

MASSACHUSETTS COMMERCIAL ENERGY CODE

*Projected to save 14 trillion Btus
over the next 20 years*



Buildings for the 21st Century

Buildings that are more energy-efficient, comfortable, and affordable...that's the goal of DOE's Office of Building Technology, State and Community Programs (BTS). To accelerate the development and wide application of energy efficiency measures, BTS:

- Conducts R&D on technologies and concepts for energy efficiency, working closely with the building industry and with manufacturers of materials, equipment, and appliances
- Promotes energy/money saving opportunities to both builders and buyers of homes and commercial buildings
- Works with State and local regulatory groups to improve building codes, appliance standards, and guidelines for efficient energy use
- Provides support and grants to States and communities for deployment of energy-efficient technologies and practices



The state of Massachusetts continues to make a difference in energy code implementation on the east coast, with a complete revision of the energy conservation requirements for new commercial buildings taking effect July 1, 2001. The revised code includes elements from *ANSI/ASHRAE/IESNA Standard 90.1-1999* and the *2000 International Energy Conservation Code (IECC)*TM, as well as several requirements that are unique to Massachusetts.

The code is the culmination of nearly three years of work in which the Massachusetts Board of Building Regulations and Standards (BBRS), the agency responsible for developing and implementing the state building codes, worked collaboratively with an Energy Advisory Committee (EAC), Massachusetts Division of Energy Resources (MADOER), U.S. Department of Energy (DOE), Pacific Northwest National Laboratory (PNNL), local utilities, building professionals, and other stakeholders. Together, they forged a commercial code that delivers significant energy savings and pollution reduction and offers the regulated community a format that is simpler to use and easier to demonstrate compliance.

Highlights of the Massachusetts Commercial Energy Code

The updated code is a complete revision to the energy conservation requirements for new buildings (other than low-rise residential) as outlined in the Massachusetts commercial energy code (780 CMR, Chapter 13) that has been in place since 1988. Some of the key changes in substantive requirements include:

- ✓ Increased efficiency requirements for HVAC equipment and systems.
- ✓ Labeling and rating requirements for fenestration and doors.
- ✓ Requirements for improved vapor barriers, continuous air barriers, and full continuous insulation on metal-framed buildings.
- ✓ Substantially reduced allowances for lighting power.
- ✓ Requirements for the installation of automatic lighting controls for most spaces.



The new student center at Worcester Polytechnic Institute was designed and built to comply with all the requirements of the revised Massachusetts commercial energy code. Photo courtesy of Woodruff and Brown Photography, West Hartford, Connecticut.

- ✓ Requirements for high-efficiency transformers as outlined by the Massachusetts Electric Utility Restructuring Act.
- ✓ New administrative requirements for approval and acceptance of HVAC, lighting, and power systems to ensure systems are designed to meet intended needs, installed as designed, and perform as intended.

BBRS rewrote the Massachusetts commercial energy code (780 CMR, Chapter 13) to simplify compliance and enforcement and increase flexibility for designers. Building professionals can take advantage of a variety of materials and activities designed to support compliance and enforcement. These include forms and compliance checklists, sample reports for approval and acceptance, *COMcheck-EZ™* compliance software, and other support outlined later in this case study.

Collaborative Code Adoption Process

Initial work on the commercial code upgrade began in late 1998—shortly after Massachusetts implemented a new residential code. Massachusetts

had been using a state-modified version of ANSI/ASHRAE/IESNA 90.1-1989 and sought an upgrade to capture the benefits of 10 years of improvements in design, technology, and construction practices.

Similar to the residential code process, BBRS's first step was to involve its EAC, comprised of professional architects, engineers, lighting designers, code officials, technical staff from MADOER, and BBRS, and others in the industry. The EAC examined drafts of ANSI/ASHRAE/IESNA 90.1-1999, proposed amendments to Chapter 7 of the 1998 IECC (now Chapter 8 of the 2000 IECC), and Massachusetts-specific amendments addressing energy issues specific to the Northeast.

Technical assistance provided through DOE's Building Standards and Guidelines Program (BSGP), supported the EAC's technical review. DOE-2 energy simulations were performed on six building types in three climate zones. Building types were chosen to provide examples of the most common buildings being built in Massachusetts and also to capture some of the variations present in current construction. A spreadsheet tool was also developed that allowed the EAC to calculate the energy and cost impacts of proposed code scenarios.

