

SPO  Maine State Planning Office 

Commercial Energy Conservation Code of Maine

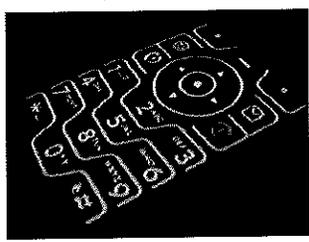
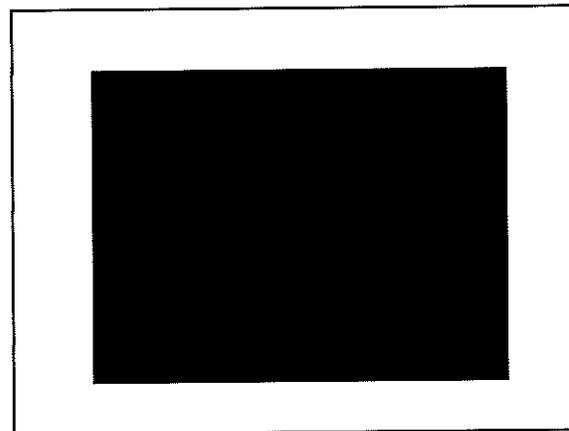


Michael Lessard

Agenda

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

Oh yeah... Those pesky cell phones!

The New Standard

Title 16 Department of Public Safety
635 (new) 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.

Purpose and Scope

- o 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

- o 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

- o The authority for this Chapter is 10 M.R.S. 9722, 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:

- o International Energy Conservation Code – 2009

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

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.

Choices

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

Energy Standard for Buildings Except Low-Rise Residential Buildings

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 lighter, it doesn't offer much flexibility, and must be complied with in full.

ENERGY Energy Efficiency & Renewable Energy

The Energy Policy Act of 1992 requires state and local governments to update their commercial building energy-efficiency codes to be at least as stringent as ASHRAE 90.1.

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



Chapter 5 of the IECC

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

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 MUBEC 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

Upon written request of any interested person or entity, the Bureau may provide a nonbinding advisory interpretation with respect to the applicability of any statute, rule or code administered by the Bureau, on that person or entity, or the property of that person or entity, or actual state of facts.

The written request shall be made on the official Bureau form and shall include the following information:

Written Request Shall Include:

- o Specific identification of the subject code or codes with a description of the questioned application or perceived conflict.
- o Relevant construction documents to fully illustrate the issue upon which an advisory interpretation is sought.
- o 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 interpretation

Other Considerations

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

MUBEC does not apply to

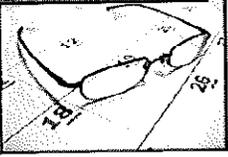
- o Log homes or manufactured homes defined in Chapter 951.
- o Post and beam or timber frame construction.
- o Warehouses or silos used to store crops.
- o Seasonally restricted cottages.

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 6, 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



A photograph of a sign that reads "Codes enforced by AIRCRAFT" positioned in front of a wooded area. The sign is partially obscured by a person's legs and feet, suggesting they are standing on it or near it.

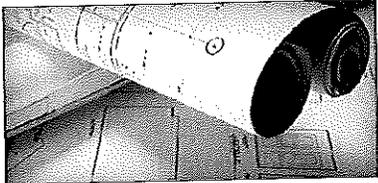
Enforcement

Pursuant to 25 M.R.S. 2373, in municipalities with a population over 4,000, enforcement of the provisions of the MUBEC 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.



A close-up photograph of a white pipe with two circular openings, likely a vent or exhaust pipe, set against a wooden background.

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. 9723.

Enforcement

Third Party Inspection by Report

Inspections performed and verified by reports from a TPI, certified pursuant to 10 M.R.S. 9723.

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 at their own cost.

Inspections



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



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

Some suggested inspection areas... **Envelope**

Foundation

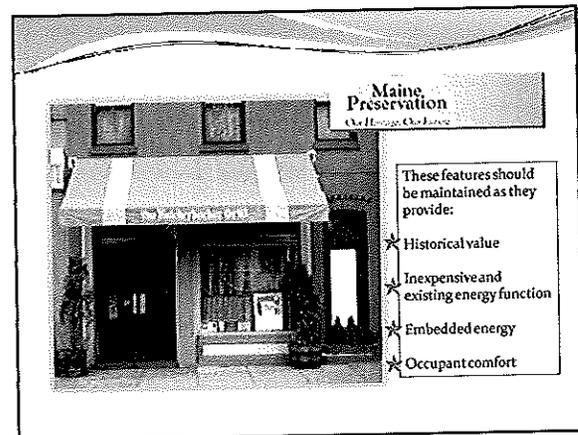
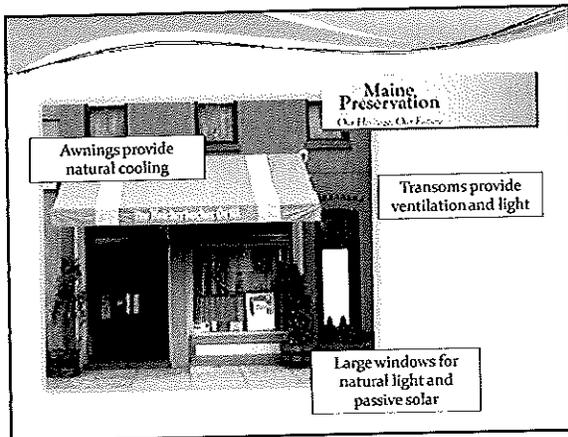
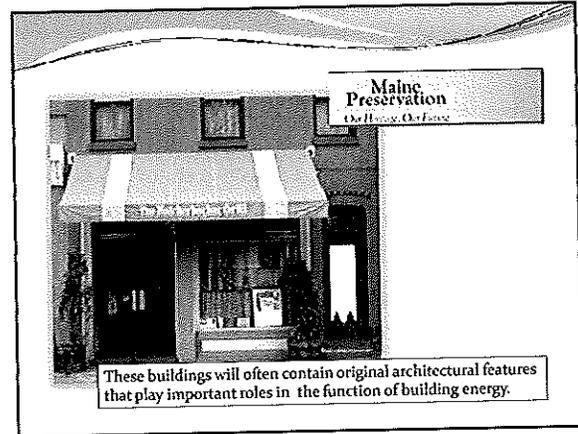
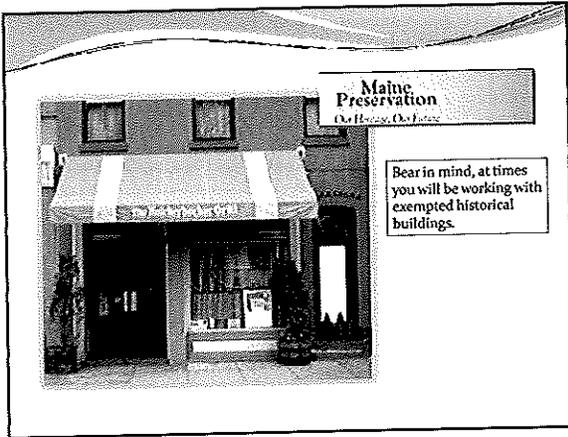
- o Perimeter slab insulation
- o Below grade wall insulation

IECC Suggested Inspections

Some suggested inspection areas...

Framing

- o Foundation discrepancies corrected
- o Fenestration requirements
- o Air leakage of windows, skylights, doors, etc
- o Envelope air leakage
- o Skylight U-factors
- o Door U-factors



IECC Suggested Inspections

Insulation

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

IECC Suggested Inspections

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.

IECC Required Inspections

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.

