2015

IECC Essentials with Maryland Amendments

ICC
INTERNATIONAL CODE COUNCIL®

2015 IECC Essentials w/Maryland Amendments

First Printing: October 2015

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T018557-12-2015

2015 IECC Essentials with Maryland Amendments

2015 IECC Essentials With Maryland Amendments

Based on the International Energy Conservation Code® (IECC®)

About The IECC

- The International Energy Conservation Code is a comprehensive model code that regulates minimum energy efficient provisions for new buildings and additions and alterations to existing buildings.

Description

- This seminar provides an overview of critical concepts in the 2015 *International Energy Conservation Code*® (IECC®) with Maryland Amendments, which form the basis for the correct use of the code in the design, plan review, inspection and analysis of projects.

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Objectives

Upon completion, participants will be better able to:

- Locate general topics in the 2015 IECC.
- Locate applicable tables in the 2015 IECC for specific situations.
- Apply code requirements to real-world situations.
- Explain the intent behind a code requirement.
- Identify borderline scenarios as compliant or noncompliant.
- Identify essential code components for designing energy-efficient building thermal envelopes, energy-efficient mechanical design principles and electrical power and lighting systems.

Maryland Provisions

- Three-part Process

Annotated Code of Maryland → COMAR 05.02.07 → Local Adoption, Implementation and Enforcement

Annotated Code of Maryland

- Enabling legislation that creates the framework for the Maryland Building Performance Standards.
  - Public Safety Article
  - TITLE 12. BUILDING AND MATERIAL CODES; OTHER SAFETY PROVISIONS
  - SUBTITLE 5. MARYLAND BUILDING PERFORMANCE STANDARDS

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Duties of the Maryland Codes Administration (COMAR)

- Duties of the Maryland Codes Administration not only adopt the codes per Maryland Building Performance Standards (MBPS) but also per the Model performance Code (MPC)

Duties of the Maryland Codes Administration (COMAR)

- **Must adopt as part of the Standards (MBPS) the IBC, the IRC and the IECC within 12 months of the issuance by ICC.**

- **Amendments to the IBC and IRC may not be more stringent than the provisions found in those documents.**

- **Amendments to the IECC must not lessen any of the IECC requirements.**

Local Jurisdiction Amendments

- Local Amendments must not prohibit the minimum implementation and enforcement set forth in §12-505
  - Review and accept plans
  - Issuance of building permits
  - Inspection of the work authorized by building permit
  - Issuance of appropriate occupancy certificates
- Cannot weaken energy conservation and efficiency provisions of the Standards

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Local Jurisdiction Amendments

- Cannot weaken the automatic fire sprinkler systems provisions for townhouses and one- and two- family dwellings.
  - Note: previous exemptions have expired.
- Cannot weaken the wind design and wind-borne debris provisions.

Local Jurisdiction Implementation and Enforcement

- Local jurisdictions **SHALL** implement and enforce the most current version of the standards and any local amendments.

- No later than 6 months after adoption by the State.

Key Maryland Dates

- COMAR adoption of the 2015 IBC:
  - **(Expected) January 1, 2015**
- Local implementation and Enforcement:
  - **Within 6 months after January 1, 2015**
- Local amendments to Maryland Codes Administration:
  - **At least within 15 days prior to local effective date**
  - **Or within 5 days after emergency local adoption**

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2015 IRC COMAR Modifications

- Chapter 1. Delete the Section 102.5 Appendices and Replace with the following:

  102.5 Appendices: All the provisions in the Appendices are adopted as part of the IRC except those in Appendices E, J, and L.

2015 IRC COMAR Modifications

MECHANICAL. Chapter 12 MECHANICAL ADMINISTRATION. Add note to Section M1201.1 Scope: The subject matter of chapters 12 through 23 is not within the scope of the Maryland Building Performance Standards. For the applicable requirements concerning the mechanical systems, refer to the local mechanical code and the mechanical code adopted pursuant to the provisions of the Business Regulations Article, §9A-205, Annotated Code of Maryland.

