

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

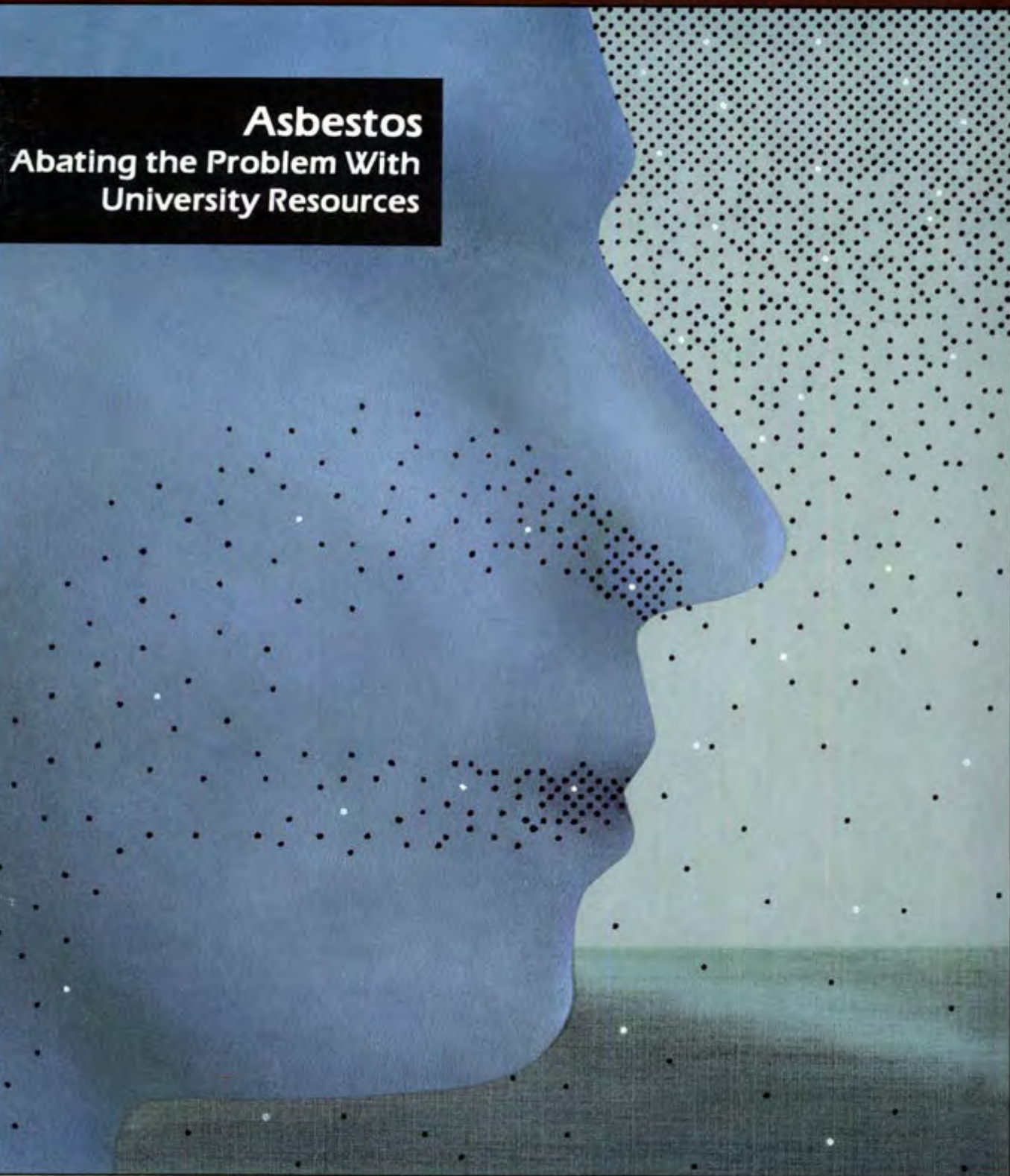
Facilities Manager

Volume 2 Number 4

Winter 1986

Asbestos

Abating the Problem With
University Resources



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Facilities Manager

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Features

The National Asbestos Training Centers:
Abating the Problem With University
Resources

by Christy Wise 4

Introducing a Four-Part Series on
Electrical Issues
PART I

Clean Power: A Case for Avoiding "Power Corruption"

by Mohammad H. Qayoumi, Ph.D. 13



Conducting an Interview

by Richard M. Engle 18

Including The Process
of Selection

by Reba L. Snively 21

Departments

Perspective 2

Management Resources 24

Data Base Update 26

The Bookshelf 28

Reviewed in this issue:

- The M-Form Society
- Translating Theory Into Practice
- Leadership and Social Change
- Solving Costly Organizational Conflicts

Classifieds 32

Guidelines for Authors 32

Index of Advertisers 32

Cover designed by J. Nick Davis



Perspective

William R. Dickson

Comments on Planning and Deferred Maintenance

We ought to take the funds that we are saving now from lower fuel costs and not spend them on faculty salaries.

We're all basking in the glory of the lessening cost of fuel, but that's temporary and we don't know how long it will last. Convince the people you work for to put your savings aside as reserve for the time when prices go back up again. Either that or accomplish some of your long-term deferred maintenance with the funds that you are saving. Depending on the size of your institution, this can be a little to a lot of money. At MIT this could mean \$6 million to \$7 million a year. If the oil prices were to stay down somewhere around \$12 to \$13 per barrel for the entire next year, that is big money over the year that just passed. You should consider how that money could be used at your institution.

The plant we all built in the boom era is now twenty to twenty-five years old. We have spent relatively little on it during that period, but maintenance costs are now accruing there. The reinforced concrete is starting to crack. The mechanical systems have to be replaced—not for energy purposes, but just because the fans are now twenty-five years old, and that's about their lifetime.

So we have large additional chunks of money that are going to have to be invested to maintain the plant with which we've had a free ride for the past two decades. That has to be factored into your equation when you decide what your plan is to be for the years ahead.

With some stabilization occurring in the growth in higher education, administrators will look within and begin to address the questions that have accrued in the area of deferred maintenance. Maintenance of facilities that were once new will require substantial increases in funds in a time when dollars are going to continue to be extremely tight. In addition, you're going to be competing for those dollars, so you'll have to plan for it.

I don't know how many of you presently have a moderate- to long-range plan (and what is long-range in this business? Maybe five years?), but it is an obligation on all of us to do this. If it hasn't already, your university or college is going to require that each of its working groups prepare plans that are concise and relate to a specific mission.

This will vary from school to school, because some of you have expanded responsibilities over others. But ask yourself: What is the mission of the plan? What are my long-term goals? What must I do to carry out that mission and make sure it is satisfied? What do I plan to do next year and the year after, in terms of shorter-range goals? How many people am I going to need? How much money, space, and equipment am I going to need?

Your mission, long-range objectives, and short-term goals can be done in synopsis form in just two or three pages, but don't think that this exercise will only take half an hour to do. Don't sit in your office and develop a plan by yourself. Make the people who work for you develop their part of it, then get together and come up with a concrete plan for your entire operation.

Updating such a plan every couple of years should be a relatively simple exercise. What have I accomplished? Has my mission changed? What are our needs now? Are they different than they were? Did we make progress in our activities? Why or why not?

Every plant administrator now needs to do more in the way of planning. The above ingredients should help you prepare for deferred maintenance funding and repair projects at your institution. ■

Letters Wanted

We welcome your comments, complaints, and clarifications to this or any other article or column in this issue. All letters should be typed, double-spaced, and no longer than 250 words; letters may be edited for clarity or brevity. Shorter letters have the best chance of being published. Send your comments to Letters, FACILITIES MANAGER, 1446 Duke Street, Alexandria, VA 22314-3492.

William Dickson is senior vice president of the Massachusetts Institute of Technology, Cambridge, Massachusetts, and served during the 1970s as its director of physical plant. He received APPA's highest honor, the Meritorious Service Award, in 1980. This article is extracted from "The Plant Manager's Changing Role in a High-Tech Era," a speech presented at APPA's 73rd Annual Meeting in July 1986.



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The National Asbestos Training Centers: Abating the Problem With University Resources

by Christy Wise

In the past forty years asbestos has evolved from being the "magic mineral" during the post-World War II building period to being declared unsafe at any level by the Environmental Protection Agency (EPA). Asbestos was used extensively in the construction of schools, office buildings, and homes until the early 1970s, and now building owners are facing the task of safe removal or containment of the substance.

In response to broad public and industry concerns, EPA created five National Asbestos Safety Institutes and four satellite centers at universities across the country. The centers sponsor seminars, workshops, and hands-on training sessions to provide contractors, engineers, architects, facilities managers, builders, government officials, educators, and health professionals with specific information about locating asbestos and initiating safe abatement procedures.

EPA formed cooperating agreements for asbestos information centers at Georgia Institute of Technology, Tufts University, University of California at Berkeley, University of Illinois at Chicago, and University of Kansas. Satellite centers are located at Drexel University, Rutgers Medical School, University of Texas at Arlington, and University of Utah.

"We felt that universities were a very good way to go because they have good faculty and a good set-up," EPA representative Karen Hoffman explained. The agency worked with the ten regional asbestos coordinators in the



Christy Wise is a freelance writer residing in Bethesda, Maryland.



United States to determine which universities were capable of and interested in establishing centers. Through a process of elimination they then chose the current five.

Hoffman said EPA used the program at Georgia Tech as a model because "they were up and going for about four or five years before we came on the scene."

The Southeast Asbestos Information Center (SAIC), as the center is now called, began giving programs in 1981 out of the Environmental Health and Safety Division at the Georgia Tech Research Institute. Eva Clay, former director of SAIC (and currently with the National Asbestos Council) said that administrators at the school "realized that there was a real need for some standardization and professionalism" in the abatement of asbestos. Because the EPA regional asbestos coordinator in the southeast was quite vocal about asbestos, public awareness of its hazards grew more quickly and caused large scale abatement to begin earlier than in other parts of the country, according to Clay.

Of the five centers, SAIC offers the most technical courses and spends a great deal of time on activities other than training, such as field work and research. However, the newly-opened center at the University of Illinois School of Public Health will also conduct research on asbestos matters.

"One of our main roles is to get the other centers up and running," said William H. Ewing, leader of the Asbestos Programs Group. "We train contractors especially in the nuts and bolts of how you do this kind of work." Ewing reported that since its inception in 1981, Georgia Tech has trained more than 6,000 people from San Diego to New York to Toronto. Georgia Tech



Lani Himegarner, project coordinator at the University of Kansas center.

recently sponsored a seminar in London called "Supervision of Asbestos Abatement Projects," which was attended by representatives from nine countries.

In the asbestos workshops, a mock-up work area is created with the actual equipment used for abatement where "workers spend two days going through and learning how to actually remove the asbestos," SAIC's Dave Mayer said. During courses on supervision, managers learn "how to supervise a project from start to finish."

Asbestos abatement can be one of three things: removal, encapsulation, or enclosure. Of the three, removal is the most expensive but also the most thorough. With encapsulation or enclosure there is a possibility that future renovation or demolition could cause asbestos to become airborne. Asbestos is most dangerous when in a "friable," or crumbly, powdery condition that can release carcinogenic fibers into the air.

Asbestos is commonly found in insulation materials on pipes, ducts, and boilers as well as in acoustical insulation and fireproofing materials. Routine maintenance or repairs in boilers can generate airborne asbestos. With more than 3,000 applications, asbestos is still used in many instances, such as in the manufacture of automobile brakes and clutches. EPA administrators estimate it was used in 733,000 buildings, or about 20 percent of the building population. Many substitute products are now being found for asbestos and steps are being taken to phase out its use entirely.

"We've got a ban and phase down rule," Hoffman explained. "Certain



An asbestos abatement training session at the Tufts University center.



Deborah Dobin, program director at the University of California at Berkeley center.

things with asbestos in it are being immediately banned: where they are trying to find substitutes for the material is called phase down. Within ten years it will be fully phased down."

EPA legislation and requirements provided the initial impetus for many contractors to begin asbestos abatement. In 1979 EPA instituted the Technical Assistance Program to encourage states and schools to initiate voluntary programs to detect and correct asbestos problems. In 1982 Congress passed



Mark Demyanek, project coordinator at the Georgia Institute of Technology center.