IECC Required Inspections

104.7 Reinspection and testing

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

IECC Required Inspections

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.stm

The screenshot shows a webpage from the U.S. Department of Energy's Building Energy Codes Program. The page is titled "State Compliance Evaluation Checklists" and lists various resources for building officials. It includes sections for "State Compliance Evaluation Checklists" and "Residential Checklists". A URL is visible at the bottom right: http://www.energycodes.gov/arra/compliance_checklists.stm.

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 IAW 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 installations but before concealment



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.



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)



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.

Maine State Plumbing Code and Maine State Fuel Gas and mechanical provisions



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.

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

IEBC Chapter 7

Level 2 alterations include the reconfiguration of space, the addition or elimination of any door or window, the reconfiguration or extension of any system, or the installation of any additional equipment.

Level 2 alterations shall comply with Chapter 6 and Chapter 7



With regards to historic buildings, efforts should be made to preserve existing long-lasting 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.



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.

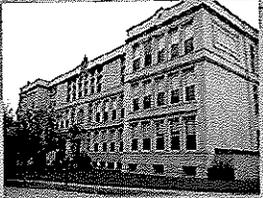
The alterations shall conform to the energy requirements of the International Energy Conservation Code or the International Residential Code as they relate to new construction only.

Level 3 Alterations

IEBC Chapter 8

Level 3 alterations apply where the work 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/original ventilation
- ★ Lighting energy saved in large windows and light shafts
- ★ How will the overall envelope perform when integrated with new structures or mechanicals?

Control moisture and Ensure Acceptable Air Quality	Maine Preservation <i>Over the Top, On the Edge</i>
--	--

★ Manage precipitation and roof runoff

★ Manage interior water vapor and dew points in walls and ceilings

Remove moisture from the immediate surrounds 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

Control moisture and Ensure Acceptable Air Quality	Maine Preservation <i>Over the Top, On the Edge</i>
--	--

- 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

Resources for Information

ICC

International Code Council
500 New Jersey Avenue, NW, 6th Floor
Washington, DC 20001
1-888-ICC-SAFE (472-7233)

www.iccsafe.org

Resources for Information

ASHRAE



American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
1791 Tullie Circle NE
Atlanta GA 30329
800-527-4723

www.ashrae.org

Resources for Information

DOE



U.S. Department of Energy
1000 Independence Ave 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 and Energy Codes University.

www.energycodes.gov/becu/documents/90.1-2007_BECU.ppt

ENERGY Energy Efficiency & Renewable Energy



ANSI/ASHRAE/IESNA Standard
90.1-2007
July 2010

226 slides

Additional Training Materials

Additional training materials are available at

www.energycodes.gov

- o Recertification credit can be obtained for COMcheck Basics Webcast

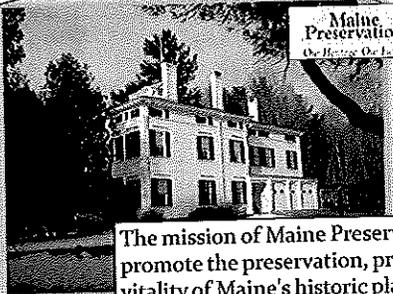
Resources for Information

Maine Preservation

500 Congress St
Portland ME 04101
207-755-3652

Maine Preservation
Our Heritage. Our Future.

www.maine Preservation.org



Maine Preservation
Our Heritage. Our Future.

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.

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Welcome to Maine Preservation
Celebrating 35 years of preservation success in Maine!

Need preservation advice on your historic building?

Maine Preservation's Field Service Advisors are here to help!

Click here for details



One of Maine Preservation's two Field Service Advisors Ad-Lynn, Christine Ors
Looking for Preservation Professionals and Suppliers? Click Here
Join Maine Preservation's Club Today for information on member benefits
Maine Preservation's 2011 magazine is available to club members for \$20

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".

Residential Building – includes R-3 buildings, as well as R-2 and R-4 buildings three stories or less in height above grade.

R-2 Apartment houses, boarding homes, convents, dorms, fraternities/sororities, non-transient hotels/motels, live/work units, monasteries, vacation timeshare

R-3 Primarily permanent in nature and not R-1, R-2 or R-4 (see IBC for details)

R-4 Residential care, assisted living – 6 to 16 occupants not including staff

Let's take a look at some basic information...

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.

**Chapter 5
Commercial Energy
Efficiency**

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 watt/ft² floor area)
2. Buildings or portions of buildings that are neither heated nor cooled

Commercial Energy Efficiency

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

- o Continued use of existing buildings
- o Historic buildings
- o 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

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

Chapter 5

Chapter 5 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 commercial buildings shall meet either the requirements of ASHRAE/IESNA Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings, or the requirements contained in this chapter.

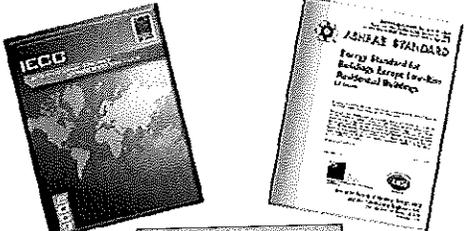
Chapter 5

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 2006 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.



Either / OR
Not both!

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

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

Chapter 5 Commercial Energy

SECTION 501	General
SECTION 502	Building Envelope Requirements
SECTION 503	Building Mechanical Systems
SECTION 504	Service Water Heating
SECTION 505	Electrical Power and Lighting Systems
SECTION 506	Total Building Performance

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!

Maine Preservation
Outstanding Codes

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.

Maine Preservation
Outstanding Codes

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

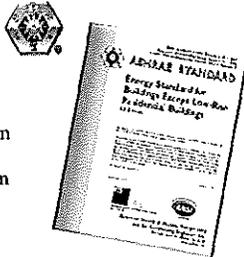
- ★ Perform an energy audit
- ★ Maximize energy savings while being least destructive, invasive, or expensive
- ★ Determine building elements that work together
 - Retain/repair existing building materials
 - Consider upgrading mechanicals and controls
 - Maintain or restore passive systems
 - Supplement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

Maine Preservation
Outstanding Codes

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 closed cell foam insulation
 - Hides the structure beneath
 - Not compatible with older wiring
 - Inhibits upgrading of wiring, plumbing or other in wall systems
 - Is flammable
 - Cracks and voids allow moisture penetration

Compliance via ASHRAE 90.1 - 2007



IP Version
or
SI version

Your Written Exam

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

IECC	6%
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 5 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 annual output energy to the annual input energy as developed IAW 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:

Definitions, abbreviations, and acronyms

A few noteworthy ones:

Building Envelope, exterior
The elements of a building that separate *conditioned* spaces from the exterior.

Definitions, abbreviations, and acronyms

A few noteworthy ones:

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

Definitions, abbreviations, and acronyms

A few noteworthy ones:

Space
An enclosed space within a building.

Definitions, abbreviations, and acronyms

A few noteworthy ones:

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 sensible output capacity exceeds 5 Btu/hr/ft² of floor area.

Definitions, abbreviations, and acronyms

A few noteworthy ones:

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.

Definitions, abbreviations, and acronyms

Table 3.1 Heated Space Criteria

Heating Output Btu/hr/ft ²	Climate Zone
5	1 and 2
10	3
15	4 and 5
20	6 and 7
25	8

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:

Definitions, abbreviations, and acronyms

A few noteworthy ones:

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-factors and surface area(s) of the space adjoining the outdoors, unconditioned spaces, or to or from semi-heated spaces (e.g., corridors)

OR

Definitions, abbreviations, and acronyms

A few noteworthy ones:

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:

That air from heated or cooled spaces is intentionally transferred (naturally or mechanically) into the space at a rate exceeding 3 ACH (e.g., atria).

Now that we are done with the definition of Conditioned Space...

