Optimizing Energy Performance & Sustainability in New & Existing Buildings Through the Whole Building Design Guide

Associated Builders & Contractors, Inc.

Webinar

August 13, 2013

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National Institute of Building Sciences

National Institute of BUILDING SCIENCES

What Is a High-Performance Building?

- **Energy Independence & Security Act of 2007, Title IV, Energy Savings in Buildings and Industry, Section 401, Definitions**

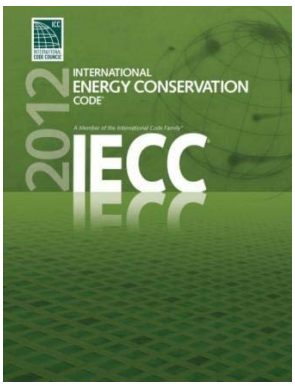
  A building that integrates and optimizes on a life cycle basis **all major high performance attributes**, including energy conservation, environment, safety, security, durability, accessibility, cost-benefit, productivity, sustainability, functionality, and operational considerations.

Why is this important to you?

How can the Whole Building Design Guide help you achieve High-Performance?

Factors Influencing Current & Future Building Projects

LEED® VERSION 4



IgCC
SAFE & SUSTAINABLE BY THE BOOK

Executive Order 13514
Federal Leadership in Environmental, Energy and Economic Performance

EISA
Energy Independence and Security Act 2007

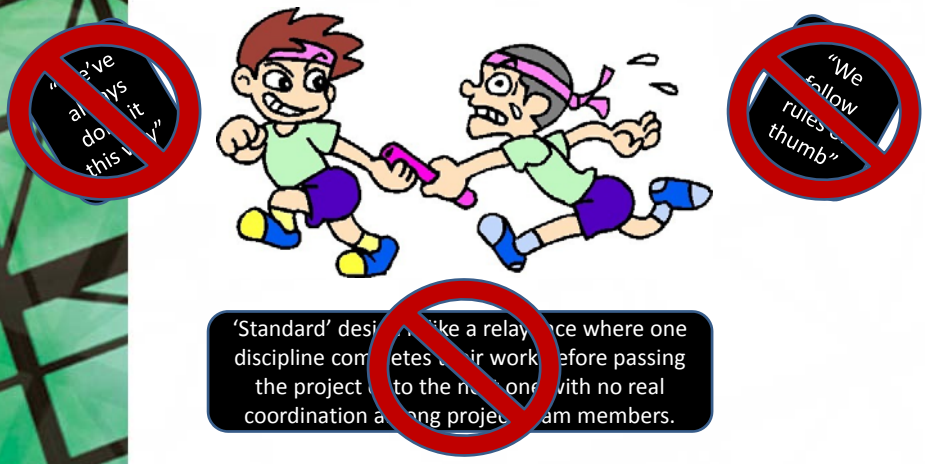
High Performance Attributes

- Accessibility
- Aesthetics
- Cost Effectiveness
- Functionality
- Historic Preservation
- Productivity
- Security/Safety
- Sustainability

The Office of Governmentwide Policy at the GSA headquarters building in Washington, DC was designed to maximize flexibility, allowing new occupants to change the space to fit their group and individual needs.

High Performance Attributes = WBDG Design Objectives

Why aren't we succeeding in creating High-Performance Buildings?



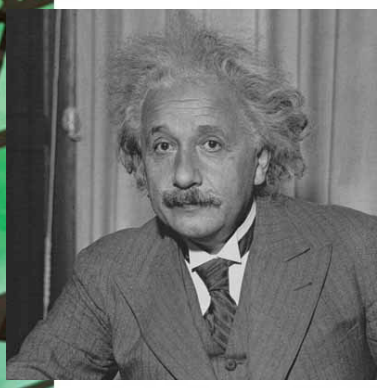
What Are We Getting Now?

- Building codes are minimum
- One attribute is prominent while others are overlooked or trivialized
- Low occupant satisfaction
- Lawsuits
- Premature failures of materials & systems
- Value of investment decreases while costs of operations & maintenance increase

A Conundrum

Can we get to where we need to go from the place we came from?

Think About It …



Albert Einstein

- To raise new questions, new possibilities, to regard old problems from a new angle, requires creative imagination and marks real advance in science.
- We cannot solve our problems with the same thinking we used when we created them.

We need Creative Thinking & Innovation!

Evolution in Lighting Technology in the Last 150 Years

Whale Oil

Incandescent

Fluorescent

What's Next?

L.E.D

The Point is this …

Green Buildings & Occupant Satisfaction

What's Working, What's Not*

- Occupants of green buildings generally show a higher level of satisfaction with their built environment than do occupants of standard buildings, but their buildings fall short in some key areas.
- Common complaints had to do with:
  - Acoustics (too noisy, not enough privacy)
  - Thermal comfort (limited temperature control)
  - Daylighting (too much glare and light spill)

Similar results from other studies done over last few years

*HOK Post Occupancy Evaluation Report
of 7 HOK-designed green buildings
as reported in BD&C June 9, 2006

What Is Whole Building Design?

To achieve high-performance buildings

- It takes an **Integrated Design Approach** and it requires an
- **Integrated Team Process**

'Whole Building' Approach

- Materials, systems, and assemblies reviewed from many different perspectives
- Building components, sub-systems and materials are interdependent, can impact the total performance of the whole, and can perform 'double duty'

NREL Solar Laboratory
Golden, CO

Integrated Project Team

- Comprehensive Stakeholder involvement throughout the building's life cycle
- Evaluation for
  - cost,
  - quality-of-life,
  - future flexibility,
  - energy efficiency,
  - overall environmental impact,
  - productivity,
  - creativity, and
  - how the occupants will be enlivened

EPA Region 8 Headquarters
Denver, CO

Applying the Integrated Team Process

Who needs to be at the table at the outset of your project to ensure an integrated team process?

- Architect / Landscape Architect
- Owner, Client, Tenants
- Engineers
- Programmers
- Interior Designer
- Contractor
- Specialists (Security, Telecom, Acoustics)
- Community Members or Other Stakeholders
- Operations and Maintenance Personnel
- Others???? (Real Estate Buyer)

An Integrated Team can find a single design strategy that meets multiple design objectives
This is a tactic that can control project cost!

Building Site Selection

- Solar Access*
- Stormwater Management
- Undeveloped Land/Wetlands
- Public Transportation
- Occupant Amenities
- Compatible Functions
- Security (ATFP, CPTED)
- Disaster Avoidance

Police & Security Operations Facility
Little Creek Naval Amphibious Base

LEED

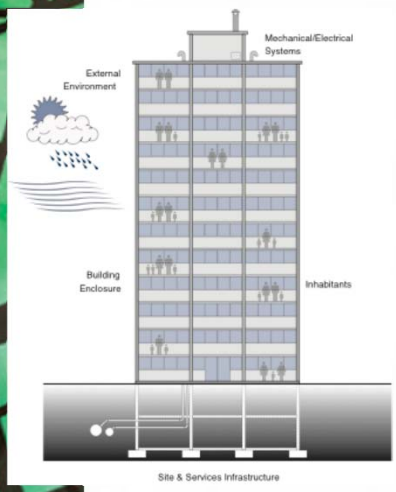
Green Globes

*Building orientation for passive solar heating, daylighting, natural ventilation, views, potential impacts of future development.

*[Real Estate Buyer **must** be informed!!!]*

Note: Applies to Selecting an Existing Building, as well!

The Building as a System



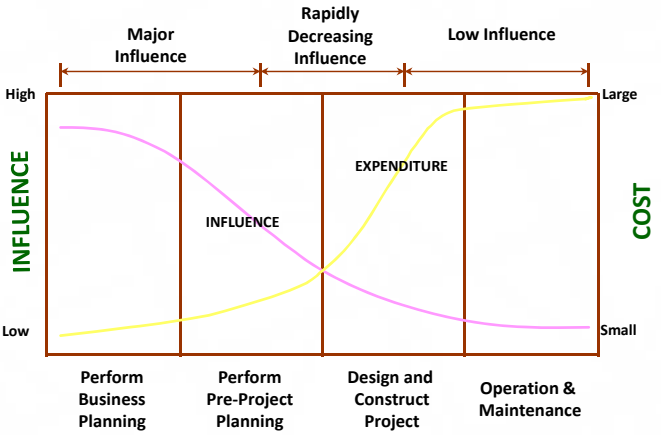
From Prof. Kesic
Building Science Concepts

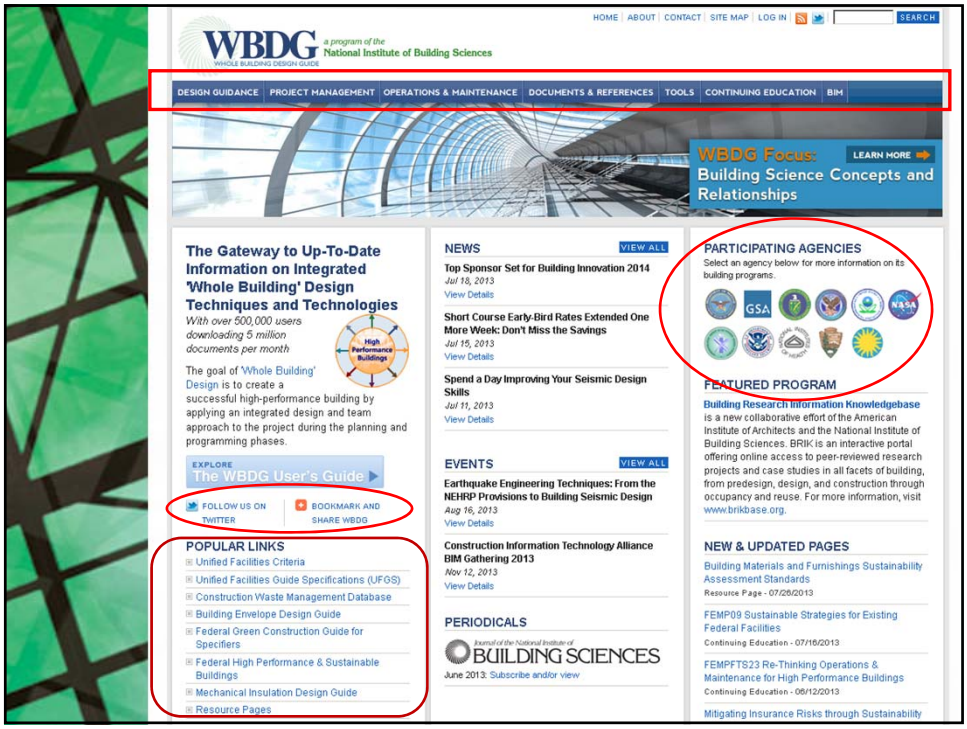
- the building enclosure (building envelope system);
- the inhabitants (humans and/or animals and/or plants, etc.);
- the building services (electrical/mechanical systems);
- the site, with its landscape and services infrastructure; and
- the external environment (weather and micro-climate).

Harmonization of these elements is the key to high performing buildings.

Cost / Influence Over the Quality of a Project

Influence early for optimal design outcome and reduced life-cycle cost.

