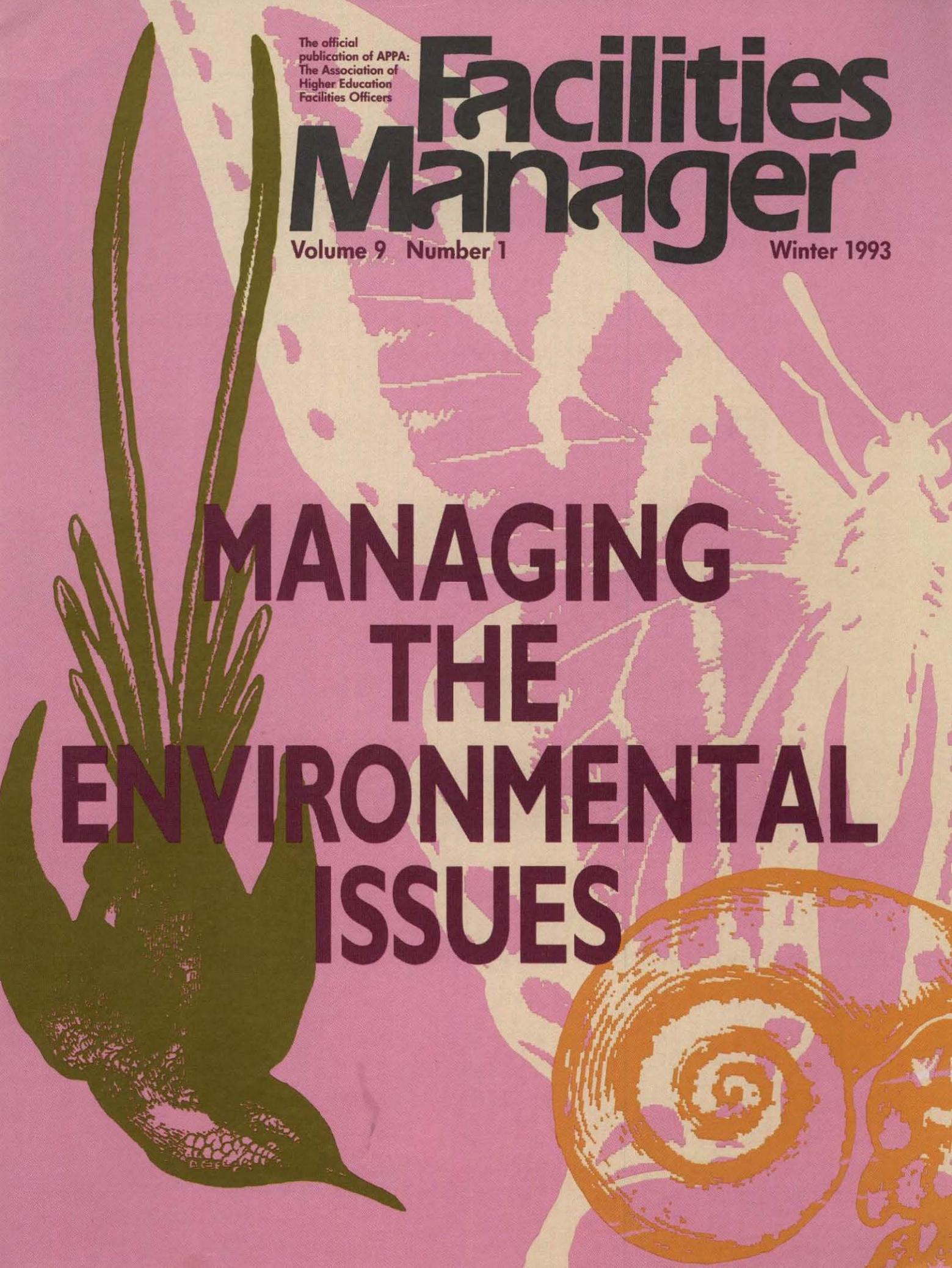
The official publication of APPA: The Association of Higher Education Facilities Officers

Facilities Manager

Volume 9 Number 1 Winter 1993

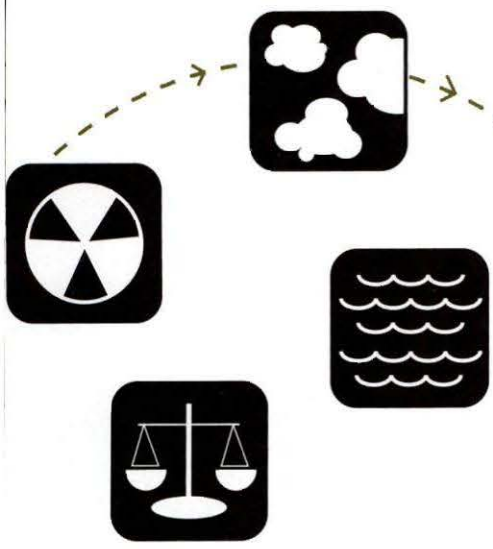
MANAGING THE ENVIRONMENTAL ISSUES



The official publication of APPA: The Association of Higher Education Facilities Officers

Facilities Manager

VOLUME 9 NUMBER 1 WINTER 1993



Managing the Environmental Issues

by Mohammad H. Qayoumi

10

Cover design by Sherrie Good

FEATURES

12 **Managing the Complex Matrix of Environmental Regulations**
by Elizabeth Stowe

18 **Air Pollution Compliance Strategies for the '90s**
by Joseph W. Hower

22 **Federal Wastewater and Stormwater Regulations**
by Robert Charbonneau

28 **Environmental Laws and Facilities Management**
by Richard M. Engle

32 **1992 Index**
by Steve Glazner

DEPARTMENTS

From The Editor 3

APPA News 4
- Denison Receives $6.1 Million for New Building
- Finance Institute A Hit
- Rightsizing Task Force To Survey Members
- CFC Task Force

The Environment 7
by Stephanie Gretchen

Focus on Management 9
by Sigmund G. Ginsburg

APPA Answers 37
by Maxine Mauldin

Global Exchange 38
by Lex Switzer

Data Base Update 40
by Howard Millman

The Bookshelf 44
Reviewed in this issue:
- Earth in the Balance
- The Indoor Air Quality Reference Guide
- Testing and Balancing HVAC Air and Water Systems
- A Guide for Building and Facility Automation Systems

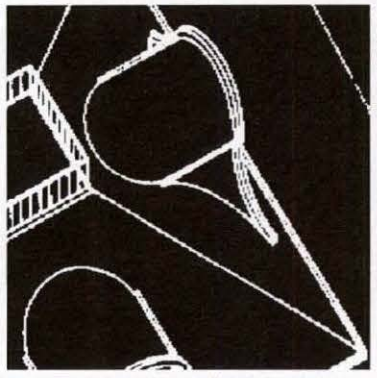
Job Corner 49

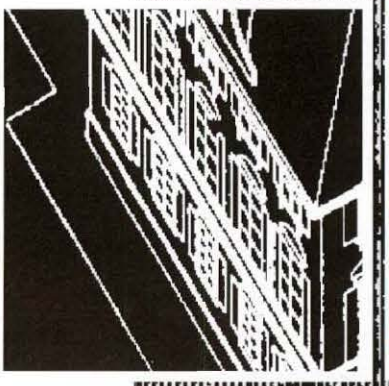
Coming Events 51

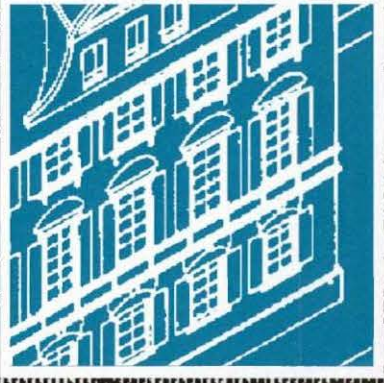
Index of Advertisers 51

Printed on recycled paper

engineered solutions







Facility Engineering and Management

Facility Condition Analysis

Elevator Systems Analysis

Infrastructure; Utility Analysis

Energy Systems; Evaluation and Design

Power Plant; Cogeneration Analysis

Operations and Maintenance Analysis

Construction Management

Deferred Maintenance / Capital Renewal Management

ISES

ISES CORPORATION

Intelligent Systems & Engineering Services

Lake Lucerne Office Park / Suite 1A / 4615 Highway 78 / Lilburn, Georgia 30247
Telephone: (404) 985-8651 / Facsimile: (404) 985-6327

Facilities Manager

EDITOR: Steve Glazner
ASSOCIATE EDITOR: Stephanie Gretchen
ADVERTISING: Diana L. Tringali
SUBSCRIPTIONS: Cotrenia Aytch
ART DIRECTION/TYPOGRAPHY: Chronicle Type & Design
PRINTING: Good Printers
EDITORIAL OFFICE: 703-684-1446
FAX: 703-549-2772
BITNET: APPA@BITNIC.BITNET

Facilities Manager (ISSN 0882-7249) is published quarterly (Winter, Spring, Summer, Fall) by APPA: The Association of Higher Education Facilities Officers, 1446 Duke Street, Alexandria, Virginia 22314-3492. Editorial contributions are welcome and should be sent to this address.

Of APPA's annual membership dues, $30 pays for the subscription to ***Facilities Manager*** and ***APPA Newsletter.*** Additional annual subscriptions for both periodicals cost $40 ($50 for non U.S. addresses). For information on rates and deadlines for display and classified advertising, telephone 703-684-1446.

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

From The Editor

Steve Glazner

In 1985 *Facilities Manager* published only one article, on asbestos control technology, on any topic related to the environment. The proliferation of regulations, the accompanying threat and reality of heavy fines, greater accountability of users and disposers of certain materials, and an increased awareness and concern for the health of our planet have all contributed to the several dozen environmental articles, reviews, and announcements that have since appeared in the magazine.

This issue of *Facilities Manager* begins our ninth year of publication with the special theme, "Managing the Environmental Issues." Produced in tandem with the special program at APPA's Institute for Facilities Management this January, virtually all of the magazine's features and departments address some aspect of the environmental/regulatory concerns affecting facilities managers today. Elizabeth Stowe, Joe Hower, Bob Charbonneau, and Dick Engle each present valuable information and specific advice on the topics of hazardous waste management, air quality, water quality, and environmental laws, respectively. Stowe also discusses the importance of conducting an environmental audit as part of a comprehensive compliance program.

Two individuals require special mention for their tremendous contributions not only to this issue of the magazine, but to the enhanced environmental knowledge base that APPA provides to its members.

Mohammad Qayoumi of San Jose State University continues to amaze us with his boundless energy and tireless pursuit of a better world through resource management, energy conservation, and environmental caretaking. Mo coordinated the special Institute program and served as our field editor for the four feature articles in this issue. With his introductory article and a book review on Vice President Gore's recent book, Mo brings to ten the number of features, and to five the number of book reviews, that he has written for *Facilities Manager*. He is the magazine's most prolific author and has supported and cajoled us from the beginning.

Stephanie Gretchen served as editor on this special theme issue of the magazine. She worked closely with Mo Qayoumi and the other authors, including the column writers. For instance, you will find a review of environmental software in Data Base Update and a list of environmental books and articles in APPA Answers.

Upon joining APPA four years ago, Stephanie immediately informed us that APPA was not doing enough to keep our members abreast of the constantly changing environmental regulations that were already having a major impact on colleges and universities. She created and writes The Environment, a monthly column that provides readers with compliance dates, upcoming legislation, news and ideas from member institutions, and additional training or information resources. *Facilities Manager*, *APPA Newsletter*, and many of APPA's promotional brochures are now printed on recycled paper, thanks to Stephanie.

Keep in mind that APPA's Regulatory Compliance Seminar will take place February 18-19 in Arlington, Virginia. Contact the Educational Programs Department for more information.

Finally, we are conducting a readership survey of *Facilities Manager* and *APPA Newsletter*, and we ask for your feedback and advice. Once you receive the survey in the mail, please respond promptly. Your answers will help us plan the periodicals to be more valuable to you and your institution. Thank you in advance for your participation. ■

APPA News

College Frosh Stats

HEATH Resource Center published *College Freshmen with Disabilities: A Statistical Profile* last fall. This booklet contains data on the change over time in the participation of students with disabilities in postsecondary education. The study reports on the 1.6 million full-time, first-time freshmen attending more than 3,100 higher education institutions.

In 1991, one in eleven first-year college students reported having a disability. That is up from one in thirty-eight in 1978. *Profile* also states that sight and learning were the most common disabilities identified. The publication costs $10. For a copy, send a check to American Council on Education, Department FD, One Dupont Circle, Washington, DC 20036.

Renewable Energy Source Saves $ for Southeast Asia

Southeast Asia is not only solving problems with one solution, but it is saving $2 billion a year to boot—and the Asian Institute of Techology (an APPA member) is involved. According to the August 1992 issue of *Asian Energy News* rice husks, coconut shells, palm oil, wood residues, and sugar cane bagasse are some of the agricultural waste that could provide up to a third of the energy needs of the region's industries in the next five years. Ludovic Lacrosse of AIT is quoted as saying, "Southeast Asian nations will save about $2 billion a year in oil imports by fully utilizing biomass residues, which already provide 20 percent of the energy consumption in industries."

AIT coordinates a program between the Commission of the European Communities and the ASEAN that works to speed up the process of implementing this technology for heat or power generation.

Denison Receives $6.1 Million for New Building

Denison University received a $6.1 million grant from the F.W. Olin Foundation to build and equip a mathematical and physical sciences building. This is the largest gift ever received by the college. Ground-breaking is to begin June 1993. The design of the new building reflects new emphases placed on how to teach science effectively. A large amount of space is devoted to areas for individual student research, and laboratories are configured to encourage student-faculty interaction. The building will provide about 44,500 square feet including classrooms, labs, faculty offices, student study space, and a planetarium.

Good ADA Contact

William J. Sharp, director of physical plant at Denison University, suggests the Great Lakes Disability and Business Technical Assistance Center as a good source of ADA information. Their address is University of Illinois/Chicago, 1640 West Roosevelt Road, Chicago, IL 60608; 800/729-8275. Their ADA compliance checklist for existing facilities costs $1, and the Title III Technical Assistance Manual costs $3.

Getz in Cleaning Management

Robert Getz, associate director of physical plant at the University of Illinois/Chicago, was quoted in the October issue of *Cleaning Management* magazine's "In-House Budgeting Tips" article. Getz suggested managers schedule some projects late in the fiscal year. This way if that year's budget is exceeded, the shortfall can be made up by rolling over year-end projects into the early part of the following year.

Endowments Rise

According to the 1992 National Association of College and University Business Officers' Endowment Study (NES), the average return of 12.7 percent on a college or university endowment is a strong improvement over last year's average of 7.4 percent. For more information on NES, contact NACUBO, One Dupont Circle, Suite 500, Washington, DC 20036-1176.

UI Facilities Creates Press Kit for Its Customers

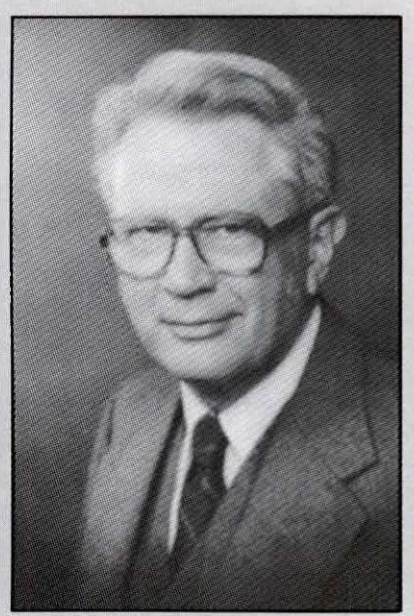
The University of Idaho Facilities Management Department has created its own press kit of sorts. The department printed a service guide complete with a directory of phone numbers; an

John Sweitzer Dies

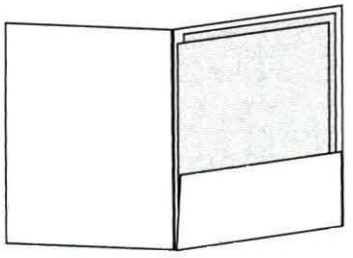
John H. Sweitzer, 75, a member of APPA since the late-1940s, died on September 18, 1992, in Richmond, Indiana. Sweitzer served as APPA Secretary from 1959 until his retirement in 1983. He received APPA's Meritorious Service Award in 1979.

Sweitzer worked as superintendent of buildings and grounds at Fisk University from 1946 to 1952, when he went to Earlham College as manager of physical plant and purchasing. He worked there until his retirement in 1983.

Sweitzer's family has requested that friends may make memorial contributions in his name to Earlham College, Richmond, IN 47374, or to the American Friends Service Committee, 1501 Cherry Street, Philadelphia, PA 19102.



organization chart; mission statement; background information on the work order system, facilities business administration, grounds maintenance, university events management, arboreta



management, utilities and plant engineering, recycling, zone maintenance, and shops, and more. It's a great way to make yourself more accessible to your customers.

Finance Institute A Hit

The third annual Institute for Facilities Finance, held November 15-17 in Washington, DC, was a great success once again. The fifty-six attendees heard speakers discuss facilities as a capital asset, models for facilities financial planning in tough times, privatization, accounting issues affecting facilities, new capital improvement options, funding sources for institutions, and make-buy options. Benjamin Quillian, vice president for administration at Southern Illinois University/Edwardsville spoke about strategic planning for facilities in austere times. Dr. Donald N. Langenberg, chancellor of the University of Maryland System, was the keynote address. He spoke on Hard Choices in Tough Times.

Attendees comments included, "Issues dealing with capital renewal helped broaden my understanding of the issues impacting facility operation"; "Sharing information with peers on problems they are experiencing and solutions was most beneficial."

Rightsizing Task Force to Survey Members

APPA President Donald Mackel asked a group of APPA members to form a Rightsizing Task Force that would survey the membership and literature for ideas and methodologies suitable for the development of alternative strategies for the effective restructuring of organizational, fiscal, service, and spatial resources; identify alternative strategies, their usefulness, and consequences; and develop a downsizing/rightsizing process model.

This task force will be polling selected institutions in the near future, and they appreciate your help in making their task a little easier.

The task force members are Chair Fred Klee, Ursinus College (PA); Scott Charmack, California State University/Long Beach; Dean Fredericks, SUNY/Buffalo; Patrick Lawlor, Virginia Commonwealth University; Ed Naretto, Cal Poly State University; Pieter van der Have, University of Utah.

From the APPA Committee for CFC Strategies and Alternatives

President Donald Mackel recently appointed a committee whose charge is to identify and evaluate CFC (chlorofluorcarbon) strategies and make recommendations. The Clean Air Act has brought yet another challenge to higher education. Recent federal regulations involving CFCs necessitate additional planning to obtain compliance with these regulations, and this committee will make recommendations to APPA's membership on working with these new laws. Members of this committee are: *Chair*, Dorsey Jacobs, West Virginia University; Martin Altschul, University of Virginia; John Houck, Oklahoma State University; Bob Nestle, Michigan State University; Mo Qayoumi, San Jose State University; Ted Weidner, Illinois State University; and Gary Reynolds, Iowa State University.

Our committee has been quite active these past few months. Information has been requested from industry to determine what they have available; we have solicited information from other member schools; and we have worked with various groups to obtain the most current data available on this critical issue. At this point, our initial goal is to develop a standard Mechanical Equipment Inventory Form. This form could be utilized for identifying all equipment data necessary for making required changes. The information provided on this form will also be useful in determining priorities and making computer data adaptable for other purposes (inventory, maintenance, scheduling, etc.). We plan to have this ready for distribution in the near future for use as Phase I of a CFC Refrigerant Change-Over Program.

Second, the committee will review various ideas and methodologies suitable for development. For example, 1) what are the advantages of the purchase of manifolding as opposed to changing-out CFCs; 2) what are the advantages of absorptions versus centrifugals; 3) are there new gases on the horizon; and 4) what could be the effects of possible new gases on current mechanical equipment systems.

The package to be sent to members will include information on the laws and regulations, pertinent data that will provide a clear overview, and a decision-process model.

In closing, I want to encourage input from every member. Your suggestions and ideas are welcome. You may send them directly to me at: West Virginia University, Physical Plant, P.O. Box 6570, Morgantown, WV 26506-6570; or feel free to contact any of the members on the committee for advice and assistance.

by Dorsey D. Jacobs, Chair
Director of Physical Plant
West Virginia University
Morgantown, West Virginia

SPECIAL ANNOUNCEMENT
Sixth Annual College/University DHC Conference

Wednesday-Friday, February 24-26, 1993
Omni Europa Hotel
University of North Carolina, Chapel Hill, NC

Sponsored by: International District Heating and Cooling Association

This workshop is for those college/university professionals who operate or are considering installation of a district heating or cooling system. The technical sessions will focus on primary problems and solutions applicable to a campus environment. The conference will encourage the participation of all of the attendees.

The following are some of the topics to be covered:

- Chilled Water Thermal Storage (Cornell University)
- Design Considerations for Chilled Water Storage Systems
- Utility Weighting Study: Indirect Cost Recovery
- Long Range Utility Master Planning
- Cooling Towers: The Overlooked Energy Conservation Profit Center
- Pre-operational Cleaning of New Piping Systems
- CFC Roundtable Discussion
- Steam Distribution (Dartmouth College and the University of North Carolina)

**Special Bonus: The Non-Member rate includes a trial membership in IDHCA through the end of the Association's 1993 fiscal year.

For more information or to register contact: IDHCA, 1101 Connecticut Avenue, NW, Suite 700, Washington, D.C. 20036-4303. The telephone number of the IDHCA office is (202) 429-5111.

The Environment

Stephanie Gretchen

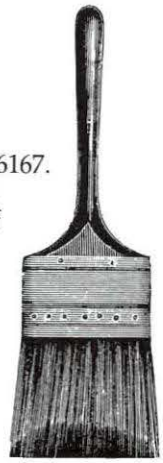
A new EPA pilot program aims to **ease the regulatory burden** on small entitites, according to the November 13 BNA *Environment Reporter*. Under the 1980 Regulatory Flexibility Act, regulatory flexibility analyses are required to minimize the impact of regulations on small businesses, small communities, or other small entities. If a rule is determined to have a large impact on the entity, regulatory compliance alternatives must be developed by the agency for such entities. The pilot program will give program offices model regulations that will help them determine how to conduct an analysis and what kinds of compliance alternatives might be provided to assist these entitites.

Last fall the EPA published *The Clean Air Act Amendments of 1990: A Guide for Small Businesses*. Many APPA members fall into the same categories as small businesses, and therefore, this publication may be helpful. The booklet includes an overview of the act, where to find help, an air pollution brief, federal and state responsibilities, types of air pollutants, key objectives of the **Clean Air Act**, clean air programs affecting small businesses (ground-level ozone, motor vehicle controls, toxic air pollutants, hazardous chemicals, operating permits), assistance programs, and more. For a copy write to EPA, Office of Small Businesses Ombudsman (A-149C), 401 M Street, S.W., Washington, DC 20460.

Stephanie Gretchen is APPA's communications manager and associate editor of Facilities Manager.

On October 29 then-President Bush signed into legislation a new title to the Toxic Substances Control Act that addresses **lead-based paint**. The bill (HR 5334) focuses on inspection and hazard reduction, especially in older buildings. The bill provides for training and accreditation programs.