Definitions, abbreviations, and acronyms

A few noteworthy ones:

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.

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.

Definitions, abbreviations, and acronyms

A few noteworthy ones:

Building Official

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

Definitions, abbreviations, and acronyms

A few noteworthy ones:

Design Professional

An architect or engineer licensed to practice IAW applicable state licensing laws.

Definitions, abbreviations, and acronyms

A few noteworthy ones:

Floor, envelope

That lower portion of the *building envelope*, including opaque area and fenestration, that has conditioned or *semi-heated space* above and is horizontal or tilted at an angle of less than 60° from the horizon but excluding slab on-grade floors.

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

Definitions, abbreviations, and acronyms

A few noteworthy ones:

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/ft² x F, or
2. 5 Btu/ft² x F 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:

Steel joist floor:

A floor that

1. Is not a mass floor and
2. That has steel joist members supported by structural members.

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 joist floors

(See building envelope, fenestration, opaque 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, plastic panels, clerestories, skylights, doors that are more than 1/2 glass, and glass block walls.

Doors that are more than 1/2 glass are considered fenestration.

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 nearest 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.

Nonrenewable Energy
Energy derived from a fossil fuel source.

Definitions, abbreviations, and acronyms

A few noteworthy ones:

Historic
A building or space that has been specifically designated as historically significant by the adopting 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:

Residential
Spaces in buildings used primarily for living and sleeping. Residential spaces include, but are not limited to, dwelling units, hotel/motel guest rooms, dormitories, nursing homes, patient rooms in hospitals, lodging houses, fraternity/sorority houses, hostels, prisons, and fire stations.

Definitions, abbreviations, and acronyms

A few noteworthy ones:

Service Water Heating
Heating water for domestic or commercial purposes other than space heating and process requirements.

Definitions, abbreviations, and acronyms

A few noteworthy ones:

Solar Heat Gain Coefficient (SHGC)
The ratio of solar heat gain entering a space through the fenestration area to the incident solar radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radiation, which is then reradiated, conducted, or convected into the space.

Definitions, abbreviations, and acronyms

A few noteworthy ones:

Substantial contact
A condition where adjacent building materials are placed so that proximal surfaces are contiguous, being installed and supported so they eliminate voids between materials without compressing or degrading the thermal performance of either product.

Definitions, abbreviations, and acronyms

A few noteworthy ones:

Ventilation

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.



Definitions, abbreviations, and acronyms

A few noteworthy ones:

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

- > 5. Building envelope
- > 6. HVAC
- > 7. Service water heating
- > 8. Power
- > 9. Lighting
- > 10. Other equipment

Section 4

4.1 General

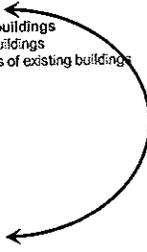
- New buildings
- Additions to existing buildings
- Alterations of existing buildings
- Replacement of portions of existing building

Shall be in compliance with

- > 5. Building envelope
- > 6. HVAC
- > 7. Service water heating
- > 8. Power
- > 9. Lighting
- > 10. Other equipment,

or

- > 11. Energy Cost Budget Method



Maine Preservation
Ordering Ordinance

Section 4

4.2.1.3

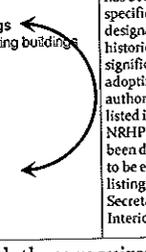
- New buildings
- Additions to existing buildings
- Alterations of existing buildings
- Replacement of portions of existing buildings

Shall be in compliance with

- > 5. Building envelope
- > 6. 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 or has been determined to be eligible for listing by the U.S. Secretary of the Interior...



Maine Preservation
The Heritage Connection

When working with historic buildings, try to determine the best "bang for your buck" in energy saving measures.

★ Insulating, air sealing, and weatherizing doors and windows may well be the lowest cost measures while preserving historic features

- Insulate attics and/or roofs
- Seal against infiltration and provide proper ventilation
- Weatherize doors and windows/add storm windows
- Avoid replacement windows
- Evaluate performance/efficiency of existing mechanicals
- Install energy efficient lighting, low flow H₂O devices and controls

Section 4

4.1.1.5 • Changes in space conditioning

- Whenever unconditioned or semi heated spaces in a building are converted to conditioned spaces, such conditioned spaces shall be brought into compliance with all applicable requirements of the standard as if the building were new.

Section 4

4.1.3 • Alternative Materials, Methods of Construction

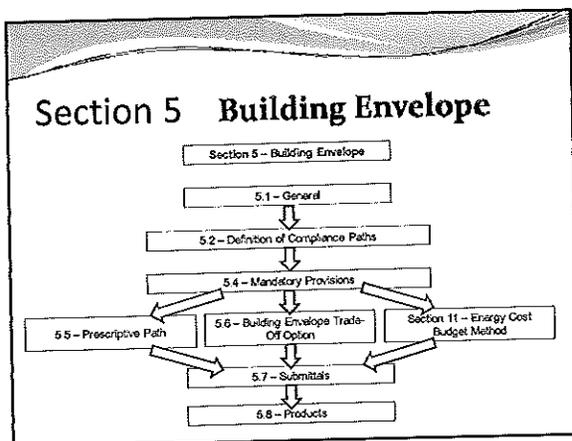
- The provisions of this standard are not intended to prevent the use of any material, method of construction, design, equipment, or building system not specifically prescribed herein.

Section 4

4.1.6 • References -- Part of the program!

4.1.7 • Normative Appendices -- Required!

4.1.8 • Informative Appendices -- Informational only (not mandatory and not part of the standard)



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

5.1.2.2 • 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

5.1.2.3 • 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

5.1.3 • Envelope Alterations

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

applicable to those specific portions of the building that are being altered.

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

5.2 Compliance Paths

- Section 5.5 Prescriptive Building Envelope Option

Provided that

1. The vertical fenestration area does not exceed 40% of the gross wall area for each space-conditioning category, and
2. The skylight fenestration area does not exceed 5% of the gross roof area for each space-conditioning category.

Or

- Section 5.6 Building Envelope Trade-Off Options

Section 5 Building Envelope

5.6 • Building Envelope Trade-Off Option

The building envelope complies with the standard if the proposed building satisfies the provisions of

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

and

- b. 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

5.6.1.3 • Building Envelope Trade-Off Option

Shall be calculated using the procedures of Normative Appendix C

See page 116
 Also includes the Building Envelope Trade-Off Option in subsections B

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 (Compliance 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)

Section 5 Building Envelope

5.8 Product Information and Installation Requirements

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 eave vents are installed, baffling 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 substantial 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

