PLANNING GUIDE for MAINTAINING SCHOOL FACILITIES

School Facilities Maintenance Task Force
National Forum on Education Statistics
and the Association of School Business Officials International (ASBO®)

Sponsored by the National Center for Education Statistics and the National Cooperative Education Statistics System

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Content Contact:
Lee Hoffman, (202) 502-7356

MEMBERS OF THE SCHOOL FACILITIES MAINTENANCE TASK FORCE

Chair

Roger Young, *Executive Director of Business,* Haverhill Public Schools, Massachusetts

Members

John P. Bowers, *Consultant,* Facility Management Consultants, LLC, Belding, Michigan

Edward H. Brzezowski, P.E., *Consulting Engineer,* Facility Energy Services, Inc., Chester, New Jersey

Janet Emerick, *Superintendent,* Lake Central School Corporation, Indiana

Mary Filardo, *Executive Director,* The 21st Century School Fund, Washington, DC

Joan Hubbard, *Facility Management Consultant,* St. Louis, Missouri

Christine Lynch, *Administrator,* School Building Assistance, Massachusetts Department of Education

Judy Marks, *Associate Director,* National Clearinghouse for Educational Facilities, Washington, DC

Patricia Murphy, *Budget Administrator,* Utah State Office of Education

Frank Norwood, *Director,* Maintenance and Operations, Katy Independent School District, Texas

Timothy Shrom, *Business Manager,* Solanco School District, Pennsylvania

John Sullivan, *Administrator,* School Business Services, Massachusetts Department of Education

David Uhlig, *Coordinator,* Data Information Systems, Charlottesville City Public Schools, Virginia

Consultant

Tom Szuba, *Education Research Consultant,* Charlottesville, Virginia

Project Officer

Lee Hoffman, National Center for Education Statistics, Washington, DC

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Joe Agron, *Editor-in-Chief,* American School and University Magazine, Overland Park, KS

Karen Anderson, Alliance to Save Energy Green Schools Program, Washington, DC

Bill Archer, *Supervisor of Electrical Trades,* Grand Rapids (MI) Public Schools

Mitch Bart, *Director of Facilities,* Kent (MI) ISD

Bruce Beamer, *Director of Business,* Clarkston (MI) Schools Services

Jim Biehle, *AIA,* Inside/Out Architecture, Inc. Clayton, MO

Jerry Blizzard, *Director of Maintenance,* Crosby (TX) ISD

Daniel Boggio, *President,* PBK Architects, Houston, TX

Don Bossley, *Director of Maintenance,* Cleveland (TX) ISD

Matthew Browne, *Energy Manager,* Alief (TX) ISD

Clint Byard, *Director of Buildings and Grounds,* Jonesboro (AR) Public Schools

Stephen Calvert, *Building & Grounds Supervisor,* Region IV ESC, Houston, TX

Patty Cammack, *Commercial Account Manager,* HVAC Mechanical/Trane, Houston, TX

C.G. Cezeaux, *Director of Operations,* Spring (TX) ISD

Peter Cholakis, *Vice President,* Marketing VFA, Inc. Boston, MA

Mike Clausen, *Executive Director of Operations,* La Port (TX) ISD

Nancy Comeau, *Industrial Hygiene Supervisor,* Commonwealth of Massachusetts

Leo Consiglio, Lincoln Park (MI) School District

Cheryl Corson, *Communications Manager,* National Clearinghouse for Educational Facilities Washington, DC

Lawrence B. Curlis, *Operations Manager,* Fort Bend (TX) ISD

John Ewen, *Support Services Director,* East Lansing (MI) Public Schools

Jim Farrington, *Maintenance Coordinator,* Sheldon (TX) ISD

Michael A. Feeney, *Chief,* Emergency Response/Indoor Air Quality Program, Massachusetts Department of Public Health

Randall Fielding, *Editor,* DESIGN SHARE, Inc. Minneapolis, MN

Josephine Franklin, *Program Development Manager,* National Association of Secondary School Principals Reston, VA

Harry Galewsky, P.E., *Mechanical and Electrical Engineering Consultant,* Beaumont, TX

Gene Grillo, *President,* Bradford Environmental Consultants, Bradford, MA

Paul Gutewsky, *Maintenance Manager,* Lamarc (TX) ISD

Charles T. Hall, Siemens Building Technologies, Inc. K-12 Performance Solutions Team, Buffalo Grove, IL

Len Hampton, Walnut Valley (CA) Unified School District

Jim Hayden, *Director of Buildings and Grounds,* Pinckney (MI) Community Schools

Michael Hayden, *Director of Operations & Maintenance,* Carson City-Crystal Area (MI) Schools

Don Hebeler, *Operations Supervisor,* Wyoming (MI) Public Schools

Willie Huggins, *Director of Maintenance,* Klein (TX) ISD

Brad Hunt, *Business Manager/Board Secretary,* Gettysburg Area (PA) School District

Andrew Kezanas, *Sales Director,* Envirotest, Inc. Houston, TX

Susan Lang, *Executive Director,* Association of School Business Officials of Alberta Edmonton, Alberta, Canada

Keith Langford, *HVAC Supervisor,* Stafford (TX) Municipal School District

Reagan LaPoint, *President,* Buckeye Cleaning Center Houston, TX

Barbara Kent Lawrence, *Coordinator,* School Community Facilities Network, The Rural School and Community Trust, Washington, DC

Gregory L. Lookabaugh, *Director,* Facilities Services Customer Support Services, Region IV Educational Service Center, Houston, TX

Lois Mastro, *Assistant Professor,* University of Arkansas at Little Rock

Patrick McCarthy, *Regional Sales Manager,* Canberra Corporation, Dallas, TX

Kathy McDonald, *Manager of Custodial Services,* Spring Branch (TX) ISD

Charles D. McGinnis, *Facilities Director,* South Lyon (MI) Community Schools

Heidi O'Brien, *Deputy Regional Director,* Bureau of Waste Prevention, Massachusetts Department of Environmental Protection

Kagan Owens, *Program Director,* Beyond Pesticides National Coalition Against the Misuse of Pesticides Washington, DC

Cathy Phillip, *Operations Manager,* Lakeland (IN) School Corporation

Ed Poprik, *Director of Physical Plant,* State College (PA) Area School District

Paul Potts, Kingscott Associates, Kalamazoo, MI

James Reed, *Maintenance Supervisor,* Crosby (TX) ISD

Lawrence Reeves, *Director of Maintenance & Operations,* Pearland (TX) ISD

Bernie Rice, Garden City (MI) Public Schools

David Rieger, Grand Rapids (MI) Public Schools

Emitte A. Roque, *Executive Director of Buildings & Property,* Aldine (TX) ISD

David Sanders, *Director of Support Services,* Friendswood (TX) ISD

Fred Schossan, *Director of Physical Operations,* Oak Park (MI) Public Schools

John Spencer, *Facilities Manager,* Portage (MI) Public Schools

Calvin Stockman, *President,* Growth Group, Inc., Scottsdale, AZ

Michelle Tanem, *Marketing Manager,* Education Johnson Controls, Inc., Milwaukee, WI

John E. Thames, *Director of Maintenance,* Aldine (TX) ISD

John Thompson, *Director of Operations & Maintenance,* Fraser (MI) Public Schools

Jack Timmer, *Director of Building Operations,* Grandville (MI) Public Schools

Glynn Turner, *Air Conditioning Technician,* Sheldon (TX) ISD

George Waldrup, Hartland (MI) Schools

Charles Weaver, *Vice President,* Educational Facilities Kennedy Associates, Inc., St. Louis, MO

Donald Yeoman, *Superintendent,* Tri-Creek (IN) School Corporation

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EXECUTIVE SUMMARY

Facilities problems affect teaching and learning, student and staff health, day-to-day building operations, and the long-range fiscal health of the entire education organization. To some people's surprise, facilities problems are less a function of geography or socioeconomics and more directly related to staff levels, training, and practices—all of which can be controlled by the organization. Thus, every school district should plan to meet the challenges of effective facilities maintenance. It is simply too big and too important of a job to be addressed haphazardly.

As America's school buildings age, we face the growing challenge of maintaining the nation's education facilities at a level that enables our teachers to meet the needs of 21st century learners. Facilities issues arise at all educational levels, from prekindergarten through postsecondary, and at all sites, from classrooms to administrative offices. Challenges arise in new and old facilities alike, although the types of concerns may differ.

Because routine and unexpected maintenance demands are bound to arise, every education organization must proactively develop and implement a plan for dealing with these inevitabilities. A sound facilities maintenance plan helps to ensure that school facilities are, and will be, cared for appropriately. Negligent facilities maintenance planning can result in real problems. Large capital investments can be squandered when buildings and equipment deteriorate or warranties are invalidated. Failure to maintain school facilities adequately also discourages future investment in the public education system.

However, school facilities maintenance is concerned about more than just resource management. It is about providing clean and safe environments for children. It is also about creating a physical setting that is appropriate and adequate for learning. A classroom with broken windows and cold drafts doesn't foster effective learning. But neither does an apparently state-of-the-art school that is plagued with uncontrollable swings in indoor temperature.

This *Planning Guide* is designed for staff at the local school district level, where most facility maintenance is planned, managed, and carried out. This audience includes school business officials, school board members, superintendents, principals, facilities maintenance planners, maintenance staff, and custodial staff. The document is also relevant to the school facilities interests of state education agency staff, community groups, vendors, and regulatory agencies.

The *Planning Guide* has been developed to help readers better understand why and how to develop, implement, and evaluate a facilities maintenance plan. It focuses on:

- ✓ school facility maintenance as a vital task in the responsible management of an education organization
- ✓ the needs of an education audience
- ✓ strategies and procedures for planning, implementing, and evaluating effective maintenance programs
- ✓ a process to be followed, rather than a canned set of "one size fits all" solutions
- ✓ recommendations based on "best practices," rather than mandates

The document offers recommendations on the following important issues, which serve as chapter headings:

- ✓ Introduction to School Facilities Maintenance Planning
- ✓ Planning for School Facilities Maintenance

- ✓ Facilities Audits (Knowing What You Have)
- ✓ Providing a Safe Environment for Learning
- ✓ Maintaining School Facilities and Grounds
- ✓ Effectively Managing Staff and Contractors
- ✓ Evaluating Facilities Maintenance Efforts

The *Planning Guide for Maintaining School Facilities* is the product of the National Cooperative Education Statistics System and the collaboration of the National Forum on Education Statistics *(http://nces.ed.gov/forum)* and the Association of School Business Officials International (ASBO®) *(http://www.asbointl.org)*. The project was sponsored by the National Center for Education Statistics (NCES) *(http://nces.ed.gov)*, U.S. Department of Education. Roger Young *(ryoung@haverhill-ma.com)*, Haverhill (MA) Public Schools, chaired the Forum's School Facility Maintenance Task Force, which was charged with developing the document. Lee Hoffman managed the project for the National Center for Education Statistics.

This document is available electronically at no cost via the World Wide Web at *http://nces.ed.gov/forum/publications.asp*. One free copy of the *Planning Guide for Maintaining School Facilities* can be ordered from the U.S. Department of Education's ED PUBS Online Ordering System at *http://www.ed.gov/about/ordering.jsp* or 877-4-ED-PUBS. Multiple copies can be ordered for a fee at the U.S. Government Online Bookstore at *http://bookstore.gpo.gov/index.html* or 888-293-6498. For more information about this *Planning Guide* or other free resources from the National Forum on Education Statistics and the National Center for Education Statistics, visit *http://nces.ed.gov/*.

EXPERIENCE AT THE LOCAL, STATE, AND NATIONAL LEVELS SUGGESTS THAT EFFECTIVE SCHOOL FACILITY MAINTENANCE PLANNING CAN:

- contribute to an organization's instructional effectiveness and financial well-being
- improve the cleanliness, orderliness, and safety of an organization's facilities
- reduce the operational costs and life-cycle cost of a building
- help staff identify facilities priorities proactively rather than reactively
- extend the useful life of buildings
- increase energy efficiency and thereby help the environment

USE THIS PLANNING GUIDE!
Readers **are permitted** to modify, customize, and reproduce any part of this document.

PREFACE: ABOUT THIS *PLANNING GUIDE*

The National Center for Education Statistics, the National Forum on Education Statistics, and the Association of School Business Officials International (ASBO®) are pleased to provide this *Planning Guide* to education administrators, facilities staff, community members, and other individuals who are interested in the responsible management of our nation's school facilities. We believe that investing in the proper maintenance of school facilities is both a sound business and wise pedagogical decision.

A primary objective of this *Planning Guide* is to provide effective and practical recommendations for school facility maintenance planning in a user-friendly format. Thus, each chapter includes:

- ✓ **Table of Contents –** to provide an overview and simplify navigation within the chapter
- ✓ **Chapter Goals –** to state the major purposes of the chapter
- ✓ **Best Practice Recommendations –** to describe how to accomplish the goals
- ✓ **Vignettes –** to show how maintenance issues can play out in the real world
- ✓ **Commonly Asked Questions –** to address anticipated concerns of readers
- ✓ **Checklists –** to summarize recommendations
- ✓ **Additional Resources –** to point readers to related information

While it is hoped that all of the information in this *Planning Guide* is valuable to facilities maintenance planners, some points stand out as being particularly important. To better emphasize these points, a few symbols are used throughout the document:

A "little birdie" isn't telling you, but the "maintenance eagle" is…
The "maintenance eagle" signifies a vignette that illustrates how good facilities maintenance (or a lack thereof) can play out in the real world.

"Key" points…
The ring of keys (which can sometimes be seen hanging from the belt of school facilities maintenance workers) signifies especially important, or "key," points.

"On the road" to the Web…
The school bus points to additional valuable resources that are available in print or on the World Wide Web.

CHAPTER 1
INTRODUCTION TO SCHOOL FACILITIES MAINTENANCE PLANNING

GOALS:

- ✓ **To explain how clean, orderly, safe, cost-effective, and instructionally supportive school facilities enhance education**
- ✓ **To introduce the purpose, structure, and format of the *Planning Guide***

When maintaining a school, we pay not only for bricks and mortar, but also student and staff well-being. Effective school maintenance protects capital investment, ensures the health and safety of our children, and supports educational performance.

Table of Contents:

Why Does Facilities Maintenance Matter? 1
Who Should Read This Document? 2
In a Nutshell… 4
Planning Guide Framework 5
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WHY DOES FACILITIES MAINTENANCE MATTER?

As America's school buildings age, we face the growing challenge of maintaining school facilities at a level that enables our teachers to meet the needs of 21st century learners. While the construction of new school facilities supports this task, many older buildings have developed modularly over time. A 1920s-era school may have gotten an addition in 1950, which in turn got an addition in 1970, and yet another addition in 1990. The task of caring for these old school buildings, some of which are historically or architecturally significant, at a level that supports contemporary instructional practices is substantial. At the same time, maintaining the finely tuned workings of new, more technologically advanced facilities also demands considerable expertise and commitment.

Thus, it is perhaps not surprising that facilities issues arise at all educational levels, prekindergarten through post-secondary, and all sites, both school buildings and administrative offices alike. Challenges arise in both new and old facilities, although the types of concerns may differ. For example, even a brand-new building may have problems with inadequate air circulation, which can lead to indoor air quality (IAQ) problems unless remedied. Older buildings, on the other hand, more frequently face age-related issues such as inefficient energy systems that can lead to uncomfortable indoor climate and high utility bills.

What causes facilities problems? Certainly extreme environmental conditions and a lack of maintenance funding contribute to building deterioration. But many facilities problems are not a function of geography or socioeconomic factors but are, instead, related to maintenance staffing levels, training, and management practices.

PAY ME NOW OR PAY ME LATER

"Pay me now or pay me later," barked the man on the TV commercial for car oil filters. The underlying message in the ad was clear: If you spent a few dollars now to change the filter in your car, you could avoid more expensive repairs in the future. This is "preventive maintenance" in its simplest form—spending a little money now to perform regular inspections and maintenance in order to minimize future big-ticket costs and prolong the functional lifetime of buildings and equipment.

-Frank Norwood, *Director of Maintenance & Operations,* Katy (TX), Independent School District
(Adapted with permission from the Texas Association of School Business Officials)

Because we know that routine and unexpected maintenance demands are bound to arise, every education organization must proactively develop and implement a plan for dealing with these inevitabilities. Thus, an organization must plan to meet the challenges of effective facilities maintenance. It is simply too big of a job to be addressed in a haphazard fashion. After all, the consequences affect teaching and learning, student and staff health, day-to-day building operations, and the long-range fiscal outlook of the organization.

A sound facilities maintenance plan serves as evidence that school facilities are, and will be, cared for appropriately. On the other hand, negligent facilities maintenance planning can cause real problems. Large capital investment can be squandered when buildings and equipment deteriorate or warranties become invalidated. Failing to maintain school facilities adequately also discourages future public investment in the education system.

However, school facilities maintenance is concerned about more than just resource management. It is about providing clean and safe environments for children. It is also about creating a physical setting that is appropriate and adequate for learning. A classroom with broken windows and cold drafts doesn't foster effective student learning. However, neither does an apparently state-of-the-art classroom that is plagued with uncontrollable swings in indoor temperature, which can negatively affect student and instructor alertness, attendance, and even health.

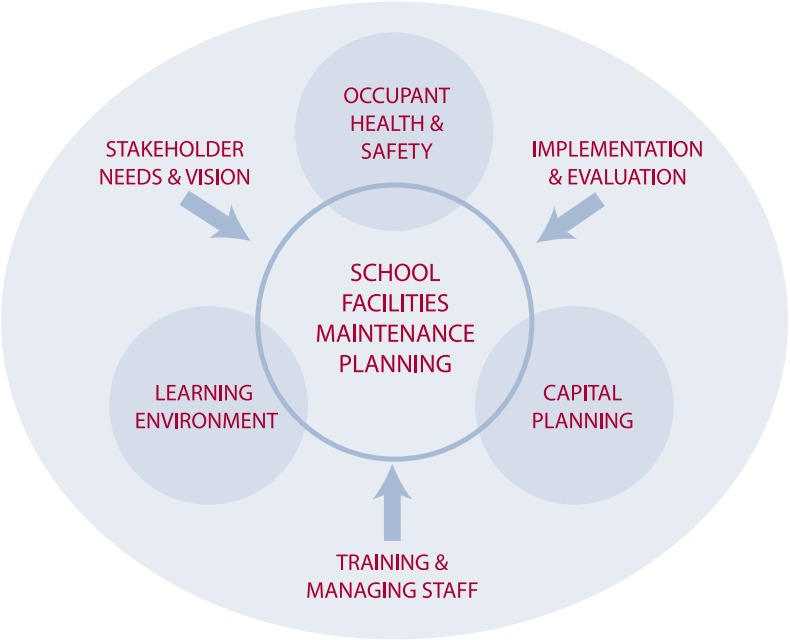
School facilities maintenance affects the physical, educational, and financial foundation of the school organization and should, therefore, be a focus of both its day-to-day operations and long-range management priorities.

Effective facilities maintenance extends the life of older facilities and maximizes the useful life of newer facilities.

WHO SHOULD READ THIS DOCUMENT?

Meeting legal standards with regard to facilities maintenance is the bare minimum for responsible school management. Planners must also strive to meet the spirit of the laws and the long-term needs of the organization.

Because facilities maintenance planning is constrained by real world budgets, planners must often think in terms of trade-offs. Thus, they must weigh routine tasks against preventive maintenance that pays off only over



School facilities maintenance affects the physical, educational, and financial foundation of the school organization and should, therefore, be a focus of both its day-to-day operations and long-range management priorities.

the long run, while always needing to be prepared for emergency responses to broken air conditioners, cracked pipes, and severe snow storms. The difficult job of planning for facilities maintenance is most effective when it relies upon up-to-date information about the condition and use of buildings, campuses, equipment, and personnel. Thus, staff who are intimately involved in the day-to-day assessment, repair, and maintenance of school facilities must also play an active role in the facilities maintenance planning process. Yet facilities maintenance planning is not solely the responsibility of the facilities department. Effective planning requires coordination of resources and commitment at all levels of the education organization.

Our vision for this *Planning Guide for Maintaining School Facilities* is to encourage information-based decision-making in this crucial, yet often overlooked, aspect of schools management. Because no two school districts face precisely the same challenges, this *Planning Guide* does not attempt to provide a single template for an all-inclusive facilities maintenance plan. Rather it focuses on best practices that can be undertaken to develop a plan that meets the unique needs of an education organization.

GOOD FACILITIES MAINTENANCE COSTS MONEY…

There is no question about it. But unlike many other investments, the return on the expenditure may not result in increased revenues. Instead, facilities maintenance produces savings by:

1. decreasing equipment replacement costs over time
2. decreasing renovation costs because fewer large-scale repair jobs are needed
3. decreasing overhead costs (such as utility bills) because of increased system efficiency

PURPOSE OF THIS PLANNING GUIDE

This *Planning Guide* is intended to help school administrators, staff, and community members better understand why and how to develop, implement, and evaluate a facilities maintenance plan.

AUDIENCE FOR THIS PLANNING GUIDE

The primary audience of this *Planning Guide* is staff at the local school district level, where most facilities maintenance is planned, managed, and carried out. This includes board members, superintendents, business officials, principals, facilities managers, maintenance personnel, and custodians. Secondary audiences include state education agency staff, community members, vendors, regulatory agencies, and students in education administration courses.

Facilities maintenance planning is not solely the responsibility of the facilities department. Effective planning requires coordination of resources and commitment at all levels of the education organization.

IN A NUTSHELL...

Experience at the local, state, and national levels suggests that effective school facility maintenance planning can:

- ✓ contribute to an organization's instructional effectiveness and financial well-being
- ✓ improve the cleanliness, orderliness, and safety of an education organization's facilities
- ✓ reduce the operational costs and life cycle cost of a building
- ✓ help staff deal with limited resources by identifying facilities priorities proactively rather than reactively
- ✓ extend the useful life of buildings
- ✓ increase energy efficiency and help the environment

The *Planning Guide* does the following:

- ✓ argues that school facility maintenance is a vital component in the responsible management of an education organization
- ✓ focuses specifically on the needs of an education audience (i.e., it is written specifically for education administrators and staff at the building, campus, district, and state levels)
- ✓ stresses strategies and procedures for planning, implementing, and evaluating effective maintenance programs
- ✓ describes a process, not a canned set of "one size fits all" solutions
- ✓ includes "best practice" recommendations, not mandates
- ✓ supports recommendations from another National Forum on Education Statistics publication, *Facilities Information Management: A Guide for State and Local School Districts (http://nces.ed.gov/forum/publications.asp)*

This *Planning Guide* is not:

- ✗ a how-to manual of maintenance procedures and instructions
- ✗ an attempt to dictate policy-making in local and state education agencies (although it can and should serve as a guide to policy-makers as they consider their options and needs)

Planning Guide Framework

This *Planning Guide* includes the following chapters and information:

Chapter 1: Introduction to School Facilities Maintenance Planning describes the purpose, scope, intended audience, and organization of this publication.

Chapter 2: Planning for School Facilities Maintenance discusses the vital role that facilities maintenance planning plays in the management of an effective learning environment. It also presents a process for developing a vision statement, justifying planning from a budgetary perspective, using data to inform decision-making, and identifying the components of a good facilities maintenance plan.

Chapter 3: Facility Audits: Knowing What You Have focuses on the necessary, but sometimes overlooked, step of inventorying school buildings and grounds. It also describes how to collect, manage, and use data from a facilities audit.

Chapter 4. Providing a Safe Environment for Learning highlights many safety-related issues that demand the absolute attention of both facilities maintenance planners and staff who are responsible for the operation of a school building.

Chapter 5. Maintaining School Facilities and Grounds details "best practice" strategies for maintaining facilities and grounds. It also reminds readers that an ounce of prevention is worth a pound of cure.

Chapter 6. Effectively Managing Staff and Contractors outlines "best practice" strategies for managing employees and outside contractors. It also emphasizes the importance of sound human resources management as a precondition for effective facilities maintenance.

Chapter 7. Evaluating Facilities Maintenance Efforts recommends ongoing evaluation of an education organization's facility maintenance program and presents various approaches for accomplishing this vital task.

Appendix A. Chapter Checklists combines all the chapter checklists into a single list.

Appendix B. Additional Resources combines all the chapter lists of additional resources into a single alphabetical list.

Appendix C. State School Facilities Web sites lists state-specific facilities web sites, including many developed by states and state departments of education.

The condition of a school facility is not just an issue for the facility manager—it affects the staff, students, and entire educational community.

RESEARCH SHOWS…

1. A positive relationship exists between school conditions and student achievement and behavior. [1]
2. Facility condition may have a stronger effect on student performance than the influences of family background, socioeconomic status, school attendance, and behavior combined. [2]
3. Students are more likely to prosper when their environment is conducive to learning. Well-designed facilities send a powerful message to kids about the importance a community places on education. [3]

Effective school facilities maintenance plans have…

Administrators who:

- ✓ recognize that facility maintenance contributes to the physical and financial well-being of the organization
- ✓ understand that school facility maintenance affects building appearance, equipment operation, student and staff health, and student learning
- ✓ appreciate that facility maintenance requires funding
- ✓ acknowledge that strategic planning for facilities maintenance is a team effort that requires input and expertise from a wide range of stakeholders
- ✓ coordinate facility maintenance activities throughout the organization
- ✓ demand appropriate implementation and evaluation of facilities maintenance plans

Facilities staff who:

- ✓ understand a wide range of facilities operations and issues
- ✓ receive training to improve their knowledge and skills related to facilities maintenance
- ✓ educate school and district administrators about facility operations
- ✓ teach other staff how they can help with facilities maintenance
- ✓ cooperate effectively with policy-makers and budgetary decision-makers
- ✓ appreciate that facility maintenance decision-making is influenced by instructional needs

Teachers who:

- ✓ recognize that facilities maintenance supports student learning
- ✓ educate students about how to treat school facilities appropriately
- ✓ communicate their expectations for facilities as they relate to enhancing student learning
- ✓ treat facilities with respect

Students who:

- ✓ see school facilities as their learning environment
- ✓ treat facilities with respect

Parents and community members who:

- ✓ recognize that school facilities are the training grounds for future citizens and leaders
- ✓ respect decision-making regarding school facility use and maintenance
- ✓ contribute to school facility maintenance decision-making as requested
- ✓ consent to the financial obligations associated with good school facility maintenance

Appendix D. Audit Form Template is a sample facility audit form designed for education organizations.

Appendix E. Record Layout for a Computerized Work Order System is a resource for education organizations as they select data elements to be included in a work order system.

Appendix F. Model Job Description for a Custodial Worker is a resource for education organizations as they develop their own job descriptions.

Appendix G. Useful Interview Questions lists questions that can guide school district personnel as they interview potential employees.

Appendix H. Using Mapping during the Interview Process describes a process that can help decision-makers identify the qualities of an "ideal" candidate for a given job.

Appendix I. Sample Customer Survey Form is a resource for school districts as they develop their own evaluation materials.

Index provides an alphabetical list of key topics in the document.

An education organization must plan to meet the challenges of effective facilities maintenance. It is simply too big (and important) of a job to be addressed haphazardly.

IN EVERY CHAPTER...

Each chapter of this *Planning Guide* includes:

- ✓ Table of Contents – to provide an overview and simplify navigation within the chapter
- ✓ Chapter Goals – to state the major purposes of the chapter
- ✓ Best Practice Recommendations – to describe how to accomplish the goals
- ✓ Vignettes – to show how maintenance issues can play out in the real world
- ✓ Commonly Asked Questions – to address anticipated concerns of readers
- ✓ Checklists – to summarize recommendations
- ✓ Additional Resources – to point readers to related information

COMMONLY ASKED QUESTIONS

What is a facilities maintenance plan?
A facilities maintenance plan details an organization's strategy for proactively maintaining its facilities. Effective maintenance plans reflect the vision and mission of the organization, include an accurate assessment of existing facilities, incorporate the perspectives of various stakeholder groups, and focus on preventive measures that ensure that capital investment is managed responsibly. As with any successful management endeavor, good facilities maintenance plans integrate best practices of planning, implementation, and evaluation.

FACILITIES RESOURCES … JUST A MOUSE CLICK AWAY

The National Clearinghouse for Educational Facilities (NCEF) is the nation's primary source of comprehensive information about school planning, design, financing, construction, modernization, and maintenance issues. NCEF's web site, which can be found at *http://www.edfacilities.org,* includes:

Resource Lists – current, subject-specific, compilations of information on more than 100 school facilities topics. The lists include links to online publications and related web sites, as well as descriptions of books, studies, reports, and journal articles.

Publications – concise explorations of facilities-related subjects and issues that concern educators and affect learning. Available in paper copies or online.

News – summaries of local, regional, and national developments regarding educational facilities, including links to online news stories and related NCEF information resources.

Calendar – complete and timely information on regional and national events related to school facilities.

Gallery – photographs and project information on award-winning school designs.

Construction Data – statistics on nationwide school construction activity, with links to sources of school construction and cost estimating data.

Ask A Question – responses by NCEF reference staff to school facilities questions submitted via an online question form. Queries are answered within two to four business days.

Newsletter – highlights of the most recent NCEF publications, events, and news sent to users periodically through an e-mail publication, *EdFacilities Updates.*

Links – links to professional organizations, federal, state, and municipal resources, academic research centers, media, and products and services.

Search – direct access through keywords or phrases to NCEF's extensive database of information about school facilities.

So whether you are searching for information about capital improvement programs, indoor air quality, or school size and security, visit *http://www.edfacilities.org* or call toll-free: 888-552-0624.

Planning for school facilities maintenance helps to ensure that school buildings are: Clean, Orderly, Safe, Cost-effective and Instructionally supportive.

How will a maintenance plan make our schools better?

Learning does not occur in a vacuum. Students and staff thrive in an orderly, clean, and safe environment. Classrooms that are well ventilated, suitably lighted, and properly maintained actually facilitate learning. Poor air quality, on the other hand, negatively affects alertness and results in increased student and teacher absences, which can have a corresponding impact on student achievement. Moreover, appropriate facilities maintenance extends the life span of older facilities and maximizes the useful life of newer facilities. Thus, a facilities maintenance plan contributes to both the instructional and financial well-being of an education organization and its community.

Why should our school district rethink the facilities plan that we wrote five years ago?

Facilities plans, like buildings, don't age well unless they are maintained on an ongoing basis. For starters, maintenance strategies depend on the condition of facilities, which changes over time. If the condition of your buildings, grounds, and equipment have changed in the past five years (which they

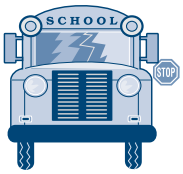
probably have), your facilities plan should be updated to clarify those steps that need to be taken to maintain these valuable assets.

Why do I need this *Planning Guide* to tell me how to keep our schools and grounds in good condition?

Your organization may already be keeping its schools and grounds in good condition. If so, spending a few hours reviewing the recommendations in this *Planning Guide* is a small investment relative to the amount of energy you already put into your facilities maintenance efforts–especially if there's a chance (and there is) that you may find something new and useful in this publication. If your organization doesn't keep its schools and grounds as well as it might, then read on.

ADDITIONAL RESOURCES

Every effort has been made to verify the accuracy of all URLs in this Guide at the time of publication. If a Web address is no longer correct, try using the root directory to search for a page that may have moved. For example, if the link to *http://www.epa.gov/iaq/schools/performance.html* is not working, try *http://www.epa.gov/* and search for "IAQ."



To err is human… but you'd like to avoid this kind of thing all the same!

The school board was happy, the community was proud, and the students were ecstatic. The high school had finally invested in a gymnasium that would meet the needs of the physical education department, the athletic department, and community organizations alike. After only four years of use, the facility looked to be in great shape, so everyone was shocked to find that school had been canceled on a Monday morning so that the maintenance staff could combat a flood that had gushed across the gym floor and into the main building.

What had happened? A $12 gasket had failed–but it happened to be the one that sealed the 40,000 gallon backup water tank that lay adjacent to the gymnasium. To make matters worse, the tank's emergency drain was covered with boxes of books (in a misguided attempt to increase the building's storage space). The unfortunate result: school was canceled for two days, the emergency response cost $26,000, and the gymnasium was closed for five weeks while $160,000 worth of repair work was performed.

How could this problem have been avoided? In truth, there were several things that could have saved the district from its woes:

- Acceptable Maintenance – Regular equipment inspections of the backup water tank might have identified a defective gasket and prevented the flood.
- Proper Planning – The water tank should have been placed in a more appropriate location than next to the gymnasium.
- Appropriate Operations – Someone should have realized that covering an emergency drain with boxes wasn't an acceptable storage system!

These and other issues are addressed in this *Planning Guide*.

Developing a coordinated maintenance plan is the first, and most important, step in exercising control over the destiny of your school buildings!

Deteriorating School Facilities and Student Learning
http://www.ed.gov/databases/ERIC_Digests/ed356564.html
A report documenting that many facilities in American public schools are in disrepair–a situation with implications on the morale, health, and learning of students and teachers. Frazier, Linda M. (1993) ERIC Clearinghouse for Educational Management, Eugene, OR.

Educational Performance, Environmental Management, and Cleaning Effectiveness in School Environments
http://www.carpet-rug.com/pdf_word_docs/0104_school_environments.pdf
A report demonstrating how effective cleaning programs enhance school and student self-image, and may promote higher academic attendance and performance. Berry, Michael A. (2001) Carpet and Rug Institute, Dalton, GA.

Facilities Information Management: A Guide for State and Local School Districts
http://nces.ed.gov/forum/publications.asp
A publication from the National Forum on Education Statistics that defines a set of data elements that are critical to answering policy questions related to elementary and secondary school facility management. Facilities Maintenance Task Force, National Forum on Education Statistics (2003) National Center for Education Statistics, Washington, DC.

Impact of Facilities on Learning
http://www.edfacilities.org/rl/impact_learning.cfm
A list of links, books, and journal articles examining the association between student achievement and the physical environment of school buildings and grounds. The National Clearinghouse for Educational Facilities, Washington, DC.

Indoor Air Quality and Student Performance
http://www.epa.gov/iaq/schools/performance.html
A report examining how indoor air quality (IAQ) affects a child's ability to learn, including case studies of schools that successfully addressed their indoor air problems, lessons learned, and long-term practices and policies that have emerged. Indoor Environments Division, U.S. Environmental Protection Agency (2000) U.S. Environmental Protection Agency, Washington, DC.

Maintenance & Operations Solutions: Meeting the Challenge of Improving School Facilities
http://www.asbointl.org/Publications/
An examination of the impact current maintenance and operations (M&O) practices have on U.S. school performance and possible avenues for improvement through the judicious use of technology and improved methodology. Facilities Project Team, Association of School Business Officials International (2000) Association of School Business Officials International, Reston, VA.

Meeting legal standards with regard to facilities maintenance is the bare minimum for responsible school management. Planners must also strive to meet the spirit of the laws and the long-term needs of the organization.

INTRODUCTORY FACILITIES MAINTENANCE CHECKLIST

More information about accomplishing these checkpoints can be found on the pages listed in the right-hand column.

ACCOMPLISHED		CHECKPOINTS	PAGE
YES	NO		
		Are top-level decision-makers aware that school facilities maintenance affects the instructional and financial well-being of the organization?	1
		Are top-level decision-makers aware that the occurrence of facilities problems (and lack thereof) is most closely associated with organizationally controlled issues such as staffing levels, staff training, and other management practices?	1
		Are top-level decision-makers aware that having a coordinated and comprehensive maintenance plan is the first and most important step in exercising control over the destiny of the organization's facilities?	2
		Has facilities maintenance been given priority status within the organization, as evidenced by top-level decision-makers' commitment to read this *Planning Guide* and refer to these guidelines while planning and coordinating facilities maintenance?	2
		Do the organization's facilities maintenance decision-makers include school administrators, facilities/custodial representatives, teachers, parents, students, and community members?	4

Footnotes:

1 J. B. Lyons, Do School Facilities Really Impact a Child's Education? (Scottsdale, AZ: Council of Educational Facility Planners International, 2001). *(http://www.cefpi.org:80/pdf/issue14.pdf)*

2 L. Morgan, Where Children Learn: Facilities Conditions and Student Test Performance in Milwaukee Public Schools (Scottsdale, AZ: Council of Educational Facility Planners International, 2000).

3 F. Withrow, H. Long, and G. Max, Preparing Schools and School Systems for the 21st Century (Arlington, VA: American Association of School Administrators, 1999).

CHAPTER 2
PLANNING FOR SCHOOL FACILITIES MAINTENANCE

GOALS:

- ✓ **To explain why planning is an essential component of managing school facilities maintenance activities**
- ✓ **To communicate that effective facilities management requires the support of many stakeholders throughout the organization and community**
- ✓ **To confirm that informed decision-making demands ready access to high-quality data that describe the status of the organization's facilities, needs, and capabilities**

An essential component of an effective school program is a well-conceived school facilities maintenance plan. A properly implemented plan provides school administrators comfort and confidence when contemplating the future of their campuses.

Table of Contents:

Effective Management Starts with Planning.....13
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Links to Budgeting and Planning 18
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Additional Resources 21
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EFFECTIVE MANAGEMENT STARTS WITH PLANNING

Unless facilities maintenance planning is a component of a greater organizational management plan, it is doomed to failure. After all, how else can maintenance planners be certain that other policy-makers share their priorities? Or that funds will be available to achieve their goals? And how else can they learn about demographic and enrollment projections and the ensuing changes in building demand? Thus, facilities maintenance planning must be an element of the overall organizational strategy–part of the "master plan."

The master plan is the "blueprint" for daily decision-making throughout a school district. It provides concrete documentation about the organization's needs and intentions. Moreover, it is a formal way of communicating the district's priorities, and establishes necessary documentation for funding authorities and other approving organizations. Good plans include short- and long-term objectives, budgets, and timelines, all of which demonstrate organizational commitment to facilities maintenance. Effective planning also requires that planners evaluate both the organization's overarching goals and the day-to-day details needed to meet those targets. Thus, a comprehensive plan serves both as a blueprint for the here and now and a road map to the future!

"Planning" is the formulation of a strategy for getting an organization from the here and now to the future. As circumstances change over time, strategies for achieving tomorrow's successes often change as well. Good planners are always mindful of the need to review, and even revise, plans to meet the changing needs of the organization.

Having said this, however, planners must also accept that the future is not now (despite the adage that suggests differently). In other words, change takes time, and improvements in organization-wide endeavors most often occur in steps. If a school district finds itself in need of a major overhaul in its facilities maintenance management system, it cannot expect to jump to the head of the field in one or two years. Instead, planners must institute improvements over longer time frames and accept that progress is measured relative to the organization's starting point rather than by comparisons with other organizations that may or may not be working under comparable circumstances.

WHY COLLABORATE DURING PLANNING (AND WITH WHOM)?

In many ways, the process of planning is more important than the outcome. The process of formulating a plan establishes a forum through which interested parties have a chance to voice their opinions about the future of the organization. This opportunity, and the dialogue (and even debate) that ensues, is an effective way of infusing fresh ideas and new perspectives into school management. Collaborative planning also helps stakeholders feel that their views are respected and valued. In turn, this atmosphere of respect often fosters staff and community support for the decisions being made about the future direction of the organization (and, perhaps more importantly, the day-to-day steps that must be taken to achieve these goals).

GOOD INTENTIONS DON'T KEEP SCHOOLS RUNNING

The school facilities belonged to Ted, or so you'd think from the devoted way in which he cared for them. He was the head of the facilities maintenance department and took great pride in the condition of the school district's buildings and grounds. He'd done a fabulous job for nearly 30 years and knew the needs of the district like the back of his hand. But the long-time superintendent had recently retired, and there was a new sheriff in town. Ted had briefed the newly hired superintendent on the status and future of the facilities she had inherited and listened politely when she told him about her own five-year plan. Ted hadn't agreed completely with her assessment of the future, but thought that he'd give her a year or two to learn on the job.

Six months later, Ted was tremendously upset when he found out that the district was closing his favorite old elementary school. He'd never thought the superintendent would actually do it and had repeatedly ignored her warnings—choosing instead to revamp the facility for 21st century instruction so that he could make a case for keeping the beautiful old building when the time came. When news of the building's impending demise arrived, he went straight to the superintendent to tell her that it was a bad decision, but to no avail. She explained to him that demographic reports showed that the school wouldn't be able to meet the needs of the growing population. Moreover, funds had already been allocated for a new building. The school supervisors were on board, she was on board, and it was time for Ted to get on board. Ted took a deep breath, swallowed his pride, and realized that the team had a new boss—and if he was going to be a team player, he had to align his work with her goals. Their efforts had to be coordinated. It was as simple as that.

DEVELOPING A FACILITIES MAINTENANCE PLAN REQUIRES:

- ✓ involving stakeholders in the planning process
- ✓ identifying needs (e.g., improving cleanliness and safety, correcting deficiencies, addressing deferred projects, increasing efficiency, decreasing utility bills)
- ✓ establishing priorities and targets
- ✓ collecting and using supporting data to inform decision-making
- ✓ sharing the plan to garner support from management and key stakeholders
- ✓ allocating funds to pay for planned activities
- ✓ training staff to implement planned activities
- ✓ implementing the plan
- ✓ being patient while awaiting cost savings or other results
- ✓ evaluating the plan systematically
- ✓ refining efforts based on evaluation findings
- ✓ reviewing and revising the plan periodically (e.g., every three years)

Who is involved in the planning process? Ideally, stakeholders include anyone who has a "sense of ownership" in facilities decision-making, even though they might not have any legal rights (or even expectations) to make decisions about school facilities and property. As the list of stakeholders grows larger, it often makes sense to include representatives of stakeholder groups (rather than every individual) as long as the selection process is conducted fairly and equitably.

Steps for effectively engaging stakeholders in the planning process include:

- ✓ identifying all stakeholders
- ✓ determining appropriate ways to invite stakeholders to share their opinions during the planning process (e.g., newspaper ads, web sites, or direct mail)
- ✓ contacting stakeholders well in advance of the planning meetings
- ✓ entering a dialogue that truly welcomes stakeholders' opinions
- ✓ inviting stakeholders to share unique skills and expertise they bring to the process (e.g., you may have engineers, architects, or landscapers in the PTA who could lend their expertise)
- ✓ fostering a consensus-building atmosphere
- ✓ recognizing dissent as necessary, but not allowing it to derail consensus building
- ✓ including stakeholders in follow-up documentation and implementation efforts

Why include stakeholders in the planning process?

- *to hear new ideas and perspectives*
- *to demonstrate that planners value stakeholder opinions*
- *to increase the likelihood that stakeholders will "buy in" to the plan*

OPINIONS WELCOME: STAKEHOLDERS AND THE PLANNING PROCESS

Potential stakeholders in the planning process include, but are not limited to:

- maintenance staff/contractors
- custodial staff/contractors
- superintendent(s)
- principals
- teachers
- department of education staff
- againsters*
- parents
- PTA representatives
- taxpayers
- school board members
- school business officials
- partners (in joint-use facilities)
- other government officials
- students
- community groups/users
- foundation representatives
- public safety officials/regulators
- city/county planners
- dept. of environmental quality staff
- expert consultants (architects, engineers, demographers, attorneys)

** Againsters are people who make a habit of opposing any kind of change. To minimize the likelihood of last-minute delay tactics, planners must include these stakeholders in the decision-making process from the onset.*

What does your community value? The appearance of your community's school buildings says a lot about its values. Some communities have gone one step further and actively planned for their schools to reflect greater community values. For example, one school district in Utah requires that art museums and climbing walls be included in all new school construction to reflect the community's belief in the importance of art, exercise, and nature.

A vision statement is a proclamation of how an organization, department, group, or individual wants to see itself in the future.

CREATING A UNIFIED ORGANIZATIONAL VISION

vision\ vizh-ən\ n: the act or power of seeing; unusual discernment or foresight.

After planners (including stakeholders) have been identified, the first and most important step in the planning process is achieving agreement on the desired outcome of the organization's efforts–that is, what is the group hoping that the plans will lead to in the future? A good way of clarifying and specifying these expectations is by developing a vision statement that affirms how an entity wants to see itself in the future. An individual can have a vision statement, as can a department, group, or even an entire organization. The purpose of a vision statement is to develop a shared image of the future, which means gaining consensus about priorities. Thus, if an individual or department in an organization has a vision for its future, it cannot conflict with the vision of the larger organization within which they work. The vision for the facilities maintenance department, for example, must be driven by, and aligned with, the mission and goals of the district it serves; otherwise, the facilities manager and school superintendent will come into conflict–which is not good for the school district and certainly not good for the facilities manager!

Some administrators might argue that the goal of the maintenance department is simply that of the greater district it serves. However, it becomes difficult to operationalize such a "vision" that is not closely related to the day-to-day operations of the department. Thus, it is good practice for the facilities department to collaborate with representatives of the rest of the organization when generating consensus about its vision but, at the same time, to create a vision that directly relates to its day-to-day activities.

A vision statement should be a living document, but not short-lived. Otherwise, it can't inform long-term decision-making and investment. All the same, a vision statement must be reviewed regularly to ensure that it remains relevant to the potentially changing needs of the organization. Investing time in creating a vision statement can save energy in the long run by reminding staff of their priorities, but it is not an answer in itself–the work of maintaining a building still needs to get done. The vision statement merely

(but not unimportantly) sets the goal against which policies, practices, and efforts will be evaluated. For this reason, a vision statement should be supported by measurable objectives.

The National School Boards Association's online toolkit for "Creating a Vision" *(http://www.nsba.org/sbot/toolkit/cav.html)* recommends that when creating a vision statement, it helps to:

- ✓ describe an ideal future for the organization
- ✓ think about the organization's best interests and not individual or department interests
- ✓ stretch one's thinking
- ✓ be open to change (even substantial change if that is deemed necessary)
- ✓ be positive and inspiring
- ✓ be clear

Moreover, when creating a vision statement, it is important to avoid:

- ✗ closed-mindedness
- ✗ parochialism
- ✗ selfishness
- ✗ disrespect
- ✗ short-term thinking
- ✗ partisanship
- ✗ complacency
- ✗ infighting
- ✗ fear of change
- ✗ apathy
- ✗ "reality" ("we don't have the budget for that anyway")

For more information about creating a vision, visit the following web pages: "Creating a Vision" (National School Boards Association) at *http://www.nsba.org/sbot/toolkit/cav.html;* "A Visioning Process for Designing Responsive Schools" (National Clearinghouse for Educational Facilities) at *http://www.edfacilities.org/pubs/sanoffvision.pdf;* and "Community Participation in Planning" (National Clearinghouse for Educational Facilities) at *http://www.edfacilities.org/rl/community_participation.cfm.*

Creating a "vision" should take place in a creative atmosphere. Brainstorming, free-thinking, and open-mindedness are essential aspects of an honest assessment of an organization's desired future.

Although a vision statement should be of a lasting nature, it must be revisited periodically to verify its continued relevance in an ever-changing world.

EXAMPLES OF UNCLEAR AND CLEAR VISION STATEMENTS

✗ Unclear: The Facilities Maintenance Department will contribute to the school district's mission of educating our children to meet the intellectual, physical, and emotional demands of the 21st century.

While commendable, this vision statement provides little direction for day-to-day decision-making about the operations of the department.

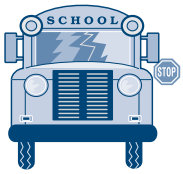
✓ Clear: The Facilities Maintenance Department will provide a clean, orderly, safe, cost-effective, and instructionally supportive school environment that contributes to the school district's mission of educating our children to meet the intellectual, physical, and emotional demands of the 21st century.

This vision statement clearly and succinctly describes the department's role in the district's overall mission, and provides a target that can direct the department's day-to-day activities.

LINKS TO BUDGETING AND PLANNING

This is not a capital planning guide, but any responsible examination of school facilities planning warrants some discussion about the links between facilities maintenance and facilities construction and renovation. Capital outlay for school construction is generally a more palatable proposition for taxpayers and public officials when a school district demonstrates that appropriate care and maintenance has been given to existing facilities.

Responsible facilities maintenance planning demands that attention be given to a wide range of other issues that influence organizational budgeting, including insurance coverage, land acquisition, equipment purchases, and building construction and renovation. While a detailed discussion of these issues is outside the scope of this *Planning Guide*, links to other resources that address these and other budgeting topics can be found at the end of this chapter.