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With over 500,000 users downloading 5 million documents per month
The goal of 'Whole Building' Design is to create a successful high-performance building by applying an integrated design and team approach to the project during the planning and programming phases.
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Mechanical Insulation Design Guide
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Spend a Day Improving Your Seismic Design Skills
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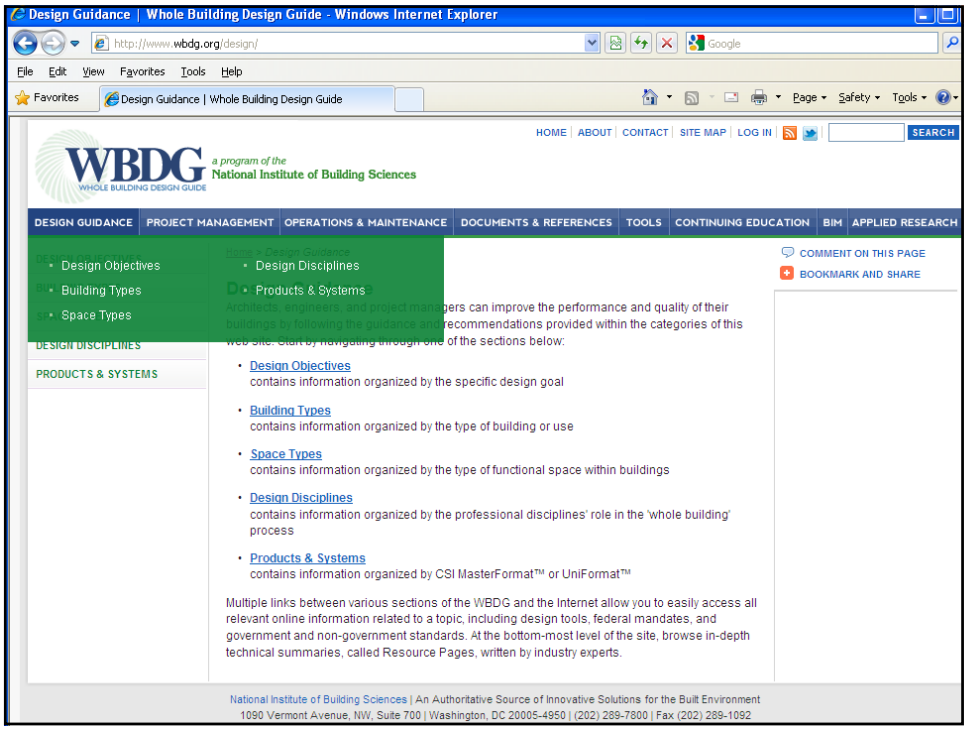
Building Research Information Knowledgebase is a new collaborative effort of the American Institute of Architects and the National Institute of Building Sciences. BRIK is an interactive portal offering online access to peer-reviewed research projects and case studies in all facets of building, from predesign, design, and construction through occupancy and reuse. For more information, visit www.brikbase.org.
NEW & UPDATED PAGES
Building Materials and Furnishings Sustainability Assessment Standards
Resource Page - 07/26/2013
FEMP09 Sustainable Strategies for Existing Federal Facilities
Continuing Education - 07/16/2013
FEMPFTS23 Re-Thinking Operations & Maintenance for High Performance Buildings
Continuing Education - 06/12/2013
Mitigating Insurance Risks through Sustainability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Design Objectives
Building Types
Space Types
Design Disciplines
Products & Systems
DESIGN DISCIPLINES
PRODUCTS & SYSTEMS
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Design Objectives
contains information organized by the specific design goal
Building Types
contains information organized by the type of building or use
Space Types
contains information organized by the type of functional space within buildings
Design Disciplines
contains information organized by the professional disciplines' role in the 'whole building' process
Products & Systems
contains information organized by CSI MasterFormat™ or UniFormat™
Multiple links between various sections of the WBDG and the Internet allow you to easily access all relevant online information related to a topic, including design tools, federal mandates, and government and non-government standards. At the bottom-most level of the site, browse in-depth technical summaries, called Resource Pages, written by industry experts.
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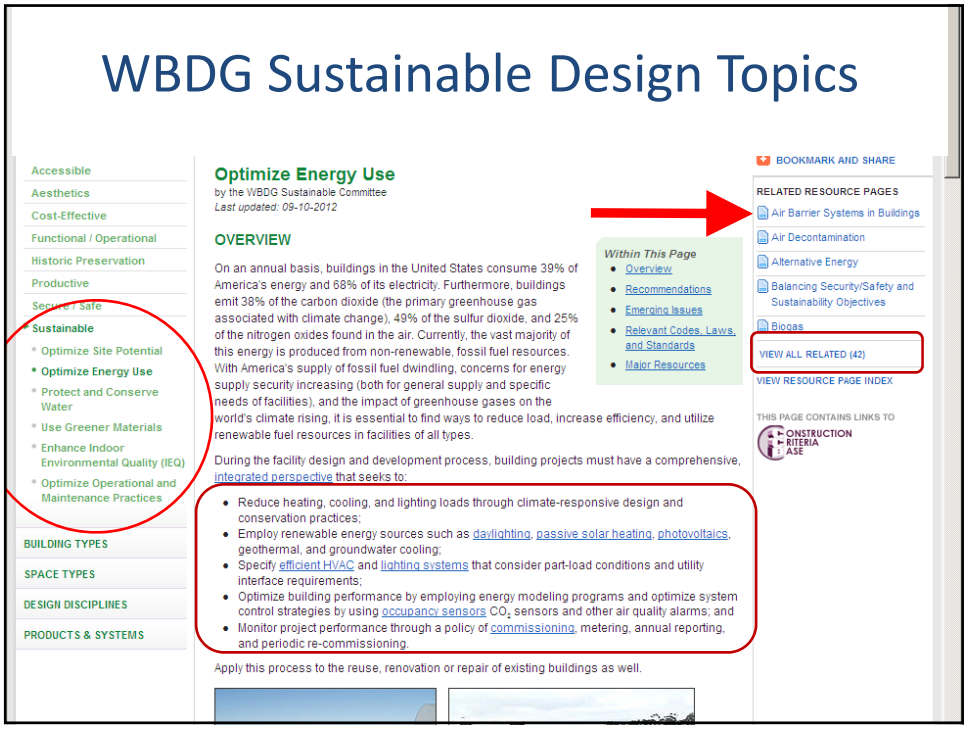
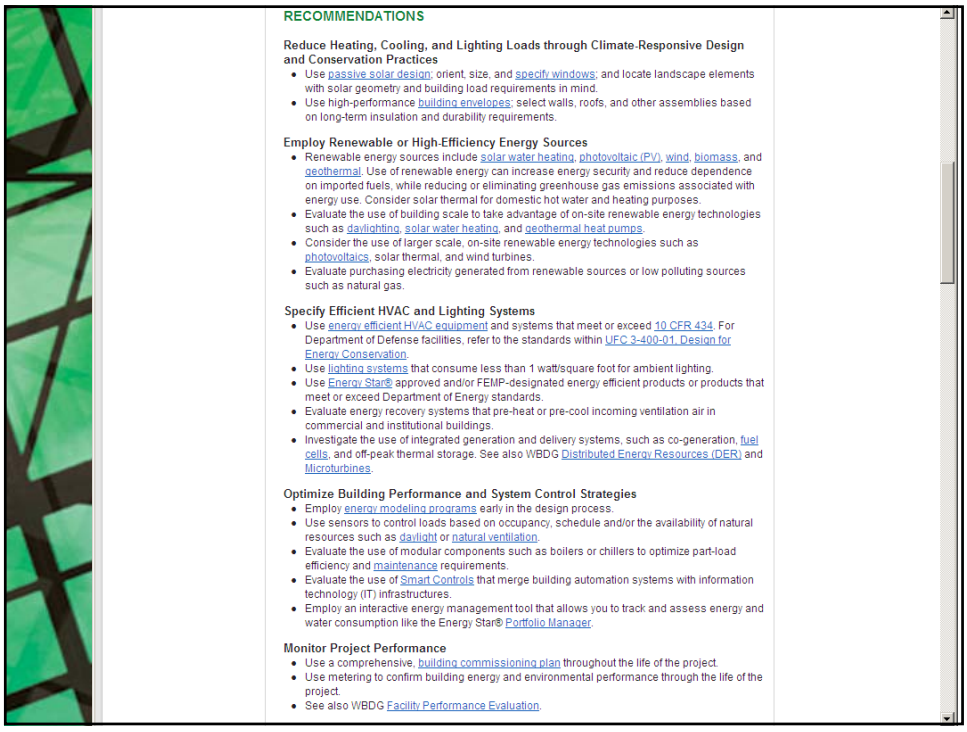
WBDG Sustainable Design Topics





RECOMMENDATIONS

Reduce Heating, Cooling, and Lighting Loads through Climate-Responsive Design and Conservation Practices

- Use passive solar design; orient, size, and specify windows; and locate landscape elements with solar geometry and building load requirements in mind.
- Use high-performance building envelopes; select walls, roofs, and other assemblies based on long-term insulation and durability requirements.

Employ Renewable or High-Efficiency Energy Sources

- Renewable energy sources include solar water heating, photovoltaic (PV), wind, biomass, and geothermal. Use of renewable energy can increase energy security and reduce dependence on imported fuels, while reducing or eliminating greenhouse gas emissions associated with energy use. Consider solar thermal for domestic hot water and heating purposes.
- Evaluate the use of building scale to take advantage of on-site renewable energy technologies such as daylighting, solar water heating, and geothermal heat pumps.
- Consider the use of larger scale, on-site renewable energy technologies such as photovoltaics, solar thermal, and wind turbines.
- Evaluate purchasing electricity generated from renewable sources or low polluting sources such as natural gas.

Specify Efficient HVAC and Lighting Systems

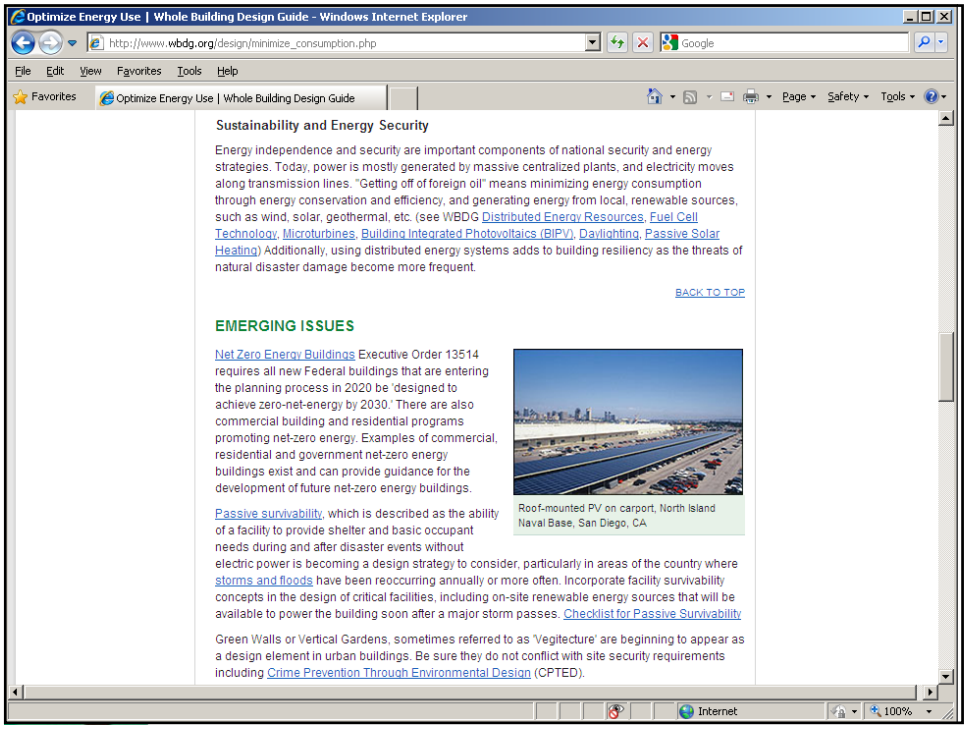
- Use energy efficient HVAC equipment and systems that meet or exceed 10 CFR 434. For Department of Defense facilities, refer to the standards within UFC 3-400-01, Design for Energy Conservation.
- Use lighting systems that consume less than 1 watt/square foot for ambient lighting.
- Use Energy Star® approved and/or FEMP-designated energy efficient products or products that meet or exceed Department of Energy standards.
- Evaluate energy recovery systems that pre-heat or pre-cool incoming ventilation air in commercial and institutional buildings.
- Investigate the use of integrated generation and delivery systems, such as co-generation, fuel cells, and off-peak thermal storage. See also WBDG Distributed Energy Resources (DER) and Microturbines.

Optimize Building Performance and System Control Strategies

- Employ energy modeling programs early in the design process.
- Use sensors to control loads based on occupancy, schedule and/or the availability of natural resources such as daylight or natural ventilation.
- Evaluate the use of modular components such as boilers or chillers to optimize part-load efficiency and maintenance requirements.
- Evaluate the use of Smart Controls that merge building automation systems with information technology (IT) infrastructures.
- Employ an interactive energy management tool that allows you to track and assess energy and water consumption like the Energy Star® Portfolio Manager.

