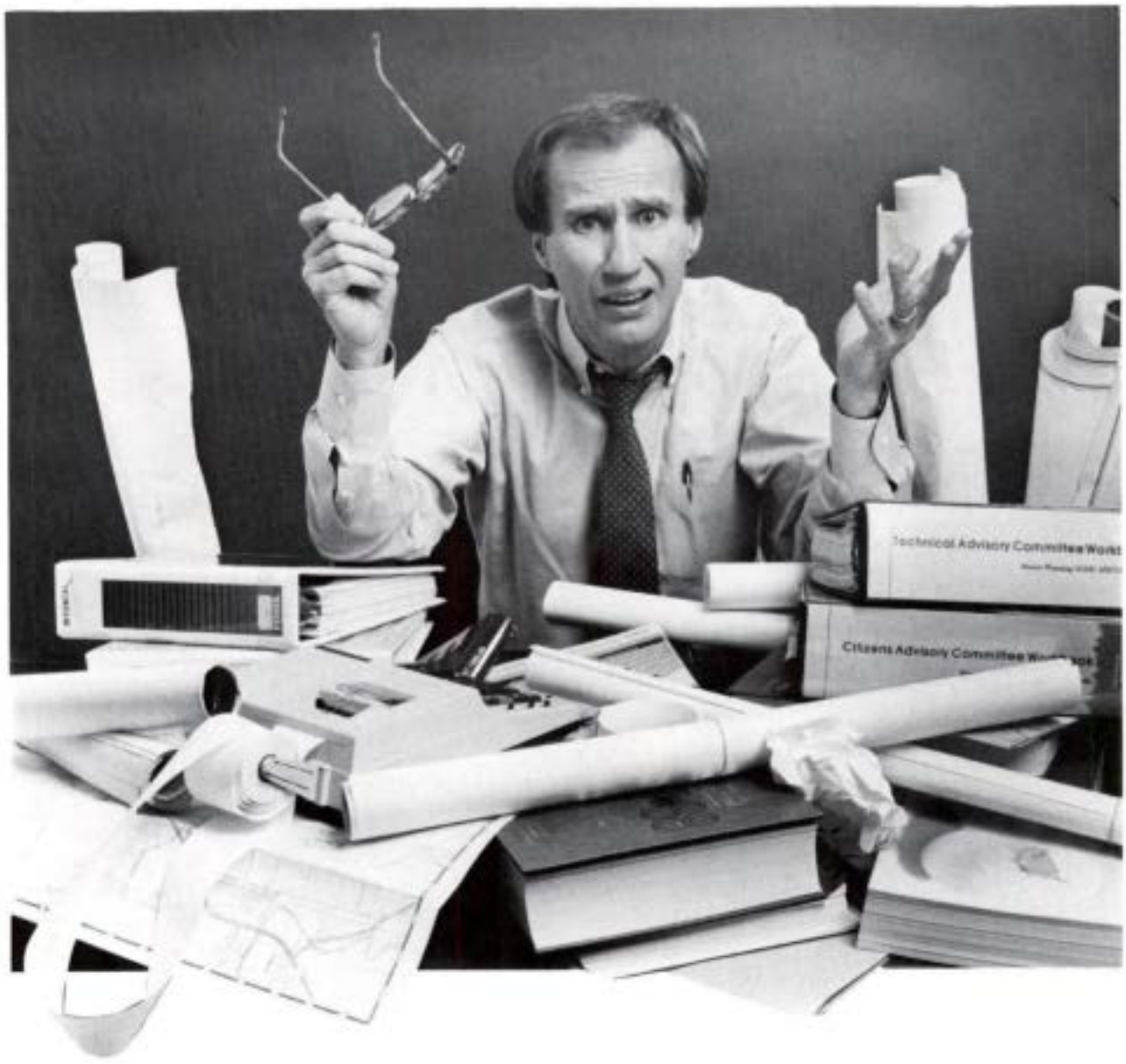
The official publication of the Association of Physical Plant Administrators of Universities and Colleges

Facilities Manager

Volume 5 Number 2 Summer 1989

RENO, NEVADA
JULY 16-19, 1989



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Volume 5 Number 2
Summer 1989

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

Facilities Manager

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

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

For information on rates and deadlines for display and classified advertising, telephone 703/684-1446.

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

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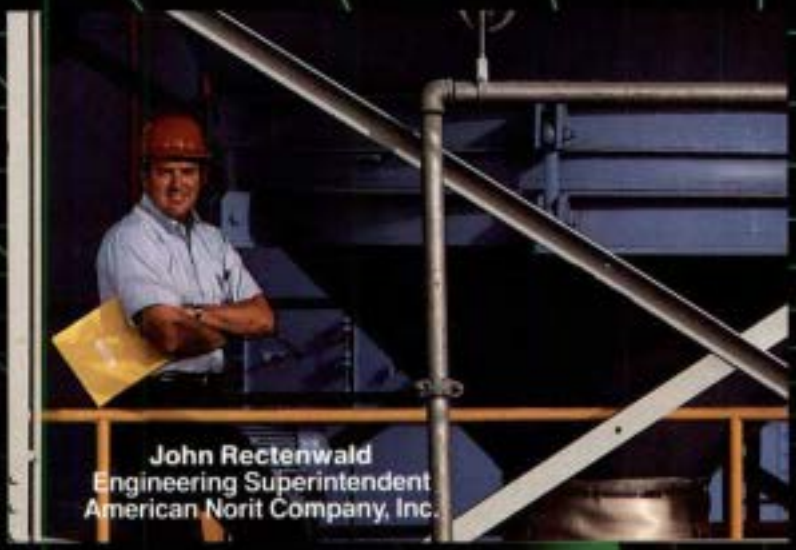

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READER SURVEY

APPA NEWSLETTER

Facilities Manager

Please complete the following questionnaire regarding *Facilities Manager* and *APPA Newsletter*. The information obtained from this survey will be used to guide future issues. Information is confidential and will only be released in aggregate form. The magazine and newsletter are published for you. If we are not meeting your needs and wants, we are not doing our job. We greatly appreciate your cooperation.

1. How much time do you spend reading each issue *of the newsletter*?
   ☐ less than 20 min. ☐ 20-45 min. ☐ 45-90 min. ☐ more than 90 min.
   Of the magazine?
   ☐ less than 20 min. ☐ 20-45 min. ☐ 45-90 min. ☐ more than 90 min.
2. What do you do with your copies *of the newsletter*?
   ☐ save the entire issue ☐ pass along to others ☐ discard when finished
   ☐ file in a library ☐ save some articles ☐ other _____
   Of the magazine?
   ☐ save the entire issue ☐ pass along to others ☐ discard when finished
   ☐ file in a library ☐ save some articles ☐ other _____
3. Please indicate the number of people who read your copy *of the newsletter* (other than yourself)?
   ☐ 0-1 ☐ 2-4 ☐ 5-7 ☐ 8 or more
   Of the magazine?
   ☐ 0-1 ☐ 2-4 ☐ 5-7 ☐ 8 or more
4. For each section listed below, please check how interested you are in reading each:

For the newsletter			
Inside APPA	☐ very interested	☐ somewhat interested	☐ not interested
Coming Events	☐ very interested	☐ somewhat interested	☐ not interested
Memorandum	☐ very interested	☐ somewhat interested	☐ not interested
Job Corner	☐ very interested	☐ somewhat interested	☐ not interested
For the magazine—			
Features	☐ very interested	☐ somewhat interested	☐ not interested
Data Base Update	☐ very interested	☐ somewhat interested	☐ not interested
Resource Management	☐ very interested	☐ somewhat interested	☐ not interested
The Bookshelf	☐ very interested	☐ somewhat interested	☐ not interested
New Products	☐ very interested	☐ somewhat interested	☐ not interested

   Comments on what you like or how to improve what you do not like _____

5. Please rate your interest in the articles that appear in this issue:

Indoor Air Quality	☐ high	☐ medium	☐ low
Radon Overview	☐ high	☐ medium	☐ low
OSU Radon	☐ high	☐ medium	☐ low
Cornell Recycles	☐ high	☐ medium	☐ low
Drug-free Workplace	☐ high	☐ medium	☐ low

6. How would you rate the appearance of the magazine?
   ☐ appealing ☐ satisfactory ☐ poor
   Comments on what you like or how to improve what you do not like _____
7. Please indicate your level of interest in reading about these topics in upcoming issues. Mark the appropriate number in the box next to the topic.
   (1-5, 1 indicates low interest, 5 indicates most interested.)

☐ deferred maintenance	☐ asbestos	☐ grounds	☐ energy
☐ lighting	☐ safety	☐ budgeting	☐ space planning
☐ contracting	☐ training	☐ custodial	☐ hazardous waste mgmt.
☐ preventive maintenance	☐ HVAC	☐ roofing	☐ personnel management
☐ animal research fac.	☐ recycling	☐ CFCs	☐ purchasing practices
☐ indoor air quality	☐ acid rain	☐ USTs	☐ minimum wage/labor issues

8. What time of year do you find you are too busy to read the magazine or newsletter?
   ☐ winter ☐ spring ☐ summer ☐ fall ☐ not too busy
   Comments on what you like or how to improve what you do not like _____

Please return this survey to APPA by August 15, 1989. Thank you.

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APPA UPDATE

NEWS FROM THE ASSOCIATION OF PHYSICAL PLANT ADMINISTRATORS OF UNIVERSITIES AND COLLEGES

ANNUAL MEETING HIGHLIGHTS

Reno's skyline at night

Welcome to Reno!—The Biggest Little City in the World. Experience the excitement, scenic beauty, and old west charm of this year's host city—Reno. Also join APPA for the Founders Celebration in honor of 75 years of service in higher education. An outstanding lineup of educational sessions—with speakers from government, industry, and higher education, as well as the exhibitors and social activities—will make this a meeting not to be missed.

Pre-Convention Activities

On Saturday, two tours offer the opportunity to explore the many faces of Reno. The Wild West Tour of Virginia City transports you to the days of the frontier. Get the flavor of the Wild West and early mining days as you stroll through the streets of Virginia City.

The Reno City Tour takes you downtown through the shopping districts, to the downtown casinos, and through the surrounding residential area. The tour also stops at the Reno Gaming Academy where you can learn to play the games of your choice.

Two conference workshops on Sunday offer attendees the opportunity to polish personal development skills: *Leadership and Motivation* with Anita L. Zimmerman, University of Notre Dame and faculty member of APPA Executive Development Institute; and *Mastering the Art of Expression: Technical Writing and Presentation Skills* with John and Sherry Rulfs, Stephen F. Austin University.

The Regional Meetings are also held on Sunday, giving attendees the chance to renew acquaintances, make new friends, and learn more about their regional activities and the upcoming fall meetings.

Opening Ceremony & Exhibit Hall Reception

The annual meeting kicks off at 2:00 p.m. with the ribbon cutting ceremony. A surprise guest will assist APPA President, Dorsey Jacobs in the ceremonial ribbon cutting and official opening of the 76th Annual Meeting. A reception with entertainment by the Joe Rossi Band is set among the 150-plus exhibiting companies. A complete listing of all exhibitors and their products begins on page *XX*.

Opening Keynote Address

Monday morning opens with breakfast and an address by **Dr. William P. Sexton**, vice president of university relations at the University of Notre Dame. Under Dr. Sexton's direction, Notre Dame is completing a $417 million fundraising campaign that has set records for annual cash gifts to a university. Dr. Sexton also teaches in the College of Business Administration and has authored a book, *Organization Theories*, which is widely used in management curricula. He will address APPA on the importance of teamwork within an institution in order to achieve its academic mission. This session will be audiotaped and available for sale after the annual meeting.

President's Breakfast

On Tuesday, APPA's leadership presents highlights of the past year and glimpses of the year to come. The focus is on new programs and services including the Facilities Management Evaluation Service and Information Services. Special recognition will also be extended to the Certificate of Appreciation recipients and the winners of the Rex Dillow Awards for Outstanding Article.

Campus Tours

Tuesday afternoon offers attendees the opportunity to visit local college/university campuses. Arranged by the Host Committee, this year features a trip to the University of Nevada/Reno and Truckee Meadows Community College. Representatives from the physical plant departments will be on hand to point out some of the more unique features of their campuses.

Annual Awards Banquet

Tuesday evening's Annual Awards Banquet commemorates APPA's Founders Celebration. Special presentations will be made to the winners of APPA's
Meritorious Service Award and President's Award. Announcement and presentation of the regional and national Award for Excellence winners will be made by Dr. Robert O'Neil, president of the University of Virginia. The banquet also celebrates the installation of new officers as

(cont. on p. 4)

Inside APPA

Downtown Reno

(cont. from p. 3)

we bid farewell to outgoing president Dorsey Jacobs, and welcome incoming president Jack Hug. After dinner, enjoy dancing to the Joe Rossi Orchestra.

Closing Keynote Address

Wednesday morning, Dr. Robert M. O'Neil, president of the University of Virginia will address APPA on the facilities role for excellence in higher education. Dr. O'Neil serves on the board of the Carnegie Foundation for the Advancement of Teaching and recently co-chaired a workshop series on the accreditation process for institutions sponsored by the Council on Postsecondary Accreditation. He will focus on the importance of facilities in providing quality education. Dr. O'Neil's remarks will be audiotaped and cassettes will be available for sale at the conclusion of the annual meeting.

Evening Activities

Reno has many casinos and nightclubs that feature live entertainment. Take advantage of the free time each evening to see a show or enjoy a casino. In addition, many companies are hosting Exhibitor Hospitality Suites where you can relax and enjoy an informal chat with the suppliers.

From Maple Leaves to Mounties: Destination 1990 Ottawa

Wrap up the annual meeting with a glimpse at next year's meeting—Ottawa, Canada. Brochures, maps and other information on Canada will be available to attendees. Meet members of next year's host committee and prepare for 1990 and The Decade of Internationalism.

Post-Convention Tour

Board the bus for Lake Tahoe, one of the world's largest and most beautiful Alpine Lakes. At the lake you can spend the afternoon exploring the shops, restaurants, and casinos or take advantage of the many water activities at the lake—boating, fishing.

EDUCATIONAL PRESENTATIONS

The *Proceedings of the 76th Annual Meeting* will contain the written presentations for most of the meeting's educational sessions at the meeting. This year the *Proceedings* will be distributed at registration to all annual meeting attendees. Copies are available for sale to all others after the annual meeting.

Critical Issues In Higher Education

Capital Renewal/Deferred Maintenance. Two-hour session focusing on the key findings of the recent APPA/NACUBO study conducted by Coopers & Lybrand. Illustrations of the problem including case-study presentations and approaches to funding and long-term planning are presented. Speakers include Walter Schaw, APPA executive vice president; Jon Gullette, Vanderbilt University; Jack Hug, University of California/San Diego; Sean Rush, Coopers & Lybrand; Henry Shelby, Tennessee Technological University; and Carson Smith, Kentucky State University.

The Regulatory Spectrum. Review of recent regulations affecting plant operations including PCBs, underground storage tanks, asbestos, indoor air quality, right-to-know, hazardous waste, and more. Presentations by Shelly Steinbach, American Council on Education, and Karen Brown, Environmental Protection Agency.

The Best of the Best. Members get a chance to review the 12 regional winning entries to the 1989 Awards for Excellence in Facilities Management program. Representatives from the institutions submitting entries will be on hand to discuss their ideas.

APPA Study—Custodial Staffing Guidelines. Update on the project to design a matrix for custodial staffing levels. The matrix combines service levels, types of buildings, and expectations. Speakers include Kirk Campbell, University of Minnesota; Jack Dudley, University of Wisconsin/Parkside; and Robert A. Getz, University of Illinois/Chicago.

The APPA Evaluation Service: How and Why. Find out more about APPA's new service for facilities evaluations. Hear results of the field tests and learn more about how your institution can benefit. Speakers include Russ Gonder, University of Western Ontario, and Phil Rector, University of Arizona.

APPA Study—Preventive Maintenance Instructions. Learn more about this new project to develop a set of PMIs to cover most types of equipment found on a typical college campus. Speaker is Kenneth A. Hall, University of Idaho.

APPA Update appears in each issue of *Facilities Manager* and features news from the Association of Physical Plant Administrators of Universities and Colleges. APPA is an international association, founded in 1914, whose purpose is to promote excellence in the administration, care, operation, planning, and development of higher education facilities. **APPA Update** is compiled and edited by **Stephanie Gretchen**.

Inside APPA

Experience Exchanges

One of the most popular sessions at the annual meeting is the Experience Exchanges. Panels of experts share their knowledge on trends and new developments in specific subject areas. The audience is encouraged to participate by asking questions and sharing their experiences. Sessions are on Monday morning and include:

- Community College Management
- Medical College Management
- Training Issues for Physical Plant Directors
- Auxiliary Services
- Plant Service Guides/Service Manuals
- Contracting for Services
- Sick Buildings
- Energy Savings Ideas

Educational Sessions

Monday

Trends in Utilities Management. Speakers: Mohammad Qayoumi, San Jose State University; Robert Burger, Burger & Associates, Inc.; Kevin Garrity, Harco Technologies Corp.; James Myers, Penn State University; Dick Swistock, University of Virginia.

Computer Applications for the Small College. Speakers: E. Diane Kerby, Berea College; Charles Jenkins, St. Mary's University; Eli Katz, Maintenance Automation Corp.; Tim Shaw, ShawWare, Inc.

Training—A Continuous Process. Speaker: Thomas Vacha, University of Delaware.

Predicting Maintenance Resources for New and Existing Facilities. Speaker: Edgar S. Neely Jr., Construction Engineering Research Laboratory.

Unique Approaches to Marketing the Physical Plant Organization. Speaker: Robert H. Clawson, University of Connecticut.

Tuesday

Revitalizing the Nation's Medical, Health, and Research Facilities. Speaker: Richard Green, National Science Foundation.

Presupervisory Training—Less Talk, More Action. Speaker: Paul Schneller, Indiana University/Bloomington.

Construction Cost Management in the Public Sector. Speakers: Jeffrey A. Turner and John Dunkerly, Project Control Co.

Managing Information Systems. Speakers: Doug Christensen, Brigham Young University; Keith E. Burres, Bonner & Moore Consulting Services; Lothar Hermann, IBM Corporation; Lee V. McQueen, Kansas State University; Mohammad Qayoumi, San Jose State University; Kenneth G. Smith, University of Virginia.

Design Approaches to the Special Challenges of Academic Facilities. Speakers: Leevi Kiil and Robert Brandt, Haines Lundberg Waehler.

Free Cooling—How and Why. Speaker: Michael Dwyer Jr., University of Arkansas for Medical Sciences.

Managing at the Small College—Being Greater with Fewer. Speaker: Charles W. Jenkins, St. Mary's University.

Empowering the Work Force to Improve Efficiency and Responsiveness. Speakers: Marilyn Lockhart, University of Virginia; William Middleton, University of Virginia; Beverly J. Wann, training consultant.

Virginia City

Roof Management—Track Records of Experience. Speakers: Dennis P. Cesari, University of Missouri; Richard L. McBride, Soderstrom Architects; John Stephens, Oregon State University.

Forestalling Complaints in Physical Plant Administration. Speaker: Edwin B. Feldman, Service Engineering Associates, Inc.

An Asbestos Abatement Project—Learning the Hard Way. Speaker: Ken Fay, University of Calgary.

Wednesday

Establishing a Waste Management Program for a Small College Campus. Speaker: Ralph O. Allen, University of Virginia.

Performance Evaluation—A Positive Experience. Speaker: Katie Smothers, University of California/San Diego.

The Next Decade of Computerization—CAD and GIS. Speakers: Tom Harkenrider, University of California/San Francisco; Chris Ahoy, Comprehensive Facilities Management; Cliff Gaunlett, AUTODESK, Inc.; Ben Woods, Texas A & M University.

Institutional Waste Management. Speaker: Edward C. Bogard, University of Nebraska Medical Center.

Team Building. Speaker: Polly S. Pinney, Arizona State University.

The Dual Purpose in Motivation. Speaker: George B. Wright, The George B. Wright Company.

EXHIBITOR TECHNICAL SESSIONS

Offered on Monday afternoon, these sessions allow company representatives to participate in the educational program. Sessions at this year's meeting include:

- *The Application of Central Monitoring and Control Systems to Multiple Facilities*, by The Kling-Lindquist Partnership, Inc., Philadelphia, Pennsylvania.
- *Budgeting for Deferred Maintenance*, by Facilities Management Services, Inc., Columbus, Ohio.
- *Economical Options for Complying with New EPA Regulations for Electrical Equipment and Transformers*, by UNISON Transformer Services, Inc., Charlotte, North Carolina.
- *Energy Management and Conservation in the University Setting*, by Energy Simulation Specialists, Inc., Tempe, Arizona.
- *The Impact of Asbestos in CIP and O&M Programs*, by The Pickering Firm, Nashville, Tennessee.
- *Options for Compliance with EPA PCB Regulations*, by General Electric Company, Schenectady, New York.
- *Techniques in Motivational Communication*, by LMJ Consultants, Sonoma, California.

Annual Meeting Exhibitors

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Manchester, CT 06040
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Offers automated lettering systems that cut vinyl letters in a variety of colors and styles.

GERLAND INDUSTRIES, INC.
2500 City West Boulevard
Suite 725
Houston, TX 77042
713/785-8002
Provides synthetic sports flooring products.

***HALL-KIMBRELL ENVIRONMENTAL SERVICES**
4840 West 15th Street
Lawrence, KS 66044
913/865-9210
Specializes in asbestos surveys, abatement design,
and environmental training courses as well as environmental testing and consulting.

HARCO TECHNOLOGIES CORP.
1055 West Smith Road
Medina, OH 44256
216/725-6681
Engineers, designs, and manufactures cathodic protection systems to arrest and control corrosion.

HEATH CONSULTANTS, INC.
100 Tosca Drive
Stoughton, MA 02072
617/344-1400
Offers combustible gas and fluid leak detection products and services.

*** HILLYARD, INC.**
P.O. Box 909
St. Joseph, MO 64502-0909
816/233-1321

Annual Meeting Exhibitors

Provides cleaning supplies for floor cleaners, sealers, polishes, waxes, disinfectants, and wood floor seals and finishes.

HUNTINGTON LABORATORIES, INC.
970 East Tipton Street
Huntington, IN 46750
219/356-8100
Provides floor products (cleaners, strippers, sealers), body fluid spill kits, and hand soaps.