2015 IRC COMAR Modifications

PLUMBING. Chapter 25 PLUMBING ADMINISTRATION. Add note to Section P2501.1 Scope: The subject matter of chapters 25 through 33 is not within the scope of the Maryland Building Performance Standards. For the applicable requirements concerning the plumbing systems, refer to the local plumbing code and the plumbing code adopted pursuant to the provisions of the Business Occupations and Professions Article, Title 12, Annotated Code of Maryland.

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2015 IRC COMAR Modifications

ELECTRICAL. Chapter 34. GENERAL REQUIREMENTS. Add note to Section 3401.1 Applicability: The subject matter of chapters 34 through 43 is not within the scope of the Maryland Building Performance Standards. For the applicable electrical requirements, refer to the local electrical code and the National Electrical Code as adopted and enforced by the State Fire Marshal, authorized fire officials, or building officials pursuant to the provisions of the Public Safety Article, title 12, Subtitle 6, Annotated Code of Maryland.

Maryland House Bill 323

(a) (1) The Department shall adopt by regulation, as the Maryland Building Performance Standards, the International Building Code, including the International Energy Conservation Code, with the modifications incorporated by the Department under subsection (b) of this section.

- (2) The Department shall adopt each subsequent version of the Standards within 12 months after it is issued.

(b) (1) Before adopting each version of the Standards, the Department shall:

- (i) review the International Building Code to determine whether modifications should be incorporated in the Standards;
- (ii) consider changes to the International Building Code to enhance energy conservation and efficiency;

Maryland House Bill 323

- (III) SUBJECT TO THE PROVISIONS OF PARAGRAPH (2)(II) OF THIS SUBSECTION, ADOPT MODIFICATIONS TO THE STANDARDS THAT ALLOW ANY INNOVATIVE APPROACH, DESIGN, EQUIPMENT, OR METHOD OF CONSTRUCTION THAT CAN BE DEMONSTRATED TO OFFER PERFORMANCE THAT IS AT LEAST THE EQUIVALENT TO THE REQUIREMENTS OF:
  1. THE INTERNATIONAL ENERGY CONSERVATION CODE;
  2. CHAPTER 13, “ENERGY EFFICIENCY”, OF THE INTERNATIONAL BUILDING CODE; OR
  3. CHAPTER 11, “ENERGY EFFICIENCY”, OF THE INTERNATIONAL RESIDENTIAL CODE;
     - [(iii)] (IV) accept written comments;
     - [(iv)] (V) consider any comments received; and
     - [(v)] (VI) hold a public hearing on each proposed modification.

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Maryland House Bill 323

(2) (i) Except as provided in subparagraph (ii) of this paragraph and § 12–510 of this subtitle, the Department may not adopt, as part of the Standards, a modification of a building code requirement that is more stringent than the requirement in the International Building Code.

(ii) The Department may adopt energy conservation requirements that are more stringent than the requirements in the International Energy Conservation Code, but may not adopt energy conservation requirements that are less stringent than the requirements in the International Energy Conservation Code.

Maryland House Bill 323

(c) The Standards apply to each building or structure in the State for which a building permit application is received by a local jurisdiction on or after August 1, 1995.

(d) In addition to the Standards, the Department may adopt by regulation the 4 International Green Construction Code.

Maryland House Bill 323

- SECTION 2. AND BE IT FURTHER ENACTED, That this Act shall take effect October 1, 2015.

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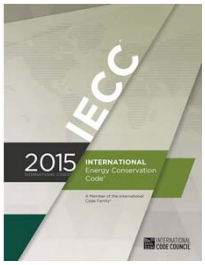
Reference and Resource Materials

- 2015 *International Energy Conservation Code*® (IECC®)



Introduction

- The focus on energy efficiency is new to many in the building design and construction trades.
- The *International Energy Conservation Code* (IECC) developed quickly into a complex document, and the learning curve was steep.
- The complexity is necessary as innovation in buildings and building systems increase.