For more information about maintenance costs and budgeting, visit the following web pages: "Budgeting for Facilities Maintenance and Repair Activities" at *http://www.nap.edu/books/NI000085/html/index.html* and "Maintenance & Operations Costs" at *http://www.edfacilities.org/rl/mo_costs.cfm.*

FACILITIES MANAGERS, GOOD ACCOUNTANTS, AND COMMON SENSE WILL TELL YOU THAT:

The maintenance and operations budget is for existing facilities and equipment. Capital project funding – including staff time devoted to capital projects – must come from other sources. Otherwise, existing facilities will be neglected whenever there is a construction or renovation project because the maintenance staff will be drafted into service to work on capital improvements.

WHAT A SHARED VISION CAN ACCOMPLISH

An elementary school created a vision statement that emphasized each child learning how to read. The development process included comprehensive input from staff, students, and community members. Moreover, planners went to great efforts to publicize the vision within the school and community. Several days after the kick-off ceremony for the school's Vision for the 21st Century, the principal noticed that labels had appeared on objects throughout the school. The water fountains were marked "water fountain," fire extinguishers were labeled "fire extinguisher," and the smoke detectors were marked "smoke detector." When the principal inquired about the phenomenon, the school custodian admitted that he had posted the labels as his contribution to helping the children learn how to read—and the principal immediately knew that the team approach to developing and publicizing the school's vision statement had been a success.

EXPERTS IN RESIDENCE: MAXIMIZING COMMUNITY RESOURCES

The facilities management planning team at Valley School District had worked very hard to devise a strategy that would ensure a sound future for the small district's grounds and buildings. Three parents, two teachers, a vice principal, an assistant superintendent, a school board member, the PTA president, the mayor's assistant, the facilities manager, his assistant, and a custodian all came to a consensus regarding the major points of the plan. When the document was presented to the superintendent, she said that the plan sounded very good but that she wanted to have it reviewed by some construction and insurance specialists. The facilities manager politely interrupted her, "Excuse me, ma'am, but I don't think we need to do that." The superintendent looked at him with surprise. "Why, Edward, I'm not doubting the planning team's abilities, but it's my professional opinion that the plan should be reviewed by experts outside the field of facilities management." "Oh, I agree," Edward responded, "I just wanted to let you know that we've already gotten input from an insurance agent and a developer, and we didn't need to pay for it either. You see, Mr. Jackson, who has a child in the high school, is a developer, and Mrs. Ramirez, the PTA president, is a commercial real estate agent. What's more, Mrs. Allen, who is also a parent, is an accountant, and she's verified that all of our financial projections are sound." The superintendent looked at the group, "My goodness, you've done a thorough job. And efficient too." She looked to the community volunteers in particular, "We owe you thanks not only for your time, but also for your expertise." The facilities manager smiled, knowing that he and his team had done a good job and maximized their community's resources to benefit the district. The project would go on without delay or additional expense.

DATA FOR INFORMED DECISION-MAKING

Good data are necessary to inform good decision-making. It is as simple as that. Thus, facilities maintenance plans should be based on a foundation of high-quality data about all school facilities. Otherwise, planners are forced to work without context, and strategic planning becomes strategic guesswork. Planners must know what facilities exist, where they are located, how old they are, and their status/condition. Are equipment and facilities working as designed? As they should? As they need to be?

Additionally, planners must consider projected needs for the future. For example, demographers can provide important estimates of the projected growth of student populations–that is, how many school-age children will be in each neighborhood over the next decade. The only way to ensure that planners have the information they need to make effective decisions is to collect data in a regular, timely, and consistent manner. Data collection is a time-consuming (and ongoing) task that cannot be overlooked. For efficiency's sake, an education organization may partner with other entities that share their interest in school facilities data–for example, the local Chamber of Commerce, the state government, or even local real estate companies. Chapter 3 of this *Planning Guide* discusses facilities audits (i.e., data collections), which are an important area of focus for responsible facilities managers. The National Forum on Education Statistics has developed a companion publication, *Facilities Information Management: A Guide for State and Local School Districts,* to help address these issues. It can be downloaded at *http://nces.ed.gov/forum/publications.asp.*

Informed decision-making requires ready access to high-quality data that describe the status of the organization's facilities, its needs, and capabilities.

Facility planners need to consider data collection and use as a valuable tool in the planning process. Having "the facts" (i.e., good data) is always a good starting place for making good decisions.

PHRASES FROM MODEL SCHOOL FACILITIES MAINTENANCE VISION STATEMENTS

- maintain a healthy school environment
- ensure the appropriate use of school space for educational practices
- maximize facility use (e.g., nights and weekends) to optimize investment
- guarantee equitable allocation of educational resources
- create and maintain a physical environment that supports the needs of the academic program, staff, students, other users, and visitors who use the campus
- operate, maintain, and promote quality facilities, grounds, and services to efficiently and effectively support the instructional and service programs
- provide the physical environment, utilities, and support services necessary to promote educational activities
- maintain buildings, grounds, and equipment that are fundamental to a healthy academic environment
- provide an atmosphere that allows students, faculty, and staff to meet or exceed their personal and departmental goals in support of the academic mission of the schools
- supply appropriate environmental services in the most efficient and economical manner
- promote a safe, clean, and aesthetically pleasing campus environment
- respond to the environmental needs and requirements of the school district
- provide an optimum learning, teaching, and working environment for all students, faculty, and staff within the school community
- sustain the integrity and appearance of the campus environment while supporting the pursuit of the educational process

COMMONLY ASKED QUESTIONS

Why plan for school facilities maintenance?

Facilities maintenance doesn't occur in a vacuum. After all, grounds and buildings belong to school districts, not maintenance departments. The maintenance department's job is to ensure that facilities and grounds are in adequate condition to support the mission of the district. Thus, day-to-day maintenance activities must be guided by a school facilities maintenance plan that is informed by, and aligned with, a larger organizational plan. Without a coordinated plan, it is impossible to know whether day-to-day maintenance operations support current and future organizational priorities.

Why should an organization go to the trouble of including stakeholders in facilities maintenance planning?

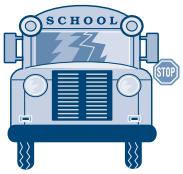
Stakeholder feedback provides new perspectives and fresh ideas to the planning process. Moreover, when stakeholders participate in organizational planning, they are more likely to buy into the strategies that they have helped to establish. "Buy-in" becomes especially significant when one recognizes that likely stakeholders in the facilities maintenance planning process include maintenance and custodial staff, teachers, parents, students, superintendents, principals, board members, school business officials, and community groups.

Why should an organization bother to develop a "vision statement" for facilities maintenance?
A vision statement helps to focus facilities maintenance policies, procedures, and day-to-day operations on the needs of the larger organization. Without a vision statement (the target), management risks inefficient use of resources by squandering time, money, and effort on activities that are not consistent with the long-term needs of the organization. Moreover, a well-publicized vision statement reminds staff at all levels of the overarching purpose of their work.

Who reads a vision statement?
Hopefully, lots of people, but that is a function of how well the organization disseminates the vision statement. A vision statement only has impact when it is read. Thus, it should be shared with everyone who maintains, supports, or uses school facilities. If stakeholders are aware of the organization's vision for its future, they can align their own long- and short-term plans to direct day-to-day activities in support of that vision.

Be prepared to meet the needs of inconvenienced stakeholders—e.g., if major renovations are scheduled for public fields, efforts should be made to identify alternative sites for community use.

ADDITIONAL RESOURCES



Every effort has been made to verify the accuracy of the URLs listed in this Guide at the time of publication. If a URL is no longer working, try using the root directory to search for a page that may have moved. For example, if the link to *http://www.epa.gov/iaq/schools/performance.html* is not working, try *http://www.epa.gov/* and search for "IAQ."

American School and University Annual Maintenance and Operations Cost Study
http://images.asumag.com/files/134/mo%20school.pdf
An annual survey that reports median national statistics for various maintenance and operations costs, including salary/payroll, gas, electricity, utilities, maintenance and grounds equipment and supplies, outside contract labor, and other costs.

Budgeting for Facilities Maintenance and Repair Activities
http://www.nap.edu/books/NI000085/html/index.html
An online publication that focuses on how to estimate future facility maintenance and repair needs. Federal Facilities Council, Standing Committee on Operations and Maintenance, National Research Council (1996) National Academy Press, Washington, DC.

Community Participation in Planning
http://www.edfacilities.org/rl/community_participation.cfm
A list of links, books, and journal articles about how community members can become involved in the planning and design of school buildings and grounds. National Clearinghouse for Educational Facilities, Washington, DC.

"CLEAN" IS A RELATIVE TERM

Your local high school can be cleaned by a single person—no kidding! The only catch is that you have to be willing to live with the job that would be done. Thus, there must be agreement on expectations. Somebody is bound to be unhappy if parents expect 4-star hotel conditions but planners only budget for discount motel standards.

Creating a Vision

http://www.nsba.org/sbot/toolkit/cav.html

An online toolkit from the National School Boards Association for creating a vision in school organizations.

Maintenance & Operations Costs

http://www.edfacilities.org/rl/mo_costs.cfm

A list of links, books, and journal articles citing national and regional maintenance and operations cost statistics and cost-reduction measures for the upkeep of school buildings and grounds. National Clearinghouse for Educational Facilities, Washington, DC.

Maintenance Planning, Scheduling and Coordination

A book focusing on the preparatory tasks that lead to effective utilization and application of maintenance resources: planning, parts acquisition, work measurement, coordination and scheduling. Nyman, Don and Levitt, Joel (2001) Industrial Press, New York, NY, 320pp.

The Rural and Community Trust

http://www.ruraledu.org/facilities.html

The web site of The Rural and Community Trust, which works with many small towns and counties in which the school remains the center of the community. The Rural and Community Trust provides a network for people who are working to improve school-community facilities, increase community participation in the facilities design process, and expand the stakeholders these public resources can serve.

A Visioning Process for Designing Responsive Schools

http://www.edfacilities.org/pubs/sanoffvision.pdf

A guide for helping stakeholders establish the groundwork for designing and building responsive, effective community school facilities, including an explanation of the benefits of community participation and how to go about the process of strategic planning, goal setting, articulating a vision, design generation, and strategy selection. Sanoff, Henry (2001) National Clearinghouse for Educational Facilities, Washington, DC, 18pp.

PLANNING + INFORMATION = SUCCESS

GOOD MAINTENANCE IS :

- ✓ proactive
- ✓ a team effort
- ✓ based on preventive maintenance
- ✓ money well spent
- ✓ an effective method of reducing the life-cycle cost of a building
- ✓ in the best interest of taxpayers
- ✓ complementary to educational objectives
- ✓ not a secondary aspect of education

PLANNING FOR SCHOOL FACILITIES MAINTENANCE CHECKLIST

More information about accomplishing these checkpoints can be found on the pages listed in the right-hand column.

ACCOMPLISHED		CHECKPOINTS	PAGE
YES	NO		
		Is there a facilities maintenance plan?	13
		Is facilities maintenance planning a component of overall organizational planning?	13
		Does the facilities maintenance plan include long- and short-term objectives, budgets, and timelines?	13
		Have potential stakeholders in the facilities maintenance planning process been identified?	15
		Have appropriate avenues for publicizing the facilities maintenance planning process to staff and community stakeholders been investigated and undertaken?	15
		Have representative members of stakeholder groups been invited to participate in the facilities maintenance planning process?	15
		Have representative members of stakeholder groups been selected fairly for participation in the facilities maintenance planning process?	15
		Have individual views and opinions been a welcomed aspect of the consensus-building process?	15
		Have stakeholders been included in follow up efforts to document and implement decisions?	15
		Has a vision statement for school facilities maintenance been constructed?	16
		Is the vision statement for school facilities maintenance aligned with the vision and plans of the rest of the organization?	16
		Is the vision statement closely related to the day-to-day operations of the facilities maintenance staff?	16
		Have comprehensive, accurate, and timely school facilities data been used to inform the planning process (see also Chapter 3)?	19

CHAPTER 3
FACILITY AUDITS: KNOWING WHAT YOU HAVE

GOALS:

- ✓ **To convey the importance of inventorying buildings, grounds, and equipment**
- ✓ **To explain how best to collect, manage, and use facilities data from a facility audit**

Facility audits require time, energy, expertise and, therefore, resources. Although performing a comprehensive and accurate audit will not be cheap, it is economical all the same because it is a necessary step in the effective and efficient management of school facilities.

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How to Conduct Facility Audits 27
Who Collects the Data? 27
What Data Need to Be Collected? 28
When Should Data Be Collected? 31
Data Management 32
Data Use 34
Commissioning: A Special Type of Facilities Audit 35
Commonly Asked Questions 37
Additional Resources 38
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LET'S GET OUR STORIES STRAIGHT… OR MAYBE IT'S BETTER THAT WE DON'T

The audit team pulled into the parking lot at the high school. As the maintenance supervisor and a local structural engineer were on their way into the building, the building principal pointed their attention to a well-worn sill on a bank of windows outside the gymnasium. "We'll have to put that window sill on the list as being in need of painting," he noted perfunctorily. "Actually," the maintenance supervisor replied, "that job is going to require scraping and maybe even power-washing. It's more than just a simple maintenance job, so we'll mark it as 30 feet of a $10-per-foot improvement project." The structural engineer looked critically at the roof above the window sill. "In my opinion, we've got to consider the possibility of a failed lintel due to a damaged roof truss and undersized roof drain. We'll need to look at it more closely to be sure." The principal scratched his head, "You know, I was really only concerned about how it looked." The maintenance supervisor nodded, "And I was only worried about what it would cost to fix." The structural engineer was quick to interrupt him, "You might very well be correct with your assessment, but the only way to be certain is to check that truss and drain." "Well," the principal smiled, "I guess that three sets of eyes are better than one." "Especially when each sees the world from a different perspective," laughed the maintenance supervisor. "That's right," the engineer agreed, "I'm the theorist." He looked at the maintenance supervisor, "You're the realist. And you, Mr. Principal, represent the bottom line."

WHY AUDIT YOUR FACILITIES?

Things change. It is a fact of life and of school facilities maintenance planning. The luster of new buildings and equipment are sure to fade over time. And as facilities age, their condition changes as well. But change isn't always a bad thing. For example, a two-year-old air-handling system might perform better than a new system because its operators have had 24 months to learn how to use it and "get out the kinks." Of course, this assumes that the operators have maintained the equipment responsibly along the way–changing filters and belts as needed. If, however, the same air handler is operating well after 10 years of service, it is safe to assume that more extensive maintenance efforts have been undertaken–valves and gaskets will have been replaced and the compressor pump serviced (probably more than once).

Because the definition of what constitutes "proper maintenance" changes over the life of the equipment or building, knowing the age and condition of a facility or piece of equipment is a prerequisite for maintaining it properly. Otherwise, maintenance efforts are a hit-or-miss situation–some things only get fixed when they break while others get "maintained" on a routine basis whether they need it or not. When an education organization knows the status of its facilities and equipment, the need for maintenance, repairs, and upgrades becomes much clearer–after all, it is tough to argue against good data!

The definition of what constitutes "proper maintenance" changes over the life of the equipment and building. Thus, knowing the age and status of one's facilities is a prerequisite for maintaining them properly.

A facility audit (or inventory) is a comprehensive review of a facility's assets. Facility audits are a standard method for establishing baseline information about the components, policies, and procedures of a new or existing facility. An audit is a way of determining the "status" of the facility at a given time–that is, it provides a snapshot of how the various systems and components are operating. A primary objective of a facility audit is to measure the value of an aging asset relative to the cost of replacing that asset. Thus, facilities audits are a tool for projecting future maintenance costs.

Facilities audits are accomplished by assessing buildings, grounds, and equipment, documenting the findings, and recommending service options to

KNOWING THE CONDITION OF YOUR FACILITIES

Facility audits are important because they:

- ✓ Help planners, managers, and staff know what they have, its condition, service history, maintenance needs, and location
- ✓ Provide facts, not guesswork, to inform plans for maintaining and improving school facilities
- ✓ Establish a baseline for measuring facilities maintenance progress
- ✓ Allow in-depth analysis of product life cycles to occur on a routine basis (i.e., measuring actual life versus expected life)

RANGE OF EXPECTED EQUIPMENT SERVICE LIFE

Equipment	Expected Years	Actual Years*
A/C window unit	10 – 15	?
Steel water-tube boiler	24 – 30	?
Wood cooling tower	20 – 25	?
Lighting ballasts	7 – 10	?
Emergency battery	5 – 7	?
Carpet	12 – 15	?

*The third column cannot be completed without an audit.

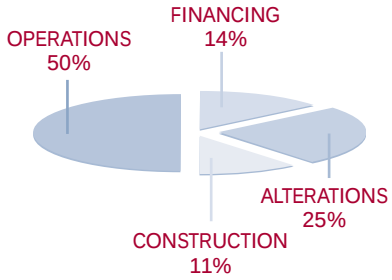
Note that factors such as location (in or out of direct sunlight), environmental conditions (humid or dry air), and actual use (as opposed to recommended use) can greatly affect the expected service life of equipment.

increase efficiency, reduce waste, and save money. Thus, an audit provides the landscape against which all facilities maintenance efforts and planning occur.

Facility audits should be a routine part of the facilities maintenance program. However, they are often precipitated by the information needs of upper management, taxpayers and voters, and legislative or regulatory bodies. By integrating the findings of annual audits over time, planners can ascertain realized (versus expected) product life cycles, the impact of various maintenance strategies and efforts on product life cycles, and the future demands the aging process might place on the infrastructure of a school district. This information can be used to increase the efficiency and cost-effectiveness of facility use and maintenance efforts in the future.

LIFE-CYCLE COSTS: MORE THAN JUST THE STICKER PRICE

The initial cost to construct a building typically represents only a small portion of the actual cost to own the facility over its lifetime.
Source: HVAC Applications (1999) American Society of Heating, Refrigeration, and Air Conditioning, Atlanta, GA.



HOW TO CONDUCT FACILITY AUDITS

data \dāt-ə\ n: factual information (as measurements, observations, or statistics) used as a basis for reasoning, decision-making, or calculation.

A facility audit is a data collection process, pure and simple. The aim of the audit is to conduct a comprehensive inventory that meets the needs of the entire district management effort – i.e., facilities, technology, and curriculum planners – in a coordinated manner and thereby avoids the need for redundant collection efforts.

Who Collects the Data?

The first step in the auditing process is to determine whose perspective will guide the audit. Auditors may be school district staff or outside consultants. Resources play a large role in this decision. Small districts may not be able to afford an audit specialist whereas larger organizations might employ several. Above all, auditors must possess a thorough understanding of facility maintenance and operations and have enough time to perform the task properly. Intangible characteristics of a good auditor include an inquisitive nature, devotion to details, and the patience to do the job thoroughly. Finally, auditors and auditing teams should understand how facilities are used for instructional purposes on a daily basis.

The terms "audit" and "inventory" are often used interchangeably—the former referring to the "act of inspecting" and the latter to the "act of recording." This Planning Guide *uses the term "audit" to refer to both activities: inspecting and recording.*

HIGH-QUALITY FACILITIES DATA CAN BE USED TO:

- ✓ determine the state and condition of the facility – because without collecting information, assessing an entity's condition is simply guesswork.
- ✓ establish a baseline for measuring change – such trend analysis (are things getting better or worse?) is only possible if the assessor has information about how things used to work at a previous point in time.
- ✓ assess progress – after all, "progress" is a relative term that has meaning only in the context of baseline measurements.
- ✓ predict and model the impact of modifications – so that systems analysis can be extended to predictions of future performance when based on quality data and sound modeling methods.
- ✓ assist in decision-making for repairs, renovation, or abandonment – because nothing "informs" sound decision-making like good "information."
- ✓ report district information in state and federal data collections and assessments – which often provide funds to help meet reporting requirements.
- ✓ populate Geographic Information Systems (GIS) – and inform new school site selection and other planning decisions.
- ✓ justify a bond initiative – which is simply a special type of decision-making process (and nothing strengthens an argument like supporting facts based on objective data).

Good auditors are inquisitive, detail-oriented, and methodical. They possess a thorough understanding of facility maintenance and operations, and have adequate time to perform the task properly.

Regardless of the size of the school district and the organizational affiliation of the auditors, facility audits are best carried out by teams of two or more people rather than by an individual. Although the auditor should understand the general workings of a school facility, he or she should be accompanied by someone who is intimately familiar with the facility being studied (e.g., a custodian, maintenance staff member, or school principal who works in the facility on a regular basis). The team approach promotes several desirable outcomes: encouraging multiple perspectives (e.g., instructional, technical, financial, and cultural) on the condition of facilities; sharing expertise when making difficult judgment calls; corroborating and confirming decision-making; and cross-training staff for future audit and facility management responsibilities.

What Data Need to Be Collected?

After deciding upon an audit team, the next step in planning for a facilities audit is to define the scope of work–that is, what information needs to be gathered and how detailed and comprehensive should it be? The simple answer is "very comprehensive." It should include data on all facilities, infrastructure, grounds, maintenance staff (e.g., specialized training courses attended), and equipment (including boilers, HVAC systems), floor finishes, plumbing fixtures, electrical distribution systems, heating and air conditioning controls, roof types, flooring, furniture, lighting, ceilings, fire alarms, doors and hardware, windows, technology, parking lots, athletic fields/structures, playground equipment and landscaping, and the building envelope. Other issues to consider during an audit include accessibility (does a facility meet the requirements of the Americans with Disabilities Act, or ADA?), clean air, asbestos, fire, occupant safety, energy efficiency, susceptibility to vandalism, and instructional efficiency (e.g., alignment with state and local classroom standards).

More specifically, building components include, but are not limited to:

- ✓ rooms
- ✓ interior walls
- ✓ interior doors
- ✓ floors
- ✓ plumbing
- ✓ electrical systems
- ✓ HVAC systems
- ✓ kitchens
- ✓ hardware
- ✓ egresses
- ✓ communications equipment (audio, video, and data)
- ✓ exterior envelope (walls and windows)
- ✓ roof and roofing materials
- ✓ foundations and basements

Grounds include, but are not limited to:

- ✓ courtyards
- ✓ unimproved fields
- ✓ athletic fields
- ✓ playgrounds
- ✓ parking lots
- ✓ campus roads
- ✓ signage
- ✓ traffic patterns
- ✓ trees and shrubs
- ✓ landscaping

Equipment includes, but is not limited to:

- ✓ fixed equipment (motors, compressors, telephones, computers)
- ✓ tools (lawn mowers, snow blowers, leaf blowers, drills)
- ✓ vehicle fleets (buses, vans, trucks, cars)
- ✓ supplies (motor oil, cleaning agents, pesticides, and other chemicals)

One can of gum and graffiti remover (a class 4 flammable) stored at a school site probably doesn't present much of a hazard. However, 10 cases in a single room is a different story. Planners must get enough detail from an audit to tell the difference!

Vision =
What you hope

Plans =
What you expect

Data =
What you know

WHO DO YOU CALL WHEN YOU NEED A FACILITIES AUDIT?

User assessments are helpful, but most users lack expertise.

Maintenance staff reviews are good, but employees may lack the time to take on this "extra" responsibility.

Expert facilities consultants are usually very reliable, but can be expensive.

THE CASE OF THE "RED HOT" CLASSROOMS

Eileen, the school facilities manager, had a problem. Most of the classrooms in the district's new science and technology magnet school were, to put it simply, hot. Eileen and her top-notch staff were stumped. They had verified that the chiller and components of the HVAC system were in working order, but the system kept getting overworked and the rooms kept getting uncomfortably warm. Eileen studied the building specs time and time again, but to no avail. The data made sense: the HVAC system fit the square footage and 200-student capacity of the building. What was wrong? Did she have bad data? What else could it be? Once again she logged into the classroom inventory database: 16 students per room, one teacher, one aide, two doors, six windows, tile floors, six electrical sockets, eight computers–and the light bulb finally went off! "That's it!" she yelled aloud to her assistant. "The computers–they give off heat too, and that means that each classroom has the equivalent of 26 people in it, not 18. That's the extra load." Sure enough, Eileen's follow-up research on the Internet verified that the "average" child and "average" computer and monitor both occupied about 30 ft^2 and emitted 300 btu per hour. Her data were sound after all, and she had solved the mystery of the "red hot" classrooms!

Facilities audits should also include a review of facility records and reports so that potential problems can be identified before they turn into full-blown problems (e.g., records indicating that filters have not been changed for nine months might suggest that indoor air quality problems are on the horizon). Furthermore, a comprehensive audit should also look at the underlying practices and processes that support the maintenance of facilities. Doing so can help to ensure that "standard operating practices" are not only in the plans, but being implemented on a daily basis. Moreover, because some types of record keeping are regulated (such as boiler maintenance records, amount and type of fuel used, operation of emergency generators, and use of pesticides), an audit should verify that required records are being maintained.

Energy use should also be included in a facilities audit–meaning that all elements of the building's structure and operation must be evaluated with respect to energy use. Energy audits typically include computer-based modeling of the building. Once a base model is developed to match existing building conditions, modifications can be introduced to evaluate the impact of potential system upgrades on annual energy use. In this way, an audit and energy model can be used to predict the impact of lighting upgrades on a building's heating and cooling systems.

Facilities data can include operational data and costs of a system. Even if overall operations are sound, data analysis can identify areas for improvement. Analysis of data may also reveal clues to impending problems that no one is even looking for!

THINK COMPREHENSIVELY…

"Buildings" include not only schools, but athletic facilities, tool sheds, and remote sites.

"Grounds" include not only unpaved surfaces (e.g., fields) and paved surfaces (e.g., parking lots), but also pedestrian and vehicular traffic that typify them. Grounds also incorporate landscaping, which affects not only the aesthetic presentation of school property, but also water flow, energy use, and even personal safety.

"Equipment" includes all vehicle fleets–from lawn mowers to school buses and district-owned automobiles.

AT A MINIMUM, AN AUDIT SHOULD RECORD THE FOLLOWING:

- ✓ what (brand name, model numbers, serial numbers, etc.)
- ✓ quantity and product size (e.g., size 4 or "medium")
- ✓ where
- ✓ age
- ✓ condition
- ✓ working as purchased/designed?
- ✓ working as it should be?
- ✓ working as it needs to be to meet the needs of the users?
- ✓ repair history
- ✓ specialized upkeep requirements (e.g., oil and filter types)
- ✓ evidence of future needs
- ✓ recommended service
- ✓ estimated remaining useful life

How audit findings get recorded depends on the data collection system being used in the organization. Options range from high-end software with electronic pick lists on palm pilots (or laptop computers) to low-end steno pads and pencils. Regardless of the recording mechanism, all data must eventually be converted into an electronic format. If the data are collected electronically at the outset, they can be exported easily into a database or spreadsheet. If the data are collected manually, they will need to be keyed into a database or spreadsheet–introducing a significant source of possible errors. Re-keying data is also an inefficient use of staff time. However, if portable electronic equipment is not available for the data collection, it may be a necessary step in the audit process.

Regardless of the recording mechanism, all data eventually need to be converted into an electronic format so they can be managed, analyzed, and stored more efficiently. Data should also be recorded consistently so that comparisons can be made over time (a task known as "trending" or "benchmarking").

Once the annual audit is accomplished, facilities staff should review the findings for accuracy. Moreover, every subsequent modification, upgrade, and renovation should be integrated into the audit records. Maintaining these data in an orderly and consistent fashion ensures that planners and repair people alike know the most current status of the facilities as they make their day-to-day and long-term decisions.

When Should Data Be Collected?

The ideal time to initiate a facility audit for the first time is when the organization undertakes major construction or renovation activities. However, if major work is not scheduled, a facility auditing program should be established just the same. Once initiated, audits must be performed on a regular basis (e.g., annually) because conditions are constantly changing. If facility audits are an ongoing feature of maintenance management, each year's data can inform the next year's audit and make the task much easier.

A PICTURE IS WORTH A THOUSAND WORDS

Videotaping of sites can be a powerful data collection and documentation tool. Videos can be taken with digital cameras or converted to digital format without much trouble. They then provide a record of facility conditions–showing improvements already made or deficiencies that must be remedied. Videos can also serve as evidence of ownership, for example, when filing an insurance claim for items lost in a fire.

GOOD DATA COLLECTION AND USE: A FRIEND TO STUDENTS AND ADMINISTRATORS ALIKE

Good data collection and use can be as simple as a log or notation system on a building's floor-plan diagram. For example, Cheryl, the school nurse at Homer Elementary, decided to identify every accident incident that was reported in her school building. When she marked a third fall in the same location on her floor plan, she told the principal who, in turn, initiated a more detailed investigation. It turned out that a newly hired custodian was over-applying buffing oil on his dry mop and leaving an extremely slippery residue on the floor. The custodian was immediately retrained on how to apply the buffing agent correctly, and the training sheet for new staff was updated to discourage similar mistakes. Thanks to Cheryl's simple (and inexpensive) data collection tool, the school probably avoided additional injuries to students.

DATA MANAGEMENT

Most school facility managers are extremely competent and have served their districts well for many years. They are ingenious problem solvers with plenty of common sense. However, the roles and responsibilities of a facility manager have changed greatly in recent years. Their duties range from asbestos management to contract procurement, from high-tech computer operations to refitting a 50-year-old coal boiler. Some of these tasks leave little room for error. Thus, facility managers must be expert collectors, organizers, and assessors of facilities data if a school district is to have safe and well-maintained school buildings.

But data collection is not an end in itself. Rather, data collection should be motivated by and geared toward providing information that results in better management of the organization. Which data are collected may be driven by diverse information needs: the boss's monthly report, the school board's quarterly report, the state's annual collection of facilities data, and regulatory requirements, to name a few. If these reports are not submitted in a timely manner, someone is going to come looking for them. However, collecting meaningless data and submitting an equally meaningless report is unlikely to be of much value to the planning process. On the other hand, collecting and reporting good data for use in analysis, trending, and planning is a vital step toward good organizational management.

The facility operations budget typically represents about 10 percent of a school district's entire spending (not including capital funding for major construction and renovation projects). Thus, facilities warrant the attention of an education organization's top management, who should appreciate that investing resources in facilities data collection and information systems is an integral part of any district-wide management plan. These systems do not have to be expensive, although effective facilities data management is worth a substantial investment. In fact, trying to manage a school district without such an effective audit system is by far the most expensive solution of all, because other resources (human, capital, and operational) might be squandered if they are not being directed by management plans based on accurate and timely data.

FEATURES COMMON TO GOOD DATA COLLECTION SYSTEMS FOR FACILITIES AUDITS INCLUDE:

- ✓ The element list includes all buildings, grounds, and equipment at all sites.
- ✓ The element list is comprehensive for all rooms and spaces in all buildings.
- ✓ The element list reflects both permanent features (structures) and temporary features (e.g., traffic patterns, snow buildup areas).
- ✓ Data collections are element driven and do not include fields for long narratives (i.e., the data must be able to fit into a spreadsheet format).
- ✓ Data are collected on an element-by-element basis so that records are maintained about each individual component (e.g., for each window a record is kept of its precise location, year of installation, brand of replacement parts, service dates and descriptions, etc.).
- ✓ The data are recorded electronically in a format that can be exported into a database or spreadsheet without rekeying (saving time and reducing clerical errors).
- ✓ The data are reviewed for accuracy and completeness by the facility management and maintenance team. This team prioritizes the findings and modifies the scope of the data collection as new issues are identified.

Because facilities data are so valuable, they should be regarded as an organizational asset that must be considered in any risk management planning–in other words, these data must be maintained securely. Backup data files should be stored in multiple safe sites (referred to as "distributed storage") to decrease the likelihood of accidental loss or damage. Many organizations, including some schools, contract with outside service providers to store backup files at remote locations.

Similarly, original facility drawings (as-designed and as-built) are irreplaceable, and should be treated as such. They should be time- and date-stamped, scanned, archived (redundantly), and loaned out only under a strictly enforced chain of custody. The facilities department needs to serve as the custodian of all facilities records or verify that someone else is handling the job responsibly.

Data exchange and the ability to move data to upgraded software systems are two issues that school districts are increasingly encountering. Thus, facilities maintenance data must be stored in a computer database that is robust enough to allow for easy data import and export. At the very least, the data should be stored using a standard spreadsheet format with each column representing a data field (or element) and each row representing a data record.

Images stored in standard formats (such as TIFF and JPEG) are also easily manipulated between systems. In recent years, document imaging software and supporting computer equipment have become more affordable. Thus, many school districts are investing in document imaging systems to reclaim office space taken up by large storage cabinets. These systems can be used to scan documents (blueprints, contracts, manuals, purchase orders, etc.) and store the images on computer hard disks or CDs. The images can be indexed by keywords for fast searching and retrieval. Some document imaging systems have optical character recognition (OCR) capabilities that enable image retrieval based on user queries.

How does your organization collect and use facilities data? If you don't know, your organization may need a more systematic approach to data management.

CMMS software is a cornerstone of facility management for any district with more than 500,000 square feet of building space.

EXAMPLES OF A FACILITIES AUDIT SPREADSHEET

This "School Building Facilities Management Checklist" is included in its entirety in Appendix D.

Although many schools and school districts have automated their data collection and record-keeping systems, smaller organizations may not have either the need or the resources to do so. However, a computerized maintenance management system (CMMS) is necessary when staff are responsible for managing more than about 500,000 square feet of facilities. At that point, facilities, assets, staff, and scheduling become complex enough to warrant an investment in CMMS software, equipment, and staff training. Moving to a CMMS requires resources, manpower and, above all, support from management at all levels of the organization. Good CMMS packages should be compatible with the district's other operating systems and software and integrate a wide range of facilities management components–including facilities (structures and spaces including grounds and equipment), staff, users, work orders, scheduling, and compliance and regulatory issues. More specifically, asset management software should track building components, furniture, and equipment by their age and life cycle, and report preventive maintenance measures necessary for effective resource management.

Facilities data are facilities history. They are essential for warranties, insurance claims, operations, and planning.

DATA USE

Facilities data are not only useful, but also a necessary component of responsible facilities management–which, for most people, is the only justification for incurring the costs associated with collecting and storing data. In a general sense, data from facility audits assist decision-making with respect to repairs, renovations, or abandonment of a building. More specifically, however, some facilities data must be readily accessible in the case of emergency (e.g., building blueprints may be important when fighting a fire). Other data are necessary for long-term planning (e.g., expiration dates on roof warranties). Finally, some information is needed on a day-to-day basis (e.g., fuel requirements and load capacities on a fleet of buses). In all cases, effective school management requires that facilities data be accessible in a timely manner.

WHEN A BAND-AID CAN SAVE YOU MONEY—EVEN IN THE LONG RUN!

The school board meeting was about to get ugly. The PTA was as hot as the east wing of the elementary school. They wanted that cooling tower repaired—and repaired properly! Hadn't it broken down last September too? The board president turned to Ted, the new school facilities manager, for an explanation. Ted began to explain, "Well, we patched several rust spots last summer, but the tower is really on its last legs." He was interrupted by the board president: "We were very clear about our expectations for the repair of capital equipment before you were hired. We will not tolerate a Band-Aid approach to maintenance in this school district. Is that understood?" Ted handed a spreadsheet to the board president before answering, "Yes sir, a Band-Aid approach is a waste of money 99 percent of the time, but the cooling tower in question is an exception. You see, it's 19 years old," he said, pointing to an entry on the spreadsheet, "and only has a 20-year expected service lifetime. So it doesn't make sense to invest in a complete overhaul when the school will be getting a brand-new piece of equipment next year. It's not a good use of our maintenance budget." The board president realized that Ted was right. He had the data in hand to prove it.

For more information about facilities data collections and audits, visit the following web pages: Basic Data Elements for Elementary and Secondary Education Information Systems at *http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=97531*; Facilities Information Management: A Guide for State and Local School Districts at *http://nces.ed.gov/forum/publications.asp*; Facilities Assessment at *http://www.edfacilities.org/rl/facility_assessment.cfm;* and Operation and Maintenance Assessments: A Best Practice for Energy-Efficient Building Operations at *http://www.peci.org/om/assess.pdf.*

COMMISSIONING: A SPECIAL TYPE OF FACILITIES AUDIT

Even the best-trained auditors are unlikely to know whether systems are operating as designed and intended just by looking at them (because "systems" can not be evaluated as easily as components can). For this reason, new and renovated facilities must be commissioned, re-commissioned, or retro-commissioned.

"Commissioning" is a specific type of facilities audit intended to verify (and document) that a facility will operate as designed and meet the demands of its intended use. Commissioning focuses not on individual elements in a building, but rather on system performance within a facility. A third party (who is not beholden to either the education organization or the construction contractor) generally carries out commissioning before site responsibility is transferred from the contractor to the school district. Commissioning typically occurs upon completion of a construction or renovation project; however, pre-commissioning can occur as early as the design phase, at which time impartial experts review

RISK MANAGEMENT ENTAILS PROTECTING FACILITIES DATA

Developing a data storage and security plan for an education organization is a substantial task in its own right. The National Forum on Education Statistics provides guidance in *Safeguarding Your Technology: Practical Guidelines for Electronic Education Information Security*, available at *http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=98297.*

FACILITIES DATA ACCESS AS A COMPONENT OF EMERGENCY PREPAREDNESS

When Jerry, the head of the maintenance office for the school district in his small community, received a call from the chief of police, he remained calm. "Yes sir," Jerry said, "I'll e-mail the building's blueprints immediately." He looked at his watch. "And I can have a paper copy to you in 15 minutes." As he hung up the phone, he turned to Eileen, his assistant. "There is an emergency at the high school and the police chief needs information about the egresses. Print out a copy of the blueprints while I e-mail him an electronic copy." Within three minutes of receiving the call, Jerry was speeding toward the high school with a copy of the blueprints in hand to supplement the electronic copy already sent to the chief. The rest of the day's events would be out of his control, but Jerry's planning had ensured that the maintenance office had done everything it could do to help.

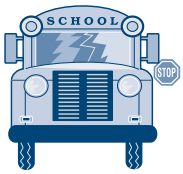
Commissioning focuses not on individual building elements, but on system performance within a facility. It is tantamount to a "stress test" in which major building components are systematically tested to ensure they meet required specifications.

blueprints and building specifications for adherence to building codes, HVAC requirements, and other performance criteria.

Commissioning should be included in all construction and renovation contracts as a standard requirement prior to the transfer of liability from the contractor to the school district. Although initial commissioning can occur as early as the design phase of a project, and more likely upon the completion of construction activities, additional tests should be required throughout the first year of building use so that components can be examined during the range of seasonal conditions (e.g., hot and cold, wet and dry). When formulating the details of a commissioning effort, district representatives should identify all systems to be studied or controlled, the design logic that supports the approach, applicable industry standards, and the acceptable range of system output (which varies with seasonal conditions).

Re-commissioning (the act of "commissioning again") should occur any time a building is renovated or substantially modified (e.g., a classroom is changed into a computer lab) or, in the absence of renovation and modification, on a five-year cycle to ensure that systems are performing appropriately over time. Re-commissioning involves retesting systems relative, at least in part, to baselines established during the original commissioning. By adopting this approach to facility auditing, the status of systems can be measured and assessed relative to their "as-new" condition.

Retro-commissioning is performed on existing buildings that were never commissioned. Although a school district may not be able to hold contractors responsible for failing or missing systems identified during retro-commissioning, the data can be useful in establishing baselines and identifying system deficiencies. This is especially valuable information for facilities that have been upgraded or otherwise modified since original construction.



For more information about commissioning, visit the following web pages: Building Commissioning at *http://www.edfacilities.org/rl/commissioning.cfm;* Building Commissioning Association at *http://www.bcxa.org;* Portland Energy Conservation, Inc. (PECI) at *http://www.peci.org/;* and Practical Guide for Commissioning Existing Buildings at *http://www.ornl.gov/~webworks/cppr/y2001/rpt/101847.pdf.*

MAJOR STEPS IN THE COMMISSIONING PROCESS INCLUDE:

- ✓ Establish expected outcomes, such as how building systems should perform, what occupants need, and acceptable costs.
- ✓ Test building systems and equipment to make sure they work correctly and meet design and operational specifications.
- ✓ Measure or predict the basic energy efficiency and thermal/environmental performance of the building's energy systems (automatic heating, air conditioning, refrigeration, lighting).
- ✓ Decide whether upgrades and modifications to the as-built facility are necessary to meet the stated needs of school leaders, teachers, and students.
- ✓ Verify that building and system operators have received appropriate training.
- ✓ Provide building system documentation for future operations and maintenance so that the facility will continue to perform reliably and reap the expected savings.
- ✓ Store the findings of the commissioning effort (i.e., the data) in a secure manner.

Adapted from the Energy Smart Schools web site *(http://www.eren.doe.gov/energy-smartschools/building_maintaining.html).*

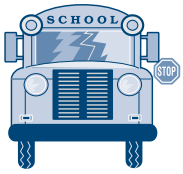
COMMONLY ASKED QUESTIONS

Why is a facility audit considered to be a data collection?
A facility audit is an element-by-element assessment, or inventory, of an organization's buildings, grounds, and equipment. If the large amounts of collected data (what, where, age, condition, maintenance needs, etc.) are not organized in a usable format, they will not meet the information needs of users. Thus, facility audits must be treated as data collections, and managed as such.

How can facilities data inform decision-making?
Facilities data can, and should, inform both short- and long-term policy making decisions. Moreover, the data also help with day-to-day operations and decision-making. For example, suppose a high school's ice machine breaks down and the estimate to repair it is one-third of the cost for a new machine. The repair-or-replace decision should be based on facilities data–that is, the age and expected life of the ice machine.

What information needs to be collected during a facility audit?
Data should be collected on all buildings, grounds, and equipment at all sites, buildings, rooms, and spaces. It should include both permanent features (structures) and temporary features (e.g., traffic patterns and snow buildup areas). Each element should be described by: what, where, size, number, age, condition, whether it is working as purchased or designed (as well as whether it is working sufficiently well to meet the needs of users), repair history, sizes and specifications for replacement parts (e.g., oil type and filter sizes), evidence of future needs, recommended servicing, and estimated remaining useful life.

ADDITIONAL RESOURCES



Every effort has been made to verify the accuracy of all URLs listed in this Guide at the time of publication. If a URL is no longer working, try using the root directory to search for a page that may have moved. For example, if the link to *http://www.epa.gov/iaq/schools/performance.html* is not working, try *http://www.epa.gov/* and search for "IAQ."

Basic Data Elements for Elementary and Secondary Education Information Systems
http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=97531
A document providing a set of basic student and staff data elements that serve as a common language for promoting the collection and reporting of comparable education data to guide policy and assist in the administration of state and local education systems. Core Data Task Force of the National Forum on Education Statistics (1997) National Center for Education Statistics, Washington, DC.

Building Commissioning
http://www.edfacilities.org/rl/commissioning.cfm
A list of links, books, and journal articles about building commissioning. National Clearinghouse for Educational Facilities, Washington, DC.

Building Commissioning Association
http://www.bcxa.org
A professional association dedicated to the promotion of high standards for building commissioning practices.

COMMISSIONING HAS ITS REWARDS!

The accountant overseeing the school renovation project had been against commissioning from the start. "Even if it does cost less than one percent of the project, that's more money than I'd like to spend… I mean for that price, we could upgrade the landscape in front of the building," he had argued to Carl, the maintenance manager who had insisted on the commissioning. Carl always had the same reply, "I know Howard, but the commissioning will pay for itself, just wait and see. Don't you know that fifteen percent of all completed buildings are missing components that they have paid for?" In the end, Carl got his way and the third-party commissioning was performed by a local general contractor. When Carl got the results, he walked straight into Howard's office and personally placed them in the accountant's hands. "See, Howard. I told you commissioning would pay for itself. It uncovered over $3,000 worth of equipment that we paid for but is still missing." Howard looked at the report. "Yes, Carl," he paused to study the findings a bit longer, "but do you see that the report shows that the current configuration of the HVAC system is not fully efficient?" Carl interjected, "But it's good that we find that out now, Howard." Howard interrupted him, "That's not good, Carl. It's fantastic. Why, fixing that alone will save us the cost of that commissioning in just two years. You know, Carl, this commissioning report doesn't just save us money now, it saves us money in the future when we're running the building too." Carl rolled his eyes, knowing that he had been right all along, but pleased that Howard had finally seen his point, "Is that so, Howard?"

Building Commissioning Handbook
http://www.appa.org/resources/publications
A book that focuses on building commissioning, including the roles of the consultant, contractor, test engineer, commissioning agent, and owner; the process of equipment and systems performance testing; testing checklists; commissioning terms; and guidance with regard to hiring a commissioning agent. Heinz, J.A. and Casault, R. (1996) The Association of Higher Education Facilities Officers, Alexandria, VA, 311pp.

Building Evaluation Techniques
Step-by-step techniques for conducting an effective building assessment, including the evaluation of overall structural performance, spatial comfort, noise control, air quality, and energy consumption. Includes sample forms and checklists tailored to specific building types. George Baird, et al. (1995) McGraw Hill, 207pp.

Energy Smart Schools
http://www.eren.doe.gov/energysmartschools/building_maintaining.html
An initiative by the U.S. Department of Energy to provide detailed information about how to increase school building energy efficiency and improve the learning environment. Includes a discussion of school facility commissioning.

Facilities Assessment
http://www.edfacilities.org/rl/facility_assessment.cfm
A list of links, books, and journal articles about methods for assessing school buildings and building elements for planning and management purposes. National Clearinghouse for Educational Facilities, Washington, DC.

Facilities Audit: A Process for Improving Facilities Conditions
A handbook presenting a step-by-step approach to all phases of facility inspection. It is designed to help a facility manager assess the functional performance of school buildings and infrastructure and provides information about how to quantify maintenance deficiencies, summarize inspection results, and present audit findings for capital renewal funding. Kaiser, Harvey (1993) APPA, The Association of Higher Education Facilities Officers, Washington, DC, 102pp.

Facilities Evaluation Handbook: Safety, Fire Protection, and Environmental Compliance, 2nd Edition
A guide to help plant and facilities managers conduct inspections and evaluations of their facilities in order to identify and address problems in the areas of maintenance, safety, energy efficiency, and environmental compliance. Petrocelly, K. L. and Thumann, Albert (1999) Fairmont Press, Lilburn, GA, 200pp.

Some types of data management may be mandated by state and local regulations (e.g., maintenance records on the boiler, amounts and types of fuel used, the operation of emergency generators, and pesticide use).

THE IMPORTANCE OF BENCHMARKING

Effective long-term planning (including both policy and financial initiatives) must be based on accurate information about the physical condition of facilities and their ability to meet the functional requirements of the instructional program. One way of determining functional ability is through the use of benchmarking, which is the act of charting and comparing activities, standards, levels of performance, and other factors against a facility's history, similar facilities (its peers), or independent building usage data (as can be found in trade publications).

Defining a school, a classroom, or an instructional space can be a tricky endeavor and is beyond the scope of this Planning Guide. *For a detailed examination of facilities terms and definitions, visit* http://nces.ed.gov/forum/publications *and read* Facilities Information Management: A Guide for State and Local School Districts.

Facilities Information Management: A Guide for State and Local School Districts

http://nces.ed.gov/forum/publications.asp

A publication that defines a set of data elements that are critical to answering basic policy questions related to elementary and secondary school facility management. Facilities Maintenance Task Force, National Forum on Education Statistics (2003) National Center for Education Statistics, Washington, DC.

Guide for School Facility Appraisal

A guide that provides a comprehensive method for measuring the quality and educational effectiveness of school facilities. It can be used to perform a post-occupancy review, formulate a formal record, highlight specific appraisal needs, examine the need for new facilities or renovations, or serve as an instructional tool. Hawkins, Harold L. and Lilley, H. Edward (1998) Council for Educational Facility Planners International, Scottsdale, AZ, 52pp.

Operation and Maintenance Assessments: A Best Practice for Energy-Efficient Building Operations

http://www.peci.org/om/assess.pdf

A publication that describes what an operations and maintenance assessment is, who should perform it, the benefits of an assessment, what it costs, and the process of performing an assessment. Includes a glossary of terms, sample site-assessment forms, a request for proposal checklist, sample procedures and plan, and a sample master log of findings. (1999) Portland Energy Conservation, Inc. Portland, OR, 54pp.