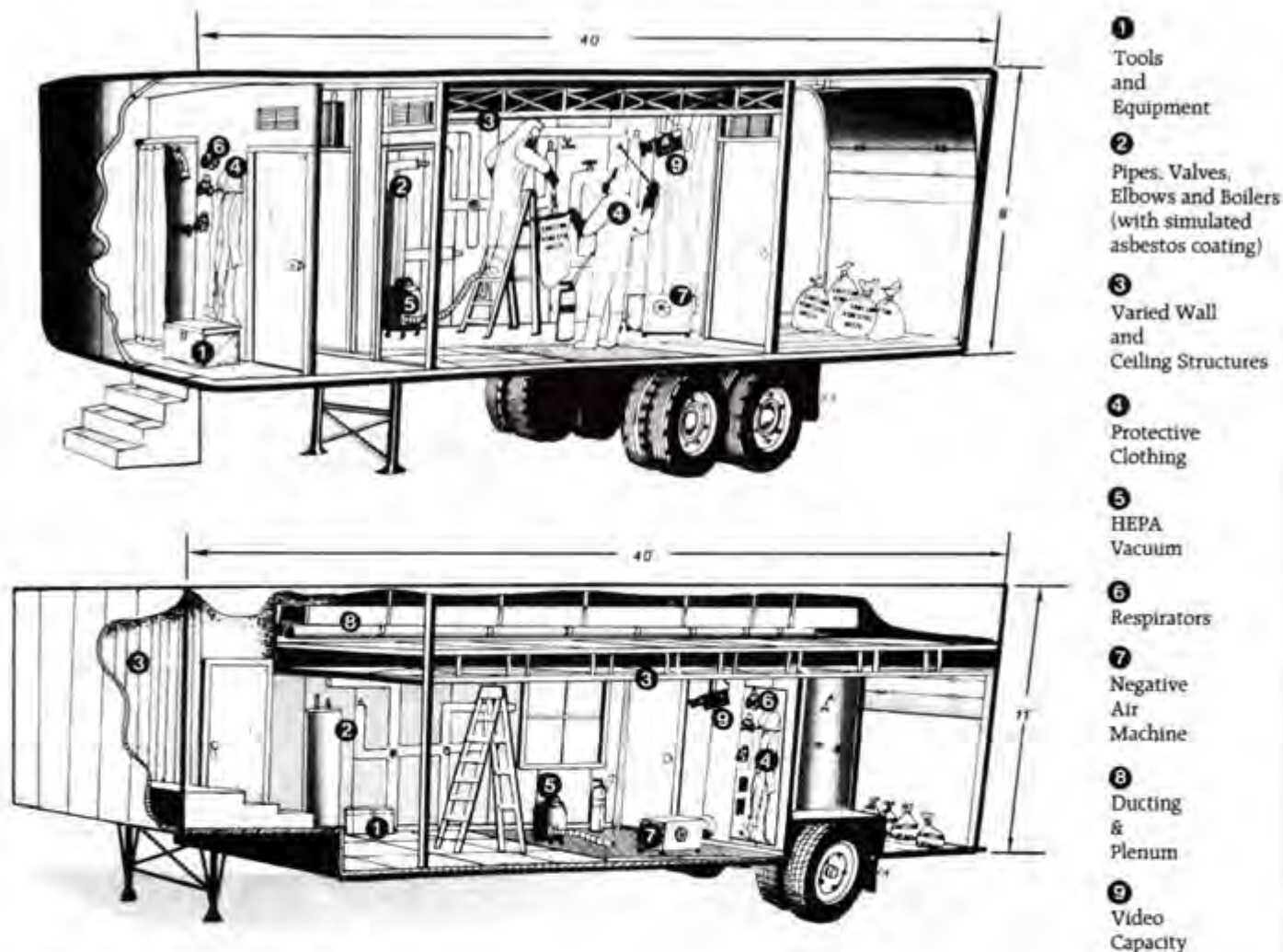
Photo by University of Kansas

Photo by Tufts University

Photo by UC Berkeley

Photo by Georgia Tech

The University of Kansas Mobile Asbestos Training Unit



Simulates a complete abatement operation: From preparation of work area to waste disposal.

EPA's Asbestos in Schools Rule requiring elementary and secondary school administrators to inspect for friable asbestos and, if they found any, to notify parents, teachers, and custodial workers about the hazard.

"This rule didn't have too much in the way of teeth," Hoffman said, explaining that school administrators were not required to clean up the asbestos they found. However, "parents would become so up in arms that they would put pressure on the schools to take action."

Compliance with the 1982 rule "worked fine in some of the more well-to-do areas, but schools that didn't have the money would go for the lowest bid," said Hoffman. These contractors

"didn't really know what entailed an excellent safe job.

"We call them rip-and-skip contractors," Hoffman continued. "Anyone can call themselves an asbestos abatement contractor; there are no licensing laws. So they were doing terrible jobs and were actually exacerbating the problem, making it much worse than had they left it alone. So we felt we had to do something to make sure that contractors were doing it right. That was the impetus behind the information centers."

EPA contracted with Georgia Tech to create written materials for the other centers, and in spring 1985 opened three institutes at Georgia Tech, Tufts University, and University of Kansas.

with two more following in 1986 at University of California at Berkeley and University of Illinois at Chicago.

"We started the centers off with \$225,000," Hoffman said. "We wanted the centers to be self-sufficient after three years. Our first year of funding was \$225,000, the second year of funding, which we are now in, is \$200,000, and \$100,000 for the third year." Administrators of the centers all predict that they will be self-supporting by the end of the third year, providing current regulations remain the same. If regulations are tightened or include greater segments of the population, increased support may become necessary.

EPA issued guidelines to the centers for three types of courses: a one-day

awareness course for a general audience to gain an overview; a three-day course for decision-makers that emphasizes inspection, sampling, assessment and abatement techniques, and specification writing; and a four- or five-day course for people who do the actual abatement, covering abatement techniques and safe work practices and including a "hands-on" abatement exercise with simulated asbestos. EPA has intentionally left the guidelines informal to allow the centers to be creative and meet needs in their own regions.

According to Bruce Johnson of the Midwest Asbestos Information Center (MAIC), "EPA sees one of the major problems with the asbestos issue is lack of training—rather than come down with more rules and regulations, better to put the money into training and education." Johnson pointed out that asbestos in place is a hazard, or potential hazard, "but if it's not removed properly or maintained properly, that's when the real risk of exposure occurs."

The Midwest Asbestos Information Center, operated out of the University of Illinois at Chicago's School of Public Health, gives a four-day seminar each month primarily for decision-makers, supervisors, and management personnel. One-and-a-half days are devoted to hands-on laboratory training with a fairly high teacher/student ratio. As with all the centers, courses are taught by professionals with experience in the field of asbestos abatement.

Two-day courses are given in operations and maintenance, which Johnson said "could be very useful to university facilities managers. The course was developed specifically for school officials; however, anyone who needs to develop an operations and maintenance plan or program could certainly benefit."

MAIC has recently started publishing a newsletter, available to the public, giving general information about activities in the field with a special insert containing specific information, such as a list of all state and regional offices that could help with asbestos abatement or details on EPA asbestos regulations.

Illinois is one of sixteen states with specific certification requirements for people working with asbestos abate-

ment. In Illinois' case, supervisors and contractors who work in schools must have special EPA certified training and workers must be licensed. This law went into effect in May 1986, making the opening of the Midwest Asbestos Information Center particularly timely.

"Prior to our opening, all of the contractors and other people needing this kind of training had to go either to Kansas, Georgia Tech, or Tufts," Johnson said.

MAIC has a close working relationship with the Chicago Lung Association,

which has been active in the health aspects of asbestos, particularly for homeowners. The Lung Association was involved in the initial formation of MAIC and continues to participate in center activities.

The University of Kansas National Training Center takes its courses on the road in a forty-foot trailer outfitted with pipes, valves, elbows, hot water tanks, duct work, flooring, walls, and ceilings to give, as project coordinator Lani Himegarner described, "real-live experience with simulated asbestos."



Photo courtesy Georgia Tech

Below: Hands-on training environment includes asbestos-covered pipes and protective wrapping.



Photo by University of Illinois at Chicago



Photo courtesy Georgia Tech

Below: Typical classroom at the University of Illinois at Chicago center.



Photo by University of Illinois at Chicago

Asbestos Laws Imminent for Higher Ed

In October legislation was passed requiring elementary and secondary schools to clean up asbestos in their buildings in accordance with Environmental Protection Agency (EPA) standards. The ruling does not yet apply to higher education facilities, but that may change. Under the law, the EPA is to study asbestos hazards in other commercial and public buildings and recommend similar requirements.

"This legislation may provide the framework for the development of similar enactments for public buildings and facilities that could be felt throughout higher education," writes Paul F. Tabolt, assistant director of physical plant at Pennsylvania State University, in a recent APPA position paper.

The paper, initiated by APPA's Special Project Committee, outlines the stipulations of present legislation, looks at its implications for universities and colleges, and recommends preparation now to avoid high costs later. For a copy of APPA's "Position Paper on New Asbestos Legislation," call or write the APPA office. ■

The mobile unit, designed and constructed by KU's Department of Facilities Operations, travels all over the country providing on-site instruction at schools, utility companies, engineering firms, construction sites, and government offices.

"We've done a lot of training for the state of Kansas for both supervisors and workers," Himegarner reported, adding that the center, which is part of the Division of Continuing Education, has trained more than 2,000 people in 100 programs since its opening. In

addition to the mobile unit, the Kansas center, like the other institutes, offers seminars locally on a variety of aspects of asbestos abatement. In 1986 the three-day foundation course, "Practices and Procedures in Asbestos Control," was offered nine times (in addition to those given in the trailer); Himegarner predicts a slight increase in 1987.

KU's training center tailors its mobile instruction to the requirements of each state, some of which specify as little as five hours of training while others require as much as thirty-two. Most states have no certification requirements at all.

"It has been suggested that EPA develop a national standard to provide reciprocity from state to state," Himegarner said. Her frustration echoes that of the other center administrators, who talk of the need for national standardization. EPA's Hoffman is aware of that need but remarked that the current administration emphasizes state and local control rather than national regulations.

Tufts held a program on this problem in October 1986 titled "Toward Standardization in the Industry," at which participants discussed the need for standardization and listened to a panel discussion by Paul Heffernan, then-regional asbestos coordinator for New England, Stan Shaw, president of the



Photo courtesy Georgia Tech

Below: Student demonstrates proper respirator adjustment.

Lower left: Students prepare for mock abatement project.



Photo by University of Illinois at Chicago



Photo by University of Illinois at Chicago

National Asbestos Council, and Paul Brodeur, *New York Times* reporter.

"All other industries have standards, whereas the asbestos industry doesn't really have anything formal," said Janet Oppenheim-McMullen, project coordinator of the Tufts University Asbestos Information Center. "It's going to take a national initiative. The federal government is going to have to step in."

Standardization will also be the theme of a January conference in Chicago sponsored by the National Asbestos Council.

The Tufts program, sponsored by

Photo courtesy Georgia Tech

Below: Scientific research of asbestos problems are conducted at Georgia Tech and the University of Illinois at Chicago.



Photo by University of Illinois at Chicago

the Center for Environmental Management, has initiated regional coordination among all New England states with regular coordination meetings where, Oppenheim-McMullen explained, "All the state officials in charge of asbestos management programs come down to Tufts and tell each other what they're doing and talk about how they can work together and help each other."

Tufts also publishes a quarterly report on the status of New England programs, contractor certification, and legislation, which is "another tool to help New

England coordinate and get to know each other," Oppenheim-McMullen said. A national quarterly newsletter is available from the center free of charge to anyone with an interest in technical information such as health effects of asbestos and asbestos abatement or how to choose an abatement contractor.

A resource center at the Tufts institute has "every document that's available in the country," Oppenheim-McMullen said. "It's a one-stop deal. People come to us and get it all." The Tufts library has more than 500 documents.

As the new kid on the block, the Pacific Asbestos Information Center (PAIC) at University of California at Berkeley is still finding its way. They offered their first seminar in December on "Asbestos Regulation: Current Status and Proposed Changes."

"There is a tremendous amount of confusion about who is doing what out there" with regard to regulations, Project Director Deborah Dobin observed. In addition to guidelines by EPA and OSHA, California contractors are regulated by Cal-OSHA and the contractor state license board.

The Pacific Asbestos Information Center operates in conjunction with University Extension (continuing education division) and works closely with the campus office of Environmental Health and Safety, sharing an industrial hygienist with Environmental Safety.

"I find that university extension is the perfect place to do this kind of thing," Dobin observed. "Marketing, promotion, printing, room reservations, facilities, and meals—in university extension that's our job, so it's all built-in."

