



SPOTLIGHT ON Maintenance

January 2003

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Building Operator Certification Program – A New Era for OPFMA

Editor's Note: This is the first in a year-long series of articles in Spotlight on Maintenance on the Building Operator Certification program being launched in Ohio with the strong support and involvement of Ohio Public Facilities Maintenance Association. This article provides a general introduction to the program and short discussion of OPFMA's general role. Subsequent articles will focus on specific aspects of the program, stories about the economic and other benefits for agencies whose employees have taken the course, impacts on the employees themselves, features on certain instructors in the program, and more information about OPFMA's role in the program as it evolves.

The Building Operator Certification (BOC) program has finally arrived in Ohio. Through its close relationship with Ohio Department of Development, Office of Energy Efficiency, OPFMA will play an important promotional role initially, then take on program administration by the middle or end of 2003. This program and OPFMA's significant role in it, fulfills a long-time vision and important goal of OPFMA.

The BOC program is intended for facilities personnel, including building operations, maintenance, and management staff. It is intended to provide a thorough and up-to-date overview of all building systems. Personnel who successfully complete the classes will receive a BOC Certification Card and have their certification status officially registered on the BOC national web site. The BOC Certification is officially recognized

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President's Message

By Larry Wiesen

It is with great pleasure that I write this message as your new President.

Much has changed in the past year, and yet, much more will change in the next. In 2002 we completed a restructuring of our Director position and hired a new Director who has implemented many internal changes.

The best news about the coming year is that the Building Operators Certification (BOC) program has arrived — with OPFMA playing a lead role. After 2 years of planning, the state of Ohio will launch the first course series at Columbus State Community College. The first class of the series will take place on February 21. In the near term, the program will be limited to the Columbus area. By the end of the year, OPFMA hopes to work with the State of Ohio to expand it in other parts of the state. It has long been a major goal of OPFMA to

provide educational programs of substance and tangible value to its members. This program represents the attainment of much of that goal. Please read our article in this issue of *Spotlight on Maintenance* for more information. We will feature other articles in subsequent issues this year.

As many of you know, we recently held a successful conference. Most comments from members were very positive. The conference is always the highlight of my OPFMA year. We see so many familiar faces, renew friendships and acquaintances, and make new friends. All of this plus the abundance of learning opportunities always make the conference worthwhile to me.

We learned some lessons that will enable us to plan and present a better conference in 2003. Mr. Constantin Draganoiu, our

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President's Message

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President-Elect is the Conference Chairperson for 2003. He is already working on job #1, developing a strong Conference Committee. Please contact Constantin or Sam Spofforth, our Director, in the OPFMA office if you are interested in serving on the Conference Committee. Service on this or any Committee is a rewarding task and an opportunity to make a valuable contribution to OPFMA's success. Please help if you can.

We've already identified the dates for next year's conference – November 19th and 20th, Wednesday and Thursday. The conference will take place in Columbus. We're tentatively planning to return to the Radisson Airport Hotel.

At our recent strategic planning meeting we took other steps to rebuild the organization. Most significantly we reorganized two standing committees. Our Education and Publications Committee will focus on marketing the BOC program and reorganizing our workshop series. The goal will be to offer workshops with proven value to members, including potentially being able to offer continuing education unit (CEU) credits. This committee also will focus on the newsletter and web site content. New Board member, Joe

Verbiar, will chair this committee, with help from former Past President, Tom Hirsch.

Our Membership and Marketing Committee will focus on increasing membership in all three major categories – institutions, active members (individuals), and associates (companies) by conducting outreach. This committee also will develop marketing materials emphasizing OPFMA's programs and the benefits for members. Ron Farthing will chair this committee.

If any member is interested in serving on any of our three committees, please contact Sam Spofforth, our Director, either by telephone or e-mail. Also, I invite you to visit our web site, which is regularly updated.

Last but not least, I want to thank Mr. Bill Tucker, our Immediate Past President, for all of his hard work and commitment to OPFMA. Bill guided us through some difficult decisions. He has been a loyal supporter of OPFMA for many years and I'm confident that he will remain so.

Thank you for your continuing support. I look forward to seeing and working with many of you in the upcoming year.