Portland Energy Conservation, Inc. (PECI)

http://www.peci.org/

Provides information about commissioning conferences, case studies, procedural guidelines, specifications, functional tests, and the model commission plan and guide specifications.

Practical Guide for Commissioning Existing Buildings

http://www.ornl.gov/~webworks/cppr/y2001/rpt/101847.pdf

A document that describes commissioning terminology, the costs and benefits of commissioning, retro-commissioning, steps to effective commissioning, and the roles of team members in the commissioning process. Haasl, T. and Sharp, T. (1999) U.S. Department of Energy, Washington, DC.

Safeguarding Your Technology

http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=98297

Guidelines to help educational administrators and staff at the building, campus, district, and state levels better understand why and how to effectively secure an organization's sensitive information, critical systems, computer equipment, and network access. Technology Security Task Force, National Forum on Education Statistics (1998) National Center for Education Statistics, Washington, DC.

FACILITY AUDIT CHECKLIST

More information about accomplishing checklist points can be found on the page listed in the right-hand column.

ACCOMPLISHED		CHECKPOINTS	PAGE
YES	NO		
		Have district planners scheduled a facility audit?	27
		Has a chief auditor been selected (based on expertise, perspective, experience, and availability)?	27
		Has a qualified auditing team been assembled?	28
		Has the scope of work been identified for the audit (i.e., how detailed and comprehensive should the audit be)?	28
		Has a data collection system (e.g., collection forms) been selected for the facilities audit?	31
		Has an automated data input system been selected as resources allow?	31
		Have audit findings been submitted in an electronic format that can be manipulated by district users?	31
		Have audit findings been reviewed by facilities managers for accuracy and quality?	31
		Are the findings from the facilities audit being stored securely as valuable organizational assets (e.g., redundantly)?	33
		Has an automated document imaging system been implemented as resources allow?	33
		Has a Computerized Maintenance Management System been installed in any organization that has more than 500,000 ft^2 of facilities to manage?	34
		Are facilities data being used to inform policy-making, short- and long-term planning, and day-to-day operations as appropriate?	34
		Have facilities been commissioned, re-commissioned, or retro-commissioned as necessary?	35
		Have commissioning, re-commissioning, and retro-commissioning been planned to include seasonal analysis of systems?	36
		Have commissioning, re-commissioning, and retro-commissioning been planned according to the Energy Smart Schools recommendations?	37
		Have facilities audit findings been used to establish benchmarks for measuring equipment life and maintenance progress?	39

CHAPTER 4
PROVIDING A SAFE ENVIRONMENT FOR LEARNING

GOAL:

✓ **To identify environmental- and safety-related topics that demand an education organization's undivided attention**

Maintenance efforts must, first and foremost, ensure safe building conditions–in other words, safety takes priority over cleanliness, orderliness, cost-effectiveness, and even instructional support.

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The "Four Horsemen" of School Facilities Maintenance.....44
Indoor Air Quality 44
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Waste Management 50
Other Major Safety Concerns....53
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Securing School Facilities 62
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ENSURING ENVIRONMENTAL SAFETY

Facilities maintenance is concerned first and foremost with ensuring safe conditions for facility users–be they students, teachers, staff, parents, or guests. As important as cleanliness, orderliness, and instructional support may be to facilities planners, occupant safety must always be the top priority. Thus, while it may be difficult to define what, precisely, constitutes a "safe" environment, it is fair to say that ensuring safe conditions is a major component of effective school facility management.

The role of facilities managers in ensuring building safety has changed in recent years. One of their chief responsibilities now is to supervise the implementation of numerous environmental regulations governing school facilities and grounds and to verify compliance with a host of regulations and laws. Thus, the successful management of a school environment has grown well beyond the capabilities of a single person.

Environmental regulations designed to protect people or the environment are many and varied, and may seem overwhelming to the uninitiated reader. Yet most environmental safety regulations require only minimal monitoring and compliance efforts unless a problem is identified.

The first step in complying with environmental regulations is to become aware of their existence, intent, applicability, and requirements. Most of this information is available from regulatory agencies, professional associations, and on-the-job training. Getting this information may not always be expensive, but it does demand considerable expertise, either hired or developed. In any case, compliance with environmental safety rules pays off relative to the alternative–the possible occurrence of

The primary responsibility of school facility planners is to ensure environmental safety in school facilities.

WOULD YOU WANT TO DRINK THE WATER?

The water inspection team showed up at the school at 7:00 a.m. sharp. Samples from the first fountain showed lead levels just below the maximum allowed by the EPA. When the second and third fountains showed lead levels above the legal standards, Phil, the chief inspector, went straight to the principal's office to explain the situation. Mr. Jackson shook his head incredulously, "Phil, that can't be right! We had a water inspection team in here just yesterday and everything was fine." He showed Phil the paperwork to prove it.

"Well," Phil replied, "we obviously need to revise our work order system because you shouldn't have been inspected twice in the same week—but even so, I can't disregard the results of the tests we just did." "No you can't," Mr. Jackson agreed, "but you can retest them just to make sure." Phil nodded and went back to the fountains, retested, and got the same results. Mr. Jackson looked perplexed, but said, "Okay, Phil, we'll shut down the bad fountains until we can figure out what's going on." After several days of additional testing, Phil determined that the drinking water failed to meet EPA requirements each day until the water had been allowed to run long enough to flush out the system. Phil and Mr. Jackson agreed that the water fountains needed new pipes. After all, it was their legal and ethical responsibility to make sure the students weren't drinking contaminated water.

significant indoor air problems, underground storage tank leaks, contaminated drinking water, or other serious environment-related safety or health incidents.

THE "FOUR HORSEMEN" OF SCHOOL FACILITIES MAINTENANCE

Indoor Air Quality (IAQ)

IAQ encompasses almost anything and everything that affects the air in a building, including radon gas, paint odors, mold, construction dust, asbestos, and stack emissions. Moreover, as allergens and irritants (such as perfumes and hair sprays) proliferate, school district maintenance staff must become knowledgeable about these issues as well. One of the best resources available is the "Indoor Air Quality (IAQ) Tools for Schools" action kit developed by the U.S. Environmental Protection Agency *(http://www.epa.gov/iaq/schools/)*, which provides investigative checklists and hints for problem solving, as well as additional resources for guiding efforts to assess and improve indoor air quality.

Catastrophic incidents are not the preferred method of learning about environmental regulations. School districts need to be proactive in learning about their responsibilities from regulatory agencies, state departments of education, and professional associations.

Poor indoor air quality can affect student and teacher performance by causing eye, nose, and throat irritation, fatigue, headache, nausea, sinus problems, and other minor or serious illnesses. Thus, steps must be taken to ensure that IAQ causes neither actual nor perceived illness in facility occupants. Reasonable actions might include the following recommendations, although official standards may vary from state to state and locality to locality:

- ✓ Ventilate occupied areas at a minimum rate of 15 cubic feet per minute (cfm).
- ✓ Maintain indoor carbon dioxide (CO^2) between 800 and 1,000 parts per million (ppm).

- ✓ Install both fresh air supply and exhaust ventilation systems in occupied areas.
- ✓ Avoid recirculating previously exhausted contaminants when ventilating.
- ✓ Ensure adequate make-up air in boilers to minimize backfires and carbon monoxide (CO) contamination.
- ✓ Maintain indoor air relative humidity below 70 percent.
- ✓ Maintain indoor air temperature at comfortable levels (68-72°F when the room is being heated and 70-78°F when the room is being cooled).
- ✓ Inspect for water damage and eliminate standing water and elevated humidity.
- ✓ Clean, dry, or remove water-damaged materials within 72 hours of wetting.
- ✓ Change filters and clean drip pans according to manufacturer's instructions. (Filters in high-pollution areas may require more frequent service.)
- ✓ Seal construction/renovation from occupied areas to minimize air exchange.
- ✓ Minimize use of volatile chemicals (in cleaning agents and pesticides), especially while the building is occupied.
- ✓ Replace toxic and noxious chemicals with less harmful products as available.
- ✓ Store toxic and noxious supplies in areas with adequate exhaust systems.
- ✓ Situate vehicle-idling areas away from occupied buildings and ventilation inlets.
- ✓ Dispose of used cleaning supplies and water-damaged materials immediately and properly (double-bagged in 6-mil polyethylene plastic).
- ✓ Balance all HVAC, air handling, and ventilation systems every five years.
- ✓ Periodically test air samples for CO^2 (a sign of poor ventilation), CO (a sign of incomplete combustion), relative humidity (a sign of leaks and moisture problems), and air temperature.
- ✓ Sample for microbial growth (e.g., mold) when an IAQ problem is suspected.

Most districts that find themselves with IAQ troubles get into this predicament because they fail to respond to warning signs. Many IAQ issues may not be preventable, but can be "fixed" when monitoring, well-trained staff, and adequate resources allow the problem to be identified and addressed in a timely manner.

School staff who ignore IAQ warning signs may end up reading about their problems in the local newspaper.

Indoor air always starts as one thing–outdoor air. Unfortunately, outdoor air may itself be of poor quality. Today's requirements for fresh-air exchange in schools mean that any impurities in the outdoor air will be brought indoors. Thus someone who is susceptible to hay fever may be able to find relief in their tightly sealed home, but they won't find it in a school classroom.

IAQ – SOMETIMES A MYSTERY FOR THE EVEN THE BEST OF DETECTIVES

Terry, the facilities director, and his staff had done everything they could think of to solve an IAQ complaint from a student's parent, but to no avail. Finally, they hired a consulting company to assess the problem. The HVAC system was examined from its intake vents, through the ductwork, and into the classroom—and all proved to be in good working order. Indoor air speciation lab tests revealed no concerns, and outdoor air control samples were all within proper tolerances. Pollutants from building and housekeeping sources were checked, as were air temperature and humidity. The roof was inspected for leaks and mold, but nothing could be found. Meanwhile, the child's parents notified every authority they could find, and soon the local media were on to the story. A medical doctor had verified that the child was, indeed, reacting to something in the school that was making him ill. In fact, when the student transferred to another school, all symptoms immediately cleared up.

Finally, after weeks of investigative work, one of Terry's staff saw a teacher's aide spraying an insecticide ("but only lightly") in the student's former classroom because she had seen ants in the area. The student was subsequently diagnosed as being hypersensitive to the pesticide. Terry was able to have the classroom thoroughly cleaned (and the teaching staff trained) so the student could return to his class.

Good IAQ plans strive for problem solving through systematic investigation and, when all else fails, professional help. District staff must be encouraged to investigate all complaints thoroughly and promptly. Individual complaints may indicate either an isolated problem in a secluded area or the intolerance of a single individual to a contaminant. Repeated or multiple complaints may indicate larger or growing problems. While the details of IAQ work can be "scientific" and difficult to understand, more frequently they are straightforward and reflect common sense. For example, IAQ investigations often point to expected sources such as a classroom's pet hamster, sprays and perfumes worn by students and staff, reactions to foods or food supplements, or even allergic reactions to the aloe in tissues and hand soaps. Investigators should keep in mind that elementary-school students may have allergies that have not yet been identified by their parents or physicians.

If there is reason to suspect biological contamination (e.g., molds and microbes), the lab testing portion of an IAQ investigation begins with a study of the molds, bioaerosols, and other "natural contaminants" in the outside air for use as a control against which indoor air can be compared. Usually, HVAC filtration purifies the outdoor air so that indoor air has lower quantities of the same impurities. When indoor air tests reveal impurities that do not exist in the outdoor control, it suggests that something is "growing" inside. If investigators suspect that the problem is chemical in nature (e.g., fumes from cleaning agents stored within a facility), then volatile organic sampling may be undertaken.

Common indoor air pollutants include (but are not limited to):

- ✓ tobacco smoke
- ✓ formaldehyde
- ✓ volatile organic compounds (VOCs)
- ✓ nitrogen oxides
- ✓ carbon monoxide
- ✓ carbon dioxide
- ✓ allergens
- ✓ pathogens
- ✓ radon
- ✓ dust
- ✓ lead
- ✓ pesticides (used in or near buildings)

While this list is far from exhaustive, each of these contaminants needs to be understood and properly managed. Many of these compounds are common outdoor air pollutants as well, and all can be routinely linked to buildings and air-handling equipment.

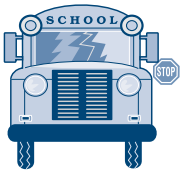
Most IAQ problems result from inadequate air handling and ventilation. Low levels of contaminants rarely accumulate to dangerous levels if the building is properly ventilated.

Potential sources of IAQ contaminants include (but are not limited to):

- ✓ "fresh" air
- ✓ odors from dumpsters
- ✓ lab and workshop emissions
- ✓ cleaning process emissions
- ✓ insects and other pests
- ✓ insecticides and pesticides
- ✓ furnaces and fuel lines
- ✓ building occupants (e.g., perfumes)
- ✓ underground sources (e.g., sewer lines and radon gas)
- ✓ HVAC equipment (which is often a path of distribution)

Building administrators also need to be concerned about creating air quality problems. For example, landscaping "environmental" areas is a popular and worthwhile school revitalization project. However, if not properly handled, such initiatives can introduce moisture and mold problems (e.g., from mulch laid outside air-intake vents), lead to fire-exit violations (e.g., if access to exits are obstructed or impeded), and invite bees and biting insects (e.g., if pollen-releasing flowers are planted). The answer is not to forbid landscape initiatives, but to make sure that projects are carried out with proper foresight. The right questions – addressing issues such as plot location, intended use, and potential impact on health and safety – must be asked (and answered) prior to granting permission for any improvement projects.

For more information about indoor air quality management, visit the National Clearinghouse for Educational Facilities' IAQ resource list at *http://www.edfacilities.org/rl/iaq.cfm*, which provides list of links, books, and journal articles addressing indoor air quality issues in K-12 school buildings, including building materials, maintenance practices, renovation procedures and ventilation systems.



MOLD, MILDEW, AND MOISTURE

Mold is a particularly prominent and pernicious IAQ problem. Mold spores occur almost everywhere in the air we breathe, and almost any building surface can support and nourish mold growth. However, the key factor in enabling mold to grow and reproduce is the presence of moisture—from leaks or elsewhere. Thus, moisture control is the primary mechanism for reducing mold growth. Even room humidifiers, which may be brought in by staff to make a classroom more comfortable, may introduce excess moisture into the building and thus have a net effect that is harmful.

COMMUNICATING NOT JUST WHAT, BUT WHY: CREATING MOISTURE AT DEW POINT

Mary Jane, the principal of Big River Elementary School, was in her second year in the newly built, fully air-conditioned building. The previous summer, she had had to deal with mold growth in a few areas of the building during the humid days of August, and she was determined to avoid the problem this year.

Mary Jane had reported the incident to the maintenance department, and the ensuing investigation revealed that three HVAC units were not operating as designed in the air-conditioning mode. The HVAC systems were repaired and had been double-checked at the end of the school year. However, John, the head of maintenance, felt that more preventive work was warranted, as he suspected that the rooms' thermostats were being set so low as to create "cold spots" that were reaching dew point. He left voice-mail messages with Mary Jane and the building's head custodian to make sure all the thermostat controls were set no lower than 75 to 78 degrees during the summer break.

When the first big heat wave hit in late June, Mary Jane asked Pete, the head custodian, to set the thermostats lower. The custodian reminded her of John's instructions, to which Mary Jane responded, "I'm all for energy conservation too, but people can't work in this heat." After a few weeks of end-of-the-year cleanup, the school was locked for the rest of the summer with the thermostats set at 65 degrees.

When the first teachers arrived in August to begin preparations for the upcoming academic year, they discovered mold growing in their classrooms. Upon further inspection, Mary Jane found mold throughout the building. She called John, who immediately recognized that the problem was beyond the expertise of his maintenance staff, and notified the superintendent that a major cleanup and air testing project would have to be initiated. As John pursued his investigation, he noticed how cool many of the rooms were and confirmed that thermostats were set much lower than 75 degrees. "Well yes," Mary Jane said, "but it was so hot in June." "But Mary Jane," John explained, "Our HVAC equipment is sized for building occupancy, which means that it cools a room based on an assumption that 24 children and a teacher will be in that room giving off body heat. When a classroom thermostat is set at 65 degrees without occupants, the room temperature reaches the thermostat setting so quickly that there isn't time to dehumidify the air completely. As a result, water vapor condenses out in the cool spots, which might reach 60 degrees along the floor and metal surfaces. And once there is standing water, mold is sure to follow."

Both Pete and Mary Jane wished that John had explained this all to them before summer break. As it was, it would take $25,000 to test and clean the rooms and HVAC equipment before school could reopen.

Asbestos

Asbestos is a naturally occurring mineral found in certain rock formations. When mined and processed, asbestos fibers can be mixed with a binding material for use in a variety of products. Asbestos products are strong, fire-resistant, corrosion-resistant, and good insulators. In schools, asbestos was commonly used in building materials and has been found in floor and ceiling tiles, cement pipes, pipe and boiler insulation, and spray-applied fireproofing. While the presence of asbestos-containing materials does not in itself pose an immediate health threat, it is well known that asbestos becomes hazardous when the microscopic fibers are released into the air, as can occur as a result of damage or deterioration.

Federal law requires that school organizations conduct asbestos inspections every three years and perform semiannual surveillance.

The type and amount of asbestos in a product varies depending upon application. The condition, location, and exposure of the material to air are factors in determining the proper response. Asbestos fibers are so small and light that they can remain airborne for many hours (increasing the chance for inhalation) if they are disturbed and released into the air. Preventing the release of asbestos fibers into the air should be a school district's primary concern.

Why is it so important that all asbestos-containing materials be identified in school facilities? Because this information guides day-to-day maintenance and operations. For example, if there is asbestos in a building's floor tiles, staff must know not to use the buffer/sander to clean the area or else hazardous fibers could be released into the air.

In 1986, the Asbestos Hazard Emergency Response Act (AHERA) was signed into federal law to regulate the management of asbestos-containing materials in public and private schools. AHERA regulations apply only to interior building materials and those under covered walkways, patios, and porticos.

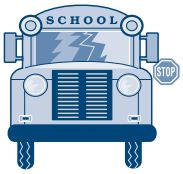
AHERA requires local education agencies to:

- ✓ designate and train an asbestos coordinator
- ✓ identify friable (i.e., easily crumbled or ground) and nonfriable asbestos-containing materials
- ✓ develop and implement an asbestos management plan that reflects ongoing surveillance, inspections, and response actions
- ✓ develop and implement a responsible operations and maintenance program
- ✓ conduct inspections for asbestos-containing materials every three years
- ✓ perform semiannual surveillance activities
- ✓ implement response actions in a timely fashion
- ✓ provide adequate staff training and meet certification requirements
- ✓ notify all occupants (and parents/guardians) about the status of asbestos-containing materials each year.

Asbestos abatement projects (i.e., removal or encapsulation) are usually undertaken by outside contractors. District staff who get involved in asbestos removal must be trained, certified and, in some instances, have their health monitored.

In other words, school districts must know where asbestos materials are located in their buildings, inform occupants, and train their staff how to work in affected areas. EPA officials conduct random checks and audit district records for asbestos monitoring and reporting.

For more information about asbestos and asbestos management, visit the National Clearinghouse for Educational Facilities' Asbestos resource list at *http://www.edfacilities.org/rl/asbestos.cfm*, which provides lists of links, books, and journal articles on how asbestos abatement and management is conducted in school buildings, and how schools can comply with federal regulations.



Water Management

Public water supplies are generally categorized as either "community water systems" or "non-community water systems." If a school district gets its water from a local city authority, it is likely on a "community water system." If a

school district uses its own wells as its water source, it would be classified as a "non-community system." In 1976, the U.S. Congress passed the Safe Water Drinking Act, which authorized the U.S. EPA to set standards for maximum contaminant levels (MCLs) for specified substances in water. Most state departments of environmental protection also have regulations addressing water-testing procedures. To ensure compliance with applicable water management regulations, school districts should:

- ✓ review pertinent federal, state, and local regulations
- ✓ develop a sampling, monitoring, and reporting plan that is commensurate with applicable regulatory guidance
- ✓ verify sampling methods used for testing and monitoring water quality
- ✓ address all water quality and systems operation deficiencies identified by the compliance plan
- ✓ incorporate water management guidelines into future construction and renovation initiatives.

Lead in drinking water has been shown to have a substantially detrimental impact on human health. The U.S. EPA requires that schools take adequate measures to ensure that lead-lined water coolers are repaired, removed, or replaced. Schools are also required to test and remove lead contamination from all sources of drinking water.

If a school district receives its water from a community system, water-testing requirements may be the responsibility of the local water authority. If, however, a school district has its own wells, it may have to comply with numerous water-testing requirements (such as for nitrates, chlorination, and turbidity), although state and local requirements vary.

In some areas, schools face water shortages. Moreover, once an adequate water source is identified, storage levels must be properly maintained, monitored, and treated. Because schools normally operate in peak-use time frames, water treatment equipment has to be sized to handle peak demand. Water-related considerations may affect the size of the boiler room as well as space for storing service equipment and chemicals. Effective water systems management requires a well-trained staff or a professional firm hired to perform the monitoring and testing. In many states, certificates and permits are required to perform these services.

THE THREE R'S OF 21st-CENTURY EDUCATION

Caring for the environment is consistent with the aims of 21st-century education:

Reading = R = Reduce

WRiting = R = Reuse

ARithmetic = R = Recycle

Waste Management

Waste management is a catch-all term that includes trash removal, recycling, and the disposal of hazardous waste. Trash removal is probably the most high-profile aspect of waste management in a school setting. In many jurisdictions, it is illegal to dump, burn, or otherwise dispose of solid waste (e.g., paper, wood, aluminum, trash) without a permit. Thus, school districts must be aware of applicable local and state laws and regulations concerning solid waste disposal.

Recycling may also play an important role in an education organization's waste management plan. Many townships and cities require recycling. In other areas, school districts may have to choose between the environmental and social benefits of recycling and the incremental costs incurred to recycle.

In any case, both solid waste and recyclables should be removed from occupied areas as soon as possible after being collected. Storage facilities (even temporary storage areas) must be located away from occupied areas to minimize the risk of fire and infestation.

The Right-to-Know Act *(http://es.epa.gov/techinfo/facts/pro-act6.html)* requires planning and assessment for a range of hazardous waste materials–from small-engine machine shop oil to science laboratory chemicals. Chemicals used by maintenance and custodial personnel may need to be noted on a material safety data sheet (MSDS) to verify that proper procedures for their use, storage, and disposal have been followed. No potentially hazardous material should be brought into a school facility without being properly labeled and having an MSDS on file. Staff must recognize the potential volatility of chemical agents that can enter breathable air when they are handled improperly. For example, many people know that when the roof leaks, wood can get wet and mold can grow. Fewer people know that the bleach used to clean mold stains may itself have serious health ramifications if the space is not properly ventilated during use. Thus, the ongoing review of systems, monitoring, and testing is critical to the recognition and handling of potentially hazardous materials.

Most states and many localities have laws that restrict the disposal of certain types of waste in public disposal facilities. For example, Massachusetts restricts the placement of cathode ray tubes (CRTs), computer screens, televisions, fluorescent bulbs, and lithium batteries in the trash because of the presence of mercury in their components. Planners must consult with authorities about specific waste guidelines applicable in their area.

Certain hazardous waste materials, including asbestos, also require that the organization sign a waste manifest for the receiving dump or waste site. For example, the dumping of soil contaminated by leaking fuel oil during a tank removal project may require the district to sign a waste manifest before the solid waste management facility will accept the contaminated dirt. This manifest may assign ownership and potential liability to the district in the event of a future site-cleanup mandate. In some cases, storage facilities may offer (for an additional cost) to burn the material, thereby avoiding the waste manifest procedure and negating potential future liabilities. These decisions require forethought, due diligence, and disclosure–and may warrant the advice of the district's legal counsel.

The disposal of medical waste, including blood-borne pathogens (BBPs), requires additional supervision and planning. "Universal precautions" is an approach to infection control that requires all human blood and certain bodily fluids to be handled as though they were infectious. Thus, all persons who clean, or otherwise come in contact with, bodily fluids should routinely take appropriate barrier precautions to prevent skin and membrane exposure. This includes wearing gloves, masks, protective eyewear, gowns, and mouthpieces (e.g., during resuscitation). The disposal of needles and sharp instruments also requires special care (e.g., used needles should never be recapped or broken by hand). All building surfaces exposed to bodily fluids should be decontaminated by cleaning with a bleach/water solution at a 1:10 ratio or another EPA-approved tuberculocidal cleaning agent. All cleaning tools should be disposed of immediately after use (and double-sealed in 6-mil polyethylene plastic bags). It is advisable for decision-makers to refer to local hospitals, clinics, and doctor offices for guidance in this area. Procedures for handling medical waste from the nurse's office and athletic training facilities should be clearly written, and all staff involved in cleanup and transport of such waste must be adequately trained. Storage and transportation of such materials is regulated, and disposal may require the services of certified or licensed individuals or firms.

"Universal precautions" is an approach to infection control that requires all human blood and certain bodily fluids to be handled as though they were infectious. Thus, all persons who clean, or otherwise come into contact with, bodily fluids should take appropriate barrier precautions to prevent skin and membrane exposure.

TRAINING STAFF TO RECOGNIZE ENVIRONMENTAL HAZARDS

While not every member of the maintenance staff needs to be an expert at remedying all the environmental hazards that can arise in school facilities, all maintenance workers should be trained to identify the signs of common environmental problems they may encounter. For example, recognizing suspicious materials, vulnerable conditions, and potential dangers enables them to take the first step (alerting others) toward protecting themselves, other building occupants, and the facility in general. It also ensures that most potential problems will be remedied before they become full-fledged catastrophes.

An issue that further complicates proper cleaning practices is that janitorial staff are advised to wear latex gloves when handling hazardous materials (and even general cleaning agents), although some individuals may have severe allergies to latex gloves. Therefore, employees must be monitored for skin or respiratory reactions when wearing latex gloves. If the use of latex gloves by students is warranted (e.g., in chemistry labs), such procedures also require monitoring, and may justify parental notification.

Wastewater management (sewage plants) is another topic that some schools may need to be concerned about. Whether wastewater goes to a local community waste plant, an in-house waste treatment plant, or an on-site drainage field, school staff should have a thorough understanding of their wastewater management responsibilities. Regardless of ownership, water treatment facilities must be managed and run by certified operators. District-owned facilities face special operational concerns that stem from the great fluctuations in demand placed on the system due to the variability of the school schedule. On a daily basis, facilities must handle peak flow during school hours (and even more specifically during windows between class periods). Weekends and holidays, on the other hand, present intervals of very low demand. Prolonged dormancy associated with summer vacation pose additional start-up issues each fall. Therefore, staff must be prepared to schedule equipment use, maintenance, and testing accordingly. Care of on-site systems should include annual inspections, pumping, and regular maintenance as needed. Kitchens should have grease traps to prevent grease from being transported to drainage beds in the system. The drainage beds themselves should be well marked. Wastewater from science labs and maintenance shops (both potentially carrying hazardous materials) must be managed from their source all the way to the treatment facility. These pipes must also be protected from accidental damage (on more than one occasion a local school organization has placed playground equipment right on top of a sewer bed or driven equipment poles through a drainage pipe).

Many states have programs to provide schools with on-site assistance in complying with occupational health and safety regulations. Check with your State Department of Labor (or Public Health) or contact *http://www.osha.gov/html/consultation.html* for more information. Most on-site consultation programs are free of charge but recipients may be obligated to remedy serious health and safety problems identified during the visit. The company that provides your organization's worker compensation insurance may also be willing to help assess your facilities for dangerous or unhealthy conditions.

OTHER MAJOR SAFETY CONCERNS

The list below denotes several prominent environmental safety issues that can occur in schools:

- ✓ chlorofluorocarbons (CFCs)
- ✓ emergency power systems
- ✓ hazardous materials
- ✓ integrated pest management
- ✓ lead paint
- ✓ mercury
- ✓ personal protective equipment
- ✓ polychlorinated biphenyls (PCBs)
- ✓ radon
- ✓ storm water runoff
- ✓ underground storage tanks (USTs)

A brief description of each of these potential environmental problem areas follows. Additional information can be found at the U.S. EPA's main index page at *http://www.epa.gov/ebtpages/alphabet.html.*

Chlorofluorocarbons (CFCs) – The release of ozone-depleting compounds – such as chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs), which are found in air conditioning and refrigeration equipment – should be minimized. School districts should ensure that all personnel servicing refrigerants are certified to do so and are using proper tools and equipment. Moreover, systems must be designed to include redundant valve settings as necessary to minimize the release of CFCs and HCFCs during routine maintenance.

Products that generate CFCs are no longer permitted to be produced or sold in the United States. HCFC production will be phased out in 2003.

Emergency Power Systems – Failure to protect the supply of power to school buildings can have both short- and long-term consequences–from damage to computers to school cancellations. One strategy for dealing with the possibility of power interruption is the installation of backup energy and power systems. This may mean installing large, multipurpose, on-site power generators for general use or smaller, portable uninterruptible power supplies (UPSs) for especially valuable equipment.

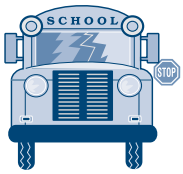
Hazardous Materials – The use and storage of hazardous materials is an important school facility management issue. Long-term exposure to chemicals (e.g., cleaning agents or reactants in chemistry labs) can cause serious health problems. Chemicals can also be fire hazards. Thus, all hazardous materials must be identified and catalogued for proper management (e.g., assigning disposal and storage responsibilities). The Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA), sometimes referred to as SARA Title III, does not place limits on which chemicals can be stored, used, released, disposed, or transferred at a facility, but it does require the facility to document, notify, and report relevant information to occupants. Right-to-Know requirements affecting a school district include:

- ✓ emergency planning
- ✓ community Right-to-Know reporting requirements
- ✓ emergency release notification
- ✓ toxic chemical release inventory reporting

For more information about the Right-to-Know Act, visit *http://es.epa.gov/techinfo/facts/pro-act6.html.*

Policy-makers should expressly prohibit the use of some materials in schools. For example, explosives and known or suspected carcinogens should never be permitted in a school environment.

Whether chemicals are being used to meet custodial or instructional needs, decision-makers should investigate whether alternative, less toxic, supplies can be used. For example, "green experiments" and "microexperiments" (see *http://www.epa.gov/greenchemistry/* and *http://www.seattle.battelle.org/services/e&s/P2LabMan/)* can be substituted for traditional science lab experiments. In any case, hazardous materials must be handled with care (using gloves and goggles, as appropriate), ordered in quantities that minimize the accumulation of excess stock, and stored in flame-resistant, lockable, safety cabinets. In addition to storing hazardous materials safely, they must be disposed of in a way that is consistent with common sense and applicable local, state, and federal regulations. This decision is sometimes complicated by the degradation of certain hazardous materials, which can become an especially serious problem. (In one school in New England, the local bomb squad had to be called in to remove old, degraded ether from a chemistry lab.) Good record keeping of hazardous material use and supplies can minimize these types of occurrences.



For more information about hazardous materials management, visit the National Clearinghouse for Educational Facilities' Hazardous Materials resource list at *http://www.edfacilities.org/rl/hazardous_materials.cfm,* which provides a list of links, books, and journal articles about the identification, treatment, storage and removal of hazardous materials found in school buildings and grounds.

Integrated Pest Management (IPM) – Nearly every school will occasionally experience problems with pest infestation. An IPM program has the goal of eliminating or drastically reducing both pests and the use of toxic pesticides in schools. IPM is based on prevention, monitoring, and nontoxic pest control methods such as sanitation improvements, structural repairs, and mechanical, biological, behavioral, or other nonchemical initiatives. Rather than focusing on pesticide use, IPM aims to identify the conditions that foster pest problems and devise ways to change those conditions to prevent or discourage pest activity. These methods include modifying the environment to inhibit pest breeding, feeding, or habitat and using pest-resistant or pest-free varieties of seeds, plants, and trees. IPM strategies may also include changing the behavior of a building's occupants to help prevent problems–for example, occupant education that leads to decreased food waste and litter, improved cleaning practices, pest-proof waste disposal, and preventive structural maintenance.

Pesticides are often temporary fixes that are ineffective over the long term. Sound IPM ensures that pest buildups are detected and suppressed before major outbreaks occur.

The identification and use of "least toxic pesticides" becomes necessary when nontoxic methods of pest control have not completely addressed pest concerns. "Least toxic pesticides" include:

- ✓ boric acid and disodium octobrate tetrahydrate
- ✓ silica gels

"Hazardous" can be a relative term–that is, something that poses a hazard to one person may not necessarily be hazardous to others. For example, latex gloves are innocuous to the vast majority of people, but can be deadly to a person with a severe latex allergy. To avoid potential problems from allergens, many states have developed registry programs to identify students with severe allergies. School districts should encourage allergy-prone students, parents, and staff to register with these valuable resources where they are available.

- ✓ diatomaceous earth
- ✓ nonvolatile insect and rodent baits in tamper-resistant containers (or for crack and crevice treatment only)
- ✓ microbe-based pesticides
- ✓ pesticides made with essential oils (not including synthetic pyrethroids) and without toxic synergists
- ✓ materials for which the inert ingredients are nontoxic and disclosed

The term "least toxic pesticides" does *not* include any pesticide that:

- ✗ is determined by the U.S. EPA to be a possible, probable, or known carcinogen, mutagen, teratogen, reproductive toxin, developmental neurotoxin, endocrine disrupter, or immune system toxin;
- ✗ is in EPA's toxicity category I or II; or
- ✗ is applied using a broadcast spray, dusting, tenting, fogging, or baseboard spraying

Whenever a chemical agent (even a "least toxic pesticide") is used, staff should be instructed to apply it according to the instructions on the label without deviation. In some states, the axiom "the label is the law" applies.

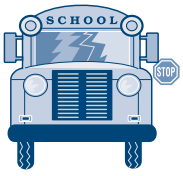
A school district is responsible for ensuring that its contractors take appropriate measures to ensure compliance with all safety regulations.

Good practices for pesticide use include:

- ✓ requiring that all persons who apply pesticides and other pest control agents be licensed by the state or locality
- ✓ requiring that all persons who apply pesticides and other pest control agents renew their certification every three years to keep abreast of evolving technologies and standards
- ✓ notifying students, parents, and school staff prior to the application of pesticides in and around schools
- ✓ maintaining records of pesticide application for at least three years (more for longer-lasting agents such as termiticides). Records should include the application date, application site (be as specific as possible), pesticide brand name, pesticide formulation, EPA registration number, total application amount (strength, rate, and duration), and the name and identification number of the certified individual applying the pesticide.

Schools that choose to have their own staff apply pesticides should obtain a business license, which documents applicable local and state requirements for the certification of personnel and insurance protection.

For more information about pesticides and integrated pest management, visit *www.beyondpesticides.org* for summaries of the 33 state laws governing integrated pest management, pesticide restrictions, and right-to-know. Also, visit the National Clearinghouse for Educational Facilities' IPM resource list at *http://www.edfacilities.org/rl/pests.cfm*, which provides a list of links, books, and journal articles about the use of pesticides, integrated pest management guidelines, specifications, training, implementation and management in school buildings and grounds.



SIX ESSENTIAL FEATURES OF AN IPM PROGRAM

Monitoring	This includes regular site inspections and pest trapping to determine the types and infestation levels of pests at each site.
Record-Keeping	A record-keeping system is essential for determining trends and patterns in pest activity. Information recorded during each inspection or treatment includes pest identification, population estimates/distribution, and plans for future prevention.
Action Levels	Pests are rarely eradicated. An "action level" is the population size that triggers remediation efforts. Action levels are based on health, economic, or aesthetic risk.
Prevention	Preventive measures are introduced into all existing structures and all designs for future structures. Prevention is the primary means of pest control in an effective pest management program.
Tactics Criteria	Chemicals should be used only as a last resort, but when needed, the least-toxic agents should be applied in a way that minimizes exposure to humans and all nontarget organisms.
Evaluation	A regular evaluation program is necessary for determining the success of current pest management strategies and plans for future IPM strategies.

Adapted from *Beyond Pesticides/National Coalition Against the Misuse of Pesticides* 701 E Street, SE • Washington DC 20003 • 202-543-5450 • *www.beyondpesticides.org*

Lead paint must be identified so that it isn't disturbed (e.g., by sanding or scraping). Once lead paint is disturbed, it must be remedied at considerable expense. If it is not disturbed, it can be safely encapsulated by simply painting over it.

Lead Paint – Lead has been shown to have a detrimental impact on human health. Lead-based paint poses numerous health risks during its application, deterioration, and subsequent release into the air and water. When assessing a building for lead exposure, considerations include building age, facility use, and occupant age and activity. Results from dust, soil, and air sampling are also necessary for designing control strategies. Abatement options include the removal and replacement of affected parts (e.g., windows and doors covered with lead-based paints), stripping of paint (which, because of the associated health risks, must be performed by hazardous waste removal specialists), encapsulation, and enclosure. Actions must also be taken to ensure the appropriate handling and disposal of hazardous materials generated by lead-based paint removal.

Mercury – Mercury is a silver-colored heavy metal that is liquid at room temperature. A person can be exposed to mercury by breathing contaminated air, swallowing or eating contaminated water or food, or having skin contact with mercury. When liquid mercury is exposed to the atmosphere, it emits vapors that are dangerous to human health. At high doses, mercury exposure can cause a range of nervous system problems, including tremors, inability to walk, convulsions, and even death. At levels more commonly seen in the United States, the effects of mercury exposure are usually more subtle, although still potentially serious, and include damage to the senses and brain.

School organizations must be aware of their use of mercury and mercury-containing products and develop policies to ensure that students, staff, and

other building occupants are protected from mercury exposure and mercury-related health risks. At a minimum, all mercury-containing equipment (e.g., fluorescent lights, mercury vapor lamps, metal halide lamps, high-pressure sodium lamps, neon lamps, light switches, relays, thermostat probes, thermometers, and laboratory solutions) should be handled according to universal hazardous waste protocols, including during disposal. Moreover, as mercury-containing equipment reaches the end of its useful life, it should be replaced with mercury-free alternatives. Most environmental experts recommend that schools adopt mercury-free purchasing policies, conduct mercury audits, and train teachers and staff to respond appropriately in the event of a mercury spill. Deficiencies in an employer's mercury management and training program that contribute to potential exposure can be cited by environmental and workplace authorities.

For more information about mercury, visit the EPA's mercury site at *http://www.epa.gov/mercury/index.html.*

Personal Protective Equipment – The personal protective equipment (PPE) program, as initiated by the Occupational Safety and Health Administration (OSHA), the Centers for Disease Control and Prevention (CDC), and many states, is intended to protect employees from the risk of injury and illness by creating a barrier against workplace hazards. In general terms, PPE requires employers to conduct an assessment of their workplace to identify environmental or safety hazards to which employees are exposed that require the use of protective equipment. Employers should have a written program to evaluate hazards, indicate appropriate control measures, provide (and pay for) protective equipment, train staff to use protective equipment properly, certify that such training has occurred, and hold yearly inspections and reviews to determine whether these efforts are preventing employee injury and illness. Deficiencies in personal protective equipment programs that lead to exposure, physical harm, or death can result in citations and monetary penalties.

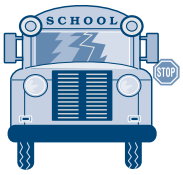
For a more detailed description of PPE requirements, visit the OSHA PPE site at *http://www.osha.gov/SLTC/personalprotectiveequipment/* or the CDC PPE site at *http://www.cdc.gov/od/ohs/manual/pprotect.htm.*

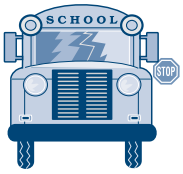
Polychlorinated Biphenyls (PCBs) – PCBs discharged into the environment pose a risk to humans and wildlife. In schools, PCB sources may include leaking fluorescent lights and electrical transformers. The use of PCB transformers near food or feed sources, or in commercial buildings (including schools), should be prohibited. Surveys must be performed to identify and remedy all potential sources of PCBs.

Radon – Radon is a naturally occurring gas that poses a danger to people if it accumulates in unventilated areas and is inhaled for long periods of time (potentially causing lung cancer). Airborne levels greater than 4 pCi/L are considered "high" and must be remedied. As part of a school's indoor air quality management, radon levels should be tested on a regular basis. Moreover, base levels for radon must be established for all buildings. Radon testers must be certified.

For more information about radon, visit the EPA's Radon resource list at *http://www.epa.gov/iaq/radon.*

If maintenance problems arise that potentially affect the health or safety of occupants (e.g., indoor air quality concerns or fire escape issues), the best policy is to address them immediately and disclose them as appropriate. Knowing that someone is in danger without warning them is at best unethical, and perhaps even legally negligent. Parents, students, and staff have a legal "right-to-know" if they are being exposed to hazardous materials or unsafe conditions.





ENSURING SCHOOL SAFETY REQUIRES AVOIDING "THE DIRTY DOZEN" OF PLAYGROUND SAFETY

1. Improper protective surfacing – The surface or ground under and around playground equipment should be soft enough to cushion a fall. Improper surfacing material under playground equipment is the leading cause of playground-related injuries. Hard surfaces such as concrete, blacktop, packed earth, or grass are not acceptable in fall zones. In fact, a fall onto one of these hard surfaces could be life-threatening. Acceptable surfaces include hardwood fiber, mulch, sand, and pea gravel. These surfaces must be maintained at a depth of 12 inches, kept free of standing water and debris, and prevented from becoming compacted through routine maintenance efforts. Synthetic or rubber tiles and mats also are appropriate for use under play equipment.

2. Inadequate fall zone – A "fall zone" or "use zone" is the area around and beneath playground equipment where a child might fall. A fall zone should be covered with protective surfacing material and extend a minimum of 6 feet in all directions from the edge of stationary play equipment such as climbers and chin-up bars. The fall zone at the bottom or exit area of a slide should extend a minimum of 6 feet from the end of the slide for slides 4 feet or less in height. For slides higher than 4 feet, add 4 feet to the entrance height of the slide to determine how far the surfacing should extend from the end of the slide. Swings require a much larger fall zone. It should extend twice the height of the pivot or swing hanger in front of and behind the swings' seats. It should also extend 6 feet to the side of the support structure.

3. Protrusion and entanglement hazards – A protrusion hazard is a piece of hardware that might be capable of impaling or cutting a child if a child should fall against it. Some protrusions also are capable of catching strings or items of clothing, causing entanglement that could result in strangulation. Examples of protrusion and entanglement hazards include bolt ends that extend more than two threads beyond the face of the nut, hardware configurations that form a hook or leave a gap or space between components, and open "S"-type hooks. Rungs or handholds that protrude outward from a support structure may be capable of causing eye injury. Special attention should be paid to the area at the top of slides and sliding devices. Ropes should be anchored securely at both ends and not be capable of forming a loop or a noose.

4. Entrapment in openings – Enclosed openings on playground equipment must be checked for head entrapment hazards. Children often enter openings feet first and attempt to slide through the opening. If the opening is not large enough it may allow the body to pass through the opening and trap the head. Thus, no openings on playground equipment should measure between 3 1/2 inches and 9 inches in diameter.

5. Insufficient equipment spacing – Improper spacing between pieces of play equipment can cause overcrowding of a play area, which may create hazards. Fall zones for equipment that is higher than 24 inches above the ground cannot overlap. Therefore, there should be a minimum of 12 feet between two play structures to provide room for children to circulate and prevent the possibility of a child falling off one structure and striking another. Swings and other pieces of moving equipment should be located in an area away from other structures.

6. Trip hazards – Tripping hazards are created by play structure components (or other items) on the playground. Exposed concrete footings, abrupt changes in surface elevations, containment borders, tree roots, tree stumps, and rocks are all common tripping hazards that are found in or near play equipment.

7. Lack of supervision – Playground supervision directly relates to the overall safety of the environment. A play area should be designed so that it is easy for a caregiver to observe children at play.

8. Age-inappropriate activities – Children's developmental needs vary greatly from age 2 to age 12. In an effort to provide a challenging and safe play environment for all ages, playground equipment must be appropriate for the age of the intended user. Areas for preschool-age children should be separate from areas intended for school-age children.

9. Lack of maintenance – A systematic preventive maintenance program is required to keep playgrounds in "safe" condition. There should not be missing, broken, or worn-out components, and all hardware should be secure. The wood, metal, or plastic should not show signs of fatigue or deterioration. All parts should be stable, without apparent signs of loosening. The surfacing material also must be maintained, and signs of vandalism should be noted, remedied, and subsequently monitored.

10. Pinch, crush, shearing, and sharp-edge hazards – Components in the play equipment should be inspected to make sure there are no sharp edges or points that could cut skin. Moving components such as suspension bridges, track rides, merry-go-rounds, seesaws, and some swings should be checked to make sure that there are no moving parts or mechanisms that might crush or pinch a child's finger.

11. Platforms without guardrails – Elevated surfaces such as platforms, ramps, and bridgeways should have guardrails that will prevent accidental falls. Equipment intended for preschool-age children should have guardrails on any elevated surface higher than 20 inches. Equipment intended for school-age children should have guardrails on elevated surfaces higher than 30 inches.

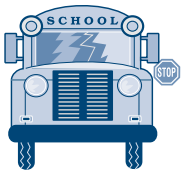
12. Equipment not recommended for the public – Accidents associated with the following equipment have resulted in the Consumer Product Safety Commission recommending that they not be used in playgrounds:

- ✓ heavy swings (such as animal-figure swings) and multiple-occupancy glider-type swings;
- ✓ free-swinging ropes that may fray or form a loop;
- ✓ swinging exercise rings and trapeze bars that are considered to be athletic equipment and, therefore, are not recommended for public playgrounds. Overhead hanging rings with short chains (generally four to eight rings) are acceptable on public playground equipment.

To receive a copy of "The Dirty Dozen" brochure, send a request, along with a self-addressed, stamped envelope, to the National Playground Safety Institute, 22377 Belmont Ridge Road, Ashburn, VA 20148.

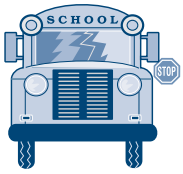
* Pressure-treated wood is another important concern for outdoor facilities. While it lasts longer than untreated wood, it can release chemical contaminants (including arsenic) that make the area dangerous for children and adults. Thus, the use of treated wood should be phased out in the school setting. When pressure-treated wood is removed from the playground, both the wood and the soil or sand on which it rested should be removed because of the likelihood of soil contamination.

Adapted from the National Playground Safety Institute, a program of the National Recreation & Park Association (http://www.uni.edu/playground/about.html).



For more information about playground safety, visit the National Clearinghouse for Educational Facilities' Playground Safety resource list at *http://www.edfacilities.org/rl/playgrounds.cfm*, which provides a list of links, books, and journal articles about playground design for varying age levels, including resources on safety, accessibility, equipment, surfaces, and maintenance.

Storm-Water Runoff – Storm-water runoff is water from rain or snow that runs off of streets, parking lots, construction sites, and residential or commercial property. It can carry sediment, oil, grease, toxics, pesticides, pathogens, and other pollutants into nearby streams and waterways. Once this polluted runoff enters the sewer system, it is discharged into local streams and waterways, creating a major threat to drinking water and recreational waters. To minimize such contamination, storm-water runoff standards have been established by the U.S. EPA, state, and local authorities.



