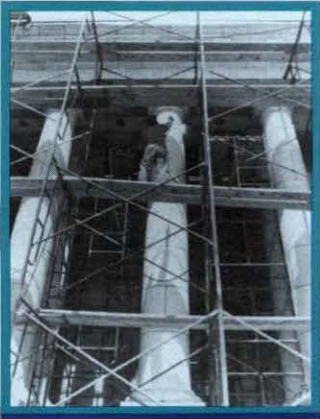


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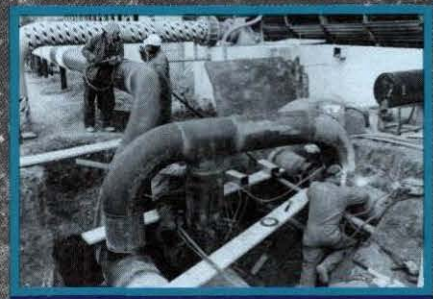
# Facilities Manager

Volume 9 Number 2

Spring 1993



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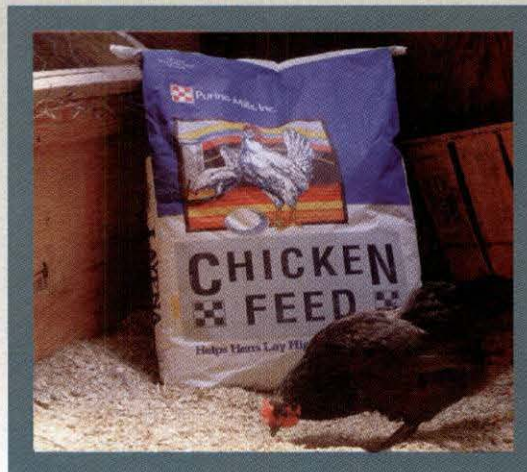


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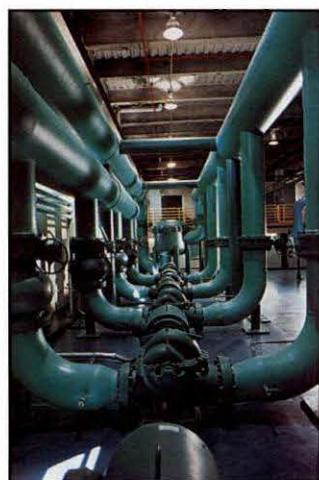
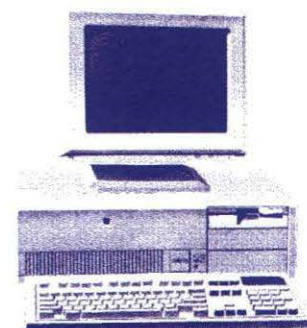
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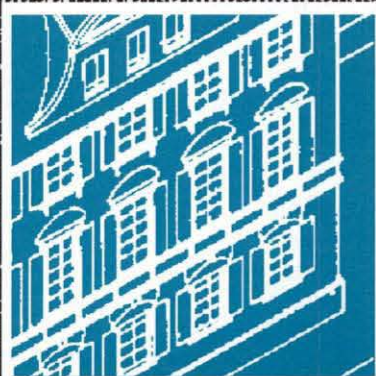
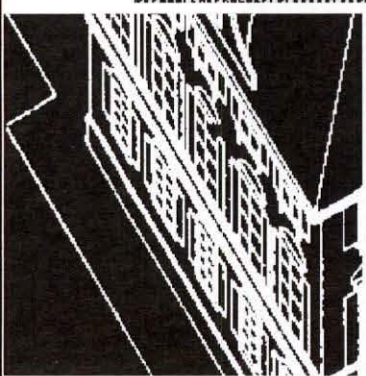
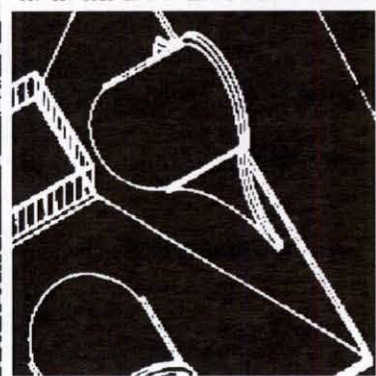
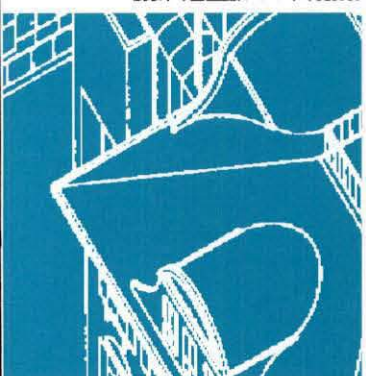
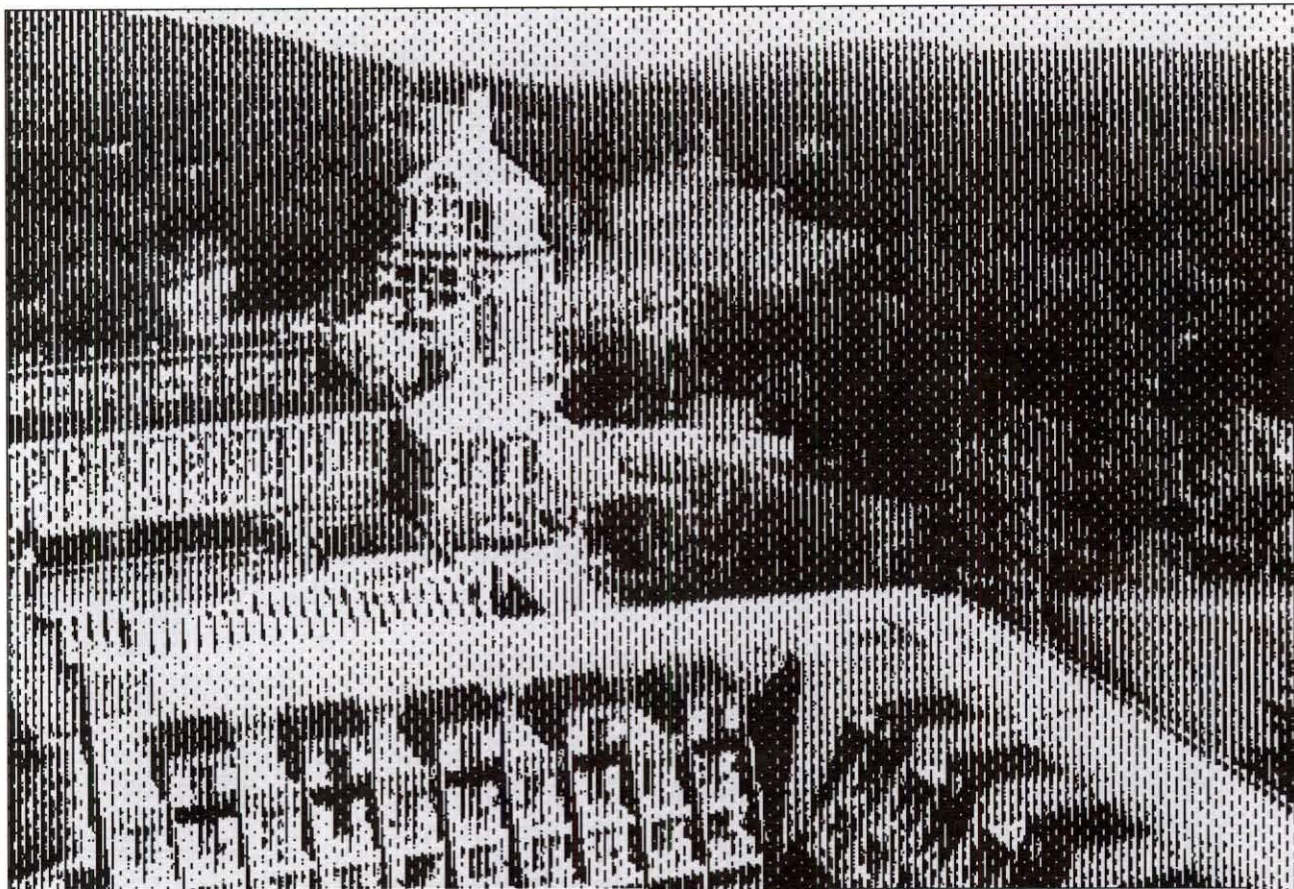
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**SUBSCRIPTIONS:** Cotrenia Aytch

**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.

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

## From The Editor

Steve Glazner

For more than ten years, APPA has promoted the value and absolute necessity for educational institutions to conduct an audit of their facilities. Our message has been consistent and firm: if you don't know the condition of your facilities, you cannot reasonably and intelligently expect that your funding requests for capital renewal projects or deferred maintenance reduction will be taken seriously by your business officer, president, chancellor, or trustees.

In 1982, through a partnership that included the Association of Governing Boards of Universities and Colleges and the National Association of College and University Business Officers, APPA published Harvey Kaiser's *Facilities Audit Workbook: A Self-Evaluation Process for Higher Education*. Several thousand copies of that book have since been sold, and it has become a standard reference for virtually every facilities manager in higher education.

Now APPA is proud to announce the publication of Kaiser's new book, *The Facilities Audit: A Process for Improving Facilities Conditions*, which takes up where *Facilities Audit Workbook* left off. The book includes new forms and checklists (including infrastructure), a means to better quantify and present your audit findings, discussion of adapting the guidelines for a computer, and a bibliography of additional

readings. We are pleased to excerpt Kaiser's closing chapter, *Capital Renewal: Putting the Audit to Work*, in this issue of *Facilities Manager*. Here you will find a vast array of information to help you move up to the next level of capital renewal planning for your campus.

Two other features complement Kaiser's article in different ways. Bruce Carmichael's article discusses the value of well-maintained campus facilities in the marketing of the institution, particularly when competition for students and funding is greater. For the techies, we have included an article explaining geographic information systems and how they may be applied to a campus facilities environment.

You will also find two case studies describing in detail the efforts of APPA members to improve productivity and service at their institutions, while also saving valuable resources: Willy Suter discusses flexible scheduling at George Washington University, and Rock Morille explains several energy savings activities at Baylor College of Medicine.

Finally, I urge you to read President Don Mackel's midyear report of APPA activities. You will quickly see that APPA continues to work hard in providing its member institutions the best service it possibly can. We wish you a productive spring and a successful commencement.



## APPA News

### From the President: A Mid-Year Report

by Donald L. Mackel

University of New Mexico  
Albuquerque, New Mexico

Sharon and I were able to attend three regional meetings this year, CAPPA, ERAPPA, and my home region, RMAPPA. This opportunity is, without a doubt, one of the greatest benefits accrued by the office of APPA President. I cannot say enough about the hospitality we received, the friendships made, and the networking potential at these meetings. While perhaps not all of you aspire to become APPA president, I can tell you with the highest conviction that the cross-pollination of ideas at these regional meetings is the epitome of all of APPA's experiences. Every chance you get, I recommend that you visit another region.

#### Major Activities

Following are some of the activities we have been working on this year. Dorsey Jacobs is heading the CFC Task Force to study the impact of chlorofluorocarbons on institutions of higher education and how APPA can help its members prepare for and mitigate the impact as much as possible. You will find their first important effort in the center of this magazine.

We also have a task force, led by Fred Klee, studying the impact of rightsizing. In recent years, many of our members have been faced with severe cutbacks and have, out of necessity, made some vital changes to their operations. It is imperative that we capture the lessons learned from these strategies

and subsequent experiences for the benefit of all the membership.

Member attendance at the annual meetings has been dropping off for the past several years. We have a committee looking into this reporting to John Harrod, Vice President for Educational Programs, chaired by Senior Representative-Elect Norm Bedell, and made up of the regional representatives. They are taking a strategic look at our annual meeting to evaluate whether in fact, the annual meeting in its current format should continue to be the principal vehicle with which to deliver APPA services, or whether the emphasis might better be shifted to other activities.

For example, should we have more workshops, more institutes, more national participation in the regional meetings? Should we have educational programs that are easily available to state and regional venues, and programs that could reach deeper into our institutional organizations? These questions are being addressed by this committee.

APPA has been a major player and has taken a leadership role with NACUBO and several other higher education associations in producing a major study on outsourcing or privatization. This study, *Contract Management or Self-Operation: A Decision-Making Guide for Higher Education*, will be available in book form to our members by early spring.

The Facilities Planning and Construction Task Force, led by H.C. Lott, completed its report, which has been passed on to the APPA vice presidents for inclusion in their functional programs, as appropriate.

The Executive Committee has reviewed and approved the Policies and Procedures Manual. The changes to the Bylaws have been overwhelmingly approved by the membership. We have also updated the *Comparative*

*Costs and Staffing Report* in its new format, as well as completed the Member Opinion Survey.

I have requested that President-Elect Diane Kerby and the Planning Committee review our Long-Range Plan. They have been asked to consider APPA's strategic position on diversity, membership recruitment and development, and ethics. In addition, I have asked them to consider if the timing is right to revisit and update *The Decaying American Campus* and selected portions of the *Facilities Management* manual.

You may recall that the most popular request for APPA's services came to light four years ago in the Member

Opinion Survey. Our members let us know they needed to be better informed on governmental regulations. We now have a Government Relations Task Force in place, and two years ago the position of director of government relations was added to the APPA staff. I have requested the staff to devote some time and resources to develop a calendar of governmental regula-

tions that will help our members to be cognizant of upcoming regulation deadlines. Related to this, I have asked John Harrod and George Preston, Vice President for Information Services, to begin a dialogue on the impact of the federal requirement to convert to the metric system by January 1, 1994 and again, how APPA might play a role in mitigating the impact on our member institutions.

#### The Long-Range Plan

The Long-Range Plan was established by past presidents Jack Hug and William Middleton and is a very sound plan. It has given our association credibility, stability, and maturity. In my opinion, APPA is currently an extremely healthy organization.

At a time when other associations in





higher education are not doing well, we have had two very good years financially. Processes and procedures are in place to ensure that the Long-Range Plan will serve us well as a guide into the 21st century. The Bylaws have been changed to help provide the necessary continuity and program development.

### Mentoring

Another area that I would like to discuss briefly is the subject of mentoring and how important it is to our profession and to our association. When most of us were in school there was no degree that specialized in facilities management. Now there are more than a dozen institutions offering just such a degree. Like myself, I suspect that most of you had a mentor who was responsible for getting you interested in the facilities management field. It was probably a special person who influenced you, helped you to confirm your values and ethics, and guided you in your experiences and career. We should not be threatened by the challenge of mentoring, because it will surely be a mutual growth experience. There is great value in delegation both to you and to those who work with you. There is opportunity in the excitement of youth and stimulation in the guiding of innovation and risk taking.

We all know the state of higher education today; it is a condition not likely to change any time soon. It is in our best interest, that we as taxpayers should make sure that we have the best and brightest individuals managing the facilities of our nation's institutions of higher education. I don't have to remind you about the magnitude of the investment that this nation has in its higher education facilities.

It is difficult to find and develop people who like people. We need to search them out and develop them, because people who don't like people are not going to make it in this business.

One of the most compelling reasons (there are many) for you to be a mentor to someone is that it will not only make you feel good about yourself, but you will be valued and treasured by that person. You will feel good about helping somebody excel in a profession about which you care a great deal. That person will come to love the work you love.

You can help them to grow not only

in your own organization, but also advance into the regional APPA and the international APPA. You can help them understand the broader perspective, the big picture, and to develop a healthy respect for their chosen profession. Then, when the opportunity presents itself, they will contribute to the body of knowledge in the APPA organization and share what they have learned with other rising stars. They will work in chapters, regions, and national committees and build their own networks, to stretch their own limits.

This is worth repeating: it is the network of professionals and the cross-pollination of ideas that is the epitome of the APPA experience. I challenge you to share the APPA experience, to help develop the higher education facilities officers and leaders of our future. Be a mentor to someone.



### Vanderbilt Plant Improving

According to a recent survey, Vanderbilt University's physical plant operations have improved over the last five years. The university received nearly 1,000 responses from students, faculty, and staff—a 50 percent response rate—in a survey that asked respondents to relate their single biggest problem in plant operations and suggest ideas for improvement. Seventy percent said restrooms needed to be cleaned more thoroughly, and a follow-up survey is being sent out to pinpoint trouble spots in maintenance and custodial services. Grounds ranked highest in the survey. Vice Chancellor for Administration William Jenkins said, "It's one thing to have a philosophy of serving the customer, but it's another thing to really play it out. I'm please that Jon [Gullette] and his staff continually evaluate their work."



### Labor Dept. Opens Electronic Bulletin Board

The Department of Labor now has an electronic bulletin board containing job safety and health regulations, statisti-

cal, employment, safety, health, and pension information. The number is 800-597-1221. To receive information from the bulletin board, users should set computer communications parameters at: parity: none; baud: 300, 1200, or 2400; data bits: 8; stop bit: 1. For more information contact Don Berry at 202-219-7343.



### Opinion Survey Shows Members Satisfied With APPA

by Steve Glazner  
APPA Director of Communications

More than 90 percent of APPA members believe that they receive value for their membership dues, according to an analysis of the responses to APPA's recent member opinion survey. We received 547 responses from institutional representatives out of 1,693 sent, which is an excellent 32.3 percent response rate for such a comprehensive survey. The survey to associate members brought 433 responses out of 1,972 sent, or 22 percent. The cumulative response rate was an extremely respectable 26.7 percent. This report is intended to provide the highlights of the institutional representatives' survey data only.

The three most important reasons for continuing membership in APPA are: 1) to have access to specialized knowledge in the field of higher education facilities administration—71.8%; 2) to network with fellow professionals—61.7%; and 3) to support the profession of facilities officers—43.4%.

### APPA Effectiveness

Respondents thought that APPA was most effective in providing a forum for the exchange of ideas (58.3%) and keeping members informed of new developments (53.2%). Only 26.3 percent said that APPA was very effective in representing the interests of facilities managers to presidents, trustees, and others; another 12.6 percent said that APPA was not effective in this area.

### Evaluation of Current APPA Services

The top five "Excellent" responses



were:

1. *Facilities Manager* magazine—38.0%
2. Membership Directory—35.7%
3. Institute for Facilities Management—33.8%
4. *Facilities Management* manual—32.9%
5. *APPA Newsletter*—32.7%

The top five responses, "Excellent" and "Good" combined, were:

1. *APPA Newsletter*—84.0%
2. *Facilities Manager* magazine—80.6%
3. Membership Directory—78.0%
4. *Facilities Management* manual—69.5%
5. Special topic books—63.7%

The highest "Fair" and "Poor" responses combined were:

1. Comparative Costs and Staffing Report—17.1%
2. Award for Excellence Program—15.4%
3. Government Relations Activity—13.5%
4. Experience Exchange Data Base—12.8%
5. Chapter/State Meetings—9.0%

#### Topics for APPA to Pursue

The highest priorities of the membership, without regard to format, were the following:

1. Utilities/energy management—46.8%
2. Customer service—45.3%
3. Environmental issues—39.8%
4. Leadership skills—38.3%
5. Supervisory training—38.2%

#### Educational Programs

A total of 48.3 percent of the respondents indicated that they had either attended a professional development program in the last year or had sent other staff members. Most of those who did not attend a program (37.4%) said that budget concerns/constraints were the leading reason.

Evaluation of current activities:

|                              | Excl  | Good  |
|------------------------------|-------|-------|
| Annual Meeting               | 22.7% | 26.7% |
| Institute for Facilities Mgt | 33.8% | 23.1% |
| Institute for Facilities Fin | 6.6%  | 11.3% |
| Executive Development Inst   | 14.3% | 10.7% |
| Seminars                     | 16.4% | 37.4% |

[Keep in mind that the Institute for Facilities Finance and the Executive Development Institute are both relatively new programs with necessarily-

limited enrollments. These also had the highest response in the "No Opinion" category.]

Supervisory training, utilities/energy management, and total quality management were listed as the top three priorities for possible seminar topics. Total quality management, customer service, and emerging technologies were listed as top priorities for annual meeting sessions.

July was listed by 29.3 percent—the highest single response—as the best month in which to hold the annual meeting. June and July together were the preferred months for 49.2 percent of the respondents.

#### APPA Books

A total of 76.7 percent of the respondents indicated that they had purchased a book in the previous twelve months.

Evaluation of current types of publications:

|                              | Excl  | Good  |
|------------------------------|-------|-------|
| Critical Issues series       | 22.9% | 34.6% |
| Monographs                   | 13.3% | 25.2% |
| <i>Facilities Management</i> | 32.9% | 36.7% |
| Special topic books          | 21.1% | 42.7% |
| Comparative Costs & Staffing | 20.9% | 37.2% |

The members tell us that their top three priorities for new APPA books are on maintenance management, strategic planning, and deferred maintenance. These are certainly not mutually exclusive topics.

#### APPA Periodicals

A total of 51.5 percent of the members read *APPA Newsletter* cover-to-cover on a regular basis; another 44.2 percent read selected articles. For *Facilities Manager*, 36.1 percent read it cover-to-cover, while another 59.6 percent read selected articles.

Evaluation of the periodicals:

|                           | Excl  | Good  |
|---------------------------|-------|-------|
| <i>APPA Newsletter</i>    | 32.7% | 51.3% |
| <i>Facilities Manager</i> | 38.0% | 42.7% |

Respondents indicated the following as the top three article topics they would like to see published: emerging technologies, government regulations, and downsizing/rightsizing.

#### Membership Directory

Nearly half of the respondents (49.8%) indicated that the Membership Directory was very useful to them; another 40.2 percent said it was somewhat useful. On the evaluation portion, 35.7 percent indicated that the directory was "Excellent," and another 42.3 percent marked "Good."

#### Experience Exchange/Information Services

More respondents (68.0%) noted that they had not used APPA's Information Services Department than said they had (28.9%). Most learned about APPA's Information Services through the APPA Answers column in *Facilities Manager* (31.8%), while another 13.7 percent learned about it through APPA staff.

The evaluation portion indicates that 48.3 percent of the respondents had no opinion of the Experience Exchange Data Base service; only 5.6 percent evaluated the service as "Excellent," but 22.6 percent rated the service as "Good." There is a strong indication here that two things are needed: 1) an improved, updated data base, 2) and better promotion of the service.

About half the respondents (45.9%) indicated that they would be interested in having greater access to the information in the data base via a summary publication. The Information Services Committee suggests that a data disk might be even more valuable and usable.

#### Government Relations

A total of 29.9 percent of our members say that their institution has a governmental affairs representative, while another 57 percent say they do not. We asked how involved the facilities department is in legislative/regulatory issues at any level: 14.7 percent are very involved; 36.7 percent are somewhat involved; and 43.2 percent are not involved.

On the evaluation portion, 38.7 percent had no opinion on APPA's government regulations activity; 7.9 percent checked "Excellent," and 28 percent checked "Good."

#### Information Technology/Electronic Access

More than half our members (54.5%) have some kind of electronic mail capa-



bility. Nearly half of the indicated networks available were Internet or Bitnet.

The top six services members indicated they would like to have access to via electronic means are 1) Bulletin boards on facilities issues—54.1%; 2) Legislative/regulatory updates—44%; 3) Experience Exchange Data Base—43.2%; 4) Individual e-mail with other members—40.8%; 5) Comparative Costs & Staffing data base—40.4%; and 6) On-line Job Corner listings—37.6%.

#### APPA-Developed Software

A strong 79.1 percent of the membership indicated that they would be interested in obtaining APPA-developed software. The top five areas of interest for such a service are 1) preventive maintenance—55.0%; 2) facilities audits/inventory—52.5%; 3) work order systems—50.7%; 4) space planning/utilization—49%; and 5) energy management—46.7%.

#### Respondent Profile

A full 88.5 percent of the respondents have a bachelor's or higher degree—48.4 percent have a bachelor's, 34.9 percent have a master's, and 5.1 percent have a doctorate. A total of 67.5 percent have spent ten or more years in the facilities management profession, with 28.8 percent serving more than twenty years.

Approximately 22.5 percent of the APPA member respondents indicated that they also hold membership in NACUBO; another 12.2 percent are members of AIPE. Respondents also have memberships in SCUP, ASHRAE, IFMA, and other organizations.

#### Conclusion

The member opinion survey will provide APPA's Board of Directors, program committees, and APPA staff with program and activity guidance for some time to come. One of the more relevant expected outcomes will be a more closely coordinated effort between Educational Programs,

Information Services, and Professional Affairs in the development of particular topics and activities.

■ ■ ■

### Members Pass Proposed Bylaws Changes

All three recent proposed Bylaws changes were overwhelmingly approved by the institutional members of APPA. Each change received "Yes" votes of at least 96 percent. A total of 371 ballots were received, which was about 25 percent of the eligible voters. The ballots were tabulated on January 25 by an ad hoc Tally Committee chaired by H. Allen Stearns, Prince George's Community College; the other members were Allan D. Guggolz, member emeritus, and Michael R. League, Smithsonian Institution.

The Bylaws changes established

and clarified international regions, clarified the duties and responsibilities of the Information Services and Professional Affairs committees, and clarified and made consistent language and terms used within the Bylaws.

At the midyear Board of Directors meeting on February 5, the Bylaws Committee, chaired by Secretary Howard A. Wells, discussed the ways in which the revised Bylaws should be distributed to the members. They recommended that the Bylaws not be reprinted in the annual Membership Directory; instead, the APPA office would retain the revised Bylaws on disk and make printed copies available to any member who requests it. In addition, each new member of APPA would receive a copy in their new-member packet.

If you would like a copy of the revised APPA Bylaws, please *mail* or *fax* your request to the APPA office.

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If you have any questions or comments, please feel free to contact the APPA office or your representative on the Board of Directors.



## The Environment

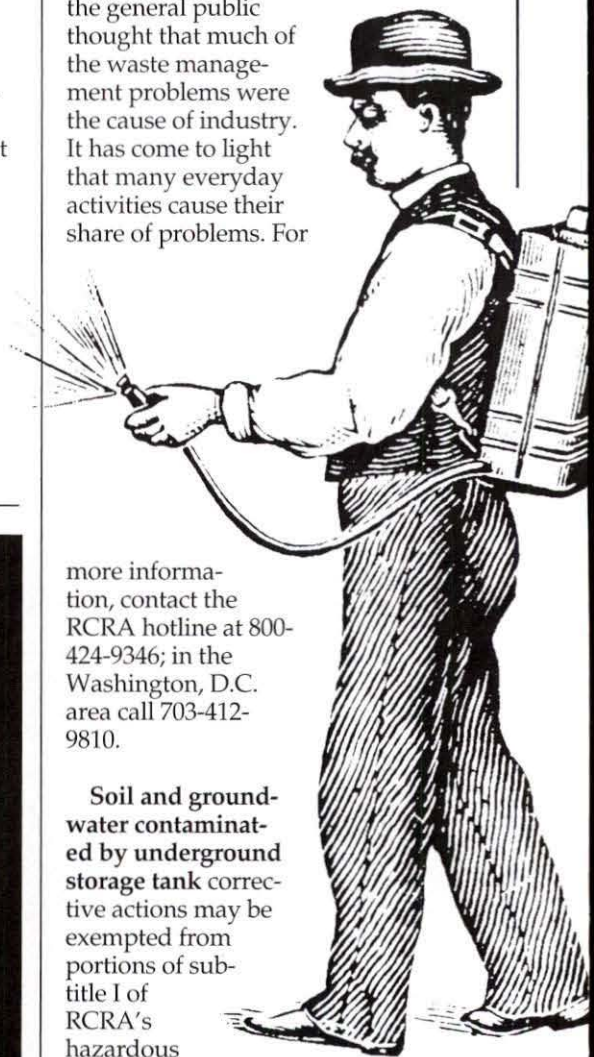
Stephanie Gretchen

Attention all schools (colleges, universities, and primary schools) controlled by your local city or county. EPA published (February 18 *Federal Register*) the final rule establishing four alternative ways for local governments to demonstrate financial responsibility for taking corrective action and compensating third parties for bodily injury and property

damage caused by **underground storage tank** releases. I called EPA and unfortunately, these mechanisms do *not* apply to public state colleges and universities. The additions will allow more government entities to comply with the financial assurance requirements and will result in a net cost savings. The rule became effective March 22, 1993. For more information, contact the RCRA hotline at 800-424-9346 or 703-412-9810, or Sammy Ng at EPA's UST office, 703-308-8882.