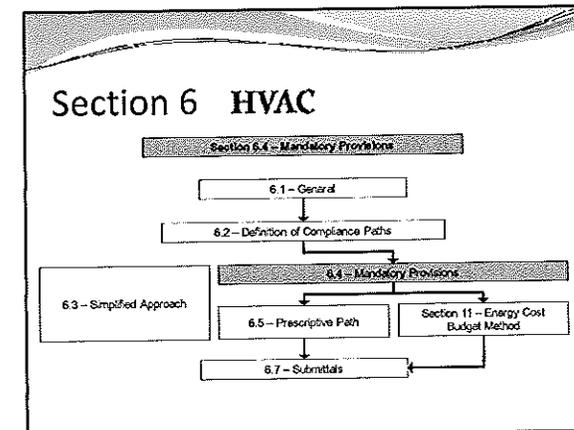
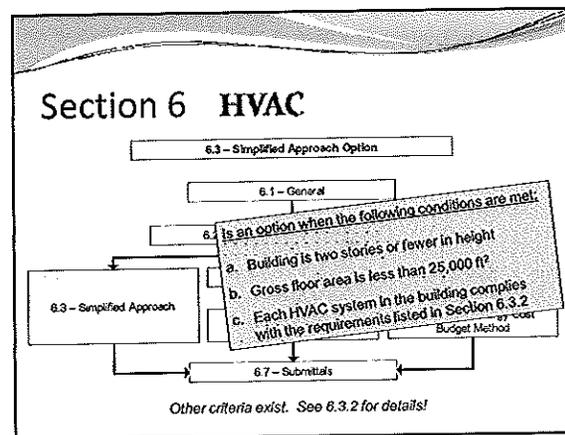
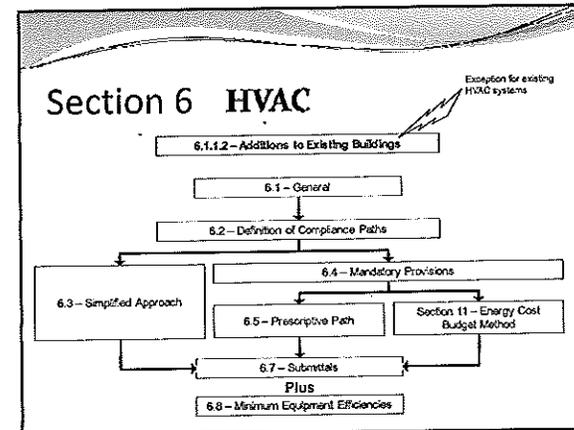
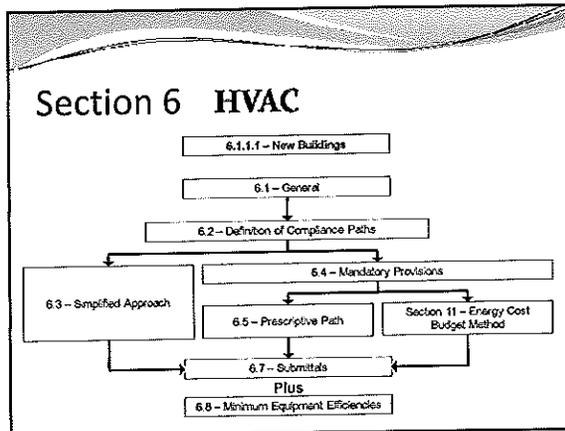
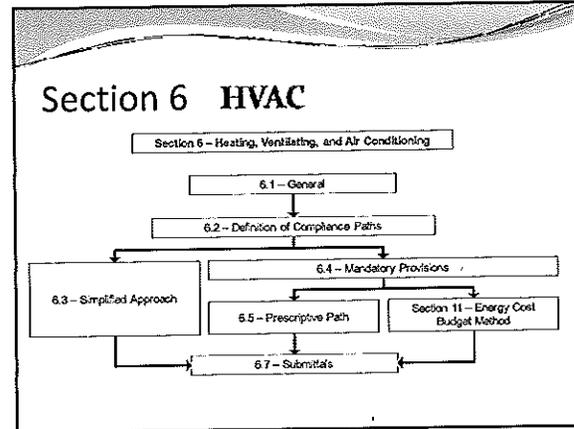
5.8 Product Information and Installation Requirements

5.8.1.6

- Recessed Equipment

Review this section in the book. Fairly strict requirement.

General intention is to preclude breaches in the building envelope!

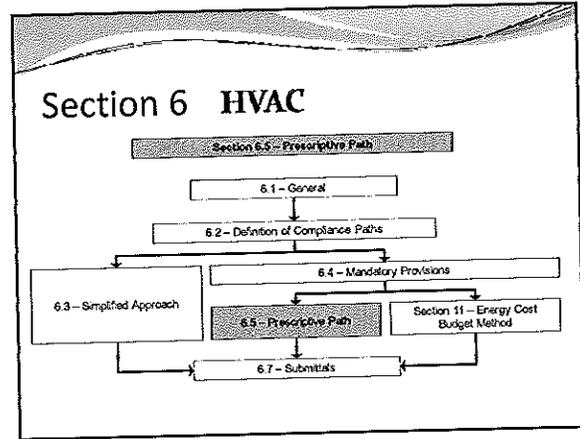


Section 6 HVAC

Section 6.4 - Mandatory Provisions

Are applicable to:

- 6.4.1 Equipment Efficiencies, Verification, and Labeling Requirements
- 6.4.2 Load Calculations
- 6.4.3 Controls
- 6.4.4 HVAC System Construction and Insulation
- 6.4.5 Completion Requirements



Section 6 HVAC

Section 6.5 - Prescriptive Path

Are applicable to:

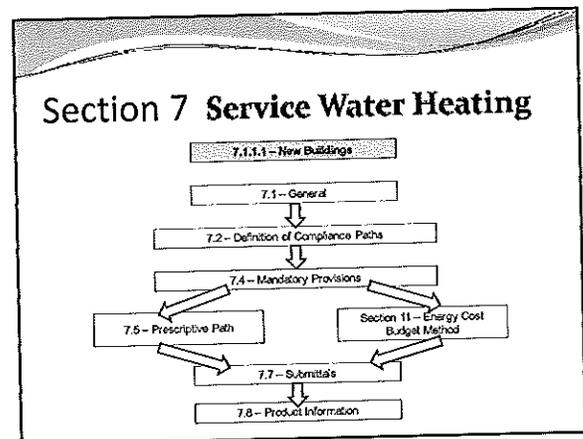
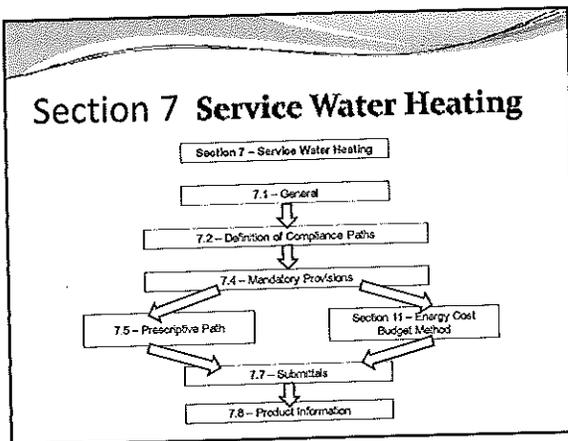
- 6.5.1 Economizers
- 6.5.2 Simultaneous Heating and Cooling Limitation
- 6.5.3 Air System Design and Control
- 6.5.4 Hydronic System Design and Control
- 6.5.5 Heat Rejection Equipment

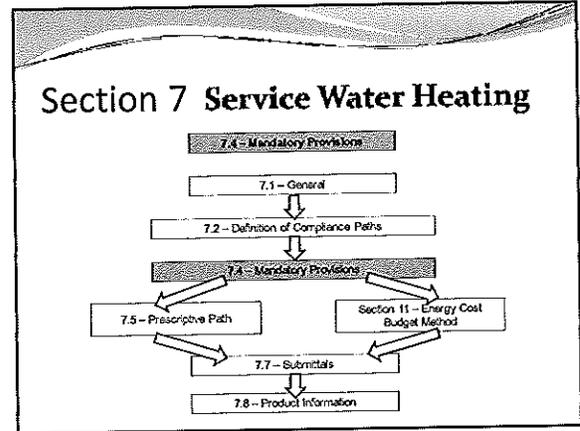
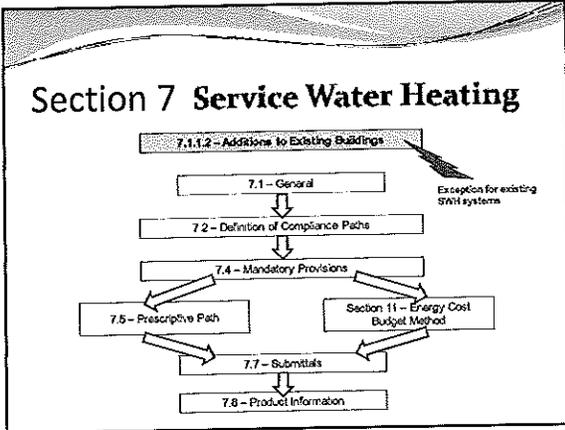
Section 6 HVAC

