

# WBDG:

A Resource for All

www.wbdg.org

By Bill Brodt and Dana K. Smith, FAIA

wbdg.org

The Whole Building Design Guide (WBDG) ([www.wbdg.org](http://www.wbdg.org)) is the only Web-based portal providing government and industry practitioners with one-stop access to up-to-date information on a wide range of building-related guidance, criteria, and technology from a “whole buildings” perspective.

The resource is a product of the National Institute of Building Sciences (NIBS), a non-government, nonprofit organization that was established by Congress in 1974 but now operates on its own. The Institute was established to build a bridge between the private and public sector. The Whole Building Design Guide is a great example of the role the Institute was meant to play. Also unique is that the Institute is required by its legislation to represent practitioners in all these building industry segments: architects, engineers, contractors, insurers, unions, manufacturers, legal, housing, vendors, owners, consumers, state & federal government, codes & standards, and testing. This makes [www.wbdg.org](http://www.wbdg.org) the perfect place for a whole buildings resource tool.

The WBDG is organized into three major categories:

- Design Guidance
- Project Management
- Operations & Maintenance (O&M)

At the heart of the WBDG are Resource Pages, reductive summaries on particular topics. The WBDG provides easy links to O&M resources developed by Department of Defense (DoD), Department of Energy (DoE), Environmental Protection Agency (EPA), the General Services Administration (GSA), and others including the Federal Energy Management Program's Operations and Maintenance Best Practices Guide. Although the WBDG was started by federal agencies to make it easier for contractors to access their many regulatory and guidance documents, its use within the building industry grows exponentially as more and more people find it a valued resource.

This past year over 22.5 million PDF files were downloaded by an average of 250,000 visitors each month. In October 2008 file downloads set a new record, exceeding 2 million. The educational community is currently the fastest growing user sector.

Among the top WBDG pages based upon access from Internet search engines in 2008 were:

1. Unified Facilities Criteria
2. Building Types
3. Project Planning, Management, and Delivery
4. Sustainable
5. Space Types
6. Building Envelope Design Guide
7. Facilities Operations and Maintenance
8. Specifications
9. Design Objectives
10. Precast Concrete Wall Systems
11. Parking Facilities
12. Natural Ventilation
13. CADD Library
14. Building Commissioning
15. Life-Cycle Cost Analysis (LCCA)
16. Construction Waste Management
17. Cost Estimating
18. Daylighting
19. Architectural Programming