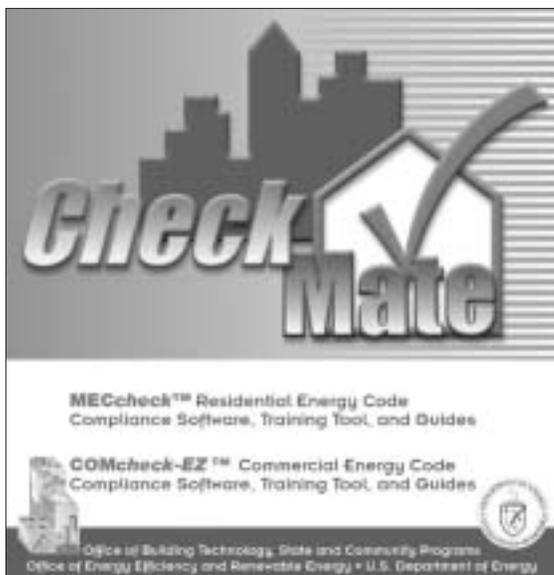
"The technical support was a critical

resource in our decision-making process," says David Weitz, BBRS energy code coordinator. "It was extremely valuable to be able to analyze the energy and financial impacts of different code requirements."

The New Buildings Institute and Northeast Energy Efficiency Partnerships, Inc. also provided technical assistance, particularly on shaping the format of the new code to match the IECC to simplify future updates.

While the code was evolving, BBRS and the EAC did extensive outreach with the design and construction community, seeking input statewide. The Building Codes Assistance Project marshaled key support within the region and industry. Over an 18-month period, this process led to 20 Massachusetts-specific improvements—and a final code that enjoys ownership within the regulated community.

The entire code review, adoption, and implementation process has been supported by DOE State Energy Program (SEP) Special Project Code grants that funded BBRS's energy code coordinator. States are eligible to compete annually for SEP Special Project funds for codes.



Working closely with state officials, DOE has developed Massachusetts-specific versions of its MECcheck residential energy code compliance software and COMcheck-EZ commercial energy code compliance software. The CheckMate CD contains both the MECcheck and COMcheck-EZ software, training tools, and guides. Software is available on the DOE Website (www.eren.doe.gov/buildings/codes_standards/buildings) or call the Energy Codes Hotline 1-800-270-CODE (2633).



**MECcheck™ for
Massachusetts
Residential Energy Code**

Massachusetts Residential Code—Another Success Story

In 1998, Massachusetts upgraded its residential code to the CABO MEC 95. The new residential code was the result of three years of collaborative effort supported by several organizations. DOE provided SEP Special Project Code grant funding that supported BBRS staff during code development, as well as training and outreach of more than 7,500 building professionals.

Through DOE's BSGP, PNNL provided technical assistance on proposed code options and developed the **MAScheck™** Software.

According to David Weitz, BBRS energy code coordinator, "**MAScheck™** is now used by about 85 percent of those demonstrating compliance with the energy code."

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Training and Compliance Tools Ensure Success

In addition to the code amendments, BBRS initiated a variety of efforts to support compliance and enforcement.

✓ **Training for building professionals.**

An extensive training effort began more than 15 months before the code was scheduled to become mandatory. BBRS hired professional architects, engineers, and designers to develop and deliver free training in four areas: HVAC, Lighting and Power Distribution, Envelope, and Code Compliance Software.

More than 3,500 building professionals have attended training in one or more of these areas. Response from participants has been favorable and constructive feedback enabled the BBRS to further refine the amendments.

"This training reflects the very positive impact of DOE grant money," says Tom Riley, BBRS code development manager. "We could not have embarked on this quality or quantity of training without DOE funding and utility matching funds."

✓ **Outreach to stakeholders.**

BBRS has also used DOE support to make presentations to architecture and engineering firms, equipment suppliers, and trade organizations such as the Associated General Contractors. More than 200 stakeholders have attended these presentations, and another 300 are expected to attend by the end of 2001.

✓ **COMcheck-EZ™ compliance software.**

BBRS asked PNNL to develop a Massachusetts-specific version of **COMcheck-EZ™**, code compliance software developed and made available through DOE's BSGP. **COMcheck-EZ™** is a recognized proof-of-compliance tool for national model building codes that is used in more than 30 states. The Massachusetts variant of **COMcheck-EZ™** can be used to show compliance of envelope and/or lighting designs. Users can trade off the energy conservation characteristics of building elements against each other (such as roof vs. wall, glazing vs. insulation.)