**Our internet presence
continues to grow.**

**Remember to give us your
email address and visit us at:**

www.opfma.org

BOC

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in Ohio plus 17 other states in a growing national network.

OPFMA members and others may sign up right now for the first course series to be offered. The series of seven classes (six lasting one day and one lasting two days) will occur monthly beginning on February 21. The fee for the seven class series is \$950. A second series that would begin during the late spring is in the planning stage. Students will be required to sign up, pay for, and take the entire course series — not just a few of the classes. All classes for the first and second series will be held at the main campus of Columbus State Community College. Much more complete information is available through links on the OPFMA web site, www.opfma.org.

What is Building Operator Certification (BOC)?

BOC is a professional certification for staff who operate and maintain commercial and public buildings. Operators earn certification by attending training sessions and completing project assignments in their facilities. The certification provides a credential for their professional development while also offering employers a way to identify skilled operators. The Ohio Department of Development, Office of Energy Efficiency has obtained a license for implementation of the program in Ohio from the Midwest Energy Efficiency Alliance. The program was developed by the Northwest Energy Efficiency Alliance.

BOC certifies individuals in energy and resource efficient operation of building systems at two levels: Level I - Building System Maintenance and Level II - Equipment Troubleshooting and Maintenance. Participants attend classes, take tests, complete in-facility projects, and receive Building

Operator Certification from the Northwest Energy Efficiency Council.

Each level of the certification program includes a series of seven classes, and each class covers a different topic of building operation. Sponsors of the BOC program have the flexibility to adjust topics of the classes to correspond with local needs, but in general, courses will include topics like the following:

Level I: Classes include topics such as a building systems overview, energy conservation techniques, HVAC systems and controls, efficient lighting, indoor air quality, and facility electrical systems.

Level II: Classes cover issues such as preventative maintenance and operations, advanced electrical diagnostics, HVAC troubleshooting and maintenance, HVAC controls and optimization, advanced indoor air quality, and motors in facilities.

In Ohio, there will be seven courses in each level. Classes will be scheduled once each month. Each class will last one day, except the class on HVAC systems, which will take two days to conduct. All classes will involve hands on “homework” assignments to be completed at the students’ facilities. Instructors will administer tests at the conclusion of each class. (See the sidebar for a more detailed description of the classes in the series.)

Program Successes

The program has proven to be successful at providing energy savings for facilities of participant. The Northwest Energy Efficiency Alliance found that over 65% of BOC certified operators are applying concepts learned in training and 26% undertake specific measures such as large energy con-

servation projects and indoor air quality improvements. They also estimate that the average annual per participant energy savings are 28,600 kWh. Obviously, this translates into enormous savings for facilities whose employees receive the training. A survey conducted for the Northwest Energy Efficiency Alliance, where the program was developed, estimated that facilities saved \$8,600 per year per employee who participated in the training.

Who Participates and What They Say About the Program

Facilities maintenance employees from numerous and varied private companies and government agencies have taken the courses and received Building Operator certification. The following is a partial list from the Northwest Energy Efficiency Alliance.

- Federal agencies: U.S. Navy, FAA, VA Medical Center, Madigan Army, GSA, Forest Service
- Major Private Companies including Boeing, Cisco Systems, Hewlett Packard, Corning, Frito Lay, Sharp Electronics, Home Depot, Sears, Doubletree Hotels, Marriott, and McDonald Miller
- Over twenty state agencies and municipal governments
- State universities in MA, NH and Oregon
- Over 40 school districts
- Others including Tri-Met Transit and the Boston Housing Authority

According to a survey done for the Northwest Energy Efficiency Alliance, facility managers and employees alike have high regard for the BOC program, based on their experience.

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“A survey ... estimated that facilities saved \$8,600 per year per employee who participated in the training.”