According to the February 11 *Federal Register*, EPA is working on a rule that would streamline disposal requirements for some widespread post-user **hazardous waste** items, such as certain batteries and pesticides. The proposed rule

hopes to facilitate separation of these items from the municipal waste stream and encourage proper treatment or recycling. In the past, the general public thought that much of the waste management problems were the cause of industry. It has come to light that many everyday activities cause their share of problems. For



more information, contact the RCRA hotline at 800-424-9346; in the Washington, D.C. area call 703-412-9810.

Soil and groundwater contaminated by underground storage tank corrective actions may be exempted from portions of sub-title I of RCRA's hazardous waste regulations if this proposed rule (published in February 12 *Federal Register*) is passed. The rule would exempt twenty-five newly listed organic chemicals under the Toxicity Characteristics rule. For more information, contact the RCRA hotline at 800-424-9346; in the Washington, D.C. area call 703-412-9810. ■

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

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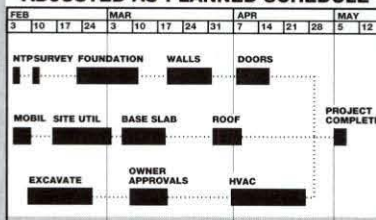
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## Capital Notes

Barbara Hirsch

During the first few weeks of the 103rd Congress, the big news is President Clinton's economic package. His combination of increased taxes, spending cuts, and economic stimulus has had mixed reviews.

**BTU Tax:** President Clinton's proposal contains a tax on the heat content of domestic and imported fossil fuels (natural gas, coal, and oil) to be phased in over a period of three years. The proposed basic tax is 25.7¢/MMBTU with a supplement for oil of 34.2¢/MMBTU. The tax will be fully phased in by 1997 and is expected to provide \$22 billion in revenues. The objectives are to increase energy efficiency, improve the environment by reducing fossil fuel consumption, enhance national security and the trade balance by reducing oil imports, and strengthen our economy through deficit reduction and long-term U.S. investment, productivity, and growth. The pass-through tax to end users is estimated at 5 percent for gasoline, 4 percent for residential natural gas, 3 percent for residential electricity, and 8 percent for home heating oil.

In the meantime, the Senate Committee on Energy and Natural Resources held hearings on February 24 to consider options, including an energy tax and value-added tax (VAT). The Congressional Budget Office (CBO) concluded that an energy tax could be a "constructive component of a tax package, with the added benefit of contributing modestly to environmental and energy security goals." A VAT could also increase tax revenues, but because of administrative costs involved in collection, would not be

cost-effective at the \$22 billion level. The CBO also noted that an energy tax would be more burdensome on lower and middle income families, but not as burdensome as a VAT. The effect of the energy tax would differ by region, with rural areas being hit the hardest.

The manufacturing industry is squarely against an energy tax and strongly feels that it should be replaced with a VAT. Jerry Jasinowski, president of the National Association of Manufacturers, said that the BTU tax would result in a loss of industrial production and would harm the competitiveness of U.S. goods abroad. The CBO does not agree with this posture, stating that companies that can switch energy forms and reduce consumption will suffer fewer economic losses. Further, many companies can pass along the tax to consumers who will typically continue to purchase the taxed products.

APPA did its own informal and extremely limited survey of several members and discovered that the tax would produce between 5 and 8 percent in additional physical plant costs. This does not include any pass-through taxes. The low and high scores were thrown out because they were well outside the curve. The rest of the results are as follows:

| Institution              | Percentage of Increase | Dollar Amount |
|--------------------------|------------------------|---------------|
| University of California |                        |               |
| San Diego                | 6.5%                   | \$290,000     |
| Rutgers/Newark           | 8%                     | 36,000        |
| University of Virginia   | 4.87%                  | 523,000       |
| West Virginia University | 8%                     | 257,000       |

Note: All results are for natural gas except for University of Virginia, which uses a combination of natural gas, oil, and coal. Dollar amounts are rounded off to the nearest thousand.

The APPA members who have expressed an opinion thought the tax was fair, and that universities should go along with the plan even if tuition costs are eventually affected. However, schools should first try to switch fuels and become more energy efficient to reduce costs before resorting to increasing tuition.

**Telecommunications:** On January 19 the House Subcommittee on Telecommunications and Finance held oversight hearings on the national communications and information structure. John Sculley, chairman of Apple Computer, recommended that the United States develop an electronic public education program. He testified that such an information infrastructure is necessary to provide for "lifelong learning in a high wage, information-based economy of the future" and will provide a tool for people to improve their skills, update their knowledge, acquire new knowledge to adapt to multiple careers, provide seniors and disabled individuals direct access to health information, and generally provide better access to information affecting our quality of life. Some of these applications are:

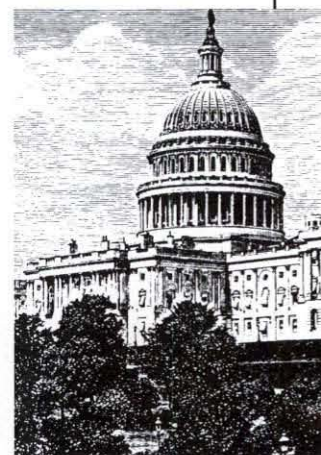
- **Electronic Libraries** for students to use at home or in classrooms.

The electronic libraries will help students find information, identify relevant data, and provide access to information and reference specialists to help users locate materials.

- **Virtual Laboratories and Field Trips:** Students will perform science experiments using equipment and facilities located anywhere in the United States in collaboration with the nation's best laboratory scientists. Students will also take "field trips" to museums, exhibits, and research centers without leaving the classroom.

### Other News

OSHA published a final rule requiring a permit for work in confined spaces in the January 14, 1993 *Federal Register*, p. 4462 (29 CFR Part 1910). OSHA defines a confined space as a configuration that hinders activity, where an employee must squeeze in and out through narrow openings and perform tasks while cramped or contorted. The permit requirement is designed to protect workers from seri-



Barbara Hirsch is APPA's director of government relations.



ous hazards such as toxic, explosive, or asphyxiating atmospheres. The rule becomes effective on April 15, 1993. For further information contact: James F. Foster, OSHA, Office of Consumer Affairs, Room N3647, Washington, D.C. 20210; 202-523-8151.

**Compliance Calendar:** I am in the process of reviewing the BNA Environmental Compliance Calendar for items relevant to APPA members. Because of the volume of information, the initial installment will be coming out in booklet form shortly and sent to every member as a supplement to this issue of the magazine. Future updates will be published on a quarterly basis in *Facilities Manager*. Anyone interested in subscription information on the calendar or any of BNA's other information services can call BNA's Customer Relations at 800-372-1033.

**Guidelines for ADA and Fair Housing Act:** The Architectural and Transportation Barriers Compliance Board (ATBCB) is offering a pamphlet on Titles II and III of the ADA. To receive a copy, contact the ATBCB at 1331 F Street, N.W., Suite 1000, Washington, D.C. 20008; 800-USA-ABLE (voice/TDD), 202-272-5444 (fax). In addition, the American Institute of Architects (AIA) offers a publication with detailed information on the Fair Housing Amendments Act of 1988 (published March 6, 1991 *Federal Register*, p. 9472). It is available at the AIA Bookstore, 800-365-ARCH.

**Bonner Gallup Poll:** Bonner & Associates commissioned a Gallup Poll of 150 Members of Congress for their opinions on a variety of business issues and to probe which actions most affected their voting decisions. More than 70 percent said they paid a great deal of attention to the following actions when deciding how to vote:

- Personally written letters from constituents
- Meetings with interest group heads
- Visits from CEOs with a job presence in the district
- Personally written letters from heads of groups in the district
- Letters from company officials with a job presence in the district
- Phone calls from constituents

Critical issues that topped their lists: jobs, the deficit, and health care. Education came in fifth at 25 percent; environmental and energy issues at 5

percent and 4 percent respectively. However, when the question was changed to "viewed as critical or very important," the figure for education jumped to 74 percent, environment to 47 percent, and energy to 42 percent. This poll confirms my suspicions that

Members of Congress pay great attention when their constituents will be affected by a particular bill. So, APPA members, when you come to Washington, call me so I can set up an appointment for you with your representative's office! ■

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## Focus on Management

Sigmund G. Ginsburg

### Realize the Importance of Vigilant Oversight and Flexible Rigidity

**A**s a manager and executive you should want to develop your subordinates and let them fly as far and as fast as they can. This is obviously good for them in terms of opportunity and motivation, and it is good for the organization because talented

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people are encouraged to give their best. It is also good for you because this type of attitude on your part will probably lead to greater creativity and productivity on theirs. This leads to making the unit look good in terms of bottom-line results, and you look good because you are a manager who develops subordinates and establishes high morale in a unit.

However, while you try to create a climate for creativity and delegation of authority, you must also recognize the importance of maintaining some degree of supervision and control while maintaining some basic principles that must be upheld. Thus, the challenge for you is how to maintain a balance between creativity and control, between maximum authority and responsibility to subordinates. The same challenge exists at all levels within the organization.

You might consider adopting a management philosophy and practice of vigilant oversight. Note the concept is not "control," but the softer approach of oversight. Of course, whether you can use this approach will depend upon your competence, self-confidence, and personality, and similar aspects for your subordinates as well as the organization's history, present environment and style, and the problems and opportunities facing the organization.

You will want a system that involves you in planning, in deciding on performance measurements, in evaluating results, in dealing with major crises, and in the need for significant changes in plan. You will want to be kept informed generally as to progress and problems. The details of this approach can be worked out with your subordinates and may differ with various subordinates depending upon your needs and concerns, their needs and concerns,

and the nature of the problem. It can range from light or little oversight to a rather strong system very close to a more formal control system.

Whatever the degree of oversight (and remember you want to give maximum opportunity for talented individuals to run their own show), you want it to be understood that while it is oversight and not control—and it may be light oversight at that—you will be vigilant. You will be interested, concerned, involved, and available. You have not abdicated, but your approach is geared to maximum results and maximum opportunity for the individual in charge to show what he or she can do.

Another aspect of how you supervise and control is the degree of flexibility in terms of policies, guidelines, and practices to be followed by your subordinates. Some people believe in rigid flexibility; that is, they will deal with every situation on an ad hoc basis.

Although this promotes maximum discretion and creativity in meeting a particular situation, it raises severe problems in regard to precedent, whether there are any organizational standards.

Thus, I suggest that the principles, guidelines, standards, and practices be clearly and simply stated without ambiguity. In a sense, these should all be rigidly set forth. However, as situations arise, your subordinates should have some leeway, and you should have more. After checking, if necessary, with your supervisor, you should be able to interpret policies and practices in as flexible a way as possible to meet the needs of the situation. This has to be done carefully so that it does not degenerate into the drawbacks of rigid flexibility.

A sensitive and sensible use of the two guidelines of vigilant oversight and flexible rigidity will provide you with ample supervisory control, while at the same time providing your subordinates with maximum opportunity to produce, learn, grow, and develop. ■



*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.*



# APPA's 1993 Educational Conference and 80th Annual Meeting

July 25-27, 1993

St. Louis, Missouri

**New Format! "Hot Topics!"  
Exhibits! Networking! Value!**

Join your fellow facilities professionals for APPA's 1993 Educational Conference and 80th Annual Meeting this July in St. Louis. This year's meeting offers an exciting new format with three value-packed days of educational sessions, exhibits, and networking opportunities. St. Louis offers easy access and many attractions.

In response to your suggestions, some key changes have been made in this year's program. The meeting will kick off on Sunday morning with "hot topic" educational sessions. Following a "brown bag" lunch, the afternoon continues with educational sessions and a "motivational" Keynote Address at 3:00 pm. The exhibit hall will be open for a light reception in the early evening.

Highlights include two dynamic keynote presentations. The Keynote Address on Sunday will be given by **Dr. T. J. Petillo, President, Qualtec Quality Services, Inc.** who will address the success and failures of total quality management. Tuesday's Keynote Speaker is **Dr. Keith H. Lovin, President, Maryville University.** His address will talk about the importance of facilities in a small institution.

More than 165 companies will be on hand displaying their products and services. Sunday evening marks the opening of the exhibit hall and a special salute to our exhibiting companies. APPA will be sponsoring a Silent Auction to benefit the HEFT Scholarship Foundation. Items to bid on will be on display in the exhibit hall area and will include APPA products, as well as donated products/services from APPA exhibitors.

When planning your trip to St. Louis, you will want to come early on Saturday to take advantage of sightseeing time in St. Louis. APPA's headquarters hotel, The Adam's Mark, is located across the street from the Arch. Area attractions include Union Station, Grant's Farm, the St. Louis Zoo, and Anheuser Busch Brewery Tour. There are many activities for the whole family.

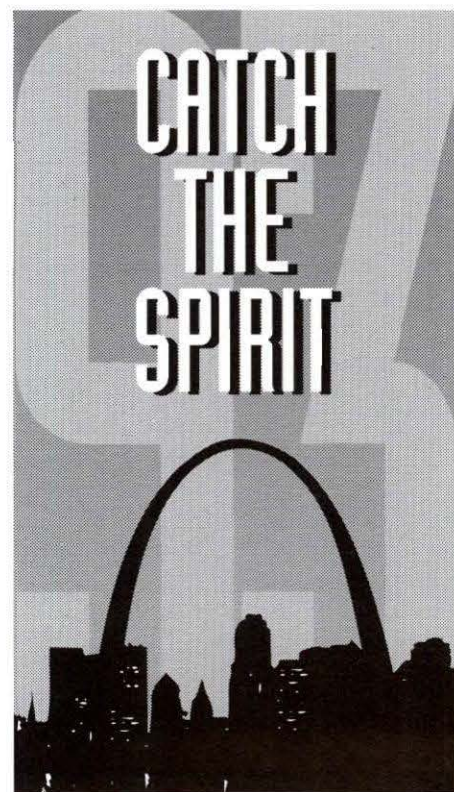
The Preliminary Program with full details on the program, registration, and hotel information will be mailed to all APPA members. You should receive it later in this month.

## EDUCATIONAL PROGRAM

In an effort to improve the educational program, APPA will be offering a series of educational program formats. The "Super Sunday" sessions include "**Hot Topics**" which focus on issues of widespread concern and interest to facilities professionals. In addition, there are sessions which focus on personal growth and development topics which are of interest to facilities managers and their spouse/guests.

To enhance the networking opportunities of the meeting, we are introducing the "**Networking/Round Table Discussions**". These will be informal small group exchanges. To help tailor these to meet your needs, APPA is asking attendees to provide suggestions on topics of interest. Once again, we will be offering the **Exhibitor/Vendor Technical Sessions** which allow corporate representatives to present topics from their unique perspective within the facilities management marketplace. The balance of the educational program consists of presentations grouped

# Reaching for Excellence:





in the following tracks: **Business Management; Facilities Operations; Facilities Planning, Design, and Construction; Human Resource Management; and International Perspectives.**

## PROGRAM HIGHLIGHTS

### "Hot Topics" --Training Issues

#### APPA-Ogden Supervisory Training Session

Training session on how to use the "Survival Kit for New Supervisors". Review the modules, use of training materials, and learn how to set-up an in-house training program for your institution.  
*Dick Cortes, Ogden-Allied*

#### Internal Training: The Process from Needs Assessment to Training Programs

Explore how one facilities management organization established a training committee to assess needs, develop recommendations, and provide training and development programs. Examine committee composition, assessment tools, and the outcome of the needs analysis.  
*Marilyn Lockhart & Ken Smith, University of Virginia*

### "Hot Topics"—Regulatory & Environmental Issues

#### Assisting Desperate Administrators: Developing an In-House ADA Compliance Plan

Case study of Purdue University's plan to comply with ADA. Examine methods used to survey buildings for compliance, develop cost estimates, determine priorities and implement the "transition plan".  
*Owen Cook, Purdue University*

#### Regulatory & Environmental Update

Focus on several areas including: new energy laws, OSHA, and ADA. CFC Task Force Report will be given by *Dorsey Jacobs, West Virginia University*.  
Moderator: *Barbara Hirsch, APPA Government Relations Director*

#### Training for Excellence in Environmental Protection & Compliance

Designed to assist institutions in establishing a comprehensive environmental protection and regulatory compliance program. Examples of organizational models, fund-

ing, and staffing guidelines.  
*Tom Anderson, Mike Richardson, and Mike Russell, University of Kansas*

### "Hot Topics"—Wellness Issues

#### Personal Financial Planning

Learn how to assess your financial position, including net worth and cash flow. Advice on how to set financial goals and develop a plan to meet them.  
*A Representative from TIAA-CREF*

#### Stress Management

Discuss types of stress and the emotional problems that it can cause. Learn coping mechanisms. Examine the differences between positive and negative stress and how each affects us.  
*Lou Farley*

### "Hot Topics"—Management Issues

#### Total Quality Management (TQM)

Focus on the principles and applications of

TQM. Improving quality is a continuous process involving participative management, statistical thinking, data-based decision-making, customer service, empowerment of the worker, strategic planning, training, and transformation of the organizational culture.

*James O. Cole, CommTech Transformations, Inc.*

#### Myers-Briggs--A Management Tool

Learn more about the Myers-Briggs Type Indicator and how that influences management and leadership style. Examples of personality types and effective approaches for dealing with these characteristics.  
*Anita Zimmerman, Interax Corporation*

### Business Management

**Benchmarks: A Comparative Study of Capital Budgeting Practices at Colleges, Universities, & Multi-Campus Systems**  
Benchmarking is being used by institutions

## CONFERENCE AT A GLANCE

#### Saturday, July 24

8:00am - 12:00noon  
12:00noon - 5:00pm  
1:00 - 5:00pm

APPA Committee Meetings  
Member Registration and Welcome Desk Open  
Campus Tours

#### Sunday, July 25

7:00 - 7:30am  
7:30 - 8:15 am  
9:00am - 5:00pm  
9:00am - 12:00noon  
12:00noon - 1:00pm  
1:00 - 3:00pm  
3:00 - 4:00pm  
4:00 - 7:00pm

Non-Denominational Religious Service  
Welcome Continental Breakfast & Orientation  
Member Registration and Welcome Desk Open  
"Hot Topic" Sessions  
"Brown Bag Lunch" Sessions  
"Hot Topic" Sessions  
Motivational Keynote Address  
Exhibit Hall Reception

#### Monday, July 26

7:00 - 8:30am  
8:00am - 4:00pm  
9:00am - 12:30pm  
12:00n - 3:00pm  
3:00 - 4:00pm  
4:00 - 5:30pm  
5:00 - 6:00pm  
7:00 - 9:30pm

President's Breakfast  
Member Registration and Welcome Desk Open  
Educational Sessions  
Exhibit Hall Open/Lunch Served  
Exhibitor/Vendor Technical Sessions  
Regional Meetings  
Military Get-Together  
An Old Fashioned Steam Boat Cruise

#### Tuesday, July 27

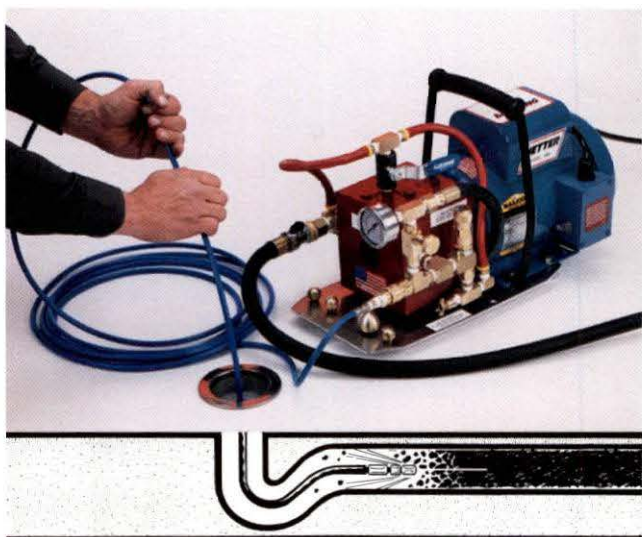
7:00 - 8:30am  
8:00am - 4:00pm  
9:00am - 12:30pm  
12:00n - 3:00pm  
3:00 - 5:00pm  
6:00 - 9:00pm

Breakfast & Keynote Address  
Member Registration and Welcome Desk Open  
Educational Sessions  
Exhibit Hall Open/Lunch Served  
Round Table Discussions/Networking  
Annual Awards Banquet & Closing Educational Address



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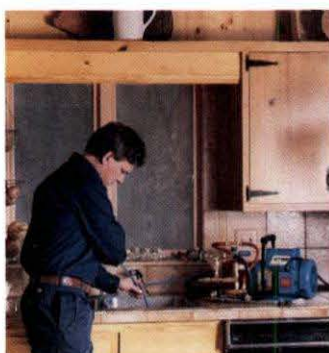
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to measure performance against comparative institutions. Examine the findings from a comparative study of capital budgeting practices employed by institutions to identify, evaluate, select, and prioritize major capital projects.

*David A. Techau, University of Missouri System*

### **The Educational Alliance of Pueblo: A New Era of Facilities Support**

Explore the innovative educational alliance between a university and large school district. Examine how they have created partnerships at every level, including the combination of physical plant operations. Learn how they met this challenge and the success of this alliance.

*Edward M. Smith, University of Southern Colorado/Pueblo School District No. 60*

### **Managing Projects: As Simple as 1-2-3**

Examine the Capital Projects Tracking System designed to monitor capital projects from proposal to completion. The system can track individual projects, report financial performance, monitor purchase order commitments, and make use of existing information networks to provide complete information.

*Stephen M. Slater, Trinity Church Wall Street*

### **Reshaping Higher Education's Facilities Management**

The economic recession, a declining pool of applicants and other factors are forcing a reexamination of the "business-as-usual" tenets of higher education management. Examine the concepts of facilities management in the future. The evolution of these changes is based on analysis and interviews with leaders at several universities.

*William A. Daigneau, University of Rochester*

## **Facilities Operations**

### **The APPA Custodial Staffing Guidelines After A Year At Work:**

Review the methods provided in APPA's text, Custodial Staffing Guidelines. Presentation of six case studies where the staffing guidelines have been used.

*Jack C. Dudley, member emeritus & Robert A. Getz, University of Illinois/Chicago*

### **Can Custodians Become Craftworkers?**

Look at how two institutions initiated pro-

grams to bring custodians into the craftshops to assist during the heavy workload periods. Examine the key components including selection, supervision, training, and evaluation.

*James Davis, Indiana University/Bloomington and Don Hufford, Purdue University*

### **Contracting/Partnering for HVAC Services**

Learn about Honeywell's "Schools Program" and the pilot program being undertaken at the University of Delaware. The "Schools Program" is a program for accelerating capital renewal, for capturing greater energy cost avoidance opportunities, and strengthening technical services of HVAC activities.

*Thomas F. Vacha, University of Delaware*

### **Developing and Implementing a Landscape Management Plan**

How to develop a five-year landscape management plan which establishes specific objectives, divides the campus into maintenance class areas, creates maintenance standards, and identifies implementation steps. The plan examines the most efficient use of existing personnel, equipment, and budget resources.

*Thomas E. Flood, University of Missouri/Columbia*

### **Justifying the Need to Allocate Financial Resources for the Preservation & Future of University Trees**

Recognizing the importance of the campus's natural environment, management initiated a program to identify and determine the value of trees on campus. Learn what steps were used to set up the Tree Maintenance and Replacement Program.

*William G. McGinnis, California State University/Chico*

### **Roof Management Program Development & Usage**

Overview of how to organize and develop a roof management program. Case studies will illustrate real-life examples. Review techniques for evaluation and selection of roofing materials and membranes.

*William J. Stevenson, Shive-Hattery Engineers and Architects, Inc.*

### **The Successful Introduction of a Total Quality Management Cleaning Program at a Mid-Size University**

Focus on how one institution implemented a participatory management style, employing the principles of TQM, in the cleaning program. Examine how the principles and concepts of APPA's Custodial Staffing Guidelines are being used.

*Richard E. Smith and James Demarest, Illinois State University*

### **Waste Management: Trash is Cash**

Learn how one university started with no facility, no equipment, no budget, and only "borrowed" personnel three years ago, and grew to recycle over 70% of their waste. Focus on organizational structure, downsizing of vehicles, applying for grants, marketing your trash, and generating enthusiasm for recycling.

*Barbara Lawrence, Indiana State University*

## **Facilities Planning, Design, and Construction**

### **Facilities Excellence Via University Standards**

Standardization minimizes training, reduces spare parts/inventory, and eases coordination and planning for construction and renovation. Explore how two institutions developed manuals for architects and engineers working on campus outlining standards to assure cost effective management of the facilities.

*Theodore J. Weidner, Illinois State University and Richard Alexander, University of Illinois/Urbana-Champaign*

### **Facility Excellence Through Effective Coordination, Communications, and Cooperation During Acquisition**

Examine how one institution developed procedures designed to ensure open communications during the planning, design, construction, and operations phases of acquisitions. Discuss the lessons learned and ideas for "continuous improvement".

*Edward B. Camden, Victor Korenman, Jason Mayhew, Frank Brewer, and Laura Wildesen, University of Maryland/College Park*

### **Negotiating the Professional Services Agreement**

Presentation of a method for negotiating for professional services for architects, engineers or construction managers which results in lump sum agreements for a clearly defined scope of work. Examine development of the project, RFP's, selecting the



professional, and guidelines for negotiation of fees.

*Howard A. Wells, Jr. and Robert Kormanik, State System of Higher Education/Pennsylvania*

#### **Planning for Master Planning**

Review the components of the master plan. Learn how to identify objectives, define the services and end product, and estimate resources for getting the master planning process started.

*Marion B. Smith, The Christner Partnership, Inc.*

#### **Human Resource Management**

##### **Innovative TQM: University of Michigan Council Framework**

Learn more about this innovative approach to participative management. A council was designed to equally involve all represented areas of the department. See how this model works and hear from representatives of the council.

*Anita L. Zimmerman, Interax Corporation*

##### **Management by Choice for Small Colleges**

TQM and other management styles attempt to remedy leadership shortfalls, but have presented some limitations in a small college environment. Management by choice in which employees at all levels are used in leadership roles is a good alternative management style. Discover how one institution implemented this program and the results it has achieved.

*Patrick J. Apel, Maryville University*

##### **An Occupational Health & Safety Program for the Wellness of Shift Workers**

Review a study on the effects of shift work on today's employee. Discover how shift work can affect diet, sleep, and stress.

Explore how shift work affects the work environment and especially safety practices. *Yves Gadler and Joseph Vincelli, McGill University*

##### **Providing Leadership and Skill Training and Development Opportunities: A Productive Leadership Training Course**

Review one university's leadership training course, which was designed for all physical plant employees with leadership responsibilities. Examine course organization, outlines and procedures, and evaluation.