What is the IECC?

- The IECC is a code that regulates minimum energy efficient provisions for new buildings and additions and alterations to existing buildings.
- It regulates the design and construction of buildings for the use and conservation of energy over the life of each building.

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How the Code is organized

There are two separate sets of provisions.

- The **commercial** and **residential** regulations each apply to heating, air-conditioning, ventilation, and lighting systems.
  - Administrative provisions and definitions specific to each commercial and residential set of regulations are also included.

Chapter 1

Energy and Building Code Perspectives

Introduction

- This chapter discusses the history of energy codes and the scope and influence of some of the companion codes and their relationship to the IECC.

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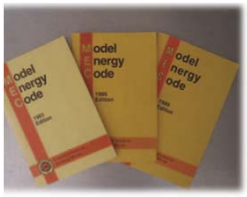
History of Energy Codes

- Standard 90, now ANSI/ASHRAE/IESNA 90.1-2013, recognized in the 2015 IECC as path to compliance for commercial energy efficiency.
- The Energy Conservation in New Building Construction code was followed by the Model Code for Energy Conservation in 1981, and the Model Energy Code (MEC)
- U.S. Department of Energy provided the contract to create the 1983 MEC with content based on ASHRAE Standard 90–1980.



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The Case for Building and Energy Codes

- Modern code books are continually developed and improved to help make our built environment safe, healthy, and energy efficient.
- Cost of energy-inefficient buildings is a matter of national importance.

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Code Development

- (I-Codes) are systematically revised at periodic intervals to keep up with technical changes and to address the improved understanding of hazards.

- I-Codes are revised and updated through an open process that invites participation by all stakeholders and affected parties.

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ICC Code Development Cycle

- New code published every 3 years
- 12 month cycle
- Codes di
  A. IBC, IF
     IPSDC
  B. IRC, IF
     IPMC,
     ICCPC
  C. IgCC

Code Changes submitted
Code Changes available
Committee Action Hearing
Report of CAH
in Group B
ange cycle
2019, etc.
mment Hearing
Governmental
ensus Vote
tion published

cdpACCESS™

- New cloud-based system for the code development process (cdp).
- It was developed to increase participation in the code development process.
- Allows users to create, collaborate, review, submit and vote (if eligible) on code change proposals and public comments.

cdpACCESS™

- After the Committee Action Hearings, ICC members can view and vote on motions for those code changes that received an assembly motion.
- After the Public Comment Hearings, ICC will post the Online Governmental Consensus Vote. The proposals and hearing testimony are available to be viewed by everyone; ICC Governmental Member Voting Representatives and Honorary Members will be able to vote.

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The Building Codes: Scope and Limitations

- Codes are minimum requirements to safeguard public safety, health, and welfare and to regulate the effective use and conservation of energy in buildings.

The Building Codes: Scope and Limitations

- International Building Code (IBC) applies to the construction, alteration, maintenance, use and occupancy of all buildings and structures except those covered by the International Residential Code (IRC).

The Building Codes: Scope and Limitations

- International Residential Code (IRC) regulates the construction of one- and two-family dwellings and town home structures.
- IRC provisions include all of the regulations for building structural elements, fire and life safety, mechanical, fuel gas, plumbing, electrical and energy in one document.

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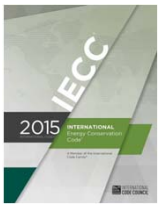
The Building Codes: Scope and Limitations

- International Mechanical Code (IMC)
- International Fuel Gas Code (IFGC)
- International Plumbing Code (IPC)
- International Green Construction Code (IgCC)

The Building Codes: Scope and Limitations

- International Energy Conservation Code (IECC) intent different than other codes and does not speak to life safety and property protection.
- 2015 IECC meets the need for document in common code format to address energy-efficient building enclosures and mechanical, lighting and power systems.



ACTIVITY

What does the energy code mean to you in your job?

- Take a few minutes to discuss as a group.