The EPA was given two additional years to develop a **storm water permitting program** for small municipalities.



On October 31 President Bush signed HR 6167. According to Michael Cook, EPA's Office of Wastewater director, the extension "reduces the concerns that people had with phase II that [sewer systems serving fewer than 100,000 people] may be discharging without a permit."

On October 26, EPA promulgated the final rule to cut annual **sulfer dioxide emissions** by 10 million tons by the year 2010. This rule will also reduce the annual NO2 emissions. For more information, call EPA's Acid Rain Hotline at 617-674-7377. ■

Focus on Management

Sigmund G. Ginsburg

Know When You Don't Know

One of the best subordinates I have ever known was truly exceptional in ability, except for one thing: he didn't know when he didn't know. For him, it was an issue of pride and ego. He was confident that he knew everything about his area of responsibility down to the most minute technical matter. It took me some time, and many mistakes, before I learned that good as he was, there were some things his subordinates, and certainly outside experts, knew better.

As you climb the executive ladder, it is natural for you to have increasing confidence in your breadth and depth of detailed knowledge, analytical ability, judgment, and experience. But there is no shame in admitting that there are some aspects of a problem or decision that you need help with or about which you may know very little. Sometimes this lack of knowledge can be overcome by relying heavily on the advice of capable associates, colleagues, or outside experts.

Sometimes you may delay making a decision, hoping the problem will go away and, thus, your indecisiveness and lack of knowledge will not be displayed. (This will not work very often, and it still leaves you vulnerable.) Occasionally, you may have time to attend briefings, training courses, and read materials so that you gain some understanding of the area; but if it is a complex problem, you may not have the time, background, or inclination to become truly knowledgeable. If it is an area outside your general responsibilities, you may want to indicate that someone other than you should head the committee or assume the responsibility.

In general, the best approach in terms of your own lack of knowledge is to first admit to yourself that you don't know or understand the issue fully or at all. Then you can decide which type of positive action to take, rather than hoping that something will go away. This will depend upon the importance of the subject and the decision at hand, the time frame for making a decision, your schedule, your interest and knowledge base, the availability and capability of subordinates and outside consultants, and the availability of training. You have to decide to become broadly knowledgeable and, if it is important enough, considerably knowledgeable. If you have good staff and consultants, you can ask questions, beginning with, "I don't understand this. Will you please provide me with sufficient information so that I can grasp the issues?" You may want to bone up by exposure to basic background documents and then move on from there.

In regard to your subordinates, you should encourage a feeling that they should be honest with you in admitting when there are gaps in their own knowledge or ability. You need accuracy, thoroughness, and informed judgment rather than guesses or desperate reaching for any solution. You can help your subordinates, yourself, and the organization by drawing up training and development plans and allocating funds to meet the needs. This would help in a general sense, but when a particular issue comes up before the knowledge gap has been closed, honesty is again important.

You can offer to give the subordinate more time to get the information or knowledge, thus relieving some of the stress he or she may be having. On the other hand, if time is short, you may want to use a task force or problem-solving team approach, utilize other resources in the company or your unit, or employ outside consultants.

Knowing when you and others do not know something helps you avoid dangerous errors and points the way to areas where increased knowledge and experience are needed. It requires honesty and self confidence that says, "I don't know now, but I will manage to meet the issue, and I am capable enough to learn so that I can meet similar issues in the future." This approach allows you to strengthen your subordinates and yourself. You will be able to maintain as an important objective in your organization an emphasis on continued learning and growth and keeping current with new and future developments, techniques, and opportunities in your field and industry. ■

Sig Ginsburg is vice president for finance and administration at Barnard College and lecturer in management systems at Fordham University, both in New York City.

MANAGING THE ENVI

by Mohammad H. Qayoumi

Lester Brown, the president of the Worldwatch Institute, during a lecture at Stanford University in 1990, remarked that "People are seeing that the real threats are not military aggression, but environmental degradation. It is helping us redefine security." As a result of this paradigm shift, the environmental concern has gained a much higher priority in today's society. Clearly, the destruction of the ozone layer, the increase of acid rain, and continuing debates on global warming are international issues for which worldwide concepts are necessary. To underline the importance of the issue, last June the United Nations sponsored the first Earth Summit with a call to save the planet. The inaugural ceremony began with two minutes of silence in honor of the Earth.

Closer to home here in the United States, during the past two decades universities have been experiencing a plethoric avalanche of federal, state, and local laws concerning environmental compliance issues such as the NAAQS (National Ambient Air Quality Standard), TSCA (Toxic Substance Control Act), RCRA (Resource Conservation and Recovery Act). These and many more laws have resulted in strict regulations on dealing with PCBs, underground storage tanks, CFCs, asbestos, NOx, and SO2 particulates, just to name a few of the pollutants. At first, such compliance issues in colleges and universities were viewed as another ancillary task of the facilities operation. Shortly thereafter, as the laws became more complex, industrial hygienists were hired and environmental health and safety offices were started at many schools. In due time, the regulating agencies continued passing more laws, and EH&S offices grew as universities reacted by expanding the administrative lattice accordingly.

Today, the bureaucratic juggernaut of compliance laws has created, among other things, a situation where facilities managers are either overwhelmed by or vociferously bellicose to the environmental issues. They are viewing many of these laws as a barrier for their departmental mission, and a financial mealstrom in times of fiscal hardship. Their dismay lies in the fact that they are seeing themselves bound by unyielding regulations without any relief insight. Given the current tumultuous situation, let us take a moment to reflect on the current era and perhaps suggest an alternate approach.

Humans and Nature

One of the fundamental environmental problems lies in the dominant social paradigm stemming from two prevailing assumptions: humans are separate and above the rest of creation; and that, due to the resilient aspect of nature, humans cannot inflict any enduring harm in the exploitation of nature.

Mo Qayoumi is associate executive vice president for facilities development and operations at San Jose State University, San Jose, California. He is a frequent contributor to Facilities Manager *and wrote on demand side management in the fall 1992 issue. In addition, he coordinated the special program on environmental issues at the Institute for Facilities Management.*

This has resulted in our narrowly utilitarian view of nature. Consequently, the large exploitation of ecosystems for strictly economic motives has resulted in our current disastrous situation. There are numerous examples through history that prove this thesis; for instance, more than 6,000 years ago, in one of the earliest civilizations along the Euphrates River plains, the inhabitants ultimately abandoned their land by 1,700 B.C. due to farming methods that caused the soil to be laden with salt.

At the beginning of this century, salmon was a plentiful and inexpensive food found in the Elbe River in Germany. Today, the Elbe is declared biologically dead because of the effluent dumped into it by Czechoslovakia and former East Germany.

Today, more than one billion urban dwellers in the world breathe unhealthy levels of sulfur dioxide and dust. According to a United Nations audit, 10 percent of the rivers in ten monitored countries are polluted. Fifteen percent of the earth's soil has been degraded by deforestation. In the United States, the average thickness of the top soil in many places (such as Iowa) has been depleted by half. About 30 percent of Americans live in an area where at least one of the federal pollutant levels is exceeded. The news media have been filled with reports of accidents such as the Exxon Valdez, the burning of the Kuwaiti oil fields, the Chernobyl nuclear reactor accident, the Bhopal chemical accident, and more. These examples illustrate humankind's basic insouciance toward the environment and is living proof that our civilization has treated the earth as a mere resource for the immediate moment without admitting it has an intrinsic value.

As a reaction to the above, numerous laws have been passed in the past two decades to contain any further degradation of the environment. Unfortunately, our approach has been hampered by our preoccupation with specific, particular, and disconnected aspects of the issues. Consequently, we have not obtained many satisfactory results in our approach. So, when we have not achieved the desired result, we have invariably blamed it on the lack of adequate resources. In the United States, presently, we are spending more than $75 billion per year on air pollution, an amount larger than what is spent on our freeways, streets, and roads. Therefore, as a nation, we are spending vast amounts of resources to address the problem.

Sometimes the solution to one environmental problem has worsened the condition of another. For instance, reacting to the indoor air quality problem in buildings, ASHRAE (American Society of Heating, Refrigeration, and Air Conditioning) increased the air flow from 5 cubic feet per minute to 20. Or, to use the old paradigm, "The solution to pollution is dilution." This, in addition to significant capital cost, will have sharp increases in energy uses. Consequently, the biosphere will be polluted with the burning of more fossil fuel.

RONMENTAL ISSUES

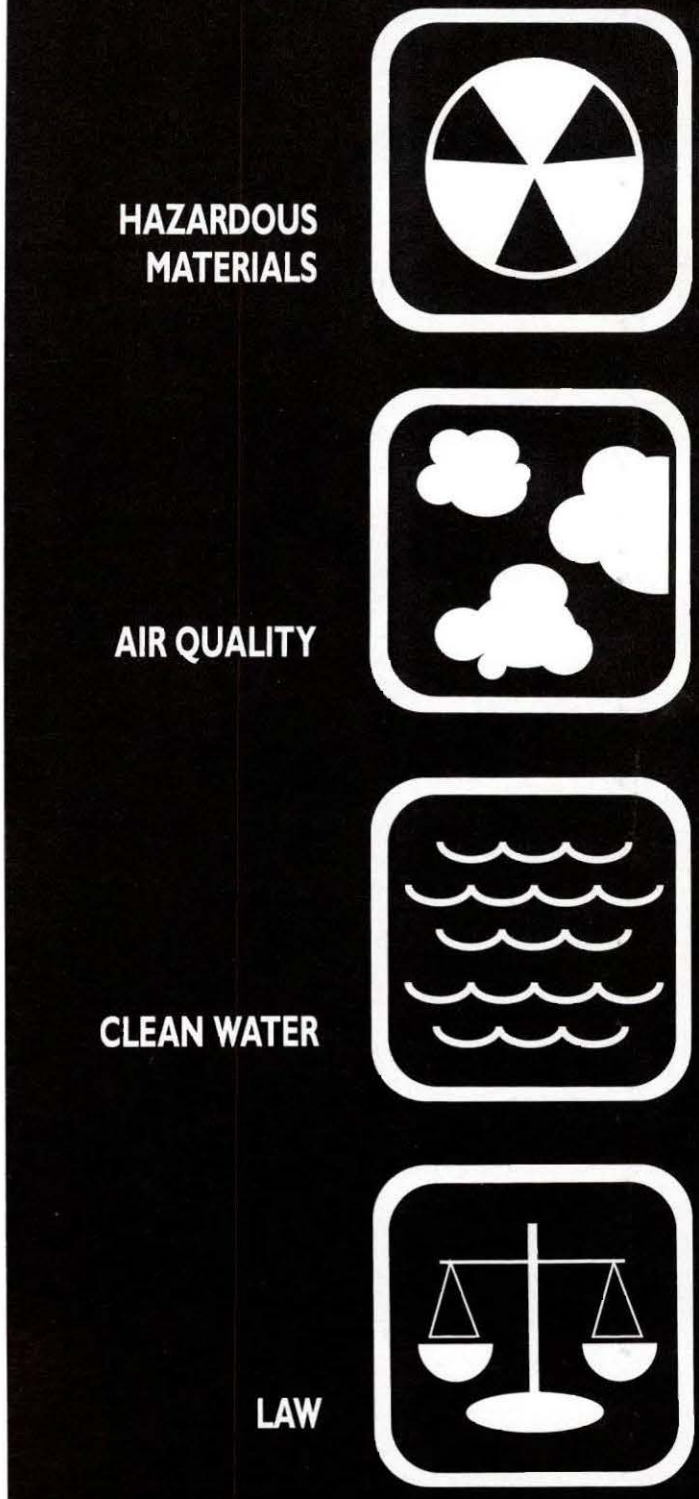
However, it would make more sense to find out and identify the root cause of the problem, which in most situations is a result of the off-gassing of certain building furnishings. For instance, based on a recent study released by Anderson Labs in Massachusetts, the lack of quality control in certain brands of carpets was one of the chief culprits in sick building syndrome. This shotgun approach of drastically increasing air flow in every situation is a terrible waste of resources that will worsen the outdoor air pollution in our cities.

The key to our problems is to find new and innovative approaches, because our current modus operandi falls short of satisfactory results. We must closely look at the societal impact of technology and develop a comprehensive systems approach to dealing with the environmental challenges.

Edward Deming, the guru on total quality management (TQM), states that about 92 percent of management problems are system related. This certainly is the case with environmental issues. As the environmental enforcement agencies have continued the practice of "button hole regulating," we at colleges and universities have accelerated the old ways of responding to them and have achieved results antithetical to our expectations. Consequently, we have become curmudgeons in dealing with the environmental issues. That proves that our processes are flawed.

In developing a new approach to environmental problems, we need to examine the fundamental ways that we are affecting our ecosystem. The essential steps in TQM is knowing who you are serving and how defects in the process can be detected in an effort to reduce process rework and rejects beforehand. Obviously, with environmental laws we are trying to serve humankind. So, if everyone in our organizations and society buys into this view, it implies that improving the environment is everyone's responsibility. An essential part of this task is recognizing the anthropogenic effects of technology. Integrating environmental concerns in all aspects of our operation—such as waste minimization, segregation of waste stream, recycling, energy efficiency improvement, etc.—will arouse everyone's sensitivity to the environment and will make these concerns an integral part of everyday operation. Unfortunately, many of the current environmental laws are trying to address effects rather than causes. Consequently, we are addressing the same problems over and over without attaining meaningful gains.

The current welter requires laureate vision and prowess in action. Let us not forget that "we did not inherit the earth from our parents, it is loaned to us by our children." It behooves us to be sagacious in protecting and safekeeping what has been entrusted to us. The balance of this magazine has a number of articles concerning managing the environmental challenges on our campuses. Hopefully, this will provide valuable information and also provide the reader with a heightened level of sensitivity to these issues. ■



MANAGING THE COMPLEX ENVIONMENTAL REGULATIO

Over the last decade, a complex matrix of environmental regulations has developed on the federal, state, and local levels. In part, this development is a result of an increasing awareness and sensitivity among the public. This new set of laws, rules, and regulations has impacted maintenance and operations at all levels for universities and colleges. Environmental laws, such as the Resource Conservation and Recovery Act (RCRA), the Clean Air Act (CAA), the Clean Water Act (CWA), and the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), have changed the ways hazardous materials are handled and disposed.

An aggressive policy of enforcement has begun to make itself felt under both civil and criminal jurisdictions. Public agencies, such as the United States Environmental Protection Agency (EPA), and citizen groups, such as the Sierra Club, have become highly active in the judicial arena.

No single magazine article can address all issues that could be covered in an environmental management program. The outline below is designed to highlight certain key provisions in federal regulations and to provide useful guidance for a campus attempting to achieve compliance. The provisions that will apply to each specific institution differ depending on the actual situation. Thus, this information is only a guide and each facility should obtain its own qualified advice. As state and local laws often impose additional requirements, these laws must also be carefully reviewed. Moreover, since regulations within the environmental field are rapidly evolving, it is critically important for each institution and individual to keep up-to-date on changes that may apply to their facility.

Responsibilities

Until recently, some people erroneously believed that most or all of the complicated environmental rules and regulations either exempted universities and colleges or, somehow, really did not apply to them. Reasons for holding this attitude range from: "We just don't have the resources!" to "We've always done it this way!" While these statements may be true, more and more institutions of higher education are learning that these excuses do not impress enforcement officers.

Most universities and colleges are subject to the same burdensome and costly standards that are applied to industry. Liability for noncompliance is not limited to big, intentional violations that cause irreparable harm to the environment. Substantial fines, penalties, and jail terms have been assessed for relatively small, unintended offenses.

Whether the individual is a facilities director or chief of maintenance, the assumption is that any person dealing with hazardous materials today knows or should know the potential risks associated with such activity. Therefore, institutions and individuals can be held criminally and civilly liable for violations of applicable laws. Campus presidents, employees, and instructors have a duty to ensure compliance with applicable regulations.

While this can be an onerous duty that absorbs severely limited resources, there are some benefits. Developing good policies and procedures can actually reduce costs in many instances. Sound environmental compliance strategies may include a shift to micro-scale chemistry laboratories and encourage recycling and the use of alternate, less hazardous materials. A reduction in the volume of hazardous wastes produced often translates into a substantial decrease in disposal costs that have a direct impact on operational budgets. A campus with a carefully designed and implemented environmental compliance program can improve its image in the community and with various regulatory agencies. By complying with existing requirements, risks of personal and environmental injury can be substantially reduced.

Environmental Audits

Each institution of higher education must integrate a detailed compliance plan into its routine educational, maintenance, and administrative activities. Such a process could begin with an environmental audit of the entire facility. In much the same fashion as an accountant would perform a financial audit, an environmental audit can be designed to help keep an institution out of trouble. Periodic audits can be a tool to identify deficiencies that need to be addressed before an enforcement officer sees them.

A quality audit program will document the safety and hazardous materials management programs in place at a facility. It can provide an analysis and prioritization of the potential liabilities of failing to comply with applicable regulations. Under some conditions, it may provide some measure of liability protection for those responsible for the operation of a facility. Additionally, an audit can help track the savings and control the costs of achieving compliance. The end result could be a better public image and fewer lawsuits and fines.

The size and composition of an audit team can vary substantially and is usually dependent on the facility to be audited and the available resources. An audit team usually does not exceed seven members and can include university employees, outside consultants, community volunteers, and retired faculty. Team membership should reflect a variety of disciplines and skills. Key team members could be computer

Elizabeth Stowe is chief of environmental resources at The California State University System, Long Beach, California.

MATRIX OF
NS

by Elizabeth Stowe

technicians, attorneys, financial analysts, regulatory specialists, chemical or environmental engineers, and scientists. The team leader should have substantial credibility with campus personnel and be extremely familiar with the operations and functions of a university.

Besides being technically competent, and remaining so, team members should understand the legal issues involved with an audit program and be skilled in the techniques of interviewing people and inspecting facilities.

The details of an environmental audit are dependent upon the unique character of each facility and institution. However, there are some common elements in nearly all quality audits.

- *Review* all maintenance schedules and records required for compliance with appropriate regulations.
- *Inspect* all facilities and personnel to determine the degree of compliance with university policy.
- *Identify* deviations from minimum conditions and make recommendations for corrective actions.
- *Develop* a written status report.

The first step of an environmental audit is usually the establishment of a dialog with significant campus staff, including the president and/or chancellor. This process should serve the dual purpose of confirming common goals and allaying any unnecessary fears. A negative attitude on the part of anyone involved is likely to make the audit process quite difficult. Critical comments could serve to emphasize the contribution that a non-cooperative attitude makes to the existence of violations. Any reasonable concerns regarding confidentiality, future regulatory inspections, the adequacy of equipment, availability of training, etc., should be addressed.

Usually, the next step in an audit is to inspect the paperwork. This should include all permits, inspection reports, notices of violation, orders of correction, consent decrees, correspondence with regulatory agencies, and other internal documentation related to the facility's compliance program. This time-consuming task involves the review and evaluation of each individual piece of paper in the file. Beyond the expected areas of concern, this review may extend into the areas of purchasing, maintenance shops, janitorial, landscape, art departments, and utilities.

The third phase of an audit usually is the on-site inspection. The use of checklists, material safety data sheets (MSDS), and supplier specifications can be quite helpful at this stage. A good resource for developing audit checklists is provided by the EPA. State and local regulatory requirements should have their own checklists or be incorporated into the federal guidelines.

There are times when samples are required to determine specific conditions, properly check the operation of environmental control equipment, and document certain conditions. It may be appropriate to take duplicate samples and have the analysis conducted in the university's laboratories. This could be both a learning tool and a check on the audit process itself.

The last portion of the audit is the preparation and submittal of the audit report. The team can meet with campus executives to present their impressions of the audit. It would be here that possible compliance problems and suggested changes can be initially discussed. Each team member should write his or her own portion of the report, highlighting possible compliance problems and making both short- and long-term recommendations. The team leader then is responsible for coordinating all the sections into a coherent, useful report. This final report is delivered to the campus chief executive.

An audit is of little use unless the findings and recommendations are implemented in a timely fashion. When specific compliance problems are identified, they should include procedures for notifying the requisite regulatory agency. A quality audit will recommend corrective actions and propose a phased response. After thorough evaluation by the campus administration, it is advisable to provide proper notice, including a phased correction plan, to regulatory agencies.

Mechanisms in a campus environmental management program should be developed to ensure any corrective action plans are implemented. Regular status reports can be made available to campus presidents, deans, and managers.

An audit should consider all applicable local, state, and federal regulations to provide a thorough review. The report should identify any conflicting laws and the more stringent of overlapping regulations. On the federal level, there are a variety of regulations that should be considered in an audit. The following should be given special consideration.

CAA

The Clean Air Act required the development of state implementation plans (SIP) and are associated with major regulatory schemes. The CAA set forth goals as defined in the National Ambient Air Quality Standards (NAAQS). Beside the NAAQS, the EPA has established emission limits for specific toxic and polluting compounds. State regulations may also cover volatile hydrocarbons, nitrous oxides, visible emissions, fugitive emissions, and odors.

There are generally four categories of stationary air pollution sources on campuses: combustion equipment, process units, material storage, and transfer areas. Emission reduction and controls are generally required on all but the smallest sources. Many schools operate fleets of motor vehicles, including buses, maintenance vehicles, and security vehicles that may be subject to strict regulation.

The CAA was recently amended with dramatic changes to the command and control structure developed for protection of air quality. It primarily applies to emissions of sulfur dioxide, volatile organic compounds (VOC) and their precursors, hazardous air pollutants, and ozone-depleting substances.

CFC and HCFC

The CAA Amendments, the Montreal Protocol, the CFC excise taxes, and the July 1, 1992 ban on venting refrigerants are all having a tremendous impact on the operations of many campuses. The rapid introduction of acceptable alternatives to chlorofluorocarbons (CFCs) and the mandated retrofit of existing CFC equipment has resulted in the escalation of interest in the development of recovery, reclamation, and conservation programs. The manufacture of CFCs in developed countries should cease by 1995, and the use of hydrochlorofluorocarbons (HCFCs) as an interim substitute refrigerant, is expected to be phased out starting in 1996.

Since last July, refrigerants used in stationary equipment must be recovered, recycled, or reclaimed. HCFCs will also have to be reclaimed starting in 1995. Campuses where plans were made in advance will be able to make the necessary

changes. Others could face large fines and inoperative chillers. Manufacturers of chillers and refrigerants have made extensive efforts to redesign equipment and retrofit existing systems to allow for the rapid phase out of CFCs. There are hundreds of successful equipment retrofits and new installations around the world, showing that these alternatives can offer performance and efficiency comparable to those of the more traditional design.

Last year, reports from the National Aeronautics and Space Administration (NASA), the United Nations Environment Program (UNEP), and the World Meteorological Organization (WMO), indicated there was accelerated ozone depletion over populated areas. Under the standards set in the amendments to the CAA, more stringent refinements to the current CFC and HCFC regulations are expected.

CWA

In 1972, Congress amended the Federal Water Pollution Control Act, also known as the Clean Water Act (CWA), to prohibit the discharge of pollutants to U.S. waters from a point source unless the discharge is in compliance with the National Pollution Discharge Elimination System (NPDES) program. Permits, inspections, and pretreatment of discharges to sanitary sewers is regulated under this program. The CWA is currently due for revision and renewal in the next Congressional session. Conflicting amendments have been proposed, most of which will increase the pressures on large institutions and their activities.