*Sam L. Polk, Sr., Tennessee State University*

#### **Response Ability**

Communications are the primary tool of management, and language is a power tool which must be handled with care.

Examine communication skills including examples of words that communicate misunderstanding. Learn about cognitive therapies, observation, and listening skills.

*Catherine Magirl Miller, University of New Mexico*

##### **Texas A&M University Physical Plant's Work Order Requirements Contracting**

WORC combines flexibility and responsiveness of in-house with expanded resources of a general contractor. WORC is a system for accomplishing physical plant work through a general contractor on retainer. Review how WORC is set up and administered.

*Joseph P. Sugg, Texas A&M University*

#### **International Perspectives**

##### **Creating a New University: An International Perspective**

Explore the challenge of creating a brand new university. Factor into the equation, a research institution, location in Hong Kong, demanding academic requirements, and private funding by the gambling monopoly, and see how problems were overcome and an institution was born.

*Mike Hudson, Hong Kong University of Science and Technology*

#### **Facility Planning - Turning the Tide**

Brief history of the development of the University of New South Wales.

Created to provide maximum floor space for the dollar, it was a cold environment with outdoor space covered with concrete and bitumen. See how these negatives were turned around with a plan that increased floor space and green space.

*Laurie Lardner, University of New South Wales, Australia*

##### **The Impact of Occupational Health and Safety Legislation on Building Quality: The Australian Model to Estimate "Deferred Maintenance"**

The OH&S legislation had a significant impact on how building assets are perceived. Giving rise to the immediate need to bring assets to current standards, a dramatic increase in the amount of backlog was recorded and a corresponding reduction in quality.

Look at how Australia compares.

*Lloyd D. Cushway, The University of Adelaide, Australia*

##### **Value Analysis of Competitive Bids for Consultant Services**

Examine the uses of a value analysis method to review bids for professional services. Discuss how bids are judged and weighted.

*Ted Dews, James Cook University of North Queensland, Australia*



Join us on Monday evening, July 26 for An Old Fashioned Steamboat Race. Cruise along the Mississippi River, enjoy dinner and live entertainment. On the return trip, the two boats will race each other back to The Arch.





The key to reducing  
deferred  
maintenance...

...is knowing what has to be done, and when.

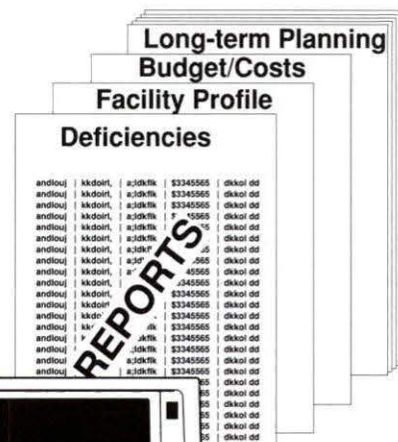
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# Putting the Facilities Work

by Harvey H. Kaiser

**P**olls of higher education CEOs have shown deferred maintenance to be one of their top five priorities. But while their view of deferred maintenance has evolved from an alert to a call for action, some public systems and private campuses still are not fully addressing the problem. Many, however, have begun the difficult tasks of identifying needs, seeking funding, and reducing the backlog of work on decaying buildings and infrastructure.

Several states have required comprehensive surveys of buildings and infrastructure conditions as a prerequisite for submitting annual or biennial capital funding requests. While campuses in some public systems must follow specific guidelines set forth in legislation or as system or institutional policy for collecting information on existing conditions, many independent institutions have developed their own ways to amass the data that reveal the deficiencies of decades of neglect. Facilities audit deficits in hundreds of millions of dollars are not uncommon; costs range from \$15 to more than \$40 per gross square foot of campus space, not including infrastructure repair costs.

## Capital Renewal

Capital renewal offers a program consistent with institutional strategic planning. As facilities and financial officers have gained experience in addressing the problem of deteriorating campus facilities, they began to expand from a facilities to a financial lexicon. Concepts such as *facilities equilibrium*

*Dr. Harvey Kaiser is senior vice president for facilities administration at Syracuse University, Syracuse, New York. He is a prolific writer, speaker, and consultant on capital renewal issues, and in 1988 he received APPA's Rex Dillow Award for Outstanding Article in Facilities Manager. Kaiser is the author of Mortgaging the Future and Facilities Audit Workbook; his newest book for APPA is The Facilities Audit: A Process for Improving Facilities Conditions, from which this article is taken.*

and *protection of capital assets* evolved into comprehensive strategies to deal with the overwhelming problems of renewing capital assets.

Building on a cornerstone of facilities audit information, the strategy alleviated the facilities managers' frustrations of inaction by introducing a financial perspective. In some cases, governing boards allocated depreciation reserves to fund programs; others used reserves on hand or developed funding sources through gifts and grants. The cycle of facilities deterioration, altered by deferred maintenance backlog reduction programs, was also addressed by some systems and campuses by creating more intensive maintenance programs to avoid future risks to capital assets.

In the new strategy for dealing with facilities deterioration, the financial perspective defines protection of capital assets as a process of capital renewal of plant assets. "Immediate critical needs" are synonymous with deferred maintenance. Long-term facilities renewal relates to concepts of depreciation; a capital reinvestment rate can be calculated to maintain the functional and financial value of facilities.

A complete capital renewal strategy includes the following:

- identifying conditions of capital assets (buildings, grounds, infrastructure, and equipment) and assessing findings;

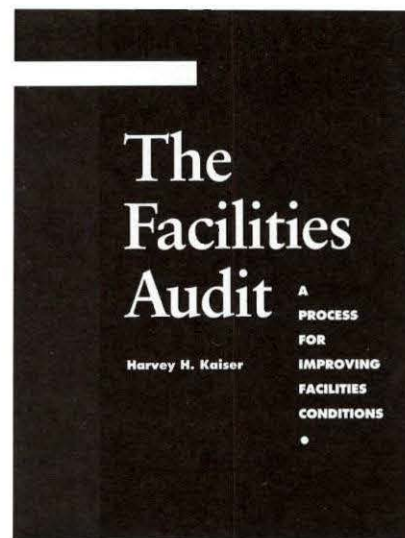
- prioritizing immediate critical needs;
- developing multiple funding sources for continuous attention to capital renewal;
- adjusting campus capital expenditure priorities from new construction to capital asset renewal; and
- establishing new maintenance programs designed to prevent accumulation of capital asset deterioration.

## Putting the Audit to Work

Putting the audit to work means developing an ethic among maintenance staff to continually inspect, observe and report deficiencies, and maintain a timely and accurate record



# Audit to



of facilities conditions. It also means developing funding alternatives—and procedures for managing funding—and assuring that current use of resources is effective and efficient.

Planning programs for capital renewal and deferred maintenance reduction requires estimating funding needs and the difficult task of assigning priorities. Presentation of audit findings should be accompanied by a facilities needs assessment describing a funding plan for capital allocation priorities and an adequate maintenance operating budget. Programs will require components for “catch-up” costs and “steady-state” costs. The program should be realistic in terms of the ability to absorb funding, with time allocated to preparing contract documents and managing projects.

The facilities audit process provides the basis for determining capital needs to avoid future facilities deterioration. This process enables you to assess your short- and long-term needs for dealing with the problem. The audit process also supports the comparative assessment of facilities conditions and development of priorities. Too often, at this point, the process ends in frustration because of the governing board’s lack of response to funding requests.

Many systems and institutions lack three important components for capital renewal: 1) a project prioritization process; 2) a resource allocation model to formulate funding planning; and 3) a will to change the campus culture in favor of capital asset renewal. Although the number of successful examples is increasing, the evidence of national surveys shows that the rate of facilities deterioration continues to increase. Despite a weak national economy and financial distress in higher education, the problem must be faced sooner rather than later.

## Capital Renewal Planning

Capital renewal planning is a continuous process that is adjusted on an annual basis. A preliminary plan for capital renewal resource allocation should define the overall goals for both short-term needs for deferred maintenance and long-term needs for life-cycle renewal of facilities components.

Such a plan for guiding the shift in the level of facilities conditions from marginal to desirable will be influenced by each institution’s mission and strategic plan. These factors have become increasingly important as declining resources have affected restructuring, resulting in rightsizing, shifts in emphasis from research to undergraduate teaching, and demands to improve the quality of residential life. Thus, a resource allocation model for capital renewal is an integral part of an overall strategic plan.

The process of developing a preliminary plan includes:

- project prioritization;
- rate of annual capital reinvestment; and
- duration of a deferred maintenance reduction program.

A final capital renewal plan evolves from fitting a funding model to a selected rate of capital reinvestment that balances a desired amount of expenditures over a period of time with the duration of reducing deferred maintenance backlog. The result is a coordinated program for capital renewal and maintenance that is designed to protect capital assets, a funding plan, and a method for monitoring the program.

## Project Prioritization

**P**rioritizing capital renewal projects is an objective process for allocating limited resources. The priority criteria used for the inspection worksheets found in *The Facilities Audit* provide a ranking that can be reviewed for budgeting decisions on a year-to-year basis. Criteria related to your campus’ goals and objectives are valuable as a standard for annual review as priorities and resources change.

## Resource Allocation

How much to spend on capital renewal is guided by the results of an audit and the total cost of prioritized projects. Questions to be posed for resource allocation are: 1) What are



the effects of different amounts of annual expenditures for capital reinvestment on total backlog reduction?; and 2) What is a desirable rate of annual expenditures for reducing marginal facilities conditions?

Restated, this could be posed as: How much must be spent to reach a desired level of conditions for all campus facilities over a certain number of years? Key variables are the capital reinvestment rate and the backlog targets. Factored into decisions in both cases are the inflation rate, the rate of plant deterioration, and the backlog deterioration rate.

The facility condition index (FCI), a method of comparing facilities conditions based on a ratio of facilities deficiencies to current replacement value (CRV), is useful in setting annual funding targets and the duration of deferred maintenance reduction. The FCI method was developed by Applied Management Engineering of Virginia Beach, Virginia, and was published in 1991 by the National Association of College and University Business Officers in *Managing the Facilities Portfolio*.

$$\text{Facility Condition Index (FCI)} = \frac{\text{deficiencies}}{\text{current replacement value}}$$

The FCI uses empirical data to benchmark relative measures of conditions on campuses:

|                              |                  |
|------------------------------|------------------|
| FCI less than 5% (.05)       | = Good condition |
| FCI equal to 5-10% (.05-.10) | = Fair condition |
| FCI greater than 10% (.10)   | = Poor condition |

For example, after conducting an inspection of buildings and infrastructure, a campus with 3.5 million GSF finds it has \$60 million in deferred maintenance. At an average CRV of \$100/GSF (\$350 million), the FCI is .171, an indication of poor conditions.

The audit's information on deficiencies provides the basis for estimating short- and long-term capital needs, in terms of a deferred maintenance reduction program and a component renewal program. Component renewal, based on life cycle of components, is necessary to prevent future deferred maintenance backlogs.

Costs for correcting facilities deficiencies obtained from an audit and a calculation of the CRV allow you to model the variables for annual and total funding needs and the rate of backlog reduction. For example, if only 1 percent of the CRV is available, the change in the FCI can be calculated. Or, a determination to achieve an FCI of 5 percent in ten years can produce a calculation of annual capital renewal needs.

A rule of thumb for the annual reinvestment rate is 1.5 to 3 percent of CRV. However, experience is showing a preference for the upper end of the range (2.5 to 3 percent) to prevent further accumulation of a deferred maintenance backlog. This is separate from funding required to eliminate immediate critical needs of deferred maintenance. A capital renewal plan must include funding for deferred maintenance backlog reduction and for component renewal. This concept is fundamental to capital renewal funding planning.

#### Funding/Planning

Seeking funds for capital renewal on the scale required to reduce deferred maintenance backlogs is a challenging venture for higher education. The traditional method of funding capital improvements—sources such as gifts and grants—is

inadequate for the task faced by many campuses. Successful examples show that multiple funding sources are necessary to provide a stream of funding that meets capital and component renewal project priorities. Spacing out projects over a period of time allows you to pool multiple sources to meet annual needs. This principle enables you to fund planning that can incorporate some of the following experiences of public systems and independent institutions.

**Bond Issues.** Borrowing for capital projects is a routine practice for public systems of higher education and used occasionally by independent institutions. The urgent need for capital renewal has made acceptable the issuing of general obligation bonds, revenue bonds, or other options for new construction or for reinvesting in existing facilities. The Commonwealth of Virginia and the states of California, Georgia, and Mississippi, among others, have recently initiated this practice. Vanderbilt University borrowed \$150 million to finance renovation and deferred maintenance projects.

**Operating Budgets.** Some institutions have begun supplementing annual operating budgets with additional funds for capital renewal. Even in difficult financial times, states and independent institutions have both begun to reallocate financial priorities by establishing an amount in the operating budget specifically for deferred maintenance.

The College of Wooster initiated a funding model in 1977 using a "capital charge" budgeting concept to develop a reliable source of capital renewal funding for five-year planning cycles. An amount incorporated annually into the operating budget was defined as a charge to create a reserve for funding capital renewal and debt reduction. An unrestricted gift was allocated to a reserve fund to initiate the concept. Each year's charge to the annual operating budget is an average of projects budgeted in the current year and estimates of projects to be done in each of the next four years. The pool of reserve funds is drawn down as required by priority projects.

The Commonwealth of Virginia developed a maintenance reserve appropriation in 1982, distributing funds to public institutions using a formula developed by Douglas R. Sherman and William A. Dergis ("A Funding Model for Building Renewal," NACUBO *Business Officer*, 1981). Each institution is required to prepare a maintenance reserve plan describing projects. Funding is a supplement to the operating budget for maintenance, following an assumption that approximately 50 percent of the formula amount is already contained in the operating budget.

**Depreciation Accounting.** The introduction of depreciation accounting to higher education in 1990 offers a potential solution to provide a constant funding source for capital renewal. Although not sufficient to fund substantial backlogs of deferred maintenance, maintenance depreciation reserves can provide a substantial source for renewal funding. The challenge is to create depreciation reserves from current revenues equal to the declining value of capital assets. Some institutions that were able to use "off-balance" sheet funding for capital renewal are now creating depreciation maintenance reserve funds from revenues and including them in operating budgets.

The model created by Boston College in 1976 combined the annual operating budget and a separate capital budget for renewal funding. Boston College was able to rely on unexpended depreciation reserves for capital budgeting. Depreciation accounting and funding the depreciation charge through its operating budget was an innovative technique.



Based on the concept that current users should pay for renewal and replacement, an equitable charge was included in the annual operating budget to develop a consistent source for funding facility renewal. The retirement of long-term debt and a reduction in acquiring debt for new projects will improve the allocation of available funds for future renewal.

**Quasi-Endowment Funds Conversion.** Institutions with quasi-endowment funds or "funds functioning as endowment" have sacrificed interest earnings by designating their use to capital renewal. This is a controversial action requiring approval of a governing board, but it is a valid stopgap when current revenues are unavailable and the institution wishes to avoid incurring additional debt. Rensselaer Polytechnic Institute plans to partially fund \$142 million in deferred maintenance by converting unrestricted quasi-endowment funds.

**Plant Fund Reserves.** Building up plant fund reserves by transferring income surpluses offers a source for capital renewal funding. This decision is made in assigning priorities in the institutional budget-making process. Although not a guaranteed stream of funding, prudent financial management can create reserves allocated to fund deferred maintenance projects. Reserves can be drawn from a pool of funds as projects are defined and expenses incurred. Syracuse University used plant fund reserves to supplement maintenance operating budgets for funding over \$150 million in capital renewal and replacement over a fifteen-year period, beginning in 1973.

**Fund Raising.** Obtaining gifts for capital renewal represents a greater challenge than funding new construction. New or expanding programs or replacement of existing facilities have a greater appeal to donors than requests to fund deferred maintenance. However, as decaying campus facilities have become a high priority, attention has shifted from new projects to the renovation of existing facilities as a target for designated gifts.

Strategies have varied, from individual campaigns for specific facilities to an overall fund raising effort with unrestricted gifts channelled to capital renewal. These approaches afford alternatives for development programs and donor choices. Some campuses have prepared lists of capital renewal projects to be included in major fund raising programs. Changes in policies at foundations have seen the new priorities as valid reasons to award grants in support of renovation projects. By pooling challenge grants with gifts and other institutional resources, campuses can achieve a goal for a designated project not easily approached with a single gift.

**Energy Conservation.** Deferred maintenance projects for mechanical and electrical systems, utilities infrastructure, or central energy plants can be treated as unique capital renewal projects for energy conservation. Facilities audits have shown that 40 to 50 percent of deferred maintenance exists in these categories. The rationale that energy conservation will result from these projects is based on cost-benefit analyses identifying payback periods. Thus, an investment in energy conservation can be considered self-financing.

Vanderbilt University finances energy conservation by a utility depreciation reserve created by a 14 percent "tax" added to the university's electric bills. The reserve has been supplemented by energy conservation grants.

Syracuse University has obtained more than \$6 million in energy conservation grants, some at 100 percent of project costs and others as matching grants. Sources include federal

and state programs, and programs offered by the local public utility to stimulate demand-side energy reductions. Incentives offered by private companies to participate in energy savings are an alternative method of funding a component of deferred maintenance.

### The Management Renewal Challenge

**T**he facilities officer should not be discouraged at the initial response to the magnitude of costs reported in a comprehensive audit for capital renewal/deferred maintenance reduction and the gap between current and required funding to maintain renewed facilities. Resource reallocation and supplementary funding will probably be required for renewal and replacement of facilities with a high proportion of deficiencies. Capital renewal is a long-term process, and programs should be designed with this in mind. The audit process is a key component of a capital renewal program that should be updated annually, reporting progress toward goals, identifying new priorities, and adjusting to programmatic changes affecting renewal and replacement.

A useful approach to consider is the revitalization of facilities staff to inspire confidence for funding deferred maintenance. Feelings of pessimism, frustration, and cynicism among the facilities staff at Santa Clara University stimulated a program of facilities management renewal to cope with lack of support for deferred maintenance funding. The concept centered on the renewal of the management team, changing attitudes to gain credibility for funding deferred maintenance. Santa Clara's facilities management department adopted a vision for its capital renewal program, which included

- communicating, with credibility, the scope of the renewal and deferred maintenance needs and costs;
- proposing a strategy for achieving facilities equilibrium in a reasonable time frame;
- engaging in the budget decision process to ensure understanding of and advocacy for renewal projects; and
- achieving measurable results, small and large, short-term and long-term.

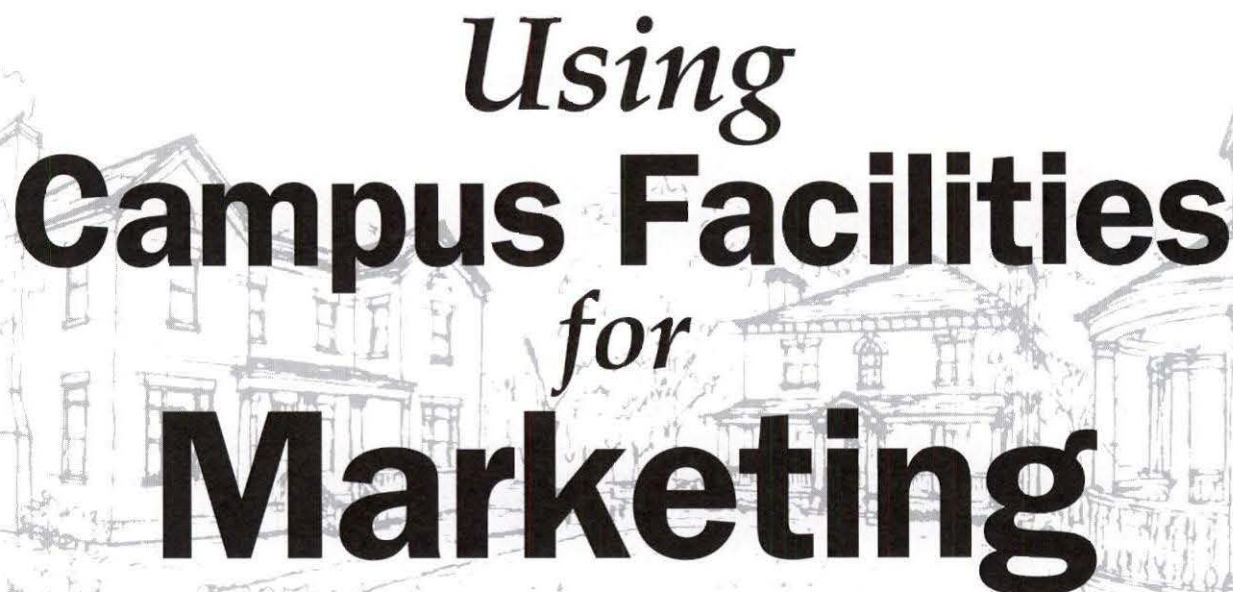
Facilities management team renewal can strengthen support for funding facilities renewal by increasing management's credibility through improved attitudes, actions, and accomplishments. The attitudes, visions, and strategies of Santa Clara University's management team are applicable to facilities managers throughout higher education.

### Conclusion

The process described in *The Facilities Audit: A Process for Improving Facilities Conditions* presents the experience of facilities administrators at public and private higher education systems and campuses, government and corporate employees, and many consultants. Application of the facilities audit process to your organization will enhance the present and future functional use of your facilities, as well as benefit the members of your campus community. ■

*Ed. Note: The Facilities Audit is now available from APPA. The cost is \$45 for APPA member institutions, \$55 for all others; add \$8 for shipping and handling. Send your order to APPA Publications, Dept. FAFM, P.O. Box 1201, Alexandria, VA 22313-1201. Prepayment is required.*





# Using Campus Facilities for Marketing

by Bruce Carmichael

**A**s nearly everyone knows, the current environment of higher education is characterized by a decreasing pool of traditional students graduating from high school and by increasing competition for members of that pool. Numerous studies have shown that U.S. colleges are in the midst of a 22 to 24 percent decline in the number of 18- and 19-year-olds in America between 1980 and 1995, and a few researchers have extended that drought to the late 1990s.<sup>1</sup>

The enrollment problem has prompted a massive increase in recruiting, promotion, advertising, and retention activities on most college campuses. New recruiting brochures, often in full color, have been produced. Mailing lists have been bought from the College Entrance Examination Board for direct-mail offensives. Marketing research has been conducted to determine a college's "image" and to find out what prospective students are looking for. Advertisements have been inserted in newspapers and magazines, on radio and even television, and on billboards, posters, and the backs of buses.<sup>2</sup> Fresh programs have been established—honors programs, new majors, weekend colleges, remedial education—to attract students. In 1988 a new biannual publication, the *Journal of Marketing for Higher Education*, was born so that

colleges could keep abreast of educational marketing techniques and innovations. And a small armful of recent books on marketing in higher education and enrollment management suggest how institutions can become more systematic in their efforts.<sup>3</sup>

## Deeper Marketing

Promotion, however, is only one of the "four Ps" of college marketing: product, price, place, and promotion.<sup>4</sup> And some analysts have stressed the growing importance of using all of an institution's resources—meta-marketing—to compete in tight markets.<sup>5</sup> Meta-marketing proposes that an institution link and marshal resources across the campus rather than limiting marketing efforts to specific offices.

What this means for colleges is that in addition to enlarged promotional activities, institutions need to revamp their academic programs, train their personnel to be more cordial and helpful, employ financial aid more strategically, watch their tuition pricing, improve faculty quality and dedication to teaching, and refine the extracurricular life. Also, colleges and universities need to improve their physical resources. By physical resources I mean buildings, equipment, land and landscaping, and nearby off-campus facilities.

In my view, physical resources play a far more important role in recruiting students, and especially in retaining students, than is generally recognized. To be sure, in opinion surveys among prospective students young women and men tend to cite academic reputation as the most important factor, followed by the kinds of majors and programs offered, tuition

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price, location, and friendliness of the faculty and staff. Physical resources usually do not rate as very important in most surveys of adolescents.

But there is much experience and some research to suggest that physical resources are in fact more important than young people, anxious to impress, are willing to admit on paper or over the telephone to interviewers. Admissions officers report that students often say they found a campus they visited to be "cold," or "beautiful," or "grubby." Research at Babson College, the University of Virginia, and the University of Massachusetts at Amherst in 1986 revealed that, for current students, the physical attractiveness of the campus could enhance their college experience.<sup>6</sup>

Young students may not have the vocabulary or developed sensibility to talk about architecture, horticulture, and campus design. But they do have emotional responses to being in a lovely small town or village, a magnificently landscaped historical estate, or an urban neighborhood with low-rise townhouses, outdoor cafes, and attractive shops. And they have emotional responses to college campuses and the "feel" of an admissions office, a library, the science laboratories, or the art studios.

Thomas Thiis-Evenson writes that the first impression that people have of a building or collection of buildings takes the form of a qualitative evaluation. People spontaneously characterize rooms, buildings, or campuses as "intimate," "dull," "monumental," "depressing," "spartan," or "charming."<sup>7</sup> Persons are struck by an immediate sense of the whole that can "overwhelm" or "establish a mood" or leave them uncomfortable. One need not be acquainted with the building's function or the distribution of rooms in order to react. Students and their parents usually behave similarly. Because the response is all-embracing, emotional, and without detailed understanding, it usually cannot be reported to others in a rational, evaluative way.

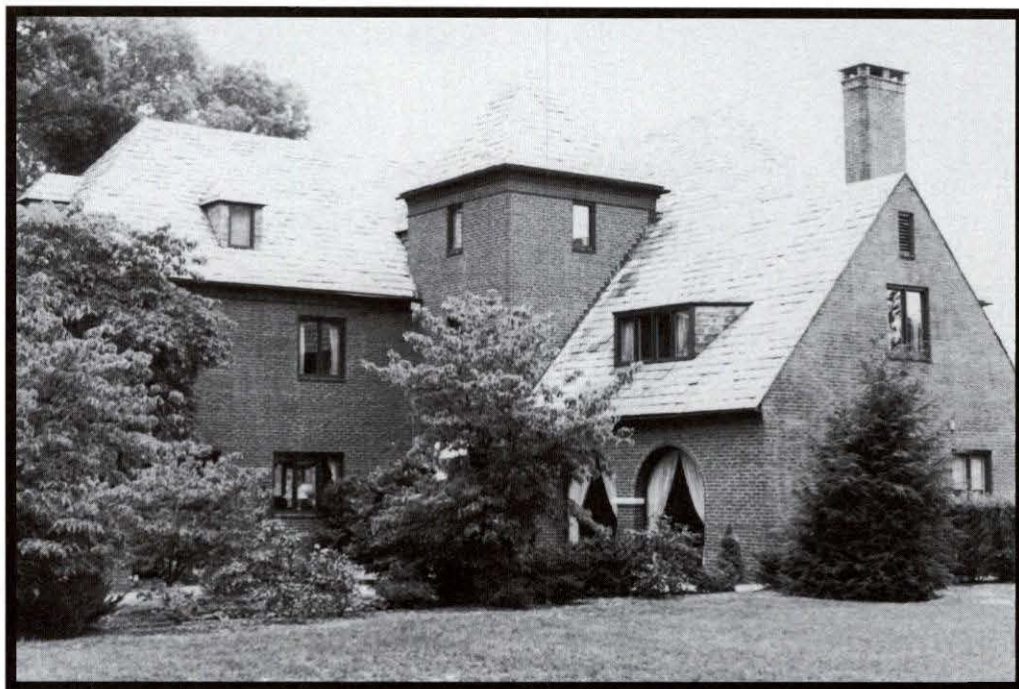
### The Importance of Physical Resources

Many of the greatest university leaders of the past understood the crucial role that physical resources play in attracting students and faculty and in enhancing the higher learning experience. In the 19th century, college founders often located their institutions on rural hilltops, alongside rivers or streams, or in a suburban setting to escape what they regarded as the "evils" of cities.<sup>8</sup>

Nicholas Murray Butler, who transformed Columbia University from a small college in downtown New York into an international research university, helped move the campus north to the edges of Manhattan in the early 1900s. He

believed that the university had to resemble a country club in some ways to attract budding merchants, financiers, and professionals to the campus.<sup>9</sup> He hired McKim, Mead, & White to design quadrangles, dormitories with fireplaces, and majestic Italianate buildings so that students did not think they had to go away from New York City to be educated in attractive surroundings. William Rainey Harper did much the same when he, with John D. Rockefeller's money, built the neo-Gothic University of Chicago, south of downtown.