Section 6.5 - Prescriptive Path

Are applicable to:

- 6.5.6 Energy Recovery
- 6.5.7 Exhaust Hoods
- 6.5.8 Radiant Heating Systems
- 6.5.9 Hot Gas Bypass Limitation



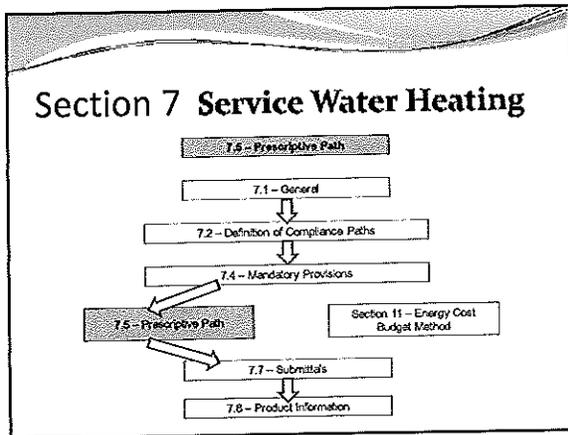
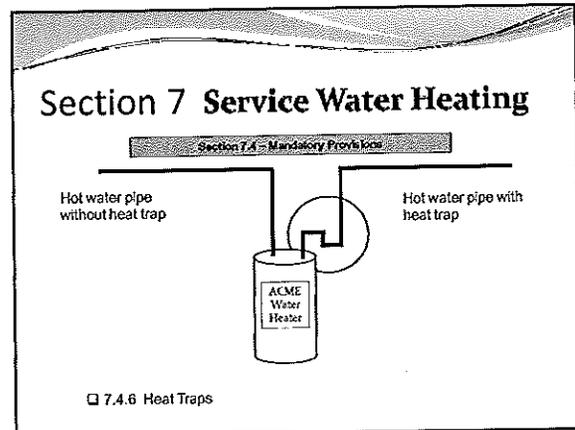


Section 7 Service Water Heating

Section 7.4 - Mandatory Provisions

Are applicable to:

- 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 Heat Traps



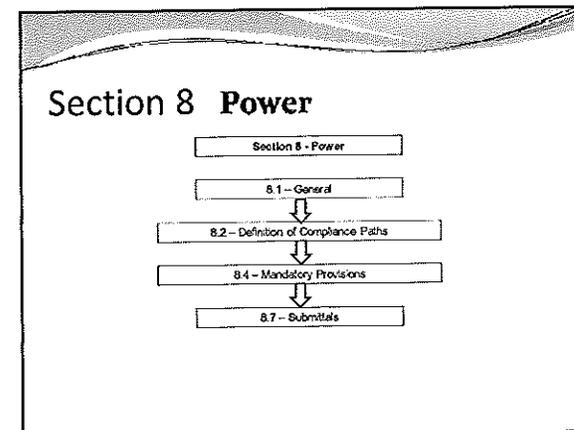
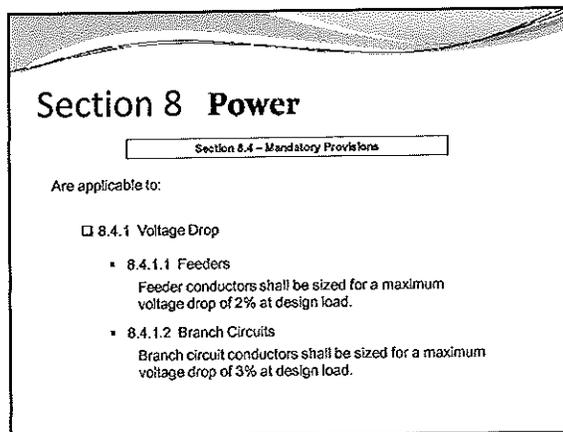
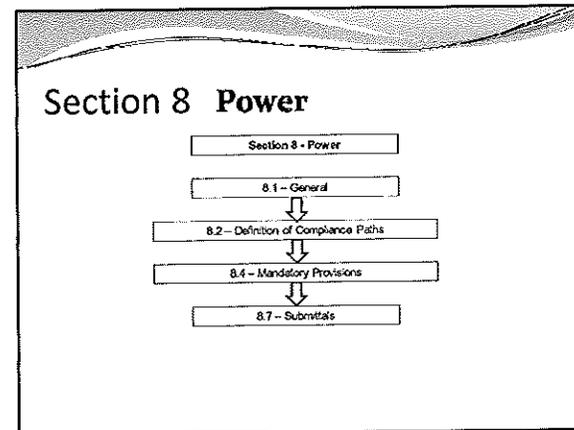
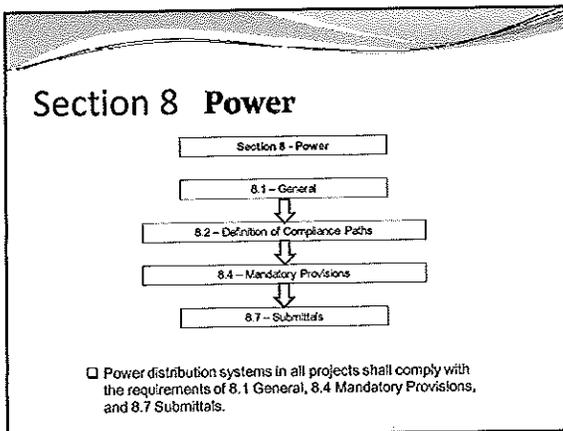
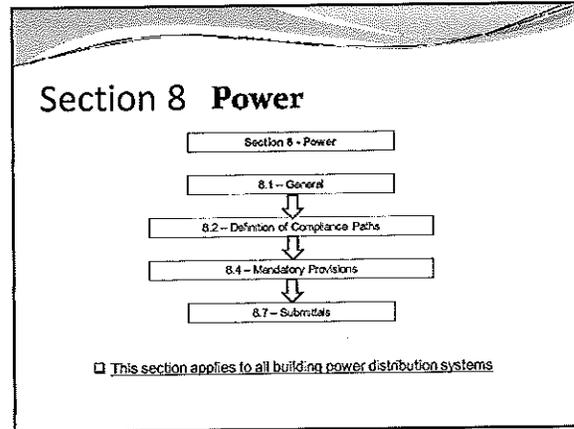
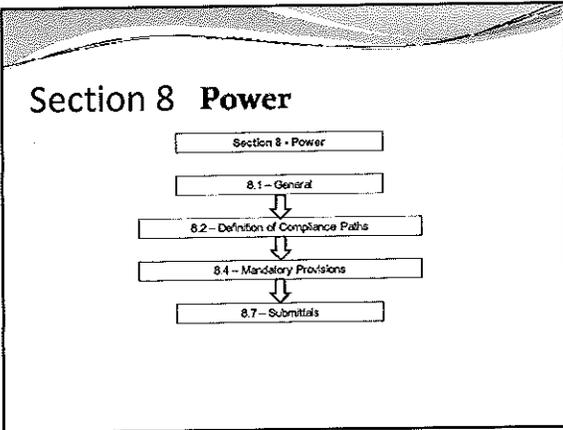
Section 7 Service Water Heating

Section 7.5 - Prescriptive Path

7.5.1 Space Heating and Water Heating

The use of a gas-fired or oil-fired space heating boiler system otherwise complying with Section 6 (HVAC) to provide total space heating and water heating for a building is allowed when one of the following conditions are met:

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



Section 8 Power

Section 8.7 - Submittals

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.