"**COMcheck-EZ™** is an excellent tool that helps architects make important design choices," says Wagdy Anis, AIA, Director of Technical Resources, Shepley, Bulfinch, Richardson and Abbott. "I have used the software on buildings in Massachusetts and New Hampshire, and it is very user-friendly. By providing information on how components of the building envelope affect performance, **COMcheck-EZ™** gives architects greater control over the building design."

The Massachusetts version of **COMcheck-EZ™** is offered free of charge from the Massachusetts BBRS Website at www.state.ma.us/bbrs/energy.htm. A CD version is available from the DOE Energy Codes Hotline at **1-800-270-CODE (2633)** for a nominal fee.

✓ **Self-help tool to familiarize code users with new requirements.**

Available at the Massachusetts BBRS Website and on CD, this tool offers the code text with an index, commentary on the code with links back to the code text, a search feature, and an introduction to **COMcheck-EZ™** software.

Projected Energy and Cost Savings and Pollution Reduction

Compared to the former code, the revised Commercial Energy Code (Chapter 13) is estimated to save approximately 13 percent of primary energy use for lighting and HVAC, and about 7.5 percent of all primary energy use in new commercial buildings.

Cumulative new construction savings are projected at 14 trillion Btus between 2001 and 2021. The present value of these projected savings is estimated to be about \$120 million. The simple payback for all code requirements is expected to average less than two years.

The reduced need for power generation offers a corresponding reduction in air pollution emissions. Over 20 years, the code is expected to prevent 7,478 tons of sulfur dioxide, 2,003 tons of nitrous oxides, and 1.3 million tons of carbon dioxide emission.

- Massachusetts has already trained more than 3,500 building professionals on the new commercial code. Training on the Massachusetts-variant of the **COMcheck-EZ™** energy code compliance software is not only popular, but is further supported by videos, computer-based training tools, and other training materials from DOE. For additional information on training, visit www.state.ma.us/bbrs/energy.htm.



MASSACHUSETTS COMMERCIAL ENERGY CODE

For more information on the Massachusetts code contact:

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DOE support offered through PNNL:

Energy Codes HOTLINE
1-800-270-CODE (2633)
and Tech Support
techsupport@bsgp.pnl.gov



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DOE's Building Standards and Guidelines Program (BSGP)

BSGP offers a range of services and products that make it easy to update, implement, and enforce commercial and residential energy codes.

- ✓ **Energy Codes Hotline** — Specialists at PNNL offer technical support on code compliance software tools and national energy codes through the Energy Codes Hotline at **1-800-270-CODE (2633) ext. 2**, or by email at techsupport@bsgp.pnl.gov. Since 1996, the Energy Codes Hotline has fielded more than 14,000 inquiries from building professionals on model residential and commercial codes.
- ✓ **Website** — Access a wealth of information, download DOE's **COMcheck-EZ™** and **MECcheck™** compliance software, and learn more about BSGP products and services at www.eren.doe.gov/buildings/codes_standards/buildings.
- ✓ **Code Compliance Support Materials** — The **COMcheck-EZ™**, **COMcheck-Plus**, and **MECcheck™** energy code compliance software provide a fast and easy way for designers, builders, and others to determine if new buildings meet the requirements of model energy codes. Different versions of the software are being used to demonstrate compliance with model energy codes in more than 30 states. The software and accompanying users' guides and

compliance manuals can be downloaded free of charge from the Website. In late 2001, these software products become Web-based, allowing users to run them online at no charge.

- ✓ **Training** — Hands-on training on the compliance software occurs regularly throughout the country.
- ✓ **Training Materials** — The **MECcheck™** and **COMcheck-EZ™** product lines include videos, computer-based training tools, and other training materials. These materials are available in hard copy and on diskette by calling the Energy Codes Hotline or by visiting the DOE Website.
- ✓ **Technical Assistance** — States can request that BSGP perform needed analysis or provide specialized support.

Influencing National Codes

Massachusetts benefited from a wealth of national expertise during code development. In addition, information from the Massachusetts experience flowed back and helped influence national model codes, local codes, and accompanying code support materials.

Development of the Massachusetts specific version of **COMcheck-EZ™** required adaptations to reflect the types of buildings and HVAC systems used in the Northeast to strengthen the product for regional and national use.



The new Massachusetts commercial energy code delivers benefits to both the business community and the state. The cumulative 20-year energy savings has a present value estimated at about \$120 million, and the reduced need for power generation helps curb air pollution emissions statewide.