Building Operator Certification Course Descriptions

LEVEL I

Level I will be the first course offered in the Midwest. To become Level I certified, participants must attend seven classes (56 hours), and complete class exams and project assignments at your facility. The Level I course series consists of the following classes:

BOC 101 – BUILDING SYSTEMS OVERVIEW

Provides overview of preventive maintenance, energy efficiency principles, and fundamentals of building systems, equipment, and operations. Reviews heating, cooling, ventilation and control systems, water, lighting, and indoor air quality. Covers system interaction and relationship to overall building performance. Provides foundation for Level I certification courses. PROJECT: Facility and Equipment Floor Plan

BOC 102 – ENERGY CONSERVATION TECHNIQUES

Helps operators gain a better understanding of how energy is used in commercial buildings and how to identify and prioritize conservation opportunities. Includes basic principles of energy accounting, evaluation of fuel options, operation and maintenance strategies to improve efficiency, and energy management planning techniques. PROJECT: Energy Use Profile for Facility

BOC 103 – HVAC SYSTEMS AND CONTROLS (2-DAY)

Focuses on operation and maintenance of equipment and components typically found in commercial buildings, including central heating, cooling, air and ventilating systems in buildings. Provides introduction to automatic control systems and equipment, particularly for central air systems. Emphasis placed on group problem solving and exercises with respect to preventive maintenance. PROJECT: Heating System Operational Review

BOC 104 – EFFICIENT LIGHTING FUNDAMENTALS

Covers lighting fundamentals and types of lighting for economical and energy efficient lighting systems. Participants learn principles of efficient lighting including evaluation of lighting levels, quality and maintenance. Other topics include lighting fixture and control technologies, common upgrades, retrofit and redesign options, and management strategies as they apply to space use and function. PROJECT: Lighting Survey for Facility

BOC 105 – MAINTENANCE AND RELATED CODES

Provides an overview of health, safety, energy, and environmental codes that impact facility operation. Stresses how to comply with the requirements of the most important health and safety codes and how to use the energy and maintenance related codes to improve energy efficiency.

BOC 106 – INDOOR AIR QUALITY

Introduces the basic causes of indoor air quality problems and begins to develop a method of diagnosis and solution. Students will gain an understanding of the dynamic components of indoor air quality in relation to source control, occupant sensitivity and ventilation. Emphasis will be placed on communications with building occupants for reliable investigations without aggravating existing issues.

BOC 107 – FACILITY ELECTRICAL SYSTEMS

Develops an understanding of how electricity is distributed in a facility and common electrical distribution problems. This course will emphasize the fundamentals of electricity and its application to the workplace. PROJECT: Electrical Distribution Sketch for Facility.

“One of OPFMA’s ... highest priorities has been to offer a rigorous and comprehensive professional certification program for building operators. The BOC is such a program.”

BOC

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Employers believe BOC changes the way operations and maintenance is valued in the workplace. Over half plan to send additional staff and over ¾ believe that a BOC certificate is a positive factor when reviewing resumes. Large employers in many places are adopting BOC as the preferred professional development program for their maintenance staff.

Similarly, participants’ responses reflected the value of the program in professional and skill development. Students believe certification confers credibility. Half believe that their successful completion of the program will lead to increases in job responsibilities and promotion. Over 90% believe that it will or has improved job performance.

A New Era and a Bright Future

The OPFMA Board believes that the BOC program will open an exciting new chapter, indeed, a new era, for the organization, its members, and building operations and facilities administration staff throughout Ohio. One of OPFMA’s long standing and highest priorities has been to offer a rigorous and comprehensive professional certification program for building operators. The BOC is such a program. It will offer high value to our institutional and individual members. We are confident that it will facilitate renewed efforts to add new members, helping to build OPFMA as an organization and strengthen the facilities maintenance profession in Ohio generally for the benefit of those employed in the profession, taxpayers, and the general public.

If you have any questions or would like registration information about the first course series to be held at CSCC, please visit the OPFMA web site, www.opfma.org and follow the links. You also may call the OPFMA office at (614) 262-8620 or email us at office@opfma.org.



Advances in Glazing Materials for Windows

OPFMA Editor: This article comes from information produced by the Energy Efficiency and Renewable Energy Network (EREN) of the U.S. Department of Energy in May 2002. It provides an overview of the advances in glazing that can make windows more energy efficient. More information including links to web based resources are provided at the end of the article.

Until recently, clear glass was the primary glazing material used in windows. Although glass is durable and allows a high percentage of sunlight to enter buildings, it has very little resistance to heat flow. During the past two decades, though, glazing technology has changed greatly.

