Commercial Energy Conservation Code of Maine

Agenda
- Title 16 Department of Public Safety
  - 635 (now) Bureau of Building Codes and Standards
  - Course time 8 hours
  - Overview of the Commercial Energy Code
  - Certification Process
  - Timeline and Enforcement
  - Resources for Information
  - Overview of ASHRAE 90.1-2007
  - Revisions to the IECC

The New Standard
Title 16 Department of Public Safety
635 (now) Bureau of Building Codes and Standards - Maine Uniform Building and Energy Code
Chapter 6 Energy Conservation Code of Maine

Commercial Energy Code
Establishes Commercial Energy code component of the Maine Uniform Building and Energy Code (MUBEC)

The provisions of this chapter are based on a nationally recognized model building code published by the International Code Council, Inc., and is made part of the MUBEC through incorporation by reference.

This chapter also contains requirements for the enforcement of the Energy Conservation Code by local building officials in municipalities with a population of more than 4,000 residents.

Oh yeah... Those pesky cell phones!
Purpose and Scope

- All building construction in Maine, with some exceptions, is governed by the MUBEC, which is adopted by the Technical Building Codes and Standards Board pursuant to 10 M.R.S. Chapter 1103.

The primary objective of the Board is to establish a uniform building code throughout the State of Maine.

Purpose and Scope

- Chapter 6 sets forth the regulation of the design and construction of buildings for the effective use of energy and is applicable to both residential and commercial buildings.

Authority

- The authority for this Chapter is 10 M.R.S. §722, which provides that the Maine Technical Building Codes and Standards Board shall promulgate rules which adopt, amend, and maintain the Maine Uniform Building and Energy Code.

Adopted Codes and Standards

The Commercial Energy Conservation Code of Maine has adopted the following:


To download rules that detail the amendments to the code, go to www.maine.gov/psb/docs

Incorporation by Reference

The following Chapters of the 2009 International Energy Conservation Code, published by the International Code Council, Inc., are hereby adopted and incorporated by reference and are an enforceable part of the MUBEC:

- Chapter 1 Administration
- Chapter 2 Definitions
- Chapter 3 General Requirements
- Chapter 4 Residential Energy Efficiency
- Chapter 5 Commercial Energy Efficiency
- Chapter 6 Referenced Standards

Excluded from Adoption

At this time, none of the content contained in the 2009 International Energy Conservation Code has been excluded from adoption.
Choices

The IECC references ASHRAE 90.1-2007 as an alternate means of compliance.

IECC

The International Energy Conservation Code offers several options in which to achieve compliance. By selecting a specific method, certain parts of the code will not be required.

ASHRAE

Although ASHRAE 90.1 is a little tighter, it doesn't offer much flexibility, and must be complied with in full.

Chapter 5 of the IECC

Commercial Energy Efficiency requirements address:

- Wall, roof and floor insulation
- Windows and skylights
- Cooling equipment
- Heating equipment
- Pumps, piping and liquid circulating systems
- Heat rejection equipment
- Service water heating
- Electrical power and lighting systems
Chapter 5 of the IECC

Is applicable to:

- New commercial buildings
- High-rise residential buildings (4+ stories in height)
- Additions, repairs and alterations to existing buildings

Does not regulate:

- Energy used by things like coffee pots, office equipment and computers, etc.
- Energy primarily used for manufacturing, commercial or industrial processing, etc.

Certification Standards

For Building Officials and Third Party Inspectors

The training and certification committee of the Technical Building Codes and Standards Board shall determine the standards for certifying building officials and third-party inspectors.

Standards shall enumerate the knowledge and training required to ensure that building officials and third-party inspectors have the basic understanding needed to apply the MUBC and the ongoing education needed to stay current with code changes and amendments.

Certification Standards

There are seven new standards in which building officials may be certified.

- International Residential Code (IRC)
- International Building Code (IBC)
- Residential Energy Code (IECC)
- Commercial Energy Code (IECC)
- Residential Ventilation Code
- Commercial Ventilation Code
- Radon - Registration now required

Advisory Rulings and Technical Support

The interpretation and enforcement of this Code are the responsibility of the local municipality.

However, the Bureau is available to provide advisory rulings and technical support for the administration of this Code, amendments, conflict resolutions, and interpretations. This support includes but is not limited to:
Advisory Rulings and Technical Support

Written Request

Written Request Shall Include:

- Specific identification of the subject code or codes with a description of the questioned application or perceived conflict.
- Relevant construction documents to fully illustrate the issue upon which an advisory interpretation is sought.
- The Bureau may request additional documentation or information required to issue an advisory interpretation or to provide technical support. All requested information shall be provided within 30 days of request, or the request for advisory interpretation or support may be deemed abandoned.

Advisory Rulings and Technical Support

The technical support shall also include:

- Written, non-binding advisory interpretations

Other Considerations

- Procedure for code amendment
- Procedures for identifying and resolving conflicts between this Code and the Fire Safety Codes and standards.
- Experimental buildings
- Native lumber

MUBEC does not apply to

- Log homes or manufactured homes defined in Chapter 951.
- Post and beam or timber frame construction.
- Warehouses or silos used to store crops.
- Seasonally restricted colonies.

Timeline
Timeline

On December 1, 2010, this code shall be applicable statewide.

No later than December 1, 2010, this Code must be enforced in a municipality with a population of 4,000 residents or more that had previously adopted any building code on or before August 1, 2008.

Timeline

No later than July 1, 2012, this Code must be enforced in a municipality with a population of 4,000 residents or more that had not adopted any building code on or before August 1, 2008.

Timeline

The provisions of the MUBEC do not apply to municipalities with a population of less than 4,000 residents, except to the extent that the municipality has adopted that code.

MUBEC Components

Maine Uniform Building Code – That portion of the MUBEC that does not contain energy code requirements as determined by the board pursuant to section 9722, subsection 5, paragraph L.

Maine Uniform Energy Code – That portion of the MUBEC that contains only energy code requirements as determined by the board pursuant to section 9722, subsection 6, paragraph L.

Municipalities Under 4,000

Effective September 2011, all towns under 4,000 in population have the following options:

1. Choose to adopt and enforce the MUBEC.
2. Choose to adopt and enforce MUBC only.
3. Choose to adopt and enforce MUEC only.
4. Choose to have no code.