Monitor Project Performance

- Use a comprehensive, building commissioning plan throughout the life of the project.
- Use metering to confirm building energy and environmental performance through the life of the project.
- See also WBDG Facility Performance Evaluation.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Sustainability and Energy Security
Energy independence and security are important components of national security and energy strategies. Today, power is mostly generated by massive centralized plants, and electricity moves along transmission lines. "Getting off of foreign oil" means minimizing energy consumption through energy conservation and efficiency, and generating energy from local, renewable sources, such as wind, solar, geothermal, etc. (see WBDG Distributed Energy Resources, Fuel Cell Technology, Microturbines, Building Integrated Photovoltaics (BIPV), Daylighting, Passive Solar Heating) Additionally, using distributed energy systems adds to building resiliency as the threats of natural disaster damage become more frequent.
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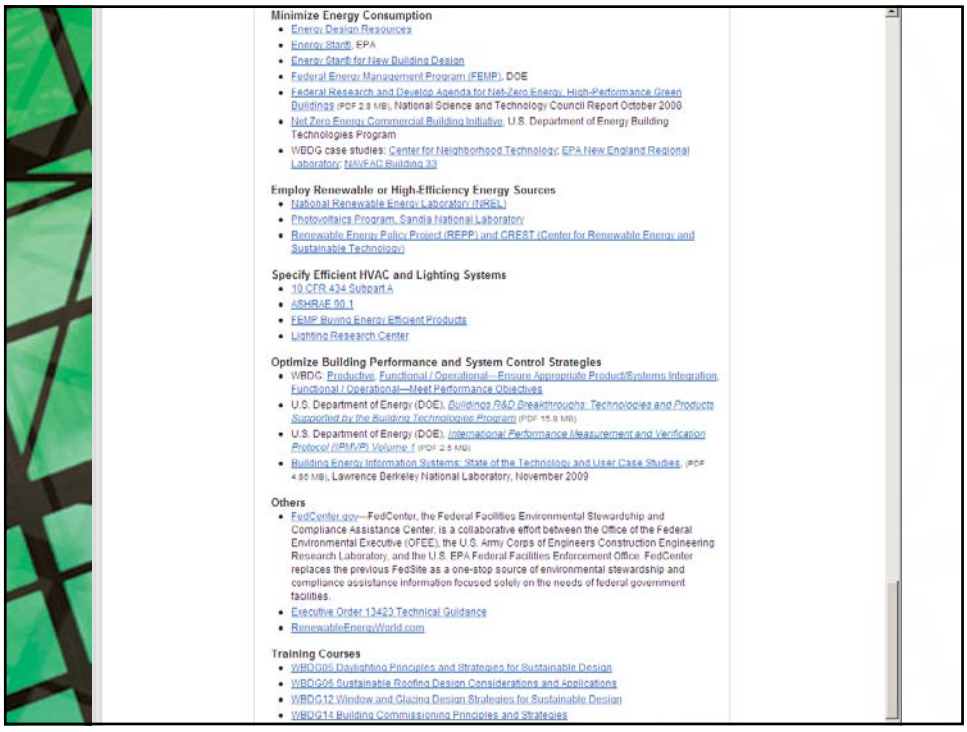
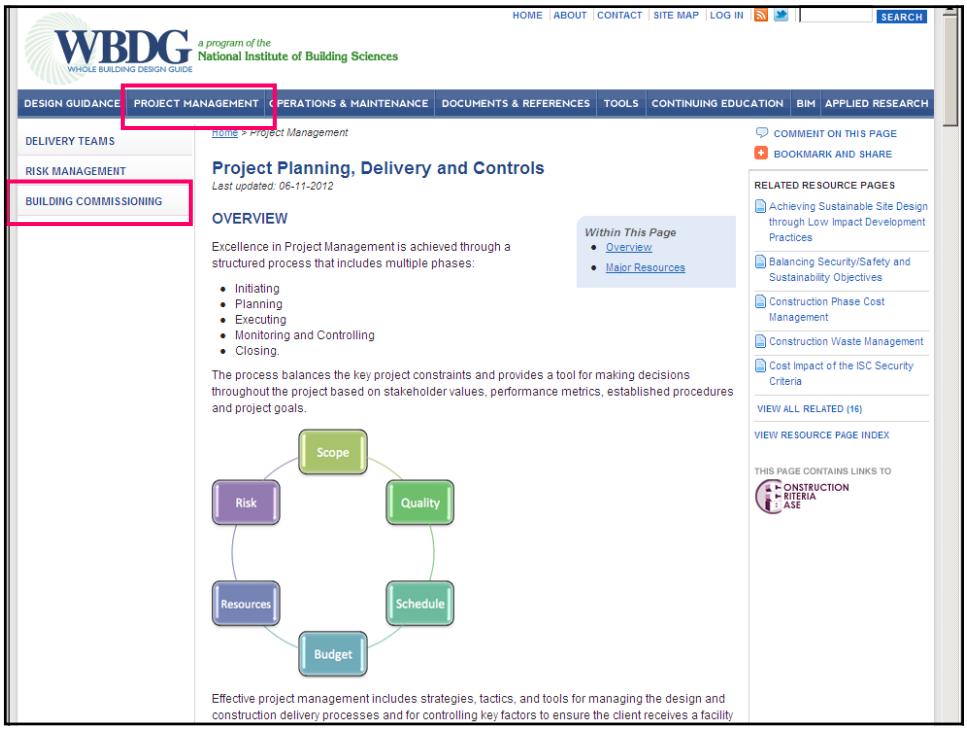
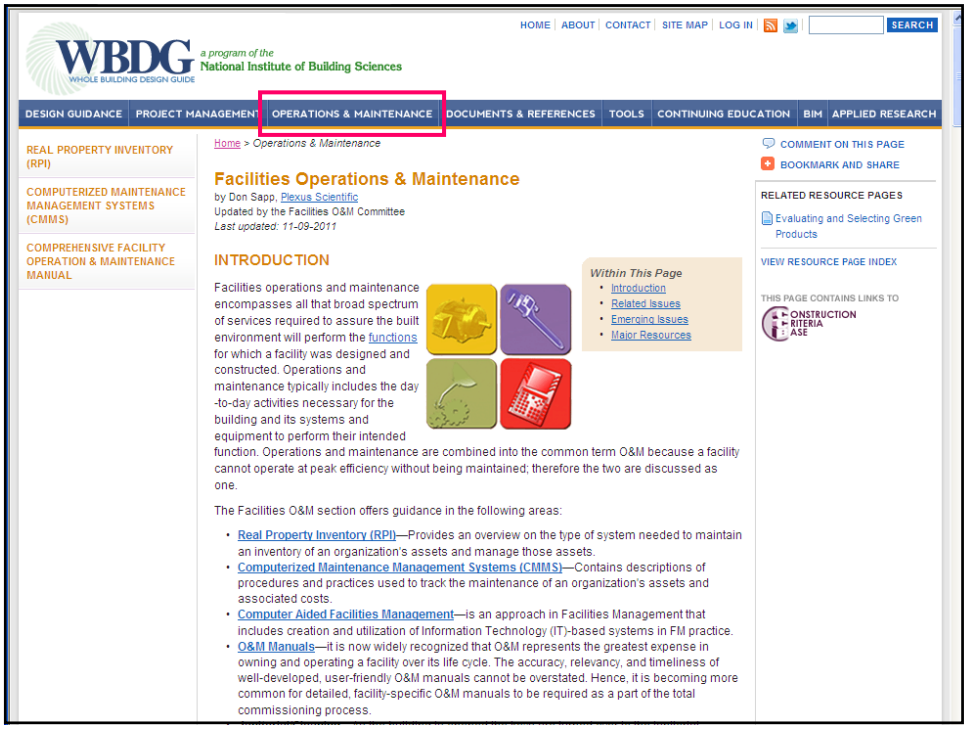
EMERGING ISSUES
Net Zero Energy Buildings Executive Order 13514 requires all new Federal buildings that are entering the planning process in 2020 be 'designed to achieve zero-net-energy by 2030.' There are also commercial building and residential programs promoting net-zero energy. Examples of commercial, residential and government net-zero energy buildings exist and can provide guidance for the development of future net-zero energy buildings.
Roof-mounted PV on carport, North Island Naval Base, San Diego, CA
Passive survivability, which is described as the ability of a facility to provide shelter and basic occupant needs during and after disaster events without electric power is becoming a design strategy to consider, particularly in areas of the country where storms and floods have been reoccurring annually or more often. Incorporate facility survivability concepts in the design of critical facilities, including on-site renewable energy sources that will be available to power the building soon after a major storm passes. Checklist for Passive Survivability
Green Walls or Vertical Gardens, sometimes referred to as 'Vegitecture' are beginning to appear as a design element in urban buildings. Be sure they do not conflict with site security requirements including Crime Prevention Through Environmental Design (CPTED).
Internet
100%


Minimize Energy Consumption
Energy Design Resources
Energy Star®, EPA
Energy Star® for New Building Design
Federal Energy Management Program (FEMP), DOE
Federal Research and Develop Agenda for Net-Zero Energy, High-Performance Green Buildings (PDF 2.8 MB), National Science and Technology Council Report October 2008
Net Zero Energy Commercial Building Initiative, U.S. Department of Energy Building Technologies Program
WBDG case studies: Center for Neighborhood Technology; EPA New England Regional Laboratory; NAVFAC Building 33
Employ Renewable or High-Efficiency Energy Sources
National Renewable Energy Laboratory (NREL)
Photovoltaics Program, Sandia National Laboratory
Renewable Energy Policy Project (REPP) and CREST (Center for Renewable Energy and Sustainable Technology)
Specify Efficient HVAC and Lighting Systems
10 CFR 434 Subpart A
ASHRAE 90.1
FEMP Buying Energy Efficient Products
Lighting Research Center
Optimize Building Performance and System Control Strategies
WBDG: Productive, Functional / Operational—Ensure Appropriate Product/Systems Integration, Functional / Operational—Meet Performance Objectives
U.S. Department of Energy (DOE), Buildings R&D Breakthroughs: Technologies and Products Supported by the Building Technologies Program (PDF 15.8 MB)
U.S. Department of Energy (DOE), International Performance Measurement and Verification Protocol (IPMVP) Volume 1 (PDF 2.5 MB)
Building Energy Information Systems: State of the Technology and User Case Studies, (PDF 4.86 MB), Lawrence Berkeley National Laboratory, November 2009
Others
FedCenter.gov—FedCenter, the Federal Facilities Environmental Stewardship and Compliance Assistance Center, is a collaborative effort between the Office of the Federal Environmental Executive (OFEE), the U.S. Army Corps of Engineers Construction Engineering Research Laboratory, and the U.S. EPA Federal Facilities Enforcement Office. FedCenter replaces the previous FedSite as a one-stop source of environmental stewardship and compliance assistance information focused solely on the needs of federal government facilities.
Executive Order 13423 Technical Guidance
RenewableEnergyWorld.com
Training Courses
WBDG05 Daylighting Principles and Strategies for Sustainable Design
WBDG06 Sustainable Roofing Design Considerations and Applications
WBDG12 Window and Glazing Design Strategies for Sustainable Design
WBDG14 Building Commissioning Principles and Strategies

Energy & Sustainability Resource Pages

- Air Barrier Systems in Buildings
- Building Enclosure Design Principles and Strategies
- Cool Metal Roofing
- Daylighting
- Electric Lighting Controls
- Energy Efficient Lighting
- Evaluating and Selecting Green Products
- Extensive Vegetative Roofs
- High-Performance EIFS
- High-Performance HVAC
- HVAC System Design for Humid Climates
- Indoor Air Quality and Mold Prevention of the Building Envelope
- Measuring Performance of Sustainable Buildings
- Natural Ventilation
- Passive Solar Heating
- Sun Control and Shading Devices
- Sustainable O&M Practices
- Water Conservation
- Windows and Glazing

