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Facilities Manager

Volume 11 Number 2 SPRING 1995

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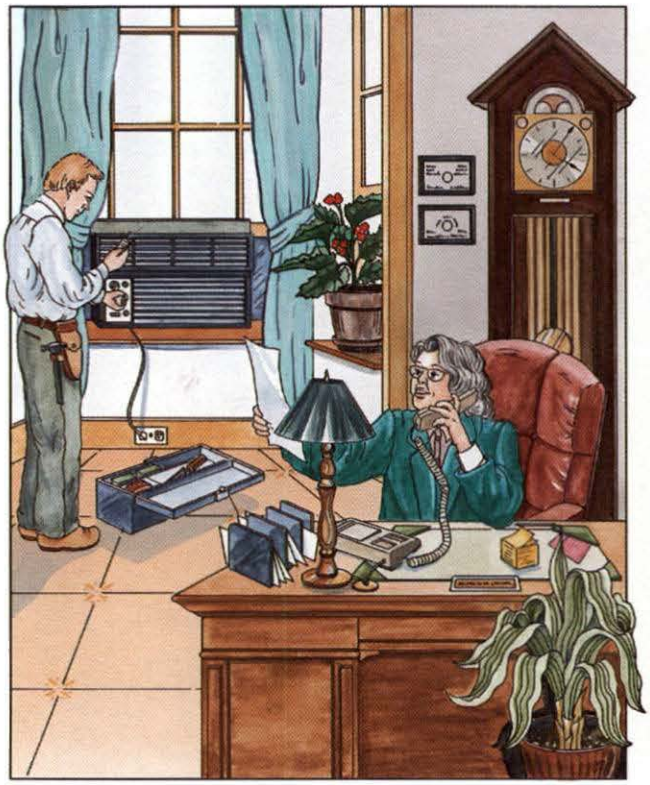

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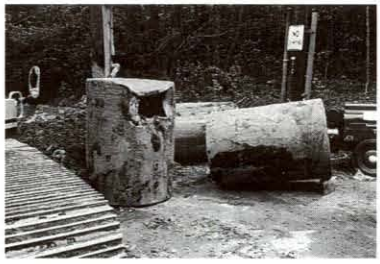

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From The Editor

Steve Glazner

How do we measure our operations? What comparisons do we make to show ourselves, and the people we report to, that we are doing a good job? What, indeed, is the definition of "a good job?" The perspectives and expectations of the president, electrician, or visiting parent are bound to be quite different from those of the biology professor, sophomore, or bookstore manager. Each has his or her own needs and desires defining accomplishment or success, and each has one or more roles within the structure of the educational institution.

For more than twenty years, through the biennial *Comparative Costs and Staffing Report for College and University Facilities,* APPA has attempted to provide comparisons of staffing levels, salaries, budgets, utilities costs, and more to assist the campus facilities officer in developing their budgets, justifying new staff, or seeing if another school has a better way of managing some part of their facilities operation. As valuable as this report may be, its shortcomings include being too dependent upon consumption (how much did we spend? how much electricity did we use? how many custodians do we have? how much do they clean per day?), and not focusing on departmental or institutional expectations and how those goals were met.

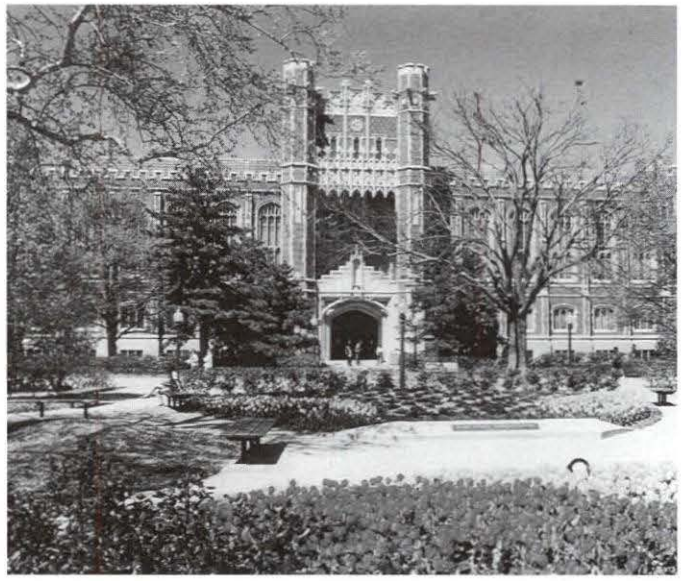
Our cover story on benchmarking describes a process and approach about which much has already been published. APPA and American Management Systems are working together to improve the comparative data we collect and how it can best he utilized by the facilities officer; we asked Dave Smith of AMS to introduce the topic as it may relate to higher education facilities management. We have also included a related article by Maurie Pawsey and Tonia Walker, providing an Australian perspective to the topic of nomenclature, definitions, and measures of comparison.

In this issue you will find several changes in our regular departments. Howard Millman's Database Update has been renamed Software & Solutions, in order to better define the valuable information he has provided our readers for most of the past ten years. And we introduce two new columns, both written by APPA staff members: in Executive Summary, Wayne Leroy will report on trends and issues in education and society and analyze how they will affect the business of facilities management; and in Information Access, Diana Tringali will update readers on the progress of APPANet and our growing information collection and dissemination activity.

Finally, see pages 15-17 for a sneak peek at the Philadelphia annual meeting. More information is on its way to you through the preliminary program. We look forward to seeing you at the July conference. ■

APPA News

University of Oklahoma is Award for Excellence Winner



A spring scene on the University of Oklahoma campus.

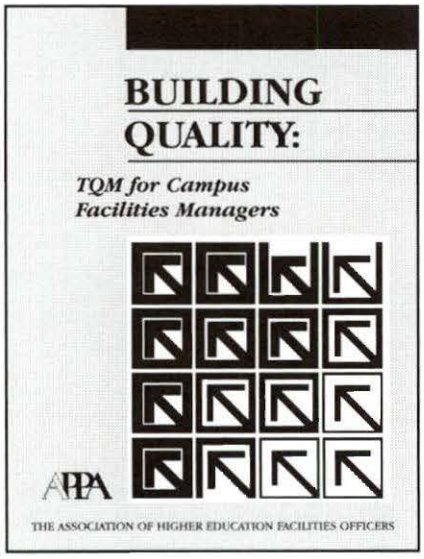
The University of Oklahoma has been named winner of APPA's Award for Excellence in Facilities Management. APPA President Charlie Jenkins presented the award to Director of Physical Plant Ben Kinder in a ceremony attended by Jerry Farley, OU vice president for administrative affairs, and more than 400 employees of the physical plant organization, who were the award recipients.

"We are pleased for the recognition. The whole staff really earned the award, and we want to stress the group effort," said Kinder.

The award specifically recognizes the university physical plant department's success with its energy management program, the condition and appearance of the campus, effective preventive maintenance, and customer service, among other accomplishments. "The award indicates a true commitment to service and teamwork by the facilities organization to everyone at the University of Oklahoma," said APPA Executive Vice President Wayne Leroy.

The Award for Excellence is APPA's highest institutional honor, recognizing institutions for their outstanding achievements in facilities management. Institutions compete for the award against a set of criteria developed by APPA's Professional Affairs Committee. An institution may be awarded an overall award, an award in any one of the nine categories of excellence, or an award for a combination of categories.

To be considered for an award, institutions must first submit an application that includes a report detailing how the facilities department exemplifies excellence in accordance with the established criteria. Institutions wishing to



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be considered for the award should contact Wayne Leroy at APPA, 703-684-1446, or contact your regional representative on the Professional Affairs Committee. ■

On-line Engineering Information

The American Society for Engineering Education (ASEE) will take over development of national engineering information system, or digital library, from the Council on Library Resources. The information system is part of the National Engineering Information Initiative, which includes a listserv on the Internet, various projects funded by Cornell University, and a Cornell University Engineering Library World Wide Web server that points to engineering information sources on the Internet.

Individuals interested in joining the NEII listserv on the Internet should send e-mail to listproc@cni.org, with the following message: subscribe NEII your name. No other information should follow this message. ■

Financing Options for Energy Upgrades

The EPA Green Lights program has available several resources to help institutions locate funding to finance energy upgrades. *The Green Lights Financial Directory* is a computerized listing of all known major utility rebate programs in the United States, and also provides names of third-party financing companies for lighting upgrades.

Also available is a booklet on *Requests for Proposals and Requests for Quotes*, which provides information on structuring performance contracts with energy service companies. To receive copies of these resources, contact the Green Light/Energy Star Hotline at 202-775-6650. ■

George Mason University to Become Virtual Campus

George Mason University in Fairfax, Virginia has contracted with Bell Atlantic to develop a comprehensive university communications network. The network will link voice, data, and video to its three campuses, classroom dormitories, and administrative office. The project, for which construction has recently begun, will include rewiring 90 percent of the Fairfax campus buildings with fiber optic and high capacity copper cabling. Immediate results will include specially equipped distance learning facilities at Prince William and Fairfax campuses, an interactive classroom with twenty to twenty-five student workstations linked to the instructors, and a presentation classroom with the instructor station linked to the university library. The plan is to add up to fifteen electronic classrooms within a few years. ■

Cornell Wins ASHRAE Award

ASHRAE, the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., selected Cornell University's thermal storage addition to its chilled water system as one of eight 1995 Technology Award winners. William P. Bahnfleth, Penn State Unviersity, and W.S. (Lanny) Joyce, Cornell University, received a first place award in the industrial facilities or processes category. The thermal storage project reduces instantaneous energy consumption up to 50 percent, and annual energy use by more than 10 percent. ■

Executive Summary

Wayne E. Leroy, CAE

External Trends and Institutional Issues

In this new column, I will attempt to convey a message that encourages APPA members and *Facilities Manager* readers to "look outside the box" of your day-to-day routines and thoughts. Executive Summary is designed to encourage you to think about facilities in the broader context of the entire higher education enterprise, as well as the importance of partnerships and connections to other groups and organizations.

• • •

The November elections made newspaper headlines and was the top story on every television and radio news report. With national, state, and local political leaders now ensconced in office, CHANGES are occurring! The news media report that these changes are the "mandates of the people." We are seeing new legislation being introduced, modifications made to regulations, consolidation of government bureaucracies, reduced spending, and many other initiatives designed to make government more efficient and effective.

It is important, now, to step back, take a deep breath, and analyze what all this might mean to higher education and, specifically, higher education's largest capital asset—its facilities. I know of no better way to do this than to utilize the results of a recent survey conducted by the Association of Governing Boards of Universities and Colleges (AGB). Each year AGB surveys a representative sample of college and university presidents, trustees, senior administrators, and others involved in higher education. The results of the survey are divided into two categories, External Trends and Institutional Issues. I would like to offer some observations and comments based on these, and perhaps provide some food-for-thought as to their relationship to facilities.

Wayne Leroy is APPA's executive vice president.

External Trends

On a daily basis all one needs to do is pick up a newspaper in any community, listen to the local evening news report, or read a professional journal from one of the higher education professional associations to hear all that is wrong with higher education. There is no shortage of controversies involving athletic scandals, misuse of research funds, low faculty workloads, unproductive staff, or a host of other items. The general feeling can best be summarized by the jargon of hundreds of current management books and articles, that "higher education is unresponsive to constituent needs, its students, the future employers of its students, and the public at large." In short, higher education has an image problem! That is not to say that higher education does not have an economic value, for dozens of studies prove that a college education has significant impact on the lifetime earnings of individuals. Instead, the problem is one of perception; the image of many institutions of higher education convey large bureaucracies, rampant with inefficiencies, showing little regard for students, parents, or the community, and a tremendous drain on state and local economies.

As public opinion about higher education continues to erode, other forces are also at work that cause consternation for higher education institutions. One such force is the shift in student demographics. A scant twelve years ago white students comprised over 80 percent of the nation's college/university student body; today 25 percent of the 14.8 million enrollment are minority and foreign students. In 1994-95, women are 55 percent of total enrollment, 45 percent of students are part-time, and one out of every seven are graduate students.

Economic performance of the nation and of specific regions are also a vital concern, and the resultant educational policies are of major interest, especially to state-supported institutions. As public pressure escalates for less taxes and lower government spending, increased competition for fewer resources will become a political reality. All areas now utilizing public funds, such as corrections, law enforcement, and social services (Medicare, etc.), will be making their case for a larger piece of a smaller pie. Perhaps we will even see increased tension among various educational groups such as elementary and secondary educational interests pitted against higher education for shrinking resources. What does all this mean to you and your institution? Let's put it into perspective by switching from the external trends of the AGB survey to institutional issues.

AGB's Top Ten Priorities for 1995

• • •

1. Public Opinion Toward Higher Education
2. Demographic Trends
3. Family Income and Savings Rates
4. Regional and Sector Economic Performance
5. State Education Policy
6. Tuition Policy and Financing
7. Productivity and Cost Control
8. Mission/Strategy/Planning/Budgeting
9. Enrollment Management
10. Charitable Giving

Source: January/February 1995 issue of *Trusteeship*.

Institutional Issues

The first area is tuition policy and financing. During the last academic fiscal year $42 billion was expended for financial aid, $31 billion of which was from federal sources. On America's college and university campuses approximately 75 percent of all students receive some type of tuition assistance. This is due to several circumstances: the recruitment of economically disadvantaged students, general flat earnings and less savings investment by parents, and the general trend by colleges and universities to increase tuition and fees to maintain current levels of expenditures. At a time when cost of living increases have been about 3 percent per year and family incomes and saving have been stagnant, tuition increases have skyrocketed.

Between 1977 and 1994 the consumer price index has risen 141 percent, health and medical costs have increased by 265 percent, and higher education tuition has increased by 347 percent. To remain competitive and to maintain enrollments, colleges and universities will be forced to continue offering student tuition assistance. When faced with the options, three scenarios are apparent:

1. Dip into the institution's endowment funds. The recent NACUBO Endowment Study indicated endowments earned 3 percent last year, but declined in total value by 6 percent.

2. Enhance private giving by donors, corporations, and alumni. However, for reasons stated in the external trends areas—concerns such as public perception, lower economic performances, and stagnant family incomes and savings rates—private giving to higher education is static.

3. Utilize funds from the current operating budget. This is usually accomplished in one of two ways or in combination: increasing revenues usually through non-traditional sources (i.e., fees and auxiliary sources), or reducing expenses. Since facilities represent one of the largest percentages of an institutions discretionary funds, it is evident that facilities organizations will be greatly affected by pressures to enhance non-traditional revenues and/or curtail expenses.

The second area of importance is productivity and cost controls. To control costs and bolster sagging public opinion, many institutions are exerting all-out efforts to enhance productivity. This effort is taking many different forms at various institutions: contracting for services or outsourcing, cooperative agreements/partnerships, restructuring, downsizing/rightsizing, reengineering, reallocation of resources, quality management initiative, and the list goes on and on. The one common thread running throughout these activities seems to be a constant increase in the amount of information needed to make management decisions and an ability to compare/benchmark one's own institution against others in similar peer groupings.

The third area is institutional mission, strategy, planning, and budgeting. The concept of strategic planning is becoming critical. Workable models to find solutions to some of higher education's dilemmas cannot be designed until such questions are asked such as: Where do we want to go? How do we get there? How do we measure our success? Developing an appropriate institutional strategic plan is a prerequisite to developing an appropriate strategic facilities plan. However, once the plans are developed, their implementation will require vision, courage, leadership, and discipline.

Indeed, there are changing as well as challenging times ahead. Solutions to the obstacles facing higher education will require exceptional teamwork, not only at the institutional level, but everyone who has an interest and stake in higher education. It will require a commitment by each of us to equip and prepare ourselves to be a contributing member of the team when we sit around the table and decisions are being made affecting institution's largest capital asset—their facilities. ■

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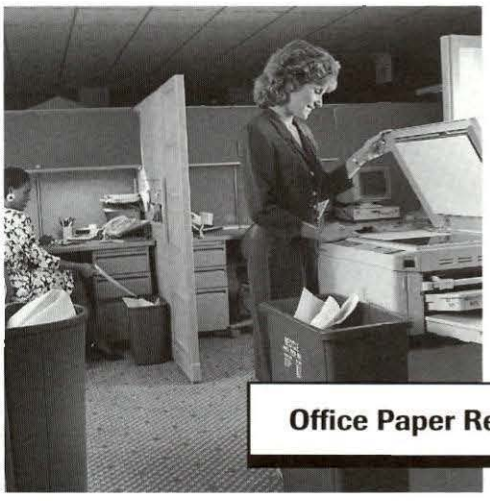

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by Harvey H. Kaiser

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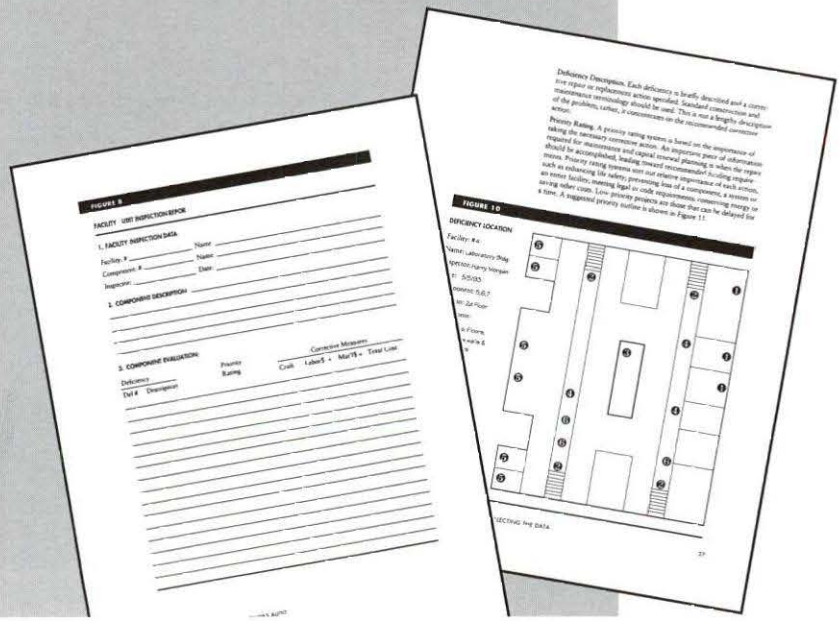

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Capital Notes

Barbara Hirsch

APPA Conducts Successful Legislative Conference

APPA launches grass roots education program. On February 1, as part of the mid-year Board of Directors meeting, thirty APPA members visited their representatives and senators to discuss unfunded mandate and risk-assessment cost-benefit analysis legislation. The visits followed a breakfast training session with speakers Dr. Robert Simon, Science Fellow to the Senate Energy and Natural Resources Committee, Joe Spoonemore, Senior PCAPPA Representative, and Barbara Hirsch, APPA Government Relations Director. Dr. Simon discussed the legislative history of unfunded mandate and risk assessment bills and offered examples of current regulations, such as asbestos and radon, that either used faulty risk assessment or no risk assessment at all. Joe Spoonemore, a veteran of last year's program, discussed the highlights of his 1994 visits to Senators Patty Murray and Slade Gorton and then Speaker of the House Tom Foley. I then shared some tips on conducting the Hill visit.

Feedback so far has been extremely positive. APPA members were surprised that members of Congress and their staffs were so willing to hear their views, and they discovered how easy it was to "walk the halls" and drop in, even if they didn't have an appointment. Of course, it didn't hurt that the unfunded mandate bill was passed in the House the same day as the APPA visit, a victory for which APPA members properly take full credit.

I encourage all APPA members to make contact with your representatives and senators. It's easier than you think:

- **Call the APPA office if you are planning a trip to the Washington area.** We will assist you in making an appointment with your member of Congress and provide you with a legislative packet, which includes a congressional directory and issue summaries.
- **Visit your representative back home.** There is no need to travel to Washington to meet with your member of Congress. Both representatives and senators come back to the state for "district work periods." For a congressional calendar and legislative packet, call the APPA office.
- **Invite your representative for a campus visit.** There is no better way to bring your point home than by showing your congressperson how federal mandates affect your campus.

However, before making any Capitol Hill contacts, be sure you have cleared your activities through the proper channels. This means to check with your campus legislative office, business officer, or president. If your experience is anything like that of the APPA leadership, you will find them to be very supportive of your activities.

Barbara Hirsch is APPA's director of government relations.

Regulatory Reform

Unfunded mandate legislation passes in both Houses. The House of Representatives and the Senate have overwhelmingly passed unfunded mandate legislation. On February 1, 1995 the House passed the Unfunded Mandate Reform Act (HR 5) by 360-74. The Senate passed its measure (S 1) on January 27, 1995 by 86-10. The bill will be cleared for signing by the President after a short House-Senate conference to iron out some minor differences in the two bills. Major provisions of the House bill:

- Establish a $50 million threshold on the costs Congress can impose on state and local governments. The bill requires that Congress take a specific, separate vote on any measure that would impose unfunded mandates on state or local governments in excess of that amount.
- Charge the Congressional Budget Office (CBO) with the responsibility for determining which bills exceed the threshold. The CBO would also be required to detail the costs of private sector mandates in excess of $100 million ($200 million in the Senate version).
- Require that federal agencies explain the costs, expected benefits, and economic implications for any regulation that would cost either state and local governments combined, or the private sector, $100 million or more to implement in any given year.
- Require that any new legislation or reauthorization specify how its programs will be funded.