The 1987 amendments establish requirements for spill prevention and control. A prevention and counter-measure plan must be developed for any facility that has established quantities of petroleum product(s) in storage.

The 1987 amendments also establish a framework for regulating storm water discharges under the NPDES program. Storm water discharges include snow melt runoff, surface runoff, and other drainage. The discharges associated with construction projects and industrial type activities are regulated and controlled. Specific regulations can be found in the 40 CFR (Code of Federal Register) Part 122 as published by EPA in 1990. The regulations allow authorized states to issue general permits or individual permits to regulate storm water discharges.

RCRA

Congress passed the Resource Conservation and Recovery Act (RCRA) in 1976. This is a complex law and requires the investment of extensive resources to achieve compliance. RCRA serves as the starting point for regulations governing solid wastes and, more particularly, hazardous wastes. In 1984, Congress amended RCRA with the Hazardous and Solid Wastes Amendment Act.

Many of the associated regulations are designed to cover the generation, transportation, and disposal of hazardous wastes. These mandates cover hazardous wastes from the point of generation, "the cradle," to the point of disposal, "the grave."

One of the most important aspects of RCRA regulations defines the four characteristics of a hazardous waste. If a waste exhibits any of the following characteristics, it is a hazardous waste:

- ignitability
- corrosivity
- reactivity
- toxicity

In addition to defining a waste by its characteristics, the regulations provide lists of specific substances that are defined as hazardous wastes. Other RCRA-associated mandates include regulations governing the operation of treatment, storage, and disposal facilities (TSDF).

Most higher education institutions produce some hazardous wastes and are regulated as generators. Chemical use in laboratories often results in the need for disposal of mixed solvents, reagents, reaction products, and excess materials. In addition, numerous other fairly common activities may result in the generation of hazardous wastes. These may include, but not be limited to, the following: developing solutions and silver compounds from a photography shop; medical test reagents; transformer oil; janitorial cleaning compounds; vehicle fluids; maintenance materials; and print shop inks and dyes.

CERCLA

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), or Superfund as it is often called, provides a mechanism for EPA to manage the cleanup of inactive hazardous waste sites. While RCRA primarily addresses prevention of contamination from current sites, Superfund primarily addresses remediation of problems that have resulted from past mismanagement of wastes.

EPA can order any of the participants in the hazardous waste chain — owner, operator, generator, transporter — to perform the cleanup of a site. These potentially responsible parties (PRP) can be held responsible either individually or in combination. PRP can be forced to reimburse the EPA for costs, administrative and operational, that the government incurs.

CERCLA expanded the reporting requirements for spills, including storm water runoff. Any significant spill of hazardous wastes or materials into an environmental media must be reported to the National Response Center operated by the Coast Guard. Additionally, any transportation-related

spill of significant quantities of specific hazardous substances is governed by the federal Department of Transportation.

TSCA

The Toxic Substances Control Act (TSCA) covers a variety of chemicals and provides a variety of regulations involving the handling and use of specific chemicals. TSCA requires extensive record keeping. In the cases of asbestos and PCB there are tight controls established with attendant stiff penalties.

PCBs are synthetically-produced organic chemicals that became widely used during the 1950s and 1960s as dielectric fluid in electric equipment and heat transformer equipment. It has been found to pose substantial risks to the environment due to its toxicity, persistence, and tendency to bioaccumulate in living organisms. If an institution does not know if its equipment contains PCBs, then EPA requires the assumption that it does contain PCBs. Some states have substantially more stringent regulations and controls that are applicable to PCB-contaminated equipment.

Until the 1980s, asbestos was widely used as a fireproofing and insulating material. It is commonly found in wall board, floor tiles, ceiling tiles, roof structures, and other building components. Where the asbestos has become friable (crumbly), it may pose significant exposure risks as fibers are released into the air. OSHA and many states have issued standards that require employers and building owners to take measures to reduce risk of exposure for employees.

SARA—Title III

The Superfund Amendments and Reauthorization Act (SARA) of 1986 has increased the liability risks to PRP. SARA addresses the "how clean is clean" issue as applied to remediation sites. Given the cost of a typical site cleanup, this is a significant issue.

One of the most demanding of all OSHA programs is the Hazard Communication Standard (HCS). This performance-oriented program governs external and internal labeling of chemicals, material safety data sheets, and employee training. Building on the HCS, Congress passed the Community Right-to-Know Act (Title III of SARA). This act is divided into two sections: emergency planning and record keeping and reporting. There is a hierarchy for emergency response planning that requires all communities be covered by a plan designed to address chemical emergencies.

All chemicals considered extremely hazardous that are stored at a facility above a designated planning threshold quantity, must be reported and controlled to minimize risks. An annual inventory must be submitted to the appropriate regulatory agencies, including an annual report submitted to the EPA.

Employers are responsible for informing employees of hazards to which they may be exposed and training employees in the methods of safe handling of hazardous substances. Facilities are required to provide information to the surrounding communities and the relevant regulatory agencies.

UST

Gasoline, fuel oil, vehicle fluids, waste oil, diesel fuel, and other petroleum products are frequently stored in underground storage tanks. Fire and building codes often restrict alternatives to underground installations. In the early 1980s, stringent monitoring requirements and engineering controls for underground tanks were initiated in a single county in California. Now these restrictions have been broadened and spread to a national application. Because underground tanks often leak contaminants into the soil and groundwater, Congress established a program under RCRA to protect the environment.

Under EPA regulations, all single-walled tanks must either meet the tough new standards or be removed by the end of 1998. New installations must at least be double-walled, have adequate insurance or proof of financial responsibility, and be properly designed and constructed to protect the environment.

Summary

In the last decade there has been a dramatic increase in the volume and complexity of environmental legislation at the federal, state, and local levels. Numerous compliance activities are mandated for campus staff, such as inspecting facilities and equipment, obtaining permits, preparing and submitting compliance reports, labeling equipment, and retaining environmental records.

In order to comply with the increasing number of environmental laws and regulations, campuses must establish an environmental compliance program that assigns responsibility to a person or persons for the coordination of implementation strategies and the tracking and maintenance of the institution's compliance activities. Environmental audits can be an important element in such a program.

A high-quality program should be designed to ensure compliance with all applicable federal, state, and local environmental laws and regulations impacting the campus. It should promote sensitivity and awareness within the campus community while integrating implementation strategies into the academic mission of instruction and research activities.

The environmental responsibilities of academic institutions are substantial, and growing each year. Insulation of colleges and universities from environmental regulation and financial exposure is a lost dream. Awareness on the part of staff and administrators must increase because of the need to protect the institution and its officials from civil and criminal liabilities. ■

APPA Information Services Presents

THE INTERNATIONAL EXPERIENCE EXCHANGE

A Data Base For Higher Education Facilities Management

The Association of Higher Education Facilities Officers
1446 Duke Street
Alexandria, Virginia 22314-3492

APPA Information Services
Telephone: 703/684-4338
Fax: 703/549-2772

For more than five years APPA has provided information and "networking" assistance through our **International Experience Exchange** data base. The data base contains a wide variety of information from more than 1,000 institutions of higher education. The APPA office has responded to thousands of requests for information and materials.

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

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

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

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

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

AIR POLLUTION COMPLIANC FOR THE '90s

by Joseph W. Hower, P.E., DEE

The signing of the 1990 federal Clean Air Act Amendments (CAAA) will have an increasingly substantial impact on higher education facilities over the next several decades. The purpose of this article is to help higher education facility managers prepare for some of the changes ahead by providing an overview of environmental air quality regulations and compliance that would most directly affect them. The following discussion will review the basic principles of air quality, the federal regulatory process, and control technologies that may be required for higher education facilities.

Principles of Air Quality

The definition of air pollution has changed over the past decade. For most of us, the only pollutants of concern were oxides of nitrogen (NOx), oxides of sulfur (SOx), carbon monoxide (CO), and particulate matter (PM). These chemicals are known as the criteria pollutants. The ambient air standards that were set for the criteria pollutants are now being challenged and may possibly be made more stringent. Ambient air standards are set to protect human health and welfare and are the benchmark for the air we all breathe. In order to meet these standards, regulatory agencies, including the U.S. Environmental Protection Agency (EPA), along with state and local agencies, have set limits on the amount of emissions allowable from air pollution sources such as boilers, printing operations, and many other activities. These limits are also getting tighter.

The issue of toxic air contaminants has been getting a high level of scrutiny from the public, lawmakers, and therefore the regulators. The list of other, primarily toxic, chemicals that are now of concern is in the hundreds, and some of them are problematic at levels that could not be detected a decade ago. Of particular public concern are the carcinogenic emissions. The regulation of carcinogenic compounds is complex, frequently requiring a process called health risk assessment (HRA) to assess the allowable levels of emissions. In many cases, these HRAs have to be done on a site-specific basis and can cost from $20,000 to $250,000. Many assumptions and extrapolations are used in HRAs, resulting in quantitative results that can vary by as much as a factor of 10,000. Nevertheless, the results of an HRA can require that a facility notify neighbors that they are being exposed to carcinogens, require the installation of expensive air pollution control equipment, or prevent a facility from expanding.

Joe Hower is section head and senior staff engineer in the El Segundo, California Radian Corporation office, a world-wide environmental, engineering, and technical services company.

History of the Federal Clean Air Legislation

The first federal Air Quality Act was passed in 1967. This law was a relatively weak statement of a desire to have clean air. The Clean Air Act was passed in 1970, and contained much stronger language, with specific goals to be achieved. The act was amended in 1977 and most recently in 1990. Based on the increasing time between federal clean air legislation, no major amendments are likely for the rest of this century.

Clean Air Act Amendments of 1990

The CAAA represents a dramatic increase in the scope and complexity of federal air quality legislation. There are eleven titles in the CAAA, with the most significant being

Title	Description
I	Non-Attainment Provisions
II	Motor Sources/Fuels
III	Toxics
IV	Acid Rain Provisions
V	Permits
VI	Stratospheric Ozone Protection
VII	Federal Enforcement

Not all of these titles will affect higher education facilities. For instance, the acid rain provisions in Title IV only apply to specified public utility power plants. Even though some campuses may have oil or coal fired boilers, Title IV will not likely require reductions. However, the non-attainment and permitting requirements may require emissions reductions. Following are the major areas of concern for APPA members, in order of significance.

Permits

The new permitting requirements of the CAAA are significant. Under the old structure, federal permits were required only when constructing a major source of air pollution. Once construction was complete, no further permits were necessary. Permits to Operate for major sources will now be required, and they will expire every five years. A major source may be a facility that emits more than 100 tons per year, is subject to New Source Performance Standards, is subject to the Title III Toxics provisions, or a source that is defined by regions and may be more stringent than the federal provisions. Thus, it is possible that new operating requirements or limitations could be required as often as every five years. On the plus side, "permit shield" provisions will protect the ma-

E STRATEGIES

jor source from new requirements more often than every five years. Permit fees will now be required, with an amount no less than $25/ton/year of emissions. In some cases, there are existing state or local permitting programs, that will be changed or supplemented to meet the federal requirements.

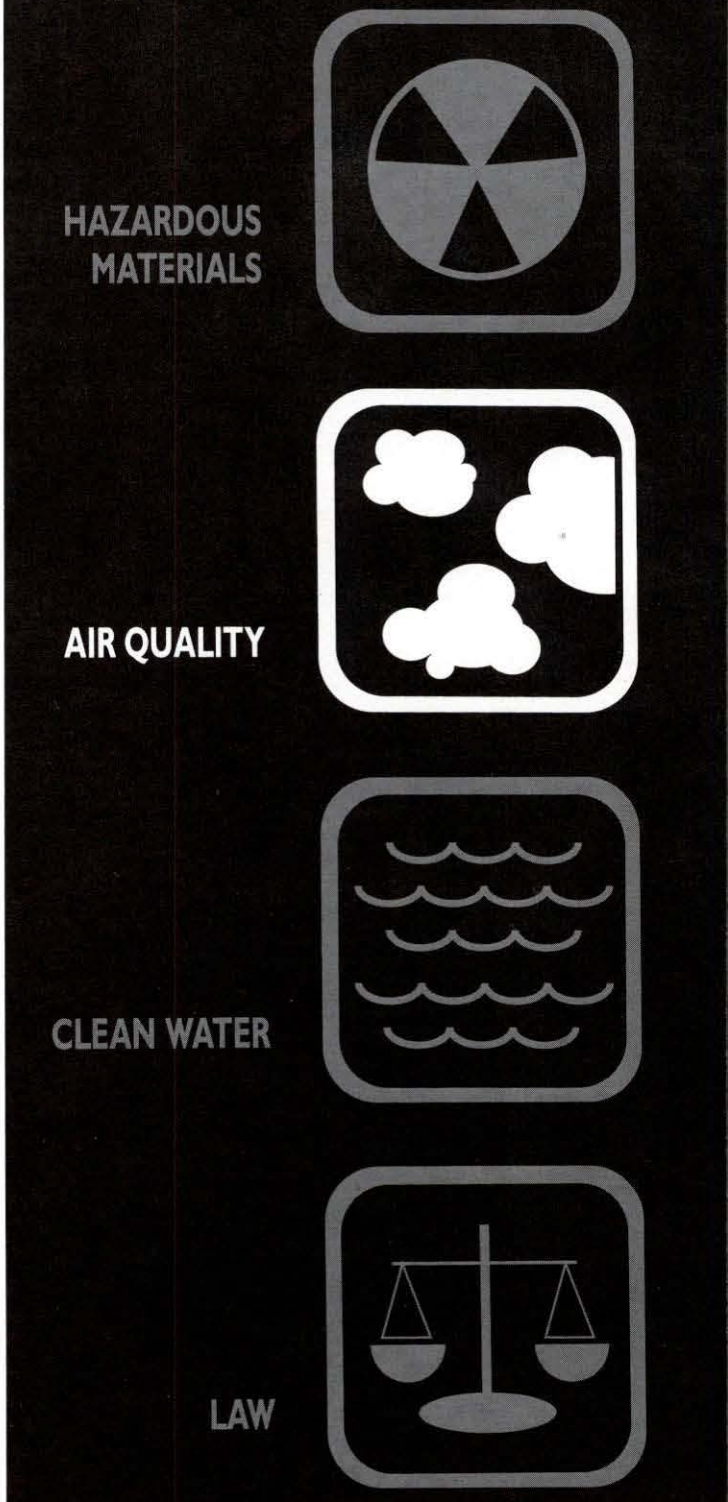
Non-Attainment

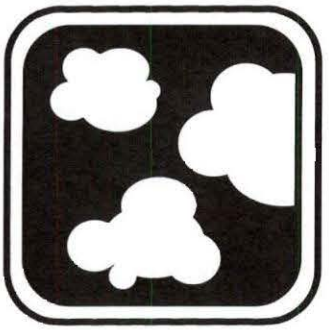
Many areas of the country do not achieve compliance with the National Ambient Air Quality Standards (NAAQS) and are designated as non-attainment areas. These areas are required to develop plans to meet these standards and are specifically required to control emissions from new or modified major sources. This process is called new source review (NSR). The major requirements of NSR are that the facility utilizes the best available control technology (BACT), or in some cases the more stringent lowest achievable emission rate (LAER), and that they offset the increases in emissions by reducing emissions elsewhere in the facility, or by purchasing emission credits from other facilities. The CAAA now requires that a facility acquire as much as 50 percent more credits than the increase in emissions. The offset provisions will vary depending on the severity of the non-attainment status. The existing NSR provisions in the South Coast Air Quality Management District are considered equivalent to the CAAA requirements.

Toxics

The toxics provisions are far reaching, covering a wide variety of sources and nearly 200 emitted chemicals. For major sources of these chemicals, maximum achievable control technology (MACT) will be required, with controls beyond MACT if the risk after installation exceeds 1 in 1 million. Few college or university facilities are likely to be classified as major sources of toxics. However, the cost of compliance with toxics provisions may exceed the cost of complying with the criteria pollutant standards.

The toxics provisions also call for risk management plans designed to prevent catastrophic releases of chemicals such as in the Bhopal incident. Ammonia, frequently used as a refrigerant in large HVAC systems, may be of concern to college and university facilities managers. California and New Jersey already have requirements for similar plans. These plans can cost from $12,000 to more than $100,000. The plans typically cover the potential scenarios that can cause a catastrophic release, the consequences of that release, and measures to prevent the release or mitigation of the consequences of the release. These steps can be operational procedures or equipment changes.





Enforcement

To enhance the implementation of the new requirements, stronger enforcement mechanisms have been put into place. These range from higher fines and giving the enforcement officers "$5,000" ticket and jail time authority for knowing releases. The focus for prison terms is on higher level management, not the individual with the hand on the valve. The penalty for an individual "knowingly endangering people by releasing a toxic material" can be as high as $250,000 per day and fifteen years in prison. Businesses can be fined up to $1 million per day. Negligent violations of this kind can also subject individuals to fines and prison time. Record keeping violations can subject violators to substantial fines.

Stratospheric Ozone Protection

Saturated chlorofluorocarbons (CFCs) have been shown to cause depletion of stratospheric ozone and will be phased out no later than the year 2000, except for methyl chloroform, which will be banned in 2002. Hydrochlorofluorocarbons (HCFCs), which have much lower ozone depletion potential, are the current best substitute for many applications, but they too will be phased out. This will affect many refrigeration systems and could affect electronics labs and others where CFCs are used as solvents. Substantial capital may be required to switch to alternative refrigerants and solvents. Halon, often used for fire suppression in computer and control rooms, will also be banned. Many of the potential replacements for these materials are more flammable or toxic as well. Care will be required in selecting alternative materials.

General Approach To Compliance

Each facility should analyze the CAAA and subsequent regulations to determine which portions of the facility will be affected by the various provisions. This can be a substantial undertaking that will need to be updated frequently as EPA promulgates its regulations. The next step to planning for compliance is to compile an accurate emission inventory of all of the regulated chemicals from the facility. Facilities in California will likely be ahead in this effort because of the requirements of the Toxics "Hot Spots" Act of 1987, which requires that emission inventories be conducted for a large variety of facilities. These inventories can cost from $10,000 to more than $250,000 for a large, complex facility. Without an emission inventory, an effective plan cannot be developed. Many facilities in California found that they could easily reduce their emissions of 1,4-dioxane, a toxic chemical which was frequently used as a stabilizer in 1,1,1-trichloroethane, by switching to a glycol-based stabilizer. This reduction would probably not have occurred without the inventory work that identified the magnitude of the emissions.

Several systems frequently found in college and university settings are likely to be affected by the CAAA. These include:

Equipment Type	Emittents of Concern
Boilers	NOx, SOx, CO, PM10, HC, PAHs
Cogeneration systems	NOx, SOx, CO, PM10, HC, PAHs
Hospital Operations	NOx, SOx, CO, PM10, HC, PAHs, PCDD/PCDF, EtO
Emergency generators	NOx, CO, HC
Fleet operations	NOx, CO, HC
Refrigeration systems	CFCs, NH3
Maintenance shops	CFC solvents
Fire suppression systems	Halon

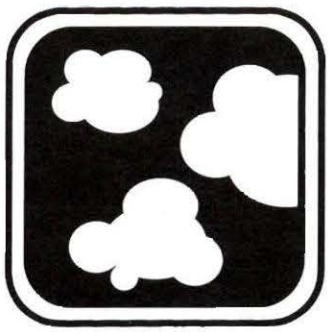
Boilers

The Title I non-attainment provisions will be the primary driver for retrofit controls for non-utility boilers. Within this framework, reasonably available control technology (RACT) will be implemented by the states. Some areas, such as the Northeast states, have joined together to enact common requirements. The North East Coordinated Air Use Management (NESCAUM) RACT requirements vary from simple boiler tuning for boilers with less than 50 million Btu/hr heat input, to limits of 0.1 lb NOx/million Btu for units larger than 50 million Btu/hr.

Boiler controls for campus facilities will likely center on NOx control, with SOx controls required for new units. For gas and oil fired units, and to some degree pulverized coal burners, low NOx burners will be the likely control of choice here. Driven by stringent NOx control regulations in California and elsewhere, low NOx natural gas burners along with flue gas recirculation (FGR) can now achieve emissions as low as 30 parts per million (ppm), or 0.04 lbs/million Btu. Tail end technologies, such as selective catalytic reduction (SCR) or selective non-catalytic reduction (SNCR), can be applied to boilers, but are much more expensive than low NOx burners with FGR and carry the liabilities of handling ammonia or urea.

Cogeneration

Cogeneration has become more common in campus settings as the energy cost savings have justified the capital cost of such systems. A common NOx control technique for gas turbine cogeneration units in California has been SCR, frequently followed by a CO catalyst. These techniques are frequently done in combination with steam or water injection. Low NOx burners for cogeneration units are being devel-



oped but are not as far along as for conventional boilers. This will make the economic feasibility of new cogen plants very difficult, and in some places not feasible.

Hospital Operations

For those universities with hospitals, the incineration of the varied wastes from these operations is becoming an environmentally sensitive topic. California has recently required controls for polychlorinated dibenzo dioxins (PCDD) and polychlorinated dibenzo furans (PCDF) that have 99 percent efficiency in removing these highly toxic compounds. Typical equipment to achieve this high efficiency includes dry and wet scrubbers, sometimes in combination with baghouses.

Ethylene oxide (EtO) sterilizer exhausts have also come under close scrutiny, and again California has required sterilizers to have 99.9 percent efficient controls, and aeration rooms to have 95 percent efficiency. Thermal oxidizers (afterburners) have been the typical control technology applied to sterilizers. Since CFCs are frequently used as a diluent gas for explosion protection alternatives will be required. Incineration of CFCs at high temperatures also results in hydrochloric acid (HCl) formation, which sometimes requires an acid gas scrubber as well as more expensive metallurgy in the oxidizer.

Emergency Generators

Internal combustion (i.c.) engines are often used to drive emergency power systems and fire water supply pumps. Even these generators, which normally run fewer than 200 hours per year, mostly for testing, have been required to install SCR or other NOx controls. Retarded timing and three-way catalysts have also been used to control emissions from these engines.

Fleet Operations

Several requirements may impact those campuses operating fleet vehicles. The requirement for additional controls for gasoline dispensing operation has been in effect in California for many years and will likely be required in non-attainment areas in other parts of the country. Emissions of benzene from these operations have caused significant risk levels for neighborhood gasoline stations, even with the Stage II controls. Requirements for flexible fuel or low emitting vehicles are also included in the CAAA for non-attainment areas.

Refrigeration Systems

Anhydrous ammonia-based refrigeration systems may require extensive risk management plans to minimize the risk to the surrounding community from the effects of a sudden release of this volatile material. For CFC (Freon)-based systems, the refrigerant will need to be replaced no later than the year 2000. Direct replacements are expected, with minimal equipment changes until the HCFCs are banned. As new data on stratospheric ozone depletion are developed, these deadlines may be accelerated. Facilities managers would be wise to plan carefully and monitor the regulations as they unfold.

Maintenance Shops

Solvents commonly used in maintenance shops, such as methylene chloride and other chlorinated solvents, will be unavailable. Planning for this will help ease the transition.

Fire Suppression Systems

Many computer room and control rooms use Halon as a fire suppressant, instead of using sprinklers. Halons are CFCs, and will be banned along with other CFCs. Hard choices may have to be made in evaluating sprinklers versus other fire suppression systems.

Where Do We Go From Here?