I.S.I. GROUP, INC.
211 Conchas SE
Albuquerque, NM 87123
505/298-7646
Markets hand-held infrared cameras used in preventive and predictive maintenance.

INTER INNOVATION LEFEBURE
P.O. Box 2028
Cedar Rapids, IA 52406
319/366-2771
Offers security systems, access control systems, cash handling systems, and alarm systems.

INTERA TECHNOLOGIES LTD.
1525 Carling Avenue
Ottawa
Ontario, Canada K1Z 8R9
613/728-6111
Conducts high resolution, airborn thermal infrared savings monitoring for leaks and insulation efficiency in buried heating distribution systems.

INTERNATIONAL PARKING DESIGN
3186L Airway Avenue
Costa Mesa, CA 92626
714/662-2230
Architects and engineers for parking facilities.

***ISES CORP.**
Lake Lucerne Office Park
4615 Highway 78, Suite 1A
Lilburn, GA 30247-4613
404/985-8651
Provides facility condition analysis, elevator engineering, cogeneration analysis, HVAC evaluation and design, custom information systems, LANs, and barcoded inventory systems.

***JAGWARE**
(Education Corporation of America)
8705 Unicorn Drive
Suite A-122
Knoxville, TN 37923
615/694-4557
Provides computer systems with objective criteria for evaluating budgets, staffing, quality levels, and organizational performance.

*** JOHNSON CONTROLS, INC.**
507 East Michigan Street
Milwaukee, WI 53202
414/274-4000
Provides building control systems, services, and products for managing energy, controlling comfort, maintaining equipment, and protecting life and property.

JOHNSON'S CARPETS, INC.
3239 South Dixie Highway
Dalton, GA 30720
404/277-2775
Manufactures carpets .

*** KENALL MANUFACTURING CO.**
4140 West Victoria Street
Chicago, IL 60646
312/463-8500
Supplies energy efficient, high-abuse lighting fixtures which have provided "peace of mind" to customers since 1963.

LCN CLOSERS
P.O. Box 100
121 West Railroad Avenue
Princeton, IL 61356
815/875-3311
Manufactures a full line of heavy-duty door control products.

*** LESLIE CONTROLS, INC.**
12501 Telecom Drive
Tampa, FL 33637
813/978-1000
Designs and manufactures steam control valves, pressure and temperature regulators, and steam-water heaters.

LIPHA CHEMICALS
150 Melrose Avenue
Albany, NY 12203
518/458-8187
Rodenticide specialist and distributor of anticoagulant rodenticides and allied products.

M.A.G. ENGINEERING & MANUFACTURING
15261 Transitor Lane
Huntington Beach, CA 92649
714/891-5100
Manufactures door reinforcement and repair hardware.

MAC-GRAY CO., INC.
22 Water Street
Cambridge, MA 02141
617/492-4040
Offers laundry equipment and services.

*** MAINTENANCE AUTOMATION CORPORATION**
3107 West Hallandale Beach Boulevard
Hallandale, FL 33009-5121
305/962-8800
Manufactures the CHIEF software, a complete modular facility maintenance management system.

MARTIN SURFACING, INC.
4103 Hillcrest Avenue, SW
Seattle, WA 98116
206/932-4219
Provides a full line of synthetic surface systems to service virtually every athletic activity.

MARVIN WINDOWS
P.O. Box 100
Warroad, MN 56763
218/386-1430
Exhibits the Magnum Series, constructed for heavy-duty commercial applications.

MECHANICAL INGENUITY CORP.
44 First Avenue
Atlantic Highlands, NJ 07716
201/291-1519
PREVAC system prevents refrigerant loss as well as air and moisture infiltration into R-11 centrifugal chillers.

*** MEDECO SECURITY LOCKS, INC.**
P.O. Box 3075
Salem, VA 24153
703/380-5000
Manufactures high-security lock products.

MITY-LITE
1301 West 400 North
Orem, UT 84057
800/327-1692
Offers light weight, durable folding leg banquet tables.

MONARCH HARDWARE & MANUFACTURING CO.
P.O. Box 548
752 Buckman Street
Shepherdsville, KY 40165
502/543-2281
Manufacturers a complete line of commercial-grade exit devices and a full line of electric devices.

***MUSTANG UNITS CO.**
P. O. Box 320
Eldridge, IA 52748
319/285-7022
Offers jetters for opening and cleaning drain lines.

*** NALCO CHEMICAL CO.**
One Nalco Center
Naperville, IL 60566
312/961-9500
Provides water treatment programs for colleges, universities, and other facilities.

NELES JAMESBURY
640 Lincoln Street
Worcester, MA 01605
508/852-0200
Offers high performance ball valves and butterfly valves.

NO FAULT INDUSTRIES, INC.
11325 Pennywood Avenue
Baton Rouge, LA 70809
504/293-7760
Builds and designs tennis facilities, along with a complete line of surfaces for tennis courts, running tracks, and multi-sport facilities.

NORTEC INDUSTRIES, INC.
P.O. Box 698
Ogdensburg, NY 13669
315/425-1255
Manufactures NORTEC—MP Series Electrode Steam Humidifier.

***NOVA GROUP, INC.**
P.O. Box 4050
Napa, CA 94558
707/257-3200
Engineers, manufactures, and installs preinsulated piping for above ground, direct buried, or concrete trench heat or chilled water distribution systems.

NUTEMP, INC.
3348 South Pulaski Road
Chicago, IL 60623
800/323-3977
Sells, rents, and leases new and reconditioned Carrier, Trane chillers.

***OGDEN ALLIED SERVICES CORPORATION**
2 Penn Plaza
New York City, NY 10121
212/868-6997
Provides a full range of maintenance services including janitorial, mechanical maintenance, security, asbestos abatement, and food services.

OHIO SECURITY LATCH
610 Enterprise Parkway
Grove City, OH 43213
614/875-4910
Provides security latches for school doors.

*** OTIS (a unit of United Technologies Corporation)**
1 Farm Springs
Farmington, CT 06032

PALMA, INC.
14 Solter Place
Bloomsfield, NJ 07003
201/429-1490

***THE PICKERING FIRM, INC.**
400 Oyster Point Boulevard
Suite 325
South San Francisco, CA 94080
415/872-2917
A full-service architectural/engineering firm specializing in asbestos management.

POSTCRAFT CO.
625 West Rillito Street
Tucson, AZ 85705
800/528-4844
Offers flame-resistant, non-allergic, bacteria and stain resistant, and machine washable and dryable PREM/ACLAVE and SOFT-O-CLAVE mattress and pillow covers, aprons, and bibs.

*** POWER ACCESS CORP.**
Bridge Street
Collinsville, CT 06022
203/693-0751
Offers electric automatic door openers which are widely used to increase handicapped accessibility in colleges and universities.

*** PROSOCO, INC.**
P.O. Box 171677
755 Minnesota Avenue
Kansas City, KS 66117
913/281-2700
Provides SURE KLEAN masonry cleaning and water repellent products, CONSOLIDECK protective treatments, and CONSERVARE stone consolidants and protective coatings.

*** PSG CORROSION ENGINEERING/ CORRPRO**
7807 Convoy Court
Suite 110
San Diego, CA 92111
619/565-6580
Performs soil surveys and post-installation checkouts and other corrosion control services.

PUREX INDUSTRIAL
7300 Bolsa Avenue
Westminster, CA 92684
714/890-3694
Provides maintenance products for floor, air, hand, health, and carpet care, degreasers, and restroom and specialty products.

QUAKER, INC.
P.O. Box 745
639 Peoples Valley Road
Cartersville, GA 30120
404/382-8252
Provides commercial and residential carpets.

RECREONICS CORP.
7696 Zionsville Road
Indianapolis, IN 46268
800/428-3254
Provides systems and equipment for swimming pools and aquatic recreation specializing in stainless steel perimeter systems, filtration systems, facility renovation, and new construction.

ROESEL, KENT & ASSOCIATES
P.O. Box 800010
Roswell, GA 30075
404/998-1691
Provides consulting and training in facilities management—housekeeping, groundskeeping, and maintenance.

*** ROVANCO CORP.**
20535 S.E. Frontage Road
Joliet, IL 60436
815/741-6700
Provides high- and low-temperature preinsulated piping systems for underground, overhead, and tunnel applications.

RUBBER PRODUCTS, INC.
4521 West Crest Avenue
Tampa, FL 33614
813/870-3090
Provides SPARTUS and TUFLEX II resilient live rubber flooring specifically designed for sports and multi-purpose surfaces.

RUSSWIN DIVISION (a Black and Decker Co.)
225 Episcopal Road
Berlin, CT 06037
203/225-7411
Offers a full line of builders' hardware including locksets, closers, exit devices, key systems, and related items.

SAFEGUARD FLOOR SYSTEMS
11151 Shady Trail
Dallas, TX 75229
214/241-3652
Provides floor panel systems to protect gym floors during special events.

SAFETY TECHNOLOGY
2306 Airport Road
Pontiac, MI 48054
313/673-1246
Manufactures the STOPPERLINE. Stops false fire alarms, damage to smoke detectors, and theft of fire extinguishers.

SALSBURY INDUSTRIES
1010 East 62nd Street
Los Angeles, CA 90001-1598
213/232-6181
Manufactures mailboxes and mailroom equipment for the U.S. Postal Service and universities, all size mailrooms.

SANTANA PRODUCTS CO., INC.
P.O. Box 2021
Scranton, PA 18501
800/368-5002

Annual Meeting Exhibitors

Manufactures poly-mar HD solid plastic toilet and shower partitions for public restrooms, lockeroom benches, and vanities.

SCHLAGE LOCK
2401 Bayshore Boulevard
San Francisco, CA 94134
415/467-1100
Offers the Intellis Electronic Locking System, a technological breakthrough in computerized locking systems.

SCHOOL AND COLLEGE
1100 Superior Avenue
Cleveland, OH 44114
216/696-7000
Publishes a monthly magazine serving the policy, administrative, and specialist levels in public school districts, private schools, junior colleges, colleges, and universities.

SELKIRK WOOD INDUSTRIES, INC.
1390 Church Avenue
Winnipeg, Manitoba
Canada R2X 1G4
204/633-1047
Manufactures wood casegoods (furniture) for use in college dormitories, health care facilities, and the hospitality industry.

*** SERVICE ENGINEERING ASSOCIATES**
1441 Dresden Drive, NE
P.O. Box 10095
Atlanta, GA 30319-0095
404/261-2050
Provides facilities management consulting (mechanical and custodial) to universities and colleges.

SERVICEMASTER MANAGEMENT SERVICES
2300 Warrenville Road
Downers Grove, IL 60515
800/225-0477
Provides managerial support programs to assist administrators in a balanced approach to physical plant, grounds, and food service management.

SHAMROCK SPECIALTIES, INC.
11044 North Cave Creek Road
Phoenix, AZ 85020
602/870-9795
Specializes in gymnasium bleacher renovation, accessories, and motorization.

***SHAWWARE, INC.**
3365 Harvester Road
Burlington, Ontario
Canada L7N 3N2
416/632-6015
Provides the ShawWare integrated facilities maintenance management system which streamlines entire maintenance operations.

SMITH FIBERGLASS PRODUCTS, INC.
2700 West 65th Street
Little Rock, AR 72209
501/568-4010
Manufactures a wide range of fiberglass piping systems.

STANMAR, INC.
Boston Post Road
Sudbury, MA 01776
508/443-9922
Designs and constructs multi-purpose recreational facilities for colleges, unitersities, YM & YWCAs, corporate offices, and sports medicine centers.

STRANCO, INC.
Route 50 North
P.O. Box 389
Bradley, IL 60915
815/932-8154
Offers automation for pools and spas, the latest in chemistry automation to ensure safe, sparkling, clear water.

THE SYSTEM WORKS, INC.
1640 Powers Ferry Road
Building #11
Marietta, GA 30067
404/952-8444
Provides MPAC (maintenance planning and control) a comprehensive, interactive system designed to improve an organization's ability to plan and manage maintenancne and material functions.

TARRANT PARTS
P.O. Box 99586
Louisville, KY 40299
800/626-1808
Provides preferred parts for all Trane equipment.

THERMAL PIPE SYSTEMS INC.
P.O. Box 443
Primos, PA 19018
215/626-9655
Provides preinsulated underground piping systems.

THERMO MATERIALS, INC.
P.O. Box 9454
San Diego, CA 92109
619/272-0061
Offers cold-process roofing systems, seamless, and elastometric with no gravel giving easy maintenance.

THIS END UP FURNITURE CO.
26404 Center Ridge Road
Westlake, OH 44145
216/892-4020
Manufactures a complete line of solid wood dormitory and lounge furniture.

3M CONTRACTOR PRODUCTS
3M Center 225-35-05
St. Paul, MN 55144-1000
612-733-9725
Supplies deck coating, sealers, and fire protection products.

TPC TRAINING SYSTEMS
310 South Michigan Avenue
Chicago, IL 60604
312/987-4100
Exhibits samples of entire line of training programs covering virtually every job skill found in industry.

THE TRANE CO.
3600 Pammel Creek Road
LaCrosse, WI 54601
608/787-2000
Offers heating, ventilating, and air conditioning products.

TRENWA, INC.
1419 Alexandria Pike
Fort Thomas, KY 41075
606/781-0831
Designs and fabricates pipe trench systems to suit piping requirements.

***UE & C-CATALYTIC**
30 South 17th Street
Philadelphia, PA 19101
215/422-4143
Provides the TRAC (total resource allocation and control) System, a comprehensive, integrated maintenance management system for physical plant operations.

UNENCO, INC.
208-B Industrial Court
Wylie, TX 75098
214/442-5493
Manufactures passive infrared and ultrasonic occupancy sensors for lighting and HVAC control.

***UNISON TRANSFORMER SERVICE INC.**
39 Old Ridgebury Road
L3501
Danbury, CT 06817-0001
203/794-2634
Features RECLASS 50, a PCB electrical transformer retrofill that reduces PCB level to below 50 ppm.

UNITED SCANNING TECHNOLOGIES
1200 West Pioneer Parkway
Peoria, IL 61615
800/223-1865
Specializes in infrared thermography as a means of detecting and diagnosing defects in roofing systems.

U.S. INTEC/INC.
2012 West Vickery
Ft. Worth, TX 76102
817/336-2724
Manufactures commercial roofing and waterproofing products, excellent for repairs as well as reroofing.

UNITED STATES PUMICE CO.
20219 Bahama Street
Chatsworth, CA 91311
818/882-0300
Offers institutional PUMIE scouring stick, a hard surface cleaner

UNITED SUPPORT SERVICES
8655 East Vie de Ventura
Suite E-185
Scottsdale, AZ 85258-3322
602/998-1173

UNITED TECHNOLOGIES CORP.
United Technologies Building
Hartford, CT 06101
203/728-7888
Divisions: Carrier, Otis.

VON DUPRIN INC.
2720 Tobey Drive
Indianapolis, IN 46219
317/897-9944
Manufactures door exit hardware and related electrical security products for over 75 years.

WALKER PARKING CONSULTANTS
2 Penn Center Plaza
Suite 1015
Philadelphia, PA 19102
215/751-9555
A multi-disciplined engineering firm specializing in the planning, design, and restoration of multi-level parking structures.

WEB SERVICE CO., INC.
3690 Freeman Boulevard
Redondo Beach, CA 90278
213/772-5131
Provides coin operated laundry equipment, including maintenance of the equipment.

WEIL-McLAIN CO.
Blaine Street
Michigan City, IN 46360
219/879-6561
Offers commercial and residential hot water and steam cast iron boilers for gas, oil, or combination gas/oil firing.

THE WESTERN GROUP
1637 North Warson Road
P.O. Box 32407
St. Louis, MO 63132
314/427-6733
Special service contractor in the two main areas of exterior building restoration and new construction waterproofing.

WIRSBO CO.
7646 215th Street
Lakeville, MN 55044
618/469-4800
Provides radiant floor heating, snow melting, and preinsulated tubing.

Job Corner

Job Corner Deadlines

Job Corner classified advertisements cost $20 per column inch; display ads cost $25 per column inch. There is a two-inch minimum charge on all ads and no agency discounts are available.

Upcoming Job Corner deadlines are **August 10** for the September edition, **September 8** for October, and **October 10** for November. Closing deadlines for job announcements are posted at the request of each institution. In some cases, deadlines may be extended by an institution. APPA encourages all individuals interested in a position to inquire at the institution regarding its closing/filing date.

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

• • •

DIRECTOR OF ENGINEERING

The University of Connecticut is a major research institution consisting of 6,000,000 square feet on a 625 acre academic core. The university manages its own water supply, sewage treatment plant, and sanitation systems. Engineering support is additionally provided to five regional and nine cooperative extension service locations. Reporting to the exectuive director of the physical plant, the director is responsible for design engineering, construction management, and code compliance. Primary activities include direction of the preparation of drawings, specifications and estimates for renovation work performed by and for the university; supervision of construction management for work performed by contractor; and coordination of the reviews of all projects designed by the university or major capital projects designed by the department of public works. Other responsibiltiies include project status reporting, the selection of outside engineers and architects, direction of the university's energy conservation efforts, and provision of technical support to colleges and satellite campuses. Minimum qualifications include a bachelor's degree in engineering/architecture, professional engineers license and five years of management experience in engineering/construction or related field. An advanced degree in a related field is highly preferred. Salary is targeted in the high fifties. Reply to:

THE UNIVERSITY OF CONNECTICUT

Search 9D16
University of Connecticut
Box U-38
624 Gilbert Road Extension
Storrs, CT 06269-1038
AA/EOE.

Manager, Facility Maintenance and Operations

Fermi National Accelerator Laboratory, the premier high energy physics research facility, is seeking an individual for the position of facility maintenance and operations manager. Responsibilities include supervision of bargaining unit staff and administrative personnel; scheduling of preventive maintenance for all mechanical, electrical and HVAC equipment without interference to the operation of the research program; project scheduling and cost tracking; budget management and cost containment; and associated administrative functions. The facility consists of 6800 acres with 1,750,000 square feet in 300 buildings.

Qualifications include a B.S. in mechanical or electrical engineering and at least five years experience managing a very large physical plant at a major research institution or university. Professional registration or the ability to attain same is preferred. Background must include extensive experience in the operation of a computerized preventive maintenance scheduling and cost tracking system. Strong leadership, employee motivation and resource organizational skills must have been demonstrated through specific past accomplishments.

Fermilab offers an excellent salary and benefits package. For consideration, please send your resume and salary history to: **Mr. James L. Thompson, Fermi National Accelerator Laboratory, P.O. Box 500, Batavia, IL 60510.** An Equal Opportunity Employer M/F.

Fermilab

Superintendent of Physical Plant. The University of California, Riverside, is seeking an individual for the position of superintendent in its physical plant deparment. The incumbent plans, estimates, coordinates, and schedules maintenance and recharge work in the physical plant department; meets with campus personnel to determine scope of work; prepares detailed price quotes; collects and reviews information for use in developing complete and accurate material lists and cost estimates; prepares weekly work schedules and assists in planning and coordinating all construction and maintenance work in the department. Must have knowledge of architectural and engineering concepts including the ability to read, interpret, and prepare plans and specifications; knowledge of and experience with estimating techniques using established engineered workhour standards for all construction. alteration, and maintenance work; general knowledge of computer applications including experience with interactive data bases. Ability to communicate effectively with campus personnel, contractors, and support staff required. Education and experience equivalent to graduation from a four-year college or university in business administration, engineering, architecture, plant management, industrial technology, or public administration, and extensive experience in two or more building or mechanical craft

Job Corner

trades required. Salary range: $36,000-$44,900. For consideration, submit application or resume to: University of California, Riverside Staff Personnel Office, 1160 University Avenue, Riverside, CA 92521. Reference position 89-05-002. *The University of California is an Equal Opportunity Employer.*

MANAGER, PHYSICAL PLANNING AND CONSTRUCTION

The physical plant department of the University of Western Ontario is seeking an energetic, responsive individual to manage the department's physical planning and construction division.

The department has responsibility for management and supervision of planning and program development, architectural and engineering design, and construction for the university's multi-million dollar renovation and capital development program.

The university is a private institution located in London, Ontario, which enrolls 21,000 undergraduate and graduate students.

The individual selected for this position must have considerable knowledge of and experience in administrative and management practices and overall project management skills including planning, design, estimating, construction methods, and scheduling together with a good working knowledge of computer systems, including CAD. An ability to maintain effective working relations and strong communication skills is highly desirable.

MINIMUM REQUIREMENTS: bachelor's degree in engineering or architecture and 10 years experience in architectural or engineering design and construction with at least five years experience in a senior supervisory or managerial position.

Salary will be commensurate with experience and will include an attractive benefit package.

Candidates may apply in confidence by submitting a resume to:

Bill Darling
Assistant Director
Human Resources
The University of Western Ontario
London, Ontario
N6A 5B8

An Equal Opportunity Employer.

Assistant Manager for the Campus Electrical Utility Infrastructure, University of Maryland. Under the general supervision of the manager, plant engineering unit, the incumbent provides leadership to the development and renewal of the 4 KV underground, high-voltage distribution systems and the 250 building distribution systems on the campus. The incumbent also works closely with the campus electric shop to coordinate repairs and adjust loads during peak consumption periods. A solid knowledge of primary and secondary power distribution systems is required with experience in design, operations, and/or maintenance. This person will have to develop standards, establish criteria, write specification, and review drawings. Qualifications: bachelor of science in electrical engineering required with Maryland registration within one year of appointment; five years of experience in the design, review, and repair of institutional high voltage electrical distribution systems and commercial building distribution systems. Benefits: university benefits are competitive. Salary: commensurate with experience. To apply: submit letter of interest, resume, salary history, and the name and address of three references to: Ms. Sue Elliott, Manager/Employment, Department of Physical Plant, 2300 Service Building, University of Maryland, College Park, MD 20742. Applications received by **July 31, 1989** will receive full consideration. *AA/EOE.*

Assistant Manager for Specifications, Plan Review and Inspection, University of Maryland. Under the general supervision of the manager, plant engineering unit, the incumbent will be responsible for developing specificatons and bid requirements for $5-6 million annually of maintenance service contracts and deferred maintenance/facilities renewal projects; developing guide specifications to be incorporated into $75-100 million annually of campus capital construction projects to assure the maintainability of these buildings when built; reviewing plans and designs for new construction and renovation projects on behalf of physical plant to assure compliance with guide specifications;

(cont. on p. 14)

PHYSICAL PLANT SERVICES

The City College of CUNY is currently searching for two senior level administrators for the Department of Physical Plant Services. The City College of CUNY is the largest senior college of the CUNY system with more than 2.6 million square feet of space on a 32 acre urban campus in northern Manhattan. The department is composed of more than 270 employees and includes Maintenance, Custodial Services, and Plant Operations.