Regulatory reform bills target risk-assessment cost-benefit analysis and private property takings. On January 4 the House of Representatives introduced a comprehensive regulatory reform bill (HR 9). Two titles of this bill address risk-assessment cost-benefit analysis and private property takings.

The major provisions of Title III on risk assessment would require:

- Federal agencies to conduct risk assessment and cost-benefit analysis for all rules and regulatory programs that cost the public $25 million or more annually; and
- Peer group review of all analyses.

Several amendments to Title III have been offered, including one that would apply risk assessment and cost-benefit analysis to existing environmental laws; another would expand the number of agencies covered by the law. Title III as written would cover the Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), the Department of Transportation (DOT) (including the National Transportation Safety Board), the Food and Drug Administration (FDA), the Department of Energy (DOE), the Department of the Interior, the Department of Agriculture (USDA), and the Consumer Product Safety Commission.

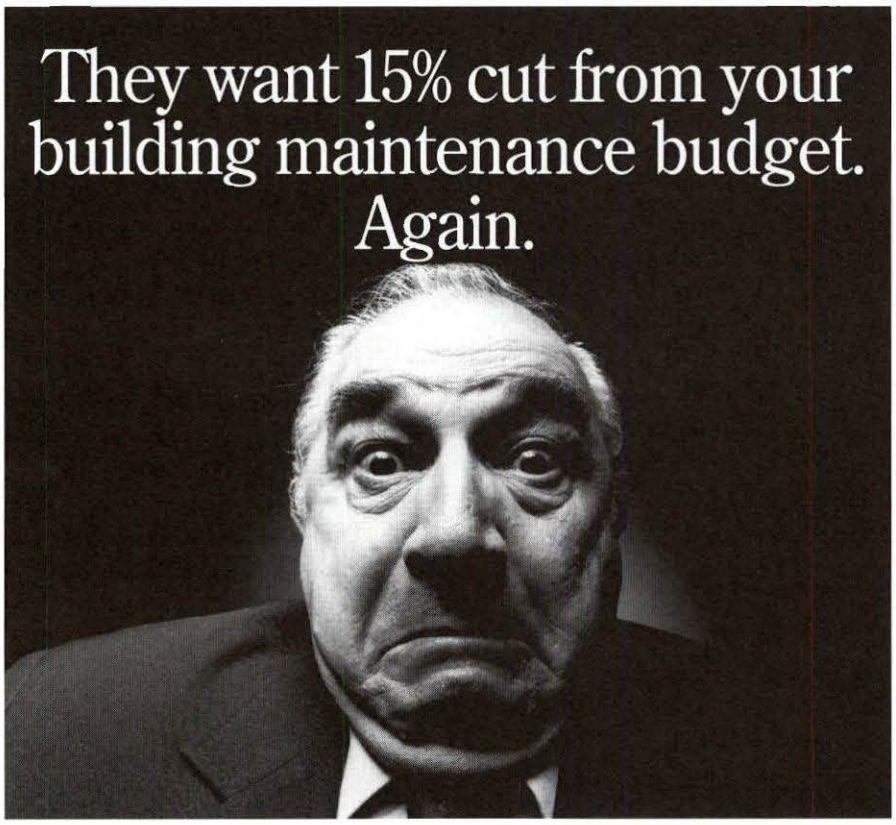
The major provisions of Title IX on private property takings would:

- Entitle owners to receive compensation for any reduction in property value of 10 percent or more resulting from an agency action;
- Establish a fund to compensate landowners;
- Establish arbitration procedures; and
- Require a halt to agency action pending resolution of a property owner's claim.

These two provisions are part of a larger regulatory reform measure that addresses a host of issues, including paperwork reduction, regulatory flexibility, and cost control of federal mandates. Both the risk and takings provi-

sions of the bill are currently in hearings, and are expected to be approved for floor debate before the 100-day deadline of the GOP's "Contract With America."

The Senate also has several regulatory reform bills addressing risk assessment cost-benefit analysis (S 291, S 343, and S 348) and private property takings (S 22 and S 145) in hearings, including Sen. Bob Dole's (R-KS) regulatory reform bill (S 343), which would allow for review of existing regulations. The House regulatory reform bill (HR 9) does not address existing statutes, but there have been rumblings on both sides of the aisle that environmental regulations, including the Clean Air and Clean Water Act, could come under review.



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House and Senate introduce regulatory moratorium bills. The House and Senate have introduced a pair of bills (HR 450 and S 219) that call for a retroactive moratorium on federal rulemaking. The House bill would freeze regulations from November 20, 1994 through December 31, 1995. Both bills were drafted with a starting date of November 8, 1994, but the House pushed up its starting date by two weeks allowing more than one hundred rules to go into effect, including a dozen environmental regulations. Among the regulations saved by the change of date is the EPA final rule on stratospheric ozone protection during refrigerant chemical recycling. HR 450 would allow for the promulgation of rules in "emergency" circumstances, and the House Government Reform and Oversight Committee is considering a broader exemption for OSHA regulations. The Senate bill, which has not yet seen any movement, would freeze regulations from November 9, 1995 through June 30, 1995.

Senate task force targets a "top ten" list of most burdensome federal rules. The Senate Republican Task Force on Regulatory Reform is preparing an action plan to address laws it considers to be burdensome on the public. Federal laws on the hit list include:

- The Clean Air Act's centralized vehicle inspection and maintenance program.
- Superfund, including retroactive liability and municipal liability.
- Safe Drinking Water Act's lack of risk assessment in monitoring contaminants.
- OSHA mandates.

Clean Air Act

House weighs possibilities of opening up Clean Air Act. The EPA is under mounting pressure to repeal and alter many Clean Air Act (CAA) requirements that members of Congress feel create needless administrative burden and costs for businesses. The VA-HUD appropriations committee has threatened to review EPA funding if the agency doesn't halt its plan to impose a federal air quality plan for several California regions. Senate freshman Rick Santorum (R-PA) has introduced a bill (S 328) that would make some sections of the Clean Air Act voluntary, including trip reductions and car-pooling requirements in severe nonattainment regions.

At all levels the Clean Air Act has come under attack, and we can expect to see oversight hearings on both sides of the House this session.

Here is a partial list of bills introduced recently that would either repeal or delay provisions of the CAA:

- HR 46 — would delay the implementation date for enhanced vehicle inspection and maintenance programs for two years and require the EPA to reissue program regulations.
- HR 307 — would modify the motor vehicle inspection and maintenance requirements of the Act to allow for greater flexibility at the state level.
- HR 325 — similar to the Santorum bill (S 328), would make trip reduction and car-pool requirements in severe nonattainment areas voluntary.
- HR 473 — would repeal the air toxics provisions.
- HR 475 — would repeal the stratospheric ozone protection provisions.
- HR 476 — would repeal certain emissions standards for motor vehicles manufactured after model year 1995.
- HR 478/S 235 — would repeal trip reduction mandates.
- HR 480/S 236 — would repeal the requirement for state motor vehicle inspection and maintenance programs in nonattainment areas.
- HR 495 — would delay implementation of enhanced motor vehicle inspection and maintenance programs for two years.

Clean Water Act

Clean Water Act hearings begin. The House Transportation and Infrastructure water resources subcommittee has begun hearings on reauthorizing the Clean Water Act, but no major reauthorization bill has been introduced so far. Committee Chairman Bud Shuster (R-PA) has said he will act quickly on Clean Water Act reauthorization. He is expected to introduce legislation similar to last year's bipartisan alternative that contained provisions to limit federal mandates, address non-point-source pollution, classify and redefine wetlands, and offer protections for private property rights.

Budget

EPA budget boosts some programs, gouges others. The EPA presented its 1996 budget the last week in January. The $7.3 billion budget is just a 2 percent increase from fiscal year 1995, but contains some significant changes in how that money will be spent. The EPA has requested major increases in its operating budget to support the salaries and administrative expenses of its air, drinking water, hazardous waste, and multimedia programs. The operations budget would grow from $2.9 billion to $3.3 billion, a 22 percent increase, under the administration's proposal.

The increase in the operations budget is being financed by dropping most of the water infrastructure construction grants. Money for congressionally earmarked water projects would fall from $560 million in fiscal year 1995 to just over $100 million in FY1996. The administration has requested a total of $2.3 billion overall in water infrastructure financing, increasing the clean water state revolving loan fund by $365 million (to $1.6 billion), reducing the drinking water state revolving loan fund by $200 million (to $500 million) and reducing the $684 million grant to hardship communities to $115 million.

EPA Administrator Carol Browner said the EPA is counting on Congress to reauthorize the Safe Drinking Water Act (SDWA) this year. SDWA reauthorization will allow the release of the $1.3 billion Congress has set aside, in addition to another $500 million in FY1996, to help finance local drinking water treatment facilities.

Other programs benefiting from the EPA proposal include air programs with an increase of $72 million in FY1996, the hazardous waste program with an additional $40 million, the radiation program up 20 percent, and the underground storage tank program with a $7 million increase.

Green Scissors Report pushes budget cuts in clean coal technology program. A coalition of taxpayer and environmental groups has announced that it intends to push for $33 billion reduction in programs from the federal budget. In its *Green Scissors Report*, the coalition released details of all the projects they would like to see cut. Among others on the hit list is the DOE clean coal technology program. ■

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Focus on Management

H. Val Peterson

Habits and Caterpillars

There is an old saying to the effect that we begin by making habits and end by habits making us. It is easy to let our lives and our work fall into a rut, and our actions become mechanical and accomplished without thought. In essence, if we fall into this pattern of behavior we become like processionary caterpillars.

Processional caterpillars are a particular type of larvae that move through the trees and other vegetation in a long procession, one leading and the others following—each with its eyes half-closed and its head snugly fitted against the rear extremity of its predecessor. The leader sets the course and the pace and the rest follow along behind.

Jean-Henri Fabre, the great French naturalist, after patiently experimenting with a group of these caterpillars, finally enticed them to the rim of a large flower pot where he succeeded in getting the first one connected with the last one, thus forming a complete circle that started moving around in a procession that had neither beginning nor end.

The naturalist expected that after a while they would catch on to the joke—get tired of their useless march and start off in some new direction.

But not so.

Through sheer force of habit, the living, creeping circle kept moving around the rim of the pot—around and around, keeping the same relentless pace for seven days and seven nights—and doubtless would have continued longer had it not been for sheer exhaustion and ultimate starvation.

An ample food supply was close at hand, and plainly visible; but it was outside the range of the circle, so they continued along the beaten path. They were following instinct, habit, custom, tradition, precedent, past experience, standard practice, or whatever you may choose to call it, but they were following blindly.

Those poor misdirected caterpillars gave their all. But they mistook activity for accomplishment. They meant well—but they got no place. Ultimately they failed.

Some people are so busy doing the immediate and the urgent that they never stop to think about the important. We have all heard (and on occasion probably used) the excuses, "we have always done it this way" or "if it isn't broke, don't fix it" or "departmental policy requires it." But when new solutions are needed, they may be obvious and even near at hand. We need to be smart enough to recognize them and to use them.

The human brain is much larger and considerably more advanced than the caterpillar, but sometimes humans function in ways surprisingly like the processionary caterpillar. Surely, as human beings we can learn something useful from the example of the lowly caterpillar. As leaders we must regularly question habits, customs, traditions, precedents, and past practices. We must put to use the tremendous power locked within our brain that allows us to reason, use logic and common sense. Hopefully, we have more sense than the caterpillar. ■

Val Peterson is director of facilities management at Arizona State University, Tempe, Arizona. He is a past APPA President and a 1984 recipient of APPA's Meritorious Service Award.

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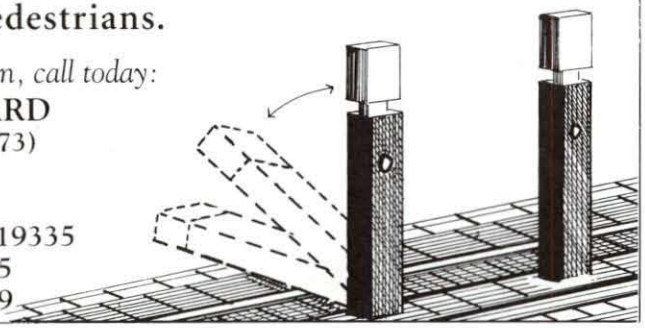

Perspective

William H. Lord, P.Eng.

APPA's Facilities Management Evaluation Program: A Canadian View

The following is a brief account of one Canadian university's experience with APPA's Facilities Management Evaluation Program (FMEP), why we undertook it, and what has been the outcome. In doing so, I thought it might be helpful, for the sake of readers in the United States and elsewhere, to give a sense of the social and financial climate in which Canadian universities are currently operating. It is this chilly climate, together with the threat of much tougher times to come, that is driving our universities and colleges to review the way they do business. For Dalhousie University's Department of Physical Plant and Planning, the APPA Facilities Management Evaluation Program proved to be the ideal vehicle for this purpose.

In recent years, publicly funded institutions across Canada have come under increasingly intense scrutiny as federal, provincial, and municipal governments seek to bring their mounting indebtedness under control. Universities have not been exempt from this scrutiny; indeed, they present a particularly enticing target in view of their "ivory tower" image, an image which, unfortunately, often gives the impression of smug insulation from the financial woes experienced by the rest of society and thus tends not to evoke public sympathy. To understand why Canadian universities now feel so exposed, it is necessary to look at the context in which they operate.

Education in Canada is a provincial responsibility and thus, apart from a handful of private institutions and a couple of military colleges (which have federal status), universities all receive most of their funding from the province in which they are located. However, in an attempt to ensure reasonably equal access to education (and other social services) for all Canadians, the federal government developed a system in which transfer payments are made to provinces. The criteria for determining the respective amounts are complex but, essentially, the end result is that money flows from the richer provinces (the "haves") via Ottawa, Canada's capital, to the poorer provinces (the "have nots"). The system whereby the federal government transfers tax points and cash to the provinces for the purposes of higher education and health care is known as the Established Program Financing (EPF) scheme.

Now, however, as Ottawa finds itself more and more unable to deal with its huge debt, it has begun to look hungrily at the large sums of money that are transferred to the provinces in this way. A recent federal "discussion paper" clearly signaled Ottawa's intentions regarding the way in which it plans to deal with the deficit. This paper, "Improving Society Security in Canada," proposes sweeping changes to the country's social programs, including the elimination of federal education transfer payments. For the provinces—especially the smaller ones like Nova Scotia, which were already reeling under the impact of their own mounting deficits—this initiative on the part of Ottawa has gone over like a lead balloon. Small wonder, then, that universities are looking around desperately for ways in which to reduce expenditures.

Here in Nova Scotia, where we have thirteen degree-granting institutions for a population of under one million, the provincial government has embarked on the "rationalization" of the university systems. (I should note here that Nova Scotia's university system has a deservedly high reputation for excellent education and thus attracts a high percentage of out-of-province students.) Almost everyone agrees that this needs to occur, but there is little consensus as to how it might be achieved. However, it seems almost certain now that it will involve some form of merger or consolidation of the six institutions located in Halifax, the provincial capital and largest city in Nova Scotia.

In fact, universities right across the country realize that the glory days are long gone, and many are now seriously considering initiatives (e.g., privatization, full cost recovery tuition) which, given Canada's long-time commitment to "universal access" to services such as health and education, would have been unthinkable a few years ago. Indeed, slashing budgets and seeking alternative sources of revenue have become for all of us a way of life.

In Canada, as in the States, one of the hardest hit sectors of the university is the physical plant department. It is this fact which, perhaps more than any other, is pushing physical plant departments to scrutinize every aspect of their operations. For increasing numbers of them, the method of choice is the APPA Facilities Management Evaluation Program. However, for Dalhousie University (and, I suspect, for several other institutions), there was another, almost as important, reason for undertaking an FMEP. Despite huge strides over the past several years, both in efficiency and effectiveness, the Department of Physical Plant and Planning (PP&P) still found itself the constant butt of criticism and complaint.

Not surprisingly, this carping has increased each year in almost direct proportion to the level of budget cuts suffered by faculties and departments. It did not seem to help at all to point out that the cuts to PP&P's budget had been

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Bill Lord is director of physical plant and planning at Dalhousie University, Halifax, Nova Scotia. APPA conducted a facilities management evaluation of Dalhousie in September 1993.

earlier and deeper than most; there was widespread suspicion that we take advantage of our monopolistic position to overcharge for our revenue-generating services. Tired of constantly having to defend us, the vice president for finance and administration (to whom I report) finally proposed that an objective review of PP&P be undertaken. At the time, we were not at all sure how this might be best achieved, although we felt that it should probably involve both internal and external reviewers. (I should point out here that a system of peer reviews of out academic departments has been in place at Dalhousie for many years. However, it was clear that if this model were to be used, it would have to be significantly modified.)

Aware of, though not personally familiar with, APPA's FMEP, I suggested to my vice president that he might like to investigate this as a possibility. Upon reviewing the introductory booklet put out by APPA, we concluded that the FMEP definitely appeared to be the route to take. Of course, a program review is only as good as the team that carries it out, and we were not disappointed. The team, consisting of two Americans and one Canadian, was well prepared, professional, and thorough. I can report that the vice president and my fellow directors (not to mention the many individuals at all levels of the organization who were interviewed) were most impressed by the way in which the FMEP was conducted.

I am not sure how other Canadian universities have structured the views of their physical plant departments, but, in our case, an Internal Review Committee (IRC) was established, consisting of a representative from each of the Board of Governors, Senate, an academic department, and a couple of major ancillary departments. To ensure that the evaluation was not based purely on a "physical plant" perspective, a concurrent review was carried out by the vice president for finance and administration of another (out-of-province) university. The reports of the two review teams were both written and submitted independently to the IRC. I believe this was a wise decision as it not only gave added credibility to the process, but made acceptance of the IRC's final report by the rest of the university community more likely.

In conclusion, I would say that, from the viewpoint of PP&P, the FMEP achieved several important objectives:

1. It provided an objective assessment of the department which (happily) confirmed that we are serving the university well.
2. It helped us in our (successful) pitch for additional funding to deal with serious deferred maintenance.
3. It pointed out those areas on which we needed to focus so as better to fulfill our mandate.
4. It has helped us to ready (and position) the department for possible institutional consolidation.

If there was a drawback to the process, I would say that it is the very brief period over which the review is carried out (three days in our case). Inevitably, impressions (and, thus, recommendations) are based on a less than comprehensive understanding of the organization. There is a tendency, also, for reviewers to underestimate the cultural and societal differences between the United States and Canada, and the impact these might have on otherwise similar organizations.

Having said that, I should add that I found the insights and the differing perspectives brought by each of the reviewers to be invaluable. Thus, any drawbacks were far outweighed by the benefits. All in all, we found the FMEP to be a very positive experience, and I would unhesitatingly recommend the process to any other university currently considering embarking on a facilities management review. ■

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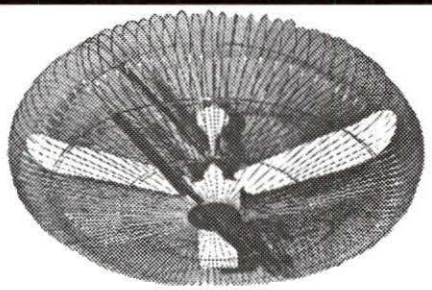

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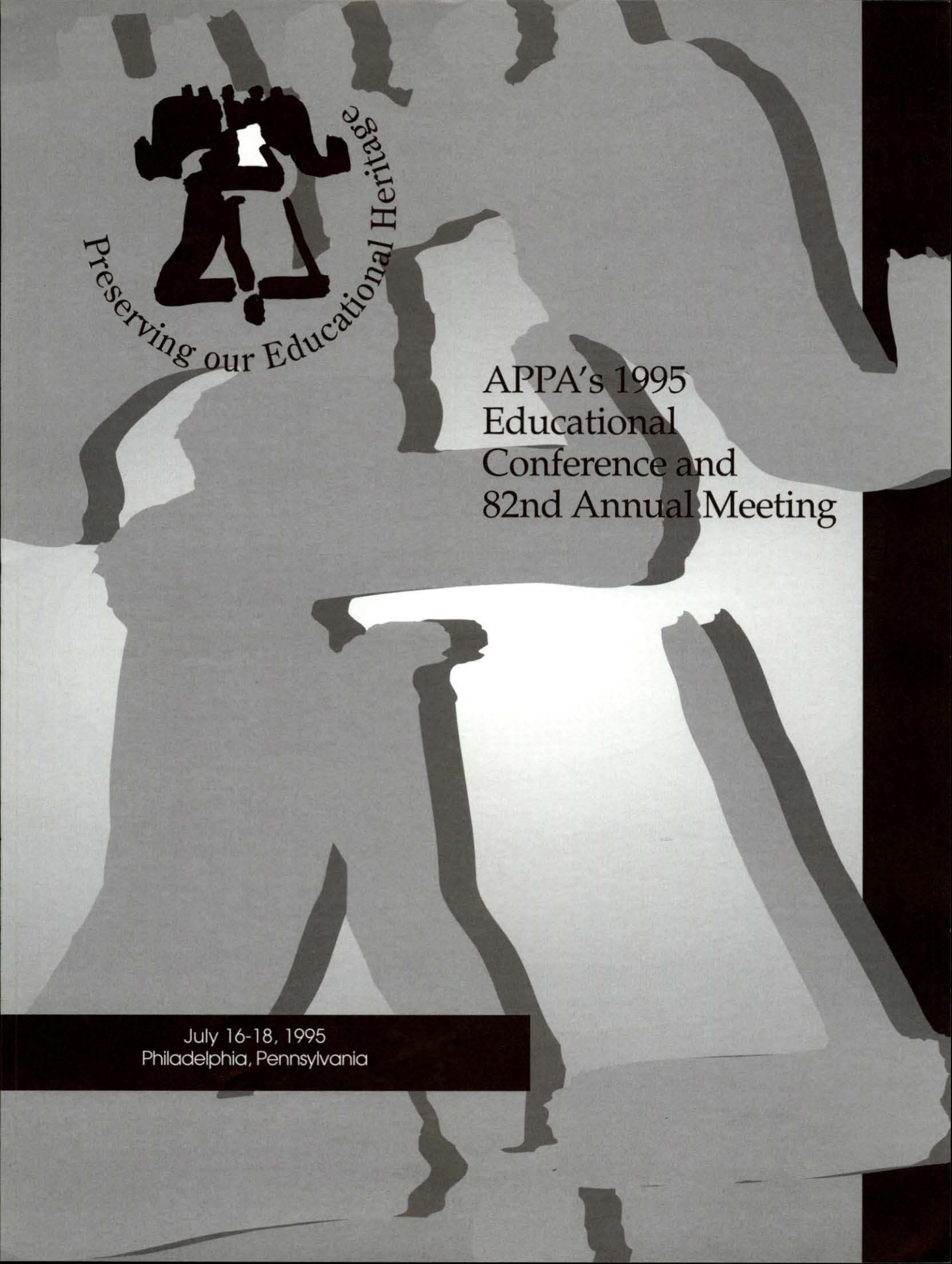


APPA's 1995 Educational Conference and 82nd Annual Meeting

July 16-18, 1995
Philadelphia, Pennsylvania

LEADERSHIP TRACK

Monday, July 17

Managing and Effecting Change will present facilities professionals with compelling arguments for change, including why change is critical to their survival, and it will outfit you with options and strategies for managing change. This program's five topic areas will closely examine where you are and how to get to your desired state.

