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
"Why didn’t I know about Burns & McDonnell years ago?"

To be perfectly honest, we’ve been around a long time, but just haven’t made a lot of noise. Burns & McDonnell has been providing study, design, and project management services for colleges, universities and institutions for over 60 years.

We’ve been quietly designing projects like two 170,000 lb/hr circulating fluidized bed boilers at Iowa State University, and upgrading physical plant controls and improving speciality laboratories at the University of Missouri. We design distribution systems for chilled water, hot water and steam, and electrical distribution systems too.

So for your next project -- new construction, retrofit or expansion -- call Bob McKenzie or Ken Clark at Burns & McDonnell. We know our way around the campus.
## Facilities Manager

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

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

## Table of Contents

### Features

- **The American Campus as a Work of Art and Utility**
  by Werner K. Sensbach ........................................... 14

- **University Facilities and Equipment: Inseparable Assets, Potential Liabilities**
  by Jack Hug .......................................................... 20

- **Underground Storage Tanks: The New National Rules**
  by Joseph R. Schuh ................................................. 26

- **Index to Facilities Manager, Volume 4, 1988** .......................... 33

### Departments

- **APPA Update** ...................................................... 3
  - Inside APPA .................................................. 4
  - Job Corner .................................................... 5
  - 76th Annual Meeting Preview .................................... 8
  - Coming Events .................................................. 12

- **Resource Management** ........................................... 37
  by Stephanie Gretchen

- **Data Base Update** ............................................... 38
  by Howard Millman

- **The Bookshelf** ................................................ 40
  - Reviewed in this issue
    - Costing Human Resources
    - The Effective Management of Technology
    - The Learning Organization

- **In Brief** .......................................................... 44

- **Index of Advertisers** ........................................ 44

---

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 recon- conditioning 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.
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 workplace-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 disastrous.”

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 choose. 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 initiate 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 Daigle 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, La Jolla, CA 92033; 619/534-0029.

CFC Alternatives

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.
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, 701/549-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 negotiated 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 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 twelve-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, 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

ASSOCIATE DIRECTOR PHYSICAL PLANT DEPARTMENT

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

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

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

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

Department of Human Resources
The University of Texas Medical Branch
Box 146, UTMB Substation 1
Galveston, Texas 77550.

UTMB is an Equal Opportunity Affirmative Action Employer. UTMB Hires Only Individuals Authorized to Work in the United States.
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 or electrical engineering, 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
BOE: AJIA/MF

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.
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 $41,000 to $61,500 with excellent benefits. To respond please send cover letter and resume postmarked to Berkeley Campus Personnel Office, Job #03-121-18, 2539 Channing Way, Berkeley, CA 94720. EOE/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 installation 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 26, 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.
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.
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 Kremelmeyer, 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 Gorder, Univ. of W. Ontario
  Phil Rector, Univ. of Arizona

- APPA Study—Castodial 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

ANNUAL MEETING

75TH ANNIVERSARY

EDUCATION SESSIONS

The educational presentations are identi-
ified 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:
  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 Kill & 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 of 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*
College students can be tough on lights, and replacing lighting fixtures can be brutal on a tight budget. So Dennis Palmer, who is in charge of numerous campus buildings, turned to Kenall quality and value for his "Peace of Mind."

The university uses Kenall exit lighting, exterior lights along sidewalks and building entrances, and interior lights in dormitory hallways and rooms. The university's first Kenall fixtures were installed in 1975, and performed exceedingly well.

As Palmer says, "We've never had a Kenall unit fail. We like their durability, reliability and low maintenance. When you put them up, you know they're going to last. It saves us the cost of sending someone out to repair or replace them. Our Kenall units have paid for themselves many times over."

For more information or a free product guide, call Kenall toll free at 1-800-634-5013.

GUARANTEE:
Kenall high abuse luminaires are designed and built to take exceptional physical punishment. When installed according to our instructions, Kenall will repair or replace any fixture rendered inoperable due to physical abuse within three years of purchase. Thereafter, Kenall will replace any refractor/diffuser broken during the life of the fixture free, subject to a handling charge equal to 25% of the published list price.
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 school's 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.

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 joint 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.

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

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


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.


May 14-17—Earthquake: An International Conference on Insuring and Managing the Inevitable. Honolulu, HI. Contact: Society of PCPU, 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 Hungford 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 24—Natural Gas Regulations. Washington, DC. Contact: Government Institutes, Inc., 966 Hungford 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.


APP A Videotape Closeout Sale!!!
Great Prices!
Limited Supplies!

