant administrators agreed, made the training far more real to participants and reduced panic levels when problems actually struck.

The campus role as a member of its community also plays a part in emergency planning; helping protect the community and pitching in when disaster strikes outside the campus border is as important as protecting the lives of students, faculty, and staff on campus. In an emergency or natural disaster, the separation between town and gown should cease to exist.

Some fortunate campuses have never been forced to put their emergency plans into action, but they have developed such plans in recognition that disaster can strike in several forms. At least one campus emergency plan was developed originally to cope

with the overload on its hospital that occurred when a plane crashed nearby; the communication system put into place for such situations has been adapted for use in other types of crises, both natural and manmade. Such plans tend to focus on keeping special facilities up and running to tend to victims or to protect sensitive equipment, but also can provide the needed guidelines for overall campus safety.

Staying Above Water

Emergency preparedness on some campuses is a result of long-ago experience. Michigan State University in East Lansing is one example. "We have a field data book that outlines flood procedures," said Ronald T. Flinn, assistant vice president for physical plant. "It comes off the shelf when the waters start to rise, before there is an actual emergency. We listen for flash flood warnings in our area and watch the rainfall levels, so we can be ready to implement the necessary steps if a crisis seems to be developing."

Flinn's staff and campus rely on a combination of old and new technology to combat flood conditions. The "old" is the field data book, developed originally after the campus was flooded in 1904 and updated constantly over the years. The "new" is a Telemark device, which can dial a phone number and relay current information on rising water elevation levels.

The data book provides checkmarks and procedures for various flood levels. "The first page of our procedures starts with six feet, when it says we need to check certain facilities as outlined," said Flinn. "It takes us through about eight feet, when it says we need to start plugging floor drains and notes what to check, what to turn off, and when and where to start sandbagging," he said. The book's guidelines go up to "100-year-flood levels" of fourteen feet, which Flinn said have been needed at least three times—1904, 1947, and 1978—in the history of the institution and community. "We keep records of crests above six feet, because you never know how high the water level will get. The book is set up to handle the maximum," Flinn said.

The planning book also includes a map showing the river basin and line of flooding from those major disasters, with small-scale drawings of campus

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Ruth Thaler-Carter is a freelance writer based in Washington, D.C. and Baltimore, Maryland. She wrote about the 1989 California earthquake in the Spring 1990 *Facilities Manager*.



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buildings showing "where things need to be checked or plugged." This detail means anyone available can make the necessary checks at minimal risk to the individual and with no loss of time in an emergency, Flinn said.

When the waters start rising, physical plant works with the campus public safety branch, which puts up road barricades to protect people from entering dangerous areas. "We handle all the rest [of the emergency plan activities]," Flinn said. "It's *our* plan—we develop and enact it." In fact, the department can be called the originator of the institution's planning process: "Someone in physical plant drove a stake into a tree in 1904 to mark the flood level. That was the beginning of our emergency plan," said Flinn.

At Michigan State, emergency training is part of the general training of anyone in maintenance or physical plant, guided by supervisors familiar with the planning document. In addition, Flinn said, "we do 'wet runs' whenever the river starts rising, even if it doesn't reach flood level, to make sure everyone knows what to do, where to check, and when to start sandbagging."

The West Virginia University campus in Morgantown, where APPA past president Dorsey D. Jacobs heads physical plant operations, also has a detailed plan for coping with flood disasters. It is part of the university's overall planning document, a detailed

book in flip-chart style "that is easy to use—you can just flip through to whatever crisis you need to handle and see who would be the leader, what to do, the responsibilities of each department, the equipment we have on hand in various departments, even what to bring to the site, such as equipment and protective clothing," said Jacobs. "It walks you through anything that could happen, including chemical spills."

The institution holds mock disasters at least once a year, usually in late summer, Jacobs said, to check on training and preparedness levels campus-wide. Each year's drill is slightly different; in 1989, "the scenario was that the physical plant office blew up and all the top management were killed, to see how our workers would respond on their own. I was locked in my office throughout the whole thing!"

Such drills are organized by the campus Safety Committee, in which physical plant operations plays an active role, Jacobs noted. When physical plant is the target, such as in 1989, the environmental health division sets up the mock disaster. "We don't know when or how the drill will occur," he said. "They just walk in and said, 'This is it.'"

To ensure that the campus learns from every mock disaster, all departments hold a detailed post-simulation debriefing to assess what worked and

what needs to be changed. The results are put in writing and disseminated campus-wide.

Like many educational institutions,

Emergency Planning Resources

Here are some key resources for developing effective emergency preparedness plans, creating training programs, and staging disaster drills, as well as potential partners in campus-community responses.

- State offices of the Federal Emergency Management Agency (FEMA), which provide support and training to state and local emergency-preparedness officials. "States are responsible for emergency responses at the local level," according to Carl Suchocki in FEMA's Washington, D.C. headquarters. "The federal government is the third-tier response mechanism. We provide supplemental assistance for individuals and public facilities when the president declares an official disaster."

- Local and county chapters of the American Red Cross.

- Local fire and police departments.