- **Evaluating and Analyzing Your Current Work Processes and Organizational Structure** will help you critically assess your operation by looking externally (benchmarking) and internally; by determining strengths, weaknesses, opportunities, and threats; by identifying and understanding the organizational culture; and by assessing the results.

  Presenters: Harvey Kaiser, Syracuse University; Lander Medlin, APPA; Mark Pastin, Council of Ethical Organizations

- **Creating a Vision Statement** examines the leadership imperative—the leader must stand behind the vision statement 100 percent. The presence of leadership is essential for successfully effecting change; the vision statement's importance; components of the vision statement; and tools for developing the vision statement.

  Presenter: Donald Langenberg, University of Maryland System (invited)

- **Approaches for Effecting Change** includes improvements on Total Quality Management; Business Process Redesign; and integrating TQM and BPR.

  Presenters: Gary Reynolds, Iowa State University and Sean Rush, IBM

- **Identifying and Communicating the Process for Change** covers how to make a compelling argument for change; making a case for action, getting the organization to embrace it, and taking ownership of the vision; and laying out a process for change.

  Presenter: William Daigneau, University of Texas M.D. Anderson Cancer Center

- **Managing Organizational Paradigm Change** will discuss strategies and tools for getting from the present state, through the transitional state, to the desired state; implementing paradigm shifts; the human factor—dealing with resistance to change; and efficiently and effectively managing change during major organizational restructuring.

  Presenters: Douglas Christensen, Brigham Young University and Charles Jenkins, Saint Mary's University

CONFERENCE AT A GLANCE

Thursday, July 13

10:00 - 12:00n	Regional Representatives Meeting
1:00 - 5:00pm	Executive/Finance Committee Meetings

Friday, July 14

8:00 - 9:00am	1994-95 Board Committee Meetings
9:00am - 5:00pm	1994-95 Board of Directors Meeting

Saturday, July 15

8:00am - 12:00n	APPA Committee Meetings
12:00n -5:00pm	Member Registration
	Welcome Desk Open
1:00 - 5:00pm	Campus Tours

Sunday, July 16

7:00 - 7:30am	Non-Denominational Religious Service
7:30 - 8:15 am	Welcome Continental Breakfast & Orientation
8:00 - 9:00am	Spouse/Guest Welcome Breakfast
9:00am - 5:00pm	Member Registration
	Welcome Desk Open
9:00am - 12:00n	"Hot Topic" Sessions
	Diversity Workshop
12:00n - 1:00pm	Box Lunch/Poster Sessions
12:00n - 1:00pm	Upward Bound Networking Lunch
1:00 - 3:00pm	"Hot Topic" Sessions
	Educational Sessions
3:00 - 4:00pm	Keynote Address
4:00 - 7:00pm	Exhibit Hall Reception

Monday, July 17

7:00 - 8:30am	President's Breakfast
8:00am - 4:00pm	Member Registration
	Welcome Desk Open
8:00am - 5:00pm	Effecting and Managing Change
9:00am - 12:30pm	Educational Sessions
12:00n - 3:00pm	Exhibit Hall Open/Lunch Served
3:00 - 4:00pm	Exhibitor/Vendor Technical Sessions
4:00 - 5:00pm	Networking/Round Table Discussions
5:00 - 6:00pm	Military Get-Together

Tuesday, July 18

7:00 - 8:30am	Excellence in Leadership Breakfast
8:00am - 4:00pm	Member Registration
	Welcome Desk Open
9:00am - 12:30pm	Educational Sessions
12:00n - 3:00pm	Exhibit Hall Open/Lunch Served
3:00 - 4:30pm	Regional Meetings
6:00 - 9:30pm	Reception & Annual Banquet

For hundreds of years, higher education has strived to prepare students for full and rewarding lives, to provide opportunities for everyone, regardless of age, race, or gender.

New challenges greet us and require us to provide access to higher education in new and exciting ways. This year's theme, "Preserving our Educational Heritage," will help us focus on preserving the excellence of our heritage while striving to better ourselves and our institutions.

In many ways our vision for the future will be shaped not only by our past successes, but our willingness to adapt to a rapidly changing environment—an environment that will require us to develop our service delivery, approach, processes, and mechanisms.

APPA's 1995 Educational Conference and 82nd Annual Meeting is a key learning experience. The conference examines issues of leadership and cutting edge developments and fosters networking to share ideas and solutions with other facilities organizations.

The 1995 Educational Conference features educational opportunities of all shapes and sizes. The program is divided into several tracks each day so that you may focus on one subject area or divide your time among topics.

Join us in Philadelphia to learn new information, hone your skills, and rejuvenate your professional life.

The "Hot Topic" sessions focus on timely issues of concern to facilities officers. This year's sessions include the following:

BUILDING A DIVERSE AND INCLUSIVE ORGANIZATION:

A Process for Creating Shared Values and Empowering Your Total Workforce

Sunday, July 16

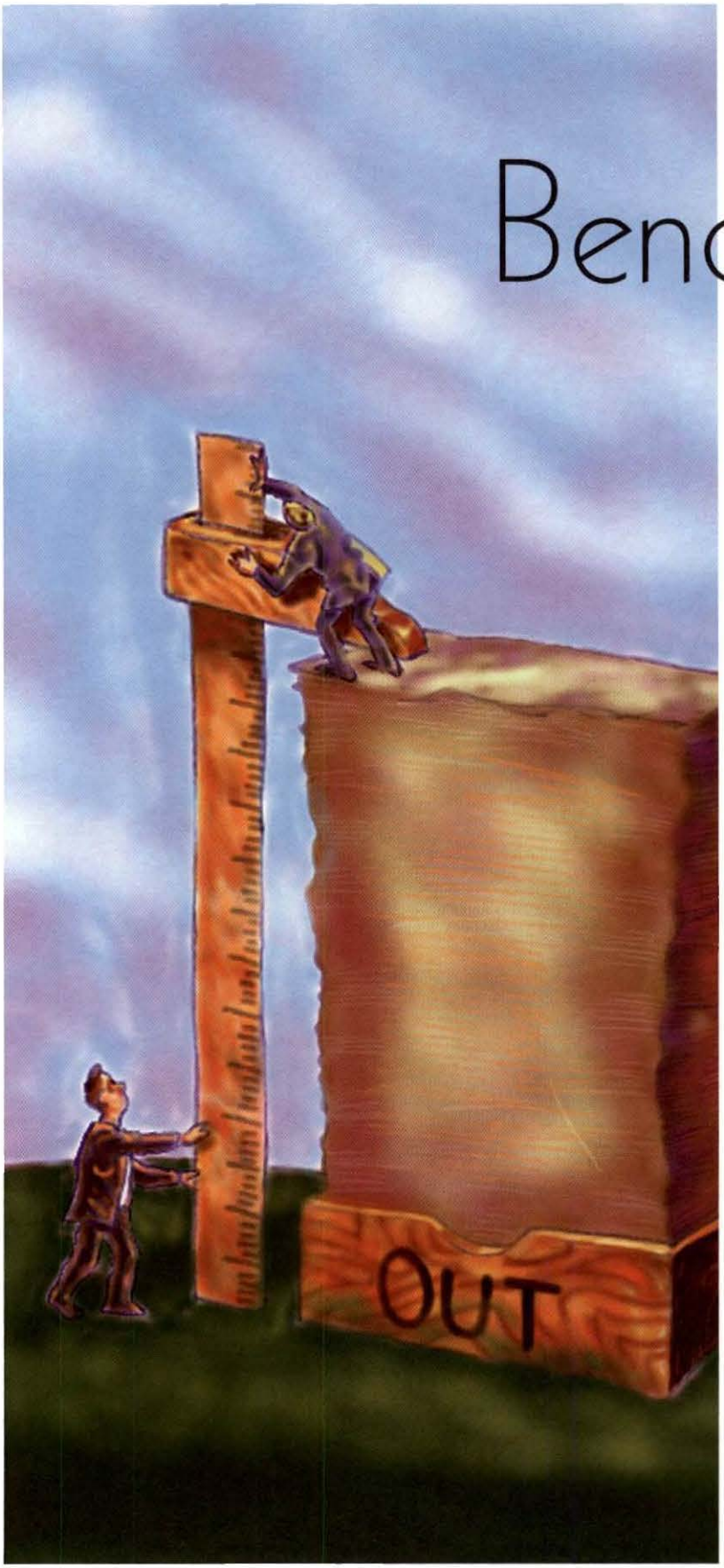
The modern workforce consists of people from all backgrounds, cultures, and educational levels, all of whom must work together to be effective. In this age of tighter budgets, team management, and increased demand for high quality services, building a cohesive team has never been more important. Learn how to be an effective manager of diverse groups in this program through case studies, exercises, and discussions.

KEYNOTE ADDRESS

Sunday, July 16

Kent M. Keith, president of Chaminade University of Honolulu, Hawaii, will share with us ideas of servant leadership, a principle based on the idea that people give authority to those who are proven and trusted servants. Dr. Keith will help us to thoughtfully reflect on the meaning of this concept for our own lives.

Preserving our Educational Heritage



Ted Benson

Benchmarking:

Old Technique, New Frontier

by Bertram D. Smith Jr.

Benchmarking is an historic technique that uses an established reference point as the basis from which measurements can be taken to evaluate a given condition. Benchmarks are used in land surveys to establish altitude gradients in property—a measure of the quality of the land. Benchmarks are used in machinery and equipment installations to ensure the hardware is located and positioned properly—a measure of the quality of readiness for service. And benchmarks are used to grind the lenses of glasses to the proper curvature—a measure of quality in providing someone's correct sight.

The benchmarking process is straightforward: someone establishes the standard, conditions are measured against that standard, and the results determine the status—and hence the value—of a current condition. But the benchmarking process itself is dynamic: standards for physical benchmarks can change as measurement techniques provide more accurate results and a requirement for improved standards can arise as users gain greater experience with a situation.

Business Benchmarking

Use of the benchmarking process is not limited to measurements of physical conditions, however. The benchmarking concept may be applied to any situation where a reference condition can be established as the basis for measurement to evaluate an important attribute of that situation. Thus, benchmarking is used today to measure such non-physical attributes of business operations as employee turnover, overtime percentage, days or weeks of work backlog, and even customer satisfaction.

The benchmarking process opens a new frontier for facilities management improvement. The condition and performance indicators that the benchmarking process can provide will help a facilities manager identify his or her current position within the competitive continuum for the facilities management business. It will also help identify areas for improvement—even as the shape of that continuum shifts with advances in technology, changes in national demographics, revisions to regulatory requirements, and variations in economic conditions.

Doug Christensen, APPA's current President-Elect, has identified the need for both leadership and management to deal successfully with the challenges of change that face facilities managers today. If the job of leadership is to provide the vision that ensures facilities management is "doing the right things," then the complementary job of management is to ensure those right things are "done right" to guarantee that maintenance is delivered efficiently. This involves analyzing the business processes themselves, and benchmarking can play a role in that analysis effort. Greg Watson, an authority on benchmarking, makes the point that the real job of management is business process improvement.[1]

Benchmarking techniques offer the college and university facilities manager the opportunity to make informed decisions for improving performance and quality in an environment of decreasing resources.

Benchmarking Basics

Many good references are available today to help the reader understand the different types of benchmarking that are available as well as the details of the benchmarking process itself: this article won't plow old ground by attempting to cover those topics. This article will, instead, outline five basic principles for benchmarking that experience indicates are essential to success, and then describe how benchmarking is being used in an APPA initiative to improve facilities management. But first the principles.

Principle #1: Begin with Thorough Self-Assessment.

The foundation for successful benchmarking is thorough self-assessment. You need to understand your own business thoroughly before you can compare it capably to anyone else's business.

At least three good reasons exist for starting the benchmarking process with thorough self-assessment:

1. You need to know how the organization *really* functions in order to make sure you're looking for the *correct* information in the *right* places;
2. You need to know the details of how the activities are actually performed in order to compare your benchmark accurately to someone else's benchmark; and
3. You may discover opportunities for improvement that were previously unrecognized simply as a result of doing the groundwork necessary for self-assessment.

Benchmarks must be measured from the same reference point to be compared effectively. Two good examples of this arose during a discussion of supervisory ratios (the ratio of workers to a line supervisor) developed using data from APPA's *1991-92 Comparative Costs and Staffing Report for College and University Facilities* (CCAS). In one case, a supervisory groundskeeper ratio (i.e., groundskeepers/groundskeeper foremen) turned out to be inappropriately low; a non-supervisory landscape architect had been listed as a foreman since there was no appropriate place to list his labor category. In a similar case at a different facility, the person responsible for piping system integrity was listed as a building maintenance foreman despite having no line supervisory responsibility. Self-assessment should identify these situations.

Thorough self-assessment makes sure the basis of each benchmark measure is well understood. This helps prevent unintentional inaccuracies when one's own benchmark data are compared with those from another facility. Thorough self-assessment is essential; it establishes the foundation for accurate benchmarking.

Principle #2: Establish The Facilities Strategy for the Future.

Benchmarking against today's facilities management paradigm will help very little if circumstances create a change in the paradigm: new values or even new benchmarks may be needed. Strategic planning is needed to help ensure the benchmarking process is conducted for the correct facilities management paradigm.

The strategic planning process needed to develop the facility's vision of future operations—and create its response to that vision—is hard work. It is also essential. To quote Greg Watson again, "Benchmarking without first understanding strategy is a waste of precious, limited resources."[2]

Principle #3: Make Sure the Culture is Ready for Change.

Benchmarking results that identify important areas for improvement will not succeed unless the "culture" is ready to accept change. There are two basic ingredients for successful change: proving the technical merit of change and overcom-

Dave Smith is vice president of American Management Systems, Inc., Arlington, Virginia.

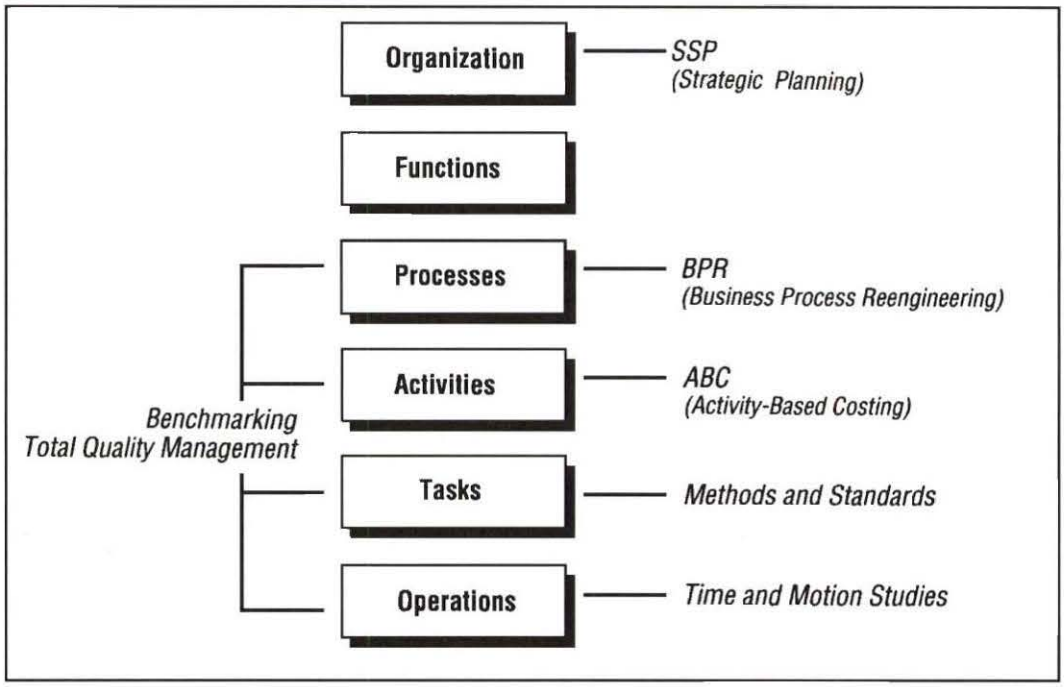


Figure 1. Relationship between improvement initiatives.

ing the cultural resistance to change. Establishing the technical merit of change is often by far the easier task. One veteran explained the situation this way: "Changing the culture is like trench warfare: you win the battle hedgerow by hedgerow."[3] Principles 1 and 2 help set the stage for winning over the culture.

Principle #4: Provide Process Enablers with the Benchmarks.

Process enablers empower change. Identifying improvements without providing enablers to achieve those improvements will only result in frustration. The enablers themselves may be tangible (e.g., personnel or monetary resources) or intangible (e.g., the influence of a "change champion" who lends authority to the effort). Enablers must come "bundled" with the improvement package or opportunities for success are limited. It's not enough to know what you need to do if you lack the resources to do it. One military maxim is the concentration of forces; the benchmarking analogy is enablers bundled with benchmarks.

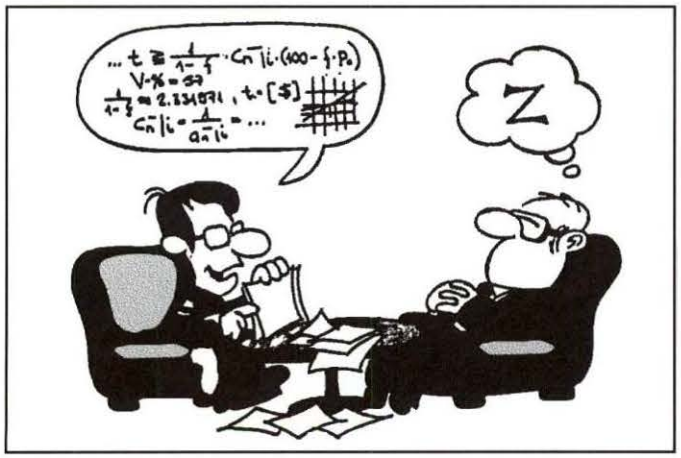


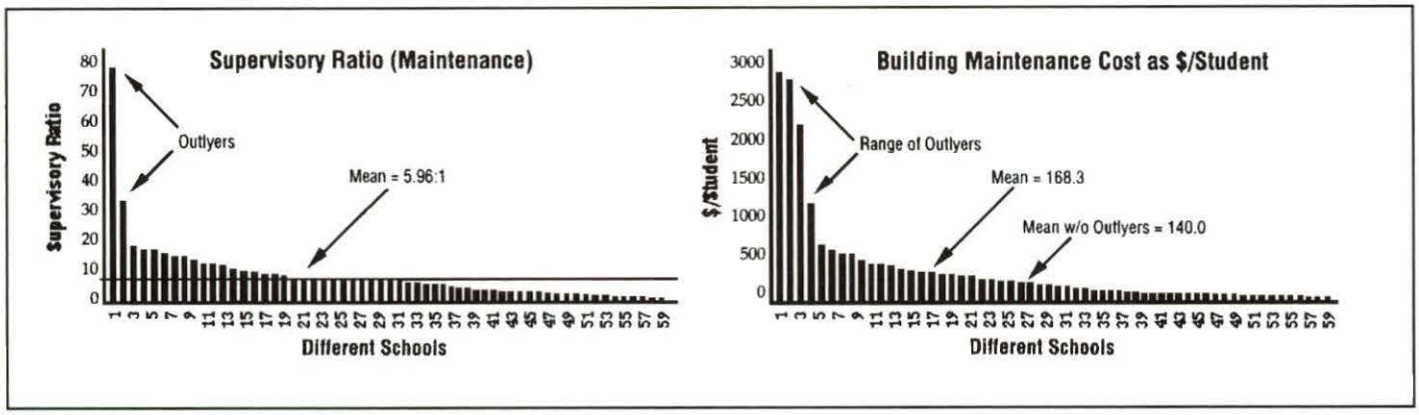
Figure 2. Not all savings are easy to express simply.