The UC/Berkeley campus itself is starting to address the problem of asbestos abatement, according to Dobin. "Being an older campus in the UC system, there are lots of big old buildings full of asbestos that they're working on having removed. It's a project that involves the physical plant people and the Environmental Health and Safety Office, and it really takes a team effort to deal with the problem."

Although universities and colleges are not currently covered under EPA's Asbestos in Schools Rule, Dobin and others suspect that may not be too far down the line (see sidebar). Universities currently must abide by OSHA specifications that workers not be exposed to levels of asbestos greater than .2 fibers per cubic centimeter, and EPA requirements for demolition or renovation of buildings that all friable asbestos be removed and that there be no discharges of visible emissions. Should physical plant administrators embark on asbestos abatement, either voluntarily or under pressure by law, the five National Asbestos Training Centers will provide the necessary guidance and support.

Asbestos Information Centers

For more information about asbestos in general or asbestos abatement in particular, contact one or more of the following organizations.

U.S. Environmental Protection Agency
Office of Pesticides & Toxic Substances
Washington, DC 20460
202/554-1405

For information, guidance, referrals, and specific material, including:

- *Guidance for Controlling Asbestos-Containing Materials in Buildings*
- *Asbestos in Buildings: Guidance for Service and Maintenance Personnel* (also available in Spanish)
- *Commercial Laboratories with Polarized Light Microscope Capabilities for Bulk Asbestos Identification*

Or contact the EPA Regional Asbestos Coordinator in your region.

Southeast Asbestos Information Center

GTRI/EDL/EHSD
O'Keefe Room 29
Georgia Institute of Technology
Atlanta, GA 30332 404/894-3806
Mark Demyanek, Project Coordinator
William M. Ewing, Leader, Asbestos Programs Group

Pacific Asbestos Information Center

University of California at Berkeley
University Extension 2223 Fulton Street
Berkeley, CA 94720 415/643-7143
Deborah Dobin, Program Director

Midwest Asbestos Information Center

School of Public Health
(MC923)
University of Illinois at Chicago
Room 225, SPH-E
2035 West Taylor Street
Chicago, IL 60612
312/996-5762 (Illinois residents)
800/227-MAIC (outside Illinois)
Anthony J. Bilotti, Project Coordinator
Bruce Johnson, Director, Community Needs Assessment

National Asbestos Training Center

University of Kansas
Division of Continuing Education
5005 West 95th Street
Shawnee Mission, KS 66207-3398
913/648-5790
Lani Himegarner, Project Coordinator

Tufts University Asbestos Information Center

Curtis Hall 474 Boston Avenue
Medford, MA 02155 617/381-3531
Janet Oppenheim-McMullen, Project Coordinator
Robert Shaw, Technical Assistance Coordinator

EPA Asbestos Satellite Centers

University of Utah
Building 512, RMCOEH
Salt Lake City, UT 84112 801/581-5710

Bureau of Engineering Research
University of Texas at Arlington
Box 19020
Arlington, TX 76019 817/273-2557
Ernest Crosby, Director

NIOSH Continuing Education
University of Medicine and Dentistry of New Jersey
Rutgers Medical School
Piscataway, NJ 08854 201/463-4500
Lee Laustsen, Project Manager

Environmental Studies Institute
Drexel University
Building 29 32nd and Chestnut Streets
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INTRODUCING A FOUR-PART SERIES ON ELECTRICAL ISSUES

PART 1 Clean Power:

A Case for Avoiding "Power Corruption"

by
Mohammad H. Qayoumi, Ph.D.

Our series begins with a discussion of the problem of maintaining clean power in an era of increasing computer demands. Future articles in this series will discuss selection and use of high voltage cables, cogeneration decisionmaking, and power electronics.

Imagine it is two-thirty in the afternoon and you are just about to finish the final touches of your three-year budget document, which you spent a week to enter on a large electronic spreadsheet. As you are getting ready to save and print the output for your three o'clock meeting,

ago. Power surges can result in damage of expensive computer data. Usually the problem is not obvious until it actually happens. Sometimes power spikes might not be strong enough to cause damage right away, but a sustained problem will weaken the circuit electronic chips and slowly result in hardware failure.

There are two types of power disturbances—harmonic and power surges.

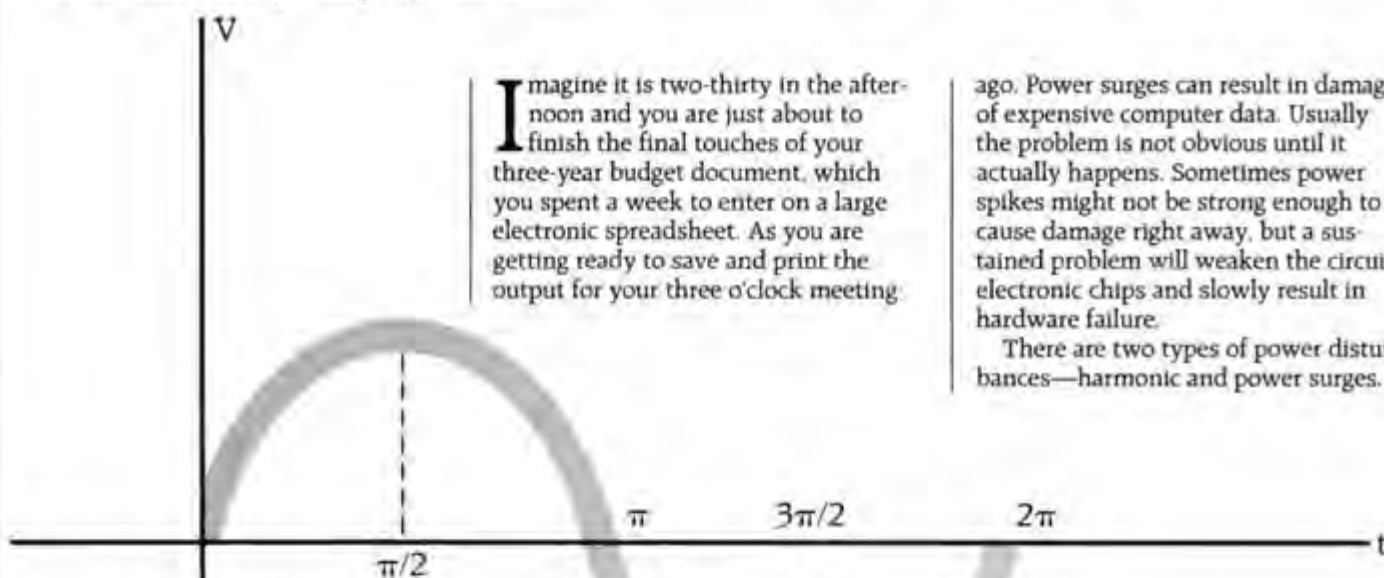


FIGURE 1

with the financial vice president, a power "glitch" initializes the computer and you lose all your data. Such stories about dirty power have become more common in the past few years as more people have started using personal computers. Why have the electric lines become dirty?

There are two reasons for this. First, as we are seeing more applications of nonlinear circuit elements such as static converters, power lines are becoming dirtier. Second, as more sensitive electronic equipment and personal computers are utilized, the problem is felt much more now than a few years

Before we discuss the problem any further, let's look into some of the fundamental principles behind power disturbances.

Background

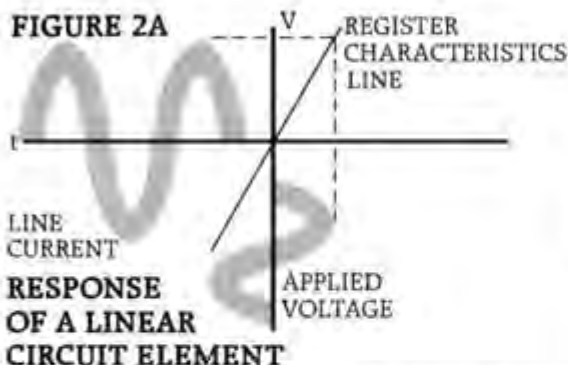
The alternating current (AC) electricity is a pure sinusoidal wave of one single frequency. More specifically, in the United States this frequency is 60 cycles per second, or commonly known as 60 Hertz. Thus, graphically and in mathematical terms, AC voltage or current can be represented as follows:

$$V = V_m \sin \omega t$$

Ideally, this is the shape of AC power at all times. In a real system, as long as the circuits have linear elements, i.e.,

Mohammad Qayoumi is associate executive vice president for facilities development and operations at San Jose State University, San Jose, California. He holds a doctorate in electrical engineering and has served as a faculty member since 1984 with APPA's Institute for Facilities Management. He is also a member of APPA's Technology Task Force.

resistors, capacitors, and unsaturated inductors, the wave shape will remain as shown in Figure 1 during steady state conditions. But as soon as nonlinear elements are introduced in the circuit, i.e., rectifiers, thyristors, and saturated inductors, the wave shape will become distorted. This phenomenon can be shown graphically as follows:



Comparing the above two figures, it becomes obvious that with a nonlinear element in a circuit, the pure sinusoidal wave is distorted. The distorted wave, however, can be analyzed as the summation of a number of sinusoidal waves using the Fourier Series.

According to Fourier Series, any periodic function can be broken down into a constant function, a fundamental sine or cosine wave having the same frequency as the original function and all of its multiple frequencies. In other words, any periodic function $F(t)$ can be written mathematically as:

$$F(t) = A_0 + \sum_{a=1}^{\infty} A_a \cos nt + \sum_{b=1}^{\infty} B_b \sin nt$$

The above equation has three basic characteristics. First, most waves seen in the electrical system exist in either the sine series or the cosine series, but not both. Second, because of symmetry considerations, in most cases only the odd multiples of the series exist. Third, the absolute magnitudes of the coefficients steadily become smaller for higher frequency multiples. This means

$$|B_1| > |B_2| > |B_3| > |B_4| \dots$$

and so on.

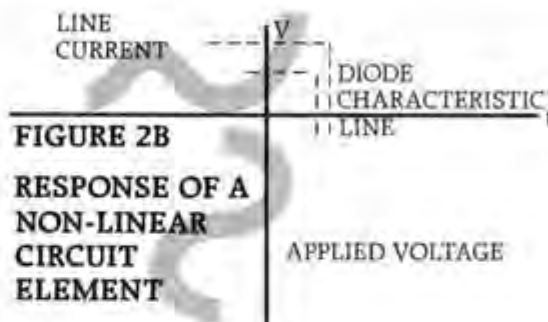
Applying Fourier Series in analyzing the current or voltage of nonlinear circuits, the voltage or current can be written as:

$$V = V_0 + V_1 \sin wt + V_2 \sin 2wt + V_3 \sin 3wt + V_4 \sin 4wt + \dots$$

Here V_0 is a DC voltage that will exist only if the nonlinear element has

Now if we total the above sinusoidal waves, the wave shape obtained will become closer and closer to a square wave as more harmonics are added.

In addition to the use of nonlinear elements, any surges imposed on a power system such as lightning discharges or circuit switching can also introduce harmonics. Usually such



a directional characteristic such as a rectifier or thyristors. The second term is an AC voltage that has the same frequency as the line voltage and is referred to as the fundamental voltage. The subsequent terms are voltages that have frequencies of three times, five times, and seven times the fundamental frequency. These voltages are referred to as harmonics in the system. Although higher harmonics also exist in the system when the absolute magnitude drops, the third, fifth, and seventh harmonics are usually of concern in power systems.

To illustrate the above, let's analyze a typical square wave shown in Figure 3 with Fourier Series:

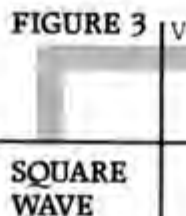
$$F(t) = \frac{2}{\pi} [2 \cos wt - \frac{2}{3} \cos 3wt + \frac{2}{5} \cos 5wt + \dots]$$

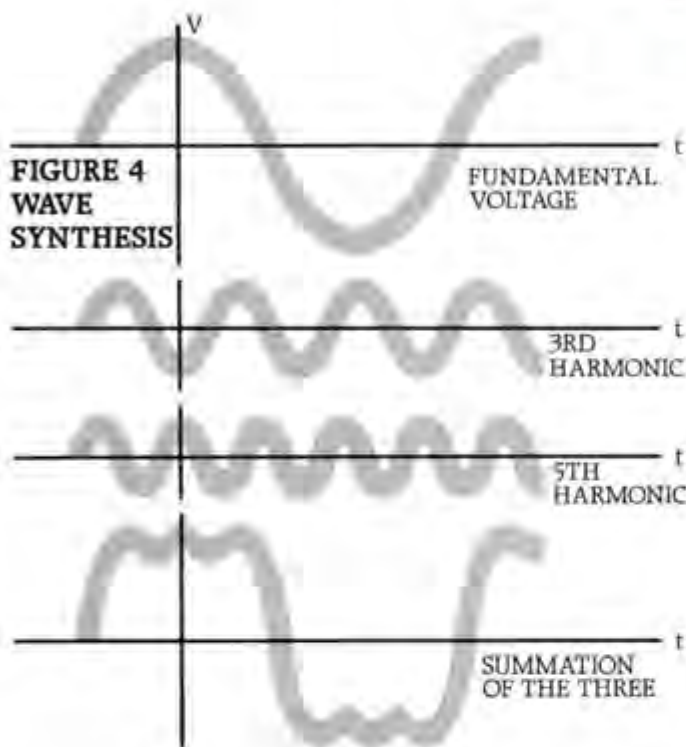
surges will have much higher frequencies. A power surge will typically be a few billionths of a second wide but thousands of volts in magnitude. Although the width of the pulse might be extremely small, the magnitude might be large enough to affect sensitive electronic equipment in the power system.