- Local units of the National Guard and Armed Services, which "regularly develop and initiate disaster plan operations that can supplement the university emergency preparedness effort," according to APPA's manual.

- Department of Defense and Defense Civil Preparedness Agency.

- The APPA *Facilities Management* manual, second edition, chapter 54, "Emergency Operations" (p.1481-1520).

—R.E.T.-C.

West Virginia University pitches in to help its neighbors during disasters. Jacobs is well known in APPA for his role in coordinating such support when a flood devastated parts of the state several years ago. Physical plant provided work crews and equipment to communities around the state at the governor's request, even though the campus itself was not affected.

Out in the Cold

The wide open spaces of the American West can threaten campuses with landslides and earthquakes, said William S. Rose, director of physical plant for Montana State University in Bozeman, but freezing weather is a more common concern. The campus has experienced severe weather conditions such as freezing temperatures of -40°F and wind chill factors at -80°F to -100°F .

In the event of either disaster or severe weather, "the role of physical plant is pretty extensive," Rose said. "We have most of the resources needed, so we provide equipment and personnel and help develop plans onsite."

Rose and his staff take a preventive approach to planning for and coping with natural disasters. "We focus on engineering for structures or systems before a disaster," he said. "For instance, we had a backup supply of liquid propane gas installed in case the local utility system fails. We can have steam and an orderly shutdown of the campus, if needed."

The university has a formal, written emergency plan that is being revised. It includes a requirement that all physical plant staff learn basic first aid and CPR. All campus health and safety workers are taught to deal with emergency medical situations, he said.

When a natural disaster or weather crisis seems imminent, physical plant assess the conditions of buildings, Rose said. "We have a network of building supervisors and occupants who keep us advised of how the facilities are faring." Student safety is the first priority. Because severe winter cold and winds can be life threatening, "we do our best to provide food-service delivery and entertainment in the dorms to alleviate the students' need to leave the buildings."

As with many campuses, MSU's physical plant has developed linkages with the campus' host community and gets involved in emergency response outside the campus boundaries. In a



recent such situation, "the physical plant emergency team stayed onsite continually, 24 hours a day, to assess conditions, make repairs, and respond to needs as they arose," Rose said. "The management team also stayed on hand nearly around the clock with the local utility company, so we could do our part for the whole state."

The wind chill factors may be a little less severe than in Montana and the rivers may freeze more often than they flood in Michigan, but Upstate New York colleges and universities have to plan for several major snowfalls a year. Those plans get used fairly often, since many cities in the region get enough snow, if not actual

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BOTH PHOTOS: UNIVERSITY OF ROCHESTER

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blizzards, to threaten lives and operations from about Halloween through Easter. "We have contingency plans for specific segments of the campus, such as the university hospital," said William A. Daigneau, director of university facilities for the University of Rochester in Rochester, New York. Rochester gets an average of twenty major snowfalls a season.

Rochester does not have a compre-

hensive emergency preparedness plan at the moment, although, according to Daigneau, "we are in the process of organizing one." With snow a commonplace occurrence, Daigneau's department does have a detailed plan of attack for that condition and is set up to handle blizzards or extreme conditions if they evolve. "We take the basic approach to snow removal and just escalate our current program to deal with conditions, depending on how

severe they are," he said. Preparedness is the key. "Our whole plant has been designed for 'redundancy'—we have twice as many boilers as we need, so we can lose 50 percent of our capacity and still operate."

That backup capacity is especially crucial, Daigneau said, because UR is home to a medical center and hospital that "has to be kept operational 24 hours a day." The university's physical plant operation provides services to the hospital on a contract basis, with the hospital's director of support services serving as a liaison between the hospital and the facilities manager.

At Rochester, physical plant develops the emergency preparedness plan and sends it to chief administrators for review, Daigneau said. "We have a prioritization system that identifies critical elements to be handled first, and that must stay open." The snow plan, in particular, is reviewed by the hospital administrator. It provides highly specific guidelines on where and how to clear the five miles of roads, eight miles of sidewalks and roughly 2 million square feet of campus parking lots. Routes and walkways must be safe and clear by 8:00 a.m. every day. Snow removal is done by crews who work on an area-based assignment system, with each snow-removal machine on a route that takes about four hours to complete.

Employees remain on call 24 hours a day; as soon as a snowfall reaches one-and-a-half inches, the snow-removal team is called in. When more than four inches of snow accumulate, all grounds crew members and supervisors are expected to join forces and stay on duty until the storm ends. Clipboards come with each machine, providing drivers with maps of the their areas, descriptions of how to plow each area and a checklist to calculate how much time is spent on each segment of each route.

A list of volunteers—university employees willing to earn some extra money by doing snow removal the old-fashioned way—can be used to bring people in to shovel snow manually from areas that cannot be cleared by machinery or plows. Shovelers also receive detailed lists telling them where to start, what to do, when to do it, and how. The university environment offers physical plant and grounds maintenance staff an unusual bonus—they can call on fraternity pledges to pitch in on snow removal in a pinch.

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The disaster plan at the University of Rochester has been so effective that the campus has never closed because of snow, despite numerous severe blizzards and ice storms over the years that closed down city and local school systems.