Timeline

Effective December 1, 2010, except as provided in 10 M.R.S. 9724(4) and 9725, any ordinance regarding any building code of any political subdivision of the State that is inconsistent with the MUBEC is void, with the following exception:

This provision does not apply to any adopted fire & life safety code, fire safety ordinance or any land use ordinance, including Land Use Regulatory Commission rules.
Enforcement

Pursuant to 20 M.R.S. 2373, in municipalities with a population over 1,000, enforcement of the provisions of a MRP shall be the responsibility of the municipality and shall be accomplished by one or more of the following means:

Enforcement

Building Officials

Inspections performed by building officials certified pursuant to 30-A M.R.S. 4451.

Enforcement

Inspections by Virtue of Inter-local Agreements

Inspections performed by virtue of inter-local agreements with other municipalities, that share the use of building officials certified in building standards pursuant to 30-A M.R.S. 4451.

Enforcement

Contractual Agreements

Inspections performed by virtue of contractual agreements with one or more municipalities, or county or regional authorities, that share the use of building officials certified in building standards pursuant to 10 M.R.S. 6723.

Enforcement

Third Party Inspection by Report

Inspections performed and verified by reports from a TPI, certified pursuant to 10 M.R.S. 6723.
Enforcement

If the municipality does not elect one or more of the four options listed above, then the applicant shall elect to have an inspection performed by a TPI of their own code.

Inspections

Will vary depending on the code/standard that you are using.

- International Energy Conservation Code - Suggested list
- ASHRAE 90.1-2007 - Subject to inspection, specified by BO
- International Existing Building Code - Required list
  (Compliance is with IECC)

IECC Suggested Inspections

Some suggested inspection areas...

- Envelope
  - Foundation
    - Perimeter slab insulation
    - Below grade wall insulation
  - Framing
    - Foundation discrepancies corrected
    - Fenestration requirements
    - Air leakage of windows, skylights, doors, etc
    - Envelope air leakage
    - Skylight U-factors
    - Door U-factors

IECC Suggested Inspections

Will vary depending on the code/standard that you are using.

- International Energy Conservation Code - Suggested list

104.1. General
Construction or work for which a permit is required shall be subject to inspection by the code official.

See Commentary
IECC Suggested Inspections

**Insulation**
- Framing discrepancies corrected
- Vapor retarders
- Roof R-values
- Type IC light fixtures (ASTM E 283)
- Interior wall R-values (adjacent to unconditioned space)
- Floor R-values
- R-values—below grade walls
- Protection of below grade insulation
- Thermal barriers in above/below grade combo walls
- R-values of exterior walls
- Inform contractor of missing items or corrections needed
- Final inspection

Other inspection areas with similar suggested lists include:

**Mechanical**
- Service water heating

**Electrical power and lighting**
IECC Required Inspections

104.5 Inspection Agencies
The building official is authorized to accept reports of approved agencies, provided such agencies satisfy the requirements as to qualifications and reliability.

104.6 Inspection Requests
It shall be the duty of the permit holder or their agent to notify the building official that such work is ready for inspection.

It shall be the duty of the person requesting any inspections required by this code to provide access to and means for inspection of such work.

104.7 Reinspection and testing
Discusses that deficiencies noted by inspection must be corrected and reinspected.

104.8 Approval
After the prescribed tests and inspections indicate that the work complies in all respects with the code, a notice of approval shall be issued by the code official.

IECC Required Inspections

Remember... the aforementioned suggested inspections are those listed by the ICC, and published in the IECC and Commentary.

Those are only suggestions!
You have a handout from the U.S. DOE that may be used by building officials as a model to develop your own inspection checklist.

http://www.energycodes.gov/arra/compliance_checklists.htm
Inspections

Will vary depending on the code/standard that you are using.

- ASHRAE 90.1-2007 - Subject to inspection, specified by CO

4.2.4
All building construction, additions, or alterations subject to the provisions of this standard shall be subject to inspection by the building official, and all such work shall remain accessible and exposed for inspection purposes until approved by the procedures specified by the building official.

ASHRAE Required Inspections

Wall insulation

After the insulation and vapor retarder are put in place but before concealment

ASHRAE Required Inspections

Roof/ceiling insulation

After roof/ceiling insulation is in place but before concealment

ASHRAE Required Inspections

Slab/foundation wall

After slab/foundation insulation is in place but before concealment

ASHRAE Required Inspections

Fenestration

After all glazing materials are in place

ASHRAE Required Inspections

Mechanical systems

And equipment and insulation after installation but before concealment
ASHRAE Required Inspections

**Electrical equipment**

After and systems after installation but before concealment.

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**Inspections**

Will vary depending on the code/standard that you are using.

- International Existing Building Code - Required list (Compliance is with IECC)

Although the IEBC is not an energy code, it does refer to the IECC in several instances.

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**IEBC Required Inspections**

**307.5 Energy**

(This paragraph is not referenced in Chapter 15: Referenced Standards)

Buildings undergoing a change of occupancy that would result in an increase in demand for either fossil fuel or electrical energy shall comply with the International Energy Conservation Code (IECC).

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**IEBC Required Inspections**

**602.4 Materials and methods**

All new work shall comply with materials and methods requirements in the International Energy Conservation Code, the International Mechanical Code, and the International Plumbing Code, as applicable, that specify material standards, detail of installation and connection, joints, penetrations, and continuity of any element, component, or system in the building.


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**IEBC Required Inspections**

**607.1 Energy Conservation**

Level 1 alterations to existing buildings or structures are permitted without requiring the entire building or structure to comply with the energy requirements of the International Energy Conservation Code or the International Residential Code.

The alterations shall conform to the energy requirements of the International Energy Conservation Code or the International Residential Code as they relate to new construction only.

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**Level 1 Alterations**

**IEBC Chapter 6**

Level 1 alterations include the removal and replacement of the covering of existing materials, elements, equipment, or fixtures using new materials, elements, equipment or fixtures that serve the same purpose.
IEBC Required Inspections

711.1 Energy Conservation

Level 2 alterations to existing buildings or structures are permitted without requiring the entire building or structure to comply with the energy requirements of the International Energy Conservation Code or the International Residential Code.

The alterations shall conform to the energy requirements of the International Energy Conservation Code or the International Residential Code as they relate to new construction only.

Level 2 alterations shall comply with Chapter 6 and Chapter 7.