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Chapter 2

Legal Aspects, Code Adoption And Code Official Authority

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Code Adoption

- Amending the IECC
- Codes and standards
- Jurisdictional amendments become part of the code provisions and are required to be made available to permit applicants doing work there.
- Know the amendments in the jurisdiction having authority to review plans and issue the permit.

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A[N] [ORDINANCE/STATUTE/REGULATION] of the **[JURISDICTION]** adopting the 2015 edition of the International Energy Conservation Code, regulating and governing energy-efficient building envelopes and installation of energy-efficient mechanical, lighting and power systems in the **[JURISDICTION]**; providing for the issuance of permits and collection of fees therefor; repealing **[ORDINANCE/STATUTE/REGULATION]** No. _____ of the **[JURISDICTION]** and all other ordinances or parts of laws in conflict therewith.

The **[GOVERNING BODY]** of the **[JURISDICTION]** does ordain as follows:

Section 1. That a certain document, three (3) copies of which are on file in the office of the **[TITLE OF JURISDICTION'S KEEPER OF RECORDS] of [NAME OF JURISDICTION],** being marked and designated as the International Energy Conservation Code, 2015 edition, as published by the International Code Council, be and is hereby adopted as the Energy Conservation Code of the **[JURISDICTION],** in the State of **[STATE NAME]** for regulating and governing energy-efficient building envelopes and installation of energy-efficient mechanical, lighting and power systems as herein provided; providing for the issuance of permits and collection of fees therefor; and each and all of the regulations, provisions, penalties, conditions and terms of said Energy Conservation Code on file in the office of the **[JURISDICTION]** are hereby referred to, adopted, and made a part hereof, as if fully set out in this legislation, with the additions, insertions, deletions and changes, if any, prescribed in Section 2 of this ordinance.

Section 2. The following sections are hereby revised:

Sections C101.1 and R101.1. Insert: [NAME OF JURISDICTION].

Section 3. That **[ORDINANCE/STATUTE/REGULATION]** No. _____ of **[JURISDICTION]** entitled **[FILL IN HERE THE COMPLETE TITLE OF THE LEGISLATION OR LAWS IN EFFECT AT THE PRESENT TIME SO THAT THEY WILL BE REPEALED BY DEFINITE MENTION]** and all other ordinances or parts of laws in conflict herewith are hereby repealed.

Sample Ordinance for Adoption

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Amending the IECC

- Every model code adoption requires amendments to reflect specific local conditions.
- Some states and jurisdictions incorporate many amendments in the adopting ordinance and others very few changes to the code text as published.

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Codes and Standards

- Code is a body of laws that helps a city, state, or country establish rules of compliance.
- Standards are developed to establish a target of performance.
- The specific code provision applies when there is a conflict between the code and the standard.

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FOR EXAMPLE

Referenced Standard

Agency's Acronym

ASTM

Standard Reference Number

E 283—04

Publication Designation

Edition Year

Title Standard

Agency's Title & Address

ASTM International
100 Barr Harbor Drive
West Conshohocken, PA 19428-2859

Title

Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen .....C402.5.1.2.2, Table C402.5.2, C402.5.7

Referenced in code section number

Code Sections

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Codes and Standards

- Jurisdictional amendments become part of the code provisions and are required to be made available to permit applicants doing work there.

- Know the amendments in the jurisdiction having authority to review plans and issue the permit.

Federal Law

Federal agencies actively involved in the building safety and energy efficiency arena:

- Department of Energy (DOE),
- Department of Housing and Urban Development (HUD),
- Department of Justice (DOJ),
- National Institute of Standards and Technology (NIST), and
- Federal Emergency Management Agency (FEMA).