Protecting Sensitive Facilities

Both earthquakes and landslides plague educational institutions in the West and Northwest and require similar levels of preparedness, but special facilities often demand special planning attention. Physical plant administrators at schools with medical, research, or sensitive technical facilities cite those services as the driving force in developing emergency preparedness plans.

"We have a disaster planning committee principally to handle the medical and research facilities on campus," said Ralph E. Tuomi, assistant vice president, facilities management, at the Oregon Health Sciences University in Portland. Those facilities pose a double problem—they require emergency systems to maintain regular operations, but they also would be expected to serve other victims of natural disasters. "The medical center is a trauma center, so we would receive and be expected to treat many of the victims of disasters," Tuomi said.

A campus committee to plan for and manage emergencies has been in existence for ten to twelve years, with the physical plant director included as an active member, Tuomi said. The plan involves a calling tree, with the director of physical plant "calling in key personnel to supplement medical services. We are prepared to set up temporary helicopter landing pads and shelters, to provide water and food, and to handle all facilities management needs such as backup generators."

Physical plant staff are trained routinely in handling all equipment needed to function in a disaster, with that training supplemented by special drills.

One vital aspect of campus emergency planning and preparedness is ongoing cooperation with the community, Tuomi said. The department works closely with city officials, with physical plant staff reporting to a command center that reports to the city command center in an emergency. "We have disaster drills twice a year on campus and citywide once a year," Tuomi said. "We are right on the spot. We work with all seven area hospitals.

Physical plant is an integral part of the command center."

In the Eye of the Storm

One of the most frightening natural disasters that can hit a community is a tornado or hurricane; both unleash unpredictable and fast-moving devastation.

"There isn't anything a plan could do to prevent or cope with something like Hurricane Hugo," said Larry D. Youngner, who oversees plant operations for Brunswick College in Brunswick, Georgia. The campus does have a direct hookup with the emergency broadcast system, "so we can alert the campus of an impending crisis," and maintains a set procedure and standards for handling emergencies. "We

are undergoing a review and self-examination of those systems, which accelerated in the aftermath of Hugo," Youngner noted.

Hurricane Hugo devastated much of The Citadel campus in Charleston, South Carolina—current damage estimates are at \$10 million and "we're still going room-by-room to assess the damage," said a member of the physical plant department—and affected a number of other educational institutions similarly.

In the aftermath, one of the most powerful resources was the supportive response from other campuses. Clemson University in Clemson, South Carolina, for instance, which

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was far enough inland and above the path of Hugo to be unaffected," sent ground and electrical crews to The Citadel and equipment to the Medical University of South Carolina," said Michael D. Faires, Clemson's assistant vice president, facilities maintenance and operations. "We had more than eighty-five volunteers pitching in on a rotating basis. We sent crews to the

state engineers to work on field inspections and debris assessments, do paperwork, and run field offices. There was a tremendous outpouring of generosity—our university alone sent six truckloads of clothes, food, and supplies, even generators. It was an unbelievable response."

Sometimes having an emergency plan in hand does little good. When Hugo struck, "we had a disaster plan,

but it provided more basic evacuation guidelines than anything else," said Robert W. Collins, currently director of facilities at Davidson College in North Carolina, and director at The Citadel when Hurricane Hugo hit South Carolina last fall. "We took a look at the magnitude of the storm and the level of risk and responded with extra efforts as things took their course. I had experience with other natural disasters, and we had had other, less severe hurricanes, which helped."

The Citadel was directly in Hugo's path and sustained among the worst damage of the institutions affected by the hurricane. Entire buildings were destroyed, roofs were ripped off, there was water damage from flooding and hard rains, and downed trees pulled up sidewalks, streets, fire hydrants, and water, electric, and gas lines. Some of the damage occurred when a hard cloudburst rainstorm hit shortly after the actual hurricane. Current damage estimates are at \$10 to \$14 million, Collins said, although assessments still are being made. That makes budgeting for damage control more complicated, he noted. "Pricing construction bids and labor costs is difficult," he said, "because the situation is still unstable."

Collins had the advantage of four to five days' warning to start preparing for Hugo. Weather forecasters had sighted the hurricane in Puerto Rico and the Virgin Islands early and predicted that it was coming toward the East Coast of the United States. "We started putting our equipment on ready and looking at our supplies—what we had and what we would need," said Collins. "We checked on generators, buckets, trucks, plywood, sandbags, and so forth. We located, put holds on, and ordered equipment and supplies. That was a risky venture from a cash-management standpoint, since there was no guarantee the materials actually would be needed."

Collins and his staff at The Citadel took the no-cost and low-cost steps first, two days before Hugo struck—physical preparations, such as checking roofs and drainage systems, removing canvas and awnings, anchoring loose equipment, topping off equipment and fuel tanks, and lowering the temperatures in cold-storage areas. They then moved to boarding up glass and taping windows. They had students move furniture and cover clothing in the dorms. "We covered desks in plastic and covered computer

BEFORE



AFTER



terminals," Collins said. "We started filling sandbags, made sure we had plenty of chainsaws, set up an emergency operations center, and started arranging for volunteers. We positioned vehicles and stocked them with supplies. We even set up and stocked some boats."