The tradition continues. De Paul University in Chicago has combined basketball, energetic marketing, and "an attractive undergraduate campus in Chicago's trendiest neighborhood"<sup>10</sup> to increase applications. The University of Miami in Coral Gables, Florida held a design competition in 1985 to improve the appearance of its campus. "The University of Miami sought a campus plan that provided memorable landmarks of its institutional goals; that was liv-



Wohlsen House: Franklin & Marshall College, Pennsylvania

able, functional, and efficient; that maximized the unusual colors and textures of tropical plants; and reflected an international rather than a purely American character."<sup>11</sup>

Recently Centre College in Kentucky unveiled a master plan to be implemented over the next ten years at a cost of \$20 million. It includes closing a city street and enhancing the park-like setting for the college, a new residential hall and ten new fraternity-sorority houses, a new student center and total athletic facility, and renovations. Centre president Michael Adams says, "Studies show that two of the most important factors in a student's choice are academics and campus appearance. We consider this a major investment that will allow us to attract and better serve top-quality students, faculty, and staff."

Other institutions, such as the University of Maryland, are



paying more attention to facilities for commuters, with improved parking, a commuter lounge, better signage, and evening office hours. Some universities are improving their employees' workspaces through better lighting, indoor plants, noise control, carpeting, and the like. Buildings and work environments help shape the attitudes of an institution's employees and send messages about how much the university cares about their well-being.<sup>12</sup>



Dartmouth College, New Hampshire (Photo by Peter Aaron/Esto)

What these initiatives demonstrate is that a college's physical plant and environment is a powerful support to the institution's academic mission and to the enrollment of students. Handsome forms tend to encourage superior performance.<sup>13</sup> Form, as Robert Geddes says, "serves as the stage and container for everyday life."<sup>14</sup> Conversation, argument, and faculty exchanges are at the heart of learning; and good talk requires what Oldenburg describes as "great good places."<sup>15</sup> These are the "informal meeting places where citizens can gather, put aside the concerns of work and home, and hang out simply for the pleasure of good company and lively conversation. All these places have in common the contribution each makes to the well-being of the individual and to the fabric of society."

### Architecture and Identity

**A** college's buildings, interiors, furniture, spaces, landscaping, and equipment make a statement about that institution. They express what the college or university stands for, cares most about, and how it views the intellectual and aesthetic enterprise. Hubbard argues that

buildings "voice an ideology." They can "propose to us what this institution means (or wants to mean) to society. ... The building talks not only about the role an institution plays in society, but also about how society ought ideally to be organized."<sup>16</sup>

In this sense, the physical quality of a college or university is a major marketing tool. The physical appearance and resources signal to prospective students and faculty what

kind of institution they are walking through. Huge, well-cared-for athletic facilities and greens but unrenovated academic buildings reveal a university's values, as do modern science buildings and a large library, but no theater, art gallery, or music practice rooms. A campus with buildings in all kinds of building styles, including rectangular cinderblock, haphazardly arranged, affects visitors and tells something about the college administrative skills and taste. A campus with up-to-date academic buildings but out-of-date dormitories tells parents the university cares for its faculty but cares less for its students.

Thiis-Evenson suggests we consider the grammar of architecture, which conveys meanings and elicits emotions. A college's buildings, spaces, landscaping, and campus layout pull emotional strings for prospective students and say something about the special emphases of the college.

Clearly, I believe physical assets should become a much more central part of a college's enrollment marketing strategy. Colleges should not be so quick to resort to deferred maintenance as a cost-saving device and should not skimp on renovations, design, or new construction. Universities in the past decade have often seen the physical plant as the easiest place to cut costs. But this is changing; very recently universities have started cutting instead into athletic budgets, academic programs, administrative slack, and abundant student services.

The literature of educational marketing seldom even mentions the role of physical resources in attracting students. This omission suggests that those colleges and universities that exploit this neglected aspect of enrollment marketing may have a potential edge over the competition. No question, outstanding physical resources are expensive, and higher education is entering a period of acute financial stress. But physical resources, when they help attract better students and faculty, are revenue-producing.

Well-designed and well-built physical resources, especially those that are memorably distinctive, should be a more widely recognized force in any institution's enrollment marketing strategy.



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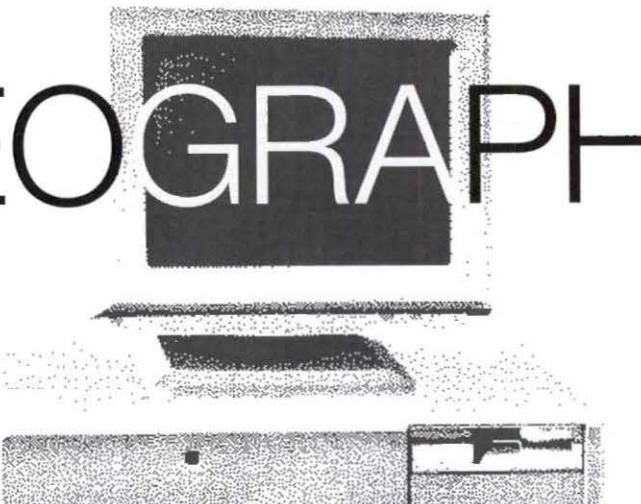
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# GEOGRAPHIC INFORMATION A PRIMER FACILITIES

by Fritz H. Grupe and John G. Burch

Geographic information systems (GIS) offer valuable decision support capabilities to organizations that require spatially-oriented data bases. By integrating maps with spatially-oriented data base information, GISs can support a variety of industries, governmental units, college campuses, and businesses. Facilities managers need to become familiar with this new technology. They can draw upon the GIS resources of other agencies, and/or they may choose to build their own GIS systems for capital improvements planning and maintenance.



## The Need for Spatially-Oriented Information

It has been said that maps preceded written language because they offer visual insight that text cannot. Maps continue to be essential aids to professionals in many firms. Civil and consulting engineering firms rely heavily on spatially-referenced data. Utility companies maintain maps of power and water lines in order to schedule repairs and to guide new installations. Local governments employ maps to track land usage, ownership of land for tax purposes, zoning areas, and political boundaries. They also use them to develop construction plans for subdivisions and developments, water and sewer lines, for planning street repaving, and for street extensions. Police and fire departments use maps to graphically display the occurrences of crimes and fires to distribute their stations, personnel, and equipment expeditiously. University facilities officers also use maps for capital improvements and maintenance.

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It is important that facilities managers become familiar with GISs because they provide a new means of integrating data from existing data bases. Facilities managers may choose to access available noncampus-based GIS resources, while some facilities departments may develop their own GISs for campus planning. If facilities managers are to play a constructive role in the development of those systems, they will have to obtain a clearer understanding of how such systems function and of the types of applications they can support.

## How Can Facilities Managers Use a GIS?

Although many universities have been using computer-aided design software for the preparation of maps, few appear to have implemented GISs. Umm Al-Quaru University in Makkah, Saudi Arabia has a brand-new campus that is being planned from the ground up using a GIS. The campus covers 3,500 acres and will serve 30,000 students, faculty, and staff. The problems involved in administering this relatively isolated campus approximates those of a small city, because it supports its own services such as utilities, water distribution, sewage treatment, and water drainage.

The 40-square block University of Alabama encounters similar problems. Drawing on the considerable effort that was invested by the city of Birmingham and by Jefferson County in the preparation of their own GISs, the university is in the initial stages of constructing its own GIS. It was able to secure the overlay data for parcel records, utility pole placement, sewage and drainage lines, land ownership, hydrology, and other coverages from the city and county. Access to the existing GISs reduced the cost and greatly facilitated the development of the university's GIS. With the assistance of an external consultant it is creating prototypes of other applications, including a base map for guiding project construction and a link to a mainframe-based computer-aided design space studies, hazardous materials locations, emergency preparedness



# INFORMATION SYSTEMS: FOR THE MANAGER

applications, and crime prevention. A longer term goal is to integrate in the voice and other telecommunications equipment. Potential applications of interest to campus facilities managers are shown in Figure 1.

- Landscape and Plant Management
- Hazardous Materials Inventory
- Water Drainage Planning
- Statewide Property Management
- Mobile Equipment Tracking
- Construction Planning
- Traffic Management
- Maintenance Planning
- Census Evaluation
- Water System Planning
- Crime Reduction Planning
- Space Utilization Studies

Figure 1. Potential University GIS Applications.

The availability of a GIS makes it possible for the facilities manager to answer questions such as:

1. If we are painting room 310, what other offices on that floor have not been painted in the past five years?
2. Which wiring conduits are completed filled and need to be expanded?
3. From surveys of students and crime statistics, which areas on campus need better lighting or other security safeguards?
4. Which water lines and hydrants have not been inspected in the last three years?
5. What is this cable that has been located during construction but that does not appear on the construction blueprint?
6. Where are the classrooms that house in-room television monitors?

## Disadvantages of Traditional Maps

For all their usefulness, maps created by traditional means have serious disadvantages.

- Most maps are drawn for specific purposes. A changed purpose implies a need to alter and redraw the map.
- Many agencies find that they duplicate their efforts many times over recreating maps for changing conditions.
- Maps are simplified representations of reality so humans must interpret them. Interpretation of maps is complicated and error prone when several different maps are used in combination.
- Maps are inconsistently drawn. Coordinates employed by different cartographers may not coincide with one another. Edge matching problems, dissimilar annotations, variations in coloration conventions, and scaling differences are some of the reasons that combine to complicate analysis because the maps cannot be joined or overlaid.

• Maps are cumbersome to use. They take up a considerable amount of space and must be cataloged efficiently.

• Computerization in the form of map plotting and computer-assisted design systems automates map production. These systems make data capture and map creation more efficient. Computer systems that are limited to producing maps, however, provide limited support for complex decision making. A human is required to derive meaning from the images. Consequently, computer programs that are restricted to producing maps do not fully utilize the capabilities of the computer.

## Geographic Information Systems: Bringing Spatial Data to Maps

*The Spatial Component.* A GIS is a decision support system that integrates spatially referenced data in a problem solving situation. GISs are not simply means of producing maps.



They are computer-based systems for digitizing spatial information and integrating this spatial data with data base information related to the elements of the map.

A city planning department might use a GIS to construct multicolored maps that display the conditions of roadways, the location of sewer lines and water mains, and the location of zone boundaries. Each identifiable element on the map, such as a specific hydrant or street segment, is associated with data about that element. This information can be used to plan and coordinate new construction projects and maintenance activities.

As with other mapping programs, the mapping portion of a GIS displays and labels points, lines and polygons (shapes). Points can indicate where entities such as manholes and survey markers exist. Lines can mark the placement of roads and rivers. Polygons can delineate plots of land, zoning areas, and potential flood zones. Three primary pieces of information are maintained for each element:

1. Where the feature is found in space (i.e., longitude, latitude, and elevation),
2. What each feature represents, including data about the feature, and
3. What each feature's spatial relationship is to other features, i.e., its distance and orientation relative to other features.

Maps can reflect the feature's location and relation to other features easily. Data about the feature's contents, i.e., ownership, status, etc., is not easily plotted. To accommodate this data, GISs integrate a data base with their mapping components. In a GIS, the location of a power substation, for example, is stored by its spatial coordinates—coordinates that are used by the software to construct the maps. Information about the substation, such as its cost, date of installation, manufacturer, and so forth, is placed in a data base against which queries can be made and relationships examined.

Many cartographic layers can be entered into the system, as

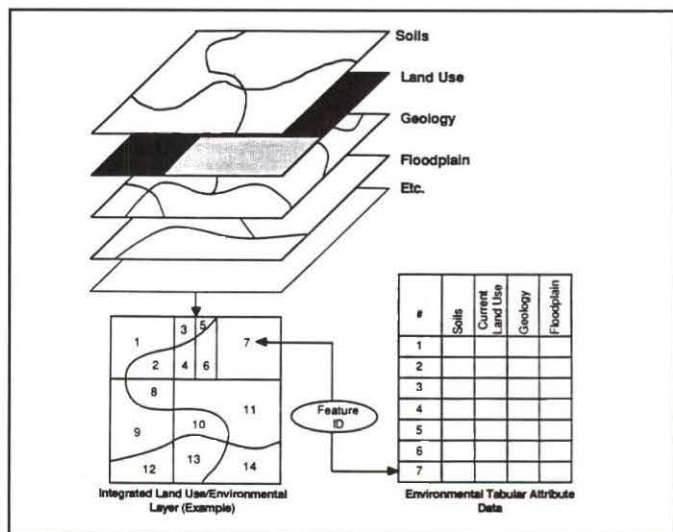


Figure 2. Components of a GIS (Reprinted courtesy of Environmental Systems Research Institute, Inc. Copyright © 1991 Environmental Systems Research Institute, Inc.)

illustrated in Figure 2. Cartographic layers are digitized maps holding specific sets of features whose coordinates are matched with other cartographic layers. This allows the layers to be superimposed on one another in any combination. The infrastructure layer conveys information about roadways and bridges. The natural features layer portrays topologic features such as soil and forestation types. The hydrology layer displays water basins, lakes, and rivers. The administrative units layer presents zip code areas and support service areas. The land parcel layer identifies parcels of land. The special features layer includes such items as fire hydrants and utility poles. Many other layers can be entered to store information about specific classes of features.

Integrating non-graphic data base information, also called attribute information, with graphic mapping operations permits the users of GISs to query the system. For instance: Where are the undeveloped sites larger than four acres, that are zoned commercial, and that are not in a potential flood zone? Which roads in residential areas are classified as being in a high-priority repair condition? Where are the areas in a given region that contain approved new housing developments? Many other questions can be asked of such systems and responded to once the GIS has been assembled. Figure 2 also illustrates how a GIS associates a feature on a city's parcel map with related attribute tables.

**The Data Base Management Component.** As is true of other data base management systems (DBMSs), techniques must be available for entering and editing data; for efficiently storing, editing, and manipulating the data; accessing and querying the data base; and for enabling programs to remain independent of the information in the data base.

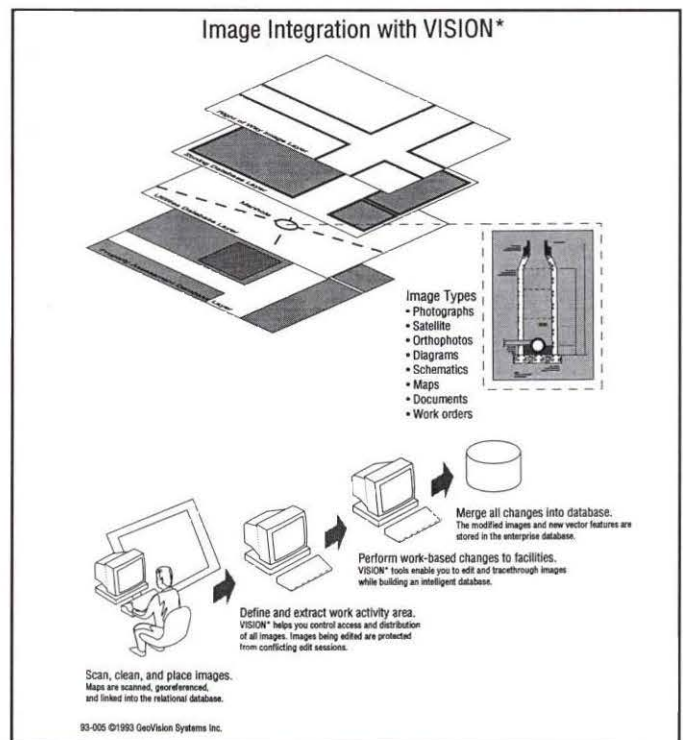


Figure 3. Integration of a Drawing into a GIS (Reprinted with permission of GeoVision Systems, Inc.)



**The Analytical Component.** Tools are provided in GISs to undertake sophisticated modeling and analysis. These features include

- Map overlay, joining, and dissolving to produce special purpose maps,
- Interactive graphics editing to maintain the data base,
- Address geocoding to produce pin maps,
- Network analysis for modeling and analytic functions,
- Capabilities for aggregating and disaggregating map features,
- Multiple window displays to simultaneously view map and data base data (Figure 3 illustrates how an engineering drawing or photograph can be related to a feature as easily as with text and numeric data), and
- Buffering to retrieve, in both map and data base form, information about a zone around a map feature.

The coverage areas shown in Figures 2 and 3 suggest some of the types of applications a GIS can be used to support. The right-of-way layer supports street map and roadway construction applications. The zoning layer supports permit tracking functions and the utility layer supports infrastructure development. The cadastral (ownership) layer supports real property and ownership applications. GIS allow for numerous coverage areas to be used. Thus, a large number of applications is possible. This article restricts itself to describing one subset of these functions. A partial list of other functional areas for which GISs have been found useful is shown in Figure 4.

- Land Usage Surveys/Projections
- Ownership and Tax Surveys
- Soil and Vegetation Surveys
- Zoning Status Reports and Projects
- Agricultural Development
- Environmental Monitoring
- Crime Distribution Studies
- Utility Asset Distribution
- Marketing Distribution Analyses
- Military Analyses
- Census Projections
- Urban Planning
- Water Shed Evaluation
- Forest Evaluations
- Highway Mapping
- Construction Tracking
- Housing Studies
- Construction Projections

Figure 4. Functional Areas Addressed by Geographic Information Systems.

A GIS can address multiple functions. Increasingly, GISs are being developed that serve multiple participants from both the private and the public sector. Shared participation in the development of a GIS spreads out the substantial costs involved in data gathering, assuring data accuracy, and assembling adequate staff and hardware. Previously experienced difficulties of using incompatible maps and charts can be avoided.

GISs do more than address themselves to the limitations of mapping and computer-aided design (CAD) systems. They

offer other advantages. They are a basis for integrating the capture and digitization of data from a variety of sources producing synergistic results. Queries are responded to efficiently and rapidly. Data duplication by many agencies can be avoided even while the utility of the data improves because massive amounts of information can be interrelated. Multiparticipant GISs are increasingly common. Electronic storage reduces the space needed for physical maps. The constant redrawing and modification of maps is carried out less expensively.

GISs offer specialized utilities for many types of data manipulation including map measurement, map overlay, transformation, graphic design, and data base manipulation. Analytic and modeling functions generate forecasts that project the impact of decisions over large areas and over multiple time periods. GISs include functions and commands for projecting trends, for conducting statistical operations, and for simulations.

Some researchers have begun to combine expert systems with GISs. GISs can respond to complex logical queries such as: "Given the current street map along with measures of traffic impedance, what is the fastest route from point X to point Y?" Three dimensional terrain modeling can be produced if the GIS has appropriate mathematical tools.

The presence of a GIS results in the tendency to integrate data collection, spatial analysis, and decision-making processes into a common information flow context. Thus, a GIS is a form of, but is not synonymous with, decision support systems. GISs are generically different from other forms of decision support. They can be very expensive, not only for the initial costs of acquiring the specialized hardware and software needed and for training staff, but also for the substantial cost of data entry. Generally, GISs are built by governmental agencies and subunits of corporations, not by MIS departments that must assist in the evaluation and implementation of GISs.

### Examples of GIS Applications

GISs support planning in many ways. Some of these include automated mapping; facilities planning and management; maintenance forecasting, costing, and analysis; vehicle tracking and monitoring; and incident tracking.

**Automated Mapping (AM).** The most basic yet most valuable function of a GIS is to produce maps. Given the large numbers of maps that are needed by many institutions and firms, this use alone is significant. Computer-assisted design software can be used for this purpose less expensively and, for maps that require greater accuracy than GISs allow, may still be required. A GIS, on the other hand, is considerably more flexible in its ability to generate special purpose maps.

Maps that interrelate several data layers to describe an area are referred to as thematic maps. A thematic map might combine information about waterways and water tables with the location of generators of hazardous wastes, or they might combine soil types with forest types.

Other types of maps emanating from GISs are useful. Base maps are drawn quickly for the addition of new data needed to meet special requirements. Source maps can be produced for extracting or rescaling existing information. Reference



maps are used to cross reference and draw comparisons with other maps.

**Facilities Planning and Management.** Some of the key uses of GISs is in the development of wide area development plans. Whole cities, counties, and U.S. Geological Survey Quadrangles have been digitized in GIS formats with the intent of improving our ability to combine many dimensions of the planning function into a visually useful resource. Decisions vary about which features are most significant to the hundreds of planning agencies that are employing GISs. Consequently, one GIS may emphasize land parcels and zoning boundaries. Another might emphasize streets and components of utility system. A third might emphasize soil types, ground cover, and elevation information. Still another might combine all of these elements.

Thanks to the data base component of a GIS, the foundations on which land use planning and infrastructure development assessment are based can be much improved. Maps can be generated that display, for instance, all of the bridges that require renovation and strengthening in the next five years. A map can display all of the sewer lines, road surfaces, and water mains that are scheduled for repair and replacement so that the modifications to a given street can be coordinated. They provide the basis for engineering analysis and work management. Similarly, maps can be used to monitor project progress and to maintain natural resource inventories.

Figure 5 illustrates how one city, Bellevue, Washington, used a GIS to determine the properties that would be affected by capital improvement projects so residents could be properly informed.

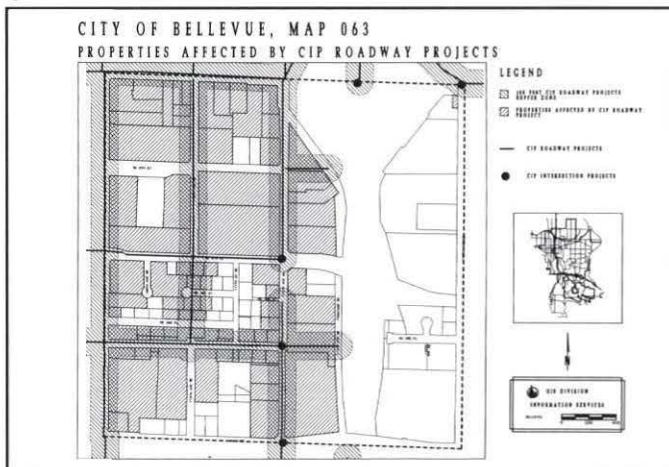
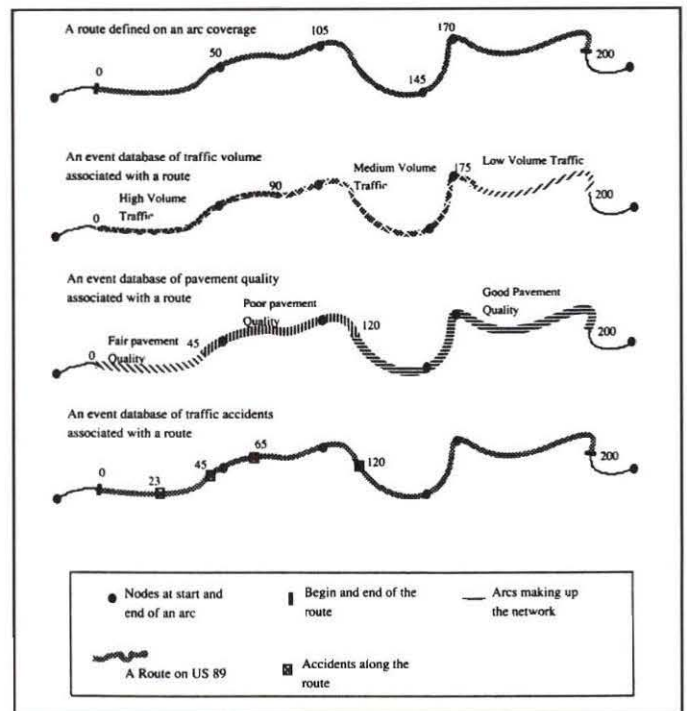


Figure 5. A GIS for Impact Assessment (Reprinted with permission of the GIS Division of Information Services, City of Bellevue, Washington)

**Maintenance Forecasting, Costing, and Analysis.** In addition to maps, GISs can generate tabular reports characteristic of any data base program. The maps and reports can be used to organize and control information that is essential for projecting the work load anticipated. This projected work load can then be translated by traditional means into cost estimates. Modeling capabilities of GISs can project trends that can be correlated with costs. Figure 6 depicts four ways by which information about a roadway stored in the data base component of a GIS can be retrieved for different purposes.



This figure shows a route defined on US 69. The event tables associated with the route have data for traffic conditions, pavement quality, and accidents.

Figure 6. (Reprinted courtesy of Environmental Systems Research Institute, Inc. Copyright © 1991 Environmental Systems Research Institute, Inc.)

**Vehicle Tracking and Monitoring.** An interesting variation on the use of GISs is in the area of vehicle control. Several companies have begun combining commercially available street maps in a GIS format with automatic vehicle location devices (AVL). The location of a vehicle on the street map is displayed in the vehicle and it is transmitted to a dispatch center so decisions can be made about the most appropriate route to a destination. The same types of devices can be used to monitor the movement of vehicles from site to site, to discover and recover stolen vehicles, and to plan efficient distribution routes for vehicles involved in such things as logistic activities and hazardous waste removal.

Companies such as Federal Express and Coca Cola use computers and GISs to make geographically-based decisions about the deployment of airplanes and trucks. Police, fire, and emergency services departments use GISs to route the closest vehicle to the site requiring service.

**Incident Tracking.** Law enforcement and fire safety departments have been using GISs for plotting the dates, times, locations, and nature of events of interest to them. By adding this information to the GIS, informative displays can be generated that support the deployment of personnel, the institution of preventive programs, and the placement of response units in the optimum location to address key problems. Figure 7 is an example of such a map used in tracking burglaries. It is easy to foresee the use of this technology to track sewer line breaks and emergency road repairs, for example, as a means of determining where major reconstruction efforts should be undertaken. It could also be helpful in campus crime reporting.



# CFC Strategies and Alternatives

*Report of the  
APPA Task Force for  
CFC Strategies  
and Alternatives*



The Association of Higher Education  
Facilities Officers



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Printed in the United States of America.

International Standard Book Number: 0-913359-74-2

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APPA Director of Communications: Steve Glazner  
Design and typography: Chronicle Type & Design  
Printing: Good Printers, Inc.

Printed on recycled paper.



# APPA CFC *Strategies and Alternatives*

## 1.0 INTRODUCTION

In July 1992 the APPA Board of Directors appointed a Task Force for Chlorofluorocarbons Strategies and Alternatives.

The task force members are:

Dorsey D. Jacobs, Chair (West Virginia University)  
Martin Altschul (University of Virginia)  
John D. Houck (Oklahoma State University)  
Robert W. Nestle (Michigan State University)  
Mohammad H. Qayoumi (San Jose State University)  
Gary L. Reynolds (Iowa State University)  
John Vucci (University of Maryland)  
Theodore J. Weidner (Illinois State University)

The charge of the CFC Task Force was as follows:

- To survey and research the membership, the literature, and the industry, as appropriate, for ideas and methodologies suitable for the development of strategies for effectively meeting the challenge presented by the regulations (those in place and those anticipated) to eliminate the chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs).
- To identify strategies, their usefulness, and their consequences.
- To develop a decision process model with appropriate fiscal analysis techniques.