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COMPREHENSIVE FACILITY OPERATION & MAINTENANCE MANUAL
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Facilities Operations & Maintenance
by Don Sapp, Plexus Scientific
Updated by the Facilities O&M Committee
Last updated: 11-09-2011
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THIS PAGE CONTAINS LINKS TO
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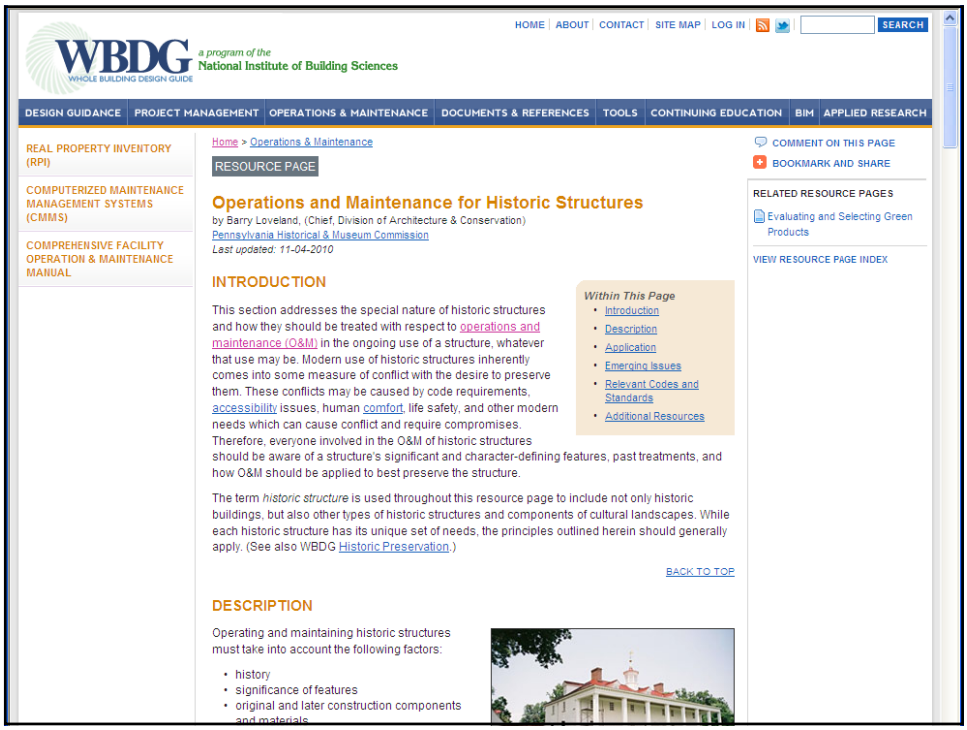
Major Resources
Facilities operations and maintenance encompasses all that broad spectrum of services required to assure the built environment will perform the functions for which a facility was designed and constructed. Operations and maintenance typically includes the day-to-day activities necessary for the building and its systems and equipment to perform their intended function. Operations and maintenance are combined into the common term O&M because a facility cannot operate at peak efficiency without being maintained; therefore the two are discussed as one.
The Facilities O&M section offers guidance in the following areas:
Real Property Inventory (RPI)—Provides an overview on the type of system needed to maintain an inventory of an organization's assets and manage those assets.
Computerized Maintenance Management Systems (CMMS)—Contains descriptions of procedures and practices used to track the maintenance of an organization's assets and associated costs.
Computer Aided Facilities Management—is an approach in Facilities Management that includes creation and utilization of Information Technology (IT)-based systems in FM practice.
O&M Manuals—it is now widely recognized that O&M represents the greatest expense in owning and operating a facility over its life cycle. The accuracy, relevancy, and timeliness of well-developed, user-friendly O&M manuals cannot be overstated. Hence, it is becoming more common for detailed, facility-specific O&M manuals to be required as a part of the total commissioning process.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RESOURCE PAGE
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Operations and Maintenance for Historic Structures
by Barry Loveland, (Chief, Division of Architecture & Conservation)
Pennsylvania Historical & Museum Commission
Last updated: 11-04-2010
RELATED RESOURCE PAGES
Evaluating and Selecting Green Products
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Relevant Codes and Standards
Additional Resources
This section addresses the special nature of historic structures and how they should be treated with respect to operations and maintenance (O&M) in the ongoing use of a structure, whatever that use may be. Modern use of historic structures inherently comes into some measure of conflict with the desire to preserve them. These conflicts may be caused by code requirements, accessibility issues, human comfort, life safety, and other modern needs which can cause conflict and require compromises. Therefore, everyone involved in the O&M of historic structures should be aware of a structure's significant and character-defining features, past treatments, and how O&M should be applied to best preserve the structure.
The term historic structure is used throughout this resource page to include not only historic buildings, but also other types of historic structures and components of cultural landscapes. While each historic structure has its unique set of needs, the principles outlined herein should generally apply. (See also WBDG Historic Preservation.)
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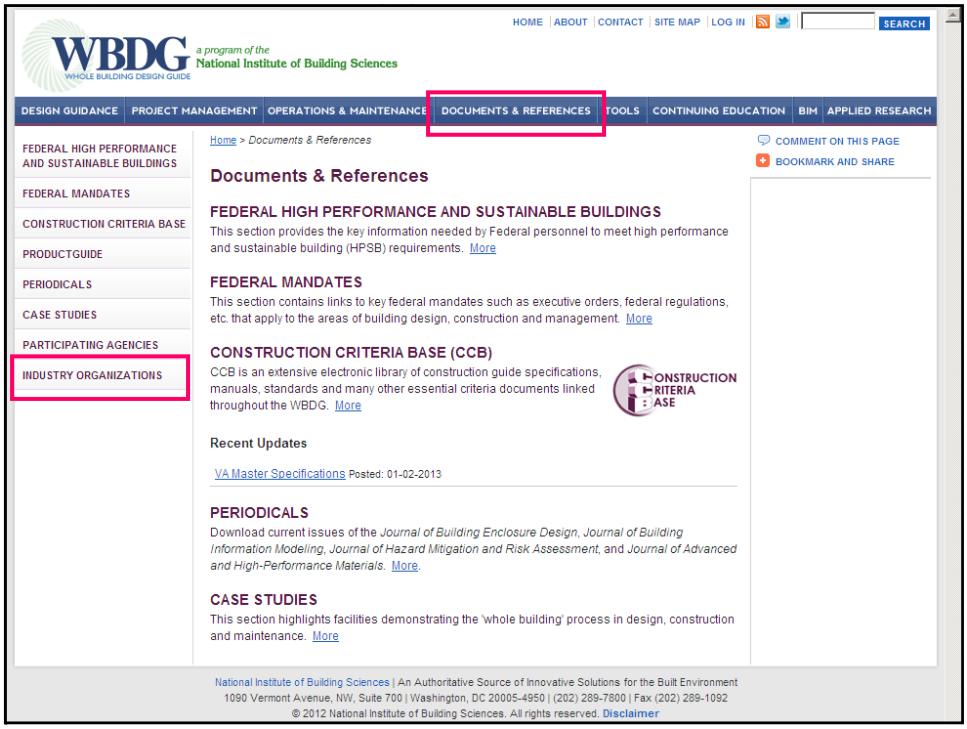
DESCRIPTION
Operating and maintaining historic structures must take into account the following factors:
history
significance of features
original and later construction components and materials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FEDERAL HIGH PERFORMANCE AND SUSTAINABLE BUILDINGS
This section provides the key information needed by Federal personnel to meet high performance and sustainable building (HPSB) requirements. More
FEDERAL MANDATES
This section contains links to key federal mandates such as executive orders, federal regulations, etc. that apply to the areas of building design, construction and management. More
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CASE STUDIES
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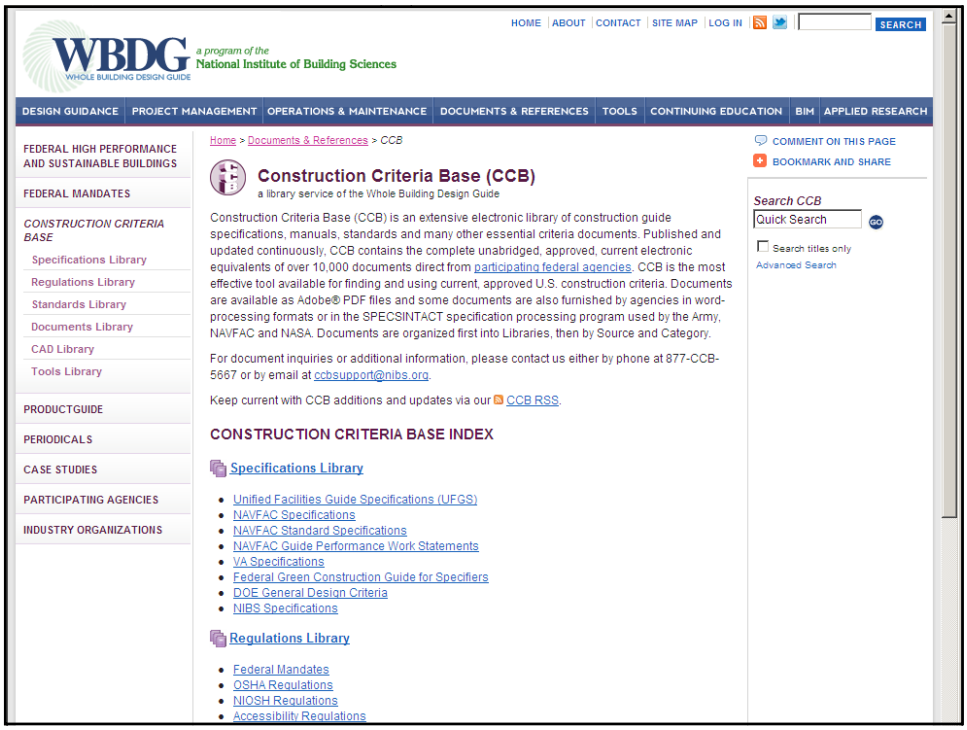
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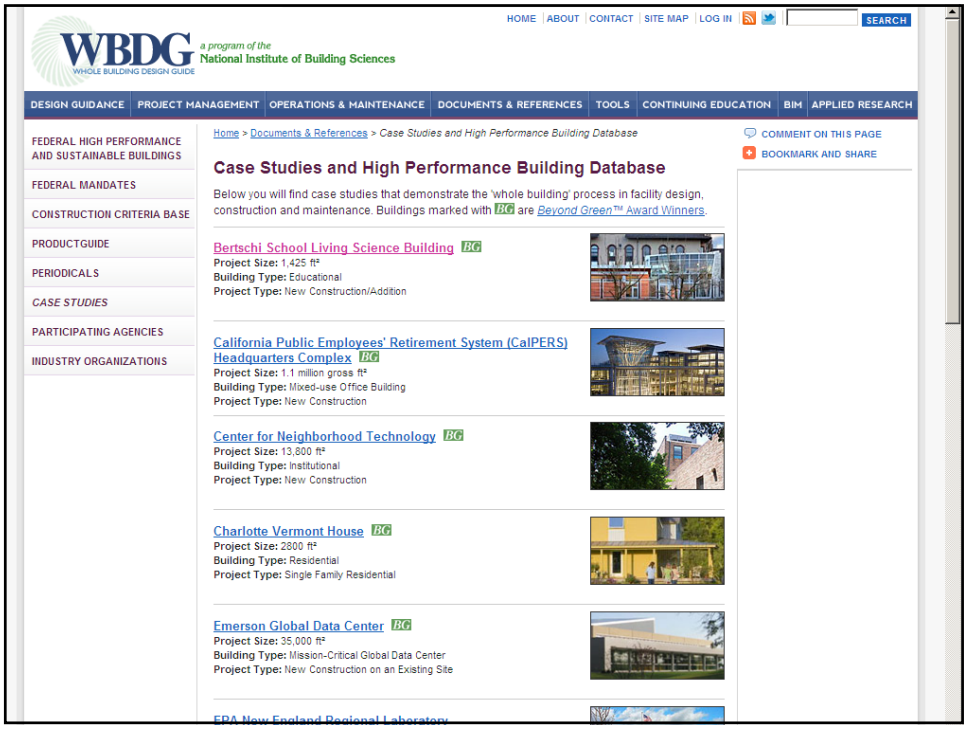
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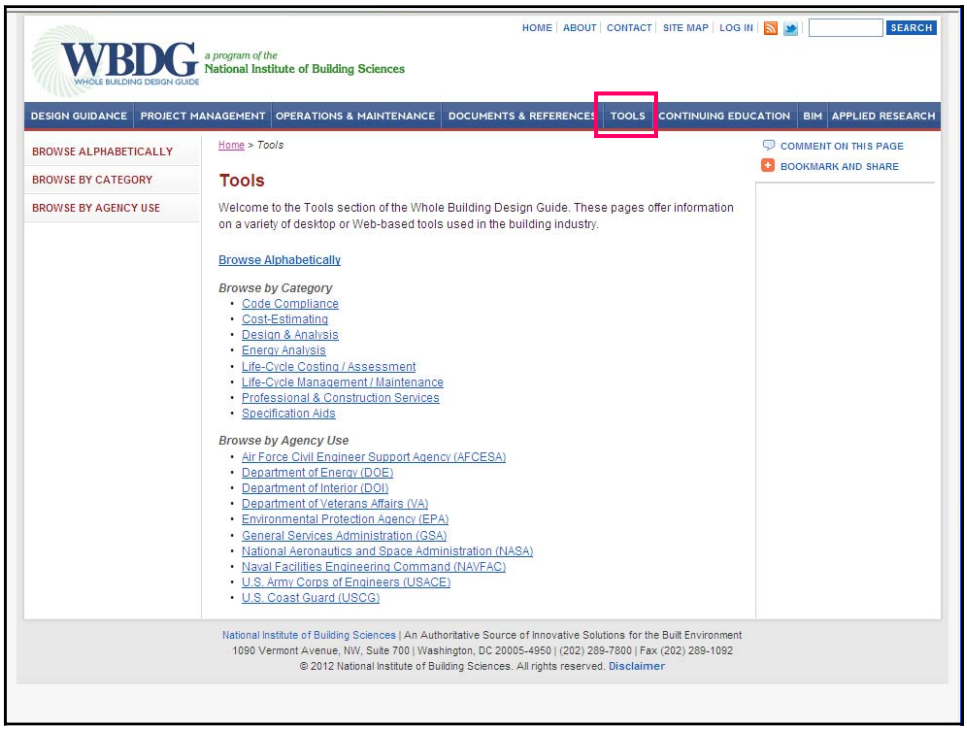
Case Studies and High Performance Building Database
Below you will find case studies that demonstrate the 'whole building' process in facility design, construction and maintenance. Buildings marked with BG are Beyond Green™ Award Winners.
Bertschi School Living Science Building BG
Project Size: 1,425 ft²
Building Type: Educational
Project Type: New Construction/Addition
California Public Employees' Retirement System (CalPERS) Headquarters Complex BG
Project Size: 1.1 million gross ft²
Building Type: Mixed-use Office Building
Project Type: New Construction
Center for Neighborhood Technology BG
Project Size: 13,800 ft²
Building Type: Institutional
Project Type: New Construction
Charlotte Vermont House BG
Project Size: 2800 ft²
Building Type: Residential
Project Type: Single Family Residential
Emerson Global Data Center BG
Project Size: 35,000 ft²
Building Type: Mission-Critical Global Data Center
Project Type: New Construction on an Existing Site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Tools
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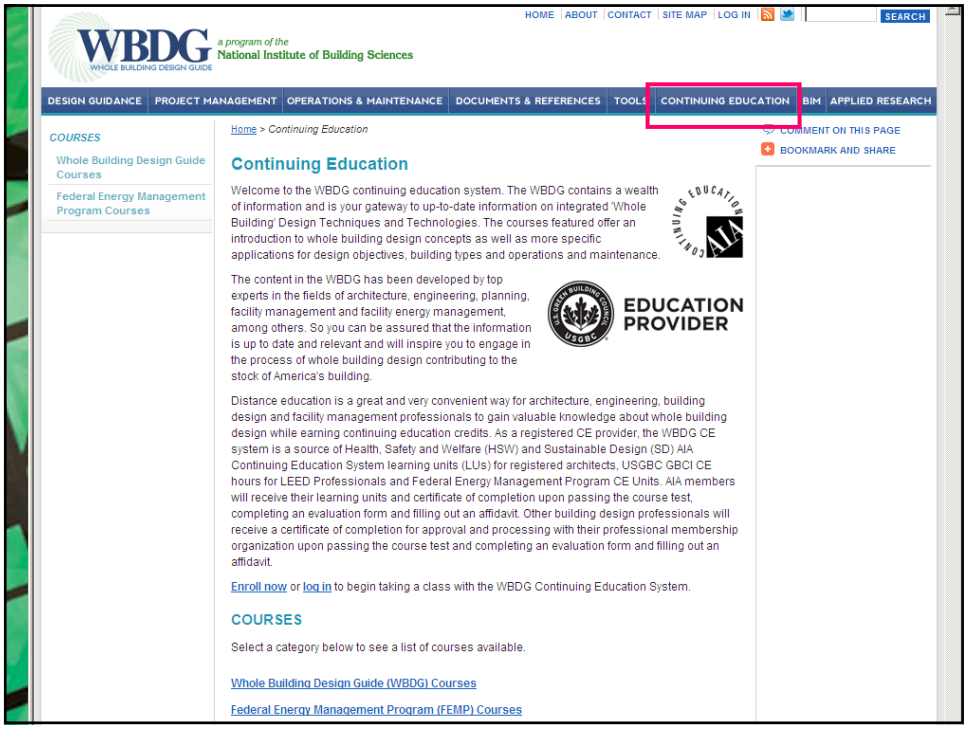
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COURSES
Whole Building Design Guide Courses
Federal Energy Management Program Courses
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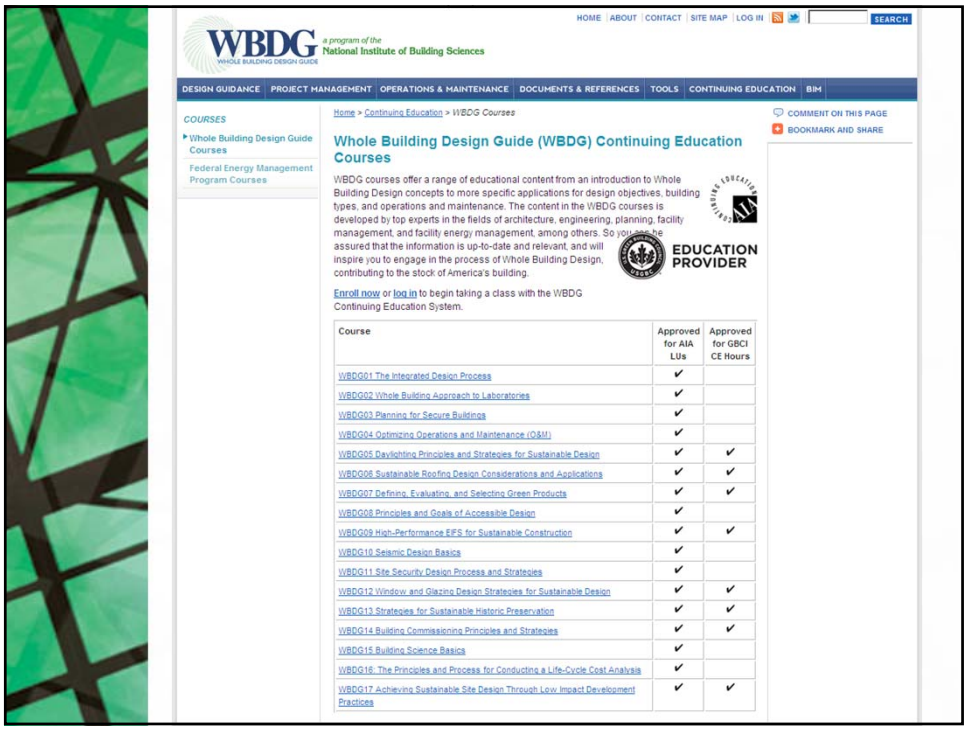
Continuing Education
Welcome to the WBDG continuing education system. The WBDG contains a wealth of information and is your gateway to up-to-date information on integrated 'Whole Building' Design Techniques and Technologies. The courses featured offer an introduction to whole building design concepts as well as more specific applications for design objectives, building types and operations and maintenance.
CONTINUING EDUCATION
AIA
The content in the WBDG has been developed by top experts in the fields of architecture, engineering, planning, facility management and facility energy management, among others. So you can be assured that the information is up to date and relevant and will inspire you to engage in the process of whole building design contributing to the stock of America's building.
USGBC
EDUCATION PROVIDER
Distance education is a great and very convenient way for architecture, engineering, building design and facility management professionals to gain valuable knowledge about whole building design while earning continuing education credits. As a registered CE provider, the WBDG CE system is a source of Health, Safety and Welfare (HSW) and Sustainable Design (SD) AIA Continuing Education System learning units (LUs) for registered architects, USGBC GBCI CE hours for LEED Professionals and Federal Energy Management Program CE Units. AIA members will receive their learning units and certificate of completion upon passing the course test, completing an evaluation form and filling out an affidavit. Other building design professionals will receive a certificate of completion for approval and processing with their professional membership organization upon passing the course test and completing an evaluation form and filling out an affidavit.
Enroll now or log in to begin taking a class with the WBDG Continuing Education System.
COURSES
Select a category below to see a list of courses available.
Whole Building Design Guide (WBDG) Courses
Federal Energy Management Program (FEMP) Courses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Whole Building Design Guide (WBDG) Continuing Education Courses
WBDG courses offer a range of educational content from an introduction to Whole Building Design concepts to more specific applications for design objectives, building types, and operations and maintenance. The content in the WBDG courses is developed by top experts in the fields of architecture, engineering, planning, facility management, and facility energy management, among others. So you can be assured that the information is up-to-date and relevant, and will inspire you to engage in the process of Whole Building Design, contributing to the stock of America's building.
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Course
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Approved for GBCI CE Hours
WBDG01 The Integrated Design Process ✔
WBDG02 Whole Building Approach to Laboratories ✔
WBDG03 Planning for Secure Buildings ✔
WBDG04 Optimizing Operations and Maintenance (O&M) ✔
WBDG05 Daylighting Principles and Strategies for Sustainable Design ✔ ✔
WBDG06 Sustainable Roofing Design Considerations and Applications ✔ ✔
WBDG07 Defining, Evaluating, and Selecting Green Products ✔ ✔
WBDG08 Principles and Goals of Accessible Design ✔
WBDG09 High-Performance EIFS for Sustainable Construction ✔ ✔
WBDG10 Seismic Design Basics ✔
WBDG11 Site Security Design Process and Strategies ✔
WBDG12 Window and Glazing Design Strategies for Sustainable Design ✔ ✔
WBDG13 Strategies for Sustainable Historic Preservation ✔ ✔
WBDG14 Building Commissioning Principles and Strategies ✔ ✔
WBDG15 Building Science Basics ✔
WBDG16: The Principles and Process for Conducting a Life-Cycle Cost Analysis ✔
WBDG17 Achieving Sustainable Site Design Through Low Impact Development Practices ✔ ✔