IEBC Required Inspections

808.1 Energy Conservation

Level 3 alterations to existing buildings or structures are permitted without requiring the entire building or structure to comply with the energy requirements of the International Energy Conservation Code or the International Residential Code.

The alterations shall conform to the energy requirements of the International Energy Conservation Code or the International Residential Code as they relate to new construction only.

With regard to historic buildings, efforts should be made to preserve existing historic materials.

- Add value
- Reduce ongoing maintenance costs
- Permit greater energy savings
- Less waste stream

Make sure that new materials used will perform effectively with existing materials and energy improvement measures.

Level 3 Alterations

IEBC Chapter 8

Level 3 alterations apply where the square area exceeds 50 percent of the aggregate area of the building.

Level 3 alterations shall comply with Chapters 6, 7 and 8.

Use caution and foresight when making significant changes to historic buildings.

- Flow of existing ventilation
- Lighting energy saved in large windows and light shafts
- How will the overall envelope perform when integrated with new structures or mechanical systems?
Control moisture and Ensure Acceptable Air Quality

- Manage precipitation and roof runoff
- Manage interior water vapor and dew points in walls and ceilings
  - Remove moisture from the immediate surroundings of a building
    - Evaluate roof and exterior siding
    - Extend downspouts
    - Keep gutters clear and ensure proper drainage
    - Ensure grading directs water away from the building

Maine Preservation

- Strategically locate vents
- Treat moisture in basements
- While installing air conditioning, consider wall systems and air quality
- Understand water vapor, moisture and condensation before adding or changing insulation
- Ventilate kitchens and bathrooms (to outside)

Resources for Information

ICG
International Code Council
500 New Jersey Avenue, NW, 6th Floor
Washington, DC 20001
1-888-ICC-SAFE (422-7233)
www.iccsafe.org

Resources for Information

ASHRAE
American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
1791 Tullie Circle NE
Atlanta, GA 30329
800-528-4716
www.ashrae.org

Resources for Information

DOE
U.S. Department of Energy
1000 Independence Avenue SW
Washington, DC 20585
202-586-5000
www.energy.gov
U.S. Department of Energy

Another excellent resource for information and training on energy conservation in commercial buildings can be found at the DOE's Building Energy Codes.


Additional Training Materials

Additional training materials are available at

www.energycodes.gov

- Recertification credit can be obtained for COMcheck Basics Webcast.

Resources for Information

Maine Preservation

500 Congress St
Portland ME 04101
207-772-9592

www.mainepreservation.org

The mission of Maine Preservation is to promote the preservation, protection and vitality of Maine's historic places and to encourage quality design that contributes to the livability of our communities.
Let's take a look at some basic information...

First of all, what is a commercial building?

For this code, all buildings that are not included in the definition of "Residential Building".

Chapter 5
Commercial Energy Efficiency

101.4.6 Mixed Occupancy

Where a building includes both residential and commercial occupancies, each occupancy shall be separately considered and meet the applicable provisions of Chapter 4 (residential) and Chapter 5 for commercial.

Commercial Energy Efficiency

Chapter 5 discusses the design and construction of most types of commercial buildings and residential buildings greater than three stories in height above grade.

Commercial Energy Efficiency

The thermal envelope requirements of this code do not apply to:

1. Very low energy use buildings
   (less than 3.4 Btu/hr/ft² or 1 W/m² K floor area)

2. Buildings or portions of buildings that are neither heated nor cooled
Commercial Energy Efficiency

While the code will exempt the applicability of some or all provisions of the code (Section 101.4) to:

- Continued use of existing buildings
- Historic buildings
- Additions, alterations, renovations or repairs

A building designed and constructed to meet the requirements of this chapter generally meets or exceeds the energy efficiency level of a similar building constructed to meet ASHRAE/IES 90.1-2004 requirements.

Commercial Energy Efficiency

The provisions of Chapter 5 simplify and clarify energy code requirements specific to commercial buildings.

Chapter 5 is presented in a format different than ASHRAE 90.1

Relevant provisions and those having no impact on overall energy performance have been removed for the utility of the user.

Chapter 5

Chapter 6 contains several options to address the energy efficiency of commercial buildings.

The options are most clearly shown in Section 501.1, which states:

The requirements contained in this chapter are applicable to commercial buildings or portions of commercial buildings. These provisions are not intended to meet either the requirements of ASHRAE/IESNA Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings. The requirements contained in this chapter:

Chapter 5

ASHRAE 90.1 is intended to promote the application of cost-effective design practices and technologies that minimize energy consumption without sacrificing either the comfort or productivity of the occupants.

Chapter 5

The 2008 edition of the code adopts ASHRAE 90.1 by reference in Chapter 5 as an alternative to meeting the remaining portions of Chapter 5.

MUBEC likes this idea as well, so in Maine, commercial buildings may use either ASHRAE 90.1 or Chapter 5 of the IECC to meet energy-efficiency requirements.
**Chapter 5 Commercial Energy**

In Chapter 5, the requirements address the design of all building systems that affect the visual and thermal comfort of the occupants, including:

- Wall, roof and floor insulation
- Windows and skylights
- Cooling equipment
- Heating equipment
- Pumps, piping and liquid circulating circulation systems
- Heat rejection equipment
- Service water heating
- Electrical power and lighting systems

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**Chapter 5 Commercial Energy**

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**Chapter 5 Commercial Energy**

The code goes into great detail about these items, particularly with regards to several methods of compliance.

*A good review is in order!*

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**With regards to historic buildings, Maine Preservation recommends that building owners and design professionals develop a long-term building energy efficiency plan.**

This will help to prioritize current and long-term rehabilitation decisions.

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**Make changes that are reversible**

- Technology changes require periodic replacement and unintended consequences may arise.
- Make changes reversible to restore prior functions.
- Changes should allow future inspection and monitoring.
- Avoid irreversible changes such as cell foam insulation.
  - Hides the structure beneath.
  - Not compatible with older wiring.
  - Inhibits upgrading of wiring, plumbing, or other in wall systems.
  - Is flammable.
  - Corrosive and allows moisture penetration.

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With regards to historic buildings, Maine Preservation recommends that building owners and design professionals develop a long-term building energy efficiency plan.

- Perform an energy audit.
- Maximize energy savings while being least destructive, invasive, or expensive.
- Determine building elements that work together:
  - Retain/repair existing building materials.
  - Consider upgrading mechanicals and controls.
  - Maintain or restore passive systems.
  - Supplement existing systems to improve performance.
  - Retain historic windows and doors.
Compliance via ASHRAE 90.1 - 2007

Your Written Exam

Your Commercial Energy Code written exam is based primarily on ASHRAE 90.1-2007.