Compliance with air quality laws and regulations nationwide is getting more complex and more resource-consuming, whether it be capital, operating expenses, or even just the resources to stay current on the regulations. As the requirements have developed, the choices for compliance get more difficult and far-reaching. A carefully thought-out plan will facilitate cost-effective compliance. This plan should be based on a thorough review of the following components.

- Federal, state, and local laws as they are adopted. It usually takes a year or two from the enactment of a law to the promulgation of the regulations that implement the details of the law. Following the legislation will provide more lead time. Of course, you will need to follow the regulations as well. Building a working relationship with your local air quality regulatory agency staff will pay dividends. Please note that local plans that have been incorporated into approved State Implementation Plans (SIP) become federally enforceable.
- An accurate inventory of the emission sources and emission rates from your facility. This will make an assessment of the impact of laws and regulations much easier and more useful. [*Ed. note: See the article on APPA's CFC Task Force on page 6.*]
- An in-depth study to evaluate the most cost-effective compliance solution. This study should involve the operating and engineering personnel for the particular systems and may involve outside engineers or consultants.

Results of the above will help set capital and expense budgets. Some of these compliance activities can be expensive, making it imperative that they be planned for and budgeted. ■

FEDERAL WASTEWATER AND REGULATIONS

by Robert Charbonneau

Federal regulations promulgated by the Environmental Protection Agency (EPA) under the Clean Water Act now apply to both wastewater and stormwater discharges to sanitary and storm sewer systems or direct discharges into receiving water bodies. These regulations are implemented through the National Pollutant Discharge Elimination System (NPDES) wastewater permitting program. All but twelve states have been delegated NPDES permitting authority by the EPA, so most states directly administer this program. State and local jurisdictions have the authority to promulgate any wastewater or stormwater regulations that they choose, as long as they are not less stringent than federal requirements. This article presents an overview of the federal regulations. It is essential to contact local and state permitting authorities for comprehensive information on regulations pertaining to site-specific operations.

The federal wastewater regulations are separated into regulations governing direct sewage discharges to receiving water bodies (rivers, lakes, bays, or the ocean) and those regulating indirect discharges to sanitary sewer systems. The newer federal stormwater discharge regulations will also be summarized. In all cases, there is an apparent trend toward increased regulation and enforcement of all wastewater and stormwater discharges, especially at the local and state level. Complex hazardous materials and waste regulations will continue to have greater impacts on wastewater disposal practices in the future. Compliance with current and future regulations will require better cooperation and communications between campus environmental and facilities management personnel.

Campus users, especially laboratory personnel, must be made aware of the increasingly wide range of regulations that affect them through a comprehensive environmental compliance program that integrates all of the different overlapping requirements into a single cohesive compliance strategy that is understandable and practical. This program can be implemented through such mechanisms as focusing on waste minimization, developing standard operating procedures, providing technical assistance and training, and implementing best management practices. An integrated environmental compliance program allows the most efficient use of campus resources and makes compliance with a plethora of regulations as easy as possible for campus personnel.

Bob Charbonneau is coordinator, environmental assessment, Facilities Design, Construction, and Management at the Environmental Protection Services Unit, Office of the President, University of California, Oakland, California.

Wastewater Discharge Regulations

Wastewater discharges into surface waters of the United States are regulated under the Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977. Wastewater regulations promulgated by the EPA under the Clean Water Act are found in the Code of Federal Regulations (CFR) Title 40 Part 400 et seq. and Title 40 Part 122 et seq. The CFR is revised constantly through daily issues of the *Federal Register*. Every year a new edition of the CFR is published that incorporates all the revisions of the past year. The Clean Water Act and accompanying EPA regulations control both direct point source discharges to surface waters, as well as "indirect discharges" of all non-domestic sewage into publicly owned treatment works (POTWs), otherwise known as state or municipal sewage treatment plants.

Direct Dischargers

Direct point source dischargers must obtain and comply with the conditions of a National Pollutant Discharge Elimination System permit. NPDES permits are usually administered by state water pollution control agencies under authority delegated by EPA. However, regional EPA offices directly administer the NPDES permit programs in the following twelve states that have not yet obtained federal authorization: Alaska, Arizona, Florida, Idaho, Louisiana, Maine, Massachusetts, New Hampshire, New Mexico, Oklahoma, South Dakota, and Texas. Dischargers in these twelve states must deal directly with the regional federal EPA offices.

A "point source" is defined as "a discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, conduit, well . . . from which pollutants are or may be discharged" (40 CFR 122.2). Return flows from irrigated agriculture and agricultural stormwater runoff are excluded from the definition of point sources. In other words, if you can point to a pipe outfall somewhere, you have a point source. All operators of facilities that have point source discharges must apply for and obtain NPDES permits. Many states also have water pollution control regulations with their own permitting requirements and wastewater effluent discharge limitations that may be more stringent than federal NPDES requirements.

Existing point sources, new sources and new discharges, dischargers of non-process wastewater (e.g., cooling towers), and stormwater dischargers all have separate permit application requirements. Although the terms of NPDES permits vary depending on the type of discharger and nature of the wastewater effluent, certain minimum standards are required of all permittees as noted in Figure 1. (All figures are on pages 26-27.) The permits set forth limited circumstances under which the permit may be modified, revoked and reissued, or termi-

STORMWATER

nated, as well as the conditions under which the permittee may be excused from a water quality violation caused by an unforeseeable breakdown of any wastewater pretreatment equipment.

Certain categories of direct point source dischargers are subject to wastewater effluent limitations and standards requiring the application of various levels of pretreatment technologies. However, it is not likely that a college or university would come under one of the industrial categories subject to these special requirements set forth in the federal regulations (40 CFR 405 et seq). These categories are listed in Figure 2.

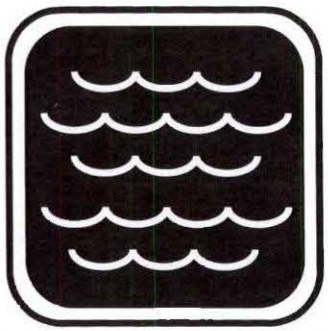
Indirect Dischargers

Many colleges and universities discharge their wastewater into a sanitary sewer system rather than directly into surface waters. All "non-domestic indirect dischargers" into sanitary sewer systems must comply with EPA general pretreatment regulations and local pretreatment standards promulgated and enforced by local POTWs. The national pretreatment standards apply to all non-domestic discharges of sewage into POTWs.

These pretreatment standards have three functions. First, they guard against the discharge of materials that could cause interference with the operation of the POTW. Second, they impose pretreatment standards for certain toxic pollutants discharged by specific industrial categories (Figure 2). Finally, they require monitoring and reporting to ensure that categorically specified industrial dischargers comply with the standards and that all other dischargers comply with effluent prohibitions, to the extent necessary as deemed by the local POTW authority.

Since colleges and universities are generally not engaged in any of the industrial activities subject to categorical pretreatment standards, this discussion will focus on the standards applicable to all general dischargers. Figure 3 provides a summary of the general and specific prohibitions applicable to all dischargers into a POTW, regardless of whether the discharger is subject to other pretreatment standards or requirements.

The national pretreatment standards require most POTWs to develop local pretreatment programs pursuant to federal guidelines. The program must include wastewater influent limits to prevent disruptions or interference with the POTW as well as a compliance program to enforce those limits to ensure that the POTW meets its own wastewater discharge requirements. Those POTWs not required to develop their own pretreatment program must still develop local influent limits (local pretreatment standards) if the sewage plant would otherwise have recurring problems.



Local pretreatment standards vary among POTWs depending on the capacity and condition of the POTW and any wastewater discharge limitations placed on it in order to meet local water quality standards. Refer to the local POTW or state permitting agency for specific information regarding applicable requirements.

POTWs enforce both the federal pretreatment standards and local pretreatment limits through ordinances and wastewater discharge permits issued to non-domestic sewage dischargers. Permits are required for all industrial dischargers subject to the EPA categorical standards (Figure 2). In addition, POTWs may require permits from other dischargers who have the potential to interfere with the treatment system or may cause the POTW to violate its own NPDES permit, or are otherwise deemed to be "significant." Federal regulations (40 CFR 403.3) define "significant industrial users" as including all wastewater dischargers that discharge an average of 25,000 gallons per day or more of process wastewater (excluding sanitary sewage, noncontact cooling water, and boiler blowdown) to the POTW; contribute process wastewater that makes up 5 percent or more of POTW capacity; or any discharger that has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement.

Many colleges and universities have teaching, research, or clinical laboratories that discharge wastewaters. These wastewaters are not only regulated by pretreatment requirements, but also by federal and state hazardous waste regulations, including RCRA, which governs hazardous wastes. RCRA contains special provisions in 40 CFR 261.3(a)(2)(iv) for laboratory wastewaters that may contain certain specified hazardous wastes. These provisions exclude wastewater generated from laboratory operations from regulation as hazardous wastes if a number of different conditions have been met. These include limitations on both wastewater chemical constituents and concentrations. However, state and local hazardous waste regulations may not contain similar exemptions. Any wastewater discharges that may contain regulated hazardous wastes must be carefully evaluated in light of all pretreatment requirements as well as all applicable federal, state, and local hazardous waste regulations. In general, disposal of wastewaters containing hazardous constituents is becoming more difficult and limited.

Future Regulations

POTWs must often change their wastewater ordinances and permitting systems in response to new federal, state, or local regulations. Stricter pretreatment requirements are then imposed on non-domestic wastewater dischargers in order to comply with new regulations. The federal Clean Air Act and state air pollution control laws are becoming much more stringent, especially in the control of volatile organic compounds (VOC) emissions. These new regulations will likely require POTWs to further limit the amount of volatile compounds such as solvents permitted in wastewater discharges. It is also quite likely that hospitals will be subject to much more stringent pretreatment requirements within the next few years.

The EPA was slated to issue final regulations governing the disposal and use of sewage sludge late in 1992. These regulations will contain numerical standards for sludge depending on various disposal options. Although water quality standards and effluent limitations will remain the driving force behind pretreatment regulations, some POTWs will probably have to place further limitations on substances adversely affecting sludges, especially heavy metals concentrations.

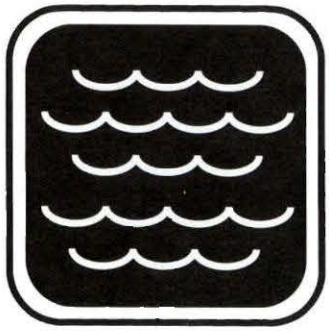
Enforcement

It is quite likely that increased federal enforcement of pretreatment requirements against both POTWs and individual non-domestic wastewater dischargers will be a continuing trend for the future. The EPA has announced a policy of increased enforcement against POTWs, but the EPA would also consider taking action directly against individual non-domestic wastewater dischargers who consistently violate their pretreatment requirements. The states also conduct POTW inspections and compliance monitoring and have enforcement authority. State and local pretreatment requirements may be more stringent than federal requirements. This all translates into increased POTW enforcement of pretreatment regulations for dischargers. In situations where POTWs can assess substantial monetary penalties for violations, there is a great incentive for POTWs to increase permit compliance monitoring activity.

Stormwater Discharge Regulations

The Water Quality Act of 1987 added Section 402(p) to the Clean Water Act, requiring the EPA to establish phased NPDES permitting requirements for stormwater discharges associated with "industrial activity" and municipal storm sewer systems serving populations of 100,000 or more. This came about because all major wastewater dischargers have been regulated under NPDES since 1972, resulting in effective pollution control, whereas "nonpoint sources" of pollution remained unregulated and became the leading cause of water quality impairment in the United States.

EPA issued final rules on NPDES Stormwater Regulations in the *Federal Register* on November 16, 1990 and April 2, 1992 modifying 40 CFR Parts 122, 123, and 124. States with authorized NPDES programs will administer this permitting program, whereas EPA will directly administer the program in the twelve unauthorized states. (Notice of final NPDES



general stormwater permits was given in the *Federal Register* on September 9, 1992.)

In addition to municipalities with populations over 100,000, eleven major categories of facilities are captured by the stormwater permitting regulations. Figure 4 presents a list of the different industrial categories subject to the federal regulations. Note that some categories are defined by SIC codes found in the Standard Industrial Classification Manual published by the federal Office of Management and Budget (OMB). Colleges and universities are listed under SIC code 8221, which is not currently covered by any of the specific industrial facility categories. However, some authorized NPDES permitting states, such as California, have ruled that the permitting requirements extend to all auxiliary facilities defined in Figure 4, regardless of the primary SIC code of the owner or operator of the overall facility. This means that if a college or university has any of the facilities listed in Figure 4, a stormwater discharge permit may be required.

The EPA allows facilities covered under the federal regulations to obtain permits in one of three different ways. First, the EPA or authorized NPDES states can issue a general, or "generic" permit for stormwater discharges associated with industrial activity. This is the most common and simplest method, and is typically satisfied by submitting a Notice of Intent (NOI) to be covered by a general permit. Usually there is a separate general permit for construction activity. Some authorized states are accepting only the general permit option. Another option is to submit an individual, or facility-specific permit application. This alternative is meant for special circumstances or facilities. Finally, a group application option is available for facilities with similar stormwater discharge characteristics, such as a number of different facilities with the same SIC code. If a facility already has an NPDES permit for wastewater discharge, it is not necessary to obtain another permit if stormwater provisions are included in the original NPDES permit. Otherwise, a separate stormwater NPDES permit will likely be required. For most existing facilities, the permit application deadline was October 1, 1992. Construction activity on sites five acres or more in size must obtain a stormwater permit prior to the start of construction.

In terms of permit applicability, a recent federal court of appeals ruling (June 4, 1992) requires the EPA to reexamine two major exemptions from the stormwater permitting regulations. The court ruled that both the five-acre cutoff on construction activity as well as the requirement that light manufacturing facilities (Figure 4 category (xi)) be covered only if materials were exposed to stormwater were both arbitrary and capricious. The court has remanded these regulations back to EPA for additional documentation concerning both of these exemptions. If the EPA cannot substantiate the reasoning behind these exemptions, it is possible that all construction activity and all light manufacturing facilities will have to obtain stormwater permits in the future.

The latest federal regulations (57 FR 11394; April 4, 1992) set forth minimum monitoring requirements for stormwater discharges (modifying 40 CFR 122.44; there is no federal requirement for actually sampling stormwater runoff.) Facilities owners must conduct annual site inspections to identify areas contributing to stormwater runoff and evaluate whether measures to reduce pollutant loadings as identified in a stormwater pollution prevention plan are adequate and properly implemented in accordance with the terms of the NPDES permit and the plan or whether additional control measures are needed. Construction sites must be inspected once a week and within twenty-four hours after any rainfall greater than half an inch. Areas of the site that must be inspected include disturbed areas, exposed building material storage areas, structural erosion control measures, and vehicle entry/exit areas.

Stormwater Pollution Prevention Plan (SWPP) requirements differ depending upon whether the stormwater permit is issued for a facility or a construction site. For facilities, a SWPP must include a storm drainage map; an inventory of exposed materials; a list of significant spills and leaks that have occurred in the last three years; and an evaluation of all non-stormwater discharges to the storm drain system. Facility SWPPs must also contain an evaluation and description of Best Management Practices and other controls that will be implemented at the facility. Construction site SWPPs must have a site description that identifies all potential sources of pollution as well as a description of the construction activity. In addition, the SWPP must include a description and implementation plan for erosion and sediment controls and other stormwater management practices. An inspection and maintenance program for construction site controls is also required.

The permit holder must keep facility inspection records for three years and certify that the facility is in compliance with the plan and NPDES permit. States with authorized NPDES programs will likely have more stringent monitoring requirements than these minimum federal requirements. In addition, local jurisdictions may promulgate any stormwater regulations that they choose, as long as they are not less stringent than any state or federal regulations. Colleges and universities located in municipalities with populations over 100,000 will likely be indirectly affected by stormwater regulations promulgated by local jurisdictions in response to their own new NPDES stormwater permits. ■

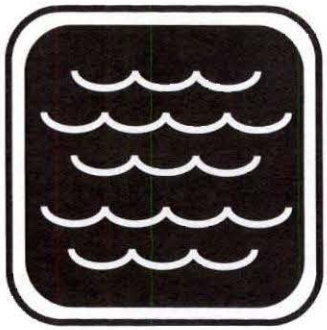


Figure 1

Minimum NPDES Permit Conditions and Requirements

1. Comply with all conditions of the permit, including effluent standards or prohibitions.
2. Take all reasonable steps to minimize or prevent any discharge in violation of the permit that has a reasonable likelihood of adversely affecting human health or the environment.
3. Properly maintain and operate all treatment facilities and systems.
4. Furnish the permitting authority with any information requested to determine whether to modify, revoke and reissue, or terminate the permit, or to determine compliance with the permit.
5. Allow the permitting authority or an authorized representative to enter and inspect the facilities, equipment, or operations; review any records; and to sample or monitor at reasonable times any substances or parameters at any location.
6. Conduct representative compliance monitoring according to approved procedures and keep complete records for at least three years.
7. Submit periodic discharge monitoring reports and notify the permitting authority of specified physical alterations in the facility or its discharges.
8. Report any noncompliance that may endanger health or the environment within twenty-four hours of the time the permittee becomes aware of it.
9. Do not bypass or intentionally divert waste streams from any portion of the treatment facility except under specified circumstances.

Source: 40 CFR 122.41

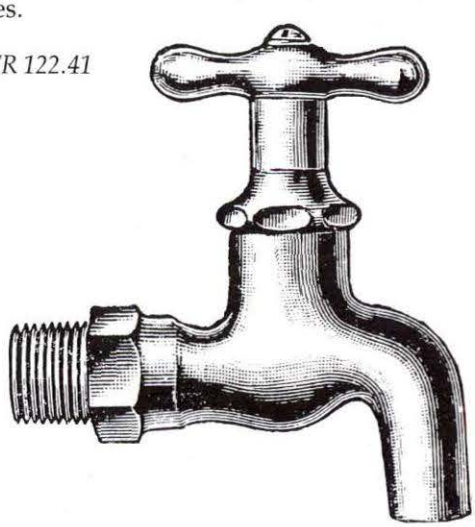


Figure 2

Industrial Categories Subject to Effluent Limitations and Standards (40 CFR)

Industrial Category	Part No.
Aluminum Forming	467
Asbestos Manufacturing	427
Battery Manufacturing	461
Builders' Paper and Board Mills	431
Carbon Black Manufacturing	458
Cement Manufacturing	411
Coal Mining	434
Coil Coating	465
Copper Forming	468
Dairy Products Processing	405
Electroplating	413
Electrical and Electronics Components	469
Explosives Manufacturing	457
Feedlots	412
Ferroalloy Manufacturing	424
Fertilizer Manufacturing	418
Fruits and Vegetables Canned Processing	407
Glass Manufacturing	426
Grain Mills	406
Gum and Wood Chemicals Manufacturing	454
Hospitals	460
Ink Formulating	447
Inorganic Chemicals Manufacturing	415
Iron and Steel Manufacturing	420
Leather Tanning and Finishing	425
Meat Products Processing	432
Metal Finishing	433
Metal Molding and Casting	464
Mineral Mining	436
Nonferrous Metals Forming	471
Nonferrous Metals Manufacturing	421
Oil and Gas Extraction	435
Organic Chemicals, Plastics, and Synthetic Fibers	414
Paint Formulating	446
Paving and Roofing Materials (Tars and Asphalt)	443
Pesticide Chemicals	455
Petroleum Refining	419
Pharmaceutical Manufacturing	439
Phosphate Manufacturing	422
Photographic Processing	459
Plastics Molding and Forming	463
Porcelain Enameling	466
Pulp, Paper, and Paperboard	430
Rubber Processing	428
Seafood Canned Processing	408
Soaps and Detergents Manufacturing	417
Steam Electric Power Generating	423
Sugar Processing	409
Timber Products Processing	429
Textile Mills	410

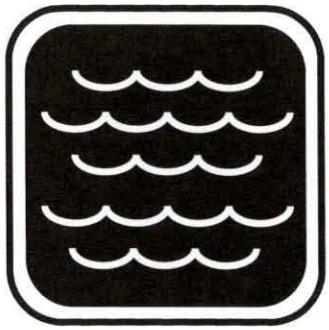


Figure 3

Federal Pretreatment Requirements

I. General Prohibitions

A. Dischargers shall not introduce into a POTW any pollutant(s) which, alone or in conjunction with a discharge or discharges from other sources, causes Interference or Pass Through defined as follows:

1) Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and

2) Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with all federal statutory provisions and regulations or permits issued thereunder (or more stringent state or local regulations)[Interference]; or

3) Exits the POTW into waters of the United States in quantities or concentrations causing a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) [Pass Through].

II. Specific Prohibitions

B. In addition, the following pollutants shall not be introduced into a POTW:

1) Pollutants that create a fire or explosion hazard;

2) Pollutants which will cause corrosive structural damage to the POTW, but in no case discharges with pH lower than 5.0, unless the works is specifically designed to accommodate such discharges;

3) Solid or viscous pollutants in amounts which will cause obstruction to the flow in the POTW resulting in Interference;

4) Any pollutant, including oxygen demanding pollutants (BOD, etc.) released in a discharge at a flow rate and/or pollutant concentration which will cause Interference with the POTW;

5) Heat in amounts which will inhibit biological activity in the POTW resulting in Interference, but in no case heat in such quantities that the temperature at the POTW plant exceeds 40 degrees C, unless alternate temperature limits are approved;

6) Petroleum oil, nonbiodegradable cutting oil, or products of mineral oil origin in amounts that will cause Interference or Pass Through;

7) Pollutants which result in the presence of toxic gases, vapors, or fumes within the POTW in a quantity that may cause acute worker health and safety problems; and

8) Any trucked or hauled pollutants, except at discharge points designated by the POTW.

Source: 40 CFR 403.3 and 403.5

Figure 4

Facilities Subject to Stormwater Permitting Regulations

Category (i): Facilities subject to stormwater effluent guidelines, new source performance standards, or toxic pollutant effluent standards under 40 CFR Subchapter N (this covers nearly all of the industries listed in Figure 2).

Category (ii): Manufacturing facilities defined as Standard Industrial Classifications (SICs) 24 (except 2411 and 2434); 26 (except 265 and 267);28 (except 283); 29; 311; 32 (except 323); 33; 3441; and 373.

Category (iii): Oil and gas/mining facilities (SICs 10 - 14).

Category (iv): Hazardous waste treatment, storage, or disposal facilities operating under interim status or permit under RCRA Subtitle C.

Category (v): Landfills, land application sites, and open dumps that receive or have received any industrial wastes from facilities described in 40 CFR 122.26 including those subject to regulation under RCRA Subtitle D.

Category (vi): Recycling facilities including metal scrapyards, battery reclaimers, salvage yards, and auto junkyards (SICs 5015 and 5093).

Category (vii): Steam electric power generating facilities.

Category (viii): Transportation facilities with SICs 40; 41; 42 (except 4221-25); 43; 44; 45; and 5171 which have vehicle maintenance shops, equipment cleaning operations, or airport deicing operations.

Category (ix): Sewage or wastewater treatment works used in the storage, treatment, recycling and reclamation of municipal or domestic sewage, including land dedicated to the disposal of sewage sludge that are located within the confines of the facility, with a design flow of 1.0 mgd or more, or required to have an approved pretreatment program under 40 CFR 403.