This is the first of a series of reports from this task force. We hope to have case studies by late summer 1993 and additional follow-up reports as changes occur.

## 2.0 PREAMBLE STATEMENTS

In light of the regulatory climate associated with CFCs, APPA formed a task force to investigate and develop guidelines for its member institutions. This document presents a number of ways to implement a CFC management strategy.

Of the many challenges facing facilities managers, those involving the regulation and phase-out of CFCs stand out as requiring immediate and significant commitments of time and money. The role of CFCs in the United States economy has been estimated at \$28 billion per year. The installed CFC-oriented equipment in the United States is valued at \$135 billion.

Refrigerants using CFCs are not simply just acquired by institutions with the purchase of new equipment. In fact, 75 percent of the amount is used to service existing equipment.

While most refrigerant-containing equipment is serviced by facility management organizations, there may be other refrigerant-containing equipment in the institution used for a variety of purposes, i.e., research, instruction, food service, vehicles, etc. Be aware that these regulations will affect all users.



# APPA CFC *Strategies and Alternatives*

CFCs make excellent refrigerants. They have been utilized for decades with little awareness of the environmental problems. CFCs have been used to refrigerate food, make insulation, and clean surfaces of grease. While CFCs continue to be reasonably safe for direct contact with humans, they become a problem when vented to the atmosphere. According to the U. S. Environmental Protection Agency (EPA):

The stratospheric ozone layer protects the earth from the penetration of harmful ultraviolet (UV-B) radiation. On the basis of scientific evidence, a national and international consensus exists that certain man-made halocarbons, including CFCs, halons, carbon tetrachloride, and methyl chloroform, must be restricted because of the risk of depletion of the stratospheric ozone layer through the release of chlorine and bromine. To the extent depletion occurs, penetration of UV-B radiation increases, resulting in potential health and environmental harm including increased incidence of certain skin cancers and cataracts, suppression of the immune system, damage to plants including crops and aquatic organisms, increased formation of ground-level ozone, and increased weathering of outdoor plastics.

In accordance with the latest regulations, the production of CFCs has been drastically curtailed. By January 1, 1996, production will cease. Facilities managers should note that current EPA regulations do not mandate the decommissioning of existing CFC-based refrigeration equipment. Regulations instead use market forces to ensure that CFCs will be in extremely short supply, will be very expensive, and that servicing and operating CFC-based equipment will be done in such a way as to minimize atmospheric releases. If institutions are not able to develop ways of managing, controlling, and eventually phasing-out the use of CFCs, they may discover that they are not able to meet the most basic elements of their mission.

Institutions need to take immediate action and develop long-range plans to reduce their dependence on CFCs. This report identifies some key points to accomplish these goals. There are no simple solutions. No single solution will work in all cases. Therefore, an institution-specific management plan is needed.

These recommendations are based on the current federal regulations, which are subject to change.

### **3.0 STRATEGIES**

The CFC Task Force has developed the enclosed standardized forms:

1. **CFC Equipment Campus Inventory** - Large Equipment (greater than 5 tons).
2. **CFC Equipment Campus Inventory** - Small Equipment (5 tons or less).
3. **CFC Refrigeration Tracking Information Log.**



**APPA  
CFC  
*Strategies  
and  
Alternatives***

The task force strongly recommends that a log be maintained for CFC refrigeration-tracking information for all CFC consumption regardless of quantity.

Additionally, the CFC Task Force has identified key points and made checklists to assist you in immediate action, in long-term strategy development and in future equipment consideration. These checklists have also been included.

Remember, institutions need to take immediate action and develop long-range plans to reduce their dependence on CFCs. In addition, no single solution will work in all cases.

If you need further information or facts, feel free to call any of the task force members or the APPA office.

Respectfully submitted,

Dorsey D. Jacobs, Chair



**APPA  
CFC  
*Immediate  
Action  
Strategies***

**IMMEDIATE ACTION**

- A. Inventory refrigerant equipment (see attached forms)
- B. Inventory refrigerant stock
- C. Track refrigerant usage
  - 1. Centralize storage of information
  - 2. Monitor procurement of refrigerants by Purchasing Department
  - 3. Monitor usage to the component level
- D. Minimize leaks
  - 1. Leak testing
  - 2. Tighten up existing equipment
  - 3. Make other repairs as necessary
- E. Procure recovery equipment
- F. Train and certify mechanic on refrigerant handling
- G. Develop procedures for recycling/reclaiming/disposal
- H. Remember, the above laws also apply to motor vehicle air conditioning systems
  - 1. Certification was required as of January 1, 1992



# APPA CFC Long Term Strategies

## DEVELOP LONG-TERM STRATEGY

- A. Improve efficiency of purge equipment
- B. Evaluate equipment life
  - 1. Eddy current test
  - 2. Oil analysis
  - 3. Refrigerant analysis
  - 4. Review of maintenance history
- C. Evaluate equipment performance and efficiency
- D. Upgrade equipment room ventilation to ASHRAE Standard 15R-1993
  - 1. On-site monitoring
  - 2. Leak detection equipment
- E. Analyze building cooling systems
  - 1. Energy profiles (analyze)
    - a. Load reduction opportunities
    - b. Cost factors
    - c. Energy source availability
  - 2. Energy conservation
    - a. Demand-side management (DSM) opportunities
      - (1) Reduce cooling load
      - (2) Reduce peak demand from refrigeration equipment, i.e., thermal energy storage (TES)
    - b. Insist on highest attainable efficiency in new equipment
      - (1) Utilize certified American Refrigeration Institute (ARI) standards
    - c. Building envelope and systems should be as energy efficient as possible to minimize requirement for cooling
- F. Life-cycle cost analysis
  - 1. Options
    - a. Minimize CFC loss in existing equipment
    - b. Retrofit existing equipment to use non-CFC refrigerant
    - c. Replace with non-CFC equipment
  - 2. Factors
    - a. Energy costs
    - b. Refrigerant cost availability
    - c. Equipment costs
    - d. Maintenance costs
    - e. Regulation costs (present and future)
    - f. Estimated equipment life (III B & C)
- G. Remember, some fire extinguishing systems also contain ozone-depleting compounds. Develop a plan for replacement.

NOTE: Investigate consolidation of refrigeration equipment into a minimum number of locations.



# **APPA CFC *Equipment Considerations***

## **EQUIPMENT CONSIDERATIONS**

### **A. Refrigerant options**

1. Ozone depletion (OD) vs. global warming potential (GWP)
2. R-134a, R-123, R-22, R-717, and others

### **B. Chiller options**

1. Absorbers
  - a. Steam
  - b. Direct gas fired
2. Compressors (hermetic vs. open)
  - a. Centrifugal
    - (1) Prime mover (electric/steam/gas)
    - (2) High pressure vs. low pressure
  - b. Screw
  - c. Reciprocating

### **C. Space factors**

1. Chiller physical size
2. Cooling tower capacity

### **D. Optimize chiller selection based on:**

1. Leaving temperature
2. Flow rates
3. Thermodynamic efficiency
4. Other



# APPA CFC *Equipment Inventory*

## Large Equipment - Greater than 5 Tons

Institution Name \_\_\_\_\_ Prepared by/Date \_\_\_\_\_

### General Information:

Building Identifier \_\_\_\_\_

Building Number \_\_\_\_\_

System Designation \_\_\_\_\_ Location \_\_\_\_\_

System Type \_\_\_\_\_

Rated Capacity \_\_\_\_\_

Manufacturer \_\_\_\_\_ Year Installed \_\_\_\_\_

Model Number \_\_\_\_\_ Serial Number \_\_\_\_\_

Refrigerant Type \_\_\_\_\_ Refrigerant Quantity \_\_\_\_\_

Responsible Department \_\_\_\_\_ Contact Person \_\_\_\_\_

Comments \_\_\_\_\_

### Compressor:

Manufacturer \_\_\_\_\_ Date Installed/Overhauled \_\_\_\_\_

Model Number \_\_\_\_\_ Serial Number \_\_\_\_\_

Type \_\_\_\_\_ Voltage \_\_\_\_\_

Comments \_\_\_\_\_

### Condenser:

Manufacturer \_\_\_\_\_ Date Installed \_\_\_\_\_

Model Number \_\_\_\_\_ Serial Number \_\_\_\_\_

Type \_\_\_\_\_

Fan HP \_\_\_\_\_ Voltage \_\_\_\_\_

RPM \_\_\_\_\_ FLA \_\_\_\_\_

Comments \_\_\_\_\_



# APPA CFC *Equipment Inventory*

## Small Equipment - 5 Tons or Less

Institution Name \_\_\_\_\_ Prepared by/Date \_\_\_\_\_

### **General Information:**

Building Identifier \_\_\_\_\_

Building Number \_\_\_\_\_

System Designation \_\_\_\_\_ Location \_\_\_\_\_

System Type \_\_\_\_\_

Rated Capacity \_\_\_\_\_

Manufacturer \_\_\_\_\_ Year Installed \_\_\_\_\_

Model Number \_\_\_\_\_ Serial Number \_\_\_\_\_

Refrigerant Type \_\_\_\_\_ Refrigerant Quantity \_\_\_\_\_

Responsible Department \_\_\_\_\_ Contact Person \_\_\_\_\_

Comments \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_



# APPA CFC Refrigerant Tracking Information

(To be completed when placing refrigerant into a new, existing, or removed piece of equipment. Do not use this form if the refrigerant was extracted for a planned outage then placed back into the machine at the end of the outage.)

1. Was the refrigerant put into a new, existing or removed piece of equipment? Circle one.

2. Which refrigerant (type) was used? \_\_\_\_\_

3. How many pounds and/or ounces were used? \_\_\_\_\_ lbs. \_\_\_\_\_ ozs.

4. Where was the leak located? \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

5. How was the leak detected? \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

6. How was the leak repaired? \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

7. What is the estimated date that the leak occurred? (Not necessarily the date that it was detected.) \_\_\_\_\_

8. What was the date of the repair? \_\_\_\_\_

9. If new equipment, when was the refrigerant put into the machine? \_\_\_\_\_

Your name \_\_\_\_\_

Date this form was completed \_\_\_\_\_

Equipment name and ID # \_\_\_\_\_

Building name/number \_\_\_\_\_

Room name/number \_\_\_\_\_



*For further information contact:*



**The Association of Higher  
Education Facilities Officers**

1446 Duke Street  
Alexandria, VA 22314-3492

ISBN: 0-913359-74-2





Figure 7. A Crime Analysis Map (Reprinted courtesy of Environmental Systems Research Institute, Inc. Copyright © Environmental Systems Research Institute, Inc.)

**Crisis Management.** GISs also can be used to address, through advance planning and emergency response, problems of a time critical nature. A GIS can, for instance, display all locations where hazardous waste materials are stored, identify the sewer line network surrounding a chemical waste spill, and call up the names and addresses of all persons who must be notified of zoning change proposals within an area potentially affected by construction of a fuel reservoir.

One GIS was used to analyze the hazard potential posed by soil slippage. This GIS permitted the planners to determine what types of slippage were occurring, to enumerate the hazards that were of consequence, and to prepare proactive responses to the dangers identified.

### Problems Related to the Use of GISs

GISs are not constructed easily. It is estimated that as much as 75 percent of the cost of a GIS is the cost of data conversion and data acquisition. A commitment to a significant up-front investment in data collection and validation precedes the output of usable information. Depending on the size of the GIS, massive amounts of data may have to be compiled, standardized, digitized, or otherwise input to the system. Developmental time and costs are reduced by the increasing availability of commercial and governmental data bases, commercial services that automate the digitization of maps, and

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the sharing of data among organizations with overlapping geographic interests.

There are up-front costs for acquiring the hardware and software and training needed to mount a GIS: a modest mini-computer system with peripherals is likely to cost approximately \$100,000. Smaller, microcomputer-based workstation-based systems can be acquired for less than \$10,000.

A careful cost/benefit analysis must be made to determine whether an adequate return can be realized to justify a GIS. Costs are hard to quantify because of the difficulty of estimating the effort involved in capturing data. Since GISs evolve and become more comprehensive, one is unable to foresee all of the additional data bases and spatial data layers that will be added over time. Benefits are hard to quantify due to an inability to specify all of the applications the GIS can produce before it is actually used by all of the potential users. Indeed, some of the users and uses may not be obvious until the system is in place.

Many projects have failed, not because the wrong hardware or software was selected, but because there was a failure to structure appropriate and cooperative efforts among the parties involved. New organizational structures may be needed in multi-participant arrangements. Legal issues associated with access and privacy must also be considered. Finding trained staff to mount a GIS effort is also a problem.



## Creating a Successful GIS

**T**he factors conducive to a successful GIS implementation are many. A person to champion the venture, a clear organizational understanding and commitment to the concept, a competent project manager, the cooperation and involvement of all interested parties, and adequate training to support the project rank high on this list of needs.

The well established presence of GISs in many fields supports the practicality of the concept when presented to top management of companies and campuses not currently using a GIS.

GIS development requires a multi-year commitment, since the development of a data base is a lengthy process. If data are not maintained, a data base becomes obsolete rapidly. System costs can range from \$5,000 to several hundred thousand dollars. Technical problems are generally thought to be less difficult to overcome than are the political, financial, and organizational issues that must be resolved.

It is now well established that GIS feasibility is no longer a concern. GISs can and are being implemented. Developmental projects can and do fail, however, so control and ongoing progress evaluation is critical. Veterans in the GIS field recommend that it is often better to use initial funding to pilot the system and to create persuasive prototypes rather than to assess feasibility. Many of the key points that must be addressed will not arise until the project is initiated.

## Summary

GISs are an important new tool available for certain types of planning. By integrating graphic and data base information with robust analytical tools, GISs address complicated geographic problems not available with conventional techniques. The merging of expert systems technologies with GISs will, in the future, further strengthen the contribution such systems make to corporate decision making. The potential market, estimated at 75,000 systems for governmental jurisdictions alone, is substantial and likely to grow dramatically in the immediate future.

GISs convey many of the same benefits attendant to other forms of data bases. The entry and retrieval of data is automated. The system enforces data consistency, allows for easier data and application maintenance, distinguishes between logical and physical views of the data, and encourages rapid development of user applications. New and revised maps can be generated quickly and at minimal cost.

By presenting spatial data in a form that is appropriate to their problems, decision makers improve their understanding of the problem, understand the impact of potential decisions, and better comprehend the nature of their enterprise. Also, GISs will have a catalytic value for integrating data from a variety of departments. To the extent that spatially-referenced data is important to their organizations, it is essential that facilities managers find ways to strengthen and enhance the GIS development process.

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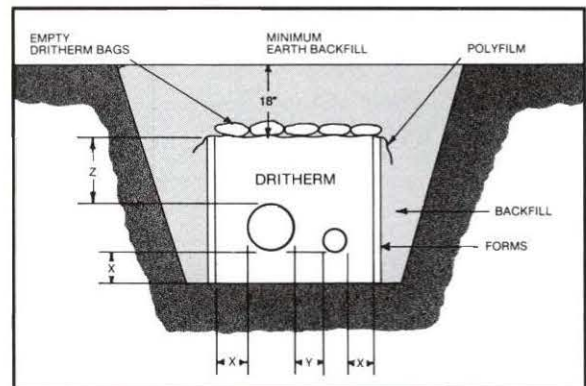
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# SCHEDULING:

## 4 DAYS OR 5?

### A PROCESS OF ALTERNATIVES

by W. G. Suter Jr.

**B**eginning in January 1991, the George Washington University Physical Plant Department, Shop Operations Division, conducted a pilot program with a new weekly work-hour schedule. We have learned a few things and have been pleasantly surprised at the success of the program.

Our initial thinking was that our traditional five eight-hour-day work week was not sensitive to the needs of our customers. We realized that when we were serving our customers well, we were often performing work outside of our normal work hours. We collected a long list of examples of times when we temporarily changed our normal schedule—either to meet an important deadline or to schedule work at a time that would lessen the disruption of the customer's activities. In the process, we discovered two examples where we were able to perform work *only* during times we were not normally scheduled to work.

The first example was the painting of the George Washington University's National Law Center. Our Law Center is a connected complex of three buildings encompassing classrooms, offices, and the Burns Law Library. From our efforts to respond to painting requests—from building occu-

pants or deficiency reports generated through our ongoing inspections and Find/Fix maintenance program—we learned that the classrooms were scheduled from 8:10 a.m. to 10:50 p.m. six days per week. The offices were subject to use any time of the day or night, seven days a week, and the library was either open for student use or occupied by housekeepers and library staff performing vital library functions. We met with Law Center administrators and determined that if we could work after 10:00 p.m. and be out before the first class at 8:10 a.m. that, for the duration of the paint job, they could arrange their after-hour's activities around our painting schedule. We found that the level of cooperation with the Law School and Law Library administration was greatly improved due to our willingness to alter our normal schedules—in this case to work at night.

We wanted to use all of the time available each night but didn't want our paint crew to become less productive and/or work unsafely due to fatigue. We decided that a good compromise between available time and employee stamina was to schedule four ten-hour shifts starting Monday night at 10:00 p.m. and finishing on Friday morning at 8:30 a.m. We were very surprised at the productivity of the night shift painters. We knew that we could be more productive without students and faculty in the building, but we did not predict the improved production related to the longer hours each day. Our estimate for the entire job was a combination of gut feel from some very experienced guts and a more formal square footage-based estimate. We originally thought that we

*Willy Suter is project manager, Quality Management Resources, at George Washington University in Washington, D.C. He cowrote an article on staff development and employee training in the Summer 1991 Facilities Manager.*



would have to keep our full crew on the night shift for two full weeks, and then reduce the crew size to four people for another couple of weeks to finish the job. At the end of the first week we were so far ahead of our estimates that we reduced the crew to three and were able to finish not only the Law School but two other small projects in the third week of night shift scheduling.

We guesstimated that our actual cost for the job performed at night was about half of what it would have been if we had tried to paint the same areas during the day. We know that the quality of our night work was much better than when we spot painted during the day. We had some changes in scope in the job due to added areas and areas requiring more than one coat, but we still were able to get through the building ahead of our estimate for the square footage covered.

The other example of how flexible scheduling worked for us was a job in one of our classroom buildings. We received funding to replace flooring, lighting, ceilings, and paint in several classrooms. Because the classrooms were heavily used, our options for scheduling were limited. We again determined that four ten-hour shifts at night was the only way we could do the work with in-house personnel. We organized crews and worked out the critical path for the scheduling, and then met with the classroom users to let them know what was going to happen.

Much to our surprise, we found the classroom users to be very helpful. Several of the instructors offered to alter or reschedule certain presentations. An example of the effort on their part was that we were able to operate one classroom with only part of the new light fixtures installed because the instructor of an evening class shifted an AV presentation requiring reduced light levels to the day that less light was available. We were told by several instructors that as long as they knew what to expect, they could handle a day with no ceiling tile, the smell of paint, or lower light levels.

We again discovered that our productivity was much better than expected. We never considered trying to fit this work into the normal work schedule, so we could not link the high productivity to the lack of students and faculty as in the Law School job. Our conclusion was that the only variable that could explain things was that ten-hour days allowed us to be much more productive.

### Planning for Change

**W**e carried the productivity lessons from these two jobs around with us for a while and talked about it at various levels in the university. We began to analyze our success and realize that there was a range of benefits for both the university and our employees through compression of the work week to four days. Determining whether university administrative methods could accommodate a new work schedule became the next task in our consideration of an alternative work week.

We determined that, in order to gain the support of the administration, we had to illustrate that a new schedule would benefit employees and the university. We felt that a compressed work week could provide not only some cost savings, but also benefits that could improve employee options for use of their leisure time. As we got together casually with an admittedly biased group of employees to discuss

potential gains for both employees and the university, a unanimity of opinion developed as to the value of a compressed work week. We came up with a list of areas where gain by some measure could be expected:

- Overtime usage
- Scheduling accuracy
- Employee turnover
- Absenteeism
- Estimated labor vs. actual labor
- Service call response time
- Employee satisfaction
- Use of contractors

At GW we had no one salient problem with any of the areas listed. We recognized that there was potential for improvement in these and many other areas, but no specific problem had ever been worth the focus of time and energy.

We began to realize that any schedule of people doing work will have its limitations, and these limitations can cut down the ability of an organization to satisfy every demand. We discovered that we did not view the limitations of the current five eight-hour-day work week (e.g., customer's schedule, rush hour) as problems, just as management challenges or as unchangeable elements of our environment. Over time, our scheduling methods had evolved around and adapted to these limitations. After we spent time informally discussing flexible scheduling, it became clear that the concept of a five eight-hour-day work week was so entrenched as to be seen as a basic element of the landscape, rather than just one of a number of variables to be adjusted for the task at hand.

In order to move toward flexibility we had to challenge a wide range of habits, assumptions, and routines that had grown up over the years. We determined that in order to effectively overcome some of the "We've always done it this way" thinking we would need to illustrate how we had bound ourselves to a schedule with no more merit or credibility than any other schedule we could devise.

This process led us to more fully understand the limitations under which we had been operating and, more importantly, to understand the extent to which we expected the compliance and conformance of our customers. As the only source for the services we provided, we had become insistent that university departments do things our way. We came to realize that our schedule of five eight-hour days had nothing to do with the academic schedule we supported and was not responsive to the needs of our customers. Discussions with our customers confirmed this institutionalized barrier to flexibility in meeting their needs.

Research into the history of the eight-hour day and five-day work week shows that our ties to this schedule are habitual and that a rethinking of how we schedule staff is probably overdue.

Employers are required to pay overtime to employees who work more than forty hours in a work week. There are some controls on how work hours may be scheduled for jobs such as truck drivers and pilots. We were unable to find any scheduling restrictions for the jobs within the shop operations division.

A traditional work week is a scheduling entity rather than a legal one and is really what was left over after big-business and newly powerful unions got finished with each other years ago.



- The traditional five-day week was established when most of the work force was male and most were from single-wage earner families. There weren't a lot of jobs available and there was little need for employers to offer flexibility in the scheduling of their work force.

Even a casual review of periodical literature illustrates that our peculiar times have created the need for employers to be more flexible and adaptive in their dealings with employees. Two examples illustrate these new needs:

- Our pool of qualified workers is shrinking. Competition between employers to attract fewer qualified workers means that we must become more than just a place to work. Flexible scheduling will make us more attractive as employers.
- We are experiencing more diversity in employees. An example of how this increased diversity affects families and employers is the increase in the number of women with small children who are now in the work force. Estimates of the percentage of women with children seven or under who hold full-time jobs range up to 70 percent.

These issues represent some of the challenges facing employers now and in the future, but they also point out opportunities for employers to gain the trust and commitment of employees. Employers who are willing to rethink old ways of doing things can use scheduling flexibility to work out mutually beneficial solutions to what may be complex scheduling problems. The pressure on two-wage earner families creates the need for flexibility in scheduling of work hours, and employers who can assist with this flexibility can tap into an extremely stable and often very dedicated pool of employees.

My efforts to gain commitment from GW's administration involved a combination of persistence and sneakiness. A true sage with whom I once worked said that the combination of energy, high moral character, and a touch of larceny is one that cannot be beaten. We found that opening up the door to flexible scheduling involved a lot more than the presentation of a fundamentally sound idea.

The first question asked by GW's physical plant director, was, "Why do we want to do this?" The basic idea was good and he understood the potential for a successful program, but I was unable to answer his basic question. "It just seems like a good idea" was a bit short of what he was looking for. I realized that we had a great need to develop our flexible scheduling idea much more fully.

At this point we determined that we had to formalize our proposal. This type of foray into the unknown would require a structure to control the entire development, implementation, and evaluation process. We wanted to show that a flexible scheduling initiative made good business sense. Most of the pressures and requirements in higher education for a successful enterprise are much the same as those in the business world, and we can benefit from thinking about ourselves as business entities with customers and the need to successfully compete for their business.

Service organizations must not ignore the hard lessons

that U.S. industry has learned over the past several decades: if you make products that don't work very well, charge a lot of money for them, and ignore the obvious wishes of your customers, then customers will not buy your product.

U.S. industry faces competition from abroad because foreign products are often of higher quality and/or cost less than the same product produced here. We must focus on the needs of our customers and how we can continuously improve the level of service we provide. Integrating flexible scheduling as a planning variable allows organizations to better adapt to changing demands through the ability to custom design work schedules for the tasks at hand.

We continue to face the challenge of having to improve service at the same time that our resources are stretched thin, and then stretched again. We can assume that there is no limit to the number of times we will be asked to do more with less. Flexible scheduling is a way to stretch our remaining resources, and maybe even provide more coverage at less cost than before.

Management literature illustrates that fundamental changes to long-standing ways of doing business have to be made carefully, but that when they were done well, the changes will succeed or fail on their own merits rather than as a factor of their implementation. The more we talked and wandered around with a slowly forming plan on our minds, the more positive reactions we got from the front-line trades people who would be working new shifts. In our preparation of a presentation to the director, we focused on three main points:

- ① In order to achieve across-the-board benefits to both employees and the university, a schedule would, at a minimum, have to extend each physical plant workday without the need for premium time, and at the same time provide employees with a range of benefits that they viewed as desirable.
- ② Our plan needed a formal structure. There were plenty of models to choose from: total quality management guru W. Edwards Deming's model is called the plan/do/check/act cycle. Organizational Development theorists call it planned change, but generically it is the scientific method applied to the alteration of methods or priorities of human systems. Our initial model claimed no roots in published theory, unless common sense and trying to be careful qualify as theories.
- ③ For no good reason there was going to be determined resistance to this type of initiative.

### Cost/Benefit Analysis

**N**ext, we attempted to conduct a cost/benefit analysis of our plan. Our intuition told us that the plan would work, but we had yet to consult any data that indicated that our intuition was sound. (Deming would not be pleased!) In deference to Deming and the naysayers in our midst, we generated the following list of potential costs and benefits to the university and employees:



**Costs to the University:****► Supervision**

We normally charge the labor of our foremen and supervisors to overhead accounts and do detailed time accounting for the remainder of employees. It may be appropriate for those trades persons put in "fill-in" supervisory roles to charge their supervisory time to overhead accounts. (Our experience is that the improved planning required of our foremen prevented a marked increase in supervisory overhead charges.)

**► Productivity**

It is possible, during the two extra hours per day, that fatigue could cause a reduction in productivity that might result in extra cost. (Our experience with night shift scheduling and experiences communicated by our trades employees is that this reduction tends to be temporary and will correct itself after an adjustment period that will be different for different employees and types of work.)

We attempted to collect other categories of potential costs, but none of the suggestions lasted through preliminary yeah-but / what if...?" analysis, so we considered them of minimal importance. Next we generated the following list of benefits.

**Benefits to the University****► Reduction in daily lost time**

We estimated that we lose an hour each day, five hours per week, per employee to start-up, lunch, and close-down activities. We know that we lose more time to other things, but we estimated that this hour was lost simply because of the schedule. A four-day schedule would result in only four hours per week lost in this manner, a loss avoidance of 20 percent. We figured this cost avoidance to be worth over \$50,000 per year for the 60-person work force with a gross work-year of 2,088 hours. For every formal break during the day, there is the potential for more savings per week with fewer days.