Benchmarking Interface With Other Improvement Efforts

Benchmarking is only one of several techniques available today for improving business productivity and cost effectiveness. Strategic planning, total quality management (TQM), business process reengineering (BPR), activity-based costing (ABC), and other initiatives are all at work today to help business perform more effectively. But how do these different approaches relate to each other? Figure 1 provides a simple illustration.

Strategic planning is the single most important, high-leverage initiative. Effective strategic planning develops an integrated set of processes, activities, tasks, and individual operations supporting the functions necessary to achieve facilities management organizational goals and objectives. It acts to ensure everything fits together properly to move forward.

Benchmarking and TQM may be conducted at different levels within this structure, and so may BPR and ABC. Figure 1 shows, however, that strategic planning should, if possible, take place before benchmarking *begins*, in order to achieve the greatest benefit from the effort. This does *not* mean that no improvement efforts should be undertaken before strategic planning has been accomplished. Improvement efforts (including benchmarking) can be introduced at any time and at a variety of different levels within the organization, and still benefit the facilities manager without strategic planning. But the effects of those efforts may improve results in one



area only at the expense of another if the integrated whole is not considered. And the results of some efforts may be invalidated if circumstances cause the facilities management paradigm to change significantly later. Effective strategic planning helps minimize the likelihood of such outcomes.

The APPA Benchmarking Initiative

So how does all of this relate to APPA?

APPA began to explore the use of benchmarking to help its membership a little over a year ago. First APPA investigated whether CCAS survey results could be used to develop useful benchmarks. The results had to be meaningful; APPA recognized the potential danger described in Figure 2.

Limitations of the 1991-92 survey data were recognized even before the investigation began, e.g., developing accurate figures for supervisory ratio (as discussed earlier). The process of dealing with potential inaccuracies in the 1991-92 CCAS survey data, however, underscored another important principle for benchmarking.

Principle #5: Some Data are Better Than No Data as Long as the Data Limitations are Managed Properly.

The point of this principle is that data do not have to be completely accurate to be useful. This principle may trouble some readers, but it is a fact that few data are 100 percent accurate. Many very good decisions are made routinely on the basis of data that are less than 100 percent accurate. These decisions have included the startup of nuclear reactors, the operation of spacecraft, and open-heart surgery.

It is true that the inaccuracy of some data is so small that it is irrelevant—but it still exists. So the real issue is not one of data accuracy, it is one of the degree of data inaccuracy and how to deal with it. The solution is to identify and deal with inaccuracy in the data that are available, not discard or ignore the data and lose the insight they might provide.

This relates directly to the 1991-92 CCAS data. When data in that report were used to develop "benchmarks" such as supervisory ratios, load factors[4], and other measures, several interesting results that may be attributable to data accuracy became evident. Two of these results are shown in Figure 3.

The first interesting aspect of Figure 3 is the existence of significant outlying data points. Almost every one of the thirty-three different benchmark indicators revealed the same phenomenon. It was not clear whether these "outlyers" truly reflect facility conditions or whether they simply demonstrate data reporting difficulties. Figure 3 only highlights outlyers on the high side; it does not highlight outlyers on the low side (which were less dramatic).

The second interesting aspect of Figure 3 is the relatively smooth distribution of values from high to low once the outlyers are removed. Such a distribution indicates the chance of finding one supervisory ratio within the range is probably not too different from the chance of finding any other supervisory ratio within the range. This distribution may reflect problems with data reporting, or it may mean the distribution of benchmark values among facilities organizations is nearly random.

The third interesting aspect of Figure 3 is the large difference between benchmark values from high to low. This variation is remarkable; it hints at sizable differences between facilities in the organization and delivery of maintenance. This difference can be turned to college and university advantage: considerable help may be available from schools on the "high" end of the spectrum sharing their techniques with schools on the "low" end of the spectrum.

Figure 4 compares values of twelve different benchmark indicators across twenty different facilities. Both the top 20 percent (clear box) and the bottom 20 percent (shaded box) of indicators are highlighted. The two right-hand columns show the number of top 20 percent and bottom 20 percent indicators per facility that result.

This figure indicates facility #7 (seven top 20 percent indicators) and facility #4 (six top 20 percent indicators) may be doing well overall, while facilities #9, 16, and 18 (all with five bottom 20 percent indicators) may not be doing very well. These results are preliminary and there is no attempt to differentiate between facilities on the basis of data quality. But clear patterns begin to emerge which differentiate between facilities on a purely objective basis. These results may simply be due to chance, but every facility had the same chance to score in the top 20 percent or bottom 20 percent of an indicator group.

Fac ##	Type	Maint Supv Ratio	Grnds Supv Ratio	Cust Supv Ratio	Mgt % of Staff	Studnt Per Staff	MgSal Per SqFt	MgSal Per Student	MgSal Per Staff	FacStaff Load SqFt/Staff	DefrMnt Per Staff	CRDM$ Per Staff	CRDM Backlog (Years)	Top 20 Pct	Btm 20 Pct
1	Rsrch	6.6	4.7	6.1	13	49.5	93.1	3.6	178	16582	6363	85228	13.39	2	1
2	"	3.9	3.7	6.1	13	54.4	115	2.4	133	15285	5609	225732	40.24	2	4
3	"	5.9	3.5	27.2	19	46.6	xxxx	xxxx	xxxx	16670	389	138585	356	2	2
4	"	12.1	17	10.6	6	46	102	3.7	170	17302	757	xxxx	xxxx	6	1
5	"	6.8	12	9.1	11	45.8	109	3.7	168	18349	xxxx	99924	xxxx	3	1
6	"	3.8	xxx	22.4	5	68.6	xxxx	xxxx	xxxx	25714	1000	34857	349	3	1
7	"	12.3	16	19	6	33.5	196	2.1	72	14046	1576	23826	5.05	7	2
8	Doct	6.8	10	26.5	10	31.9	29.7	14.1	451	13389	10613	187051	15.12	2	2
9	"	2.5	2.3	4.3	22	67.3	38.4	7.6	511	19601	5167	485000	17.62	1	5
10	"	9.5	5.4	20	10	94.3	60.4	2.9	273	16489	2305	14805	6.42	5	1
11	"	15	27	44	6	86.5	56.6	3.4	289	16392	12568	77481	6.16	5	0
12	"	77	20	10.5	7	35.6	85.1	4.9	173	14751	38672	74627	1.93	5	3
13	"	5.3	16	8.9	14	36	90.2	5	179	16131	24933	169175	6.79	2	2
14	"	6.9	6.4	6.5	10	52.7	94.3	2.8	150	14112	2510	33102	131.9	3	2
15	Comp	19	10	25	12	72.9	xxxx	xxxx	xxxx	9639	1085	23085	21.3	3	1
16	"	7	1	5.3	26	68	15.4	17.7	1200	18539	3714	1028571	27.7	1	5
17	"	3.2	8	16	23	33.3	15.4	21.8	727	11167	1667	4583	2.8	3	4
18	"	3.6	6	4	25	60.6	21.8	21.6	666	14477	2338	178954	76.5	0	5
19	"	6.4	12	11	14	111.9	16.6	4.6	519	8630	1964	2775	1.41	3	1
20	"	17	13	30	7	81.8	19.7	7.9	644	12650	xxxx	xxxx	xxxx	3	0

Figure 4. Benchmark performance indicator matrix.

The next logical step, if the process were to be continued, would be to develop accurate figures for a select set of facility benchmark indicators and display the results. These results could validate the selection of individual facilities as potential benchmarking partners, either in a specific area of interest or across a range of activities. The management approaches that resulted in such good results for these facilities could also be codified in a book of facilities management "best practices" for use by APPA membership at large.

The variance in values for different benchmark indicators shown in Figures 3 and 4 hints that different levels of maintenance management performance may exist at different facilities. Such differences in performance levels bring to mind a technique for evaluating software development processes created by the Software Engineering Institute of Carnegie Mellon University. This technique categorizes the "maturity" of a facility's software development process at one of the five levels shown in Figure 5. The Carnegie Mellon approach does not compare process maturity of one facility to that of another facility; it categorizes each facility against an idealized model.

Level	Characteristic	Key Challenges	Result
5 Optimizing	Improvement fed back into process	Still human intensive process Maintain organization at optimizing level	**Productivity & Quality**
4 Managed	(Quantitative) Measured process	Changing technology Problem analysis Problem prevention	
3 Defined	(Qualitative) Process defined and Institutionalized	Process measurement Process analysis Quantitative quality plans	
2 Repeatable	(Intuitive) Process dependent on Individuals	Training Technical practices – reviews, testing Process focus – standards, process groups	
1 Initial	(Ad hoc/chaotic)	Project management Project planning Configuration management Software quality assurance	**Risk**

Figure 5. Software Process Assessment Maturity Model overview.

The Software Process Assessment Model

Figure 5 illustrates the Carnegie Mellon Software Process Assessment

Continued on page 24

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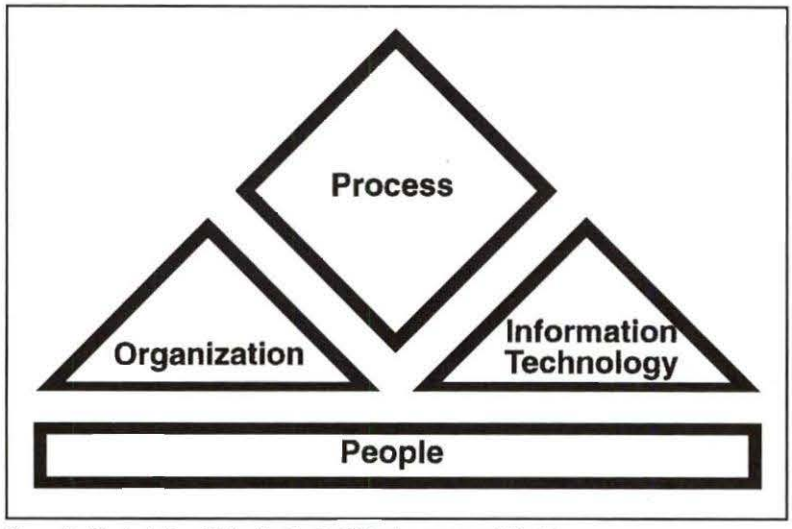

Figure 6. Strategic foundation for the Facilities Improvement Model.

(or Maturity) Model concept. The term "maturity" in this context relates to the extent to which the software development process is explicitly defined, managed, measured, controlled, and effective[5]. The rationale behind the model is that different levels of process maturity can be related to different levels of risk or productivity and quality in software development—and that these levels can be differentiated in terms of their characteristics and the key challenges to improvement.

This concept can be adapted for use in evaluating facilities management "maturity" (or effectiveness) at colleges and universities. We know that different values of benchmark performance indicators exist; this provides us a basis for developing different *levels* of facilities management "maturity." We also know that a large number of different benchmark performance indicators can be developed to measure facilities management attributes because facilities management is a complex business. What remains to be developed is a framework that provides a context for relating benchmark indicators to categories of facilities management operation as well as a means of describing different levels of maturity for each individual indicator.

The Facilities Improvement Model Concept

The three primary elements of business process reengineering—organization, business process, and information technology—were chosen to provide the strategic foundation for such a model (see Figure 6). These primary elements rest on a foundation of people.

Figure 7 fits these three primary elements—plus a fourth element that relates to customer satisfaction (maintenance evaluation)—into an overall framework for the Facilities Improvement Model. This model uses different quantitative values for benchmark indicators within each of the four elements to develop an overall qualitative evaluation of the level of facilities maintenance management effectiveness.

Each of the three major elements of the Model is further broken down into two major categories; the Organization element, for example, is broken into maintenance strategy and personnel management categories.

The current form of the Facilities Improvement Model describes five levels of facilities management effectiveness. Figure 8 illustrates the nature of each of those levels. The choice of five levels is qualitative and follows the Carnegie Mellon precedent.

At the lowest level of facilities improvement efforts shown in Figure 8, management is reacting to breakdown maintenance requirements, it lacks the ability to plan maintenance and evaluate facility conditions effectively, and it is faced with customers who are skeptics and detractors. At the highest level, management is deterring maintenance requirements through improved hardware and facility design, it is reengineering maintenance delivery processes for greater efficiency, it is

	Organization (Maintenance Requirements)		Business Process (Maintenance Delivery)		Information Technology (Maintenance Management)		Maintenance Evaluation
Level	**Strategy**	**Personnel**	**Process**	**Admin/ Support**	**Measures**	**Display**	**Customer**
5							
4	Fundamental *Maintenance Planning* Paradigm	Personnel *Resource Management* Paradigm	Maintenance *Delivery* Paradigm	Maintenance *Delivery Support* Paradigm	Maintenance *Performance Measurement* Paradigm	Maintenance *Performance Display* Paradigm	Maintenance *Delivery Evaluation* Paradigm
3							
2							
1							

Figure 7. Facilities Improvement Model framework.

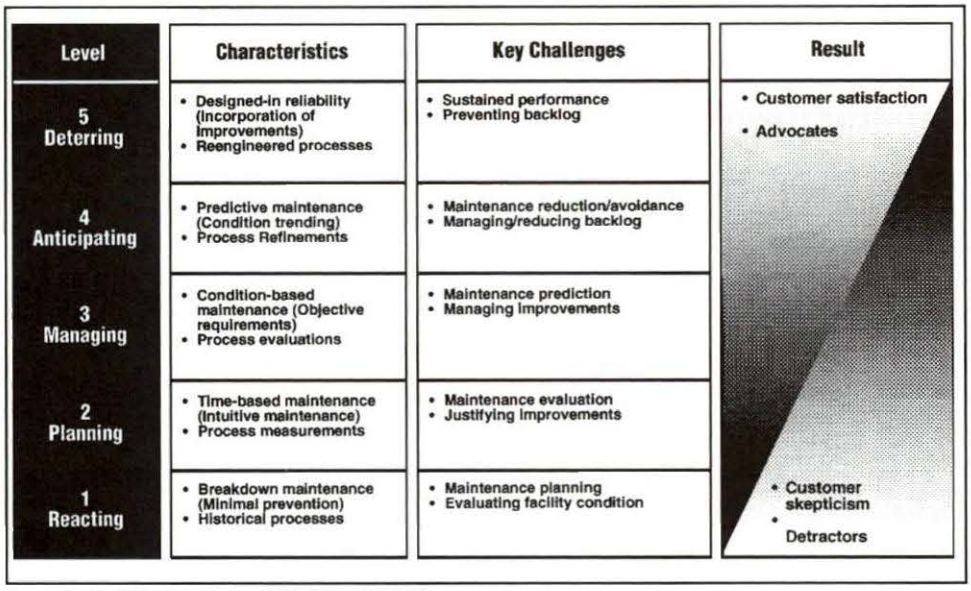

Figure 8. Facilities Improvement Model levels of effectiveness.

focused on sustaining its current high level of performance, and it is enjoying satisfied customers who are advocates for the department.

The next step in developing the Facilities Improvement Model is to identify specific benchmark performance indicators for each of the categories and elements shown. The current, preliminary form of the Model uses eighty different benchmark indicators.

Use of the Facilities Improvement Model

The proposed APPA Facilities Improvement Model contains more internal detail than the Carnegie Mellon Software Process Assessment (Maturity) Model. This should not be surprising since it is not focused on a single process (i.e., software development). The Facilities Improvement Model encompasses *all* the processes within facilities management.

One of the unusual aspects of the Model is its ability to provide an evaluation of facilities maintenance management effectiveness at several different levels of detail. This includes evaluation at the level of:

- individual benchmarks,
- complete categories of facilities management (e.g., maintenance delivery process administration and support),
- major elements of facilities management (e.g., maintenance requirements), or
- the complete facilities management operation as an entity.

The flexibility and scope of the Facilities Improvement Model permit it to be tailored for presentation to a variety of audiences. The mechanic who is concerned with specific hardware can relate to the Model's use of individual benchmark indicators that relate to his or her work (e.g., training focus, personnel evaluation, overtime usage). At the same time, the Model's broad scope and the overview of facilities management it provides allow it to present a comprehensive picture of facilities management status to the president of the college or university—or even the Board of Trustees.

The different levels of benchmark performance indicators in the Model allow the facilities manager to develop benefit/cost figures for evaluating the effect of changes from one level of facilities management to another. Benefits can be shown for resource investments that permit moving up to the next higher level. Penalties for shortfalls in funding can be shown as movement back to the next lower level. The Model comprises a mix of quantitative (e.g., material inventory accuracy) and qualitative (e.g., personnel recruiting focus) benchmark indicators that provide a balanced perspective of facilities management status and the potential impact of change.

Next Steps

APPA is currently working with a group of facilities managers from participating colleges and universities to refine the preliminary form of the Facilities Improvement Model. The near-term objective for APPA is to offer interested members of APPA a validated, hard copy configuration of the Model for their own internal use by year's end. Development of a software version of the Model that leads users through its application and calculates and displays the results is also under evaluation as a potential longer-term objective.

The overall objective of APPA is to use the Model as the basis for developing an improved, focused data collection effort for the *Comparative Costs and Staffing Report*, beginning with the 1995-96 survey. The goal is to provide the membership a *Comparative Costs and Staffing Report* that is more focused, accurate, and useful than ever before.

The process of refining the preliminary Model will take into account the benchmarking project undertaken by the National Association of College and University Business Officers (NACUBO). It will also build on experience gained from APPA's own Facilities Management Evaluation Program. It will draw from all relevant sources of benchmarking data available within the college and university facilities management environment, but it will also draw from benchmarking data available in the government and private industry. Because it is intended for internal use by individual facilities to help them shape their individual improvement efforts, it will be oriented to providing a large variety of benchmark indicators and values from which they may select the most appropriate set of benchmarks for their own purposes.

The status of progress in developing and offering the Model and a report of results of its initial implementation and

refinement will be provided during a session at the July educational conference in Philadelphia, as well as in future editions of *Facilities Manager*.

Conclusion

The business of facilities management is complex and challenging. Very few individuals outside facilities management itself understand the diversity of maintenance management activities required to sustain a pleasant and effective college environment. Few inside the business have had the experience necessary to grasp the entire scope of activity required for effective operation. The Facilities Improvement Model provides a graphic illustration of the range and depth of activities involved—and it provides the basis for developing a road map for improvement. APPA is excited at the potential of this new tool for the improvement of facilities management and it looks forward to completing its development and making it available to the membership this year.

Winston Churchill once said: "True genius resides in the capacity for evaluation of uncertain, hazardous, and conflicting information." That's the life of the facilities manager—we already *know* that. APPA hopes the Facilities Improvement Model will provide a tool that helps to relieve some of the pressure on the membership to continually demonstrate true genius; the goal is to make the facilities manager's life a little easier. We also expect the Model to show the Board of Trustees the true genius residing in facilities managers that enables them to grapple daily with a host of complex issues.