Despite the serious damage to campus, buildings, and community, students were back at The Citadel within ten days of the hurricane, Collins noted.

Among the lessons Collins learned in the experience were:

- "We should have paid closer attention to the actual progression of the hurricane and its aftermath; in reality, we received little rain compared to what we expected until shortly after Hugo went through;

- "I wish we could have used more qualified people on damage assessments immediately after the hurricane—because we had minimal staff, we used volunteers for some of that activity—but that's hard to do. You have to allow your own people to take care of themselves and their families;

- "It makes a great difference to plan your resources and volunteers *in advance*—that worked out quite well for us;

- The campus itself, and physical plant administration expertise in particular, is a valuable community resource—"we had a lot of community interaction. The difference between a community and a college campus with physical elements is that we had the facilities, equipment, and staff on hand to handle much of the disaster;

- "Realize that resources to make repairs and recover from the disasters may be limited—when you have an area devastated by a storm of this magnitude, *everyone* is affected." The Citadel provided emergency workers with food and housing after the storm, as well as members of the community left homeless in its aftermath; and

- It is important to recognize and meet the personal needs of physical plant and other campus employees promptly—"the sooner we could help them meet their needs at home, the sooner they could help us." Since most of the town's gas stations were wiped out by the hurricane, for instance, the university gave essential employees gas to get to and from campus, once it was possible to do so.

The Medical University of South

Carolina (MUSC) also had some advance warning of Hugo's impending arrival, since George F. "Tony" von Kolnitz IV, head of the university's physical plant operations, was participating in an Air Force reserve duty assignment and had access to information "the week Hugo was born." In terms of special planning and preparations, "we thought the most likely landfall would be between Florida and North Carolina," von Kolnitz recalled. "That put Charleston right smack in the middle. We had a plan in place, but we are primarily geared to handling things like plane crashes. We put the plan aside, did what we could to prepare, and prayed a lot."

Von Kolnitz and his staff began holding meetings that included the university's hospital preparedness disaster officer, who contacted the National Guard. "We started making plans to get the National Guard involved, with them doing the outside work with heavy equipment and our own people inside the hospital and university, since they know where everything was," he said. "We started stocking plywood for covering glass and other fragile surfaces. We got all

we could from Charleston and Savannah and still barely had enough. In the first aftermath of the hurricane, we still had to borrow more."

One crucial issue for MUSC was to protect its generators from tides far higher than normal. Since storm surges were predicted to reach twenty-five feet above normal sea level, and eight feet is what the university considers safe, "we ordered four smaller generators and positioned them around the hospital, wired in so we could switch them in twenty minutes to carry the intensive care units," von Kolnitz said. Plans to put one backup generator on the hospital roof had to be reconsidered when the item turned out to weigh 9,000 pounds instead of the anticipated 3,000; the roof would not have supported the excess weight, so that generator was placed on a truck. The storm waters, von Kolnitz noted, "came to within two feet of putting the generators out."

Although city officials assured the campus that "the storm had not been invented that could interrupt the local water supply," the university lost generators in the main hospital when the

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city water did get cut off. The National Guard "saved our lives," von Kolnitz said. "They kept the generators fueled and brought us one more backup unit."

Damage to MUSC originally was estimated as at least \$25 million, but loss of revenue and considerable equipment damage revealed after the dust settled will increase the damage levels, von Kolnitz said. "Structural damage probably will be in the \$10 million to \$15 million range, but we are still assessing the situation." The most damage was to the campus chapel, which would have been on the National Register of Historic Places but has been essentially destroyed.

Doing as Much as Possible

In areas of the country that are vulnerable to tornadoes, emergency preparedness tends to have a somewhat fatalistic edge. Dangerously high, strong winds can whip up with little notice. "With a tornado, you don't have time to plan—you're lucky to get a fifteen-minute warning," said Arthur L. Johnson, director, physical plant, for Washburn University in Topeka, Kansas. "There just isn't a whole lot

of planning you can do."

The campus does have an emergency preparedness committee, of which Johnson is chair, and works closely with the community to provide drills and shelters. "The city set up a warning system around town and at a central location on campus," Johnson said. "We have designated areas for tornado shelters on campus. We hold drills once a year in the fall, with a designated day to blow the sirens and activate our 'calling tree' systems for the campus. We send around written information with instructions on what to do if the warning were the real thing." That documentation has been developed by physical plant, he said. If another tornado approached, "we would sit down and organize a response based on what happens," said Johnson. "How we'd react would depend on what happens."

Physical plant tends to have a more clearly defined mission in the aftermath of a tornado than in planning for it ahead of time, according to Johnson. Experiencing a tornado also was a learning experience. "Now, we know more about area facilities we could rent or use if we get hit with a tornado again," he noted. After the destructive

1966 tornado, "we assigned architects to assess and handle repairs, hired local contractors to handle debris, and arranged for a gigantic tent to cover the library and protect books," he said. "We bought temporary classrooms and set them up in 'villages' so the business of the campus could continue."

