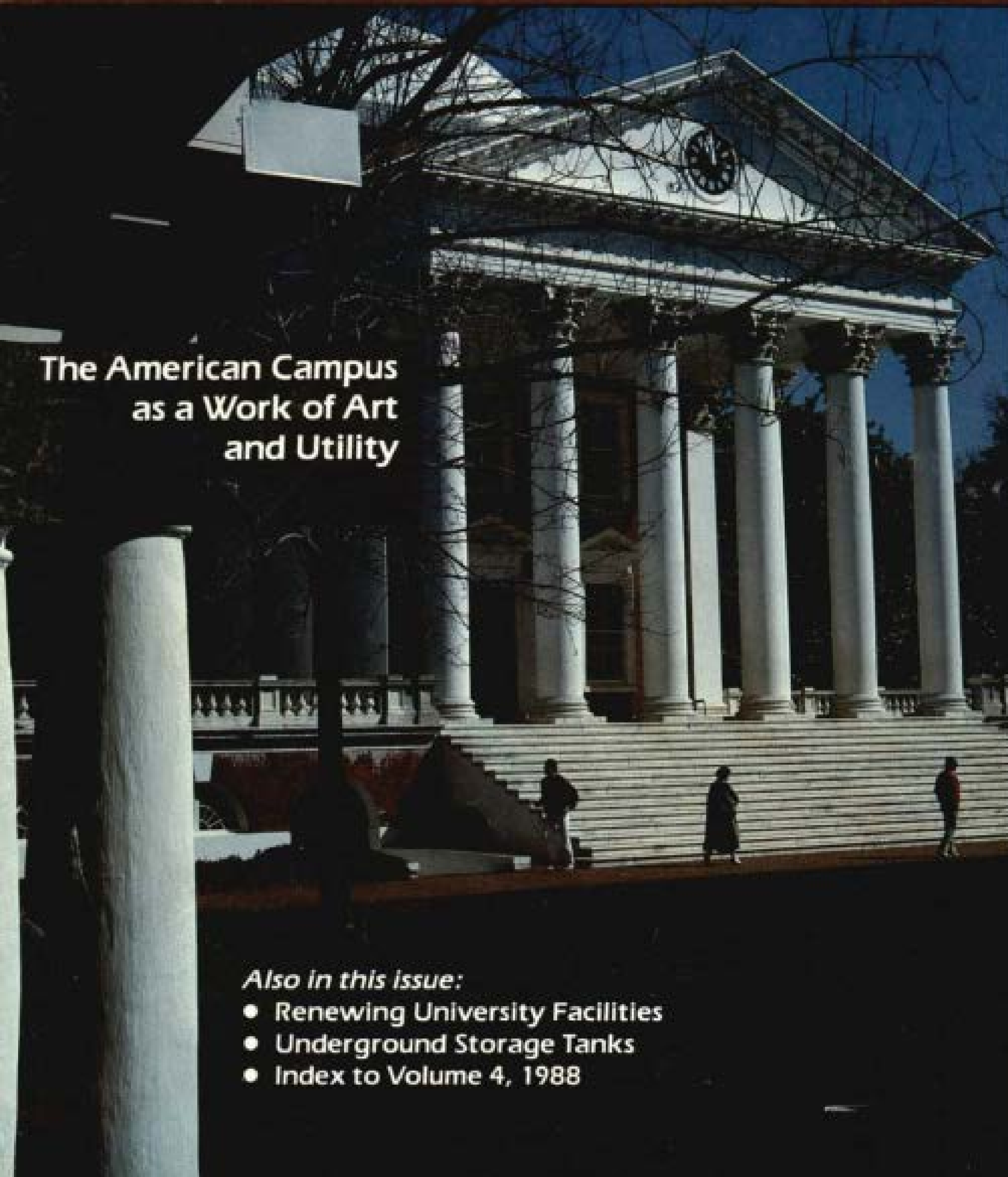
The official publication of the Association of Physical Plant Administrators of Universities and Colleges

Facilities Manager

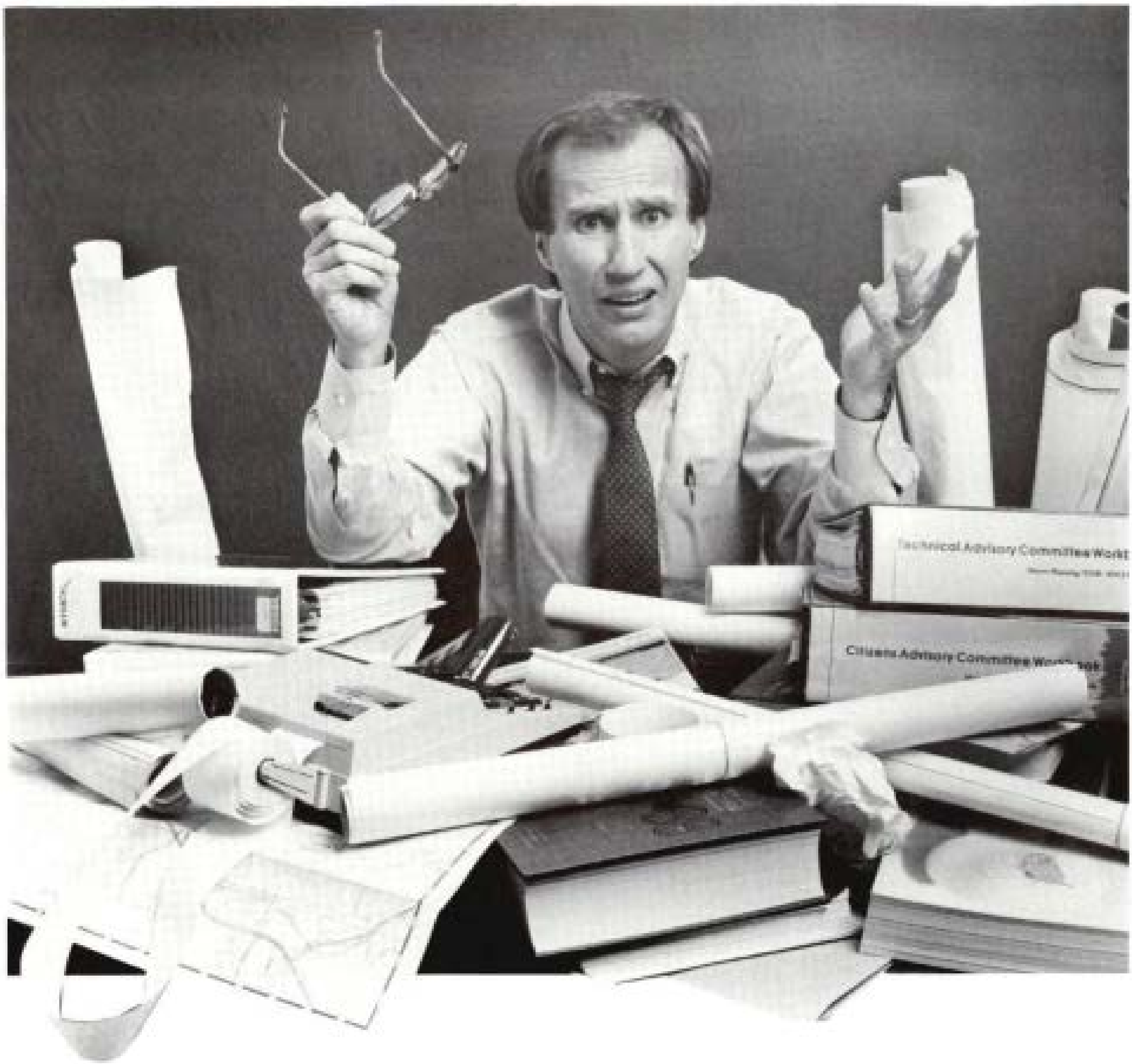
Volume 5 Number 1 Spring 1989



The American Campus as a Work of Art and Utility

Also in this issue:

- Renewing University Facilities
- Underground Storage Tanks
- Index to Volume 4, 1988



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Facilities Manager

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Editor
Steve Glazner

Assistant Editor
Stephanie Gretchen

Advertising
Diana L. Tringali

Subscriptions
Maxine Mauldin

Design
Sans Serif Graphics, Ltd.

Typography
Unicorn Graphics

Printing
Hundley Lithograph, Incorporated

Editorial Office
703/684-1446

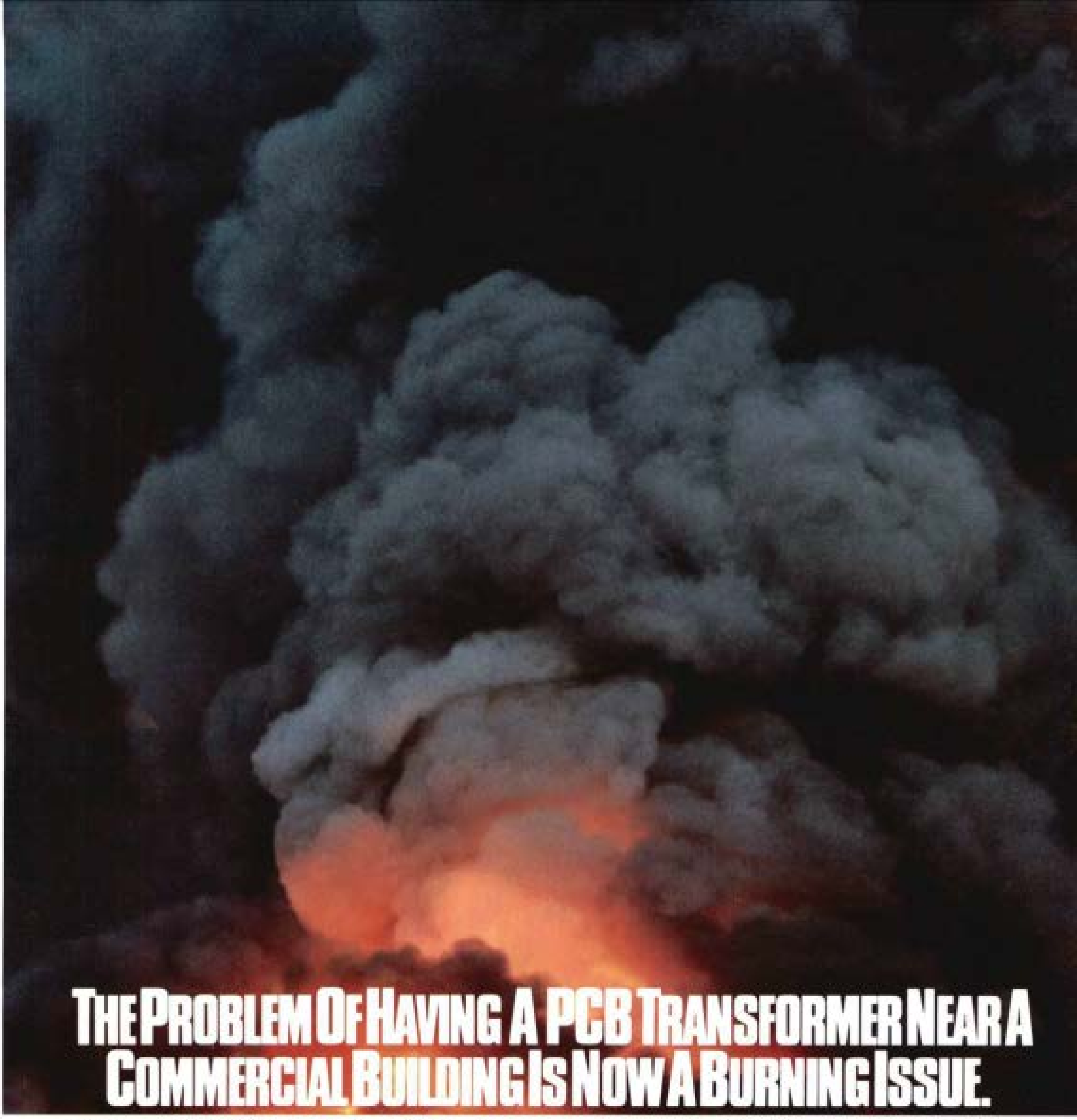
FAX
703/549-APPA (2772)

Table of Contents

Features

Departments

Cover photo of the Rotunda, courtesy of the University of Virginia.



By October 1, 1990, the EPA requires that all PCB transformers in or near commercial buildings be retrofilled, replaced or have enhanced electrical protection. The reason is that toxic PCB's can produce extremely dangerous gases in the event of fire. Which means all PCB's have to be dealt with.

And that's where UNISON comes in. Because we're the most experienced, dependable, cost-effective choice for transformer retrofilling or destruction, bar none.

First, if your existing transformer is in good condition, you'll want our RECLASS 50℠ service. It's a retrofill and reconditioning service that removes and destroys PCB's, and it can save you as much as 50% of the cost of a new transformer. Or, if your transformer needs replacing, we'll destroy the old transformer along with the PCB's using our TRANS-END℠ service. With either approach, UNISON gives you excellent protection from future liability.

Solving the PCB problem takes time, and meeting the October, 1990 deadline means acting now. So give us a call at 800 544-0030. Or write to us at UNISON, Department A, 1338 Hundred Oaks Drive, Charlotte, North Carolina 28217. And we'll take the heat off the situation.

UNISON

APPA UPDATE

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

OSHA Regulations Affect APPA Members

Many colleges and universities will be affected by Occupational Safety and Health Administration's (OSHA) tightened exposure limit regulations on almost 400 materials. The new standards set permissible exposure limits (PELs) "on the amount of the affected substances to which employees are allowed to be exposed," said NACUBO's *Business Officer*. According to the Labor Department these new levels are hoped to help reduce work-related illnesses; the regulations went into effect March 1.

As of September 1, mandatory compliance must be followed. Only public institutions in states with OSHA-approved occupational safety and health plans must comply. Those included are: Alaska, Arizona, California, Connecticut, Hawaii, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Nevada, New Mexico, New York, North Carolina, Tennessee, Utah, Vermont, Virginia, the Virgin Islands, Washington, and Wyoming.

These more stringent regulations have had varying reactions from APPA members. Jim Joyce, safety officer of Oregon Health and Science University, has less to worry about than some other institutions. "In most cases, we already fall within the new guidelines," he said, stating that his institution is well prepared because they have been making adjustments through the years. "This topic has been in many journals for a long time, so we have been waiting for this [the OSHA regulations] to happen." Joyce admitted that although pretty well prepared, they will still have to make some changes for formaldehyde and ethylene oxide because "they're the hardest levels to achieve."

Wallace Glasscock, assistant director of human resources at the University of Maryland, said, "We've looked at all of [the regulations] and the one that deals with us particularly is asbestos. We're looking at guidelines to implement change. We are most interested in health issues, so we are working with the environmental safety department and the health center. The health center gives physicals for people who work with asbestos."

Although these regulations mean some work, Glasscock said the standards "need to happen. Most of what [OSHA is] regulating should be done anyway." To Glasscock the regulations are not the problem—money is. "Since there is no money on the federal level the regulations can't be enforced," he said. "There are so many violations in so many different areas, but money is cut and cut and cut."

Ralph Allen, professor of environmental health and safety at the University of Virginia, said, "These particular regulations have relatively little impact by themselves. We use many of these materials and are aware of these emissions, but people's exposure is limited. We're already concerned about these levels. The new lower levels combined with generic personnel monitoring could be disasterous." Generic personnel monitoring determines whether people are being exposed to new levels of materials. "This is something that should have been done. [The new exposure levels] are good, but that in combination with having to prove you haven't exceeded levels will be very onerous and expensive."

Allen's primary concern on campus will be the laboratories. "We will try to push for standards of good practices for labs. We will design labs with a good ventilation system."

A smaller institution's response comes from Pat Apel, director of physical plant at Maryville College (MO) who said, "We're doing what we can. We are seeking alternative sources to get us on programmatic changes. We are allocating money and staff to overcome the difficulties. I'm frightened by what could happen. We could receive a fine for something we're doing unknowingly. We just can't read through the mountains of information on this topic."

Apel's suggestion to improve what OSHA has done is to increase community effort and communication. "It is difficult to follow and enforce these rules because we don't know who to report to, EPA or OSHA. It's hard to figure out what we're supposed to be doing because of all the information. It is difficult to sort it all out. The worst thing is the proliferation of companies and seminars that crop up that want to help you, but you can't figure out which to chose. No one is telling us which the good ones are."

HAPPA Meets in Houston

The bimonthly meeting of Houston Association of Physical Plant Administrators (HAPPA) was held February 14 at the University of Houston (TX) hosted by Herb Collier. Twenty visitors from 11 universities and colleges attended the meeting. The maintenance computer software package developed by University of Houston was demonstrated for the benefit of the institutions considering development of a software program or in purchasing a software package. The UH program was developed for IBM-compatible PCs networked together and provides for a fully integrated maintenance program. The next meeting of HAPPA is scheduled for April 4 at Alvin Community College, hosted by Bob Richarz, director.

APPA Cosponsors International Conference of University Administrators

APPA, the University of Maryland at College Park, and other U.S. associations will host the sixth International Meeting of the Conference of University Administrators on July 23-28. The meeting's theme, "Administrative Excellence in Higher Education—the International Dimension," focuses on revenue allocation, organization and governance, fund raising, image building, and the impact of technology on administration.

Keynote speakers will include Robert Atwell, president of the American Council on Education, and Kenneth Mortimer, president of Western Washington University.

Visits to American University, Catholic University, Georgetown University, Howard University, Johns Hopkins University, the University of Maryland at Baltimore, and Prince George's Community College will be planned in addition to conference activities.

For more information contact Dr. John Bielec, University of Maryland, Main Administration Building, College Park, MD 20742; 301/454-5421.

Inside APPA

From the President

Dorsey Jacobs
University of West Virginia

I would like to share with you some of the highlights of the APPA Board of Directors meeting held in Alexandria on February 3-4.

We had one of the best attendances on record for this meeting, and we were happy to see all Junior-Elect Representatives present. Due to the relocation of Central Region Representative Glen Carver, we welcomed Vince Seyer as the Central Region's new representative.

A bright financial picture was presented by Treasurer Bill Mutch. Publications, institutes, and seminars are doing well financially, and dues collections for 1988-89 stand at 96 percent, well ahead of any comparable association we know of and a record for APPA.

Donald Mackel, vice president for membership, reported that as of February 1, APPA had 3,263 members—184 more than one year ago. He also discussed APPA's capability to bill for regional dues along with national dues, if desired.

Because of increased demand from APPA members for a variety of information, products, and services, the APPA board approved an expansion in member services. The commitment to expand and improve services, information currently being provided, and a system for delivery are being formulated.

Another area of service where APPA members can help each other is the facilities evaluation service. With the results of the capital renewal/deferred maintenance survey just now getting wide dissemination, the ability for APPA member institutions to draw upon the expertise of their fellow facilities professionals for conducting facilities evaluations is critical.

For APPA to take the lead and initiative in assembling groups of trained professionals is a giant step for APPA and truly a valuable service for higher education institutions. A pilot evaluation has already been completed at the University of Arizona, and the results will appear in a report within the next few months.

Also coming up in the near future is the Award for Excellence program. In April and May the regions will make their selections for the awards program, and national winners will be selected by the Professional Affairs Committee and announced at the July Annual Meeting in Reno.

The Retired Directors Data Bank project, which lists information on former physical plant directors who have retired but may be able to volunteer expertise and service for auditing, evaluation, or to fill in as an interim directors at schools, is now underway.