DIRECTOR

This position reports to the Assistant Vice President for Facilities and Space Planning and will be responsible for the overall management, budgeting and long range planning of the department. Candidates must have significant experience with demonstrated and verifiable accomplishments in the management of a large and complex facility, preferably in a university or institutional setting. This is a highly visible position with significant interaction with students, faculty, and staff. Candidate must be articulate and possess effective communication skills. Preference will be given to licensed Professional Engineers or licensed Stationary Engineers. Experience with preventive maintenance systems, labor relations, and computer applications are desired. Salary is commensurate with experience and in the range of $55,000 to $70,000.

ASSISTANT DIRECTOR

This position reports to the Director of Physical Plant Services and will be primarily responsible for the adminstrative supervision of Custodial Services and Grounds Maintenance. Candidates must possess effective communications skills and have significant experience in personnel practices and labor relations. Preference given to candidates with a degree in a related field plus four years experience in a managerial/administrative position although candidates may apply with a high school diploma and eight years similar experience. Salary is commensurate with experience and in the range of $38,000 to $55,000.

Interested candidates should submit a resume and the names of three professional references, postmarked no later than August lst, 1989, to Assistant Vice President Anthony Rodriguez, Chairman, Search Committee for Physical Plant Services, c/o Offices of Affirmative Action, Room A-206, at the address below.

THE CITY COLLEGE OF CUNY
Convent Avenue at 138th Street
New York, NY 10031
An AA/EO Employer M/F

Job Corner

Jobs *(cont. from p. 13)*

and further refine the guide specifications to assure thorough oversight of $5-6 million annually of renovation and minor construction projects. The incumbent will supervise specification writers and construction supervisors. Qualifications: bachelor of science in engineering or architecture preferred; five years experience in specification development, the development of bid packages for construction/renovation and/or construction inspection required. Benefits: university benefits are competitive. Salary: commensurate with experience. To apply: submit letter of interest, resume, salary history, and the name and address of three references to: Ms. Sue Elliott, Manager/Employment, Department of Physical Plant, 2300 Service Building, University of Maryland, College Park, MD 20742. Applications received by **July 31, 1989** will receive full consideration. *AA/EOE.*

Physical Plant Superintendent, residence halls and commons. The qualified candidate for this position must have a bachelor's degree (advanced training preferred) with at least five years of engineering experience, including two years in a supervisory capacity. Other requirements include a thorough knowledge of plumbing, electrical, heating, ventilation, and mechanical systems; the ability to evaluate and prepare mechanical specifications and direct the work of building engineers and outside tradesmen. Excellent interpersonal communication and analytical skills are essential. Reporting to the director of administration for residence halls and commons, the incumbent will be responsible for the engineering and maintenance services for seven residence halls and three commons. Salary range is in the mid-thirties. Excellent benefits are provided. Start date is August 1, 1989. For confidential consideration send a resume, complete with cover letter to: Candiss McCaffrey, Employment Manager, The University of Chicago, 956 East 58th Street, Chicago, IL 60637. *An Affirmative Action Equal Opportunity Employer.*

ASSISTANT VICE PRESIDENT, FACILITIES PLANNING AND MANAGEMENT

Wayne State University, located in Detroit, Michigan with an enrollment of 31,000, seeks applications for the assistant vice president for the office of facilities planning and management.

The assistant vice president will direct all aspects associated with physical plant operation, including campus planning, budget planning, new construction, facility rehabilitation, architect selection, interior design, capital budget requests, project planning and design, grounds and custodial services, and physical plant maintenance and operation.

The assistant vice president provides leadership to organize and implement a comprehensive campus development and facilities planning and management program. The AVP reports directly to the senior vice president of administration and finance.

Candidates will be required to possess a bachelor's degree in architecture or engineering, five to seven years of applicable managerial experience in the public sector with planning, construction, and facilities management, and a professional registration.

Salary is commensurate with qualifications.

Position available August 1, 1989. For full consideration, send resume and salary history with cover letter and four references to:

Ria C. Frijters
Senior Vice President
Administration and Finance
Wayne State University
1110 Mackenzie Hall
Detroit, MI 48202

Wayne State University is an equal opportunity educator and employer and specifically invites and encourages applications from women and minorities.

Wayne State University

DIRECTOR OF HORTICULTURAL OPERATIONS

An internationally recognized horticultural organization has an immediate opportunity available for a seasoned professional with exceptional leadership skills and previous experience in the field of horticulture. Position will be available after September 1, 1989.

The qualified individual will report to the CEO and be responsible for the overall management of all horticultural activities, outdoors and under glass. The incumbent must provide leadership for up to 150 employees. Other duties include planning and managing large scale landscape design, construction and maintenance projects, plus developing and managing capital/operating budgets, as well as monitoring the conditions/upkeep of equipment and physical plant.

Position requires a minimum of a bachelor's degree in horticulture, with 5 to 10 years previous management/leadership experience. Excellent communication/interpersonal skills and a proven ability to understand quality in landscape design are also required.

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Coming Events

APPA Events

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

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

Aug. 20-25—**APPA Institute for Facilities Management.** Baltimore, MD.

Jan. 7-12—**APPA Institute for Facilities Management.** Tempe, AZ.

Regional Meetings

Sep. 10-13—**Rocky Mountain and Pacific Coast**-*Joint Meeting*. University of Arizona, Tucson, AZ. Contact: Phil Rector, 602/621-1228.

Oct. 1-4—**Central.** St. Mary's University, San Antonio, TX. Contact: Charles Jenkins, 512/436-3335.

Oct. 7-11—**Southeastern.** Berea College, Lexington, KY. Contact: Diane Kerby, 606/986-9341.

Oct 14-17—**Eastern.** Technical University of Nova Scotia, Halifax, NS, Canada. Contact: Carl Day, 902/429-8300.

Oct 15-18—**Midwestern.** Chicago, IL. Contact: George Preston, Art Institute of Chicago, 312/443-3940; or Bob Getz, University of Illinios/Chicago, 312/996-2837.

Other Events

Jul. 29-Aug. 1—**Association of College Unions - International, Building Services and Maintenance Seminar**. Southern Illinois University at Carbondale, Carbondale, IL. Contact: Doug Daggett, Seminar Coordinator, Student Center, Southern Illinois University at Cabondale, Carbondale, IL 62901.

Aug. 9-11—**Environmental Regulation Course.** The Peabody Orlando, Orlando, FL. Contact: Executive Enterprises, Inc. 22 West 21st Street, New York, NY 10010-6904; 800/831-8333, outside the U.S. 212/645-7880.

Sep. 6-8—**Making Sense of Environmental Regulations**. Kansas City, KS. Contact: Lani Himegarner, University of Kansas, 6600 College boulevard, Suite 315, Overland Park, KS 66211; 913/491-0221.

Sep. 11-12—**1989 Elevatoring Seminar by Elevator World.** Boston, MA. Contact: Linda Williams, Elevator World, P.O. Box 6507, Mobile, AL 36606; 205/479-4514.

Sep. 17-20—**NCSBCS 22nd Annual Conference.** Newport, RI. Contact: NCSBCS, 481 Carlisle Drive, Herndon, VA 22070; 703/437-0100.

Sep. 19-22—**Asbestos Contractor/Supervisor/Project Designer**. Kansas City, KS. Contact: Lani Himegarner, University of Kansas, 6600 College boulevard, Suite 315, Overland Park, KS 66211; 913/491-0221.

Sep. 18-20—**Environmental Regulation Course.** Washington Hilton & Towers, Washington, DC. Contact: Executive Enterprises, Inc. 22 West 21st Street, New York, NY 10010-6904; 800/831-8333, outside the U.S. 212/645-7880.

Sep. 18-21—**43rd Annual Northwest Turfgrass Conference and Exhibition**. Sheraton Tacoma Hotel and Bicentennial Pavilion, Tacoma, WA. Contact: Turfgrass Association, P.O. Box 1367, Olympia, WA 98507; 206/754-0825.

Inside APPA

Internship Exchange Network Developing

by Nick Cimino
Truckee Meadows
Community College
Reno, Nevada

The Professional Affairs Committee is soliciting information from member institutions that have experience or interest in internships or professional personnel exchanges between institutions. The Small College Committee has expressed an interest in this subject as a means of professional development.

A variety of formats have been proposed. If you have an interest or experience with any of the following formats, please respond to this request for information.

- One-week visit—An administrator selects an institution with a well established physical plant to draw ideas and insights for use at his or her home institution. The visiting administrator identifies certain key issues to be addressed by the host institution, but the program will include a fairly comprehensive overview of plant operations.
- Long-term mentor relationship—An established physical plant director would establish a relationship with a novice director over a one-or two-year period. Periodic meetings would be scheduled to focus on specific issues and the established director would be available for general advice and support by telephone and written communication.
- One- or two-day visit—Highly targeted, this visit would focus on a specific issue such as hazard communication or work control systems. The physical plant staff that has specific information on the identified topic would be allowed to provide an intensive experience exchange to an individual or small group.
- Experience exchange meetings—Open discussion forums could be scheduled in national or regional locations to allow physical plant directors to exchange experiences and ideas concerning "hot" topics such as capital renewal/deferred maintenance. The exchange would emphasize open discussion rather than lecture and would rely on moderators to keep the discussions on track.

Information or inquiries concerning this topic should be addressed to: APPA, Professional Affairs Committee, 1446 Duke Street, Alexandria, VA 22314-3492.

Information Exchange

Norman Loat, assistant director, physical plant, at the **University of Winnipeg**, would like to hear from anyone who has experience with greenhouse lighting. For example, 347 volt VHO lamps versus metal halide lamps in a high humidity environment. Please contact him at the University of Winnepeg, 515 Portage Avenue, Winnipeg, Manitoba, R3B 239, Canada; 204/786-9235; fax 204/783-8910.

Section 89 Effective Date Postponed

Hold off on any plans to comply with Section 89. Treasury Secretary Nicholas Brady announced in May that the effective date of Section 89 would be postponed until October 1, while Congress and the administration rework the law. Sheldon E. Steinbach, ACE general counsel, was quoted in ACE's *Higher Education & National Affairs* as saying, "There are going to be changes to the Section 89 nondiscrimination rule in the next several months, and institutions should not even consider trying to comply with the rule as it currently is written." Steinbach noted that institutions may have to "comply with a qualification rule of Section 89 requiring employers to provide notice of plan terms to employees." The delay was caused, according to Brady, by the realization that the regulations cause excessive compliance burdens on business.

Membership

New Institutional Members

Cabrillo College, 6500 Soquel Drive, Aptos, CA 95003; 408/479-6465. Representative: Jim Graefe, manager, maintenance and operations.

Northern Territory University, P.O. Box 40146, Casuarine, Darwin, NT 0811, Australia; 08/946-6666. Representative: Graeme Dennehy, head, buildings and grounds.

Royal Melbourne Institute of Technology, 124 La Trobe Street, Melbourne 3000, Australia; 03/660-2034. Representative: Len Butterley, chief buildings officer.

South Australian College of Advanced Education, 46 Kintore Avenue, Adelaide, South Australia 5000, Australia; 08/228-1648. Representative: Neville Thiele, assistant manager, properties and services.

South County Community College District, 25555 Hesperian Boulevard, Hayward, CA 94545; 415/786-6648. Representative: Nick Pereira, manager, maintenance and operations.

Western Australia College of Advanced Education, Pearson Street, Churchlands, Western Australia 6018, Australia; 09/383-8275. Representative: M. Donald, head of buildings and grounds.

Windsor Board of Education, 280 Eugenie Street, Windsor, Ontario, Canada N8X 2X8; 519/255-3357. Representative: M.P. Graham, p. eng., manager of plant.

New Institutional Representatives

John Brown University, Siloam Springs, AR: **Everett Easley**, director of physical plant.

Linn-Benton Community College, Albany, OR: **David Wienecke**, director of facilities.

North Harris County College, Houston, TX: **Phil Baker**, district plant director.

Pfeiffer College, Misenheimer, NC: **Dirk Wilmoth**, vice president for financial affairs.

Santa Clara University, Santa Clara, CA: **Robert M. Bernthal**, director of physical plant.

United States Naval Academy, Annapolis, MD: **John G. Dempsey**, public works officer.

University of California/Davis, Davis CA: **Darrell P. Ralls**, vice chancellor, facilities.

University of Southern Indiana, Evansville, IN: **Stephen P. Helfrich**, director of physical plant.

Westminster College, New Wilmington, PA: **Ronald J. Pennington**, co-director of physical plant.

New Associate Members

Augustana College, Sioux Falls, SD: **Irene Nelsen, Omer Smolnisky**.

Auraria Higher Education Center, Denver, CO: **Maggie McConaghie, Michael Thornton**.

Colby College, Waterville, ME: **Gordon E. Cheesman**.

Colorado School of Mines, Golden CO: **Robert Clearwater**.

Emmanuel College, Boston, MA: **Kevin Murphy**.

Grand Valley State University, Grand Rapids, MI: **Richard G. Mehler, Nola Nielsen**.

Humber College of Applied Arts & Technology, Rexdale, Ontario, Canada: **Douglas Deason, Gary Jeynes**.

Iowa State University, Ames, IA: **A. Dean Morton, Elizabeth C. Starleaf, Lynn R. Seiler**.

Johnson & Wales College, Providence, RI: **Marco S. Maio**.

Northern Alberta Institute of Technology, Edmonton, Alberta, Canada: **Dennis M. Deagle, Phil Dutton**.

Oregon State University, Corvallis, OR: **Curt McCann**.

Palomar College, San Marcos, CA: **Carmine M. Mancuso, Phil V. Ryan**.

Parks College, Parkville, MO: **David C. Reker**.

The Pennsylvania State University, Hershey, PA: **James R. Klehr**.

Pepperdine University, Malibu, CA: **Gary Powhall, Bill Salyer**.

Pratt Institute, Brooklyn, NY: **Anthony Gelber**.

Roger Williams College, Bristol, RI: **Skip Learned**.

Saginaw Valley State University, University Center, MI: **Thomas W. Summers, Jerry A. Woodcock**.

St. Louis Community College, St. Louis, MO: **Bill Close, Don Ward**.

Tulane University Medical Center, New Orleans, LA: **Larry St. Romain, Charlotte Steger**.

United States Naval Academy, Annapolis, MD: **Frederick C. Corey, Richard Fernald**.

University of Arizona, Tucson, AZ: **Tom Harkenrider**.

University of California/Davis, Davis, CA: **Robert P. Kelleher**.

University of South Dakota, Vermillion, SD: **Jerald L. Lane, David Stockland**.

University of South Florida, Tampa, FL: **George Blenkhorn**.

University of Texas Medical Branch/Galveston, Galveston, TX: **Dennis Bailey**.

Yale University, New Haven, CT: **Kenneth Bloch, Robert Goss, Wayne Rountree**.

New Affiliate Members

City of Greeley, 651 10th Avenue, Greeley, CO 80631; 303/350-9420. Representative: Gene Haffner, director, public facilities.

Medford Township Public Schools, 320 Stokes Road, Medford, NJ 08055; 609/654-6416. Representative: Hines B. Davis, director of facilities.

Northwest Connecticut YMCA, 259 Prospect Street, Torrington, CT 06790. 203/489-8713. Representative: Paul Sadowski, physical plant director.

Radford Community Hospital, Eighth and Randolph Streets, Radford, VA 24141; 703/731-2684. Representative: Robert Barbatti, vice president, support services.

New Subscribing Members

Manning Knapp Architects, 1525 Spruce Street, Suite 300, Boulder, CO 80302; 303/442-7042. Representative: John H. Knapp, partner.

Manning Knapp Architects is an architecture and plannign firm serving higher education and other education agencies in Colorado.

PC PLUSYSTEMS SOLVE THREE REROOF PROBLEMS

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

Kenwood High School, Baltimore County School District

Hertz Hall, Central Washington University

Physical Education Building, Westchester Community College

Kenwood High School, Baltimore County School District, MD

The fiberboard insulation in this school's original 1953 roof was completely saturated with water in some sections—a total reroofing was required.

Since PC PLUSYSTEMS had previously proved successful in other Baltimore Schools, PC PLUSYSTEM 1, the All-FOAMGLAS® system — the only insulation on the market resistant to moisture in both liquid and vapor forms — was selected for Kenwood.

The over-110,000 ft^2 of FOAMGLAS® insulation is providing Baltimore school officials with energy savings, reduced maintenance costs, the security of total noncombustibility, and dimensional stability which will add years of efficient performance to the *entire* roof.

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

Hertz Hall, Central Washington University, Ellenburg, WA

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

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

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

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

Physical Education Building, Westchester Community College, Valhalla, NY

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

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

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

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APPA

Association of Physical Plant Administrators of Universities and Colleges

Perspective

APPA Opinion Survey Reflects Member Interests

Walter A. Schaw, CAE

A total of 361 Institutional Member representatives responded to APPA's recent opinion survey. Its purpose was to explore member interest in three service activities being developed by APPA committees: an expansion of Information Services, and the newly-proposed programs offering facilities evaluation and facilities audit services.

The basic response was as follows:

	Want to Use	Don't Know (But a Good Idea)	Won't Use	No Answer
Information	43%	48%	8%	1%
Evaluation	17%	42%	41%	—
Audits	10%	46%	43%	1%

The Evaluation and Audit Services were proposed as entirely fee-supported services. The expansion of Information Services offered a choice of being funded by either a modest increase of member dues or user fees. The response for funding Information Services was:

Dues (no fee to members) 38%
User Fees.....62%

Commentary included with each question provided insights not possible with a simple "yes" or "no." These are summarized as:

1. Expanded Information Service

Many members favoring a user fee basis saw it as most fair, although some suggested that an annual subscription fee would be more practical than repeated purchase orders. Some fourteen small colleges made similar comments—that a fee would inhibit participation more than a modest dues increase. A few members suggested that the expansion take place without either fee or special dues support.

Also frequently suggested was a higher fee charge for non-members (which is our normal policy) or limiting the service to APPA members. The survey comments, while mixed on method of funding, were overwhelmingly positive about the proposed program expansion.

Typical comments were: "The reason for having an association is to exchange information!" . . . "This service appears to benefit all members." . . . "Competent information is a key to management effectiveness." . . . "I see this as one of the most valuable benefits, and I would most willingly pay."

2. Facilities Evaluation

While 17 percent asked to be added to a "waiting list," a key group to long-term success may be the 42 percent who "want more information, but it's a good idea." Given the limited program description possible with a multiple question-and-answer survey, a typical comment was, "We don't want to commit until we see a definitive proposal" or "What can I expect from the evaluation?"

With a proposed fee of $5,000 for the Evaluation Service, some believed it "too high," but one member said we ought to charge more—"$15,000 would be more like it." Another said, "I just paid $40,000 for a review—probably not better than you can get here [APPA]."

Many of the 41 percent of the members who checked off "won't use" were positive in their commentary, noting cost as a problem. Typical was: "The cost is too high for us, but the service itself sounds wonderful."

Several members urged caution in implementing the program; others suggested that business officers be added to the visitation team to enhance credibility. (The idea has been adopted by the Professional Affairs Committee!)

3. Audit Service

While the overall "vote" indicated better than half the respondents either wanted the service (10 percent) or may with more information "but it's a good idea" (46 percent), many comments concluded the service was not affordable at the estimated five cents per square foot. While the service assumes an APPA break-even cost for a detailed, line-item audit, some respondents perceived the service as "a money-maker." One commentator said, "I think this is a good idea; just not needed for [APPA]."

Several members suggested that APPA promote the audit concepts and methodology, and even develop "canned software" without going into the service itself.

4. Other Comments

One section of the survey asked for comment on other needs and interests, in addition to the three specific services proposed. About one-fourth of those commenting in this section suggested greater emphasis on information and assistance for compliance with federal regulations. "Why doesn't APPA provide information and interpretations on new legislation?" asked one. Another suggested the need for "one full-time person just to [keep up with] the mandates."

A number of the remaining comments were positive, such as "you folks are doing a good job," and "good education programs!" Others cautioned, "you have asked enough; don't try to do too much," and "you have already focused on the good ones."

Conclusions

The member opinion survey accomplished its objectives of identifying not only member interests but also the means and methods to service them (fees or dues). Key committee meetings held just before and after the survey utilized the opinions gathered.

Professional Affairs recommended to drop the Audit Service as proposed, but develop a stronger educational effort. This is one illustration of the survey's value.

The considerable interest shown in Information Services gives it a high priority—independent of funding alternatives. Funding (or its lack) may restrict its scope, *not* its immediacy.

The strength of both the opinion and commentary suggests that the Facilities Evaluation Service will be both well accepted and a tangible benefit.

Finally, comments from two respondents are an appropriate closing: "Let's have more of this type questionnaire—find out what the membership wants." and "I support the services you are trying to put in place. Let's make these successful before adding more." ■

Indoor Air Quality: Should You Be Concerned?

by Jolanda N. Janczewski and Jon M. Yareb

In the last several years, a growing body of scientific evidence has indicated that the air within buildings and homes can be more seriously polluted than the outdoor air, in even the largest and most industrialized cities. Other research indicates that people spend approximately 90 percent of their time indoors. Thus, for most people, the risks to health may be greater from exposure to air pollution indoors than outdoors. In addition, people who are exposed to indoor air pollutants for the longest periods of time may be most susceptible to the adverse effects of indoor air pollution. The levels of pollutants from individual sources may not pose a significant health risk by themselves; however, most buildings have more than one source contributing to indoor air pollution, rendering a serious risk from the cumulative effects of these sources.

Colleges and universities, comprising numerous buildings, are not immune to this problem. Indoor air pollution levels can easily increase in administration, dormitory, research, hospital, and academic facilities, resulting in ill health to employees, students, and visitors.