Authority and Duties of the Code Official

- The IECC grants the code official authority to enforce the requirements in the energy code.
- The code official also establishes a board of appeals to hear problems permit holders may have with decisions or orders

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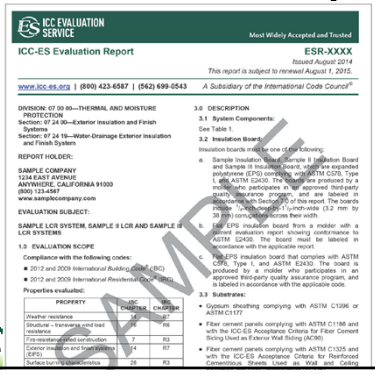
Authority and Duties of the Code Official

- The code official also has the job of accepting plans and documentation for review and performs this duty by requiring that information specific to energy compliance be included in the building plans.

Authority and Duties of the Code Official

- Tests and inspections specific to the energy code must be done to verify that the work complies with the IECC.

The ICC-ES Evaluation Report



ICC EVALUATION SERVICE

Most Widely Accepted and Trusted

ICC-ES Evaluation Report

ESR-XXXX

Issued August 2014

This report is subject to renewal August 1, 2015.

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DIVISION: 07 00 00—THERMAL AND MOISTURE PROTECTION
Section: 07 24 00—Exterior Insulation and Finish Systems
Section: 07 24 19—Water-Drainage Exterior Insulation and Finish System

REPORT HOLDER:

SAMPLE COMPANY
1234 EAST AVENUE
ANYWHERE, CALIFORNIA 91000
(800) 123-4567
www.samplecompany.com

EVALUATION SUBJECT:

SAMPLE LCR SYSTEM, SAMPLE II LCR AND SAMPLE III LCR SYSTEMS

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2012 and 2009 *International Building Code®* (IBC)
- 2012 and 2009 *International Residential Code®* (IRC)

Properties evaluated:

PROPERTY	IBC CHAPTER	IRC CHAPTER
Weather resistance	14	R7
Structural – transverse wind load resistance	16	R6
Fire-resistance-rated construction	7	R3
Exterior insulation and finish systems (EIFS)	14	R7
Surface burning characteristics	26	R3

3.0 DESCRIPTION

3.1 System Components:

See Table 1.

3.2 Insulation Board:

Insulation boards must be one of the following:

a. Sample Insulation Board, Sample II Insulation Board and Sample III Insulation Board, which are expanded polystyrene (EPS) complying with ASTM C578, Type I, and ASTM E2430. The boards are produced by a molder who participates in an approved third-party quality assurance program, and are labeled in accordance with Section 3.0 of this report. The boards include "ship-lap" edges, 1½-inch-wide (3.2 mm) by 30 mils) compression forces their width.

b. Type EPS insulation board from a molder with a current evaluation report showing conformance to ASTM E2430. The board must be labeled in accordance with the applicable report.

c. Type EPS insulation board that complies with ASTM C578, Type I, and ASTM E2430. The board is produced by a molder who participates in an approved third-party quality assurance program, and is labeled in accordance with the applicable code.

3.3 Substrates:

- Gypsum sheathing complying with ASTM C1396 or ASTM C1177
- Fiber cement panels complying with ASTM C1186 and with the ICC-ES Acceptance Criteria for Fiber Cement Siding Used as Exterior Wall Siding (AC90)
- Fiber cement panels complying with ASTM C1325 and with the ICC-ES Acceptance Criteria for Reinforced Cementitious Sheets Used as Wall and Ceiling

SAMPLE

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DISCUSSION

Tests and inspections

- Are building inspectors present during the energy tests and inspections in your jurisdiction?
- What are the challenges related to testing and inspection that you encounter on your job?

Chapter 3

General Commercial Energy Provisions

Scope, Intent

- Code sections C101 and C102 of the IECC, discussed in this section, govern the relationships and understandings between the building department authority and the design and construction community.

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Applicability, Compliance

- Code lists both general and specific requirements, often in different sections, that may apply to the same condition or situation.
- All plans, specifications, and details must comply with the minimum provisions of the code.

Alternate Methods & Materials

Section C102.1

- Materials or methods of construction not specified in the code but meeting the intent of the applicable provision can be used if such are evaluated by the code official and approved before the building is permitted and inspected.
- Mandatory energy efficiency provisions in Chapter 4 of the IECC must be met.