IECC
8%

ASHRAE 90.1-2007
94%

Purpose

The purpose of this standard is to provide minimum requirements for the energy efficient design of buildings except low-rise residential buildings.

Scope of ASHRAE 90.1

The standard provides:

- Minimum energy efficient requirements for the design and construction of
  - New buildings and their systems
  - New portions of buildings and their systems
  - New systems and equipment in existing buildings
- Criteria for determining compliance with these requirements

Scope of ASHRAE 90.1

The provisions of this standard apply to:
The envelope of the buildings, provided that the enclosed spaces are:

- Heated by a heating system whose output capacity is greater than or equal to 3.4 Btu/hr/ft²
- Cooled by a cooling system whose sensible output capacity is greater than or equal to 6 Btu/hr/ft²

Scope of ASHRAE 90.1

The following systems and equipment used in conjunction with buildings:

- Heating, ventilating, and air-conditioning
- Service water heating
- Electrical power distribution and metering provisions
- Electric motors and belt drives
- Lighting
Scope of ASHRAE 90.1

The provisions of this standard do not apply to:

- Single family houses, multifamily structures of three stories or less above grade, manufactured houses (mobile homes) and manufactured houses (modular)
- Buildings that do not use either electricity or fossil fuels
- Equipment and portions of building systems that use energy primarily to provide for industrial, manufacturing, or commercial processes

Scope of ASHRAE 90.1

Where specifically noted in this standard, certain other buildings or elements of buildings shall be exempt.

Scope of ASHRAE 90.1

This standard shall not be used to circumvent any safety, health, or environmental requirements.

Section 3
Definitions, Abbreviations, and Acronyms

3.1 General

Certain terms, abbreviations, and acronyms are defined in this section for the purposes of this standard.

Definitions, abbreviations, and acronyms

A few noteworthy ones:

3.2 Definitions

Annual fuel utilization efficiency (AFUE)

An efficiency descriptor of the ratio of a system's output energy to its annual input energy as developed in the requirements of U.S. DOE 10 CFR Part 430.

Definitions, abbreviations, and acronyms

A few noteworthy ones:

Building

A structure wholly or partially enclosed within exterior walls, or within exterior or party walls, and a roof, affording shelter to persons, animals, or property.
Definitions, abbreviations, and acronyms

A few noteworthy ones:

Building Envelope,

The exterior plus the semi-exterior portions of a building.

For the purposes of determining building envelope requirements, the classifications are defined as follows:

Building Envelope, exterior

The elements of a building that separate conditioned spaces from unconditioned space or that enclose elements through which thermal energy may be transferred to or from the exterior, or to or from unconditioned spaces, or to or from conditioned spaces.

Space

An enclosed space within a building.

Conditioned space

A cooled space, heated space, or indirectly conditioned space defined as follows:

Cooled space: An enclosed space within a building that is cooled by a cooling system whose output capacity exceeds 850 Btu/hr/ft² of floor area.

Conditioned space

A cooled space, heated space, or indirectly conditioned space defined as follows:

Heated space: An enclosed space within a building that is heated by a heating system whose output capacity relative to the floor area is greater than or equal to the criteria in Table 3.1.
Table 3.1 Heated Space Criteria

<table>
<thead>
<tr>
<th>Heating Output (Btu/hr)</th>
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<td>8</td>
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</tbody>
</table>

Definitions, abbreviations, and acronyms

A few noteworthy ones:

- Conditioned space: A cooled space, heated space, or indirectly conditioned space defined as follows:

  Indirectly conditioned space: An enclosed space within a building that is not a heated or a cooled space, which is heated or cooled indirectly by being connected to adjacent space(s) provided:

  The product of the U-factor(s) and surface area(s) of the space adjacent to connected space(s) exceeds the combined sum of the product of the U-factor and surface area(s) of the space adjoining the outdoors, unheated space(s), or to or from semi-heated spaces (e.g., corridor)

  OR

- Unconditioned space: An enclosed space within a building that is not a conditioned space or a semi-heated space.

  Crawlspace, attics, and parking garages with natural or mechanical ventilation are not considered enclosed spaces.

Now that we are done with the definition of Conditioned Space...
Definitions, abbreviations, and acronyms
A few noteworthy ones:

- Semi-heated space
  An enclosed space within a building that is heated by a heating system whose output capacity is greater than or equal to 3.4 Btu/hr/ft² of floor area but is not a conditioned space.

- Building Official
  The officer or other designated representative authorized to act on behalf of the authority having jurisdiction.

- Design Professional
  An architect or engineer licensed to practice in accordance with applicable state licensing laws.

- Floor, envelope
  For the purpose of determining building envelope requirements, the classifications are defined as follows:
  - Mass floor:
    A floor with a heat capacity that exceeds 1.7 Btu/lb x ft², or
  - 5 Btu/lb x ft² provided that the floor has a material unit mass not greater than 120 pounds ft².
Definitions, abbreviations, and acronyms
A few noteworthy ones:

Floor, envelope
For the purpose of determining building envelope requirements, the classifications are defined as follows:
Wood framed and other floors:
All other floor types, including wood post floors
(See building envelope, fenestration, opaqueness area, and slab on grade floor)

Definitions, abbreviations, and acronyms
A few noteworthy ones:

Fenestration
All areas (including the frames) in the building envelope, that let in light, including windows, glass panels, clerestories, skylights, doors that are more than 1/3 glass, and glass block walls.

Definitions, abbreviations, and acronyms
A few noteworthy ones:

Opaque
All areas in the building envelope, except fenestration and building service openings such as vents and grilles.

Definitions, abbreviations, and acronyms
A few noteworthy ones:

Slab on grade floor
That portion of a slab floor of the building envelope that is in contact with the ground and that is either above grade or is less than or equal to 24 inches below the final elevation of the adjacent exterior grade.

Definitions, abbreviations, and acronyms
A few noteworthy ones:

Heated slab on grade floor
A slab on grade floor with a heating source either within or below it.

Definitions, abbreviations, and acronyms
A few noteworthy ones:

Unheated slab on grade floor
A slab on grade floor that is not a heated slab on grade floor.
Definitions, abbreviations, and acronyms
A few noteworthy ones:

Fossil Fuel
Fuel derived from a hydrocarbon deposit such as petroleum, coal, or natural gas derived from living matter of a previous geological time.