We have found that the majority of causes and solutions to indoor air quality (IAQ) center on the operation and maintenance of mechanical systems. It is important for facilities administrators to understand what causes these "sick building" problems and how to solve them by using a cost-effective approach to sound facilities management.

Jolanda Janczewski is president, and Jon Yareb is safety and occupational health specialist, of Consolidated Safety Services, Inc., Oakton, Virginia.

Air sample with microbial growth in a petri dish.

What are the Health Effects of Indoor Air Pollution?

A number of well-identified illnesses, such as Legionnaire's disease, asthma, hypersensitivity pneumonitis, and humidifier fever, have been directly traced to specific building problems. These are called "building-related illnesses." Most of these diseases can be treated, but some can pose serious risks for particular individuals.

Frequently, however, a significant number of building occupants experience symptoms that do not fit the pattern of any particular illness and are difficult to trace to any specific source.

Roll-type prefilter should be used before more efficient filters and should be changed on a regular basis. Roll is broken.

This phenomenon has been labeled "sick building syndrome." People may complain of one or more of the following symptoms: dry or burning mucous membranes in the nose, eyes, and throat; sneezing; stuffy or runny nose; fatigue or lethargy; headache; dizziness; nausea; irritability; and forgetfulness. Poor lighting, noise, vibration, thermal discomfort, and psychological stress may also cause or contribute to these symptoms.

There is no single manner in which these health problems appear. In some cases, problems begin as workers enter their offices and diminish as workers enter their offices and they diminish as workers leave; at other times, symptoms continue until the illness is treated. Sometimes there are outbreaks of illness among many workers in a single building; in other cases, health symptoms show up only in individual workers.

There are usually some occupant complaints about health and comfort in new buildings. In fact, the ventilation guidelines for indoor air quality set by the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) are intended to satisfy 80 percent of a building's occupants. When complaint levels rise above the normal 20 percent, a serious problem usually exists.

In the opinion of some World Health Organization experts, up to 30 percent of new or remodeled commercial buildings may have unusually high rates of health and comfort complaints from occupants that may be related to indoor air quality.

The likelihood of an individual developing immediate reactions to indoor air pollutants depends on several factors. Age and pre-existing medical conditions are two important influences. In other cases, whether a person reacts to a pollutant can be determined by individual sensitivity, which varies tremendously from person to person. Some people can become sensitized to biological contaminants after repeated exposures, and it appears that some people can become sensitized to chemical pollutants as well.

Certain immediate effects of indoor air pollution are similar to those associated with colds or other viral diseases, so it is often difficult to determine if the symptoms are a result of exposure to indoor air pollution. Since none of these symptoms are unique to indoor air problems, medical diagnosis is often difficult. Other health effects may show up years after exposure has occurred or only after long or repeated periods of exposure. These effects, which include emphysema and other respiratory diseases, heart disease, and cancer, can be severely debilitating or fatal.

While pollutants commonly found in indoor air may be responsible for many harmful effect, there is considerable uncertainty about what concentrations, or periods of exposure, are necessary to produce specific health effects. Further research is needed to better understand which health effects can occur after exposure to the average pollutant concentrations found in the workplace and which can occur from higher concentrations over short periods of time.

What Causes Indoor Air Quality Problems?

Sources

The indoor environment houses numerous sources that release gases or particles into the air; these sources are likely to occur in any building. They can include building materials and furnishings as diverse as deteriorated asbestos-containing insulation, wet or damp carpeting, cabinetry or furniture made of certain pressed wood products, products for household cleaning, paper dust, adhesives, perfumes, combustion byproducts, pest-control products, biological organisms, smoke, and outside sources such as pollen, radon, pesticides, and auto emissions.

The following is a list of the most common gas and particulate sources found during our investigations:

Biological contaminants including bacteria, mold and mildew, fungi, viruses, dust mites, and pollen. Even simple dust can comprise many of these organisms, as can bits of biological matter such as insect parts and animal dander. In addition, building occupants liberate thousands of microorganisms in the course of a day. These contaminants are often associated with wet or water-damaged areas, as well as stagnant or standing water on or around air intakes, dehumidifiers, and cooling coils. Symptoms associated with biological pollutants include sneezing, watery eyes, coughing, shortness or breath, dizziness, lethargy, fever, and digestive problems.

Carbon monoxide is most often asso-

Outside of dampers.

ciated with combustion byproducts from automobile exhaust, leaking chimneys and furnaces, gas stoves, and heaters. At low concentrations, carbon monoxide can cause fatigue in health people and chest pain in people with heart disease. At higher concentrations, it can cause impaired vision and coordination, headaches, dizziness, confusion, and nausea.

Organic vapors are associated with evaporative products including paints, paint strippers, wood preservatives, aerosol sprays, cleaners, disinfectants, insect repellents, and air fresheners. In addition, copier and photographic chemicals contain high organic solvent levels. Health effects include eye, nose, and throat irritation, loss of coordination, and nausea. Long-term exposure has been associated with damage to liver, kidneys, and central nervous system. A particularly important organic vapor, formaldehyde, is discussed below.

Smoke associated with lighted tobacco products and cooking operations can be an annoyance and irritant to some individuals.

Radon is a colorless, odorless gas that occurs naturally from decaying uranium and is found virtually everywhere at very low levels. Sources include earth and rock beneath buildings, well water, and building materials. There are no immediate health effects attributed to radon, but exposure over a period of years has been estimated to cause about 10 percent of all lung cancer deaths. [*Ed. note*: see other articles in this issue.]

Formaldehyde is an important chemical used widely in industry to manufacture building materials and numerous household products. Sources include plywood, particleboard, fiberboard, urea-formaldehyde foam insulation, adhesives, carpet, and other textiles. In addition, carbonless paper contains levels of formaldehyde. Acute exposure to high levels of formaldehyde can produce eye, nose, and throat irritation, wheezing and coughing, fatigue, skin rash, and severe allergic reactions.

Pesticides frequently are used both inside and outside a facility. Outside lawn applications may drift into or become trapped inside a building. Immediate health effects include irritation to eyes, nose, and throat. Long-term exposure has been associated with cancer and damage to the central nervous system and kidneys.

Asbestos is a mineral fiber that has been used commonly in a variety of building construction materials for insulation and as a fire-retardant. Sources include deteriorating or damaged insulation, fireproofing, or acoustical materials. There are no immediate health effects associated with asbestos. Asbestos fibers accumulate and remain in the lungs and can eventually cause lung cancer and other diseases of the lung.

Particulates associated with dust, textile fibers, and paper products are continuously liberated into the air in any occupied space. These materials can cause upper respiratory irritation including runny noses and scratchy throat. Long-term health effects are still under investigation, however sinus infections and congestions have been frequently reported.

Ventilation

Many buildings contain gases or particulates from a variety of individual sources and yet are never associated with health problems. Thus, in many cases, poor indoor air quality results not from the pollutants themselves, but from the inability of ventilation systems to remove pollutant levels. Many facilities, however, have chosen to address their indoor air quality problems by targeting a single source of contamination. Therefore, facilities managers at colleges and universities are likely to encounter this type of administrative policy as indoor air quality becomes an increasing national concern.

For example, tabacco smoke has been directly related to the cause of sick building syndrome complaints in only about 2 percent of all indoor air quality investigations. Any smoke, whether from tobacco, a fireplace, a charcoal grill, or cooking, can be an annoyance if sufficient ventilation is not provided. Accumulated smoke is often the only visible warning that ventilation is inadequate. The efforts to ban or restrict smoking have created political and social difficulty, but have done nothing to solve the problem of inadequate or poorly maintained ventilation systems. The bottom line is that if a ventilation system is operating properly, the pollutants in the air, if any, are diluted and removed before they have a chance to become an irritant.

The following is a discussion of the most common ventilation problems associated with indoor air pollution:

Standing water on roof. Could cause fungi or bacteria to be pulled into building.

Poor design of HVAC systems results in inadequate fresh air and exhaust for occupied spaces. In these instances fan size and exhaust locations are unable to handle minimal airflow needs. Even in cases where the design is sufficient, deterioration of equipment (particularly variable air volume systems) or inadequate maintenance can result in problems after several years of effective operation.

Energy management retrofits of existing systems, commonly installed during the 1970s energy crisis, have reduced the levels of fresh air intake and cumulatively increased the levels of pollutants.

Space-use modifications and changes in the location of walls or other partitions, without change in HVAC design, have resulted in too much air supply in one area and virtually none in others. Of particular note is the recent trend in performing operations in spaces not designed for them. Many facilities have now incorporated photoprocessing and printing operations as part of their in-house activities. Because the original HVAC design did not take into consideration the release of solvents and other chemicals needed for these activities, irritating and dangerous levels of these pollutants will often begin to accumulate. Similarly, many scientific disciplines are now beginning to use photographic ad x-ray development techniques in conjunction with research operations. This trend has increased the need to retrofit darkrooms into spaces not designed to handle such an excessive use of chemicals.

Distribution systems can move indoor air pollutants from portions of the building used for specialized purposes, such as restaurants, laboratories, or industrial shops, into offices in the same building. Carbon monoxide and other components of automobile exhaust can be drawn from underground parking garages through stairwells and elevator shafts into occupied spaces.

Inadequate make-up air becomes a problem when the air supply and return vents within each room are blocked or placed in such a way that the outside air does not actually reach the breathing zone of building occupants. Improperly located outdoor air intake vents can also bring in air contaminated with auto and truck exhaust, boiler emissions, odors from dumpsters, and biological contaminants from standing pools of water on the roof.

Ventilation systems can be a source of indoor air pollution themselves by spreading biological contaminants that have multiplied in cooling towers, humidifiers, dehumidifiers, air conditioners, or the inside surfaces of ventilation duct work.

Fresh air intakes closed.

How do you Know if you Have an Indoor Air Quality Problem?

Complaints of health effects can be useful indicators of an indoor air quality problem, especially if they appear after a move to a new office, remodeling or refurnishing, or pesticide application. Excessive absenteeism is another indicator. Indoor air quality studies have shown that in areas where a problem has been diagnosed, absenteeism has been above normal. In addition, noticeable odors, mold growth, airborne and settled dust, and chronic temperature control problems are useful indicators. Although the presence of such problems does not necessarily mean that you have an indoor air quality problem, being aware of potential indicators is an important step toward assessing the quality of the air in your facilities.

Standing water in air handling unit leads to microbial growth and dispersion of same.

Current standards exist for controlling exposure levels to contaminants in industrial environments. These standards, however, are not applicable to office environments where contaminants, when found, are usually at very low levels. Conventional sampling techniques to quantify airborne contaminants, therefore are often of little help. In most workplaces these fall far below accepted exposure levels cited by the Occupational Safety and Health Administration and the American Council of Government Industrial Hygienists. It is therefore important to understand that industrial environment exposure levels should not be applied to "sick building" environments or used as a justification for no corrective action.

How Can IAQ Problems Be Solved?

Physical plant managers often are in the best position to address indoor air quality problems in the most cost-effective manner. Many facility managers will choose to procure the services of a consulting firm for assistance in diagnosing the problems. However, there are simple in-house steps that can be taken before calling a consultant, and which will often solve the problem at little or no cost.

If you suspect a problem in any building, a walk-through survey can be most helpful in determining the overall condition of the building and to see if corrective action is needed. The following are some specific problems that you may identify along with some possible solutions.

Ensuring an adequate supply of fresh outside air is the single most effective method of correcting and preventing indoor air quality problems. Even if a specific contaminant appears to be the cause of ill health effects, dilution may be the most practical way of reducing exposures. Obtain a set of mechanical, as-built drawings and control diagrams to assist the inspection process.

Fresh, outdoor air should be adequately distributed to all office areas during the entire time they are occupied. Facility managers should be aware that ASHRAE is currently revising standard 62-1981, "Ventilation for Acceptable Indoor Air Quality," to require a minimum of 15 cubic feet per minute (cfm) per person, for all areas. It is therefore necessary to measure actual supply rates to determine if sufficient air is provided for the occupants in each building space. Air flow rates should be measured on a regular basis to ensure they remain at optimal levels.

Check that the outdoor air supply louvers are open. They may have been closed deliberately to save energy, or automatically by a faulty control system. During occupancy periods it should be assured that outside air dampers remain open and that fans of air handling units remain in operation throughout the day and within the set temperature range. Modifications may be required in the ventilation system so that it can handle very cold or very warm air.

Locate and verify the actual operation of exhaust fans. Be sure that time clocks, which can prevent proper run time, are operating properly. Ensure that fire dampers have not fallen shut and reduced the air flow.

All air vents (diffusers) should be checked to ensure they are open and unobstructed, providing for adequate air mixing in each supplied area. Also, the diffusers should be adjusted so that occupants are not sitting in a direct stream of air. The temperature of the air stream will often be less than body temperature and will be uncomfortably cool.

An insufficient supply of fresh air can cause the building to be at a negative pressure with respect to the outdoor atmosphere. This can create a condition whereby untreated air and contaminants are drawn in from the outside. The direction of air movement around windows and doors will determine if this condition exists. Proper balancing of the air supply and exhaust system should prevent this problem. If locations have been changed by erecting new walls, door, or partitions, an assessment should be made to ensure that adequate air supply and exhaust are still being maintained.

To ensure that all systems are operating at peak performance, inspect all duct work, damper positions, fan belts, baffles, and system balance. Actual air flow supplied to occupied areas should be measured and any maintenance or repairs should comply with the original design specifications and ASHRAE guidelines. Gauges should be installed in air ducts to provide information or air volumes delivered by supply and return fans, and maintenance staff should be trained to read them and make appropriate repairs or adjustments.

Filters on air handling units must be replaced on a regular basis. Filters should have at least a 30 to 50 percent efficiency rating and should be of the extended surface type. Prefilters such as the roll type should be used before air passage through higher efficiency filters. Immediately change all filters if they appear dirty or damaged. Also, check all air handling unit panels and doors to ensure that they fit and close properly, so that air flow does not bypass filters.

Examine the location of air intakes

for the ventilation system to see if they are located near sources of contaminated air. Correction of a building's air intake problem may require some structural modification or operational changes. For example, an influx of carbon monoxide from auto exhaust may only occur during rush hour traffic or under certain weather conditions. If such problems appear to occur only under specific conditions or short duration, one solution may be to shut off a particular air intake at certain times during the day. If the air intakes are located directly adjacent to building exhausts, sewer vent stacks, cooling towers, or chimneys, a modification of the system may be required. It may be necessary to relocate intakes or raise exhaust stacks.

Adequate exhaust ventilation with inadequate make-up air being drawn into the building reduces the efficiency of the exhaust ventilation and may lead to reverse flow in some vents. Under more extreme conditions this may appear as an influx of outside air whenever a door or window is opened. This condition can also lead to the back-drafting of flue gases from vented natural gas appliances such as hot water heaters and boilers. Such situations will require that more make-up air be supplied.

The ventilation system may be out of balance or the temperature control may be inadequate. Poor temperature control may be due to inadequate recovery time after the ventilation system has been shut down overnight or over the weekend. Another possibility is that windows allow certain rooms to pick up a greater heat load than the ventilation system can handle, thereby creating excessive and uncomfortably warm temperatures. The desirable temperature is dependent on customary dress, level of physical activity, amount of air movement, and individual variation.

There is no one "ideal" temperature. However, ASHRAE guidelines state the operative temperature for thermal acceptability of sedentary or slightly active persons at 50 percent relative humidity is 73°F to 79°F.

During winter, indoor air can become excessively dry when heated to comfortable temperatures. This can lead to drying and irritation of mucous membranes of the eyes, nose, and throat. Therefore, it may be necessary to humidify the air.

If the air is to be humidified (ASHRAE guidelines recommend 20 to 60 percent), remember the necessity of adequately cleaning the humidifier. To avoid problems, recirculating or independent steam humidification should be used instead of the filter-plate type humidifiers.

Microbial Contamination

All areas where water collection or leakage has occurred should be promptly and permanently repaired. Water-damaged porous furnishings, such as carpets, upholstery, and ceiling tiles, should be discarded rather than disinfected, to effectively eliminate microbial contamination.

A variety of ventilation system problems can result in excessive microbial contamination. For example, filters and wet areas (humidifiers, dehumidifiers, cooling coils) in the ventilating system may not be cleaned frequently enough. Wet areas may not be draining properly. The most unfortunate outcome can be excessive fungal spores being distributed through the system. Some individuals may become hypersensitive and develop hayfever-like symptoms or hypersensitivity pneumonitis. Because assessment of spore counts is neither simple nor inexpensive, cleaning up the system is the preferred first step.

Maintain relative humidity at less than 60 percent in all occupied spaces and low-air-velocity plenums. During

Moisture causing fungal growth between insulation panels due to moisture incursion.

Poor air distribution around fluorescent lights and exhaust causes poor air movement.

the summer months, cooling coils should be run at a low enough temperature to promptly dehumidify conditioned air. Use only steam as the moisture source for humidifiers in the ventilation systems. Steam should not be contaminated with volatile amines, which are sometimes used as rust inhibitors.

Prevent the accumulation of stagnant water under cooling deck coils of air handling units by ensuring that drain pans are properly inclined and draining continuously.

Air handling units should be constructed so that maintenance personnel have easy and direct access to both heat exchange components and drain pans for checking drainage and cleaning. Access panels and doors should be installed where needed.

Nonporous surfaces where moisture collection has promoted microbial growth, such as drain pans or cooling coils, should be cleaned and disinfected with detergents, bleach, or proprietary biocides. Care should be taken to ensure that these cleaners are removed before air handling units are reactivated.

Chemical Contaminants

Improper cleaning procedures may leave irritating residues in the carpets. Underdilution of industrial strength cleaners is a major cause of this condition. Repeated steam or clean water cleaning can improve or eliminate the problem.

Use local exhaust where appropriate to capture and remove contaminants generated by specific processes such as cooking, photoprocessing, and duplicating. In some instances, the manufacturer of office machines may advise that exhaust ventilation is necessary. In areas where large amounts of solvents are used, such as degreasing operations, room air should be exhausted directly outdoors rather than recirculated into the rest of the building's air supply.

Equipment or cleaning products (such as typewriter or duplicator cleaners) may be emitting solvent vapors. Other uses of solvent-based materials (paints, adhesives) in greater than minimal quantities may also be a source of contamination. Isolate activities involving renovation, painting, carpeting, and other such short-term operations from occupied areas, through use of physical barriers and separation of involved ventilation systems. If possible, perform these jobs at night and on weekends. Supplying the maximum amount of ventilation on a twenty-four-hour basis can assist in rapid dispersion and dilution of contaminants.

Pesticides should only be applied by persons licensed to do so, and only when the building is unoccupied. The building should be thoroughly ventilated before being reoccupied. Building occupants should be informed before pesticide application takes place, and you should look for any adverse health effects in occupants after pesticides are applied.

How Can a Consultant Help?

If your preliminary examination of the building has not determined any problems, or if corrective action does not mitigate the symptoms experienced by the occupants, you may want to enlist the assistance of an indoor air quality specialist.

Because there may be many different sources of symptoms and complaints in a building with indoor air quality problems, IAQ consultants will try to use a variety of investigatory procedures that are practical, economically feasible, and sensitive enough to detect the multiple and sometimes minute sources of potential problems. These problems can be complicated due to the complexity of the buildings themselves, and the fact that standard epidemiology and industrial hygiene evaluation techniques may be inconclusive. Therefore, it is necessary to use an approach that is both methodical and pragmatic. Depending on the situation, an IAQ assessment may include: a background investigation, an initial site visit, and a follow-up site visit if necessary.

Background Evaluation

The purpose of a background evaluation is to obtain as much historical information as possible on the building itself. Information such as when it was constructed, what materials were used in its construction, recent renovations, ventilation system problems, and uses of the building, all help to identify a pattern and establish a chronology of events that may be responsible for the symptoms that employees are experiencing. Much of this information can be collected by reviewing building documents such as blueprints, engineering reports, equipment brochures, and distributing questionnaires. Upon analyzing this data, an effective strategy can be developed for identifying and solving the problems that are causing the indoor air quality complaints.

Microbial growth on pipe wrapping due to excessive moisture.

Initial Site Visit

The initial site visit begins the physical investigation of the building and can be conducted in three separate steps: a walk-through evaluation, personal interviews, and environmental monitoring.

A walk-through evaluation is needed to gain first-hand, visual knowledge of the building's design, floor plan, uses, and equipment. A critical inspection of the ventilation system is also important in order to thoroughly identify potential sources of chemical and microbiological contaminants.

Personal interviews, when combined with questionnaires, can help to better characterize the building population and determine the nature of the symptoms and complaints being reported. Personal interviews are also helpful in determining the magnitude and severity of the problem, specifically if the problem is widespread throughout the building, or if it is isolated in a particular section of the building or among a certain group of employees.

Environmental monitoring will be used to confirm or rule out a number of problem source possibilities identified from the background evaluation,

the walk-through evaluation, and the personal interview portions of the initial site visit. During the initial site visit, direct-reading monitoring methods are most commonly used because they are excellent screening mechanisms that provide immediate results and thus allow the IAQ consultant to provide anxious employees with immediate feedback.

The types of instruments that are commonly used include a CO_2 analyzer or detector tubes for measuring the amount of carbon dioxide in the air, psychrometers for measuring temperature and humidity, and smoke tubes for determining air movement. Tests for microbiological contaminants can also be conducted, but the analysis takes longer and is usually expensive because most biological contaminants must be cultured and analyzed by trained specialists under laboratory conditions.

Follow-up Site Visit

If, during the background evaluation or the initial site visit, a problem has been identified that needs further investigation, or if no problem can be isolated, an additional site visit may be needed, but only if further work is most likely to result in meaningful recommendations. Subsequent site visits may result in more specific and extensive environmental monitoring for chemical or microbiological contaminants, and/or tracer gas monitoring to evaluate the ventilation system.