Category (x): Construction activity including clearing, grading, and excavation activities resulting in the disturbance of five acres or more, or sites less than five acres if it is part of a larger common plan of development or sale.

Category (xi): Light manufacturing facilities where materials are exposed to stormwater as defined by SICs 20; 21; 22; 23; 2434; 25; 265; 267; 27; 283; 285; 30; 31 (except 311); 323; 34 (except 3441); 35; 36; 37 (except 373); 38; 39; and 4221 - 4225.

Source: 40 CFR 122.26(b)(14)

ENVIRONMENTAL LAWS AND MANAGEMENT

by Richard M. Engle

In an effort to protect the environment we live in, as well as ensure a safe and healthful climate for our higher education community, the constant flow of laws and regulations from the federal and state levels create an ever treacherous tightrope that a facilities manager must walk to keep his or her institution out of potentially embarrassing situations and/or expensive litigations. Every facilities manager wants a safe and healthful climate for every student, faculty, and staff member, and would probably strive toward those goals regardless of outside mandates. In preparing for this article I have been fortunate to have assistance from some experts in the field: Bob VanOrden from Melick-Tully and Associates, Mike Quinlan, director of the Rutgers environmental health and safety office, and members of the Rutgers University facilities team.

Rutgers, The State University of New Jersey is located in a state that has developed a national reputation for being at the leading edge in terms of protecting its environment. This requires compliance with a variety of laws, rules, and regulations. However, this article will relate, in general terms, to recent experiences regarding the environmental impact on planning, legislation, operations, and maintenance of education facilities. The specific rules of the applicable state or government agency must be reviewed in each instance to ensure compliance. I hope that, as you read on, a warning flag will be raised that will keep you out of future hot water.

There are a multitude of laws, rules, and/or regulations that frequently impact our planning processes and fiscal resources. Some specific areas that need to be considered are: coastal and/or freshwater wetlands, underground storage tanks (UST), asbestos, indoor air quality, right-to-know, hazardous waste, medical waste, Clean Air Act, Americans with Disabilities Act (ADA), and the Occupational Safety and Health Administration (OSHA).

Wetlands (Coastline and/or Freshwater)

Where potential wetlands are being considered as a site for a proposed project, a field delineation and site assessment must be conducted to ensure that the site will not impose significant restrictions or controls on the proposed construction. It is important to remember that if it looks like it could be a wetland (even a human-built one such as a constructed drainage ditch), it will probably need to be treated as a wetland. It is useful to minimize the extent of the wetlands disturbance. Formal permits need to be obtained prior to any disturbance within or adjacent to wetlands. Sometimes disturbed wetlands can be mitigated by the creation of new wetlands on portions of nearby property.

Underground Storage Tanks

Because of federal laws and special state laws, the financial impact of this regulation is difficult to estimate up front. While the cost of removal, replacement, or remediation of a specific size tank is generally known, the environmental cleanup costs associated with any petroleum fuel tank leakage can be enormous, sometimes over two-and-a-half times the cost of the tank removal. The full extent cannot be fully known, or estimated, until the tank is removed and the surrounding soil is exposed for examination. Nevertheless, testing of the tank or taking surrounding borings beforehand sometimes can provide clues to the extent of leakage that may have occurred and remediation that might be required.

Most tank removals will require some type of post-excavation soil and/or groundwater sampling and laboratory testing to confirm that all contaminants have been removed. Based on past experiences, Rutgers estimates the average remedial costs are in the range of three to five dollars per gallon (based on the size of the tank being removed).

Where USTs are known to be in a construction area, it is good practice to remove the tanks in advance of commencing construction in order to allow time to deal with any encountered contamination. An unknown abandoned tank, suddenly discovered from a visible sheen on the ground or during the excavation process, can have a serious effect on a project schedule. This type of situation can also create numerous potential environmental liabilities.

In some states, as in New Jersey, there may be a requirement that all underground motor fuel tanks and most underground heating oil tanks be registered. This then puts each college or university on record with the state about the tank and encourages continued compliance with regulations. Since New Jersey specifies a timetable for removal of old tanks (and penalties for not meeting deadlines) and upgrade of existing tanks (leak prevention and detection systems), we at Rutgers cannot always wait for construction to become involved in the UST process. Other states may have similar requirements. Some states may also require that the installstion, removal, and disposal of UST be completed by a certified contractor.

Cleanup Standards for Contaminated Sites

Perhaps this would be a good place to talk about site clean up in general. Contaminants or hazardous substances are generally thought of as humanmade waste, such as petroleum products. They could also be residues of chemicals or other manufacturing processes or toxins. Do not overlook

Dick Engle is associate vice president for facilities at Rutgers University, New Brunswick, New Jersey. He wrote on conducting an interview in the Winter 1986 Facilities Manager.

FACILITIES

materials found in everyday life, such as paint, batteries, or asphalt. A site may contain such materials due to former activities conducted on the site, subterranean migration of contaminants through groundwater or other mechanisms, or from "dumping." Regulations set forth a long list of contaminants that, when found, must be properly removed from a site. Usually the past and current owners of a property, along with those who generated or transported the contaminants (if they can be found), are jointly liable for the cost of any cleanup. As normally happens, a disproportionate share of the cost may have to be borne by the current owner since it is difficult to determine who the other parties are. Thus, it is prudent to insist on a certified "clean site" *before* acquiring new property.

Transfer of ownership of land sometimes requires prior cleanup or a disclosure of the presence of contaminants. Thus, the presence of hazardous substances can create a high financial risk or liability for the owner. To determine if any such problems exist, an environmental site assessment is useful to help determine whether or not a site is, a) probably not contaminated, b) might be contaminated, or c) is known to be contaminated. Judgments on these positions should be based, as a minimum, on research in the form of a historical review of the area and a site reconnaissance. These should be sufficient to indicate if any further study is needed.

The extent and nature of further study will depend on these initial factors and any requirement to identify the nature and extent of the contamination. In addition, excess materials generated at a construction site may need to be evaluated prior to reuse or off-site disposal. (Landfills are much more selective in what they now will accept.)

For those institutions that are involved with medical facilities, laboratories, and laboratory animals, the handling and disposal of hazardous waste or medical waste can cause special concerns. Special procedures need to be followed to ensure a safe cleanup of chemical spills or blood.

Remember, there is always a "cradle to grave" responsibility that stays with the institution, regardless of what a cleanup or removal contractor may guarantee. As a source generator, an audit trail follows disposal of contaminated material. If not done properly, it can come back to haunt you, even though the "disposer" may be at fault.

It should be noted that the presence of a contaminant at a low concentration level may not violate any regulatory standard or pose a health threat. In the final analysis, safety of people is what we are really concerned about, although perceived concerns by the university community can force remedial action beyond what is legally required.

Asbestos

This is perhaps the best known of hazardous materials, and which at one time was considered to be an entirely safe and most valuable material, frequently used to satisfy life safety codes. It is therefore widely found in many forms, i.e., sewer pipes, building siding, flooring, insulation, brakes, fireproofing, acoustical treatment, and much more. The list goes on and on. Because of its widespread uses and concerns among the general population, asbestos can easily change from a national safety issue to a magnified emotional issue that is heavily controlled and regulated.

The danger from asbestos is in breathing and getting its small fibers in one's lungs. Exposure to fibrous asbestos material does not cause an immediate decline in health, and the eventual severity to one's health depends as much on other contributing factors, such as smoking or personal hygiene.

To prevent exposure to the general public, asbestos can either be removed or encapsulated to keep the fibers from becoming airborne. Sometimes the easiest solution is just painting the surface, such as ceiling tile, to prevent the fibers from getting loose and suspended in the breathing air. One danger sign is water damage, which can quickly and easily ruin an otherwise satisfactory asbestos application.

Most states have regulations that make asbestos not only complicated to remove, but also difficult to dispose of properly. Depending on the magnitude of the corrective action, a permit to remove the asbestos may be required. This then may require a certified licensed contractor, as well as a certified licensed monitoring firm, to ensure that no asbestos fibers are allowed to escape the contaminated areas and that the work area is safe enough to be reoccupied.

The final monitoring, lab analysis, and reclean ing by again wiping down areas may require several additional days before the area can be certified as safe for the public to reoccupy. This can become a highly sensitive problem when the building has to be vacated and sealed while asbestos is being removed.

One of the most frequent reasons to deal with an asbestos problem is when a space requires alterations or modifications to be done. It is not uncommon for the asbestos removal to cost two or more times the original cost of the alteration work. One advantage of having a licensed contractor involved is that they will assume the risk of exposure and know how to properly and legally dispose of removed material.

It is possible that in-house forces can be trained to do this work, but extensive training, personal protection equipment, and ongoing health monitoring is required. Continuous training of all employees is still required to ensure asbestos is recognized and not inadvertently released. If there is any question as to what a material is, a worker should not be allowed to disturb it until the material in question has been properly identified and poses no danger.

Indoor Air Quality

In January 1992, new and restrictive regulations for public buildings in New Jersey became effective regarding indoor air quality. The same may be true elsewhere. The requirements for site investigation and testing is now something that can be triggered by an occupant complaint, for whatever reason. It is required to respond to all complaints, even if from only one person. It should be noted that "poor air quality" is sometimes cited as a problem, when temperature comfort or HVAC control is the real issue. In all buildings, the standard for compliance is ASHRAE 92-1989 and 55-1981 (ventilation and thermal comfort).

There is a real concern and problem with new buildings where chemicals and odors from fabrics, glue, new paint, and rugs have not been properly allowed to disperse or "air out." It may be advantageous to "bake or flush out" a new building and its contents for a period of time before allowing full permanent occupancy. This process involves turning the heat up high and, with full outside air, the exhaust fans are turned on full for several days.

New New Jersey rules also prohibit air in any smoking areas from being recirculated within the building. Smoking areas must now be vented directly outdoors. Since the cost of accomplishing this may be expensive, it may be preferable to ban smoking entirely within a building. This is now common practice, even in private industry. As a matter of compliance, records of all periodic and preventive maintenance, as required by the manufacturer, should be retained to demonstrate that an HVAC system, which

could be attributed to a complaint, has been properly serviced.

Right-to-Know

This may be a law or regulation that varies with each state and yet affects every facilities organization. New Jersey requires that all substances be labeled with all ingredients, down to the lowest level of use: i.e., each can of a kitchen cleanser must be labeled with all hazardous agents, the five most prevalent ingredients, and the Chemical Abstract Services (CAS) number for widespread recognition. One way to solve this is to require the manufacturer do the labeling on the container before purchase. Proper labeling becomes more complicated as you get involved with mixing cleaning and spraying compounds, such as materials bought in bulk and mixed locally. This occurs often with custodians or groundskeepers. There must be proper training and checks and balances to be sure the procedure is done consistently and safely. Comprehension of labels needs to be taken into consideration with regard to literacy and foreign languages. Once all hazardous substances have been identified and reported, annual training is required for all employees who come in contact with them. To illustrate the problem: to what extent are most people aware of the contents of the materials used in the copy machine in your office?

Clean Air Act

These regulations place new restrictions on incinerators and will require permitting of fuel burning sources. They eventually may require "control devices" on discharge stacks, depending on the quality of air in a given region. One of the things we can look forward to is better utilization of the private automobile. Employers may be required to raise the average occupancy of vehicles through an employee trip vehicle program. In some areas special blends of gasoline will be mandated to reduce pollution during critical seasons.

Federal law now mandates an end of chlorofluorocarbon (CFCs) production by January 1996. CFCs were originally introduced as refrigerants and gained widespread use in other areas, such as aerosol propellants. In the 1980s scientists working in the Antarctic made a shattering discovery—this refrigerant was making holes in the earth's ozone layer. We now have to effect the recovery of this gaseous material, commonly used in building and automotive air conditioning systems. This cannot be achieved without costs, as it requires licensed and certified mechanics to work on any CFC containing air conditioning unit. Also, CFC refrigerants will become much more costly as production is phased out.

Because it is now illegal to vent currently used CFCs into the atmosphere, it is necessary to modify existing equipment so that emissions are minimized. CFCs are to be recovered and reused during maintenance. One thing hindering a full and quick solution to the CFC problem is finding an acceptable alternate CFC substitute. Current systems are commonly designed to use R-11 or R-12 CFC, which are being phased out. We know there will be a deterioration in efficiency of this equipment, but the extent of this is still being evaluated.

Americans with Disabilities Act (ADA)

While not specifically related to the environment, the ADA is a federal law that experience has yet to sort out and test over time. The Justice Department has recently issued implementing regulations for this act that is civil rights legislation, designed to improve access to the job or workplace for people with disabilities. Title I (Employment), Title II (Public Accommodations Required of Public Institutions), and Title III (Public Accommodations Required of Private Institutions) of the act are now in effect. ADA should be thought of more of as civil liability than a code requirement. Under this new law, discriminating against people with disabilities is prohibited. Disabilities are broadly defined to include those with visual, speech, hearing, mobility, as well as mental or psychological impairments. Owning, operating, or leasing a public building that is determined to be in noncompliance, can make the institution vulnerable to civil lawsuits.

Costly fines and penalties may be levied against those whom the courts determine to be liable. To assure compliance, it is necessary that a comprehensive building survey, where each facility as a whole—parking lots, entrances, building rooms—must be reviewed to determine ADA compliance. Sweet's *Accessible Building Products* 1993 catalog file has a good brief overview of ADA. Another publication is APPA's *Removing the Barriers: Accessibility Guidelines and Specifications*. Complying with the regulations will almost certainly require physical changes to campus structures. Dealing with these ADA issues early on will not only make facilities and buildings accessible to all Americans, but will reduce the possibility of prolonged, expensive civil litigation.

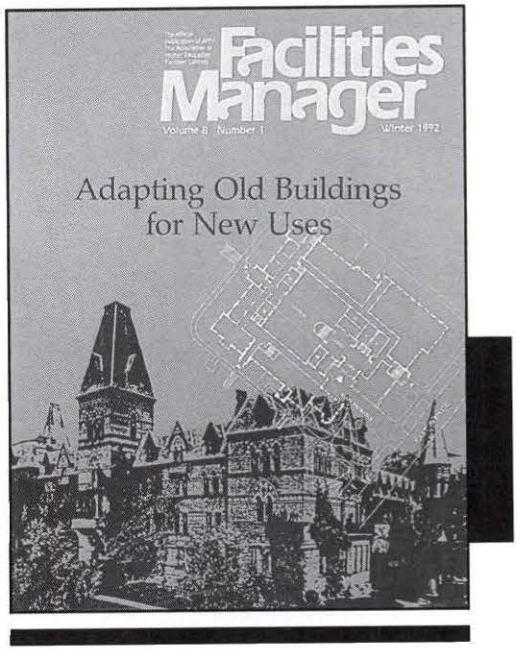
Conclusion

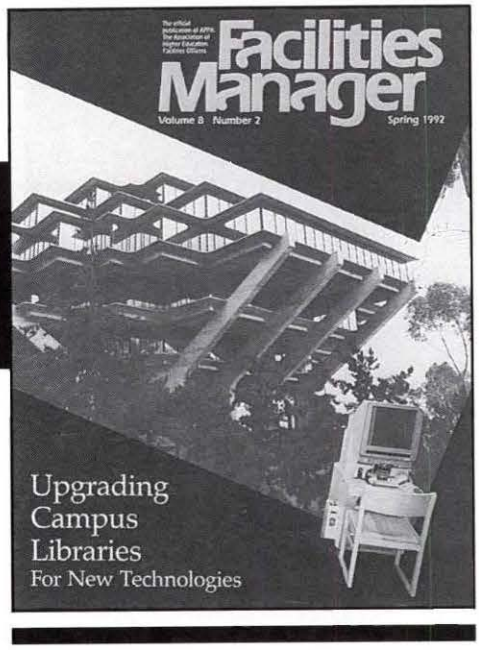
As you may have surmised from this brief essay, there are a myriad of laws, regulations, rules, and codes that govern the planning, design, construction, maintenance, and operation of our college and university facilities. Due to space limitations, the general nature of each has only been introduced here. Some, such as OSHA's recent standards and proposed regulations, have been left to each of you regarding lockout/tagout standards, bloodborne pathogens, confined spaces, motor vehicle safety, TB guidelines, or construction safety. It is now up to you as the facilities manager for your institution to delve further, to ensure that you and your institution are ahead of the crowd that always seems to be looking over your shoulder. Good luck! ■

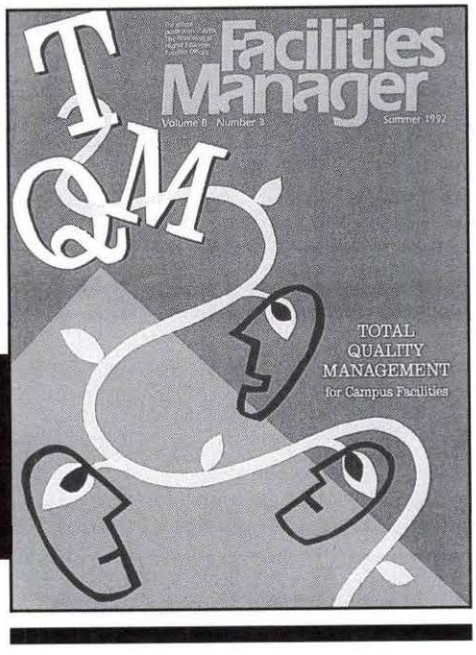
1992 Index

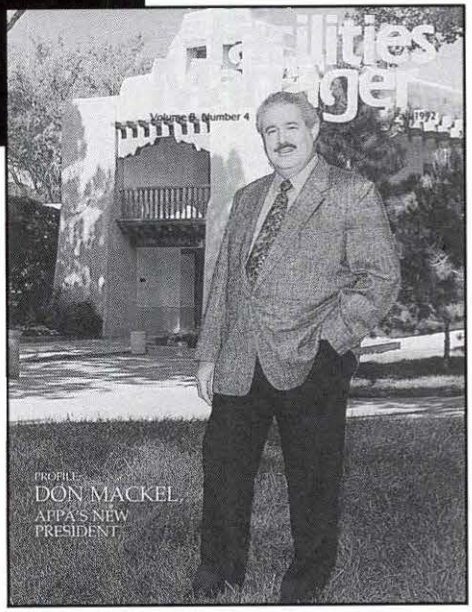
Facilities Manager, Volume 8

by Steve Glazner









Steve Glazner is APPA's director of communications and editor of Facilities Manager.

Articles by Subject

Americans With Disabilities Act
ADA Assistance — Summer 6
Rx: Handicapped Accessibility, *by Winthrop M. Wassenar* — Fall 11

APPA Business
APPA's Theological Study Attracts Widespread Media Interest — Winter 3
APPA Challenges Vision of Facilities Condition — Winter 3
Midyear Report From the President-Elect, *by Don Mackel* — Winter 4
1991 APPA Regional Meeting Highlights — Winter 5
1991-92 Regional Officers — Winter 7
Taking Advantage of APPA's Information Services, *by Maxine Mauldin* — Winter 34
What's the Latest in Membership? From the Vice President for Membership, *by George Preston* — Spring 3
Facilities: Still a Key Issue in Higher Education, *by Walter A. Schaw* — Spring 3
APPA Publishes Emergency Prep Book — Spring 4
Candidates Chosen for APPA Election — Spring 4
Higher Ed Associations Cooperate on Privatization/Self-Operations Study — Summer 4
Christenson Wins Rex Dillow Award — Summer 5
Answering Your Calls, Letters, and Faxes, *by Maxine Mauldin* — Summer 40
Capital Renewal/Deferred Maintenance
APPA Challenges Vision of Facilities Condition — Winter 3
Emeritus Club Update, *by George T. Preston* — Fall 3
APPA Committees 1992-93 — Fall 5
Mentoring and Planning: A Visit With Donald L. Mackel, *by Pauline O. Hovey* — Fall 12

Capital Notes (column)
Reauthorization of Higher Education Act/ Sallie Mae/Research and library facilities/ Infrastructure Modernization Act/ Proposed rules for gasoline & alcohol blends, and for motor vehicle lamps & reflective devices/Formaldehyde exposure/ ZIP + 4, *by Donna Wiesner* — Winter 9
Proposed rules defining hazardous waste/ Superfund cleanup/Fiberglass safety/CFCs/ Clean Air Act/PCBs and Rhode Island College/HCFCs/OSHA reauthorization/ On-line EPA access/Asbestos accreditation requirements, *by Donna Wiesner* — Spring 11
Virginia's adoption of ADA/Virginia's facilities bond issue/Florida's budget/ Connie Lee/Clean Air regulations/Carbon dioxide emissions/ASEAM energy analysis software/Low-level radioactive waste, *by Donna Wiesner* — Summer 8
Hepatitis B vaccine/Leaking USTs/FEMA rules for school facility cleanups/TQM excellence awards/Merit-based competitive awards/Calling EPA/Recommended CFC article/Asbestos/Superfund sites/Storm water regulations/Bush letter to APPA, *by Donna Wiesner* — Fall 7

Computerization
Housing Assignments Drive Computer Crazy, *by Howard Millman* — Winter 37
Easy-to-Use CMMS Runs on Apples and Under DOS Windows, *by Howard Millman* — Spring 42
Capital Asset Management Helps You Track the Big Bucks, *by Howard Millman* — Summer 43
Windows of Opportunity, *by Howard Millman* — Fall 42

Contracted Services
Higher Ed Associations Cooperate on Privatization/Self-Operations Study — Summer 4

Customer Service
UVA Publishes FM Annual Report — Spring 5
Book Review: "Keeping Customers for Life," *rev. by Tom Sichko* — Spring 46
Book Review: "Managing the Total Quality Transformation," *rev. by Ronald R. Maassen* — Spring 47
Total Quality Management for Campus Facilities, *by Gary L. Reynolds* — Summer 14
Reorganizing for Zone Management, *by Kenneth A. Hall* — Summer 34

Emergency Preparedness
APPA Publishes Emergency Prep Book — Spring 4

Energy Management/Utilities
Book Review: "Strategic Planning for Energy and the Environment," *rev. by Mohammad Qayoumi* — Winter 39
Book Review: "Planned Maintenance for Productivity and Energy Conservation," *rev. by Kate Fenton* — Spring 44
Book Review: "Energy and Environmental Strategies for the 1990s," *rev. by Mohammad H. Qayoumi* — Spring 47
Universities Win Cogen Grants — Summer 6
Book Review: "Cogeneration and Small Power Production Manual," *rev. by Eric Shawn* — Summer 46
Demand Side Management, *by Mohammad H. Qayoumi* — Fall 28

The Environment (column)
Books and courses/Pesticides issues/Storm water pollution deadline extended, *by Stephanie Gretchen* — Winter 10
Books and courses/Air toxic emissions control equipment/Clean Air Act Amendments/ Hazardous waste crackdown/Government as green consumer, *by Stephanie Gretchen* — Spring 6
Biomedical waste disposal/Batteries/ Improving air quality and lowering energy consumption/Books and courses/ Hazardous and nonhazardous waste/Out-of-state waste shipments/Used oil, *by Stephanie Gretchen* — Summer 7
Indoor air quality/Ithaca College recycling program/Environmental certificate programs/Environment and Safety Compliance Calendar/Hazardous Materials Transportation Uniform Safety Act/Used oil/ Alternative refrigerants/Complaints to EPA/ Indoor Radon Abatement Act/UST video, *by Stephanie Gretchen* — Fall 8