Notes

1. *Strategic Benchmarking*, Gregory H. Watson, John Wiley and Sons, Inc., New York, 1993.
2. *The Benchmarking Workbook—Adapting Best Practices for Performance Improvement*, Gregory H. Watson, Productivity Press, Cambridge, Massachusetts, 1992.
3. William M. Purdy, manager of the Defense Systems Group, American Management Systems, Inc.
4. A load factor shows the hypothetical burden or "load" of one variable on another. Examples include maintenance dollars per student, square feet of facility per facilities staff member, etc.
5. Capability Maturity Model for Software, Version 1.1, Software Engineering Institute, Carnegie Mellon University, February 1993, page 4. ■

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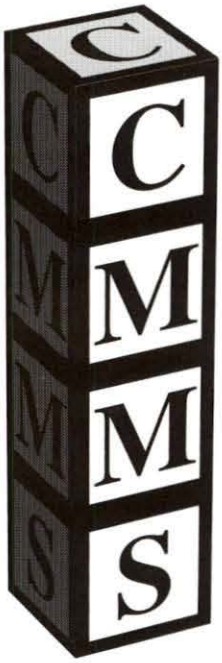

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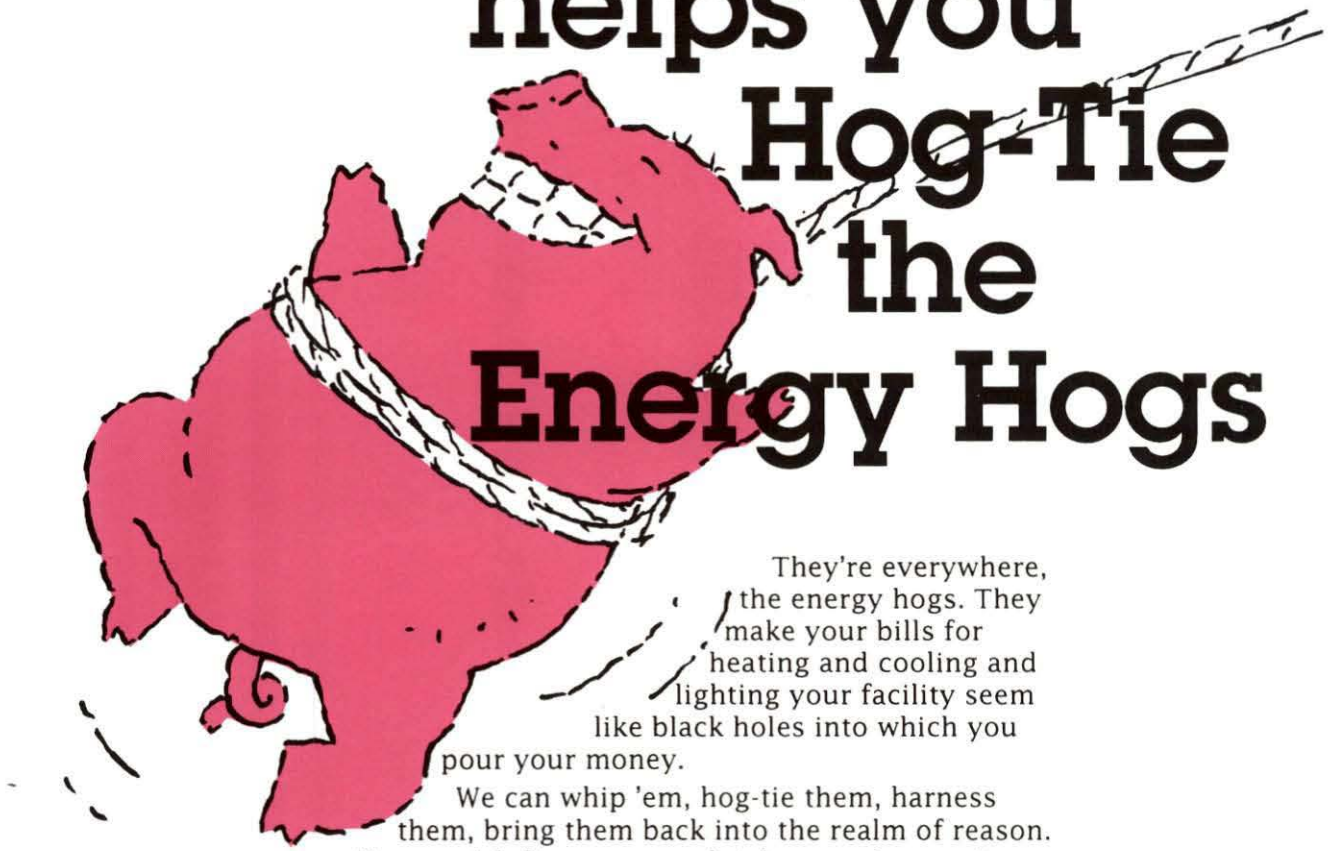

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Building B.E.T.T.E.R

by Maurice R. Pawsey and Tonia Walker

The Bible tells us about the failure of a major building project to be satisfactorily completed because the construction workers could not communicate with each other. They did not speak a common language and so the Tower of Babel could not be completed. It seems little has changed since biblical times, particularly when we talk about maintenance and asset management.

One of the toughest questions about building maintenance is deciding exactly what the term "maintenance" means.

Does it cover all of the building, part of the building, services, the exterior only, or just the interior? Does it include cleaning or security? There was no accepted definition of such a fundamental term when attempts were made to standardize statistical collections so as to provide a basis on which to compare maintenance expenditure.

Planning and construction of a new building is a major exercise for any organization, but keeping the building in good condition to enable it to function for its planned life is equally, if not more, important. Without planned maintenance, problems can grow until the building ceases to function efficiently, or even becomes uninhabitable or derelict. Sensible forward planning provides maximum utilization of a major asset, with provision for repairs and rehabilitation and allowance for eventual replacement.

Facilities managers in Australia and overseas have long seen the need to be able to compare their performance with others, particularly on maintenance expenditure.

Other areas where comparison is possible include energy, cleaning, use of space, work measures, and so on.

In Australia, there are several agencies working in the area of facilities management research. As well as AAPPA, the facilities managers in universities have developed policies through the Facilities Management Reference Group of the Australian Vice-Chancellors' Committee. [*Ed. Note:* In Australia, the vice-chancellor is equivalent to the university president.] There has been considerable overlap between these groups and the Building Asset Management Sub-committee (BAMS) of the National Committee for Rationalised Building (NCRB). BAMS has investigated ways of collecting data for performance indicators, but found considerable difficulties because the information supplied was either inadequate or inconsistent.

The problems included poor institutional records of expenditure, often badly collated. It was impossible to extract information in the form requested, usually because of a lack of uniform accounting standards or chart of accounts.

A major problem was the lack of uniform terminology—just what was understood by the term "maintenance"?

Similarly, people defined "cleaning" in so many different ways that standardizing the terms was as difficult as standardizing costs.

Fifteen Years Work

The Building Asset Management Sub-committee decided that the first need was standardization of terminology. A comprehensive set of definitions has been developed and refined through consultation with industry over fifteen years.

The recommended terms for items such as "maintenance" have now been included in *Glossary of Building Terms*, thus giving it national standing. Other areas of work by the NCRB-BAMS have been in performance indicators and information guidelines.

Life Cycle Costs

The Building Asset Management Sub-committee saw the Life Cycle Cost System—the study and use of life-cycles of elements of buildings—as the desirable approach to the management of buildings and other assets.

BAMS investigated charts of accounts needed for performance data recording. This resulted in the issue of a brochure entitled "A National System for Life Cycle Cost Performance Data."

BAMS also examined the lists and charts of elements of building (assets) used by organizations such as the Building Owners and Managers Association (BOMA), the National Public Works Conference (NPWC), and APPA to enable it to compare methods of collecting data on asset management.

The Chart of Elements (parts of buildings) used by the National Public Works Committee was considered most appropriate, with some amendments, and published with the recommendation that it be used Australia-wide as a means of producing comparable life-cycle data across Australia.

Maurie Pawsey is a consultant and an APPA member emeritus formerly of the University of Melbourne, Australia. He is also a founding president of the Australasian region of APPA, and a 1993 recipient of APPA's Meritorious Service Award. Tonia Walker is quality control officer in the facilities management department at Griffith University, Queensland, Australia.

United Kingdom System

In an attempt to widen the Sub-committee's database on performance indicators, inquiries were made to several sources in the United Kingdom, including the Building Officers of the Universities and through the Official Returns to the United Kingdom University Funding Council. BAMS was surprised to find that universities in the United Kingdom had not adopted a similar approach to updating their systems.

The data showed wide divergence and lack of coordination similar to the situation in Australia fifteen years ago.

Finance officers in UK universities were not familiar with the data collected by the building officers, and the building officers were not familiar with the Official Returns.

The building officers recorded only the expenditure involved in "routine maintenance" but not on "long-term maintenance" received from special grants from the University Funding Council.

It appeared that the Official Returns from the finance officers included routine maintenance, long-term maintenance, and substantial allowances for staff costs of maintenance, plus minor and major construction staff.

Even after making allowance for the possible costs of including these construction staff in the maintenance category, the variance between the two totals defied explanation: building officers reported expenditure of £66 million, while the Official Returns showed £154 million.

If the performance measures commonly used in Australia are examined, (either cost per square meter or percentage of replacement cost), the lower figure is too low and the other too high.

The Way Forward

The Australian Building Assets Management Sub-committee has been at the forefront in establishing a common language of standardized guidelines and procedures for recording and accounting for expenditure on asset management in Australia.

The Sub-committee suggests that there is a notable lack of advice on financial issues, for example desirable levels of maintenance expenditure, definition of deferred maintenance, and adequate protection of assets against loss or deterioration. To the extent that records are being kept, there is little or no exchange of this information (except in specific areas such as commercial buildings through BOMA and in the universities) and no common approach.

The Australian Building Asset Management Sub-committee has adopted a measure of performance defined in terms of a percentage of the Asset Replacement Value (ARV).

In the Sub-committee's opinion, annual expenditure or provision for maintenance for most classes of building assets should be between 1 and 1.5 percent of Asset Replacement Value, to keep the asset in good condition. This excludes any provision for refurbishment or rehabilitation (facility adaption).

The Australian recommendation on maintenance (facility renewal) allocations does not compare well with the recommendations in the United States of 1.5 to 2.5 percent of the plant replacement cost, as indicated in *Financial Planning Guidelines for Facility Renewal and Adaption*, a publication developed by the Society for College and University Planning, APPA, and the National Association of College and University Business Officers.

There are social and climatic differences between the United States and Australia, which account for some of the difference. It would be worthwhile at some future date to review these recommendations and evaluate their appropriateness.

The Australian recommendations are based on several detailed studies, as well as local experience. One of these studies is of the University of Melbourne, carried out by Dr. Frank Bromilow. The study used actual and estimated data over a theoretical life cycle of one hundred years, and showed that the calculated average requirement for maintenance ranged from 1.44 to 1.54 percent.

The Building Asset Management Sub-committee is therefore preparing a document entitled *Financial Planning Guidelines for Facilities Management in Australia*.

These guidelines attempt to set desirable levels of maintenance and refurbishment funding on the basis that funding in the past has been inadequate and that infrastructure is at risk because of an increasing backlog of deferred maintenance. Setting of credible levels of desirable funding would ensure that methods of calculating backlogs can be established.

Different methods of determining funding levels are discussed, including condition surveys of facilities, life cycle costs-based assessment, and use of a formula. The guidelines recommend that organizations consider the establishment of a Sinking Fund or Maintenance Management Fund from which annual maintenance requirements would be met.

Further, the need for depreciation of facilities should be recognized and the amount so applied to depreciation after a condition survey be considered as the basis for funding to recognize the ongoing obsolescence of those facilities and to apply funds so created toward maintenance, deferred maintenance, and refurbishment.

The use of Australia-wide criteria to enable organizations to measure performance is urged and the Building Asset Management Sub-committee is considering the possibility of a national database of performance indicators to this end.

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■

BUILDING ASSET MANAGEMENT CONFERENCE, 1995

The work detailed above is part of the activities of the BAMS, which is holding the next in its series of Asset Management Conferences June 5-7, 1995, at the University of Melbourne. The conference will offer the opportunity for informed discussion between attendees and presenters. Further information can be obtained from Michael Sullivan, Conference Management Unit, University of Melbourne, international telephone +61-3-344-4490, facsimile +61-3-344-6122.

EPA's Green Lights Program Saves Money and Prevents Pollution

by Doña Canales and Jim Mroz

Jesse Hall, UMC's current administration building, was built in 1895 and is surrounded by the columns that remain from the original Academic Hall, circa 1841. Thanks to UMC's Green Lights Upgrades, Jesse Hall is lit by brillant white light provided by energy-efficient metal halide lamps.

COLLEGES AND UNIVERSITIES across the country have discovered a way to reduce overhead expenses and still maintain extensive facilities—and they're preventing pollution in the process. The University of Missouri at Columbia (UMC), which generates its own electricity and steam, continues to expand its facilities and enrollment—without having to expand its generating capacity. The University of Cincinnati (UC) is already saving more than $900,000 per year on its electricity bill—and Cincinnati Gas & Electric (CG&E) is offering additional incentives *to reduce* its electricity usage. By using creative financing, the City University of New York (CUNY) is also enjoying significant energy bill savings, even as it *improves* the light levels in its landmark status buildings to modern standards.

Doña Canales is university coordinator, marketing team, for the Green Lights and Energy Star Programs, an office of the U.S. Environmental Protection Agency, Washington, D.C. Jim Mroz is communications associate with Technical Resources International, Inc., Rockville, Maryland.

How are these universities saving money, improving their lighting, and preventing pollution? Like many other colleges and universities, UMC, UC, and CUNY have joined the Green Lights program, a voluntary partnership with the U.S. Environmental Protection Agency to install energy-efficient lighting upgrades in their facilities wherever profitable. In colleges and universities, lighting consumes approximately 35 percent of all electricity—and the heat output adds 10 to 25 percent to the heating, ventilating, and air conditioning (HVAC) system's energy load. This is a tremendous energy cost saving opportunity, and Green Lights can show colleges and universities how to save 30 to 60 percent on their lighting electric bills.

For colleges and universities that want the financial, environmental, and physical benefits of energy-efficient lighting upgrades, Green Lights is the perfect source for information and support. EPA provides Green Lights participants with complimentary Lighting Upgrade Workshops, the *Lighting Upgrade Manual* and other informative literature, and unbiased consumer reports on the latest lighting technology. Upgrade and financial software, on-line services, and ongoing technical assistance from the Lighting Services Group are also available to assist participants. Green Lights is also a network through which colleges and universities can share energy-efficiency ideas and gain expertise and assistance from other participants. In addition, the program offers recognition for the efforts of Partners, Allies, and Endorsers through public service advertisements, awards ceremonies, articles in publications, and *Green Lights Update*, a monthly newsletter.

Upgrades involve replacing inefficient technologies, such as magnetic ballasts, incandescent lamps, and mercury vapor lamps, with more efficient electronic ballasts, compact fluorescent lamps, and metal halide lamps. To maximize their savings, participants are encouraged to install energy-efficiency systems, such as occupancy and daylight sensors. With these upgrades, Green Lights participants prevent air pollution by reducing energy consumption. For every kilowatt-hour of electricity that is saved, generating plant emissions equivalent to 1.5 pounds of carbon dioxide, 5.8 grams of sulfur dioxide, and 2.5 grams of nitrogen oxides are reduced. With the Energy Star Computer and Energy Star Buildings programs (see sidebars), the savings will be even greater.

Organizations can choose to participate in the Green Lights program as Partners, Allies, or Endorsers. Signing the Green Lights Memorandum of Understanding (MOU) creates specific commitments for each type of participant.

Partners agree to:
- survey domestic facilities and upgrade 90 percent of lighting systems, where profitable, given five years;
- assign a Green Lights Implementation Director (GLID) to manage surveys and upgrades; and
- endorse Green Lights by educating their students, faculty, and staff about the energy-saving measures they are implementing.

Allies agree to:
- fulfill Partner commitments;
- help EPA promote the benefits of energy-efficient lighting;
- educate industry about the benefits of energy-efficient lighting; and
- work with EPA to encourage development and use of new lighting technologies.

Endorsers agree to:
- endorse Green Lights; and
- help EPA promote the benefits of energy-efficient lighting.

For colleges and universities, endorsing Green Lights is a terrific opportunity to educate and promote the benefits of energy conservation in environmental, economic, and resource terms. Endorsing involves educating students, faculty, staff, and the community at large through lighting upgrade literature and discussions, demonstration projects, and, where possible, student involvement in surveys and upgrades. It also involves promoting Green Lights with campus events, newspaper articles, and other publicity. By educating students, faculty, and staff about Green Lights and promoting the program to the public at large, schools are making a long-term impact on the people and environment they serve. In addition, they gain positive publicity by being associated with a winning environmental initiative.

Since Carnegie Mellon University joined Green Lights in June 1991, the number of colleges, universities, and academic organizations participating in Green Lights has grown to more than one hundred (see next page). Colleges, universities, and facilities associated with academic institutions can join Green Lights as Partners, and educational organizations and student associations can join as either Partners or Endorsers.

Green Lights: Three Universities' Experiences

Green Lights has made a great difference in the lighting upgrade and savings results of every college and university that has joined. The experiences of UMC, UC, and CUNY provide outstanding examples of the benefits Green Lights can provide to a university's facilities and community and what colleges and universities can do to help the environment. Let's take a look at some of the opportunities the Green Lights program has offered these schools.

The University of Missouri at Columbia

A new Green Lights Partner as of February 1994, UMC earned the 1994 Partner of the Year Award for Colleges and Universities because of the impressive results it has already produced. Although energy conservation programs have been an aspect of campus life since the mid-1980s, UMC saw Green Lights as a great opportunity to maintain and maximize its lighting upgrade efforts. "Green Lights has particularly helped with information on up-to-date lighting technologies. And other Green Lights participants' experiences have been helpful. Information sharing is important to us," says Mark Culp, manager of energy engineering and the GLID at UMC. "The five-year commitment was also a big step for us. It helped commit the university to provide the financing and resources to complete our projects."

With 22,000 full-time students and more than 300 facilities (150 major buildings) totaling 5.3 million square feet of floorspace, UMC is a small city unto itself. In fact, the university generates its own electricity and steam to light, heat, and cool these facilities and operate equipment in classrooms, dorms, labs, cafeterias, hospitals, stadiums, and other academic and social centers on campus. Like many public universities,

Higher Education Participants in the Green Lights Program

Endorsers

Alliance for Environmental Education
American Association for the Advancement of Science
American Institute of Architecture Students
APPA: The Association of Higher Education Facilities Officers
Associated Students of UC Berkeley
Association of Science-Technology Center
Association of Washington School Principals
Georgetown University Students Association
Hampshire College Pugwash
Kent State University Undergraduate Student Senate
Maryland Science Center
National Earth Science Center of Greensboro, Inc.
Science Teachers Association of New York State
Student Association of SUNY at Oswego
Student Association of the George Washington University
Students for an Energy-Efficient Environment
University of Maine Student Government
University of Oklahoma Student Association
Vermont Student Environmental Program
Washington Association of School Administrators
Washington Association of School Business Officials
Washington State School Directors' Association

Partners

Anne Arundel Community College
Baylor College of Dentistry
Biola University
Bluffton College
Brandeis University
Broward Community College
Brown University
Bucknell University
Buffalo State College
California State University System
Carnegie Mellon University
Catholic University of America
Central Florida Community College
Chabot Community College
City University of New York
Clark Atlanta University
Cleveland State University
College of Saint Rose
Colorado State University
Columbia University
Connecticut College
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George Washington University
Georgetown University
Georgia Institute of Technology
Georgia State University
Hahnemann University
Hofstra University
Hood College
Illinois State University
Indiana State University
Jackson State University
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Johns Hopkins/SAIS
Kennesaw State College
Lake Tahoe Community College
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UMC is also experiencing continued growth—1 million square feet of floorspace have been added since 1987—which would soon require expanded energy generating capacity if not for Green Lights upgrades and other energy conservation programs implemented. "These lighting projects will save enough energy during peak periods to postpone the need for more generators," says Culp.

By implementing state-of-the-art, energy-efficient lighting technology, UMC has reduced its lighting load by 750 kilowatts (kW), is producing energy savings of 4.5 million kilowatt-hours (kWh) annually, and is saving more than $320,000 annually with only 35 percent of its floorspace upgraded. When completed, the upgrades will save more than $1 million annually. These upgrades are already preventing pollution created by power plant emissions—9 million pounds of carbon dioxide (CO_2) per year, 84,000 pounds of sodium dioxide (SO_2) per year, and 38,000 pounds of nitrogen oxides (NO_x) per year. In basic terms, these saving are equivalent to removing 844 cars from U.S. highways or planting 1,730 acres of trees. When these upgrades are complete, expected pollution prevention will total 28.6 million pounds of CO_2 per year alone.

In interior settings, Culp installed more than 20,000 energy-efficient electronic ballasts and fluorescent lamps to replace magnetic ballasts and fluorescent T-12 lamps. In upgraded facilities, 1,000 compact fluorescent lamps have replaced inefficient incandescents. The staff also installed more than 1,000 occupancy sensors or daylight sensors to automatically shut off lights in rooms that are unoccupied or when natural light is available. A direct digital control (DDC) system is minimizing energy usage while allowing for varying usage schedules. In exterior settings, the university is installing high pressure sodium and metal halide lamps to replace inefficient incandescent and mercury vapor lamps. Metal halide lamps, which provide a whiter light, are used to light landmarks on campus—and with some structures dating to the late 1800s, the campus has been able to highlight its historic sites and still save money. In these respects,

Culp and his staff relied on Green Lights on-line services and the *Lighting Upgrade Manual* to provide valuable information about disposal of magnetic ballasts and other upgrade procedures.