Research and development into types of glazing have created a new generation of materials that offer improved window efficiency and performance for consumers. While this new generation of glazing materials quickly gains acceptance in the marketplace, the research and development of even more efficient technologies continues.

and Air-Conditioning Engineers (ASHRAE), (2) are calculated for the entire window, including the frame, and not just for the center of the glass, and (3) represent the same size and style of window.

Today, several types of advanced glazing systems are available to help control heat loss or gain. The advanced glazings include double- and triple-pane windows with such coatings as low-emissivity (low-e), spectrally selective, heat-absorbing (tinted), or reflective; gas-filled windows; and windows incorporating combinations of these options.

Low-e Glazings: Low-e glazings have special coatings that reduce heat transfer through windows. The coatings are thin, almost invisible metal oxide or semiconductor films that are placed directly on one or more surfaces of glass or on plastic films between two or more panes. The coat-

ing of soft-coat films. Windows manufactured with low-e films typically cost about 10% to 15% more than regular windows, but they reduce energy loss by as much as 30% to 50%.

Although low-e films are usually applied during manufacturing, retrofit low-e window films are also widely available for do-it-yourselfers. These films are inexpensive compared to total window replacements, last 10 to 15 years without peeling, save energy, reduce fabric fading, and increase comfort.

Spectrally Selective Coatings: Spectrally selective (optical) coatings are considered to be the next generation of low-e technologies. These coatings filter out from 40% to 70% of the heat normally transmitted through clear glass, while allowing the full amount of light to be transmitted. Spectrally selective coatings can be applied on various types of tinted glass to pro-

“When comparing ... windows, you should ensure that all U- or R-values ... (1) are based on current standards set by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), (2) are calculated for the entire window, including the frame, and not just for the center of the glass”

Current Options that Increase a Window's Energy Efficiency

Manufacturers usually represent the energy efficiency of windows in terms of their U-values (conductance of heat) or their R-values (resistance to heat flow). If a window's R-value is high, it will lose less heat than one with a lower R-value. Conversely, if a window's U-value is low, it will lose less heat than one with a higher U-value. In other words, U-values are the reciprocals of R-values ($U\text{-value} = 1/R\text{-value}$).

Usually, window R-values range from 0.9 to 3.0 (and U-values range from 1.1 to 0.3), but some highly energy-efficient exceptions also exist. When comparing different windows, you should ensure that all U- or R-values listed by manufacturers: (1) are based on current standards set by the American Society of Heating, Refrigerating,

and Air-Conditioning Engineers (ASHRAE), (2) are calculated for the entire window, including the frame, and not just for the center of the glass, and (3) represent the same size and style of window.

When applied inside a double-pane window, the low-e coating is placed on the outer surface of the inner pane of glass to reflect heat back into the living space during the heating season. This same coating will slightly reduce heat gain during the cooling season.

Low-e films are applied in either soft or hard coats. Soft-coat low-e films degrade when exposed to air and moisture, are easily damaged, and have a limited shelf life, so they are carefully applied by manufacturers in insulated multiple-pane windows. Hard low-e coatings, on the other hand, are more durable and can be used in add-on (retrofit) applications. But the energy performance of hard-coat low-e films is slightly poorer than

ings typically face air spaces within windows and reduce heat flow between the panes of glass.

duce “customized” glazing systems capable of either increasing or decreasing solar gains according to the aesthetic and climatic effects desired. Computer simulations have shown that advanced glazings with spectrally selective coatings can reduce the electric space cooling requirements of new homes in hot climates by more than 40%. Because of the energy-saving potential of spectrally selective glass, some utilities now offer rebates to encourage its use.

Heat-Absorbing Glazings: Another technology uses heat-absorbing glazings with tinted coatings to absorb solar heat gain. Some heat, however, continues to pass through tinted windows by conduction and reradiation. But inner layers of clear glass or spectrally selective coatings can be applied with tinted glass to further

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SERVICE TECH
Full-page ad
P.U. from Sept./Oct. 2002 issue
(Keyline FPO)

OPFMA 2002 Awards Honor High Achievement

Cleveland Metroparks Employee, Franklin County, and Former OPFMA President Recognized at Conference



Wayne King accepts the **Facility of the Year** on behalf of the Franklin County Training Academy from Larry Wiesen.