The Nominating Committee, chaired by H.C. Lott, presented an impressive slate of officers for the 1989-90 term. They are:

President-elect:
Chuck Codding and Bill Middleton
Treasurer:
Bill McDonald and Bill Mutch
VP/Educational Programs:
Bill Daigneau and Mo Qayoumi
VP/Information Services:
Bob Getz and Henry Shelby
VP/Membership:
Dean Fredericks and Don Mackel
VP/Professional Affairs:
Charlie Jenkins and George Preston

The winners of these offices will be announced in the May issue of *APPA Newsletter*.

Holding the board meeting in Alexandria gave us the opportunity to visit the APPA office and to meet and interact with the APPA staff, including our two newest members, Stephanie Gretchen and Patti Saylor. I would like to commend the staff for the excellent job they do with a complex organization. The size of staff has stayed constant in the last 10 years in spite of an increase of 100 percent in membership and 200 percent in total organizational income. These increases represent more responsibility, programs, correspondence, and complex organization—yet they are all absorbed by our dedicated staff.

Plans for the July 16-19 Annual Meeting in Reno, Nevada, are going well, and we are looking forward to a record attendance. See you in Reno!

CRDM—NSF and APPA May Join Forces

Walt Schaw, APPA executive vice president, and Wayne Leroy, APPA associate vice president, were invited by the National Science Foundation (NSF) to meet with its new Research Facilities officers to discuss implications of APPA's research in deferred maintenance of research facilities. APPA may support joint efforts in the area of research facilities.

NSF's Research Facilities Office was formed to oversee and coordinate needs of current research facilities. Schaw and Leroy met with Richard J. Green, director, and William B. Cole, executive officer.

Information Exchange

Jack Hug, assistant vice chancellor, physical plant services at the University of California/San Diego, would like to hear from anyone who has had experience with underground ventilation ducts, either metal encased or fiberglass. Please contact him at the University of California/San Diego, 601 Matthews Administration/Academic Complex, LaJolla, CA 92093; 619/534-0029.

CFC Altenatives

With the possibility of new legislation, Dupont's U.S. patent on alternatives to environmentally hazardous fully halogenated chlorofluorocarbons (CFCs) is a timely advance. The company's patent was for a "more efficient method to produce HCFC-123 and HCFC-124, alternatives for CFC-11, CFC-12, and CFC-114 in certain blowing agents and refrigeration applications," said the January *Indoor Comfort News*.

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.**

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 **May 10** for the June edition, **June 9** for July, and **July 10** for August. 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.

Director of Facilities Management. Moorhead State University in Moorhead, Minnesota is seeking a director of facilities management. The director, who reports to the vice president for administrative affairs, oversees the supervision of approximately 100 custodial, maintenance, and heating plant personnel on a 104-acre campus that consists of 26 major buildings. Applicants must have breadth of knowledge and a minimum of five years experience in at least one of the principal areas of facilities operations management. Applicants must also be able to demonstrate successful experience in the management of people, budgets, and operations. Employment history should demonstrate progressively increasing levels of responsibility and complexity. A bachelor's degree in architecture, engineering, facilities management, or other appropriate field is required. A master's degree is desirable. The salary range, which is $32,722 to $51,422, will be renegotiated for 1989-90. Completed applications, which include a resume and a minimum of three letters of reference, must be postmarked on or before **May 1, 1989**. Applications and letters of inquiry should be sent to: Search Committee Chair, Director of Facilities Management, P.O. Box 2000, Moorhead State University, Moorhead, MN 56560. *Moorhead State University is an AA/Equal Opportunity Employer.*

Director of Physical Plant. California University of Pennsylvania invites applications for the position of director of physical plant. California University, one of the 14 state-owned universities of the Pennsylvania State System of Higher Education, is located 35 miles south of Pittsburgh and has an enrollment of 6,000 students. The university comprises 38 buildings containing 17.6 million cubic feet of space and a total of 108 acres. The director of physical plant reports directly to the vice president for administration and finance and has primary responsibility for planning, coordinating, and directing all programs regarding the maintenance of all campus buildings (including the college farm), grounds, and equipment. Areas of responsibility consist of the building and trades areas that include the plumbing, electrical, carpentry, HVAC, vehicle maintenance, grounds and labor divisions, housekeeping services, preventive maintenance, capital projects, budget for all maintenance areas, and the utility plant. Candidates must have at least four years managerial experience; college or university experience is desirable. An engineering degree or a degree in a related field is preferred but is not a requirement for application. The position is a Manager V level with a salary range of $33,186 to $49,780 based on qualifications and experience. Salary ranges are updated annually. This is a 12-month managerial position, which includes generous fringe benefits. The committee began reviewing applications in March and will continue to do so until a suitable candidate is selected. Applicants must submit a letter of application, a resume, and the names, addresses, and telephone numbers of three references, preferably from current or former employers, to: Eugene P. Grilli, Chairperson, Search Committee, Director of Physical Plant, California University of Pennsylvania, California, PA 15419. Those interested in additional information may contact Eugene P. Grilli at 412/938-4432. *California University of Pennsylvania is an affirmative action/equal opportunity employer actively seeking applications from minorities.*

Utilities Engineer. Dartmouth College is seeking an individual to provide engineering support for the upgrading and maintenance of the college's steam and electrical generation and underground distribution systems. The utilities engineer, working in conjunction with the operating engineer and his staff, will design or contract with outside consultants to design changes within the utility plant and

Job Corner

underground distribution systems, in order to keep the full plant operating at peak efficiency. In addition, the utilities engineer will coordinate utility work with affected departments to minimize the impact of shutdowns, will work with the plant maintenance staff to develop and implement preventive maintenance procedures for the utility plant, and will assist with the design and installation of mechanical and electrical systems in other college buildings. A B.S. degree in mechanical engineering with four to five years experience in power plant design with steam and electrical generation/underground mains distribution experience or equivalent is preferred. NH Professional Engineering registration desirable. Interested applicants should send cover letter with current resume, including salary requirements, to Dartmouth College, Office of Personnel, Employment Section, Clement Hall, Hanover, NH 03755. This is an ongoing search and recruiting is continuing while we review applications.

SUPERINTENDENT PLANT MAINTENANCE

Oakland University is seeking a superintendent of plant maintenance for the Department of Campus Facilities and Operations. This person will direct the skilled trades personnel in the operation and maintenance of all campus structural, mechanical, electrical, and HVAC systems. Qualifications: a bachelor's degree in engineering (preferably mechanical or electrical) or an equivalent combination of education and experience; minimum of five years experience in maintaining large building systems; utility networks; supervising skilled trades; operation of automated Work Order System; knowledge of HVAC systems; preventive maintenance programming; and fiscal planning/control. Comprehensive benefits package with salary in the upper $30s. Starting date on or about May 15, 1989. Application deadline: **April 20, 1989**. Forward letter of application, resume, salary history, and at least three professional references to: Oakland University, Employment and Staff Development Office, 140 North Foundation Hall, Rochester, MI 48309-4401. *An affirmative action/equal opportunity employer.*

Manager, Custodial Services. Iowa State University is looking for an individual to manage custodial services and oversee daily operation; perform long-range planning; meet daily with assistant managers and supervisors to discuss and resolve job related problems, interview, select, and discipline employees and keep related work records; inspect work areas; meet with department heads and others to discuss housekeeping and evaluate services; test, select, and procure cleaning supplies and equipment and meet with sales representatives. Qualifications: degree in related field and five years experience in custodial management. Salary: $24,216 minimum, commensurate with experience. Full-time, permanent position. Submit letter of application, resume, and three names of work references to Kelly S. Irwin, Manager, Administrative Services, Facilities Planning and Management, Iowa State University, Ames IA 50011-4000. Application deadline: **April 26, 1989.** *An Equal Opportunity Employer.*

DIRECTOR OF PHYSICAL PLANT

Position is responsible for the planning, budgeting and overall management of the maintenance, repair and renovation of campus facilities, custodial services, grounds maintenance, heating, ventilation and air conditioning systems, and campus security. Lee College is currently beginning a major building and renovation program. Qualifications include:

- Bachelor's degree or equivalent in mechanical, civil or electrical engineering, architecture, or other field closely related to the responsibilities of the position.
- Significant management experience in plant operations, preferably at a college or university.
- Demonstrated management and technical skills needed to administer all physical plant functions.
- Excellent communication and interpersonal skills.

This is a full-time, twelve-month position with a competitive salary and liberal benefits. Evaluation of credentials begins immediately and continues until a suitable candidate is selected.

Qualified applicants should submit a letter of application, resume, college transcripts and three professional references to: Personnel Officer, Lee College, 511 South Whiting, Baytown, Texas 77520-4703. 713-425-6532.

LEE COLLEGE
EOE - A/A/M/F

Energy Systems Manager. The University of Iowa physical plant department, power plant, is looking for an individual who will be responsible for managing the energy supply control system as well as the coordination of the energy supply to the university, including recommendations on generation versus purchase. The University of Iowa has a 21 MW coal-fired cogeneration power plant in the process of starting a new Riley fluidized bed boiler. Minimum education required is a master's degree in electrical engineering (registration preferred) or an equivalent combination of education and training that provide a comparable level of knowledge. Individual must possess five years or more experience in electrical distribution systems and at least two years experience with instrumentation and electronic control systems. The University of Iowa offers an excellent benefits package in addition to a competitive salary commensurate with experience. Interested candidates should forward a letter of application, resume, and salary history to: John Schenk, Associate Director for Utilities, University of Iowa, Physical Plant Department, Iowa City, Iowa 52242. The screening process will begin on **June 1, 1989**. *The University of Iowa is an Equal Opportunity/Affirmative Action Employer.*

Director, Physical Plant. The University of Hartford invites applications for the position of director of physical plant. This position is responsible for the daily operation of areas such as custodial services, grounds, building trades, and maintenance control center. The ability to work in a service capacity for a campus community and excellent people skills are key elements in this technical field. A bachelor's degree in engineering or related facility field and at least five years experience in physical plant is required. The individual who is selected reports to the assistant vice president for operations. The University of Hartford is a private university, situated on 275 acres of land. Its 40 major buildings encompass 1.9 million gross square feet of space. Applications will be accepted until **May 1, 1989**. Come join our facility management team. Send cover letter and resume with salary history to: Mr. Robert Martin, University of Hartford, 200 Bloomfield Avenue, West Hartford, CT 06117. *An Equal Opportunity Employer.*

Job Corner

Maintenance Manager. The University of Iowa physical plant department, power plant, is looking for an individual who will be responsible for directing and managing the maintenance, instrumentation, and control functions within the power plant. The University of Iowa power plant is a 21 MW coal-fired steam cogeneration plant in the process of starting a new Riley fluidized bed boiler. Minimum education is a bachelor's degree in mechanical or electrical engineering (registration in discipline preferred) or an equivalent combination of education and training which provides a comparable level of knowledge. Individual should possess three to five years supervisory experience in coal-fired power plant maintenance, including electrical, mechanical, instrumentation, and control functions. The University of Iowa offers an excellent benefits package in addition to a competitive salary commensurate with experience. Interested candidates should forward a letter of application, resume, and salary history to: Don Paul, Manager of Power Plant, University of Iowa, Physical Plant Department, Iowa City, Iowa 52242. The screening process will begin on **June 1, 1989**. *The University of Iowa is an Equal Opportunity/Affirmative Action Employer.*

Director for Facilities Management and Planning. This position is responsible for planning, coordinating, and directing the activities of a university physical plant engaged in the operation and maintenance of 1,300,836 g.s.f. of facilities, including 32 major buildings, 174 acres; supervise 63 employees including custodial, grounds, power plant, skilled crafts, and allied workers; administer a budget in excess of $2,000,000; devise and conduct safety programs; and coordinate major repairs and renovations. The position requires a bachelor's degree in architectural engineering with preference to a Professional Engineering license and seven years experience with progressive responsibility in facilities management for maintenance and construction within a union environment. Please submit a resume and three letters of reference to: Human Resources Department, G-1 Alumni hall, Mansfield University, Mansfield, PA 16933, postmarked by **May 15, 1989**. Refer to position M-10. *Mansfield University is an affirmative action, equal opportunity employer. Minority persons are encouraged to apply.*

Manager of Custodial Operations. An excellent career opportunity exists for the University of California/Berkeley's manager of custodial operations. The position is a key member of the facilities management team and has direct-line responsibility for over 300 employees and 10 managers/supervisors. Major duties include management and administration of an operating budget of $7.4M and custodial operation for 95 campus buildings. Plan, organize, and manage activities affecting campus/custodial services. Develop workload/productivity standards. Qualifications require demonstrated progressively responsible management experience in a comparable custodial operation. Experience in the design and implementation of training and development programs, technical expertise in workload and productivity standards, and participative employee programs desired. Annual salary range $41. to $61.5K with excellent benefits. To respond please send cover letter and resume by **April 28, 1989** to: Berkeley Campus Personnel Office, Job #03-121-18, 2539 Channing Way, Berkeley, CA 94720. *EEO/AA.*

Supervisor, Mechanical Systems. Search extended. Reporting to the assistant director of physical plant for operations. Major duties include supervising the maintenance, repair, alteration, and installment of mechanical HVAC, plumbing and related systems, including computerized heating energy control methods. Responsibilities include supervision of personnel; all aspects of contract work; and administration of a $400,000 budget, inventories, record keeping, and correspondence. Minimum qualifications: Journeyman's license and eight to ten years experience. Desired qualifications: associate degree in mechanical engineering technology or equivalent experience, which includes demonstrated supervision and management of personnel responsible for the operation and maintenance of all mechanical, HVAC, and energy management systems at an equivalent plant; thorough working knowledge of all federal, state, and local codes; and experience with personal computers for use with correspondence, finance, cost control, and inventory programs. Competitive salary and benefits. Applications accepted until position filled. Send letter of application and resume to: Personnel Office, Box 2204, Converse Hall, Amherst College, Amherst, MA 01002. *An Equal Opportunity/Affirmative Action Employer.*

Director of Physical Plant (District). Central Arizona College is looking for an individual whose qualification are: supervisory ability and communication skills; a bachelor's degree in management, engineering, or related field from a regionally accredited institution; supervisory experience and communication skills; five years experience in maintenance and/or construction, two years of which must have been in a supervisory capacity (in an educational setting preferred); must be able to attain Arizona certification in waste water management and water management. Must be willing to relocate. The physical plant consists of three campuses, 18 buildings with 340,000 square feet on 725 acres and a work force of 41 employees. Salary: $36,000-$43,000. Starting date: July 1, 1989. Application deadline: **April 21, 1989.** To apply for this position, send letter of interest, resume, names, addresses and telephone numbers of three references to: Office of Human Resources, Central Arizona College, 8470 N. Overfield Road, Coolidge, AZ 85228. *EOE/AA.*

MANAGER CUSTODIAL SERVICES

Organizes and directs over 100 employees in cleaning and maintenance of more than 1.7 million square feet of classrooms, offices, and public areas. Plans, schedules, and prepares and administers budget. Sets job standards, establishes procedures, inspects, and responds to complaints. Handles or oversees all matters of personnel. Maintains and reviews information on computerized maintenance management system.

Five years custodial experience, including four years supervisory experience in very large building or group of buildings. Equivalent to associate arts degree and experience in environment similar to large educational institution desirable.

Competitive salary and outstanding benefits. Submit letter of application and resume postmarked by **April 20, 1989**, to: Personnel and Employee Relations—OPER, California State University Northridge, 18111 Nordhoff Street, Northridge, CA 91330.

An Equal Opportunity/Affirmative Action, Title IX, Sections 503 & 504 Employer.

RENO

APPA 76th ANNUAL MEETING

JULY 16–19, 1989 • RENO, NEVADA

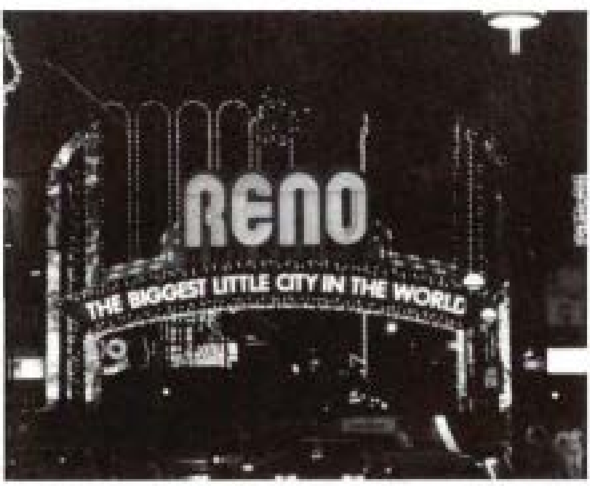
Join APPA for the 76th Annual Meeting and Founder's Celebration, in honor of 75 years of service to higher education. Reno is the perfect setting for this celebration, combining the charm and nostalgia of the Wild West with the glamour and excitement of casinos, shows, and top name entertainers.

Kick off the meeting with the Opening Ceremony and Exhibit Hall Reception on Sunday. More than 160 companies will be displaying their products and services. Fine entertainment and good food, plus a festive atmosphere get this celebration rolling.

The Educational Program features more than 70 technical presentations on a wide range of subject areas. The Critical Issues in Higher Education series is back by popular demand. Introduced last year, these sessions cover important issues facing facilities managers in the present and the future. Programs are geared toward the senior facilities management executive. Some of these topics focus on APPA's new services and the progress of studies initiated with HEFT funding.

The Annual Awards Banquet features the announcement and award presentation for the national winners of the Awards for Excellence program. A visual presentation of the regional award winners will be shown during dinner. Other highlights include the Opening Keynote Address featuring Dr. William Sexton, Vice President-University Relations, University of Notre Dame and the Closing Keynote Address by Dr. Robert M. O'Neil, President of The University of Virginia. A special closing celebration steals a glimpse at next year's annual meeting.

The Preliminary Program with complete program details and registration information is in the mail on its way to all APPA members. Please watch for it to arrive. If you have not received your packet by the end of April, please contact the APPA Office.



76TH ANNUAL & MEETING
FOUNDERS CELEBRATION
75 Years of Service

Educational Program Highlights

CONFERENCE WORKSHOPS

W-1 Leadership & Motivation
by Anita L. Zimmerman, Associate Professor, University of Notre Dame and Faculty Member APPA Executive Development Institute

W-2 Mastering the Art of Expression: Technical Writing and Presentation Skills
By John and Sherry Rulfs, Stephen F. Austin State University

EXPERIENCE EXCHANGES

- Auxiliary Services
- Community College Management
- Contracting for Services
- Energy Saving Ideas
- Medical College Management
- Plant Services Guides/Service Manuals
- Sick Buildings
- Training Issues for Physical Plant Directors

CRITICAL ISSUES IN HIGHER EDUCATION

Focus on topics of vital interest to the present and future of facilities management.

- Capital Renewal/Deferred Maintenance
  Speakers:
  Jon Gullette, Vanderbilt Univ.
  Jack Hug, Univ. of CA/San Diego
  Harry Kriemelmeyer, Univ. of Maryland
  Sean Rush, Coopers & Lybrand
  Walter Schaw, APPA
  Henry Shelby, Tennessee Technological Univ.
  Carson Smith, Kentucky State Univ.
- The Regulatory Spectrum
  Speaker:
  Shelly Steinbach, American Council on Education
- The APPA Evaluation Service: How & Why
  Speakers:
  Russ Gonder, Univ. of W. Ontario
  Phil Rector, Univ. of Arizona
- APPA Study—Custodial Staffing Guidelines
  Speakers:
  Kirk Campbell, Univ. of Minnesota
  Jack Dudley, Univ. of Wisconsin/Parkside
  Robert Getz, Univ. of Illinois
- APPA Study—Preventive Maintenance Instructions
  Speaker:
  Kenneth Hall, Univ. of Idaho
- The Best of the Best—Ideas from the Awards for Excellence Program
  Speakers:
  Representatives from the institutions submitting ideas

76TH ANNUAL & MEETING
FOUNDERS CELEBRATION
75 Years of Service

EDUCATION SESSIONS

The educational presentations are identified by tracks. Each track emphasizes the skills and target audience for the subject matter. These guidelines can be used to assist you in choosing which sessions may be of the most interest or focus on current needs.