Federal Energy Management Program (FEMP) Continuing Education Courses

FEMP
Federal Energy Management Program

E-LEARNING COURSES

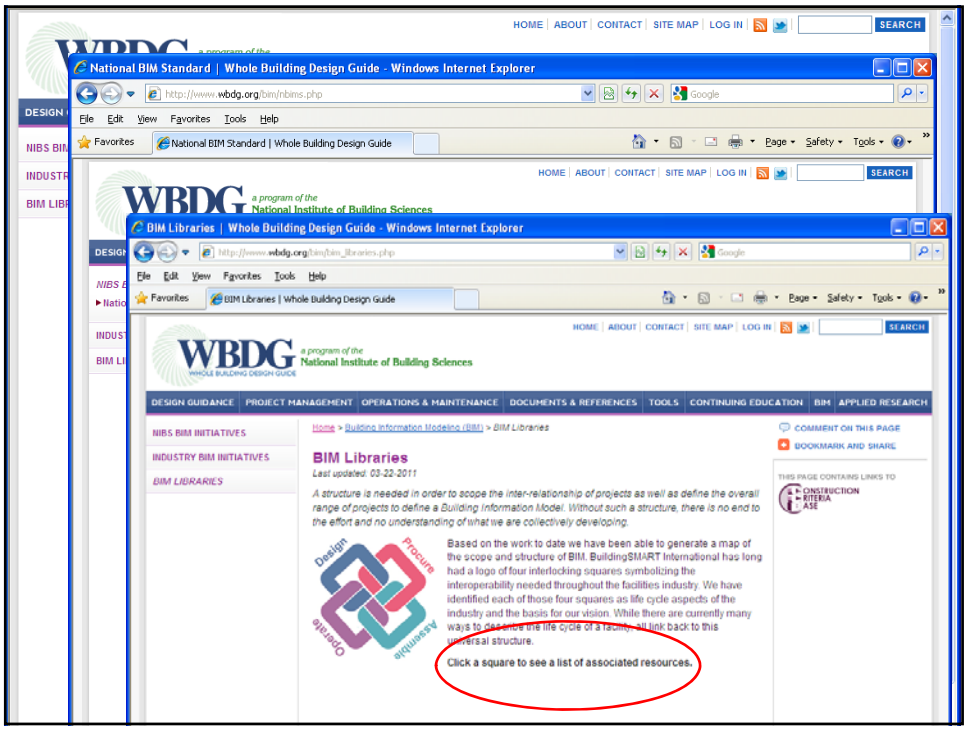
These interactive, on-demand, self-paced, and self-tracking courses are supportive of the Federal Building Personnel Training Act competencies and will provide up-to-date information targeted to mid-level Federal Energy, Water, and Sustainability Managers.

Course	Approved for AIA LUs	Approved for GBCI CE Hours	Approved for FEMP CEUs
FEMP01 Commissioning for Existing Federal Buildings	✔	✔	✔
FEMP02 Planning an Energy Assessment for Federal Facilities	✔	✔	✔
FEMP03 Launching a Utility Energy Services Contract (UESC): Getting to Yes!	✔		✔
FEMP04 Federal On-Site Renewable Power Purchase Agreements	✔		✔
FEMP05 Advanced Electric Metering in Federal Facilities	✔	✔	✔
FEMP06 Managing Water Assessment in Federal Facilities	✔	✔	✔
FEMP07 Selecting, Implementing, and Funding Photovoltaic Systems in Federal Facilities	✔	✔	✔
FEMP08 Sustainable Institutional Change for Federal Facility Managers	✔	✔	✔
FEMP13 Energy-Efficient Federal Purchasing	✔		✔

FIRST THURSDAY SEMINARS

FEMP First Thursday Seminars provide training for Federal energy and environmental professionals. Leading experts address timely topics in 90-minute sessions.

Course	Approved for FEMP CEUs
FEMPFTS21 Combined Heat and Power: An Integrated Approach to Energy Resources	✔
FEMPFTS20 Placing UESC Task Orders Under a GSA Areawide Contract	✔
FEMPFTS19 Implementing Deep Retrofits: A Whole Building Approach	✔
FEMPFTS18 Streamlining ESPCs for Small Sites	✔
FEMPFTS17 Achieving Energy Security in Federal Facilities	✔
FEMPFTS16 Selecting and Evaluating New and Underused Energy Technologies	✔
FEMPFTS15 Achieving Energy-Efficient Data Centers with New ASHRAE Thermal Guidelines	✔
FEMPFTS14 New Lighting Technologies	✔



Additional Energy/Sustainable Content

- Green Building Standards & Certification Systems
- Living, Regenerative & Adaptive Buildings
- Greenhouse Gas Emissions in Federal Buildings
- Biomimicry: Designing to Model Nature
- Alternative Energy
- Net Zero Energy Buildings
- Distributed Energy Resources
- Smart (whole bldg) Controls

EcoSense in British Columbia is one of the first 3 Living Buildings certified in the world (Photo Credit: ILBI.org.)

FEMP Guide to Integrating Renewable Energy in Federal Construction

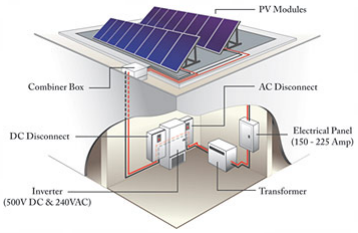
The *Federal Energy Management Program Guide is* available online at www.femp.energy.gov/reconstructionguide/.