Alternate Methods & Materials

- The permit applicant is responsible for supplying information supporting the proposed alternate.
- The code official irresponsible for evaluating the information to determine equivalency and compliance.
- The authority having jurisdiction to administer the building code may accept a program that exceeds the energy efficiency provisions of this code.

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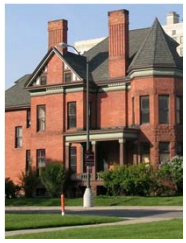
Existing & Historic Buildings

- Legally constructed (permitted) existing buildings or building systems are not required to comply with the energy code provisions for new buildings.
- Alterations or repairs to such buildings are exempt from the provisions of the IECC.



Work Requiring Permits, Change in Use or Occupancy

Section C503.1

- Additions and renovations in non-historic buildings must comply with the energy code provisions required for new construction.
- Commercial tenant occupancy changes may trigger review of energy code compliance.

Discussion Questions

- Do you discuss energy code during the pre-submittal planning meeting?
- How are alternative materials and methods submitted in your jurisdiction?

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Chapter 4

Administration and Enforcement

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Preparing the Plans

- A more complete understanding of the specific provisions and requirements of the code by the design professionals and contractors will help the plans examiner to review the project for compliance and issue the permit.

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Section C103, Construction Drawings and Documents

- The construction documents must clearly indicate the nature and extent of the proposed work.
- The details include insulation materials, window and door schedules, mechanical system design, lighting fixture schedule, location of daylight zones and air-sealing details.

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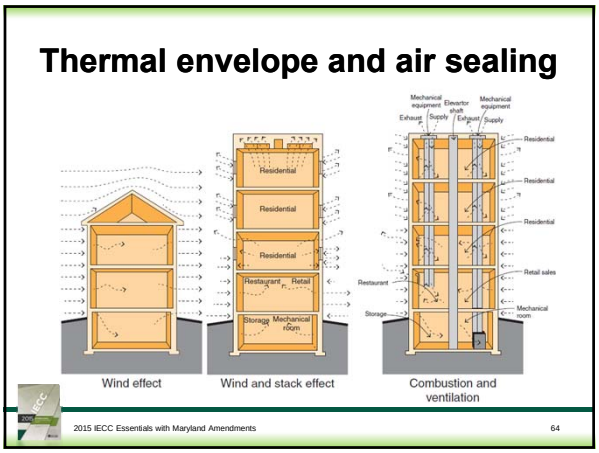