Harmonic Sources

Some of the common sources of harmonics in power systems are as follows:

1) A saturated transformer core results in non-sinusoidal exciting current in the iron core when a sinusoidal voltage is applied. Usually the third, fifth, and seventh harmonics are of primary concern. Moreover, transformer energization may result in even





**FIGURE 4
WAVE
SYNTHESIS**

harmonics where the second and fourth are the important ones.

2) Arc welding equipment and arc furnaces generate odd harmonics, where the fifth harmonics can be six to eight percent.

3) Rotating machines, namely motors and generators, produce harmonics caused by the magnetic reluctance variations from the stator and rotor slots. The generated harmonics are equal to $(2N \pm 1) \times f$, where f is the fundamental frequency and N is the number of slots per pole. Therefore, the higher the number of slots in the machine, the higher will be the harmonic frequency and the disturbance it will cause in the system.

4) All types of electronic power conversion devices—namely rectifiers, voltage controllers, inverters, cycloconverters, uninterruptible power sources, variable frequency drives, self commutated and line commutated

converters—introduce harmonics. For rectifiers the third and fifth harmonics are of prime concern. For all types of converters, including variable frequency drives and uninterruptible power sources, the generated harmonics are of the order $nP \pm 1$, where P is the pulse number of converters and n is any integer. Most devices use six pulse converters, so the generated harmonics are fifth, seventh, eleventh, thirteenth, etc., where the fifth and seventh are of prime concern.

In addition to the above, other sources include lightning surges, switching surges, and bad fluorescent ballasts.

System Responses to Harmonics

The power system response to voltage and current harmonics will be based on the system inductance, capacitance, and resistance. The capacitors are the most important element in harmonic responses because the impe-

dance of a capacitor falls as the harmonic frequency is reduced. Moreover, the capacitor and the system inductive reactance form series and parallel resonant circuits. If the natural frequency of the parallel resonant circuit is close to one of the harmonics generated by nonlinear elements, the harmonics current will excite the resonant circuit and an oscillating current moves back and forth between the inductive and capacitive elements. The high harmonic currents will produce high harmonic voltages, which will force harmonic current to flow in nearby circuits.

The following criterion is used to determine potential problems with resonant circuits:

$$f_p = \sqrt{\frac{X_c}{X_L}}$$

Where f_p is the per unit frequency, X_c is the capacitor reactance, and X_L is the system reactance. As long as f_p is larger than 8.5, then the probability of a problem is minimized; however, if f_p is close to one of the harmonics, then it could result in generating high voltages and currents.

Similarly, the criterion used for converters is the short circuit ratio (SCR) defined below:

$$SCR = \frac{\text{short circuit MVA}}{\text{converter MW}}$$

As long as the ration of the system short circuit duty and converter size is over 20, then the probability of harmonic problems is low.

Effects of Noise in Power Systems

When static power converters were used in mining, electrometallurgical, and electrochemical industries in the 1960s, certain techniques were developed to minimize harmonics and other electric noise problems. One of the popular methods to cancel out low harmonics is multiphasing the rectifiers.

Today, with the use of nonlinear circuit elements in hundreds of applica-

tions for pumps, air handling units, compressors, fans, hoists, etc., the problem has become much more complex. Furthermore, with the ever increasing proliferation of desktop computers and other sensitive electronic equipment, harmonic effects are potentially more disastrous than in the past.

One of the biggest challenges with noise in the power system is to determine the source of the problem. This is especially true with power "glitches" because they are intermittent; and sometimes it can be hard to determine whether the source is from nearby equipment or from another customer on the utility grid.

Some of the common techniques to protect devices from harmonics and surge problems are as follows:

1) *Isolation Transformer*: This is a special purpose transformer where metallic shields are utilized between the primary and secondary windings. Because there is complete electrical isolation between the primary and

secondary, effective protection against power surges is achieved.

2) *Reactors*: Use of series inductive reactors in conjunction with dedicated circuits from the stepdown transformer in most instances can be an effective means of dealing with harmonics. In view of the fact that harmonics will experience higher impedance than the fundamental wave, the harmonic effect can be damped out to extremely low levels.

3) *Harmonic Filter*: If a particular harmonic is identified to be the problem, then a band pass filter tuned to the particular harmonics frequency will be the answer. Usually the harmonic filter consists of an inductor and capacitor in series having adequate rating to withstand the harmonic current and voltage that it may have to absorb.

4) *Uninterruptible Power Source*: An uninterruptible power source (UPS) generates clean AC power from a battery source. AC line power is converted to DC with rectifiers, which keeps the batteries charged. The battery in turn powers an inverter, which converts DC power back to AC. In addition to being an effective means of providing a clean

power source, a UPS will protect a system from short duration power outages.

5) *Surge Suppressors*: These devices protect systems against surges, glitches, and other short duration, high-voltage spikes. There are many surge suppressing devices with a wide range of characteristics and prices. They consist of resistors, avalanche diodes, capacitors, metal oxide varistors, carbon gap, gas tubes, and capacitors.

No one of these elements can protect power surges at all times, but a combination of the above elements is needed to perform a satisfactory job. For instance, a diode can quickly respond to the leading edge of a surge pulse in less than a billionth of a second; however, it cannot withstand large power transients. On the other hand, a metal oxide resistor is not as fast as a diode but can withstand larger power transients.

Therefore, if both elements are used, there will be benefits derived from both; but it should be made clear that even this combination will not be a solution at all times. Moreover, if a large pulse is applied to such a surge suppressor, the metal oxide resistor might burn out. If the device does not

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have an external sign to indicate the damage, there might be a sense of false security if the metal oxide resistor has burned out. More expensive surge protectors have indicators as well as more complex circuitry to improve performance.

Conclusion

There are more than 200 firms that manufacture a wide range of products used for "clean" power application. The cost and protection level provided by these products vary greatly, from less than \$30 for a simple surge suppressor to thousands of dollars for a UPS, and you generally get what you pay for.

When it comes to choosing power conditioning, it is essential first to determine the type of "power pollution" occurring in the particular location. This might be accomplished by attaching a line monitor to determine the type of power disturbance, such as a particular harmonic or power glitch. Then choose the right level of protection required.

The need for "clean power" will continue to rise as the use of personal computers expands. Providing and maintaining such systems will be a challenge to every facilities department for years to come. ■

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[The author wishes to acknowledge Aileen Marquardt for her assistance in typing various drafts of this article.]

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Conducting an Interview

by Richard M. Engle

The successful selection interview is a face-to-face encounter that enables an interviewer to determine accurately whether or not the person being interviewed is suitable for employment. The primary objective is a "Yes" or "No" decision by the interviewer.

It follows, then, that the successful interview is one in which the interviewer elicits the information needed to make the decision, and that an unsuccessful interview is one in which he or she does not. Additional objectives such as "selling" the job to the candidate, discussing the interviewer's experiences and preferences, or making friends are either tangential or secondary, at best, and are better pursued on other occasions.

Just as the ultimate "Yes" or "No" decision can only be as good as the information elicited from the applicant, the information elicited can only be as good as the questions asked. To help ensure success and consistency, a list of questions for each job interview is helpful. As with every question, the interviewer should be constantly evaluating the interviewee's response from two standpoints. First, what material needs to be probed further? Second, how do the responses compare to those of the *ideal* employee? The first aspect requires skillful follow-up questions; the second, a valid criterion.

Since average people rather than ideal employees fill most of our jobs, the interviewer may not enjoy the luxury of an idealized yardstick with which to measure and compare interviewee performance. This increases the importance of the interviewer developing and asking the same series of basic questions in the selection interviews. Only by gradually building a large "pool" of individuals who have responded to the same stimuli-questions over the course of time can the skillful inter-

viewer develop a feel for effective and ineffective answers—and answerers. What might seem to be a superior answer by a candidate the first time a question is used could be considered routine the seventy-eighth time it's heard.

As answers are given, the interviewer should make mental notes. However, "mental notes" is not a euphemism for "definite conclusions." The successful selection interviewer does not make conclusions when questionable or negative information is uncovered unless the material is so damaging that pursuing the interview further is a blatant waste of time. In most cases, the successful interviewer simply makes mental notes as reminders and discreetly probes further. He or she generally does not eliminate the candidate during the course of the interview.

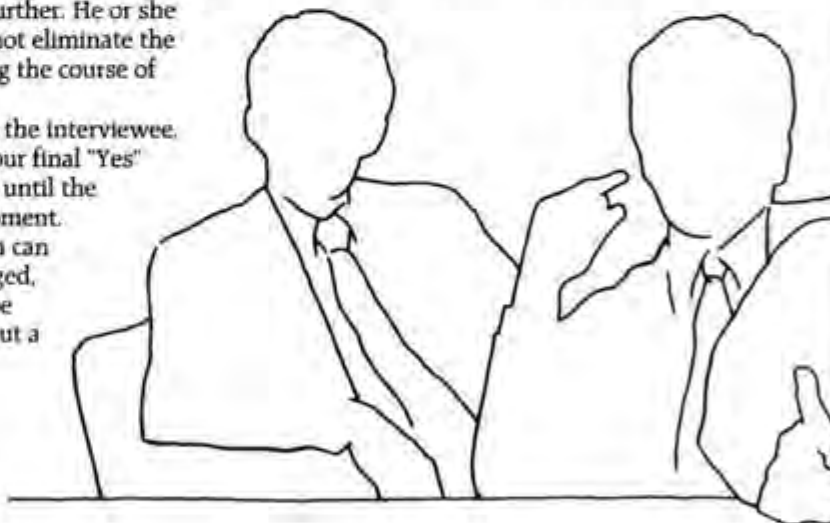
In fairness to the interviewee, delay making your final "Yes" or "No" decision until the last possible moment. A "Yes" decision can always be changed, a "Maybe" can be later resolved, but a

"No" decision is generally final and irrevocable. You lose nothing by waiting to make your definite conclusions at the last possible moment.

The following series of questions have been designed to obtain the information we need for ultimate selection. Since interpretation of answers is also important, desired objectives are included for some questions.

1. *"I have read your resume. Will you please bring me up to date about your background and qualifications?"*

This is clearly the single most important question in the interview. With certain articulate candidates, this might be the *only* question required. They



perceive it for what it is: an open-ended, unstructured opportunity to provide factual information and to demonstrate skill at organizing, evaluating, and communicating information. In the course of responding with specific, sequential facts about their background, they are offering first-hand oral and visual evidence of their ability to handle an ill-defined (although routine) assignment without further direction.

Of course, not every applicant reacts with a masterful presentation of childhood details, followed by school experiences, work qualifications, and a list of both positive and negative personal attributes. Some applicants stare blankly and shift uncomfortably before

they ask, "Well, what do you mean?" or "Would you give me an example?" or "Why don't you ask me direct questions and I'll answer those?" While not jumping to conclusions so early in the proceedings, the interviewer already can hypothesize after asking only this one question that this prospective employee may require clear-cut instructions, additional direction, or even psychological support on the job.

Some candidates may not be able to reply at all. If, after a long silence, no response is forthcoming, prompters may be used. These are "encouraging words" that still do not define the task, but merely encourage the interviewee to make a start, any start. "Whatever you think is important" or "Anywhere you'd like to begin is fine" are suitable, non-directive prompters. We hope that all the applicant needs is some additional friendly support to begin his or her discourse.

If, however, even the prompters do not have the desired effect, specific directions may be required. "Home . . . school . . . work" is a little more definite.