The experience of UMC is not unique among colleges and universities. However, in earning the distinction of Green Lights Partner of the Year, UMC was exemplary in fulfilling every aspect of being a Green Lights Partner. Like several other universities, UMC used students on work-study to survey most of the lighting systems and even involved them in simple upgrades, such as replacing incandescent light bulbs with compact fluorescent lamps. The university also has made numerous efforts to educate students, faculty, and staff about Green Lights and get them involved in increasing energy savings. Green Lights-related activities include:

- **Energy Extravaganza**—At a yearly energy fair held during Energy Awareness Week to promote energy technologies, the emphasis in 1994 was on Green Lights. More than 5,000 students, faculty, and staff participated in events around campus sponsored by UMC, Green Lights Partners (including the State of Missouri) and Allies, and the campus Environmental Affairs Council. Game winners at the Energy Management Department's booth were awarded Green Lights-Energy Extravaganza T-shirts.
- **Publicity**—In campus publications that reach an estimated 30,000 readers, UMC placed advertisements providing information on Green Lights and new lighting technologies. Additional ads discussing Green Lights and energy-efficient lighting were also placed in local newspapers, and a press release was issued to local newspapers and radio and TV stations.
- **Coordinators**—Each major building has its own Green Lights Building Coordinator to coordinate Green Lights issues. A kick-off meeting was held in spring 1994, at which EPA's Green Lights video was shown to the 150 coordinators. A *Green Lights Program Newsletter* is issued twice a year to update them on progress and keep them abreast of new issues.
- **Lights Out Campaign**—UMC worked with the Environmental Affairs Council to place 17,000 cardboard signs at light switches reminding occupants: "We have the *POWER* in our little finger to save the University **$250,000 ANNUALLY**."
- **Policies and Standards**—The university established lighting policies and a lighting standard for new buildings and renovations that requires all new designs to meet engineering standards and make use of lighting systems with the lowest life-cycle cost.

With the majority of its facilities yet to be upgraded and a campus that continues to expand, UMC looks forward to continued energy savings that will reduce overhead, prevent pollution, and prevent the need for more generators. UMC also plans to take advantage of the opportunity to educate students, faculty, and staff, publicize Green Lights, and involve students in its efforts to conserve energy.

The University of Cincinnati

"The University of Cincinnati has taken an aggressive approach toward improving energy conservation, reducing environmental pollution, and maximizing utility cost savings," says James R. Tucker, GLID and director of facilities management at UC. "We wanted to join Green Lights to take advantage of the environmental benefits to UC and the community and to commit to complete our upgrades within five years."

With 7 million square feet of floorspace and 35,000 students, up to 50,000 people use the campus on any given day. When UC reduces electricity usage, both the university and Cincinnati breathe easier. A contender for 1994 Partner of the Year for Colleges & Universities, UC is already preventing emissions of more than 29.7 million pounds of CO_2 per year, 216,000 pounds of SO_2 per year, and 114,000 pounds of NOx per year thanks to its Green Lights upgrades.

As CG&E's largest customer, the university is already saving more than $1.3 million per year, producing a lighting load reduction of 3,135 kW, and reducing energy usage by 29.8 million kWh per year. UC signed on as a Green Lights Partner on Earth Day 1994 but began its Lighting Incentive Program in 1991. The university recently completed Phase One of the program, which involved upgrades to 2.9 million square feet of facilities. UC spent almost $1.6 million on its Phase One upgrades and received $714,000 in rebates from Green Lights Utility Ally CG&E, resulting in a payback period of less than one year. Tucker's staff installed more than 40,000 electronic ballasts and almost 90,000 energy-efficient fluorescent lamps, with a reduction in the number of lamps needed (delamping) to maintain or improve light levels. Phase Two, which is almost complete, involves an additional 18,000 fixtures. Upon completion, 85 percent of academic facilities will be upgraded.

Tucker and his staff have taken advantage of UC's Return On Investment (ROI) program to obtain university financing for these projects. Under ROI, viable campus improvement projects that have a payback period of less than two years are eligible for university funding, with the resultant savings split 75/25 between the president's office and the department's budget. UC's ROI

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The University of Southern Maine's new library, which incorporates T-8 lamps, occupancy sensors, and perimeter lighting that switches off at sunrise, is saving 658,865 kWh each year thanks to the Green Lights program.

projects, which exemplify the Energy Star Buildings profile, include: campus-wide insulation of bare steam, condensate, and chilled water lines; DDC system for research facilities; replacement windows; and steam trap retrofits. At a time when many universities' facility budgets are being reduced, retaining 25 percent of the savings from the Green Lights upgrades is allowing Tucker to finance other projects at UC.

With the help of Allies like CG&E, UC plans to continue to benefit from the Green Lights program. Tucker's next projects involve installing occupancy sensors and upgrading the HVAC systems. UC is looking forward to the launch of the Energy Star Buildings program and hopes to take advantage of the whole building applications that are developing. As the university strives to educate its students, faculty, and staff about Green Lights, the bottom line for UC remains reducing overhead while preventing pollution and improving light levels.

City University of New York

Another contender for 1994 Partner of the Year, CUNY holds the distinction of being the largest university considered. With more than 400 buildings on 19 campuses totaling 19.3 million square feet, CUNY's energy manager, Jerold Marmer, is using Green Lights to upgrade a vast array of facilities, including buildings protected by landmark status. "Some lighting levels went up by 200 percent, so that the university's lighting standards were met," says Marmer about implementing energy-efficient upgrades in all facilities. "The Brooklyn College Library lights were very poor prior to their total replacement, but now students and staff are delighted with the lighting."

Since joining Green Lights in August 1992, CUNY's student body (213,000) has expanded by more than 6.6 percent and a number of buildings have opened and/or reached full capacity. And, at a time of continued growth and accompanying budgetary pressures, CUNY has succeeded in reducing its lighting load by 3,926 kW, producing annual energy savings of 22.3 million kWh, and enjoying annual energy cost savings of $3.6 million compared with CUNY's annual electricity bill of $27.1 million.

"Economics are the key concern," says Marmer. "People are seeing the financial results and the lighting benefits. The demand for upgrades is so great that the timeline is becoming an issue." Fourteen campuses are almost complete, with five more in the design phase, and their facilities managers are eager to see upgrades begin.

CUNY is taking advantage of creative upgrade financing provided by Green Lights Ally New York Power Authority (NYPA), a state agency that provides electricity to many public and private organizations in New York State. Under the program, NYPA is paying for the cost of CUNY's upgrades, which already total approximately $16 million, half of which will be provided as a rebate to CUNY and half of which will be paid through the energy cost savings in CUNY's utility bills. "We have a stable utility cost while we pay off a capital expenditure," says Marmer. The payback periods for the upgrade projects are two to two-and-a-half years, after which half the energy cost savings for two years go directly to CUNY's campus facility budgets.

CUNY has relied on three lighting management companies to survey and upgrade its lighting systems. Because of the number of people required to survey and upgrade so many facilities—two to three consultants under the supervision of a CUNY facility staff manager on each campus—hiring consultants proved cost-effective. These companies, including two

Continued on page 36

Energy Star Showcase Buildings

The Energy Star Showcase Buildings program is a pilot program involving 24 Green Lights participants—including the Catholic University of America and the Maine College of Art—each of which has volunteered to perform comprehensive energy-efficiency upgrades to one of its facilities. The Showcase Buildings program is due for completion in July 1995 and includes: Green Lights upgrades; heating, ventilating, and air-conditioning (HVAC) system tune-ups and upgrades; maximization of a building's energy management system to reduce energy consumption; installation of insulation; and the purchase of Energy Star Computers, which power down when not in use. Catholic University has committed an 85,000-square-foot theater and classroom facility in Washington, D.C., and the Maine College of Art is converting a 148,000-square-foot department store in Portland into an art education center as a Showcase Building.

The results of these 24 projects will serve as case studies for the Energy Star Buildings program, which will launch later in 1995. EPA estimates that the potential energy savings for an Energy Star Building is enormous. For example, a hypothetical 840,000-square-foot building in Los Angeles utilizing Energy Star technologies would yield energy savings of $28 million and prevent the emission of 115,000 tons of pollution over 30 years.

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Lighting Management Company Allies, are installing energy-efficient compact fluorescents with electronic ballasts and occupancy sensors, delamping fixtures from four to two lamps with reflectors, and using tandem wiring to reduce the number of ballasts required. In instances where the lighting fixtures are considered part of the landmark's structure, they have been able to utilize compact fluorescents that suit the fixtures and increase light levels to university standards while reducing the wattage significantly.

Following the Green Lights strategy, Marmer relied on test models before any retrofits were performed. This provided input from the occupants to correct any problems before the project proceeded. "The public response to the upgrades has been extremely positive."

Indeed, the upgrades are producing unexpected responses. "Security loves the occupancy sensors!" exclaims Marmer. The occupancy sensors have the expected benefit of reducing unnecessary lighting when a room or area is unoccupied; however, the campus security patrols are finding that they can detect intruders when the lights are on in locations which should be unoccupied.

Marmer found the Lighting Upgrade Workshop valuable and is considering the Energy Star Buildings program for CUNY. The next steps in CUNY's Green Lights upgrade process will involve installing light-emitting diode (LED) exit signs and replacing motors and variable speed drive (VSD) fans in the HVAC system. Students, faculty, and staff are delighted that the Green Lights upgrades are already preventing emissions of 37.5 million pounds of CO_2, 256,000 pounds of SO_2, and 98,000 pounds of NOx annually, and CUNY is eager to complete its upgrades and take advantage of new developments as they occur.

Even Small Participants Can Get Big Results

The majority of schools in Green Lights have less than 10,000 students, and they are taking advantage of the opportunities to save money, prevent pollution, and improve lighting, and they are contributing to the program's success with their efforts.

Brown University

A Green Lights Partner since October 1991, Brown is doing an outstanding job of promoting Green Lights on the Internet. Beneath the Green Lights Partner logo, Brown University summarizes its Green Lights upgrades and encourages other Partners to become "information providers." Brown has upgraded 20 percent of its 4 million square feet and is reducing electricity consumption by an average of 30 percent. Projects have an average payback period of three years, and utility rebates cover up to 25 percent of costs. Brown is also retrofitting incandescent exit signs with fluorescent lamps, and LED signs are specified for all new non-dorm applications. At a cost of $24,000, the exit sign project is reducing maintenance costs by $50,000, and annual energy cost savings are $18,000.

Rochester Institute of Technology

With 12,000 students and 4.5 million square feet of facilities, RIT is making use of its students to save money and prevent pollution. Three students who are environmental studies majors work for RIT's Energy Management Department and have helped survey and upgrade more than 1.1 million square feet in five buildings—and they have taken Green Lights information back to their environmental classes. The upgrades, which are producing annual energy savings of 1.6 million kWh and annual electric bill savings of $132,000, include electronic ballasts, T-8 lamps, occupancy sensors, and 1,100 LED exit signs. Grants from New York State and rebates from Rochester Gas & Electric totaling more than $320,000 have helped cover $570,000 in upgrade costs. Using Green Lights ReportKalc software, RIT reports that it is preventing 2.4 million pounds of CO_2 per year. With the help of its environmental studies majors, RIT plans to do more.

Union College

A Partner since May 1992, Union has upgraded more than 300,000 of its 1.3 million square feet. With less than 3,000 students, Union College is saving money and preventing pollution on a scale comparable with larger universities. Annual energy cost savings already total 43,000 and pollution prevented equals 545,000 pounds of CO_2, 3,751 pounds of SO_2, and 1,375 pounds of NOx annually. Union is installing electronic ballasts, T-8s, compact fluorescents, LED exit signs, and, where useful, occupancy sensors, all promoted by Green Lights. With more than 60 percent of its floorspace yet to be upgraded, Union sees only large opportunities to save money, prevent pollution, and improve lighting around campus.

What Green Lights and Energy Star Mean to Your Organization

Academic institutions need to think about tomorrow as they educate today's students, and those thoughts must include holding down overhead costs, conserving energy, preventing pollution, educating students, faculty, and staff about the environment and the latest technologies, and keeping facilities up to date. EPA and the Green Lights program are available to assist organizations that want to benefit from the technological innovations and support Green Lights offers. For more information about what Green Lights and Energy Star can do for your school, call the Green Lights/Energy Star Hotline at 202-775-6650. ■

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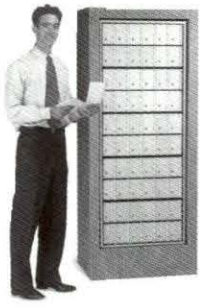

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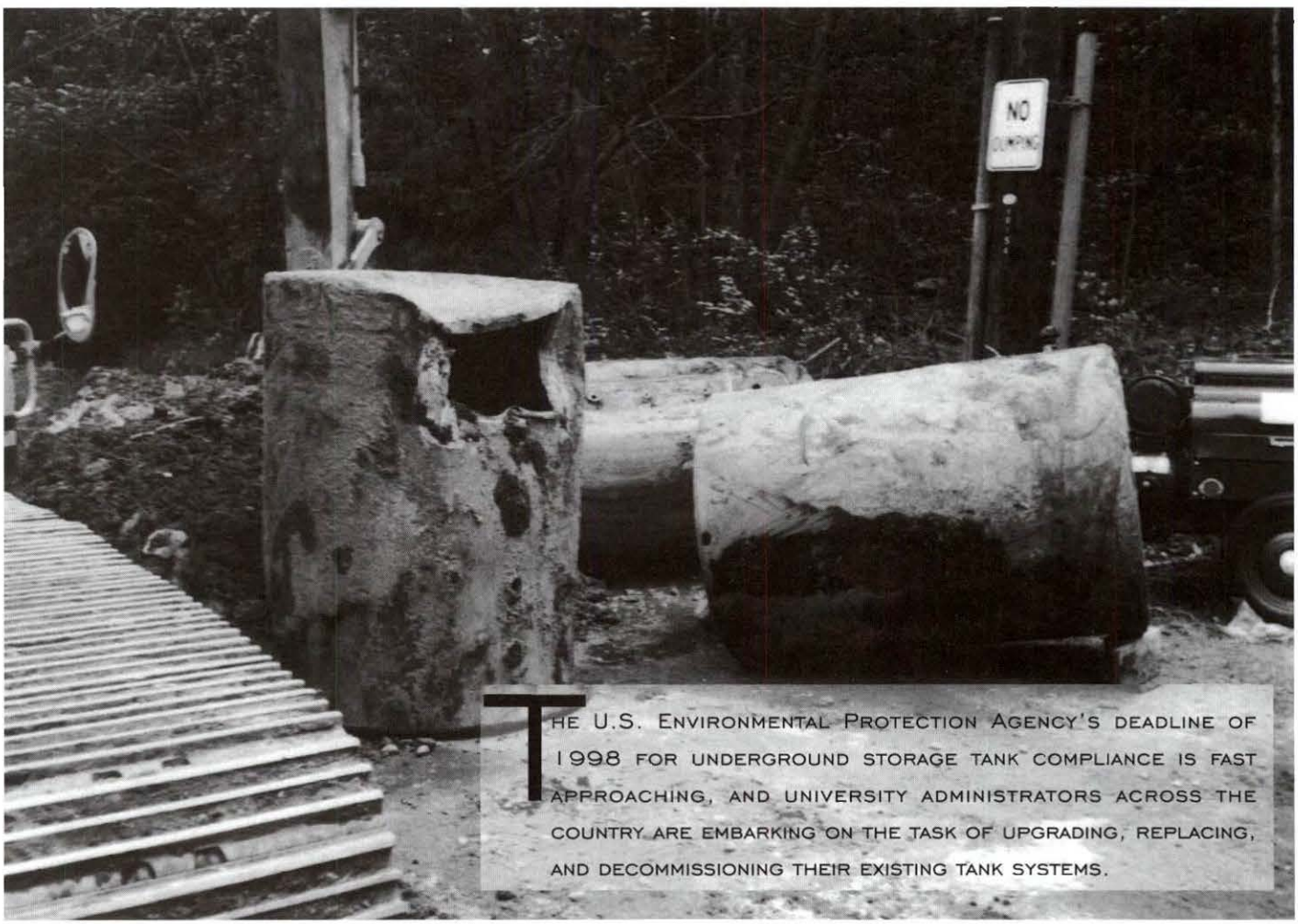

THE U.S. ENVIRONMENTAL PROTECTION AGENCY'S DEADLINE OF 1998 FOR UNDERGROUND STORAGE TANK COMPLIANCE IS FAST APPROACHING, AND UNIVERSITY ADMINISTRATORS ACROSS THE COUNTRY ARE EMBARKING ON THE TASK OF UPGRADING, REPLACING, AND DECOMMISSIONING THEIR EXISTING TANK SYSTEMS.

Two underground storage tanks have been removed.

The regulations require the addition of leak monitoring, spill/overfill protection, corrosion protection, and (for gasoline tanks) vapor recovery features. Abandoned tanks must be closed or removed and any soil or groundwater contamination caused by the tanks must be cleaned up.

While tank requirements and remediation issues vary somewhat for the different fuels and lubricants, the process of finding and evaluating the condition of existing tanks is essentially the same for all facilities. The first step, finding all the tanks and related piping on the property, is sometimes the hardest. The absence of complete, up-to-date drawings and specifications for all tanks ever in use at a facility tends to be the rule rather than the exception, thus making a certain amount of detective work essential.

A typical educational facility might have multiple large heating oil tanks, a 5,000-gallon gasoline tank for vehicles, and numerous smaller tanks for lubrication oil, motor oil, and antifreeze. Many school facilities also have underground diesel fuel tanks. Over the years, some of these tanks may have been abandoned as new ones were installed.

To find the tanks it is usually necessary to start with a document review. Installation and maintenance records, site plans, and leak and spill reports filed in local health or fire departments are often helpful. The memories of long-term employees can also be goldmines of information.

Any clues gleaned from the document review must be followed up by a walk-through of the site by an experienced evaluation team. On the site, the most obvious tip-off is an exposed fill cap or concrete dispensing island. If a fill cap has been paved over, the vent pipe leading up from the tank may still be seen on a nearby wall. If the vent pipe has been removed, discolored brick or paint on the wall may indicate its former presence.

If there are no such indicators, but there is reason to suspect the existence of unidentified tanks, a magnetometer is usually the next step. This device works on the same principle as airport weapon detection systems; it magnetically detects the existence of bulky metal items under the ground such as tanks and pipes. Another method of detection is to utilize ground penetrating radar. When abandoned tanks are found, they must be completely emptied and sealed, or removed from the ground.

Determining the condition of active tanks is the next task. Leaking tanks must be immediately removed from service. In the past, tanks that leaked were often lined or patched and put back into use. This is no longer an option, and in fact most school facilities are upgrading single-walled tanks with double-walled tanks.

Tank Replacement

The likelihood of future leaks makes replacement with double-walled tanks the preferred option in almost every case today. The cost of a new, corrosion-resistant 5,000-gallon tank is about $4,000 for a single-walled type and $5,000 for a double-walled type. The cost of the tank is a small part of the $40,000 price tag for a completely upgraded system. To avoid the expense of digging up the tank again in the near future and cleaning up more leaks, adding a new tank at the time of the system upgrade is usually the best approach.

The testing strategy for leaks is based in part on site conditions and the type of tank involved. Steel tanks and fiberglass tanks have different vulnerabilities. Since steel is susceptible to corrosion, the type of soil that surrounds a steel tank and the level of the groundwater table will affect its integrity over time. In a wet area with rocky soils, a steel tank and related piping can develop holes or breaks in a very short time. In dry sand, they can hold up for decades. Today's double-walled steel tanks have a life expectancy of about thirty years.

With fiberglass, the surrounding soil support is the key. If the soil shifts or settles beneath a fiberglass tank, the tank may become overstressed and cracks and fractures can develop in the walls. Fiberglass pipes if not properly supported may also break if heavy vehicles drive over the soils above them.

Data gleaned from the document review and the field investigation is used to determine the location and number of monitoring wells and soil samples that are needed to check for leaks. If testing indicates no contamination of the soil or groundwater, the system may be presumed to be in good condition. If product is found in the soil or water the tank will have to be tested or dug up to see if it is actually leaking or if the contamination is the result of a past spill or overfill.

The subject of soil and groundwater remediation is another article in itself. Suffice it to say that at $75 per ton, hauling soil to a landfill can be extremely expensive if contamination is at all extensive. More and more facilities are opting instead for in situ treatments, which involve leaving the contaminated material in place and applying advanced technologies such as air sparging/vapor extraction and bioremediation. The investigation team can recommend appropriate alternatives given the particular conditions of the site and the extent of contamination.

THE ABSENCE OF COMPLETE, UP-TO-DATE DRAWINGS AND SPECIFICATIONS FOR ALL TANKS EVER IN USE AT A FACILITY TENDS TO BE THE RULE RATHER THAN THE EXCEPTION.

At this point, the project engineers should have enough information to prepare detailed drawings that identify the field-verified site conditions, the details of existing tank and piping runs, the system modifications that will be required to meet state and federal regulations, installation details for those modifications, and a wiring diagram for new system components. All new systems must include overfill, spill protection, and a leak detection system. Gasoline tanks must also have vapor recovery systems.

Overfill protection is afforded by a simple ball float device inside the tank. When the tank is 95 percent full, the buoyant pressure that keeps the ball afloat makes it impossible for more fuel to enter. To prevent spills, new systems must also include sumps, welded to the fill pipes, which catch fuel from the fill nozzle that would otherwise fall to the ground.

Leak Detection

There are a number of ways to provide leak detection. One is to install monitoring wells on the outside of a tank to detect product in the groundwater. Another is to place a monitor

George Kelley is vice president of Langan Engineering and Environmental Services, Inc., Elmwood Park, New Jersey.

An underground storage tank is being removed.

between the double walls of a tank to detect any fuel that enters the interstice. A third option is an electronic control inside the tank that reads any reduction in tank content when the tank is not in use. Most new systems use some combination of these devices.

There are two kinds of vapor recovery systems. The stage one type uses an extra pipe on the fuel truck to catch vapors as they are released during filling and vent them back into the truck. The stage two variety uses a black cap around the vehicle fill nozzle to collect vapors and keep them from escaping into the air.