Environmental Concerns
Storm water permits (The Environment) Winter 10
Solid Waste Management: A Paradigm Imperative, *by Alan S. Bigger* Winter 22
Book Review: "Strategic Planning for Energy and the Environment," *rev. by Mohammad Qayoumi* Winter 39
Clean Air Act Amendments/Air toxic emissions control (The Environment) Spring 6
Hazardous waste rules/Superfund cleanup/ CFCs/OSHA (Capital Notes) Spring 11
Book Review: "Community Right-to-Know Handbook," *rev. by Robert W. Pharr* Spring 44
Book Review: "Energy and Environmental Strategies for the 1990s," *rev. by Mohammad H. Qayoumi* Spring 47
College's Eco-Design Summer 5
Out-of-state waste shipments/used oil (The Environment) Summer 7
Book Review: "Fundamentals of Noise Control Engineering," *rev. by Kate Fenton* Summer 45
Book Review: "Indoor Air Quality: Design Guide Book," *rev. by Robert McDowall* Summer 45
Call for Safety Papers Fall 3
Leaking underground storage tanks/school facility cleanups (Capital Notes) Fall 7
Recycling program/transportation of hazardous materials/used oil (The Environment) Fall 8

Facilities Finance
APPA's Theological Study Attracts Widespread Media Interest Winter 3
APPA Challenges Vision of Facilities Condition Winter 3
A Leader Emerges: Harvard Sets an Example for Financial Reporting on Facilities as a Capital Asset, *by Walter A. Schaw* Summer 3
Capital Asset Management Helps You Track the Big Bucks, *by Howard Millman* Summer 43
Book Review: "Budgeting of Higher Education at the State Level: Enigma, Paradox, and Ritual," *rev. by David Techau* Summer 45
Demand Side Management, *by Mohammad H. Qayoumi* Fall 28
Productivity-Based Facilities Management: Managing to the University Bottom Line, *by Thomas C. Hier* Fall 34

Facilities Management International
Griffith University, Australia (Global Exchange), *by Sam Ragusa* Winter 36
University of Otago, New Zealand (Global Exchange), *by Roger McK. Dodd* Spring 40
Asian Institute of Technology, Thailand (Global Exchange), *by Noppadon Muangkroot* Summer 41
Royal Melbourne Institute of Technology, Australia (Global Exchange), *by Marcus Taylor* Fall 40

Facilities Management Profession
Quality Education and the Facilities Component, *by Richard T. Ingram* Winter 12
Facilities: Still a Key Issue in Higher Education, *by Walter A. Schaw* Spring 3
The 2020 Vision, *by Mohammad H. Qayoumi* Spring 32
A Leader Emerges: Harvard Sets an Example for Financial Reporting on Facilities as a Capital Asset, *by Walter A. Schaw* Summer 3
Higher Ed Associations Cooperate on Privatization/Self-Operations Study Summer 4
Ethics of Hazardous Waste Management, *by Sharon L. Cramer* Summer 13
Total Quality Management for Campus Facilities, *by Gary L. Reynolds* Summer 14
Book Review: "Planning and Managing Higher Education Facilities," *rev. by Kate Fenton* Summer 47
Mentoring and Planning: A Visit With Donald L. Mackel, *by Pauline O. Hovey* Fall 12
Educational Leadership: The Role of Facilities in Educational Excellence, *by Samuel H. Smith* Fall 18
Power, Influence, and Survival in Difficult Times, *by Mark Pastin* Fall 22

Facilities Manager
1991 Index: Facilities Manager, Volume 7, *by Steve Glazner* Winter 28
Christenson Wins Rex Dillow Award Summer 5

Government Relations
Academic, research, and library facilities and equipment (Capital Notes) Winter 9
ADA requirements/facilities bond issues/ RCRA/energy management programs (Capital Notes) Summer 8
Leaking underground storage tanks/school facility cleanups (Capital Notes) Fall 7

Hazardous Waste Management
Solid Waste Management: A Paradigm Imperative, *by Alan S. Bigger* Winter 22
Hazardous waste rules/Superfund cleanup (Capital Notes) Spring 11
Book Review: "Community Right-to-Know Handbook," *rev. by Robert W. Pharr* Spring 44
Out-of-state waste shipments/used oil (The Environment) Summer 7
Ethics of Hazardous Waste Management, *by Sharon L. Cramer* Summer 13

Housing Facilities
Housing Assignments Drive Computer Crazy, *by Howard Millman* Winter 37
Residential Facilities Maintenance: A University Housing Perspective, *by Floyd B. Hoelting & David A. Cain* Summer 28

Human Resource Issues
Miami University's Job Enrichment Program, *by Esther M. Geiermann* Winter 18
Work Place Excel: Developing a Skills Enhancement Program, *by Wilma Mpelo Worrell* Spring 26
Working With a Difficult Person, *by Sigmund G. Ginsburg* Summer 10

Information Services
Taking Advantage of APPA's Information Services, *by Maxine Mauldin* Winter 34
Sharing the Fruits of Knowledge, *by Maxine Mauldin* Spring 39
Answering Your Calls, Letters, and Faxes, *by Maxine Mauldin* Summer 40
New and renovated construction, *by Maxine Mauldin* Fall 39

Library Facilities
Academic, research, and library facilities and equipment (Capital Notes) Winter 9
On the Cutting Edge: Upgrading Campus Libraries for New Technologies, *by Ruth E. Thaler-Carter* Spring 18

Maintenance
Easy-to-Use CMMS Runs on Apples and Under DOS Windows, *by Howard Millman* Spring 42
Book Review: "Planned Maintenance for Productivity and Energy Conservation," *rev. by Kate Fenton* Spring 44
Residential Facilities Maintenance: A University Housing Perspective, *by Floyd B. Hoelting & David A. Cain* Summer 28
Reorganizing for Zone Management, *by Kenneth A. Hall* Summer 34
Book Review: "Fundamentals of Noise Control Engineering," *rev. by Kate Fenton* Summer 45
Hands on History Fall 3
Productivity-Based Facilities Management: Managing to the University Bottom Line, *by Thomas C. Hier* Fall 34

Management Issues
Mixing the Right Dose of Power and Prestige, *by Sigmund G. Ginsburg* Winter 11
Book Review: "Building Productive Teams," *rev. by R.A. Jackson* Winter 39
Book Review: "Essentials of Management," *rev. by Alfred M. Rozeiu* Winter 40
Take "Principles" of Management With Grains of Salt, *by Sigmund G. Ginsburg* Spring 12
Life in the Change Lane: Are You Growing Fast Enough?, *by Martha Spice & Alan Gilburg* Spring 15
The 2020 Vision, *by Mohammad H. Qayoumi* Spring 32
Book Review: "How to Present Like a Pro," *rev. by Ronald R. Maassen* Spring 45
Book Review: "Improving College Management: An Integrated Systems Approach," *rev. by James J. Lettiere* Spring 46
Book Review: "Managing the Total Quality Transformation," *rev. by Ronald R. Maassen* Spring 47
Working With a Difficult Person, *by Sigmund G. Ginsburg* Summer 10
Total Quality Management for Campus Facilities, *by Gary L. Reynolds* Summer 14
Trust Your Guardian Angels—But Don't Assume They Work Overtime, *by Sigmund G. Ginsburg* Fall 10

New Technologies
On the Cutting Edge: Upgrading Campus Libraries for New Technologies, *by Ruth E. Thaler-Carter* Spring 18
The 2020 Vision, *by Mohammad H. Qayoumi* Spring 32

Planning, Design, and Construction
Adapting Old Buildings for New Uses, *by Steven Einhorn & Jim McKinney* Winter 14
Selecting a Campus Planning Consultant, *by Wain Gaskins* Spring 34
College's Eco-Design Summer 5
Continuity and Contradiction in Contemporary Campus Architecture, *by Werner K. Sensbach* Summer 22
Book Review: "Indoor Air Quality: Design Guide Book," *rev. by Robert McDowall* Summer 45
Book Review: "Planning and Managing Higher Education Facilities," *rev. by Kate Fenton* Summer 47
New and renovated construction, *by Maxine Mauldin* Fall 39
Book Review: "The Campus as a Work of Art," *rev. by Werner K. Sensbach* Fall 44
Book Review: "Campus Design," *rev. by Frederick W. Mayer* Fall 44

Recycling
Solid Waste Management: A Paradigm Imperative, *by Alan S. Bigger* Winter 22
Ithaca College recycling program (The Environment) Fall 8

Research Facilities
Academic, research, and library facilities and equipment (Capital Notes) Winter 9
On the Cutting Edge: Upgrading Campus Libraries for New Technologies, *by Ruth E. Thaler-Carter* Spring 18
Facilities Promote Math and Science Summer 5

Safety
Call for Safety Papers Fall 3

Training
Work Place Excel: Developing a Skills Enhancement Program, *by Wilma Mpelo Worrell* Spring 26
Book Review: "Training for Non-Trainers: A Do-It-Yourself Guide for Managers," *rev. by David Mayocchi* Spring 44

Authors

Bigger, Alan S. "Solid Waste Management: A Paradigm Imperative" Winter 22
Cain, David A. (with F.B. Hoelting). "Residential Facilities Maintenance: A University Housing Perspective" Summer 28
Cramer, Sharon L. "Ethics of Hazardous Waste Management" Summer 13
Dodd, Roger McK. "University of Otago" Spring 40
Einhorn, Steven (with J. McKinney). "Adapting Old Buildings for New Uses" Winter 14

Fenton, Kate. Book review of *Planned Maintenance for Productivity and Energy Conservation* Spring 44
———. Book review of *Fundamentals of Noise Control Engineering* Summer 45
———. Book review of *Planning and Managing Higher Education Facilities* Summer 47
Gaskins, Wain. "Selecting a Campus Planning Consultant" Spring 34
Geiermann, Esther M. "Miami University's Job Enrichment Program" Winter 18
Gilburg, Alan (with M. Spice). "Life in the Change Lane: Are You Growing Fast Enough?" Spring 15
Ginsburg, Sigmund G. "Mixing the Right Dose of Power and Prestige" Winter 11
———. "Take 'Principles' of Management With Grains of Salt" Spring 12
———. "Working With a Difficult Person" Summer 10
———. "Trust Your Guardian Angels—But Don't Assume They Work Overtime" Fall 10
Glazner, Steve. "1991 Index: *Facilities Manager*, Volume 7" Winter 28
Gretchen, Stephanie. The Environment Winter 10
———. The Environment Spring 6
———. The Environment Summer 7
———. The Environment Fall 8
Hall, Kenneth A. "Reorganizing for Zone Management" Summer 34
Hier, Thomas C. "Productivity-Based Facilities Management: Managing to the University Bottom Line" Fall 34
Hoelting, Floyd B. (with D.A. Cain). "Residential Facilities Maintenance: A University Housing Perspective" Summer 28
Hovey, Pauline O. "Mentoring and Planning: A Visit With Donald L. Mackel" Fall 12
Ingram, Richard T. "Quality Education and the Facilities Component" Winter 12
Jackson, R.A. Book review of *Building Productive Teams* Winter 39
Lettiere, James J. Book review of *Improving College Management: An Integrated Systems Approach* Spring 46
Maassen, Ronald R. Book review of *How to Present Like a Pro* Spring 45
———. Book review of *Managing the Total Quality Transformation* Spring 47
McDowall, Robert. Book review of *Indoor Air Quality: Design Guide Book* Summer 45
Mackel, Don. "Midyear Report From the President-Elect" Winter 4
McKinney, Jim (with S. Einhorn). "Adapting Old Buildings for New Uses" Winter 14
Mauldin, Maxine. "Taking Advantage of APPA's Information Services" Winter 34
———. "Sharing the Fruits of Knowledge" Spring 39
———. "Answering Your Calls, Letters, and Faxes" Summer 40
———. New or renovated construction Fall 39
Mayer, Frederick W. Book review of *Campus Design* Fall 44
Mayocchi, David. Book review of *Training for Non-Trainers: A Do-It-Yourself Guide for Managers* Spring 44
Millman, Howard. "Housing Assignments Drive Computer Crazy" Winter 37
———. "Easy-to-Use CMMS Runs on Apples and Under DOS Windows Spring 42
———. "Capital Asset Management Helps You Track the Big Bucks" Summer 43
———. "Windows of Opportunity" Fall 42
Mpelo Worrell, Wilma. "Work Place Excel: Developing a Skills Enhancement Program" Spring 26
Muangkroot, Noppadon. "Asian Institute of Technology" Summer 41
Pastin, Mark. "Power, Influence, and Survival in Difficult Times" Fall 22
Pharr, Robert W. Book review of *Community Right-to-Know Handbook* Spring 44
Preston, George T. "What's the Latest in Membership? From the Vice President for Membership" Spring 3
———. "Emeritus Club Update" Fall 3
Qayoumi, Mohammad H. Book review of *Strategic Planning for Energy and the Environment* Winter 39
———. "The 2020 Vision" Spring 32
———. Book review of *Energy and Environmental Strategies for the 1990s* Spring 47
———. "Demand Side Management" Fall 28
Ragusa, Sam. "Griffith University" Winter 36
Reynolds, Gary L. "Total Quality Management for Campus Facilities" Summer 14
Rozeiu, Alfred M. Book review of *Essentials of Management* Winter 40
Schaw, Walter A. "Facilities: Still a Key Issue in Higher Education" Spring 3
———. "A Leader Emerges: Harvard Sets an Example for Financial Reporting on Facilities as a Capital Asset" Summer 3
Sensbach, Werner K. "Continuity and Contradiction in Contemporary Campus Architecture" Summer 22
———. Book review of *The Campus as a Work of Art* Fall 44
Shawn, Eric. Book review of *Cogeneration and Small Power Production Manual* Summer 46
Sichko, Tom. Book review of *Keeping Customers for Life* Spring 46
Smith, Samuel H. "Educational Leadership: The Role of Facilities in Higher Education" Fall 18
Spice, Martha (with A. Gilburg). "Life in the Change Lane: Are You Growing Fast Enough?" Spring 15
Taylor, Marcus. "Royal Melbourne Institute of Technology" Fall 40
Techau, David. Book review of *Budgeting of Higher Education at the State Level: Enigma, Paradox, and Ritual* Summer 45
Thaler-Carter, Ruth E. "On the Cutting Edge: Upgrading Campus Libraries for New Technologies" Spring 18
Wassenar, Winthrop M. "Rx: Handicapped Accessibility" Fall 11
Wiesner, Donna. Capital Notes Winter 9
———. Capital Notes Spring 11
———. Capital Notes Summer 8
———. Capital Notes Fall 7

APPA Answers

Maxine Mauldin

Environmental Resources From APPA

In today's society, much emphasis has been placed on such environmental issues as the correct and safe way to remove asbestos, the clean air and water acts, OSHA regulations, and much more. Many institutions have implemented recycling programs, and even at home we are separating our reusable trash. This not only helps the environment, but it also makes economic sense. As the saying goes, every little bit helps.

As you review your current and future environmental programs, APPA's International Experience Exchange Data Base can provide you with a list of institutions that currently have a trash recycling program. In addition, we can also provide a list of institutions that contract or self-provide asbestos removal, chemical waste handling, PCB removal, air monitoring, and more.

It is not too late to register for APPA's Regulatory Compliance Seminar, scheduled for February 18-19 in Arlington, Virginia. This seminar will touch on all aspects of environmental compliance, as well as ADA and other concerns. For more information on the seminar contact APPA's Educational Programs Department.

APPA's publications have provided a wealth of information on environmental issues. Stephanie Gretchen, APPA's communications manager, writes a monthly column called The Environment, which is featured in *APPA Newsletter* and *Facilities Manager*. In addition, each year the winter issue of *Facilities Manager* and the February issue of *APPA Newsletter* include an index of all articles published the previous year on environmental, and many other, topics.

Following are several books currently available from APPA that will help you assess and improve your campus environmental program:

- *Regulatory Compliance for Facilities Managers* ($22 APPA members, $30 others)
- *Case Studies in Environmental Health and Safety* ($25 APPA, $35 others)
- *Asbestos in the Workplace: Managing Small-Scale Abatement* ($45 APPA, $55 others)
- *Hazardous Materials and Solid Waste Management* ($25 APPA, $31 others)

In addition, you may purchase selected *Facilities Manager* articles on environmental topics; the cost is $3 per article. Several are listed in the index to Volume 7, published elsewhere in this issue. Also available are the following articles from previous years:

- The Campus Environmental Crisis: Part 4, The Hazardous Waste Challenge (Winter 1991)
- Environment and Maintenance: Challenges and Opportunities (Summer 1991)
- The Campus Environmental Crisis: Part 1, The PCB Crackdown (Spring 1990)
- The Campus Environmental Crisis: Part 2, Asbestos in the Classroom (Summer 1990)
- The Campus Environmental Crisis: Part 3, The Move to Recycle (Fall 1990)
- Indoor Air Quality: Should You Be Concerned? (Summer 1989)
- The Many Dangers of Radon (Summer 1989)
- Preventable Disasters: Spill Detection at Stanford's Center for Integrated Systems (Winter 1988)
- The National Asbestos Training Centers: Abating the Problem With University Resources (Winter 1986)

All books and articles listed above can be ordered from APPA Publications, P.O. Box 1201, Alexandria, VA 22313-1201. If books are ordered, add $8 for shipping and handling; the articles are postage-paid. All orders must be prepaid. ■

Maxine Mauldin is APPA's information services manager.

Global Exchange

Northland Polytechnic

Lex Switzer

About 3 million people inhabit New Zealand. This country has snow-capped peaks in the south, large native and exotic forests, and beautiful beaches in the north. The northern end of North Island, where Northland Polytechnic is located, is the warmest region of New Zealand. The climate varies from a mild winter, 12°C to 15°C, to a warm summer in the 25°C to 30°C range.

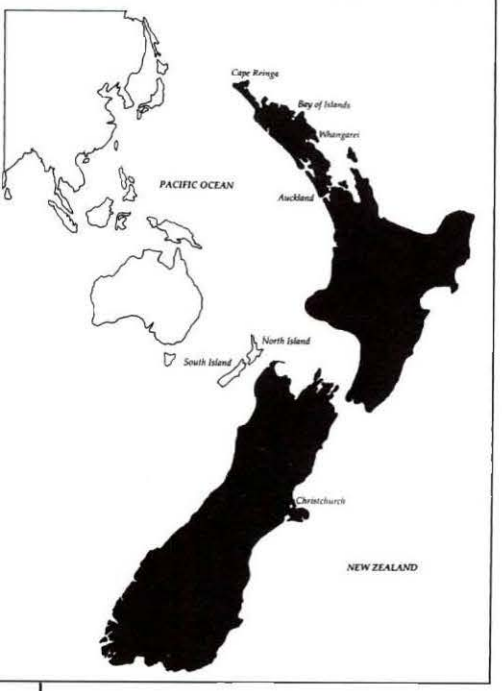
Northland Polytechnic opened in 1978 to provide public, tertiary education in vocational subjects up to the diploma level. It also offers academic courses that are linked with Auckland and Hamilton universities' degree programs.

Diplomas and certificates are given in journalism, nannying, nursing, applied arts, performing arts, business computing, business studies, fiber fabric and fashion, office systems/secretarial, hospitality management, tourism studies, civil engineering, production engineering, electronics, environmental health, chemistry, horticulture, agriculture, wood-turning, carpentry, environmental and conservation studies, and video and television studies.

Northland Polytechnic International is the division of the Polytechnic that deals with all overseas students and trainees. Currently, most students are studying English for speakers of other languages (ESOL), but the international division is able to develop programs in the above fields and associated subjects for groups of ten or more students.

Northland Polytechnic also has a very active professional development center that caters to the training needs of staff and those who are able to provide specialized training in teaching methodology, assessment techniques, self-paced learning, accelerated learning, time management, and associated subjects.

Our main campus is located on eleven acres of land within the urban area of Whangarei, and we have approximately 1,200 full-time and 700 to 800 part-time students. Students pay their own fees; for comparison, the New Zealand dollar is about half the U.S. dollar.



Because the campus has expanded so rapidly during the past eight to ten years, the building program has been quite substantial. We have outpost campuses in six other area as well, all requiring classroom facilities.

Our energy source is mainly hydroeletricity from the national grid, and we also use natural gas to fire the kilns in the arts department. As property officer, my work entails the day-to-day activities of repairs and maintenance plus planning and organizing new facilities for the various courses at all campuses.

We will be pleased to welcome visits from any other educational personnel and enrollments from individual students or groups, particularly from overseas. Anyone wishing to spend time for study here will be especially welcome. ■

Lex Switzer is recently retired property officer at Northland Polytechnic, Whangarei, New Zealand.

Data Base Update

Howard Millman

Environmental Management Application Does Everything But Worry

Howard Millman is a systems integrator with twenty years of experience in facility management. He assists universities and hospitals in planning their purchase, update, or installation of information management systems. He is based in Croton, New York.

Computers can do things I can't." Doesn't that sound like a excellent reason to replace a manual system with an automated one? Unfortunately, in this less-than-perfect world, that statement is more often the reason that computers are **not** installed.

Computers chunk information faster than you do, but they are not smarter. Popular misconceptions about "machine intelligence" result from the unsettling ability of these machines to store the captured intelligence of other people—people who really know much more about a specific topic than you do. Those experts have focused their research and resources on doing just one thing flawlessly. They then record it on a disk and offer it to you to help you solve specific problems.

That's what Chemical Safety does. Based in Richmond, California, Chemical Safety provides software that manages the myriad details of hazardous waste transactions. Its software, the Environmental Management System (EMS), contains a wealth of features including a hazardous waste inventory, a chemical data base of 3,200+ chemicals, waste manifest tracking, permit tracking, employee training, and emergency response information.

Comprehensive Data Bases

The nucleus of EMS is two relational data bases. The Chemical Data Base maintains a list of current hazardous waste inventory. The second data base, Materials Inventory, stores technical and safety data in the form of material safety data sheets (MSDS) related to those chemicals. Other, subsidiary data bases track safety equipment (types and locations), incident reporting, and employee information (training, medical background, and personal information).

Students, staff, faculty, and (increasingly) community leaders often take an interest in knowing specifically which hazardous products are used behind closed lab doors. Federal laws grant these inquirers rights to obtain specific information. EMS generates the Right-to-Know data from its data bases. Much of that data, incidentally, comes from an exhaustively complete CD-ROM data base that the Canadian government created and maintains. CD-ROMs are just one way to keep EMS current. Its built-in communications module provides the ability to download and integrate information from online electronic bulletin boards. These include the Federal Emergency Management Agency's Hazardous Materials Information Exchange (HMIX) and EPA's Technical Information Exchange (TIX). To ease the transfer of information from existing data bases, EMS imports files in industry standard ASCII delimited, Lotus 1-2-3, Excel, and dBASE formats. Data held in UNIX and mainframe repositories can likewise be downloaded.