Public Relations, Communications, & Marketing for Physical Plant

- Unique Approaches to Marketing the Physical Plant Organization
  Speaker:
  Robert Clawson, Univ. of Connecticut

Strengthening Management Skills

- Performance Evaluation—A Positive Experience
  Speaker:
  Katie Smothers, Univ. of CA San Diego
- Team Building
  Speaker:
  Polly Pinney, Arizona State Univ.

Developing Employee Skills & Productivity

- The Dual Purpose in Motivation
  Speaker:
  George Wright, George Wright Co.
- Empowering the Work Force to Improve Efficiency & Responsiveness
  Speakers:
  Marilyn Lockhart, Univ. of Virginia
  William Middleton, Univ. of Virginia
  Beverly Wann, training consultant
- Forestalling Complaints in Physical Plant Administration
  Speaker:
  Ed Feldman, Service Engineering Assoc.
- Presupervisory Training—Less Talk, More Action
  Speaker:
  Paul Schneller, Indiana Univ.
- Training—A Continuous Process
  Speaker:
  Thomas Vacha, Univ. of Delaware

Plant Operations & Maintenance

- An Asbestos Abatement Project—Learning the Hard Way
  Speaker:
  Ken Fay, Univ. of Calgary
- Computer Applications for the Small College
  To Be Announced
- Establishing a Waste Management Program
  Speaker:
  Ralph Allen, Univ. of Virginia
- Free Cooling—How & Why
  Speaker:
  Michael Dwyer, Jr., Univ. of Arkansas for Med. Sciences
- Institutional Waste Management
  Speaker:
  Ed Bogard, Univ. of Nebraska Med. Center
- Nuts & Bolts of Utilities Management
  Speakers:
  Robert Burger, Burger & Assoc.
  Kevin Garrity, Harco Technologies
  James Myers, Penn State Univ.
  Mo Qayoumi, San Jose State Univ.
  J.R. Swistock, Univ. of Virginia
- Roof Management—Track Records of Experience
  Speakers:
  Dennis Cesari, Univ. of Missouri
  Richard McBride, Sonderstrom Architects
  John Stephens, Oregon State Univ.

Facilities Planning and Construction

- Construction Cost Management in the Public Sector
  Speakers:
  Jeffrey Turner & John Dunkerley, Project Control Co.
- Design Approaches to the Special Challenges of Academic Facilities
  Speakers:
  Leevi Kiil & Robert Brandt, Haines Lundberg Waehler
- The Next Decade of Computerization—CADD/GIS
  Speakers:
  Chris Ahoy, Comprehensive Fac. Mgmt.
  Cliff Gauntlett, AUTODESK
  Tom Harkenrider, Univ. of CA/ San Fran.
  Ben Woods, Texas A & M Univ.
- Predicting Maintenance Resources for New & Existing Facilities
  Speaker:
  Dr. Edgar S. Neely, Construction Eng. Research Lab

Managing the Physical Plant Workload

- Managing Information Systems
  Speakers:
  Keith Burres, Bonner & Moore Consulting
  Doug Christensen, Brigham Young Univ.
  Lothar Hermann, IBM
  Lee McQueen, Kansas State Univ.
  Mohammad Qayoumi, San Jose State Univ.
  Kenneth Smith, Univ. of Virginia

Facilities Management in Small Colleges

- Computer Applications for the Small College
  Speakers:
  To Be Announced
- Managing at the Small College—Being Greater with Fewer
  Speaker:
  Charles Jenkins, St. Mary's Univ.

Research, Medical, and Health Science Facilities

- Institutional Waste Management
  Speaker:
  Ed Bogard, Univ. of Nebraska Med. Center

International Perspectives

- An Asbestos Abatement Project—Learning the Hard Way
  Speaker:
  Ken Fay, Univ. of Calgary

Exhibitor Technical Sessions

(partial listing)

- Asbestos—Managing the Problem
  The Pickering Firm
- Economical Options for Complying with New EPA Regulations for Electrical Equipment & Transformers
  Unison
- Techniques in Motivational Communication
  LMJ Consultants

HIGHLIGHTS

Saturday, July 15	
Pre-Convention Tours	
10:00am – 3:00pm	The Wild West Tour—Virginia City
1:00pm – 5:00pm	Win, Lose or Draw: Reno City Tour and Reno Gaming Academy
Sunday, July 16	
12:00n – 1:30pm	Regional Meetings
2:00pm – 6:00pm	Opening Ceremony & Exhibit Hall Reception
Evening	A Night on the Town SHOWTIME! Opportunity to see some the world's best entertainers. Watch for listings and how to reserve a seat for the show of your choice.
Monday, July 17	
7:15am – 8:45am	Opening Keynote Breakfast Dr. William Sexton Vice President- University Relations University of Notre Dame
12:30pm – 3:00pm	Exhibit Hall Open
Evening	Exhibitor Hospitality Suites
Tuesday, July 18	
7:15am – 8:45am	President's Breakfast
12:30pm – 3:00pm	Exhibit Hall Open
3:15pm – 5:15pm	Campus Tours University of Nevada/Reno and Truckee Meadows Community College
6:00pm – 11:00pm	Reception & Annual Awards Banquet
Wednesday, July 19	
7:00am – 8:30am	Closing Keynote Breakfast Dr. Robert M. O'Neil President, The University of Virginia
11:00am – 12:00n	From Maple Leafs to Mounties: Destination Ottawa Kick-off for 1990's Annual Meeting
12:30pm – 7:00pm	Post-Convention Tour Lake Tahoe Bound

76TH ANNUAL & MEETING
FOUNDERS CELEBRATION
75 Years of Service

Inside APPA

Salaries on the Rise

Salaries for higher education employees have been able to keep pace with inflation better over the past 11 years, according to CUPA's *1988-89 Administration Compensation Survey*, published in early February. During this time period salaries for administrators of public and private colleges and universities have averaged 6.2 percent, with inflation growing 6.3 percent for that period.

Physical plant professionals are included in this data. The mean salary for chief physical plant management officers at all institutions in the study was $44,076. The associate director of physical plant/facilities manager's mean salary was $37,269.

The academic year 1988-89 was especially profitable for private institutions with an average salary gain of 6.7 percent, compared to 2.5 percent for last year, according to *The Chronicle of Higher Education* on February 15. Public schools' salaries increased 4.9 percent, compared to 4.2 percent for last year.

The book gives data on more than 165 positions at 1,268 colleges and universities of higher education. Copies are $55 for CUPA members, $140 for non-members who participated in the survey, and $250 for others. For a copy contact: Lourie W. Reichenberg, 1233 Twentieth Street, N.W., Suite 503, Washington, DC 20036: 202/429-0311.

NICA Helps Asbestos and Insulation Industries

The National Insulation Contractors Association (NICA) is a service organization working toward improvements in the asbestos abatement and industrial and commercial insulation industries. Members are entitled to low-cost group insurance and are kept updated on federal laws and legislation. NICA publishes many books on pertinent topics and the monthly magazine *Outlook*. For more information contact Sandra LeBlanc, 202/783-6277.

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

Expansion Joint

Engineers at the West Virginia University physical plant have developed a new aid in the forming and placement of concrete. An expansion joint holder made of sheet metal will greatly reduce forming time and speed the placement of concrete. The holder itself consists of a sheet metal base designed to hold standard asphalt expansion-joint fillers in an upright manner. When placed properly, the holder acts as a free-standing form that allows concrete to be poured on either side without additional forming.

The expansion joint holder is relatively inexpensive to manufacture and is an improvement over conventional expansion joint installation methods. The rigid form may be screed when it is properly secured and stabilized during installation.

Since this expansion joint form can be prepared ahead of time in sections of convenient length, it is easily installed. It allows for a great reduction in forming time, which also reduces labor costs. Holes can be cut in the base of the form to allow it to be held in place with spikes which can be easily removed once the concrete is in place. Holes can also be drilled horizontally through the form to accommodate stabilizing rods.

Proper installation of expansion control joints is a must when pouring concrete, and this new expansion joint form makes them easier than ever to install. The form is time-saving, inexpensive, and currently being used with excellent results in sidewalks and driveways on the WVU campus. For more information contact Drew Chidester, West Virginia University Physical Plant, Rawley Lane, Morgantown, WV 26506; 304/293-4911.

—**Dorsey Jacobs**
Director of Physical Plant
West Virginia University
Morgantown, West Virginia

Coming Events

APPA Events

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

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

May 22-23—**Capital Renewal/Deferred Maintenance Executive Briefing.** Washington, DC.

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

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

Other Events

Apr. 24-27—**Fortieth Anniversary of National Plant Engineering & Maintenance Show and Conference.** McCormick Place East, Chicago, IL. Contact: Show Manager, National Plant Engineering & Maintenance Show, 999 Summer Street, Stamford, CT 06905; 203/964-0000.

Apr. 27-28—**HVAC Controls Seminar.** Washington, DC. Contact: Association of Energy Engineers, AEE Energy Seminars, P.O. Box 1026, Lilburn, GA 30226; 404/925-9633.

May 14-17—**Earthquake: An International Conference on Insuring and Managing the Inevitable.** Honolulu, HI. Contact: Society of CPCU, 720 Providence Road, Malvern, PA 19355; 215/251-2765.

May 18-19—**Environmental Laws and Regulations '89 Update.** Washington, DC. Contact: Government Institutes, Inc., 966 Hungerford Drive #24, Rockville, MD 20850; 301/251-9250.

May 22-26—**Methods and Techniques for Boiler Plant Optimization.** Virginia Beach, VA. Contact: Dr. E.K. Greenwald, Engineering Professional Development, 432 North Lake Street, Room 721, Madison, WI 53706; 800/262-6243; in Wisconsin 800/362-3020.

May 23-25—**Environmental Regulations Course.** Washington, DC. Contact: Executive Enterprises, Inc., 22 West 21st Street, New York, NY 10010-6904; 800/831-8333.

May 24—**Natural Gas Regulations.** Washington, DC. Contact: Government Institutes, Inc., 966 Hungerford Drive #24, Rockville, MD 20850; 301/251-9250.

May 25-26—**Direct Purchase of Natural Gas by End-Users Conference.** Washington, DC. Contact: Government Institutes, Inc., 966 Hungerford Drive #24, Rockville, MD 20850; 301/251-9250.

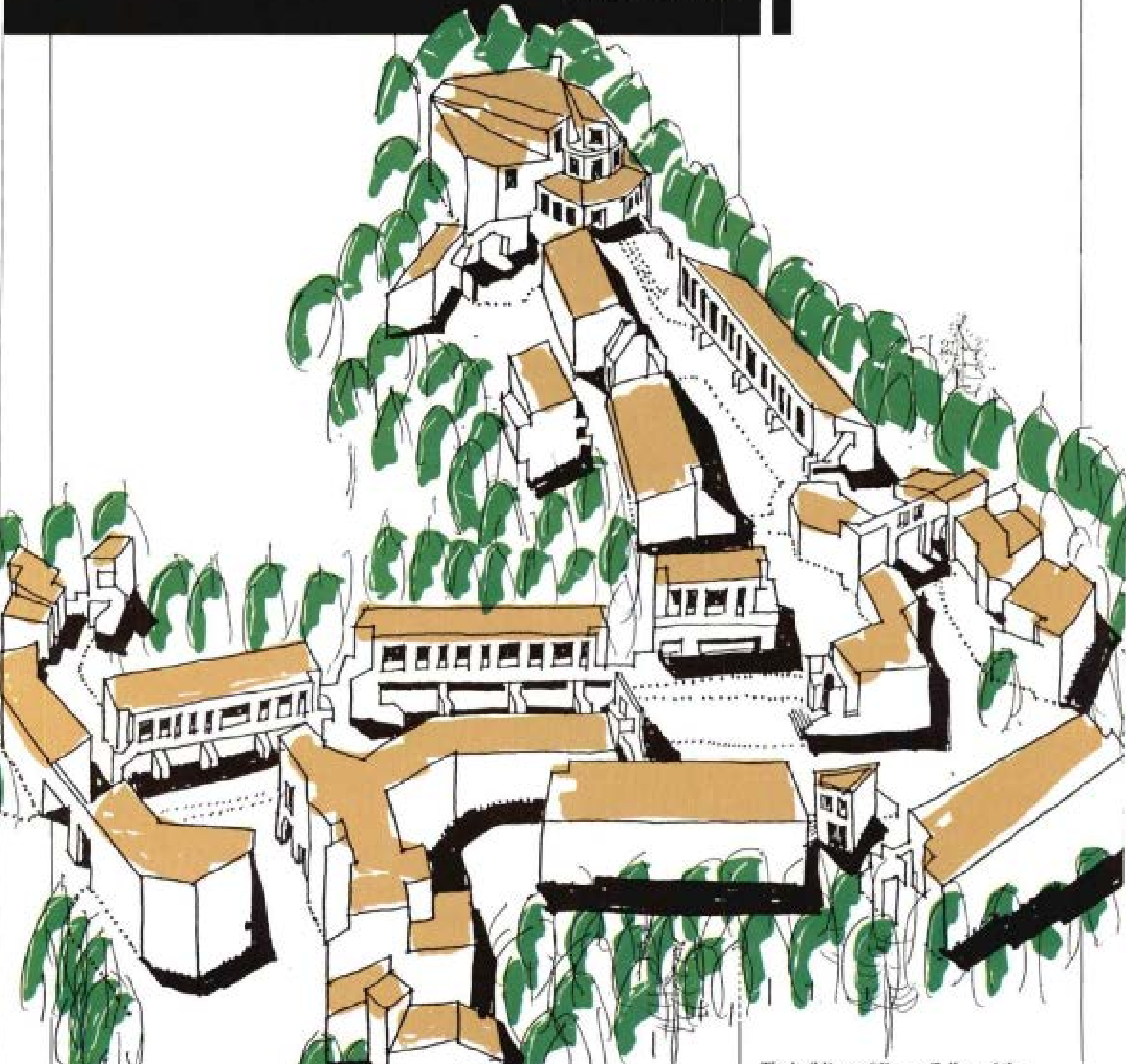
Jun. 5-7—**Grounding of Electrical Distribution Systems.** Madison, WI. Contact: Dr. E.K. Greenwald, Engineering Professional Development, 432 North Lake Street, Room 721, Madison, WI 53706; 800/262-6243; in Wisconsin 800/362-3020.

Jun. 5-8—**A/E/C Systems '89—The Tenth International Computer and Management Show for the Design and Construction Industry.** Anaheim Convention Center, Anaheim, CA. Contact: Sharon Price, A/E/C Systems '89, P.O. Box 11318, Newington, CT 06111; 800/451-1196.

Jun. 18-21—**International District Heating and Cooling Association 80th Annual Conference.** Virginia Beach, VA. Contact: IDHCA, Lock Box Dept. 4090, Washington, DC 20061-4090; 202/429-5111.

The American Campus as a Work of Art and Utility

by Werner K. Sensbach



The buildings of Kresge College of the University of California/Santa Cruz were built on a steep, hilly site surrounded by redwoods and arranged along a "village" street.

It has been said, first we shape our buildings, then our buildings shape us. Where would this old adage apply more aptly than at American university campuses, where the mission of the institution is education, where young, open minds absorb indelible impressions that last for a lifetime, and where money and skills are constantly at work to create and maintain a physical environment of utility and beauty.

From the start, Americans have taken particular pride and an abiding interest in the accomplishments, as well as in the appearance, of their colleges and universities. But today our society has assigned many roles to its university campuses: to provide a useful and inspirational environment of higher education for its youth; to serve as a paradigm of communal life, reflecting man's ordering hand at work; and to portray the image of a place, to which people may retreat in memory from time-to-time. Today, in a rapidly changing physical world, American college campuses also present the double image of innovation and preservation, of progress and repose, of change and continuity.

In the Shadow of a Long Building Tradition

Like a history book opened up and come to life, American campuses can give a vivid account of 350 years of changing styles in architecture, landscaping, and the use of building materials. The deeper influences reach back into the Renaissance and medieval centuries.

Eight hundred years ago the first universities grew in the shadow of Notre Dame Cathedral in Paris and in the narrow streets of Bologna. Located far away from urban centers, Oxford and Cambridge adapted the enclosed court of the medieval cloister, and thus furnished the collegiate prototype in the Anglo-Saxon realm.

Since many Puritans of the Massachusetts Colony were graduates of Emanuel College of Cambridge, they recreated a familiar image when they founded Harvard College in 1636. While the prototypical English college is enclosed on all four sides and accessible only through a defensible heavy gate, the American colleges, from the beginning, preferred an open arrangement in which three individual college halls formed an academic U-shape, leaving the fourth side free to the community and the unobstructed view of the horizon.

This reflection of man's unshackled position in society and an enlightened relationship with nature carried forward into Thomas Jefferson's plans of 1817 for the University of Virginia. A shaft of space, formed by a parallel row of colonnaded buildings, directs the view from the Rotunda, the central library, into the distant Virginia mountains as a symbol of harmony between the man-made world, a beneficient nature, and the heavens above.

Form and Function of the Earliest University Buildings

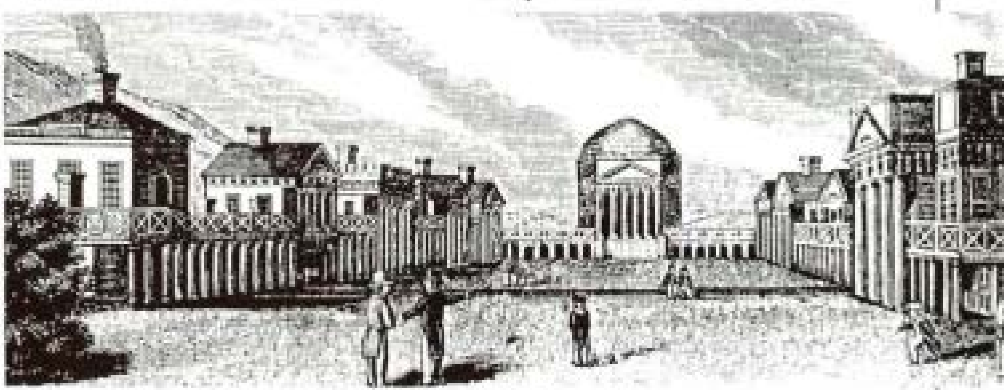
If we look for images of the earliest American colleges, buildings such as Massachusetts Hall at Harvard, Connecticut Hall at Yale, and Nassau Hall at Princeton quickly come to mind as prototypical structures. With a height of three or four stories, frequently the largest buildings in the whole community, academic halls usually housed all manner of college activities: dormitories for up to fifty students, recitation halls, library, kitchen, dining hall, and single rooms for unmarried teachers.

When the need for enlarging the college arose, it usually required the sustained effort of the already strained energies of the whole community. For the "Doubling of the College" at Yale in the 1750s the whole New Haven populace was enlisted in felling timber, digging clay, and making brick in an effort that extended over several years. In order to avoid such exhaustion of community resources and energy, Thomas Jefferson later proposed an open plan that permitted the addition of smaller, more economical building units, which could be fitted comfortably into the fabric of his "academical village."