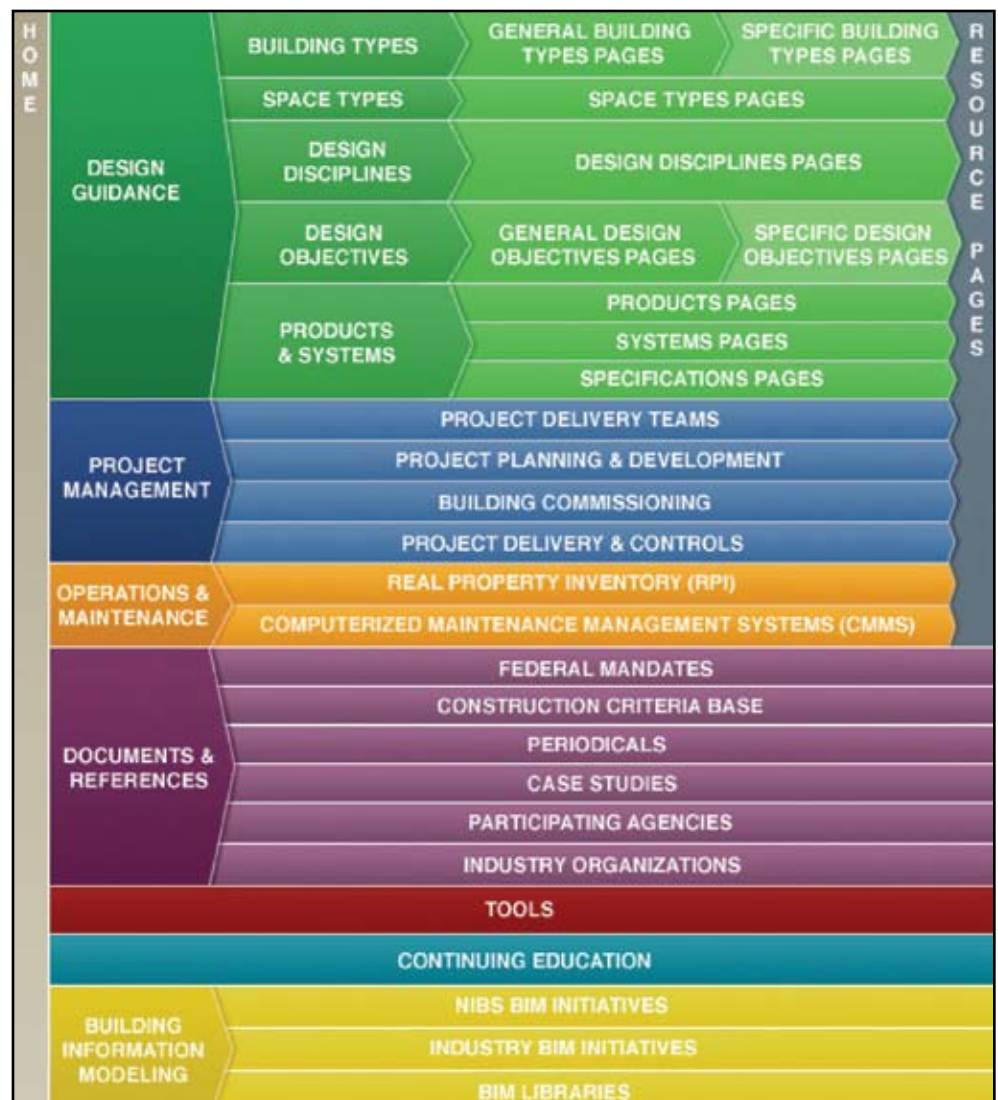
Development of the WBDG is a collaborative effort among federal agencies, private sector companies, nonprofit organizations, and educational institutions. Its success depends on industry and government experts contributing their knowledge and experience to better serve the building community. Twelve WBDG subcommittees were convened in

2008, leading to the revision and update of over two-thirds of the website pages. If you find issues that you feel are missing from the resource there is an easy way to identify the area of expertise that you may wish to add. However, the process to enter information does go through significant review to ensure accurate information is being included.

In this article, we will look at a few of the items that you will find in the WBDG as examples to support your job as facilities management professionals for educational institutions. You should begin to think of the resource as your first stop when seeking information about a facility.

The graphic below illustrates the layout and structure of information within the Whole Building Design Guide. This will also provide an idea of the scope and breadth of this unique resource.

The WBDG embeds links to outstanding authoritative references into the text which summarizes each topic as well as provides links to other key resources identified by the authoring committee of subject experts. APPA members may be especially interested in Operations & Maintenance, Tools,



Emerging Issues, or Building Information Modeling as shown in the following examples:

- **Real Property Inventory (RPI)** — Provides an overview on the type of system needed to maintain an inventory of an organization's assets and what is required to manage those assets.
- **Computerized Maintenance Management Systems (CMMS)** — This section 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.
- **Historic Buildings Operations and Maintenance (O&M)** — this is a unique and complex issue: balancing keeping old equipment running while contemplating the impact of installing new equipment that is more efficient. Further, cleaning of delicate surfaces and artwork require the use of products that are less likely to damage these surfaces, while providing a healthy environment for the building's occupants. Maintaining strict temperature and humidity control to protect artwork and antiques is an additional challenge for the operations and maintenance staff. Extensive research has been done by the Smithsonian Institution regarding the effect of temperature and humidity on artifacts and the reports can be found on the WBDG.
- **Sustainability** — Sustainability as we know is an important aspect of the O&M process and of keen interest to owners and practitioners alike. A well run O&M program should conserve energy and water and be resource efficient, while meeting the comfort, health, and safety requirements of the building occupants.
- **Energy** — The impact of Energy Policy Act of 2005 (EPACT 2005) and the Energy Independence and Security Act of 2007 (EISA 2007) must all be considered in the facilities O&M process. Having the latest and most up to date information in one place is of significant value. Future updates that are planned will provide additional guidance in the following areas:
- **Janitorial/Cleaning** — As the building is opened, the keys are turned over to the janitorial, custodial, or housekeeping staff for interior "cleaning" and maintenance. What information should be passed to them so that they will be able to provide the proper maintenance for the new facilities and all the products contained therein? A Standardized Clean-

O&M activities start with the planning and design of a facility and continue through its life cycle.

ing System (SCS) provides a scientific approach to cleaning and provides for better property asset management. It most importantly provides a healthy workplace for the occupants.