The WBDG resources pages accompanying the *Guide* are:

- Biogas
- Biomass for Heat
- Fuel Cells and Renewable Hydrogen
- Geothermal Electric Technology
- Geothermal Heat Pumps
- Ocean Energy
- Passive Solar Heating
- Solar Ventilation Air Preheating
- Biomass for Electricity Generation
- Daylighting
- Geothermal Energy – Direct-Use
- Hydropower
- Photovoltaics
- Wind Technology
- Solar Water Heating

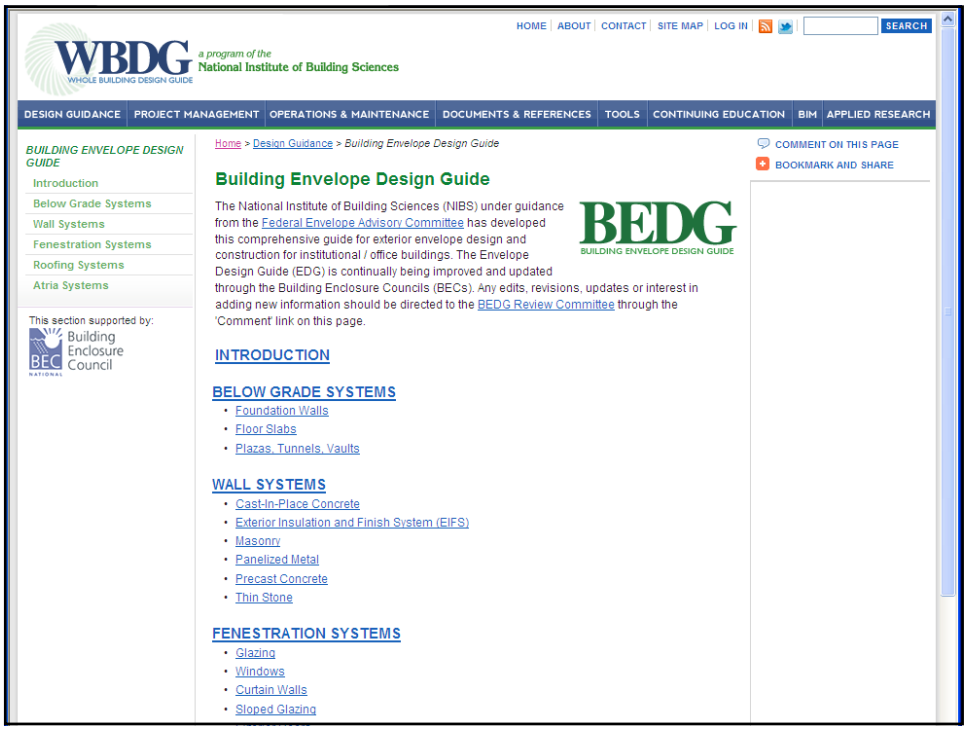
Renewable Energy Resource Pages

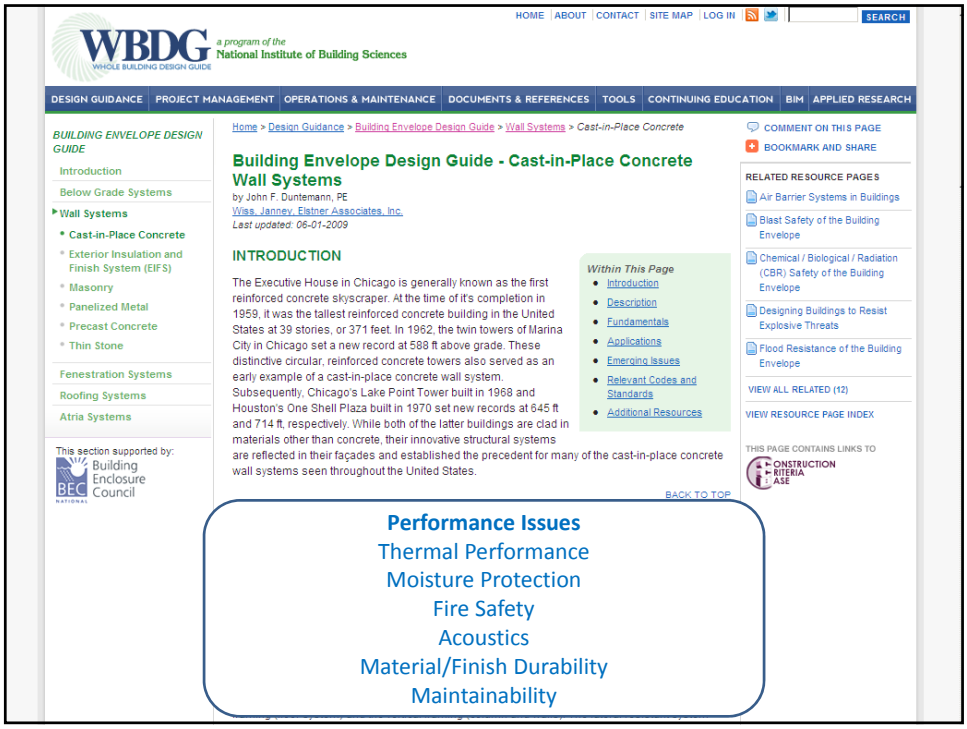
- Description: How does it work; types & cost of technology
- Application: Economics; assessing resource availability
- Design & Procurement considerations
- Operations & Maintenance
- Special considerations



Typical grid-connected photovoltaic system

The Judith Gap Wind Energy Center in Montana is comprised of 90 GE 1.5-MW turbines, for a total capacity of 135 MW

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Panelized Metal
Precast Concrete
Thin Stone
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Roofing Systems
Atria Systems
This section supported by:
Building Enclosure Council
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Building Envelope Design Guide - Cast-in-Place Concrete Wall Systems
by John F. Duntemann, PE
Wiss, Janney, Elstner Associates, Inc.
Last updated: 06-01-2009
INTRODUCTION
The Executive House in Chicago is generally known as the first reinforced concrete skyscraper. At the time of it's completion in 1959, it was the tallest reinforced concrete building in the United States at 39 stories, or 371 feet. In 1962, the twin towers of Marina City in Chicago set a new record at 588 ft above grade. These distinctive circular, reinforced concrete towers also served as an early example of a cast-in-place concrete wall system. Subsequently, Chicago's Lake Point Tower built in 1968 and Houston's One Shell Plaza built in 1970 set new records at 645 ft and 714 ft, respectively. While both of the latter buildings are clad in materials other than concrete, their innovative structural systems are reflected in their façades and established the precedent for many of the cast-in-place concrete wall systems seen throughout the United States.
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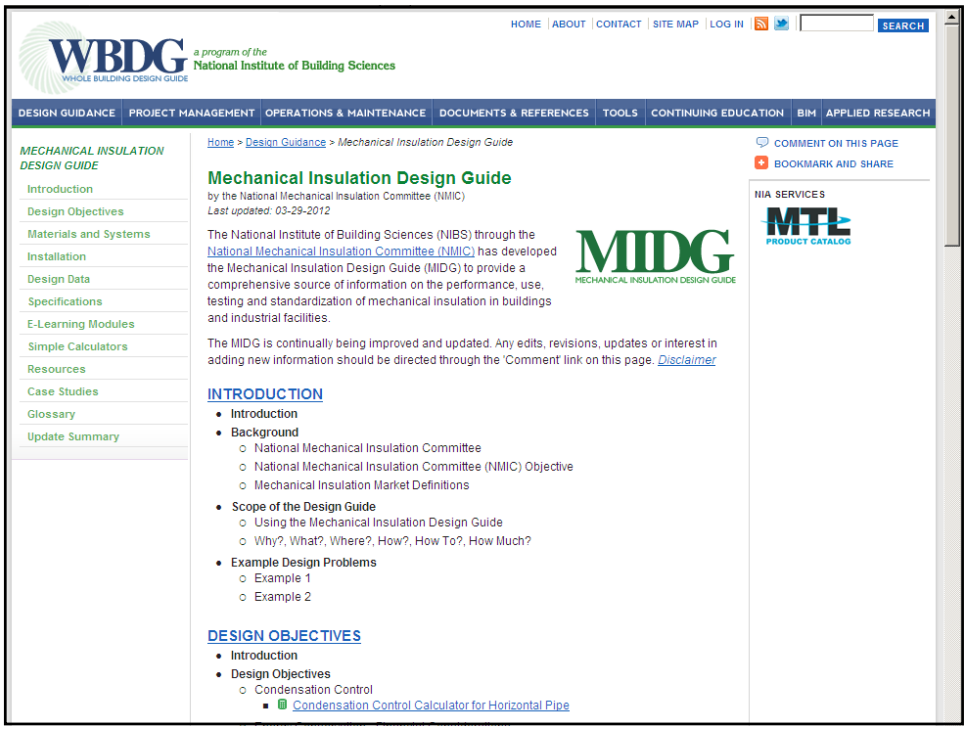
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Mechanical Insulation Design Guide
by the National Mechanical Insulation Committee (NMIC)
Last updated: 03-29-2012
The National Institute of Building Sciences (NIBS) through the National Mechanical Insulation Committee (NMIC) has developed the Mechanical Insulation Design Guide (MIDG) to provide a comprehensive source of information on the performance, use, testing and standardization of mechanical insulation in buildings and industrial facilities.
MIDG
MECHANICAL INSULATION DESIGN GUIDE
The MIDG is continually being improved and updated. Any edits, revisions, updates or interest in adding new information should be directed through the 'Comment' link on this page. Disclaimer
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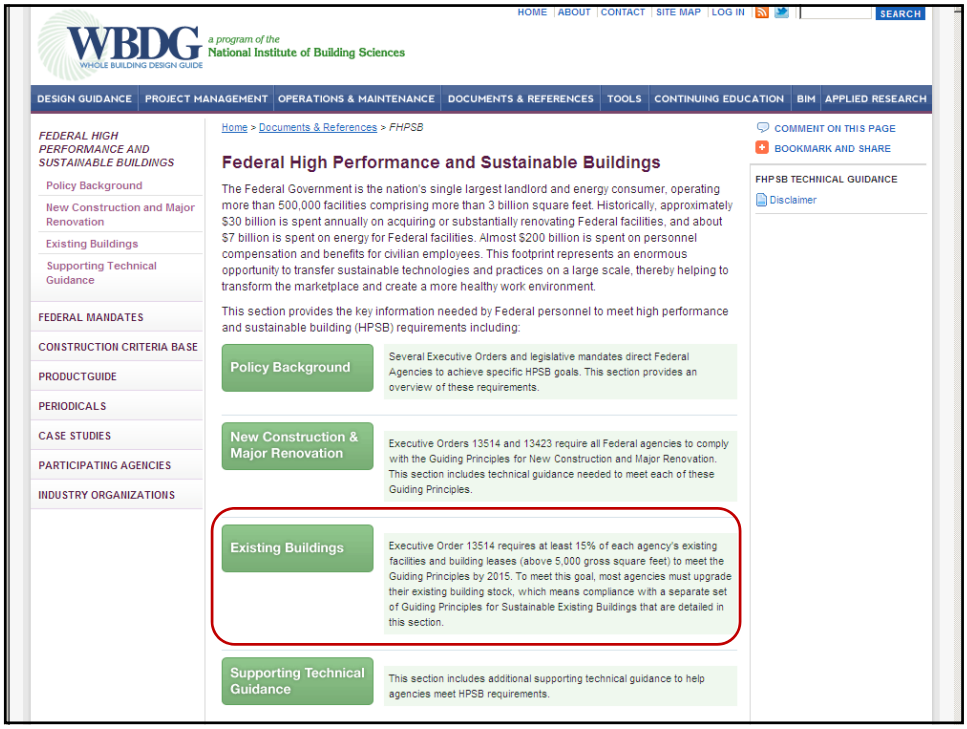
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Federal High Performance and Sustainable Buildings
The Federal Government is the nation's single largest landlord and energy consumer, operating more than 500,000 facilities comprising more than 3 billion square feet. Historically, approximately $30 billion is spent annually on acquiring or substantially renovating Federal facilities, and about $7 billion is spent on energy for Federal facilities. Almost $200 billion is spent on personnel compensation and benefits for civilian employees. This footprint represents an enormous opportunity to transfer sustainable technologies and practices on a large scale, thereby helping to transform the marketplace and create a more healthy work environment.
This section provides the key information needed by Federal personnel to meet high performance and sustainable building (HPSB) requirements including:
Policy Background
Several Executive Orders and legislative mandates direct Federal Agencies to achieve specific HPSB goals. This section provides an overview of these requirements.
New Construction & Major Renovation
Executive Orders 13514 and 13423 require all Federal agencies to comply with the Guiding Principles for New Construction and Major Renovation. This section includes technical guidance needed to meet each of these Guiding Principles.
Existing Buildings
Executive Order 13514 requires at least 15% of each agency's existing facilities and building leases (above 5,000 gross square feet) to meet the Guiding Principles by 2015. To meet this goal, most agencies must upgrade their existing building stock, which means compliance with a separate set of Guiding Principles for Sustainable Existing Buildings that are detailed in this section.
Supporting Technical Guidance
This section includes additional supporting technical guidance to help agencies meet HPSB requirements.
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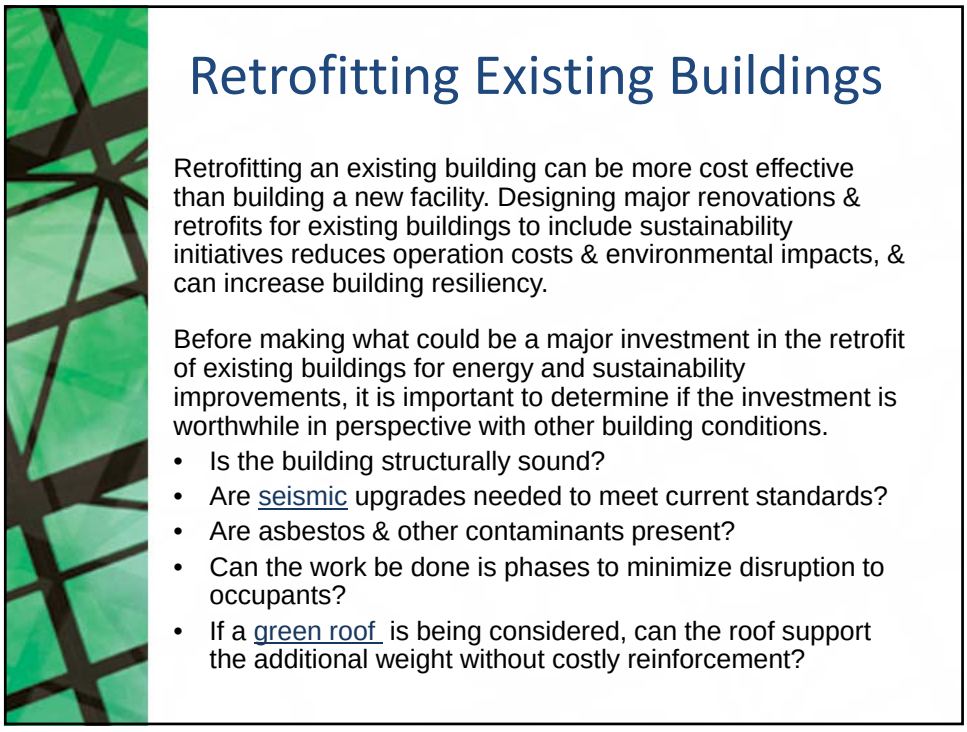
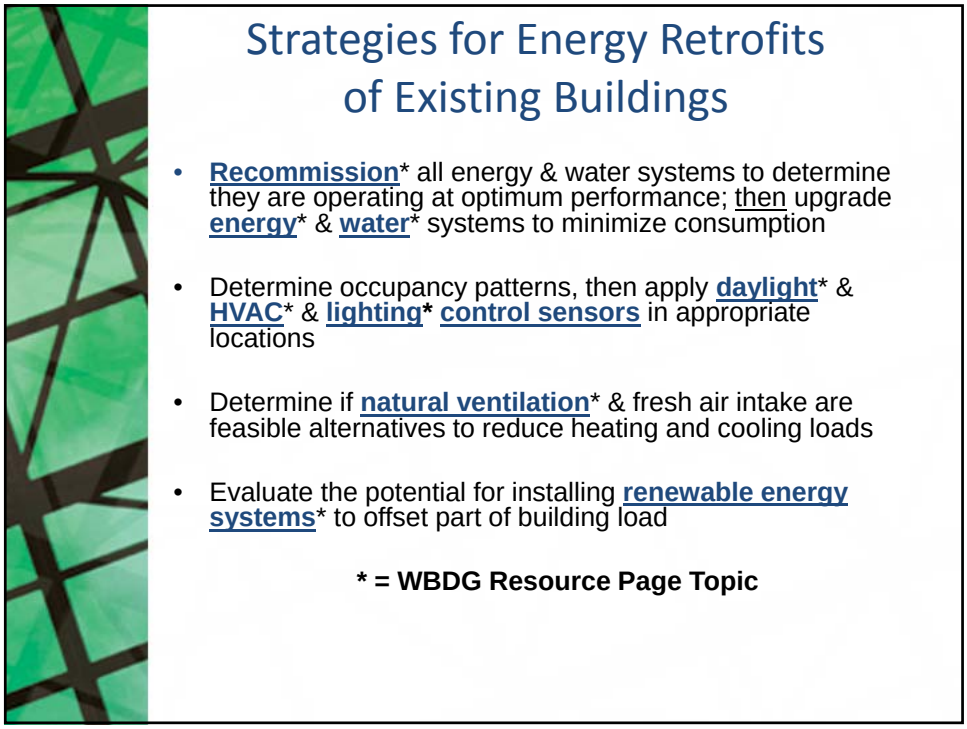
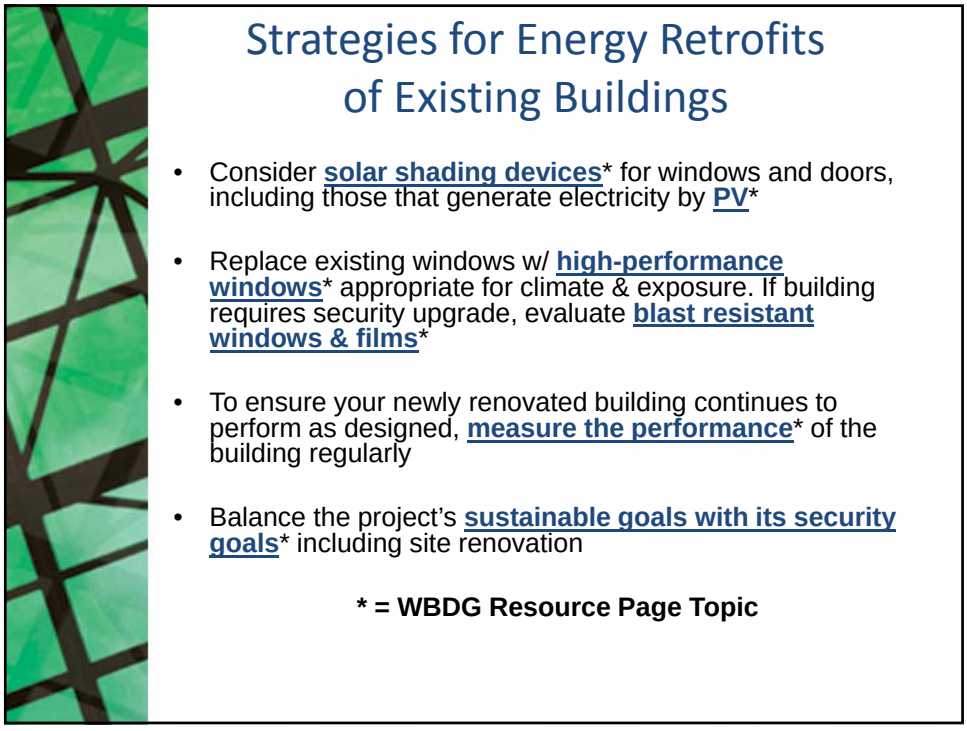