**► Reduction in time lost on projects**

Often, a major labor cost on larger projects is the cost of the mobilization of workers and equipment to the job site. The four-day schedule reduces the number of mobilizations for the same number of on-site work-hours and reduces this cost.

**► Productivity**

Service organizations have had trouble with and refrained from measuring productivity. Space constraints prevent a complete exploration of the measurement opportunities, so suffice it to say that if input (labor costs) goes down and output (completed repairs/projects) stays the same, there is higher productivity. If input goes up and output goes up more, there is higher productivity. Productivity in a service organization is more difficult to measure than that in a production environment, but productivity measurement in service organizations is possible and provides an improved understanding of the operational dynamics.

**► Improved response time**

Because we would work more hours per day, we could get to service calls sooner than with eight-hour scheduling. When we respond to a customer during the extended hours of operation, they experience our response a day sooner than before. Any improved productivity will play a role in getting to things more quickly, but our customers' perception of

improved response time (even though the work took almost as many work-hours to do) may be more important than any real productivity gains. This perception is not unimportant. We are often judged not by our actual success, but by a customer's perception of our success. These perceptions should not be ignored.

**► Increased coverage**

With each participating shop split into two four-day/ten-hour shifts (Monday through Thursday 07:30 - 18:00 and Tuesday through Friday 07:30 - 18:00), our shops would be on campus performing a full range of services for ten hours each day, rather than eight. This amounts to ten additional hours per week of straight time coverage.

**► Increased rush project flexibility**

With the new schedule we now have two days per week of rush project time by having employees work the weekday they would normally have off. We are often able to control these overtime projects with straight time supervision, so our supervisory overhead cost for such a project is near zero. This capability also requires no special hours for the customer, who may need or want to be around while the project is going on.

**Benefits for Employees:**

- Three-day weekends when weekdays off fall on Mondays and Fridays.
- Weekday off available for personal business, second job, DMV, etc.
- 20 percent reduction in commuting costs.
- 20 percent reduction in need for child care.

**Setting Up the Pilot Program**

**A**fter several iterations of proposal presentations to the director, he approved the implementation of a pilot program in two of our trade shops. We selected our electrical shop and our emergency response shop for the pilot program. These two shops were chosen because their work represents the complete range of work performed by the department and involve all levels of supervision. The two shops perform emergency service, preventive maintenance, and minor alteration work, and each reports to a different supervisor.

For ease of implementation we decided to start the new ten-hour shifts at the same time shifts had always started, 7:30 a.m., and run them until 6:00 p.m. each night. In meetings with the two supervisors and subsequent meetings with foremen and shop members, it was decided that we would try to accommodate the major employee benefit of a three-day weekend every week with our new schedule. The resulting schedule involved the splitting of each shop into two shifts. One shift would work Monday through Thursday; the other shift would work Tuesday through Friday. Our initial lessons in ten-hour scheduling came from operating at night. It is our belief that the productivity gains resulted at least as much, if not more, from work week compression rather than from night time hours.

We developed some criteria for the decision making about who would work when. These included necessary supervi-



sion, technical expertise, commuting arrangements, family responsibilities, and more. We attempted to satisfy as many employees' schedule preferences as possible, and have the expertise and supervisory coverage to provide for a safe and effective presence throughout the expanded schedule. Much to everyone's delight we were able to satisfy all of the scheduling needs of both shop groups.

We met with the pilot group several times before the beginning of the pilot program and implemented the new schedule in January 1991. We had not yet approached higher university administrative levels with our plan. We figured that it would be easier to get forgiveness than permission. We did, however, receive an all-clear from the human resources people with whom we consulted on compensation issues and the application of university policies.

### Evaluating the Pilot Program

**W**e attempted to structure the implementation of our program to provide for opportunities to evaluate the plan's effectiveness and monitor customer and participant reactions. Our initial concept for the evaluation of the program included an evaluation team with representation from across the university community. This team was to be tasked with the establishment of a list of evaluation criteria, an evaluation schedule, a system for the collection and analysis of data, and a presentation to decision makers of the findings.

It was a good evaluation strategy and would have served purposes beyond determining if the flexible scheduling initiative was working. The plan would also have exposed customers to the complexities of our operations and established a constructive relationship focused on the improvement of our level of service. However, in our efforts to collect team members we found that many of the people we serve are as busy as we are, and though willing to help, few had enough time to spend as team members. Our ideas about current and new measurement criteria needed further development, and the time requirements within the department and for evaluation team members from outside of the department were beyond what we eventually decided we could afford.

Our quantitative evaluation ended up being a before-and-after comparison of statistics developed from data we had always collected. But the evaluation did not include development of new statistics from this data, or the development of new data. Results of these comparisons indicated that the program was making things better in some areas and no worse in others. We did not develop the list of statistics that in theory could have been sensitive enough to identify unanticipated spin-off benefits or costs, and show how things changed.

The most consistently positive reaction to the plan from the participants was that it was great; other employees not participating asked, "When can we do it?", and our own customers asked, "When are you going to expand it to the locksmiths and the plumbers?"

In the absence of fine tuned quantitative evaluation criteria and an unbiased evaluation criteria and an unbiased evaluation team, we decided to survey plan participants and customers. Our thinking was that this type of primarily subjective

analysis could improve the evaluation of our pilot program. We surveyed employees before they started four-day scheduling, one month later, and then again after several months. It was apparent that some employees discovered unanticipated problems with changes to family time and commuting schedules. In keeping with the emphasis on flexibility, the two employees who needed to return to five-day scheduling were allowed to do so.

Our customer surveys indicated that they either didn't notice any change or found that they were getting things done sooner than before. We did not choose the customers to be surveyed at random, but we did try not to stack the deck with all "good guys." Several of those who filled out survey forms didn't even know that there had been a change, and faulted us only for not letting them know earlier.

With these surveys we discovered that in the past people from housing would accommodate the physical plant department's schedule by putting off the reporting of non-emergency problems until the next day if they came up right at 4 p.m. or later. The housing resident directors told us that most of the reports of problems they got came late in the afternoon as students returned from classes or returned before going to supper, and that the extended hours were quite helpful. This benefit to the RDs was unexpected and may not have been caught had we not used surveys to collect customer views.

In early December 1991, we met with our associate vice president and briefed him on the success of the program during the year. We presented what we thought were the salient lessons, our cursory cost/benefit analysis, and the nature of the method we attempted to use throughout the pilot program. He approved the expansion of flexible scheduling to the remainder of the shop operations division. In the briefing we tried to make very clear that it was not our intention to move toward any one particular schedule, but instead to move away from any single schedule being cast in stone. It is clear now that if we were to attempt this type of change again we would do some things differently, and probably not have to wait a year before collecting lessons and organizing a presentation.

### Lessons Learned

**W**e think it is important to formally recognize the things we did well and those that could have been done differently. We are pleased to say that hindsight has been kind to us and our "if only" list is short.

**Institute a process for the ongoing analysis of scheduling** as an avenue toward improved service. Stress flexibility over any one schedule. No matter how popular/unpopular and no matter how much success or failure is attributed to any one schedule, the long-range benefits will be derived from increased flexibility, not from any one schedule. (To some extent we are currently tied to our new schedule, but as we work with new groups we are trying to overcome this.)

**Involve customers, staff, and trades employees early**, and involve them in each stage of the change process. We did not and found that we would have known much more about the success of our project if we had assembled all of the stake



holders much earlier in the process. Involving the customer will keep the process in touch with the need (real, not perceived). Staff input will assist in the ever important "what-if" analysis, and the employees will develop ownership and commitment to the new schedule and the process for fine tuning it.

If there is no in-house statistical resource, develop one or **get some outside statistical help** to ensure that your statistical method is sound. Our use of data and statistics to illustrate our problems and success was poor. It is also interesting that none of the thresholds of review and approval we crossed required more quantitative information than that provided herein. A resource for statistical methodology could be your university's statistics department.

We have had a few occasions where vacation schedules, absenteeism, sick leave, and such have lead to understaffing on a Monday or Friday. It was due only to the quality of our people that we came through as well as we did. This remains the major problem encountered with compressed scheduling. There are indications that for our size campus, there is a minimum crew size necessary to get needed coverage with two four-day shifts. Our new shifts will integrate this lesson and try to more **evenly distribute staff over the work week**. We may simply include a rotating shift that works Monday, Tuesday, Thursday, and Friday, with Wednesday off to provide more consistent staffing.

### Conclusion

**M**any in-house organizations have evolved into groups that take their customers for granted and use the fact of fiscal and operational constraints to justify poor quality service. The competition for in-house service organizations is represented by those who do not make excuses, but offer better quality at reduced cost. There are horror stories about institutions who have tried to solve their problems by going to a full service contractor and have had a miserable time of it. There have also been successes, and there are good reasons for administrators to consider this option. An unprofessional, insensitive, and lethargic in-house maintenance organization with a poor service orientation, and who cannot or will not adapt to ever changing customer demands—and who may represent just such a reason!

Over the year or so since our flexible scheduling plan was expanded to all of the shop operations division, much has changed at GW. Physical plant staffing has been reduced through elimination of administrative positions, and the organization has been reorganized into the Facilities Management Department. I have moved from the old physical plant department to a new department involved in a campus wide TQM effort. The massive amount of change that has occurred has disrupted monitoring of new benefits/costs related to flexible scheduling, but the potential for flexibility has been realized as groups and individuals have successfully changed their work schedules for a variety of reasons. In spite of our weak statistical methodology, we are convinced that flexibility is the key, and our subjective analysis support this truth. Just as any work schedule has limitations, they also each have benefits and it is only through flexibility that the "best"

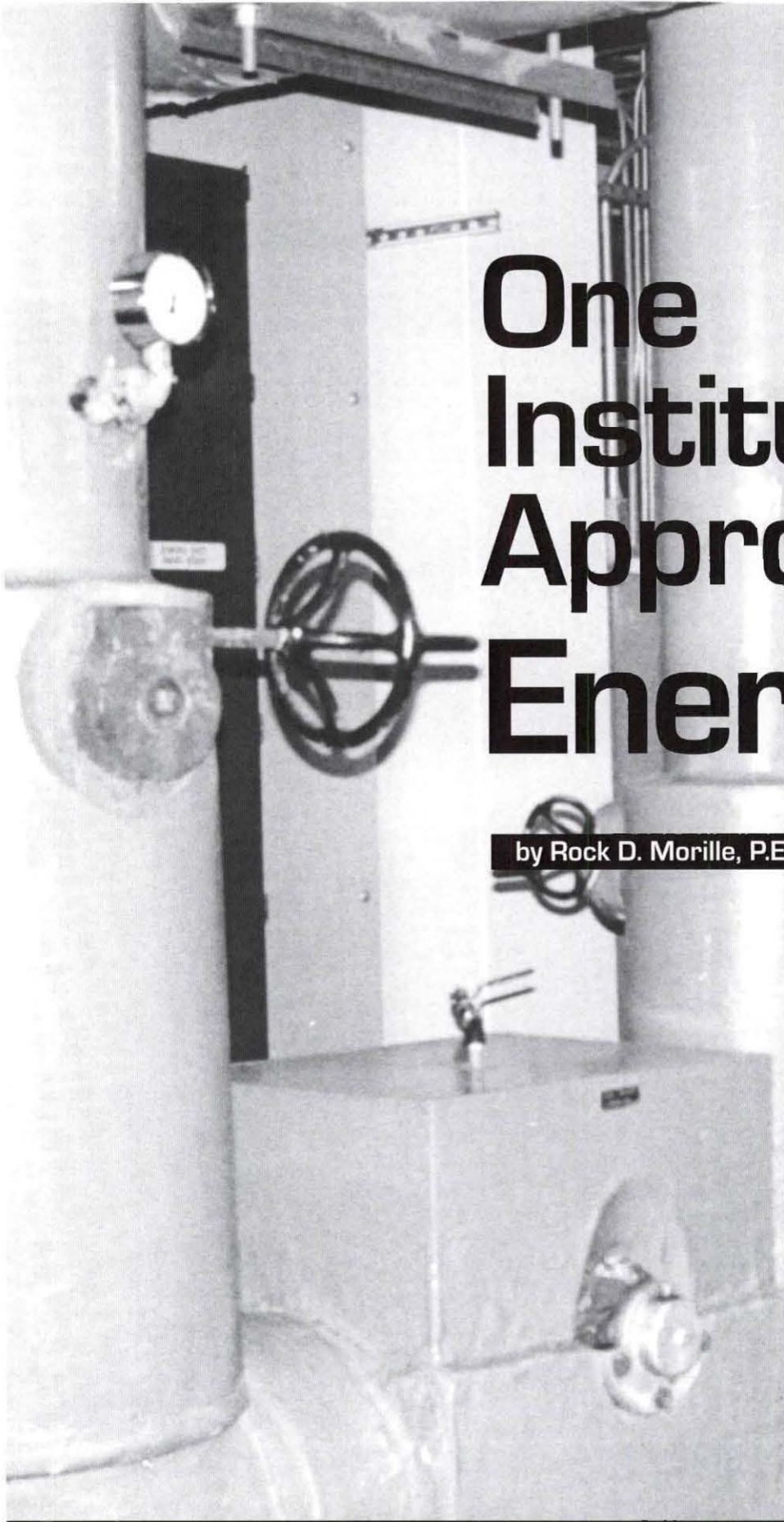
schedule is developed.

Flexible scheduling is not a panacea for maintenance problems. We have yet to work out all of the bugs that are attracted to a changing organization. At GW, however, flexible scheduling has assisted in efforts to be more responsive to our customers and to increase leisure time options for our employees. We are proud of what we have accomplished and suggest that flexible scheduling is a positive step that can result in improved service on any campus.

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# One Institution's Approach to Energy Con

by Rock D. Morille, P.E.

**A**lmost every campus has an energy management group that is responsible for better utilization of the purchased utilities. But how much emphasis is being given to the energy management group today? With the technological developments of the past few years, the specialty of energy management has changed dramatically.

*Chilled water variable speed drive shown with the primary chilled water pumps in parallel.*



Physical plant administrators and university staff have recently been bombarded with new issues that have reduced the priority of energy management. Issues such as asbestos abatement, chloroflourocarbon refrigerants (CFCs), and deferred maintenance have replaced energy management as the number one, two, or three priority. While these issues stand to have significant impact on the physical plant operations now and in the future, none are likely to have cost implications comparing to the ongoing cost of utilities. Realizing that utilities can account for up to 30 percent of a physical plant department's yearly operating budget, it is time that energy management is given the priority it deserves.

At Baylor College of Medicine, three of the newer strategies in energy management have been implemented with amazing results. The three ideas implemented are energy efficient lighting, power factor correction, and variable speed motor control (on pumps and cooling tower fans). An overview of the implementation of these ideas and their associated savings follows.

# ervation

## Energy Efficient Lighting

In January 1991, we recognized that there had recently been substantial advances in fluorescent lighting technology, so we began researching ways to take advantage of the new technologies. In choosing the lamp that would suit our needs best, there were many considerations. The most important considerations were as follows:

1. The color of the new light compared to the existing light.
2. Will the new lamp work with the existing (magnetic) ballast.
3. The cost of the lamp compared to the existing lamp.
4. The life of the lamp compared to the existing lamp.
5. The projected payback of the project.

After looking at the options we chose to use the Philips F40-AX-41 (referred to hereafter as AX). The retrofit fixture configuration uses two of the AX (40 watt) lamps and one ballast instead of the existing four watt saver (34 watt) lamps and two ballasts. This configuration decreases the lumen output by 10 percent per fixture while decreasing the energy consumption by 42 percent per fixture. The new AX lamps last longer than the watt saver lamps (24,000 hours as compared to 20,000 hours) and operate with less total watts per fixture.

*Rock Morille is manager of technical operations and engineering at Baylor College of Medicine, Houston, Texas.*

The end result is that the retrofit saves energy consumed by lighting, decreases the frequency of lamp change out (reduces labor), and reduces the air conditioning load. These savings amount to a total of \$44 per fixture per year. This gives us a payback of approximately six months including the labor to change out the lamps. In order to get maximum usage from the existing ballasts, we disconnected one of the ballasts and saved it for future use.

The Philips AX lamp gives off a light that causes colors to be more vivid (especially red) and is compatible with most of the magnetic ballasts currently in use. The brightness of the color red in the light spectrum did present some problems when the lamps were initially changed out in the office spaces. However, after the first full day of use, most people had no problems with the new color spectrum. When used with some types of ballasts (15 percent throughout the project) the lamp flicker was objectionable; in these cases the ballast had to be changed to the electronic type. Electronic ballasts operate at a much higher frequency (20,000 HZ.), which eliminates the lamp flicker.

In April 1991, we began retrofitting the 3,500 fluorescent fixtures in the hallways throughout our facility. We started in the hallways for two reasons. First, this caused minimal interruption of classwork and research. Second, it enabled us to evaluate the AX lamp and receive occupant feedback in case the retrofit turned out to be a bad idea. We completed the retrofit of all 3,500 hallway fixtures in May 1992. We had originally anticipated completing the campus-wide retrofit by the end of 1993, but because of our success with the hallway retrofit program, we embarked on retrofit all 8,000 fixtures remaining in the classrooms, offices, and laboratories by the end of 1992. In order to achieve our new completion date we hired and trained students to work with the electrical staff on the retrofit project during the summer and during Christmas break. We just completed the retrofit as the students returned to school this past January.

In addition to the fluorescent lamp retrofit, we wanted to remove all PCB ballasts in our facility. This can be an extremely expensive program, but if you retrofit as we did (assuming there are some fairly new buildings on your campus) you end up with so many "spare" ballasts that storage soon becomes a problem. Basically, if a ballast does not specifically state that it contains no PCBs, then you must assume that it does contain PCBs. Most ballasts are stamped with the manufacture date on the bottom, for our project most ballasts dated before 1980 contained PCBs. In order to achieve our no-PCB goal, we retrofitted the newer buildings first and saved the ballasts for use in the older buildings where, in most cases, both ballasts in the fixture contained PCBs. Once the ballasts containing PCBs are removed, they must be disposed. In most states it is illegal to just throw the ballasts containing PCBs in the trash. Therefore, it must be decided whether to recycle the ballasts (cost is about \$5 each) or to ship them off to a certified landfill (cost is uncertain, especially if they ever leak).

In the future we will be switching to electronic ballasts from the conventional magnetic ballasts. The electronic ballast



we are currently purchasing is about three times more expensive than the magnetic ballast but gives a payback of 1.9 years. This includes the fact that it draws less current and operates at a much lower temperature (96 °F. compared to 115 °F.), which reduces the air conditioning load.

These ideas are applicable in almost any building complex that uses fluorescent lighting. Specifically, in areas where 2-by 4-lay-in, three lamp or four lamp fixtures are in use. The reason this idea is so adaptable is that the actual reduction in foot candles of lighting is 10 percent or less. The only place where this could be a problem is in areas where there are special processes taking place that have special lighting requirements. The only other issue to be aware of is the potential sensitivity of the occupants to the color spectrum of the lamp selected to be used in the retrofit.

The important aspects of this program are that it uses the most advanced in fluorescent lighting and electronic ballast technology. This program will save you money by reducing your electrical usage (KWH) and your peak electrical demand (KVA) because it actually eliminates about 30 percent of the lighting load.

What makes our program different than many is that we are not wholesale changing out all the existing magnetic ballasts. Instead, we are using the existing ballasts in order to get their full life service. This substantially lowers the implementation cost of our program in that it spreads out the costs over

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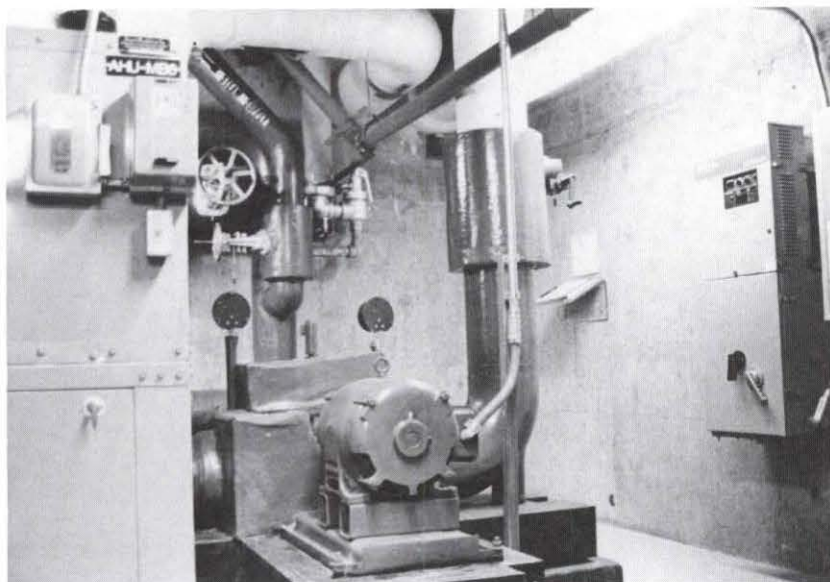
**What makes our program different**  
**is we are using the existing ballasts**  
**in order to get their full life service.**

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a longer period of time without wasting resources (existing ballasts) that we have already purchased and installed. Meanwhile, we are able to pay for the ongoing PCB ballast removal and electronic ballast installation projects using the electric utility cost savings of the fluorescent lamps already installed.

The costs associated with this project are as follows:

The Philips F40-AX-41 lamp price is \$7 per lamp (discounts are available when large lots are purchased; we paid \$5.90



*Building chilled water pump with Toshiba drive unit on wall.*

each). This equates to \$14 per fixture.

The electronic ballast (Magnetek Triad Ballastar model number B240R277) price is \$36 (quantity discounts are available; we recently purchased a 1,000-lot quantity for \$20 each). This ballast came with a three-year parts warranty and a \$10 refund for the labor to install the new ballast in case of a failure.

One issue that we did not investigate was the

possibility of the removed lamps and ballasts having a salvage value that could help offset the cost of the project.

We are currently experimenting with motion sensors to turn off the lights when rooms are not occupied. While we have not installed a significant number of the devices, our experience is that sensitivity decreases in the less expensive models (to an unacceptable level in some cases). As such, we have installed a few of the more expensive devices (\$225 each) in our auditoriums where there are substantial numbers of incandescent lamps, therefore justifying the cost. However, we have not found a device we like using for small lighting loads (eight fixtures or less) such as classrooms.

### **Capacitor Addition for Power Factor Improvement**

**B**efore you can begin a project to improve your facility's power factor you must understand the definition of the term power factor and its impact on your electric bill. Power factor is like a box of cereal in that although the manufacturer says the box is full (according to weight) before you open it, about 30 percent of the contents is air and what you really want is the cereal. Increasing the power factor is the electrical equivalent to filling the box full of cereal and removing the air (regardless of the weight).

Power factor is the measurement electrical utility companies use to identify how effectively electrical power is being consumed. A high power factor indicates efficient use of electrical power and a low power factor indicates poor usage of electrical power. The reason utility companies measure power factor is to be fair in the billing of everyone they serve. Power companies contend that it is unfair to charge customers who make efficient use (have a high power factor) of generated power the same as those who basically waste (have a low power factor) generated power. This may be the only point that the customers and the utility company can agree on. The way utility companies penalize customers who have low power factors is through the peak electrical demand charges. Customers with high power factors will have a lower KVA demand for a given KWH usage than will those with low



power factors. This will result in lower demand charges.

The next question to address is what is a high power factor? Power factor is generally measured in one-hundredth increments from zero to one. In the past, facilities with power factors above .90 were considered to have high power factors (i.e., not worth the project cost to improve them). Today power factors above .96 are considered high.

In reality, the definition of high power factor is a combination of a facility's peak electrical demand and the penalty imposed by the utility company in terms of the peak electrical demand charge. Increasing your power factor will decrease your peak electrical demand and thus reduce your electric bill. In order to determine the electrical peak demand charge, you must have a program of the electrical rate schedule because sometimes the utility company will "hide" the actual demand charge in formulas used to calculate the bill.

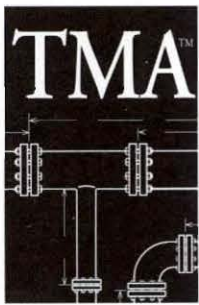
Once you have the program, input your last electrical KWH usage and KVA demand from your electric bill to make sure that the program total is what you were charged. To find your "real" demand charge, reduce the KVA (demand) by one (i.e., from 8700 to 8699), keeping your KWH usage the same and then subtract the new total from the old total. The difference is your real demand charge per KVA.

Our plan at Baylor College of Medicine was to raise our power factor from .94 to .99 by adding capacitors to our elec-

trical system. We receive power from Houston Lighting and Power, and our bill is based on their Large General Service (LGS) rate structure. This rate is structured such that each KVA of peak demand is charged at a rate of \$12.13. Our peak demand is typically 8700 KVA. Therefore, we calculated that we should be able to save about \$4,500 per month if we were successful in raising our power factor from .94 to .99 (reducing our demand from 8700 KVA to 8330 KVA).

We began looking at adding fixed capacitors because they are less expensive than automatic switching capacitors and our electrical load is fairly constant. We called Houston Lighting and Power and had them provide us with copies of their 15-minute demand meter readings, which would be necessary in order to make sure that we add the maximum amount of capacitance without adding too much. (Going above .995 can cause the voltage to climb throughout your electrical system.) We chose the months of January and February to analyze the electrical demand because these are the months when our peak demand is the lowest. After analyzing the data, we calculated the capacitance (KVAR) necessary to safely increase our power factor without going over unity (1.00). Reducing the KVAR by adding capacitors is how you increase the power factor.

In order to do this, we calculated the KVAR (KVAR is a measure of capacitor size) inductive reactance at the minimum



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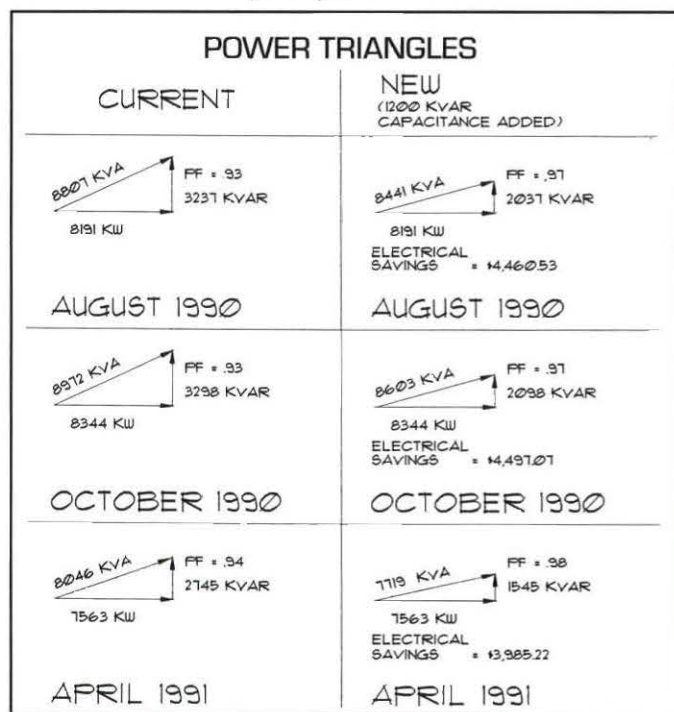
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KVA (electrical demand) over the past year. The minimum yearly demand occurred on January 9, 1991 at 2:45 a.m. Our calculations yielded a KVAR value of 1577. The project design added 1200 KVAR of capacitors to our main service leaving us with a 377 KVAR safety margin to keep from correcting the power factor past unity. The capacitors were connected to the main distribution panel so that the capacitors would be on line at all times. This design enables us to maintain a power factor of .98+ by adding capacitance in the future in case of an increase usage in power due to expansion of the facility.