Non-renewable Energy
Energy derived from a fossil fuel source.

Historic
A building or structure that has been specifically designated as historically significant by the selecting authority or is listed in The National Register of Historic Places or has been determined to be eligible for such listing by the U.S. Secretary of the Interior.

Note that historic buildings are not exempted by ASHRAE 90.1.
Definitions, abbreviations, and acronyms
A few noteworthy ones:

Variation
The process of supply or removing air by natural or mechanical means to or from any space.
Such air is not required to have been conditioned.

HVAC Zone
A space or group of spaces within a building with heating and cooling requirements that are sufficiently similar so that desired conditions (e.g., temperature) can be maintained throughout using a single sensor (e.g., thermostat or temperature sensor).

Section 3
3.3 Abbreviations and Acronyms
Just to take note...

Section 4
4.1 General
New buildings
Additions to existing buildings
Alterations of existing buildings
Replacement of portions of existing buildings

Shall be in compliance with

6. Building envelope
8. HVAC
9. Service water heating
8. Power
9. Lighting
10. Other equipment
or
11. Energy Cost Budget Method

Section 4
4.2.13
New buildings
Additions to existing buildings
Replacement of portions of existing buildings

Shall be in compliance with

6. Building envelope
8. HVAC
7. Service water heating
8. Power
9. Lighting
10. Other equipment

Need not comply with these requirements.

A building that has been specifically designated as historically significant by the adopting authority or is listed in the NRHP has been determined to be eligible for listing by the U.S. Secretary of the Interior...
Section 4

4.1.3  Alternative Materials, Methods of Construction

- The provisions of this standard are not intended to prevent the use of any material, method of construction, design, equipment, or building system not specifically prescribed herein.

Section 5  Building Envelope

5.1.2  Space conditioning categories

- Separate exterior building envelope requirements are specified for each of the three categories of conditioned space:
  - Nonresidential conditioned space
  - Residential conditioned space
  - Semiheated space
Section 5 Building Envelope

5.1.2.3 Space conditioning categories

- Spaces shall be assumed to be conditioned spaces and shall comply with the requirements for conditioned space at the time of construction, regardless of whether mechanical or electrical equipment is included in the building permit application or installed at that time.

Section 5 Building Envelope

5.1.3 Envelope Alterations

- Alterations to the building envelope shall comply with the requirements of Section 5 for:
  - Insulation
  - Air Leakage
  - Fenestration

Note the list of exceptions

Section 5 Building Envelope

5.2 Compliance Paths

For the appropriate climate, space conditioning category, and class of construction, the building envelope shall comply with:

- Section 5.1 General
- Section 5.4 Mandatory Provisions
- Section 5.7 Submittals
- Section 5.8 Product Information and Installation Requirements
- and either...

Section 5 Building Envelope

5.6 Building Envelope Trade-Off Option

The building envelope complies with the standards if the proposed building satisfies the provisions of:

- Section 5.1 General
- Section 5.4 Mandatory Provisions
- Section 5.7 Submittals
- Section 5.8 Product Information and Installation Requirements
- and the envelope performance factor of the proposed building is less than or equal to the envelope performance factor of the budget building.

Section 5 Building Envelope

5.1.3 Space conditioning categories

- In climate zones 3—8, a space may be designated as either semi-heated or unconditioned only if approved by the building official.
Section 5  Building Envelope

5.6.3  Building Envelope Trade-Off Option

Shall be calculated using the procedures of Normative Appendix C.

Section 5  Building Envelope

5.7  Submittals

- The authority having jurisdiction may require submittal of compliance documentation and supplemental information IAW Section 4.2.2 (Completed Documentation) of this standard.

Section 5  Building Envelope

5.8  Product Information and Installation Requirements

5.8.1.1  Insulation

- Labeled or certified (for unlabeled products)

5.8.1.2  Compliance with Manufacturers’ Requirements

Insulation materials shall be installed IAW manufacturers’ recommendations and in such a manner as to achieve rated R-value of insulation.

This is mostly about not compressing insulation.

Section 5  Building Envelope

5.8  Product Information and Installation Requirements

5.8.1.4  Baffles

When no vents are installed, baffles of the vent openings shall be provided to deflect the incoming air above the surface of the insulation.

Wind washing

Section 5  Building Envelope

5.8  Product Information and Installation Requirements

5.8.1.5  Substantial Contact

Insulation shall be installed in a permanent manner in suitable sealant contact with the inside surface IAW manufacturers’ recommendations for the framing system used.

Flexible batt insulation installed in floor cavities shall be supported in a manner by supports no greater than 24 inches on center.

General building envelope rules
Section 5 Building Envelope

5.8 Product Information and Installation Requirements

5.8.1.6

- Preassembled Equipment

Review this section in the book. Identify and its requirements.

General intention is to preclude breaches in the building envelope.
Section 7 Service Water Heating

7.12 - Additions to Existing Buildings

7.1 - General

7.2 - Definition of Compliance Path

7.3 - Mandatory Provisions

7.4 - Prescriptive Path

Section 11 - Energy Cost Budget Method

7.7 - Submittals

7.8 - Final Inspection

Section 7 Service Water Heating

Section 7 Service Water Heating

Section 7 Service Water Heating

Section 7 Service Water Heating

Section 7 Service Water Heating

Section 7 Service Water Heating

7.4.1 Load Calculations
7.4.2 Equipment Efficiency
7.4.3 Service Water Piping Insulation
7.4.4 Service Water Heating System Controls
7.4.5 Pools
7.4.6 Hot Tubs

Section 7 Service Water Heating

7.5 - Prescriptive Path

7.6 - Mandatory Provisions

7.7 - Submittals

7.8 - Final Inspection

Section 7 Service Water Heating

7.6.1 Space Heating and Water Heating

The use of a gas-fired or oil-fired space heating boiler system otherwise complying with Section 8 (HEA) to provide space heating and water heating for a building is allowed when one of the following conditions are met:

a. Maximum standby losses are not exceeded.
b. It is demonstrated that the use of a single heat source will result in less energy than separately used.
c. The energy input of the combined boiler and water heating system is less than 150,000 Btu/hr.