For more information about storm water runoff, visit the EPA's Storm-Water Runoff regulations site at *http://www.epa.gov/fedsite/cd/stormwater.html.*

Underground Storage Tanks (USTs) – USTs have been a particularly high-profile environmental issue during the past few decades. Leaking USTs can contaminate groundwater and lead to the accumulation of potentially explosive gases. If USTs contain hazardous materials, both people and the environment can be threatened. Although each state defines USTs somewhat differently (e.g., some states consider commercial heating-oil tanks to be USTs), recommended practices for the use and disposal of any UST include:

- ✓ surveying for groundwater channels and reservoirs before selecting a site for UST installation
- ✓ considering UST abandonment strategies prior to finalizing installation decisions
- ✓ adjusting levels of scrutiny according to the type of liquid or gas to be stored (e.g., hazardous materials demand extra caution)
- ✓ instituting a precautionary testing program for all USTs (including tightness-testing, visual inspection by a certified inspector, and soil and groundwater surveying in the vicinity)
- ✓ maintaining original UST construction and installation records (and backup copies)
- ✓ maintaining detailed inventory records (e.g., percent filled, filling dates, and amounts)
- ✓ maintaining detailed records of testing and inspection results
- ✓ requiring product suppliers to notify the maintenance manager when new delivery people will be filling the UST so that their work can be reviewed for quality
- ✓ keeping a spill response kit on the premises at all times
- ✓ removing or sealing the UST according to applicable regulatory standards upon abandonment or discontinued use

GOOD FACILITIES MANAGEMENT ALLEVIATES BOTH HEALTH AND FINANCIAL CONCERNS

The county's newly renovated middle school was only four years old when staff in the lower level of the new addition began complaining about curling book pages, musty smells, and the onset of respiratory ailments. An initial evaluation of the building showed the appearance of a variety of molds—not a good sign!

Over the next two years, tens of thousands of dollars were spent on testing, consultants, cleaning, and carpet replacement. It wasn't until investigators reviewed the facility's "as-built" drawings that a cause was discovered. It seems the building contractor had run into a clerical snafu during HVAC installation and had received a univent system that was larger than ordered. Since the mistake was on the part of the manufacturer, the contractor went ahead and installed the larger component. Unfortunately, the oversized cooling coils in the system moved air so quickly that it was being cooled without being dehumidified—and the excess water vapor that was left in the air was free to condense throughout the building, causing paper to yellow, mold to grow, and occupants to get sick.

Because the school board had relieved the building contractor of liability upon completion of the renovation, several board members were reluctant to consent to the project to replace and downsize the univents and install power exhaust fans. But the fact that students and staff alike were falling ill meant that they had no choice but to deal with the hundred thousand dollar problem!

ENVIRONMENTALLY FRIENDLY SCHOOLS

There is a growing emphasis on creating environmentally friendly school buildings, sometimes referred to as "green schools," "sustainable schools," or "high-performance schools." The term "environmentally friendly" was once considered to be synonymous with both higher initial costs and higher operating costs. However, this assumption is no longer valid. School buildings and budgets can benefit immensely from the "green" concept when properly applied. This goal is best accomplished by emphasizing long-term, sustainable systems, including the concept of building life-cycle costs (i.e., the total cost of acquisition and ownership of a building or system over its useful life, including capital costs, energy costs, and maintenance and operating costs).

The sustainable high-performance school concept seeks to introduce a comprehensive environmental approach to all aspects of school design, construction, operations, and maintenance. The benefits include:

- ✓ improved occupant health, motivation, and productivity
- ✓ improved flexibility when designing facilities
- ✓ reduced energy use, water use, maintenance costs, insurance costs, and operation costs

The U.S. Green Building Council *(http://www.usgbc.org)* provides evaluation tools through the Leadership in Energy and Environmental Design (LEED) initiative. LEED is an assessment system designed for rating new and existing buildings. It evaluates environmental performance from a "whole

Environmental health and safety is regulated by several authorities, including federal regulations, state laws, local laws, district policies, and good, old fashioned, common sense. While these guidelines cite several relevant federal laws, they cannot detail the wide range of individual state, local, and district-level regulations, many of which vary considerably between jurisdictions. For more information about federal and state regulations, visit the U.S. Environmental Protection Agency's Links to EPA Regional Office and State Environmental Departments web page at *http://www.epa.gov/epapages/statelocal/envrolst.htm.*

WEB SITES DESIGNED TO HELP WITH THE DEVELOPMENT AND CONSTRUCTION OF HIGH PERFORMANCE SCHOOLS INCLUDE:

The National Best Practices Manual for Building High Performance Schools
http://www.eren.doe.gov/energysmartschools/order.html

Energy Design Guidelines for High Performance Schools
http://www.eren.doe.gov/energysmartschools/order.html

High Performance School Buildings
http://www.edfacilities.org/rl/high_performance.cfm

building" perspective over the building's entire life cycle, and provides a definitive standard for what constitutes a "green" building. LEED is based on accepted energy and environmental principles and strikes a balance between proven effective practices and emerging concepts.

SECURING SCHOOL FACILITIES

security \si-'kyur-ət-ē\ n: freedom from danger; freedom from fear or anxiety; measures taken to guard against crime or attack.

Securing school facilities relies mostly on common sense. Locks can be installed, but entrances will remain security breaches if people insist on propping doors open.

"Securing" a facility refers to ensuring the physical security of both a facility and its occupants–and requires a comprehensive approach to planning. At a minimum, planners must consider the following issues:

Locking systems

- ✓ Install locks on doors and windows as appropriate.
- ✓ Maintain locking devices responsibly so that keys and combinations are protected.
- ✓ Change locks that get compromised.
- ✓ Assign locking responsibilities to individuals and perform spot-checks to ensure the job is being handled properly.
- ✓ Prohibit manipulation of locks and entries (e.g., propping doors open).

Equipment protection

- ✓ Secure particularly valuable equipment (e.g., computers) with heavy-duty cables and locks.
- ✓ Keep an up-to-date log of all valuable equipment, including equipment location, brand, model, and serial number.
- ✓ Label equipment in a visible way to deter theft (e.g., with fluorescent paint, permanent markers, or engraving equipment).
- ✓ Simultaneously label equipment in an unobtrusive way (e.g., labels hidden inside the computer case so they are less likely to be noticed and removed by thieves) so that items can be identified if they are stolen and later recovered.
- ✓ Never leave expensive portable equipment unattended (e.g., don't leave a laptop computer on the desk in an unlocked office).

Visibility

- ✓ Keep vehicle routes clear in terms of the field of view (e.g., trim hedges and branches around intersections, stoplights, and signs).
- ✓ Keep pedestrian paths clear in terms of the field of view (e.g., trim hedges and branches along sidewalks).
- ✓ Keep pedestrian paths well lighted.
- ✓ Install security lighting and motion detector lighting outside of back windows and doors.

Police/security facilities

- ✓ Train security personnel to behave professionally at all times.
- ✓ Install metal detectors at building entries as necessary.
- ✓ Install surveillance cameras in otherwise unobservable parts of the buildings as necessary.

Fire protection

- ✓ Maximize structural fire protection by building full-height walls and fireproof ceilings.
- ✓ Install fire-response equipment as appropriate (e.g., automatic sprinklers and well-marked manual fire extinguishers).

Communications systems

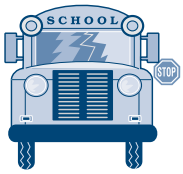
- ✓ Provide administrators (or all staff) with wireless handsets equipped with 911 panic buttons.
- ✓ Develop and practice an emergency communications action plan for contacting local fire, police, and medical authorities in an emergency.

Crisis management/disaster planning

- ✓ Perform a risk assessment to identify potential threats and risks facing the organization.
- ✓ Convene top-level managers to determine appropriate crisis and disaster response for the organization.
- ✓ Include staff from throughout the organization in disaster-response efforts.
- ✓ Include representatives from outside the organization as necessary for coordinating response with police, fire safety, and emergency services.
- ✓ Write a disaster-response plan that can be understood by staff members who will be expected to implement it.
- ✓ Practices crisis-management and disaster-response activities.

Visit *http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=98297* to read the detailed school security planning guidelines presented in *Safeguarding Your*

Technology, an online publication of the National Forum on Education Statistics.



For more information about school security, visit the following web pages: Keep Schools Safe at *http://www.keepschoolssafe.org;* National School Safety Center at *http://www.nssc1.org/;* and Safe and Drug-Free Schools Program at *http://www.ed.gov/offices/OESE/SDFS.*

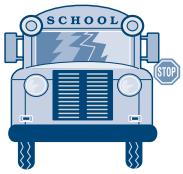
COMMONLY ASKED QUESTIONS

Does the school environment really affect student learning?
Yes. Any factor that affects student health is likely to influence student attendance and alertness as well. For example, if a classroom has poor indoor air quality, the likelihood of students suffering from respiratory illness increases substantially–which results in higher absenteeism rates. Moreover, when teaching staff are exposed to unhealthy environmental conditions, they are more likely to miss school more often as well, resulting in more substitute teachers and disrupted instructional programs.

How does a school district become better informed about the regulations and laws with which they must comply?
Numerous federal, state, and local laws that are intended to protect both our children and the environment must be complied with (and, in some instances, followed to the letter) when managing school facilities. School districts can request assistance from both federal and state regulatory agencies in ensuring that existing regulations are understood and are being properly implemented. Districts might also contact peer organizations to exchange information and ideas about compliance strategies.

How does an organization know when it has met its obligation to provide safe, healthy, and environmentally friendly facilities?
There is no way to confirm 100-percent effectiveness on these fronts. However, a district that makes the effort to learn about the issues and laws, proactively complies with the regulations, trains staff thoroughly, and performs self-evaluations regularly should feel confident that it is doing everything it can to ensure occupant health and safety and to preserve the environment. On the other hand, ignoring or otherwise neglecting these serious issues (in other words, hoping for the best) is not an acceptable management strategy from the perspective of either the public or the regulatory agencies charged with protecting the public.

ADDITIONAL RESOURCES



Every effort has been made to verify the accuracy of all URLs listed in this Guide at the time of publication. If a URL is no longer working, try using the root directory to search for a page that may have moved. For example, if the link to *http://www.epa.gov/iaq/schools/performance.html* is not working, try *http://www.epa.gov/* and search for "IAQ."

Asbestos
http://www.edfacilities.org/rl/asbestos.cfm
A list of links, books, and journal articles about how asbestos abatement and management is conducted in school buildings, and how schools should comply with federal regulations. National Clearinghouse for Educational Facilities, Washington, DC.

Beyond Pesticides
http://www.beyondpesticides.org
A nonprofit membership organization formed to serve as a national network committed to pesticide safety and the adoption of alternative pest management strategies.

California Collaborative for High Performance Schools (ChiPS)
http://www.chps.net
A group that aims to increase the energy efficiency of public schools in California by marketing information, service, and incentive programs directly to school districts and designers. The goal is to facilitate the design of high-performance schools–environments that are not only energy efficient, but also healthy, comfortable, well lit, and contain the amenities needed for a quality education.

Children's Environmental Health Network
http://www.cehn.org
A national multidisciplinary project dedicated to promoting a healthy environment and protecting children from environmental hazards. The site presents a variety of useful publications and materials.

Creating Safe Learning Zones: The ABC's of Healthy Schools
http://www.childproofing.org/ABC.pdf
A primer prepared by the Healthy Buildings Committee of the Child Proofing Our Communities campaign to offer guidance about constructing, maintaining, and renovating healthy schools.

Disaster Planning and Response
http://www.edfacilities.org/rl/disaster.cfm
A list of links, books, and journal articles about building or retrofitting schools to withstand natural disasters and terrorism, developing emergency preparedness plans, and using school buildings to shelter community members during emergencies. National Clearinghouse for Educational Facilities, Washington, DC.

Energy Design Guidelines for High Performance Schools
http://www.eren.doe.gov/energysmartschools/order.html
A manual written by the U.S. Department of Energy to help architects and engineers design or retrofit schools in an environmentally friendly manner. U.S. Department of Energy, Washington, DC.

Green Schools
http://www.ase.org/greenschools/
A comprehensive program designed for K-12 schools to create energy awareness, enhance experiential learning, and save schools money on energy costs.

Why is it so important that all asbestos-containing materials be identified in school facilities? Because this information guides day-to-day maintenance and operations. For example, if there is asbestos in a building's floor tiles, staff must know not to use the buffer/sander to clean the area or else hazardous fibers could be released into the air.

Hazardous Materials
http://www.edfacilities.org/rl/hazardous_materials.cfm
A list of links, books, and journal articles about the identification, treatment, storage, and removal of hazardous materials found in school buildings and grounds. National Clearinghouse for Educational Facilities, Washington, DC.

Healthier Cleaning & Maintenance: Practices and Products for Schools
A paper that provides guidance to schools with regard to selecting, purchasing, and using environmentally preferable cleaning products. Healthy Schools Network, Inc. (1999) New York State Association for Superintendents of School Buildings and Grounds, Albany, NY, 8pp.

Healthy School Handbook: Conquering the Sick Building Syndrome and Other Environmental Hazards In and Around Your School
A compilation of 22 articles concerning "sick building syndrome" in educational facilities, with attention given to determining whether a school is sick, assessing causes, initiating treatment, and developing interventions. Miller, Norma L., Ed. (1995) National Education Association, Alexandria, VA, 446pp.

Healthy Schools Network, Inc.
http://www.healthyschools.org/
A not-for-profit education and research organization dedicated to securing policies and actions that will create schools that are environmentally responsible for children, staff, and communities.

High Performance School Buildings
http://www.edfacilities.org/rl/high_performance.cfm
A resource list of links and journal articles describing "green design," a sustainable approach to school building design, engineering, materials selection, energy efficiency, lighting, and waste management strategies. National Clearinghouse for Educational Facilities, Washington, DC.

Indoor Air Quality (IAQ)
http://www.edfacilities.org/rl/iaq.cfm
A list of links, books, and journal articles about indoor air quality issues in K-12 school buildings, including building materials, maintenance practices, renovation procedures, and ventilation systems. National Clearinghouse for Educational Facilities, Washington, DC.

Indoor Air Quality (IAQ) Tools for Schools
http://www.epa.gov/iaq/schools/
A U.S. Environmental Protection Agency kit showing schools how to carry out a practical plan for improving indoor air problems at little or no cost by using straightforward activities and in-house staff. The kit includes checklists for school employees, an IAQ problem-solving wheel, a fact sheet on indoor air pollution issues, and sample policies and memos.

Integrated Pest Management
http://www.edfacilities.org/rl/pests.cfm
A list of links, books, and journal articles about integrated pest management guidelines, the use of pesticides, staff training, and program implementation and management in school buildings and grounds. National Clearinghouse for Educational Facilities, Washington, DC.

Janitorial Products: Pollution Prevention Project
http://www.westp2net.org/Janitorial/jp4.htm
A site sponsored by the U.S. Environmental Protection Agency that includes fact sheets, product sample kits, purchasing specifications, and other materials to advise users on the health, safety, and environmental consequences of janitorial products.

Keep Schools Safe
http://www.keepschoolssafe.org
A site resulting from a partnership between the National Association of Attorneys General and the National School Boards Association to address the subject of school violence. A bibliography on school violence resources is provided, as is information specific to school security, environmental design, crisis management, and law enforcement partnerships.

Lead-Safe Schools
http://socrates.berkeley.edu/~lohp/Projects/Lead-Safe_Schools/lead-safe_schools.html
A site established by the Labor Occupational Health Program at the University of California at Berkeley to house publications about lead-safe schools, provide training to school maintenance staff, and offer a telephone hotline to school districts and staff.

LEED™ Rating System
http://www.usgbc.org/
A self-assessing system designed for rating new and existing commercial, institutional, and high-rise residential buildings. It evaluates environmental performance over a building's life cycle and provides a definitive standard for what constitutes a "green" building. LEED is based on accepted energy and environmental principles and strikes a balance between known effective practices and emerging concepts.

Mercury
http://www.epa.gov/mercury/index.html
A web site of the U.S. EPA intended to provide information about reducing the amount of mercury in the environment. It includes both general and technical information about mercury and mercury-reduction strategies.

Mercury in Schools and Communities
http://www.newmoa.org/newmoa/htdocs/prevention/mercury/schools/
Information from the Northeast Waste Management Officials' Association (NEWMOA), which was funded by the Massachusetts Department of Environmental Protection and the Massachusetts Executive Office of Environmental Affairs to assist in identifying and removing elemental mercury and products containing mercury from schools and homes.

National Best Practices Manual for Building High Performance Schools
http://www.eren.doe.gov/energysmartschools/order.html
A manual by the U.S. Department of Energy to help architects and engineers design or retrofit schools in an environmentally friendly manner. U.S. Department of Energy, Washington, DC.

The goal of an IPM program is to control pest activity while minimizing the use of pesticides and the subsequent risks to human and environmental health.

National Program for Playground Safety
http://www.uni.edu/playground/about.html
A site that describes playground safety issues, safety tips and FAQs, statistics and additional resources, and action plans for improving playground safety.

National School Safety Center
http://www.nssc1.org/
An internationally recognized resource for school safety information, training, and violence prevention. The web site contains valuable summaries of school safety research, including contact information for locating the studies.

Playgrounds
http://www.edfacilities.org/rl/playgrounds.cfm
A list of links, books, and journal articles about playground design for varying age levels, including resources on safety, accessibility, equipment, surfaces, and maintenance. National Clearinghouse for Educational Facilities, Washington, DC.

Poisoned Schools: Invisible Threats, Visible Actions
http://www.childproofing.org/poisonedschoolsmain.html
A report that includes more than two dozen case studies of schools built on or near contaminated sites or where children have otherwise been exposed to pesticide use in and around school buildings. Gibbs, Lois (2001) Center for Health, Environment and Justice, Child Proofing Our Communities Campaign, Falls Church, VA, 80pp.

Radon Prevention in the Design and Construction of Schools and Other Large Buildings
http://www.epa.gov/ordntrnt/ORD/NRMRL/Pubs/1992/625R92016.pdf
A report outlining ways in which to ameliorate the presence of radon in schools buildings. The document presents the underlying principles (suitable for a general audience) and also provides more technical details for use by architects, engineers, and builders. U.S. Environmental Protection Agency (1994), Washington, DC, 51pp.

Safe and Drug-Free Schools Program
http://www.ed.gov/offices/OESE/SDFS
A program dedicated to reducing drug use, crime, and violence in U.S. schools. The web site contains many full-text publications on school safety and violence prevention.

Safeguarding Your Technology
http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=98297
Guidelines to help educational administrators and staff understand how to effectively secure an organization's sensitive information, critical systems, computer equipment, and network access. Technology Security Task Force, National Forum on Education Statistics (1998) National Center for Education Statistics, Washington, DC.

Safety and Security Design
http://www.edfacilities.org/rl/safety_security.cfm
A list of links, books, and journal articles about designing safer schools, conducting safety assessments, implementing security technologies, and preventing crime through environmental design. National Clearinghouse for Educational Facilities, Washington, DC.

Safety in Numbers: Collecting and Using Crime, Violence, and Discipline Incident Data to Make a Difference in Schools
http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2002312
Guidelines for use by school, district, and state staff to improve the effectiveness of disciplinary-incident data collection and use in schools. It provides recommendations on what types of data to collect and how the data can be used to improve school safety. Crime, Violence and Discipline Task Force, National Forum on Education Statistics (1998) National Center for Education Statistics, Washington, DC

Storm Water Runoff
http://www.epa.gov/fedsite/cd/stormwater.html
A list of Storm Water Management Regulatory Requirements provided by the U.S. EPA.

THOMAS Legislative Information on the Internet
http://thomas.loc.gov
A site maintained by the U.S. Congress to provide status reports on proposed legislation.

Underground Fuel Storage Tanks
http://www.cefpi.org/issue4.html
A briefing paper about the responsibilities associated with owning and securing an underground fuel storage tank. McGovern, Matthew (1996) Council of Educational Facility Planners International, Scottsdale, AZ, 5pp.

U.S. Environmental Protection Agency (EPA)
http://www.epa.gov/
The main web site of the U.S. EPA, which works closely with other federal agencies, state and local governments to develop and enforce regulations under existing environmental laws. EPA Regional Office and Linked State Environmental Departments can be found at *http://www.epa.gov/epapages/statelocal/envrolst.htm*

U.S. Green Building Council
http://www.usgbc.org
A web site intended to facilitate interaction among leaders in every sector of business, industry, government, and academia with respect to emerging trends, policies, and products affecting “green building” practices in the United States.

ENVIRONMENTAL SAFETY CHECKLIST

More information about accomplishing checklist points can be found on the page listed in the right-hand column.

ACCOMPLISHED		CHECKPOINTS	PAGE
YES	NO		
		Do facilities planners recognize that occupant safety is always their overarching priority?	43
		Has the organization contacted regulatory agencies (e.g., the EPA), the U.S. Department of Education, its state department of education, professional associations, and peer institutions to obtain information about applicable environmental regulations?	43
		Does the organization have a plan for responsibly managing indoor air quality?	44
		Does the organization have a plan for responsibly managing asbestos?	48
		Does the organization have a plan for responsibly managing water quality and use?	49
		Does the organization have a plan for responsibly managing waste handling and disposal?	50
		Does the organization have a plan for responsibly managing CFCs and HCFCs?	53
		Does the organization have a plan for responsibly managing emergency power systems?	53
		Does the organization have a plan for responsibly managing hazardous materials?	53
		Does the organization have a plan for responsibly managing integrated pest management?	54
		Does the organization have a plan for responsibly managing lead paint?	56
		Does the organization have a plan for responsibly managing mercury?	56
		Does the organization have a plan for responsibly managing personal protective equipment?	57
		Does the organization have a plan for responsibly managing PCBs?	57
		Does the organization have a plan for responsibly managing radon?	57
		Does the organization have a plan for responsibly managing playgrounds?	58
		Does the organization have a plan for responsibly managing storm water runoff?	60

		Does the organization have a plan for responsibly managing underground storage tanks?	60
		Does the organization have a plan for introducing environmentally friendly school concepts to new construction and renovation projects?	61
		Does the organization have a plan for responsibly managing locking systems?	62
		Does the organization have a plan for protecting equipment?	62
		Does the organization have a plan for ensuring pedestrian and vehicle visibility?	63
		Does the organization have a plan for policing/securing facilities?	63
		Does the organization have a plan for responsibly managing fire protection?	63
		Does the organization have a plan for protecting communications systems?	63
		Does the organization have a plan for responsibly dealing with potential crises and disasters?	63

CHAPTER 5
MAINTAINING SCHOOL FACILITIES AND GROUNDS

GOALS:

- ✓ **To remind readers that an ounce of prevention is worth a pound of cure**
- ✓ **To convey strategies for planning and implementing "best practices" for maintaining facilities and grounds**

A comprehensive facility maintenance program is a school district's foremost tool for protecting its investment in school facilities. Moreover, preventive maintenance is the cornerstone of any effective maintenance initiative.

GOOD MAINTENANCE: A WIN-WIN SITUATION

Russell Elementary School had its act together, and Jenny, the district's facilities manager, wanted to let everyone know it. "Principal Dalton, your school has worked very hard this year to conserve energy. According to reports I've received, you have a school-wide "turn-off-the-lights program," you insist on "energy saver" mode on all resting computers, and you maintain strict climate control on a year-round basis. Because your students and staff have done so much to conserve energy and protect the environment, I am pleased to issue your school a check for $2,000 out of the money you saved the district this year in utility bills. Please earmark the funds for student field trips and assemblies." What Jenny chose not to mention was that the school's utility bill had decreased by more than $6,000 that year for a variety of reasons, including considerable forethought on her part while planning a major renovation to the building. Still, the building staff had motivated the kids to do their part as well, and for that, they deserved the reward!

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"Breakdown maintenance" is not in the best interest of the taxpayer, the maintenance department, or students and staff.

PREVENTIVE MAINTENANCE: AN OUNCE OF PREVENTION IS WORTH A POUND OF CURE

Under the guise of "saving money," many school districts (and other organizations for that matter) practice what is known as "breakdown maintenance"–a maintenance program in which nothing is done to a piece of equipment until it breaks down. And then, after the equipment breaks, the least expensive repair option is used to return the equipment to service. While this may sound like a cost-saving approach to maintenance, precisely the opposite is true.

Breakdown maintenance defers repairs and allows damage to accumulate, compounding an organization's problems. On the other hand, regularly scheduled equipment maintenance not only prevents sudden and unexpected equipment failure, but also reduces the overall life-cycle cost of the building.

Maintenance entails much more than just fixing broken equipment. In fact, a well-designed facility management system generally encompasses four categories of maintenance: emergency (or response) maintenance, routine maintenance, preventive maintenance, and predictive maintenance. The one everyone dreads is *emergency maintenance* (the air conditioner fails on the warmest day of the year or the main water line breaks and floods the lunchroom). When the pencil sharpener in Room 12 finally needs to be replaced, that is *routine maintenance. Preventive maintenance* is the scheduled maintenance of a piece of equipment (such as the replacement of air conditioner filters every 10 weeks or the semiannual inspection of the water fountains). Finally, the cutting edge of facility management is now *predictive maintenance,* which uses sophisticated computer software to forecast the failure of equipment based on age, user demand, and performance measures.

Good preventive maintenance practices interrupt the cycles that perpetuate high energy use and short equipment life cycles.

A FOCUS ON PREVENTIVE MAINTENANCE

A good maintenance program is built on a foundation of preventive maintenance. It begins with an audit of the buildings, grounds, and equipment (see Chapter 3). Once facilities data have been assembled, structural items and pieces of equipment can be selected for preventive maintenance. When designing a preventive maintenance program, heating and cooling systems are always a good place to start, but planners should think creatively because there may be other components that would be good candidates for preventive maintenance.

Once the items (structures, equipment, and systems) that should receive preventive maintenance have been identified, planners must decide on the

THE MAINTENANCE SPECTRUM

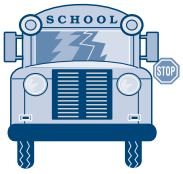
When planning preventive maintenance, decision-makers should consider how to most efficiently schedule the work—i.e., concurrently with academic breaks or other planned work. For example, preventive maintenance work such as boiler pipe replacements can be conducted while the boiler is out of commission for routine maintenance (such as when cleaning the scale and mud from inside the boiler or cleaning the manhole and handhold plates). Whereas emergency events demand immediate attention whenever they occur, preventive maintenance activities can be scheduled at a convenient time. Because a rigorous preventive maintenance system results in fewer emergency events, it tends to reduce disruptions to the school schedule.

frequency and type of inspections. Manufacturers' manuals are a good place to start when developing this schedule; they usually provide guidelines about the frequency of preventive service, as well as a complete list of items that must be maintained. Many manufacturers will assist customers in setting up preventive maintenance systems (if for no other reason than they get the additional business of selling replacement parts).

Once the information is assembled, it must be formatted so that preventive maintenance tasks can be scheduled easily. Ideally, scheduling is handled by a computerized maintenance management program (see Chapter 3). However, a district that does not have such a system can accomplish the task with a stack of 3" x 5" index cards and a dozen manila folders (one for each month). One side of the index card should contain information about the equipment and the services that need to be performed. The back side of the card is used to record the date on which service is performed, the name of the technician, and the cost of materials. After each inspection, the card gets placed in the manila folder assigned to the month of the next inspection. For example, if the initial inspection is in February and the inspection is a semi-annual, the card would be returned to the August folder. This simple system should meet the needs of a smaller school district. However, larger districts should invest in a computerized maintenance management system designed specifically for school districts.

Record keeping is important for many reasons, including justifying costs associated with preventive maintenance. A computerized maintenance management system (see Chapter 3) is designed to track preventive (and other) maintenance costs. Districts that don't have automated systems should track costs manually.

For more information about preventive maintenance, visit the National Clearinghouse for Educational Facilities' Maintenance Page at *http://www.edfacilities.org/rl/maintenance.cfm*, which provides list of links, books, and journal articles on how to maximize the useful life of school buildings through preventive maintenance, including periodic inspection and seasonal care.

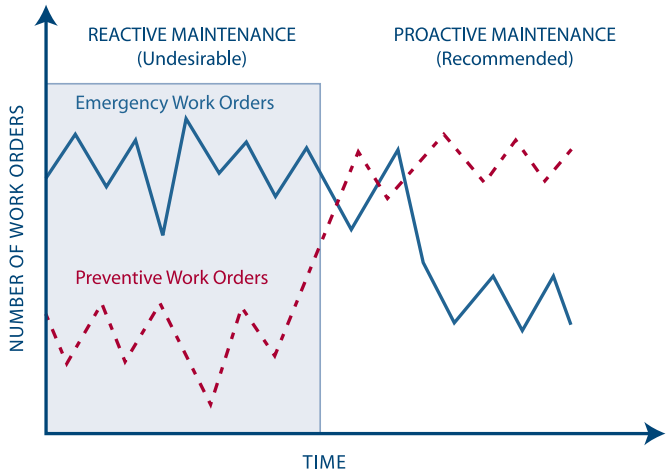


MAINTENANCE AND OPERATIONS ISSUES

A number of specific maintenance topics are addressed in the following paragraphs. Every school organization in the nation may not encounter every one of these issues since school facilities and circumstances facing school districts vary enormously. Additional information about relevant environmental topics can be found at the U.S. Environmental Protection Agency's Web index page at *http://www.epa.gov/ebtpages/alphabet.html.*

Access Controls – Keys and key control are a major concern for all districts. For example, who has the authority to issue keys? A great grand master keying system – a pyramid system that allows several doors to be opened by one master key – is well worth the investment. (All major manufacturers of

A good maintenance plan is preventive—i.e., preventive work orders outnumber emergency work orders.



Keys are only one of many methods for controlling building access. People who are authorized to be in a district facility should be clearly identifiable, even from a distance. Thus, it is wise to require maintenance and operations staff to wear district-issued uniforms when working at school sites. (Even a T-shirt with "Evergreen School District Maintenance Staff" silk-screened across the front can serve as an "official" uniform when worn with khaki work pants and boots. Identification badges with an individual's picture are another effective means for identifying individuals who are authorized to enter a school.

lock systems produce great grand master keys.) Also, the concept of a "key" has changed rather dramatically over the past decade or so. Electronic locks that open by card, code, or password are now being used in many schools. Some systems record the time and identification number of each person who opens a door. Whether traditional metal keys or electronic "keys" are used, top-level school managers and the school board should establish a clear and concise "key policy."

Boilers – Boilers, which can be used to generate hot water for domestic use (e.g., kitchens, showers, and bathrooms) or for heating buildings, should definitely be included in an organization's preventive maintenance program. Most large boilers are subject to state or local inspection laws, which typically require that the boiler be maintained on a regular basis (at least annually) and that maintenance records be kept on-site. Records of hours of operation and fuel use must also be maintained on-site and made available to inspectors. Moreover, permits may be required for boilers that generate more than 10,000,000 btu/hour. Energy-saving techniques include equipping boilers with hot-water temperature resets (which adjust the temperature of the hot water being produced based on the outside temperature) and using boiler economizers to capture and recycle heat that would otherwise be lost in the stacks.

Electrical Systems – Electrical equipment must be maintained like any other piece of equipment, whether it is a distribution pole with transformers or a breaker box for controlling a classroom's electrical power. Professional engineers and electricians should help to determine preventive maintenance tasks and schedules for electrical components. Thermographic scanning, which identifies overheating in connections, motors, bearings, and other electrical switchgear, can be an important tool for determining the condition of electrical gear (the principle behind the test is that a loose connection, bad bearing, or bad breaker bars will produce more heat than a proper connection). Thermographic scanning devices are not expensive and should be part of every district's standard maintenance toolkit. Another new technology, motor current analysis, checks the line current going to a motor and can be used to identify unacceptably high resistance and other defective parts in a motor before it fails. With the widespread use of computers, the proper maintenance of electrical systems is more important than ever in 21st-century schools. Reliance upon extension cords and an excessive number of power

FOCUS ON ENERGY EFFICIENCY

Direct Digital Controls (DDCs): DDCs are a state-of-the-art method of controlling temperature with sensors and computers. Thermostats are replaced by a sensor that transmits the current room temperature to a computer, which has been programmed with a desired "target" temperature and signals the controller to raise or lower the room temperature as needed to reach the target. DDCs are not yet standard with most Energy Management Systems, but they can be purchased as an upgrade or retrofitted to existing systems.

Two-Pipe and Four-Pipe HVAC Systems: HVAC water systems heat and cool buildings by transferring hot or cold water through a system of pipes. One method of moving the water through a building uses a " two-pipe" system, in which one pipe is used to supply the water to the point of use and the other is used to return the water to its source. Because only two pipes need to be installed, it is initially less expensive than a "four-pipe" system. The drawback is that chilled and hot water can't both be supplied at the same time. In other words, a building is either being heated or being cooled in its entirety at any given time. If, for example, the south face of a building heats up faster than the shaded north face, there is no way to heat one part of the building while another part is being cooled.

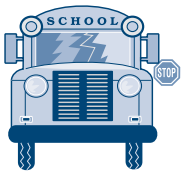
In contrast, a four-pipe system (which is basically a dual two-pipe system) allows both chilled and hot water to be sent to different parts of a building at the same time. Because four-pipe systems minimize the need for unnecessary heating or cooling, they are recommended in all new building construction and renovation. Although they cost more to install, their operational savings will quickly recoup the costs and lead to substantial energy savings over a building's life.

poles is an indication that permanent upgrades to the electrical system are needed. However, upgrading existing electrical systems in old buildings must be carefully managed. Building codes vary by locality, but whatever procedures, standards, and inspection requirements exist are designed for standardization and safety and must be carefully followed by school personnel.

Energy Management – The cost of energy is a major item in any school budget. Thus, school planners should embrace ideas that can lead to reduced energy costs. Energy Management Systems are computer-controlled systems that operate HVAC units. They can automatically turn on and off air conditioning, lights, and boilers according to pre-programmed instructions entered by facilities staff. Investment in Energy Management Systems will generally be recouped within a few years. The following guidelines will help a school district to accomplish more efficient energy management:

- ✓ Establish an energy policy with specific goals and objectives.
- ✓ Assign someone to be responsible for the district's energy management program, and give this energy manager access to top-level administrators.
- ✓ Monitor each building's energy use.
- ✓ Conduct energy audits in all buildings to identify energy-inefficient units.
- ✓ Institute performance contracting (i.e., contracts requiring desired results rather than simply a list of needed products) when replacing older, energy-inefficient equipment.
- ✓ Reward schools that decrease their energy use.
- ✓ Install energy-efficient equipment, including power factor correction units, electronic ballast, high-efficient lamps, night setbacks, and variable-speed drives for large motors and pumps.
- ✓ Install motion detectors that turn lights on when a room is occupied (and off when the room is unoccupied).

Some schools save energy by closing at 5 p.m. one night a week—meaning no after-school clubs, athletic events, or community use for that evening. The inconvenience to users is minimal compared to the substantial savings, which include not only lower utility bills but also improved staff sanity since it is the one night a week everyone will go home at a reasonable hour!



For more information about energy management, visit the National Clearinghouse for Educational Facilities' Energy Page at *http://www.edfacilities.org/rl/energy.cfm*, which provides list of links, books, and journal articles on various methods of heating, cooling, and maintaining new and retrofitted K-12 school buildings and grounds.

Fire Alarms – Fire drills should be held on a monthly basis both to test fire alarms and practice occupant response to fire emergencies. During school breaks when buildings are not occupied, detailed inspections of all fire alarms should be performed. This includes testing all pull stations, smoke detectors, and heat detectors located in building ductwork. (Note that the installation of smoke and heat detectors in HVAC ducts is a recent, but important, revision to many building codes.) Some states require that a licensed contractor perform fire alarm inspections.

Experienced facilities managers recommend that all grout be in earth tones (or on the dark side of the color spectrum) because light-colored grout tends to stain and discolor over time, often to the point that it is difficult to restore or repair.

Floor Coverings – Selecting appropriate floor coverings for a school is an important issue that planners must address during renovation and new construction. Often lunchrooms, main halls, and secondary halls are covered in terrazzo, vinyl composition tile (VCT), or quarry tile. These coverings have hard surfaces that are easily cleaned and do not collect dirt. In classrooms where noise control is important, carpets with an impermeable backing, which prevents the passage of water or dirt and are easily cleaned, may be used. Carpets can also be purchased with adhesives already attached to the backing, which helps to ensure complete adhesion without the emission of volatile organic compounds (VOCs). Some primary schools use area rugs

FOCUS ON FLOORS: A COMMON CUSTODIAL TASK

A large part of custodial responsibilities in a school building involves the cleaning of various types of flooring. In heavy-traffic areas such as corridors, classrooms, and cafeterias, an effective cleaning regimen might be:

CARPETS

- ✓ Shake floor mats in entryways
- ✓ Vacuum daily
- ✓ Apply spot remover as needed
- ✓ Deep-clean prior to start of school year
- ✓ Deep-clean during holiday break
- ✓ Scrub-clean twice yearly

HARD SURFACES

- ✓ Shake floor mats in entryways
- ✓ Dry-mop daily
- ✓ Apply spot remover as needed
- ✓ Wet-mop three times/week
- ✓ Spray-burnish every other week
- ✓ Strip and finish yearly

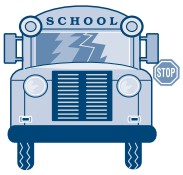
Although carpets help to protect floors, they are difficult to keep clean. They collect dirt and pesticides, and incubate fungi and bacteria when moisture gets trapped. Adhesive backing can also give off harmful fumes. (Some new school buildings are being constructed without carpets to alleviate these health concerns.) If, however, the floor-covering inventory includes carpet, then provisions must be made for proper cleaning. A hot-water extractor should be available at each school and used weekly to remove stains and dirt. Carpets should be steam-cleaned annually with a professional-quality steam cleaner that generates water at least 140ºF and an extraction capability of 60 pounds per square inch. Note, however, that carpets must be dried within 24 hours of wet-cleaning to prevent mold from growing. Carpet bonnets, which attach over a buffer wheel, should never be used because they damage carpets. Larger districts should have in-house staff who are capable of repairing buffers, vacuum cleaners, and other types of carpet-cleaning equipment. Equipment manufacturers will advise customers about training repair people and obtaining replacement parts.

For more information about recommended carpet and rug care, visit the Carpet and Rug Institute (CRI) at *http://www.carpet-rug.com/*. The CRI also has a site that focuses on carpet use in schools, including such topics as indoor air quality, allergies, and carpet selection, installation, and care at *http://www.carpet-schools.com/*.

rather than carpets because they can be easily removed and cleaned at the end of the school year or as needed. Periodic cleaning of both carpets and rugs is necessary to minimize the likelihood of dirt and other contaminants causing indoor air quality problems. Ceramic floor tile is an excellent surface material for bathrooms or other areas with high exposure to water. Good specifications for a high-performance, soft-surface floor covering include:

- ✓ nylon type 6.6
- ✓ face weight no greater than 20 ounces
- ✓ 100 stitches per square inch
- ✓ vinyl pre-coated as primary backing
- ✓ close-cell vinyl cushion
- ✓ permanently fused to tufting blanket
- ✓ no moisture penetration after 10,000 impacts
- ✓ no backing or seam degradation after 50,000 cycles from Phillips Chair Caster Test
- ✓ factory-applied non-wet, low-VOC adhesive with no off-gassing (required)
- ✓ permanent chemically welded seams
- ✓ warranty non-prorated for 20 years against zippering, delamination, edge ravel, excessive surface wear, and loss of resiliency

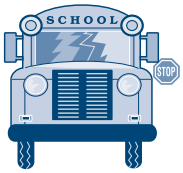
For more information about floor care, visit the National Clearinghouse for Educational Facilities' Floor Care Page at *http://www.edfacilities.org/rl/floor_care.cfm*, which provides list of links, books, and journal articles on the maintenance of a variety of floor coverings in K-12 school classrooms, gymnasiums, science labs, hallways and stairs.



Gym Floors – Gym floors are generally constructed with vinyl composition tile (VCT), one of several grades of maple flooring, sheet rubber, or other synthetic materials. Regardless, all floor types must be kept clean and properly maintained. VCT floors must be periodically stripped and re-waxed to ensure a safe surface. Wood floors require annual screening and resealing with a water-based sealant. They should also be sanded, re-marked, and resealed in their entirety every 10 years. Synthetic floors (including sheet rubber but excluding asbestos tile) require monthly cleaning and scrubbing with buffers.

Heating, Ventilation, and Air Conditioning (HVAC) Systems – All schools require HVAC systems to control indoor climate if they are to provide an environment that is conducive to learning. In fact, oftentimes a district's ability to convene classes depends on acceptable climate control. If the air conditioning is broken on a 90ºF day or the heating system is malfunctioning on a 30ºF day, school gets canceled. It's as simple as that. Different regions of the country may place emphasis on different elements of the HVAC system, but the bottom line is the same: HVAC components must be maintained on a timely and routine basis. This preventive maintenance will ensure reliability, reduce operating costs, and increase the life expectancy of the equipment.

Two effective ways to improve HVAC performance are through air balancing and water balancing. Air balancing ensures that the desired amount of air reaches each space in the building, as specified in the mechanical plans. Water balancing ensures that the flow of water from the chiller and boiler is in accordance with the mechanical plans. Water balancing is normally performed before air balancing. Balancing is usually conducted upon installation of new equipment and at 5- to 8-year intervals. Balancing should also be conducted when building space is substantially modified or room use is changed dramatically.



For more information about HVAC systems, visit the National Clearinghouse for Educational Facilities' HVAC Page at *http://www.edfacilities.org/rl/hvac.cfm*, which provides list of links, books, and journal articles on HVAC systems, including geothermal heating systems, in school buildings.

Hot Water Heaters – Hot water heaters in schools range in size from small 10-gallon heaters to the larger 100- to 300-gallon units. Preventive maintenance programs must be established for each hot water heater. At a minimum, maintenance should include inspection for failing safety devices and leaks (especially if fired by natural gas).

Kitchens – Kitchens present special problems for school districts: not only must equipment be maintained properly to ensure reliability, but 1) a high state of cleanliness must be maintained in all food preparation areas; 2) the use of certain cleaning agents may be discouraged in food preparation areas; and 3) ovens and stoves pose special fire safety concerns. Floor surfaces are also of particular concern in kitchens since they must be easy to clean yet slip-resistant. Recommended floor surfaces for kitchens include terrazzo, vinyl composition tile (VCT), quarry tile, and sealed concrete. Kitchen equipment is a prime candidate for inclusion in a preventive maintenance program.

Painting – Painting should be done on a regular schedule that is published well in advance of work dates to minimize inconvenience to building occupants. Painting needs will be determined largely by the type of surface, the type of paint applied previously, and surface use (e.g., a window pane may be expected to receive less wear than a chair rail). A wall constructed of concrete masonry units (CMU) and painted with a two-part epoxy can last 8 or 10 years whereas drywall will require painting every 5 or 6 years. Bathrooms, special education areas, and other high-traffic areas will require painting on a more frequent schedule. A durable, cleanable (i.e., able to be cleaned by the custodial staff with their standard tools), paint from a major manufacturer should be used for indoor areas. Water-based latex paints are a good choice because they are low in volatile organic compounds (VOCs) and do not produce noticeable odors. Surfaces must be properly prepared for painting, which may require the use of a primer to cover stains and discolored patches.

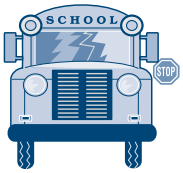
Plumbing – Like other major building components, plumbing should be included in the preventive maintenance program. Sprinkler systems, water fountains, sump pumps, lift pumps, steam traps, expansion joints, and drains are likely targets for preventive maintenance. Standing water must be avoided at all costs since it damages building materials and can lead to mold concerns that affect indoor air quality.

Public Address Systems and Intercoms – These communications tools are vital to the management of school buildings and, in an emergency, the safety of building occupants. Public address (PA) systems must be connected to the emergency power system to ensure uninterrupted communications in the event of a power failure. Public address systems and intercoms should be tested on a daily basis during the broadcast of a school's morning announcements. If broadcast systems fail to perform properly, they must be repaired immediately.

Roof Repairs – Roofs should be included in a preventive maintenance program and inspected on a regular schedule. The key to maintaining good roofs is the timely removal of water from the surface and substructure of the roof. Thus, all leaks and damaged tiles must be repaired as soon as possible to prevent water damage and mold growth. On composition built-up roofs, hot tar is the only appropriate repair method. Single-ply and modified roofs should be repaired in accordance with the manufacturer's instructions. Staff should read carefully all warranties issued with new roofs to ensure that required maintenance is conducted according to specification so as to avoid invalidating the warranty protections. For example, failing to inspect or repair a roof on an annual basis (and document such efforts) may be considered justification for a manufacturer invalidating a warranty.

The facility manager must verify the annual assessment of each roof within the district, recording the date of installation, type of roof, type and thickness of insulation, type of drainage, and type and frequency of repair work. Detailed drawings or photographs that show the location of repairs should be maintained, as should contact information for the installing contractor. This information is extremely important in the event of a major roofing problem or an insurance or warranty claim. Whatever type of roof is selected, it should be installed by a reputable (and bonded) roofer and should include a non-prorated warranty.

For more information about roof repairs, visit the National Clearinghouse for Educational Facilities' Roof Repair Page at *http://www.edfacilities.org/rl/roof_maintenance.cfm*, which provides list of links, books, and journal articles discussing maximizing the life cycle performance of school roofs, as well as roof inspection strategies, scheduling, documentation, and repair resources.



Water Softeners – Water softeners are often used in hot water lines in those regions of the country where the water has a high concentrate of calcium. Water softeners remove the calcium from the water, which prolongs the life of dishwashers and other kitchen equipment.

Schools are subject to federal regulations, state law, local law, district policy and, hopefully, good, old-fashioned common sense. While these guidelines cite relevant federal regulations they cannot fully describe the wide range of individual state, local, and district-level regulations, many of which vary considerably between jurisdictions. For more information about federal and state regulations, visit the U.S. Environmental Protection Agency's Links to EPA Regional Office and State Environmental Departments web page at *http://www.epa.gov/epapages/statelocal/envrolst.htm.*

ESTABLISHING EXPECTATIONS FOR CUSTODIAL EFFORTS

Planners, administrators, and community members must agree on what constitutes "cleanliness." While there is not a nationwide standard for describing standards of cleanliness, a five-tiered system of expectations is emerging to help guide decision-making:

> Level 1 cleaning results in a "spotless" building, as might normally be found in a hospital environment or corporate suite. At this level, a custodian with proper supplies and tools can clean approximately 10,000 to 11,000 square feet in an 8-hour period.
>
> Level 2 cleaning is the uppermost standard for most school cleaning, and is generally reserved for restrooms, special education areas, kindergarten areas, or food service areas. A custodian can clean approximately 18,000 to 20,000 square feet in an 8-hour shift.
>
> Level 3 cleaning is the norm for most school facilities. It is acceptable to most stakeholders and does not pose any health issues. A custodian can clean approximately 28,000 to 31,000 square feet in 8 hours.
>
> Level 4 cleaning is not normally acceptable in a school environment. Classrooms would be cleaned every other day, carpets would be vacuumed every third day, and dusting would occur once a month. At this level, a custodian can clean 45,000 to 50,000 square feet in 8 hours.
>
> Level 5 cleaning can very rapidly lead to an unhealthy situation. Trash cans might be emptied and carpets vacuumed on a weekly basis. One custodian can clean 85,000 to 90,000 square feet in an 8-hour period.

The figures above are estimates. The actual number of square feet per shift a custodian can clean will depend on additional variables, including the type of flooring, wall covers, and number of windows, all of which must be taken into account when determining workload expectations.

Area cleaning is the traditional approach in which a single custodian is responsible for all aspects of cleaning (vacuuming, dusting, trash removal, etc.) in a specific area. Team cleaning is performed by a team of specialists where one uses the vacuum, another a dust mop, and yet another empties wastebaskets or cleans the chalkboards.

CUSTODIAL ACTIVITIES

The first step toward establishing an effective custodial program is to determine the district's expectations of its custodial services. This requires input from both the school board (who ultimately will fund the program) and the building administration (who will live with the results of the program). Facilities managers must then determine how to staff and support custodial efforts to meet these expectations. Managers must also determine the chain of command for custodial staff. In smaller districts, the head custodian often reports to the school principal. In larger districts, the custodial staff generally work directly for a central administrator who is trained in custodial operations and has ultimate responsibility for the cleanliness of the district's buildings.

Another management decision concerns the type of custodial cleaning to be used: area cleaning or team cleaning. Area cleaning is a traditional approach to custodial work, still commonly used in small districts, in which a custodian is responsible for all aspects of cleaning (e.g., vacuuming, dusting, trash removal) in a specific area. By contrast, team cleaning relies on specialists, with one person handling all the vacuuming, one person washing all the chalkboards, one person cleaning all the bathrooms, etc.