At Charlottesville, Thomas Jefferson designed the University of Virginia grounds with its open lawn, pavilions, gardens, colonnades, hotels, serpentine walls, and its Rotunda in neoclassical architecture to serve as an "example of chaste architecture" and to exert a life-long influence on the aesthetic sensibilities of the young students.

From Pastoral to Urban Campus

With Oxford and Cambridge as guides, the founders of American colleges traditionally chose campus sites away from existing settlements and population concentrations. Lest the diversions of the city of Boston proved too tempting for the youthful Puritan scholars, Harvard's founders chose a site at Cambridge, two hours away from the harbor bars and other seaport temptations.



The Lawn of the University of Virginia, designed by Thomas Jefferson.

The state charter for the University of North Carolina stipulated a location for the campus twenty miles away from any existing city or town of the state. The campus master plan of 1795 called for the layout of "ye adjacent village," Chapel Hill. At that time, only the campus of William and Mary College assumed urban importance in the shaping of the baroque city plan of Williamsburg, Virginia. It came to occupy a pivotal location as the terminus of the mile-long Duke of Gloucester Street, opposite the House of Burgesses.

Colonial colleges saw their purpose in bringing up young men "to teach and to preach." When the independent American states created state universities, they hoped to generate a cadre of capable loyal public servants, lawyers, and judges to whom the administration of the New Republic could be entrusted. But not until Thomas Jefferson developed a plan for

Werner Sensbach is director, facilities planning for the University of Virginia, Charlottesville, Virginia. He has published articles on urban design, land use planning, and history of urban development.

"an useful American Education" did the idea of a "comprehensive" university first appear in American educational annals.

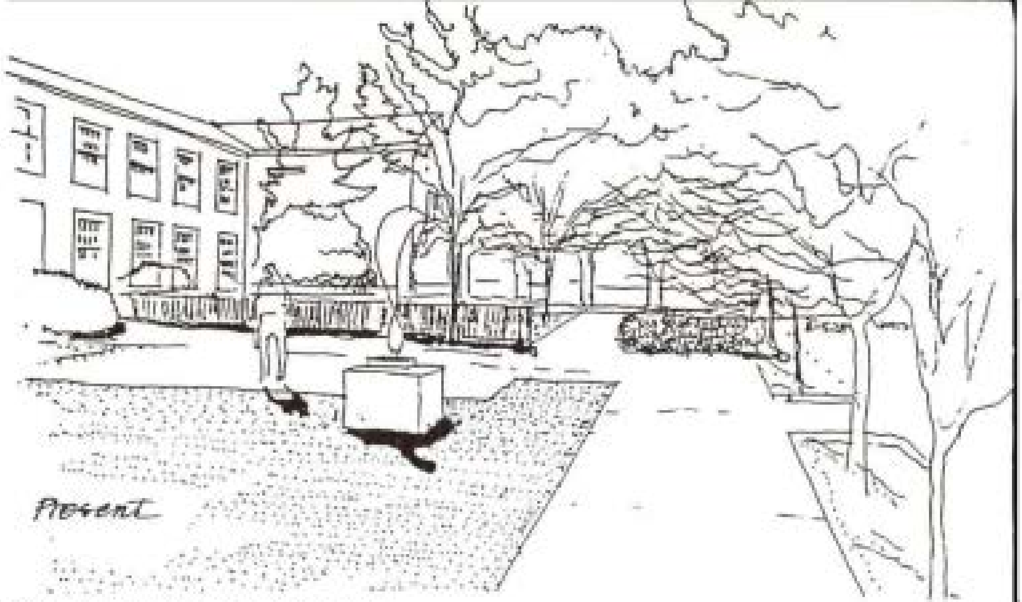
It was quite a different environment that spawned the urban universities in the latter part of the 19th century. Urban universities, some of which were exclusively graduate schools, emerged at the fringes of older cities, sometimes in the warehouse districts or residential neighborhoods, as did Johns Hopkins in Baltimore, MIT in Cambridge, Northeastern in Boston, Temple in Philadelphia, and the University of Chicago, which settled along the midway of the 1893 World Columbian Exposition.

Sometimes dubbed "street car universities," they initially had no need for student dormitories but saw their role in providing intensive advanced education in the newly developing fields of engineering, science, and social research for an increasingly urbanizing society. In the process, they also changed the image of the traditional university campus from a pastoral setting to a place of turbulent urban energy. Over the years, urban universities paradoxically strove to carve out academic quadrangles and open spaces from their dense urban fabric, both as symbolic gestures as well as useful design elements.

The Need for a Design Philosophy

Through the many years of their existence, American universities and colleges have lavished much care, thought, and financial resources in the development and maintenance of their campuses. The logic of an efficient utilities and services system may have the power to convince a skeptical state legislature to provide adequate funding. However, the elusive, aesthetic qualities that account for the ambiance and the architectural excellence that distinguishes one university campus from another are hard to pin down and cast into words.

Thomas Jefferson, again, was the first to argue an aesthetic philosophy of design when he explained the use of ornate neoclassical elements in his architecture. The scale and style of the university building were to be "proportionate to the respectability, the means and the wants of our country . . . not what was to perish with ourselves, but what would remain, be respected and preserved thro' other ages." Fortified by this philosophy, he established an artistic palette of architectural opportunities never imagined before and not achieved since the completion of his masterpiece, the Grounds of the University of Virginia.



Thornton Hall, University of Virginia
Campus grounds abound with unexplored aesthetic opportunities. Frequently improvements can be simple and inexpensive; completing a disjointed system of walkways, opening up vistas by limbing up trees, relocating shrubbery and introducing interesting patterns of sidewalk surfaces.

Methods of Design Analysis

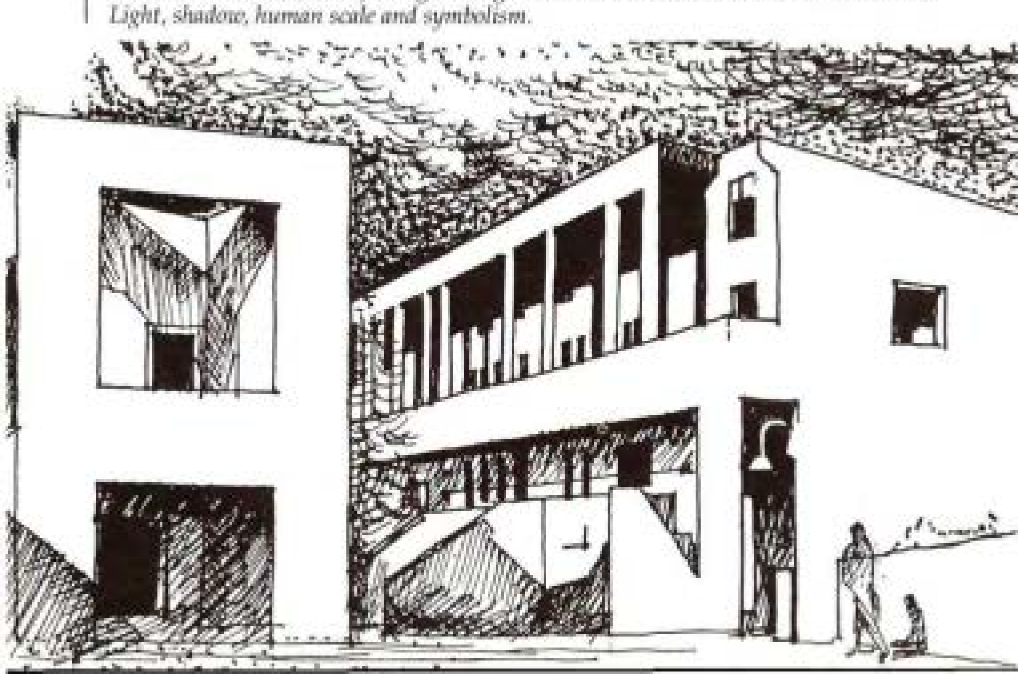
If a campus architect wants to discern the aesthetic qualities and design opportunities inherent in his campus he may benefit from the use-analysis methods common in urban design as established by such urbanists as Gordon Cullen, Kevin Lynch, and Lawrence Halprin. With the aid of a careful analysis of the architectural image of the campus, the university may incorporate a philosophy of design into its master plan. The plan is made up of three parts: *program*—an examination and identification of goals, design objectives, and needs; *performance*—a prescription of standards and criteria for design; and *perception*—an elaboration of the perceptual dimensions of design (spatial, visual, and chronological).

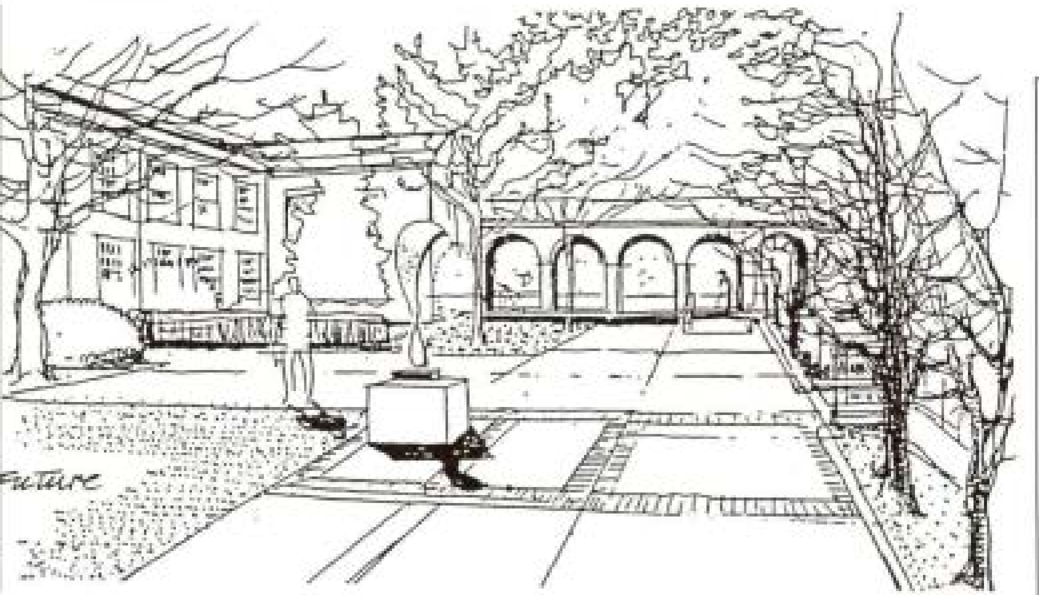
In order to record the findings of a design analysis, a campus architect, short of devising his or her own shorthand method, would benefit from using the design vocabularly of five elements: paths, edges, nodes, precincts, and architectural landmarks. This information may be amplified by recording changes of use and density in the campus landscape as they occur in the course of a day in a temporal sequence. The usefulness of the master plan will be greatly enhanced if it is informed by the insights of a sensitive spatial, aesthetic analysis.

Scale as Design Determinant

While the aesthetic appeal of a campus space may be traced to the skills

The modern architecture of Kresge College's central street relies on traditional values: Light, shadow, human scale and symbolism.





ranean light "eats away" from the substance of the fluted marble columns, compensated for this visual loss by adding a "swelling" (entasis) to the middle portion of the column.

Thomas Jefferson, in designing the University of Virginia, gradually increased the distance between the pavilions starting from the Rotunda, in order to emphasize the equidistant regularity of the structures facing the Lawn. Through the centuries, architects from Vitruvius to Palladio to Le Corbusier have developed aesthetic theories that explain the past and prescribe for the future.

In the second half of the 19th century, John Ruskin's architectural theories, expressed in his *Seven Lamps of Architecture*, exerted a powerful influence on American campus planning. As a consequence, Yale University, deprecating its simple spartan structures as "brick barracks" and "muse's factories," tore down its colonial brick buildings to replace them in the Gothic style. Today only Connecticut Hall is left to tell of Yale's venerable early years as a colonial college.

After 1945, when post-war generations swelled the enrollments of almost every college and university, modern, unadorned, form-follows-function architecture easily invaded American campuses. Large, squat, air conditioned research and classroom structures succeeded the traditional, single corridor, cross-ventilated college buildings. In the process, they all but abandoned the ambiance, the intimate spaces, the careful landscaping inherent in the older campus core.

In contrast, today's "post-modern" architects are trying to reintroduce traditional symbolic elements in their de-

and influence of a single, solitary, form-giving genius, campus design, as an ongoing process, will require agreement on artistic conventions to facilitate the dialogue between architects, engineers, and clients.

What, for example, is our understanding of "human scale," the term so frequently used in urban design as well as in campus planning? The term derives from our sense of visual perception and our ability to move about effortlessly and pleasurably within architectural or landscaped spaces.

The forward-focused human eyes perceive the visible world in an irregular conical shape of 130° horizontal and a 75° vertical coverage. Within this "general field of view" is embedded a detailed field covering a narrow cone of sharp focus. These visual capabilities determine our sensory perceptions and affect our responses.

Within the categories of design scale, several dimensional qualities may be detected. If we stand within a range of three to ten feet from other people, we can clearly understand normal voices, discern subtleties of speech, and observe facial emotions. We can distinguish facial expressions up to forty feet and recognize a familiar person up to about eighty feet. Therefore, "intimate" spaces rarely exceed eighty feet in their minor dimension.

Bodily motions and gestures, however, can usually still be recognized up to 450 feet away, which is also the distance at which we can distinguish a man from a woman or observe athletic action, making it the ideal maximum viewing distance for a sports stadium. Urban spaces not exceeding 450 feet can therefore be considered "communal" spaces in which large crowds can participate in common events.

As we proceed to larger dimensions, we lose our ability to see objects smaller than six feet high—e.g. people—when they are further than 4,000 feet away. Within these "monumental" spaces people cease to play a significant part in the functioning of a man-made enclosure. The vast vistas of the Versailles Gardens and the Washington Mall serve useful ceremonial functions and achieve monumentality, but transcend the "human scale."

The Architecture of University Campuses

In the course of its long history, architecture absorbed many artistic subtleties which derived from an amalgam of structural capabilities, visual perceptions, and aesthetic theories. The builders of classical Greece, having observed how the bright Mediter-

The Colonnades, University of Virginia. Thomas Jefferson introduced the neo-classical style as a reflection of the ideals of democratic Athens and republican Rome.

sign. They have discovered, for example, the inviting effect of an arched entrance way, the sense of shelter projected by a pitched roof, and the sensual play of light and shadow in a carefully sculpted building facade.

In a world of discontinuities and conflicting theories, it appears that those campuses have fared best which permitted variety in unity, yet maintained regular building heights, continued using vernacular building material traditional to their area, and considered the spaces between the buildings as important as the buildings themselves. With the aid of a thoughtfully developed, flexible master plan and the interest of an alert, intelligent university community, an institution should be capable of integrating all kinds of architectural artifacts into the fabric of its grounds and survive any past and future architectural theories—so long as these are friendly to people and consider technical progress only subservient to the well-being of the community.

Campus Landscaping - Variety in Unity

American campuses derive their distinction through the fine balance between aesthetically pleasing buildings and a carefully landscaped environment. In his plan for the University of Virginia, Thomas Jefferson called for a "lawn of trees and grass," bordered on three sides by academic buildings and residences. In this tradition, the "academic quadrangle" derives its quality from the harmonious relationship between buildings and open spaces.

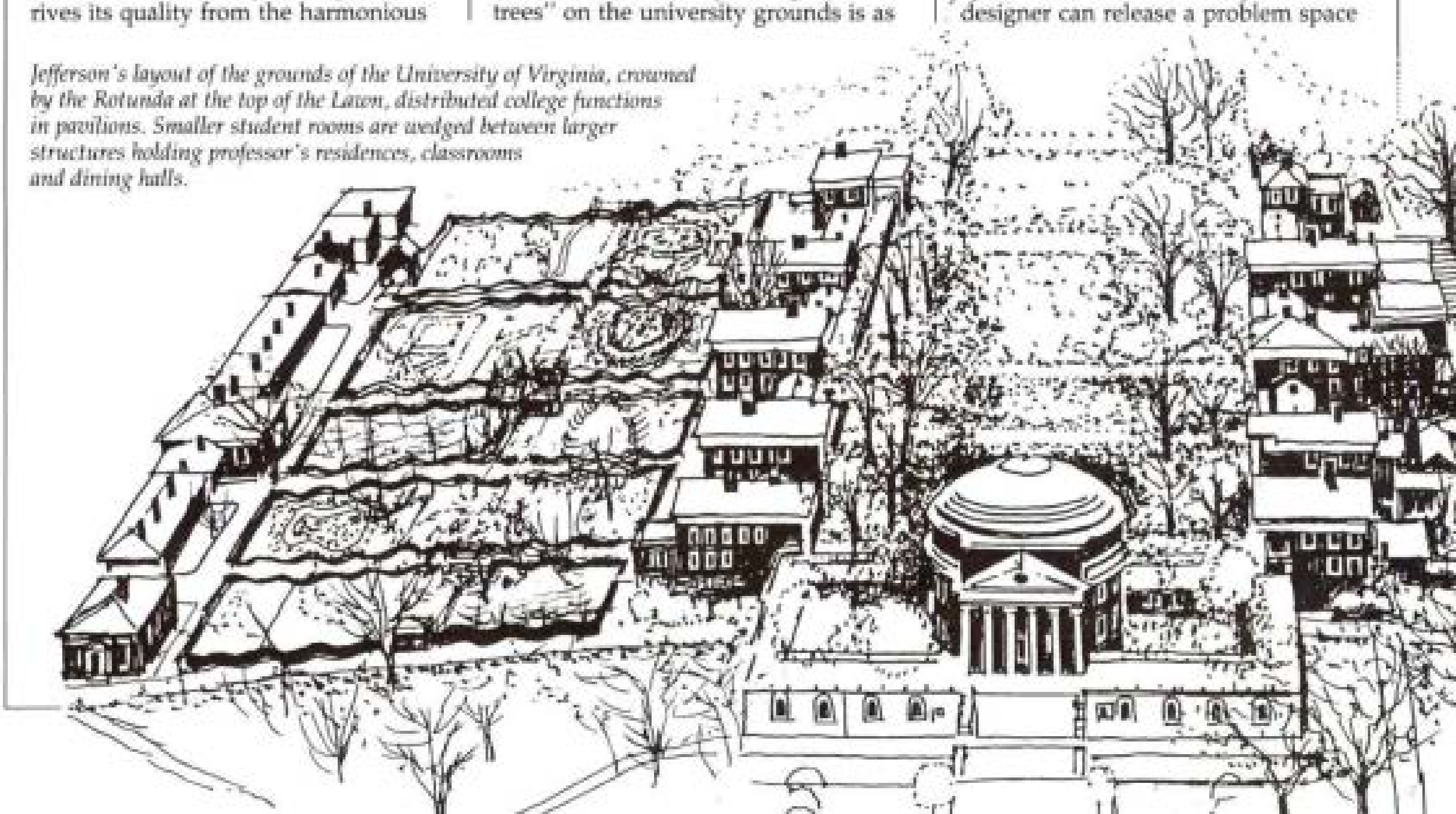
Urban universities, existing in dense urban environments have problematic conditions of a different nature. But even they, as shown by Boston University, Temple University in Philadelphia, or Virginia Commonwealth University in Richmond, have managed to carve out in-town academic quadrangles and park-like open spaces.

Traditionally, landscape architects have lent their skills to the development of campus landscape. Frederick Law Olmsted, with more than two dozen campus plans to his credit, is probably the most influential landscape architect and planner of American campuses. Wherever a university has followed a policy of employing many different landscape architects for individual design tasks, the campus tends to gain variety but loses uniformity.