Section 8 Power

Section 8.7 - Submittals

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. Submittal data stating equipment rating and selected options for each piece of equipment requiring maintenance
- b. Operation manuals and maintenance manuals for each piece of equipment requiring maintenance. Required routine maintenance actions shall be clearly identified.

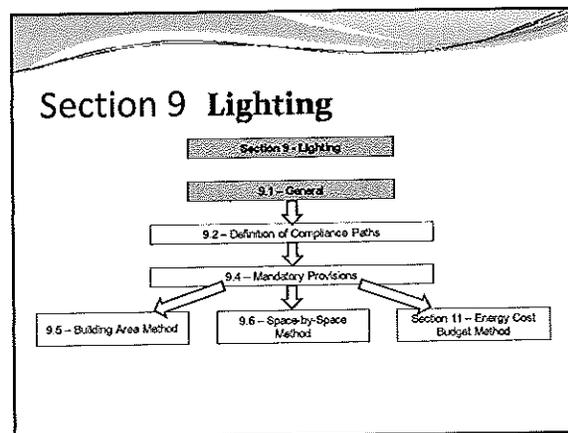
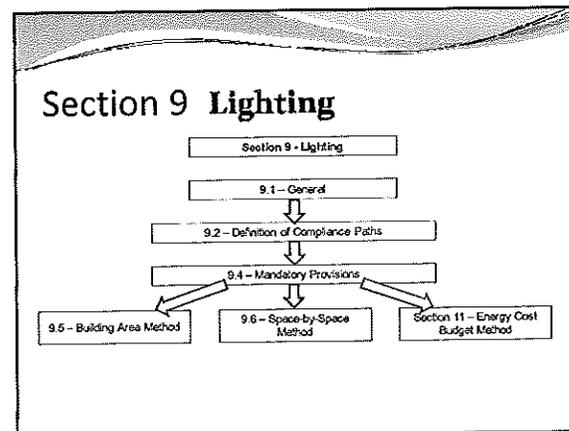
Section 8 Power

Section 8.7 - Submittals

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:

- c. Names and addresses of at least one qualified service agency
- d. A complete narrative of how each system is intended to operate.



Section 9 Lighting

Section 9.1 - General

Is applicable to:

- Interior spaces of buildings
- Exterior features, including facades, illuminated roofs, architectural features, entrances, exits, loading docks, and illuminated canopies
- Exterior building grounds lighting provided through the buildings electrical service.

Section 9 Lighting

Section 9.1 - General

Exceptions:

- Emergency lighting that is automatically off during normal building operation
- 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

Section 9 Lighting

Section 9.1 - General

Other "General" considerations include:

- 9.1.2 Lighting Alterations
- 9.1.3 Installed Interior Lighting Power
- 9.1.4 Luminaire Wattage

Section 9 Lighting

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graph TD
    A[Section 9 - Lighting] --> B[9.1 - General]
    B --> C[9.2 - Definition of Compliance Paths]
    C --> D[9.4 - Mandatory Provisions]
    D --> E[9.5 - Building Area Method]
    D --> F[9.6 - Space-by-Space Method]
    D --> G[Section 11 - Energy Cost Budget Method]
    
```

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 demonstrating 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

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graph TD
    A[Section 9 - Lighting] --> B[9.1 - General]
    B --> C[9.2 - Definition of Compliance Paths]
    C --> D[9.4 - Mandatory Provisions]
    D --> E[9.5 - Building Area Method]
    D --> F[9.6 - Space-by-Space Method]
    D --> G[Section 11 - Energy Cost Budget Method]
    
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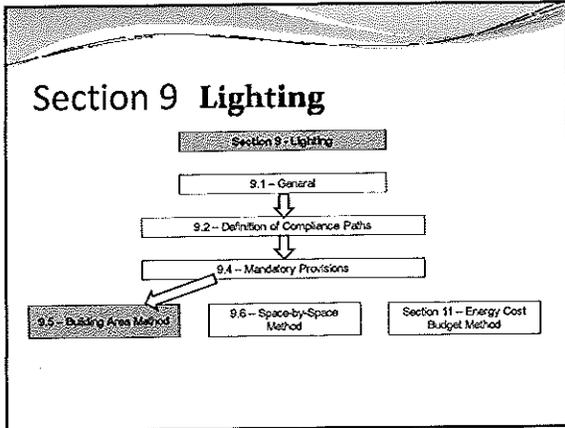
Lighting systems and equipment shall comply with Sections 9.1 General, 9.4 Mandatory Provisions, and the prescriptive requirements of either 9.5 Building Area Method or 9.6 Space-by-Space Method.

Section 9 Lighting

Section 9.4 - Mandatory Provisions

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

**Section 9.5 - Building Area Method
Of Calculating Interior Lighting Power Allowance**

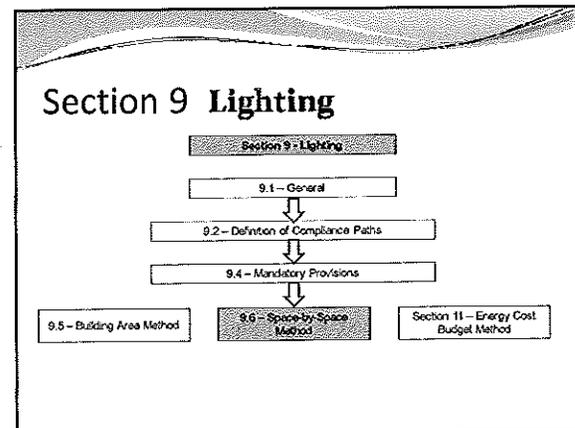
Use the following steps to determine the interior lighting power allowance by the Building Area Method:

- Determine appropriate building area type (Table 9.5.1) and the allowed LPD (lighting power density) from the Building Area Method column.
- Determine gross lighted floor area of the building area type.
- Multiply gross lighted floor areas of the building type(s) times the LPD.
- The interior lighting power allowance for the building is the sum of the lighting power allowances of all building area types.

Section 9 Lighting

**Section 9.5 - Building Area Method
Of Calculating Interior Lighting Power Allowance**

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



Section 9 Lighting

**Section 9.6 - Space-by-Space Method
Of Calculating Interior Lighting Power Allowance**

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

- Determine appropriate building type from Table 9.6.1.
- For each space enclosed by partitions 80% or greater than the ceiling height, determine the gross interior floor area by measuring to the center of the partition wall.

Section 9 Lighting

**Section 9.6 - Space-by-Space Method
Of Calculating Interior Lighting Power Allowance**

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

- 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

**Section 9.6 – Space-by-Space Method
Of Calculating Interior Lighting Power Allowance**

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 internal lighting power does not exceed the interior lighting power allowance.

Section 9 Lighting

**Section 9.6 – Space-by-Space Method
Of Calculating Interior Lighting Power Allowance**

9.6.2 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 luminaries
- Not for any other purposes
- Only allowed under certain cases and conditions (see 9.6.2)

**Maine Preservation
Designating Ordinance**

Section 9 Lighting

9.2.2.3 Exception i

The following lighting equipment and applications shall not be considered when determining the interior lighting power allowance developed IAW Section 9.5 or 9.6, nor shall the wattage for such lighting be included in the installed interior lighting power identified IAW Section 9.1.3

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

Section 10 Other Equipment

```

    graph TD
      A[Section 10 – Other Equipment] --> B[10.1 – General]
      B --> C[10.2 – Definition of Compliance Paths]
      C --> D[10.4 – Mandatory Provisions]
    