<table>
<thead>
<tr>
<th>Title</th>
<th>1/2&quot;</th>
<th>3/4&quot;</th>
<th>Discount Price</th>
<th>Was</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fundamental Skills of Managing People</td>
<td>n/a</td>
<td>✓</td>
<td>$600</td>
<td>$900</td>
</tr>
<tr>
<td>Fundamental Skills of Communicating with People</td>
<td>✓</td>
<td>✓</td>
<td>$600</td>
<td>$900</td>
</tr>
<tr>
<td>Giving Orders and Instructions</td>
<td>✓</td>
<td>✓</td>
<td>$600</td>
<td>$900</td>
</tr>
<tr>
<td>Using Positive Discipline</td>
<td>✓</td>
<td>✓</td>
<td>$600</td>
<td>$900</td>
</tr>
<tr>
<td>Daily Carpet Maintenance</td>
<td>n/a</td>
<td>✓</td>
<td>$125</td>
<td>$190</td>
</tr>
<tr>
<td>Periodic Carpet Maintenance</td>
<td>n/a</td>
<td>✓</td>
<td>$125</td>
<td>$190</td>
</tr>
<tr>
<td>Resilient Floor Care, Part 1</td>
<td>✓</td>
<td>✓</td>
<td>$125</td>
<td>$190</td>
</tr>
<tr>
<td>Resilient Floor Care, Part 2</td>
<td>n/a</td>
<td>✓</td>
<td>$125</td>
<td>$190</td>
</tr>
<tr>
<td>Resilient Floor Care, Periodic Restoration</td>
<td>✓</td>
<td>✓</td>
<td>$125</td>
<td>$190</td>
</tr>
<tr>
<td>Pruning of Woody Plants</td>
<td>n/a</td>
<td>✓</td>
<td>$100</td>
<td>$150</td>
</tr>
<tr>
<td>Natural Gas Briefing</td>
<td>✓</td>
<td>n/a</td>
<td>$40</td>
<td>$65</td>
</tr>
<tr>
<td>Your Right to Know</td>
<td>✓</td>
<td>n/a</td>
<td>$20</td>
<td>$25</td>
</tr>
</tbody>
</table>

Special Bonus!!

With every order over $500, we will send you a surprise package of APPA publications worth $100. If your order is over $1,000, we will send you APPA's current Selected Resources publication package worth more than $200!

All orders final. Returns will not be accepted except for damaged products only. Be sure to specify tape size when ordering. Add $10 for shipping and handling. APPA members may use purchase order; all others must prepay.

Send your order to: APPA Publications
1446 Duke Street
Alexandria, Virginia 22314-3492

Telephone orders will not be accepted. All orders accepted on a first-come, first-served basis. Offer good as long as supplies last.

APP A
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 beneficent 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 prove 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 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 Colombian 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 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.

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 vocabulary 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...
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 Mediterranean 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-
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 regularity of form and function. This is thoughtfully developed, buildings as considered the spaces in which the visual play of light and shadow is affected by a pitched roof, the entrance hall, and the sense of shelter projected by a pitched roof, the sense of shelter projected by the "academic quad." The suggestion of employing many different landscape architects has led 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 beyond the university grounds. The ornamental campus landscaping is not carefully kept within bounds, it will quickly turn into an expensive maintenance liability. Thomas Jefferson's advice 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 pavior, 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 poured 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 an open 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 into an opportunity.
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. At 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
University Facilities and Equipment: Inseparable Assets, Potential Liabilities

by Jack Hug


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
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.”

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.

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 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.

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.
A great deal to be done 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 magnus 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. 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-intensive 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.

(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 comprehen-

---

**DON'T SPEND HOURS WITH HEAVY ROTO TURNING CABLES WHEN THE MUSTANG UNITS JETTER CAN HAVE YOUR DRAIN CLEANED IN MINUTES... EVEN SECONDS**

Fast! Jet washed clean! Lightweight power! Plug the jetter into a 110 volt outlet. Garden-hose-connect to a hot or cold water faucet. Insert the self-propelled jet hose with thruster into the drain line and turn the machine on! Watch as the steel-loud flexible, lightweight jetting line moves easily around several bends to blast through and make quick and easy work of sludge, grease, debris and ice.

**Simple To Operate.** **Superior To All Other Drain Cleaners.**

Visa/AMX/MasterCard


**Mustang Units Company, Inc.**

P.O. Box 29
120 North Scott Road, Eldridge, IA 52748

1 (800) 624-5934
1 (319) 285-7022

---

**TURNING CABLES**
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 magnets 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 reali-
cally 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 fact 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
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.