Unity is an essential in landscape, as it is in architecture, and its continuity can only be assured by a landscape philosophy supported by the university community and by a competent staff. In an age of affluence, when residential landscaping has become the hobby of the urban gardener, the tendency of overplanting with flowering and ornamental shrub has affected campus landscaping across the continent. If ornamental campus landscaping is not carefully kept within bounds, it will quickly turn into an expensive maintenance liability. Thomas Jefferson's advise to plant "grass and trees" on the university grounds is as appropriate and useful today as it was 160 years ago.

Pedestrian walkways are the sinews of a university campus. Their convenient locations and choice of surface material can affect the quality of the university grounds far beyond the cost of their construction. When selecting the appropriate surface material, one may keep in mind the surprising survey result Kevin Lynch received when he asked his students at MIT how they remembered paving materials they had experienced in their youth. The preferred surface material turned out to be neither brick paving, cobblestone, concrete, gravel, nor sand, but asphalt pavement. Although the walks across Harvard Yard are indeed of asphalt macadam, other universities have opted for more traditional material such as brick, irregular flagstones, rectangular-cut natural stone, granite, limestone, or simply concrete, all depending on availability, cost, ease of maintenance, and comfort and safety of the pedestrian.

Each campus also appears to have its special landscape problem spots, green spaces pounded into dust, which no amount of landscaping seems to be able to remedy. Problem areas however may uncover special opportunities, especially if the area acts as interim space and pedestrian "Venturi" channel between two larger academic areas. Such a spot may beg to be converted into a lively community space inviting passers-through to spend some time. But, only a sensitive designer can release a problem space



Jefferson's layout of the grounds of the University of Virginia, crowned by the Rotunda at the top of the Lawn, distributed college functions in pavilions. Smaller student rooms are wedged between larger structures holding professor's residences, classrooms and dining halls.

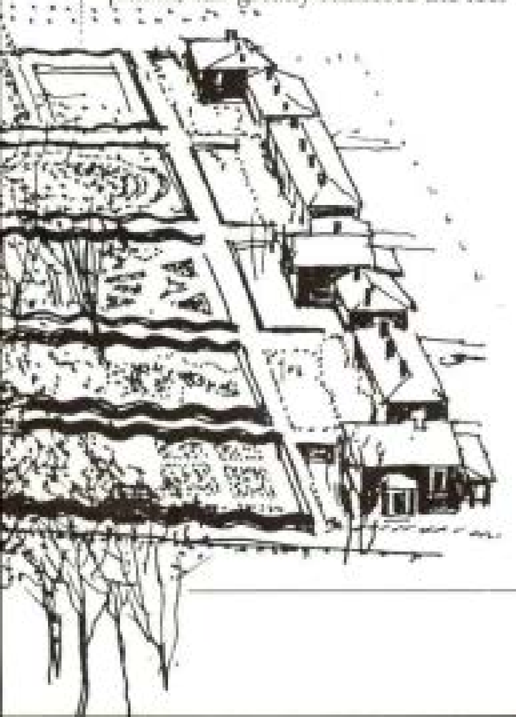
Visitors, alumni and students alike use and enjoy campus walks. The quality of old narrow walkways may be substantially improved, by widening with compatible paving material as on the University of Pennsylvania campus.

from its bondage and turn an abomination into an attraction.

Street Furniture

The institution that builds classrooms, laboratories, libraries and dormitories, also has to provide for loading docks, trash dumpsters, rubbish bins, bicycle racks, street lights, emergency telephones, parking and street signs, newspaper vending boxes, kiosks, benches, and bus stops. Intended to make daily life of campus easier and more convenient, this "street furniture" also has the potential of creating visual havoc in a campus environment. Placed haphazardly and without coordination it will give the impression of visual confusion and may turn the campus into an obstacle course.

However, street furniture of carefully chosen design, unobtrusively placed, can greatly reinforce the feeling of safety and convenience conveyed to students and visitors to the campus. There are many excellent commercial products of varying designs and materials available. When no satisfactory commercial design can be found, campus designers may need to devise their own solution. Campus architects at the University of Virginia, for example, despairing over the inadequacy of commercially available emergency telephone standards, resorted to their own design which was built in the university shops at considerable savings.



The Campus After Dark

At night, when darkness envelops the university grounds, a different campus reveals itself along its lighted pathways, below illuminated windows of dormitories and research labs, and around spotlighted towers and building facades. After women students entered the universities in greater numbers, security lighting increased dramatically, yet not always in a manner that would enhance the aesthetic integrity of the nighttime campus.

Lights placed too low, i.e., less than eight feet above ground level, have the capacity of blinding the viewer and cause the opposite of the intended effect. Most unshielded light sources placed below eye level, though well intended, merely annoy and irritate, inviting students to destroy them.

Nighttime lighting of university campuses presents one of the most important, yet unused, opportunities available to the campus engineer. Like a skillful stage designer, he or she may select from an extensive arsenal of lighting devices, well designed street lamps along pedestrian walkways, spotlights reflecting from building walls, and up-lighting of major trees and shrubbery areas to create a tracery of light, providing not only security, but also extending the hours of use and the visual integrity of the campus.

When we realize that university and college campuses are more than brick and mortar, or tree-lined alleys and academic quadrangles, we will discover that they touch us at our emotions, respond to our need for shelter and satisfy our sense of beauty. If the caretakers of American campuses are also sensitive to their responsibility as guardians of a rich cultural heritage, they will find satisfaction in knowing that through their work they will preserve and pass on a national treasure that will enrich the lives of future generations.

Whether for an "academical village" or a "multi-university," American college campuses will endure as long as they respect their traditions and uphold Aristotle's definition of the human community as a "place where common people can live a simple life for a noble end."

References

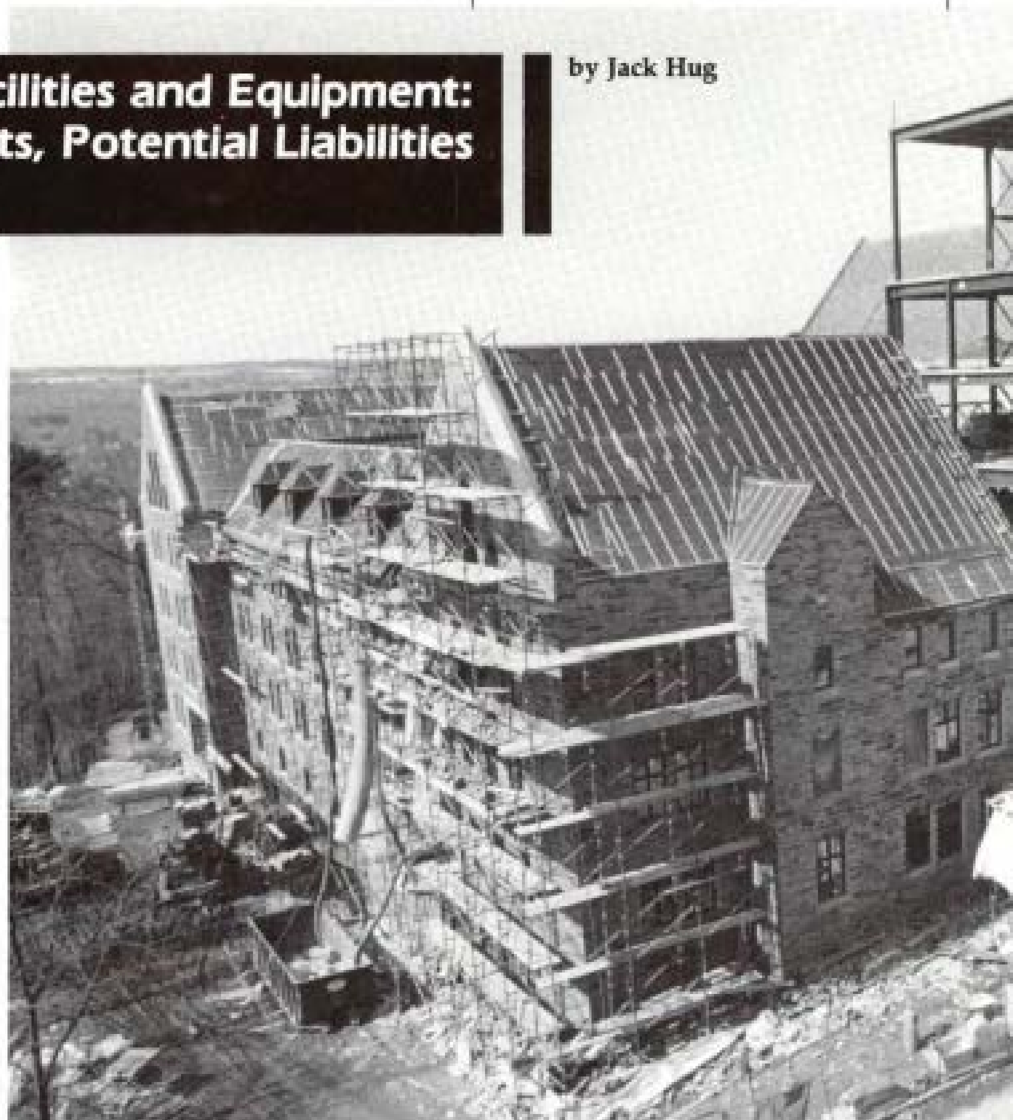
1. Paul Venable Turner, *Campus*, p. 3-87. Cambridge, Massachusetts: The MIT Press, 1984.

2. Kevin Lynch, *Site Planning*. Cambridge, Massachusetts: The MIT Press, 1962.

3. Hans Blumenfeld, "Scale in Civic Design," in *The Modern Metropolis: Essays by Hans Blumenfeld*, ed. P.D. Spreiregen. Cambridge, Massachusetts: The MIT Press, 1967. ■

University Facilities and Equipment: Inseparable Assets, Potential Liabilities

by Jack Hug



Exterior shell nearing completion, Cornell University Law School expansion, March 1988.

PHOTO BY GLEN HITCHCOCK

The problems of capital renewal and replacement, and operation and maintenance of our facilities and academic research equipment cannot be overstated. Capital facilities and equipment are a foundation of higher education teaching and research. After years of quiet erosion, this foundation is silently crumbling, and the vitality of one of our most valuable national assets is now severely threatened.

This quote by Lawrence Landry and Rodney Mebane in their paper "Capital Crisis in Higher Education," was published almost a decade ago, but it would be just as accurate if it were written today.

Much has been offered as advice to higher education about managing resources effectively. The alarm was sounded by Educational Facilities Laboratory and the Carnegie Commission in the mid-1970s. The message has been repeated since then by countless books, articles, and speeches, and with good reason.

Many colleges and universities have developed tools to assess this need effectively, and most importantly, many now can provide reliable and verifiable information to support the call for serious attention to this problem.

The questions facing campus administrators concern not whether we have a capital renewal/replacement problem for facilities and equipment, but how serious the problem is and what we are doing about it.

Armed with this assessment, plus

Jack Hug is APPA's president-elect and assistant vice chancellor, physical plant services, at the University of California/San Diego, La Jolla, California. This article is reprinted with permission from the Spring 1989 issue of Educational Record, *published by the American Council on Education.*

(Above) The Engineering Instruction and Research Facilities under construction at the University of California/San Diego.

(Left) Scripps Pier of the University of California/San Diego.

two recently published national surveys on the condition of facilities and the condition of science and engineering academic research equipment, we can begin to see the outline of a continuing trend that started to develop years ago.

Facilities Needs Assessed

The APPA/NACUBO/Coopers & Lybrand study of facility needs [published in January as *The Decaying American Campus: A Ticking Time Bomb*] is reinforced by the National Science Foundation's *Survey of Scientific and Engineering Research Facilities: 1988*, which estimates the cost of today's facility needs for research space alone to be $3.6 billion. (There are an estimated 114 million net assignable square feet of research space available at the nation's research performing universities and colleges.)

Not only do we have a serious facility need, we also have serious problems developing the equipment that is housed in and connected to our facilities.

Equipment Needs Assessed

In 1980, a survey of investigators at leading research universities, conducted by the Association of American Universities, identified what seemed to be an emerging instrumentation crisis in academic science and engineering.[1]

The AAU study reported numerous

instances where scientists and engineers felt that, because of inadequate instrumentation, they were—or soon would be—no longer able to work at the frontiers of research in their respective fields. In recognition of this, the House Committee on Science and Technology recommended that the National Science Foundation "conduct inventories of, and analyses of the needs for, scientific instrumentation."[2]

The resulting legislation, when enacted and signed into law, directed the foundation to:

> develop indices, correlates, or other suitable measures or indicators of the status of scientific instrumentation in the United States and of the current and projected need for scientific and technological instrumentation.[3]

The results of this effort are documented in what has become known as the 1982-83 "baseline" survey.

The survey program was designed to identify national trends in these major categories—quantity, age, cost, condition, and/or perceived adequacy of academic research equipment in selected science/engineering fields. In 1988 the National Science Foundation published another report presenting information on each of these four major categories to compare to the baseline study. This kind of survey now will be performed every two years.

What's Changed?

Little change was found in department heads' evaluations of the general adequacy of their research equipment in spite of some significant quantitative increases and some qualitative improvements seen from the baseline study. Across all of the science and engineering fields surveyed, 35 percent of the department heads reported that the research equipment available to their faculty is generally "insufficient" to enable them to pursue their major research interests. This was essentially the same as statements made during the baseline survey from 1982-83 (36 percent).

Although instrumentation stocks have increased since the baseline study of 1982-83, there is an ever-widening gap between the equipment needed to keep up with technological advances and the equipment available.

The value of science/engineering academic research equipment in use is estimated at more than $2 billion. Although the total instrumentation stock and investment increased, so did the maintenance costs requirements. Engineering departments, particularly, reported substantial rising rates of maintenance costs. The engineering department heads more than any other indicated no perceived improvement in the overall adequacy of available research equipment or support resources. There is little question but that we will have increasing difficulties in maintaining current stock of basic research equipment in good condition and that the cost of replacing equipment in many fields will outpace available funds.


PHOTO BY UNIVERSITY OF UTAH


PHOTO BY BAYLOR UNIVERSITY

In 1985, "Financing and Managing University Research Equipment" was published by members of three associations: Association of American Universities, National Association of State Universities and Land-Grant Colleges (NASULGC), and Council on Governmental Relations (COGR). This publication tells it all. The problems identified are real and the actions recommended require a partnership between the federal government, the states, business and industry, and the universities. This publication was influenced by more than 500 scientists,

(Above) Staging area for construction project at the University of Utah.

(Left) A Hitachi absorption chiller was installed in 1988 when Baylor University switched to cogeneration.

university administrators, governmental officials, and industry leaders who provided valuable insights into the reality of this issue. Its reading is highly recommended for all who have an interest in financing and managing university research equipment.

How Are We Doing? Compared to What?

The major question of how we are doing has many different answers. How the question is asked and to whom the question is addressed has a great deal to do with what is concluded.

Surveys can be too general and do not necessarily give a true representation of actual conditions at a specific institution. Almost every institution has, on paper, a system to deal with equipment replacement; but in fact, none appears to have a comprehensive program to address the many different components of the equipment issue.

The fund source, the specific field of inquiry, the type of institution, the location, the age, politics, and tradition are all factors that impact the management of academic research equipment. However, the condition of the facilities and the support infrastructure has an impact of magnum force.

The Problem

To obtain a clear picture of total needs, we must examine the differences in institutions. A particular university is "context bound," and the contexts vary greatly among institutions.[4] There may be no single best way or no single possible strategy for everyone to follow. The condition and equipment needs should be evaluated within the possibilities and the limitations of the institution. How big the total need may be, no one knows.

During the 1960s the expansion and growth of many of our universities was the greatest single factor that gave a boost to the replacement of instructional/research equipment. As part of a capital improvement program, new equipment was installed in new buildings. The slowdown of growth that followed created declining budgets and fewer capital projects. Consequently, less money was available for equipment repair and replacement. Especially hard hit were the equipment-intense sciences.

Today, expansion and growth is occurring at many of our universities. The excitement of the new can easily overshadow the existing problem, but many campus administrators have had to temper this excitement with the reality that a substantial backlog of facility and equipment needs exists.

The problem created for us today was brought about by several factors:

1. Universities already have large quantities of obsolete equipment and functionally inadequate space on hand.
2. Annually, large quantities of equipment and space are added to this "obsolescent" inventory.
3. Program changes and increased volume of research place new demands on institutions that can only be met with specialized equipment and space.
4. Inflationary cost increases alone account for significant erosion of the available equipment and facility dollars.

The University of Texas Balcones Research Center during construction in late 1987.

An example: The high cost of today's astronomical research facilities is underscored by a comparison of the estimated replacement cost to the original cost of the 300-foot radio-telescope. Build in 1962 at a cost of $850,000, its replacement will cost $50 million.

5. A most significant problem can be traced to technological developments. A few years ago, a chemistry research group possessing a five megahertz nuclear magnetic resonator that may have cost up to $500,000 was on the cutting edge of its field. Within too short a time, the higher resonance of more powerful magnetics was required to maintain that position, but the cost of the replacement equipment was now $5 million, and there is nothing functionally wrong with the original piece of equipment—it's just outmoded!

6. Another indirect impact of rapidly increasing technology relates to housing of equipment. Research using lasers and electron microscopes necessitates that equipment be placed on isolation tables for a vibration free environment. If existing space must be retrofitted for this, the expense must be added to the cost of acquiring the equipment. And as the range of lasers expands, larger and larger tables demanding more and more space must be dedicated.

Too often the space available to receive new science and engineering programs and their concomitant equipment was never designed to accommodate the high energy requirements of the newer technology. Building air handling systems are inadequate and cannot be easily upgraded. Campus central utility systems are reaching capacity and cannot provide sufficient cooling for new space without major capital investments. Too frequently, a solution is to add on-site cooling, expense to be borne by the research, and by the institution as utility costs climb rapidly.

7. Funding has not kept pace with the need for equipment replacement.

Surveys and studies represent a noble attempt to get a hold of a growing problem. However, if the growth of the problem is going to be slowed and held at a manageable level, cooperation and action is needed now.

A Marathon, Not a Sprint

The problem is larger than any institution can tackle individually and the solution is long-term. This is not just a facilities or equipment issue; it is an issue for all of higher education.

Not an Exclusive Domain

Taken individually, the facility dollar needs and the equipment dollar needs are each staggering. Coupled, the eyes glaze over. We cannot realistically or effectively separate the two and achieve a quality program. A lot of things can happen along the way of managing the research effort that thrust the physical plant manager into the heart of the research equipment issue.

Common Ground

Research work is different from many other types of work, but is much like managing a project. The planning, directing, and organizing of the activity for a defined period of time, to produce a single specified product or result, on a specific date in the future is what distinguishes this type of work.

It is this finite period of time and the importance that is placed on achieving a planned result on or before a predetermined date that makes a difference. Physical plant administrators understand this. Interruptions of any kind effectively stop the assembly line and are very costly, and the source of money needed to replace what has been lost is, more often than not, identified. The physical plant department doesn't have it, the research department doesn't have it, the grant or contract can't support it, and the insurance doesn't cover it. We have lost a valuable national resource and have added to our problem.

There is not a college or university in the country that does not proudly display its research efforts and advertise its benefits to the community, the state and the nation—virtually all of humankind. The research work already being done, the "work in progress," and the resources available to apply toward being the "first" is boasted regularly in state and regional economic reports. The facts supporting statements of research activity and availability are accepted and expected as normal "taking care of business."

Growing Needs and Declining Assistance

Choices include:

A. A cornerstone of this issue could be a careful statement of what the national interest in academic research is.

B. A realization of deferred maintenance of facilities and equipment is not one problem but many problems.

C. The economic, fiscal, political, and technical constraints over the next several years are going to be especially severe. The great challenge is to make government, institutional, and private participation truly effective.