```

Section 10 Other Equipment

```

    graph TD
      A[Section 10 – Other Equipment] --> B[10.1 – General]
      B --> C[10.2 – Definition of Compliance Paths]
      C --> D[9.4 – Mandatory Provisions]
    
```

This Section applies only to the equipment described below:

Section 10 Other Equipment

Section 10.1 – General

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 other building 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 direct replacement of existing equipment or control devices, shall comply with the specific requirements applicable to that equipment or control devices.

Section 10 Other Equipment

Section 10.1 – General

This Section applies only to the equipment described below:

Exception:

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

Section 10 Other Equipment

Section 10.2 – Compliance Paths

10.1 – General

↓

10.2 – Definition of Compliance Paths

↓

9.4 – Mandatory Provisions

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

Section 10 Other Equipment

Section 10.2 – Compliance Paths

10.1 – General

↓

10.2 – Definition of Compliance Paths

↓

9.4 – Mandatory Provisions

Section 10 Other Equipment

Section 10.4 – Mandatory Provisions

Are applicable to:

- 10.4.1 Electric Motors
- 10.5 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 1992 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

Section 11.4 – Compliance

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

- 6.4 – 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

Section 11 Energy Cost Budget Method

Section 11.4 – Compliance

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

- The design energy cost, as calculated in section 11.3 does not exceed the energy cost budget, as calculated by the simulation program described in Section 11.2

and

- The energy efficiency level of components specified in the building design meet or exceed the efficiency levels used to calculate the design energy cost.

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

The design energy cost, as calculated in section 11.3 does not exceed the energy cost budget, as calculated by the simulation program described in Section 11.2

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:

1. 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.

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:

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

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:

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 IAW the requirements in Table 11.3.1.




Another detail that you should be familiar with is the differences between IECC Chapter 5 (Commercial Energy) and ASHRAE 90.1-2007

Both are a valid means of compliance!

Let's take a look!

<p>ASHRAE 90.1</p> <p>Provides:</p> <p>a. energy efficient requirements for</p> <ol style="list-style-type: none"> 1. New buildings and systems 2. New portions of buildings or systems 3. New systems and equipment in existing buildings <p>b. Criteria for determining compliance</p>	<p>IECC Chapter 5</p> <p>Requirements are applicable to commercial buildings, or portions of commercial buildings</p>
--	--

Both address new buildings, additions and alterations, new and existing systems. The code exempts new work to historic buildings. The standard does not.

<p>ASHRAE 90.1</p> <p>Applies to:</p> <p>Building envelope HVAC systems Service water heating Electrical power distribution Electric motors and belt drives Lighting</p>	<p>IECC Chapter 5</p> <p>Applies to:</p> <p>Building envelope Building mechanical systems Service water heating Electrical power and lighting systems</p>
--	---

- Envelope: The standard adds provisions for heated spaces based on climate zone as well as adding subcategories (indirectly conditioned, semi-conditioned).
- Electrical power distribution: Standard only
- Electrical power metering: Code only
- Other motors and belt drives (vertical/ passenger conveyance): Standard only

<p>ASHRAE 90.1</p> <p>Provides comprehensive and specific requirements for nearly all building thermal envelope systems, based on climate zones (Tables 5.5-1 thru 5.5-8)</p>	<p>IECC Chapter 5</p> <p>Provides certain default metal building, fenestration U-factor and Solar Heat Gain Coefficient (SHGC) requirements</p>
--	--

- Efficiencies are 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 "IAW" generally acceptable engineering standards and handbooks"

<p>ASHRAE 90.1</p> <p>Prescriptive Building Envelope Option</p> <p>YES</p>	<p>IECC Chapter 5</p> <p>Prescriptive Building Envelope Option</p> <p>YES</p>
--	---

Both the code and the standard provide for prescriptive methods of compliance, however, there are several differences in the efficiencies in certain categories.

Neither is better or worse, just different

<p>ASHRAE 90.1</p> <p>Prescriptive Building Envelope Option</p> <p>Roof U-factor (above deck systems) Better in Zones 1 - 6</p> <p>Roof U-factor (metal buildings) Better in Zone 1</p> <p>Roof U-factor (attic systems) Better in Zone 8</p>	<p>IECC Chapter 5</p> <p>Prescriptive Building Envelope Option</p> <p>Roof U-factor (above deck systems) Better in Zones 7 and 8</p> <p>Roof U-factor (metal buildings) Better in Zones 2 - 8</p> <p>Roof U-factor (attic systems) Better in Zones 1 - 7</p>
--	---

Other roof requirements are otherwise identical

<p>ASHRAE 90.1</p> <p>Prescriptive Building Envelope Option</p> <p>Above grade walls (metal buildings) Better in Zones 7 and 8</p> <p>Floor U-factor (metal buildings) Better in Zone 8</p> <p>Slab-on-Grade Floor U-factor (heated or unheated) Identical</p>	<p>IECC Chapter 5</p> <p>Prescriptive Building Envelope Option</p> <p>Above grade walls (metal buildings) Better in Zones 1 and 6</p> <p>Floor U-factor (metal buildings) Better in Zones 1 - 7</p> <p>Slab-on-Grade U-factor (heated or unheated) Identical</p>
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Just for a few examples...

ASHRAE 90.1	IECC Chapter 5
Prescriptive Building Envelope Option	Prescriptive Building Envelope Option
Opaque doors U-factor Identical	Opaque doors U-factor Identical
Fenestration heat transmission (vertical) Identical	Fenestration heat transmission (vertical) Identical
Fenestration heat transmission (skylights) Better for plastic units	Fenestration heat transmission (skylights) Better for glass units

ASHRAE 90.1	IECC Chapter 5
Prescriptive Building Envelope Option	Prescriptive Building Envelope Option
Fenestration SHGC (vertical) Identical	Fenestration SHGC (vertical) Identical
Fenestration heat transmission (skylights) Better in Zone 7	Fenestration heat transmission (skylights) Better in all zones except Zone 7

ASHRAE 90.1	IECC Chapter 5
Heating, Ventilating and Air Conditioning	Building Mechanical Systems
Simple systems, General Limited to buildings two stories or less and 25,000 ft ² or less and served by unitary or packaged equipment serving one zone and responding to one thermostat	Simple systems, General Limited to buildings served by unitary or packaged equipment serving one zone and responding to one thermostat
Complex systems, General Designs of all complex HVAC system types and configurations, unless specified, afford identical requirements	Complex systems, General

ASHRAE 90.1	IECC Chapter 5
Pipe insulation	Pipe 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	1.5 or 3 inch thick R-3.7 insulation as required

ASHRAE 90.1	IECC Chapter 5
Duct sealing	Duct sealing
Based on operating static pressure Requires leak testing IAW SMACNA Seal class (i.e. A, B, C)	Based on operating static pressure Requires leak testing IAW SMACNA Seal using pressure classifications IAW International Mechanical Code