Tom Hirsch accepts the **Distinguished Service Award** from Larry Wiesen.



Alan Tellep (center) accepts the **Award of Excellence** with Keith Kessler (left), his supervisor, Manager of Rocky River Park, OPFMA President.

Each year at the annual conference, Ohio Public Maintenance Association presents awards. The Award of Excellence recognizes one individual who exemplifies the standard of professionalism and outstanding day to day job performance. The award is open to any employee of a public facility in the state of Ohio. Facility of the Year was a new category created in 2002 to recognize truly outstanding examples of public facilities in Ohio. Both of these awards are given based on nominations from any OPFMA member. The third is the Distinguished Service Award, given to one individual who has made a particularly noteworthy personal contribution, usually over many years, to OPFMA. This recipient is chosen by the OPFMA Board of Trustees.

This year, OPFMA presented the Award of Excellence to Alan Tellep. Al is a thirty-year employee of Cleveland Metroparks. During that time, he has served in various skilled positions at Rocky River Reservation, a 3,600 acres park that receives over four million visitors annually. Al's responsibilities have included the maintenance of a large, diverse fleet of vehicles and equipment, complete facility maintenance, sewage treatment plant maintenance, grounds maintenance, special event planning, emergency preparedness and staff supervision.

According to Keith Kessler, Manager

of Rocky River Park, who nominated Al for the award, his accomplishments have included 1) designing a lighting system, resulting in increased efficiency and a reduction in energy consumption of approximately 16%; 2) a water consumption analysis resulting in a 20% reduction in domestic water usage, and much more. Keith also stressed his work ethic, contagious enthusiasm and dedication to our agency.

For Facility of the Year Award, OPFMA chose the Franklin County Training Academy. The recently completed Training Academy is a unique facility for the exclusive use of Central Ohio law enforcement personnel. Construction of the facility will involve several phases. The first was completed in May of this year. It includes pistol and rifle firing ranges with a control building and a Support Building. Future Phases will include more elaborate indoor training instruction areas (for physical fitness and self defense), an appropriate facility and area for the K-9 unit, complete dive facilities to train for underwater recovery, and a driving track with a drive skill/skid pad area.

As Marianne Barnhart, the person who nominated the facility put it, "This is truly a World-Class facility that will set the standard for future firing ranges everywhere." Marianne added that during the week that President Bush gave the Commencement Address at OSU, one of his advance

teams from the Secret Service used the facility to "zero in" their rifles. They stated that they had never seen such a high-quality firing range. Wayne King accepted the award on behalf of the County.

Finally, for Distinguished Service, OPFMA recognized Tom Hirsch. Tom's work with OPFMA dates back 15 years to the founding of the organization. He was a member of the Membership Committee for several years then served as its chairman in 1991. As chair of this committee, OPFMA's membership grew to over 500. In 1994 he was elected to the Board as the representative of K-12 public schools. After many more years of service as a Trustee, he served as Secretary Treasurer, then President-Elect in 2000. As such he chaired the Conference Committee. He served as President of the Association in 2001 and Past President in 2002.

Fortunately for OPFMA, Tom he has decided to remain actively involved with the organization by assisting new Board member and Chair of the Education and Publications Committee, Joe Verbiar, in efforts to develop OPFMA's role in the Building Operator Certification program.

OPFMA thanks each award recipient for their contribution to the facility maintenance industry in Ohio. For more information about the awards or recipients, please contact the OPFMA office.

Keys to Boiler Maintenance and Efficiency

OPFMA Editor: This article is taken from the USDOE Office of Energy Efficiency and Renewable Energy

Most medium-to-large facilities use boilers to generate hot water or steam for space heating, food preparation, and industrial processes. For boilers to run at peak efficiency, operators must attend to water chemistry, pumping and boiler controls, boiler and pipe insulation, fuel-air mixtures, burn-to-load ratio, and stack temperatures.

Every effort should be made to upgrade boiler systems to peak efficiency to reduce operating costs and environmental impacts. When replacing old equipment or installing new equipment, consider the advantages that multiple boiler systems offer. Multiple boiler systems are more efficient than single boilers especially under part-load conditions. Also, consider solar-assisted systems or biomass-fired boilers in place of conventional boiler systems.