Chapter 8 Space Heating and Water Heating

Section 11 - Energy Cost Budget Method

Hot water pipe without heat trap

Hot water pipe with heat trap

Chapter 8 Space Heating and Water Heating

Section 11 - Energy Cost Budget Method

7.4.6 Hot Tubs
Section 8 Power

Section 8 - Power

8.1 - General

8.2 - Definition of Compliance Paths

8.4 - Mandatory Provisions

8.7 - Submittals

This section applies to all building power distribution systems.

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Section 8 Power

Section 8 - Power

8.1 - General

8.2 - Definition of Compliance Paths

8.4 - Mandatory Provisions

8.7 - Submittals

Power distribution systems in all projects shall comply with the requirements of 8.1 General, 8.4 Mandatory Provisions, and 8.7 Submittals.

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Section 8 Power

Section 8 - Power

8.1 - General

8.2 - Definition of Compliance Paths

8.4 - Mandatory Provisions

8.7 - Submittals

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Section 8 Power

Section 8 - Power

8.1 - General

8.2 - Definition of Compliance Paths

8.4 - Mandatory Provisions

8.7 - Submittals

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Section 8 Power

Section 8 - Power

8.4.1 Voltage Drop

- 8.4.1.1 Feeders
  Feeder conductors shall be sized for a maximum voltage drop of 2% at design load.
- 8.4.1.2 Branch Circuits
  Branch circuit conductors shall be sized for a maximum voltage drop of 5% at design load.
Section 8 Power

8.7.1 Drawings

Construction documents shall require that within 30 days after the date of acceptance, record drawings of the actual installation shall be provided to the building owner, including:

a. A single line diagram of the building electrical distribution system, and

b. Floor plans indicating location and area served for all distribution.

8.7.2 Manuals

Construction documents shall require that an operating manual and maintenance manual be provided to the building owner. The manuals shall include, at a minimum:

a. A list and description of the equipment and systems requiring maintenance.

b. Operation manuals and maintenance manuals for each piece of equipment requiring maintenance. Required routine maintenance actions shall be clearly identified.

Section 9 Lighting

9.1 General

9.2 Definition of Compliance Path

9.4 Maintenance Probabilistic

9.5 Building Area Method

9.6 Space-by-Space Method

Section 11 - Energy Cost Budget Method

Section 9 Lighting

Is applicable to:

- Interior spaces of buildings
- Exterior features, including facades, illuminated signs, architectural features, entrances, exits, loading docks, and illuminated canopies
- Exterior building grounds lighting provided through the building's electrical service.
Section 9 Lighting

Exceptions:
- Emergency lighting that is automatically off during normal building operations
- Lighting within dwelling units
- Lighting that is specifically designated as required by a health or life safety statute, ordinance, or regulation
- Decorative gas lighting systems

Other "General" considerations include:
- 9.1.2 Lighting Alterations
- 9.1.3 Installed Interior Lighting Power
- 9.1.4 Luminaire Wattage

Section 9 Lighting

Lighting systems and equipment shall comply with Sections 9.1 General, 9.4 Mandatory Provisions, and the prescriptive requirements of either 9.5 Building Area Method or 9.6 Space-by-Space Method.

Interior Lighting Power Allowance

The Building Area Method for determining the interior lighting power allowance is a simplified approach for determining compliance. The Space-by-Space Method is an alternative approach that allows greater flexibility.

Lighting systems and equipment shall comply with Sections 9.1 General, 9.4 Mandatory Provisions, and the prescriptive requirements of either 9.5 Building Area Method or 9.6 Space-by-Space Method.

Section 9 Lighting

Lighting systems and equipment shall comply with Sections 9.1 General, 9.4 Mandatory Provisions, and the prescriptive requirements of either 9.5 Building Area Method or 9.6 Space-by-Space Method.

Section 9 Lighting

Lighting systems and equipment shall comply with Sections 9.1 General, 9.4 Mandatory Provisions, and the prescriptive requirements of either 9.5 Building Area Method or 9.6 Space-by-Space Method.

Are applicable to:
- 9.4.1 Lighting Control
- 9.4.2 Tandem Wiring
- 9.4.3 Exit Signs
- 9.4.4 Exterior Building Grounds Lighting
- 9.4.5 Exterior Building Lighting Power
Section 9 Lighting

Use the following steps to determine the interior lighting power allowance by the Building Area Method:

a. Determine the appropriate building area type (Table 9.6.1) and the allowed LPD (lighting power density) from the Building Area Method column.

b. Determine gross lighted floor area of the building area type.

c. Multiply gross lighted floor area of the building type(s) times the LPD.

d. The interior lighting power allowance for the building is the sum of the lighting power allowances of all building area types.

Trade-offs among building area types are permitted provided that the total installed interior lighting power does not exceed the interior lighting power allowance.

Use the following steps to determine the interior lighting power allowance by the Space-by-Space Method:

a. Determine appropriate building type from Table 9.6.1.

b. For each space enclosed by partitions 80% or greater in the ceiling height, determine the gross interior floor area by measuring to the center of the partition wall.

c. Determine the interior lighting power allowance by using the columns designated Space-by-Space Method in Table 9.6.1. Multiply the floor areas of the spaces times the allowed LPD for the space type that most closely represents the proposed use. The product is the lighting power allowance for the space(s).
Section 9 Lighting

Use the following steps to determine the interior lighting power allowance by the Space-by-Space Method:

d. The interior lighting power allowance is the sum of the lighting power allowances of all spaces.

Trade-offs among spaces are permitted provided that the total installed interior lighting power does not exceed the interior lighting power allowance.

Section 9 Lighting

6.6.2 Additional Interior Lighting Power

When using the Space-by-Space Method, an increase in the interior lighting power allowance is allowed for specific lighting functions:

- Must be automatically controlled to turn off during nonbusiness hours
- Only used in specified locations
- Not for any other purposes
- Only allowed under certain cases and conditions (see 9.6.2)

Section 9 Lighting

9.2.3 Exception

The following lighting equipment and applications shall not be considered when determining the interior lighting power allowance developed in AW Section 9.2.3:

- Lighting in interior spaces that have been specifically designated as a registered historic landmark.

Section 10 Other Equipment

Section 10 Other Equipment

This Section applies only to the equipment described below:

- Other equipment installed in New Buildings or in Additions to Existing Buildings.
Section 10  Other Equipment

Section 10.1 - General

This Section applies only to the equipment described below:

- Alterations to existing service equipment or systems shall comply with the requirements of this Section applicable to those specific portions of the building and its systems that are being altered.