#### Resource links

Energy Policy Act of 2005 (EPACT 2005):  
[www.wbdg.org/pdfs/epact2005.pdf](http://www.wbdg.org/pdfs/epact2005.pdf)  
Energy Independence and Security Act of 2007 (EISA 2007): [http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=110\\_cong\\_bills&docid=f:h6enr.txt.pdf](http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=110_cong_bills&docid=f:h6enr.txt.pdf)

- **Access to 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.

A critical component of an overall facilities O&M program is its proper management. Per the Federal Energy Management Program of the Department of Energy, the management function should bind the distinct parts of the program into a cohesive entity. The overall

program should contain five distinct functions: Operations, Maintenance, Engineering, Technology, and Administration.

O&M activities start with the planning and design of a facility and continue through its life cycle. During the planning and design phases, consideration should be given for professionally developed system-level O&M Manual(s), rather than the typical vendor-supplied equipment manuals.

The Construction Operations Building Information Exchange (COBIE) initiative should also be a consideration. For larger complexes, O&M staff should consider system-wide integration and compatibility of proposed products with existing systems, including tools, equipment and cleaning supplies. This is where the full system commissioning process starts:

**Construction Phase** — Near the end of the construction phase and prior to turnover of the facility, vendor/manufacture O&M manuals are organized and provided to the owner/operator. Typically, personnel are trained in specified areas to support operations. Assurance that the manuals and training are provided is a part of the Building Commissioning process. In addition, typically part of the construction contract, warranties/activation dates and spare parts information should be organized and tracked.



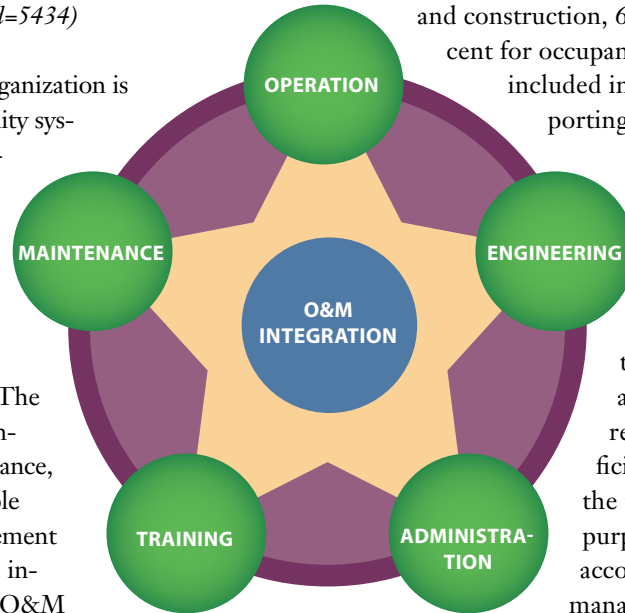
- WBDG—Construction Operations Building Information Exchange (COBIE) ([www.wbdg.org/tools/cobiex.php](http://www.wbdg.org/tools/cobiex.php))
- FEMP O&M Continuous Commissioning Guidebook ([www1.eere.energy.gov/femp/operations\\_maintenance/om\\_ccguide.html](http://www1.eere.energy.gov/femp/operations_maintenance/om_ccguide.html))
- GSA Building Commissioning Guide (04-2005) ([www.wbdg.org/cdb/browse\\_doc.php?d=5434](http://www.wbdg.org/cdb/browse_doc.php?d=5434))