Retrofit Underground Pipelines

- Energy Savings
- Protects Against Corrosion

Gilsulate® 500 XR
For heat transfer calculations, energy savings potential, technical details and design assistance contact:

AMERICAN THERMAL PRODUCTS, INC.
P.O. BOX 1778, BONITA SPRINGS, FL. 33925 (800) 839-3881
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.
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.
- 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

- except pressurized piping within two years
- Replace or upgrade within ten years

Existing Petroleum Tank Systems
- Begin leak detection
  - for all systems within one to five years

Existing Petroleum Tank Systems
- Begin leak detection
  - for all systems within one to five 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—

NO MORE HIDE AND SEEK FOR BURIED PIPING LEAKS

- Accurately Locate Pipe Leaks
- Reduce System Downtime
- Minimize Repair Costs
- Eliminate Unnecessary Excavation
- Prioritize Maintenance Schedule

PSS Piping Specialists accurately identify, locate and evaluate leaks in buried thermal distribution systems. Utilizing infrared, sonic, tracer gas, electronic mapping and coating discontinuity technologies. And certified technicians. Contact us today for additional information on all our available services, including preventive maintenance programs.
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 re-
sults, 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 oozes. Instead, you’ll get some warning from your monitoring devices or you’ll notice something wrong
when pumping your stored fluid that indicates a leak. If that is the case, double check your equipment; then, before reporting a leak; it could be a false alarm, a bad sensor, or faulty pump.
If you do see oozes, 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 uncontaminated material.
Notice that in this process you start cleanup actions immediately. This helps everyone, because the pollution

---

**1988 Roofing Contractor of the Year Award Winner**

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

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

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

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

**WILLIAM R. STEINMETZ, JR., Corporate Services Manager**

**MIDLAND ENGINEERING COMPANY, INC.**

52369 U.S. 33 North, P.O. Box 1019, South Bend, Indiana 46624

(219) 272-0200
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 cleanup 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.
ARTICLES

A Bibliography of Capital Renewal/Deferred Maintenance Resources, compiled by Steve Glazner
Celebrating APPA's First 75 Years, by Christy Wise
Choosing the Team for Major Physical Development Projects, by E.A. Dew
A Commitment to Professional Development, by Beth A. Rosenfeld
Deferred Maintenance: A Rose By Any Other Name, by Pieter van der Hame
Facilities and the Academic Mission, by Ernest L. Boyer
Higher Education's Ticking Time Bomb (Perspective), by Walter A. Schaw
Home Made Energy Management System: A Do-It-Yourself Success Story, by Jim Hines
Index to Facilities Manager, Volume 3, 1987
Moving Up the Ladder: Facilities Managers Reach the Vice President Level, by Ruth E. Thaler
The 1988 Olympic Winter Games: The University of Calgary Involvement, by William S. Mutch
An Overview of New Energy Management Technologies, by W.L. Christy Jr., P.E.
A President's Commitment to Service and Education: An Interview With Dorsey Jacobs, by Ruth E. Thaler
Preventable Disasters: Spill Detection at Stanford's Center for Integrated Systems, by Renee Olivier Olsen
The Pursuit of Excellence in Facilities Management, by Beth A. Rosenfeld
Value Analysis of Competitive Design and Build Tenders, by E.A. Dew

AUTHORS

Boyer, Ernest L. Facilities and the Academic Mission.
Dews, E.A. Choosing the Team for Major Physical Development Projects.
Glazner, Steve, A Bibliography of Capital Renewal/Deferred Maintenance Resources.
Rosenfeld, Beth A. A Commitment to Professional Development.
Thaler, Ruth E. Moving Up the Ladder: Facilities Managers Reach the Vice President Level.
van der Have, Pieter. Deferred Maintenance: A Rose By Any Other Name.
Wise, Christy. Celebrating APPA's First 75 Years.

BOOK REVIEWS

Beyond Time Management: Organizing the Organization, by Jane Elizabeth Allen (reviewed by Donald L. Mackel)
Design Engineering Project Maintenance: A Reference, by Joseph R. Hilton Jr. (reviewed by Gregory W. Bressler)
The Empowered Manager: Positive Political Skills at Work, by Peter Block (reviewed by Barbara Pluta)
Financial Management of Colleges and Universities, by NACUBO (reviewed by Charles C. Fusco)
Hazardous Waste Management, ed. by Dominiguez & Bartlett (reviewed by Gary Kent)
Hazardous Waste Management at Educational Institutions, by NACUBO (reviewed by Gary Kent)
High Tech Real Estate, ed. by Sugarman, Lipman, & Cushman (reviewed by Mohammad H. Qayoumi)
Integration of Efficient Design Technologies, ed. by F. William Payne (reviewed by Gregory W. Bressler)
Management for Supervisors, by Preston & Zimmerman (reviewed by Rick J. Beal)
Mechanical and Electrical Equipment for Buildings, by McGuinness, Stein, & Reynolds (reviewed by Rick J. Beal)
Professionalizing the Organization: Reducing Bureaucracy to Enhance Effectiveness, by Gay Benveniste (reviewed by Joe M. Cannon)
“American Norit, part of a leading worldwide 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.