D. It is unwise to assume that the government's ability to help is only a matter of money and political will (policy). Programmatic and organizational know-how at our universities are a most critical ingredient.

E. Leadership, in addressing this need means having the wisdom to recognize this evolving problem and to provide an effective response before it is forced onto our agenda in the clear form of a crisis.

References

1. Association of American Universities. *The Scientific Instrumentation Needs of Research Universities,* Report to NSF, 1980.

2. House of Representatives Report No. 96-61 (1979), pg. 30.

3. An Act to Authorize Appropriations for Activities for the National Science Foundation for Fiscal Year 1980, and for other purposes. Public law 96-44.

4. *Leaders for a New Era,* Madeleine Green. ■

Underground Storage Tanks: The New National Rules

by Joseph R. Schuh

Last September, the Environmental Protection Agency (EPA) published its final rules for underground storage tanks. This article outlines those rules and what you should know about underground storage tanks.

The problem of leaking underground storage tanks has received increasing attention in recent years. Retail gas stations come to mind first when we think of underground tanks. But they only represent about 50 percent of petroleum storage tanks. Transportation fleets of all kinds have tanks—school districts, colleges and universities, taxi companies, car rental agencies, and textile rental companies. Often these tanks are not the best installed or maintained.

Unfortunately, many of these underground storage systems are made of bare steel or covered only with tar or lead paint, inadequate to protect them from corrosion for long. Installed in the boom years of the 1950s and 1960s or perhaps during the oil crisis of the 1970s, many are now old, corroded, and prone to leak.

Congress banned unprotected steel tanks and piping in May 1985 for most uses. Today, improved non-corroding systems are required. These include tanks made of fiberglass reinforced plastic, also called FRP. FRP does not corrode.

Steel tanks can still be used if they are protected from corrosion. Another option is a composite tank, a tank clad with thick layer of fiberglass reinforced plastic that effectively protects it from corrosion.

Joseph Schuh is manager of textile control, environmental issues, and service/distribution for the Textile Rental Services Association, Hallandale, Florida. This article is reprinted with permission from the January 1989 issue of Textile Rental, *published by TRSA. Illustrations and other materials furnished courtesy of the EPA.*

CHART I Types of Tanks

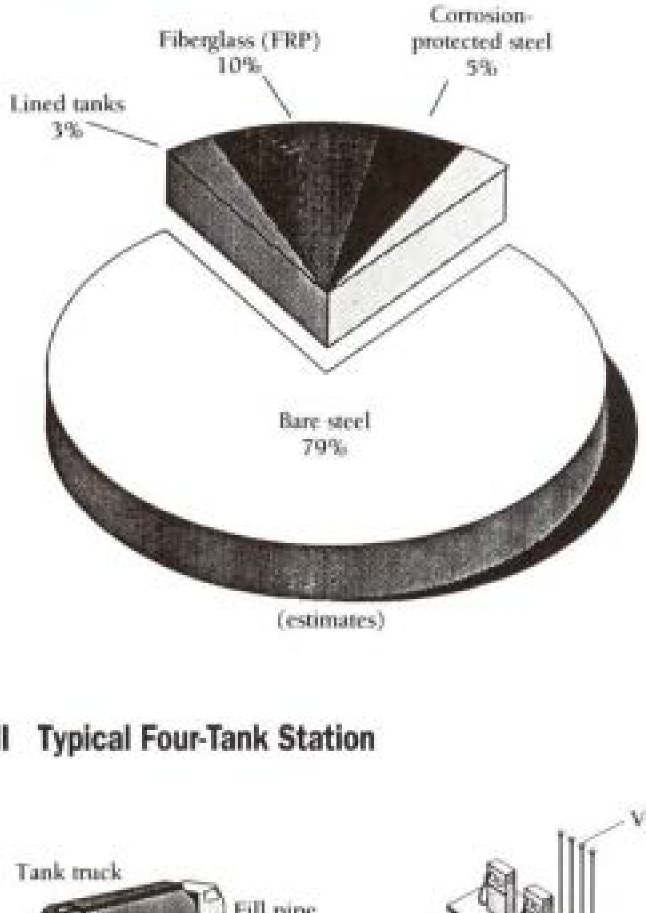
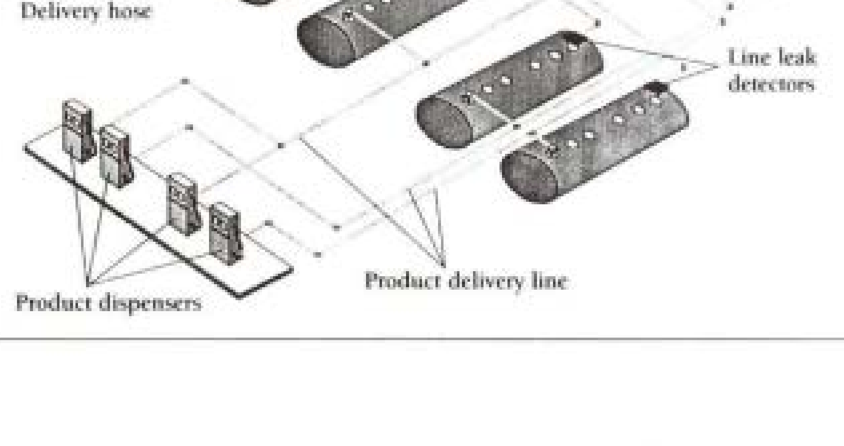


CHART II Typical Four-Tank Station



Congress excluded the majority of buried tanks when it excluded heating oil tanks, smaller farm tanks, and process tanks. The EPA has also excluded a large number of vessels you wouldn't normally think of as underground tanks, such as hydraulic lift tanks, because they do not pose threats to groundwater the way normal tanks do.

The EPA also is deferring regulation on a small segment of tanks that require different technologies. The EPA estimates there are about two million tanks covered by the new rules, with most used for storing motor fuels and other petroleum products.

Looking at the types of regulated tanks now in use we see that the vast majority—almost 80 percent—are unprotected bare steel, 5 percent are protected steel tanks (they have some form of corrosion protection), and just over 10 percent are FRP or fiberglass tanks. The remaining percentages are composite tanks and lined tanks—tanks with an interior plastic lining. Given the EPA's estimate of two million regulated storage systems in use, that means a whopping 1,500,000 plus are bare steel and prone to leak.

Most leaks occur in the piping to and from the tank—especially at connections. All those elbows are potential leak points. Tank fittings are the next most likely source of leaks, especially fittings at the top of tank and delivery trucks. If the tank is overfilled, any loose fittings at the top of the tank will leak. (This is often the reason tanks fail tightness tests.)

Spills can occur if a tank is overfilled or if the delivery driver spills out product left in the hoses (which can be twenty gallons or more). Virtually all sites more than ten years old show evidence of accumulated spills and overfills when the tanks are removed.

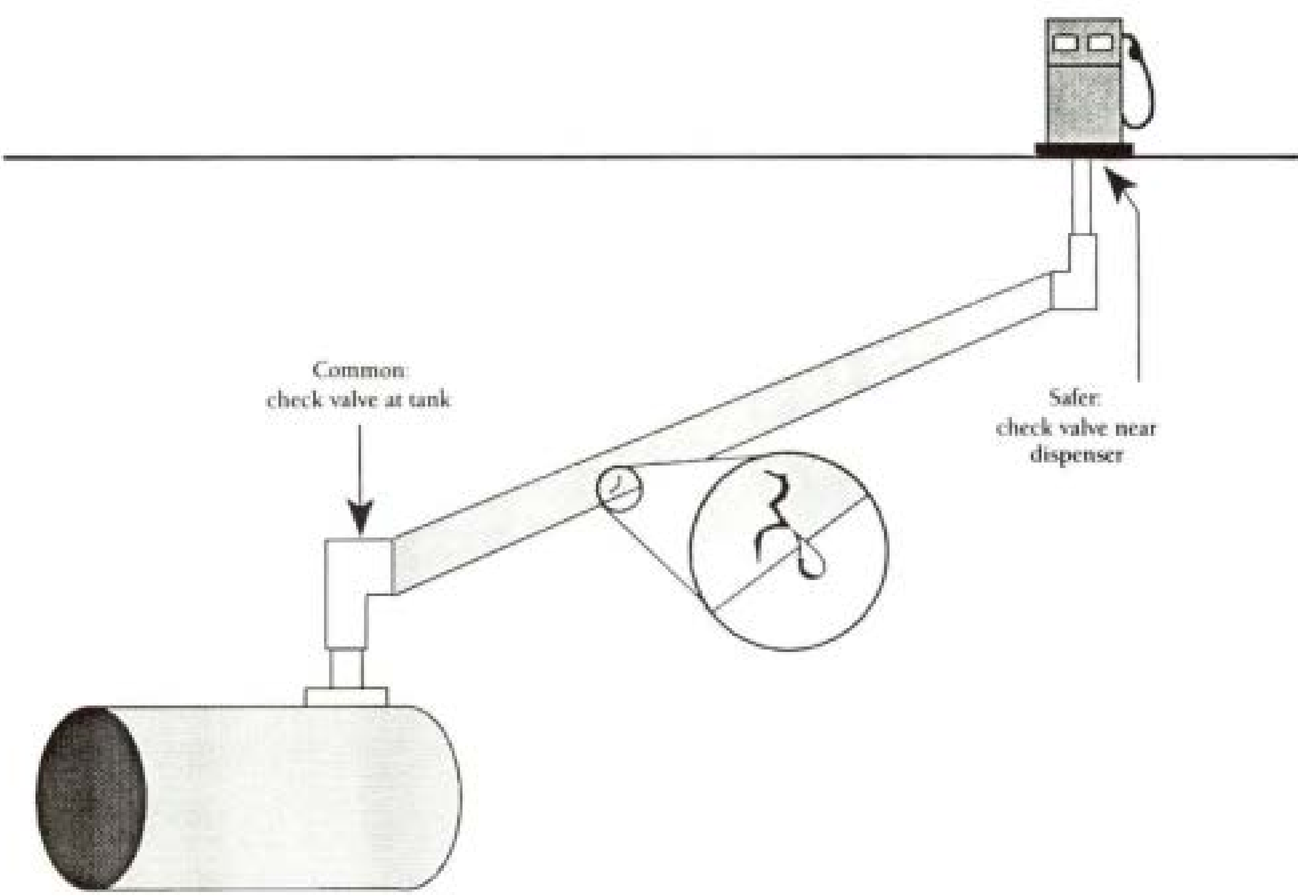
To protect human health and the environment, the goals of the National Underground Storage Tank Program are to prevent leaks and spills in the future by using improved technologies to find leaks quickly when they do occur by using leak detectors, to see that leaks and spills are cleaned up, and to make sure owners pay for cleanups and any other damages if they have a leak. Finally, the EPA is committed to building state programs so citizens and tank owners have an authority to contact when problems arise.

New Nationwide Requirements for Petroleum Systems

For new petroleum tanks and piping, the EPA is allowing single-walled systems but they must have:

- corrosion protection,

CHART III Suction Piping



• overfill *and* spill prevention devices, and
• leak detection for both tanks and piping.

The new rules require a device that automatically shuts off or alerts the operator *before* the tank is overfilled. This will prevent leaks from the fittings on the top of the tanks. Theoretically, this should also prevent most spills from the delivery hoses because there will be space left in the tank to drain the hoses. However, we're not dealing with theory, but with people—and people make mistakes—so a form of spill control or catchment is also required.

Pressure and Suction Systems

The new rules emphasize *piping leak detection*. As we noted earlier, piping is the biggest culprit in leaks. Pressure in a pipe can push a lot of product out of even a tiny hole. A typical line-leak detector for pressure piping restricts the flow of product if there is a loss of pressure—usually caused by a leak in the line. All pressure systems will need some form of continuous leak detection. (See Chart III.)

Let's talk about suction piping and pumps to see why the rules for these systems differ. The suction pump, located adjacent to the dispenser, sucks the product up through the lines just like a person sucking lemonade up a straw. The product is held in the lines between uses, so if there is a hole in the line, the product will drip out, but at least it's not being forced out as in pressure systems.

With suction piping, the system malfunctions when it leaks—it's just like sipping lemonade when your straw has a crack in it.

The environmentally safer type of suction used commonly in Europe has some advantages. A single-check valve is put near the dispenser. If there is a hole in the line, the suction pressure is broken, and the product flows back into the tank. Only a small amount can leak into the environment.

But the suction system used most commonly in America has a check valve right above the tank, which stops the product from flowing back into the tank. So, whatever fuel is in the line will leak to the crack or hole.

The bad news is that in warmer climates the safer systems tend to malfunction when used with volatile products such as gasoline. So, it may not be a realistic option for some uses in southern states. The good news is that either type of suction system is better for the environment than a pressure system.

Monitoring Techniques and Requirements

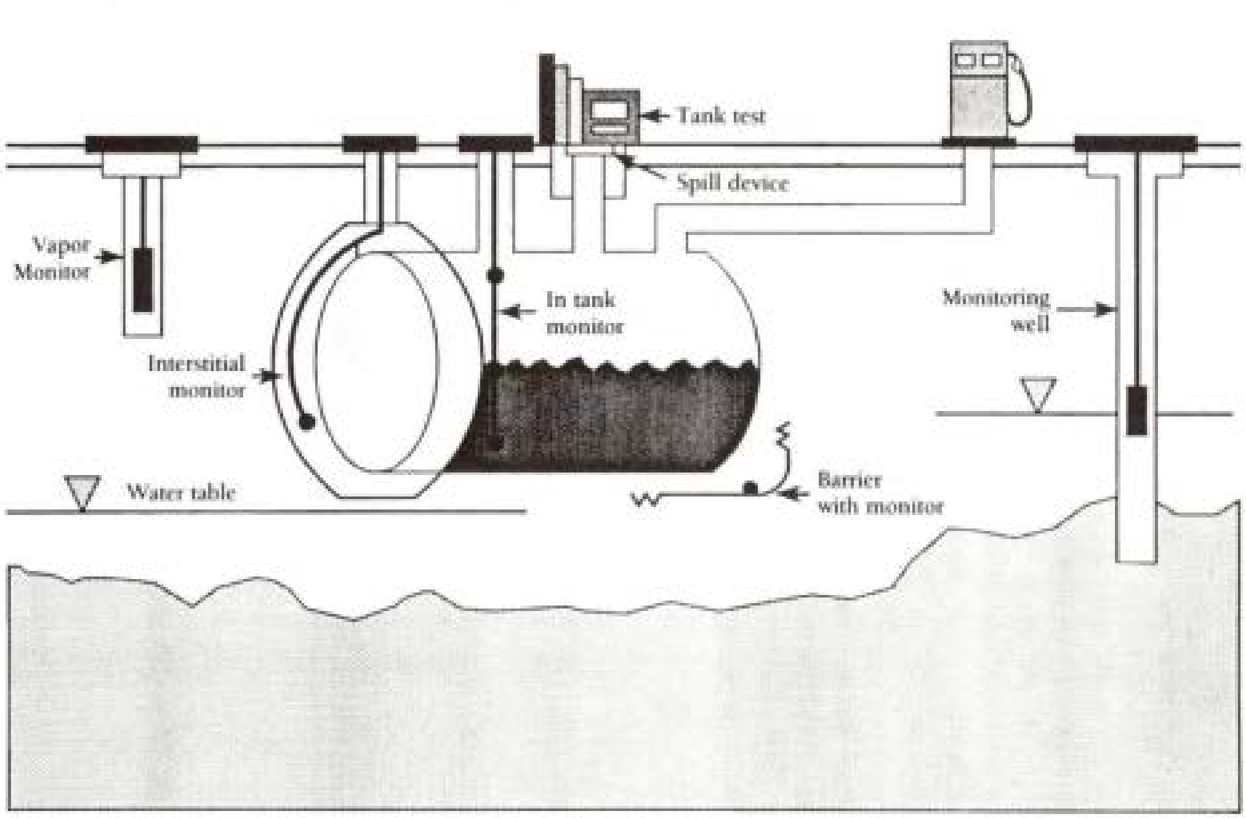
How does this affect you?

Because of these differences, pressure systems need a continuous line-leak detector with automatic alarms or shutoffs. With pressure systems you will also have to test the lines at least once a year and do monthly monitoring for leaks.

The common American system must have a line test every three years as a minimum—or you can use a leak detection technique monthly. For the safer type suction (with only one check valve located by the dispenser) no special leak detection is required; you just have to be able to inspect the check valve.

For new tanks the requirement is to have monthly monitoring by the time the tank is ten years old. That is when the tank is most likely to start leaking. Initially, any old fashioned monitoring test is okay (sticking the tank daily and calculating any losses monthly)

CHART IV Leak Detection Alternatives



and testing your tank within five years. Within ten years, you will need to install leak detection that is monitored at least monthly.

Leak Detection Alternatives

Leak detection alternatives can be any of the following:

- sniffers for vapor detection,
- groundwater monitoring wells,
- tank tightness test, and
- continuous in-tank monitors (see Chart IV).

If you have double-walled tanks or install a barrier under your tank, you can use interstitial monitors between the walls or between the tank and barrier. The choice depends on many factors such as the soil type and depth of groundwater at the site, as well as costs and the level of security desired.

How much will these new rules cost you? Typically, gas stations now installing three new 10,000-gallon tanks incur about $4,000 more under the new national rules than under the existing Interim Prohibition (the Congressional ban on bare steel system). That's about a 5 percent increase. While this is not an insignificant expense, especially for smaller businesses, the EPA believes that in the long run it's worth it. This cost is based on using *continuous* monitors on the tanks.

Another requirement for new tanks is that the owner must get a certified installer to verify that the system was installed properly.

Installers have several ways to verify proper installation. The system can be inspected either by a registered professional engineer, by the implementing tank agency, by showing that you followed the manufacturer's installation checklist, or by using another method allowed by the implementing agency. This is a job that requires many skills and knowledge of recommended industry practices.

Remember, piping is the part most likely to cause leak problems. Before you hire the low bidder for a new installation, ask yourself what corners are being cut. Since the installed system is the owner's responsibility, it pays to have the job done right! If you fail to install proper corrosion-protected systems, you are subject to federal fines of up to $10,000 per day.