Recent trends in boiler systems include: installing multiple small boiler units; lowering system pressures; decentralizing systems; and installing direct digital control (DDC) systems. Boilers that have efficiencies over 90% are available. Because these systems capture the latent heat of vaporization from combustion water vapor, flue gas temperatures are low enough to vent the exhaust through PVC pipes. PVC resists the corrosive action of flue gas condensate.

1. Add radiator controls. Radiators that operate at full output are common in older office buildings. Adding thermostatic valves that control hot water or steam output to each radiator enables occupants to maintain comfort without opening windows in the winter. In some situations, adding radiator controls can cut steam or hot water use by one-third.
2. Replace inefficient boilers. In newer units, more fuel energy goes into creating steam, so both stack

temperatures and excess oxygen are lower. Estimate efficiencies of existing units by measuring excess air, flue and boiler room temperatures, and percent of flue gas oxygen and carbon dioxide. Some utilities will provide this service free of charge.

3. Decentralize systems. Several smaller units strategically located around a large facility reduce distribution losses and offer flexibility in meeting the demands of differing schedules, and steam pressure and heating requirements. Estimate standby losses by monitoring fuel consumption during no-load periods.
4. Downsize. Strive to lower overall heating demands through prudent application of energy conservation measures. Smaller boilers may be staged to meet loads less expensively than large central plants. Many new units are designed to ease retrofit by fitting through standard doorways.
5. Modernize boiler controls. Direct digital controls (DDC) consist of computers, sensors, and software. DDCs allow logic-intensive functions such as optimizing fuel/air mixture based on continuous flue gas sampling, managing combustion, controlling feedwater and claim levels, and controlling steam header pressure.
6. Install an economizer. Install a heat exchanger in the flue to pre-heat the boiler feedwater. Efficiency increases about 1% for every 5.5°C (10°F) increase in feedwater temperature. If considering an economizer, ensure: (1) that the stack temperature remains higher than the acid dew point in order to prevent flue damage; and (2) that excess flue temperature is due to insufficient heat transfer surfaces in the boiler rather than scaling or other maintenance problems.
7. Install oxygen trim system. To optimize fuel/air ratio, these systems monitor excess oxygen in the flue gas and modulate air intake to the burners accordingly.
8. Install automatic flue dampers to reduce the amount of boiler heat that is stripped away by natural convection in the flue after the boiler cycles off.
9. Retrofit gas pilots with electronic ignition systems that are readily available.
10. Install air pre-heaters that deliver warm air to the boiler air inlets through ducts. The source of warm air can be the boiler room ceiling, solar panels, or solar-preheat walls. Managers should check with boiler manufacturers to ensure that alterations will not adversely alter the performance, void the warranty, or create a hazardous situation.
11. Add automatic blowdown controls. Uncontrolled, continuous blowdown is very wasteful. A 10% blowdown on a 200 psia steam system results in a 3% efficiency loss. Add automatic blowdown controls that sense and respond to boiler water conductivity and pH.
12. Add a waste heat recovery system to blowdowns. By capturing blowdown in recovery tanks and using heat exchangers to preheat boiler feedwater, system efficiency can be improved by about 1%.
13. Consider retrofitting boiler fire tubes with turbulators for greater heat exchange, after checking with your boiler manufacturer. Turbulators are baffles placed in boiler tubes to increase turbulence, thereby extracting more heat from flue gases.
14. Detect and repair steam leaks. Leaks in underground distribution pipes can go undetected for

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Hot vs. Cold Applied Roof Asphalt: Selecting the Right Application for Your BUR

By Greg Rudolph, TREMCO

Hot kettles often send building inhabitants into the streets and sometimes to the hospital because of fumes. In the past, odors were just a necessary evil when repairing or replacing a roof; but now fumes can be a thing of the past with cold bitumen products. Dollar for dollar hot applied products are less expensive than cold applied products; however cold products may be a more cost effective in the long run.

Determine the real costs.

When analyzing the actual cost of a roofing application, make sure you factor in some of the unforeseen costs that can occur during repair or replacement. Additional costs can include facility shut downs due to fumes, and potential future repairs due to original application errors. These additional costs can actually be more expensive in the long run than the pennies saved from hot application.