What to do if You Suspect a Problem

Should occupants of your buildings or offices experience problems that may be caused by indoor air pollution, you can do the following:

- Talk with your institution's physician or health or biosafety officer to discuss the problem and explore possible solutions. Ask that a record be kept of reported complaints if one has not already been established. This will help you identify problem areas so that corrections or repairs can be made.
- Conduct a walk-through survey, using the guidelines described above.
- Consider hiring a commercial company that conducts building investigations to diagnose the problem, or problems, and suggest solutions. Carefully select such companies on the basis of their experience in identifying and solving indoor air quality problems in nonindustrial buildings.
- Call the National Institute for Occupational Safety and Health (NIOSH) at 800/35-NIOSH for information on obtaining a health hazard evaluation of your problem areas.
- Call your state or local health department or pollution control agency to talk about employee symptoms and their possible causes. ■

IAQ Bill Introduced

Following a similar bill introduced in the U.S. Senate, the Indoor Air Quality Act of 1989 (HR 1530) was recently introduced in the House of Representatives. The bill would be nonregulatory, but is intended to reduce risks posed by indoor air contaminants in workplace, schools, and other buildings.

The Many Dangers of Radon

by Matthew R. Frieje

On April 20th, 1989, the United States Environmental Protection Agency (EPA) held a major press conference to release the findings of its school radon survey. EPA recommended that schools immediately test for radon. Prior radon warnings focused on homes, this was the first significant effort to alert the public of the potential danger from radon exposure in schools and workplaces.

Federal funding may bring more warnings soon. Former president Ronald Reagan signed a $45 million radon bill last year, and the National Ad Council is planning radon television commercials. At present, action is not mandatory; however, as awareness escalates, building owners will be pressured by their occupants to ensure radon-safe breathing.

Matthew Frieje is president of Alpha-tech, Inc., Indianapolis, Indiana.

Radon and its Hazards

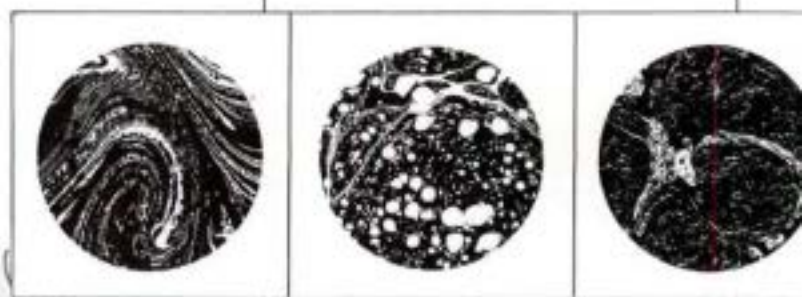
Radon-222 is a colorless, odorless, tasteless, radioactive gas occurring naturally in soil and rocks. Radon is not a threat outdoors; however, it seeps into buildings, sometimes accumulating to hazardous concentrations.

Radon has been a concern among uranium miners for many years. The recent scare was sparked when a Pennsylvania nuclear power plant worker tripped the radiation alarm as he entered the plant. The problem was traced to radon in his home, which measured 2,700 picocuries per liter (pCi/l) —a radon level comparable to smoking 3,000 cigarettes each day!

Radon is now considered the leading cause of lung cancer among nonsmokers. According to the American Cancer Society, the radon risk for smokers multiplies ten-fold. Radon breaks down to decay products that attach themselves to dust particles. The particles are breathed into the lungs. As the decay process continues, the particles release bursts of energy that penetrate some of the most cancer-sensitive cells in the human body. The damage to the lung tissue can, over time, cause lung cancer. Scientists are fairly certain of radon risk estimates, since they are based on studies of humans (uranium miners), rather than animals.

Radon is one of the nation's main indoor pollution threats. Naomi Harley, professor of environmental medicine at New York University, told *U.S. News & World Report*, "Nothing approaches the magnitude of this, not asbestos or formaldehyde. Radon is a major cancer causer and certainly leads the list of indoor pollutant problems in the nation."

According to the National Council on Radiation Protection and Measurement, radon is the source of more radiation for the average American than all other sources—x-rays, cosmic, terrestrial, occupational, nuclear fallout—combined.



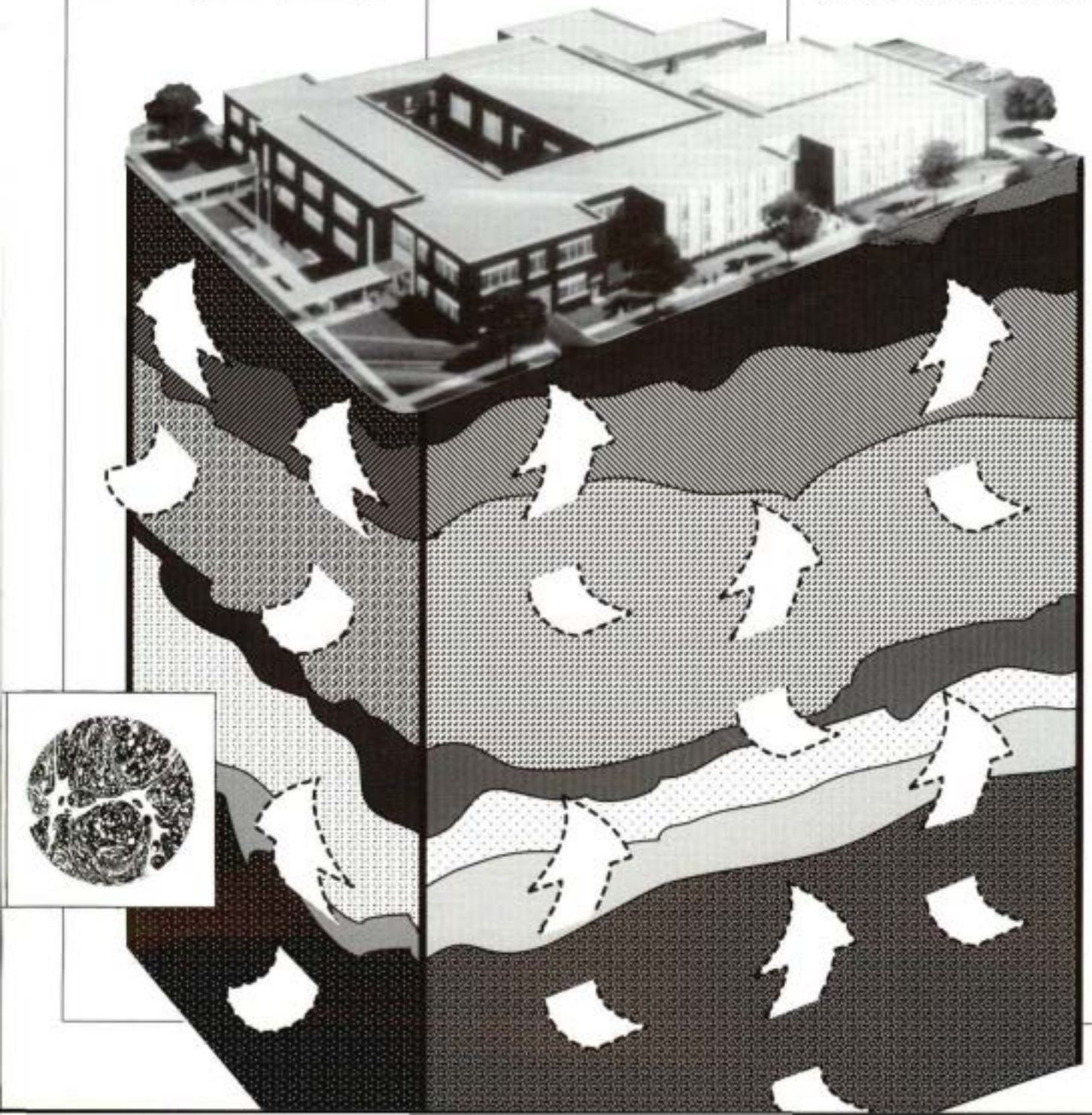
Although more research is needed, it is possible to assume that children are at greater risk from radon exposure than are adults. Studies of Japanese atomic bomb survivors suggest that children are more susceptible than adults to radiation-induced cancers. Children also have smaller lung volumes and higher breathing rates, increasing their radon dose from a given concentration.

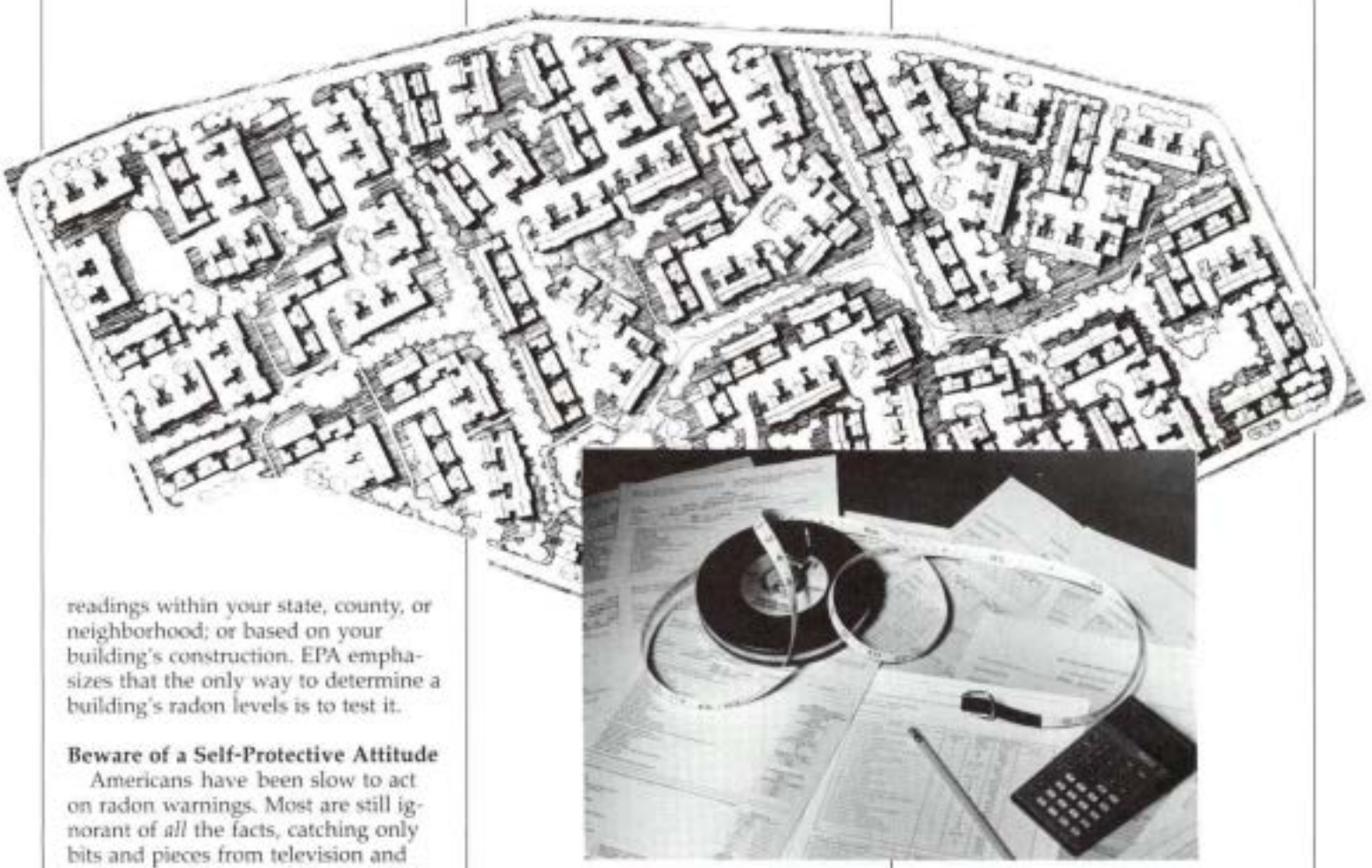
EPA Survey Results

EPA conducted a ten-state survey of 11,600 homes in 1987. Twenty-one percent tested over the EPA safety level of four picocuries per liter (exposure to 4 pCi/l is comparable to getting 300 chest x-rays each year, or smoking half a pack of cigarettes each day). The news got worse with the 1988 seven-state survey. Nearly one in three homes tested above the action level, and many were extremely high. This prompted EPA to urge that all homes and apartments (below the third floor) be tested.

EPA's recently-completed school tests found high levels in all sixteen states surveyed. One hundred thirty schools and 3,000 classrooms were tested; 54 percent of the schools had at least one unsafe room. One school had levels as high as 136 pCi/l; the same dose would require uranium miners to use respirators.

Each of the surveys confirmed that radon levels are unpredictable. Elevated radon levels were found in every state surveyed. Even the states with the lowest overall averages had some of the highest individual readings. Schools surveyed in the same community had appreciably different readings. Levels even varied from room to room within school buildings. EPA and university studies conclude that it is absolutely futile to assume a high or low radon level based on





readings within your state, county, or neighborhood; or based on your building's construction. EPA emphasizes that the only way to determine a building's radon levels is to test it.

Beware of a Self-Protective Attitude

Americans have been slow to act on radon warnings. Most are still ignorant of *all* the facts, catching only bits and pieces from television and newspaper. However, a Rutgers University study of homeowners confirmed that, even among those with more radon knowledge, there are optimistic biases in their perceptions of their risk from radon.[1] Here is what the Rutgers study found:

1. People are seldom willing to take preventive measures unless convinced that their own risk is significant and that effects would be serious. Since personalized risk information is rarely available, perceptions of risk are usually wrong.

2. People often display "unrealistic optimism"; regardless of their view of the average risk, they show a consistent tendency to assert that their own risk is less than that faced by their peers. Those who are aware that high levels have indeed been found in their community generally believe that their risk is much less than average.

3. An open-ended question asked respondents to explain why they thought their risk was above or below average. Answers included comments related to: lack of knowledge of problems in the area, distance from industry, soil/rock around the house, ventilation, insulation, no basement, new house, old house, health effects unnoticed. Answers indicated that respondents were optimistic in their own risk perceptions.

4. Respondents with more radon knowledge were more likely to acknowledge risks within the community, but were no more willing to admit that their own homes might be dangerous.

The study concluded that even when people are convinced that radon can be serious, many will resist the belief that they themselves are at risk, or that radon would be serious in their own case. They unconsciously do this to justify inaction.

Busy physical plant administrators need to be on guard against the self-protective attitudes that Rutgers found in homeowners. Lack of radon awareness is still the biggest problem. However, even managers with some radon knowledge tend to have falsely optimistic perceptions of their own risk. Here are some examples:

- *False Optimism*: "We are on sandy soil here, not rock."
  Fact: High radon levels have been found in buildings built on sand. Although the radon source may not be strong, the communication through sand may be much better, and the radon entry rate much faster.
- *False Optimism*: "We have excellent ventilation; several air changes per hour."
  Fact: Well-ventilated areas have had high radon levels because of negative pressure. The increased radon entry rate (due to the negative pressure) may more than offset the ventilation benefits.
- *False Optimism*: "We don't have a basement; everything here is on a slab."
  Fact: Any space in contact with the ground has potential danger. The lowest levels will typically measure

higher, but this is only relative to the strength of the radon source. If the source and/or entry rate is strong enough, even second floor rooms could be unsafe. Buildings on slab may also, in reality, be more hazardous because they often have more occupied rooms on the lowest level. Conversely, the basement of a multistory facility may have only seldom-occupied storage and utility areas.

In spite of the human tendencies toward unrealistic optimism, decision-makers for non-residential facilities are generally more responsive to radon warnings than homeowners. They are more cautious since they are responsible for the health and lives of many, not just themselves. They also fear the legal vulnerability of not having a clean radon report in hand. Others are motivated to test in order to please their occupants.

Your Potential Liability

An article in *Best's Review* stated that as more people become aware of radon and its effects, a wide range of radon-related claims and lawsuits can be expected.[2] It reported that "claims and such may result from children and personnel exposed to radon in schools." The worst-case scenario would obviously involve a lung cancer victim suing a building owner that did not address high radon levels. This should not come as a surprise, since lung cancer is common, and radon can be found everywhere.

Check with your insurance company and your university cousel. Your liability policy might exclude radon claims under the general category of either "nuclear hazards," or "pollution." However, it is yet to be determined how the courts will interpret these exclusions.

Testing Your Building

Testing your facilities will involve the following tasks:

1. Selecting a measurement device.

Charcoal or alpha-track detectors are commonly used for screening measurements. These are small passive devices that essentially "collect" radon for laboratory analysis. Charcoal devices measure over a period of one to seven days; alpha-track devices are used over a period of twelve months.

Advantages of charcoal devices:

- Quick results. Measurements can be taken over a two-day period. The laboratory report is returned within two weeks.
- Slightly less expensive than alpha-tracks.
- Tampering is minimized. The detectors are placed for a much shorter period of time. Also, testing can be done over a weekend, when some buildings are unoccupied.
- Some advanced charcoal devices can monitor periods of occupancy and non-occupancy separately, providing a clearer picture of the actual risks.

Disadvantages of charcoal devices:

- "Snapshot" measurements may not provide an accurate average, since radon levels fluctuate with time.
- The commonly-used canisters are susceptible to inaccuracies caused by extreme temperature and humidity conditions.
- Accurate measurements depend on good quality control and expertise at the laboratory. A thorough diligence is a must.

Advantages of alpha-track devices:

- Longer-term monitoring should avoid inaccuracies due to fluctuating radon levels.
- Immediate analysis is not required. This may prevent inaccuracy due to delays in shipment, or a backlog at the laboratory.

Disadvantages of alpha-track devices:

- The higher cost per detector, though slight, adds up on a multi-building program.
- Greater likelihood of tampering or loss, since the detectors are placed for a much longer time.
- The laboratory analysis is less automated, increasing the possibility for error.
- No ability to measure during specific, shorter time intervals.

I favor a certain state-of-the-art charcoal device (not the typical "hockey puck" canister design) for screening measurements. For confirmatory testing, I prefer a combination (depending on the case) of charcoal, alpha-track, and E-perm monitors.

Before choosing a device, gather information from presumably unbiased sources. Study technical reports for detectors and their corresponding lab equipment. Also call ten or fifteen university scientists (who have practical radon knowledge) for their opinions.

2. Selecting a manufacturer and laboratory.

Your manufacturer and laboratory selection is crucial. Start by obtaining a list of firms that have passed the EPA's Radon Measurement Proficiency Program. (Contact your EPA regional office for a list.) Choose only from "EPA-listed" firms, but do not expect the EPA listing to stand for quality. It is quite easy to pass the proficiency test.

Quality varies remarkably (especially for charcoal devices). Ask specific, technical questions about the firm's devices and lab equipment. Homework is a must; the technical considerations are too numerous to cover here.

Verify a lab's analysis capacity. If there is a backlog, your detectors may sit in storage for three or four days, even longer. This can drastically affect the results of a charcoal test.

Financial stability is also important. Most radon labs are small. Even some larger publicly traded firms may be short of cash, and struggling. The written report of your test results may later lack credibility (particularly in a lawsuit) if the company behind the report is no longer in business.

Be thorough. If your test results are wrong, you will probably never know; nothing will break or leak. And you will base consequential decisions on your results. If practical, visit laboratories before making your selection final. One last caution: do not be lazy in the selection process.

3. Analyzing your buildings and selecting rooms to test.

EPA recommends testing every occupied room on or below grade in schools. Since levels vary from room to room (sometimes significantly), this is the only way to obtain a complete representation of the building. However, if budget constraints prohibit testing every room, selective-area testing is certainly better than none.

To effectively test by selective-area, study each building to deter-

mine which rooms are likeliest to have high radon levels, and which rooms pose the greatest health risk at any given radon level. For example, dormitory rooms have a high health risk since they are occupied several hours a day by the same person(s).

The same could apply to administrative offices. Classrooms occupied by the same person for only two or three hours a week are not as dangerous relative to the same radon level. On the other hand, infrequently occupied areas can be risky if the radon concentration is high.

Selective-area testing entails a degree of speculation directly related to the percentage of rooms tested. There is less uncertainty if 50 percent of a building's rooms are measured, than if only one in three are tested. As a loose rule of thumb, test at least 25 percent of the rooms in lower-risk buildings, and up to 100 percent where the risk is greatest. Ultimately, you will only know the levels of the rooms actually tested. The others will still remain a mystery. Do not test one or two rooms and declare a building safe or unsafe.

4. Developing procedures, forms, etc.

Develop a checklist to ensure that proper testing conditions are met before starting the test. Write detailed, clear instructions for conducting the test. Tell employees about the test, so disturbance is minimized. Develop a data collection log. Certain data is important for interpreting the results, and for protecting yourself legally. Check and recheck your forms and instructions; mistakes can produce inaccurate and/or useless readings.

5. Conducting the test.

Conducting the test involves placing the monitors, recording data, retrieving the monitors, and shipping the monitors to the lab. Timing is key to conducting the test (especially for charcoal detectors). Before placing the monitors, make sure that personnel will be able to retrieve the monitors on time. Collect some of the data beforehand, to save time during the placement phase.

Once the detectors are retrieved, ship them to the laboratory as soon as possible. This is important for accurate readings of charcoal devices. If steps one through four above have been done well, conducting the test will be fairly simple.

6. Interpreting the test results.

Follow-up testing is necessary if high levels are found in the screening test (or if the screening test was deficient). If high levels are confirmed, you will need more testing to diagnose the problem.

7. Costs.

There are basically three options for testing your facilities:

- Hire a professional to handle every aspect of the test (steps one through six above);
- Test entirely on your own (handle steps one through six yourself);
- Have a professional handle steps one through four, and six, but use your staff to conduct the test.

The first option will cost the most for the test itself, but will require very little of your labor. The second option will likely cost the least for the test, but will require a significant amount of preliminary research, plus involve more risk of error. The third option will fall in the middle on price, and will require your time only for conducting the test. In each case, the cost will depend on the magnitude, complexity, and quality of the test. Insist on high quality. It will not cost much more initially. And skimping on quality could ultimately be very expensive.

Mitigating a Radon Problem

EPA school studies show that the HVAC system is the leading factor contributing to elevated radon levels, and a key to mitigation. Rooms with negative pressure pull radon in through wall and floor cracks, expansion joints and utility supply lines. Conversely, if the HVAC system pressurizes the room, radon entry can be prevented. In other cases, radon gas can be pulled into the system, and distributed throughout the building. Mitigation may only require minor changes in the HVAC system or its operating schedule.

Where HVAC system adjustments will not solve a radon problem, a subslab ventilation system is often installed. In buildings where subslab ventilation will not work, such as buildings where the cold air return is located beneath the slab, mitigation could be very expensive.