Proper Installation Options

☐ Installer certified

- by tank and piping manufacturers
- by tank agency

CHART V Costs for Improving Existing Tank Systems

(Cost ranges for a typical gasoline station with three 5,000 gallon tanks)

☐ Leak detection	$2,000 to $8,000
☐ Spill and overfill retrofit	$3,000 to $8,000
☐ Corrosion protection retrofit	$10,000 to $20,000
☐ Interior coating of the tanks	$10,000 to $15,000

CHART VI Leak Detection

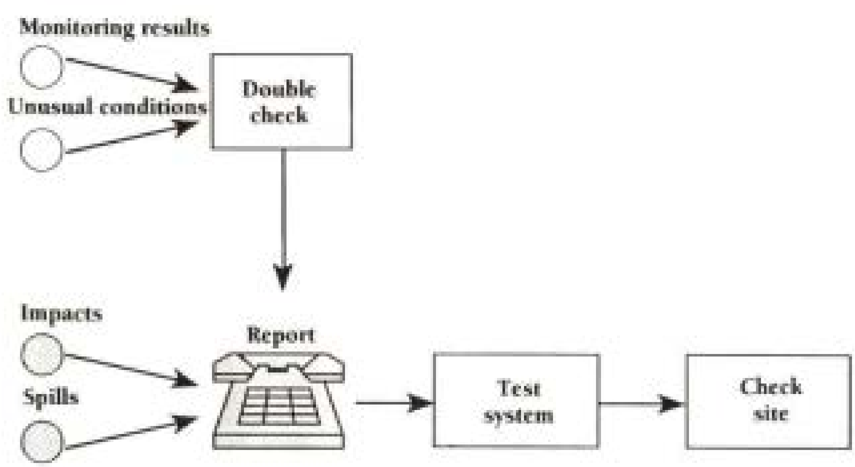


CHART VII Corrective Action (confirmed releases)

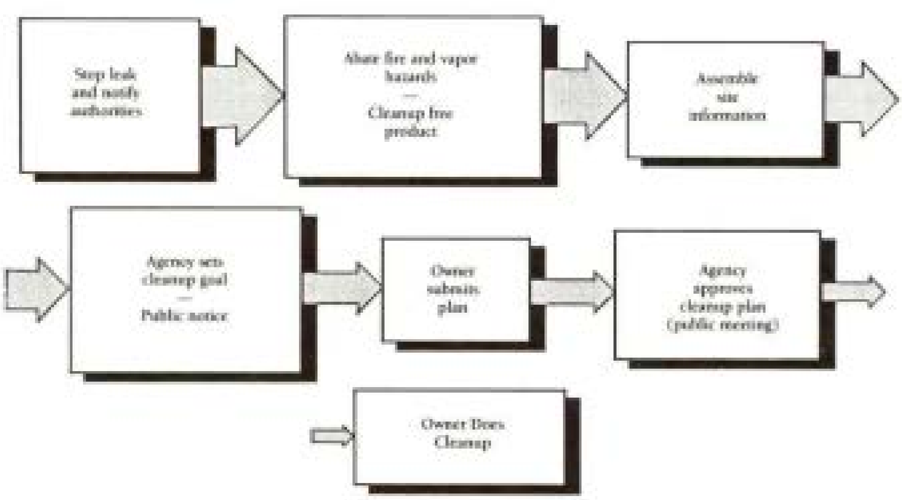


CHART VIII Petroleum Cleanup Costs*

- ☐ Assessing problem and controlling immediate hazards — $2,700
- ☐ Removing and disposing saturated soil, investigating site — $25,000
- ☐ Recovering floating product — $33,000 to $49,500
- ☐ Cleaning ground water — $75,000 to $225,000 or more

*Estimated cumulative costs

☐ Installation inspected
- by professional engineer
- by tank agency

☐ Manufacturer's checklist done
☐ Other method allowed by tank agency

Existing Petroleum Tank Systems
☐ Begin leak detection
- for all systems within one to five years
- except pressurized piping within two years

☐ Replace or upgrade within ten years

Existing Petroleum Tanks

An operator should begin leak detection on all tank and piping systems within one to five years. But pressurized piping, because of its greater threat to the environment, needs detectors within two years.

All older systems should be replaced or upgraded within ten years. Here's what is required—first is the leak detection phase-in, then the upgrading requirements.

If your tank is over twenty-five years old, you'll need to begin leak detection in 1989 or replace or upgrade your system. (All this is based on the age of the tank as of December 1988.) By 1993 all systems must have leak detection. The EPA has materials that show this phase-in schedule and explain the options for leak detection.

For the enormous number of unprotected steel tanks, the key upgrading need is to prevent structural failure from corrosion. Adding corrosion protection is one way to do this. For piping, you would typically add anodes. For tanks you could add anodes or apply an electric current on the tank.

Designing corrosion protection systems requires an expert. Corrosion protection systems need to be checked to ensure they're working right—keep records of your checks!

Another upgrading option for protecting the structure of tanks is interior lining. This is a temporary upgrade—

it basically renews the tank for ten years. This requires an internal inspection after ten years, then every five years.

Another option is to add both corrosion protection and interior lining; this really safeguards the tank. If you do both, you don't need to do any internal inspections and will not need to add leak detection to the tank for ten years! It's like having a new tank.

Another upgrade need is spill and overfill devices. Over ten years all systems must be upgraded, replaced, or closed. Unlike leak detection, there is no set schedule for upgrading—as long as you do it within ten years. Otherwise, you'll face the prospect of fines up to $10,000 per day.

Chart V shows some estimated costs for improving a typical existing gas station with three 5,000-gallon tanks. Leak detection costs run from $2,000 to $8,000. Adding spill and overfill devices costs $3,000 to $8,000. Retrofitting cathodic protection costs $5,000 to $10,000. Lining a tank's interior costs $10,000 to $15,000.

All of this is not cheap, but it's a lot less expensive than dealing with a leak. It's also less than a completely new three-tank system; that would run about $80,000. (Older stations tend to have smaller tanks, so our retrofit costs are based on 5,000-gallon tanks. However, we noted with new systems mostly 10,000-gallon tanks are being installed.) Note: the lower leak detection cost is based on one set of tank tightness tests and daily inventory, the higher end is for continuous in-tank monitors.

Record Keeping

Federal law requires owners or operators to keep records so that an inspector can be shown that you have done what is necessary to comply with the law.

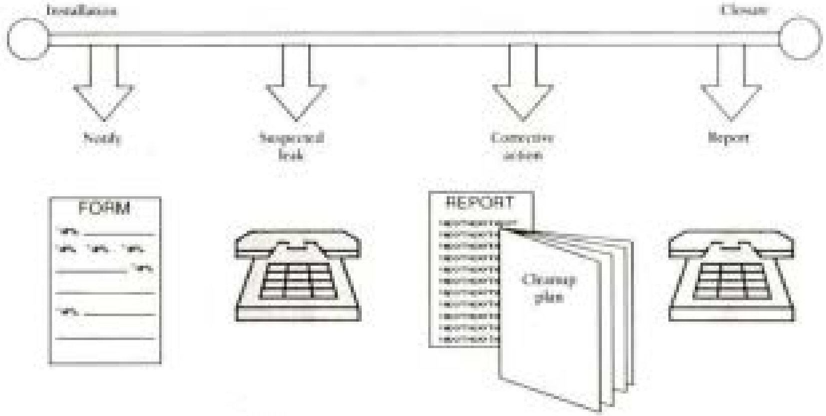
What will an inspector want to see? Warranties from any lining or other upgrades, corrosion protection test results, your leak monitoring data, and other similar data. You want to keep most of this anyway, if only for liability protection.

Corrective Action

(See Charts VI and VII.)

In the improved world of tomorrow when everyone has leak detection, most likely you won't be looking at black ooze. Instead, you'll get some warning from your monitoring devices or you'll notice something wrong

CHART IX Reporting Procedures



when pumping your stored fluid that indicates a leak. If that is the case, double check your equipment before reporting a leak; it could be a false alarm, a bad sensor, or faulty pump.

If you do see ooze, sheen on nearby surface water, or some other sign of a leak, report it to a local or state tank agency. The next step is usually to test the system to pinpoint the leak's source and then to check the site for contamination. If you have a spill, the first step is to contain and clean it up. If the spill is twenty-five gallons or more, report it to your local agency.

For all confirmed leaks the procedures are first to stop the leak and notify the appropriate agency. The second step is to abate any fire and vapor hazards and clean up any uncontained material.

Notice that in this process you start cleanup actions immediately. This helps everyone, because the pollution won't stand still while you're waiting for approval to act.

This may be all you will have to do. However, your regulatory agency may ask you to assemble information on the amount of the release and how far it may have spread, what nearby wells might be affected, and so forth. Again, this may be all that's required.

If the agency sees a need for further cleanup it will set a cleanup goal. Moving to the next step, you must submit a plan to meet the cleanup goals. The agency reviews the plan. There may be need for public notice or a meeting. Assuming you have hired a good cleanup contractor, you get approval and do the cleanup.

This is a simplified sketch of a difficult and usually costly set of operations. Removal of contaminants is expensive and may be subject to local and state environmental controls. For example, spreading saturated soils on the land to let the fumes evaporate may violate local air pollution rules.

How Much Does All This Cost?

Groundwater cleanups can run several hundred dollars or more, but each site is unique. The EPA has had clean-up costs in the millions. Costs like these make improved systems and continuous monitors look like very good investments. (See Chart VIII.)

Closures

Some people are even thinking about getting out of the tank game. This leads to the subject of tank closures. There are two types of closures: temporary and permanent.

You can temporarily close an older, unprotected system for only three to twelve months. (After twelve months you will have to decide if you are going to return it to service or permanently close it.) All lines, pumps, and other equipment must be capped and secured (except vent lines). If the product is left in the tank, leak detection must be continued.

For a new or corrosion-protected system, there is no time limit on temporary closure. Again you cap it off, and continue operation and maintenance of corrosion protection and leak detection.

For permanent closure the system must be emptied of all fluid and cleaned. It must be removed from the ground or filled with an inert solid (sand, concrete, or foam.) You will need to do a site assessment to see if the excavation area is contaminated. If so, you must clean the site. Closing tanks that have held volatile products like gasoline is a dangerous business and should be done by experienced professionals.

Temporary Tank Closure

Existing/unprotected USTs (3-12 months):
☐ Maintain leak detection
New/protected USTs (3 months-unlimited):
☐ Maintain corrosion protection
☐ Maintain leak detection

Permanent Tank Closure

☐ Empty product
☐ Clean tanks
☐ Remove from ground or fill with inert solid
☐ Do site assessment

Reporting Requirements

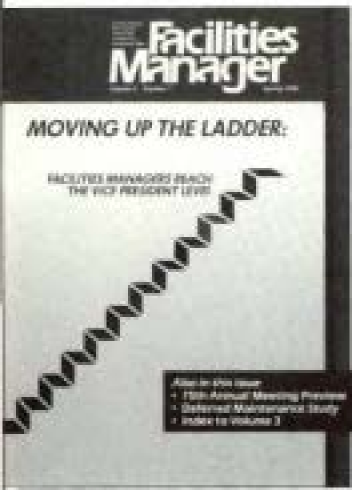
A few words about reporting requirements. There are two occasions when you need to report to your tank authority. The first is when you install a new system—there is a notification form to fill out telling the agency what type and size of tank you have, what product, and how you are certifying its proper installation. Then, depending on your state's rules and if all goes well, the second occasion is when you decide to report a tank closure. If, however, you have a suspected leak, or worse, have to take corrective action, you will have to report on your plans and progress to the tank authority.

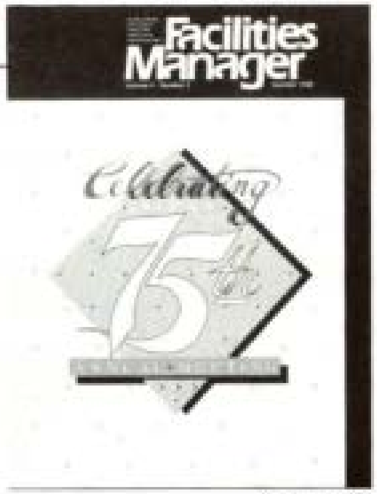
Conclusion

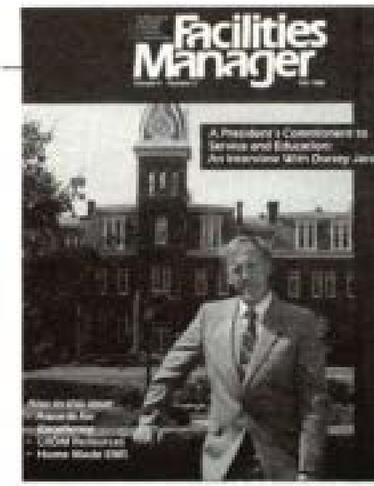
To review the new national rules for petroleum, the key points are:

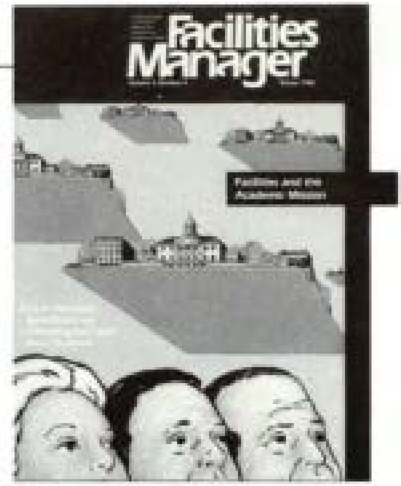
- new systems need corrosion protection, leak detection, and both spill and overfill devices;
- existing systems must include phase-in leak detection within five years and be upgraded or replaced within ten years; and
- leaks need to be reported and cleaned up.

I urge all readers of this article to immediately begin implementing these procedures through local and state agencies. The liability for ignoring these new regulations could be extremely costly. ■



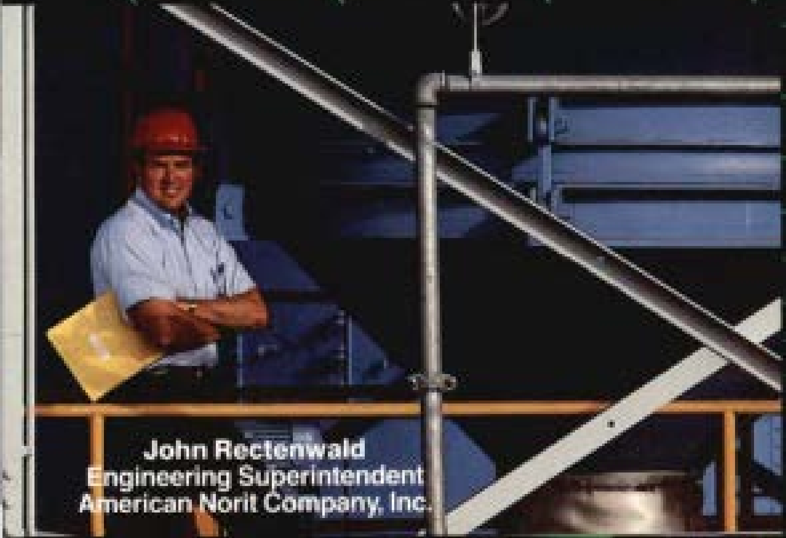






Index, *Facilities Manager* Volume 4, 1988

The Maintenance Planning and Control System for the 1990s



John Rectenwald
Engineering Superintendent
American Norit Company, Inc.

"American Norit, part of a leading world-wide manufacturer of activated carbon, is a maintenance-intensive plant. We employ nearly 60 craftsmen, and our storeroom stocks nearly 10,000 replacement parts. We needed a computerized maintenance system that could handle the load. MAPCON II® is as work-intensive as we are.

"Before we invested in MAPCON II®, we took a look at it in action. We were impressed by what we saw in a plant already operating on the system.

"MAPCON II® is extremely user friendly. It allows us to use our existing numbering system and enter data only once.

Resource Management

Stephanie Gretchen

Leaf Pickup

Leaf pickup at **Texas Christian University** is an exhausting task. The 237-acre campus has about 2,000 mostly deciduous trees, which make leaf pickup a requirement two times a year, spring and fall. The most troublesome aspect, however, is leaf pickup around automobiles. TCU has parking spaces for 5,700 cars, many of which are rarely moved during the day. To combat the problem, the physical plant department modified a Diahatsu HiJet scooter to allow cleaning of parking lot gutters even around parked cars. The scooter bed was fitted with a box 48 inches high, 76 inches long, and 50-1/2 inches wide that provides almost 12 cubic yards of leaf storage. The box was constructed around an angle iron frame, with lifting eyes so that the box could be removed when not needed for leaf pickup. This allows the scooter to be used for other grounds maintenance. On the back of the scooter, a Billy Goat TR500 blower was mounted with a pickup nozzle at the end of an eight-inch diameter flexible hose, 15 feet long. Two eight-inch by eight-inch screened exhaust openings were cut in the top of the leaf container box. One side of the box was hinged to allow dumping of the contents. Thanks to the department's innovation the campus can remain relatively leaf-free year round.

Campus Hotel

Construction began last June 9 on the first commercial hotel situated on a west coast public university campus. The 224-room, full-service Marriott will be located at **California State University/Fullerton** on approximately three acres. The $20 million facility is expected to open this summer. The project is a three-way partnership between CSU, the city of Fullerton, and Marriott. The contract calls for the hotel to revert to university ownership after a maximum of 70 years. The hotel will help finance about half the cost of the $6.7 million stadium and sports complex on campus.

Swimming Pool Repair

The **University of Illinois** opened its Intramural-Physical Education Building in fall 1971. The facility contains one outdoor pool primarily used for recreation and one indoor pool, 50 meters by 25 yards, used mostly for instruction and competition. Both pools use a highly sophisticated water circulation system. Water is circulated to the pool by a spinal underground distribution system, enters the pool bottom through diffusing inlets, and leaves the pool by overflowing the gutter. The pool system worked fine until January 1988 when daily makeup had reached 60,000 gallons per day, about twelve times the winter average.

The civil engineering section checked the water meter and water make-up controls but found no problems. When they checked for leakage, pool water was discovered in a building underdrainage sump. The next step was to identify the leak. It was not feasible to dig up the entire 12,400 square feet of pool bottom to identify the leak. In addition, the pool needed to remain in use for instruction and swim team use; therefore, it could not be drained.

Carl Wegel, civil engineer, and Larry Pridemore, water station foreman, concluded that the water might leak out through a filter head if the recirculation pump was shut off. They closed the pool one night and shut off the recirculation pump. William Greenwood from the engineering staff, a registered scuba diver, dove to the bottom of pool and injected small quantities of dye consecutively around each head. On one head the dye disappeared immediately; after several tests he concluded that the leak was adjacent to this head.

The university decided to accept the leak until the end of the spring semester when the pool was drained. The leak was found in almost the exact position predicted, the pipe was replaced at an elbow, and the pool bottom was repaired.

Safety

A 24-hour phone line links **Indiana University/Bloomington**'s physical plant department with the office of personal safety to ensure campus safety. The physical plant phone line is always open in order to encourage students, faculty, and staff to report maintenance or repairs that are needed, particularly those that affect safety. When someone reports a problem, the physical plant will correct the problem as soon as possible. Only emergency work is conducted after hours.

The physical facilities department (PFD) at **Miami University** (OH) organized a safety committee last April, to promote safety practices throughout the department and safe working conditions for all employees. The committee works with the university safety committee, the environmental health and safety office, the PFD training committee, the PFD employee and supervisor advisory groups, and principal staff members.

The committee investigates unsafe practices and working conditions, makes recommendations, improves communication of safety-related topics, provides literature and programs for better safety, and evaluates need for new safety equipment.

The following are some of the accomplishments of the committee: discussed safety devices for new maintenance utility vehicles used by the area maintenance shops; made recommendation that resulted in the welding shop installing rollbars and seatbelts in the vehicles; recommended yield signs that have been placed at strategic points in the Cole Service Building parking lot; posted an accident board in the building that reports the number of days since the last accident; investigated an accident and recommended that a memo be sent to all shop supervisors that advises the use of the "Power-Mate" when moving heavy equipment up steps; and sends a monthly SafetyGram and is working on a supervisor safety handbook that provides safety information and instructions on conducting safety meetings. ■

Stephanie Gretchen is assistant editor of Facilities Manager *and editor of* APPA Newsletter.

Data Base Update

Howard Millman

ACCEPTING THE INEVITABLE

The secret to political success is to foresee what is going to happen, then support it—Charles DeGaulle

Endorse the inevitable—Millman's Corollary

Colleges and universities lead the nation in introducing computer technology to tomorrow's entrepreneurs and employees. Does this spirit of computer competency and proliferation carry through to the physical plant? It should: after all, first-rate causes deserve first-rate resources.

How are facility managers using computers? We talked to four APPA members, representing institutions of various sizes and geographic locations. Reading between the lines, the way a manager uses computers reveals as much about the condition of their campus as the attitude of the institution's administrators.