Paper Trails

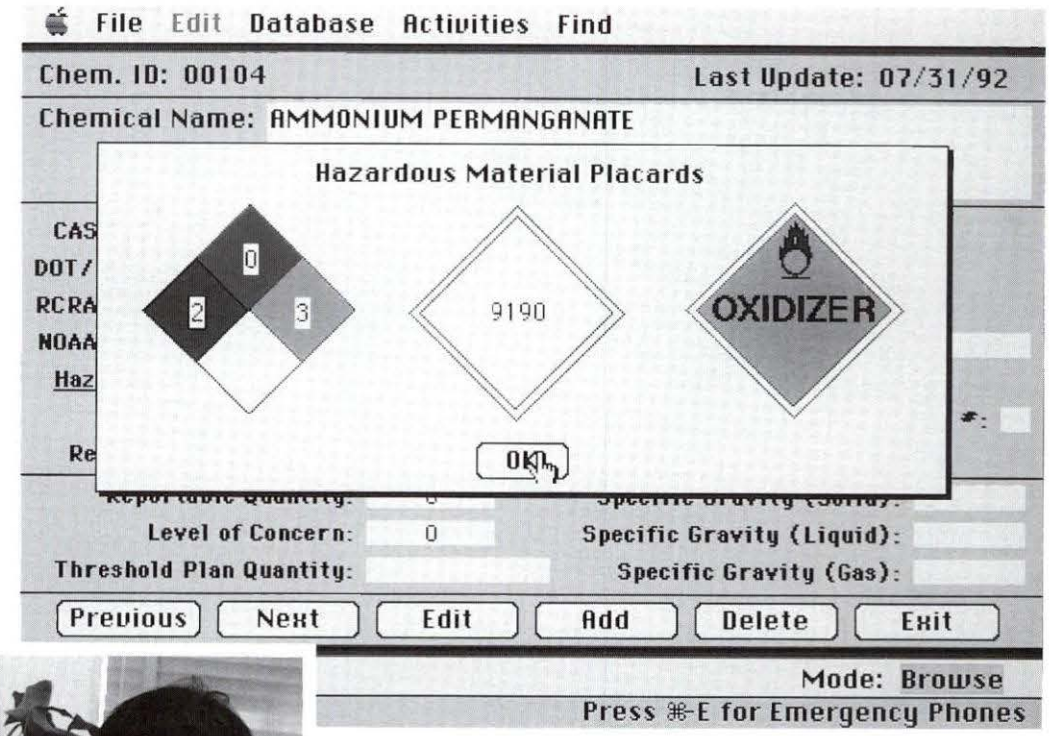
Standard printed reports generated by EMS comply with SARA Title III, Tier I, and II inventory reporting; OSHA; CERCLA; and Resource Conservation and Recovery Act (RCRA). Most statutory report forms are available from within the program, users just need to fill in the blanks. EMS's management reporting function generates custom reports for local agency or in-house use.

EMS contains a few nice touches such as graphics and multiple security levels. Graphics enable facility offices with CAD or other graphic display proficiency, to generate emergency evacuation routes, chemical caution signs, building/room schematics, and such security-related features as employee photographs.

EMS's multi-tier security enables the system supervisor to establish access levels by user ID. Security levels include read selected data, read all data, and various levels of data entry and editing.

Reducing Inventory Increases Savings

Chemical Safety claims, with some merit, that by identifying and reducing



your hazardous wastes you can reduce the facility's liability and insurance costs. In addition, you can reduce time-consuming record keeping procedures. One user, Pacific Gas & Electric, estimates that they save between 300 to 700 hours each year as a result of improved data management techniques.

Although EMS can be used on a single workstation, its cost and sophistication indicate that it's better suited for use on local and wide area networks. Prices range from $14,000 for a one- to four-site license, and $18,000 for a two- to eight-site license. Versions are available for Apple and IBM-compatible PCs. Either version supports up to 250 simultaneous users on Novell, 3-COM, LAN Manager, and NetBios networks. Chemical Safety offers a variety of installation, training, consulting, upgrade, and maintenance options.

EMS appears to be an obsessively complete package offering numerous opportunities for customization. In fact, it's designed to be custom-tailored to meet the specific needs of larger campuses. According to Chemical Safety spokesperson Rebecca Jehorek, EMS was originally developed at the University of California to enable the school to get a handle on their waste tracking problem. It is presently used at several UC campuses including Irvine, Santa Cruz, San Francisco, and Berkeley.

Chemical Safety, 1301 South 46th Street, Building 180, Richmond, California 94804; 510/231-9490. ■

Do you know of a software package that can guide facilities managers through the Americans with Disabilities Act (ADA) regulatory maze? If you do, please let us know about it. For a forthcoming issue of *Facilities Manager* we plan to focus on software that coherently interprets the ADA and helps facilities managers comply with the law. Ideally, the program should be complete, accurate, easy-to-search, contain hypertext-like references, and perhaps even simple graphics. In other words — useful. We've looked at some, but we felt they needed a bit more time in the oven before they were ready for consumption. Write or fax the APPA office at 703/549-2772, 1446 Duke Street, Alexandria, VA 22314-3492.

The Bookshelf

Protecting the Earth

Earth in the Balance, by Al Gore. New York: Plume/NAL Penguin, 1992. 407 pp. $13, softcover.

The new U.S. vice president and former senior senator from Tennessee has been studying global ecology for the past twenty-five years and has consistently introduced and supported legislation to save the environment. This well-written book contains a wealth of information regarding the current global ecological crisis that faces our planet.

In the introduction, the author illustrates the general state of apathy toward the issues. Gore recalls that when he decided to run for president in 1987 he focused on global warming, ozone depletion, and other ailing-globe environmental issues for his 1988 campaign. Contrary to his expectations, he received sobering reaction when the environmental concerns were referred to as issues that were not even peripheral in the eyes of the electorate; one of his opponents stated that Gore was "running for national scientist."

The underlying reason for the anguish that our current civilization faces stems from the banality of diatribe over the real issues rather than a genuine effort to provide leadership in making the tough choices. For instance, during the 1988 election George Bush, commenting on the global warming, stated that he would "confront the greenhouse effect with the White House effect." But unfortunately, neither the White House nor Congress addressed this important concern head-on.

The book consists of three sections: 1) The Balance at Risk, 2) The Search for a Balance, and 3) Striking a Balance. The first section discusses the ecological welter caused by anthropogenic impacts on our planet. To underline the serious nature of the problem, a plethora of valuable and alarming data are presented.

For instance, today about 1.7 billion people in the world do not have adequate safe drinking water, and three billion do not have proper sanitation. There are approximately 100 extinctions of living species occurring daily. The world's population, which was two billion during World War II, is now at 5.5 billion. Currently, the world's population is increasing at the equivalent of one New York City's worth of people every month and one China's worth every decade. The air that we breathe now has 600 percent more chlorine than during biblical times. Our coastal waters receive 2.3 trillion gallons of municipal effluent and 4.9 billion gallons of industrial waste water every year. In the course of time, humankind has created seven million different chemicals, of which 80,000 are in common use today. Out of the 20,000 landfills in the United States, 15,000 have already been closed because they had reached their permanent capacity.

The book points out a new form of discrimination toward the poor and economically unprivileged as it relates to toxic waste dump sites. According to a study by the United Church of Christ, communities with two or more toxic waste dumps have an average of three times the minority population than that of communities without such facilities. Moreover, those communities containing one of the nation's five largest sites also has an average minority population that is more than three times that of communities without such facilities. Similarly, as an example of "garbage imperialism," officials in Baltimore negotiated a contract with China to dump thousands of tons of municipal solid waste in Tibet, a country that has faced China's subjugation for the past forty years. The author concludes this section by stating that unless we dramatically change our way of thinking about humanity and the environment, "our children will inherit a wasteland."

In the second section, Gore is trying to analyze the underlying reasons for this current tragic state of affairs by presenting bold statements and brilliant analogies. He concludes that for many of us means have become ends, and tactics are prevailing over principles imposed on us by the "visual rhetoric" of the television generation. The ten-second television blurb has reduced our leaders to a collection of actors distracting us from the real issues. Consequently, owing to instant-gratification philosophy, we have started treating the world as if it were a business in liquidation.

To illustrate our lack of awareness to the environmental cataclysm, Gore uses the 1930 analogy when *Kristallnacht* revealed Hitler's intention toward the Jews, many failed to foresee the horrific events that followed. Similarly, if we cannot foresee or admit the reckless destruction of our ecological balance we could face an environmental holocaust. Gore suggests that one of the root causes of our "dysfunctional civilization," similar to that of a dysfunctional family, lies in the fact that we are not questioning the rules. In particular, he is criticizing the Cartesian approach and Francis Bacon's philosophy of vivisectioning nature for the pure joy of learning. He then seeks the union of science and religion in a deeper understanding of the universe with the concept of "spiritual triangulation," namely an alliance among God, human beings, and nature. To underline this point, he quotes from the Bible, the Koran, and from the teachings of other religions namely Buddhism, Hinduism, and Baha'i.

In the final section, Gore lays the foundation for new approaches to the environment in order to strike a balance between modern industrialization and the earth's ecological system. At this point, the author suggests some controversial proposals. For instance, he suggests a new method to calculate GNP that will take the depreciation of natural sources into account. He proposes a Global Marshall Plan that will stabilize world population and create the transition for an environmentally responsible pattern of life. In addition, he proposes an annual global environmental summit meeting, the creation of a new generation of anti-trust laws that will protect the environment, and the development of a Strategic Environment Initiative (SEI) that will disseminate new environmentally benign technologies and phase out older and inappropriate technologies. Following such a master plan can help us achieve the now missing balance in our relationship to earth.

In conclusion, Gore not only has been able to provide a sobering view of the problems, he presents visionary solutions interwoven with a strong thread of values and ethics. This reflects the alacrity and rectitude of the author in eloquently pre-

senting sometimes quite technical information in easily understandable form. The book successfully convinces the reader that the magnitude of the environmental carnage is partly due to the avaricious practices of many industries, as well as societal disillusionment. But more importantly, it offers, with a high degree of certitude, hope, and direction. I highly recommend that my colleagues read this book.

This book is available from most bookstores.

— **Mohammad H. Qayoumi**
Associate Executive Vice President,
Facilities Development and Operations
San Jose State University
San Jose, California

Indoor Air Quality

The Indoor Air Quality Reference Library, ed. by George Benda, Buffalo Grove, Illinois: Landis & Gyr Powers, Inc., 1991. 297 pp. $145, hardcover.

The Indoor Air Quality Reference Library is a two-book guide for building owners and facility managers, intended to help them deal with indoor air quality (IAQ) issues.

The first volume, *Building Air Quality — A Guide for Building Owners and Facility Managers*, is a good tool for the task. This work, a joint effort by EPA and NIOSH, with significant review from the private sector, includes more than 200 pages in a three-ring binder, well designed to be read, understood, and used.

The main text is divided into three sections — prevention, diagnosing, and mitigating IAQ problems. These are followed by appendices providing detail on measurements, systems, and particular problems and fifteen blank forms.

The prevention section describes a methodology for assessing the current situation within a building and the operation of its systems. It proposes the appointment of an individual to be responsible for IAQ issues and an idealistic outline of all the aspects of operations to monitor.

The diagnostic section is the least satisfactory part of the guide as it lacks clarity, organization, and content. The lack of clarity arises from the text adopting the perspective of NIOSH, which is usually called into a situation after there is a serious problem, and therefore, a lot of engineering and effort in it. However, the normal building owner and facility manager, for whom the book is written, generally needs a more basic perspective.

What they need is a straightforward, step-by-step guide or checklist for establishing the environmental conditions where the complaint arises. What they get is a lot of checklists, which are good in themselves but which aren't prioritized. The least satisfactory part of this section is that it doesn't mention the simple possibilities. The obvious activity of going to the problem site, meeting the person, and checking what is going on in that environment is not covered in the checklist. The content also contains some inaccuracies. The text confuses the ASHRAE Standard 55-1981 79 "acceptable" summer temperature with comfort. Although 79°F is not comfortable for most people, it can be considered "acceptable."

The guide would have benefited from a priority list with which the owners and managers could have organized their efforts. For example, space temperature is a significant problem in more than half the IAQ investigations that NIOSH has completed. It is also the easiest and most inexpensive factor to measure. In spite of this, it is not identified as the first measurement owners and facility managers should undertake. Neither the text nor the form in the appendix suggests that occupants can assist by keeping a diary of temperature. This is one of the best ways of identifying temperature problems and involving staff in solving problems. NIOSH is into "instruments for measuring temperature," while owners and managers can do a great amount with a $4 thermometer from the local hardware store.

So while the guide is quite good, it lacks the simple, straightforward suggestions that would allow an owner to easily determine the most obvious problems first.

The guide is in the public domain and can be freely photocopied. EPA and NIOSH will, no doubt, update and reissue the guide. I hope the many owners and facility managers will benefit from using the guide and take the time to write to EPA with their suggestions for an improved second edition.

The second volume, *The Invironment* by Landis and Gyr, starts off very owner-oriented, with straightforward, well-organized texts and lots of checklists. Altogether, there is a lot of good material.

It suggests how to set about things, how to prioritize, and gives tables of ways to work through IAQ issues. For example it says: Have you just been doing alterations, YES or NO. If you have, do this and this and this, and if you haven't, then these are the things you should try. This is an excellent way to introduce the manager to the process.

Unfortunately, when you look in the appendix, which accounts for the majority of the book's pages, it is quite daunting for the normal person. After page 121, the appendices are most suitable for industrial hygienists, and from page 259 on is the ASHRAE ventilation standard, which is intended for engineers. Since the book was designed for building owners and managers, these appendices are inappropriate material. It would have been less intimidating if the volume included only those aspects of IAQ issues that would be valuable for the intended audience, leaving pages on Cadmium and Beryllium to a different book. A more comprehensive index would also have been appreciated. The strength of this book is definitely the first 121 pages, which encourage you to do things in a systematic way and offers effective checklists for doing them.

The problem that these two volumes have is that there is a huge amount of overlap. The second book has a nice checklist, and the first book maintains a reasonably consistent perspective from the view of the owner. My suggestion to owners and managers is to use the first 121 pages of the Landis and Gyr volume, augment it with the clear description found in the EPA book, and think about comfort rather than standards.

This book is available from Invironment, P.O. Box 103, Palos Park, IL 60464.

— **Robert McDowall**
Assistant Director, Physical Plant
University of Manitoba
Winnipeg, Manitoba

HVAC

Testing and Balancing HVAC Air and Water Systems, by Sam Monger. Lilburn, Georgia: Fairmont Press, Inc., 1989. 277 pp. $58, hardcover.

Because many demands are placed on a facilities manager, the need for a concise reference to effectively coordinate staff and contractor activities is vital. With utility costs, notably heating, ventilating, and air conditioning (HVAC), being a facilities department's largest single operating expense, the book used to manage this specialty needs to provide the timely information without turning the job into a major project. My goal is to determine if *Testing and Balancing HVAC Air and Water Systems* is that concise reference.

The majority of the book deals with ducted air systems, starting with general testing, adjusting, and balancing (TAB) methodology. The reader is given some broad lists to define the work scope, such as job packages for field inspection, TAB, and the final TAB report. A select number of checklist items are explained with examples of typical equipment. The illustration for a fan/motor drive system is of V-belt sheaves.

The book takes the reader through the identification of two Browning Company sheaves, complete with part numbers and physical dimensions. This example is helpful to the reader who doesn't work with sheaves on an everyday basis.

A major shortcoming of this section is that it assumes more than a passing knowledge of TAB procedures; for example, the pitot tube, which is a basic but precise TAB instrument for measuring duct pressures, is put right into service without its use or limitations being explained. In addition, the author's definition of a pitot tube is not technically complete. It appears that he uses a description from a prominent instrument manufacturer's catalog, and he doesn't caution the reader that a pitot-static tube and manometer combination is not accurate below a given air flow velocity (feet per minute) unless specially constructed. Angular alignment of a pitot tube in the duct, which is also important, is not explained, and no tolerances are provided.

A number of duct shapes are described to provide an overview of the required test technique needed to determine air flow in a given configuration; round, square, oval. If your systems have basic air flows that "go in/go out" this book will do, but issues of fresh air make-up for indoor air quality (IAQ)/energy conservation and personnel health are conspicuously missing. The author also does not discuss duct leak testing. If duct leakage is excessive, TAB is compromised and in some cases impossible to complete.

The author does provide some helpful information in determining if final TAB result are acceptable, such as the percent difference between the design airflow and the adjusted (as-left) airflow, but there are no acknowledgments of the industry standards that govern such acceptance criteria.

Part two is relatively brief and deals with water systems. Basic pump principles are discussed and illustrated with a number of pump curves (flow vs. pressure) that graphically depict performance. Again, the abbreviated procedures suggest previous TAB experience. The section on multi-pump arrangements explains the difference between pumps in parallel and serial operation and is well-detailed with curves. Other figures, however, do not show a true system representation and may leave the occasional user with an incomplete understanding of the subject.

While the author writes about the importance of adjusting the water system within certain limits (plus/minus) of design, no caution is given for the accuracy of the data that will determine system acceptance. Flows and pressures need to be taken in straight sections of pipe (within guidelines) to ensure repeatable data. If you were not aware of these limitations beforehand, the data may lead to needless system rework and the "condition" space needing further TAB.

Part three is a credible lexicon that gives the facilities manager the "language" to communicate with people in the HVAC trade. The definitions can be incorporated into specifications and drawings and can be used to help decipher proposals and cryptic staff notes. The five chapters of this section group definitions by broad categories, such as air systems, water systems, etc. I feel that the alphabetical dictionary/glossary format — blending all five chapters together — would be easier to use and then be consistent with most other technical publications.

Part four concludes the book with a collection of performance equations and conversion tables. This type of information is always a favorite with practicing engineers. The formulas are grouped by application (airflow, electrical, etc.) and have abbreviations clearly defined. While no completed examples are given, a person with a knowledge of algebra should have no trouble using this section.

The TAB chapters on air and water systems refer to "report forms," but the lack of examples require the use of one or more other publications to compile a TAB report. This really drives home the point that previous TAB experience is essential and that this book is not a complete, stand-alone reference. In reviewing industry procedures, I note that there are twenty separate data sheets that can be used to compile a formal TAB report. Although the individual data sheets require specific information for air, water, or refrigeration systems, a final TAB report may not include all twenty documents. Conversely, knowledge of the various available data sheets makes the facilities manager an informed consumer.

Much of the design/as-left data found in a final TAB report can be used to establish or enhance a preventive maintenance program, and should be updated as equipment is replaced or when system adjustments are made.

This book is a marginal reference for writing specifications or evaluating proposals. The definitions are good and the checklists provide insight on what to specify and expect from HVAC TAB work. The details of HVAC TAB should be obtained from industry organizations, which the author has listed but makes difficult to contact because addresses and telephone numbers are not provided. To successfully perform HVAC TAB work, I highly suggest you consider publications of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, (*ASHRAE Standard 111-1988*), and the Sheet Metal and Air Conditioning Contractors' National Association, (*SMACNA HVAC SYSTEMS Testing, Adjusting & Balancing*, 1983 edition, latest printing).

Testing and Balancing HVAC Air and Water Systems is available from the Fairmont Press, Inc., 700 Indian Trail, Lilburn, GA 30247.

— **Bernie Jwaszewski**
Adjunct Faculty, Building Services
Mount Ida College
Newton Centre, Massachusetts

Automation Systems

A Guide for Building and Facility Automation Systems, by Cilia John. Lilburn, Georgia: Fairmont Press, 1991. 220 pp. $58, hardcover.

Do not buy this book! If you feel compelled to self torture, borrow it, request it through inter-library loan, or go jogging on the freeway; just don't buy it.

Hopefully, the copy supplied for review was an advance publisher's copy that had not yet been through the final editing process. The text is riddled with abbreviations, some industry standard, many unfamiliar to this reader. Abbreviations quite common in the computer industry are given new meaning. Items referred to once, or a small number of times, are frequently given an abbreviation. The content of the material is lost in a jumble of alphabet quiche.

The book offers consolation in an extensive list of abbreviations. Do not rely on it! Just when you relax and begin to read, you will refer to the list to discover that the abbreviation you wish to verify is not listed. Back you go into the text — only to discover that the convention of spelling out the first use and then showing the abbreviation has been violated. It may be only a typo, but so many abbreviations are used that it is impossible to be sure what was meant.

The author is clearly a loyal IBM employee. If you already own an IBM building automation system, you may gain some insight from the book. Very little information about alternative hardware is provided.

Information is provided for developing request for proposal specifications for software and hardware acquisitions. Technical system architecture descriptions may be useful to someone with an engineering or electrical background who has not previously encountered a mechanically or electrically controlled building.

Many questions remain. What factors should be considered in developing a plan for retrofitting existing facilities? Does facility age bear a material relationship to modification costs? What retraining and staffing constraints should be included? What is the cost per sensor tradeoff to personnel time and maintenance costs?

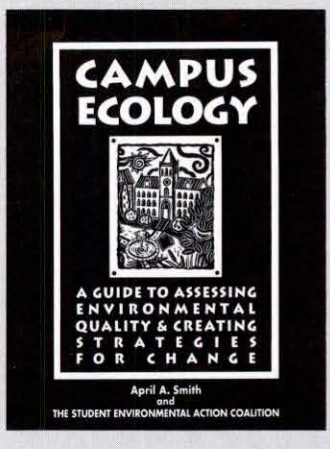
The happy news is that other books are being written. Automation systems are being documented for users as they are developed. Training is being provided by responsible vendors, and usable materials are being developed for on-site use.

This book is available from Fairmont Press, 700 Indian Trail, Lilburn, GA 30247.

— **Kate Fenton**
Fiscal Officer
University of Alaska/Fairbanks
Fairbanks, Alaska

In Brief

Campus Ecology: A Guide to Assessing Environmental Quality & Creating Strategies for Change is a new book by April A. Smith and the Student Environmental Action Coalition. Living Planet Press developed this workbook for college students that provides a step-by-step framework for researching, evaluating, and improving the environmental sustainability of their campuses. Key topics addressed in the book include wastes and hazards, natural resources, campus infrastructure, and taking action. For more information on the $17.95-book, contact the Living Planet Press, P.O. Box 1679, Venice, CA 90294; 310/396-0188.



■ ■ ■

Waste Management for Healthcare Facilities, the American Society for Hospital Engineering's updated manual, is designed to help healthcare facilities manage more efficiently while complying with current regulatory standards. The book costs $75 for ASHE members, $98 for all others. For more information, contact ASHE, 840 North Lake Shore Drive, Chicago, IL 60611; 312/280-6379.

How to Save Time and Money in Facilities Management tells you how to make every dollar count while improving productivity and increasing customer satisfaction. This book is 223 pages and costs $49.95. For more information, contact Cleaning Management Institute, 13 Century Hill Drive, Latham, NY 12110.

■ ■ ■

John Snell & Associates is offering "Surveying the Elements of Successful Infrared Predictive Maintenance Programs," a paper that helps people set up an infrared PM program. This paper is free. For more information, contact John Snell & Associates, 17 First Avenue, Montpelier, VT 05602; 802/229-9820.

■ ■ ■

Anyone involved in grounds maintenance may be interested in Professional Grounds Management Society's Landscape Management Supervisory Training Manual. This book includes chapters on tools and equipment, pesticides, vehicles and equipment, personnel, and grounds maintenance practices. The book costs $35 for PGMS members and $69.95 for nonmembers, plus $5 for shipping and handling. For more information, contact PGMS, 10402 Ridgland Road, Suite 4, Hunt Valley, MD 21030.