Retrofitting Existing Buildings
Retrofitting an existing building can be more cost effective than building a new facility. Designing major renovations & retrofits for existing buildings to include sustainability initiatives reduces operation costs & environmental impacts, & can increase building resiliency.
Before making what could be a major investment in the retrofit of existing buildings for energy and sustainability improvements, it is important to determine if the investment is worthwhile in perspective with other building conditions.
• Is the building structurally sound?
• Are seismic upgrades needed to meet current standards?
• Are asbestos & other contaminants present?
• Can the work be done is phases to minimize disruption to occupants?
• If a green roof is being considered, can the roof support the additional weight without costly reinforcement?


Strategies for Energy Retrofits of Existing Buildings
• Recommission* all energy & water systems to determine they are operating at optimum performance; then upgrade energy* & water* systems to minimize consumption
• Determine occupancy patterns, then apply daylight* & HVAC* & lighting* control sensors in appropriate locations
• Determine if natural ventilation* & fresh air intake are feasible alternatives to reduce heating and cooling loads
• Evaluate the potential for installing renewable energy systems* to offset part of building load
* = WBDG Resource Page Topic


Strategies for Energy Retrofits of Existing Buildings
• Consider solar shading devices* for windows and doors, including those that generate electricity by PV*
• Replace existing windows w/ high-performance windows* appropriate for climate & exposure. If building requires security upgrade, evaluate blast resistant windows & films*
• To ensure your newly renovated building continues to perform as designed, measure the performance* of the building regularly
• Balance the project's sustainable goals with its security goals* including site renovation
* = WBDG Resource Page Topic

Strategies for Energy Retrofits of Existing Buildings

- Take the opportunity afforded by the building renovation to incorporate **sustainable operations & maintenance*** practices & switch to **green cleaning products & methods***
- For historic buildings, **update systems appropriately*** to maintain a balance between the need for energy & water savings with the character of the original building fabric
- Develop a plan to optimize the recycling and reuse of demolition debris & **construction waste*** to minimize waste to landfill
- Determine if a **cool roof*** or **green roof*** are cost effective ways to reduce heat island effect & stormwater runoff

*** = WBDG Resource Page Topic**

Determine Building Air Tightness

- *Before upgrading to High-Efficiency HVAC, check air tightness of building envelope*
- **ASTM E1827** *Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door*
- **ASTM E779**, *Determining Airtightness of Buildings Air Leakage Rate by Single Zone Air Pressurization*
- *Also check for stuck dampers, dirty filters, bad sensors, faulty or incorrect wiring*

Blower Door Testing

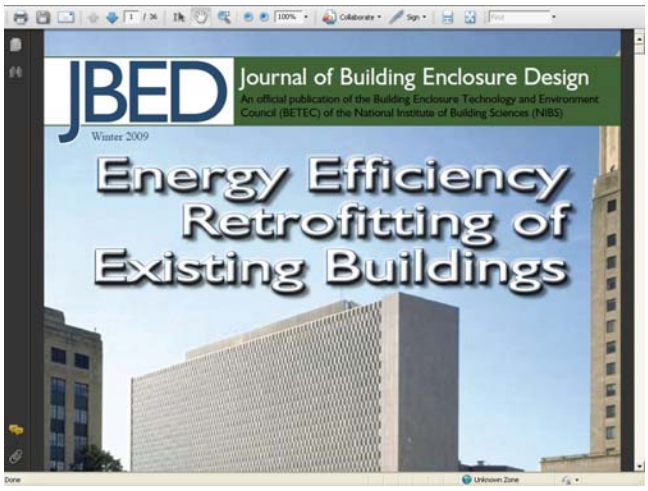
Wagdy Anis WJE
Building Enclosure Councils
BETEC

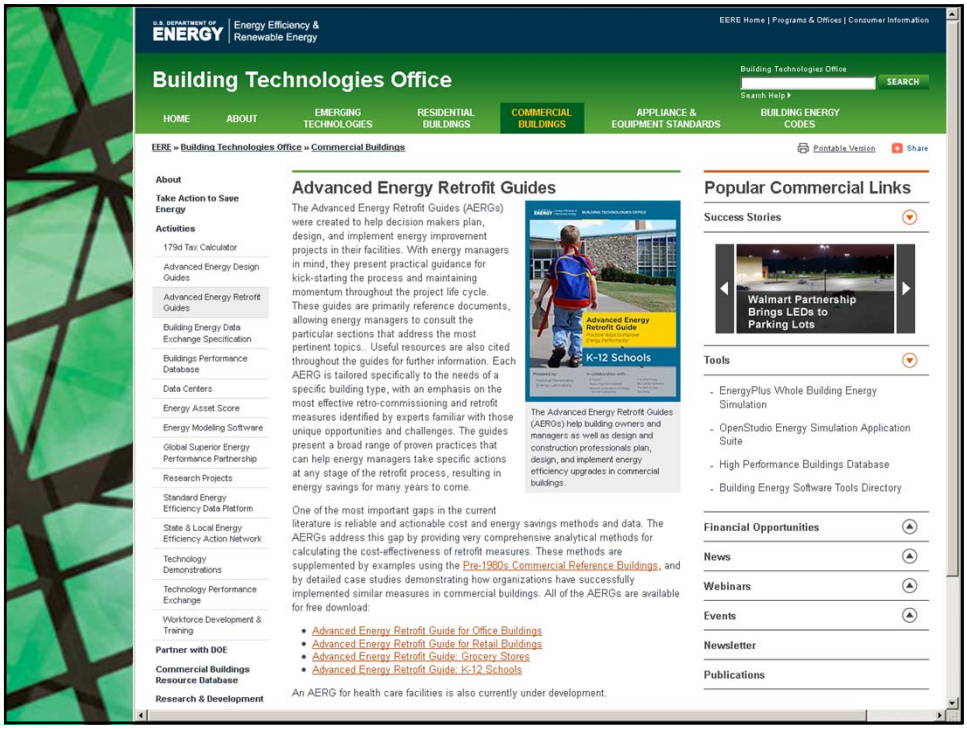
Measurement & Verification

- If the building is metered, review last two years of utility bills to determine if consumption [not cost] has risen
- Plan on installing meters for electric, gas, water and any other utilities

- Smart meters and submeters are preferable to monitor real-time consumption, control demand and increase tenant accountability [cost control]