In order to give exact estimates of the savings involved with this project, we recalculated old electric bills using the new power factor of .99. In the figure below, we used past bills and figured potential savings using the "new" power factor assuming the addition of the 1200 KVAR capacitance. The savings for each bill is located in the lower right corner and ranges from \$3,900 to \$4,500 per month. Using historical data we quite accurately estimated the payback on this project at six or seven months depending on the installation date. The cost for the purchase and installation of the two 600 KVAR capacitor banks totalled \$24,201. The anticipated life of the capacitors is twenty-five years.



These drawings illustrate the actual savings we can expect with the installation of 1200 KVAR of capacitance. The drawings above are made from historical data, but the savings are calculated using the current rate schedule.

This project illustrates that there can be substantial savings on electric utility costs even if you have a high power factor. In our case we had a .94 power factor, which is very good, but we were still able to obtain large savings by improving the power factor to .99. Therefore, it is important to realize that

there are savings available in a project of this type. I believe this is something that most physical plant administrators overlook. In doing this they are overlooking one of the simplest strategies to reap substantial savings in electric utility expenditures.

**This project illustrates that**  
**there can be substantial savings**  
**on electric utility costs**  
**even if you have a high power factor.**

This approach to power factor improvement can be used by any large facility. The rate of savings (payback) will depend on the electric utility rate structure and the existing power factor. The other factor is whether the electrical load is fairly constant. If it is, the facility will be able to add fixed capacitors as we did. If the load varies substantially, the facility may have to add switching capacitors that tend to be much more expensive. As a guide for this project, we used an engineering brochure called "Dry Type Power Factor Correction Capacitors Application Manual", available from ABB Control Inc., 1206 Hatton Road, Wichita Falls, TX 76302. While this brochure is filled with enough information to design a complete installation, it is no substitute for an experienced electrical engineering consultant. Because of the costs involved and the potential dangers inherent in a project of this nature a qualified electrical design team should always be used to issue specifications and construction documents.

We designed our project and had an electrical engineering consultant verify that our design would work. Our capacitors have been in operation since August 1991 (nineteen months). If I could do the project over again I would have installed more switching capabilities in the system. We only have one level of switching capability, and it is a 1800 KVAR bank of capacitors that is really much too large for our facility. It would be desirable to have switching capabilities of around 600 KVAR, but the budget just did not allow for the added expense. What we do to overcome this problem is monitor the KVAR and KVA usage of our facility (through our energy management system) on a five-minute interval. When the KVAR decreases to 300 we turn off one bank of capacitors. When the KVAR increases to 2000 we turn on the capacitor bank back. We need to deal with this only during the winter months and really was not a problem until we completed the lighting retrofit that decreased our electrical load by almost 500 KVA. Because we are currently adding a new 250,000-square-foot building (increasing the electrical load) to our campus, we expect to eliminate this problem in the next year or two.



## Variable Speed Motor Control Units on Pumps and Cooling Tower Fans

**A**t Baylor College of Medicine we air condition our buildings using a chilled water distribution system designed and installed in 1960. Recently we have found that most of the pumps in our chilled water distribution system are substantially oversized. Specifically, they are operating at a much lower discharge pressure than they were designed to operate at for maximum efficiency. This presents the opportunity for substantial savings using the current variable speed drive technology on pumps in our chilled water system.

Our chilled water distribution system is similar to the type commonly known as a primary/secondary loop system. We have eight primary chilled water pumps, a 60 HP, and seven 50 HP in parallel in the central plant which feed the chilled water out to the buildings. Each building has a secondary chilled water pump that removes chilled water from the primary loop and feeds chilled water to its respective building. Initially (January 1991), we installed a variable speed drive on one of the 50 HP chilled water pumps in the central plant. We began controlling the speed of the pump based on the pressure differential across the buildings on the primary chilled water loop. We started with a pressure differential set point of 10 PSI. We soon discovered that we could operate with a pressure differential of just 5 PSI across the last building (sensor location is very important).

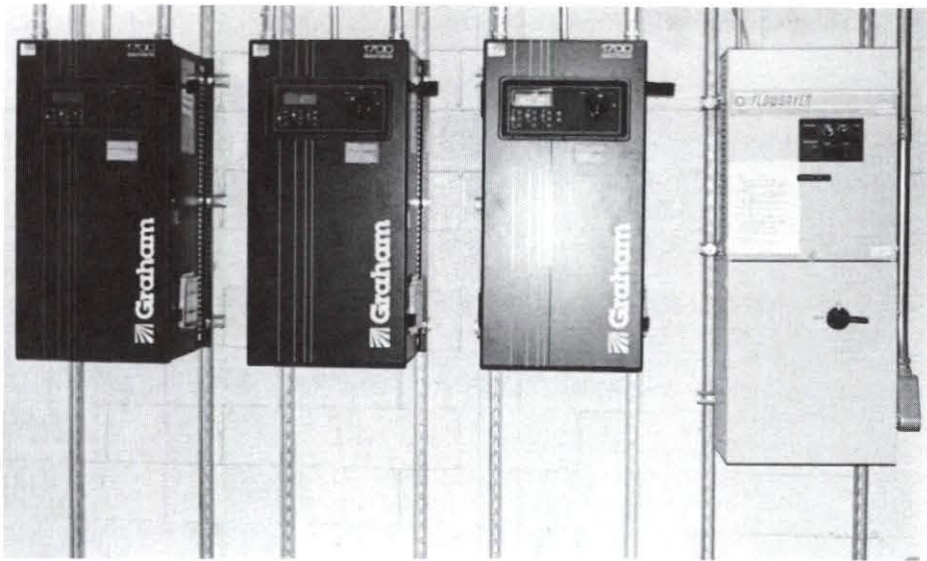
We operate the speed of the variable speed drive within the limits of 40 percent speed to 95 percent speed. When we reach 95 percent speed we have to make a decision to react in one of the following ways depending on the load of the chillers at that time.

1. If the chillers are not fully loaded we increase the load on the chillers by decreasing the chilled water supply temperature. Colder chilled water decreases the required flow and in turn reduces the speed of the pump.

2. If the chillers are loaded we look at the flow through the chillers. If we are not at maximum flow through the chillers we turn on another chilled water pump.

3. The last option (because it is the most expensive) is that when the chillers are fully loaded and at maximum flow, we turn on another chiller.

We make the decision to turn off equipment based upon the chilled water pump speed. As the building load decreases, the air handling unit chilled water valves shut. This in turn causes the variable speed drive on the chilled water pump to slow down to maintain the constant differential pressure across the buildings. When the pump speed reduces to 45 percent we make decisions to change the operating conditions based on a reverse of the items listed above. Of course,



*Variable speed drive with units for the cooling tower fans.*

turning off a chiller requires that the chilled water temperature be cold enough to carry the load when the chiller is turned off. This decision is easier where the chiller plant comprises several similar-sized chillers. Even then it takes some experience in the operating characteristics of the specific facility in order to make a good decision.

There are many consultants who do not recommend the use of one variable speed drive in conjunction with constant speed drives in a parallel pumping system. Their recommendation is to install a variable speed drive on every pump in the parallel group. The argument they make is that a single pump with a variable speed drive in a group of constant speed pumps in parallel will not pump water below 80 percent speed because the discharge pressure of the pump will not be high enough to overcome the system pressure. Therefore, the check valve in the discharge of the variable speed drive pump will not open, thus making flow from the pump impossible.

While we agree that it would save more money if all pumps were equipped with a variable speed drive, this is a much more expensive approach with a much longer payback. The key to a successful application using our approach is knowing the slowest speed at which the pump with the variable speed drive will produce the primary loop supply pressure. This speed can be obtained from pump manufacturers by contacting them and discussing your intent to use a variable speed drive and the need for the information.

Our experience is that we can run our variable speed drive (on one of the 50 HP pumps) down to 40 percent before the pump pressure is below the system pressure. This has resulted in significant savings because we are able to identify the load on the chiller plant much more accurately. Therefore, we are able to delay starting chillers, which is a significant contribution to the savings we get from the variable speed drive



unit. In addition to the other benefits, our chilled water temperature differential has increased 1 to 2 degrees, which has improved the operating efficiency of the chillers. We are experiencing excellent results controlling our variable speed drive based on the chilled water pressure differential across the last building on the primary loop. We had estimated the payback to be about eight months, but our actual payback was two months. The drive has been in operation for twenty-four months.

This application was so successful that we have installed variable speed drives on the building (secondary) chilled water pumps as well. Our experience is that the savings on the secondary pump drives is not as dramatic as the primary pump savings, however, we believe the a payback was about one year on each of these drives.

The six-building chilled water pump drives have been in service for twelve to eighteen months, each without any problems. These building variable speed drive units are controlled by the chilled water differential pressure across the building each serves.

This application of variable speed water pumping will work for any system that has pumps that are oversized. It works particularly well in places that have systems designed for peak loads but which operate at less than peak load for much of the year. In some cases, this application can also resolve problems with chilled water distribution throughout a system. This scheme can also be used in systems that have central heating plants that use hot water for heating. We have variable speed drives on four of our buildings hot water systems. Because of our climate (Houston, Texas) the payback is longer on hot water pump drive units than on the chilled water pump drives.

The costs involved in the primary chilled water loop variable speed drive project were:

1. One 50 HP variable speed drive complete with a three-year extended warranty including parts and labor-\$7,320.
2. Parts and labor to install drive-\$850.
3. Programming labor-\$350.

The savings involved have been averaging \$6,000 per month. This savings is calculated using the reduced KWH usage (current bill compared with the same period last year) on the electric bill times a factor of \$0.05 per KWH (our average electric cost).

We are currently in the process of installing variable speed drive units to control the fan speed in our cooling tower cells. We have seven tower cells but are installing variable speed drive units to control only the four cells we use in the winter months. Energy savings using variable speed drive technology are only available when you can run a motor at partial speed and in the summer in Houston we run all tower cell fans at full speed. We control the speed of the cooling tower fan in order to keep a constant condenser water supply temperature of 70° F when the wet bulb temperature is below 62° F. When the wet bulb temperature is above 64° F, we control the condenser water temperature at the wet bulb temperature plus 6°.

In order to maintain this control we monitor the cooling

tower discharge water temperature through our energy management system. The energy management system then calculates the desired cooling tower supply water temperature and adjusts the speed of the fan in order to maintain the calculated temperature. This is a fairly complicated project that involves controlling the variable speed drive unit (cooling tower fan speed) using electronic controls and software programming. The total budget (materials and labor) for the cooling tower fan variable speed drive project is \$50,000. The payback is estimated at three to five years.

The anticipated life of the variable speed drive unit is ten years. This is an estimate on our part. We used Graham variable speed drive units for the primary chilled water loop and for the cooling tower fans. We used Toshiba variable speed drive units on the building chilled water pumps. Both manufacturers drive units have been in operation for twelve to twenty-four months with no problems. We used different manufacturers because of lower price quotes on different projects (both met our technical standards). No spare parts or supplies are required.

Because of the cost involved in the installation of variable speed drive units, it is worth the expense to seek professional advice on the first installation. Make sure that the engineer has experience in your particular application and that they can show you at least one installation that is working properly.

It is also important that you have an experienced contractor install the first variable speed drive unit including the controls and programming. After the first drive is installed and working, it is fairly simple to copy the programming instructions for the second and following drive units. In general, only small changes will have to be made to the program of the first drive unit in order to get the second drive unit controlling properly. Sometimes only set points and control unit formulas have to be changed.

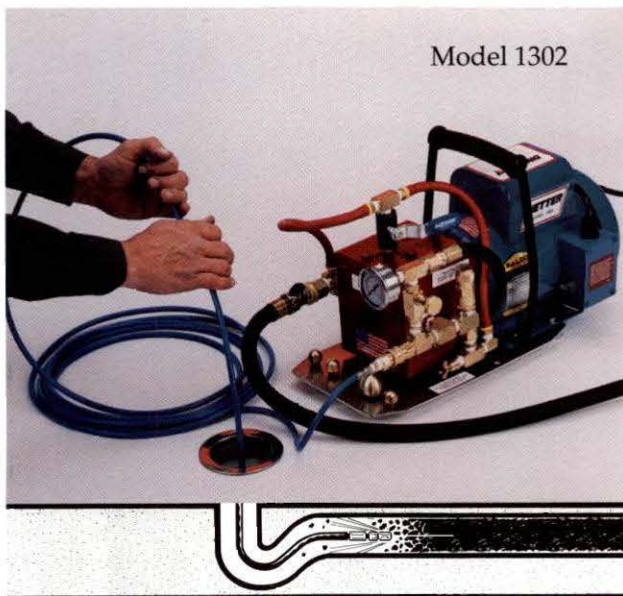
## Conclusion

**I**n the day-to-day management of the physical plant of any institution, it is an accomplishment not to be further behind at the end of the day than you were when the day started. With the number of problems encountered on a typical day, it is understandable that energy management is only thought of on the day the utility bill comes in the mail. At times there are so many problems that it is difficult deciding where to start; that is until the president calls with a problem— then it is easy knowing where to start.

In completing the projects outlined in this article, the hard part was deciding where to start. I spent two years learning the operations of the facility before I was convinced that these projects would work. It took another six months to get the funding for the first variable speed drive unit. Fortunately, the variable speed drive unit was a great success. Because of this success, getting funding for the power factor improvement project took only five months. Getting funding for the lighting project took seven months. During this time all the day-to-day problems continued to happen and get solved.



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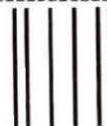
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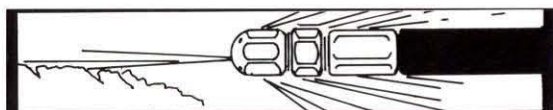




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In deciding which energy saving project to do first, the answer is simple. Do the easiest one first. It may be that you have a project that is even easier than those discussed in this article. If not, the lighting project has to be the easiest. In our case we were able to purchase the lamps with our electrical utility budget funds at the beginning of the year and, because of the quick payback, still meet the electrical budget by year end. In some areas this project qualifies for a rebate from the electrical utility company (we received \$22,000 for our project). The United States Department of Energy also has a program (Institutional Conservation Program Grants) that pays for half of the costs of implementing some energy saving projects.

The electric utility usage and demand graphs show the implementation times of the projects discussed in this article. They also show the savings resulting from each project over time. In order to really understand the graphs, you have to realize that there is an overall trend in the electrical usage at our facility and that any deviation in that trend is a result of the implementation of the projects discussed in this article. Exact dollar savings figures are hard to pinpoint because of the dynamics of the facility and the continually changing electrical rates. However, based on the current electric rate sched-

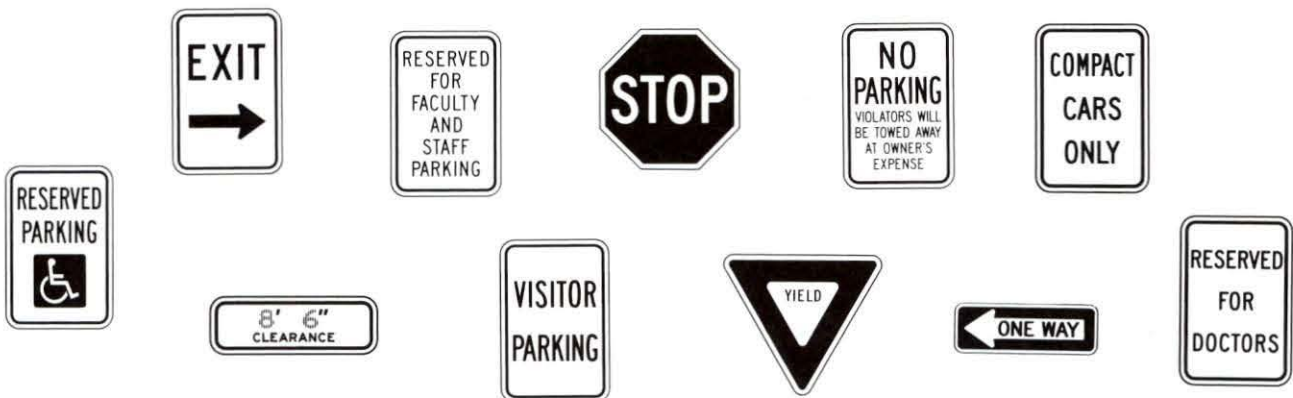
ule, we have reduced our electrical costs by over \$350,000 (12 percent) per year when compared to the 1990 electrical demand and usage amounts.

In any of the projects discussed in this article there is a certain amount of risk involved. The results from the implementation of them will depend on the existing facility conditions and the electric utility rate structure. In some cases you will have the expertise on staff to evaluate the potential success of a project. In some cases you will not. In all cases there is no substitute for experience. You may have local consultants that can help you on the more technical projects (power factor correction and variable speed drive units).

There are also plenty of APPA members who have as much experience as any consultant and are willing to help you get started. When you get right down to it, that is why we are members of APPA. It is an organization in which everyone enjoys seeing projects completed and wants to share accomplishments with those in the profession of facilities management.

I hope that this article will be useful in helping you sell the importance of energy management to your administration. As we all know, getting the money to solve problems is the really difficult part of facilities management. ■

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## APPA

### Answers

#### Responding to the Member Opinion Survey

Maxine Mauldin

At its January meeting, the Information Services Committee voted to update the International Experience Exchange Data Base every two years. With this scheduling, the Experience Exchange survey will be mailed out in alternating

years from the Comparative Costs and Staffing survey. This will allow us to update as well as research not only the current issues affecting facilities management, but the new avenues we need to explore in the name of higher education.

APPA has conducted an opinion survey to assess current programs and identify current and future needs of the membership. The survey results have provided me with a lot of inside information as to the strengths and weaknesses of this department.

First, it indicated that more than half of APPA's members do not know about the information services department. The service is a member benefit, but many are not aware of how once you are a part of this service you help yourself and your fellow colleagues and institutions. Those who do use the service know of it primarily through this column in the quarterly *Facilities*

*Manager*, but also through handouts at the twice-yearly Institutes, and word of mouth from another member or APPA staff. There is a great need for better promotion of this valuable member service. It is free, and you can use it any time by writing to APPA, or by calling the information services hotline at 703-684-4338.

The survey also indicated an overwhelming interest in electronic mail capability. Walt Schaw has established an in-house task force to assess the information needs and systems requirements for providing an enhanced information services via electronic means. The task force consists of Steve Glazner and Tina Myers (co-chairs), Wayne Leroy, Diana Tringali, and myself. I will keep you informed on our progress as it relates to the Experience Exchange Data Base. Who knows? You may later be able to extract information right from your computer, by means of an e-mail/data access system.

The survey also shows an overall evaluation rating of "good" for the information services department. It's not at excellent, but as you can see, we are working on many new ways to improve the department.

As I stated in the beginning, a new International Experience Exchange survey will be going out later this year. The members of the Information Services Committee are currently revising the eight-page survey form that we have been using for the past few years. We still need your help. If there is an issue you would like to have surveyed and for which you think others would have a need, please let me know. If many of the responses have the same issue, we will add it to the survey. ■

Maxine Mauldin is APPA's information services manager.

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For institutions currently using the JOC (Job Order Contract) Program, please contact Wayne Leroy at the APPA office, 1446 Duke Street, Alexandria, VA 22314-3492; or fax 703-549-2772. Thank you!



## Global Exchange

### James Cook University of North Queensland

Edwin A. Dews

Situated in the city of Townsville, Australia at latitude 19°S, James Cook University has a tropical monsoon climate, that has essentially two seasons—wet in the summer and dry in winter. Our campus buildings are fully air-conditioned;

the wet season's high humidity and high temperatures make this essential. We have no heating installed, and the dry, warm winter is very comfortable. We average more than 3,000 hours of sunshine each year.

Special problems with facilities arise from thermal stress, high levels of ultraviolet attack, prolonged droughts (frequently many months without rain) and, when it does rain, very high intensities, e.g., a recent storm with eight inches in two hours! Intense tropical thunderstorms with associated lightning strikes cause power supply problems and disruption of services controlled by microprocessors.

We are publicly funded, but increasing attention is being given, with success, to raising additional funds from private sources. Very substantial research funding is being won from external sources, and the overseas student contingent is growing rapidly.



Many are from the United States and Indonesia. This year, we have 8,500 students, or approximately 7,100 EFTSUs (equivalent full-time student units).

We offer a wide range of courses up to the Ph.D. level, including the humanities, education, general sciences, commerce, economics, nursing, engineering, veterinary science, marine biology, and performing and visual arts. Within each program there is strong emphasis on problems relating to life in the tropics.

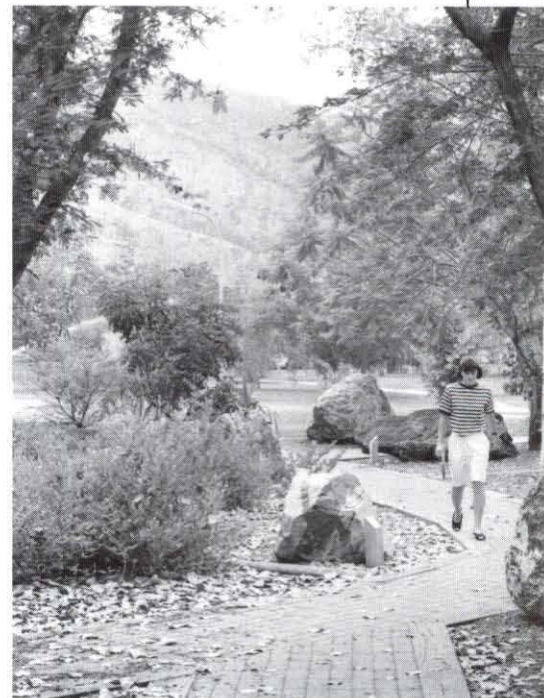
The main campus was started about twenty-five years ago, and we are in the early stages of developing a satellite campus 200 miles north at Cairns. At the main campus we have a large, 400 hectare (1 hectare equals 2.5 acres) land area with generally low-rise buildings (up to four stories) in concrete and concrete masonry construction. Our primary energy source is electricity, supplemented in limited (for laboratory purposes) areas by gas from cylinders.

The staff of the university totals about 1,200, one hundred of whom are in the buildings and grounds division. The controller (buildings and grounds) reports to the pro-vice-chancellor (administration). In U.S.-terminology, a pro-vice-chancellor is the equivalent of a vice president or vice chancellor.

The primary concerns as a facilities manager are common to most: the increasing deferred maintenance list,

general resources shortages, and the pressure on building space. We have more than doubled in size in five years, but our budget has not kept pace. Always present is the effect of isolation. Our major supply centers are all more than 1,000 miles away. ■

*Ted Dews is controller of buildings and grounds at James Cook University of North Queensland in Townsville, Australia. He wrote about construction contracts in the Fall 1990 Facilities Manager.*





## Data Base Update

Howard Millman

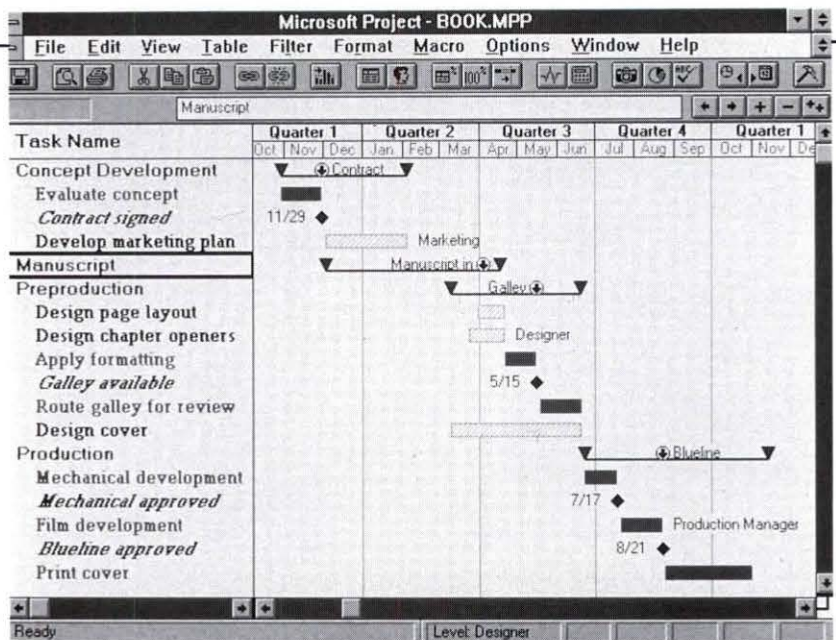
### Microsoft Project Version 3.0 Point-and-Click Project Management

Few facility managers use project management software. Why? Because as a solution it's often worse than the problem. That is quickly changing, so you may want to consider using project management software—experimentally at first, then subsequently for real-world projects.

What can this category of software offer you? We looked at Microsoft's Project to find out. Project is a Windows-based, mouse- and keyboard-controlled application with graphical interface that can provide a consistent flow of accurate and focused data. As a planning tool, Project will help you keep your eyes focused on the horizon while not tripping over the obstacles at your feet.

Project uses two chart layouts to help you control tasks—time driven or logic driven. An example of the first is a

*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.*



Gantt Chart Screen

Working graphically is easy and efficient. Change task dates by dragging the bar on a Gantt chart. To add formatting, just double-click, then select the patterns, colors, symbols and fonts you want.

Gantt chart; an example of the latter is a PERT chart. Despite their differences (more on that in a moment) they share some similarities. In both chart formats you first define the project by dividing it into individual tasks. You establish the relationships of these events to each other by priority, chronology, or a mixture of both (relationships between tasks are called dependencies). Next, you fix the duration of each task. You can express duration in minutes, hours, days, or years. Finally, you assign tangibles—material and financial resources as well as staffing levels.

### Gantt, PERT, and Critical Path

Project's Gantt charts visually inform you when a specific event was scheduled to occur and if it did. They also suggest damage control techniques if the event occurred late. Gantt charts look like annotated horizontal bar charts and usually read from left (project start) to right (project completion).

PERT charts emphasize the linear flow of job progress-based not so much on time, but on priority. Instead of horizontal bars, PERT charts resemble organization charts. Like an org chart, PERT charts use boxes. These boxes, called nodes, contain descriptive text about the event including its duration. PERT charts are particularly adept in providing best, worst, and most likely case scenarios. Just a few keystrokes or mouseclicks switch you between Gantt and PERT chart views.

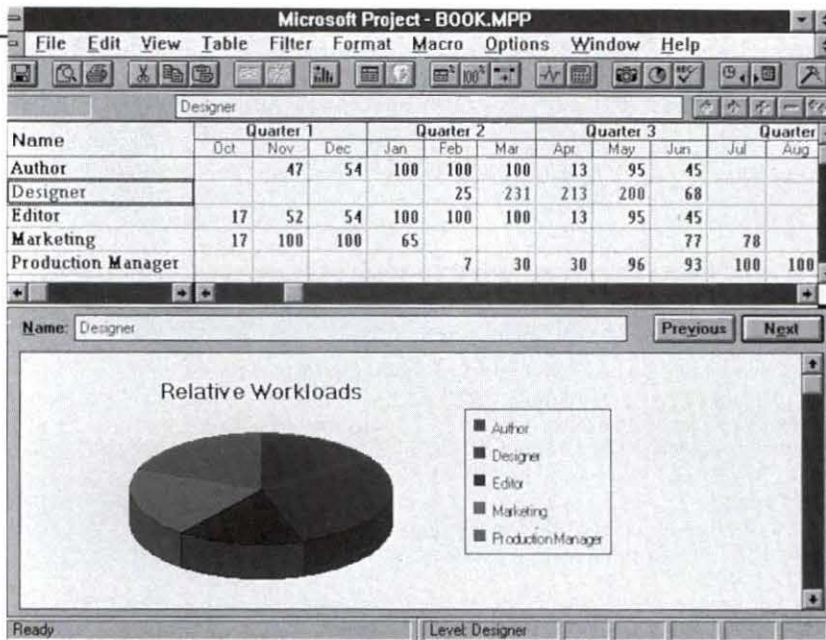
Project's filters enable you to selectively specify, search for, and highlight specific tasks. For example, you can highlight only completed projects, all tasks, tasks in progress, overbudget tasks, or those on the critical path. Critical path is a planning strategy that defines the crucial tasks required to complete a project that must be accomplished in a specific order and on time. By definition, it allows for no slack time. Both Gantt and PERT charts factor in critical path activities.