ASHRAE 90.1	IECC Chapter 5
Gravity hoods, vents and ventilators	Gravity hoods, vents and ventilators
Gravity dampers permitted for buildings two stories or less in height and buildings located in Zones 1 – 3.	Gravity dampers are permitted by exception for all buildings two stories or less in height

ASHRAE 90.1	IECC Chapter 5
Hydronic systems controls	Hydronic systems controls
No such provision.	Improves energy efficiency as follows: Multiple-packaged boiler operation shall be sequenced, single boilers >500,000 Btu/hr shall be equipped with multistage or modulating burners.

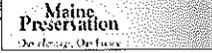
ASHRAE 90.1	IECC Chapter 5
System commissioning	System commissioning
Requires HVAC control systems to be tested to ensure that control elements are calibrated, adjusted, and in proper working condition	Does not include these provisions

ASHRAE 90.1	IECC Chapter 5
Service water heating – Load calculation	Service water heating – Load calculation
Requires calculation of service water heating system design loads for the purpose of sizing systems and equipment	Does not include these provisions

ASHRAE 90.1	IECC Chapter 5
Service hot water piping insulation	Pipe 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	1 inch thick R-3.7 insulation



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.

Maine Preservation
Our Heritage, Our Future

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.

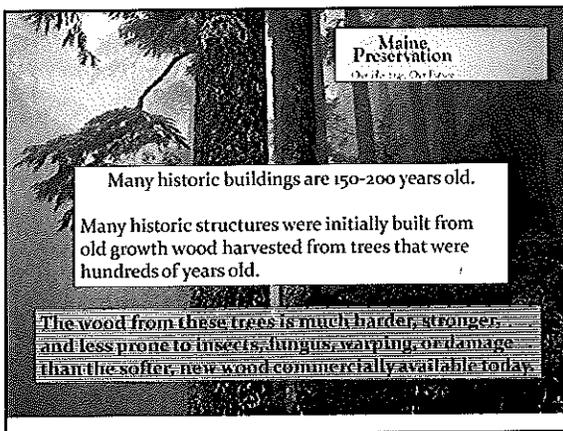
Maine Preservation
Our Heritage, Our Future

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.

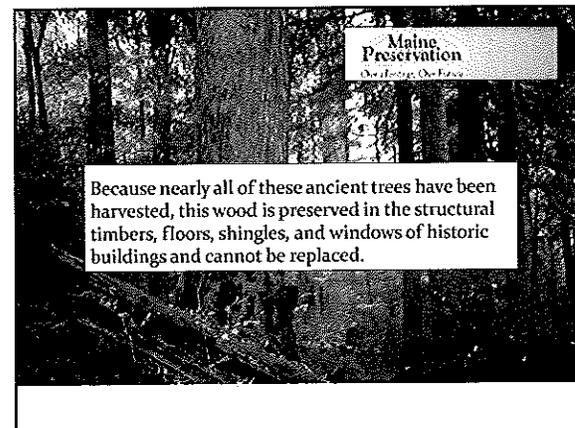


Maine Preservation
Our Heritage, Our Future

Many historic buildings are 150-200 years old.

Many historic structures 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, fungus, warping, or damage than the softer, new wood commercially available today.



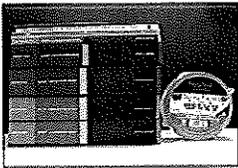
Maine Preservation
Our Heritage, Our Future

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

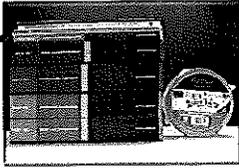
Navigating the Code

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



Navigating the Code

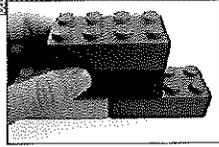
International Energy Conservation Code



Clearly, we won't be able to teach you all of the IECC today, however.

Navigating the Code

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



Quickly!
NICKIAI

Chapters



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

Chapters

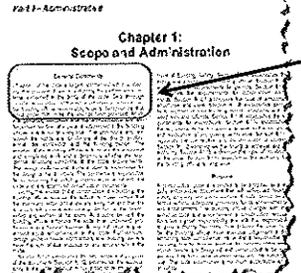


Please note that all Chapters of the IECC are included in the MUBEC

General Comments

Part I—Administrative

**Chapter 1:
Scope and Administration**



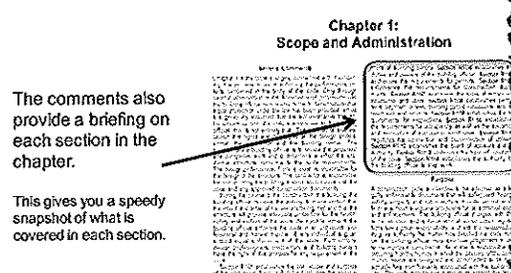
Each chapter starts with some general comments about the material that will be covered.

This information can be helpful to when interpreting code or trying to explain details to others.

General Comments

Part I—Administrative

**Chapter 1:
Scope and Administration**



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

Part—Administrative

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 sub-sections, according to more specific topics

Commentary

The commentary follows many of the code references

It serves as a statement of its objective and intent, and discusses why the requirement commands the conditions set forth

Commentary

The commentary is advisory only. Only the code is enforceable

Revisions to the IECC

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

The following changes should be made to the text:

ELECTRICAL
REQUIREMENTS FOR ELECTRICAL SYSTEMS
 1. The following code shall apply to all buildings, structures, and premises:
 a. The National Electrical Code, 2008 Edition, as amended by the 2009 National Electrical Code Addendum, published by the National Fire Protection Association, Inc., Quincy, Massachusetts, 2009.
 b. The National Electrical Code, 2008 Edition, as amended by the 2009 National Electrical Code Addendum, published by the National Fire Protection Association, Inc., Quincy, Massachusetts, 2009, shall apply to all buildings, structures, and premises, except as otherwise provided in this code.
 c. The National Electrical Code, 2008 Edition, as amended by the 2009 National Electrical Code Addendum, published by the National Fire Protection Association, Inc., Quincy, Massachusetts, 2009, shall apply to all buildings, structures, and premises, except as otherwise provided in this code.

REVISIONS TO THE IECC
 1. The following code shall apply to all buildings, structures, and premises:
 a. The International Energy Conservation Code, 2009 Edition, published by the International Code Council, Inc., Bethesda, Maryland, 2009.
 b. The International Energy Conservation Code, 2009 Edition, published by the International Code Council, Inc., Bethesda, Maryland, 2009, shall apply to all buildings, structures, and premises, except as otherwise provided in this code.
 c. The International Energy Conservation Code, 2009 Edition, published by the International Code Council, Inc., Bethesda, Maryland, 2009, shall apply to all buildings, structures, and premises, except as otherwise provided in this code.

Revisions to the IECC

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

www.maine.gov/dps/bbcs

FINAL ADOPTION CHAPTER 1 - ADMINISTRATION
FINAL ADOPTION CHAPTER 2 - THIRD-PARTY INSPECTORS
FINAL ADOPTION CHAPTER 3 - IBC (2009) International Building Code
FINAL ADOPTION CHAPTER 4 - IBC (2009) International Existing Building Code
FINAL ADOPTION CHAPTER 5 - IBC (2009) International Residential Code
FINAL ADOPTION CHAPTER 6 - IECC (2009) International Energy Conservation Code

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"

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

Revisions to the IECC

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

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, 2008, 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 its entirety, without substitution.

Revisions to the IECC

Section 402.4.2.1
Delete "33.5 psf (50 Pa)" at the end of the first sentence and insert "50 Pa (1 psf)" in its place.

Revisions to the IECC

Section 403.9.1
Insert "or LPG" after "natural gas".

Revisions to the IECC

Section 503.2.5
Delete "Chapter 4 of the International Mechanical Code" and insert "ASHRAE 62.1 – 2007" in its place for both occurrences.

Revisions to the IECC

Section 503.2.5.1
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 90A" in it's place.

Revisions to the IECC

Section 503.2.9.1
Delete "in accordance with the requirements of Chapter 6 of the International Mechanical Code" without substitution.

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 90.1-2007" in it's place.

Revisions to the IECC

Chapter 6, First Paragraph
Delete "107" from the end of the last sentence and insert "106" in it's 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 sure 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

- o Interior design conditions
- o Materials
- o Systems
- o Equipment

Let's flip over to Chapter 3

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

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

Let's flip over to Chapter 3

If you are using a code book that is older than 2006, you will notice many changes in the climate zone map.

A thorough discussion of the zones development can be found at

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

Climate Classification for Building Energy Codes and Standards