As a last resort, "Why don't we start with: 'What was it like growing up in

Toledo?'" should mobilize all remaining individuals for a very practical start-at-the-beginning presentation.

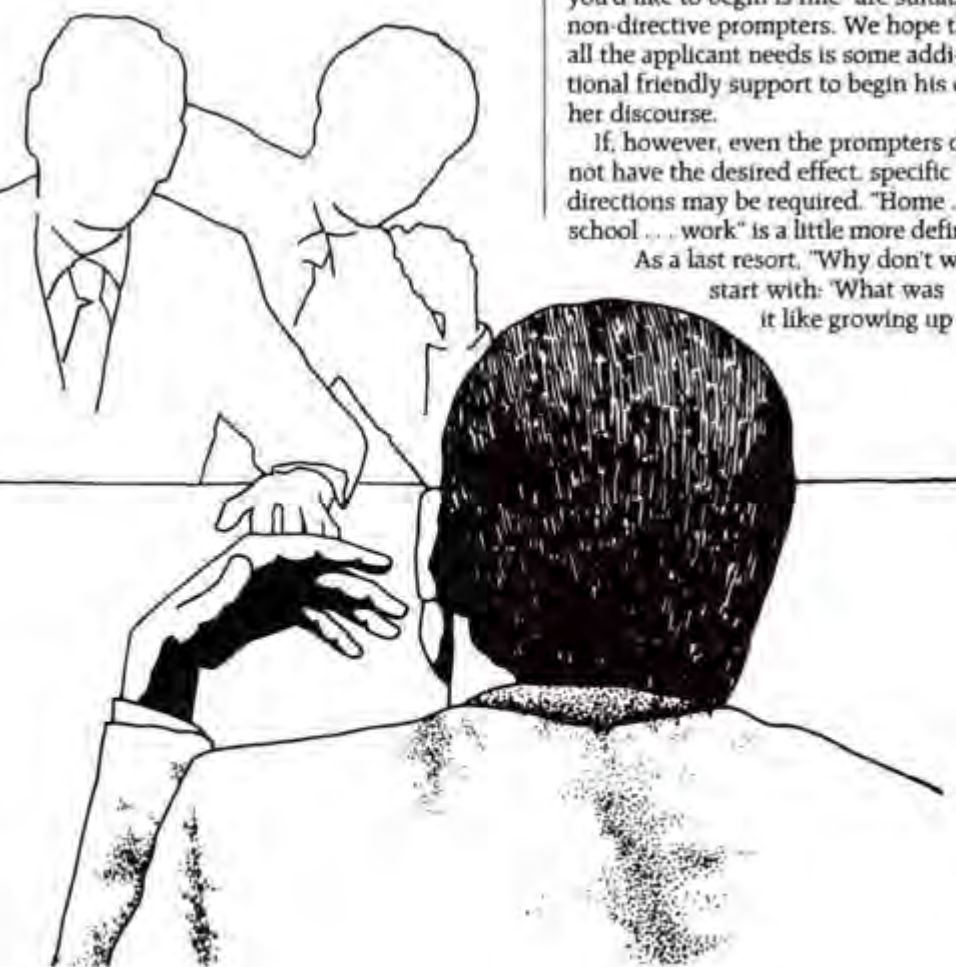
The interviewee may want to respond to this first question with material about graduate school, current job, or some other event in the relatively recent past. He or she should be stopped with, "Could we start before that . . . ?" so that the interviewer can obtain a feel for emerging patterns and themes that may reveal themselves as the individual moves from school to school or job to job.

The best possible answer to this first question would be one in which the applicant presents a chronology of events and discusses their relationship to the job at hand. He or she would touch on childhood events, educational and vocational experiences, current situations, and long range goals and expectations.

Occasionally some material in the candidate's presentation may be unclear or inconsistent. A follow-up question is needed. A "Why?" often works wonders, as does "Would you explain that further?"

In phrasing other more situation-specific follow-ups, the interviewer must be sure *not* to ask direct questions answerable by a "Yes" or "No." Interviewees asked a question such as "Do you think you will succeed on this job?" never answer "No!" As a result, the interviewer gets no real information.

A remarkable, yet simple rule to remember is phrasing your own follow-ups or any questions you ask is this: *Never ask a question in which "you" is the second word.* This eliminates questions beginning with Will you, Do you, Are you, Can you, etc., that can always be answered "Yes" or "No." Whenever tempted to begin such a question, insert before it a word such as How, Why, or What—making the question much better. "Why do you think you will succeed on this job?" elicits far more illuminating information than the poor "will you" version of the same item.



2. "What is your understanding about the nature of the job under consideration?"

The emphasis here shifts to the job or, more accurately, to the applicants' expectations of what the job involves without having been told a great deal about it. Do the applicants know what it involves? Are they here for a specific position, a career spot, or just any job that's available? Do they think they'll be the top person or do they see the job (and themselves) filling a junior slot where they will be trained and developed? Do they understand the job in a realistic manner?

Costly, irreconcilable dissatisfaction and discontent on the job, because of a mismatch between unshakable employee expectations and actual job content, can be prevented right here if the interviewer remains attuned to discrepancies between what the applicant thinks exists and what does exist. Then, if a decision is made to make a definite job offer at a later date, these discrepancies can be discussed and removed.

3. "What do you think are the most critical parts of the job?"

Further information about the applicant's understanding of the job can be obtained here. If he or she thinks innovativeness and delegation of responsibility are central aspects in a job that really requires precision and stick-to-itiveness, future on-the-job trouble may be brewing and the interviewer should pursue the matter further: "How do you feel innovativeness will make a difference?"

In clarifying points or probing deeper, the interviewer must be careful not to provide negative feedback to the interviewee. As soon as the applicant detects that one kind of answer is good and another kind bad, he or she will begin monitoring and slanting his or her responses.

Careful phrasing of indirect follow-up questions with noncommittal words can reduce the likelihood that an interviewer will telegraph the kind of information he or she is looking for. Rather than asking, "Why would anyone need financial planning skills as a junior accountant?" more valuable material could be obtained by asking, "In what way do you expect your financial planning skills to help you on this particular job?"

4. "How do you meet these requirements?"

This gives the applicant an opportunity to relate to the position he or she has already defined. Here's the first chance to "sell himself." It is a straightforward, strategically placed opportunity for the candidate to paint as bright a picture of himself or herself as possible with factual job related data.

5. "What parts of the job do you think would be least satisfying to you and why?"

This is the first question to which the applicant must respond with negative information. He or she should not be allowed to evade answering. The answer to this question is just as important as all the other answers. Here the applicant not only will be providing actual material about the kinds of work

Success on a job frequently requires more than ability: loyalty and motivation are two such attributes.

he or she doesn't really like, but will begin to become accustomed to providing critical and even negative assessments. In addition, the perceptive interviewer can gain psychologically valid insights about the applicant's approach to unpleasant tasks by the way he or she answers—or tries to evade the issue.

6. "What do you consider your strong points and your weak points?"

With regards to strong points, many individuals feel they have personal attributes that could compensate for certain deficiencies in skill or background. They are often correct. Success on a job frequently does require far more than ability; ambition, loyalty, motivation, trustworthiness, tenacity, and humanitarianism are but a few such attributes. By responding to this question, the interviewee is able to talk about some of his or her desirable,

possibly compensating, characteristics.

A natural follow-up question is, "How do you think 'tenacity' would be helpful in this job?"

Asking about weak points is where the candidate can reveal if he or she has a temper, is absentminded, or prefers a great deal of flexibility and variety in work assignments. The answers also tell much about his or her self-perception and system of values.

Some interviewees profess to having no limitations, no shortcomings. Since this is patently not true, a more direct prompter delivered in a humorous manner is warranted: "You are, then, a perfect person?" The invariable answer is "No . . . I do this . . . and that . . ." The rare individual who seriously says "Yes, I am," is, of course, providing negative information.

7. "Why are you interested in leaving your current employment?"

This gives us some idea of the goals of the applicant (later questions go into greater detail), or why there might be dissatisfaction with an employer. What has been his or her previous record of stability with an employer? Does he or she soon become disenchanted or bored with the work?

8. "What have you to offer this university's physical plant department?"

Another question for the candidate to relate his or her good points and how they relate to his or her perception of the job. By now we can see if a good fit of person to job is a possibility.

A corollary follow-up question might be, "What does this university offer to you?"

9. "What supervisory duties/responsibilities have you had?"

For jobs requiring supervision, this gives the applicant a chance to demonstrate the extent of his or her experience and in what areas he or she has had full responsibility; i.e., pay, hiring, firing discipline, training, etc. Otherwise, this question may not be necessary.

10. "What have you been particularly praised for on other jobs?"

Although the responsible interviewer is as much concerned with discovering negative as well as positive information, he or she realizes that no applicants are hired because of negative material. They may be hired despite it, but in the

final analysis they are hired because of positive information. This question represents another source of such essential positive information.

11. "What have you been criticized for?"

At this point, the pattern of positive question/negative question/positive question is likely to be apparent to the interviewee. He or she is comfortable with it and has learned how to handle

it. Thus, asking for information about "what you did wrong in your previous jobs" is not regarded as an unwarranted invasion of privacy or constitutional rights against self-incrimination.

A good technique should not be overworked, however. To continue in the same alternating positive/negative fashion would be unproductive. Verbal gears should be shifted and a new direction pursued.

12. "If you wanted to describe yourself in the most complete, accurate manner, what words would you use?"

Another wide, unstructured item. The objective here is to understand, with minimal interviewer influence, how applicants see themselves. Does the prospective plant supervisor for the difficult 11:00-3:00 shift see himself or herself as "quiet, mild-mannered, and patient?"

Continued on page 22

The Process of Selection

by Reba L. Snavelly

When interviewing to fill an existing vacancy, how do you decide who is the best applicant? Who is the one applicant who can do the tasks required of this job most completely? As the person who supervises the vacant position, you probably ask yourself these questions often.

Getting the right person in the job can mean the success (or failure) of your work area. Since the interviewing and selection process is becoming more detailed and complex, a specific structure must be developed for supervisors that is usable, adaptable, and consistent. We have developed such a system in University Facilities at Kansas State University and it is working!

The Interview

You must interview using the requirements needed for the job.

- 1) Make yourself a listing of the important factors of the job.
- 2) Review the existing position description.
- 3) If needed, revise the position description before filling the job.
- 4) Prepare a set of *job-related* questions to ask each applicant.
- 5) To each question assign a rating that weights the question in accordance with its importance in the job description.
- 6) Determine a cut-off point for an acceptable rating. (We use 70 percent.)
- 7) Allow space on your rating sheet for applicant's name, date, your notes, and each answer's rating.
- 8) Schedule your interviews. Thirty to forty-five minutes should be appropriate, but top professional positions may require more time while clerical positions might need less.
- 9) Rate the applicant immediately after each interview is concluded to eliminate forgetting important points.
- 10) When you have completed the interviewing, the best candidate will surface.

The Selection

Because you want your final selection to also be the best qualified applicant, you will be looking for a person who meets your requirements best. You want the best person who can competently do the tasks required of the job as stated in the current position description, and you want the best person who can cope with the worksite you have to offer. In addition, you want the best person who can work well with the existing work group.

These requirements are both objective and subjective and must be dealt with in priority order as listed. They are otherwise known as the job dimension, the environmental dimension, and the human dimension. The interviewer must never make an interview decision based on only one of these requirements. If you do, you are providing opportunity for the selected applicant to fail.

Reba Snavelly is the personnel officer in the Division of University Facilities at Kansas State University, Manhattan, Kansas.

The requirements include everything necessary there is to know about the job, the jobsite, and the person in order to make your decision. When considering the job, define the job tasks. Does the person measure up to what you require? If not, are the areas where the shortage occurs extremely important, and how long will it take to train the person to do it? Are the things you require, as the supervisor, in the job description? If not, *how important are they?*

When considering the worksite, what restrictions does the work area impose? Will you have to make any changes? How costly will it be? Where is the parking? Where is the work area? Is it well ventilated, heated, and lighted? What kind of equipment and materials are available? Does the employee have to supply anything?

When considering the work group, what are the personality qualities you are looking for? Does the employee make an appropriate appearance? Were they properly prepared for the interview? Did they present themselves well?

If this does not help you narrow your selection to one individual, bring the top candidates back in for a second interview. Show them around the work area and introduce them to peers. Spend at least an hour talking about the job and the goals of the area to see how enthusiastic the applicant is. Finally, get three job-related references from them and call at least one recent reference for each applicant. Don't accept the name of a neighbor, minister, or peer. Their opinion is biased. Ask the references specific questions about attendance, work habits, dependability, and experience. Record your questions and answers.