“We have found MAPCON II to be...
BOOK REVIEWERS

Beal, Rick J. (Management for Supervisors).......
Bressler, Gregory W. (Design Engineering Project Management)
Cannon, Joe M. (Professionalizing the Organization)
Cross, Gene B. (The Subjective Side of Strategy Making)
Frey, Mary (Trends in Technology Transfer at Universities)
Fusco, Charles C. (Financial Management of Colleges and Universities)
Kent, Gary H. (Hazardous Waste Management)...

OTHER BOOKS

Spring 1989

SPRING 1989

FACILITIES MANAGER

The Subjective Side of Strategy Making: Future Orientations and Perceptions of Executives, by T.K. Das (reviewed by Gene B. Cross)
Take the Road to Creativity and Get Off Your Dead End, by David Campbell (reviewed by Thomas R. Wray)
Trends in Technology Transfer at Universities: A Report of the Clearinghouse on University-Industry Relations, by Association of American Universities (reviewed by Mary Frey)
Whatever It Takes: Decision Makers at Work, by McCall & Kaplan (reviewed by Gary H. Kent)

BOOK REVIEWERS

Beal, Rick J. (Management for Supervisors)
Bressler, Gregory W. (Design Engineering Project Management)
Cannon, Joe M. (Professionalizing the Organization)
Cross, Gene B. (The Subjective Side of Strategy Making)
Frey, Mary (Trends in Technology Transfer at Universities)
Fusco, Charles C. (Financial Management of Colleges and Universities)
Kent, Gary H. (Hazardous Waste Management)...
A recent nationwide survey has found that there exists a potential price tag of between $60 and $70 billion in capital renewal and replacement costs for decaying college and university facilities. Consistent policies of deferring expenditures for maintenance and repair have created an immediate need of $20 billion for renewal and repair of campus buildings, equipment, and utilities.

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

terred 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 recapitulates, 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 streamlined regular office work. As well as running a commercial maintenance program. COMAC.

COMAC is a combination software and (IBM) hardware package for scheduling routine maintenance. 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. Exercising 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 win in 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 IC-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 newly computerized 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-
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 use primarily for maintaining engineering and construction record drawings.

Bill's staff received some gradual exposure and training before they were expected to use the 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 faculty 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 maintenance 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 Peppard, Les had more than his share of start-up problems. It required nearly a year to get the system fully up and running. Les attributes that mostly to bad timing. No sooner than their system 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 keeping 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 added—while keeping the peace.
Human Resources


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 incurred 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 the employees can quickly reach six digits for a single company, depending on size.

Absence 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, absences, mortality and replacement, property damage, employee morale as well as on-the-job time loss. Again the figures are stupifying.

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 ledger. 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 every 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


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, along 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. With the introduction 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 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 recommend 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 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 generalized 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

---

**Energy Savings To A Higher Degree.**

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

**Our energy analysis:**

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

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

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

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

Kenwood High School, Baltimore County School District

The fiberboard insulation in this school’s original 1953 roof was completely saturated with water in some sections—a total reroofing was required. Since PC PLUSYSTEMS had previously proved successful in other Baltimore Schools, PC PLUSYSTEM 1, the All-FOAMGLAS® system—the only insulation on the market resistant to moisture in both liquid and vapor forms—was selected for Kenwood.

The over-110,000 ft² of FOAMGLAS® insulation is providing Baltimore school officials with energy savings, reduced maintenance costs, the security of total noncombustibility, and dimensional stability which will add years of efficient performance to the entire roof.

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

Hertz Hall, Central Washington University

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

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

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

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

Physical Education Building, Westchester Community College, Valhalla, NY

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

This State University of New York (SUNY) building required reroofing over both its gymnasium and natatorium. Membrane cracks had developed and severe ponding and leaking were occurring.

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

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

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

For copies of Case Studies on the three facilities, or more information, call (412) 327-6100, Extension 356. Or write Pittsburgh Corning Corporation, Marketing Department FB-9, 800 Presque Isle Drive, Pittsburgh, PA 15239. In Canada, 106-6 Lansing Square, Willowdale, Ontario M2J 1T5, Tel: (416) 222-8084.
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.

In Brief

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 Manetta 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.