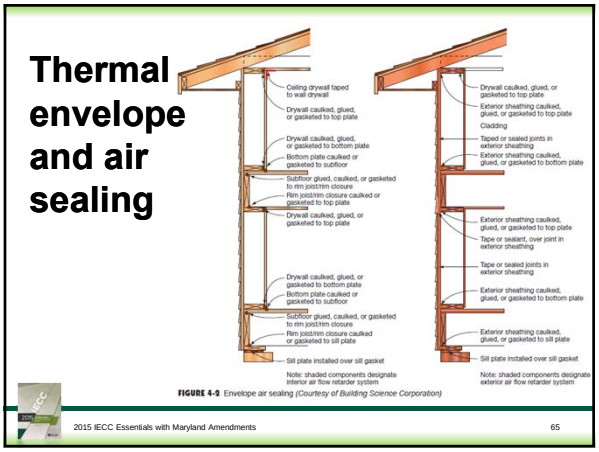

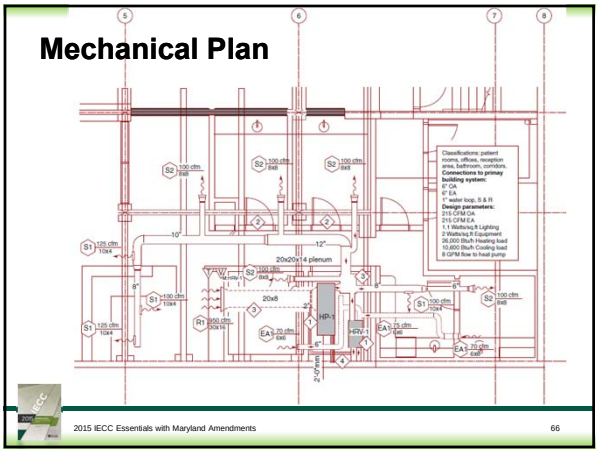

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Service water heating

- Piping layout, equipment location, and control operation information for service water heating systems and schedules for equipment efficiencies and control systems must be included in the design documents.

Lighting and controls

- Interior and exterior lighting systems and controls must be included in the design documents and must demonstrate compliance with the provisions of the IECC.

Plan Review

- **Section C103.3:** Code official is charged with reviewing the construction documents for code compliance.
- Officials will visit the work site for field inspections, and the construction must agree with the approved plans.

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Inspections, Fees

- Building construction work that requires a permit also requires inspection.
- Mechanical, plumbing and electrical inspections are required to verify compliance with the approved plans.
- Every jurisdiction that adopts building codes establishes a fee schedule.

Section C108 Enforcement, Section C109 Board of Appeals

- Code official has the authority to stop work on any part of a project if the work regulated by the code is dangerous, unsafe or not code compliant.
- Board of appeals exists to allow a means to appeal decisions made by the building official.

Section C202 Defined Terms

- Specific words and terms listed in Section 2 of the IECC define what code users agree to understand as the meaning of such terms when written and appearing in the code provisions.
- Terms not defined in IECC but defined in IBC, IFC, IFGC, IMC, IPC, or IRC shall have meanings as defined in those codes.

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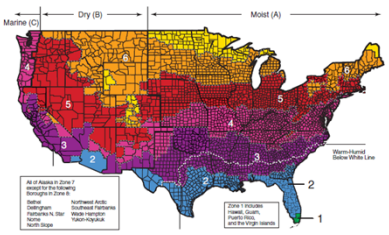
Discussion Question

- How do you educate staff, designers, contractors and the public about specific provisions and requirements of the energy code.

Chapter 5

Specific Requirements for Commercial Buildings

Section C301.1 Climate Zones



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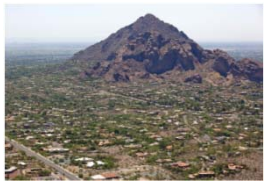
Design Conditions

- The maximum design temperature for heating equipment is 72 degrees. The minimum design temperature for cooling is 75 degrees.



Insulation Materials

- Insulation materials used in the building thermal envelope must somehow be marked and identified to confirm compliance with the approved plans.

Fenestration Products

- National Fenestration Rating Council (NFRC) develops testing criteria for whole-assembly performance.
- Window, door or skylight glass, seals, frame, and latching mechanisms are tested to produce the U-factor energy performance rating.

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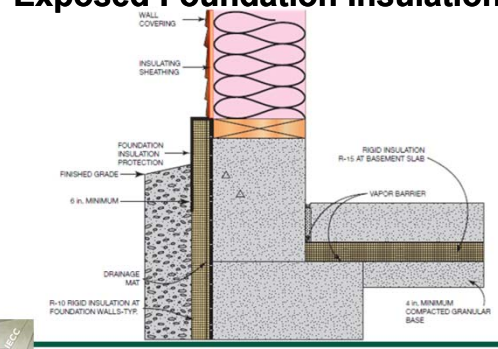
Exposed Foundation Insulation



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Discussion Question

- What do you do when there is not a visible marking or label for the product during an inspection?

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Chapter 6

Efficiency Requirements for Commercial Buildings

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Building Envelope Walls and Roofs

- The typical elements of the thermal envelope include roofs and above- and below-grade walls and floors, as listed in the prescriptive tables C402.1.3 and C402.1.4.
- Code offers three choices for prescriptive compliance: the R-value approach, the U-factor approach and the component performance alternative approach.