Anticipating a Modern Catastrophe

It's hard enough to anticipate and plan for the freaks of nature in protecting the college or university campus. The modern facilities manager also has to be prepared to cope with the new threats created by people and technology. Clemson's Michael Faires said he has to be conscious of the constant risks imposed by a nearby nuclear power plant and a railroad track next to campus carrying trains loaded with hazardous waste, as well as those of being in the path of an occasional hurricane and in a potential flood plain near a dammed lake. "We have a joint plan with the Duke Power Company to respond to an emergency at the plant," Faires said. "Physical plant also has met with the state engineer's office and state Emergency Pre-

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paredness Office, the Nuclear Regulatory Commission, and the City of Clemson to develop our planning systems. We work with the Army Corps of Engineers to develop plans in the event of facilities being flooded by Lake Hartwell." The Clemson planning structure is university- and community-wide, Faires noted: "The community turned to us because we had the resources to provide the data."

Clemson maintains a separate emergency plan to be implemented depending on the nature of the disaster. It starts with the campus fire department and goes on to assignments from there, Faires said. To develop its plans, Clemson "supplied [collegial organizations] with everything about the university, including a role for our own fire department," he said. "We looked at what would happen to our students or during a football game, where we'd have 90,000 people concentrated in our stadium." Physical plant's role is to supply relevant data, rather than actually write the emergency preparedness plan, he said, but "our parts of the plans were developed by us—roles, assignments. We identified what to do and who would do it for handling electricity, power shutdowns, security, setting up radio networks, mobile command center (cellular radios in a four-wheel drive vehicle), generators, and supplies for work crews." Anticipating a variety of needs, the school maintains a permanent supply of military food rations, bedrolls, ice chests, Coleman stoves and lanterns, and other vital tools, maintained by the tool room supervisor.

Disaster plans are in writing and the campus fire department holds regular training sessions for staff, Faires said. Physical plant also maintains an asbestos team that is "cross-trained to handle other hazardous waste," he said. "Our electrical teams and other staff already know how to handle their areas in any situation. The administration has been trained in implementing everything from a snow plan to a drought plan. We get training from the university risk management office for various situations—we're all very aware of the risks."

Having an emergency planning structure in place to handle the "big ones" can have unexpected benefits when physical plant has to handle incidents that are not covered in the plans. For instance, Faires recalled, "we had a measles outbreak here this

year. "Because we had a plan for other emergencies, we were able to gear up to inoculate 18,000 people against red measles in two days."

The Bottom Line

In these uncertain modern times, both natural and manmade disasters can sweep over a college or university campus in record time. Planning for emergencies clearly is essential to the role and success of physical plant administration. Preventive measures and

planning systems may not stop the floods or winds, but they can make the difference in protecting the lives and properties of the institutions that rely on physical plant administrators as the first line against disaster.

As the *APPA Facilities Management* manual states, "The key to successful emergency operations is the extent of physical plant preparation in an orderly, logical way that supports the unique college or university environment involved." ■

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Tape #1—The Importance of Image (approximately 50 minutes)

Designed for viewing by institutional leaders, including the president, trustees, vice presidents, and facilities officer. This segment focuses on the critical nature of facilities management and recognition of the investment of the physical plant.

Featured speakers: Father Theodore Hesburgh, President Emeritus, University of Notre Dame; Jack Hug, APPA President; Walter A. Schaw, APPA Executive Vice President; Robert Nestle, Michigan State University; and Winthrop M. Wassenar, Williams College.

Tape #2—Achieving a Positive Image (approximately 1 hour, 50 minutes)

Designed for viewing by senior facilities administrators, key facilities management staff, and training personnel. This tape looks at the concept of customer satisfaction in facilities management through case studies of successful operations.

Guest Speakers: Winthrop M. Wassenar, Williams College, and Dr. John J. Kennedy, Department Chairman of Marketing, University of Notre Dame.

Case Studies (Past winners of APPA's Award for Excellence in Facilities Management): Charles W. Jenkins, St. Mary's University; Ronald R. Maassen, Waukesha County Technical College; and Robert Nestle, Michigan State University.

Tape #3—The Image Makers (approximately 2 hours, 20 minutes)

Designed for viewing by training personnel and first-line supervisors. This session focuses on building a base of customer satisfaction in the day-to-day activities of physical plant staff and features case studies highlighting successful training programs.

Guest Speaker: Dr. William P. Sexton, Vice President—University Relations, University of Notre Dame.

Case Studies: Paul Schneller, Indiana University/Bloomington; Polly Pinney, Arizona State University; E. Lander Medlin, University of Maryland/ College Park; and Barb Kunz, Duke University.

Ordering Information

Videotapes are available in 1/2" VHS format. You may purchase tapes separately or buy the package of all three tapes. Brochures with ordering information are available from the APPA office.



Resource Management

In an effort to share information, get to know one another better, and learn from each other, the following article is a collection of statistics and anecdotes on some of APPA's international members. As the Trinidad and Tobago flag states, "Together we aspire, together we achieve."