Good diagnostics can save a lot of money on mitigation. Two things are necessary in order to know the best and cheapest solution: a thorough understanding of a building's construction and HVAC systems, and knowing how radon behaves. Implementing the solution is usually simple. In fact, your own maintenance crew may be able to install a subslab ventilation system.

EPA is designing a proficiency program for mitigators. Until it is completed, there is no "official" list of mitigation contractors. Your testing firm may have suggestions, as may your state's radon contact. When calling contractors, make sure they have tested large buildings, not just homes. Also ask the firm's past clients about their radon levels before and after mitigation. Visit the firm's jobs, if possible, to check the quality of their work.

High radon is a lot like high blood pressure. It is easy to ignore because we cannot see or feel it. The danger is normally far in the future. Odds are that we do not have a problem, but we will not know until we test for it. The remedy does not usually require excessive cost. The veritable danger is to do nothing.

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The DECAYING AMERICAN CAMPUS

A TICKING TIME BOMB

by Sean C. Rush
Coopers & Lybrand

A recent nationwide survey has found that there exists a potential price tag of between $60 and $70 billion in capital renewal and replacement costs for decaying college and university facilities. Consistent policies of deferring expenditures for maintenance and repair have created an immediate need of $20 billion for renewal and repair of campus buildings, equipment, and utilities.

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

A joint report of
Association of Physical Plant Administrators of Universities and Colleges
and
National Association of College and University Business Officers
with the assistance of
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Sampling for Radon Gas in a University Setting

by John D. Houck, P.E.

It has been with us since the dawn of time and it is destined to be with us forevermore. Radon gas is an odorless, tasteless and invisible substance that is a link in the natural evolutionary chain of events that transforms unstable uranium into stable lead isotopes. During the transformation process radon gas is formed for only a few fleeting days—the half life of the most stable radon isotope is approximately 3.8 days.

Although its half-life is relatively short, the amount of natural radon gas in the environment is such that there is always an abundance of this potentially deadly material around. One estimate suggests that the top six inches of dirt on one square mile of the Earth contains only about one gram of radium-228, the immediate precursor of radon gas.

However, varying amounts of this gas are naturally found in the air throughout the year depending on the weather.

It is a heavy gas that does not readily combine with other gases in the air. Because of its weight, it naturally accumulates in the lower levels of buildings once differential air pressures draw it into the interior of the building from its surrounding area. In homes and small commercial buildings this gas can be drawn through basement openings via natural convection. In larger industrial and institutional buildings this convection process may be aided through the use of mechanical ventilation systems.

In the mid-1980s several studies by the U.S. Environmental Protection Agency and others determined that small amounts of radon gas in buildings can be deadly. It apparently kills its victims slowly by means of lung cancer through its prolonged inhalation. The EPA and the Surgeon General's office has urged that every home be tested for radon presence.

How Real is the Risk of Radon Exposure?

In recent months questions began to emerge on the actual risk of low level radon exposure. One recently published article even suggested that a little radon gas may even be beneficial.

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Criteria for Phase I Building Selection

What Buildings and Rooms?

- Demography and Use
- Geography
- Geology or Subsurface Information
- Type of Building Construction
- Size, Condition, and Age of Building
- Long-term Occupancy
- Mechanical Air Movement Systems
- "Worse Case"

EPA Radon Risk Evaluation Chart

pCi/1	Comparable Exposure Levels	Comparable Risk
200	1,000 times the average outdoor level	More than 60 times non-smoker risk
100	100 times the average indoor air level	4-pack-a-day smoker risk
40		20,000 chest x-rays per year
20	100 times the average indoor air level	2 pack-a-day smoker risk
10	10 times the average indoor air level	1 pack-a-day smoker risk, 5 times non-smoker risk
4	Safe level?	200 chest x-rays per year
2	10 times the average outdoor air level	Non-smoker risk of dying from lung cancer
1	Average indoor air level	
0.2	Average outdoor air level	

Radon Detector Locations

Location of Radon Detectors	Number
High Occupancy Offices	60
Classroom, Labs, etc.	25
General HVAC ducting	14
Duplicates (along side others)	10
Background (outdoor monitors)	4
Controls (remained sealed)	4
	117

In the past policy makers assumed that exposure to the gas should produce harmful effects. This notion was attributed to 1) the study of the Japanese people who were exposed to the atomic bombings, 2) certain recipients of the early x-ray dosages, and 3) the miners working in the uranium mines.

Affects of radiation poisoning on these people ranged from devastating in the case of atomic bomb victims to mild in the other cases. The basic belief that any level of radon gas exposure is harmful is based on the downward extrapolation of these three study groups. Also, there seems to be a preconceived notion that any level of exposure is bad no matter how low it is.

After looking at the radon materials long enough, one finds the name of Bernard Cohen of the University of Pittsburgh appearing prominently in most of the articles on this subject. Cohen has been collecting, analyzing, and sifting through radon data for some time now and has uncovered some surprising results.

He has compared U.S. data on average indoor radon levels with lung cancer (perhaps the most affected internal organ) rates for the county in which each of the samples were taken. Surprisingly, there seems to be a tendency for counties that have high radon levels to have low lung cancer rates. This statement was not made based observing a couple of samples over a handful of counties. On the contrary, it is based on roughly 39,000 measurements covering some 415 counties throughout the United States.

Another study sampled radon levels in approximately 1,200 homes selected at random in the 40 counties having the highest and lowest cancer rates in the United States. Again, the results appeared to be the same. In every case the radon level for low lung cancer counties was much lower than had been predicted and the radon level in the high lung cancer counties was much higher than predicted. There are a handful of other similar studies—which were conducted in Finland and the states of New York (two studies), Florida, South Carolina, and New Jersey—which showed the similar trends. At present, the EPA is reviewing these findings to see if they hold water.

The Ohio State University Building Survey Plan

The university responded to the general public awareness to elevated radon gas levels in late 1987. At that time there was (and still is) practically no information for institutional settings. Most of the EPA thrust is toward homes and other single family dwellings. In December 1987, Ohio State's Office of Radiation Protection (ORP) and the Physical Facilities Department met to determine ways and means of analyzing the Columbus campus of OSU.

The Ohio State University is arguably the largest single campus in the United States. With roughly 58,000 students housed in about 21 million gross square feet of building space, it would be nearly impossible to survey all areas throughout the campus. It was therefore decided early on that an experiment of this kind would be accomplished in two separate phases.

The first phase would be a sampling of small but representative number of the university's buildings. The criteria used to select a limited number of buildings is shown in the adjacent table. Radon studies would be conducted in a few buildings to see if we could easily infer that there were high radon gas levels on campus.

The second, more costly, phase of the radon gas testing would be done if the overall radon levels in the first phase proved high. This second phase was envisioned to cover most of the buildings on campus so that a prioritized building retrofit program could be developed and approved. A building retrofiting program would include such standard measures as analyzing the air flows within high radon level areas; plugging all cracks, holes, and penetrations through the foundation; and introducing positive ventilation systems to vent off the remaining radon gas to the atmosphere.

After some discussion of the building selection criteria and reviewing the resources available to conduct this experiment (remember, this is a "low budget" operation), we was determined that the Office of Radiation Protection and the Physical Facilities Department could conveniently survey about 5 percent of the building space on the Columbus campus. A review of campus maps for geographical diversity; the building operating and maintenance data for construction information and mechanical ventilation data; campus space assignment records; and geological strata narrowed our search to ten buildings throughout the campus.

The Office of Radiation Protection researched sampling techniques for radon gas testing. They determined that the system developed by the University of Pittsburgh seemed to offer the best testing devices at an affordable price, and they also provided the

Composite Building Results (Radon gas levels by floor)

Location	Mean pCi/1	Median pCi/1
Roof/Attic	0.30	0.36
5th Floor	0.24	0.30
4th Floor	0.36	0.20
3rd Floor	0.70	0.30
2nd Floor	0.55	0.40
1st Floor	0.71	0.35
Basement	1.65	0.70
Crawl Space	5.17	5.30

Sampling Results

pCi/1	Number	Pct
0.0 - 0.5	52	61%
0.6 - 1.0	17	20%
1.1 - 4.0	12	14%
4.1 - 10.0	4	5%
> 10.0	0	0%
	85	100%

highest quality assurance in lab testing once the devices were submitted for evaluation.

Altogether, some eighteen radon testing and evaluating service bureaus were screened for use. However, the University of Pittsburgh source was used because of: 1) "name recognition" within the field, 2) their previous experiences in this field, 3) they were relatively close to Ohio State, and 4) they were relatively inexpensive. ORP determined that each building would receive at least four detectors and that each detector should cover no more than between 15,000 and 17,000 gross square feet of building space. The general dispersement of the detectors is listed in the Radon Detector Locations table.

The university-wide survey was conducted during March 1988. This period was selected for various reasons: 1) late winter to early springtime ambient conditions (high gas concentration period), 2) the school was on spring break to minimize the chance of tampering, 3) relative ease of access to building areas, and 4) availability of personnel to place and collect samples. It was also felt that a four-day continuous sampling period would result in good, repeatable data.

Of the 117 units placed, 85 were within areas of normal occupancy. The balance were in ducting, outdoor locations, duplications, etc. The table labeled Sampling Results shows the range of readings throughout the campus. The average reading of the 85 indoor samples was 1.0 pCi/l, which is approximately one-fourth of the accepted "safe" standard of 4.0 pCi/l. The outdoor samples were also within the range of normal readings with an average of 0.3 pCi/l. Finally, both the duplicate and control detectors showed repeatability and good quality control, respectively.

There were two other interesting results of this test, both of which are not the least surprising. First, the larger the volume of outside air used in the mechanical systems, the lower the level of radon gas buildup in the building. Building-wide radon levels varied from as low as 0.26 pCi/l in the case of the University Veterinary Hospital, which is essentially 100 percent outside air make-up, to as high as 5.0 pCi/l in the Public Safety/University Police building where ventilation air is limited to that which naturally infiltrated through operable windows.

The second discovery is that, in general, the level of radon gas decreases the higher you are in a building. An Ohio State structure shows the pattern shown in the Composite Building Results.

No Radon Problem at Ohio State

The radon gas debate will probably continue for some months or even years on what levels are harmful to humans. At the present time the EPA feels that a threshold level is roughly 4.0 pCi/l of air. The results of the tests show there is no significant problem with the radon gas levels in ten Ohio State University buildings under this guideline.

We believe that similar results would be found if we were to test the balance of our buildings. We therefore see no need to initiate a second and more costly study at this time. ■

Cornell Recycles: A Major University Commitment

by Teresa S. Hargett
and Robert C. Osborn

Cornell University, in the beautiful Finger Lakes region of Upstate New York, has taken a giant step toward preserving the environment. The recycling of paper on a campus-wide basis began in fall 1988 with all staff participating. Tens of thousands of pounds of office paper, previously thrown into the trash and ultimately disposed of in the county landfill, is now being recycled in an extremely effective manner. The program, entitled "Cornell Recycles," involves 9,000 employees and a large portion of Cornell's 18,000 students.

Cornell's new recycling program started shortly after Labor Day 1988. Its introduction to the campus was preceded by a summer-long study by a group of facilities staffers. Cornell's associate vice president for facilities and business operations appointed a task force of fourteen facilities professionals from a variety of disciplines.

This group researched the feasibility of introducing a recycling program for the Cornell campus. The decision to evaluate the subject was prompted by a number of issues including recent state and federal environmental legislation, a local landfill crisis, and pressure from the Cornell community to address the subject of recycling on a university level.

An aerial view of Cornell University, Ithaca, New York.

Local Landfill Crisis

Initial research brought the task force into early contact with local city and county government officials responsible for solid waste management. It was immediately evident that the local landfill crisis in our county would have a significant financial impact on the Cornell community, just as it has on other communities across the country. The closing of our existing landfill and the opening of a new county landfill facility would introduce "tipping fees," something never experienced before in our community.

The task force subsequently determined that Cornell's waste stream

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amounted to 8,000 tons annually and that the county was projecting tipping fees at $40-$64 per ton. The realization that Cornell was facing new trash disposal costs ranging from $320,000 to $520,000 reinforced the need for a formal recycling program at Cornell.

Initial Program Objectives

Cornell's primary reason for starting a recycling program was to preserve the environment. However, as the realities of the landfill crisis and affiliated costs became known, the issue of cost avoidance of tipping and hauling fees also became a major factor. The task force therefore established these objectives:

- Design a program that provides for the greatest amount of recyclable material to be removed from Cornell's waste stream, thus keeping new landfill costs at a minimum.
- Keep the overall mechanics of the recycling program simple and easy to use for the Cornell community to ensure immediate and long-term success.
- Maintain environmental responsibility.

Key Issues: What would be recycled? How would it be marketed?

The task force looked at a number of issues, including the make-up of Cornell's waste stream, the materials that would be targeted for recycling, how they would be collected and marketed, who would run the program, and how it would be promoted. These issues were addressed, keeping in mind that Cornell's physical plant involves more than 200 buildings and

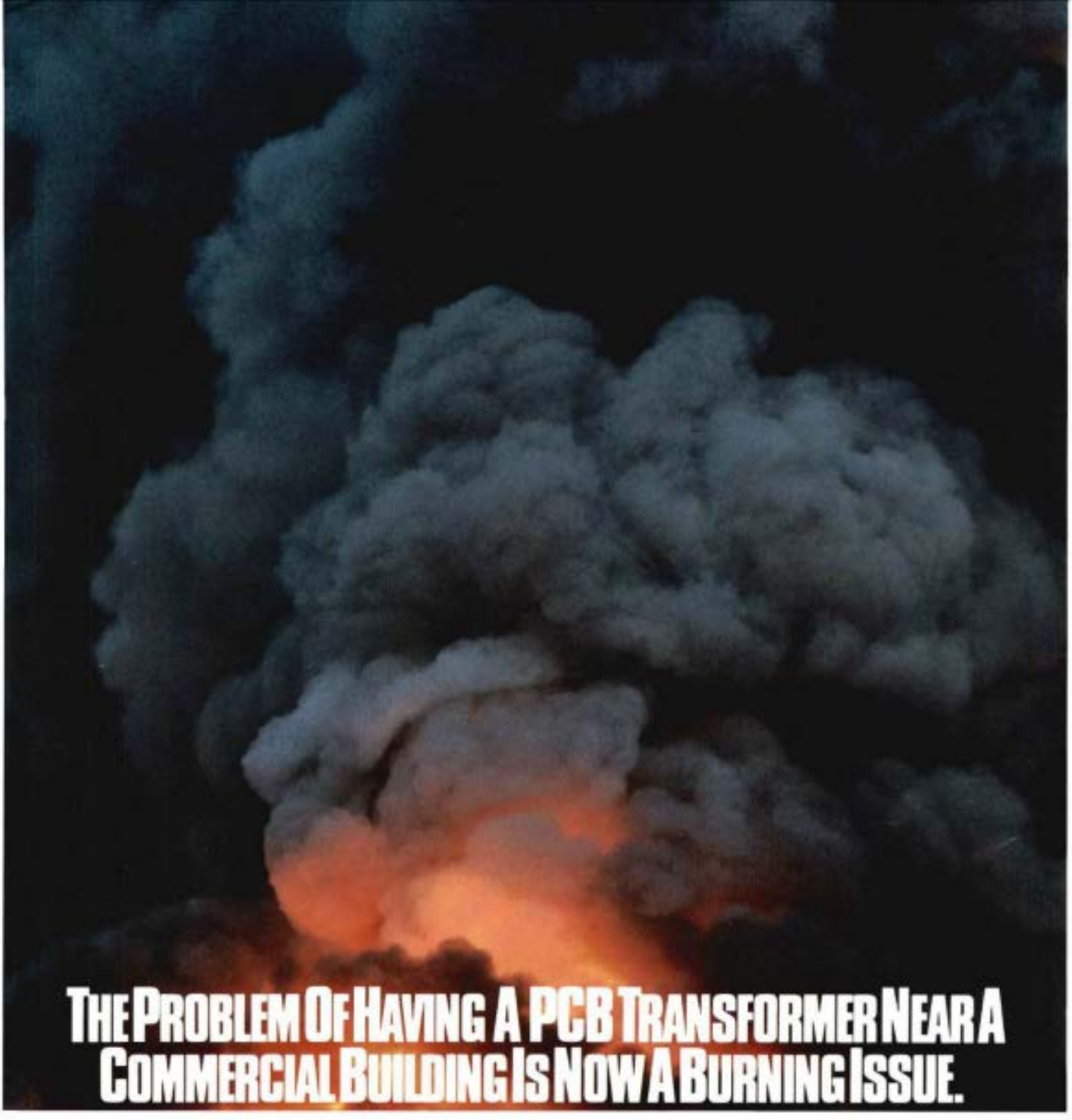
10.7 million gross square feet.

An analysis of the annual waste stream revealed that as much as 50 percent of Cornell's 8,000 tons consisted of office paper. It was also determined that the majority of the paper types contained in the waste stream could be recycled. Consequently, office paper was the initial target of recycling.

Thirty-five vendors were contacted to determine their interest in purchasing Cornell's recyclable paper. A group of finalists was selected for interviews on campus to discuss their

Cornell's recyclable paper being compacted into bales.

CORNELL UNIVERSITY



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potential participation in the program. All offered a variety of services. However, the majority would have required Cornell to establish an elaborate processing operation on campus to include collection, trucking, manual sorting, compacting, and baling, all at a substantial cost to the university.

One vendor, who had been operating in the Ithaca community and who had been picking up a limited amount of paper through volunteer recycling efforts on campus, offered a simple and comprehensive package that would not require Cornell to build a processing operation. This vendor offered to pick up recyclable office paper at the individual buildings across campus, providing it was bagged and placed by building loading docks for pickup.

Furthermore, this vendor was willing to collect a mixed variety of office paper, versus separated and sorted paper as required by the majority of vendors. The local vendor stated that they would remove mixed office paper from campus, pay Cornell for the mixed paper, and handle all the sorting and baling at their warehouse. This vendor, who was backed by a national company, seemed to be best fit for Cornell's recycling program.

Designing a Program on Cornell's Large Campus - Pilots Established

Designing a recycling program that would involve 9,000 employees across Cornell's large campus was a major feat. The challenge at hand was to design a program in which everyone would participate and which would not involve a lot of effort on their part. At the same time, another process had to be instituted to pick up and collect the recyclables in each building, including bagging and preparation, for Cornell's vendor to pick up. These processes were determined to be two separate operations that would be handled in separate steps. After a great deal of study, it was determined that individual employees should separate their paper from other trash at their desks and that the custodial staff would pick up the separated entities.

During the summer of 1988, the task force instituted two unique pilot programs designed to evaluate the processes of separation and collection of recyclable paper. The programs were also designed to take a close look at the "human element," the willingness of faculty and staff to participate in the different steps involved in separation, collection, and handling. In both test programs, faculty and staff were provided with an extra wastebas-

ket or container for the collection of recyclable mixed office paper. The two wastebaskets were labeled with color-coded labels, white for "Recyclable Paper" and red for "Non-Recyclables." The white label included the definition of recyclable paper. Faculty and staff were asked to place all appropriate office paper in one basket and trash in the other.

In one pilot, faculty and staff were asked to carry their collected paper to a central collection location in their office area or building. The custodial staff continued to pick up the trash daily, as was routine. In the second pilot, the custodial staff was asked to pick up both separated entities at each employee's desk. Custodians who were accustomed to using one 32-gallon barrel on a dolly for trash pickup, were provided with a second 32-gallon barrel on a dolly for picking up recyclable paper. Custodians then placed the bagged recyclable paper in a new tilt-truck dumpster labeled "Cornell Recyclables." Trash continued to be placed in the regular garbage dumpster.

The pilots were monitored closely over the summer with conclusions drawn after twelve weeks. Both pilots were determined to have been successful from the standpoint of employee participation; faculty and staff enthusiastically separated their paper from trash in the two containers at each work station. The contrast in the pilots occurred, however, in the process of moving the paper from individual desks to collection points.

In the first pilot, where staff were asked to "carry their paper" to large centrally located containers, participation began to fall after a number of weeks, and good recyclable office paper began to appear in the trash.

In the second pilot, where custodians picked up both separated entities at individual work stations, participation was excellent over the entire test period. In addition to the positive response from faculty and staff, Cornell's custodians were cooperative and positive about the process. They did not feel that the separate collection operation added a significant burden to their workload.

(It should be noted that the union representing Cornell service workers was involved with the recycling task force from the outset, with a union leader actively participating as a member of the committee.)

Recycling Program Recommendations Accepted by Administration

Recommendations were made to Cornell's senior administration outlining plans for a formal recycling program targeting the collection of mixed office paper in the university's academic/administrative buildings. The collection method preferred by the task force was, not surprisingly, that in which the custodians picked up both trash and recyclable paper at employee work stations or desks. This method was determined to be most successful in meeting original objectives. It provided for the removal of the greatest amount of recyclable material from Cornell's waste stream, was

the easiest to use for employees, and was projected to ensure immediate and long-term success of the program. Because this operation would involve 275 university custodians, it was furthermore determined that the custodial services administration would play a key part in monitoring and managing the program.

Facilities on campus, including the student dormitories, dining halls, and student activity centers, were recommended to have separate recycling programs of a similar type. Activity centers and dining halls would focus primarily on paper collection in individual offices, utilizing their custodial staff for paper collection. Residence halls would be set up differently with collection bins for recyclable paper on each floor. Students would carry recyclable paper from their rooms to the collection points. Containers already in student rooms would be labeled in the same manner as in the academic buildings.

The facilities task force recommendations for a formal recycling program at Cornell were unanimously accepted by the senior administration. The decision was made to place responsibility for the program with the Division of Facilities and Business Operations and to administer the new recycling program with existing facilities staff. The associate vice president selected the authors to administer the program rather than recruit and hirea recycling director from outside the university.

"Cornell Recycles" Is Born - Implementation Steps

The planning for implementation of the new recycling program led to the development of a number of basic steps that codirectors considered to be crucial. The steps followed are listed below. It should be noted that the actual implementation of the program took place in phases, given the immense size of the campus and the large number of buildings to be

Bob Falada labeled 12,000 trash cans.

The authors standing in front of Cornell's mountain of recyclable paper.

Jean J. Rogers, Director, Custodial Services, separating paper at her desk.

brought on line. With the exception of the first step, the other steps did not necessarily occur in the order listed and often happened simultaneously.