Additional Resources

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Commercial Buildings Resource Database
Research & Development
Advanced Energy Retrofit Guides
The Advanced Energy Retrofit Guides (AERGs) were created to help decision makers plan, design, and implement energy improvement projects in their facilities. With energy managers in mind, they present practical guidance for kick-starting the process and maintaining momentum throughout the project life cycle. These guides are primarily reference documents, allowing energy managers to consult the particular sections that address the most pertinent topics. Useful resources are also cited throughout the guides for further information. Each AERG is tailored specifically to the needs of a specific building type, with an emphasis on the most effective retro-commissioning and retrofit measures identified by experts familiar with those unique opportunities and challenges. The guides present a broad range of proven practices that can help energy managers take specific actions at any stage of the retrofit process, resulting in energy savings for many years to come.
Advanced Energy Retrofit Guide
K-12 Schools
The Advanced Energy Retrofit Guides (AERGs) help building owners and managers as well as design and construction professionals plan, design, and implement energy efficiency upgrades in commercial buildings.
One of the most important gaps in the current literature is reliable and actionable cost and energy savings methods and data. The AERGs address this gap by providing very comprehensive analytical methods for calculating the cost-effectiveness of retrofit measures. These methods are supplemented by examples using the Pre-1980s Commercial Reference Buildings, and by detailed case studies demonstrating how organizations have successfully implemented similar measures in commercial buildings. All of the AERGs are available for free download:
Advanced Energy Retrofit Guide for Office Buildings
Advanced Energy Retrofit Guide for Retail Buildings
Advanced Energy Retrofit Guide: Grocery Stores
Advanced Energy Retrofit Guide: K-12 Schools
An AERG for health care facilities is also currently under development.
Popular Commercial Links
Success Stories
Walmart Partnership Brings LEDs to Parking Lots
Tools
EnergyPlus Whole Building Energy Simulation
OpenStudio Energy Simulation Application Suite
High Performance Buildings Database
Building Energy Software Tools Directory
Financial Opportunities
News
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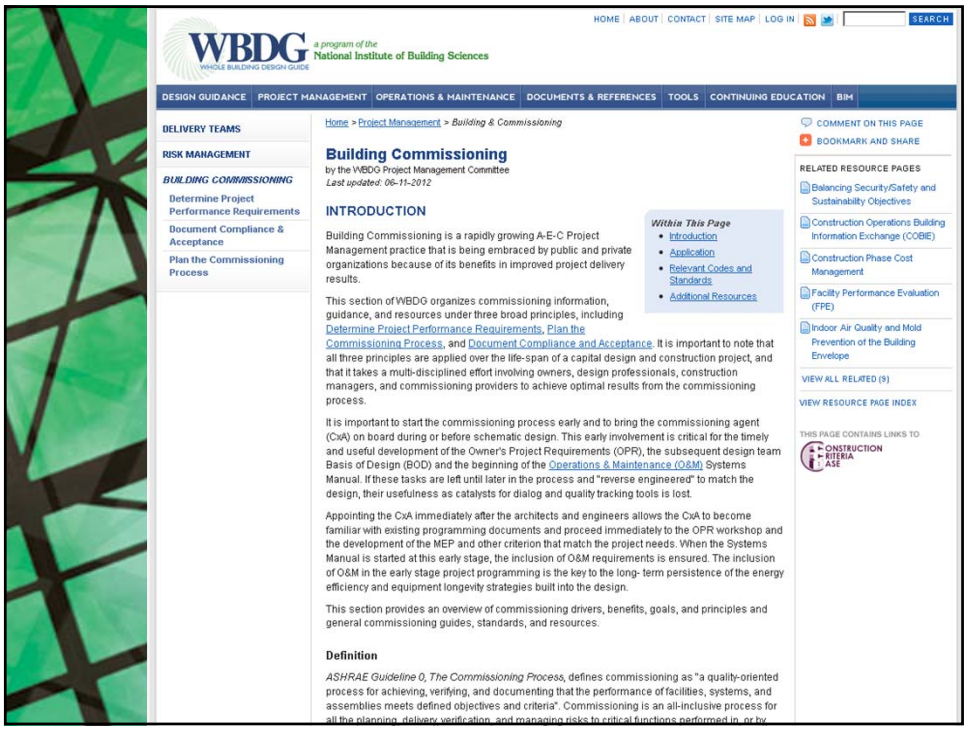
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WBDG a program of the National Institute of Building Sciences
WHOLE BUILDING DESIGN GUIDE
DESIGN GUIDANCE | PROJECT MANAGEMENT | OPERATIONS & MAINTENANCE | DOCUMENTS & REFERENCES | TOOLS | CONTINUING EDUCATION | BIM
DELIVERY TEAMS
RISK MANAGEMENT
BUILDING COMMISSIONING
Determine Project Performance Requirements
Document Compliance & Acceptance
Plan the Commissioning Process
Home > Project Management > Building & Commissioning
Building Commissioning
by the WBDG Project Management Committee
Last updated: 06-11-2012
INTRODUCTION
Within This Page
Introduction
Application
Relevant Codes and Standards
Additional Resources
Building Commissioning is a rapidly growing A-E-C Project Management practice that is being embraced by public and private organizations because of its benefits in improved project delivery results.
This section of WBDG organizes commissioning information, guidance, and resources under three broad principles, including Determine Project Performance Requirements, Plan the Commissioning Process, and Document Compliance and Acceptance. It is important to note that all three principles are applied over the life-span of a capital design and construction project, and that it takes a multi-disciplined effort involving owners, design professionals, construction managers, and commissioning providers to achieve optimal results from the commissioning process.
It is important to start the commissioning process early and to bring the commissioning agent (CxA) on board during or before schematic design. This early involvement is critical for the timely and useful development of the Owner's Project Requirements (OPR), the subsequent design team Basis of Design (BOD) and the beginning of the Operations & Maintenance (O&M) Systems Manual. If these tasks are left until later in the process and "reverse engineered" to match the design, their usefulness as catalysts for dialog and quality tracking tools is lost.
Appointing the CxA immediately after the architects and engineers allows the CxA to become familiar with existing programming documents and proceed immediately to the OPR workshop and the development of the MEP and other criterion that match the project needs. When the Systems Manual is started at this early stage, the inclusion of O&M requirements is ensured. The inclusion of O&M in the early stage project programming is the key to the long- term persistence of the energy efficiency and equipment longevity strategies built into the design.
This section provides an overview of commissioning drivers, benefits, goals, and principles and general commissioning guides, standards, and resources.
Definition
ASHRAE Guideline 0, The Commissioning Process, defines commissioning as "a quality-oriented process for achieving, verifying, and documenting that the performance of facilities, systems, and assemblies meets defined objectives and criteria". Commissioning is an all-inclusive process for
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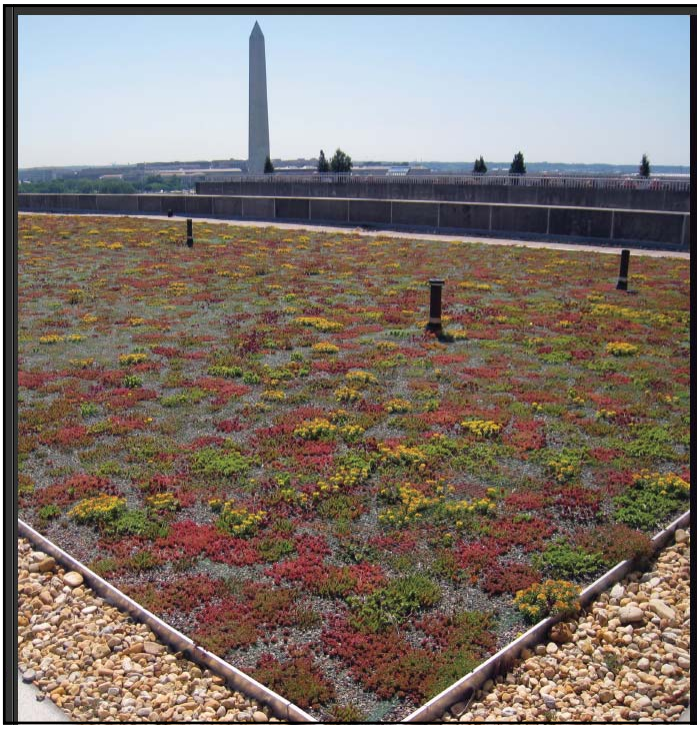
Construction Operations Building Information Exchange (COBIE)
Construction Phase Cost Management
Facility Performance Evaluation (FPE)
Indoor Air Quality and Mold Prevention of the Building Envelope
VIEW ALL RELATED (9)
VIEW RESOURCE PAGE INDEX
THIS PAGE CONTAINS LINKS TO

SUSTAINABILITY AND HISTORIC FEDERAL BUILDINGS

Integrating the Requirements of the National Historic Preservation Act with the Requirements of Executive Order 13514: Federal Leadership in Environmental, Energy, and Economic Performance

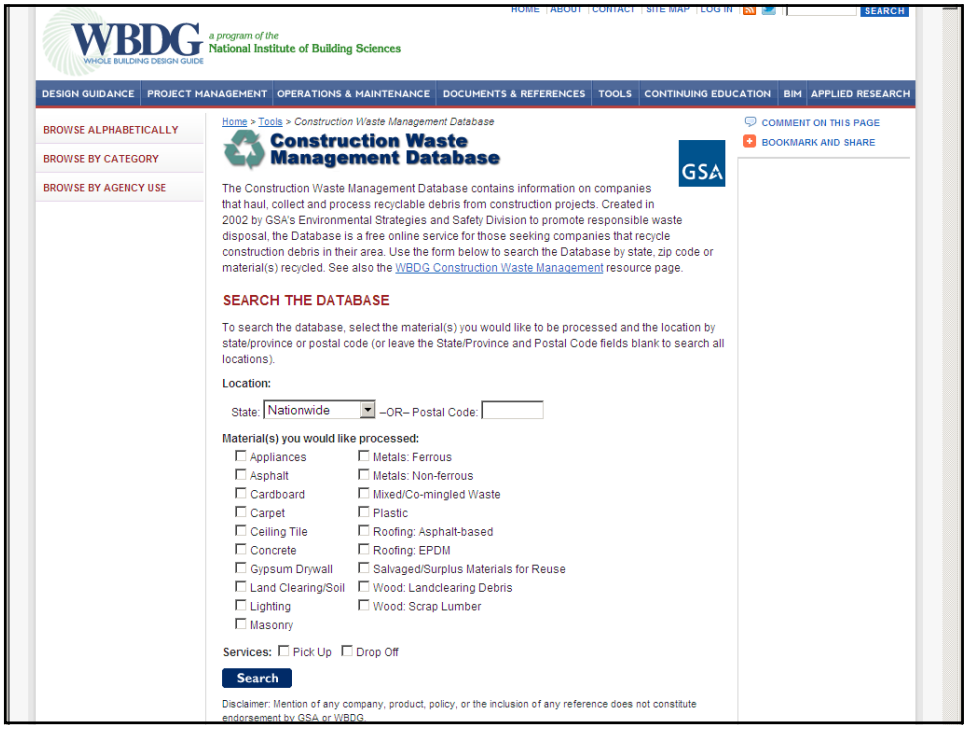
May 2, 2011



THE SECRETARY OF THE INTERIOR'S STANDARDS FOR REHABILITATION &

ILLUSTRATED GUIDELINES ON **SUSTAINABILITY** FOR REHABILITATING HISTORIC BUILDINGS

U.S. Department of the Interior
National Park Service
Technical Preservation Services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Construction Waste Management Database
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The Construction Waste Management Database contains information on companies that haul, collect and process recyclable debris from construction projects. Created in 2002 by GSA's Environmental Strategies and Safety Division to promote responsible waste disposal, the Database is a free online service for those seeking companies that recycle construction debris in their area. Use the form below to search the Database by state, zip code or material(s) recycled. See also the WBDG Construction Waste Management resource page.
SEARCH THE DATABASE
To search the database, select the material(s) you would like to be processed and the location by state/province or postal code (or leave the State/Province and Postal Code fields blank to search all locations).
Location:
State: Nationwide –OR– Postal Code:
Material(s) you would like processed:
Appliances
Asphalt
Cardboard
Carpet
Ceiling Tile
Concrete
Gypsum Drywall
Land Clearing/Soil
Lighting
Masonry
Metals: Ferrous
Metals: Non-ferrous
Mixed/Co-mingled Waste
Plastic
Roofing: Asphalt-based
Roofing: EPDM
Salvaged/Surplus Materials for Reuse
Wood: Landclearing Debris
Wood: Scrap Lumber
Services: Pick Up Drop Off
Search
Disclaimer: Mention of any company, product, policy, or the inclusion of any reference does not constitute endorsement by GSA or WBDG


Are people getting the message that WBDG is the best resource to achieve high-performance buildings?
WBDG averages 500,000 unique visitors per month from all over the globe who download over 6 million documents each month

Getting to High-Performance

- An energy-efficient, high-performance building is best achieved using the integrated design approach
- Conduct charrettes & project team meetings from concept through planning, design & construction (include O&M folks)
- So, now you know that the best resource available to plan, design, construct, operate & maintain New Buildings and major Building Renovation Projects is the

Whole Building Design Guide

National Institute of Building Sciences Annual Conference

BUILDING INNOVATION 2014 | National Institute of BUILDING SCIENCES CONFERENCE & EXPO | ADVANCING LIFE-CYCLE PERFORMANCE

January 6-10, 2014
Washington Marriott
at Wardman Park
Washington, D.C.

Building Innovation 2014 is a gathering place for building community leaders to convene for five impactful days of information sharing, networking and a content-rich conference and educational program, offering sponsors and exhibitors a great opportunity to support the Institute's efforts, reach their target audience, showcase their products and services, and gain valuable exposure and recognition for their contribution to the built environment

http://www.nibs.org/?page=conference2014

To Achieve High-Performance Buildings & Meet the Challenges of the Future

You need ….

- Vision
  - Creative Thinking
    - Knowledge
      - Information
        - Tools

You provide the Vision & Creative Thinking…
WBDG will provide the rest!

Whole Building Design Guide

Thank you for your time!

QUESTIONS??

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