- Any new equipment subject to the requirements of this Section that is installed in conjunction with the alterations, as a result of replacement of existing equipment or control devices, shall comply with the specific requirements applicable to that equipment or control devices.

Exception:
Compliance shall not be required for the relocation or reuse of existing equipment.

Section 10.2 - Compliance Path

- 10.2.1 - General
- 10.2.2 - Definition of Compliance Path

Compliance with Section 10 shall be achieved by meeting all requirements of Sections 10.1 General, 10.4 Mandatory Provisions, and 10.8 Product Information.

Section 10  Other Equipment

Section 10.6 - Mandatory Provisions

Are applicable to:

- 10.4.1 Electric Motors
- 10.5.1 Product Information (Table 10.8)

10.4.1 Electric Motors
Electric motors shall comply with the Energy Policy Act of 1992 where applicable, as shown in Table 10.8. Motors that are not included in the scope of the Energy Policy Act of 1993 have no performance requirements in this section.

Section 11  Energy Cost Budget Method

The building Energy Cost Budget Method is an alternative to the prescriptive provisions of this standard.

It may be employed for evaluating the compliance of all proposed designs except designs with no mechanical systems.
Section 11
Energy Cost Budget Method

11.1.2
Trade-offs are allowed, but only on the part of the building that is permitted.

Section 11
Energy Cost Budget Method

11.4 - Compliance
Compliance with Section 11 will be achieved if all requirements of these sections are met:

- 5.4 - Mandatory Provisions, Building Envelope
- 6.4 - Mandatory Provisions, HVAC
- 7.4 - Mandatory Provisions, Service Water Heating
- 8.4 - Mandatory Provisions, Power
- 9.4 - Mandatory Provisions, Lighting
- 10.4 - Mandatory Provisions, Other Equipment

Design Energy Cost
The annual energy cost calculated for a proposed design.

Energy Cost Budget
The annual energy cost for the budget building design intended for use in determining minimum compliance with this standard.

Budget Building Design
A computer representation of a hypothetical design based on the actual proposed building design. This representation is used as the basis for calculating the energy cost budget.

Section 11
Energy Cost Budget Method

11.1.5 Documentation Requirements
Compliance shall be documented and submitted to the authority having jurisdiction, and shall include:

a. The energy cost budget for the budget building design and the design energy cost for the proposed design.
Section 11

Energy Cost Budget Method

11.1.5 Documentation Requirements

Compliance shall be documented and submitted to the authority having jurisdiction, and shall include:

2. A list of energy-related features that are included in the design and on which compliance with the provisions of Section 11 is based.

3. The input and output reports from the simulation program.

4. An explanation of any error messages noted in the simulation program output.

Section 11

Energy Cost Budget Method

11.2 Simulation General Requirements

Suggested simulation software is DOE-2 or BLAST.

See 11.2.1.1 through 11.2.1.4 for specific simulation capabilities and requirements.

Section 11

Energy Cost Budget Method

11.3 Calculation of Design Energy Cost and Energy Cost Budget

The simulation model for calculating the design energy cost and the energy cost budget shall be developed in accordance with the requirements in Table 11.3.1.

Another detail that you should be familiar with is the differences between IECC Chapter 6 (Commercial Energy) and ASHRAE 90.1-2007.

Both are a valid means of compliance!
Let's take a look!

ASHRAE 90.1
Provides:
- Energy-efficient requirements for
  1. New buildings and systems
  2. New portions of buildings or systems
  3. New systems and equipment in existing buildings
- Criteria for determining compliance

IECC Chapter 5
Requirements are applicable to commercial buildings, or portions of commercial buildings.

ASHRAE 90.1
Provides comprehensive and specific requirements for nearly all building thermal envelope systems, based on climate zones (Tables 8.5-1 thru 8.5-6).
- Efficiencies not consistent one method to the other
- The code specifies interior design temperatures used for heating and cooling load calculations
- The standard stipulates such interior design temperatures are determined by ASHRAE recommended engineering standards and handbooks

IECC Chapter 5
Provides certain default metal building, fenestration U-factor and Solar Heat Gain Coefficient (SHGC) requirements

ASHRAE 90.1
Prescriptive Building Envelope Option
- Roof U-factor (above deck systems)
  - Better in Zones 1 - 6
- Roof U-factor (metal buildings)
  - Better in Zones 1 - 6
- Roof U-factor (attic systems)
  - Better in Zones 6

IECC Chapter 5
Prescriptive Building Envelope Option
- Roof U-factor (above deck systems)
  - Better in Zones 7 and 8
- Roof U-factor (metal buildings)
  - Better in Zones 1 - 6
- Roof U-factor (attic systems)
  - Better in Zones 1 - 7

Other roof requirements are otherwise identical.

ASHRAE 90.1
Prescriptive Building Envelope Option
- Above grade walls (metal buildings)
  - Better in Zones 1 and 6
- Above grade walls (metal buildings)
  - Better in Zones 7 and 8
- Above grade walls (metal buildings)
  - Better in Zones 1 - 7
- Slab-on-Grade Floor U-factor
  - (heated or unheated)
  - Identical

IECC Chapter 5
Prescriptive Building Envelope Option
- Above grade walls (metal buildings)
  - Better in Zones 1 and 6
- Above grade walls (metal buildings)
  - Better in Zones 7 and 8
- Slab-on-Grade Floor U-factor
  - (heated or unheated)
  - Identical

Just for a few examples...
ASHRAE 90.1
Hydronic systems controls
No such provision.

IECC Chapter 5
Hydronic systems controls
Improves energy efficiency as follows:
Multiple-packaged boiler operation shall be sequential, single boilers
>500,000 Btu/hr shall be equipped
with multistage or modulating burners.

ASHRAE 90.1
System commissioning
Requires HVAC control systems to
be tested to ensure that control
elements are calibrated, adjusted,
and in proper working condition.

IECC Chapter 5
System commissioning
Does not include these provisions.

ASHRAE 90.1
Service water heating - Load
calculation
Requires calculation of service water
heating system design loads for the
purpose of sizing systems and
equipment.

IECC Chapter 5
Service water heating - Load
calculation
Does not include these provisions.

ASHRAE 90.1
Service hot water piping insulation
1/2 to 4 inch thick and R-2.9 to R-4.5
Insulation as required, based on
system, fluid temperature,
conductivity (k), and pipe diameter.