Your number one applicant will surface.

An important thing to remember is that you are looking for the best qualified applicant. It makes no difference what sex or race the selected candidate is. The only thing important is that, in your opinion as the supervisor, no one else in the pool of applicants you interviewed can do the job better. When you have a white male or female or minority who are equally qualified finalists, the affirmative step for you to take in support of equal employment opportunity is to select the female or minority applicant.

In Summary

Interviewing and selecting the best applicant for a job is the first key to a supervisor's success in any work area. The job descriptions must be current, the interview process must be consistent, and the selection must be objective. A good record of events must be maintained. Your decision must be based on *facts* you can justify.

This process is not exact. Some selections still won't work out, but this method, used properly, will make your selections easier, more objective, and certainly non-discriminatory. ■

Temptation for the interviewer to provide more specific cues is likely to be great. An interviewee frequently asks, "Do you mean on the job or in my personal life?" While it might be interesting, if more time were available, to consider how they describe themselves differently on the job than in their personal life, the main thrust of the question can be pinpointed simply by repeating it or by prompting, "Whatever would give the most accurate picture of you."

Allowing sufficient time on this question is critical. Invariably, once the flow starts, the first few adjectives mentioned are flattering and superficial, with each applicant seeming to be the proverbial trustworthy, loyal, helpful, friendly Boy Scout. More substantial positive and negative descriptions are likely to be forthcoming after the initial burst, if the interviewer waits for them!

After you have elicited a reasonable number (six to eight) of accurate, descriptive words, including one or two

possibly uncomplimentary ones, you should follow up with, "Would you give me an example of when you were especially 'level-headed'?" having selected one of the more provocative words from the interviewee's own list.

13. *"Forgetting the job we are talking about today, if you could create your 'ideal job', how would you be spending your time?"*

Fast on the heels of one fantasy item comes another. The groundwork is already held for a full, relatively uncensored response. The description that emerges could show that the applicant is genuinely interested in—and likely to be satisfied by—the day-to-day activities of the job's assignment. But then again, it could show the opposite.

14. *"At this stage in life, what goals are you aiming for?"*

How long-range is the applicants' planning? How crystallized is their current direction? What are their per-

sonal and vocational goals? Are they vocationally floundering? Is this job just a job or is it part of a sensible career plan? Are they in a growth, maintenance, or decline stage? This is where the interviewer learns such details. It is then up to you to decide if the applicant's personal goals are compatible with job and organization realities.

15. *"What other information that perhaps we did not cover would you want us to know?"*

Perhaps, despite all the previous opportunities for the applicant to provide favorable material, there still may be more. This is the last call. This is when it should come forth.

This question also serves as a built-in Interview Evaluation Item. If the interviewee has more than a few facts to add, the interview probably has not been well conducted. In short, this question evaluates both interviewee and you, even though the interviewee does not know this. ■

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Smaller Is Better

The average federal employee of the 1990s will work in an office that is smaller and more efficient, but also more attractive and people-oriented, if the General Services Administration (GSA) has its way. According to their "New Agenda for Quality Work Environment," announced with much fanfare at an October press conference, federal offices will be getting modular or systems furniture to replace the traditional, more cumbersome desks, chairs, and cabinets presently in use. The result will be forty-square-foot less space per worker, but greater productivity due to a more efficient use of space and a more pleasant environment. A trial of the systems furniture in one section of the Department of Defense resulted in a 20 percent productivity increase, claims the GSA. The new agenda is part of the agency's attempt to shed its monolithic image. "GSA is no longer the bureaucrats' bureaucracy," Administrator Terence C. Golden said. GSA is the central management agency in charge of federal facilities and office space for 890,000 government workers in more than 8,900 buildings.

Town-Gown Cooperation

The University of Virginia is making deliberate efforts to coordinate its land-use policies with municipal and county authorities, a move that is making for good community relations. The City of Char-

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J. Roger Kurtz

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lottesville, Albemarle County, and the university are the three political entities allowed to make decisions about how land in the area is used. That can make for occasional problems—such as the time the school wanted to build a new teaching hospital on the same site that had been recommended as a good location for a regional solid waste facility. The recent efforts at better cooperation are part of

UVA's new overall look at real estate management. As a result, the school has formed a Real Estate Foundation to manage its land interests. It has also drafted a "Memorandum of Understanding"—after many hours of negotiation with city and county officials—that establishes ground rules for future land development. With its new strategy, UVA is set to use its real estate effectively, broaden its revenue base through its property holdings, and improve relations with the community at the same time. In drafting the program, the school used the services of the Urban Land Institute, a Washington, D.C.-based land use education and research organization.

Industry and academe have joined forces in Milwaukee, where Johnson Controls and the Milwaukee School of Engineering jointly built and now share a new educational laboratory. The facility provides hands-on experience with heating, ventilating, and air conditioning equipment and their controls. It will be available for use by MSOE students and students of Johnson Controls Institute, the corporation's training school.

Student Power

The University of Massachusetts saved an estimated \$500,000 by using volunteers to help in the extensive renovation of its twenty-eight-story Tower Library. Students were among the 3,500 volunteers who participated in the four-day "mass transformation" project. The school hopes to rejuvenate a building that has been beset by a number of structural problems resulting in flooding, faulty elevators, and falling brick chips.

Signs of Progress

The Sign Shop of the University of Washington has been keeping pace with new technology with its \$10,000 computerized signmaker. The machine has been in constant use since its purchase last year and does the equivalent work of one full-time employee, the school claims. Sign Shop staff use the computer to compose a sign, and the machine will cut letters out of plastic, glass, or other material. It can also draw signs on paper or make patterns for silkscreen stencils. The Sign Shop's three-person staff produces about 200 signs per month for the university.

Cogeneration News

Indiana University of Pennsylvania will be using four Bessemer engine/generator sets as the heart of their campus cogeneration facility. The project is expected to save \$40 million in energy costs during the first fifteen years of operation. The new facility will be one of the first of its kind in the nation, and the only total campus energy system in the state. Engines will be fired

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with natural gas from Pennsylvania wells, with diesel oil as a backup. The cogeneration facility will supply all electrical requirements and most of the thermal requirements for the campus plus generate electricity to sell back to Pennsylvania Electric Company. Savings will be used to enhance academic programs and improve facilities.

Hau Aden mining works in West Germany is undertaking a different sort of cogeneration project. The pilot plant will use coal gas from the mines to provide electricity to the utility grid and hot water for space heating at the mine sites. Coal mine gas is 90 to 95 percent methane and when mixed with air is highly explosive. Gas is routinely removed from the mines. A system of piping will carry the gas from the mines to the cogeneration plant. A central control system will regulate the gas flow. In addition, the whole system is portable since gas is not produced in a steady flow and continued operation may require relocation. The project hopes to save the equivalent of 10,600 tons of oil a year.

fit project cost \$32,165 and payback came in fourteen months. Other advantages of the projects: reduced demand for steam and chilled water, wider range of control, quieter operation, and reduced maintenance.

The state of Texas has encouraged conservation efforts through the passage of legislation that created the Texas Public Building Authority. They can make available more than \$3.8 million for energy-saving projects. One of the projects involves more than eight facilities that have installed computerized energy conservation systems to automatically turn off air conditioner during the night and on weekends and to adjust load on heating and cooling systems. A cogeneration system at Austin State Hospital saved 70 percent on its electric bill and steam production. Travis State School uses a waste heat recovery system to recycle laundry wastewater to heat fresh water for a savings of \$800 a month. Installation of a \$2 plastic device that reduces water flushed down toilets by 40 percent is saving water and wastewater costs at many facilities.

Energy Information

The New York Institute of Technology has established a Job Clearinghouse for Energy Professionals. Employers from commercial, government, and utilities seeking energy professionals in areas of cogeneration, resource recovery, and alternative energy systems may make use of the computerized clearinghouse. Employers inform the clearinghouse of existing job openings and in response receive at no charge employment profiles with ten qualified candidates to contact. For more information, contact NYIT's Center for Energy Policy and Research at 516/686-7578.

Computer Applications

Georgia Tech has joined Princeton and other institutions in operating an electronic mailbox, bulletin board, and conference channel for alumni, faculty, staff, and students. At Georgia Tech, the alumni association runs the system, known as Wreck Net. They have plans to add a listing of continuing education classes and alumni and student publications. (Source: *Atlanta Journal*, May 5, 1986.)

Hazardous Waste Management

Iowa State University saves \$13,000 annually by designing their own chemical spill-control kits. Commercial kits cost \$81, but ISU pays only \$18.60 for bulk materials and labor to create their own. Kits contain calcium bentonite in a five-gallon plastic bucket, two pairs of neoprene gloves, and polyethylene bags for disposal. For more information, contact Sharon Harless, Environmental Health and Safety, 215 Nuclear Engineering Laboratory, ISU, Ames, IA 50011.

Energy Projects

The Town of Derry, New Hampshire is planning to develop a \$60 million, 400-ton-per-day, waste to energy plant with Power Recovery Systems, Inc. The system will use the Power Recovery proprietary fluidized bed gasification technology for converting municipal solid waste into clean electrical energy. They will be the first to make use of this technique.

Installation of a 150-hp AC variable frequency drive at a Midwest hospital has reduced air handling energy costs by 67 percent, or \$28,484 a year. The total retro-

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Getting ORGANized

An associate of mine claims her university's turnover rate is so formidable that she writes co-workers' names in her Rolodex in pencil.

Although she is likely stretching the truth, she still has a point. Universities, like all other businesses, have their share of personnel turnover, which predictably promotes dilemmas for our customers when they request assistance. To intelligently use our services the academic community needs to know who is in charge of what.

Organization charts are a simple, quick way of letting customers as well as new employees know the who, what, and where of your department. Still, not many of us use them. Why? Because they're tedious to draw or revise.

Org draws organization charts quickly and simply. It accepts up to six lines of text per box. Ordinarily, that includes the name, title, and phone. But the boxes will accommodate any text including room number, job description, departmental budget, and so on. Each line can carry as many as twenty-five characters.

Org offers a choice of eight outlines for your chart's boxes. Outlines can be blank or a mix of solid, dashed, started, or shadow borders. Boxes connect to the mainline of command by dashed or solid lines. Upper- and mid-management positions intersect the mainline while staff and subordinate positions generally reside off to the side. However, with seven default chart styles to choose from, Org offers extensive design flexibility.

Using the function keys, Org moves up or down through all levels in the chart. Other function keys call an abbreviated Help menu, schematically display the entire

Data Base Update

Howard Millman

chart on one screen, or summon specific printing, editing, or disk functions.

Once you understand the instructions, Org is simple to use. And understanding them isn't difficult, since the easy reading, well-designed manual contains numerous examples and illustrations. The sections dealing with the printing options are notably well done.

As part of the initial printer setup menu you're offered a choice of fifteen paper length and width combinations. But what happens when the chart you design is too large for the page? Org asks your permission to shrink the chart. If it's still too large Org then asks to trim the chart. If you don't want your chart shrunk or trimmed, it is then printed on multiple sheets that you later tape together.

Printing itself is completely automatic. While Org is compatible with nearly all printers, including daisy wheel, I recommend a dot matrix—it's faster.

After you design and print your chart, save it to disk. Then whenever there's a change in personnel, just a few simple keystrokes will reflect that change in the chart.

Org has yet another use in maintenance and engineering. Since its boxes can be configured to contain any information, it will generate simple flowcharts. By no means as sophisticated as Quiknet, reviewed in our last column, Org will quickly diagram basic CPM networks.

Granted, Org isn't the kind of program you use all the time (for your peace of mind and job security, let's hope not). But it is an outstanding timesaver and delivers what it promises: neat, professional-looking charts delivered with a minimum of fuss.

Tornado Notes

The human brain is an organic computer. It sorts and sifts through a vast collection of information to reach a conclusion. Unlike a computer, however, the brain processes random information, bits and pieces of seemingly extraneous data. In an effort to get computers to act more like a human mind, software vendors are introducing loosely or entirely unstructured programs. Since these programs feel more natural, they're easier to use.

Tornado Notes stores random information—anything and everything—telephone numbers, travel directions, birthdays, business forms, conversion tables, and so on. By itself that's no big deal; many data base programs already do that. The difference is that Tornado Notes resides in your computer's random access memory so that data is instantaneously available.

Ordinarily, that same diverse data is usually available elsewhere. But rather than search through reference books, scraps of paper, file folders, or desk diaries, now you store it neatly in one place. And it stays there until you need it.