The designs for new school facility tank systems should take into account the required use of alternate fuels during months when air quality drops. In the past, some system parts, most notably gaskets, have disintegrated after coming in contact with alternate fuels such as methanol. The compatibility of all new tank, piping, and seal materials with alternate fuels is therefore an important consideration.

Case in Point

Each underground storage tank project is different, calling for slightly different solutions. The City University of New York is currently developing a compliance strategy for the gasoline tanks servicing its campuses at seven locations within the five boroughs. Each of the twelve tanks that have been identified has its own set of circumstances to consider.

For example, one campus is extremely congested and the choice of a site for the new tank and pumping facilities had significant cost implications. At another campus, subsurface soil conditions and the elevation of the groundwater table had a major impact on the site selected for the tanks and associated fueling facility. At several of the campuses, the existence of highly corrosive soils was factored into the analysis that led to the design of fiberglass tanks as the most cost-effective system.

While fiberglass tanks can often be an obvious choice in a highly corrosive environment, the added strength and toughness of steel can override the choice when these characteristics are assigned a higher priority. In some instances, steel tanks coated with fiberglass can be a good choice based on both cost and technical considerations.

Sometimes a tank system upgrade can offer benefits that go beyond clean soil and groundwater. On the CUNY project, it was found that the procedures used for monitoring the usage of the fuel were cumbersome and time consuming. Most pumps were controlled only by lock and key, creating a nightmare for those responsible for dispensing the fuels to authorized persons. Additionally, the antiquated gauges made inventory control extremely difficult.

These problems were eliminated by providing completely electronic monitoring systems in conjunction with a card reader actuation mechanism. Data is transmitted from the fueling station to a designated location where it is entered into a personal computer for sorting and formatting. Reports are then printed out showing usage trends, both by time and by user code.

The CUNY project includes long-term protection against system failures. Sophisticated electronic monitoring systems were designed so that leaks could be immediately detected and repaired before a significant contamination results. As a backup system, simple and inexpensive monitoring wells were installed at critical locations. As an added safety feature, the fueling stations contain a fire suppression system, which is automatically triggered if a fire or extreme heat source is detected.

The CUNY fuel dispensing facilities were designed to have low maintenance requirements, sophisticated inventory control, and excellent long term performance characteristics, promising to safeguard the environment as well as the campus residents and employees for many years. ■

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A Utilities Overcharge Case Study

by Brian K. Yeoman and Raudel Villaneda

Utilities expenditures constitute a significant portion of most institutional facilities budgets. In these times of high energy costs, the monitoring of consumption, the collection of data and its analysis, and active measures to reduce consumption are the order of the day. Further, computerized monitoring has removed much of the error in billing questions. However, billing disputes do occur. The following case study serves as an example of how the careful monitoring of energy usage can point out a problem before it becomes a budgetary issue and how the collection, analysis, and presentation of data can effectively buttress negotiations during utility overcharge disputes.

Institutional Background

The University of Texas Houston Health Science Center (UTHHSC) comprises six major schools and one teaching hospital. These facilities encompass a combined area of approximately 2.9 million square feet. All facilities, with the exception of one, are located in what is considered to be the largest medical center in the world: The Texas Medical Center.

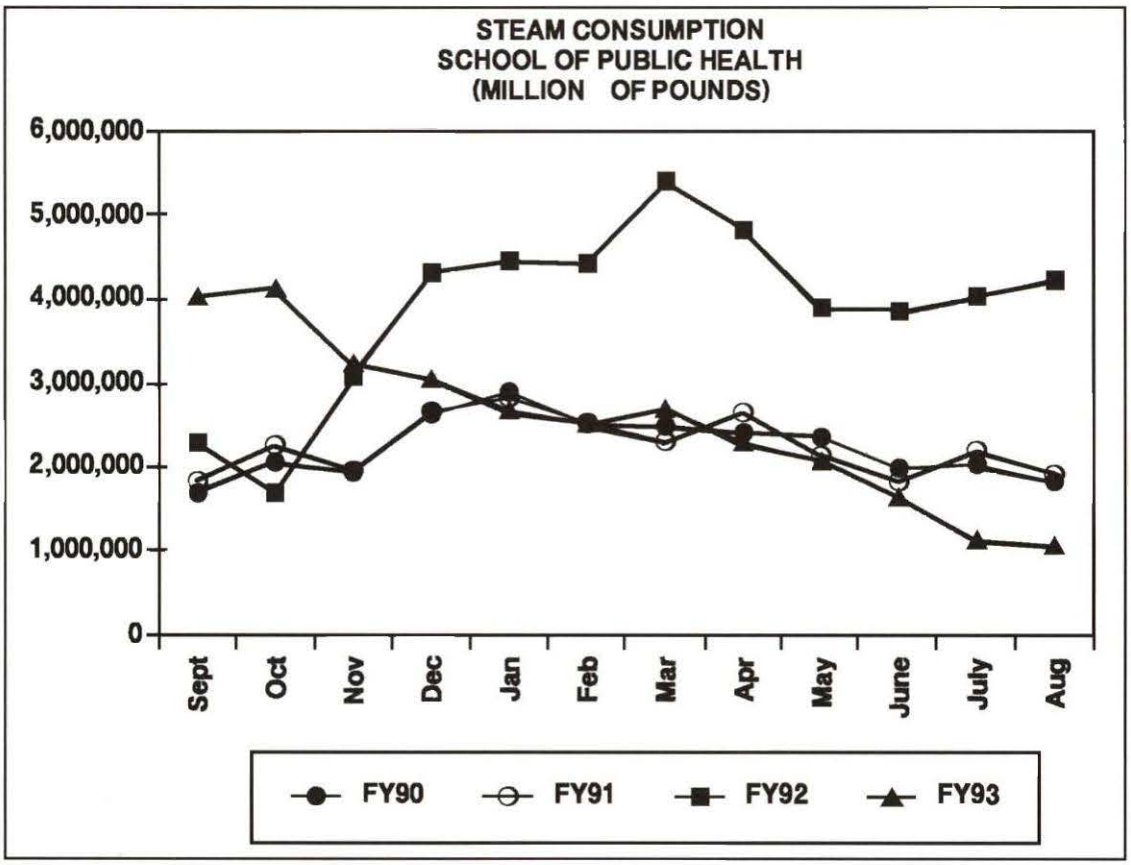
Brian Yeoman is assistant vice president-support services, and Ron Villaneda is energy manager/ombudsman, at the University of Texas Health Science Center in Houston, Texas. A version of this article first appeared in School and College.

This large and complex institution is provided with steam and chilled water by the largest heating, cooling, and cogeneration system in the world. This energy utility's plant delivers chilled water and steam through an underground distribution system; like many others, it employs a computerized monitoring system to oversee the production and distribution of thermal energy products.

Problem Definition

The UTHHSC Building Services Department is charged with the dual responsibility of building maintenance and energy conservation. In the latter role, the department prepares the purchased utilities budget, monitors the facilities energy consumption levels, and receives, verifies, and authorizes the payment of the utility bills. The actual consumption is tested against a consumption model developed by the department and which utilizes the prior three years consumption data as parametric bounds for the current consumption rates. Actual consumption must not exceed a 3 percent variance from the rate established by the model. Exceptions for seasonal variances are accounted for in the model.

Each of our primary facilities are now metered and billed on a monthly basis. In November 1991, our School of Public Health registered an unusually high rate of consumption for



steam. The percentage increase, as compared to the projection model for the same month in the previous three years, was an incredible 57 percent. This was an indication that a problem might exist.

Initial Steps

Our first step was to alert the utility company of the apparent anomaly. Our next step was to chart the consumption pattern in the remainder of our facilities to determine if a similar increase had occurred. No comparable increase was found in any other building. The steam consumption increase was confined to our School of Public Health facility.

We then asked the utility to examine the possibility of a metering error. They conducted a battery of tests on their metering system and found them to be in good operating condition.

At this point, we informed our assistant vice president for support services, under whose operational umbrella the department functions, as to the nature of the problem. He instructed us to ensure that any and all areas of possible waste be identified and repaired and to provide him with periodic updates. The important perspective that he brought to the analysis was an immediate understanding of the negative budgetary implications of this situation.

The building superintendent for this facility undertook the task of inspecting all steam traps. Over a two-month period, fifty-eight of ninety steam traps were found to be operating improperly. Twenty-eight traps were replaced and the remaining thirty repaired. However, the bills received during this period demonstrated an even higher increase in steam consumption. This occurred during December and January, a time of year in Houston where the weather does not change appreciably.

We then arranged a meeting with the utility to articulate our findings. At this meeting it was decided that the entire facility was to be inspected by both parties' personnel. This inspection resulted in a consensus that the abnormal increase in steam consumption could not be attributed to faulty mechanical systems.

The utility company once again reviewed their billing formulas and procedures and found them to be correct. During this phase all electronic equipment was replaced, as was the orifice plate. In addition, a dedicated line was installed for the meter.

These steps were carried out over a seven-month period. The mechanical equipment had been inspected and repairs made when necessary. Billing formulas and procedures had been analyzed and found to be sound. Despite these efforts, steam consumption continued to register much higher levels than would be supported by our consumption model. This was

Table 1. UTHHSC Steam Consumption and Demand, in lbs/hrs. (Selected Facilities)

Facility	Month		Difference	
	October	November		
School of Public Health	1,749,370	3,194,480	1,445,110	(82.6%)
Medical School Building	7,185,982	10,089,548	2,903,566	(40.4%)
Speech & Hearing Institute	523,759	470,833	- 52,926	(-10.1%)
Mental Sciences Institute	419,070	528,016	108,946	(26%)
Dental Branch Building	1,027,585	1,597,847	570,262	(55.5%)

Table 2. School of Public Health
Steam Consumption Overcharge Financial Implications (Selected Months)

	December	March	April
FY 92 Metered Consumption	4,313,520	5,416,872	4,822,790
Three Year Average	2,632,643	2,540,134	2,456,348
Difference	1,680,877	2,876,738	2,366,442
Monthly Rate	$.00507	$.00450	$.00450
Total Overcharge	$8,522	$12,945	$10,649

Figures are pound-hours unless otherwise designated; months were selected as representative of the overcharge problem.

accompanied, as can be expected, by utility bills that were much higher than our utility budget had anticipated. The problem of steam consumption had become a riddle wrapped in an enigma with no visible solution in sight.

Our contract with utility specifies that in the event of a billing conflict, an independent engineering firm may be brought in to provide technical assistance in the resolution of the dispute. Further, if a 2 percent discrepancy is found, the utility will be required to pay for the expenses incurred. Once we had satisfied ourselves that our own systems were in good working condition, by way of inspections and equipment replacement and repair, we informed the utility of our intention to invoke this clause. At this point, they requested an additional two weeks to further review their systems. We acceded to this request.

Technical Problem Found

During this two-week period, the utility discovered, nine months after this costly and unfortunate incident began, that they indeed had a technical problem. They discovered that the setting on the "smart" differential pressure transducer had been factory set for square-root output rather than linear output as is required. The result of this error was higher than actual consumption readings.

The proverbial needle in the haystack had been found, the riddle solved. The technical question had been resolved. However, we rejoiced too soon, as the business problem remained: how to determine the monetary value of the overcharge.

Settlement Negotiations

We have always been firm believers that data collection coupled with rigorous analysis is the *sine qua non* element every organization must have to adequately discern and serve the needs of its clients. Hard economic times make the application of this theory more relevant than ever. This is where time spent in analysis and maintenance of accurate records has its rewards. Records maintained are actual usage, not projections, and serve as the basis for the analytical decision making process. Based on our data collection models, which employ monthly consumption data from fiscal years 1989 through the present, we were able to determine, on a month-to-month basis, the projected sum of the overcharge.

The formula to determine the annual overcharge can be formally expressed as:

$$\text{Annual Overcharge} = \Sigma(SC_i - \mu_i)(R_i);$$

where:

SC_i is the steam consumption in lbs/hrs for month i;

μ_i is the averaged consumption in lbs/hrs for the fiscal years 1989, 1990, and 1991 at month i;

R_i is the rate charged for consumption/demand at month i.

Using data from the period during which the overcharge occurred, we applied this model and estimated an annual overcharge of $205,036.

During a scheduled meeting with utility company personnel, we presented our findings and explained a rationale that we felt strongly substantiated the validity of our claim. The utility independently arrived at a much lower overcharge value of $103,618. The difference was not acceptable to us. Further, we felt that our data and the rigorous analysis that we had undertaken would withstand any scrutiny or challenge.

Our monetary estimate rested on the premise that yearly consumption for the prior three years (fiscal years 1989, 1990, and 1991) demonstrated a similar pattern and volume of consumption/demand. The emergent pattern showed about 26 million pounds on the consumption side, and 975,000 lbs/days on the demand side. This compared to the anomalous consumption/demand for fiscal year 1992 of 46 million and 1.6 million, respectively. The magnitude of this increase could not be attributed solely to faulty steam traps; furthermore, neither the HVAC schedule of operations for the facility in question had been altered, nor had any new space been added to the facility.

We were being asked to accept their offer of $103,618 as final, to either take it or leave it. We agreed to accept this offer, but only as a partial payment with the caveat that if steam consumption, after having corrected the metering problem, did not conform to their projections, a review of actual data would be used in a determination of final payment.

The next four months supported our original contention. The consumption pattern of steam at the School of Public Health was clearly and unmistakably lower. This, we felt, substantiated our claim and provided us with an air-tight case. Thus, we informed the utility of our desire to have the full original amount refunded.

They countered with another final offer of $50,000, claiming that some consideration had to be taken in light of the fact that a good number of steam traps were found to be in need of replacement. They felt that this was in part responsible for the higher than usual steam consumption rate.

Negotiations had again come to a standstill. Every indication seemed to point to the fact that to pursue the matter any further would involve a protracted, costly, and unpleasant legal battle. This seemed to be the only recourse left.

The utility company is a cooperative, and the UTHHSC is a

member with a 26 percent virtual ownership of the cooperative. Because of the closeness of our relationship, we proposed a Win-Win agreement that we felt would maintain our cordial relationship, settle our rate dispute, and simultaneously address the needs of another one of our facilities.

The agreement consisted of the following: the utility would refund an additional $85,795 and install a separate meter, valued at $28,000, in the Graduate School of Biomedical Sciences, which had been sharing a metering system with the School of Public Health. The benefit to them would be the increased accuracy of usage data for the two buildings; credit toward our settlement in the way of labor costs; and the final settlement of the dispute. The benefits to us would be also increased accuracy of metering and the settlement of the dispute.

Much to our pleasure, the utility agreed to our Win-Win proposal, and the matter was put to rest.

Conclusion

Accurate records are an invaluable resource both for budgeting purposes as well as a means for settling real or perceived differences in utility charges. The time spent on keeping these records up-to-date can be offset by the potential benefits derived. It is simply not enough to think or suspect that a bill might be wrong; one must be able to prove one's contention based on hard data.

In the final analysis, you must trust your instincts and enlist the cooperation of all personnel involved. Utility providers are known for the state-of-the-art equipment they use; by and large, they are a model of sophistication and accuracy. However, human error cannot be ruled out. The need then arises for a watchful eye, especially when a bill that defies common sense is presented for payment.

This case study is presented as an example of: 1) how mutual cooperation across disciplines within the same department can result in effective use of expertise and resources for the good of the institution; 2) how accurate data collection, usage models, and exhaustive analysis can yield tangible, usable information; 3) how patient, persistent bargaining can yield results without resorting to legal recourse; and, finally, 4) how finding mutually beneficial solutions to seemingly intractable problems, in the form of Win-Win agreements, can leave both parties satisfied and with material gains.

The UTHHSC, applying these concepts, was able to recover over $186,000 resulting from a billing error. Further, we achieved separate metering for another of our facilities, which was also a benefit to the utility company. If this billing error had not been detected and addressed, the institution would have been saddled with approximately $250,000 per year in additional and unbudgeted purchased utilities costs.

The moral of the story is: trust but monitor and you can negotiate anything if you can find Win-Win solutions. ■

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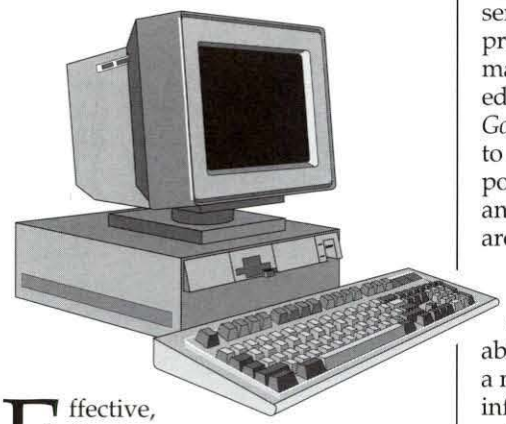
APPA Signs on the Information Superhighway



Effective, timely communication is the driving force in business, in customer service, and in associations today. The information superhighway is a revolution about instant access, effective communication, and the ability to network with the world. This technology is coming to APPA.

The APPA Information Services Committee was asked by the Board of Directors to evaluate electronic access to data and enhanced information and communication methods. A series of informal discussions, followed by surveys at the 1994 regional meetings and a survey in APPA's newsletter, led to the conclusion that the average member does want to see APPA develop its electronic communication. After much research and many discussions, a proposal placing APPA in the role to be a leader in electronic services was presented to the APPA Board of Directors at its mid-year meeting in February.

We are pleased to announce that the Board of Directors supported the proposal to establish the APPANet. When operational, any APPA member with a PC will be able to access the APPANet via the Internet or a modem.

Diana Tringali is APPA's director of member services.

What Does This Mean to APPA?

The first phase of the project will involve establishing a bulletin board system with capability for e-mail communication. This will enhance communication between member institutions, as well as to APPA staff. This phase will include establishing a link through APPA to the Internet. After that we hope to establish a variety of member services on-line, including a member profile/directory, *Job Express*, summaries of *Inside APPA*, registration for educational conferences, *APPA Government Relations Update*, and access to APPA's information databases. The possibilities for information sharing and new/expanded member services are endless.

One additional advantage of this system will be "crisis" or time-sensitive communications. APPA will be able to transmit or fax to all members in a matter of minutes vital and timely information.

Electronic services will mean 24-hour access to APPA services. Members can receive information on demand, transfer documents electronically, and network with throusands of colleagues. APPA will become an extension of your office with information available at your fingertips.

We look forward to announcing the progress of the APPANet and hope to offer a preview of services at the APPA Annual Meeting in July in Philadelphia. As this is a new experience for APPA, and perhaps a new venture for many of you, let's explore some of the terms and concepts associated with the information superhighway.

Bulletin Board System

A bulletin board system (BBS) is a computer-based way of exchanging information and posting messages. It is a forum to talk to others. Discussion groups may be formed to trade opinions and information on a particular subject. BBSs are a '90s way of networking via computer. One of the advantages is the immediate feedback you receive, as well as the volume of responses from many areas and institutions.

Among our members are several discussion groups hosted by various institutions. Topics include custodial operations, the MAPPA trainers network, safety issues, TQM, pest control, marine facilities, grounds management, and general facilities management concerns.

Electronic Mail

Electronic mail (e-mail) is a mail system that allows electronic distribution of mail. The Internet provides a link among e-mail systems, making it possible to communicate virtually instantaneously with millions of individuals worldwide.

Many members already have e-mail addresses, and these are listed in the APPA membership directory. As we go on-line, one of the initial offerings will include a "telephone listing" of members. We encourage all members to provide us with their e-mail addresses.

Internet

The Internet is the largest scientific, research, and academic computer network in the world. A network of computer networks connecting computers at educational institutions, government agencies, commercial firms, military sites, and private organizations through the United States and the world. Estimates run that more than 20 million individuals are able to access Internet resources and services.

History. The original Internet transmission was sent by UCLA to various universities on September 1, 1969. Originally, the project was funded by the U.S. Department of Defense and was known as ARPAnet (Advanced Research Projects Agency Network). In 1986, the National Science Foundation took over and formed the Internet.

Resources. The resources and services on the Internet are growing every day. It is a vehicle to communicate with faculty, staff, and students on campuses throughout the world, business representatives, and many others. You can access databases and resources including library catalogs, congressional documents, and current weather reports.

World Wide Web

World Wide Web is a set of connections that organizes the Internet in a graphical manner and makes it easier for the user to find your way around. It provides hypertext access to resources and services through the Internet. Hypertext is a highlighted word in a document that, when clicked upon, is linked to a text file, picture, sound, or resources that provide additional information on the word.

Mosaic

A popular "freeware" software program developed at the National Center for Supercomputing Applications at the University of Illinois/Urbana-Champaign. The program lets you access the World Wide Web.

Gopher

A gopher client is a software program that makes it easy for Internet users to locate, read, and download files. Gopher organizes everything into menus. This can assist in interface to campus information systems worldwide, library on-line catalogs, phone books, and other materials.

Archie

Archie is a system for locating files that are stored on FTP servers.

Veronica

Veronica is a search tool, like Archie, which searches text that appears in gopher menus.

Telnet

This is the name for a communication protocol and the programs that allow your computer to log into a remote computer and use it as if you were sitting at a computer at that location.