**O&M Approach** — The O&M organization is typically responsible for operating utility systems and for maintaining the built environment. To accomplish this, the O&M organization must operate the systems and equipment responsibly and maintain them properly. The utility systems may be simple supply lines/systems or may be complete production and supply systems. The maintenance work may include preventive/predictive/(planned) and maintenance, corrective (repair) maintenance, trouble calls, (e.g., a room is too cold), replacement of obsolete items, predictive testing & inspection, overhaul, and grounds care. O&M organizations may utilize a Reliability-Centered Maintenance (RCM) program that includes “the optimum mix of reactive, time- or interval-based, condition-based, and proactive maintenance (predictive/planned) practices. These primary maintenance strategies, rather than being applied independently, are integrated to take advantage of their respective strengths in order to maximize facility/equipment reliability, while minimizing life-cycle costs.” Particularly for heating, ventilating, and air conditioning (HVAC) systems, retro-commissioning is an option to improve operating efficiencies. The O&M organization is also normally responsible for maintaining records on deferred maintenance (DM), i.e., maintenance work that has not been accomplished because of some reason—typically lack of funds. However, in a life-cycle view one should look at the cost impact of not doing on the life of the facility. Currently we do not have the tools to evaluate properly the long-term cost of our decisions.

- Energy Star® Buildings Manual
- EPA I-BEAM — The Indoor Air Quality Building Education and Assessment Model (I-BEAM) is a guidance tool designed for use by building professionals and others interested in indoor air quality in commercial buildings.
- FEMP Operations and Maintenance
- Types of Motors
- Society for Machinery Failure Prevention Technology ([www.mfpt.org/](http://www.mfpt.org/))
- LEED for Existing Buildings: Operations and Maintenance ([www.usgbc.org/DisplayPage.aspx?CMSPageID=221](http://www.usgbc.org/DisplayPage.aspx?CMSPageID=221))

- FEMP O&M training ([www1.eere.energy.gov/femp/operations\\_maintenance/](http://www1.eere.energy.gov/femp/operations_maintenance/))

**Life-Cycle O&M** — According to the International Facilities Management Association (IFMA), the operating life cycle costs of a facility typically comprise 2 percent for design and construction, 6 percent for O&M, and 92 percent for occupants’ salaries. O&M of the elements included in buildings, structures and supporting facilities is complex and requires a knowledgeable, well-organized management team and a skilled, well-trained workforce whether the functions are performed in-house or contracted. The objective of the O&M organization should be to operate, maintain, and improve the facilities to provide reliable, safe, healthful, energy efficient, and effective performance of the facilities to meet their designated purpose throughout their life cycle. To accomplish these objectives, the O&M management must manage, direct, and evaluate the day-to-day O&M activities and budget for the funds to support the organization’s requirements. For federal agencies full life cycle costing is a requirement of the 2004 Executive Order 13327—Federal Real Property Asset Management.



- DOD UFC 3-410-05N Heating Systems Operation and Maintenance ([www.wbdg.org/cdb/browse\\_doc.php?d=2899](http://www.wbdg.org/cdb/browse_doc.php?d=2899))
- Society for Machinery Failure Prevention Technology ([www.mfpt.org/](http://www.mfpt.org/))
- The Pennsylvania Green Building Operations and Maintenance Manual ([www.dgs.state.pa.us/dgs/lib/dgs/green\\_bldg/greenbuildingbook.pdf](http://www.dgs.state.pa.us/dgs/lib/dgs/green_bldg/greenbuildingbook.pdf))

**Computerized Maintenance Management Systems** — O&M organizations may utilize Computerized Maintenance Management Systems (CMMS) to manage their day-to-day operations and to track the status of maintenance work and monitor the associated costs of that work. These systems are vital tools to not only manage the day-to-day activities, but also to provide valuable information for preparing facilities key performance indicators (KPIs)/metrics to use in evaluating the effectiveness of the current operations and to support organizational and personnel decisions. These systems are starting to be integrated more and more with Geographic Information Systems (GIS) and Building Information Modeling (BIM) technologies to increase/improve a facility’s longevity.

**Non O&M Work** — Most O&M organizations typically

also perform work that is beyond the definition of O&M, but is so often required and performed by them, that the work often becomes a part of their baseline. This work is facilities-related work that is new in nature, and as such, should not be funded with O&M funds but funded by the requesting organization; e.g., from installing an outlet to support a new copier machine, providing a compressed air outlet to a new test bench, day porter services for special event set-ups and moves, or other minor facilities work of like nature to a complete room rehab and/or new, small construction projects. Methods available to document the built environment's condition and its maintenance/repair needs include the periodic Facility Condition Assessment (FCA).