One other application is worth mentioning—safeguarding personal information. By recoding the call-up keystrokes, you can keep the data at hand, yet protected from premature disclosure.

Store any and all information, privileged or public, that you want readily available. Data is entered in either of two ways. The first is directly by using TN's built-in text editor. Or for larger files, you can import text directly from your word processor or spreadsheet. Conversely, you can also export data to other programs just as easily.

Lest all these random notes, charts, tables, directions, etc., become a mind-boggling jumble, TN offers options to prioritize, delete, or even transfer them to a back burner.

Two notes of caution. First, since TN is ram resident (temporary) any changes to your files *must* be saved to disk before you turn off your computer. Actually, you should *always* save your data often, whether the program is disk or ram resident.

Second, the program is easy to live with, but the instruction manual is not. Rest assured, however, everything you need to know is included in the manual. Somewhere. At the risk of appearing nit-picky, I have another minor complaint—the book's printing quality is less than desirable.

Nevertheless, the program's dynamic performance dramatically outweighs the manual's need for rewriting.

Member Published Software

Chuck Harrington, associate provost of Ohio University, offers three programs targeted specifically to facilities managers' needs. Chuck markets the software through his firm Harrington & Sons. Here's an overview of the programs:

dKEYS—a key inventory and control system. dKeys tracks an almost infinite number of keys using up to nine separate indices. For instance, you can track by employee name, I.D. number, phone and room number, as well as building name, key and core marks, etc. The program prints complete and partial records of key holders. \$395.

dLOCKS—a stand-alone version of the foregoing for, naturally, locks. It too tracks an almost infinite number of locks, limited only by disk space. The tracking indices include: building, room, core mark, lock availability, etc. \$395.

PRONTO—a multiple project scheduling and tracking system. Pronto provides an overview of projects by status, funding, personnel, and resource assignment. \$295.

All programs run on the IBM PC and compatibles; a hard disk is recommended.

A note of caution: these are specific focus, no-nonsense programs devoid of the usual bells and whistles common to commercial software. While sometimes those enhancements are unnecessary, other times they are welcome.

Available from Harrington & Sons, 20 Pleasantview Drive, Athens, OH 45701, 614/593-6012.

Thwarting the Tax Time Traumas

Most people regard income tax with irritation and apprehension. Maybe even dread. A good many people supplement their own income by preparing your tax return. Why? Because this annual ritual creates a natural apprehension as taxpayers fret over deciphering complex and ever-changing tax forms, schedules, and instructions; identifying all their lawful deductions; and completing the math correctly.

The adventuresome who wade in, determined to do it themselves, need a map to lead them through the quagmires. For many that map is the venerable J.K. Lasser manual *Your Income Tax*. Now, after nearly fifty years in print, its tips and techniques are available on disk.

Using the program is like visiting a tax preparer. It first asks you questions about your income, sources, expenses, dependents, and so on. Your answers are evaluated and the program determines which of its twenty-eight forms and schedules you must file. If you already know that, you can bypass this fact-finding module.

Next, it walks you through each of those forms, prompting you for the specific infor-

mation required for line-by-line entry.

If you have any questions, pressing the F1 key summons an abbreviated Help menu. If you require further explanation, the program refers you to the page and section number of the Lasser manual, included as part of the package.

As you complete each form, the function keys summon options to simplify data entry. For instance, an onscreen calculator is available for computations. Press another function key and all entries are totaled and entered into the correct box. Even your tax liability or refund is computed.

When you are finished entering all the required data, you're now ready for printing your return. Almost. Here's where the program stops acting like a tax preparer living inside your computer and gets mired in the IRS red tape.

Let's discuss two of the print options. First, you can print out your computer generated copy of the IRS forms. Unfortunately, the IRS doesn't accept computer generated copies of their forms. They want only their original submitted. (I'm reminded of *Star Trek's* Captain Kirk's line, "Beam me up, Scotty, there's no intelligent life down here.")

There is an alternative but it too has its drawbacks. The program offers an option to type your data onto a computer feed IRS issued form. To do this you feed their forms, one at a time, into your printer, align

the printhead at the name box, and turn the program loose. The printhead skips around the form to the exact location and types in the data. Supporting worksheets, of course, are acceptable in a computer printed format.

So you have two choices: print the data and copy it manually onto the IRS form, or feed in the IRS forms one at a time.

Yet another concern of *Your Income Tax* is the short useful life of the program. Tax laws, especially now with tax reform looming so prominently, change from year to year. And at \$69.95 for the program and manual (tax deductible, of course) it's a bit pricey. In the past Simon & Schuster has offered updates to registered owners for \$29.95. Let's hope they continue that far-sighted policy. One solution is to divide the cost among several users. Providing the program is used by only one person at a time, you will not violate the vendor's license agreement.

Software Availability

Org Plus. Banner Blue Software, P.O. Box 7865, Fremont, CA 94537; 415/794-6850. \$69.95.

Tornado Notes. Micro Logic Corporation, Box 174, Hackensack, NJ 07602; 201/342-6518.

Your Income Tax. Simon & Schuster Software, One Gulf and Western Plaza, New York, NY 10023; 800/624-0023, 800/624-0024 (NJ).

Letter to Our Columnist

The Summer 1986 edition of Data Base Update reviewed three software packages—Word Finder, Right Writer, and Textra—and clearly stated that all three are compatible with each other, regardless of what their publishers say. I recently purchased these programs based on the strength of your column and found that upon installing Word Finder, Textra was not nominated as a compatible word processing package. Please advise the proper procedure in which these packages are compatible with each other.

To achieve compatibility between the three programs, just follow these steps—

With Word Finder: In the installation (WFINSTALL) menu choose "Generic Version" as the word processor. For your command keys, do not use any function keys (F1 through F10) because Textra uses those same keys for editing.

With Rightwriter: Save your Textra files in ASCII. The F3 key in Textra's save/exit menu toggles between the ASCII and Textra formats. By using the Tacustom program you can have Textra always save files in the ASCII format and avoid the minor bother of toggling the F3 key.

When a program offers the option, I always store files in the generic or ASCII format. It is one of the few standards that is consistent and reliable.

[Ed. Note: If you have a question about any aspect of using a personal computer or the software reviewed in this column, write to Data Base Update, FACILITIES MANAGER, 1446 Duke Street, Alexandria, VA 22314.

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Two Books on Japanese Management Theories

The M-Form Society, by William Ouchi. Reading, Massachusetts: Addison-Wesley Publishing Co., 1984. 315 pp. \$19.95, hardcover.

In *The M-Form Society*, William Ouchi has again turned his attention to the contrast between the Japanese and American styles of management. An earlier best-selling work, *Theory-Z*, focused on the cooperation and spirit of teamwork in Japanese corporations. The current book further develops Ouchi's theories, this time analyzing the relationship between business and government in Japan.

American managers have been obsessed for some time with the success of Japanese business. Ouchi's ideas are encouraging, even comforting, in that they provide organizational rather than cultural reasons for the success of Japanese business. Consequently, with a little teamwork from American businessmen, and perhaps a few incentives from the U.S. government, Japanese successes can be translated into American successes.

The persuasive arguments of the work are based on a relatively simple concept, that the so-called "M-form" is the most effective and successful organizational structure. Ouchi believes that the structure of all large organizations falls into three basic categories. The most familiar, the functional form, is recognizable in an organization in which similar activities are grouped together into a unit. For example, all of the functional units of research, engineering, sales, and finance in such an organization would report to the chief executive officer. On the other end of the spectrum, an organization might be composed of totally independent subsidiaries, each having its own functional units, reporting to the CEO or a corporate staff. The latter structure is also referred to as H-form (because it operates like a holding company), the former structure as U-form (because it must operate as a unity).

The third alternative is the multi-divisional, or M-form. An organization of this type has operating units that are largely independent, but which must also be interdependent to the extent that they utilize certain resources in common. For example, a corporation might have two subsidiaries, one that manufactures medical instruments, and the other, kitchen utensils. Both, however, might utilize a common research staff. Although each would be a profit-maximizing center and would be evaluated individually, the cost of the common resources would be allocated between them. In this manner the M-form organization maintains the advantage of competition between divisions while avoiding the wasteful duplications of effort implicit in the H-form.

Ouchi believes that the success of

The Bookshelf

Japanese business is due primarily to the utilization of this M-form structure, rather than central planning as some writers have suggested. Ouchi's vision of society as a whole is analogous to the workings of an individual M-form corporation. Government must at certain times allow the sharing of resources among corporations just as individual corporations allow the sharing of resources among divisions. Cooperation and dialogue among competitors, whether intra-corporate or inter-corporate, is the essential factor. Thus, the competitive spirit that gave rise to stringent anti-trust regulations must co-exist with the cooperative spirit that gave rise to our space program. It is a myth, Ouchi claims, that all government and business relations must be wholly adversarial, and it is a myth that crippled any real progress in U.S. industrial policy.

The M-form facilitates the important concept of "social memory." Insofar as the decisions of governments must frequently give advantage to one group over another, there must be a repository for this social memory; that is, the remembrance of who has sacrificed or benefited over the years. According to Ouchi, this function could best be served by a network and hierarchy of strong trade organizations. These trade organizations, while performing their main function of presenting consensus-derived policy recommendations to Congress, would also be a check against a single self-interested group affecting legislation to an anomalous degree.

As a result, policy could proceed in a more ordered fashion, all of the constituents having a voice through their self-determined representatives. As it is, American congressmen are inundated by recommendations from individual lobbyists. They can't possibly be aware of all of the issues, and many times cannot even make reasonably informed decisions. A network of trade or industry organizations would be a more effective liaison to Congress by reducing the number of bills. At the very least, such organizations would serve as an important central source of information in the policy process.

The reader is constantly impressed with the breadth of Ouchi's research and conclusions. His main hypothesis is persuasively presented and well supported by the analysis of a number of Japanese and American agencies and industries. The descriptions of the inner workings of Japanese government

is thorough and interesting. The historical analysis of several industries, especially microelectronics, comprises somewhat of a business education in itself. More importantly, though, his agenda for future policy, even if not to everyone's liking, is a likely point of departure for the future of government-business relations.

The potential reader should be aware, however, that the book's practical import will not be directly relevant to everyone in the field of management. The focus of the book is primarily concerned with profit oriented organizations. Government and other nonprofit organizations do, of course, figure prominently in the work, but mostly as they relate to a corporation or to an industry. Nevertheless, the manager in a university or hospital environment can, with a little imagination, see the applicability of Ouchi's concepts of cooperation and shared resources. The harshest criticism of the work is that the writing style is uneven, sometimes a little technical, then a little too preachy—as though Ouchi were running for office. But overall, it is a readable work and certainly an important one for anyone who wishes to remain current in the field of management theory.

The M-Form Society is available at your local bookstore or from Addison-Wesley Publishing Co., Reading, MA 01867.

—J. Gary Brown
Senior Analyst/Programmer
Northwestern University
Evanston, Illinois

Translating Theory Into Practice: Implications of Japanese Theory for Student Personnel Administrators, by William L. Deegan, Brenton H. Steele, & Thomas B. Thielens. Columbus, Ohio: National Association of Student Personnel Administrators, 1985. Monograph Series Vol. 3. 84 pp. \$7.50 (\$5.95/NASPA members), softcover.

Translating Theory Into Practice is a well researched, clearly written description of popular Japanese management techniques. It includes information on the significant differences between Japanese and American management approaches, problems of implementation, "how to" implement, and estimated costs of initial training and materials.

American management practice generally perceives promotion between organizations, rather than within an organization. Employees tend to remain in similar positions throughout their careers; loyalty is to a profession, not an organization. The Japanese management philosophy views employees as lifetime assets of the firm. Typically, 5 percent of employees are rotated within the company each year. An employee will work many different positions, but remain within the same company, during their work life. Employee development and evaluation are conducted on a lifetime

expectancy that is sharply in contrast to the six months to one year American performance appraisal model.

Japanese manage four variables in addition to the traditional American strategy, structure, and systems: staff, in important personnel categories, within the organization; style, cultural style of the organization and management behavior; skills, distinctive capabilities of individuals within the firm; and subordinate goals, guiding concepts for organization members, are a functional part of the decision framework.

The monograph suggests that American postsecondary education, specifically student service divisions, can benefit from the Japanese framework. Three common tools from the model are explored—quality circles, matrix project management, and job rotation. The experiences from Iowa State University with job rotation are described in detail. One position is identified for internal candidates only—a one year appointment with right to return to their previous position. The vacated position is filled temporarily at entry level and the employee selected for the target position retains the rate of pay associated with their old position. The employee has an opportunity to gain new experience. Cost to the unit is less than would be expended for two permanent employees filling the positions.