According to Microsoft, the single most important reason that anyone uses project management software is to create schedules for simple projects. They define simple as a project containing fewer than 100 tasks. In my test of Project, creating the first 100-task project took me about five hours. The second project required less than two hours. I attribute most of the difference to the one-time effort of understanding the program's commands, features, and in customizing its look to suit me.

Project makes it easy for users to customize the way it looks. For example, you can alter the appearance of the menus by adding, deleting, or modifying menu items and changing the terminology to words you routinely use. Also, you can create your own project management forms as well as ad hoc reports that contain what *you* want—not what Microsoft or any other vendor thinks you want.

Project's math capability is limited to addition and multiplication, so you





#### Resource Screen

Keep track of all the people and equipment needed for your project with comprehensive resource management tools. And, for those times when a picture is worth a thousand words, a graphing tool is included.

may have to link it to a spreadsheet for advanced number munching. That's easy to do since Project exploits all of Windows' data exchange techniques. In addition, it will import and export popular file formats including comma delimited, ASCII, dBASE, WK\*, and XLS.

Project's resource graph view depicts your resources (people, finances, and materials). The resources you earlier defined are listed along with the tasks you assigned them to. This feature reveals over-allocation conflicts. Project helps you reduce over-allocation by resource leveling. Some of the techniques it employs include delaying specific tasks, adding resources, assigning overtime, etc. Yet another feature, variable resource loading, provides for temporary scheduling changes. For example, rather than having your supervisors work straight eight-hour days during a project's startup, you might ask them to work four ten-hour days.

In the eye wash department, Project offers multiple fonts, line/bar patterns, and a variety of chart and spreadsheet formats to display project information. To help you understand all of its features, Project offers on-line, context sensitive help.

Project, like all Windows programs, requires a minimum of a 386 computer with 4MB RAM, a 120 MByte (18 millisecond or less access time) hard drive and a color VGA monitor. Don't believe Microsoft when it says you can get by with less horsepower. Project's suggest-

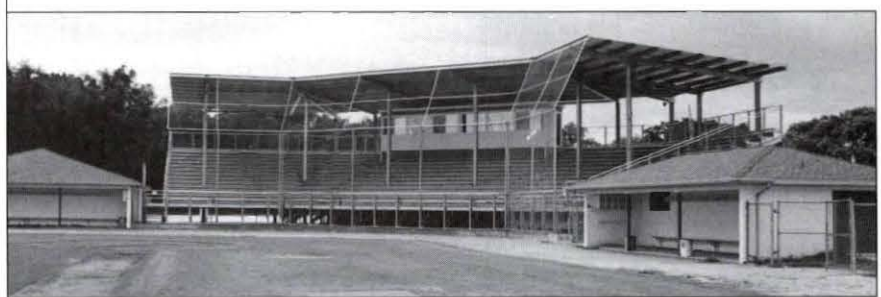
ed list price is \$695. Project will let you plan to the year 2049. If your vision extends beyond that, call me, and let's talk stocks.

### What's the Difference Between Project Management Software and Capital Asset Management Software?

Project management software primarily tracks single, large, complex projects. Generally, these projects are underway or planned, but not yet completed. It uses tasks as the essential building blocks to describe and track the project. It also uses these same tasks to objectively measure progress. Project management software is widely used by engineers, architects, city planners, as well as facility managers contemplating major capital construction.

Capital asset management software is a product primarily used by facility and property managers. It tracks total dollars spent or allocated by craft, vendor, capital project, single building, or multiple buildings. As a result, it will competently track deferred maintenance. While you can use it to manage a number of planned, under construction, and completed capital projects, it is best used for obtaining a fast global overview of the financial and physical condition of your facility's capital assets.

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## The Bookshelf

### DSM

**Demand-Side Management: Concepts & Methods**, by Clark W. Gellings & John H. Chamberlin. Lilburn, Georgia: Fairmont Press, 1988, 465 pp. \$74.95, hardcover.

At its broadest definition, demand-side management (DSM) is a tool created by electric utility companies to ensure their future success and their profit margins.

Utilities today are facing a dilemma. With state regulatory commissions continuing to

cut into utilities' profits by keeping electric rates as low as possible, there is little incentive for an electric company to invest in new power plants. Additionally, environmental concerns have made the construction of new plants quite unpopular.

During the 1980s as the cost of electricity fell and stabilized, customer demand grew. With no new power plants being built, electric generating capacity was fast becoming scarce. While utilities have tried to make up the difference by implementing more cost efficient technologies in existing plants, the problem still persists.

Enter DSM, a method devised by utilities to encourage customers to become more energy-efficient, thereby eliminating the need to build costly power plants. The encouragement is generally offered in the form of monetary incentives, i.e., rebates and/or preferential rate structures.

The objective of these DSM programs is to shift the responsibility for power generation away from electric utilities to the consumer-side, or the demand-side of the meter.

According to an article in *DSM Quarterly*, this means users "will be increasingly obligated to manage their own power supplies, through conservation, load management, bulk power contracting and on-site generation."

Thus, it is imperative for electric utility customers, especially institutional and commercial users, to become DSM literate.

*Demand-Side Management: Concepts and Methods* attempts to do just that: educate. In their foreword to the book, the authors state that their intent is "to bring together in one place, a comprehensive volume of information, techniques, and guidelines for use in demand-side management, planning, and implementation. It is written for the practicing demand-side planner, analyst, or manager. It is intended for those who desire a comprehensive guide to both the engineering as well as the economic aspects of these programs."

In fact, what the authors have created is a fourteen-chapter textbook that provides a comprehensive, in-depth analysis of demand side management. The book meticulously explains the nuances of the various incarnations of DSM and delves into the history, evolution, theory, and practicality of various means of load control.

The reader is presented with strategic and tactical methodologies, including programs that are presently utilized by utility companies and their customers. It also offers foresight into possible future study of these technologies and their implementation.

Using complex mathematical formulas, utilities' rate design structures and planning processes are explained in chapter 8. The authors also provide a detailed analysis of utility cost benefit techniques taken from the consumer's perspectives, the program par-

ticipant, the utility company, the nonparticipant, and society in general. These various perspectives are then compared and examined.

In chapter 9, the reader is taught how a utility company should market DSM strategies and their implementations using detailed statistical modeling to forecast the impact of various programs. Finally, in chapter 14, the future of DSM is analyzed, from the institutional perspective, the technological perspective, and the economic perspective.

In actuality, the book is written for the trained technician, not the day-to-day DSM practitioner. *Demand-Side Management* would make an excellent textbook for a graduate course on electric utility long-range planning. In fact, it has the semblance of a doctoral thesis.

While the authors enumerate the references they used to compile their information (sometimes as many as eighteen per chapter), many of these sources are dated prior to 1980. Used as a university textbook, this lack of timeliness may be relatively minor. But in the realm of practical application, it is a major deterrent, especially when one considers the technological advances that have occurred since the mid-1980s. For information on DSM programs currently in progress, your local utility company is a better source.

In my opinion, the book is too technical, too detailed, and too theoretical for the everyday practitioner. As a treatise on DSM to be used in an academic environment, it's great. As a handy reference guide for a facilities manager, it overshoots the mark. The book's abundance of data hinders the reader's immediate access to tidbits of useful information.

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

—Lenny Zimmerman

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### Property Management

**The Guide to Practical Property Management**, by John Philip Bachner. New York: McGraw-Hill, Inc., 1991. 358 pp. \$42.50, softcover.

For those of you who own an apartment complex, office building, or other commercial property, you might find *The Guide to Practical Property Management* a useful reference manual. The book's author is executive vice president for the Property Management Association, a professional group devoted to management of residential and commercial real estate. This book is based on a series



of contractor guides developed by the association to assist property managers specializing in this field.

The book covers three general areas: basic building maintenance, building services, and business management. The stated intent of the book is to provide property managers with an overall synopsis of these areas and to provide practical tips and guidance in managing them. It does not attempt to provide an in-depth treatise on the various aspects of building construction, maintenance, or business finance and law.

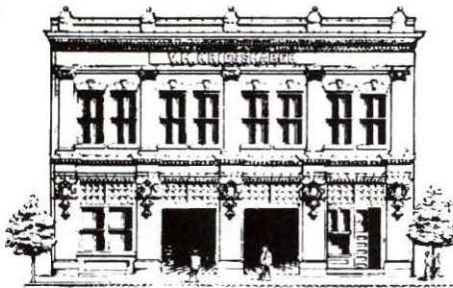
The book devotes five chapters to the topic of building maintenance. Subjects covered include asphalt pavement maintenance and repair, roofing, painting, water treatment, and swimming pool operation and maintenance. The organization of the chapter on asphalt pavement maintenance is fairly typical of the other chapters in this section. It begins with a basic review of asphalt types

and the school of hard knocks. The chapter on dealing with contractors likewise reviews various contract provisions covering various aspects of contractor services, and includes supplementary explanations, the reasons for such requirements, and alternative approaches.

Generally, the book is well-written, com-

plete, and, most importantly, accurate. There is one annoying aspect of the book that detracts from its overall usefulness.

Throughout the book the author refers to the acronyms of professional or trade associations that can provide additional information on the various topics covered in the book. Unfortunately, there is no standardized bibli-



and pavement mixtures. This is followed by a section that defines the basic terminology, using straightforward, nontechnical language. Equipped with a general understanding of asphalt, pavement, and the lexicon used to describe them, the reader is then provided a description of the most common problems encountered, the most likely causes of those problems, and the methods of correction generally followed by the industry. Interspersed with the text are descriptive diagrams, figures, and photographs. There are also examples of various formats for notification of hazards as well as samples of actual work specifications.

The remaining five chapters of the book are dedicated to business aspects of residential and commercial property management. The subjects covered include insurance, risk management, advertising and promotion, and working with consultants and contractors. The chapters on insurance and risk management are quite good. They provide a basic, common-sense description of types of insurance coverage and the most routine methods for controlling one's risk exposure. The chapter on dealing with consultants covers many of the traps that many experienced facility managers have learned (sadly!) via

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ography or reference list that one can quickly turn to for the full citation and address. This makes it difficult to write for additional information. In many cases this information is interspersed throughout the text of the book, and in some cases no reference or footnote is provided.

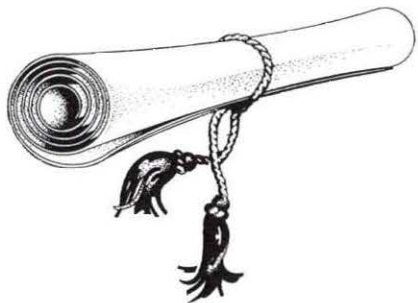
Who would find this book useful? Most experienced facility managers, especially

those within higher education, would find the book to be very elementary. However, to the facilities management newcomer who is dealing with residential and commercial properties, the book is informative and could be a useful reference manual. In this respect, it is probably more of a "beginners" guide to practical property management.

This book is available from McGraw-Hill, Inc., Professional Book Group, 11 West 19th Street, New York, NY 10011.

—William A. Daigneau  
Director of University Facilities  
University of Rochester  
Rochester, New York

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## Participative Management

**Joint Management and Employee Participation: Labor and Management at the Crossroads**, by Neal Herrick. San Francisco: Jossey-Bass, Inc., 1990. 464 pp. \$33.95, hardcover.

Neal Herrick's book, *Joint Management and Employee Participation*, proposes and develops new ground for a changed paradigm or model for management and labor relationships.

Herrick brings a unique perspective to this issue. He is a charter member of UAW local 422 in Farmington, Massachusetts, and has worked as an auto worker, construction worker, municipal worker, salesperson, meteorological aide, football coach, and reporter. He earned a B.A. in English literature and received a Ph.D. in industrial relations. He served as chief of policy development for the Federal Wage and Labor Standards Administration, and he headed the HEW/Labor Task Force that drafted the Occupational and Health Act first submitted to Congress in 1968.

Herrick's proposal develops the concept of incorporating worker participation systems into the existing collective bargaining process and developing additional agreements governing the workplace through the process he calls extended bargaining.

Herrick proposes extended bargaining as a means to create a structured, power-sharing work environment that he feels is the next step in the evolution of the workplace environment. A midpoint in this evolution, Herrick believes, is the participative systems that have become more common in North America.

Employee involvement systems, worker participation, and quality of work life are all terms that have been used to describe this new approach. Such programs emphasize the involvement of employees in solving a variety of production and quality problems, and are typified by the "quality circles" approach now often found in industry.

Herrick and other experts attuned to the philosophical orientation and history of unions have serious questions about the role of such team concepts. Some of the more extreme observers charge that such teams "are no more than management's latest tool for speeding up production and busting unions."

Herrick believes that the best way to



address these issues and concerns is to formalize these workplace changes through the extended bargaining process, making participative behavior on the part of managers enforceable, ultimately increasing worker satisfaction and productivity. Also, this would give unions a clearer role and responsibility in workplace management and would strengthen the relations between workers and their unions. A fundamental issue is the clear and growing need to have better cooperation between labor and management, and the need to somehow overcome the long history of labor and management conflict.

Herrick develops his case carefully and draws much background and rationale from behavioral science theorists and management authorities, as well as organizational development concepts.

Although the book is well written and develops the theories and concepts carefully, the recommendations and approaches will be difficult to apply in the public sector.

The concept of having large policy-setting committees made up of elected workers that set goals and establish operational policies for operating organizations may be an excellent approach in some circumstances. But given the difficulty of developing performance analysis in the public sector, it seems unworkable.

The sole case in which a process somewhat similar to that described by Herrick is identified in the public sector is the Pima County government in Arizona. Herrick reports that there are considerable differences in his concept and that used in Pima County and notes, "It is important to recognize that the dynamics of public sector organizations do not favor participative management. In order for meaningful participation to exist, top management must make it in the interests of middle and lower level managers to share power."

Ultimately, I found Herrick's proposal to be stimulating and full of effective arguments from the union perspective that those of us in management rarely have an opportunity to review and consider. I also began to better understand the difficult situations that unions are in now. Faced with a declining membership and limited financial gains for members, new issues pivotal to the day-to-day life of members are being sought. I doubt that these ideas and concepts will be implemented soon. Some of the organizational concepts would make responsibility so distributed as to be indefinable, and organizational problems and deficiencies would be nearly impossible to pinpoint and take timely action on. This book does provide worthwhile reading, however. Challenging points are made, and the prospective taken will give new insights for public managers.

This book is available from Jossey-Bass, Inc., Publishers, 350 Sansome Street, San Francisco, CA 94104.

—George Hecht  
Director of Physical Plant  
University of Oregon  
Eugene, Oregon

## Design

**Design of General-Purpose Classrooms and Lecture Halls**, by Robert L. Allen.  
University Park, Pennsylvania: Penn State University-wide Classroom Improvement Committee, 1992. 53 pp. \$10, softcover.

*Design of General-Purpose Classrooms and Lecture Halls* wants to be a detailed, informative manual for facilities and instructional people in higher education, which combines data from visits to nine universities for classroom and lecture hall improvements. These visits were to provide data for a comprehensive design manual in classrooms and lecture hall improvements for changing teaching technologies and creating general guidelines to the needs of the future.

However, this book does not fit this crite-

ria. There are numerous errors, such as on page 1, which states that a general-purpose classroom shall be at least 350 square feet and have a minimum capacity of twenty students. Anything less than that is defined as a seminar room, which has its own set of requirements.

The basic minimum requirements of a classroom is 650 square feet and minimum ceiling height of twelve feet. All entrance and exit doors to classrooms are mandated to give accessibility to students with disabilities and shall meet a minimum requirement of 42 inches wide by 7 feet high. All large lecture halls shall have windows to outer air, light, and ventilation. In reviewing this book, I find that perhaps it was testing the knowledge and experience of the reviewer. My recommendation is that I can not refer this book to any facilities professionals.

This book is available from Penn State, University-wide Classroom Improvement Committee, 206 Special Services Building, University Park, PA 16802.

—Daniel A. Terribile  
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### 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 **May 10** for the June issue, **May 25** for July, and **July 9** for August. Closing deadlines for job announcements are posted at the request of each institution. In some cases, deadlines may be extended by an institution. APPA encourages all individuals interested in a position to inquire at the institution regarding its closing/filing date. Send all ads, typed and double-spaced, 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.

■ ■ ■

**Associate Director for Engineering and Construction, Physical Plant.** West Virginia University is seeking to fill a new position of associate director for engineering and construction. This position reports to the director of physical plant. The associate director is responsible for planning, program-

ming, designing, and supervising matters pertaining to the university's construction and engineering projects, its energy management program, the utilities department's environmental responsibilities, and related matters. The associate director will participate in program development and will executive alteration, construction, and engineering projects. This position also manages the elevator maintenance program, major construction estimating, alteration construction, and facility as-built documents and computer drafting functions. Requirements include a BS in engineering (mechanical, civil, or electrical) or architecture with additional formal training in business administration, particularly in the areas of organization, management, finance, accounting, and computer systems/operations.

Master's degree in business administration, engineering, or architecture is desirable. Professional license required in related field. Experience should include a minimum of multi-building facilities with overall professional experience of a minimum of ten years. Extensive experience in commercial construction, facility procurement, and budget management is highly desirable. Salary will be commensurate with qualifications. For consideration send resume and names of three references to Stephen S. Showers, Assistant Vice President for Facilities and Services, West Virginia University, P.O. Box 6555, Morgantown, WV 26506-6555. The position will remain open until a suitable candidate is selected. *WVU is an affirmative action/equal opportunity institution.* ■

### ASSISTANT DIRECTOR OF PLANT OPERATIONS #93-182 DEKALB COLLEGE

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DeKalb College, located in metropolitan Atlanta, enrolls approximately 16,000 students on four campuses. The physical plant department has a staff of 100 employees and is responsible for maintenance, construction, and grounds on all campuses.

Responsible for assisting the director of plant operations with the management of personnel, budgets, and maintenance. Bachelor's degree required (engineering, architecture, construction technology, maintenance, etc.). Ability to establish and maintain effective working relations with diverse college community; excellent oral and written communication skills; demonstrated proficiency in mechanical and structural trades; working knowledge of computer, architectural plans, and specifications. Recent supervisory experience (minimum five years) relating to construction and/or building management of a complex educational facility or equivalent. Salary commensurate with experience. Excellent benefits. Start date: ASAP.

To be considered, applicants should reference position number 93-182 and send the following as a single packet: 1) letter of interest, 2) resume, 3) unofficial copy of college transcript(s), and 4) list of three references. Send to: Judy Chastonay, DeKalb College, Personnel Dept., 3251 Panthersville Road, Decatur, GA 30034.

*DeKalb College is an equal opportunity, affirmative action employer that invites and encourages applications from minorities. Georgia is an open records state.*

**Deadline: April 30, 1993.**



## Director of Physical Plant

The University of Iowa is seeking candidates for the position of director of physical plant. The university is a leading teaching and research institution, including a large health care complex, with an enrollment of more than 27,000 students and a budget of more than \$1 billion. The director of physical plant reports to the university business manager and is a part of the senior management group in finance and university services. The director is responsible for providing direction and coordination of the university's physical plant services including the operation and maintenance of 6.5 million square feet of building space, 1,900 acres of grounds, and the production and distribution of utilities for more than 11 million square feet.

A bachelor's degree in engineering, business administration, or an equivalent combination of education and experience, is required. Extensive knowledge and experience in a comparable physical plant operation including appropriate administrative and management responsibilities is required. Experience in a comparable major research university is desirable.

Applications and nominations should be sent to: N. June Davis, Chair, Physical Plant Director Search Committee, 416 North Hall, The University of Iowa, Iowa City, IA 52242-1223. Questions may be directed to Ms. Davis at 319-335-0011. Screening will begin immediately and continue until the position is filled.

*Members of minority groups and women are encouraged to apply. The University of Iowa is an equal opportunity, affirmative action employer.*

## Director of Facilities Management

California State Polytechnic University, Pomona, invites applications and nominations for the position of Director of Facilities Management. Cal Poly Pomona, noted for its scenic 1,400 acre campus, is located 25 miles east of Los Angeles near the foothills of the San Gabriel mountains. The university is comprised of approximately 2,000 faculty and staff personnel educating over 18,000 students.

### The Position

The Director of Facilities Management reports to the Associate Vice President of Capital Planning and Facilities Management, and is responsible for the management, maintenance and repair of approximately 1,800,000 gross square feet of State supported facilities and 548 acres of landscaped grounds. The Director has responsibility for the efficient administration of the Facilities Management Department's subunits including Administrative Services, Building Trades, Engineering Services, the Work Order/Service Center, Transportation Services, Grounds and Landscape Services, Facilities Services and the Department Plan Room.

A primary function of this position is to provide technical expertise to campus administrators and academic departments regarding facilities management concerns. The Director has the responsibility for initiating and maintaining a good working relationship with the campus community. The Director also serves as a member of the Campus Planning Committee and other committees as assigned.

The Director represents the Associate Vice President of Capital Planning and Facilities Management when necessary.

This position serves at the pleasure of the President.

### Qualifications

The position requires six years of experience in planning, organizing and directing the work of a large journey-level work force consisting of four or more of the building, engineering, and/or maintenance trades, which clearly demonstrates the ability to independently perform the wide range of complex and responsible management and technical assignments associated with physical plant administration such as: utilities management, preventive maintenance programming, contract administration, building inspection and fiscal planning and control. Experience in an academic setting is desirable. Strong management and communication skills are necessary for this position.

The position also requires the equivalent to graduation from a four-year college or university with a relevant degree. (Additional experience beyond the minimum requirement, which has demonstrated that the applicant has acquired and successfully applied the knowledge and abilities shown above, may be substituted for up to two years of the education on a year-for-year basis.)

### Compensation

The starting salary, \$57,600 to \$73,000, will be negotiated depending on qualifications. The position includes an attractive management benefits package.

### Nominations and Applications

A university application, resume, and completed supplemental questionnaire are required. Final date to submit nominations or request application materials is **April 21, 1993**. Nominees for the position will be invited to apply. For information, please contact the Personnel Services Department, Cal Poly University, 3801 West Temple Avenue, Pomona, CA 91768, 909-869-3733

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### Coming Events

#### APPA Events

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

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

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

**Aug. 22-27—Institute for Facilities Management.** Milwaukee, WI.

#### Regional/Chapter Meetings

**May 23-25—Virginia APPA Conference.** Williamsburg, VA. Contact: Jo Brooks, Colonial Williamsburg Foundation, P.O. Box 1776, Williamsburg, VA 23187-1776; 804-220-7028

**Sep. 6-7—Facilities Management: International Problems, Local Solutions.**

Surfers Paradise, Queensland, Australia.

**Sep. 17-20—CAPPA.** Dallas, TX. Contact: Kirby Vahle, University of Texas/Southwestern Medical Center, 214-688-2400.

**Sep. 19-21—RMAPP.** Alberta, Canada. Contact: Gordon Bulat, University of Alberta, 403-492-4210.

**Oct. 3-6—ERAPPA.** Saratoga Springs, NY. Contact: Richard Drury, Hofstra University, 516-560-6623.

**Oct. 3-6—MAPPA.** Lansing, MI. Contact: Ron Flinn, Michigan State University, 517-355-3366.

**Oct. 9-13—SRAPPA.** Charlotte, NC. Contact: Robert Collins, Davidson University, 704-892-2220.

**Oct. 10-13—PCAPPA.** Bellingham, WA. Contact: Peter Harris, Western Washington University, 206-676-3492.

#### Other Events

**May 4-5—Idea\$ 1993 Energy Symposium Energy Efficiency-An Investment in the Future.** Birmingham, AL. Contact: Kenny Spain or Bob Quick, University of Alabama/Huntsville at 800-874-3327.

**May 5-8—National Association of Educational Buyers Annual Meeting.** Atlanta, GA. Contact: NAEB, 450 Wireless Boulevard, Hauppauge, NY 11788.

**May 6-9—Level III-Advanced Roof Consulting.** Raleigh, NC. Contact: Roof Consultants Institute, 7424 Chapel Hill Road, Raleigh, NC 27607; 800-828-1902.

**May 7—AHERA Refresher Course for Asbestos Abatement Project Designers.** Berkeley, CA. Contact: UC Berkeley Extension, 2223 Fulton Street, Berkeley, CA 94720; 510-643-7143.

**May 10-14—Hazardous Substances: Basic Evaluation, Management, and Control.** Salt Lake City, UT. Contact: Program Coordinator, Rocky Mountain Center for Occupation and Environmental Health, Building 512, University of Utah, Salt Lake City, UT 84112; 801-581-5710.

**May 24-25—1993 ICP National Conference.** Point Clear, AL. Contact: DOE at 202-586-8034.

**Jun. 7-10—A/E/C Systems '93.** Anaheim, CA. Contact: Sharon Price, A/E/C Systems '93, P.O. Box 310318, Newington, CT 06131-0318; 800-451-1196.

**Jun. 13-15—Fans and Air Systems Seminar.** Chicago, IL. Contact: AMCA, 30 West University Drive, Arlington Heights, IL 60004; 708-394-0150.

**Jun. 14-17—The Intelligent Buildings Conference.** Chicago, IL. Contact: NeoCon at 800-677-MART (6278).

**Jun. 15-16—Indoor Air Quality Congress '93.** Boston, MA. Contact: Association of Energy Engineers, 4025 Pleasantdale Road, Suite 420, Atlanta, GA 30340-4264; 404-925-9633.

**Jun. 15-16—Implementing an Effective**

**Natural Gas Purchase Program.** Boston, MA. Contact: AEE Energy Seminars, P.O. Box 1026, Lilburn, GA 30226; 404-381-9865.

**Jul. 4-8—6th International Conference on Indoor Air Quality and Climate: Indoor Air '93.** Helsinki, Finland. Contact: Indoor Air '93, P.O. Box 87, SF-02151 Espoo, Finland; fax 358-0-451 3611.

**Jul. 11-16—Safety: Challenging the Summit, 40th International Conference of the Campus Safety Association.** Bellingham, WA. Contact: Campus Safety Association, Western Washington University, Old Main Room 345, Mail Stop 9018, Bellingham, WA 98225; or call Jose Harrison at 206-650-6511.

**Jul. 31—Rutgers Gardens Annual Open House.** New Brunswick, NJ. Contact: Sherry Dudas, Friends of the Rutgers Gardens, c/o Cook College, Office of Continuing Professional Education, P.O. Box 231, New Brunswick, NJ 08903; 908-932-9271.

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A large photograph of a female student with glasses, wearing a white t-shirt, sitting at a desk in a classroom. She is leaning her head on her hand and writing on a piece of paper. In the background, other students are visible at their desks, and a teacher is standing. The scene is dimly lit, suggesting it's late in the afternoon.

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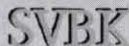
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