### EMERGING ISSUES

**Teardowns.** Demolishing old, historic buildings and replacing them with new structures that may not be as durable, sustainable or secure is a problem found in many communities in both the government and private sector. Currently there is no single tool available to solve the teardown problem but rather a combination of strategies works best. One tool available online is Teardown Tools on the Web, created as part of the National Trust for Historic Preservation Teardowns Initiative. This tool is intended as an easy-to-share, user-friendly, one-stop-shop highlighting approximately 30 tools and more than 300 examples of best practices being used around the country: ([www.preservationnation.org/issues/teardowns/](http://www.preservationnation.org/issues/teardowns/)).

**System-level O&M Manuals.** Organizations that require a higher level of O&M information beyond the typical vendor equipment documents should ensure sufficient funds are set aside and appropriate scope/content requirements are written and specified during the planning stage. It is important to analyze and evaluate a facility from the system level, then develop procedures to attain the most efficient systems integration. System-level manuals include as-built information, based on the maintenance program philosophy. O&M procedures at the system level do not replace manufacturers' documentation for specific pieces of equipment, but rather supplement those publications and guide in their use. For example, system-level troubleshooting will fault-analyze to the component level, such as a pump, valve or motor, then reference specific manufacturer requirements to remove, repair, or replace the component. Documentation should typically meet or exceed client or commercial standards, such as ASHRAE Guidelines (e.g., 4-1993, Preparation of O&M Documentation for Building Systems) for format and content, and be tailored specifically to support the Owner's Maintenance Program (MP).

### TOOLS

The Tools section of the Whole Building Design Guide offers information on a variety of desktop or Web-based tools used in the building industry. Current categories are:

- Code Compliance  
([www.wbdg.org/tools/tools\\_cat.php?c=4](http://www.wbdg.org/tools/tools_cat.php?c=4))
- Cost-Estimating  
([www.wbdg.org/tools/tools\\_cat.php?c=2](http://www.wbdg.org/tools/tools_cat.php?c=2))
- Design & Analysis  
([www.wbdg.org/tools/tools\\_cat.php?c=1](http://www.wbdg.org/tools/tools_cat.php?c=1))
- Energy Analysis  
([www.wbdg.org/tools/tools\\_cat.php?c=8](http://www.wbdg.org/tools/tools_cat.php?c=8))
- Life-Cycle Costing / Assessment  
([www.wbdg.org/tools/tools\\_cat.php?c=3](http://www.wbdg.org/tools/tools_cat.php?c=3))
- Life-Cycle Management / Maintenance  
([www.wbdg.org/tools/tools\\_cat.php?c=9](http://www.wbdg.org/tools/tools_cat.php?c=9))
- Professional & Construction Services  
([www.wbdg.org/tools/tools\\_cat.php?c=6](http://www.wbdg.org/tools/tools_cat.php?c=6))
- Program & Project Management  
([www.wbdg.org/tools/tools\\_cat.php?c=7](http://www.wbdg.org/tools/tools_cat.php?c=7))
- Specification Aids ([www.wbdg.org/tools/tools\\_cat.php?c=5](http://www.wbdg.org/tools/tools_cat.php?c=5))

It is important to analyze and evaluate a facility from the system level, then develop procedures to attain the most efficient systems integration.

### BUILDING INFORMATION MODELING (BIM)

A Building Information Model is a digital representation of physical and functional characteristics of a facility. As such, it serves as a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life cycle from inception onward.

A basic premise of building information modeling is collaboration by different stakeholders at different phases of the life cycle of a facility to insert, extract, update, or modify information in the model to support and reflect the roles of that stakeholder. The model is a shared digital representation founded on open standards for interoperability.

BIM standards have many objectives but one of the most important is to improve business function so that collection, use and maintenance of facility information is a part of doing business by the authoritative source and not a separate activity.

The scope of BIM is from the smallest part rolled up to the world or portfolio view, from inception onward in the life cycle of a facility and includes all stakeholders that need facility information from the designers to the occupants.