In theory, team cleaning is more efficient than area cleaning: thus, a four-person team can be expected to clean more than four times the square footage of a "generalist" custodian in the same time period. This approach is also equipment-efficient–each team of four needs only one vacuum cleaner;

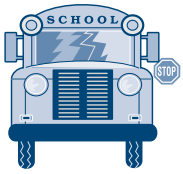
SHOULD CUSTODIANS PERFORM LIGHT MAINTENANCE ACTIVITIES?

In many large school districts, job overlap is frowned upon—both from the perspective of "time off-task" and union agreements. In smaller districts, it wouldn't be realistic to expect a maintenance person to drive out from central office just to change a light bulb or replace a fuse, especially when there is an on-site custodian who is perfectly capable of doing the job. Small organizations will argue that this is plain common sense. Big districts may claim that it upsets the organizational chart. There's no right answer: local decision-making depends on local circumstances.

whereas each "generalist" custodian needs his or her own vacuum, mop, broom, and floor waxer. On the down side, a specialist who vacuums for eight hours at a time may burn out more quickly than a custodian who has more varied duties (although this can be minimized by "rotating" team members' cleaning duties). Team cleaning also tends to inhibit the personal interaction between custodians and faculty that is characteristic of area cleaning.

Many districts have used both approaches to cleaning successfully. The key variable is the degree of cleanliness the district desires relative to its willingness to incur increased personnel and equipment costs. In general, area cleaning results in cleaner facilities because a single custodian is responsible for an entire area, allowing him or her to become intimately familiar with the specific needs of the area. Team cleaning, however, tends to be somewhat less expensive.

For more information about custodial activities, visit the National Clearinghouse for Educational Facilities' Cleaning Page at *http://www.edfacilities.org/rl/cleaning.cfm*, which provides list of links, books, and journal articles on custodial standards and procedures, equipment, safety, and product directories for the cleaning and maintenance of schools and colleges.



GROUNDS MANAGEMENT

The entire school grounds must be properly maintained on a routine and preventive basis. School grounds can be defined as the full extent (i.e., corner pin to corner pin) of all school property, including school sites, the central office, and other administrative or support facilities. This includes, but is not limited, to:

- ✓ courtyards
- ✓ exterior lighting and signage
- ✓ outdoor learning equipment
- ✓ pools
- ✓ museums
- ✓ bike trails
- ✓ modular facilities
- ✓ paved surfaces (e.g., sidewalks, parking lots, and roads)
- ✓ athletic fields (including synthetic surfaces such as Astroturf)
- ✓ vacant property owned by the district

Properly maintained athletic turf, physical education fields, and playgrounds can help to improve student health and safety. Specifically, well-rooted, flat, and divot-free surfaces reduce the occurrence of leg and foot injuries.

KEEPING A SCHOOL CLEAN ISN'T ONLY THE CUSTODIAN'S RESPONSIBILITY

Some schools have adopted the "30-second rule" in which everyone in the building stops what they are doing and cleans the room they are in during the last 30 seconds of the day. (Most parents seem to approve of their kids getting used to cleaning up their space at the end of each day!)

In other schools, the student council is hired (via a donation from the maintenance department) to make sure that trash stays off of the floor.

Another approach is to give a "Golden Trash-Can Award" to the homeroom that is kept the cleanest during the week—with the winners earning a pizza party from the maintenance department at the end of the month.

Some school districts have responsibility for managing areas of special concern, including (believe it or not):

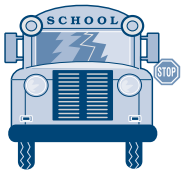
- ✓ wetlands
- ✓ caves
- ✓ mine shafts
- ✓ sinkholes
- ✓ sewage treatment plants
- ✓ historically significant sites
- ✓ other environmentally sensitive areas

Other grounds-related factors that demand consideration include:

- ✓ use of fertilizers/herbicides
- ✓ watering and sprinkler systems
- ✓ use of recycled water (gray water) for plumbing, watering fields, etc.
- ✓ drainage
- ✓ scheduling "rest" time (e.g., time for new grass to grow after the football season)
- ✓ weighing the aesthetic benefits of flower beds versus the health costs of increased allergy events and bee stings
- ✓ use of the grounds as a classroom (e.g., "science" courtyards and field labs)

Larger education organizations may want to have someone on the grounds crew who is certified in the application of pesticides and herbicides. For more information about this issue, see the discussion about Integrated Pest Management (IPM) in Chapter 4.

Planners must determine the frequency and level of maintenance service desired for grounds and outdoor equipment. For example, should the grass be cut once or twice a week? Is this schedule modified during peak and low growing seasons? Is a grassy area's use taken into consideration when determining its maintenance needs? Clearly, fields used for gym classes require less attention than the varsity baseball infield.



For more information about managing grounds, visit the National Clearinghouse for Educational Facilities' Grounds Maintenance Page at *http://www.edfacilities.org/rl/grounds_maintenance.cfm*, which provides list of links, books, and journal articles on managing and maintaining K-12 school and college campus grounds and athletic fields.

RECOMMENDED LEVELS OF SERVICE FOR BASIC GROUNDS CARE:

Acceptable	=	staff 1:20 acres
Standard	=	staff 1:18 acres
High	=	staff 1:15 acres

RECOMMENDED LEVELS OF SERVICE FOR ATHLETIC FIELD AERATION:

Acceptable	=	once (1)/year
High	=	five (5) times/year

These recommendations must be modified to accommodate local circumstances. For example, a school district that is responsible for managing five acres of wetlands would need to adjust staffing levels to ensure the preservation of this property.

DEPARTMENTAL ORGANIZATION AND MANAGEMENT

The ideal organization of the maintenance and operations department depends on the size of the school district–in square miles and the number and distribution of campuses. Large districts often use the "area support management concept," in which the district is divided into two or more areas, each with its own direct-support team that provides comprehensive maintenance. Each team would include skilled craftsmen such as painters, plumbers, electricians, HVAC repairmen, general maintenance personnel, and grounds personnel. Other tasks for which there is less demand – such as kitchen equipment specialists, small-engine specialists, cabinetmakers, roofers, and locksmiths – are supported from a central location. An alternative approach is to group staff according to their skill or craft – for example, all electricians work for the lead electrician, all plumbers work for the lead plumber, and so on. Both approaches to maintenance and operations organization are valid provided the chosen system supports current district needs and can adapt to future growth. Because local circumstances vary so greatly, there is no national staffing standard for determining the number of plumbers, roofers, or electricians needed by a district. However, several professional organizations offer guidelines based on the amount of building square footage that needs to be maintained. Other factors that must be considered include the size of the district in miles, the age of the buildings, the maintenance history of the buildings, funds available for maintenance activities, and the expectations of the community and school administration.

MARKETING MAINTENANCE

Few people notice when facilities are clean and working properly (although the opposite is far from true!). Facilities staff are often uncomfortable calling attention to their own good work, but they shouldn't be. After all, top-level administrators should occasionally be reminded of the important role that well-maintained facilities play in the effective operation of an education institution.

Maintaining schools also entails maintaining corollary and special-needs facilities such as trailers and modular buildings. These facilities demand all the support required by "regular" buildings, and usually merit additional attention because of their construction limitations. Modified management standards may be required (e.g., they may fill up with carbon monoxide or lose heat more quickly). Even the field house at the football stadium where the PTA sets up its hotdog stand is a special-needs facility because it is used for food preparation and, therefore, must meet high standards of cleanliness.

Maintenance and Operations Manuals

Every maintenance and operations department should have a policies and procedures manual that governs its day-to-day operations. The manual should be readily accessible (perhaps via an Intranet or the Internet), and written at a level consistent with the reading ability of department members. At a minimum, the manual should contain:

- ✓ mission statement
- ✓ personnel policies
- ✓ purchasing regulations
- ✓ accountability measures
- ✓ asbestos procedures
- ✓ repair standards
- ✓ vehicle use guidelines
- ✓ security standards
- ✓ work order procedures

Managing Facilities "Partners"

Schools belong to their communities. Individuals and groups in a community often take "ownership" in their schools' facilities in the sense that they initiate efforts to improve building condition, technological capabilities, and recreational equipment. This is a good thing—certainly parent-teacher associations, booster clubs, and business circles are all friends of our school systems. Having said this, facilities managers must supervise any activities undertaken by these organizations to upgrade or otherwise modify school facilities. For example, internet cabling installed by parents and community members must be coordinated with the rest of the building's electrical system and recorded on wiring diagrams. Similarly, all upgrades to playground structures, whether installed by maintenance staff or "amateurs," must meet safety requirements. Thus, facilities managers must be proactive in their communications with community groups so that all well-intentioned aid to our schools proves to be a benefit to student learning, recreation, health, and safety.

Work Order Systems

Work order systems help school districts register and acknowledge work requests, assign tasks to staff, confirm that work was done, and track the cost of parts and labor. At the simple end of the spectrum, a work order system can be a manual, paper-based, tracking tool. On the more complex, but perhaps more efficient (depending on the size of the organization) side, work order systems come in the form of computerized maintenance management systems (CMMS as discussed in Chapter 3). Such systems have become increasingly affordable and easy to use. Their purpose is to manage work requests as efficiently as possible and meet the basic information needs of the district. CMMS software must also be user friendly so that it can be implemented with minimal training (although training needs are inevitable and should not be overlooked). Many CMMS systems offer "bells and whistles" that are not needed for accomplishing primary maintenance management tasks and, in fact, often unnecessarily complicate the user interface.

"Jury-rig" is not a synonym for "repair." To repair equipment means to return it to its original operating state.

GOOD INTENTIONS AND A PRIME EXAMPLE OF HOW NOT TO SAVE MONEY

Each year the parents at Central Elementary School raised funds for much-needed playground equipment, which they installed themselves. Jim was proud of their efforts, but he knew it was his responsibility to supervise their work. So Jim met with the PTA president and school principal on a Friday afternoon in May to discuss the installation of a new swing set. He had reviewed the city's map of the building site for gas lines, water pipes, and telephone connectors and had carefully selected the spot for the equipment. "I am sorry I can't be here with you tomorrow," he apologized, "but if you just set the swing at the bottom of the hill, it will be fine. I'll be by first thing on Monday morning to perform a safety inspection and lay rubber chips around it so the kids can be playing on it by lunch time." Everyone smiled and nodded, and Jim left for the weekend, not imagining that anything could go wrong.

The call came from Jim's assistant at 11:00 a.m. on Saturday morning. Jim left his son's soccer game and went straight to Central Elementary. He was shocked by what he saw: fire trucks were everywhere, and an entire city block had been evacuated. The police chief explained that a natural-gas line had been cut. "But how?" Jim thought, "The swing set wasn't to be anywhere near that line." Then Jim saw a hole in the ground more than 20 yards from where he had instructed the parents to place the swing. "Well," the PTA president explained sheepishly, "The early morning sun was right in our eyes when we were at the spot you selected, and we didn't want the kids to have to squint when they were swinging, so we thought we'd move to a shadier spot. Bad idea, I guess, huh?"

Jim realized the situation was the result of more than one bad idea. Not only had the parents acted on their bad idea, but trusting the parents to install the swing unsupervised had been an even worse idea on his part. They could have been killed if the gas line had exploded. As it was, the city had to spend thousands of dollars on emergency service and repairing the break—all for a $900 swing set. Jim frowned. Things would have to be different next time.

The CMMS should be network- or Web-based, be compatible with standard operating systems, have add-on modules (such as incorporating the use of hand-held computers), and be able to track assets and key systems. Source codes must be accessible so that authorized district staff are able to customize the system to fit their needs as is necessary. In terms of utility, a good CMMS program will:

- ✓ acknowledge the receipt of a work order
- ✓ allow the maintenance department to establish work priorities
- ✓ allow the requesting party to track work order progress through completion
- ✓ allow the requesting party to provide feedback on the quality and timeliness of the work
- ✓ allow preventive maintenance work orders to be included
- ✓ allow labor and parts costs to be captured on a per-building basis (or, even better, on a per-task basis)

At a minimum, work order systems should account for:

- ✓ the date the request was received
- ✓ the date the request was approved
- ✓ a job tracking number
- ✓ job status (received, assigned, ongoing, or completed)

Work order system documentation should be used to augment and help interpret facility audit findings.

Are You Being Well Served?

Maintenance & Operations
XYZ School District

The maintenance staff has completed the following work order in this area. Please feel free to write down any questions or comments in the space below, or call [insert number here]. Thank you for the feedback, because your opinion matters to us.

Work Order # _____

Job Description _____

COMMENTS: _____

_____

_____

_____

_____

_____

How many people need to "touch" a work order before the task gets completed? That depends on the size and organization of the school district. However, a good rule of thumb is that work order systems should be streamlined to minimize the number of people involved in delivering, approving, and performing a job.

JOB PRIORITIES

Some tasks are urgent (e.g., there is a giant leak in the girls' bathroom). Others are less pressing (e.g., there is a dent in the paper towel dispenser in the boys' bathroom). Thus, assigning "job priority" is a necessary step in any good work order system. Some facility managers use the following system:

Emergency	overtime is authorized
Routine	overtime is not authorized; complete in order of receipt
Preventive	overtime is not authorized; complete according to the maintenance schedule

- ✓ job priority (emergency, routine, or preventive)
- ✓ job location (where, specifically, is the work to be performed)
- ✓ entry user (the person requesting the work)
- ✓ supervisor and craftsperson assigned to the job
- ✓ supply and labor costs for the job
- ✓ job completion date/time

Staff from every building and campus in a district should have the ability to initiate a work request and determine its status. However, it is a good policy to limit "official" requesting authority to a single person at each site so that better internal oversight is maintained (e.g., to prevent multiple requests being submitted for the same job). Many organizations provide staff with a one-page work request (in either paper or electronic form) that is then submitted to the person responsible for evaluating and entering requests into the work order system.

Once a work order reaches the maintenance department, a control number is issued and the work is given a priority rating. The task is then assigned to a craftsman and a supervisor. Upon completion of the work, the craftsman records all labor and parts needed to complete the job. The work order is then submitted to the maintenance office for close-out. But first the supervisor must determine that the quality of the work meets or exceeds departmental standards. Because it is unrealistic to check every work order that goes through the maintenance office (even in small districts), good supervisors often take a two-step approach to evaluation: 1) randomly inspecting a small percentage (e.g., 3 percent) of completed work orders; and 2) in every case, providing the requesting party an opportunity to respond to a customer satisfaction survey.

Upon closing out a work order, all information about the request should be placed in a data bank for future historical and analytical use (e.g., for determining the yearly cost of building maintenance). Sophisticated CMMS enable the data to be analyzed in detail and at different scales (e.g., weekly, monthly, and annual reporting; as well as by room, building, and campus), depending on user need.

BASIC ELEMENTS OF A WORK ORDER SYSTEM FOR SCHOOL DISTRICTS

Primary Types of Users

Work order initiators: Typically school-based personnel, including school secretaries, teachers, and principals

Work order recipients: Typically facilities management staff, including the facilities maintenance manager and secretary

Typical Workflow

A maintenance need is identified at a school district facility. Information required to request a work order includes:

- ✓ Contact name: A person in the facilities department to contact about the work order
- ✓ Contact phone: The telephone number of the contact person
- ✓ Contact e-mail: The e-mail address of the contact person
- ✓ Room number/location: The building, room, or other site where the work is to be performed
- ✓ Work requested: A short description of the work to be performed
- ✓ Job type: Carpentry, custodial, electrical, environmental, glazing, grounds, maintenance, heating, masonry, new construction, painting, plumbing, roofing, supplies, systems, or vehicles
- ✓ Urgency: Typically a yes/no indicator as to whether the work order is urgent; may also be a "pick list" (e.g., urgent, routine, preventive)
- ✓ Requested date of completion: When the school-based personnel initiating the work order would like to have it completed. (Note that the actual date the work is scheduled by maintenance staff may differ because of work loads or other factors.)

A good CMMS will automatically generate the following:

- ✓ Job number: A unique number that identifies the work order (often sequential)
- ✓ Received date: The date the work order was requested
- ✓ Entry user: Verifies the ID name/password of the person authorized to request a work order

The maintenance administrator adds the following to the work order:

- ✓ Work person: The person to whom the work order is assigned
- ✓ Scheduled date: When the work is to occur (not necessarily the requested date)
- ✓ Work order priority: Emergency, routine, or preventive
- ✓ Status code: For example –

  O (Open) – The work order has not yet been assigned

  A (Assigned) – The work order has been assigned to a worker and is in process

  C (Completed) – The work order has been completed

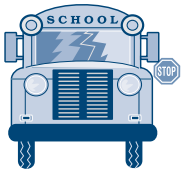
  R (Reopened) – The work order was completed but is now reopened

  D (Deferred) – A work order will not be assigned at the current time

  Comments: Additional instructions or guidance as necessary

After the assignment and scheduling information is entered, the work order record is updated in the database so the person who initiated the job can view the status of the request. Time and materials data are optional and may or may not be entered against a work order. These data are tracked in a separate but related database.

A record layout that incorporates the basic data elements for an effective computerized work order system is shown as Appendix E.



For more information about work order systems, visit the National Clearinghouse for Educational Facilities' Facilities Management Software Page at *http://www.edfacilities.org/rl/software.cfm*, which describes and evaluates computer-aided facilities maintenance management systems for handling priorities, backlogs, and improvements to school buildings.

Publishing an annual calendar of school or district events helps prevent duplicate scheduling of resources and facilities. To be most useful, the calendar should be posted to a network or web site so that it is easily accessible and new events can be added as they are scheduled.

Building Use Scheduling Systems

Another use for computers in facilities maintenance is the employment of an automated building use scheduling system for planning special events (activities such as athletic contests, PTA meetings, and holiday concerts that occur during non-instructional hours). The building secretary enters into a database all special activities in the facility that will require extended heating, cooling, or lighting. Information captured for each activity includes: the date of the event, expected attendance, beginning and ending time, specific location within the building where the activity will occur (e.g., classroom #201, the gymnasium, or the auditorium), HVAC and lighting needs, person authorizing the event, and a contact name. The HVAC department can print a list of all special needs on a weekly basis, allowing staff to schedule its systems for appropriate heating, cooling, and lighting in the particular areas where these after-hour events are taking place. The Facilities Manager can also access the building use scheduling the activities.

Managing Supplies

A large portion of a school district's maintenance budget goes to purchasing supplies for day-to-day maintenance and custodial work. Managing supply inventories efficiently may not seem like a difficult task, but a considerable amount of planning is required to ensure that valuable funds are not tied up in excess inventory.

A REASONABLE EXPECTATION

Marty Simmons was a reasonable man, everyone at Lincoln High School agreed. As principal, Marty rarely had time to waste, so when the lock on the door to the teacher's lounge broke, he promptly instructed his secretary to notify Jack, the maintenance supervisor for his building. Twenty-four hours later, when the lock hadn't been repaired, Marty called the maintenance department himself. Linda, the maintenance secretary, said the supervisor was in a meeting, but she was sure he was handling the job. Two days later, Marty called again. This time Jack caught the brunt of the frustrated administrator's impatience. "Jack, how tough can it be to fix a lock? I've got teachers who need a quiet place to retreat during the day and they deserve their privacy. What's wrong with you guys?" He was surprised by Jack's calm reply: " I know it's not a big job, Marty, but I've finally been authorized to get that heavy-duty, tamper-resistant lock you've wanted for so long. It will be here tomorrow. I thought it would be well worth the wait." Marty smiled. He had wanted that type of lock installed for years and it was surely worth a day or two's delay. "But why didn't you just tell me so I wouldn't have wasted my time worrying about the repair job?" he asked. It was a reasonable question, Jack realized (after all, Marty was a reasonable guy). "Hmm," Jack wondered out loud, "maybe it's time I got that work order system that I've always wanted. It would have allowed you to see the status of the job right from your desk." "Yes," Marty replied, "you should definitely get that system—so that I don't call and chew you out for no good reason any more."

Parts purchased for storage should meet one of the following criteria:

- ✓ High-volume purchases generate cost savings that exceed the cost of storage.
- ✓ The parts may be needed at any time for emergency repairs.
- ✓ The parts are difficult to obtain or take a long time to get delivered.

Many facility managers take advantage of consignment cabinets that vendors supply at their cost. That is, a vendor stocks the district's storage space, but the district does not pay for the material until it is used. What's in it for the vendor? Well, the consignment cabinet translates into guaranteed business for the vendor whenever the district needs the stored parts or supplies.

Another effective system for managing equipment inventories is the use of open purchase orders or open procurement cards, which can be issued to a local store (e.g., a $1,000 purchase order at the hardware store that is valid for a 30-day period). As parts are needed for a project, craftsmen go to the store, select the items, and sign the purchase ticket. At the end of the 30-day period, the purchase order is closed out and paid. To verify the legitimacy of all purchases, receipts must include an itemized list of the items purchased, the name and ID number of the staff person, and the work order number.

Centralized Versus Decentralized Parts Storage. Both site-based storage and central storage systems have costs and benefits. Site-based storage keeps parts where they will be needed–i.e., maintenance staff don't have to wait for supplies to arrive from central office. On the other hand, supplying multiple sites leads to increased costs associated with redundant inventories. When vendor-supplied consignment cabinets are used, redundant inventories don't cost the district any extra money except for the storage space. Another drawback with site-based storage is that inventory management is difficult, leaving the district vulnerable to property loss from theft (making effective key control for supply facilities essential). Whether centralized or decentralized, the inventory management system must be integrated with other facilities and financial management software in use (e.g., the organization's CMMS).

Standardization of Parts and Equipment. It makes sense to standardize equipment and parts whenever possible. After all, if a district has three different brands of chillers (or even three different models of the same brand), then it will need three different kinds of replacement parts – a waste of storage space. Moreover, staff training requirements increase since maintenance workers will need to know how to service three different pieces of equipment instead of one. Unfortunately, many school districts must adhere to low-bid contracting, which can result in a

Every dollar in parts sitting on a shelf is a dollar that is not available for classroom instruction.

Consignment cabinets save money and time—they contain supplies that are provided by vendors, but not paid for by the district until they are used.

For routine replenishment of supplies, a "just in time" system may be used. For example, because HVAC filters are needed on a routine and predictable schedule, they don't need to be stored in-house; instead, they can be ordered in bulk for delivery by a vendor the day before they will be used.

A large portion of the custodial budget goes to the purchase of cleaning chemicals. Thus, chemical dispensers that automatically mix chemical concentrates with water at the proper ratios can result in significant savings by ensuring proper mixing, as well as reduced waste and theft of cleaning agents. Other custodial supplies can also be purchased in bulk and managed using appropriate inventory control procedures.

If constrained by "low bid" requirements, district planners might consider switching to performance-based specifications to ensure they get the equipment they want.

different vendor getting a given contract in successive years. One way to overcome this problem is to include language in all procurement contracts that requires vendors to provide services and equipment that is consistent with the existing infrastructure and staff expertise.

When selecting parts, keep in mind that you may not always need the best product–for example, if your HVAC system has a 10-year life expectancy, there is no need to purchase a top-of-the-line 15-year pump as a corollary component. But neither does it make sense to buy cheap 15-year shingles for a new building that has a life expectancy of 40 years.

The facilities manager should be one of the team leaders in any renovation or construction project. After all, he or she is the school district's in-house expert on building management and knows how the district's maintenance and operations departments can best support a new or renovated facility. To best accomplish this task, the facilities manager must keep an open mind to the needs of all stakeholders throughout the planning process.

THE ROLE OF MAINTENANCE DURING RENOVATION AND CONSTRUCTION

There are two prevailing approaches to planning a renovation or construction project. The first is an item-by-item (or building block) approach; it is driven by school need and the final project cost is calculated only after needs have been addressed. The risk is that the total cost often comes in far higher than anticipated because actual needs sometimes get confused with perceived need (or even a wish list). The second approach is the "top-down method," in which building features are selected based on a preconceived "acceptable" total cost of the project. Often, total project cost gets translated into cost per square foot, which then dictates what options and features are available. The risk with this approach is that the district gets only what it thinks it can afford and not necessarily what it needs. Most renovation and construction projects blend the two approaches to planning–in other words, some tasks will rely upon item-by-item planning, whereas other aspects will use the top-down approach.

When establishing selection criteria for an architect, consider what experience the firm has with designing environmentally friendly schools, including components such as active and passive solar heating, ground-water recycling, garden space, and low-VOC (volatile organic compound) building materials.

Another key to successful renovation and construction is the assembly of a diverse project team consisting not only of school staff (e.g., business personnel, maintenance and operations staff, principals, and teachers), but also construction professionals, architects, engineers, and general contractors. Other stakeholders such as students, parents, and other community representatives should also be included in the planning efforts. Each stakeholder should be encouraged to share his or her opinions about the needs and expectations of the new or renovated facility. Of course there will be disagreements during this phase, but the net effect of this exchange of ideas should be positive if the interactions are managed respectfully.

This team of stakeholders should review all plans and construction documents throughout the project (e.g., at 25, 50, 75, and 100 percent complete) to minimize the likelihood of last-minute surprises and objections. Key team members, such as the district's business personnel and maintenance staff, must review the construction documents prior to the release of procurement guidelines because any changes thereafter will invariably result in additional costs to the school district. Generally, the mechanics of the bid process are mandated by local or state law (e.g., fixed bids or competitive sealed proposals).

The topic of building renovation and construction is, quite literally, a separate book. There are many excellent resources available to the education community, including those available from:

American Institute of Architects
http://www.aia.org

American School and University Magazine
http://www.asumag.com

Council of Educational Facility Planners International
http://www.cefpi.org

National Clearinghouse for Educational Facilities
http://www.edfacilities.org

SchoolDesigns.com
http://www.schooldesigns.com/

School Planning and Management Magazine
http://www.spmmag.com

U.S. Department of Energy, Energy Smart Schools
http://www.eren.doe.gov/energysmartschools/

In this *Planning Guide*, we address only those renovation and construction issues that directly relate to facility maintenance planning.

These types of decisions should be made only after consultation with the district's architects and legal advisors.

Although construction staff need to limit access to work sites and ensure site safety, district representatives have every right to expect access to the work site on a regular basis (after all, it is the district's property and the contractor works for the district). Thus, during construction, members of the maintenance and operations department (or locally hired and trusted plumbers, electricians, etc.) should visit the construction site regularly to observe the quality of the work, monitor the placement of valves and switches, and verify overall project progress. Digital cameras, video recorders, and still photos are valuable tools for documenting construction activities. On large projects, the district's chief project officer, the architect, general contractor, and subcontractors should meet on a weekly basis to discuss progress and problems. All such discussions should be well documented.

As construction begins to wind down, the project may be designated as having reached "substantial completion": although work may not be 100 percent complete, the building can be used for its intended purpose. Building "ownership" is customarily transferred to the district at this point, meaning that the contractor is no longer responsible for utility or insurance bills. Upon designation of "substantial completion," however, the architect must prepare a "punch list" to identify those components that are not yet complete (or which do not meet the district's quality standards).

Digital cameras, video recorders, and still photos are valuable tools for documenting construction activity.

Maintenance should be a consideration even during the building design phase. For example, designing a building without carpeting may make sense because wall-to-wall carpeting is so hard to keep clean over time. Situating vents and cleaning wells in areas that can be easily reached is another area where maintenance needs can influence building design. Seasoned maintenance staff can also inform construction and renovation planners about where the maintenance equipment should be housed.

Be wary of "casual renovation." Construction that takes place in occupied buildings can have an adverse impact on occupants' health (e.g., air quality problems may arise during construction).

The school district should retain the last payment to the contractor to ensure that the balance of the work is completed in a timely manner.

Finally, it has been estimated that 15 percent of all new buildings have missing system components for which the owner has paid. Thus, construction contracts should require that a third party commission the facility before contractors are relieved of their contractual obligations. Commissioning is discussed in greater detail in Chapter 3 of this document and in the PECI document *Model Commissioning Plan and Guide Specifications (http://www.peci.org/cx/mcpgs.html)*.

Facilities planners generally schedule renovations during breaks in the academic year so as to minimize disruptions. But in some cases this may not be possible (e.g., in year-round schools, schools with summer programs, and after-school enrichment programs).

COMMONLY ASKED QUESTIONS

How does preventive maintenance save on costs?

Equipment failure is often a direct result of wear and tear on parts that should be replaced on a periodic basis (such as filters, belts, gaskets, and valves). Preventive maintenance is designed to minimize these breakdown events by attending to these deteriorating components in a timely fashion. This means replacing filters and belts, changing oil, and cleaning coils according to schedule. The costs associated with routine servicing of equipment (in terms of both parts and labor) is small compared to the cost of coping with unexpected and catastrophic breakdown events that will inevitably occur if equipment is not properly maintained – particularly since breakdowns often require not only major repairs but even the replacement of affected components and systems. Another argument is that failure to perform preventive maintenance may invalidate the warranties on major equipment and systems.

What is the difference between preventive maintenance and predictive maintenance?

Preventive maintenance is the routine, regularly scheduled maintenance of a piece of equipment to ensure its continued use and maximize its life expectancy (e.g., by replacing filters, changing oil, and cleaning coils). Predictive maintenance uses advanced computer software to monitor equipment operation and forecast future failures based on performance measures and statistical analysis.

What role does computing technology play in facility maintenance management?

When dealing with facilities management, technology use must be considered from two perspectives: 1) operations technology and 2) administrative technology. Increasingly, maintenance personnel are required to master the use of computerized diagnostic and programming tools for many types of building components. HVAC systems, for example, are now operated almost exclusively through computerized interfaces. From the perspective of facilities managers too, technology has become an essential tool in all but the smallest of organizations. By automating maintenance records in even simple ways (e.g., use of spreadsheets), facilities managers can more effectively evaluate and analyze facility use, maintenance demands and history, and funding trends.

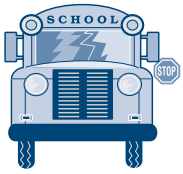
Why is a work order system necessary?

Work order systems have always been necessary in the school business–it's just that 50 years ago the "work order system" was probably a note from the principal to the building custodian to repair a broken fan before completing the day's cleaning. But times have changed and school operations have become substantially more complicated. Buildings are larger, and contain complex electrical, HVAC, and technology systems. If these components and systems are to be properly maintained, communications between administrative staff, instructional staff, maintenance staff, and the central office (e.g., business personnel) must be seamless and well documented. Modern work order systems have evolved into computerized maintenance management systems (CMMS), which allow staff to submit work requests, assign tasks to craftspeople, track project status, record parts and labor costs, verify completion, and evaluate performance–all automatically. Thus, automated work order systems have become an indispensable part of effective school facilities management.

WHEN YOU CAN'T AFFORD NOT TO MAKE THE INVESTMENT

Harry had worked hard to mine his database for all the relevant information. He didn't want the district to waste money on unnecessarily high utility bills at yet another school. He arrived at the construction planning meeting. "Now listen," he said after several speakers advocated cutting corners on the quality of construction materials, "You may save $30,000 or $40,000 now, but that is just peanuts compared to what we'll pay for that mistake over the life of the building." He saw an assistant superintendent roll his eyes, but he continued: "In 1978, we built Spinner Middle School correctly because of the high utility bills we saw during the winter of '77. And now we pay 88 cents a square foot to heat and cool that building, even after 25 years, compared to $1.72 per square foot for the elementary buildings you skimped on in 1995. I've done the math; at those rates you recoup the additional upfront costs in less than three years. After that, we'll save $15,000 a year on the building's utility bills. You can't tell me this doesn't make sense." No one said a word. Harry was right. They couldn't tell him it didn't make sense.

ADDITIONAL RESOURCES



Every effort has been made to verify the accuracy of all URLs listed in this Guide at the time of publication. If a URL is no longer working, try using the root directory to search for a page that may have moved. For example, if the link to *http://www.epa.gov/iaq/schools/performance.html* is not working, try *http://www.epa.gov/* and search for "IAQ."

Carpet and Rug Institute (CRI)

http://www.carpet-rug.com/

The web site of the national trade association representing the carpet and rug industry. It is a source of extensive information about carpets for consumers, writers, interior designers, facility managers, architects, builders, and building owners and managers, installation contractors, and retailers. CRI also publishes the web site "Carpet in Schools" *(http://www.carpet-schools.com/)* to address topics such as indoor air quality, allergies, and carpet selection, installation, and care.

Cleaning and Maintenance Practices

http://www.edfacilities.org/rl/cleaning.cfm

A list of links, books, and journal articles about custodial standards and procedures, equipment, safety, and product directories for the cleaning and maintenance of schools and colleges.

Custodial Methods and Procedures Manual

http://asbointl.org/Publications/PublicationCatalog/index.asp?s=0&cf=3&i=139

A manual that discusses school facility cleaning and maintenance from the perspective of work management, physical assets management, and resource management. A reference section contains guidelines and forms for custodial equipment storage and care, as well as safety measures and employee management forms. Johnson, Donald R. (2000) Association of School Business Officials International, Reston, VA, 96pp.

Energy Savings

http://www.edfacilities.org/rl/energy.cfm

A list of links, books, and journal articles providing extensive resources on various methods of heating, cooling, and maintaining new and retrofitted K-12 school buildings and grounds. National Clearinghouse for Educational Facilities, Washington, DC.

Facilities Management: A Manual for Plant Administration

http://www.appa.org/resources/publications/pubs.cfm?Category_ID=1

A four-book publication about managing the physical plant of campuses. Its 67 chapters cover general administration and management, maintenance and operation of buildings and grounds, energy and utility systems, and facilities planning, design and construction. Middleton, William, Ed. (1997) APPA: Assn. of Higher Education Facilities Officers, Alexandria, VA.

Facilities Management Software

http://www.edfacilities.org/rl/software.cfm

A resource list of links, books, and journal articles describing and evaluating computer-aided facilities maintenance management systems for handling priorities, backlogs, and improvements to school buildings. National Clearinghouse for Educational Facilities, Washington, DC.

Floor Care
http://www.edfacilities.org/rl/floor_care.cfm
A list of links, books, and journal articles about the maintenance of a variety of floor coverings in K-12 school classrooms, gymnasiums, science labs, hallways, and stairs. National Clearinghouse for Educational Facilities, Washington, DC.

Good School Maintenance: A Manual of Programs and Procedures for Buildings, Grounds and Equipment
http://www.iasb.com/shop/details.cfm?Item_Num=GSM
A manual that describes the fundamentals of good school maintenance, including managing the program and staying informed about environmental issues. Procedures for maintaining school grounds are detailed, as are steps for maintaining mechanical equipment, including heating and air-conditioning systems, sanitary systems and fixtures, sewage treatment plants, and electrical systems. Harroun, Jack (1996) Illinois Association of School Boards, Springfield, IL, 272pp.

Grounds Maintenance
http://www.edfacilities.org/rl/grounds_maintenance.cfm
A resource list of links, books, and journal articles about managing and maintaining K-12 school and college campus grounds and athletic fields. National Clearinghouse for Educational Facilities, Washington, DC.

Guide to School Renovation and Construction: What You Need to Know to Protect Child and Adult Environmental Health
A guide that presents cautionary tips for protecting children's health during school renovation and construction projects. It includes a checklist of uniform New York state safety standards during school renovations and construction, and several examples of the potential negative consequences of disregarding the risks of renovation and construction on occupant health. (2000) Healthy Schools Network, Inc., Albany, NY, 6pp.

HVAC Systems
http://www.edfacilities.org/rl/hvac.cfm
A resource list of links, books, and journal articles about HVAC systems in school buildings, including geothermal heating systems. National Clearinghouse for Educational Facilities, Washington, DC.

IAQ In Schools and Preliminary Design Guide
http://www.healthybuildings.com/s2/Schools%-20%20IAQ%20Design%20Guide%2001.01.pdf
An educational tool and reference manual for school building design, engineering, and maintenance staff. Healthy Buildings International, Inc. (1999) Healthy Buildings International, Inc., Fairfax, VA.

Operational Guidelines for Grounds Management
http://www.appa.org/resources/publications/pubs.cfm?Category_ID=2
A comprehensive guide to maintaining and managing grounds and landscaping operations. Chapters discuss environmental stewardship, broadcast and zone maintenance, grounds staffing guidelines, contracted services, position descriptions, benchmarking, and environmental issues and laws. Feliciani, et al. (2001) APPA: Assn. of Higher Education Facilities Officers, Alexandria, VA, 159pp.

Principal's Guide to On-Site School Construction

http://www.edfacilities.org/pubs/construction.html

A publication that explores what school principals should know when construction takes place in or near a school while it is in session. It covers pre-construction preparation, including how to work with architects/engineers and other school staff; actions to take during construction, including proper information dissemination and student and property protection; and post-construction activities, including custodial and maintenance staff training and post-occupancy evaluations. Brenner, William A. (2000) National Clearinghouse for Educational Facilities, Washington, DC, 5pp.

PECI Model Commissioning Plan and Guide Specifications

http://www.peci.org/cx/mcpgs.html

A resource that details the commissioning process for new equipment during both the design and construction phases. It goes beyond commissioning guidelines by providing boilerplate language, content, format, and forms for specifying and executing commissioning.

Preventive Maintenance

http://www.edfacilities.org/rl/maintenance.cfm

A resource list of links, books, and journal articles about how to maximize the useful life of school buildings through preventive maintenance, including periodic inspection and seasonal care. National Clearinghouse for Educational Facilities, Washington, DC.

Preventive Maintenance Guidelines for School Facilities K-12

http://www.rsmeans.com/index.asp

A five-part manual that is intended to increase the integrity and support the longevity of school facilities by providing easy-to-use preventive maintenance system guidelines. It includes a book, wall chart, and electronic forms designed to help maintenance professionals identify, assess, and address equipment and material deficiencies before they become costly malfunctions. Maciha, John C, et al. (2001) R.S. Means Company, Inc., Kingston, MA, 232pp.

Project Management

http://www.edfacilities.org/rl/project_management.cfm

A list of links, books, and journal articles about the management of school construction projects by school administrators, business officials, board members, and principles. National Clearinghouse for Educational Facilities, Washington, D.C.

Roof Maintenance and Repair

http://www.edfacilities.org/rl/roof_maintenance.cfm

A list of links, books, and journal articles about maximizing the life-cycle performance of school roofs. Roof inspection strategies, scheduling, documentation, and repair resources are also addressed. National Clearinghouse for Educational Facilities, Washington, DC.

School Design Primer: A How-To Manual for the 21st Century

http://www.edfacilities.org/pubs/li/little.html

A resource that describes the school planning and design process for decision-makers (e.g., superintendents, planning committee members, architects, and educators) who are new to school construction and renovation projects.

Software for Facilities Management

http://www.edfacilities.org/rl/software.cfm

A resource list of links, books, and journal articles about computer-aided facilities maintenance management systems for handling priorities, backlogs, and improvements to school buildings. National Clearinghouse for Educational Facilities, Washington, DC.

U.S. Environmental Protection Agency (EPA)

http://www.epa.gov/

The main web site of the EPA, whose mission is to protect human health and safeguard the natural environment – air, water, and land – upon which life depends. The EPA works with other federal agencies, state and local governments, and Indian tribes to develop and enforce regulations under existing environmental laws. The web site includes an alphabetical index of topical issues at *http://www.epa.gov/ebtpages/alphabet.html*. EPA Regional Office and Linked State Environmental Departments can be found at *http://www.epa.gov/epapages/statelocal/envrolst.htm*.

MAINTAINING SCHOOL FACILITIES AND GROUNDS CHECKLIST

More information about accomplishing checklist points can be found on the page listed in the right-hand column.

ACCOMPLISHED		CHECKPOINTS	PAGE
YES	NO		
		Do district planners recognize the four major components of an effective facilities maintenance program: emergency (responsive) maintenance, routine maintenance, preventive maintenance, and predictive maintenance?	74
		Do district planners recognize that preventive maintenance is the most effective approach to sound school facility maintenance?	74
		Has a comprehensive facilities audit (see Chapter 3) been performed before instituting a preventive maintenance program?	74
		For districts that are instituting preventive maintenance for the first time, has an appropriate system (e.g., heating or cooling systems) been identified for piloting before commencing with a full-scale, district-wide program?	74
		Have manufacturer supplied user manuals been examined for guidance on preventive maintenance strategies for each targeted piece of equipment?	75
		Are records of preventive maintenance efforts maintained?	75
		Has the schedule for preventive maintenance activities been coordinated with the routine maintenance schedule so as to minimize service interruptions?	75
		Does the organization have a plan for responsibly managing access control?	75
		Does the organization have a plan for responsibly managing boilers?	76
		Does the organization have a plan for responsibly managing electrical systems?	76
		Does the organization have a plan for responsibly managing energy use?	77
		Does the organization have a plan for responsibly managing fire alarms?	78
		Does the organization have a plan for responsibly managing floor coverings?	78
		Does the organization have a plan for responsibly managing gym floors?	79
		Does the organization have a plan for responsibly managing HVAC Systems?	79
		Does the organization have a plan for responsibly managing hot water heaters?	80

		Does the organization have a plan for responsibly managing kitchens?	80
		Does the organization have a plan for responsibly managing painting projects?	80
		Does the organization have a plan for responsibly managing plumbing?	80
		Does the organization have a plan for responsibly managing public address systems and intercoms?	81
		Does the organization have a plan for responsibly managing roof repairs?	81
		Does the organization have a plan for responsibly managing water softener systems?	81
		Has organization management determined its expectations for custodial services?	82
		Have facilities managers staffed the custodial workforce at a level that can meet the organization's expectations for its custodial service?	82
		Has a chain of command for custodial staff been determined?	82
		Has a suitable approach to custodial services (e.g., area cleaning versus team cleaning) been selected to meet the organization's expectations for custodial service?	82
		When planning grounds management, have grounds been defined as "corner pin to corner pin" for all property, including school sites, remote locations, the central office, and other administrative or support facilities?	83
		Have areas of special concern (e.g., wetlands, caves, mine shafts, sinkholes, sewage plants, historically significant sites and other environmentally sensitive areas) been identified and duly considered for grounds management?	84
		Does the organization have a plan for responsibly managing fertilizer and herbicide use?	84
		Does the organization have a plan for responsibly managing watering and sprinkler systems (e.g., the use of recycled water/gray water for plumbing, watering fields)?	84
		Does the organization have a plan for responsibly managing drainage systems?	84
		Does the organization have a plan for responsibly managing "rest time" for fields/outdoor areas?	84
		Does the organization have a plan for responsibly managing the costs and benefits of flowerbeds?	84
		Does the organization have a plan for responsibly managing the use of the grounds as a classroom (e.g., "science courtyards" and field laboratories)?	84
		Is the Maintenance & Operations Department organized and administered to best meet the needs of the maintenance plan?	85

		Does the maintenance and operations staff take time to market its efforts and successes to the rest of the organization?	85
		Are facilities managers proactive with their communications to and management of community groups (e.g., PTAs, booster clubs)?	86
		Has an automated work order system (e.g., a Computerized Maintenance Management System or CMMS as discussed in Chapter 3) been instituted within the organization?	86
		Does the CMMS incorporate the basic features of a "best practice" system?	87
		Do staff in every building and campus in a district know the procedures for initiating a work order request?	88
		Is the ability to officially submit a work order limited to a single person at each site (who can evaluate the need for work prior to sending it)?	88
		Does a supervisor evaluate (either by random personal assessment or customer feedback) whether the quality of work meets or exceeds departmental standards before "closing out" a work order?	88
		Is all information about a completed work order maintained in a database for future historical and analytical use upon its completion?	88
		Is the work order system streamlined so as to minimize the number of people involved in work order delivery, approval, and completion as is reasonable for managing the process?	88
		Has an automated building use scheduling system been instituted within the organization?	90
		Has the organization investigated the use of a "consignment cabinet" as a tool for storing supplies and parts in a cost-effective manner?	91
		Has the organization investigated the use of "open purchase orders" as a tool for purchasing supplies and parts in a cost-effective manner?	91
		Have appropriate control checks been placed on supply storage and purchasing systems?	91
		Have planners considered the costs and benefits of both local and central site storage for supplies and parts?	91
		Has equipment selection been standardized throughout the district (as possible and necessary) in order to save on storage space and costs associated with increased staff training for servicing multiple brands?	91
		Are chemical dispensers used to automatically mix and conserve cleaning agents?	91
		Have performance-based specifications been introduced to procurement contracts for the purpose of standardizing equipment purchasing?	92
		Have planners considered the costs and benefits of both the item-by-item (building block) and top-down approaches to renovation and construction planning?	92

		When selecting an architect to help plan a renovation or construction project, have planners considered the firm's experience designing environmentally-friendly schools?	**92**
		Has a qualified, yet experientially diverse, project team be identified, including business personnel, maintenance staff, principals, teachers, construction professionals, architects, engineers, and general contractors?	**92**
		Does the project team meet to review all plans, construction documents, and decisions throughout development (e.g., at 25, 50, 75 and 100 percent complete)?	**92**
		Do members of the maintenance and operations department (or locally hired and trusted plumbers, electricians, etc.) visit the construction site on a routine basis to observe the quality of the work, monitor the placement of valves and switches, and verify the overall progress of the project?	**93**
		Do the chief project officer and the project architect, general contractor, and subcontractors meet on a weekly basis to discuss project progress and obstacles?	**93**
		Are the results of all renovation/construction meetings well documented and archived?	**93**
		Upon the renovation or construction project being designated "substantially complete," did the architect prepare a "punch list" to identify components that are not yet complete (or which do not meet the quality standards)?	**93**
		Has the organization retained the last of its payments to the contractor in order to ensure that the balance of work on the "punch list" is completed in a timely manner?	**94**
		Has the renovated or newly constructed facility been commissioned by a third-party specialist?	**94**

CHAPTER 6
EFFECTIVELY MANAGING STAFF AND CONTRACTORS

GOALS:

- ✓ **To communicate the necessity of good human resources practices as a pre-condition for effective facilities maintenance management**
- ✓ **To describe best practice strategies for effectively managing staff**

Why bother to put energy into managing your staff? Because they are the people who make the day-to-day decisions that determine how your facilities work. Their preparation and support will determine whether or not facilities are run properly, efficiently, and safely.

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- Selecting the Right People .. 107
- Dotting Your I's and Crossing Your T's 108

Training Staff 111
- Newly Hired Employees .. 111
- Ongoing Training and Professional Development .. 112
- The "Moment of Truth" Chart 113

Evaluating Staff 113

Maintaining Staff 116

Managing Contracted Staff and Privatized Activities 117

Commonly Asked Questions .. 118

Additional Resources 118

Managing Staff and Contractors Checklist 121

HIRING STAFF

Times are changing. It used to be that maintenance and custodial work was categorized as "basic labor." Today, however, most maintenance jobs demand specialized skills and training. For example, staff working in a modern boiler room need to be trained in computer use to operate the building's heating and cooling systems. This change in the expectations requires a corresponding change in the selection and training of maintenance personnel. Selecting the right staff requires that time and energy be put into identifying the needs of the organization, developing accurate job descriptions, envisioning the characteristics of "ideal" employees, and verifying each applicant's qualifications.

> Someone on the hiring team must have command of the technical aspects of the position. The superintendent can't accurately evaluate whether a candidate knows a great deal about HVAC repair, or just a little more than the hiring committee knows. Unless a committee member can verify expertise, the organization won't find out how much (or little) the candidate knows until the person is already on the job!

Job Descriptions

See Appendix F for a model job description for a custodial worker.

A good job description accurately identifies the knowledge, skills, and abilities needed by an individual to meet the expectations of the job. It also describes the type of person the organization wants to hire into its ranks.

THE TALE OF THE UNHAPPY "GROUNDSKEEPER"

Jack enjoyed being outdoors. He'd always liked picnics and parks, so it didn't surprise him when he realized that an office job just wasn't his cup of tea. He was surprised, however, when he didn't even like his job as a "groundskeeper" at the local high school. Jack had thought that he'd love the job—he had visions of working in the sun, cutting grass, maintaining gardens, trimming trees. Instead he found he had to spend most of his time in the shop tinkering with mowers, leaf blowers, and power saws—while his "field personnel" got to use (and break) the equipment out under the sun. Shouldn't someone have told him in advance what a groundskeeper's job was in the school district? He probably wouldn't have accepted the position but, at least then, he wouldn't hate his job.