Dhahran, Saudi Arabia King Fahd University of Petroleum & Minerals

Yousuf A. Al-Koohej
Director General, Maintenance

The campus is located on a weathered limestone Jebel, 100 meters above the surrounding desert. It is easily accessible by road or airline from any point in the kingdom. The highway distance to Riyadh is about 400 kilometers.

The faculty is multinational. The majority of the instruction is in English and the technical library is exclusively in English. Teaching methods, curricula, administration, and organization of the university are largely designed according to reputable international standards adapted to Saudi Arabian needs.

Besides awarding master of science and master of business administration degrees, the university also offers PhD programs in chemical, civil, electrical, mechanical, and petroleum engineering, chemistry, and mathematical sciences.

The facilities available include faculty/staff offices; shops and lab buildings such as the heavy equipment lab building and energy research lab building; data processing center; classrooms; administration building; library; faculty/student center,

Stephanie Gretchen



which includes faculty dining hall, post office, bookstore, and barber shop; auditorium that seats 850; gymnasium; mosques; research institute; stadium that seats 10,000; medical center; conference center, and multistory parking garages. The facilities also include exterior amphitheater, playing fields, and the distinctive KFUPM

water tower with circulatory water systems.

The student housing area includes the student reception center; student cafeteria; mosques; transportation center; the garage for maintenance of university vehicles; and the prep year campus, consisting of a faculty office building, classroom buildings, and various labs and service buildings. All the students reside on the campus.

The faculty and staff housing includes family recreation center and the cooperative store. There is also the telephone exchange, university press building, and university schools (nursery, kindergarten, elementary, and intermediate).

We are funded totally by government subsidy.

We serve 5,000 students. Our primary academic focus is technical, graduate studies.

Our campus is twenty-five years old. Buildings' ages vary from five to twenty-five years. There are twenty-eight major and twenty-one support buildings, 162 student lines/buildings, 1,003 faculty/staff houses on campus.

The campus is 1,600 acres. The primary type of construction is concrete.

The primary energy source is electrical, second fuel is diesel for A/C boilers.

The primary concerns as a facilities manager are funding for operation and repairs.

My staff includes 230 in-house maintenance people.

I report to the Secretary General (Chief Business Executive).

Kuopio, Finland University of Kuopio

Juhani Jokinen
Financial Manager

The climate in Kuopio, located in eastern Finland, latitude 63°, is quite cold in the winter. Temperatures from December through March are about -10°C to -20°C (-50°F to -68°F), but at times it goes down to -30°C (-86°F). The summer is nice and warm, with May to September temperatures about 15°C to 25°C (59°F to 77°F), occasionally it even reaches 30°C (86°F). Because of the climate the facilities must have good heating equipment and efficient facilities.

We are publicly funded.

The university serves 3,000 students, including extension education. The primary academic focus is graduate studies.

The campus is fifteen years old, but the age of the main buildings are about ten years old. The campus consists of two main buildings and five smaller buildings. The campus is about forty-two hectares (105 acres). The primary types of construction are concrete and bricks.

Our primary energy source is "long distance energy" for heating coming from the city energy company (turf engine mill).

I take care of the cooperation between the university and the technical depart-

TRINIDAD, WEST INDIES

FINLAND

JAMAICA, WEST INDIES

SAUDI ARABIA

KOWLOON, HONG KONG



ment of the local unit of construction administration (centralized state construction unit). Equipment delivery is my office's responsibility.

My staff includes forty people, mainly financial officials.

I report to the director of administration.

Jamaica, West Indies **College of Arts, Science & Technology**

A.W. Sangster
President

The college is a unique institution within the Caribbean, being the equivalent of a polytechnic. More than eighty different programs are offered at certificate, diploma, and degree levels. The institution is complementary to the University of the West Indies.

Our climate is hot and tropical and within a hurricane area and earthquake zone. Construction must take these factors into account. Because we have heavy rains at times, buildings must be able to handle large volumes of runoff over a short period of time.

The university is supported 90 percent by government subvention and 10 percent by fees. Special projects are funded separately.

We serve more than 5,000—1,972 full-time, 1,053 part-time, 1,105 evening, 834 modular and summer credit students. This includes more than 200 overseas students. Our primary academic focus is technology and business.

The college is thirty-two years old. The age of the buildings vary. Eighty-year-old wooden buildings were taken over from another institution that moved out. Newer structures built over a period of time are five to thirty years old. There are twenty-five major buildings, and the campus is 40 acres large.

The campus is primarily constructed of wood (old campus, pre-1960) and concrete (new campus after 1960).

The primary energy source is electricity for power, lighting, and air conditioning; propane for cooking; and solar for heating water.

My primary concerns as a facilities manager are ongoing repairs and maintenance of physical plant and equipment and the appearance of grounds and surroundings.

Plumbing, electrical, and masonry work are done on a contract basis. Mechanical and air conditioning are done by the engineering department on a contract basis.

Kowloon, Hong Kong **The Hong Kong University of Science & Technology**

Michael Hudson
Director of Estates Management

Hong Kong has a semitropical climate with temperatures ranging from 10°C to 35°C (50°F to 95°F). Humidity is generally high and the territory is occasionally sub-

jected to typhoon conditions during the summer months. As a result, almost all accommodations are airconditioned and designed to cope with torrential downpours and winds of up to 150 mph.