Ensure Adhesion.

When using hot applied asphalt, temperatures need to be at a minimum 390 degrees Fahrenheit for Type III asphalt (most common type of asphalt used for BUR). When mopping hot asphalt, felts need to be laid immediately to ensure proper adhesion at the required temperature. Depending on the climate, the temperature can cool below the necessary temperatures within seconds when this occurs voids are created, which eventually can lead to a blistering problem. Cold applied bitumen on the other hand does not have these strict application temperature requirement, therefore such problems are greatly reduced.

Eliminate Fumes.

Hot asphalt and cold tar pitch both emit fumes that can permeate several city blocks — a nuisance for surrounding buildings' inhabitants as well as your own. Cold process bitumen has a very

low odor, eliminating the potential of shutting down the building during roof installation.

Selecting a cold or hot system.

Cold-applied roof systems can offer building owners an alternative option, especially when the smell of roofing materials or closing the building for roofing repairs are not desirable. Additionally, here's a list of questions to ask when selecting your roof system.

- Does the building have a sensitive environment?
- Is the building a high rise or a roof with unique and hard to reach areas?
- Are health and safety or low-solvent products important in selecting roofing products?

If you answered "yes" to any of these questions, consider using a cold-process system when installing your BUR.

Duro-Last® Roofing, Inc.

Duro-Last® Roofing, Inc., headquartered in Saginaw, Michigan, manufactures a prefabricated, thermoplastic reinforced single-ply roofing system for flat and low-sloped buildings. Over 825 million square feet of Duro-Last membrane have been installed since 1978. Our customers have chosen Duro-Last because our roofing system is:

- Prefabricated. Every Duro-Last roof is measured and manufactured to exact size, accommodating every rooftop penetration. Prefabricating the roof in our controlled factory environment eliminates up to 85% of seaming that's done on-site during rooftop installation, and improves the long-term performance of the roofing system. This precise attention to detail ensures an excellent fit and delivers worry-free, leak-proof protection.
- Durable. The Duro-Last Roofing System is resistant to fire, chemicals, grease, high winds and punctures, and easily accommodates wide tem-

perature extremes. Duro-Last's custom flashing resists ponding water and helps solve roof problems before they can occur.

- Installed with no disruptions. Installation is quiet, fast, and safe. There are no loud machines, no hazardous materials, no noxious fumes, no hot tar, and no mess. In many cases, a new Duro-Last Roofing System can be installed over an existing roof without an expensive tear-off, virtually eliminating dust or falling debris that might interfere with building activities or damage sensitive equipment.
- Backed by the industry's best warranties. Duro-Last's written 15 or 20-year commercial warranties provide our customers with maximum protection. While other roofing manufacturers offer limited warranty coverage, Duro-Last provides the world's best material and labor warranties.
- Energy-efficient. Duro-Last is a leader in cool roofing solutions, and has introduced the Duro-Last Cool Zone™

brand to address the growing nationwide interest in energy efficient roofing systems. Duro-Last is proud to be a "charter partner" in the Energy Star® Roof Products Program, sponsored by the U.S. Environmental Protection Agency (www.energy star.gov).

Of the white, singly-ply roofing products rated by the Energy Star program, only the Duro-Last Cool Zone roofing system has retained re-reflectivity of greater than 85% after three years of weathering (based on Energy Star roof products testing procedures). This high, sustained reflectivity is saving significant energy and money for building owners all over the U.S.

The Duro-Last Roofing System is a proven product, backed by a nationwide customer service network. We're committed to delivering the information and support our customers need in order to make good decisions about their roofing investment. Please contact us at 800-248-0280 or sales@duro-last.com.

The Cold Hard Facts on Roofing.



Facts: Tremco's Cold Process Adhesive

- SAFE—no flames, hot kettles or fire risks
- Reduces start-up time and equipment needed for job
- Adhesion not temperature dependent
- Material can be pumped to limited access areas
- Low odor, less offensive to building occupants
- Not Red Label. Ships and stores at lower cost
- Readily used in restrictive areas like schools and hospitals
- Welds ply sheets forming monolithic membrane
- Environmentally friendly

TREMCO

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Glazing Materials

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reduce this heat transfer. Heat-absorbing glass reflects only a small percentage of light and therefore does not have the mirror-like appearance of reflective glass.