Components of an effective job description include:

✓ *Duties and responsibilities.* If the organization needs someone to run a leaf blower for 40 hours a week, it shouldn't advertise a position that would stir the interest of someone who wants to be a gardener. The aspiring gardener will likely resent the misunderstanding every time he or she has to ask the real gardener to step aside in order to clear the grounds of leaves. As this resentment builds and the employee either quits the job or begins to perform in a lackluster manner, both the employee and employer will likely regret the miscommunication.

✓ *Working conditions.* What are the days and hours of employment? Where, and under what conditions, will the work be accomplished? Are there exceptions to these conditions? For example, will a custodian be expected to arrive at school early on winter mornings to shovel snow? If so, the job description needs to state clearly that the job requires travel in inclement weather.

✓ *Physical requirements.* Many maintenance and custodial tasks require considerable physical strength (e.g., one might reasonably be expected to lift 50 pounds to waist level in order to dispose of the trash). The requirements of the job must be documented and included in the job description so as to meet the requirements of federal, state, and local laws designed to protect the employment opportunities of physically challenged applicants.

To comply with equal opportunity laws*, the hiring process (including advertising job openings) may neither intentionally nor inadvertently screen out disabled or minority applicants. Thus, employment standards must relate to the actual job assignments, not to beliefs, desires, or prejudices about the job. The following guidelines can help in making employment decisions.

✓ All employment requirements must be related to the duties actually required of a person in the position.

✓ Hiring standards should not automatically eliminate applicants whose speech, dress, personal habits, or lifestyle differ from those of the predominant group.

✓ Education and other requirements (e.g., licenses or certificates) must be justified by objective assessments of their relatedness to performing the job.

*Visit *http://www.eeoc.gov* for more information about the U.S. Equal Employment Opportunity Commission and employment laws.

No matter how much forethought goes into the preparation of a job description, the text must allow some flexibility for the organization to adapt to changing circumstance. One way of accomplishing this is by including standard language in all job descriptions that reads, for example, "and other duties as may be assigned." This leaves the organization much needed flexibility in adapting staff responsibilities to meet the ongoing (and potentially changing) needs of the organization.

- ✓ *Educational requirements.* Some positions demand knowledge and skills that are best verified by the completion of certain academic work (e.g., a degree in accounting might be a job requirement for the manager of the maintenance department's budgeting and accounting).
- ✓ *Credentials and licensure.* Licenses are required to operate certain pieces of equipment (e.g., a bus driver needs a commercial drivers license), while other tasks and duties might require licensure or credentialing that is independent of equipment used (e.g., electricians).
- ✓ *Equipment used.* Some equipment works better when it is handled skillfully (e.g., a floor sweeper), whereas other equipment is dangerous to the user and others when it is not handled properly (e.g., power saws, forklifts, and chemical dispensers). Employees should be made aware of these risks and be required to demonstrate expertise before being permitted to use potentially dangerous pieces of equipment. "Demonstrating expertise" may require a license or other credential, or the employing organization may provide the required training. Even if a tool isn't particularly dangerous, the organization benefits if it is used properly so that the task gets accomplished effectively.
- ✓ *At-will versus unionized position.* Depending upon local conditions (e.g., state laws, labor agreements, and the size of the organization), some positions may be limited to personnel who either belong or do not belong to a union. If an employee does not belong to a union, he or she may be designated as an "at-will" staff member–a person who has no expectation of continued employment and may be dismissed at any time without cause or reason. The terms of employment must be spelled out clearly at the onset of the hiring process.
- ✓ *Channels of authority.* You want to know who your boss is, right? Well so does your staff. Employees should always know whom they report to and who has the authority to direct their efforts. A clear channel of authority starts with an accurate job description and an unambiguous organizational chart.
- ✓ *Evaluation mechanisms.* Just as everyone wants to know who the boss is, most people want to know how their performance will be measured. For example, will custodial staff performance be measured by spot checks of their work, by school staff customer service surveys, or some other process? The organization should clearly communicate to employees what evaluation mechanism will be used.

Selecting the Right People

The qualities of an "ideal" staff member should be identified before the interview process begins. Doing so requires an accurate assessment of the culture of the organization and the personalities of the people with whom

CONSIDERATIONS WHEN INTERVIEWING AN APPLICANT

Personal Characteristics
- ✓ eye contact
- ✓ demeanor
- ✓ interpersonal skills
- ✓ appropriateness of dress
- ✓ work ethic

Special Qualifications
- ✓ work history
- ✓ educational background
- ✓ certifications and licenses
- ✓ professional affiliations
- ✓ professional interests

Technology Use
- ✓ energy management
- ✓ electronic work order system
- ✓ inventorying (portable devices)
- ✓ use of e-mail
- ✓ other computer skills

Leadership Potential
- ✓ articulated vision
- ✓ goal orientation
- ✓ consensus building
- ✓ communication skills
- ✓ personnel management

Job Growth Possibilities
- ✓ supervisory experience
- ✓ budgeting experience
- ✓ organized work schedules
- ✓ resource management
- ✓ staff selection

Appendix G includes a list of specific interview questions that have proven useful to school district personnel as they interview potential employees.

MAPPING: THE ART OF USING YOUR ENTIRE BRAIN IN THE STAFF SELECTION PROCESS

Mapping is a concept that combines left and right brain perspectives on managing. The goal of mapping is to focus on the desired traits of the new employee throughout the interview process. Here's how it plays out. Say your district is interviewing for a supervisor of maintenance. Before candidates are interviewed, write down the specific characteristics that the new supervisor of maintenance should demonstrate. Share this with the selection committee and see if they have traits or characteristics to add or delete. This process will help each member of the selection committee to develop a clearer idea of the profile that best matches the "ideal" candidate. Next, prepare an interview worksheet that lists the ideal characteristics. During the interviews for the position, each committee member can take notes about whether (or to what degree) the applicant exhibits the ideal characteristics. The results might very well help to inform your decision-making regarding the selection process.

See Appendix H for an example of how mapping can be used to identify knowledge, skills, and abilities that a supervisor of maintenance should possess.

the newly hired person must interact. Some general qualities of effective employees are described below, but many more can be developed. From a practical perspective, it may be helpful to take notes during the interview about how well the applicant matches the various qualities that have been identified as desirable in the position.

Dotting Your I's and Crossing Your T's

Once a person has been identified during the interview process as the preferred candidate for a position, additional screening is required before an offer of employment can be extended. These essential tasks include:

- ✓ *Reviewing references.* While there is no need to talk to all former employers (for most positions), an applicant's most recent employment should be verified. In addition to providing information about a person's job performance, references can verify information provided by the applicant on resumes, employment applications, and during interviews. Some applicants may choose to supply character reference; these can be valuable, but should be accepted in lieu of a reference from past employers only if the person does not have prior (or recent) work experience.
- ✓ *Performing a background check.* While contacting an applicant's references is one form of checking a person's background, performing a "background check" has a very specific meaning for people who will work with or in the vicinity of children. Background checks are conducted by local, state, and national authorities to determine whether an individual has been convicted of a criminal offense. Several states require that all prospective employees in schools and school districts undergo a fingerprint-driven criminal history check. Thus, hiring committees should work with the district's Human Resources Department to ensure that all required procedures are followed in accordance with best practices and/or state and local laws as applicable.

VERIFYING AN APPLICANT'S RIGHT TO WORK IN THE UNITED STATES

Employers may not specify which documents they will accept from a job applicant. However, the Immigration and Naturalization Service (INS) requires that documents establish both the applicant's identity and employment eligibility. The INS recommends either ONE document that establishes both identity and employment eligibility from List A below OR ONE of the documents that establishes identity in List B AND ONE of the documents that establishes employment eligibility in List C.

List A (documents that establish both identity and employment eligibility)

1. U.S. Passport (unexpired or expired)
2. Certificate of U.S. Citizenship (INS Form N-560 or N-561)
3. Certificate of Naturalization (INS Form N-550 or N-570)
4. Unexpired foreign passport (with I-551 stamp or attached INS Form I-94 indicating unexpired employment authorization)
5. Alien Registration Receipt Card with photograph (INS Form I-151 or I-551)
6. Unexpired Temporary Resident Card (INS Form I-688)
7. Unexpired Employment Authorization Card (INS Form I-688A)
8. Unexpired Re-entry Permit (INS Form I-327)
9. Unexpired Refugee Travel Document (INS Form I-571)
10. Unexpired Employment Authorization Document with photograph (INS Form I-688B)

List B (documents that establish identity only and must be matched to a document from List C)

1. Driver's license or ID card issued by a state or outlying possession of the U.S. provided it contains a photograph or information such as name, birth date, sex, height, eye color, and address
2. ID card issued by federal, state, or local government agencies or entities provided it contains a photograph or information such as name, date of birth, sex, height, eye color, and address
3. School ID card with photograph
4. Voter's registration card
5. U.S. military card or draft record
6. Military dependent's ID card
7. U.S. Coast Guard Merchant Marine card
8. Native American tribal document
9. Driver's license issued by a Canadian government authority

List C (documents that establish employment eligibility only and must be matched to a document from List B)

1. U.S. social security card issued by the Social Security Administration (other than a card stating it is not valid for employment)
2. Certification of Birth Abroad issued by the Dept. of State (Form FS-545 or Form DS-1350)
3. Original or certified copy of a birth certificate issued by a state, county, municipal authority or outlying possession of the U.S. bearing an official seal
4. Native American tribal document
5. U.S. Citizen ID Card (INS Form I-197)
6. ID Card for Use of Resident Citizen in the U.S. (INS Form I-179)
7. Unexpired employment authorization document issued by the INS (other than those listed in List A)

Visit *http://www.ins.gov/* for more information about the Immigration and Naturalization Service.

WHEN CHECKING REFERENCES

Recommended actions:

✓ Verify position title and dates of employment.
✓ Verify candidate's reasons for leaving.
✓ Ask whether candidate is eligible for rehiring.

Optional actions:

✓ Ask about candidate's attendance record.
✓ Ask about job performance specific to the position for which candidate is applying.

Prohibited actions:

✓ Do not ask questions requiring value judgments (e.g., did she have a good attitude?).
✓ Do not ask questions about an applicant's personal life (e.g., what about his family commitments?).

Due diligence must be demanded by board policies and met during the day-to-day hiring process.

✓ *Verifying Employment Status.* Under the Federal Immigration Reform and Control Act of 1986, it is unlawful for employers to recruit, hire, or continue to employ illegal immigrants to the United States. At the same time, it is illegal to discriminate against work-eligible individuals solely because of their country of origin. The employer must take three steps when a job applicant is hired: 1) verify the applicant's right to work in this country (within three business days of the initial date of employment); 2) attest that written proof of the right to work has been presented (by completing INS Form I-9); and 3) maintain records of steps 1 and 2.

Only after the selected candidate has satisfied all pre-hiring requirements should an offer of employment be made. However, the new employee still must provide certain additional information to the employer, including the following:

✓ *Personnel records.* The employee must provide emergency medical information, emergency contact information, home contact information, and other personal information.

✓ *Payroll records.* The employee must provide a permanent mailing address, bank account routing numbers (for automatic deposit of paychecks), tax instructions (e.g., number of deductions, applicable taxing authority, etc.), beneficiary information for insurance policies, and participant information for joining medical, dental, and other insurance plans as applicable.

✓ *Immunization Records.* Newly hired employees may also be required to provide an immunization record and medical history to verify that they are free from certain communicable diseases. Since details of these requirements vary from state to state (and even school district to school district), be sure to consult your Human Resources staff about this topic prior to initiating the hiring process.

POLICIES MUST SUPPORT STAFF DEVELOPMENT

✓ New employees must be trained when they join the organization.
✓ Current employees must be trained on an ongoing basis as a means of improving their job satisfaction and performance.

WHO PROVIDES TRAINING?

- ✓ Other staff who have demonstrated expertise with the equipment or performing the task
- ✓ Managers who will supervise and evaluate the work
- ✓ District trainers (in large organizations)
- ✓ Product vendors and equipment manufacturers
- ✓ Vocational education staff

TRAINING STAFF

Newly Hired Employees

People who are new to an organization have special training needs. They need to know how to complete a time sheet, the procedure for lodging a complaint and, for that matter, where to find the bathroom—and that doesn't even take into consideration what they need to know to accomplish the task they have been hired to perform. Consequently, newly hired personnel should receive the following types of training as soon as possible after joining the organization:

- ✓ *Orientation (or tour) of the organization's facilities* – including the payroll division (where timecards are punched and submitted), emergency locations (such as the nurse's office), the cafeteria, and the supervisor's office.
- ✓ *Orientation (or tour) of the person's work area* – including the primary location where he or she reports to work and all areas where he or she might be expected to perform job-related tasks (e.g., a plumber should be shown the organization's plumbing headquarters and all campuses he or she will be servicing).
- ✓ *Equipment instructions* – including an introduction to all tools, machinery, and vehicles the individual will be expected to use (e.g., industrial floor sweepers, lawn cutting equipment, power tools, and district trucks).
- ✓ *Task-oriented lessons* – including instructions on how to best perform the individual's work tasks (e.g., how to clean a carpet, repair a roof, or service a school bus).
- ✓ *Expectations* – including a clear description of precisely what the individual must do to meet the requirements of the job (what, where, when, and to what extent).
- ✓ *Evaluation information* – including an explanation of all criteria on which the individual will be evaluated, such as the tasks that will be evaluated, all relevant performance standards and expectations, who will do the evaluating, what mechanisms will be used to perform the evaluations (e.g., random checks or daily assessments), and the potential ramifications of the evaluations.

A NOTE ABOUT TRAINING NEW STAFF MEMBERS

It might be 10 or 20 years since you've ridden a bike—still, you likely remember how to do so. But do you recall how many times you fell off of your first bike while trying to master the skill? It is much the same for staff members who have to learn new skills for their jobs, except that they have the added burden of knowing that their paycheck depends upon their performance! So be patient and supportive when training new staff. Mastering a new task takes time and practice, especially if you are worried about making a good impression on your new boss.

THE PURPOSE OF STAFF TRAINING MAY BE TO:

- ✓ ensure that your staff stay safe (e.g., OSHA training)
- ✓ teach staff how to deal with changing needs (e.g., caring for newly installed floors)
- ✓ provide a stimulating experience to people who perform repetitive tasks (thereby improving staff morale and retention rates)
- ✓ prepare staff for future promotions

School districts can't treat their employees like full-time students; nonetheless, preparing staff to get their work done properly, efficiently, and safely is cost-effective in the long run—and managers need to have the wisdom to balance the competing concerns.

Ongoing Training and Professional Development

Skills tend to get rusty unless they are used on a regular basis (who among us can jump rope like we did when we were kids?). The fact that a person has been taught how to perform a specialized task doesn't mean that he or she will be able to perform the task in the future, especially if the task is not a regular part of his or her routine.

Admittedly, there is a trade-off between the benefits of staff training and the costs of lost work time during training. School districts can't simply treat their employees like full-time students; nonetheless, preparing staff to get their work done properly, efficiently, and safely is cost-effective in the long run–and managers need to have the wisdom to balance the competing concerns. Planners should also be open to considering the benefits of developing "general" skills in their staff. For example, should a custodian be able to spend one hour per month learning about computer use with other staff? This professional development activity may seem unrelated to a custodian's job, but custodial work may someday (soon) require e-mail skills for communicating with centralized supervisors. Moreover, in light of their overall mission, school districts may be uniquely motivated to provide educational opportunities to their personnel.

Managers must think creatively about how to provide high-quality training opportunities in the face of time and budget constraints. Proven methods include:

- ✓ Sharing training costs with other organizations on a collaborative basis (e.g., training may be sponsored by several neighboring school districts or jointly by the school facilities department and the public works department in the same community).
- ✓ Hiring expert staff or consultants to provide on-site supervision during which they actively help staff improve their skills while still on-the-job.
- ✓ Developing training facilities, such as a custodial training room in which equipment (e.g., vacuums) and techniques (e.g., mopping) can be demonstrated and practiced. Providing this type of training will pay for itself in more efficient and better work from the trainee. Larger school districts, which are more likely to find such specialized facilities to be worth the investment, can do a good deed (and generate goodwill) by hosting training events for smaller districts in the area.

All staff training sessions should be documented. Videotaped sessions can be used in future training activities.

"Staff training" refers to learning opportunities designed specifically to help an employee do his or her job better. "Professional Development" has a broader meaning, which includes expanding participants' knowledge and awareness to areas outside their specific job duties, yet still related to the overall well-being of the organization. Such topics might include:

- ✓ asbestos awareness
- ✓ energy systems
- ✓ building knowledge
- ✓ first aid
- ✓ emergency response
- ✓ biohazard disposal
- ✓ technology use
- ✓ universal precautions
- ✓ Right-to-Know

- ✓ Offering tuition reimbursement programs which provide educational opportunities to staff who might not otherwise be motivated to improve their knowledge and skills.
- ✓ Building training into contracts so that vendors are obligated to provide training at either an on-site or off-site training center as a condition of the purchase of their products.

The "Moment of Truth" Chart

Training staff to not just do their jobs, but to do them well, can be a difficult task. One proven method for accomplishing this challenging task is the "Moment of Truth" chart. To begin, a trainer asks the employees to think of a task that is a routine part of their work. They are then asked to think of the minimum standards that must be met to accomplish this task. Finally, they are asked to consider what would be required of them to exceed that minimally acceptable performance. The results should be recorded in a tabular format, as shown in the accompanying chart.

EVALUATING STAFF

Managing a school district effectively requires that two vital tasks be navigated successfully. First, district leadership must institute policies that direct the organization's efforts toward desired goals and objectives. Second, the organization's employees must act on those policies on a daily basis so as to meet the goals and objectives the organization has set. Thus, if policies lead the organization in the wrong direction, "good" workers will only take it there more efficiently. On the other hand, good policies aren't worth the paper on which they are written if staff aren't getting their jobs done properly. To ensure that staff are doing their part to meet an organization's goals and objectives, employee performance must be evaluated on a regular basis.

To assess staff productivity, the organization (through its managers and supervisors) must establish performance standards and evaluation criteria. For example, a custodian's performance might be measured by the amount of floor space or number of rooms serviced, the cleanliness of those facilities, and his or her attendance

The goal of staff evaluations is the ongoing positive growth of staff members. Although shortcomings in performance must be addressed, evaluations should not be viewed as disciplinary events and should never be the venue for unexpected criticism. Employees who are under-performing should be told so as soon as it is recognized (not just during their formal evaluations).

TRAINING: FOCUSING GOOD INTENTIONS INTO PRODUCTIVE ACTIVITIES

Hal couldn't figure out why the school's ventilator fan kept turning off overnight. He'd verified that it was running before he left the office at 6 p.m. the evening before, but it was off again by 8 a.m. the next morning. He spent the day checking fuses and switches, but everything appeared to be working fine. He was about to go home very perplexed when the night shift custodian arrived. "Linda," he asked, "did you see anyone in the ventilator room last night?" "No," she answered, "why?" "Well," Hal explained, "the ventilator keeps switching off at night and I can't figure out why." "Oh," Linda said openly, "I started turning it off during my rounds." Hal looked incredulous. "Why would you do that, Linda?" "Because you told me to make sure that all lights, fans, and computers get turned off every night so that we stop wasting so much energy around here," she replied. "Well, yeah, I did say that, but I didn't mean…" Linda interrupted him again. "My job isn't to guess what you mean, Hal. I get paid to do what you tell me." She had a point, and Hal knew it. He had to do a better job of communicating what he wanted Linda to do (and not do).

"MOMENT OF TRUTH" CHART

A Girl Scout troop meets every Thursday night at James Elementary School, where Steve is the custodian. Following is the "Moment of Truth" chart Steve created at a staff development meeting:

On Thursday nights…

BELOW STANDARD	STANDARD TO BE MET	OPPORTUNITY TO EXCEED
✗ Outside doors locked	✓ Outside doors unlocked	✓✓ Exterior and lobby lights turned on; Scouts greeted as they arrive
✗ Room door locked	✓ Room door unlocked	✓✓ Room lights turned on; signs pointing to the meeting room
✗ Meeting area unprepared	✓ Meeting area prepared (e.g., temperature checked, room straightened)	✓✓ Closest bathroom unlocked, lit, cleaned, and supplied; introduce self to troop leader; tell troop leader to call if they need any other help; reappear at end of meeting to escort the troop out of the building and lock the doors behind them

How did the "Moment of Truth" chart inform Steve's actions?

Because Steve knew that the Girl Scouts would be arriving at 7 p.m., he planned his work schedule so that he would be in the lobby area to welcome them. He opened the door and greeted Mrs. Jones, the troop leader, two parents, and the scouts as they entered the building. Steve told them that he had checked their room, and that the lights were on, the temperature was comfortable, and the bathrooms on that corridor were open and supplied. He also mentioned that he would be working down the hall in the cafeteria in case they needed him for anything. When the meeting was over, Steve walked the guests out of the building and locked up behind them.

The next day Steve got summoned to the main office where the principal asked him what in the world he had done to Mrs. Jones! The troop leader had called the principal that morning for the sole purpose of recognizing Steve's hospitality and efficiency the previous evening. The principal was pleased to pass along the thanks to Steve, adding that she was proud of him for leaving such a positive impression on the school's guests.

And what were things like before Steve constructed his "Moment of Truth" chart?

Steve was cleaning the gymnasium floor when he heard pounding on the windows down the corridor. He opened the front doors and found Mrs. Jones and the girls standing in the dark and the cold. Mrs. Jones explained that two parents had walked around to the back of the building to look for an open door. Steve went to look for them. When he returned, he found Mrs. Jones and the troop waiting outside the locked meeting room. When he opened the door and turned on the lights, he found the room in a state of disarray. Mrs. Jones grimaced and said that the girls would straighten it if Steve could get some heat into the room. Forty minutes later, he heard someone calling through the dark halls for "Mr. Janitor." He was asked not only to open the bathroom, but also to bring a mop since one of the young girls had not been able to wait. The next day Steve got called to the office by the principal, who had just received an angry phone call from the troop leader.

Conclusions

Would you rather work in a school district that hears praises or complaints about the custodial staff? Most people would rather be helpful when possible—and one of the keys to good leadership is helping staff to see that doing a good job is not only possible, but preferable. The Moment of Truth Chart is a technique for accomplishing this objective. It shows that doing an exceptional job doesn't require that much more work, just that the work be done more efficiently. In the example above, Steve had to open the doors, turn on the lights, heat the rooms, and supply the bathrooms anyway. The Moment of Truth Chart just reminded him that he should plan to reorganize his schedule on Thursday nights so that he performed these tasks before the guests arrived!

GUIDELINES FOR DEVELOPING PERFORMANCE STANDARDS

Management must:

- ✓ Establish goals
- ✓ Create an evaluation instrument (e.g., a checklist)
- ✓ Be as detailed and specific as possible
- ✓ Define the performance scale (e.g., 0 = poor to 5 = excellent)
- ✓ Be flexible (i.e., acknowledge extraordinary circumstances when they arise)
- ✓ Convey expectations to affected staff people
- ✓ Review the performance standards on a regular basis (e.g., annually)

history. The custodian's work likely will be assessed by his or her immediate supervisor and the principal of the school. Self-evaluations can also be useful personnel management tools–i.e., ask the staff member to rate his or her own work and then discuss the outcomes relative to the supervisor's opinion.

Determining performance standards may be best accomplished as a joint endeavor between the individual and his or her supervisor. Although some supervisors may be reluctant to share this authority, joint decision-making with the staff member has two very positive features: 1) the staff member can communicate atypical features of his or her working conditions that warrant modification of "normal" performance standards (e.g., the vinyl tile floor in the work area requires additional time to clean properly); and 2) the supervisor will know that the staff member is fully aware of the jointly developed expectations.

A "desk audit" is a good place to begin establishing performance standards: ask employees to write down how they spend each day (i.e., what are their current duties and responsibilities?).

Assessing how an employee measures up to performance standards is an uncomfortable task for many supervisors. To avoid unpleasantness, the supervisor must maintain his or her composure, objectivity, and professionalism–otherwise one risks inciting staff morale issues and, perhaps, personnel complaints or even legal issues. To avoid these problems, evaluators must be careful to:

- ✓ Be objective and not allow personalities to influence the assessment
- ✓ Document evidence that supports the assessment
- ✓ Encourage improvement rather than fixate on shortcomings

Does it seem like an employee is consistently absent on Fridays and Mondays? If so, personnel records should verify this before the issue is brought up as a concern during a staff evaluation.

An evaluation system that fails to discriminate between performance levels is failing the organization. For example, a system is flawed when every staff member is rated "above average" in every facet of his or her performance. After all, by definition, "above average" means better than half of one's peers!

WHAT KEEPS GOOD PEOPLE ON THE JOB?

✓ good pay ✓ good benefits ✓ a sense that they are respected ✓ a feeling that their work is valued ✓ opportunity for advancement

MAINTAINING STAFF

A great deal of time, energy, and money goes into hiring good employees and providing them with worthwhile staff training opportunities. Thus, it is an expensive proposition to replace good staff who leave prematurely. Moreover, when a position is unfilled, the work either doesn't get accomplished or morale is hurt when existing staff are expected to work harder or longer to pick up the slack. Therefore it should not be surprising that retaining good staff is an essential aspect of effective management.

The first step to retaining staff is to determine the current staff turnover rate. If it is high, does this reflect how personnel are treated, either because of policies (e.g., poor compensation or benefits) or organizational culture (e.g., do staff feel undervalued)? And how might these data inform organizational policies and practices? For starters, staff retention can be affected by changes in policies. If turnover is costing the organization too much money and affecting the amount of work that is getting done, it may be time to introduce financial incentives for staff who stay on the job. For example, a one-year anniversary bonus equal to 5 percent of a person's annual salary might be a very effective tool for retaining staff for a full 12 months.

Consider allowing staff to vote on award recipients—it shows that their opinions are valued and may help to eliminate controversial decisions on the part of management.

Staff retention efforts might also take the form of staff appreciation awards, parties, and gifts. After all, nothing says "we value your work" like an end-of-the-year picnic (paid for by the district) where the facilities manager and superintendent pass out performance awards to maintenance and custodial staff who might otherwise not receive very much recognition for their work.

INCENTIVES IDEAS INCLUDE:

- ✓ on-the-spot awards
- ✓ annual cash bonuses
- ✓ hats or shirts with the department logo
- ✓ plaques
- ✓ gift certificates (to restaurants, movies, etc.)
- ✓ tickets to sporting events or musical concerts
- ✓ employee-of-the-month announcements
- ✓ picnics or banquets
- ✓ tuition reimbursement
- ✓ special privileges (e.g., coffee and doughnut parties)

AND THE AWARD FOR "BEST ATTITUDE" GOES TO…

It was Henry's favorite day of work each year—the facilities department picnic! Every May, he and his family would meet his co-workers (and their families) at the outdoor swimming pool for an afternoon of food and fun. The facilities department would roast a pig, fry fish, bake potatoes, boil corn, invite the ice cream vendor, and pick up the tab!

This year, when Mr. Davis stood up to recognize his staff, the day got even better for Henry, as he was recognized for having the best attendance rate in the department over the past 12 months. Henry was proud to shake Mr. Davis's hand at the podium, but even happier to receive a $50 gift certificate to a local seafood restaurant. His friend Samantha also received an award—a plaque that read "Most Conscientious Employee"—that everyone in the department had voted on.

It was a day of family fun and pride. Henry's kids enjoyed the day as much as he did (which was part of why he liked the picnic so much), and Henry knew that his department valued the job he did throughout the school year!

MANAGING CONTRACTED STAFF AND PRIVATIZED ACTIVITIES

Some school districts hire outside agencies to handle certain maintenance and custodial tasks – that is, they use "privatized" or "contracted" services. Why would an organization want to pay a third party enough money to perform a service and make a profit? There are many reasons for outsourcing jobs. Perhaps in-house staff are constantly being bombarded with "special" projects and emergencies that take priority over their daily duties. Maybe a small school district may not be able to afford to keep specialized personnel on the staff. Or a large district may need to cut back on the number of permanent staff.

While there may be financial benefits to privatizing certain activities in a school system, the effects on an organization's work culture must also be considered.

Whatever the reason, privatizing is not just a question of the school district writing a check to pay for services. School staff must still put considerable energy into managing privatized endeavors. For example, when contracted staff are hired, precise specifications must be drawn up for the procurement, including an objective standard for measuring performance. Moreover, depending on the complexity of the task, a member of the in-house staff may still need to serve as project manager. To be effective, the project manager should have expertise in maintenance and operations, a thorough understanding of the contractor's scope of work, the skills to evaluate the contractor's performance, and the authority to assign supplemental support tasks to in-house staff.

Where on the organizational chart does one draw the line when privatizing maintenance responsibilities? The short answer is that at least the "manager" should be a school district employee.

Opportunities for in-house staff to work alongside outside contractors should never be ignored if schedules allow for such interaction. This type of cooperation can provide valuable (albeit informal) training for the district's maintenance and operations staff. At the same time, outside contractors can pick up valuable information about the practical applications of their work. Including in-house staff in all aspects of the maintenance program may have the added bonus of building support for the privatization program from within the organization.

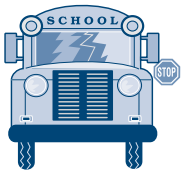
COMMONLY ASKED QUESTIONS

How does "training" apply to maintenance and custodial staff?
Caring for a school facility requires considerable expertise. While the organization may prefer to hire maintenance and custodial staff who possess this expertise, this is not always possible. Sometimes "hiring" experts is just too expensive. In other cases, existing staff need training to meet changing facility needs. No matter the circumstances, developing staff expertise is a necessary and cost-effective component of getting the job done–and "developing" expertise is simply another way of saying "training." Staff training provides employees with the knowledge, skills, and experience (through practice) to accomplish their jobs effectively.

How does one justify professional development versus time-on-task?
Staff do not get hired to be students–they are hired to accomplish a job. Nonetheless, effective managers understand that helping employees improve their knowledge and skills also helps them to become better employees. Professional development can also be an effective tool for boosting or maintaining staff morale. After all, nothing conveys that an organization values and respects its workers like its willingness to invest in them.

What types of reward and incentive programs are effective?
Reward and incentive programs should be tailored to the needs and wants of the staff and the best interests of the organization. Staff might appreciate creativity when conceiving incentive programs, but planners should ensure that the incentives are things that the staff (and not the planners) would want. Examples include: on-the-spot awards, annual cash bonuses, gift certificates (e.g., to restaurants, movies, and stores), tickets to sporting events or musical concerts, hats or shirts with the department logo, plaques, employee-of-the-month announcements in the newspaper, picnics and banquets, tuition reimbursement, and special privileges (e.g., bonus time for coffee breaks or free doughnuts during breaks).

ADDITIONAL RESOURCES



Every effort has been made to verify the accuracy of all URLs listed in this Guide at the time of publication. If a URL is no longer working, try using the root directory to search for a page that may have moved. For example, if the link to *http://www.epa.gov/iaq/schools/performance.html* is not working, try *http://www.epa.gov/* and search for "IAQ."

Association of Higher Education Facilities Officers (APPA)
http://www.appa.org/
An international association that maintains, protects, and promotes the quality of educational facilities. APPA serves and assists facilities officers and physical plant administrators, conducts research and educational programs, produces publications, and develops guidelines.

Cleaning & Maintenance Management Online
http://www.cmmonline.com/Home.asp
The online home of Cleaning & Maintenance Management Magazine, which features articles, buyers guides, key topics, and a calendar.

Custodial Staffing Guidelines for Educational Facilities
http://www.appa.org/resources/publications/pubs.cfm?Category_ID=2
A guide about custodial staffing in educational facilities that addresses custodial evaluation, special considerations, staff development tools, and case studies. Appendices include information about custodial requirements, space classification, standard space category matrices, standard activity lists, and audit forms. APPA (1998) The Association of Higher Education Facilities Officers, Alexandria, VA, 266pp.

Custodial Standards
http://ehs.brevard.k12.fl.us/PDF%20files/custodial_standards_03.pdf
Guidelines that detail cleaning requirements for each area of a school, including classrooms, restrooms, cafeterias, gymnasiums, locker rooms, and corridors. Samples of assessment forms include emergency lighting, fire extinguisher inspection, air conditioner maintenance/service log sheets, and monthly custodial preventive maintenance forms. Office of Plant Operations and Maintenance (1998) Brevard Public Schools, Rockledge, FL, 44pp.

FacilitiesNet
http://www.facilitiesnet.com/
A commercial web site for facilities professionals sponsored by Trade Press Publishing Corporation and developed by the editors of Building Operating Management and Maintenance Solutions magazines. It includes a chat room on educational facilities.

Facility Management
http://www.facilitymanagement.com/
The online home of American School and Hospital Maintenance Magazine. This site is intended to help facility managers stay informed about current issues and the latest products.

International Facility Management Association (IFMA)
http://www.ifma.org/
The web site of a group that is dedicated to promoting excellence in the management of facilities. IFMA identifies trends, conducts research, provides educational programs, and assists corporate and organizational facility managers in developing strategies to manage human, facility, and real estate resources.

National Clearinghouse for Educational Facilities (NCEF)
http://www.edfacilities.org
A web site that includes reviews of and links to cutting-edge education facilities news; a calendar of conferences, workshops, and other facilities management-related events; a gallery of photos showing off innovative and provocative building design and construction from real schools across the nation; categorized and abstracted resource lists with links to full length, online, publications; and pointers to other organizations that provide online and off-line resources about education facilities management. NCEF can also be reached toll free at 888-552-0624.

National School Plant Management Association (NSPMA)
http://www.nspma.com/
A membership organization that facilitates the exchange of information about school plant management, maintenance and care.

Occupational Safety and Health Administration (OSHA)

http://www.osha.gov/

The web site of OSHA, which has as its core mission to save lives, prevent injuries, and protect the health of America's workers. To accomplish this, federal and state governments work in partnership with the more than 100 million working men and women and their 6.5 million employers who are covered by the Occupational Safety and Health Act of 1970.

Plant Operations Support Program

http://www.ga.wa.gov/plant

A self-sustaining consortium comprised of facility managers from Washington state agencies, educational facilities, municipalities, and port districts. This web site includes a library of practices, policies, research studies, and other references on subjects including emergency preparedness, energy savings, maintenance management, IAQ, and accessibility.

SchoolDude

http://www.schooldude.com/

A site that connects school facility professionals with each other to solve problems, share best practices, and improve learning environments. This includes tools for work management, information, and resources, as well as online procurement for equipment and school supplies. Some sections are accessible only to fee-paying members.

SchoolFacilities.com

http://www.schoolfacilities.com

A professional support network for school facility administrators and support personnel that provides school-related news, products, resources, and facility management tools.

SchoolHouse Plant Operation & Maintenance Resource Center: School House Library

http://faststart.com/cps/Library.html

An online library containing reports dealing with various aspects of plant operation and maintenance that relate to the operation of school buildings.

U.S. Equal Employment Opportunity Commission

http://www.eeoc.gov

The web site of the EEOC, which is charged with enforcing numerous employment-related federal statutes.

U.S. Immigration and Naturalization Service (INS)

http://www.ins.gov/

The web site of the INS, which is responsible for enforcing the laws regulating the admission of foreign-born persons (i.e., aliens) to the United States and for administering various immigration benefits, including the naturalization of qualified applicants for U.S. citizenship.

MANAGING STAFF AND CONTRACTORS CHECKLIST

More information about accomplishing checklist points can be found on the page listed in the right-hand column.

ACCOMPLISHED		CHECKPOINTS	PAGE
YES	NO		
		Have job descriptions been developed for all maintenance and operations positions?	105
		Do job descriptions describe “duties and responsibilities” accurately and in detail?	106
		Do job descriptions accurately describe working conditions?	106
		Do job descriptions accurately describe the physical requirements of the position?	106
		Do job descriptions comply with equal opportunity laws?	106
		Do job descriptions accurately describe the educational requirements of the position?	107
		Do job descriptions accurately describe the credential and licensure requirements of the position?	107
		Do job descriptions accurately describe equipment used in the position?	107
		Do job descriptions accurately describe at-will versus unionized requirements of the position?	107
		Do job descriptions accurately describe channels of authority for the position?	107
		Do job descriptions accurately describe evaluation mechanisms for the position?	107
		Do job descriptions include the phrase “and other duties as assigned”?	107
		Before interviewing candidates, have the characteristics of the “ideal” candidate been identified?	108
		After selecting the preferred candidate, but before extending an offer of employment, have the applicant’s references been contacted?	108
		After selecting the preferred candidate, but before extending an offer of employment, has a criminal background check been performed on the applicant?	108
		After selecting the preferred candidate, but before extending an offer of employment, has the applicant provided evidence of employment eligibility?	110
		After extending an offer of employment, has the applicant provided all information needed to complete a personnel record?	110

		After extending an offer of employment, has the applicant provided all information needed to satisfy payroll needs?	110
		After selecting the preferred candidate, but before extending an offer of employment, has the applicant provided required medical and health records?	110
		Do all newly hired employees undergo staff training upon initially joining the organization?	111
		Does training for new staff include an orientation to key district sites (e.g., emergency locations) and all sites at which the individual will work?	111
		Does training for new staff include an introduction to all equipment the individual will be expected to use?	111
		Does training for new staff include instructions about how to best perform the individual's work tasks?	111
		Does training for new staff include a clear description of precisely what the individual must accomplish in order to meet the expectations of the job?	111
		Does training for new staff include an explanation of all criteria on which the individual will be evaluated?	111
		Is ongoing training provided to existing staff?	112
		Is professional development offered to all staff on an ongoing basis?	112
		Are all training and professional development activities documented on videotape so that they can be showed to other staff and at later times?	112
		Have cost-sharing and cost-minimizing methods for training programs and facilities been considered by management?	112
		Have staff been trained to create and use a "Moment of Truth" chart?	113
		Have performance standards and evaluation criteria been established for all staff positions?	113
		Have performance standards and evaluation criteria been adequately explained to all staff?	115
		Have managers been trained on how to perform fair, objective, accurate, and well-documented evaluations?	115
		Have staff turnover rates been determined and analyzed?	116
		Have the organization's personnel policies been adjusted to increase staff retention rates?	116
		Have rewards and incentives been introduced to improve staff morale and retention?	116
		Do privatization procurements include precise specifications for measuring performance?	117
		Has an in-house staff member been assigned the duties of "project manager" for each privatization contract?	117

CHAPTER 7
EVALUATING FACILITIES MAINTENANCE EFFORTS

GOALS:

✓ **To communicate the importance of regular facilities maintenance program evaluation**

✓ **To recommend best practice strategies for evaluating facilities maintenance efforts**

Program evaluation allows planners to see which initiatives are working, which are not working, and which strategies need to be reconsidered. There is simply no substitute for good data when making evaluation and program decisions.

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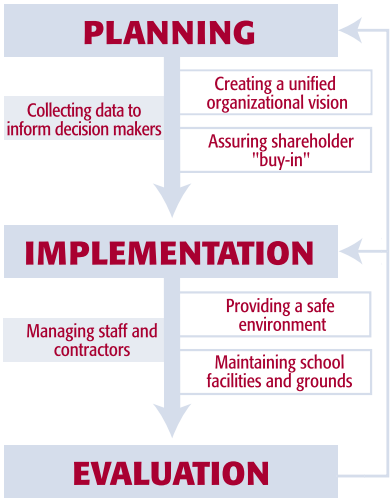
WHEN THE GOING GETS TOUGH, THE TOUGH GET EVALUATING

Nick had pretty much staked his reputation, and perhaps his job, on a preventive maintenance program. He'd championed the idea, recommending it in no uncertain terms to the superintendent and school board. So when the money was earmarked for a preventive maintenance program, everyone congratulated him. But Nick knew that getting the money and implementing the initiative was only the start of the job. He had to show that the program was working—or at least find out where it wasn't working and then reassess his strategy as needed.

When the next year's budget cuts came down from the top, the assistant superintendent tried to reassure Nick that the maintenance program would survive the cut. "Look, Nick, you could make up nearly a third of the cut if you just reassign your program evaluation funds back into the maintenance budget." Nick looked at his boss with surprise. "Ted, in ten years of working together, I've never heard such a bad idea come out of your mouth." Ted was taken aback by the reply, "But Nick, I just want to make sure that you're getting the biggest bang for your buck out of the budget." Nick laughed, "So do I, and that's why we've got to evaluate our work. Otherwise, we'll have no way of knowing what the 'buck' is really buying us. We won't know what we're doing right, or doing wrong, or where we needed to improve our performance. I'm telling you, Ted, when the budget gets lean—that's when we really need to stay serious about evaluating our work so that we can determine our priorities and allocate those tight dollars." Ted scratched his head, "I hadn't thought of it that way, Nick. I bet the same is true in the rest of the district as well, huh?" Nick cracked a smile, "I bet it is."

EVALUATING YOUR MAINTENANCE PROGRAM



This *Planning Guide* provides a framework for proactively developing a comprehensive, district-wide facility maintenance plan. The preceding chapters address the primary elements of maintenance planning, including recognizing the need for effective maintenance programs, planning maintenance programs, performing facilities audits (i.e., data collections), ensuring environmental safety, maintaining grounds and facilities, and managing staff and contractors. One other vital component of adequate school facilities maintenance is periodic evaluation to assess the success of these efforts at a program level.

To realize the full potential of a comprehensive preventive maintenance system, school staff, the school board, and town planners must incorporate maintenance priorities into all modernization goals, objectives, and budgets. However, it is also fair for stakeholders to expect the maintenance program to yield results–namely: clean, orderly, safe, cost-effective, and instructionally supportive school facilities that enhance the educational experience of all students. But stakeholders also need to demonstrate patience because the only thing that takes more time than implementing changes to a maintenance program is waiting to see the improvements bear fruit.

Reasons for evaluating the facilities maintenance program include:

- ✓ *internal management control*
- ✓ *school board requests*
- ✓ *state reporting mandates*
- ✓ *regulatory inspections (e.g., EPA)*

CONSIDERATIONS WHEN PLANNING PROGRAM EVALUATIONS

Evaluation doesn't have to mean more dollars and more surveys. Many of the day-to-day activities or systems used to plan and operate a maintenance program also generate the types of information needed to evaluate the program's effectiveness. These can include:

- ✓ *Physical inspections:* Records of physical inspections are good evaluative material. To care for buildings and grounds, staff must observe and assess their condition on a regular basis. Inspections should be both visual (i.e., how things look) and operational (i.e., how things work), and should result in work orders for items requiring service or repair.
- ✓ *Work order systems:* An effective work order system, as explained in Chapter 5, is a good tool for identifying, monitoring, and projecting future maintenance needs. All maintenance work should be recorded on work orders, which then provide valuable quantitative information for evaluations.
- ✓ *User feedback/customer satisfaction surveys:* There are many ways to gather information from users/customers (i.e., the people who benefit from the maintenance activities), including collecting satisfaction surveys and convening advisory committees of stakeholders. The value of user perception should not be overlooked as an evaluation tool. Appendix I provides a sample customer survey form used to request feedback relating to custodial and maintenance work.

Program success can only be evaluated relative to program objectives. In other words, measuring "success" means answering the question: Are we reaching our goals and objectives?

- ✓ *Audits:* Performance audits, commissioning, retro-commissioning, comparisons with peer organizations, benchmarking, and annual reviews of accomplishments provide important data for the facility plan and ensuing evaluation.
- ✓ *Alternative resources:* Maintenance staff need not reinvent the wheel when it comes to evaluations. Maintenance and operations manuals, vendor expertise, warranties, and other resources (e.g., Web sites) can be sources of benchmarking data or evaluation standards.
- ✓ *Regulatory activities:* Appropriately trained staff or contractors must be assigned to determine whether applicable public safety and environmental regulations are followed. These staff must be responsible for documenting inspection activities and reports, notifying appropriate oversight organizations of deficiencies, developing strategies for remedying deficiencies, and verifying compliance to applicable laws and regulations. Documentation of these activities can be used in program evaluation.

A NOTE ABOUT BUDGETS

Even with the best planning, budget cutbacks are sometimes unavoidable. This may force planners to reprioritize their operational objectives—which can affect the goals of an evaluation effort as well. For example, under shortfall conditions, evaluators might be asked to assess whether budget cutbacks have prevented the department from reaching one or more of its goals. Or the evaluation effort might be used to identify mission-critical components of the maintenance plan in the event of ongoing program cuts.

QUESTIONS TO DRIVE EVALUATION EFFORTS

A simple evaluation program can be implemented by answering these four questions:

Step 1:
What is the purpose of the evaluation? That is, what decisions need to be made and by whom?

Example: The facilities maintenance director and the school business official want to know whether the new work order system is worth the money that was invested in its purchase, installation, and staff training.

Step 2:
What questions need to be answered to make an informed decision, as identified in Step 1?

Example: Is the new work order system accomplishing all that we had hoped it would?
Is the new work order system running more efficiently than the old system?

Step 3:
What information needs to be available to answer the questions identified in Step 2?

Example: What was the total cost for purchasing and installing the work order system?
What was the total cost to train staff to use the work order system?
Are staff time and materials accounted for in the work order system?
Does the system maintain historical data about maintenance at each site?
Does the system track all purchases, from ordering through delivery, installation, and storage?
Does the system document all preventive maintenance activities?
Has the response time for work order requests decreased? If so, by how much?
Has the number of work orders accomplished increased? If so, by how much?

Step 4:
What is the best way to capture the information needs identified in Step 3?

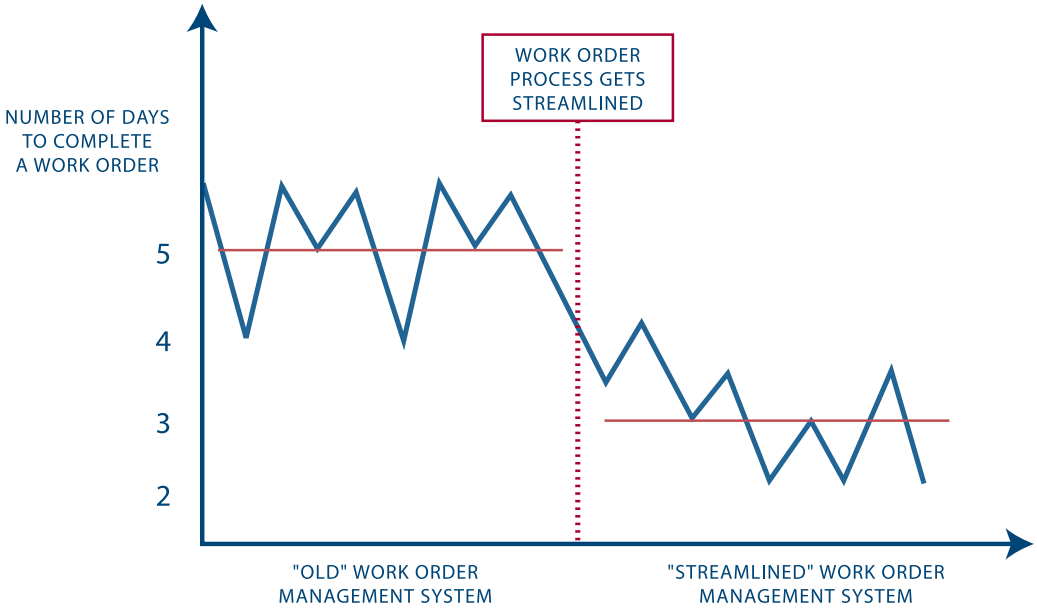
Example: Accounting and management audits, work order system user surveys, current work order system reports, and data from previous work order requests.

The only thing worse than no data is misplaced confidence in bad data. Decisions are bound to be bad if the data used to inform them are of poor quality.

COLLECTING DATA TO INFORM A COMPREHENSIVE EVALUATION

To evaluate a facilities management program, the district must collect and maintain accurate, timely, and comprehensive data about its facilities. After all, responsible decision-making requires good data and documentation. Before assessing maintenance improvements, it is necessary to identify the baseline against which progress will be measured (see Chapter 3). In other words, will the organization compare its current status against its previous status, against peer organizations, or relative to commonly accepted norms and best-practice standards?

The graph shows the number of days it took for a work order to get completed in a school district before and after the process was streamlined. Although the amount of time it takes for the actual work to be accomplished has not changed, two significant time-saving approaches have been adopted: 1) the number of people handling the work order has been cut, and 2) the parts and materials procurement system has been linked to the work order system. This type of streamlining not only increases efficiency with respect to getting work accomplished, but also decreases unnecessary administrative costs.