IECC Chapter 5
Pipe insulation
1 inch thick R-3.7 insulation.

Maine Preservation
A few other suggestions on behalf of
Maine Preservation.

Consider Durability
Many historic buildings are 150-200 years old.
Survey the condition of all existing materials to
save considerable labor and materials expenses.
**Consider Durability**

Many historic buildings are 150-200 years old. Determine the expected lifetime of replacement products and substitute materials.

- Consider embedded energy in existing materials.
- Historic windows are made of old growth wood and can be continually repaired and weatherized.
- Preserve historic plaster which can be a better insulator than sheetrock.

**Consider Durability**

Many historic buildings are 150-200 years old. Determine the expected lifetime of replacement products and substitute materials.

- Avoid removal of historic features and replacing with shorter term solutions.
- Avoid removing old growth durable timber and replacing with short-lived contemporary wood.

**Navigating the Code**

Many historic buildings were initially built from old growth wood harvested from trees that were hundreds of years old. The wood from these trees is much harder, stronger, and less prone to insects, damage, warping, or damage than the softer new wood commercially available today.

Because nearly all of these ancient trees have been harvested, this wood is preserved in the structural timbers, floors, shingles, and windows of historic buildings and cannot be replaced.

**Navigating the Code**

The ICC codes and ASHRAE standards contain a substantial amount of information and updates for the new building code program.
Navigating the Code

We can break it down into manageable parts and show you how to find the information that you need quickly!

Chapters

The book is broken down into Chapters to discuss major categories of information.

Please note that all Chapters of the IECCE are included in the MIREC.

General Comments

Each chapter starts with some general comments about the material that will be covered. This information can be helpful when interpreting code or trying to explain details to others.

The comments also provide a briefing on each section in the chapter. This gives you a speedy snapshot of what is covered in each section.
General Comments

Chapter 1: Scope and Administration

Finally, a purpose statement is provided to give specific meaning and importance of the chapter.

Sections

Sections are further broken down into subsections, according to more specific topics.

Commentary

- The commentary follows many of the code references.

Revisions to the IECC

Not all of the text in all sections are adopted by the State of Maine.

The commentary is advisory only. Only the code is enforceable.
Revisions to the IECC

For up to date listings of all changes to the MUBEC, go to

www.maine.gov/dps/bbcs

Revisions to the IECC

The following additions, insertions, deletions, and other changes are hereby made to the 2009 International Energy Conservation Code:

Generally all sections
Delete "International Mechanical Code"
Insert “applicable state codes and statutes”

- Except for the specific Sections below where references to International Mechanical Code are specifically deleted and/or altered.

Revisions to the IECC

Section 101.1
Delete [NAME OF JURISDICTION], and
Insert "State of Maine" in its place.

Revisions to the IECC

Sections 103, 104, and 108, and any amendments thereto, shall only be applicable:

A. In a municipality with a population of 4,000 or more residents, beginning:
   (1) No later than December 1, 2010, if the municipality had previously adopted any building code on or before August 1, 2006, or
   (2) No later than July 1, 2012, if the municipality had not adopted any building code on or before August 1, 2008.

B. In a municipality with a population of less than 4,000 residents, if the municipality voluntarily elects to enforce the MUBEC.

Revisions to the IECC

Section 101.4.7
Insert: "No provisions of the MUBEC shall be construed to prohibit the adoption or enforcement of an ordinance of any political subdivision that sets forth provisions for local enforcement of building codes.

Such ordinances may include items such as permits, fees, boards of appeals and violations."
Revisions to the IECC

Section 107
Delete Section R107 "Fees" in its entirety, without substitution.

Revisions to the IECC

Section 109
Delete Section 109 "Board of Appeals" in it’s entirety, without substitution.

Revisions to the IECC

Section 402.4.2.1
Delete "35.6 psf (60 Pa)" at the end of the first sentence and Insert "60 Pa (1 psf)" in it’s place.

Revisions to the IECC

Section 403.8.1
Insert "or LPG" after "natural gas".

Revisions to the IECC

Section 603.2.5
Delete "Chapter 4 of the International Mechanical Code" and Insert "ASHRAE 62.1 – 2007" in it’s place for both occurrences.

Revisions to the IECC

Section 603.2.6.1
Delete "(as established in Table 403.3 of the International Mechanical Code)" without substitution.
Revisions to the IECC

Section 503.2.6
Delete Exception 1 "Where energy recovery systems are prohibited by the International Mechanical Code," with no substitution.

Revisions to the IECC

Section 503.2.7.1
Delete "the International Mechanical Code" and insert "NFPA 60A" in its place.

Revisions to the IECC

Section 503.3.1 Exception 2
Delete Exception 2 "in order to meet the minimum ventilation requirements of Chapter 4 of the International Mechanical Code" without substitution.

Revisions to the IECC

Section 503.4.5, Item 3
Delete "Chapter 4 of the International Mechanical Code" and insert "ASHRAE 60.1-2007" in its place.

Revisions to the IECC

Chapter 6, First Paragraph
Delete "107" from the end of the last sentence and insert "108" in its place.
Tables and Figures

There are many tables and figures, conveniently numbered by the sub-sections that they apply to.

Some tables contain numerous notes and conditions which must be considered to arrive at an accurate determination of the data.

Be careful and read to apply all notes and conditions as required.

Let's flip over to Chapter 3

The first part of Chapter 3 defines climate zones for the United States.

These serve to establish exterior design conditions and provide general requirements for

- Interior design conditions
- Materials
- Systems
- Equipment

Let's flip over to Chapter 3

The climate zones are referred to throughout the codes to help you to determine

- Required wall and roof insulation R-values
- Window and door thermal transmittance requirements (U-factors)
- Provisions that affect mechanical systems

Let's flip over to Chapter 3

If you are using a code book that is older than 2008, you will notice many changes in the climate zone map.

A thorough discussion of the zones development can be found at

www.energycodes.gov/implement/pdfs/climate_paper_review_draft_rev.pdf

Climate Classification for Building Energy Codes and Standards
CLIMATE ZONE MAP

Notice that all of Maine except for Aroostook County is in Climate Zone 6A

Remember!

A thorough study of ASHRAE 90.1-2007 and the IECC are in order.

And Don’t Forget the IEBC!

Thanks for Joining Us Today!