Transmission Control Protocol/Internet Protocol (TCP/IP)

A compilation of network- and transport-level protocols that allows a PC to speak the same language as other PCs on the network.

File Transfer Protocol

A protocol that describes file transfer between a host and remote computer system.

The Information Age is upon us in the business world, academic world, and our personal lives. Technology is a tool that can enable us to respond more quickly and efficiently, and facilitate the sharing of information. The APPANet is not designed to replace the human element or customer service that APPA delivers to its members. It will enable us to expand the network to include many more people in communications, to deliver printed material or data sources in a timely manner, and to utilize the information available in the public sector. The next few months will be challenging for the Association as we "cruise" the highway and share with you our knowledge and experience. Buckle up and stay tuned for updates on our journey. ■

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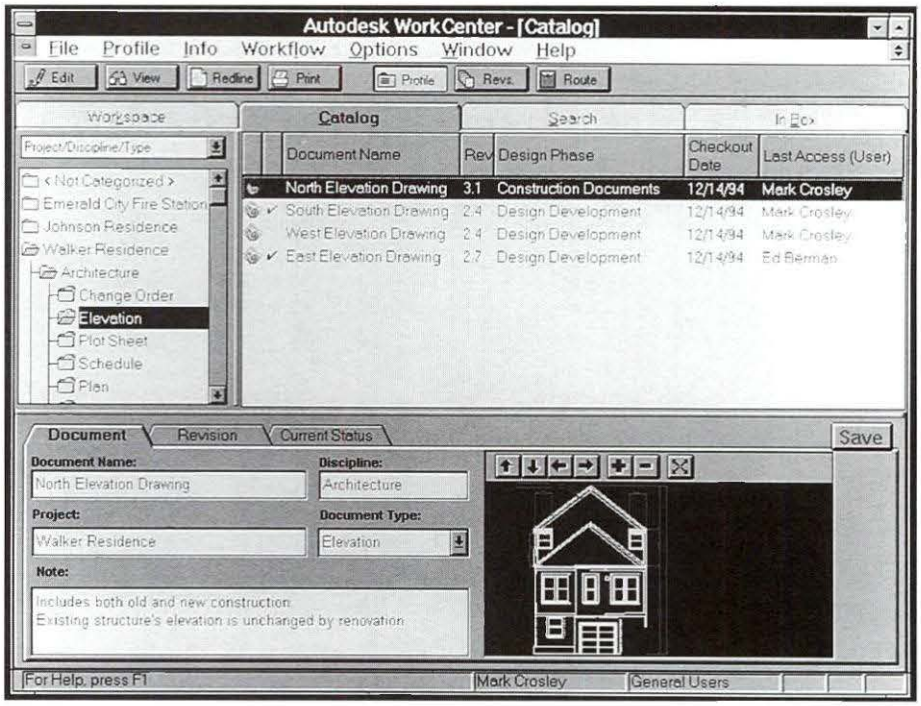
Software & Solutions

Howard Millman

Autodesk's WorkCenter Organizes & Tracks Project Documents

Everybody has at least one theory that won't fly, but they never give up trying to make it work. Homegrown solutions that use colored tabs and sticky notes to organize, file, and find paperwork fall into that group.



Autodesk's WorkCenter allows users to tag and view in-depth information about a document.

Most often, the drawing, letter, or manual someone needs is available, but finding it (or finding the person who knows where it is) can resemble a fox and hound chase. For information to be of value it must be in the hands of the people who need it—and when they need it.

A new Windows-based application from Autodesk, the makers of AutoCAD, can help. Called Autodesk WorkCenter, the package provides document and workflow management for people involved in the design, construction, or operation of buildings. Tightly integrated with AutoCAD and AutoCAD LT, WorkCenter enables users to organize, catalog, track, and view a variety of documents and drawings associated with large projects or a campus-wide building complex.

To help make that happen, WorkCenter will track more than one hundred file types, including text, spreadsheets, graphics, and database files, as well as all other files that affect the design process on campus. You can scan in equipment parts manuals, contract specifications, diagrams, as-builts, correspondence, spreadsheets, and building drawings.

Autodesk's project manager, Mark Crosley, describes software as groupware, meaning that it's meant to be used by, well, a group. These teams can consist of the staff in the new construction office intent on collaborating on a building design. Otherwise, a team can consist of the physical plant's departments, all of whom need access to the institutional data reservoir.

Crosley suggests that one of WorkCenter's more important contributions to facilities management can be in providing easier access to site inventory surveys. WorkCenter's viewers provide access to dozens of DOS and Windows databases, so it can be a way to view the valuable data stored in those files.

Customization enables changing the look and feel of the program, including renaming/hiding fields, changing system defaults, and preferences. System preferences can customize the WorkCenter for a specific workgroup or department. The SmartViews feature allows all users to organize and display document names in any way they wish.

With all the opportunities to share and modify data, purposefully or accidentally, WorkCenter includes multilevel password security. Its security features protects original documents from simultaneous revisions, overwriting, and accidental deletions as well as locking out unauthorized users. Whenever a user changes or annotates a document, an audit function gener-

Howard Millman is a systems integrator for universities and hospitals. His company, Data Systems Services, is based in Croton, New York. Software & Solutions is the new name for Millman's Database Update column.

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ates a new version number while noting who made the changes. A compare function gives users the opportunity to view and highlight the differences between revisions.

As part of the information sharing strategy, WorkCenter offers e-mail and Lotus Notes-like document routing system. Using the network, users can transmit the document to another team member for review and redlining.

For schools that have a developer on staff, Autodesk provides an API, a way to add new features or functions to the program. For the technical minded, the API works with C, C++, and Visual Basic development tools. According to Autodesk, more than fifty third-party vendors are busily at work developing add-ins. The program does not support Windows' built-in data exchange mechanism, Object Linking and Embedding, but instead uses a proprietary system of maintaining hypertext links and document tracking. It will, however, launch other Windows applications.

Shipping now, the present version runs only on Novell networks and Windows. Autodesk says they will release versions for Windows NT and peer-to-peer networks in the near future. Crosley noted that Autodesk does not intend to release a DOS version, because "we find that users increasingly ask only for Windows products."

List price begins at $695 per node on a five-user network. For more information, call Autodesk at 800-964-6432. They offer special discounts to schools, so be sure to ask. ■

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The Bookshelf

BPR Reaches the Campus

Business Process Redesign for Higher Education, by Jennifer Dougherty, Jillinda Kidwell, Donna Knight, Loren Hubbell, & Sean Rush. Washington, D.C.: National Association of College and University Business Officers, 1994. 193 pages, $39, softcover.

Corporate America has experienced significant changes in the past decade, as companies attempted to reduce expenses and reposition themselves in the volatile environment of modern business practices. Not surprisingly, higher education has been invaded by business-developed programs and strategies that are aimed at promoting similar changes in the academy. As a result, it seems that the three "Rs" of higher education have changed; they now appear to be Reengineering, Restructuring, and Rightsizing.

Every area of postsecondary education is being encouraged to change, and articles describing these efforts have appeared in *The Chronicle of Higher Education*, *Today's Facility Manager*, and APPA's own *Facilities Manager*, to name but a few examples. The article by Dr. Harvey Kaiser, "Rightsizing Through Restructuring: A Higher Education Challenge" from the fall 1994 edition of *Facilities Manager*, is an excellent overview of the dilemma facing higher education from the perspective of one who is arguably the premier spokesperson for members of the facilities management profession. In addition, APPA's new monograph, *Rightsizing: An APPA Task Force Report*, focuses even more on facilities organizations in the academy.

Recently, the National Association of College and University Business Officers (NACUBO) published *Business Process Redesign for Higher Education*. NACUBO has been a leader in the movement toward managing costs in the face of pressures from today's cutback management trend, and joined with the Coopers & Lybrand consulting firm to publish the recent benchmarking study *Operational Benchmarking for Quality Improvement and Cost Management in Higher Education*. Coopers & Lybrand published its own process redesign book for the business sector in 1992, and then adapted their methodology for higher education when they were commissioned by NACUBO to help write *Business Process Redesign*.

The authors have furnished higher education with a comprehensive review of their process, which is specifically designed to help institutions identify and improve their business management methods. While acknowledging that the customers, culture, and core business of the academy are different from those in the business sector, they suggest that their method is effective, and offer results of implementing their process in specific higher education applications as proof. This book is intended for review and use by senior management personnel engaged in the task of revamping obsolete management functions. It is described as a "toolkit" for "addressing the extraordinary confluence of today's external issues."

The book is divided into four chapters, and also contains a glossary of terms used in the text and three appendices with sample forms, flowcharts, and surveys. Chapter I describes the underlying philosophy and theory behind the proposed process. Chapter II develops the theory as a three-phased conceptual framework—Discover, Redesign, Realize—from which institutional analysts can develop their own unique approach to change. The subsequent work steps result in an "overarching blueprint for implementing change," weaving together technological solutions, process improvement techniques, and change management strategies. The third chapter provides the change team with a set of analytical tools for assessing current "as is" conditions and generating specific redesign ideas. The key to this step of the procedure involves the development of data for a "process profile," which ideally detects and defines so thoroughly existing defects that appropriate changes are readily apparent. Finally, in Chapter IV, case studies are presented describing the results of the successful application of the process in several areas of business management, including evaluations of procurement practices, physical plant operation, employee personnel records, and financial aid disbursement.

The sweeping scope and complexity of the proposed business process redesign (BPR) is evident at the beginning of the

In Brief

The *1994 Indoor Air Quality Directory* is now available from IAQ Publications. The directory lists thousands of service firms, product manufacturers, training resources, workshops and courses, federal and state government agencies, and publications and glossaries relevant to indoor air quality. The cost of the directory is $75. To order or for information, contact IAQ Publications, Inc., 2 Wisconsin Circle, Suite 430, Chevy Chase, MD 20815; 800-394-0115; fax 301-913-0119.

When Crisis Strikes on Campus, a handbook and companion videotape on handling campus crises, is available from CASE, the Council for Advancement and Support of Education. The publication gives a behind-the-scenes look at how the University of Florida responded to the murders of five students in 1990. Other sections of the book present case studies in crisis communications, and issue papers on communicating about sensitive campus concerns. The 254-page book and 24-minute VHS videotape are available for $79.95 from CASE. To order call CASE Publications Order Department or mail to P.O. Box 90386, Washington, DC 20090-0386. Specify item number 24902s.

CAUSE, the association for managing and using information resources in higher education, has published the *CAUSE Institution Database 1994 Profile*, a 170-page summary of its annual survey of colleges and universities on information technology-related issues. Copies of the report are available for $35 to CAUSE members; $70 others. For information contact CAUSE at 303-939-0310.

Parke Industries, Inc. is offering free copies of its video, *Inside a Successful Lighting Retrofit Program*, a 12-minute production documenting Parke's work in developing the Green Lights award-winning Southern California Gas Company lighting retrofit project. The video is intended to be a tool for training and information by organizations considering a lighting retrofit. For a copy of the videotape contact Parke's marketing department at 800-367-2753.

Peterson's Guides Inc. has established The Education Center on the Internet on World Wide Web. The center presently carries searchable data and narrative on educational institutions at all levels and will provide communication and transaction services such as e-mail and college applications. Future development of the center will include providing a site for all institutions that Peterson's traditionally works with in ongoing publishing projects. Each site will become an information office containing multimedia viewbooks, on-line applications, announcement postings, and other resources. ■

book. The authors frankly indicate that this proposed redesign process involves many people, occurs over long periods of time, and requires visible and vocal support from the highest institutional leaders. They suggest, however, that their process will have significant positive results if implemented correctly, and therefore is worth the effort required for its use in most institutions. They also indicate that this process is the next step in management theory and practice after total quality management (TQM). The authors suggest that their BPR is superior, since TQM usually accepts the status quo and attempts to improve it, while BPR challenges the status quo and is employed where more radical improvements are needed to solve systemic problems.

Business process redesign is a thoroughly researched and well-crafted prescriptive punch list for evaluating how well a college or university runs its business-related departments. No other association in higher education is better qualified to promote this concept than the business officers, nor is anyone else better positioned to superintend and implement changes suggested by, and resulting from, the redesign process. This process, however, attempts to systematize the chaos that seems to be an integral part of most colleges and universities, and seems to overemphasize management, or doing things rights, at the expense of leadership, or doing the right thing. The authors suggest that "the best and brightest" be selected for teams that reach a consensus regarding what should be changed. Such consensus-building procedures may be effective with intuitive processes, but these will probably not produce the same direction that effective leadership brings to non-intuitive decisions, especially those requiring an overview of the entire academic process.

Another aspect of the process, a reliance on data collected regarding specific tasks or procedures, affects facilities managers immediately. APPA has been successful in compiling an enormous amount of benchmarking data for facilities-related processes, especially that presented in the biennial *Comparative Costs and Staffing Report*. It would seem logical that any BPR program would immediately concentrate on areas where data already exists, causing facilities managers to walk the BPR plank first. Finally, the book contains no index, an egregious deficiency that is compounded by the fact that numerous acronyms are used throughout; the constant searching through the text for definitions of terms was distracting.

In sum, *Business Process Redesign for Higher Education* is another excellent work from the publication department of NACUBO and the consulting expertise of Coopers & Lybrand. This is a solid book which, if followed to the letter, would produce significant changes in certain facilities management functions in certain institutions. Unfortunately, the only way to identify which functions, if any, should be changed at an institution is to buy the book and evaluate existing conditions according to BPR methodology. Even if facilities managers do not formally dissect every business process, informal evaluations based on the proposed process should be very helpful to all. I suggest that each APPA member obtain a copy of this book and use its information wherever and whenever possible.

Business Process Redesign for Higher Education is available from NACUBO, One Dupont Circle, Suite 500, Washington, DC 20036.

—Dr. John M. Casey, P.E.
Manager, Engineering Department
Physical Plant Division
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Jul. 16-18—***Preserving Our Educational Heritage: APPA's 1995 Educational Conference and 82nd Annual Meeting.*** Philadelphia, PA.

Aug. 13-18—***Institute for Facilities Management.*** Washington, D.C. [Three-track program plus special program on human resource issues.]

Regional Meetings

Sep. 20-24—***Australasian Region.*** Hobart, Tasmania, Australia. Contact: David Archer, University of Tasmania, 61-02-20-2796; fax 61-02-20-2797; e-mail david.archer@admin.utas.edu.au.

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Oct. 1-3—***Rocky Mountain Region.*** Montana State University. Contact: Robert Lashaway, Montana State University, 406-994-2001.

Oct. 1-4—***Eastern Region.*** Valley Forge, PA. Contact: Howard Holden, Albright College, 610-921-7535.

Oct. 13-19—***Southeastern Region.*** Norfolk, VA. Contact: Dick Plante, Old Dominion University, 804-683-4281.

Oct. 14-18—***Central Region.*** Manhattan, KS. Contact: Ed Rice, Kansas State University, 913-532-5967.

Oct. 22-24—***Midwest Region.*** Madison, WI. Contact: John Harrod, University of Wisconsin/Madison, 608-263-3077.

Other Events

May 1-3—***Indoor Environment '95 Conference and Exhibition: Strategies for a New Era of Regulation.*** Baltimore, MD. Contact: IAQ Publications, Inc., 2 Wisconsin Circle, Suite 430, Chevy Chase, MD 20815; 301-913-0115; fax 301-913-0119.

May 2—***AHERA Refresher Course for Asbestos Inspectors.*** Berkeley, CA. Contact: UC Berkeley Extension, 2223 Fulton Street, Berkeley, CA 94720-7019; Alice Boatwright, 510-643-8093.

May 4-5—***Fundamentals of Indoor Air Quality.*** Minneapolis, MN. Contact: AEE Energy Seminars, P.O. Box 1026, Lilburn, GA 30226; 404-925-9633; fax 404-381-9865.

May 4-5—***Fundamentals of Lighting Efficiency.*** Minneapolis, MN. Contact: AEE Energy Seminars, P.O. Box 1026, Lilburn, GA 30226; 404-925-9633; fax 404-381-9865.

May 8-10—***Instructional Design for Trainers.*** New York, NY. Contact: American Management Association, P.O. Box 319, Saranac Lake, NY 12983; 800-262-9699; fax 518-891-0368.

May 9-10—***OSHA Laws and Regulations.*** Alexandria, VA. Contact: Government Institutes, Inc., 4 Research Place, Suite 200, Rockville, MD 20850; 301-921-2300.

May 15-19—***64th General Meeting of National Board of Boiler and Pressure Vessel Inspectors.*** Contact: Paul Brennan, NBBI, 1055 Crupper Avenue, Columbus, OH 43229; 614-888-8320.

May 22-24—***Managing Energy for Greater Profitability.*** Raleigh, NC. Contact: Gertha Heggie, Continuing and Professional Education, Box 7401, McKimmon Center, North Carolina State University, Raleigh, NC 27695-7401; 919-515-2261; fax 919-515-7614.

May 22-24—***Professional Cleaners School.*** Racine, WI. Contact: Chuck Frahm, Von Schrader Company, 414-634-1956.

May 24-26—***How to Conduct and Maximize the Results of Your Energy Surveys.*** San Bernardino, CA. Contact: Gertha Heggie, Program Assistant, Continuing and Professional Education, Box 7401, McKimmon Center, North Carolina State University, Raleigh, NC 27695-7401; fax 919-515-7614.

May 24-26—***Annual Conference on Transportation Management.*** Bronx, NY. Contact: Dr. S. Yahalom, Graduate Program, SUNY Maritime College, Fort Shuyler, Bronx, NY 10465; 718-409-7285.

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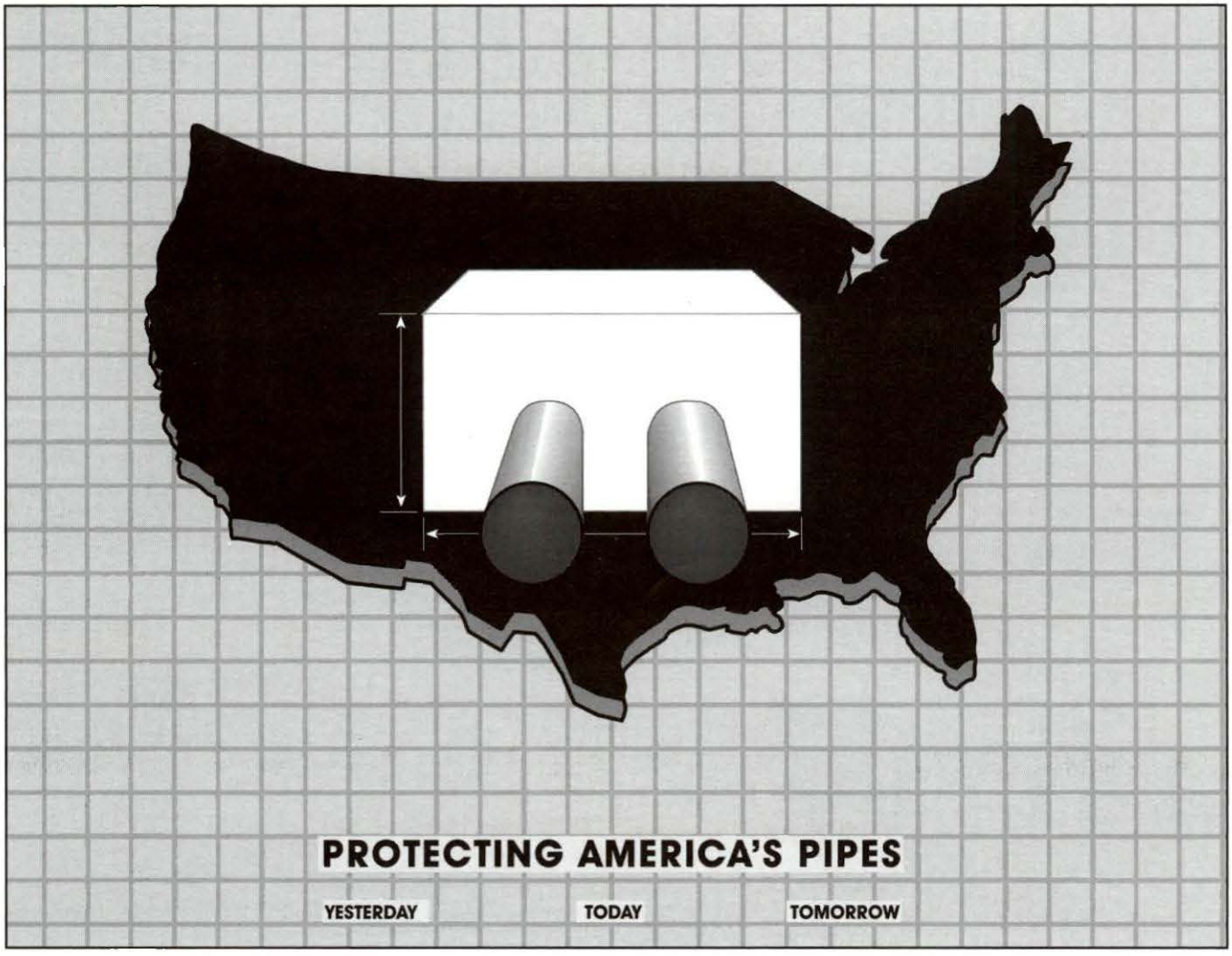

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