Arkansas Tech University has provided a model, with estimated budget, for implementing a quality circle program. Recommendations for quality circles include initial outside training for a facilitator, purchase of training materials for in-house use, and a clear charge from upper management on issues to be resolved or support provided.

Matrix management must be monitored to ensure that it does not become overly complex. Opportunities exist to bring people from varying disciplines to resolve a problem. The more effective approach appears to be defining a matrix for the life of a project or problem that functions in conjunction with the traditional line/staff organization. Cautions and suggestions are provided for successful implementation for all three techniques.

The monograph is clear and thoughtfully written. Problems and possible solutions are shared. Many of the techniques presented are applicable to facilities management as well as student services.

Translating Theory Into Practice is available from NASPA, Central Office, Room 160, Rightmire Hall, 1060 Carmack Road, Columbus, OH 43210. All orders must be prepaid.

—Kate Fenton

former Dean, Support Services
Kenai Peninsula Community College
Soldotna, Alaska

Exercising Our Options

Leadership and Social Change, ed. by William R. Lassey & Marshall Sashkin. Third edition, revised and updated. San Diego: University Associates, 1983. 342 pp. \$18.95, softcover.

"Leadership" has been a topic of endless discussion and much study for the past fifty years. Lewin, Lippitt, and White, in their 1939 study with boys clubs, first defined several definite leadership styles: authoritarian, democratic, laissez-faire. The University of Michigan and Ohio State studies soon followed, developing and refining previous theses. Through the years, claim Lassey and Sashkin, continued research has shown that "effective leadership requires an understanding . . . of two basic characteristics of human nature: the rational tendency and the emotional need." Generically referred to as "task" vs. "interpersonal/maintenance" functions, a great deal of the theory of organizational behavior is based on the interplay of those two basic needs.

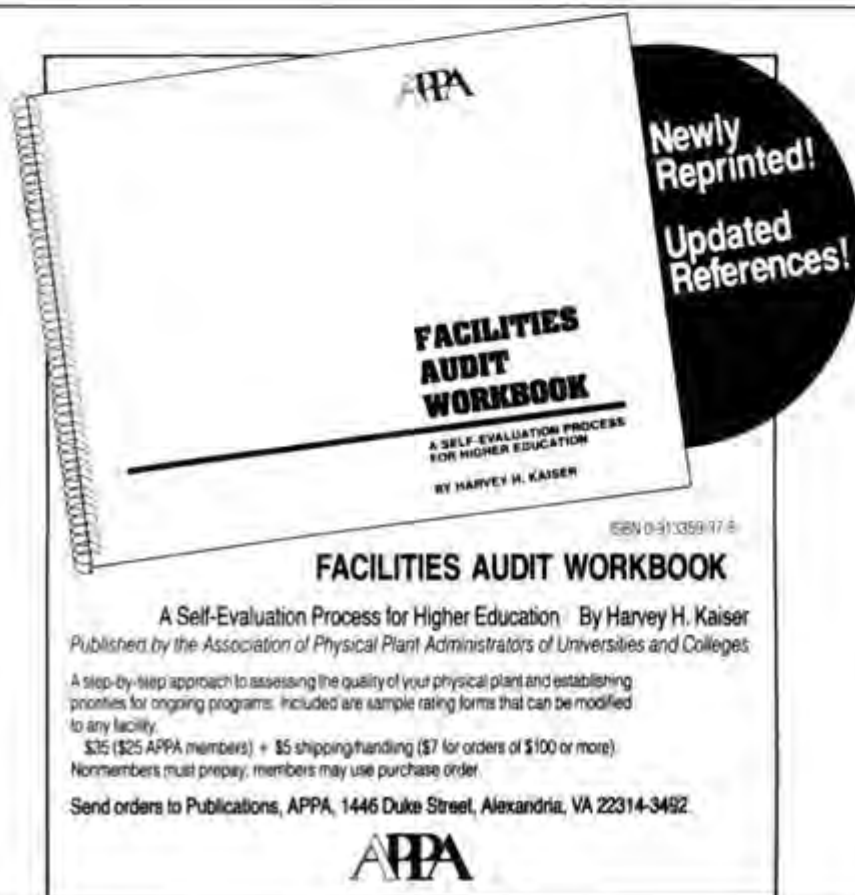
In the third edition of *Leadership and Social Change*, Lassey and Sashkin have extended their focus and emphasized research findings as well as theory. This edition is more current than the second edition (more than 75 percent of the articles were published after 1970; 50 percent after 1975), yet retains the classic material by reference or in its entirety. Some of the

articles will appeal only to those who are students of the management sciences, while others will appeal to the practical (and often harried) plant maintenance manager. This review will try to highlight the more practical (and in one case, whimsical) articles from the point of view of today's physical plant administrator.

First, however, any discussion needs to focus on a definition of leadership. Needless to say, in a collection such as this there will be many variations. In searching for a clear definition of leadership, I found that Abraham Zaleznik's 1977 article, "Managers and Leaders: Are They Different?," seems to do the best job of defining leadership and separating it from management. His basic argument is that "leadership" is a solitary activity, highly risky, in which leaders work "to develop fresh approaches to long-standing problems and to open issues for new options."

Leaders use charismatic identification, one-to-one persuasion, and visions to move people toward their goal. It "inevitably requires using power to influence the thoughts and actions of other people." "Management," on the other hand, is a participatory (group) activity which emphasizes making choices, seeking the security of predictability, and solving problems. Deal and Kennedy (*Corporate Children*) say essentially the same thing: "Managers run

Continued on page 30



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institutions; heroes create them."

By these definitions, most of us are (quite appropriately) managers, not leaders; and Lassey and Sashkin's book is about effective managerial behavior, not leadership in a charismatic, visionary sense.

The book is divided into five parts: basic concepts, leadership in complex organizations, leadership in educational settings, community leadership, and social movement and political leadership. Parts I and II are a basic review of the dimensions and theories of managerial behavior. Of particular interest to the busy physical plant administrator in Parts I and II are the two articles by Lassey and Sashkin in Part I and the articles by McGregor, Blake and Mouton, and Hersey and Blanchard in Part II.

In Part I Lassey and Sashkin review the basic dimensions of "leadership" (task functions vs. maintenance functions), the types of skills needed (technical, interpersonal, administrative, and institutional), power relationships, and the impact of the situation on the manager's ability to be effective. "Leadership is not the only factor important to organizational effectiveness and may not even be the most important factor. . . . Leadership is more likely to be an effect of other organizational variables. . . . rather than a cause, and may even be irrelevant to organizational effectiveness." Their review of the research on managerial behaviors is a good basic synopsis of the important work of the last fifty years.

For Part II the editors have chosen some classic examples of management theory, beginning with Douglas McGregor's Theory Y. Blake and Mouton's Grid Theory, with its dual axes of "concern for people" and "concern for production" (cf. task functions vs. managerial functions), provides some specific managerial behaviors that can be identified for a level of sophistication which makes it practical and concrete for the average manager. Its limitation is, however, that it suggests a "best" (or at least a better) style.

In contrast, Hersey and Blanchard maintain that "an effective leader must be able to *diagnose* the demands of the environment and then either *adapt* his (sic) leader style to fit these demands, or develop the means to *change* some or all of the other variables." Their Life Cycle Theory of Leadership/Situational Leadership Theory takes the basic theses of the Grid Theory and adds the maturity level of the manager's subordinates as another variable that helps to determine which style of managing will be most appropriate and, by extension, most effective.

Hersey, Angelini, and Carakushansky (in Part III) develop the theory more fully and describe specifically the types of leadership behaviors necessary when one's followers are low on maturity (telling behaviors) in contrast to the leadership behaviors that are appropriate when one's followers have a high level of maturity (delegating behaviors).

The movement from telling to selling to participating to delegating is quite similar to the behaviors an effective manager uses as an employee gains experience and, one hopes, maturity.

The last article I would recommend to the busy physical plant manager is Cohen and March's "Leadership in an Organized Anarchy." Aside from providing some good, spiritually uplifting chuckles, it also provides sharp insight into functioning as a manager in an educational institution. Aimed originally at college presidents, their analyses and recommendations are easily translated into the arena of the plant manager. If one were to read only one article in the entire collection, it should be this one.

Leadership and Social Change is a good, basic reference on the elements of effective managerial behavior. While it is not earth-shattering in its basic theses, it does have its shining moments, particularly March and Cohen's article. It is a book to be read in bits and pieces as the need arises and then passed around to other colleagues.

The book is available from University Associates, Inc., 8517 Production Avenue, San Diego, CA 92121.

—Phyllis Rossiter Forbes

Division Chief, Management Services
Arlington County
Arlington, Virginia

Models for Conflict Solutions

Solving Costly Organizational Conflicts, by Robert R. Blake & Jane Snyggly Mouton. San Francisco: Jossey-Bass, Inc., 1985. \$21.95, hardcover.

Solving Costly Organizational Conflicts is primarily written for executives and line managers. It provides much good information and insight for the new and inexperienced manager as well as much to be relearned, confirmed, or formalized for the experienced management person.

The authors postulate that "internal conflict is one of the most serious and destructive problems an organization can face. Conflicts within organizations often result in increased costs, higher turnover, lower productivity and profits, poor quality, and sabotage of important plans. Yet resolving conflicts among groups and departments is one of the most difficult management tasks in an organization because the tension, distrust, and antagonism that conflict engenders feed on themselves and become self-perpetuating."

The authors describe a method for problem solving that has been developed and refined over the course of twenty years. They provide detailed case study illustrations of how their advocated method works.

The book highlights trust and confidence, cooperation, communication, coordination, information flow, and decision making as tools of successful management. The authors describe what they call an Interface Conflict-Solving Model and provide a long list of applications, one of which (better scheduling of maintenance) relates directly to physical plant managers. The results of using their model and system are better use of personnel and equipment and the reduction of expense through the elimination of unnecessary overhead, claim the authors.

So what else is new? Don't all books, systems, and formulas profess to "do it all" for you if you will but follow their instructions or, even better, hire them at a fancy consulting fee to show you how to do it?

I did find the book to be insightful and to provide segments directly applicable to and illustrative of physical plant management. There are three later chapters covering corporate goals, parent and subsidiary organizations, and mergers that do not have much relevance for the physical plant manager, but the last chapter encompasses a chronology of questions and answers about implementing the new approach that is clear and informative.

Three early chapters give an overview of the key concepts and outline of the Interface Conflict-Solving Model by developing an extended case example showing the principles, strategies, and techniques involved.

Chapter 4 introduces and describes the actual use of the Interpersonal Facilitator Model, or in-house arbitrator, and Chapter 5 compares it to the previous model. Chapter 6 illustrates the approach in a union-management conflict, which could help us all.

The text is written in an applied manner that gives it reality and application. It summarizes the ten key properties that make up the design of the Interface Conflict-Solving Model and gives a concise outline of a comparison of when to use it versus the Interpersonal Facilitator Model.

I found the book to be worthwhile for its new insights and variations in approach to the ever-present problems of organizations and their efficiencies. *Solving Costly Organizational Conflicts* is not great, but it is useful as a practical approach to an ever-present problem. Any manager can benefit by taking the time to read it.

The book is available from Jossey-Bass Inc., 433 California Street, Suite 1000, San Francisco, CA 94104.

—Gene B. Cross

Assistant Vice Chancellor for
Facilities Management
University of California/Berkeley
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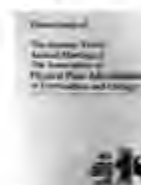
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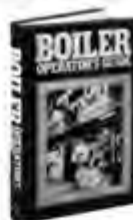
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2. All articles submitted to *Facilities Manager* must be original and previously unpublished. Adapted speeches or other presentations are acceptable, as long as they have not been published in conference proceedings. Simultaneous submissions are not accepted. Articles from consulting firms and other companies are welcome but cannot be proprietary in nature.

3. If you are unsure about a topic's suitability for *Facilities Manager*, send a

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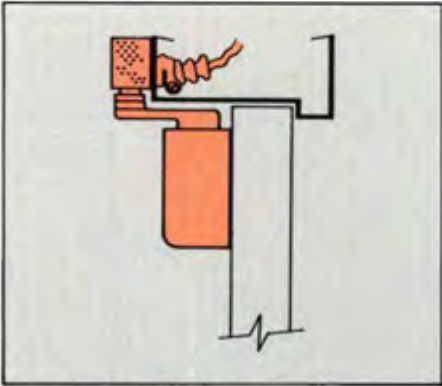
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