Collecting data may require substantial effort, but it is a necessary task all the same. Proven sources of information about the condition of school facilities and the impact of a facility maintenance program include:

- ✓ number of work orders completed
- ✓ changes in maintenance costs
- ✓ major incident reviews (e.g., number of school shutdowns, safety events, etc.)

Document all "lessons learned" to keep a record of things that didn't work as planned so that mistakes can be avoided the next time around.

PITFALLS TO AVOID WHEN INTERPRETING MAINTENANCE EVALUATIONS

Stakeholders should not assume that improvements to a maintenance program will always yield cost savings in real dollars. To obtain an accurate assessment of maintenance initiatives, evaluators must also look for:

- ✓ Cost avoidance rather than direct savings (e.g., well-maintained equipment tends not to wear out or need to be replaced as quickly as poorly maintained equipment)
- ✓ Fewer service interruptions resulting from better maintained, and better performing, equipment.

Moreover, improving facilities maintenance requires patience. A comprehensive, proactive program takes resources, energy, and time to initiate—and even more time before results are realized.

- ✓ "customer" feedback (e.g., the opinions of principals and other occupants)
- ✓ visual inspections by supervisors and managers
- ✓ comprehensive management audits
- ✓ performance audits
- ✓ organizational studies
- ✓ annual snapshots (e.g., maintenance/operations cost per square foot or per student)
- ✓ facility report cards or other summaries
- ✓ comparisons with "peer" organizations
- ✓ benchmark performance
- ✓ trend analysis (e.g., progress toward the organization's long-range plans)
- ✓ external audits/peer reviews
- ✓ weekly foreman's meetings
- ✓ staff turnover rates
- ✓ public opinion (e.g., newspaper articles, etc.)

EXAMPLES OF GOOD EVALUATION QUESTIONS

Over the years, experienced facilities maintenance planners have learned to ask some very good evaluation questions, some of which are listed below. Some questions may not apply to every school district, but the list illustrates the types of questions that facilities maintenance planners can ask to meet the information needs of their evaluation efforts.

Work Orders

- ✓ Does the work order system account for all maintenance staff time and materials?
- ✓ Does the work order system produce data about the history of all maintenance activities at each site?
- ✓ Does the work order system track all purchases, from ordering through delivery, storage, and installation?

- ✓ Does the work order system document all preventive maintenance activities?
- ✓ Is priority recognition available to differentiate between emergency, routine, and preventive maintenance?
- ✓ Do preventive maintenance activities outnumber emergency responses in the work order system logs?
- ✓ Is user feedback documented through work orders, surveys, or minutes of stakeholder meetings?

Needs Assessment

- ✓ Does the needs assessment include a mechanism for collecting, analyzing, and prioritizing input from users?
- ✓ Does the needs assessment include data from the work order system?
- ✓ Are stakeholders (e.g., maintenance staff, educators, users) included in needs assessment and capital planning activities?
- ✓ Does the needs assessment include information from the work order system?
- ✓ Does the needs assessment include information from site and equipment inspections?
- ✓ Does the needs assessment include data from performance and systems audits?
- ✓ Does the needs assessment include commissioning and retro-commissioning results?
- ✓ Does the needs assessment include comparisons with peer organizations?
- ✓ Does the needs assessment reflect outstanding regulatory or compliance issues?
- ✓ Are safety checks based on documentation and incident reports?
- ✓ Is an annual facility plan created from the needs assessment?

Site Inspections

- ✓ Are inspectors adequately trained for their task?
- ✓ Are there clear standards for inspections?
- ✓ Are inspections conducted with both property needs and maintenance capacity in mind?
- ✓ Are all inspection results documented?

Data Management Systems

- ✓ Does the data management system document the current status of the major systems and components in every school building?
- ✓ Does the data management system document the capital and maintenance needs of every school building?

- ✓ Does the data management system document the short- and long-term needs of the district?

Budgeting

- ✓ Does the budget request accurately reflect the needs of the annual facility plan?
- ✓ Are there both short- and long-term budget objectives?
- ✓ Are maintenance staff involved in developing the budget?
- ✓ Does the annual budget reflect the inevitability of unplanned emergency maintenance issues?
- ✓ Are there contingency plans in the budget?
- ✓ Are industry standards used to estimate costs?
- ✓ Does the budget include funds for new hires, contracting, and equipment and supply purchases?
- ✓ Is the financing plan for long-term capital needs separate from the maintenance budget?

Staffing

- ✓ Does the personnel policy include maintenance and contracted staff?
- ✓ Do job descriptions reflect the identified needs of the organization?
- ✓ Do job descriptions outline the necessary qualifications to perform the work?
- ✓ Does the organizational chart accurately delineate reporting responsibilities?
- ✓ Are training opportunities available and relevant to the duties of the staff?
- ✓ Are all tradespeople fully licensed for their work?
- ✓ Are industry guidelines used to determine custodial staffing needs?
- ✓ Are cost-benefit analyses conducted to determine staff/contracting needs?
- ✓ Is cost-benefit analysis based on numbers of available staff, skill levels or training needs of existing staff, and the type of job?

Staff Evaluations

- ✓ Are staff performance evaluations performed on a regular schedule?
- ✓ Do data drive staff performance evaluations?
- ✓ Is there follow-up to staff performance evaluations that includes additional training opportunities, reassignment of staff, changes in job duties, contracting out duties, and hiring of additional staff?
- ✓ Are staff accomplishments reviewed and documented on an annual basis?

- ✓ Are staff accomplishments measured in part by comparing budget estimates to actual expenditures?
- ✓ Are staff accomplishments measured in part on the basis of work order system records?
- ✓ Are staff accomplishments measured in part by personnel evaluations?

Facility Plan

- ✓ Does the facility plan provide for periodic reports of staff accomplishments to stakeholders?
- ✓ Are staff accomplishments related to the objectives stated in the annual facility plan?
- ✓ Were all facility plan objectives met?
- ✓ Was reprioritization of objectives needed to meet goals?
- ✓ When goals and objectives were not met, was the reason for this failure substantiated?
- ✓ Were cost estimates sufficient to meet the objectives?
- ✓ Were other aspects of the budget negatively affected to meet maintenance objectives?
- ✓ Were staffing levels sufficient to meet the objectives?
- ✓ Are the goals and objectives of the facility plan reprioritized based on actual budgets received, number of emergencies, school shutdowns, complaints, safety issues, school days lost or sick days increased, negative inspection reports, loss of accreditation, compliance, regulatory or legal action, impact on capital plan or long-term plan, staff overtime, staff turnover, or the impact on other planned projects?
- ✓ Are unmet goals and objectives documented?
- ✓ Are unmet goals and objectives included in the next planning cycle?

COMMONLY ASKED QUESTIONS

Doesn't "evaluation" take precious resources from actually maintaining facilities?

Absolutely. However, without earmarking funds for evaluation, there is no way of knowing whether the money, time, and energy going into facilities maintenance efforts are producing worthwhile results. After all, the only thing worse than "wasting" part of the maintenance budget on evaluation is wasting the entire maintenance budget on activities that aren't really working.

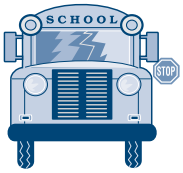
What tools are available for maintenance program evaluation activities?

An "evaluation tool" is any means by which an organization can get accurate and timely information about the status of its facilities, and any improvements that are a result of the maintenance program. In addition to the services of outside evaluation consultants, potential tools available to a school district include: work order records, major incident reviews (e.g., the number of school shutdowns, safety events, etc.), "customer" feedback

from building principals and other stakeholders, weekly foremen's meetings, visual inspections by supervisors and managers, comprehensive management audits, focused operational reviews, performance audits, organizational studies, reengineering projects, annual snapshots (e.g., cost per square foot or per student), facility report cards, comparisons with "peer" organizations, benchmarks, measured progress toward the organization's long-range plans, external audits and peer reviews, staff turnover rates, and public opinion (e.g., newspaper articles).

Who is in charge of evaluating the facilities maintenance program?
Program evaluation is the responsibility of the facilities manager. However, because facilities are such a key aspect of an organization's overall budget and mission, other senior staff should be included in evaluation oversight as appropriate to ensure sound management and planning. Moreover, many school districts employ in-house staff with considerable expertise in program evaluation who may also be able to contribute to the process.

ADDITIONAL RESOURCES



Every effort has been made to verify the accuracy of all URLs listed in this Guide at the time of publication. If a URL is no longer working, try using the root directory to search for a page that may have moved. For example, if the link to *http://www.epa.gov/iaq/schools/performance.html* is not working, try *http://www.epa.gov/* and search for "IAQ."

APPA Custodial Operation Self-Analysis Program
http://www.appa.org/pdffiles/AllCustodialAnalysis.pdf
A survey and self-analysis tool designed to identify many of the variables that influence institutional custodial operations. It also establishes standardized benchmarks for the industry. APPA (1998) The Association of Higher Education Facilities Officers, Alexandria, VA, 15pp.

FMEP: Facilities Management Evaluation Program
http://www.appa.org/FMEP/
A program to provide the chief facilities officer at APPA member institutions with the opportunity to receive an evaluation by a team of APPA members from organizations with similar educational, financial, and physical characteristics. This document is designed to help an institution assess the value of this program and the commitment required to conduct such an evaluation.

EVALUATING FACILITIES MAINTENANCE PROGRAMS CHECKLIST

More information about accomplishing checklist points can be found on the page listed in the right-hand column.

ACCOMPLISHED		CHECKPOINTS	PAGE
YES	NO		
		Do stakeholders realize that it will take time (months to years) before they will be able to see improvements in a maintenance program?	124
		Is progress toward attaining the goals and objectives of the maintenance department being explicitly assessed?	124
		Does the evaluation program incorporate physical inspections?	124
		Does the evaluation program incorporate work order systems?	124
		Does the evaluation program incorporate user and user/customer feedback?	124
		Does the evaluation program incorporate audits?	125
		Does the evaluation program incorporate alternative resources?	125
		Does the evaluation program incorporate regulatory concerns?	125
		Have evaluators answered the question “What is the purpose of the evaluation?”	125
		Have evaluators answered the question “What questions need to be answered to make an informed decision during this evaluation?”	125
		Have evaluators answered the question “What information needs to be available to answer the pertinent questions in this evaluation?”	125
		Have evaluators answered the question “What is the best way to capture the information needs of this evaluation?”	125
		Have evaluators decided whether the organization hopes to measure its performance against past performance, peer organizations, or other norms or standards?	126
		Do decision-makers recognize that the value of maintenance activities is not always measurable in terms of simple “dollars saved”?	127

APPENDIX A
CHAPTER CHECKLISTS

The following is a list of all checklists included in this *Planning Guide*. More information about accomplishing checklist points can be found on the pages listed in the right-hand column.

CHECKPOINTS	PERSON ASSIGNED	ACCOMPLISHED YES	NO	PAGE
CHAPTER 1				
Are top-level decision-makers aware that school facilities maintenance affects the instructional and financial well-being of the organization?				1
Are top-level decision-makers aware that the occurrence of facilities problems (and lack thereof) is most closely associated with organizationally controlled issues such as staffing levels, staff training, and other management practices?				1
Are top-level decision-makers aware that having a coordinated and comprehensive maintenance plan is the first and most important step in exercising control over the destiny of the organization's facilities?				2
Has facilities maintenance been given priority status within the organization, as evidenced by top-level decision-makers' commitment to read this *Planning Guide* and refer to these guidelines while planning and coordinating facilities maintenance?				2
Do the organization's facilities maintenance decision-makers include school administrators, facilities/custodial representatives, teachers, parents, students, and community members?				4
CHAPTER 2				
Is there a facilities maintenance plan?				13
Is facilities maintenance planning a component of overall organizational planning?				13
Does the facilities maintenance plan include long- and short-term objectives, budgets, and timelines?				13
Have potential stakeholders in the facilities maintenance planning process been identified?				15
Have appropriate avenues for publicizing the facilities maintenance planning process to staff and community stakeholders been investigated and undertaken?				15
Have representative members of stakeholder groups been invited to participate in the facilities maintenance planning process?				15
Have representative members of stakeholder groups been selected fairly for participation in the facilities maintenance planning process?				15

CHECKPOINTS	PERSON ASSIGNED	ACCOMPLISHED YES	NO	PAGE
CHAPTER 2 *continued*				
Have individual views and opinions been a welcomed aspect of the consensus-building process?				15
Have stakeholders been included in follow up efforts to document and implement decisions?				15
Has a vision statement for school facilities maintenance been constructed?				16
Is the vision statement for school facilities maintenance aligned with the vision and plans of the rest of the organization?				16
Is the vision statement closely related to the day-to-day operations of the facilities maintenance staff?				16
Have comprehensive, accurate, and timely school facilities data been used to inform the planning process (see also Chapter 3)?				19
CHAPTER 3				
Have district planners scheduled a facility audit?				27
Has a chief auditor been selected (based on expertise, perspective, experience, and availability)?				27
Has a qualified auditing team been assembled?				28
Has the scope of work been identified for the audit (i.e., how detailed and comprehensive should the audit be)?				28
Has a data collection system (e.g., collection forms) been selected for the facilities audit?				31
Has an automated data input system been selected as resources allow?				31
Have audit findings been submitted in an electronic format that can be manipulated by district users?				31
Have audit findings been reviewed by facilities managers for accuracy and quality?				31
Are the findings from the facilities audit being stored securely as valuable organizational assets (e.g., redundantly)?				33
Has an automated document imaging system been implemented as resources allow?				33
Has a Computerized Maintenance Management System been installed in any organization that has more than 500,000 ft^2 of facilities to manage?				34

CHECKPOINTS	PERSON ASSIGNED	ACCOMPLISHED YES	NO	PAGE
CHAPTER 3 *continued*				
Are facilities data being used to inform policy-making, short- and long-term planning, and day-to-day operations as appropriate?				34
Have facilities been commissioned, re-commissioned, or retro-commissioned as necessary?				35
Have commissioning, re-commissioning, and retro-commissioning been planned to include seasonal analysis of systems?				36
Have commissioning, re-commissioning, and retro-commissioning been planned according to the Energy Smart Schools recommendations?				37
Have facilities audit findings been used to establish benchmarks for measuring equipment life and maintenance progress?				39
CHAPTER 4				
Do facilities planners recognize that occupant safety is always their overarching priority?				43
Has the organization contacted regulatory agencies (e.g., the EPA), the U.S. Department of Education, its state department of education, professional associations, and peer institutions to obtain information about applicable environmental regulations?				43
Does the organization have a plan for responsibly managing indoor air quality?				44
Does the organization have a plan for responsibly managing asbestos?				48
Does the organization have a plan for responsibly managing water quality and use?				49
Does the organization have a plan for responsibly managing waste handling and disposal?				50
Does the organization have a plan for responsibly managing CFCs and HCFCs?				53
Does the organization have a plan for responsibly managing emergency power systems?				53
Does the organization have a plan for responsibly managing hazardous materials?				53
Does the organization have a plan for responsibly managing integrated pest management?				54
Does the organization have a plan for responsibly managing lead paint?				56
Does the organization have a plan for responsibly managing mercury?				56

CHECKPOINTS	PERSON ASSIGNED	ACCOMPLISHED YES	NO	PAGE
CHAPTER 4 *continued*				
Does the organization have a plan for responsibly managing personal protective equipment?				57
Does the organization have a plan for responsibly managing PCBs?				57
Does the organization have a plan for responsibly managing radon?				57
Does the organization have a plan for responsibly managing playgrounds?				58
Does the organization have a plan for responsibly managing storm water runoff?				60
Does the organization have a plan for responsibly managing underground storage tanks?				60
Does the organization have a plan for introducing environmentally friendly school concepts to new construction and renovation projects?				61
Does the organization have a plan for responsibly managing locking systems?				62
Does the organization have a plan for protecting equipment?				62
Does the organization have a plan for ensuring pedestrian and vehicle visibility?				63
Does the organization have a plan for policing/securing facilities?				63
Does the organization have a plan for responsibly managing fire protection?				63
Does the organization have a plan for protecting communications systems?				63
Does the organization have a plan for responsibly dealing with potential crises and disasters?				63
CHAPTER 5				
Do district planners recognize the four major components of an effective facilities maintenance program: emergency (responsive) maintenance, routine maintenance, preventive maintenance, and predictive maintenance?				74
Do district planners recognize that preventive maintenance is the most effective approach to sound school facility maintenance?				74
Has a comprehensive facilities audit (see Chapter 3) been performed before instituting a preventive maintenance program?				74

CHECKPOINTS	PERSON ASSIGNED	ACCOMPLISHED YES	NO	PAGE
CHAPTER 5 *continued*				
For districts that are instituting preventive maintenance for the first time, has an appropriate system (e.g., heating or cooling systems) been identified for piloting before commencing with a full-scale, district-wide program?				74
Have manufacturer supplied user manuals been examined for guidance on preventive maintenance strategies for each targeted piece of equipment?				75
Are records of preventive maintenance efforts maintained?				75
Has the schedule for preventive maintenance activities been coordinated with the routine maintenance schedule so as to minimize service interruptions?				75
Does the organization have a plan for responsibly managing access control?				75
Does the organization have a plan for responsibly managing boilers?				76
Does the organization have a plan for responsibly managing electrical systems?				76
Does the organization have a plan for responsibly managing energy use?				77
Does the organization have a plan for responsibly managing fire alarms?				78
Does the organization have a plan for responsibly managing floor coverings?				78
Does the organization have a plan for responsibly managing gym floors?				79
Does the organization have a plan for responsibly managing HVAC Systems?				79
Does the organization have a plan for responsibly managing hot water heaters?				80
Does the organization have a plan for responsibly managing kitchens?				80
Does the organization have a plan for responsibly managing painting projects?				80
Does the organization have a plan for responsibly managing plumbing?				80
Does the organization have a plan for responsibly managing public address systems and intercoms?				81
Does the organization have a plan for responsibly managing roof repairs?				81
Does the organization have a plan for responsibly managing water softener systems?				81

CHECKPOINTS	PERSON ASSIGNED	ACCOMPLISHED YES	NO	PAGE
CHAPTER 5 *continued*				
Has organization management determined its expectations for custodial services?				82
Have facilities managers staffed the custodial workforce at a level that can meet the organization's expectations for its custodial service?				82
Has a chain of command for custodial staff been determined?				82
Has a suitable approach to custodial services (e.g., area cleaning versus team cleaning) been selected to meet the organization's expectations for custodial service?				82
When planning grounds management, have grounds been defined as "corner pin to corner pin" for all property, including school sites, remote locations, the central office, and other administrative or support facilities?				83
Have areas of special concern (e.g., wetlands, caves, mine shafts, sinkholes, sewage plants, historically significant sites and other environmentally sensitive areas) been identified and duly considered for grounds management?				84
Does the organization have a plan for responsibly managing fertilizer and herbicide use?				84
Does the organization have a plan for responsibly managing watering and sprinkler systems (e.g., the use of recycled water/gray water for plumbing, watering fields)?				84
Does the organization have a plan for responsibly managing drainage systems?				84
Does the organization have a plan for responsibly managing "rest time" for fields/outdoor areas?				84
Does the organization have a plan for responsibly managing the costs and benefits of flowerbeds?				84
Does the organization have a plan for responsibly managing the use of the grounds as a classroom (e.g., "science court-yards" and field laboratories)?				84
Is the Maintenance & Operations Department organized and administered to best meet the needs of the maintenance plan?				85
Does the maintenance and operations staff take time to market its efforts and successes to the rest of the organization?				85
Are facilities managers proactive with their communications to and management of community groups (e.g., PTAs, booster clubs)?				86
Has an automated work order system (e.g., a Computerized Maintenance Management System or CMMS as discussed in Chapter 3) been instituted within the organization?				86
Does the CMMS incorporate the basic features of a "best practice" system?				87

CHECKPOINTS	PERSON ASSIGNED	ACCOMPLISHED YES	NO	PAGE
CHAPTER 5 *continued*				
Do staff in every building and campus in a district know the procedures for initiating a work order request?				88
Is the ability to officially submit a work order limited to a single person at each site (who can evaluate the need for work prior to sending it)?				88
Does a supervisor evaluate (either by random personal assessment or customer feedback) whether the quality of work meets or exceeds departmental standards before "closing out" a work order?				88
Is all information about a completed work order maintained in a database for future historical and analytical use upon its completion?				88
Is the work order system streamlined so as to minimize the number of people involved in work order delivery, approval, and completion as is reasonable for managing the process?				88
Has an automated building use scheduling system been instituted within the organization?				90
Has the organization investigated the use of a "consignment cabinet" as a tool for storing supplies and parts in a cost-effective manner?				91
Has the organization investigated the use of "open purchase orders" as a tool for purchasing supplies and parts in a cost-effective manner?				91
Have appropriate control checks been placed on supply storage and purchasing systems?				91
Have planners considered the costs and benefits of both local and central site storage for supplies and parts?				91
Has equipment selection been standardized throughout the district (as possible and necessary) in order to save on storage space and costs associated with increased staff training for servicing multiple brands?				91
Are chemical dispensers used to automatically mix and conserve cleaning agents?				91
Have performance-based specifications been introduced to procurement contracts for the purpose of standardizing equipment purchasing?				92
Have planners considered the costs and benefits of both the item-by-item (building block) and top-down approaches to renovation and construction planning?				92
When selecting an architect to help plan a renovation or construction project, have planners considered the firm's experience designing environmentally-friendly schools?				92

CHECKPOINTS	PERSON ASSIGNED	ACCOMPLISHED YES	NO	PAGE
CHAPTER 5 *continued*				
Has a qualified, yet experientially diverse, project team be identified, including business personnel, maintenance staff, principals, teachers, construction professionals, architects, engineers, and general contractors?				92
Does the project team meet to review all plans, construction documents, and decisions throughout development (e.g., at 25, 50, 75 and 100 percent complete)?				92
Do members of the maintenance and operations department (or locally hired and trusted plumbers, electricians, etc.) visit the construction site on a routine basis to observe the quality of the work, monitor the placement of valves and switches, and verify the overall progress of the project?				93
Do the chief project officer and the project architect, general contractor, and subcontractors meet on a weekly basis to discuss project progress and obstacles?				93
Are the results of all renovation/construction meetings well documented and archived?				93
Upon the renovation or construction project being designated "substantially complete," did the architect prepare a "punch list" to identify components that are not yet complete (or which do not meet the quality standards)?				93
Has the organization retained the last of its payments to the contractor in order to ensure that the balance of work on the "punch list" is completed in a timely manner?				94
Has the renovated or newly constructed facility been commissioned by a third-party specialist?				94
CHAPTER 6				
Have job descriptions been developed for all maintenance and operations positions?				105
Do job descriptions describe "duties and responsibilities" accurately and in detail?				106
Do job descriptions accurately describe working conditions?				106
Do job descriptions accurately describe the physical requirements of the position?				106
Do job descriptions comply with equal opportunity laws?				106
Do job descriptions accurately describe the educational requirements of the position?				107
Do job descriptions accurately describe the credential and licensure requirements of the position?				107

CHECKPOINTS	PERSON ASSIGNED	ACCOMPLISHED YES	NO	PAGE
CHAPTER 6 *continued*				
Do job descriptions accurately describe equipment used in the position?				107
Do job descriptions accurately describe at-will versus unionized requirements of the position?				107
Do job descriptions accurately describe channels of authority for the position?				107
Do job descriptions accurately describe evaluation mechanisms for the position?				107
Do job descriptions include the phrase "and other duties as assigned"?				107
Before interviewing candidates, have the characteristics of the "ideal" candidate been identified?				108
After selecting the preferred candidate, but before extending an offer of employment, have the applicant's references been contacted?				108
After selecting the preferred candidate, but before extending an offer of employment, has a criminal background check been performed on the applicant?				108
After selecting the preferred candidate, but before extending an offer of employment, has the applicant provided evidence of employment eligibility?				110
After extending an offer of employment, has the applicant provided all information needed to complete a personnel record?				110
After extending an offer of employment, has the applicant provided all information needed to satisfy payroll needs?				110
After selecting the preferred candidate, but before extending an offer of employment, has the applicant provided required medical and health records?				110
Do all newly hired employees undergo staff training upon initially joining the organization?				111
Does training for new staff include an orientation to key district sites (e.g., emergency locations) and all sites at which the individual will work?				111
Does training for new staff include an introduction to all equipment the individual will be expected to use?				111
Does training for new staff include instructions about how to best perform the individual's work tasks?				111
Does training for new staff include a clear description of precisely what the individual must accomplish in order to meet the expectations of the job?				111
Does training for new staff include an explanation of all criteria on which the individual will be evaluated?				111

CHECKPOINTS	PERSON ASSIGNED	ACCOMPLISHED YES	NO	PAGE
CHAPTER 6 *continued*				
Is ongoing training provided to existing staff?				112
Is professional development offered to all staff on an ongoing basis?				112
Are all training and professional development activities documented on videotape so that they can be showed to other staff and at later times?				112
Have cost-sharing and cost-minimizing methods for training programs and facilities been considered by management?				112
Have staff been trained to create and use a "Moment of Truth" chart?				113
Have performance standards and evaluation criteria been established for all staff positions?				113
Have performance standards and evaluation criteria been adequately explained to all staff?				115
Have managers been trained on how to perform fair, objective, accurate, and well-documented evaluations?				115
Have staff turnover rates been determined and analyzed?				116
Have the organization's personnel policies been adjusted to increase staff retention rates?				116
Have rewards and incentives been introduced to improve staff morale and retention?				116
Do privatization procurements include precise specifications for measuring performance?				117
Has an in-house staff member been assigned the duties of "project manager" for each privatization contract?				117
CHAPTER 7				
Do stakeholders realize that it will take time (months to years) before they will be able to see improvements in a maintenance program?				124
Is progress toward attaining the goals and objectives of the maintenance department being explicitly assessed?				124
Does the evaluation program incorporate physical inspections?				124
Does the evaluation program incorporate work order systems?				124
Does the evaluation program incorporate user and user/customer feedback?				124

CHECKPOINTS	PERSON ASSIGNED	ACCOMPLISHED YES	NO	PAGE
CHAPTER 7 *continued*				
Does the evaluation program incorporate audits?				125
Does the evaluation program incorporate alternative resources?				125
Does the evaluation program incorporate regulatory concerns?				125
Have evaluators answered the question "What is the purpose of the evaluation?"				125
Have evaluators answered the question "What questions need to be answered to make an informed decision during this evaluation?"				125
Have evaluators answered the question "What information needs to be available to answer the pertinent questions in this evaluation?"				125
Have evaluators answered the question "What is the best way to capture the information needs of this evaluation?"				125
Have evaluators decided whether the organization hopes to measure its performance against past performance, peer organizations, or other norms or standards?				126
Do decision-makers recognize that the value of maintenance activities is not always measurable in terms of simple "dollars saved"?				127

APPENDIX B
ADDITIONAL RESOURCES

The following is an alphabetical list of all Additional Resources included in this Guide.

Every effort has been made to verify the accuracy of all URLs listed in this Guide at the time of publication. If a URL is no longer working, try using the root directory to search for a page that may have moved. For example, if the link to http://www.epa.gov/iaq/schools/performance.html is not working, try *http://www.epa.gov/* and search for "IAQ."

American School and University Annual Maintenance and Operations Cost Study
http://images.asumag.com/files/134/mo%20school.pdf
An annual survey that reports median national statistics for various maintenance and operations costs, including salary/payroll, gas, electricity, utilities, maintenance and grounds equipment and supplies, outside contract labor, and other costs.

APPA Custodial Operation Self-Analysis Program
http://www.appa.org/pdffiles/AllCustodialAnalysis.pdf
A survey and self-analysis tool designed to identify many of the variables that influence institutional custodial operations. It also establishes standardized benchmarks for the industry. APPA (1998) The Association of Higher Education Facilities Officers, Alexandria, VA, 15pp.

Asbestos
http://www.edfacilities.org/rl/asbestos.cfm
A list of links, books, and journal articles about how asbestos abatement and management is conducted in school buildings, and how schools should comply with federal regulations. National Clearinghouse for Educational Facilities, Washington, DC.

Association of Higher Education Facilities Officers (APPA)
http://www.appa.org/
An international association that maintains, protects, and promotes the quality of educational facilities. APPA serves and assists facilities officers and physical plant administrators, conducts research and educational programs, produces publications, and develops guidelines.

Basic Data Elements for Elementary and Secondary Education Information Systems
http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=97531
A document providing a set of basic student and staff data elements that serve as a common language for promoting the collection and reporting of comparable education data to guide policy and assist in the administration of state and local education systems. Core Data Task Force of the National Forum on Education Statistics (1997) National Center for Education Statistics, Washington, DC.

Beyond Pesticides
http://www.beyondpesticides.org
A nonprofit membership organization formed to serve as a national network committed to pesticide safety and the adoption of alternative pest management strategies.

Budgeting for Facilities Maintenance and Repair Activities
http://www.nap.edu/books/NI000085/html/index.html
An online publication that focuses on how to estimate future facility maintenance and repair needs. Federal Facilities Council, Standing Committee on Operations and Maintenance, National Research Council (1996) National Academy Press, Washington, DC.

Building Commissioning
http://www.edfacilities.org/rl/commissioning.cfm
A list of links, books, and journal articles about building commissioning. National Clearinghouse for Educational Facilities, Washington, DC.

Building Commissioning Association
http://www.bcxa.org
A professional association dedicated to the promotion of high standards for building commissioning practices.

Building Commissioning Handbook
http://www.appa.org/resources/publications
A book that focuses on building commissioning, including the roles of the consultant, contractor, test engineer, commissioning agent, and owner; the process of equipment and systems performance testing; testing checklists; commissioning terms; and guidance with regard to hiring a commissioning agent. Heinz, J.A. and Casault, R. (1996) The Association of Higher Education Facilities Officers, Alexandria, VA, 311pp.

Building Evaluation Techniques
Step-by-step techniques for conducting an effective building assessment, including the evaluation of overall structural performance, spatial comfort, noise control, air quality, and energy consumption. Includes sample forms and checklists tailored to specific building types. George Baird, et al. (1995) McGraw Hill, 207pp.

California Collaborative for High Performance Schools (ChiPS)
http://www.chps.net/
A group that aims to increase the energy efficiency of public schools in California by marketing information, service, and incentive programs directly to school districts and designers. The goal is to facilitate the design of high-performance schools–environments that are not only energy efficient, but also healthy, comfortable, well lit, and contain the amenities needed for a quality education.

Carpet and Rug Institute (CRI)
http://www.carpet-rug.com/
The web site of the national trade association representing the carpet and rug industry. It is a source of extensive information about carpets for consumers, writers, interior designers, facility managers, architects, builders, and building owners and managers, installation contractors, and retailers. CRI also publishes the web site "Carpet in Schools" *(http://www.carpet-schools.com/)* to address topics such as indoor air quality, allergies, and carpet selection, installation, and care.

Children's Environmental Health Network
http://www.cehn.org
A national multidisciplinary project dedicated to promoting a healthy environment and protecting children from environmental hazards. The site presents a variety of useful publications and materials.

Cleaning & Maintenance Management Online
http://www.cmmonline.com/Home.asp
The online home of Cleaning & Maintenance Management magazine, which features articles, buyers guides, key topics, and a calendar.

Cleaning and Maintenance Practices
http://www.edfacilities.org/rl/cleaning.cfm
A list of links, books, and journal articles about custodial standards and procedures, equipment, safety, and product directories for the cleaning and maintenance of schools and colleges.

Community Participation in Planning
http://www.edfacilities.org/rl/community_participation.cfm
A list of links, books, and journal articles about how community members can become involved in the planning and design of school buildings and grounds. National Clearinghouse for Educational Facilities, Washington, DC.

Creating a Vision
http://www.nsba.org/sbot/toolkit/cav.html
An online toolkit from the National School Boards Association for creating a vision in school organizations.

Creating Safe Learning Zones: The ABC's of Healthy Schools
http://www.childproofing.org/ABC.pdf
A primer prepared by the Healthy Buildings Committee of the Child Proofing Our Communities campaign to offer guidance about constructing, maintaining, and renovating healthy schools.

Custodial Methods and Procedures Manual
http://asbointl.org/Publications/PublicationCatalog/index.asp?s=0&cf=3&i=139
A manual that discusses school facility cleaning and maintenance from the perspective of work management, physical assets management, and resource management. A reference section contains guidelines and forms for custodial equipment storage and care, as well as safety measures and employee management forms. Johnson, Donald R. (2000) Association of School Business Officials International, Reston, VA, 96pp.

Custodial Staffing Guidelines for Educational Facilities
http://www.appa.org/resources/publications/pubs.cfm?Category_ID=2
A guide about custodial staffing in educational facilities that addresses custodial evaluation, special considerations, staff development tools, and case studies. Appendices include information about custodial requirements, space classification, standard space category matrices, standard activity lists, and audit forms. APPA (1998) The Association of Higher Education Facilities Officers, Alexandria, VA, 266pp.

Custodial Standards
http://ehs.brevard.k12.fl.us/PDF%20files/custodial_standards_03.pdf
Guidelines that detail cleaning requirements for each area of a school, including classrooms, restrooms, cafeterias, gymnasiums, locker rooms, and corridors. Samples of assessment forms include emergency lighting, fire extinguisher inspection, air conditioner maintenance/service log sheets, and monthly custodial preventive maintenance forms. Office of Plant Operations and Maintenance (1998) Brevard Public Schools, Rockledge, FL, 44pp.

Deteriorating School Facilities and Student Learning
http://www.ed.gov/databases/ERIC_Digests/ed356564.html
A report documenting that many facilities in American public schools are in disrepaira situation with implications on the morale, health, and learning of students and teachers. Frazier, Linda M. (1993) ERIC Clearinghouse for Educational Management, Eugene, OR.

Disaster Planning and Response
http://www.edfacilities.org/rl/disaster.cfm
A list of links, books, and journal articles about building or retrofitting schools to withstand natural disasters and terrorism, developing emergency preparedness plans, and using school buildings to shelter community members during emergencies. National Clearinghouse for Educational Facilities, Washington, DC.

Educational Performance, Environmental Management, and Cleaning Effectiveness in School Environments
http://www.carpet-rug.com/pdf_word_docs/0104_school_environments.pdf
A report demonstrating how effective cleaning programs enhance school and student self-image, and may promote higher academic attendance and performance. Berry, Michael A. (2001) Carpet and Rug Institute, Dalton, GA.

Energy Design Guidelines for High Performance Schools
http://www.eren.doe.gov/energysmartschools/order.html
A manual written by the U.S. Department of Energy to help architects and engineers design or retrofit schools in an environmentally friendly manner. U.S. Department of Energy, Washington, DC.

Energy Savings
http://www.edfacilities.org/rl/energy.cfm
A list of links, books, and journal articles providing extensive resources on various methods of heating, cooling, and maintaining new and retrofitted K-12 school buildings and grounds. National Clearinghouse for Educational Facilities, Washington, DC.

Energy Smart Schools
http://www.eren.doe.gov/energysmartschools/
An initiative by the U.S. Department of Energy to provide detailed information about how to increase school building energy efficiency and improve the learning environment. Includes a discussion of school facility commissioning.

Facilities Audit: A Process for Improving Facilities Conditions
A handbook presenting a step-by-step approach to all phases of facility inspection. It is designed to help a facility manager assess the functional performance of school buildings and infrastructure and provides information about how to quantify maintenance deficiencies, summarize inspection results, and present audit findings for capital renewal funding. Kaiser, Harvey (1993) APPA, The Association of Higher Education Facilities Officers, Washington, DC, 102pp.

Facilities Assessment
http://www.edfacilities.org/rl/facility_assessment.cfm
A list of links, books, and journal articles about methods for assessing school buildings and building elements for planning and management purposes. National Clearinghouse for Educational Facilities, Washington, DC.

Facilities Evaluation Handbook: Safety, Fire Protection, and Environmental Compliance, 2nd Edition
A guide to help plant and facilities managers conduct inspections and evaluations of their facilities in order to identify and address problems in the areas of maintenance, safety, energy efficiency, and environmental compliance. Petrocelly, K. L. and Thumann, Albert (1999) Fairmont Press, Lilburn, GA, 200pp.

Facilities Information Management: A Guide for State and Local School Districts
http://nces.ed.gov/forum/publications.asp
A publication that defines a set of data elements that are critical to answering basic policy questions related to elementary and secondary school facility management. Facilities Maintenance Task Force, National Forum on Education Statistics (2003) National Center for Education Statistics, Washington, DC.

Facilities Management: A Manual for Plant Administration
http://www.appa.org/resources/publications/pubs.cfm?Category_ID=1
A four-book publication about managing the physical plant of campuses. Its 67 chapters cover general administration and management, maintenance and operation of buildings and grounds, energy and utility systems, and facilities planning, design and construction. Middleton, William, Ed. (1997) APPA: Assn. of Higher Education Facilities Officers, Alexandria, VA.

Facilities Management Software
http://www.edfacilities.org/rl/software.cfm
A resource list of links, books, and journal articles describing and evaluating computer-aided facilities maintenance management systems for handling priorities, backlogs, and improvements to school buildings. National Clearinghouse for Educational Facilities, Washington, DC.

FacilitiesNet
http://www.facilitiesnet.com/
A commercial web site for facilities professionals sponsored by Trade Press Publishing Corporation and developed by the editors of Building Operating Management and Maintenance Solutions magazines. It includes a chat room on educational facilities.

Facility Management
http://www.facilitymanagement.com/
The online home of American School and Hospital Maintenance Magazine. This site is intended to help facility managers stay informed about current issues and the latest products.

Floor Care
http://www.edfacilities.org/rl/floor_care.cfm
A list of links, books, and journal articles about the maintenance of a variety of floor coverings in K-12 school classrooms, gymnasiums, science labs, hallways, and stairs. National Clearinghouse for Educational Facilities, Washington, DC.

FMEP: Facilities Management Evaluation Program
http://www.appa.org/FMEP/
A program to provide the chief facilities officer at APPA member institutions with the opportunity to receive an evaluation by a team of APPA members from organizations with similar educational, financial, and physical characteristics. This document is designed to help an institution assess the value of this program and the commitment required to conduct such an evaluation.

Good School Maintenance: A Manual of Programs and Procedures for Buildings, Grounds and Equipment
http://www.iasb.com/shop/details.cfm?Item_Num=GSM
A manual that describes the fundamentals of good school maintenance, including managing the program and staying informed about environmental issues. Procedures for maintaining school grounds are detailed, as are steps for maintaining mechanical equipment, including heating and air-conditioning systems, sanitary systems and fixtures, sewage treatment plants, and electrical systems. Harroun, Jack (1996) Illinois Association of School Boards, Springfield, IL, 272pp.

Green Schools
http://www.ase.org/greenschools/
A comprehensive program designed for K-12 schools to create energy awareness, enhance experiential learning, and save schools money on energy costs.

Grounds Maintenance
http://www.edfacilities.org/rl/grounds_maintenance.cfm
A resource list of links, books, and journal articles about managing and maintaining K-12 school and college campus grounds and athletic fields. National Clearinghouse for Educational Facilities, Washington, DC.

Guide for School Facility Appraisal
A guide that provides a comprehensive method for measuring the quality and educational effectiveness of school facilities. It can be used to perform a post-occupancy review, formulate a formal record, highlight specific appraisal needs, examine the need for new facilities or renovations, or serve as an instructional tool. Hawkins, Harold L. and Lilley, H. Edward (1998) Council for Educational Facility Planners International, Scottsdale, AZ, 52pp.

Guide to School Renovation and Construction: What You Need to Know to Protect Child and Adult Environmental Health
A guide that presents cautionary tips for protecting children's health during school renovation and construction projects. It includes a checklist of uniform New York state safety standards during school renovations and construction, and several examples of the potential negative consequences of disregarding the risks of renovation and construction on occupant health. (2000) Healthy Schools Network, Inc., Albany, NY, 6pp.

Hazardous Materials
http://www.edfacilities.org/rl/hazardous_materials.cfm
A list of links, books, and journal articles about the identification, treatment, storage, and removal of hazardous materials found in school buildings and grounds. National Clearinghouse for Educational Facilities, Washington, DC.

Healthier Cleaning & Maintenance: Practices and Products for Schools
A paper that provides guidance to schools with regard to selecting, purchasing, and using environmentally preferable cleaning products. Healthy Schools Network, Inc. (1999) New York State Association for Superintendents of School Buildings and Grounds, Albany, NY, 8pp.

Healthy School Handbook: Conquering the Sick Building Syndrome and Other Environmental Hazards In and Around Your School
A compilation of 22 articles concerning "sick building syndrome" in educational facilities, with attention given to determining whether a school is sick, assessing causes, initiating treatment, and developing interventions. Miller, Norma L., Ed. (1995) National Education Association, Alexandria, VA, 446pp.

Healthy Schools Network, Inc.
http://www.healthyschools.org/
A not-for-profit education and research organization dedicated to securing policies and actions that will create schools that are environmentally responsible for children, staff, and communities.

High Performance School Buildings
http://www.edfacilities.org/rl/high_performance.cfm
A resource list of links and journal articles describing "green design," a sustainable approach to school building design, engineering, materials selection, energy efficiency, lighting, and waste management strategies. National Clearinghouse for Educational Facilities, Washington, DC.

HVAC Systems
http://www.edfacilities.org/rl/hvac.cfm
A resource list of links, books, and journal articles about HVAC systems in school buildings, including geothermal heating systems. National Clearinghouse for Educational Facilities, Washington, DC.

IAQ Overview in Schools and Preliminary Design Guide
http://www.healthybuildings.com/s2/Schools%20-%20IAQ%20Design%20Guide%2001.01.pdf
An educational tool and reference manual for school building design, engineering, and maintenance staff. Healthy Buildings International, Inc. (1999) Healthy Buildings International, Inc., Fairfax, VA.

Impact of Facilities on Learning
http://www.edfacilities.org/rl/impact_learning.cfm
A list of links, books, and journal articles examining the association between student achievement and the physical environment of school buildings and grounds. The National Clearinghouse for Educational Facilities, Washington, DC.

Indoor Air Quality (IAQ)
http://www.edfacilities.org/rl/iaq.cfm
A list of links, books, and journal articles about indoor air quality issues in K-12 school buildings, including building materials, maintenance practices, renovation procedures, and ventilation systems. National Clearinghouse for Educational Facilities, Washington, DC.

Indoor Air Quality and Student Performance
http://www.epa.gov/iaq/schools/performance.html
A report examining how indoor air quality (IAQ) affects a child's ability to learn, including case studies of schools that successfully addressed their indoor air problems, lessons learned, and long-term practices and policies that have emerged. Indoor Environments Division, U.S. Environmental Protection Agency (2000) U.S. Environmental Protection Agency, Washington, DC.

Indoor Air Quality (IAQ) Tools for Schools
http://www.epa.gov/iaq/schools/
A U.S. Environmental Protection Agency kit showing schools how to carry out a practical plan for improving indoor air problems at little or no cost by using straightforward activities and in-house staff. The kit includes checklists for school employees, an IAQ problem-solving wheel, a fact sheet on indoor air pollution issues, and sample policies and memos.

Integrated Pest Management
http://www.edfacilities.org/rl/pests.cfm
A list of links, books, and journal articles about integrated pest management guidelines, the use of pesticides, staff training, and program implementation and management in school buildings and grounds. National Clearinghouse for Educational Facilities, Washington, DC.

International Facility Management Association (IFMA)
http://www.ifma.org/
The web site of a group that is dedicated to promoting excellence in the management of facilities. IFMA identifies trends, conducts research, provides educational programs, and assists corporate and organizational facility managers in developing strategies to manage human, facility, and real estate resources.

Janitorial Products: Pollution Prevention Project
http://www.westp2net.org/Janitorial/jp4.htm
A site sponsored by the U.S. Environmental Protection Agency that includes fact sheets, product sample kits, purchasing specifications, and other materials to advise users on the health, safety, and environmental consequences of janitorial products.

Keep Schools Safe
http://www.keepschoolssafe.org
A site resulting from a partnership between the National Association of Attorneys General and the National School Boards Association to address the subject of school violence. A bibliography on school violence resources is provided, as is information specific to school security, environmental design, crisis management, and law enforcement partnerships.

Lead-Safe Schools
http://socrates.berkeley.edu/~lohp/Projects/Lead-Safe_Schools/lead-safe_schools.html
A site established by the Labor Occupational Health Program at the University of California at Berkeley to house publications about lead-safe schools, provide training to school maintenance staff, and offer a telephone hotline to school districts and staff.

LEED™ Rating System
http://www.usgbc.org/
A self-assessing system designed for rating new and existing commercial, institutional, and high-rise residential buildings. It evaluates environmental performance over a building's life cycle and provides a definitive standard for what constitutes a "green" building. LEED is based on accepted energy and environmental principles and strikes a balance between known effective practices and emerging concepts.

Maintenance & Operations Costs
http://www.edfacilities.org/rl/mo_costs.cfm
A list of links, books, and journal articles citing national and regional maintenance and operations cost statistics and cost-reduction measures for the upkeep of school buildings and grounds. National Clearinghouse for Educational Facilities, Washington, DC.

Maintenance & Operations Solutions: Meeting the Challenge of Improving School Facilities
http://www.asbointl.org/Publications/
An examination of the impact current maintenance and operations (M&O) practices have on U.S. school performance and possible avenues for improvement through the judicious use of technology and improved methodology. Facilities Project Team, Association of School Business Officials International (2000) Association of School Business Officials International, Reston, VA.

Maintenance Planning, Scheduling and Coordination
A book focusing on the preparatory tasks that lead to effective utilization and application of maintenance resources: planning, parts acquisition, work measurement, coordination and scheduling. Nyman, Don and Levitt, Joel (2001) Industrial Press, New York, NY, 320pp.

Mercury
http://www.epa.gov/mercury/index.html
A web site of the U.S. EPA intended to provide information about reducing the amount of mercury in the environment. It includes both general and technical information about mercury and mercury-reduction strategies.

Mercury in Schools and Communities
http://www.newmoa.org/newmoa/htdocs/prevention/mercury/schools/
Information from the Northeast Waste Management Officials' Association (NEWMOA), which was funded by the Massachusetts Department of Environmental Protection and the Massachusetts Executive Office of Environmental Affairs, to assist in identifying and removing elemental mercury and products containing mercury from schools and homes.

National Best Practices Manual for Building High Performance Schools
http://www.eren.doe.gov/energysmartschools/order.html
A manual by the U.S. Department of Energy to help architects and engineers design or retrofit schools in an environmentally friendly manner. U.S. Department of Energy, Washington, DC.

National Clearinghouse for Educational Facilities (NCEF)
http://www.edfacilities.org
A web site that includes reviews of and links to cutting-edge education facilities news; a calendar of conferences, workshops, and other facilities management-related events; a gallery of photos showing off innovative and provocative building design and construction from real schools across the nation; categorized and abstracted resource lists with links to full length, online, publications; and pointers to other organizations that provide online and off-line resources about education facilities management. NCEF can also be reached toll free at 888-552-0624.

National Program for Playground Safety
http://www.uni.edu/playground/about.html
A site that describes playground safety issues, safety tips and FAQs, statistics and additional resources, and action plans for improving playground safety.

National School Plant Management Association (NSPMA)
http://www.nspma.com/
A membership organization that facilitates the exchange of information about school plant management, maintenance and care.

National School Safety Center
http://www.nssc1.org/
An internationally recognized resource for school safety information, training, and violence prevention. The web site contains valuable summaries of school safety research, including contact information for locating the studies.

Occupational Safety and Health Administration (OSHA)
http://www.osha.gov/
The web site of OSHA, which has as its core mission to save lives, prevent injuries, and protect the health of America's workers. To accomplish this, federal and state governments works in partnership with the more than 100 million working men and women and their 6.5 million employers who are covered by the Occupational Safety and Health Act of 1970.

Operation and Maintenance Assessments: A Best Practice for Energy-Efficient Building Operations
http://www.peci.org/om/assess.pdf
A publication that describes what an operations and maintenance assessment is, who should perform it, the benefits of an assessment, what it costs, and the process of performing an assessment. Includes a glossary of terms, sample site-assessment forms, a request for proposal checklist, sample procedures and plan, and a sample master log of findings. (1999) Portland Energy Conservation, Inc. Portland, OR, 54pp.