Gray- and bronze-tinted windows reduce the penetration of both light and heat into buildings in equal amounts (i.e., not spectrally selective) and are the most common tint colors used. On the other hand, blue- and green-tinted windows offer greater penetration of visible light and slightly reduced heat transfer compared with other colors of tinted glass. When windows transmit less than 70% of visible light, plants inside could die or grow more slowly. In hot climates black-tinted glass should be avoided because it absorbs more light than heat.

Reflective Coatings: Like black-tinted coatings, reflective coatings greatly reduce the transmission of daylight through clear glass. Although they typically block more light than heat, reflective coatings, when applied to tinted or clear glass, can also slow the transmission of heat. Reflective glazings are commonly applied in hot climates in which solar control is critical; however, the reduced cooling energy demands they achieve can be offset by the resulting need for additional electrical lighting.

Tomorrow's Options for More Efficient Windows

"Superwindows" now coming on the market can attain high thermal resistance by combining multiple low-e coatings; low-conductance gas fills; barriers between panes, which reduce convective circulation of the gas fill; and insulating frames and edge spacers.

Also, optical properties such as solar transmittance can be customized for specific climate zones. The heat from even a small amount of diffuse winter sunlight will convert these super-windows into net suppliers of energy. This first generation of superwindows now available have a center-of-glass R-value of 8 or 9, but have an overall window R-value of only about 4 or 5 because of edge and frame losses.

Also under development are chromogenic (optical switching) glazings that will adapt to the frequent changes in the lighting and heating or cooling requirements of buildings. These "smart windows" will be separated into either passive or active glazing categories.

Passive glazings will be capable of varying their light transmission characteristics according to changes in sunlight (photochromic) and their heat transmittance characteristics according to ambient temperature swings (thermochromic). Active (electrochromic) windows will use a small electric current to alter their transmission properties. Both types should be on the market within 2 to 5 years.

Conclusion

No one type of glazing is suitable for every application.

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Glazing Materials

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Many materials are available that serve different purposes. Moreover, consumers may discover that they need two types of glazing for a home because of the directions that the windows face and the local climate. To make wise purchases, consumers should first examine their heating and cooling needs and prioritize desired features such as daylighting, solar heating, shading, ventilation, and aesthetic value.

Source List

The Energy Efficiency and Renewable Energy
Clearinghouse (EREC)
(800) DOE-EREC (363-3732)
Email: doe.erec@nciinc.com

Efficient Windows Collaborative,
Alliance to Save Energy
(202) 530-2245
ewc@ase.org

National Fenestration Rating Council (NFRC)
(301) 589-6372
Email: info@nfr.org

Windows & Daylighting Group
Lawrence Berkeley National Laboratory
1 Cyclotron Road, MS 90-3111
Berkeley, California 94720

Window & Door Manufacturers Association
(800) 223-2301
Email: admin@wdma.com

For a complete list including addresses and descriptions visit www.eren.doe.gov/erec/factsheets/windows.html.

Boiler Maintenance and Efficiency

...Continued from page 8

years. Monitor blowdown and feedwater to help detect these leaks.

15. Reduce excess air to boiler combustion. The common practice of using 5000 to 10000 excess air decreases efficiency by 5%. Work with the manufacturer to determine the appropriate fuel/air mixture.
16. Insulate boiler and boiler piping. Reduce heat loss through boiler walls and piping by repairing or adding insulation. The addition of 2.5cm (1 inch) of insulation can reduce heat loss by 80% to 90%.

Proper operation and maintenance is the key to efficient boiler operation. Any large boiler plant should maintain logs on boiler conditions as a diagnostic tool. When performance declines, corrective action should be taken.

Reduce soot and scale. Deposits act as insulation on heat exchangers and allow heat to escape up the flue. If the stack temperature rises over time under the same load and fuel/air mixture, and deposits are discovered, adjust and improve water chemistry and fuel/air mixture accordingly. Periodically running the system lean can remove soot.

On systems operating with negative pressure, air may enter the system after the combustion process and give false indications of excess air measured with flue gas oxygen.