■ ■ ■

Electrical Systems for Health Care Facilities is the American Society for Hospital Engineering's resource manual. This publication was developed to help health facilities professionals comply with regulatory standards and better manage department operations. The book costs $75 for ASHE members, $98 for nonmembers. For more information, contact American Society for Hospital Engineering, 840 North Lake Shore Drive, Chicago, IL 60611; 312/280-6379. To order this book (catalog number 055206), call 800/AHA-2626.

■ ■ ■

The *1992 Guide to Federal Funding for Education* details federal programs providing financial assistance to colleges, community colleges, and other nonprofit organizations. The guide is supplemented monthly with grant updates that provide the latest grant and aid information. The two-volume guide and monthly updates cost $248. For more information, contact Education Funding Research Council, 1611 North Kent Street, Suite 508, Arlington, VA 22209; 703/528-1000.

■ ■ ■

The National Parking Association has published the following titles: *Parking and the ADA, Recommended Zoning Ordinance Provisions For Parking and Off-Street Loading Spaces, Parking Garage Maintenance Manual*, and *1993 Parking Products and Services Directory*. NPA also has *Parking Studies* available for $25. This book is designed to help you determine when parking studies are needed and how they can best be used. For more information or to order, contact NPA, 1112 16th Street, N.W., Suite 300, Washington, DC 20036; 202-296-4336.

■ ■ ■

The National Association of College and University Business Officers (NACUBO) recently published *Years of Challenge: The Impact of Demographic and Work Force Trends on Higher Education in the 1990s*. This book looks into financial management concerns confronting higher education up to the year 2000. Increased education is becoming more important for the country as a whole, and work force changes are affecting postsecondary education. This combination is examined in *Years of Challenge*, which costs $30 for NACUBO members and $45 for nonmembers. For more information, contact NACUBO, One Dupont Circle, Suite 500, Washington, DC 20036-1178; 202/861-2560.

■ ■ ■

Practical Approaches to Rightsizing is a series of essays giving accounts of the process of cutting back operations of colleges and universities. The book costs $45 for NACUBO members and $65 for nonmembers. Other recent releases from NACUBO include *Selecting and Evaluating an Investment Manager* ($40 NACUBO members, $60 nonmembers) and *Human Resource Practices for Small Colleges* ($35 NACUBO members, $50 nonmembers). For more information, contact NACUBO, One Dupont Circle, Suite 500, Washington, DC 20036-1178; 202/861-2560. ■

—Compiled by Stephanie Gretchen

Job Corner

Job Corner Deadlines

Job Corner advertisements are available to any nonprofit institution with a facilities-related position opening available. Regular 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. If you would like to include a logo with your display ad, please mail it into APPA by the ad deadline. APPA does not accept faxed logos.

Upcoming Job Corner deadlines are **February 10** for the March issue, **February 25** for April, and **April 9** for May. Closing deadlines for job announcements are posted at the request of each institution. In some cases, deadlines may be extended by an institution. APPA encourages all individuals interested in a position to inquire at the institution regarding its closing/filing date.

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

■ ■ ■

Director of Grounds Maintenance. Responsible for maintaining and improving the outside environment of the Ohio University/Athens campus. Directly responsible for coordinating the activities of the grounds maintenance department, the university garage, campus recycling and solid waste, and campus signage. A bachelor's degree in landscape architecture, agriculture, or related field preferred. A minimum of five successful years of experience in operations involving grounds maintenance, landscape planning, and equipment maintenance. Surveying experience is desirable. Should be able to work effectively with people of diverse backgrounds and possess good communication and administrative skills. Competitive salary with excellent employee benefits program. Send letter of interest with resume, including names of current professional references, to: Duane Bump, Assistant Director of Physical Plant, Ohio University, Athens, OH 45701. The application deadline is **January 20, 1993**. *An equal opportunity employer.*

DIRECTOR, PLANNING AND CONSTRUCTION UNIVERSITY OF COLORADO/BOULDER

At the flagship campus of the four-campus University of Colorado System, 25,000 students are educated on a 600-acre campus that includes 160 buildings, most constructed of native sandstone with red clay tile roofs. The Boulder campus is recognized as one of the most beautiful and architecturally cohesive university campuses in the nation. The magnificent Rocky Mountain backdrop makes Boulder a highly desirable place to live, work, and study.

Responsibilities:

The campus is currently seeking a dynamic individual to manage and supervise the facilities and campus planning and programming process, capital renewal and replacement programs, remodeling and renovations, and all capital planning, programming, design, and construction. The campus is currently engaged in construction contracts valued at $130 million; with an additional $110 million in planning and design phases; and remodeling, renovation, and controlled maintenance projects valued at $10 million annually.

Minimum Qualifications:

The individual must be capable of developing and delivering a strategic facilities program that incorporates academic requirements, space inventory and management, a facility condition assessment, a facilities master plan, a renewal and replacement program, and a strong capital program.

The individual must be able to work in an academic environment and must be able to successfully interact with a variety of clientele including students, faculty, staff, external agencies, as well as a list of others.

The individual who fills this position reports to the Director of Facilities Management and will supervise a staff of planners, architects, estimators, inspectors, and support personnel.

The candidate to be selected must possess strong managerial and interpersonal skills, and must be an excellent communicator. The candidate must be able to manage numerous and complex projects simultaneously while also maintaining overall budgetary and scheduling control. This is a position of visibility, responsibility, and impact.

In addition, the candidate must have a Bachelor's degree in architecture or engineering, and be licensed as a professional architect or engineer. (If license is from another state, candidates will be granted six months following an offer and acceptance to obtain a license to practice in Colorado.)

Ten years of extensive planning, design, and construction management experience is required; five of which must be at a senior supervisory or managerial level.

Preferred Qualifications:

Preference will be given to candidates who have three to five years of experience at a senior manager or supervisory position in planning, design, and construction in higher education.

A Total Quality Management Program is presently being implemented in Facilities Management organization, and experience in Total Quality Management is desirable.

Salary:

Negotiable. Commensurate with experience and education.

Applications and/or nominations material:

Must be postmarked by **January 30, 1993**. Must include a resume and letter of application that specifically addresses the requirements listed above. Also, please include the names and telephone numbers of three references. Please send applications to:

Chair, Planning and Construction Search Committee
University of Colorado, Boulder
Campus Box 53
Boulder, CO 80309-0053

The University of Colorado at Boulder has a strong institutional commitment to the principle of diversity. In that spirit, we are particularly interested in receiving applications from women, members of ethnic minorities, and disabled individuals.

EXECUTIVE HOUSEKEEPER BRYN MAWR COLLEGE

Bryn Mawr College, a nationally known liberal arts institution located in the suburbs of Philadelphia, is currently accepting applications for the position of executive housekeeper.

Responsibilities include ensuring the proper custodial care of college facilities, coordinating set-ups for special functions, guaranteeing compliance with all safety and security regulations, and overseeing personnel matters, such as staffing, performance, disciplinary action, and training.

The ideal candidate will possess a minimum of five years of administrative experience with demonstrated supervisory experience, in-depth knowledge of safety precautions related to the housekeeping industry, a minimum of three years of prior experience in housekeeping for a residential college/university or hospital, and superior interpersonal and communication skills. Individual must be a certified or registered member of the National Executive Housekeepers Association or be able to attain that status. Position also requires individual be able to walk up and down steps, climb ladders, stand for long periods of time, see clearly, have hand dexterity, discern sounds clearly, and be able to lift more than 30 pounds.

For immediate consideration, please forward resume, cover letter including salary history, and names, addresses, and telephone numbers of three references to: MaryBeth Lopes, Personnel Services, Bryn Mawr College, 101 N. Merion Avenue, Bryn Mawr, PA 19010-2899. Application deadline is **January 25, 1993**. *EOE.*

THE UNIVERSITY OF AKRON
ASSISTANT VICE PRESIDENT OF ADMINISTRATIVE SERVICES FOR PHYSICAL FACILITIES

The University: The University of Akron is the third largest state-assisted university in Ohio. Located in the culturally and ecologically diverse and vibrant northeastern sector of Ohio, the university offers nearly 29,000 students, at its main campus, 15 doctoral degree programs and more than 260 associate, bachelor's, and master's degrees. In addition, five departments offer well-established and recognized Ph.D. programs.

Qualifications: The candidate must have a baccalaureate or higher degree in engineering, architecture, or other related area. Registration as a professional architect or engineer is desirable. A minimum of five years of experience with physical facility planning and/or management is essential. Previous experience with college/university physical plant operations is desirable. The University of Akron encourages applications from the disabled and veterans as well as minorities and women.

Salary: The salary will be commensurate with qualifications and experience.

Application: Nominations should include addresses of nominees. Applications should include a letter expressing interest, a complete resume, and the names and addresses of three colleagues who could be contacted to obtain a letter of recommendation. Nominations and applications may be sent in confidence to: Mr. David L. Jamison, Chair, Assistant Vice President for Administrative Services Search Committee, Buchtel Hall—Suite 102, The University of Akron, Akron, OH 44325-4703. Candidates will be notified if additional materials are needed.

Review of applicants will begin immediately. All application material should be received no later than **January 31, 1993**. The position is available on or before June 1, 1993.

The University of Akron is an equal education and employment institution.

PENNSYLVANIA STATE SYSTEM OF HIGHER EDUCATION
PHYSICAL PLANT MANAGER

The state system is a public enterprise consisting of the 14 state-owned universities in Pennsylvania. The office of the chancellor within the state system seeks to fill the full-time permanent position of physical plant manager. Essential functions entail the supervision of assigned personnel and the preparation and administration of service contracts in the operation, maintenance, and repair of facilities and in the design and construction of facilities using professional architectural, engineering, and construction services of facilities under the direct control of the office of the chancellor. Further, prepares and manages the annual facilities budget, develops, and maintains a facilities data base, and resolves facilities problems through engineering and administrative applications. Daily operations require the oversight of space administration, routine building maintenance, and housekeeping and groundskeeping services. Position will be filled through merit selection and reports to the vice chancellor for finance and administration.

Applicants need to possess a bachelor's degree in architecture or related science discipline from an accredited school and at least four years of progressive professional and administrative experience in facilities management and procurement of design and construction contracts of public facilities in university environments, or similar private facilities. Prior experience must have included two years of financial management responsibility dealing firsthand with senior federal, state, and local officials, and with architect/engineering firms and construction contractors. Registration as an engineer/architect-in-training with capaiblity to become professionally registered in Pennsylvania and possession of a valid motor vehicle operator license are required. Demonstrated computer-based literacy skills in facilities management are essential. Other forms of preparation will be assessed for equivalency.

Expected appointment salary is $40,058 to $50,073. Resume with letter of interest is due not later than **January 29, 1993** to Employee and Labor Relations, State System of Higher Education, Box 809, 301 Market Street, Harrisburg, PA 17108.

The State System is an equal opportunity/affirmative action employer and encourages applications from minorities, veterans, and persons with disabilities. Applicants with disabilities selected for interview who are in need of special accommodations should request such accommodations in advance.

Coming Events

APPA Events

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

Feb. 18-19—**Regulatory Compliance Seminar**. Arlington, VA.

Mar. 1-2—**Total Quality Management**. Washington, DC.

Mar. 4-5—**Total Quality Management**. Denver, CO.

Mar. 22-23—**Contract Administration and Project Management**. St. Louis, MO.

Apr. 18-23—**Executive Development Institute**. South Bend, IN.

Jul. 25-27—**Educational Conference and 80th Annual Meeting**. St. Louis, MO.

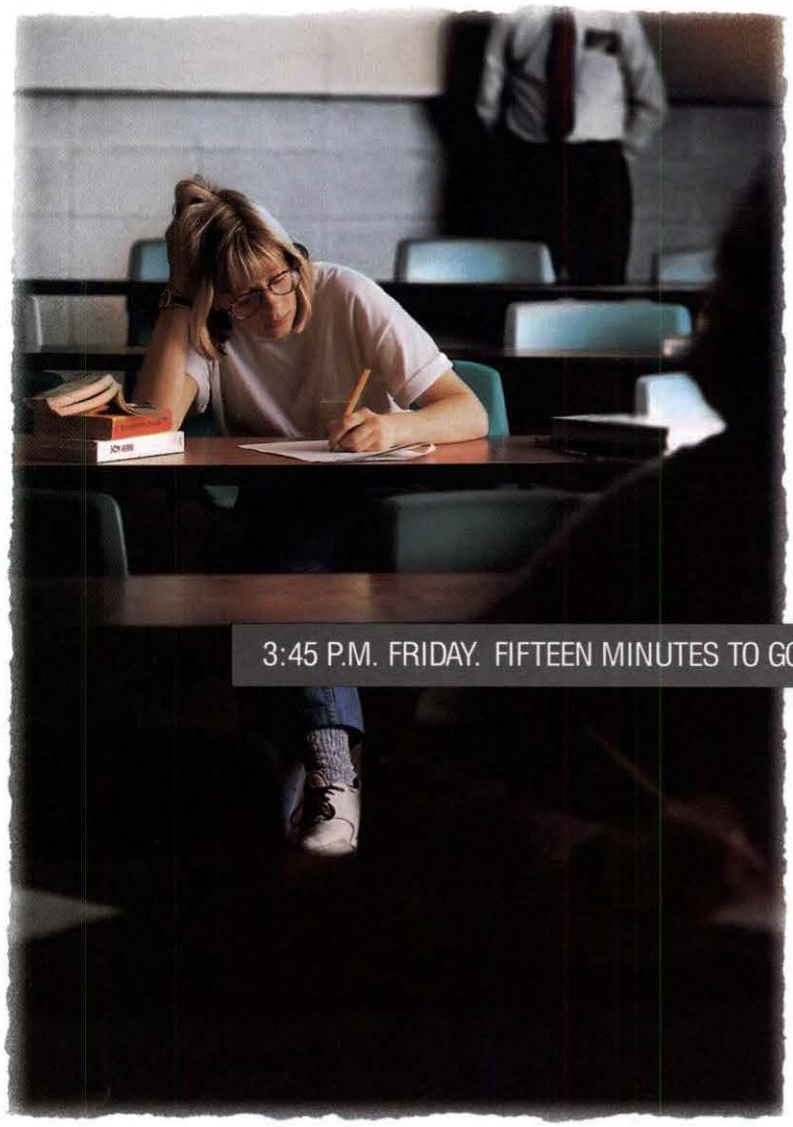
Other Events

Feb. 1-4—**Power Plant Performance Monitoring**. East Brunswick, NJ. Contact: The Center for Professional Advancement, P.O. Box 1052, East Brunswick, NJ 08816-1052; 908-613-4535.

Feb. 3-4—**Ohio State University Athletic Field Short Course**. Columbus, OH. Contact: Barbara Bloetscher, Ohio State University, Ohio Cooperative Extension Service, Agronomy, 2021 Coffey Road, Columbus, OH 43210-1086; 614-292-7457.

Index of Advertisers

AIA/EPA/APPA 40
American Building Maintenance . 46
APPA Publications . 8, 42, 43, cover 4
APPA Information Services 17
Data System Services 9
Energy Controls, Inc. 43
Excell, Inc. . . . . cover 2
Exeter 43
IDHCA 6
ISES Corporation 2
Lozon & Associates 5
Johnson Controls 52
Maintenance Warehouse 37
Orr-Schelen-Mayeron . . . . . cover 3
Southern Bleacher Company 7
Virginia Tech 39



An improved learning environment made this student a success. Johnson Controls helped make it possible.

The true mark of a quality college or university is in the education opportunities it can offer students.

In fact, in these days of scarce funds, many schools find it hard to offer innovative instruction, let alone provide basic educational necessities. Like comfortable, well-lit classrooms, safe hallways, and effective professors.

Johnson Controls can help. We'll create an interactive energy management program that turns money you spend on utilities into money you can invest in educating students more effectively. And we'll help you save more through upgraded mechanical and electrical systems. So you get more efficient buildings, as well as more comfortable, productive learning environments.

Best of all, you don't need to raise taxes or tuition. You finance the investment from the energy savings that our products and services produce. Put new solutions in *building comfort, security and productivity,* to the test. Call your local Johnson Controls office, or 1-800-972-8040, soon.

And expand your honor roll instead of your utility budget.

JC9239

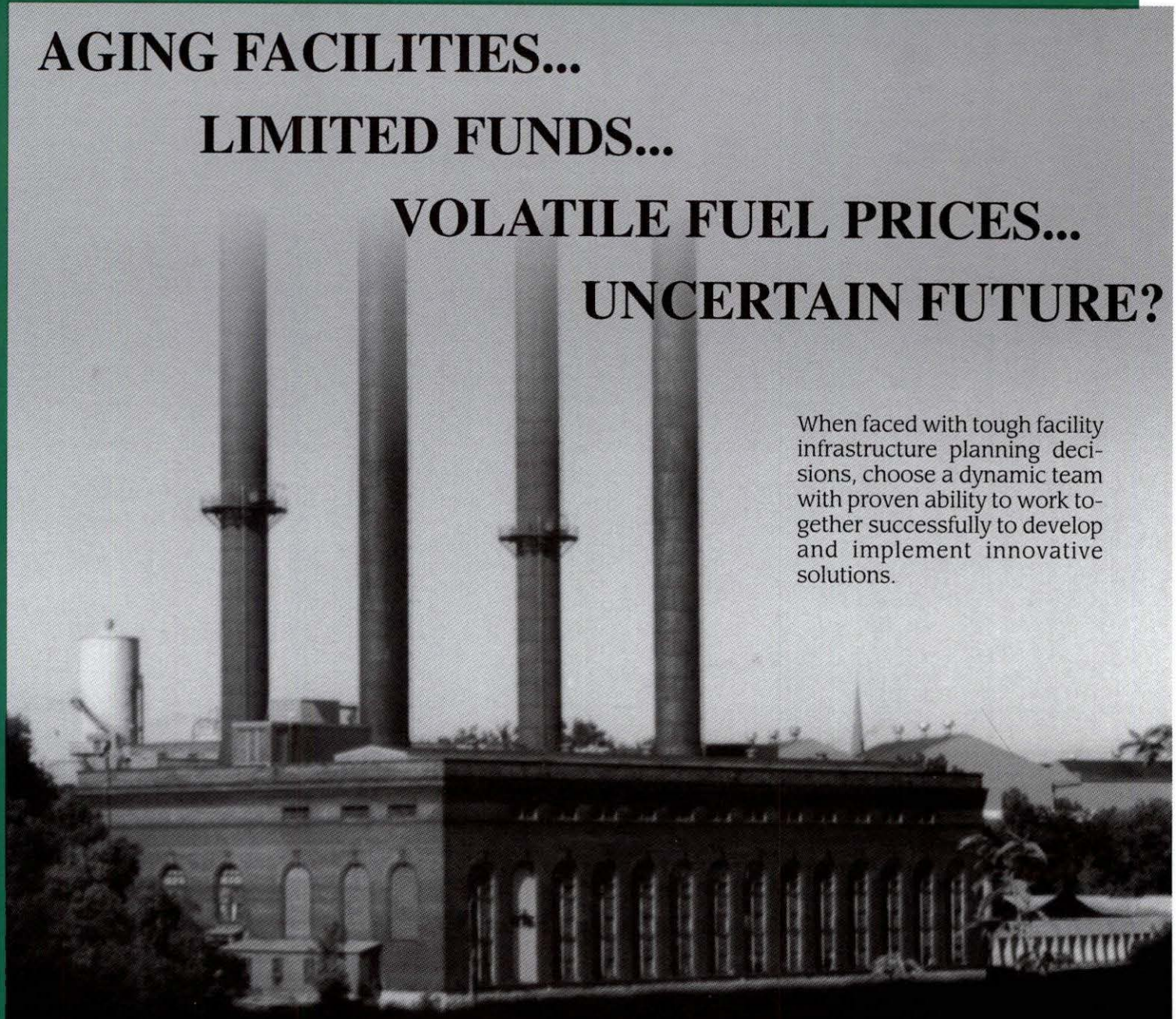
JOHNSON CONTROLS

AGING FACILITIES...

LIMITED FUNDS...

VOLATILE FUEL PRICES...

UNCERTAIN FUTURE?



When faced with tough facility infrastructure planning decisions, choose a dynamic team with proven ability to work together successfully to develop and implement innovative solutions.

- Least Cost Planning
- Feasibility Studies
- Cogeneration Analyses
- Public Procurements
- Project Financing Options
- Cost Recovery
- Environmental Permitting
- Labor Relations
- Risk Management
- Contract Negotiation
- Fuel Procurement
- Privatization

Orr-Schelen-Mayeron & Associates, Inc.
Saffer, Vumbaco, Brown & Kersten Consulting Group
O'Neill, Burke, O'Neill, Leonard & O'Brien

OSM Orr Schelen Mayeron & Associates, Inc.
Engineers • Architects • Planners • Surveyors
Contact: James J. Sebesta
300 Park Place Center • 5775 Wayzata Boulevard
Minneapolis, Minnesota 55416-1228
Tel. (612) 595-5757 FAX (612) 595-5773

SAFFER, VUMBACO, BROWN & KERSTEN
CONSULTING GROUP
Financial, Engineering & Management Consultants
SVBK
CHARLOTTE • DENVER • INDIANAPOLIS • ORLANDO
CONTACT: SHEREE L. BROWN
201 SOUTH ORANGE AVENUE, SUITE 1020 • ORLANDO, FL 32801-3477
TELEPHONE (407) 872-1500 • FAX (407) 843-3200

O'NEILL, BURKE, O'NEILL
LEONARD & O'BRIEN
Attorneys at Law
Contact: PETER H. GRILLS, 800 Norwest Center
55 East Fifth Street, St. Paul, Minnesota 55101
(612) 227-9505 FAX (612) 297-6652

Removing the Barriers: Accessibility Guidelines and Specifications

by Stephen R. Cotler, AIA

ISBN: 0-913359-59-9

$45/APPA member institutions; $55/all others.

The new Americans with Disabilities Act expands protections for individuals with disabilites and bars discrimination in employment and in access to public accommodations. The time frame for compliance is relatively short. New facilities to be occupied after January 1993 are to be designed for accessibility. Existing facilities were required to be accessible by January 26, 1992. Barriers in existing facilities must be removed, if removal is readily achievable and can be accomplished without much difficulty or expense. If not, alternative methods of providing services must be offered.

Removing the Barriers will assist you in surveying your campus and identifying barriers. More than 100 drawings are included to illustrate barrier-free entrances, hardware, floor plans, and more. The book outlines suggestions and cost effective solutions for providing accessibility.

CONTENTS:

Chapter 1: Site Accessibility
Chapter 2: The Building Entrance
Chapter 3: Doors
Chapter 4: Interior Circulation
Chapter 5: Restrooms and Bathing Facilities
Chapter 6: Drinking Fountains and Pay Telephones
Chapter 7: Special Spaces and Equipment
Chapter 8: Facilities Inventory and Evaluation
Chapter 9: Achieving Accessibility
Chapter 10: Additional Resources
Glossary
Index

TO ORDER:

All orders must be prepaid in U.S. funds. Please add $8 for shipping/handling. All international orders add 20% of subtotal ($10 minimum shipping/handling charge). Enclose check (made payable to APPA) and mail to:

APPA Publications • P.O. Box 1201 • Alexandria, Virginia 22313-1201

Orders are shipped via UPS; please allow 3-4 weeks for delivery.

The official publication of APPA: The Association of Higher Education Facilities Officers

Facilities Manager

1446 Duke Street
Alexandria, Virginia 22314-3492

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