The university is less than two years old, and, as yet, has no students. The first intake is in 1991.

The university's income arises primarily from government. The Royal Hong Kong Jockey Club has made a donation in excess of US \$200 million toward capital cost of construction, with the balance being met by the government, who, in the first instance, made the 60 hectare (150 acres) of land available for the university. Recurrent expenditure is to be met primarily by the government, although fund raising campaigns are under way.

The university primarily focuses on science, technology, and business, but has a general education center to broaden the student's perspective.

The academic and support departments will be housed in a monolithic, reinforced concrete structure. Staff and student residential accommodations will be provided together with sporting facilities in independent structures within the campus.

The primary energy source is electricity, although a gas supply is available and used for cooking and water heating. The airconditioning plant is sea-water cooled.

The university is in its infancy. The estates management office has a staff of

twelve, which is expected to grow to more than 400 during the next few years.

The primary concerns arise from the speed at which the project is being implemented. For political reasons, Hong Kong generally has short time horizons and this project is no exception. Design and construction is proceeding simultaneously. The university has employed a network of architects primarily from the United States to assist in the design, but the arrival of a large number of academics can be expected to generate requests for a number of changes. Staff recruitment may also prove problematic.

Trinidad, West Indies **The University of the West Indies/ St. Augustine**

Kenrick Nobbee
Estate Manager

The Trinidadian climate is tropical with wet periods between July and December and dry periods between January to June. Our location is 10°N latitude and 61°W longitude. Temperatures range from 19°C (66°F) in December and January to 34°C (93°F) in March and April, with an average temperature of 32°C (89.6°F).

While there are no major facilities efforts within either period, our objectives are to make the maximum use of the prevailing conditions. During the long dry spell, we concentrate on external works for build-

Continued on page 50

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ings. This includes roof repairs, external painting, cleaning of fungal growths, external sealing, and paving. During this period we also prune the trees and shrubs and work on the grounds.

During the wet period we merely maintain by cutting lawns and replant trees and shrubs.

The major source of funding for the university is from the contributing governments of the region (all former British West Indian territories): Antigua/Barbuda, Bahamas, Barbados, Belize, British Virgin Islands, Cayman Islands, Dominica, Grenada, Jamaica, Montserrat, St. Christopher/Nevis, St. Lucia, St. Vincent, Trinidad, and Tobago. Special funding is obtained from private endowments, foundations, foreign governments, and international organizations. In the past the UWI has had buildings donated by the United States and Canadian governments.

The academic year runs from October to June. The total student body for 1989-90 is 4,178. Undergraduate faculties include agriculture, arts, engineering and medical, natural, and social sciences. Graduate faculties include agriculture, arts, engineering, education and medical, natural, and social sciences. In all faculties the academic emphasis is relevant to the Caribbean area. The special focus for St. Augustine is in ag-

riculture and engineering; these two disciplines are not offered at the other campus.

The St. Augustine estate has a long history dating from the turn of the century when it served as a major sugar plantation. Until 1989 one building (formerly used as a Yaws Hospital) from that era existed and was in constant use. Unfortunately, it was destroyed by fire last year.

The Imperial College of Tropical Agriculture (ICTA) was established in 1923. In 1960 the then ICTA was merged with the University of the West Indies to become the Faculty of Agriculture, the first faculty of the university to be set up at St. Augustine.

Our campus buildings bear testimony to the long history of the area. Our administration building was constructed for the ICTA in 1922 and some of the buildings in one hall of residence (Milner Hall), from the same era are still in use.

The residence of the campus principal is another historic landmark, as are the offices of the estate manager (facilities manager), called the works department. The latter formed part of the Sugar Technology Buildings of the ICTA period.

The main campus area consists of 116 acres. The staff residential area nearby consists of 69 acres. All is maintained by the works department headed by the estate manager.

The campus has fifty-eight buildings and seventy-six houses. There are five miles of roadway and seventeen carparks with facilities for 1,000 vehicles. Primary construction material is concrete.

The campus buildings include three halls of residence, administration, library, student union, bank, bookshop, and credit union.

Our energy source is electricity from the national grid, via a system of 7MW installed capacity. Primary voltage of 33kV; secondary 12kV-480/444/230/110. Consumption 3.5MW.

Primary concern of the facilities manager at the moment is the implementation of a comprehensive computerized preventive maintenance program.

Total staff on the campus is approximately 1,500. The works department office staff totals twenty-seven together, with a work force of 125 daily paid employees skilled and unskilled in various trades.

The facilities manager reports directly to the campus registrar, who is the administrative head of the campus.

APPA members would be happy to hear that we, in this part of the world, share concerns that are similar to those expressed in APPA publications. It is to our disadvantage that we are unable to attend conferences and meetings and actively pursue these discussions. ■

Memo

Bob:

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Casey Stengel, the one time manager for the New York Yankees, once said, "Finding good players is easy; getting them to play well together is the hard part."