The four directors who participated in our informal survey deserve our "thank you." We were pleased by their candor and surprised by some of their answers.

Ithaca College
Ithaca, New York
6,000 enrollment
1,700,000 S.F.

Tom Brown, physical plant director, is in the enviable position of operating a relatively new campus; most buildings are less than twenty years old. As if that is not enough to give us a green tint, Tom, in a matter-of-fact tone, added, "The administration has an explicit policy against accumulating a deferred maintenance backlog. They insist on resolving problems as they arise, when repairs are least expensive and disruptive." While we all agree with that sentiment, Tom is one of the fortunate few to be able to achieve the goal.

Tom's computer system reflects the needs and priorites of his operation. He estimates their hardware and software investment at about $100,000; the desktop hardware primarily comprises Apples. They use desktop computers for word processing and maintaining personnel records. Two terminals tie into the college's (soon to be updated) Digital Equipment VMS mainframe.

The mainframe fills their budgeting, accounting, and record keeping needs. It also serves as home base for their work order processing system. Service requests are entered into the system, which then generates the requisite work orders for distribution. Tracking the maintenance service requests and work orders, as well as labor/material recaps, are done by the digital equipment.

At present, Tom has little need for computer aided design and drafting (CADD) programs since their architectural and engineering work is subcontracted to consultants.

Tom was enthusiastic when discussing his staff achievements and their acceptance of computers. Initially, to smooth the transition from manual to computerized systems, Tom encouraged his staff to enroll in Ithaca's computer learning programs. That, in conjunction with attending off-site seminars, helped the staff make a relatively pain free transition. When the changeover occurred, they were well prepared and retained few doubts about implementing the new technology.

Tom is likewise appreciative of the time savings and increase in accuracy he and his staff have achieved. His overall assessment? "I don't think a cost conscious physical plant can afford to be without a computer now."

Pepperdine University
Malibu, California
3,500 enrollment
1,000,000 S.F.

Like Tom at Ithaca, Charlie Roberts' buildings are fairly new. Most were built within the last fifteen years, so he too has little in the way of a deferred maintenance problem. Charlie, Pepperdine's director of central plant operations, uses desktop computers for streamlining regular office record keeping as well as running a commercial maintenance program, COMAC.

COMAC is a combination software and (IBM) hardware package for scheduling routine maintenace. This includes both planned maintenance and work orders received from the academic community. COMAC also tracks time and labor charges, accruing them to specific tasks.

COMAC is running smoothly and reliably now, but it was not always that way. Charlie categorized the problems they had as the "service after the sale" variety. Exorcising the system's bugs required numerous long distance calls to COMAC's Florida offices. These in turn led to spirited discussions and subsequent field visits by COMAC's representatives. Ultimately, the problems were satisfactorily resolved.

Pepperdine's administration supported the purchase of computers for the physical plant. Charlie estimates his office's hardware/software investment at $75,000. While Charlie's office staff quickly accepted the new technology, some of the mechanics were not so enthusiastic. The additional record keeping required to keep the system's records current, as well as the increased accountability, caused some of the maintenance staff to chafe at the new system. Most, notes Charlie, if not all, have by now "come around to accept the new system as both inevitable and efficient."

Charlie's obviously not intimidated by computer technology. His plans include investigating other COMAC modules and perhaps expanding the system beyond its present functions, when he is sure the expansion will be part of the solution and not add to the problem. Project management and CADD software are also possibilities, depending on the level of future need.

While the desktop computers suffice for accounting and maintenance tracking, they use a recently installed Johnson Controls energy management system to control lighting and HVAC.

Charlie's overall assessment: "In our situation, we have been helped dramatically by having computerized systems."

Iowa State University
Ames, Iowa
23,500 enrollment
12,000,000 S.F.

If surmounting technology was an Olympic event, Bill Whitman, Iowa State's associate vice president for facilities, would be in for the gold. According to Bill's reckoning, his shop has invested about $2,200,000 for hardware and another $1,200,000 for software. These numbers exclude the Johnson JC-85 they use for energy management and facility control.

Bill's group was initially tied into the university's mainframe. After four years online, their operation required functions unavailable on the mainframe. For instance, the mainframe was competent at number crunching, but it was inadequate for personnel record keeping and related management functions.

It was then that Bill installed a Hewlett Packard mini computer. The HP operates as a file server, serving a sixty-five-terminal local area network (LAN). The HP handles work orders, job orders, accounting, personnel, wordprocessing, project management, budgeting, and forecasting. In other words, according to Bill, "Just about any function here that can be computerized, is."

Their now venerable work order system was developed in-house to interface with the university's accounting system. Some of its extensive features include tracking of work requests, material/personnel allocations, job cost/estimating, and tracking la-

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.

bor hours/dollars and material costs by job. While it has served admirably, there are newer systems available that offer more features. Bill thinks it may be time for a change. He intends to survey some of the newer maintenance packages now available to see if they match his needs.

The sixty-five terminals fulfill a dual function. In addition to serving as LAN terminals, they are also stand-alone PCs capable of independent processing. The physical plant's Hewlett Packard mini interfaces with other HP systems on campus for data exchange, including electronic mail.

In yet another stand-alone system Bill's shop uses five high-speed IBM compatible 386s for CADD. These they use primarily for maintaining engineering and construction record drawings.

Bill's staff received some gradual exposure and training before they were expected to use computers. According to Bill, "It's gone very well. The only thing we use typewriters around here for these days is to fill out forms and envelopes that we can't do on printers."

Iowa State also employs a Johnson Controls JC-85. The unit, purchased outright, is used mostly for card access control, monitoring fire systems/alarms, and controlling HVAC equipment. All software and firmware changes are made by facility in-house staff. Johnson is only involved in upgrades of the system's software.

Since Iowa State generates its own power, Johnson is not used for demand load shedding. Even without load shedding, the Johnson system has "paid for itself many times over"according to Bill.

About half of the campus, comprising academic buildings and offices, are under Johnson's watch. The balance of the campus consists of non-academic buildings that have their own separately monitored systems.

Columbus College
Columbus, Georgia
3,800 enrollment
530,000 S.F.

From one of the largest to one of the smallest.

Lester Smith, director of plant operations at Columbus, relates that most of the buildings are twenty-five years old, so deferred maintenace is not an overwhelming concern. And it may not become one, at least if the administration continues its present policy. The University System of Georgia, of which Columbus is a part, wants to prevent the newer institutions from accumulating a backlog.

Their system consists of two PC compatibles, a $12,000 investment. One PC is dedicated to key control the other one is primarily used for work orders and budgets. They use a commercial package, CAMS-3, that provides accounting of labor and material and accrues total dollars by job.

Both units are also terminals for the university-wide LAN. This allows transferring electronic mail and provides access to centrally stored programs residing on the college's IBM mainframe. One notable timesaving feature is the use of the LAN for room scheduling. Requests for space use are electronically transmitted to the physical plant office. In addition to reducing paperwork and request transit time, each request is permanently recorded, eliminating "Yes, I did," "No, you didn't" confrontations.

Columbus uses a Johnson Controls JC-85 for controlling HVAC systems on campus. Similar to Bill's system at Iowa, major program changes are made by Johnson while the scheduling changes are entered in-house. Unlike Iowa's outright purchase, Columbus entered into a five-year lease-purchase plan. Now in its third year, Johnson's overall cost of $300,000 will be amortized from accrued savings over the five-year life of the lease. Since lighting and fire alarms do not provide "savings," they are not presently included in the monitored systems.

Unlike the smooth initiation of the Johnson systems at Iowa and Pepperdine, Les had more than his share of start-up problems. It required nearly a year to get the system fully up and running. Les attritubes that mostly to bad timing. No sooner than their sytem was uncrated, Johnson issued a major software upgrade. That, combined with personnel changes in Johnson's local office, led to unanswered questions and bugs that needed to be flushed. Johnson persevered and in time the problems were resolved. Although Les feels it took longer than it should have, the system is now online and performing reliably.

Les' office staff and field staff readily accepted the introduction of computers. He too smoothed the transition by training his staff and reorganizing record data into a computer compatible format. In the future, Les will expand his system to include CADD.

"If you have plenty of people, you probably can get away without using a computer," said Les. "By using a computer and a couple of well trained people, you can generate data that's immediately usable."

When I asked Les for an example of what he meant, he replied, "Say you ask your secretary, 'How much did we spend on X?' Depending on what you asked for, it might take her two days to find the answer. By the time you get your answer, you're already impatient and she's already mad at you." So much for doing business the old fashioned way.

"See," continued Les, "with a computer, your data's readily available and you can do so much more with it."

To that I add—while keeping the peace. ■

The Bookshelf

Human Resources

Costing Human Resources: The Financial Impact of Behavior in Organizations by Wayne F. Cascio. Belmont: Wadsworth, Inc., 1987. 274 pages, softcover.

Many times the salary of an employee is naively thought to be the only financial outlay that impacts a company's budget in the realm of personnel management. It is thought that an employee, whether laborer, manager, or clerk draws a base salary of $30,000 annually, costs the company that amount plus whatever benefits are incorporated to present a fair salary package. Unfortunately this premise is not true and never has it been established more plainly than in Wayne F. Cascio's book *Costing Human Resources: The Financial Impact of Behavior in Organizations.*

Cascio's book is part of a larger selection that makes up the Kent Human Resource Management Series. This series constitutes Kent Publishing Company's attempt to present not only a viable apparatus where by its readers can gain a better understanding of federal regulations, human resource costing, compensation, and performance appraisal, but a manual for use in the classroom for training and expanding a company's cognizance of human resource management. After all, the employees that make up a company's work force have the potential of being a large factor in economic savings and, at the same time, the cause of economic loss. Hence, human resource is a company's most valuable commodity.

In his book Cascio begins by introducing the human resource accounting concept. He delineates the activities of human resource management as "those associated with the attraction, selection, retention, development and utilization of people in organizations." Although this concept has been around since the 1940s, it was not until the 1970s that measurements associated with employees' behaviors were incorporated. Throughout the course of his book, Cascio introduces various formulas and theories for placing dollar values on various human resource activities.

In chapter one he postulates the plan of his book and moves on.

As his treatise expands, Mr. Cascio delves into the cost of employee turnover. Inherent in these costs are separation costs (encompassing exit interviews, severance pay, unemployment taxes), and replacement costs (advertising, interviewing, testing, travel and moving expenses, and training). Cascio presents a formula for getting some staggering figures. For this reader many of the expenses he outlines were thought of as given and written off, but in this book the cost of replacing employees can quickly reach six digits for a single company, depending on size.

Absenteeism and sick leave also account for staggering expenses absorbed by a company. Not only do many companies provide sick pay, which is nothing more than a salary outlay for no production, but the productivity of the other employees working in the area drops, costing the company decreased product output.

Smoking on the job costs the company in high health insurance premiums, absenteeism, mortality and replacement, property damage, employee morale as well as on-the-job time loss. Again the figures are stupefying.

In Part I, Cascio develops an apparatus for costly employee attitudes. He presents three models:

1. human asset valuation
2. unit cost approach
3. behavior cost approach

Each attempts to place an employee's ability to perform on a scale and compare it with an average. Cascio backs up the validity of such approaches with brief case studies.

Another cost that must be absorbed by a company is the economic impact of a labor contract and the compensation package it presents for its constituency.

Part III discusses personnel programs and their inherent costs. Cascio states: "Personnel programs often have been selected and implemented because they were fashionable or commercially appealing . . . ." He continues to say that personnel program executives, because of the high cost of their plans, are having to justify its validity on the ledgers. Throughout this section the reader is compelled to examine several utility models that present concepts and postulate formulas for "increasing the odds" for better staff selections and heightened job performance.

The cost and benefits of human resource development programs was the subject of Cascio's final consideration. In this section one is asked to consider if it is indeed worthwhile to invest in programs to train, change, and eliminate costly human behaviors and personnel activities.

Costing Human Resources: The Financial Impact of Behavior in Organizations is an eye-opening book for those who have little exposure to the activities of a company's personnel office or for someone not familiar with human resource management. It is thought provoking and at times mind boggling. The general construction of the volume makes it very suitable for training purposes. It comes complete with exercises at the end of each chapter so that the reader can work through what the author has presented in the text.

However, at times the reading was laborious and somewhat difficult. Cascio reduces everything down to a number in a formula or a percentage on an effectiveness scale. The concept is fine for reports and audits, but perhaps too cut and dry when dealing with the subject at hand: human resources.

The text as a whole was well written, quite enlightening, and very well documented. It should be considered required reading for any manager dependent on the effectiveness of his company's most precious commodity, its employees.

—Douglas W. Cooper
Assistant Director of Residence Hall Facilities
Montclair State College
Upper Montclair, New Jersey

Effective Management

The Effective Management of Technology, by Sushil K. Bhalla, Massachusetts: Addison-Wesley Publishing Co., 1987. 200 pp.

While technological advancements continue to improve the quality of life, it is not without costs and societal risks. Technology is ambivalent, because it is both friend and foe. The good technology that provides better things can be effectively managed and integrated with successful business practices.

This book presents a succinct 200-page survey on the management of technology. It begins with an introduction to business and portfolio planning concepts that are commonly known as long range planning techniques. The author presents a summary of historical technological events that resulted during and after World War II when European scientists and technicians emigrated to the United States. President Roosevelt encouraged use of the newly acquired talents that resulted in tremendous technological involvements in the 1950s and 1960s. Vannevar Bush, director of the Office of Scientific Research and Development, advanced a philosophy that scientific progress on broad fronts results from free play of free intellects working on subjects of their own choice motivated by their curiosity for an explanation of the unknown. This is the science-technology technique or "push" model. In the 1960s and 1970s, the "market pull" model emerged because social-economic needs dictated basic research efforts.

Following the historical summary is a discussion of strategic planning techniques developed by consulting firms in the early 1980s. The consultants recognized that strategic planning of technology is a challenging process needing commitment from top management. This should include support for continuing education programs for technical and business professionals. Several key concepts are examined such as management's perception of and responsibility for technology.

The author presents an agenda of technology forecasting techniques. The key to successful technology forecasting involves an appreciation of the holistic environments in which technology operates the dynamic societal forces. This section will give the reader many concepts to think about in relation to technology, social, political, economic, environmental, ecological and competitive forces.

One concept is that the technologist must understand the business and top management's role. The technologist will find continuing education programs in arts and business techniques helpful in understanding the dynamic forces in which technology strives. Finally, the concepts are presented for integrating technology with business planning and how top management can design an architectural framework for strategic planning. I would recommended this book to physical plant administrators, facilities managers and engineers who strive to integrate professional resources. Although the author did not distinguish between good and bad technologies, the reader should be aware of the ambivalent nature of technology.

—J.J. Lettiere
Director, Management & Systems Engineering
Pennsylvania State University
University Park, Pennsylvania

Learning Organization

The Learning Organization and the Need for Directors Who Think, by Bob Garratt. England: Gower Publishing Company Ltd., 1987. 141pp. $38.95, hardcover.

The Learning Organization by Bob Garratt is an extremely interesting analysis of the perennial question of why the organization doesn't run as it should. Garratt's approach is different, well intended, and feasible. As such, I would recommend the book for people interested in management functions and for those wondering what is wrong with their organization or their director.

Garratt argues "that organizations can only become effective if the people selected to run them are capable of two key skills - learning continuously and giving direction." He contends that "most of the people at the top of organizations have not been trained in, and are uncomfortable with, giving directions to their organization."

The book is divided into two parts. The first part (Reflections and Concepts) addresses the issue of giving direction; part two (Experiments and Action) discusses the procedures for learning continuously.

Section 1.1: "What is the Problem?" suggests that directors grow up in the specialized environment of modern management as specialists and when given a directorship are not really prepared for a generalists role. Further, they are not transitioned into their new role, but rather are simply given the reins. Thus, often, new directors suffer from insecurity, stress, and, in the eyes of their subordinates, verification "of the Peter Principle — that people are promoted to the level of incompetence in organizations."

Section 1.3 "What Can Be Done?" observes that the issues needed to be addressed to achieve a more effective and efficient organization are easy to identify, but more difficult to achieve. This chapter is perhaps one of the most instructive in the book and tends to encourage a deeper appreciation of the author's experience and knowledge on the subject of management and of the problem of directorship.

Section 2.1 "How Do We Get There?" contains "a synopsis of maps, tools, and processes which have proven effective in helping to develop both the thinking and behavior necessary to take up the roles outlined in the learning organization model." The section then develops the how-to's of creating conditions for organizational learning, thinking processes, criteria for selecting directors, management teams, and other issues all designed to enhance the creation of the learning organization. This section may be too involved for the general-interest reader though it is easily read. The models and concepts presented are on-target and thought provoking. The problem I had with it, however, is that it is written for consumption by top echelon persons (presidents, vice presidents, board members, etc.) or serious students of management.

As I suggested at the start, this book addresses an aspect of management from a different perspective. It does so very well and encourages the reader to think about his or her organization and how it is being operated. Individuals with goals of becoming top managers or board members will want a copy of this book for reading and constant reference. For others and physical plant directors, I would suggest the book be added to their reading list. Its 140 pages are read easily, rapidly, and provide enough new ideas to make the expenditure of time worthwhile.

—**Gary Kent**
Assistant Director, Physical Plant
SUNY College at Buffalo
Buffalo, New York

In Brief

Asphalt

Introduction to Asphalt is a 66-page overview of the uses of asphalt and how it is manufactured. It includes an extensive glossary. Approximately 75 percent of the book deals with tests used to rate the major properties of asphalt such as viscosity, consistency, etc.

A Basic Asphalt Emulsion Manual describes the difference between asphalt emulsions and solvents, how emulsions are manufactured, and proper application of emulsions in pavement maintenance. The authors devote several chapters to a technical and detailed discussion on the test methods that can be used to select the proper emulsified asphalt mix. This book may be useful to specialists heavily involved in asphalt maintenance; however, it is too detailed and specialized for most facility managers.

Asphalt in Pavement Maintenance is a manual for those directly involved in pavement maintenance. The authors review principle terms involved in asphalt, the most common defects and failures in asphalt pavements, and the primary causes of these failures. Pictures illustrate these conditions and the recommended way to repair them.

The authors describe the primary ways in which asphalt is used to maintain portland cement concrete pavements. They do not go into much detail about portland cement but concentrate on ways to repair concrete with asphalt. Various grades of asphalt and their uses and properties are addressed in more detail. Photographs of equipment used in asphalt maintenance are included.

This manual is a good overview of the principal causes of asphalt failures and defects and ways to repair them. It is compact, with only 125 pages, but is excellent for field personnel and managers who want to become more conversant with asphalt maintenance.

Calculating Pavement Costs is a pamphlet designed for estimators who prepare or evaluate projects involving pavement costs. It includes specific examples of how to calculate cost per square yard when given cost per ton or per cubic yard. It provides some useful tables that can be used to convert cost per ton to a cost per square yard by using a given pavement thickness.

All of these publications are available from The Asphalt Institute, Asphalt Institute Building, College Park, MD 20740; 301/277-4258.

—George F. Irving
Manager, Public Services
City of Irvine Public Services Department
Irvine, California

Utilities Conservation

A Review of Utility Conservation Programs for the Commercial Building Sector, prepared for the Department of Energy by Martin Marietta Energy Systems Oak Ridge National Laboratory, presents results of a survey of 26 utility conservation programs in the commercial building sector. Information on four types of conservation is presented: financial incentive programs; energy service programs; rate research and incentive programs; and case studies and demonstration studies. Results are summarized in terms of type of program, program history, marketing strategies, program motivation, system load effects and goals, and active or planned evaluation activities. The book is available from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161. ■

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