1. *Announced by Senior Administration*—A letter of introduction of the new recycling program was sent to all of Cornell's employees by the provost and senior vice president. The announcement introduced "Cornell Recycles" to the university and asked employees to be prepared for the introduction of the program in their individual buildings. The letter also outlined how the program would operate, what would be expected of employees, and solicited their cooperation.
2. *Purchasing Equipment*—Equipment was needed for an initial 130 buildings and 9,000 staff. A plan was established to purchase this equipment in installments. Bids were obtained for the total quantity of each item, and purchase contracts were awarded based on total quantities required. The items listed below were purchased over the course of eight months during the main implementation of the program.
   - 12,000 small trash containers
   - 500 32-gallon trash containers with dollies
   - 130 1-1/2 yard tilt-truck dumpsters with lids
   - 50,000 33-gallon clear trash can liners (initial order)
   - 15,000 small container liners
   - 30,000 labels: "Recyclable Paper" and "Non-Recyclables"
   - 250 large dumpster labels: "Cornell Recycles"
3. *Contract Established with Vendor*—Cornell entered into a limited-term contract with the vendor for its services. The contract included terms and conditions regarding the pickup and payment to the university for all campus mixed recyclable paper.
4. *Orientation of Custodial Managers*—Early in the planning process, meetings were held with custodial management staff. These important sessions were of particular assistance in reviewing and fine tuning the actual collection mechanics for the program.

Decisions were made about which buildings would be brought on line first and served as examples for all other buildings. Equipment planning was performed for each building on an individual basis. Cornell's 275 custodial personnel are divided into nine supervisory complexes across campus. The manager for each custodial complex was responsible for the priority of setup planning. An active dialogue was maintained with the custodial managers throughout the nine month period.

5. *Orientation of Custodial Staff*—Meetings were held with all custodial staff in each building as it was brought on line. Considerable emphasis was placed on these sessions to thoroughly familiarize the staff with the mechanics of the process. The importance of the recycling program and the role that they individually and collectively would play in the process were discussed. These sessions proved to be extremely productive in that many practical ideas were generated regarding the actual engineering of the collection process. For example, the suggestion that recyclable paper would be collected in clear plastic bags versus black bags utilized for ordinary trash came out of one of these sessions.
6. *Initial Building Contact, Promotion, and Setup*—Building coordinators for each facility were contacted in advance of each planned setup. The recycling program was reviewed in detail and promotional material provided for distribution to all building employees. This material included an introductory letter and list of the most frequently asked questions about the program. Immediately following its distribution, the buildings were set up for recycling by the custodial staff. Setups usually were performed on Saturday, and the buildings were ready for recycling on the following Monday morning. Close contact was maintained with building coordinators and custodial staff as each individual setup was performed.
7. *Monitoring the Program*—The program co-directors view the process of monitoring and follow-up to be essential to the success of the program. An active dialogue continues with building coordinators and the custodial staff throughout the campus. Continued feedback has aided the program with excellent suggestions for improvements in the program design and actual hands-on operation.

Conclusion

The program implementation occurred in four main phases over eight months. Eleven thousand five hundred containers were distributed across campus in 130 buildings. Two hundred seventy-five custodians were given program orientation in thirty-five separate sessions across campus. Tremendous cooperation was received from hundreds of staff at all levels who were directly involved in inaugurating this mammoth process.

CHARLES HARRINGTON

Early estimates that Cornell's waste stream was composed of 50 percent paper led to speculation that, if we had a 50 percent participation rate, 25 percent of the total waste stream could be recycled. To date, all expectations have been exceeded as the majority of buildings are demonstrating paper recycling in excess of 50 percent. Some buildings are recycling paper at the rate of 70 percent! Our custodial staff campus-wide have been astounded to find the "trash" component of the waste stream now in the minority.

"Trash in the minority" and "recycled paper in the majority" is especially good news for Cornell; in fact, it's great news! As tipping fees are put into effect in the near future, Cornell University will be ahead of the game. The recycling of each piece of paper multiplied by the thousands will add up to saving the university a significant amount of money.

Cornell Recycles is working thanks to all employees and thousands of students who believe in the preservation of the environment. It is extremely interesting and gratifying to know that in a university community as great and as diverse as Cornell, one thing that almost everyone agrees on is that "recycling is a good thing!" ■

The Impact of the Drug-Free Workplace Act on Colleges and Universities

by Paul C. Skelley, Martin Michaelson, and Anne Parten

The federal government has recently issued a number of anti-drug provisions that require most colleges and universities, among other employers, to take various new measures to combat illegal drugs in the workplace. These requirements are set forth in the statutes and regulations described below.

Anti-drug legislation is not new to the higher education community. The Higher Education Amendments of 1986, for example, require all colleges and universities maintaining federal financial aid eligibility for students to certify that they have drug abuse prevention programs that are accessible to institutional officers, employees, and students. The new requirements, however, substantially expand and complicate compliance obligations.

Most colleges and universities are covered by the Drug-Free Workplace Act of 1988, which became effective on March 18, 1989. The Act applies to all colleges and universities that wish to be eligible for federal grants and certain federal contracts, and requires such institutions to take specific steps to achieve a drug-free workplace.

Many institutions also are subject to a recent Department of Transportation Rule. The Rule requires, under certain circumstances, that persons and employers operating large motor vehicles such as buses and trucks ensure that the drivers participate in drug testing and educational programs.

Finally, a number of colleges and universities are covered by a Department of Defense Interim Rule that applies to individuals and institutions that contract with DOD. The DOD rule affects contracts that involve classified information or that DOD otherwise identifies as requiring a drug-free workforce clause. This report summarizes the new laws and the primary obligations they impose on colleges and universities. The report gives an overview; institutions should work with legal counsel to implement the requirements.

Paul Skelley and Martin Michaelson are partners, and Anne Parten an associate, in the law firm of Hogan and Hartson, Washington, D.C.

The Drug-Free Workplace Act

The Drug-Free Workplace Act of 1988, Pub. L. No. 100-690, 102 Stat. 4304 ("the Act"), applies to recipients of all federal grants awarded after March 18, 1989. The same requirements apply to institutions awarded federal procurement contracts after March 18, 1989, if the contracts are valued at or above $25,000.

To be eligible, a college or university must certify that it will maintain as a drug-free workplace any area of the institution where the grant or contract work is performed. The certification ordinarily will be part of the grant or contract application. Under the Act, the college or university must take these steps to comply:

1. Publish a statement notifying employees that the unlawful manufacture, distribution, dispensation, possession, or use of a controlled substance is prohibited in its workplace, and specifying the actions the institution will take against employees who violate the prohibition.

2. Include in the statement a notice to employees working on covered grants and contracts that as a condition of such work they must obey the prohibition and notify the employer within five days of their conviction for violating any criminal drug law by an action in the workplace.

3. Give each affected employee a copy of the statement.

4. Notify the granting or contracting agency within ten days after learning of an employee's conviction of a violation of the drug laws while covered in the workplace.

5. Within thirty days of learning of such a conviction, discipline the employee or require that he or she complete a drug rehabilitation program.

6. Communicate to affected employees the employer's policy of maintaining a drug-free workplace, the dangers of workplace drug abuse, the penalties the employer will impose for drug violations, and information about any available drug counseling, rehabilitation, or employee assistance programs.

7. Make a good faith effort to preserve a drug-free workplace by continuing to observe the preceding requirements.

A grant or contract recipient that fails to comply with these requirements risks suspension of payments, termination of the grant or contract, or debarment from receiving grants or contracts for up to five years. The Act sets out three grounds for these sanctions: if the grantee or contractor makes a false certification, if it does not comply with the Act's requirements (for example, by failing to publish the necessary statement), or if the number of covered employees convicted of violating the drug laws in the workplace is high enough to indicate that the employer has not made a good faith effort to maintain a drug-free workplace.

To meet the Act's certification requirement, a college or university

should take the following steps:

- Prepare the employee notification statement the Act requires. Some colleges and universities have chosen to publish and distribute a single unified compliance document that includes the require prohibition of illegal drug use, notice of the actions the institution will take against violators, a description of employee self-reporting requirements, an enumeration of the dangers of workplace drug abuse, and information about drug counseling programs. In describing actions they will take in response to drug violations, colleges and universities should consider any collective bargaining agreements or other contracts, or provisions of state or local law, that may limit penalties for particular offenses.
- Provide copies of the statement to all employees who will work under a covered federal grant or contract. Colleges and universities may find it practical to extend the anti-drug prohibition, and to provide copies of the compliance statement, to all employees. In any event, the institution should document its distribution of the materials. Copies should also be given to new employees.
- If such information is not already included in a single document of the kind discussed above, start a program to information employees about the dangers of drugs, the employer's anti-drug policy, and drug counseling opportunities available through the institution or the community.
- Establish an administrative mechanism for receiving reports of any covered employees convicted of violating the drug laws, and reporting those convictions to the federal granting or contracting agencies.
- Acquaint supervisory personnel with the Act's requirements, with procedures for reporting violations and convictions, and with any limits on discipline imposed by state or local law or collective bargaining agreements.

Department of Transportation Rule

The Department of Transportation Final Rule, 53 Fed. Reg. 47,134 (Nov. 21, 1988) (to be codified at 49 C.F.R. pts. 391 & 394), requires motor carriers—essentially, all entities operating commercial motor vehicles—to implement drug testing and education programs for drivers under the motor carrier's control. Colleges and universities with fifty or more covered drivers must have programs in place by December 21, 1989; those with fewer than fifty must comply by December 21, 1990.

The Rule does not apply universally. To be deemed a motor carrier and hence come under the Rule, a college or university must operate commercial motor vehicles that sometimes travel across state lines, that transport passengers for hire or that transport property, and that meet certain size or cargo requirements. The Rule identifies three types of vehicles as "commercial motor vehicles": vehicles weighing at least 26,001 pounds, vehicles designed to transport more than

fifteen persons, and vehicles carrying hazardous material in amounts requiring placarding under applicable regulations. Colleges and universities should determine whether their operation of buses or trucks is covered.

The Department of Transportation regulations are lengthy and not entirely clear. For example, a bus transporting the football team, without separate charge to the players, would not seem to be "for hire." A proposed Department of Transportation rule would eliminate the "for hire" requirement. See 54 Fed. Reg. 7362 (Feb. 17, 1989).

A college or university must ensure that drivers of covered vehicles it operates participate in the mandated programs. The requirement extends not only to regular employees of the college or university, but also to drivers the institution anticipates hiring and individual drivers with whom it contracts for extended periods. If a college or university contracts with a trucking or bus company, that company—not the institution—is the motor carrier that must ensure compliance with the Rule.

Under the Rule, drivers of covered vehicles must be tested before they are hired, when the undergo the mandatory biennial physical examination required by the Department of Transportation driver qualification regulations (49 C.F.R. pt. 391.43-.45), and whenever there is reasonable cause to believe that a driver is using drugs. Private motor carriers such as some colleges and universities are often unaware that they are covered by general Department of Transportation rules governing driver qualification. The Federal Motor Carrier Safety Rules appear at 49 C.F.R. Parts 350-99.

In addition, the Rule requires motor carriers to phase in a random drug testing program. The Department of Transportation has issued detailed procedural guidelines that must be followed during tests, and the Rule itself outlines mandatory procedures for keeping records and disclosing results.

A college or university that has covered drivers must also implement an educational program for them and their supervisors. The program must present information on the institution's drug policy, the dangers of illegal drug use, signs of drug abuse, and available drug-counseling services. Institutions may arrange for testing and educational programs to be handled through outside contractors, consortia, or comparable alternatives if they do not wish to perform these functions themselves.

Department of Defense Interim Rule

The Department of Defense Interim Rule, 53 Fed. Reg. 37,763 (Sept. 28, 1988) (to be codified at 48 C.F.R. pts. 223 & 252), requires that after October 1, 1988, a drug-free workforce clause be inserted in defense contracts that involve access to classified information or that are otherwise determined by the contracting officer to require such a clause for national security, safety, or health reasons.

To obtain and keep such a contract, a college or university must maintain a program for achieving a drug-free workforce among the employees working under the contract. The program must include four elements: an employee assistance program, supervisory training in detecting and dealing with illegal drug use, a confidential referral system, and a method of identifying illegal drug users.

The DOD has indicated in published questions and answers that the last of these requirements can be met only by random testing of employees in positions the contracting institution identifies as sensitive. Although the Interim Rule states that drug testing is not required where it would conflict with state or local law or existing collective bargaining agreements, if the collective bargaining agreement prohibits such testing, the issue must be a subject of negotiation at the next bargaining session. An employee found to be using drugs illegally may not continue to work under the contract. The Department of Defense anticipates issuing a revised final version of the rule later this year.

Conclusion

The new federal anti-drug rules impose substantial obligations and penalties. Higher education institutions should carefully determine which, if any, of the rules apply to them. Covered institutions must act promptly to ensure that their practices comply with the laws.

When implementing anti-drug programs, colleges and universities should be mindful of any additional state or local laws relating to drug policies, and of the potential for legal challenges by employees. ■

Resource Management

Stephanie Gretchen

Safety

Last May, **Tulane University**'s (LA) fire and safety division began conducting fire safety classes for the building services division. The physical plant department recommended the training for the division because building services employees spend more time in the buildings on a regular basis than other employees and are in the best position to spot fires and hazardous conditions. Classes addressed controlled and uncontrolled fires, location and operation of pull stations and fire extinguishers, various types of fire extinguishers and their uses, and conditions under which an employee should either try to extinguish a fire or pull the alarm and exit the building. The fire safety division is planning a series of these fire safety classes for each division within the physical plant department.

Stephanie Gretchen is assistant editor of Facilities Manager *and editor of* APPA Newsletter.

Working with asbestos seems to be a catch-22 situation where doing anything, including nothing, can be dangerous. The **University of Western Ontario** physical plant department made dealing with this substance a little easier while saving money. The department created "The Mustang," a portable work enclosure for performing work above ceilings containing asbestos. The Mustang eliminates the need for constructing a separate plastic enclosure each time the ceiling space is entered. Safety is also increased because there is no plastic to be punctured, which would allow asbestos fibres to escape. A HEPA filter-equipped vacuum is outside the enclosure, but the switch and an electrical supply are both inside so the worker can complete the job without leaving the enclosure. Because of the materials used in construction of the Mustang decontamination is easy. The University of Western Ontario physical plant saved $6,000 with the Mustang.

Advanced Classroom Technology

The physical plant department at **Indiana University/Bloomington** designed a state-of-the-art, computer-controlled audiovisual system for its large lecture halls. The system, first installed as a major component in the renovation of Ballantine 013, is a joint effort of the audiovisual center and the media resources and physical plant departments. The system allows students to see and hear from every seat in the room. The project, started in September 1984 with money from the university's general fund, provides instructors with control of chalkboards,

lights, the audio system, a 16mm motion picture projector, a 35mm slide projector, 1/2" and 3/4" videotape equipment, a television receiver, and a personal computer that projects images onto a wall-size screen. The instructor can control all the equipment from the lectern at the front of the room. Similar systems are planned for other large lecture halls, and the addition of a remote controller is planned. The IU Foundation is working on a patent for the system.

The Parking Dilemma

Parking seems to be an eternal thorn in the sides of colleges and universities. Some schools, however, do manage to squeeze out another few spaces through various alternatives. For example, the **University of Virginia** department of physical plant eased the problem by changing parking spaces to a 90-degree angle. **Eastern Michigan University** has attacked their parking dilemma on a larger scale. The institution's campus master plan includes a 1000-car, satellite parking lot and shuttle service. EMU's master plan focused on a pedestrian oriented campus, which would have parking available only on the outskirts. Copies of Susan A. Kirkpatrick's *Campus Planner*, which details the parking solution in addition to other items of interest, are available from Eastern Michigan University, Ypsilanti, MI 48197.

Flextime for Student Workers

Eastern Montana College decided if you can't beat them, join them. Richard Hedman, director of physical plant, explained that during the summer months the department hires ten to twelve students to maintain some of the college's eighty acres. The physical plant found that with students hired for eight hour days, five days a week, there was a high absentee and low productivity rate. The department decided to change the work day to include six-hour days, from 7:30 a.m. to 2:00 p.m. Their absentee rate went to nil and the students were happy to have the afternoon to "do as they pleased," according to Hedman. The result of the changed day was a savings of one quarter of the summer help budget, so both parties had better summers.

Refrigerant Recovery System

Especially in view of pressing environmental demands, the **University of Western Ontario**'s maintenance shop has made great strides for the environment and cost savings with their refrigerant recovery system. The system reclaims freon and cuts down on ozone depleting chlorofluorocarbons. Because there is no commercially available equipment for reclaiming large amounts of refrigerant, the personnel in the refrigeration shop built a recovery system at a cost of $500 in labor and materials. The system reclaims R11 and R113. During the first cooling season $1,200 worth of refrigerant was reclaimed. This winter they propose to reclaim $7,000 worth of refrigerant.

Public Service for Law Violators

Well, it is not exactly a chain gang, but the idea is similar. **Utah Valley Community College** maintenance department saved $36,488 and 10,710 staff hours by permitting law violators to pay their fines through public service work. Although UVCC is the only local governmental unit in Utah County to participate with the Corrections Field Services Office's program, Bob Clark, assistant director of physical plant, said in the April *Smoke Signals* that the program could be applied to other communities. The law violators work on ground maintenance, custodial services, or miscellaneous maintenance on UVCC's 692,732 total square footage. This system is not only innovative and cost cutting, but it also works well. Lynn Brough, director of physical plant, said in *Smoke Signals* that 75 percent of the law violators "are very effective."

Turf Research

Good news for people in the Southwest concerned about outdoor sports athletic injuries. Stephen T. Cockerham, leader of University of California, Riverside's sports turf research program said, "new perennial ryegrass varieties offer important safety features for football and baseball players. They provide better cushion during the winter months when bermudagrasses are dormant and less capable of recovery form the stress of high impact sports. The risk of player injury is reduced with better groundcover." In 1984, the latest year for composite figures, there were over 98,000 football-related injuries treated in hospital emergency rooms. It is hoped that some of the injuries caused by the unsafe fields can be avoided now with this new research. ■

Data Base Update

Howard Millman

THE BIG EASY: SUPERCALC 5

It has taken five versions, but Computer Associates has released the quintessential spreadsheet. Delivering full Lotus 1-2-3 compatibility, superb graphics, and enhanced printer control, Supercalc 5 (SC5) runs on computer systems ranging from XTs to PS/2s, and everything in between.

All well-bred spreadsheets, and that includes Lotus 1-2-3, offer enough sophistication to whirl numbers the way a cheerleader spins her baton. But the many powerful features found in SC5 lend themselves to much more than just maneuvering numbers. So why, when a better package comes along, do some computer users settle for dated software and limited ability rather than upgrade?

Market studies reveal that the cost of upgrading has little impact. People avoid upgrading to avoid the hassle of learning a new program's unfamiliar commands and keystrokes. With Release 5, Computer Associates finally addresses why some Lotus users conclude that even the promise of reaching the sweetest fruit doesn't warrant climbing the tree. So CA lowered the tree by crafting a superb spreadsheet offering total compatibility with Lotus.

To avoid droning on about the compatibility issue, suffice to say Supercalc 5 freely loads and saves 1-2-3's files and macros, so your investment in Lotus is preserved. What's more, SC5 offers an optional Lotus menu duplicating 1-2-3's terminology and "slash" commands. But, if you use this option you lose the benefits version 5 delivers. In addition to its eye-catching graphs, SC5 offers "3-D" linking of multiple spreadsheets, spreadsheet auditing, and extensively customized printouts.

New Features

Cell linking heads the list of new operating features. As an analogy, imagine each department in your division as a financially separate operation. These departments (such as security, grounds, carpentry/electrical/plumbing shops) each have their own individual budgets comprised of ten lines wages, fringe, materials, and petty cash. If you prepared a printed budget you would likely pull all these sub budgets together, place one on top of another, and top them with a recap sheet.

Even with a spreadsheet, every time a purchase order is cut you still have to manually change at least two numbers, one on the department's sheet and another on the recap sheet. With 3-D spreadsheets, however, when a change is made to any number in any of the underlying sheets all numbers related to it automatically change.

That is similar to what happened in the older spreadsheets, except the numbers all had to be on the same "page" (spreadsheet). Now it can be on other pages or in other files. The resultant gain in accuracy, speed and convenience (the three reasons we use computers) is more than worth the effort in setting up the links.

All commands controlling the spreadsheet's format, links, and math functions are leading letter selectable, function-key driven, or chosen by bracketing it with the highlight bar.

A four-line dialog box helps traverse SC's nested (one menu leads to another) menus by displaying a status, prompt, entry, and help line. When the terse help message proves inadequate, F1 summons more extensive context sensitive help. Plastic keyboard overlays, included with the package, serve as reminders by listing the numerous single and dual function key commands.

If a command string, formula, or macro look right, but the command refuses to execute, another new feature, Audit, reveals the relationships between cells and highlights errors in formulas and macros.

An especially powerful new feature, one that will be a boon to users needing a combination spreadsheet/data base, is the "data" option. Here, SC5 behaves as a data base with sophisticated sort and selection of fields and records. DATA expands SC's considerable "what if" forecasting and data analysis ability. Data base files are automatically converted when imported.

Release 5 also provides extensive printer control options for customizing hard copy printouts. Type treatments such as italics, bolding, and underlining, as well as lines, boxes, grids, and shading are available to add zip to your printouts. Type faces (fonts) may be assigned to a single cell, a range of cells, or an entire spreadsheet. Rows and columns can be titled.

Are words and numbers inadequate to express your point? Here's where SC5 surpasses other programs. It offers nine varieties of two- and three-dimensional word, bar, hi-lo, pie, area, and line graphs.

What if you cannot design your own printouts? Suppose your budgeting office requires data presented in a specific format. You can recreate those forms and then instruct SC5 to fill in the form's blanks with data drawn from spreadsheets.

Output devices include lasers, dot matrix printers, and plotters. For printing spreadsheets horizontally, Release 5 includes the popular printer utility, Sideways.

Despite these and its other features, SC5 runs on conventional XTs although it re-

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quires a minimum of 512K RAM. The new Lotus (Release 3.0), like Excel and Quattro, require the faster 286 ATs or 386 computers. For spreadsheets larger than Rhode Island, Supercalc will use up to 32Mbytes of (LIM 4.0) expanded memory.