Operational Guidelines for Grounds Management
http://www.appa.org/resources/publications/pubs.cfm?Category_ID=2
A comprehensive guide to maintaining and managing grounds and landscaping operations. Chapters discuss environmental stewardship, broadcast and zone maintenance, grounds staffing guidelines, contracted services, position descriptions, benchmarking, and environmental issues and laws. Feliciani, et al. (2001) APPA: Assn. of Higher Education Facilities Officers, Alexandria, VA, 159pp.

Plant Operations Support Program
http://www.ga.wa.gov/plant
A self-sustaining consortium comprised of facility managers from Washington state agencies, educational facilities, municipalities, and port districts. This web site includes a library of practices, policies, research studies, and other references on subjects including emergency preparedness, energy savings, maintenance management, IAQ, and accessibility.

Playgrounds
http://www.edfacilities.org/rl/playgrounds.cfm
A list of links, books, and journal articles about playground design for varying age levels, including resources on safety, accessibility, equipment, surfaces, and maintenance. National Clearinghouse for Educational Facilities, Washington, DC.

Poisoned Schools: Invisible Threats, Visible Actions
http://www.childproofing.org/poisonedschoolsmain.html
A report that includes more than two dozen case studies of schools built on or near contaminated sites or where children have otherwise been exposed to pesticide use in and around school buildings. Gibbs, Lois (2001) Center for Health, Environment and Justice, Child Proofing Our Communities Campaign, Falls Church, VA, 80pp.

Portland Energy Conservation, Inc. (PECI)
http://www.peci.org/
Provides information about commissioning conferences, case studies, procedural guidelines, specifications, functional tests, and the model commission plan and guide specifications.

Practical Guide for Commissioning Existing Buildings
http://www.ornl.gov/~webworks/cppr/y2001/rpt/101847.pdf
A document that describes commissioning terminology, the costs and benefits of commissioning, retro-commissioning, steps to effective commissioning, and the roles of team members in the commissioning process. Haasl, T. and Sharp, T. (1999) U.S. Department of Energy, Washington, DC.

Principal's Guide to On-Site School Construction
http://www.edfacilities.org/pubs/construction.html
A publication that explores what school principals should know when construction takes place in or near a school while it is in session. It covers pre-construction preparation, including how to work with architects/engineers and other school staff; actions to take during construction, including proper information dissemination and student and property protection; and post-construction activities, including custodial and maintenance staff training and post-occupancy evaluations. Brenner, William A. (2000) National Clearinghouse for Educational Facilities, Washington, DC, 5pp.

PECI Model Commissioning Plan and Guide Specifications
http://www.peci.org/cx/mcpgs.html
A resource that details the commissioning process for new equipment during both the design and construction phases. It goes beyond commissioning guidelines by providing boilerplate language, content, format, and forms for specifying and executing commissioning.

Preventive Maintenance
http://www.edfacilities.org/rl/maintenance.cfm
A resource list of links, books, and journal articles about how to maximize the useful life of school buildings through preventive maintenance, including periodic inspection and seasonal care. National Clearinghouse for Educational Facilities, Washington, DC.

Preventive Maintenance Guidelines for School Facilities K-12
http://www.rsmeans.com/index.asp
A five-part manual that is intended to increase the integrity and support the longevity of school facilities by providing easy-to-use preventive maintenance system guidelines. It includes a book, wall chart, and electronic forms designed to help maintenance professionals identify, assess, and address equipment and material deficiencies before they become costly malfunctions. Maciha, John C, et al. (2001) R.S. Means Company, Inc., Kingston, MA, 232pp.

Project Management
http://www.edfacilities.org/rl/project_management.cfm
A list of links, books, and journal articles about the management of school construction projects by school administrators, business officials, board members, and principles. National Clearinghouse for Educational Facilities, Washington, DC.

Radon Prevention in the Design and Construction of Schools and Other Large Buildings
http://www.epa.gov/ordntrnt/ORD/NRMRL/Pubs/1992/625R92016.pdf
A report outlining ways in which to ameliorate the presence of radon in schools buildings. The document presents the underlying principles (suitable for a general audience) and also provides more technical details for use by architects, engineers, and builders. U.S. Environmental Protection Agency (1994), Washington, DC, 51pp.

Roof Maintenance and Repair
http://www.edfacilities.org/rl/roof_maintenance.cfm
A list of links, books, and journal articles about maximizing the life-cycle performance of school roofs. Roof inspection strategies, scheduling, documentation, and repair resources are also addressed. National Clearinghouse for Educational Facilities, Washington, DC.

The Rural and Community Trust
http://www.ruraledu.org/facilities.html
The web site of the Rural and Community Trust, which works with many small towns and counties in which the school remains the center of the community. The Rural and Community Trust provides a network for people who are working to improve school-community facilities, increase community participation in the facilities design process, and expand the stakeholders these public resources can serve.

Safe and Drug-Free Schools Program
http://www.ed.gov/offices/OESE/SDFS
A program dedicated to reducing drug use, crime, and violence in U.S. schools. The web site contains many full-text publications on school safety and violence prevention.

Safeguarding Your Technology
http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=98297
Guidelines to help educational administrators and staff understand how to effectively secure an organization's sensitive information, critical systems, computer equipment, and network access. Technology Security Task Force, National Forum on Education Statistics (1998) National Center for Education Statistics, Washington, DC.

Safety and Security Design
http://www.edfacilities.org/rl/safety_security.cfm
A list of links, books, and journal articles about designing safer schools, conducting safety assessments, implementing security technologies, and preventing crime through environmental design. National Clearinghouse for Educational Facilities, Washington, DC.

Safety in Numbers: Collecting and Using Crime, Violence, and Discipline Incident Data to Make a Difference in Schools
http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2002312
Guidelines for use by school, district, and state staff to improve the effectiveness of disciplinary-incident data collection and use in schools. It provides recommendations on what types of data to collect and how the data can be used to improve school safety. Crime, Violence and Discipline Task Force, National Forum on Education Statistics (1998) National Center for Education Statistics, Washington, DC.

School Design Primer: A How-To Manual for the 21st Century
http://www.edfacilities.org/pubs/li/little.html
A resource that describes the school planning and design process for decision-makers (e.g., superintendents, planning committee members, architects, and educators) who are new to school construction and renovation projects.

SchoolDude
http://www.schooldude.com/
A site that connects school facility professionals with each other to solve problems, share best practices, and improve learning environments. This includes tools for work management, information, and resources, as well as online procurement for equipment and school supplies. Some sections are accessible only to fee-paying members.

SchoolFacilities.com
http://www.schoolfacilities.com
A professional support network for school facility administrators and support personnel that provides school-related news, products, resources, and facility management tools.

SchoolHouse Plant Operation & Maintenance Resource Center: School House Library
http://faststart.com/cps/Library.html
An online library containing reports dealing with various aspects of plant operation and maintenance that relate to the operation of school buildings.

Schools as Centers of Community: A Citizen's Guide for Planning and Design
http://www.cefpi.org/pdf/schools.pdf
This guide provides parents and other citizens with ten examples of innovative school designs, and outlines a step-by-step process about how parents, citizens and community groups can get involved in designing new schools. Bingler, Stephen and Quinn, Linda (2000) U.S. Department of Education.

Software for Facilities Management
http://www.edfacilities.org/rl/software.cfm
A resource list of links, books, and journal articles about computer-aided facilities maintenance management systems for handling priorities, backlogs, and improvements to school buildings. National Clearinghouse for Educational Facilities, Washington, DC.

Storm Water Runoff
http://www.epa.gov/fedsite/cd/stormwater.html
A list of Storm Water Management Regulatory Requirements provided by the U.S. EPA.

THOMAS Legislative Information on the Internet
http://thomas.loc.gov
A site maintained by the U.S. Congress to provide status reports on proposed legislation.

Underground Fuel Storage Tanks
http://www.cefpi.org/issue4.html
A briefing paper about the responsibilities associated with owning and securing an underground fuel storage tank. McGovern, Matthew (1996) Council of Educational Facility Planners, International, Scottsdale, AZ, 5 pp.

U.S. Environmental Protection Agency (EPA)
http://www.epa.gov/
The main web site of the EPA, whose mission is to protect human health and safeguard the natural environment – air, water, and land – upon which life depends. The EPA works with other federal agencies, state and local governments, and Indian tribes to develop and enforce regulations under existing environmental laws. The web site includes an alphabetical index of topical issues available at http://www.epa.gov/ebtpages/alphabet.html. EPA Regional Office and Linked State Environmental Departments can be found at http://www.epa.gov/epapages/statelocal/envrolst.htm.

U.S. Equal Employment Opportunity Commission (EEOC)
http://www.eeoc.gov
The web site of the EEOC, which is charged with enforcing numerous employment-related federal statutes.

U.S. Green Building Council
http://www.usgbc.org
A web site intended to facilitate interaction among leaders in every sector of business, industry, government, and academia with respect to emerging trends, policies, and products affecting “green building” practices in the United States.

U.S. Immigration and Naturalization Service (INS)
http://www.ins.gov/
The web site of the INS, which is responsible for enforcing the laws regulating the admission of foreign-born persons (i.e., aliens) to the United States and for administering various immigration benefits, including the naturalization of qualified applicants for U.S. citizenship.

A Visioning Process for Designing Responsive Schools
http://www.edfacilities.org/pubs/sanoffvision.pdf
A guide for helping stakeholders establish the groundwork for designing and building responsive, effective community school facilities, including an explanation of the benefits of community participation and how to go about the process of strategic planning, goal setting, articulating a vision, design generation, and strategy selection. Sanoff, Henry (2001) National Clearinghouse for Educational Facilities, Washington, DC, 18pp.

APPENDIX C
STATE SCHOOL FACILITIES WEB SITES

The following list is provided as a resource, but is not intended to be an exhaustive list of all facilities web sites available from states and state departments of education.

Every effort has been made to verify the accuracy of all URLs listed in this Guide at the time of publication. If a URL is no longer working, try using the root directory to search for a page that may have moved. For example, if the link to *http://www.epa.gov/iaq/schools/performance.html* is not working, try *http://www.epa.gov/* and search for "IAQ."

Alabama State Department of Education: School Architect & School Facilities
www.alsde.edu/text/sections/section_detail.asp?section=86&menu=sections&footer=sections

Alaska Department of Education & Early Development: Facilities
http://www.eed.state.ak.us/facilities/home.html

Arizona School Facilities Board
http://www.sfb.state.az.us/

Arkansas Department of Education: Public School Finance & Administration
http://arkedu.state.ar.us/directory/publicschool_finance.html

California Department of General Services: Office of Public School Construction
http://www.opsc.dgs.ca.gov/

Connecticut State Department of Education, Division of Grants Management: School Construction
http://www.state.ct.us/sde/dgm/sfu/index.htm

Delaware Department of Education: Facility Assessment System
http://sitenet.doe.state.de.us/sitenet/welcome.htm

Florida Department of Education: Office of Educational Facilities
http://www.firn.edu/doe/bin00012/home0012.htm

Georgia Department of Education: Facilities Services
http://www.doe.k12.ga.us/facilities/facilities.asp

Hawaii Department of Education: Facilities and Support Services
http://fssb.k12.hi.us

Illinois School Construction Grant Program
http://www.cdb.state.il.us/schools/school1.htm

Illinois State Board of Education: School Business and Support Services Division
http://www.isbe.state.il.us/construction/default.htm

Indiana State Board of Education: School Facility Guidelines
http://www.board-of-education.state.in.us/constguide.html

Iowa Department of Education: School Infrastructure
http://www.state.ia.us/educate/ecese/asis/si/sr/index.html

Kentucky Department of Education: Division of Facilities Management
http://www.kde.state.ky.us/odss/facility/default.asp

Maine Department of Education: School Facilities Services and Transportation
http://www.state.me.us/education/const/homepage.htm

Maryland Public School Construction Program
http://www.pscp.state.md.us/

Massachusetts Department of Education: School Building Assistance
http://finance1.doe.mass.edu/sbuilding/1_sbuilding.html

Minnesota Department of Children, Families and Learning: Facilities/Organization
http://cfl.state.mn.us/FACILIT/facilit.htm

Mississippi Department of Education: Office of School Building
http://www.mde.k12.ms.us/lead/osos/webpage.htm

Missouri Department of Elementary and Secondary Education: School Governance and Facilities
http://www.dese.state.mo.us/divadm/govern/

New Hampshire Department of Education: Office of School Building Aid
http://www.ed.state.nh.us/buildingAid/building.htm

New Jersey Department of Education: School Facilities
http://www.state.nj.us/njded/facilities/index.html

New Mexico Public School Capital Outlay
http://www.nmschoolbuildings.org/index.html

New York State Education Department: Office of Facilities Planning
http://www.emsc.nysed.gov/facplan/

North Carolina Department of Public Instruction: School Planning
http://www.schoolclearinghouse.org/

North Dakota Department of Public Instruction: School Finance and Organization
http://www.dpi.state.nd.us/finance/index.shtm

Ohio School Facilities Commission
http://www.osfc.state.oh.us

Pennsylvania Department of Education: School Construction and Facilities
http://www.pde.state.pa.us/constr_facil/site/default.asp

Rhode Island Department of Education: Federal and State Funding, School Construction Aid
http://www.ridoe.net/funding/construction/schoolconstruction.htm

South Carolina Department of Education: Office of School Facilities
http://www.myscschools.com/offices/sf

Texas Education Agency: Facility Funding and Standards
http://www.tea.state.tx.us/school.finance/facilities/index.html

Vermont Department of Education: Programs and Services/ School Construction
http://www.state.vt.us/educ/new/html/pgm_construction.html

Virginia Department of Education: Facility Services
http://www.pen.k12.va.us/VDOE/Finance/Facilities/

Washington State Board of Education: School Construction Assistance Program
http://www.k12.wa.us/facilities/

West Virginia School Building Authority
http://www.state.wv.us/wvsba/default.htm

Wisconsin Department of Public Instruction: School Management Services
http://www.dpi.state.wi.us/dpi/dfm/sms/index.html

Following is a list of state-specific web sites that are not directly affiliated with state departments of education.

Florida School Plant Management Association
http://www.fspma.com

Iowa School Buildings and Grounds Association
http://www.isbga.org/

Kentucky School Plant Management Association
http://www.kspma.org/

Minnesota Association of School Maintenance Supervisors
http://www.masms.org/

Missouri School Plant Managers Association
http://www.mspma.com/

New Jersey School Buildings and Grounds Association
http://www.njsbga.org/

New York State Association for Superintendents of School Buildings and Grounds
http://sbga.org/

Oklahoma School Plant Management Association
http://www.ospma.org/

Tennessee School Plant Management Association
http://www.tspma.com/

Washington Association of Maintenance and Operations Administrators
http://www.wamoa.org/

APPENDIX D
AUDIT FORM TEMPLATE

The following is a sample facility audit form that an education organization can refer to as it develops its own auditing materials. This checklist was provided by Edward H. Brzezowski, P.E., Facility Energy Services, Inc., Chester, NJ 07930 *(http://www.fes-nj.com)*. Not all items will be applicable to all school facilities. Moreover, this audit form does not represent a standard or agreed-upon convention.

SCHOOL BUILDING FACILITY MANAGEMENT CHECKLIST

EXTERIOR ENVELOPE

Exterior Walls
- ❑ Curtainwall
- ❑ Finishes–Ceilings
- ❑ Masonry

Roof
- ❑ Roofing
- ❑ Skylights

Doors
- ❑ Doors/Hardware-Exterior

Windows
- ❑ Windows

Misc.
- ❑ Other Exterior

Notes:

INTERIOR ENVELOPE

Classrooms
- ❑ Finishes–Ceilings
- ❑ Finishes–Floors
- ❑ Finishes–Walls
- ❑ Casework
- ❑ Chalkboards & Markerbds
- ❑ Bulletin Boards

Offices
- ❑ Finishes–Ceilings
- ❑ Finishes–Floors
- ❑ Finishes–Walls

Music Room
- ❑ Finishes–Ceilings
- ❑ Finishes–Floors
- ❑ Finishes–Walls
- ❑ Casework
- ❑ Chalkboards & Markerbrds
- ❑ Bulletin Boards

Auditorium
- ❑ Auditorium Seating
- ❑ Stage Curtain
- ❑ Handicapped Access
- ❑ Finishes–Ceilings
- ❑ Finishes–Floors
- ❑ Finishes–Walls

Media Center
- ❑ Finishes–Ceilings
- ❑ Finishes–Floors
- ❑ Finishes–Walls

Art Room
- ❑ Finishes–Ceilings
- ❑ Finishes–Floors
- ❑ Finishes–Walls
- ❑ Casework
- ❑ Chalkboards & Markerbds
- ❑ Bulletin Boards

Science Room
- ❑ Finishes–Ceilings
- ❑ Finishes–Floors
- ❑ Finishes–Walls
- ❑ Casework
- ❑ Chalkboards & Markerbds
- ❑ Bulletin Boards

Life Skill/Home Ec
- ❑ Finishes–Ceilings
- ❑ Finishes–Floors
- ❑ Finishes–Walls
- ❑ Casework
- ❑ Chalkboards & Markerbds
- ❑ Bulletin Boards

Teachers Room
- ❑ Finishes–Ceilings
- ❑ Finishes–Floors
- ❑ Finishes–Walls

Technology Ed
- ❑ Finishes–Ceilings
- ❑ Finishes–Floors
- ❑ Finishes–Walls
- ❑ Casework
- ❑ Chalkboards & Markerbds
- ❑ Bulletin Boards

Small Group
- ❑ Finishes–Ceilings
- ❑ Finishes–Floors
- ❑ Finishes–Walls
- ❑ Casework
- ❑ Chalkboards & Markerbds
- ❑ Bulletin Boards

Gymnasium
- ❑ Bleachers
- ❑ Finishes–Ceilings
- ❑ Finishes–Floors
- ❑ Finishes–Walls
- ❑ Gym Partitions

Cafeteria/MP Room
- ❑ Finishes–Ceilings
- ❑ Finishes–Floors
- ❑ Finishes–Walls

Kitchen
- ❑ Finishes–Ceilings
- ❑ Finishes–Floors

Nurse
- ❑ Finishes–Ceilings
- ❑ Finishes–Floors
- ❑ Finishes–Walls

Toilet Room Finishes
- ❑ Toilet Partitions
- ❑ Handicapped Access
- ❑ Finishes–Ceilings
- ❑ Finishes–Floors
- ❑ Finishes–Walls

Mechanical Room
- ❑ Finishes–Ceilings
- ❑ Finishes–Floors
- ❑ Finishes–Walls

Janitor Closet
- ❑ Finishes–Ceilings
- ❑ Finishes–Floors
- ❑ Finishes–Walls
- ❑ Casework

Storage
- ❑ Finishes–Ceilings
- ❑ Finishes–Floors
- ❑ Finishes–Walls

Stairs
- ❑ Finishes–Ceilings
- ❑ Finishes–Floors
- ❑ Finishes–Walls
- ❑ Railings
- ❑ Guard Rails
- ❑ Stair Treads
- ❑ Stairs
- ❑ Chalkboards & Markerbds

Corridors
- ❑ Finishes–Ceilings
- ❑ Finishes– Floors
- ❑ Finishes–Walls
- ❑ Lockers
- ❑ Finishes–Walls

Handicapped Access
- ❑ Handicapped Access
- ❑ Ramps–Interior
- ❑ Railings

Doors
- ❑ Doors/Hardware-Exterior
- ❑ Doors/Hardware-Interior

Elevators/Lifts
- ❑ Elevator

Structural Issues
- ❑ Structural

Misc.
- ❑ Other–Interior
- ❑ Sump Pump
- ❑ Swimming Pool

Other
- ❑ Finishes–Ceilings
- ❑ Finishes–Floors
- ❑ Finishes–Walls

Notes:

DISCIPLINE: ELECTRICAL SYSTEMS

Power & Distribution System
- ❑ Electrical–Service
- ❑ Electrical–Distribution
- ❑ Electrical–Wiring
- ❑ Electrical–Receptacles
- ❑ Electrical–Transformer

Communication Systems
- ❑ Cable TV System
- ❑ Clocks & Program
- ❑ Local Area Network
- ❑ Public Address System
- ❑ Security System

Lighting Systems
- ❑ Lighting–Exterior
- ❑ Lighting–Interior
- ❑ Lighting–Theatrical

Emergency and Exit Systems
- ❑ Egress Lighting
- ❑ Emergency Generator
- ❑ Exit Signs

Fire Alarm Systems
- ❑ Fire Alarm–Entire System
- ❑ Fire Alarm–Main Panel
- ❑ Fire Alarm–Remote

Annunciator
- ❑ Fire Alarm–Detection System
- ❑ Fire Alarm–Audible Alarms

Notes:

DISCIPLINE: NEW CONSTRUCTION

- ❑ Addition
- ❑ Alteration
- ❑ Building Demolition

Notes:

DISCIPLINE: PLUMBING SYSTEMS

Piping
- ❑ Piping–Domestic Water
- ❑ Piping–Sanitary
- ❑ Piping–Storm

Pipe Insulation
- ❑ Pipe Insulation

Fixtures
- ❑ Sinks
- ❑ Toilets
- ❑ Urinals
- ❑ Water Fountains

Hot Water System
- ❑ Hot Water System

Drains
- ❑ Floor Drains
- ❑ Roof Drains

Pumps
- ❑ Pumps–Plumbing

Misc. Plumbing
- ❑ Backflow Preventors
- ❑ Grease Traps
- ❑ Sewage Ejectors

Fire Suppression
- ❑ Fire Suppression–Kitchen Hood
- ❑ Fire Suppression–Limited Area Sprinkler
- ❑ Fire Suppression–Sprinklers-Add System
- ❑ Fire Suppression–Fire Pump
- ❑ Fire Suppression–Standpipes

Notes:

DISCIPLINE: MECHANICAL SYSTEMS

Heating Plant
- ❑ Boiler
- ❑ Boiler Burners

Cooling Plant
- ❑ Air Conditioning System-Add
- ❑ Chiller
- ❑ Cooling Tower

Piping
- ❑ Piping-HVAC-Hot Water
- ❑ Piping-HVAC-Steam
- ❑ Piping-HVAC-Chilled Water
- ❑ Piping-HVAC-Condensate

Terminal Units
- ❑ Radiators
- ❑ Unit Ventilators
- ❑ Exhaust Fan
- ❑ Terminal HVAC Units

Pumps
- ❑ Pumps-HVAC

ATC System
- ❑ Automatic Temperature Controls
- ❑ Automatic Temperature Controls Air Compressors

Return
- ❑ Steam Traps

Exhaust System
- ❑ Exhaust Systems

Ventilation System
- ❑ Ventilation Systems

Miscellaneous
- ❑ Dust Collection System

Notes:

DISCIPLINE: SITE

Exterior Paving/Walks/Stairs
- ❑ Paving/Walks
- ❑ Stairs-Exterior

Handicapped Access
- ❑ Ramps-Exterior

Landscaping
- ❑ Landscaping
- ❑ Fencing

Site Drainage
- ❑ Drywell

Play Areas
- ❑ Play Fields
- ❑ Play Equipment

Notes:

DISCIPLINE: LIFE SAFETY

- ❑ Life Safety

Notes:

DISCIPLINE: CHANGE OF USE

- ❑ Maximum Renovation
- ❑ Minimum Renovation
- ❑ Moderate Renovation

Notes:

APPENDIX E
RECORD LAYOUT FOR A COMPUTERIZED WORK ORDER SYSTEM

Following is a listing of the basic data elements for the work order system described in Chapter 5.

Work Order Master File Record:

Data Element	Data Properties
Job Number	Numeric, Unique, Auto-generated
Entry Date	CCYYMMDD Format
Location	Building Location Code List
Room Number	Alphanumeric
Status Code	O (Open), A (Assigned), C (Completed), R (Reopened), D (Deferred)
Entry User	Auto-generated user ID of person making request
Contact Name	Alpha
Contact Phone	Numeric
Contact Email	Email
Work Requested	Alphanumeric 60 characters
Urgent (Y/N)	Y (Yes) or N (No), defined by requestor
Requested Date of Completion	CCYYMMDD Format
Received Date	CCYYMMDD Auto-generated
Assigned To (Workperson)	Alpha, Worker's name or ID
Scheduled Date	CCYYMMDD Format
Work Order Priority	Priority level code list (e.g., urgent, routine, preventive)

Optional Time Record:

Job Number	Indexed to the main file
Sequence	Numeric, 4 digits within request queue
Workperson	Alpha, Worker's name or ID
Begin date	CCYYMMDD
End Date	CCYYMMDD
Hours Worked	Numeric

Optional Materials Record:

Job Number	Indexed to the main file
Sequence	Numeric, 4 digits within request queue
Item Description	Code or Alpha Description (60 characters)
Quantity	Numeric
Unit Cost	Numeric
Extended Cost	Quantity * Unit Cost

APPENDIX F
MODEL JOB DESCRIPTION FOR A CUSTODIAL WORKER

The following is a model job description for a custodial worker that an education organization can refer to as it develops its own job descriptions. Some of the duties and responsibilities listed may not be applicable to all education organizations. This list is presented only as a resource, and does not represent a standard or agreed-upon convention.

GENERAL RESPONSIBILITY

The Custodian is responsible for keeping assigned building(s) clean, safe, functional, and secure in accordance with prescribed codes and established district policies and standards. A custodial worker must maintain all assigned building(s) in a state of operational excellence such that they present no interruptions, distractions, or obstacles to the education program.

Essential Duties and Responsibilities

- ✓ Perform regular custodial duties in assigned area(s) of building(s).
- ✓ Accept instructions from head custodian/supervisor verbally or in writing.
- ✓ Provide services as necessary to support curricular and extracurricular events and activities.
- ✓ Maintain inventory of custodial/maintenance supplies and equipment.
- ✓ Restock disposable custodial/maintenance items and provide head custodian/supervisor with inventory usage data.
- ✓ Clean and preserve designated spaces, equipment, furniture, etc. in the building(s).
- ✓ Assist visiting members of the public who are utilizing the facilities.
- ✓ Maintain work related records and prepare work reports as directed.
- ✓ Project a positive image for the schools district with his/her team, whenever the public, guests, or visitors are in the building.
- ✓ Work closely with the head custodian/supervisor and/or building administrator(s) to be prepared for scheduled evening activities and unscheduled events as needed.
- ✓ Shovel snow and salts walks as needed.
- ✓ Maintain building and grounds security by opening/closing the building each school day and during special events as directed.
- ✓ Work on call as needed at any time for emergency repairs, equipment monitoring, overtime, or special needs falling outside of normal working hours.
- ✓ Identify and schedule work to be performed during summer, winter, and spring break.
- ✓ Accept other duties as assigned by the Director of Facilities/Administration or his/her designee.

Daily Duties

- ✓ Check daily activities schedule to see if any special equipment must be set up.
- ✓ Perform general cleanup–any and all incidents as they arise.
- ✓ Removal snow (as needed) from sidewalks. Note that snow should be removed as it is falls rather than after it falls. It should be removed to the bare cement.
- ✓ Inspect entrances and sidewalks for damage, clutter/dirt, malfunction, or other hazards.
- ✓ Vacuum all entrance mats, outside mats, and clean sidewalk up to 10 feet from entrance.
- ✓ Wet mop inside of entrances if wet or in bad condition.
- ✓ Sweep all stairways.

- ✓ Machine vacuum all carpeted corridors, walkways, and 10 feet in from doorway of each room.
- ✓ Clip all carpet sprigs as necessary.
- ✓ Remove all spots from carpet.
- ✓ Extract soiled areas on carpets as needed.
- ✓ Remove gum from floors.
- ✓ Dust mop and sweep corners of all tiled classrooms and adjacent rooms. Wet mop if needed.
- ✓ Spot vacuum all classrooms, offices, and other carpeted areas. Pick up any paper left on floor.
- ✓ Make sure rooms appear orderly.
- ✓ Empty all trash cans (rinse or wash if needed).
- ✓ Put all trash in dumpsters.
- ✓ Remove all marks from walls and lockers nightly.
- ✓ Replace defective light bulbs as needed.
- ✓ Wash all main entrance windows.
- ✓ Thoroughly clean all surfaces in restrooms.
- ✓ Clean all drinking fountains.
- ✓ Lock all doors as directed by the director of facilities/administration or his/her designee and lock all outside doors as soon as daily activities are over.
- ✓ Close and lock windows.
- ✓ Clean all equipment after use (e.g., mop buckets and custodian's service sink).
- ✓ Hang up brooms, dust mops, and wet mops. Do not stand them against wall.
- ✓ Clean and straighten janitor's closet.
- ✓ Keep shelves and supplies in neat order and stocked with supplies.
- ✓ Turn in any items or articles found to the Lost and Found Department.
- ✓ Check entire area for vandalism and report to the director of facilities/administration or his/her designee.
- ✓ Assist other employees with cleanup after large activities (e.g., after a basketball game).
- ✓ Accept other duties as assigned.

Weekly Duties

- ✓ Sweep under all entrance mats (both inside and outside).
- ✓ Dust mop and sweep out corners of all the tiled areas that are not covered under daily routines.
- ✓ Vacuum all carpets thoroughly in all classrooms and work areas according to schedule.
- ✓ Wet mop tiled areas. Wax, if needed.
- ✓ Wash all desktops, chairs, and furniture according to schedule.
- ✓ Dust everything in rooms and corridors according to schedule.
- ✓ Make sure all lockers are dusted and marks removed.
- ✓ Wash all hallway door windows.
- ✓ Clean cove molding and edges thoroughly.
- ✓ Vacuum blackboard erasers.
- ✓ Wash all blackboards, chalkboard rails, and marker boards according to schedule.

✓ Wash display case glass, if needed.

✓ Check the furniture once a week for breakage and either repair it or report it to the head custodian/supervisor.

✓ Check all playground equipment for damage or unsafe conditions and inform Plant Service of repair needs.

✓ Accept other duties as assigned.

Monthly Duties

✓ Vacuum or clean all intakes and exhaust ventilating louvers in ceiling of every room.

✓ Clean out all storage rooms.

✓ Accept other duties as assigned.

Winter and Spring Break Duties

✓ Light-scrub and re-wax all hard tile floors. Strip, if needed.

✓ Extract carpeted rooms as needed.

✓ Extract entrance mats.

✓ Lightly dust all rooms.

✓ Wash all desktops.

✓ Wash inside of all windows.

✓ Scrub floors and clean all walls and partitions in restrooms.

✓ Make sure all sinks, urinals, and stools are cleaned (in, under, and around).

✓ Accept other duties as assigned.

Summer Duties

✓ Wash all windows inside and out.

✓ Wash all desks (including teachers') inside and out.

✓ Wash all walls as needed.

✓ Remove all dirt from lights and high-dust everything.

✓ Wash all doors and frames. Pay special attention around lock assembly.

✓ Scrub all floors and re-wax, strip if needed.

✓ Thoroughly vacuum all carpeted areas and extract.

✓ Completely clean all fixtures, furniture, ceiling, walls and floors.

✓ Accept other duties as assigned.

Working Conditions

The work environment characteristics described here are representative of those that a custodian encounters while performing the essential functions of the job. Reasonable accommodations may be made to enable individuals with disabilities to perform the essential functions.

While performing the duties of this job, the employee regularly works indoors and will occasionally work outdoors, including during both hot and cold weather. The employee will work near or with moving mechanical equipment. The employee may occasionally work with toxic or caustic chemicals such as petroleum products, degreasers, and sprays. The employee must be able to meet deadlines with severe time constraints. The noise level in the work environment is usually moderate. Some evening and weekend work can be expected on a regular basis (i.e., more than twice per month).

There is a high probability that contact with blood-borne materials will occur within daily duties. All duties and procedures are to be performed within health safety standards as established by local and state OSHA and school district emergency procedures.

Equipment Used

The custodian should expect to move, operate, and clean various manually powered brooms, mops, vacuums, dusting tools, and snow shovels as well as mechanically powered waxing and buffing equipment. He/she will be expected to climb and work from ladders as necessary. The custodian will also handle and apply chemical cleaning agents, some of which may be toxic if handled improperly. All custodial staff will undergo training with regard to equipment and chemical use.

General Qualifications

To be eligible for employment as a custodian, a person shall demonstrate the knowledge, skills, and experience necessary to complete the assigned work efficiently. The person must be able to operate, maintain, and make adjustments to various types of equipment, as needed. He/she must also have the ability to pass a written and physical test, as well as establish and maintain effective working relationships with students, staff, and the community. He/she is required to perform duties within the expectations of all district requirements and board of education policies. He/she must understand proper procedures, handbook rules, school schedules, (i.e., practice times, game times–both home and away) and maintain confidentiality with regard to students and staff. He/she must also be available for duties on some Saturdays, Sundays, and evenings as assigned.

Moreover, the individual must be adaptable to working around children and possess skills for maintaining school buildings in a manner acceptable to the general health and safety standards of school buildings. He/she must also develop a basic understanding of the following areas: board of education policies and administrative regulations, school public relations, the role and function of public schools in the community, safe operation of mechanical equipment, and the importance of developing constructive working relationships with supervisors, fellow workers, students, the general public, and visitors to the school.

Educational Requirements, Credentials, and Licenses

To perform this job successfully, an individual must be able to perform each essential duty satisfactorily. The requirements listed below are representative of the knowledge, skills, and/or ability required. Reasonable accommodations may be made to enable individuals with disabilities to perform the essential functions.

- ✓ High school diploma or general education degree (GED). Two years or equivalent experience in the custodial field. Prior leadership experience. Basic computer knowledge; knowledge of building layouts, systems, and controls.
- ✓ Ability to read and interpret documents such as safety rules, operating and maintenance instructions, and procedure manuals. Ability to write routine reports and correspondence. Ability to speak effectively before groups of customers or employees of the organization.
- ✓ Ability to add, subtract, multiply, and divide in all units of measure, using whole numbers, common fractions, and decimals. Ability to compute rate, ratio, and percent, and interpret bar graphs.
- ✓ Ability to apply common-sense understanding to carry out instructions furnished in written, oral, or diagram form. Ability to deal with problems involving several concrete variables in standard situations.

Physical Requirements

The physical demands described here are representative of those requirements that must be met by a custodian to successfully perform the essential functions of the job. Reasonable accommodations may be made to enable individuals with disabilities to perform the essential functions.

While performing the duties of this job, the employee is regularly required to stand; walk; use hands and fingers to handle or feel objects, tools, or controls; and give and receive oral and written instructions. The employee frequently is required to reach with hands and arms. The employee is occasionally required to sit. The employee frequently must squat, stoop, or kneel, reach above the head, and reach forward. The employee frequently uses hand strength to grasp tools and rungs of ladders. The employee will frequently bend or twist at the neck and trunk more than the average person while performing the duties of this job.

The employee must frequently lift and/or move up to 50 pounds, including cleaning supplies, pails, and bags/boxes. Occasionally the employee will lift or move up to 80 pounds, including bags of salt and furniture. The employee will sometimes push or pull items such as tables, bleachers, scrubbing machines, etc. This job requires close vision, color vision, peripheral vision, depth perception, and the ability to adjust focus.

Physical Performance Required to Perform the Job

The custodial position requires that an individual be able to perform the following tasks at the physical levels indicated in order to carry out the essential functions of the job.

	RARELY (1-10% shift)	OCCASIONALLY (11-32% shift)	FREQUENTLY (33-66% of shift)	CONSTANTLY (67-100% of shift)
LIFTING TASKS				
FLOOR TO WAIST LIFTING	100 lbs	80 lbs	50 lbs	– lbs
WAIST TO SHOULDER LIFTING	40 lbs	25 lbs	17 lbs	– lbs
OVERHEAD LIFTING	– lbs	10 lbs	– lbs	– lbs
HORIZONTAL LIFTING	80 lbs	35 lbs	17 lbs	7 lbs
CARRYING: Front Carry	30 lbs	25 lbs	12.5 lbs	– lbs
PUSHING: Horizontal tractive force	40 lbs	30 lbs	25 lbs	12.5 lbs
PULLING: Horizontal tractive force	30 lbs	25 lbs	12.5 lbs	10 lbs
POWER GRIPPING: Right	19 lbs	16 lbs	10 lbs	5 lbs
Left	19 lbs	16 lbs	10 lbs	5 lbs

	RARELY (1-10% shift)	OCCASIONALLY (11-32% shift)	FREQUENTLY (33-66% of shift)	CONSTANTLY (67-100% of shift)
MOVEMENT TASKS				
REACH: Overhead			✓	
Right			✓	
Left			✓	
Lateral			✓	
SQUAT: Sustained			✓	
Repetitive			✓	
BEND				✓
HEAD/NECK: Flexion			✓	
Rotation			✓	
Static flexed position			✓	

Channels of Authority/Organizational Relationships

The Custodian is responsible and accountable to the head custodian/supervisor and director of facilities.

Evaluation Mechanisms

The custodian undergoes an annual formal written evaluation by the head custodian/supervisor and semiannual face-to-face evaluation meetings.

Position Status

The position of custodian is categorized as at-will within the school district.

The information contained in this job description is for compliance with the Americans with Disabilities Act (ADA) and is not an exhaustive list of the duties performed for this position. The individuals currently holding this position perform additional duties, and additional duties may be assigned.

APPENDIX G
USEFUL INTERVIEW QUESTIONS

Following is a list of questions that have proven useful to school district personnel as they interview potential employees. Specific questions may not be applicable for all positions or in all school organizations. They are presented only as a resource and do not in any way represent a standard or an agreed-upon convention.

Warm-up Questions:

What are your interests?
What made you apply for this position?
Why do you want to work for this organization?

Work History:

How do you feel about your current job?
Why are you leaving your current job?
What are your major responsibilities in your current job?
What have done particularly well (i.e., your greatest success) in your current job?
What are some of the challenges you encounter in your current job? Which ones frustrated you the most? What do you do about them?
What aspects of your current job do you find most difficult, and why?
Are there certain aspects of your current job that you feel more confident doing than others? What are they, and why do you feel that way?
What do you want from your next job that you are not getting from your current job?
Can you describe one of the most important accomplishments in your career?
Can you describe one or two of the biggest disappointments in your career?
What is important to you in a job? Why?
What would you like to avoid in a job? Why?
What kinds of co-workers do you like to work with best? Why?
Which of all your jobs have you liked the best? The least? Why?
What would you say was the most, or least, promising job you ever had? Why?
What kind of an organization do you most prefer to work for?
What specific aspects of your work experience have prepared you for this job?

Leadership:

What kinds of supervision have you received in previous jobs?
What kinds of supervision have you used with your subordinates?
How much time do you spend supervising?
How much time do you spend doing detail work (i.e., not supervising)?
What kind of working relationship do you want to have with the person you report to?
What kind of working relationship do you want to have with a person who reports to you?
What has been your greatest risk with regard to managing staff and/or projects?
What is your experience developing and managing budgets?
What is your management style?

Education and Training:

How do you feel your education and training will relate to this job?
What areas would you most like additional training in if you got this job?
Can you give an example of a time when you felt you needed to improve your skills?

Career Goals:

Where does this job fit into your overall career plan?
Why did you choose to pursue this kind of career?
What makes you feel that is the best career path for you?
What kind of job do you see yourself holding five years from now?
How will this job help you achieve your career goals?
What would you most like to accomplish if you got this job?
What might make you leave this job?

Job Performance:

How do you think your last/current employer would describe your job performance?
How did your supervisor rate you on your most recent job evaluation? What were some of the good points and constructive criticisms of that rating?
How do you respond to constructive criticism with regard to your job performance? Give an example.
Have you ever disagreed with a supervisor about your work performance? Give an example.
What motivates you?
What are some of the techniques you use to organize your time?

Lateness and Absenteeism:

How many days of work did you miss during the last year? For what reasons?
How many times were you late for work during the last year? For what reasons?
What do you feel is a satisfactory attendance record?
How do you think problems of tardiness should be handled by a supervisor?
How do you think problems of absenteeism should be handled by a supervisor?

Self Perception:

How would your co-workers describe your job performance?
How important to you are other people's opinions of your work performance?
Can you describe yourself and your work ethic?
What are your professional strengths? Weaknesses?

Listening and Oral Communication Skills:

What do you think the role of listening is in good management?
How do you react to someone who dominates a discussion?
What is the worst communication problem you have experienced? How did you deal with it?
Do you think your co-workers perceive you as a good listener? Why?

Salary:

What is your salary history?
What are your current expectations for compensation?
What are your future (e.g., 1-3 years from now) expectations for compensation?

Closing Questions:

Why should we hire you?
What makes you think you that you might be the most qualified candidate?
What would you like to know about our organization?
Is there anything else you would like to mention that we haven't discussed?
Do you have any other questions?

Questions for Additional Scenarios:

If you could have the "perfect job," what would it be?
Can you give an example of how you handled a "problem" employee or co-worker in your last job?
Can you describe a situation in which you felt it was justified to modify standard policies and procedures?
Can you give an example of how you handled a communication problem in your last job?
What have you accomplished in your current job that you felt was creative?
Can you give an example of a quick decision you had to make that you were proud of?
Can you give an example of an important goal you had and how you worked to achieve it?
Can you give an example of how a management change affected your work for the better, or for the worse?
Can you give an example of a time when you had to "roll with the punches"?
How do you deal with deadlines and work under pressure? Give an example.
Are you overqualified for this job?

APPENDIX H
USING MAPPING DURING THE INTERVIEW PROCESS

The use of "mapping" during the interview process helps decision-makers focus on the desired traits of a candidate being interviewed for a job. The goal is to determine how well the candidate demonstrates the ideal qualities for the position sought by the hiring organization.

Mapping can be conducted as follows: Say your district is interviewing for a supervisor of maintenance. First identify the general categories of knowledge, skills, and abilities required for the position. Then list specific expertise or experience that the ideal candidate will demonstrate as evidence of these characteristics (see Figure 1). Share this with the selection committee to see if they have traits or characteristics to add or delete. As the discussion evolves, each member of the selection committee will develop a better idea of the profile that best matches the "ideal" candidate.

Next, prepare an interview worksheet that lists only the general categories of the knowledge, skills, and abilities required for the position (i.e., only the headings in the ovals) (see Figure 2). During the interview, each member of the interview team can then take notes about whether and how the applicant exhibits the related characteristics. The team members can later compare their notes to the detailed list of expertise and experience that characterizes the ideal candidate. The results of this type of exercise might very well help to inform your decision-making during the selection process.

Note that mapping is a technique that combines left and right brain perspectives on an issue. In this case, the concept is applied during the process of interviewing candidates for potential employment. However, this management approach can also be applied for other tasks as well. While it may not appeal to everyone, it is a proven method for integrating information and informing decision-making.

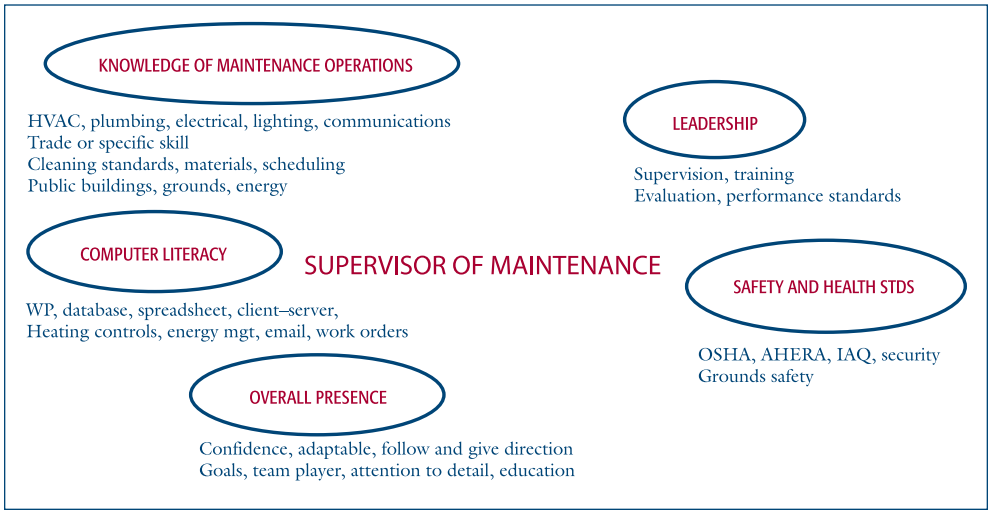


Figure 1. An example of the use of mapping while interviewing candidates for the position of Supervisor of Maintenance. The selection committee identified five basic categories of knowledge, skills, and abilities (represented by the ovals) that the ideal candidate would possess. They then listed specific traits or know-how that candidates might be expected to demonstrate.

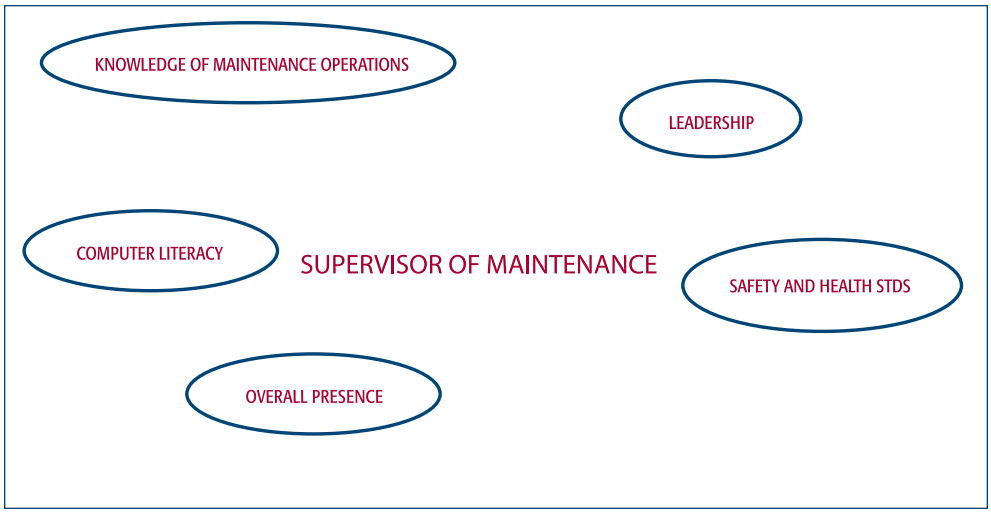


Figure 2. The "blank" mapping form on which interviewers take notes about whether and how an applicant exhibits the knowledge, skills, and abilities of the "ideal" candidate during the job interview. The members of the selection team then compare their notes to the detailed list of expertise and experience, as seen in Figure 1.

APPENDIX I
SAMPLE CUSTOMER SURVEY FORM

The following is a sample customer survey form provided by the Michigan School Business Officials (MSBO). An education organization can refer to it as it develops its own evaluation materials. However, every item may not be applicable to all school organizations. It is presented only as a resource, and does not represent a standard or an agreed-upon convention.

Custodial

1 = STRONGLY DISAGREE 2 = DISAGREE 3 = NEUTRAL 4 = AGREE 5 = STRONGLY AGREE

Measure/Rating	1	2	3	4	5
My work area is kept clean.					
Insects are rarely or never found in my work area.					
Rodents are rarely or never found in my work area.					
Floors are kept clean.					
Spills are cleaned up immediately.					
Bathrooms are kept clean.					
Bathrooms are free of graffiti.					
School grounds are kept clean.					
Graffiti is removed within 24 hours of its appearance.					
Paper, cans, and debris are cleaned up quickly.					
Snow and ice are removed quickly.					
Custodial staff are rarely seen to be wasting time.					
Custodial staff are cooperative and responsive.					
I am satisfied with custodial service in general.					
TOTALS					

Maintenance

1 = STRONGLY DISAGREE 2 = DISAGREE 3 = NEUTRAL 4 = AGREE 5 = STRONGLY AGREE

Measure/Rating	1	2	3	4	5
My work area is well maintained.					
Nonworking lights are replaced in a timely manner.					
Ceiling tiles are replaced when they are soiled or broken.					
Emergency work orders are handled in a timely manner.					
Safety related work orders are completed immediately.					
Maintenance staff use safe practices at all times.					
Maintenance staff don't disrupt students and classes.					
Maintenance staff are cooperative and responsive.					
I am satisfied with maintenance service in general.					
TOTALS					

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