Numerous organizations have initiatives underway to develop a National BIM Standard. The following sections provide links and describe the efforts underway to develop a standard for information sharing that will help weave all stakeholders into a common fabric:

- **NIBS BIM Initiatives** — information on initiatives led by the National Institute of Building Sciences.
- **Industry BIM Initiatives** — information on industry initiatives from buildingSMART alliance associations to government programs pioneering BIM.
- **BIM Libraries** — information on reports, guidelines, roadmaps, white papers, articles and BIM tools.

#### CONTINUING EDUCATION

The WBDG now offers several continuing education courses built upon the content of the WBDG. For example, Accessible Design, ([www.wbdg.org/education/accessible\\_design.php](http://www.wbdg.org/education/accessible_design.php)), is a one-hour AIA Learning Unit.

The WBDG website is offered as an assistance to the building community by the National Institute of Building Sciences (NIBS) through funding support from the Department of

A Building Information Model is a digital representation of physical and functional characteristics of a facility.

Defense, the NAVFAC Engineering Innovation and Criteria Office, the Army Corps of Engineers, the U.S. Air Force, the U.S. General Services Administration (GSA), the Department of Veterans Affairs, the National Aeronautics and Space Administration (NASA), and the Department of Energy, and the assistance of the Sustainable Buildings Industry Council (SBIC). A Board of Direction and Advisory Committee, consisting of representatives from over 25 participating federal agencies, guide the development of the WBDG. If you are interested in contributing to the Whole Building Design Guide, contact the authors. §

Bill Brodt works in the Facilities Engineering and Real Property Division of NASA, Washington, DC; he can be reached at [bbrodt@nasa.gov](mailto:bbrodt@nasa.gov). This is his first article for *Facilities Manager*. Deke Smith is executive director of the buildingSMART alliance, Washington, DC, and can be reached at [deke@dksic.net](mailto:deke@dksic.net).

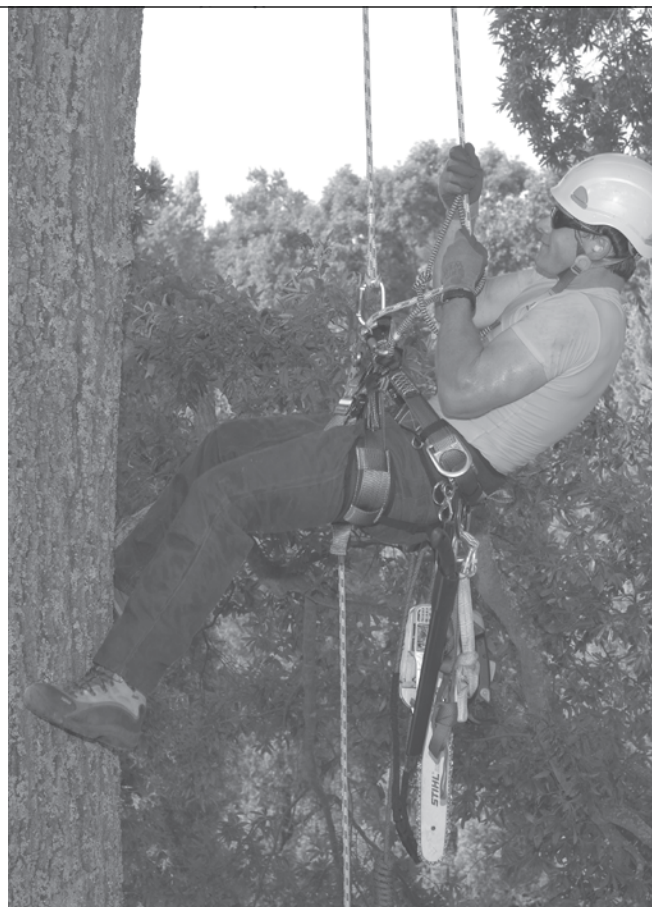
# Service and Support.

It's how Bartlett Tree Experts improves the landscape of commercial tree care



We can make a significant difference in the beauty and value of the trees and shrubs on your property. Bartlett innovations lead the industry in hazard prevention, soil management, root care and pest control. Our services include pruning, fertilization, lightning protection, tree removal, bracing, cabling and detailed inspections.

Bartlett has been dedicated to caring for trees on commercial properties since we first broke ground in 1907.



877-BARTLETT (877-227-8538) or visit our website [www.bartlett.com](http://www.bartlett.com)