An Ounce of Image

For maximum impact, present your graphs and data in full color. One problem surfaces with this idea: Although graphics provide great eyewash at presentations, who wants to lug a monitor and computer to meetings?

CA sidesteps this limitation by offering professional printed slides through Magicorp's slide making service. Users transmit their data files via modem or disk; Magicorp promises next day delivery of slides, transparencies, or prints.

Supercalc's new features touch on many aspects of creating, editing, and printing spreadsheets. Considering the mass and complexity of the program, head scratching is minimal. SC offers several levels of instructions to ease new users into its terminology and commands. These range from a disk-based tutorial to a concise indexed user's guide.

The network version of Supercalc allows file locking/sharing with password protection. A bundled file locking utility, Privacy Plus, enciphers files according to the federal data encryption standard. Supercalc's new features, options, graphics, and performance are, in a word, outstanding. Combine these with its total 1-2-3 compatibility, upgrading to SC5 warrants serious consideration by any spreadsheet user.

Supercalc's suggested retail is $495. Users switching from other spreadsheets can buy in for $100. The three user LAN versions are $495 additional. All purchasers receive six months free technical support; one year's additional tech support is $150. ■

The Bookshelf

Asbestos Abatement

Asbestos Abatement: Risks & Responsibilities, by Bureau of National Affairs. Washington: Bureau of National Affairs, Inc. 1987. 248 pp. $75, softcover.

Asbestos in Buildings, Facilities & Industry: Legal, Regulatory, Insurance & Economic Strategies edited by Courtney M. Price. Maryland: Government Institutes, Inc., 1987. 296 pp. $58, softcover.

It would appear that the proliferation of books and articles on asbestos has reached the point at which a graduate student at one of our fine universities could service the college community significantly and himself academically by preparing a compendium of books and articles on asbestos that is categorized in such a way that administrators would merely have to look up the area they are interested in and be referred directly to the various texts or articles specifically discussing their point of concern. Too many books and other materials are now available and administrators are having a time trying to select the most useful. Following are reviews of two books neither of which has a direct benefit or utility for the physical plant director. Both do, however, have a use in the industry and the compendium suggested above would identify such.

Asbestos In Building, Facilities, and Industry consists of a series of varying articles written by attorneys to discuss the legal, regulatory, insurance, and economic strategies associated with the asbestos problem in America.

The publication is not very well written, is outdated, and is far too legal in tone to be useful to the general physical plant director. While not specifically stated, the book's objective is to explain the large amount of litigation that has spawned as a result of the asbestos problem.

The first five articles of twelve discuss the legal perspective, the EPA, the OSHA, the Department of Transportation, and state regulatory efforts. Very little of the book deals with those aspects of asbestos that impact directly on the college or university. Rather it approaches the effects of asbestos in a generic sense.

Several of the individual authors attempt to bring together the various laws in an effort to explain one or more of the asbestos related responsibilities. However, the amount of legal terminology and referencing back and forth make the reading difficult and somewhat confusing. In addition, there are quite a few references to California laws and regulations that may or may not apply in other portions of the United States.

This text may have some value in certain fields, but not to directors of physical plants unless they have a real interest in the law portion of the responsibilities they have for asbestos control. I would not recommend this book as one that physical plant directors should have on their bookshelves.

Asbestos Abatement: Risks and Responsibilities, when initially published in 1987, would have been an excellent document for any physical plant director to have read. It is however, also outdated in that the material dates prior to and during 1986, and many things have happened with the asbestos problem since then. For example, on page 24 the report said, "If EPA does not issue final regulations by October 17, 1987, schools are instructed . . . ."

This book reports on the various aspects of the asbestos problem by summarizing much of the laws and regulations into a capsulated form that is readable and understandable. It reports on the public laws, the state laws, the involvement by unions, the general accounting office, different colleges, and universities, what actions are necessary by people responsible for asbestos control, what the abatement standards are, and so on. It is easily read and answers many questions that may come to mind by someone who is looking for general information on asbestos.

There are some twenty-two sections in the book beginning as most do with an introduction followed by highlights and then a lengthy description of Public Law 99-519, also known as the Asbestos Hazard Emergency Response Act or AHERA. That particular chapter describes the legislative history and then provides a section by section analysis of the law.

Subsequent chapters deal with the abatement standards, accreditation programs, emergency actions, insurance issues, asbestos in commercial buildings, asbestos in homes, financing abatement projects, asbestos as a pollutant, asbestos in the workplace, employee relations, control on future use of asbestos, international controls, asbestos litigation, and state asbestos laws. Each is concise and readable reporting the pertinent factors applicable through 1986. For example, the chapter on Emergency Action is two pages in length and relates how the EPA may act in emergencies and what its rights (and realities) are for cost recovery. Nothing in the chapter tells the school administrator how he or she may act in emergencies or how to recover his expenditures. The chapter on state asbestos laws is quite different from other texts that I have reviewed in that it reports on statutes enacted by thirty-two states. It records each state's laws on asbestos, the public laws in the state, the scope of those laws, who has administrative responsibility, what enforcement is available, what are the inspection standards, and the abatement procedures, and so on. It is a very useful section and one that is not too often found.

The next chapter summarizes several case studies including a school district, New York City, California State buildings, and the Potomac Electrical Power Companies (PEPCO) generating plants. It is an interesting section in that it provides a view of what each has done to manage its asbestos and to educate its employees. The subsequent chapter reports on selected news items and developments. The following three chapters provide resource material for individuals involved in the asbestos program. One is a resource directory, the next an appendix containing information on the public laws, different city laws, specific contractors, a sample of a college asbestos procedure and glossary.

The final chapter is a table of different cases that have been tried and where they are referenced within the book.

Considering the fact that this book has a price tag of $75 and that it is currently almost two years out of date, I wouldn't recommend anyone buying this particular issue, but if the Bureau of National Affairs has published a more current document, the new version might be worth a $75 expenditure.

This book is entitled as a special report by the Bureau of National Affairs and that is really what it is. It brings together many topics involving asbestos as they were being addressed through 1986 and makes them readable and understandable to the general public. Much of the reading today in asbestos books refers to laws and regulations often containing legal jargon that is difficult for the average reader to understand or follow. This particular book does not do that, although it references many of the laws and regulations that affect asbestos throughout the states and the federal government. The descriptions and wordage are such that it is quite easy for the average reader to comprehend.

As I had indicated earlier in this report the number of volumes coming out that deal with asbestos and asbestos problems has reached the saturation point and except for those that are more current and provide information on the most current aspects of the laws and regulations, it is difficult for a physical plant director to decide which books to have on the shelf, which to peruse and which to ignore. I suspect this problem is true in many of the other areas that are currently of concern to physical plant directors such as the Right-to-Know laws, the hazardous waste laws, and so forth.

I don't think that either of these two books at this time would be beneficial for a physical plant director to keep on his bookshelf. I do think, however, that if you could obtain a copy of the *Asbestos Abatement: Risks and Responsibilities* by the Bureau of National Affairs and had an opportunity to peruse it you would find it most interesting and in certain aspects valuable in answering a question or two.

Asbestos Abatement: Risk & Responsibility is available from SourceFinders Information Corporation, P.O. Box 758, Mount Laurel, New Jersey 08054. *Asbestos in Buildings, Facilities and Industry* is available from Government Institutes, Inc., 966 Hungerford Drive, #24, Rockville, MD 20850-1714.

—John J. Byrne
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Buffalo, New York

Managing Data Centers

Data Center Operations by Howard Schaeffer. Englewood Cliffs, New Jersey: Prentice Hall, 1987. 500pp. $48, hardcover.

Data Center Operations is written as a guide to directors or managers of data centers. It is a thorough undertaking, covering three broad subjects in detail. The subjects are data center planning, data center processing, and data center performance. As I read the first few chapters, the idea that this book was only for data center managers and not related to physical plant operations was slowly overcome.

Schaeffer's chapter on organization structure and management control reviews the five characteristics of traditional organization structure. He points out that these characteristics require careful consideration to attain precise meaning and scope. Structuring principles and structure types are discussed in an attempt to show their pros and cons. Guidelines for consideration of restructuring are given and pitfalls of restructuring are discussed. In one section entitled "Management Guidelines" the author gives some good indicators of success and problems within management. With a little imagination and substitution of "physical plant" for "data center," this chapter and the chapter on personnel is a good review for the top levels of a physical plant organization.

As we are all aware, increased sophistication in equipment, increased demand for goods and services by users, and increased regulation by governmental agencies have placed an increased demand on our management skills and skills of the personnel we hire. Schaeffer sets as a goal "to obtain competent personnel who, while obtaining satisfaction from their jobs, strive to obtain the objectives of the data center (physical plant)." Highlights in this chapter include career specifications—career paths, job requirements, salary ranges and responsibilities; personnel recruiting—with goals, precautions, and a process to improve the likelihood of hiring desirable personnel; personnel planning—with training programs to meet personal objectives and commitment to meet company objectives; personnel motivation and performance appraisal—stressing positive progress oriented interviews.

Schaeffer makes a case for zero-base budgeting as a means of defining objectives and justifying expenditures. He states pros and cons of charge-out systems and gives guidelines for deciding whether a charge-out system will work for an organization. The discussion of financial analysis is slanted towards data center costs and is difficult to relate to physical plants.

Standards and procedures are necessary in any user-based operation. Benefits of standards and procedures include control of efficiency, service, and costs while permitting technological and environmental changes to occur smoothly.

Schaeffer writes of four types of standards and procedures: administration, operating, contingency, and support services. While the standards and procedures are not the same, the types can be easily transferred to physical plant, and a seven phase procedure is presented for their development. Standards and procedures need enforcement, which is made easier by educating personnel as to the reasons behind these guidelines. Frequent monitoring, random testing, and occasional questioning of personnel reinforces good standards and procedures.

Schaeffer has written an excellent guide to effective planning, processing, and performance for data center operations. His discussions impart a good sound basis and reasoning process for making necessary decisions. Chapters of Schaeffer's book can easily be related to physical plant operations, since both data centers and physical plants are service organizations within a larger institution. There are, however, several chapters that are directed to data centers only. Since there are other books that focused more on physical plant operation and offer the same information as Schaeffer's book, I would not recommend this book for reading by other physical plant personnel.

Data Center Operations is available from Prentice-Hall, Inc. a division of Simon & Schuster, Englewood Cliffs, NJ 07632.

—Carl V. Thompson
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Wake Forest University
Winston-Salem, North Carolina

Plant Operations

Supervisors Guide to Custodial and Building Maintenance Operations Volume II, by Edwin B. Feldman, P.E. Irvine, California: Cleaning Management Institute, Inc., 1987. 261pp. $9.95 softcover.

All of us involved with custodial work know there is a solution; someone has spent the time and effort to research our custodial-related problems and discovered the answer. I thought so when I started reading Feldman's book. Well, he's made a good start, so good that I suggest a copy of the book be given to whomever you have in charge of your custodial department.

The introduction states that this guide (and Volume I) "are valuable as quick references for information concerning problems and decisions faced daily by supervisors and managers in the custodial/maintenance field." The book is then divided into five major categories: communication, motivation, leadership, organization and work performance. Each category includes a discussion of related topics within the main issue. While there are only five major categories the number of topics is extensive (almost 75) and varied, covering many of the issues custodial supervisors encounter daily. Got a problem with attitudes, stain removal, unions, sick-leave policy, sexual harassment, retirement? This guide can help.

The choice of the word "guide" in the title is appropriate. The book does not give answers, it guides you toward finding the answers. For instance, in the chapter "Testing your Housekeeping Management Capabilities" the author gives 80 questions with which a whole department can be rated. After I got started in rating my department, I found I had given up the idea of the rating and had become entranced with the ideas—why don't I have a departmental newsletter; why am I not getting a monthly report from the supervisors; should I start orientation training and/or classroom training; what happened to our procedural manuals?

Our campus encounters a considerable amount of vandalism, principally kids playing on elevators and breaking windows. I decided to test the book to see how it would help me with this problem. (Mind you, graffiti is not a significant problem.) I scanned "Vandalism: Can Anything be Done About It?" for an answer. I found nothing under "Reasons for Action," "Why do People Vandalize," "Security," "Apprehension and Punishment," and "Publicity." Somehow, I knew the article was going to help, so I reread it. By thinking through each of these subtopics and relating them to my problem, I discovered some potential solutions. Each evolved from the why, who, and when questions the subtopics generated.

The author states in the introduction that "the objective of this book is to guide the supervisor/manager towards more efficient department and worker operations through the incorporation of better organizational, communications, motivational and leadership skills." I think he succeeds. His is not the kind of text a student of

management would refer to, but rather the kind of book a practitioner would keep handy for ideas and direction.

Should this book be on the director's bookshelf? No, it should be on his desk; it is useful. P.S. I'm sending for Volume I.

—**Gary H. Kent**
Acting Director, Physical Plant
Buffalo State College
Buffalo, New York

Reference Manual

Physical Plant Operations Handbook, by K.L. Petrocelly. Atlanta, Georgia: AEE Energy Books, 1988. 233pp. $64, hardcover.

"Knowledge and gut instinct are the brick and block with which we build our reputations. This work is meant to provide you with the footing on which to begin construction," Says Petrocelly. To a limited extent the book succeeds.

I say limited because so much of what a physical plant director does is not discussed. For example, custodial activity is missing so is electrical, general plumbing, and carpentry. In fact, the only trades discussed are those impacting on the power plant and its related systems. Of the 214 pages 120 are devoted to text and 94 are appendices.

However, the author has done a decent job of "providing the footing" for a building manager who is just getting into the business, but the limited scope of the book does not provide enough useful materials to benefit most physical plant directors.

The author's approach is very down-home and thus easy-reading. The book is a one-nighter with some staying-power. Tidbits are tossed in at various points which catch the reader's attention and get him or her to think.

In the first 120 pages we are introduced to our new job as a plant director. Petrocelly establishes a routine, inventories the equipment (boiler systems, air conditioning systems and auxiliary equipment), introduces equipment troubleshooting; and explains preventive maintenance, water treatment, and power plant operations. He also gives some management aids, department operations, personnel considerations, project work, and assessment criteria. Obviously, a mere 120 pages on these topics limits the coverage.

The remaining 94 pages are devoted to appendices including an extract from the Ohio Stationary Steam Engineers License laws, a sample short-range management action plan, a sample budget distribution schedule, a sample Request for Quotations (RFQ), an outline of a work requisition system—including forms, a department assessment plan, and a series of engineering tables.

I don't think this book has enough useful material to benefit most physical plant directors. It is not an "operations handbook," but rather an introduction. If you run across this book at the library, while browsing, check it out, it will help you recall your first days as a plant manager.

Physical Plant Operation Handbook is available from AEE Energy Books, Department 226, The Association of Energy engineers, 4025 Pleasantdale Road, Suite 420, Atlanta, GA 30340.

—**Gary H. Kent**
Acting Director, Physical Plant
Buffalo State College
Buffalo, New York

Natural Gas

New Opportunities for Purchasing Natural Gas, by Anna Fay Williams and Leonard V. Parent. Lilburn, Georgia: AEE Energy Books, 1988. 359 pp. $75, hardcover.

Chapter one, "Opportunities in the Spot Market," describes the infrastructure and growth of the spot market and pros and cons for purchasers dealing in that market. The "spot market" or "direct purchase" market refers to the purchase of gas suppliers directly from the producer by a marketer, end-user, or local distribution company (LDC).

End-users are entering the spot market because they can save money on the price of natural gas. The Association of Physical Plant Administrators of Universities and Colleges estimated that its members could

save $500 million per year in gas costs during 1986. It is difficult to produce a precise savings amount, because of the varying price of natural gas and the numerous contract options, but the publisher suggests that up to 30 percent savings are possible.

With advantages come disadvantages. While the larger purchaser with more financial resources and alternate fuel sources can make some gains, the smaller buyer may face some difficulties and assume some risks. By dealing in the spot market you are undertaking responsibilities and risks for your own fuel deliveries. As the authors say, "Surplus exists today, but there is no guarantee that it will be there in the next few years." The end-user choosing to direct-purchase natural gas is leaving the relative safety and security of dealing with his regulated public utility, its contracts, established rate schedules, and stability. If spot market deals become unattractive or unavailable in the future, you are not guaranteed service by the utility, since you would have the status of a new customer in a time of possible curtailments or limited hookups.

This possibility suggests that contingency planning must be considered, if the end-user is relying on a single supplier. If you use an LDC or a pipeline affiliate, standby service may be available. In evaluating direct purchase of natural gas for your institution you must think about your degree of risk tolerance, your or your staff's capacity to deal in paperwork, and your willingness to manage the process closely by "blending long- and short-term commitments."

The next five chapters deal with topics related to the direct purchase of natural gas, as opposed to making purchases through a broker. This may not be of interest to most physical plant administrators because "contracting in the spot market may be compared to juggling . . . you hope that when you get one part of the deal arranged" the other part is still in place. "Agility is the name of the game." Most physical plant administrators will prefer the lower-risk, less troublesome but still money-saving method of buying gas through a broker.

Chapter seven, "Intermediaries in the Market," discusses brokers or marketers. There are several hundred firms that provide services in purchasing, selling, and reselling natural gas. Unfortunately, this chapter was not written with the end-user in mind. Its focus is on describing the brokerage industry and how it works, rather than telling us how to select or what to look for in a broker.

The final two chapters of *New Opportunities for Purchasing Natural Gas* are also not of interest to the college end-user: treating subjects of the LDCs and the future of the industry.

New Opportunities for Purchasing Natural Gas lacks focus. It is broadly written and contains an enormous amount of information. However, only a little of it is of interest or value to the typical college physical plant administrators. Everything you probably need to know could be contained in only a few pages.

This book was not written from a single point of view or to a single audience and it lacks clarity of purpose. Ineptly trying to cover all the bases, it winds up a confusing clutter.

For $75, *New Opportunities for Purchasing Natural Gas* should be much better produced than it is. There is no evidence that this was professionally edited or proofed. Misspelled words abound, wrong page numbers are displayed in the table of contents, and the printing is faint and hard on the eyes. Although the text includes a large amount of numerical information, there is no use of graphics, like pie charts, which otherwise might ease the reader's comprehension of information. This high incidence of misspellings and typos cast doubt on the accuracy of numerical values. The book has no introduction or executive summary, which would have helped the reader orient himself to the material being presented.

Other evidence of the careless production of this book is that the index is very short for a detailed technical manual, and nearly half the book is an appendix which is not indexed at all. This makes the appendix inaccessible, which is unfortunate because it contains some useful information.

There is little coordination between the text and the appendix; the two seem thrown together. Example: page 60 refers the reader to the appendix for a map of the nation's pipelines, but a search of the appendix turns up no such map.

Finally, the promotion for this book has been, I think, deceptive. The Winter 1989 catalog of the AEE Energy Books describes *New Opportunities for Purchasing Natural Gas* as "new," but it was apparently written in late 1986. Although copyrighted in 1988, the data in most tables do not extend past July 1986 and the footnoted references stop at December, 1986.

This book is poorly written, edited, and produced and contains only a little information of value to the physical plant administrator. I do not recommend this book.

New Opportunities for Purchasing Natural Gas is available from AEE Energy Books, Department 135, P.O. Box 1026, Lilburn, GA 30226.

—**Wayne Robertson, P.E.**
General Manager
Heery Energy Consultants, Inc.
Atlanta, Georgia

1987-88
Comparative Costs and Staffing Report

for College and University Facilities

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In Brief

Management

The authors of *The Power of Ethical Management*, Kenneth Blanchard *(The One Minute Manager)* and Norman Vincent Peale *(The Power of Positive Thinking)*, take the reader on a soul-searching excursion from which only good can emerge. This book is must-reading for everyone—no exceptions.

The authors prove that inethical behavior is related to self-esteem, in and that, inethical managers are winning managers. They assert that people who feel good about themselves have what it takes to withstand outside pressure and to do what is right rather than do what is merely expedient, popular, or lucrative. How often do we, as physical plant managers, find ourselves opting for the easy way out?

If you've read the *One Minute Manager* you are already familiar with the format of *The Power of Ethical Management*. In approximately 140 pages the authors assist a fictitious manager through an ethical dilemma while providing the reader with thought-enhancing ideas and practical guidelines for action. This book should be on your bookshelf at work and at home—it is that relevant.

—Gary H. Kent
Acting Director, Physical Plant
Buffalo State College
Buffalo, New York

The Environment of Leadership, by John S. Flanagan, is a 72-page, softcover book covering ten management topics and eleven specialized leadership techniques. Chapters include such topics as planning, organization and management, leadership as a way to solve problems, and effective supervision. In addition, the chapter, Specialized Leadership Techniques, contains information on conducting meetings, project, task force, inventory, maintenance, and procurement management, the management process, and other leadership methods. A sample format for problem solving, a bibliography, and an index are included. Cost is $8.95 plus postage and handling. Contact: Ridge Row Press, Attention: Business Office, 10 South Main Street, Montrose, PA 18801. The book is also available in many university and college bookstores.

Finances

The primary reason public colleges and universities have had to increase tuition at twice the inflation rate since 1980 is tied specifically to shortfalls in revenues from state and federal governments, according to *A Call for Clarity in Higher Education Finance: Income, Loans, Cost*, published by the American Association of State Colleges and Universities (AASCU). The book, part of the AASCU Issues series, is an economic primer that summarizes a variety of statistical and analytical sources to explain recent college cost trends.

The study summarizes three main aspects of the college cost debate: 1) the relationship between tuition increases and incomes of students and families; 2) the cost to higher education institutions of providing an education; and 3) the implications of the increasing reliance on loans in student financial aid, the Income-Contingent Loan Program in particular.

The book costs $5 ($6 for nonmembers) and is available from AASCU Publications, One Dupont Circle, Suite 700, Washington, DC 20036-1192; 202/293-7070.

Architecture

The eighth edition of the Ramsey/Sleeper *Architectural Graphic Standards*, prepared by the American Institute of Architects, is available. Sixty-five percent of the book is new or revised; 226 pages are new, 303 are revised and updated. More than 5,000 new illustrations are included. Three new sections on historic preservation, sports facility design, and energy design have been added. The largest edition ever, this 864-page book contains 811 technical pages and 10,000 illustrations. Cost is $150. Contact: John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10158-0012.

Radon

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