Index of Advertisers

American Thermal Products ... 25
Applied Management Engineering ... 42
APPA ... 13, 36
Burns & McDonnell ... cover 2
DFM Business Systems, Inc. ... 34
The George B. Wright Company ... cover 3
In-Site ... 35
Intergy, Inc. ... 30
Kenall Manufacturing ... 11
Midland Engineering Company ... 31
Mustang Units Company, Inc. ... 23
National Energy Management Institute ... 41
Neles-Jamesbury ... cover 4
Page Aluminized Steel Corporation ... 39
Pittsburgh Corning ... 43
Recoveries Corporation ... 24
Sega Inc. ... 32
Selkirk Wood Industries ... 42
Topog-E Gaskets ... 44
Unison ... 2
VIDEO TAPES ON SUPERVISORY TRAINING AND DEVELOPMENT

THE SUPERVISORS BASICS

1 Leadership Principles for the Frontline Supervisor
   Most Supervisors come up "through the ranks." This tape will provide Supervisors with an excellent foundation from which to lead and direct others.

2 The Supervisor as a Communicator
   This tape will help Supervisors understand the importance of communication and, more importantly, help them develop their skills as a Communicator.

3 An Organized Department Means Motivation
   What motivates employees? What is the role of the Supervisor? These questions and many others are answered in this very important tape.

4 Employee Evaluations
   Most Supervisors dread employee evaluations. Indeed they can be tough but they are also very important. This presentation will help Supervisors view employee evaluations in a more positive light.

FUNCTIONS OF A SUPERVISOR'S JOB

5 Customer Relations
   Many Supervisors have never viewed customer relations as part of their job. This tape helps the Supervisor realize the value of establishing and maintaining good customer relations.

6 Training in Facilities Management
   A good training program will find the Supervisor involved in all of it. The more a Supervisor trains others, the more he/she learns.

7 Physical Plant Yesterday vs. Today
   A tracing of evolutionary development in the Facilities Management (Physical Plant) world. These changes impact the Supervisor's world.

8 You Must Get the Work Done Through Others
   The Supervisor must multiply himself/herself through others. He/she cannot do the job alone. This tape lists obstacles the Supervisor faces in getting the work done, and suggests actions to take to overcome these obstacles.

ORDER FORM—VIDEO TAPES

<table>
<thead>
<tr>
<th>1/2&quot; VHS</th>
<th>TAPE SIZE</th>
<th>TAPE</th>
<th>PRICE</th>
<th>QTY.</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1/2&quot; BETA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3/4&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>□</td>
<td>□</td>
<td>□</td>
<td>$195.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□</td>
<td>□</td>
<td>□</td>
<td>$195.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□</td>
<td>□</td>
<td>□</td>
<td>$195.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□</td>
<td>□</td>
<td>□</td>
<td>$195.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□</td>
<td>□</td>
<td>□</td>
<td>$195.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□</td>
<td>□</td>
<td>□</td>
<td>$195.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□</td>
<td>□</td>
<td>□</td>
<td>$195.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□</td>
<td>□</td>
<td>□</td>
<td>$195.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5% DISCOUNT for purchasing any 4 tapes MINUS $39.00
10% DISCOUNT for purchasing all 8 tapes MINUS $156.00

□ Payment Enclosed □ Purchase Order # GRAND TOTAL

GRAND TOTAL

Make checks payable to George B. Wright Company

SEND TO:

Name
Address
City State Zip Code

Return Form to:
The George B. Wright Company
c/o APPA Publications
1446 Duke Street, Alexandria, VA 22314-3432

Guaranteed Insured Delivery
Postage & Handling Included
PAY FOR THE STEAM YOU USE, NOT THE STEAM YOU LOSE.

It's simple economics. Valves that leak or freeze in position can cost a bundle.

But with Neles-Jamesbury steam generation and distribution valves, you can drastically reduce lost steam and maintenance costs and see a big improvement in plant efficiency.

Neles-Jamesbury Wafer-Sphere® valves are not conventional butterfly valves. They come with our unique, positive sealing seat and shaft seals for tight shutoff and easy operation — even after extended periods in one position. They're also less expensive, more compact and easier to install and maintain than gate, globe or other conventional valves.

So find out why institutions across the country are switching to Neles-Jamesbury Wafer-Sphere® high-performance valves. Just complete and mail in the coupon and we'll send you our new brochure for educational institutions and hospitals.

Sure! Send me more information on Neles-Jamesbury Wafer-Sphere® steam system valves.

Neles-Jamesbury
640 Lincoln Street
Worcester, Mass. 01615-0004
(517) 852-0200

NELES-JAMESBURY