As head of facilities management, you're cast in the role of team manager. How do you get a team's members to play together? As a prelude, start by telling them they are part of a team, and that you expect them to work together.

Whether it is to play center field or custodian, team members require assignments. You need to define, and workers deserve to know, the specifics of their obligations and what you expect.

Easier said than done. On a baseball team players, occupy the same position in every game. On your team, staff assignments change daily, maybe hourly. If your supervisors can afford the time to continually update your mechanics, then you're over staffed.

Creating and Applying Standards

Tasks that can be reduced to work quota units (I dislike that term when talking about people, but it's accurate) are grist for a computer. Work quota units is a management science (is that a contradiction?) buzzword that means square feet cleaned per day, number of hours to repair a door closer, acres of grass cut, or the number of window A/Cs serviced, i.e. standards.

Despite the risk of appalling personal injury at the hands of program publishers, I claim that most facilities management software applications are just different stripes on the same cat. They quantify, report, summarize, and display data on personnel, work orders, job assignments, inventory, costing, and work quota units. You chose one product because it's a better fit for your unit. We have said it before and it warrants repeating: in facility management software one size does not fit all. You are best qualified to determine if the package fits your needs.

Some time ago we favorably reviewed a facility maintenance package, The Chief, published by Maintenance Automation Corporation of Hallendale, Florida. We recently discovered another maintenance software package you should consider when comparison shopping. Jagware, from Management Systems Corporation, offers the requisite maintenance modules. These include custodial, work order, grounds, inventory control, grounds, key tracking, and PM. These modules are available sepa-

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.

Data Base Update

Howard Millman

rately and integrate after installation. They share the same easy to use interface and command structure.

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Technically, Jagware is a cut above. The

software's consistent interface, sequential menus, drop down menus, and logical screens flatten the learning curve for new users.

Still, there's more to life than just increasing its speed. While Jagware's designers created a technically excellent product, they wisely included provisions to equitably evaluate staff performance. Considering the often subjective nature of work assignments and the variability of working conditions, equalization of work loads is difficult to achieve. Using suggested standards, which you can readily alter, Jagware objectively compensates for working conditions by factoring in frequency (or amount), productivity, and quality. The end result is a gauge of performance.

When dealing with staff, integrity isn't important, it's essential. By stressing positive reinforcement and minimizing inequities in work load and conditions, Jagware enables supervisors to reward the producers and to concentrate on helping the uninspired. Restated, Jagware's designers recognize that praise and fairness powers the mill while criticism decays it.

Jagware is available from Management Systems Corporation, 8705 Unicorn Drive, A-122, Knoxville, TN 37923; 615-694-4557. Modules cost from \$795 (key control) to \$5,900 (custodial). A free demo is available. Jagware requires an AT or 286 machine, color monitor recommended. ■



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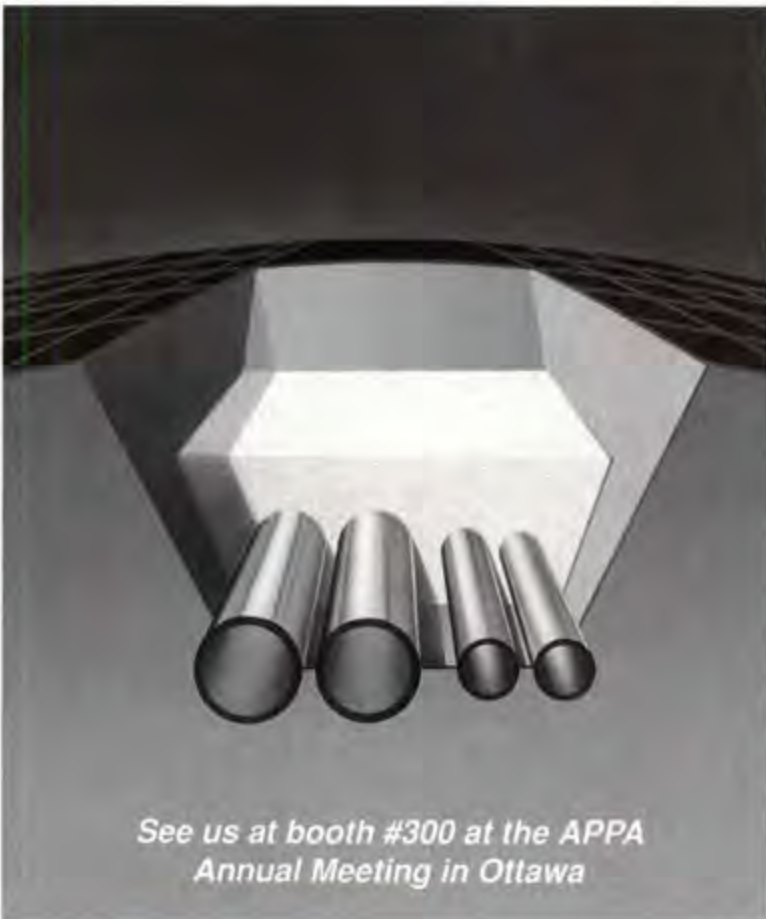
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