Building Envelope Walls and Roofs

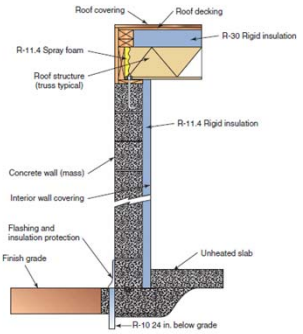

FIGURE 6-2 R-value insulation requirements for commercial building in climate zone 5

Windows, Skylights and Doors

- Table C402.4 of the IECC lists the prescriptive compliance requirements for commercial fenestration.
- The maximum window area allowed is 30 percent of the gross above-grade wall area.
- Skylight area is limited to not more than 3 percent.

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Component Performance Alternative

- Component Performance Alternative formula allows various envelope components to be traded off against each other, provided that the overall calculated building heat loss of the proposed design is no greater than a code-compliant design.

FOR EXAMPLE

Equation 4-2

A + B + C + D + E ≤ Zero

Where each factor represents the difference between the proposed design and a prescriptive design for:

A. The sum of the *U*-factor for each envelope assembly times its area.
B. The sum of the F-factor for each slab-edge assembly times its length.
C. The sum of the C-value for each basement wall assembly times its area.
D. The additional amount for vertical glazing area in excess of maximum.
   - (Substitutes the average wall *U*-factor for the average vertical glazing *U*-factor in the prescriptive case for the excess vertical glazing area.)
E. The additional amount for skylight area in excess of code maximum.
   - (Substitutes the average roof *U*-factor for the average skylight *U*-factor in the prescriptive case for the excess skylight area.)

Performance Compliance

- The total building performance provisions of Section C407 of the IECC offer a fourth path for energy code compliance.
- This performance method allows trade-offs between the building envelope, HVAC system, and lightings systems to achieve an overall building energy conservation result equal to or better than that of the other code compliance paths.

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Equipment Buildings

- Separate electronic equipment buildings up to 500 square feet are exempt from the building thermal envelope provisions of the code when they meet a set of specified requirements.

Commissioning

- With some exceptions, service water heating systems, swimming pool water heating systems, spa water heating systems and the controls for those systems must be commissioned and completed in accordance with Section C408.2, identical to the existing requirements for mechanical systems.

ACTIVITY

Discussion Question

- What is your experience with the commissioning of energy systems?

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Chapter 7

Controlling Air Leakage in Commercial Buildings

91

Basic Concepts

- Uncontrolled outdoor-to-indoor air exchange through the building envelope is known as *infiltration*.
- The opposite air movement, indoor-to-outdoor exchange, is *exfiltration*.

The Air-Barrier Requirements

- Three methods are available to the designer and builder to comply with the air-barrier provisions for the solid portions of the building envelope:
  - (1) compliance with a list of 16 prescriptive materials with a specific air permeability,
  - (2) acceptance of assemblies with a specified average air- leakage rate, or
  - (3) performance of a test of the completed building to verify the actual air-leakage rate.
- Penetrations in the air barrier must be sealed to maintain continuity.

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TABLE 7-1 Common building materials that comply with the air leakage requirements

Air-barrier material (prescriptive)	Thickness (minimum)
Plywood	3/8 in.
Oriented strand board	3/8 in.
Extruded polystyrene insulation board	1/2 in.
Foil-faced urethane insulation board	1/2 in.
Closed cell spray foam minimum density of 1.5 pcf	1-1/2 in.
Open cell spray foam density between 0.4 and 1.5 pcf	4.5 in.
Exterior gypsum sheathing or interior gypsum board	1/2 in.
Cement board	1/2 in.
Built-up roofing membrane	Thickness not applicable
Modified bituminous roof membrane	Thickness not applicable
Fully adhered single-ply roof membrane	Thickness not applicable
A Portland cement/sand parge, stucco, or gypsum plaster	5/8 in.
Cast-in-place and precast concrete	Thickness not applicable
Sheet metal or aluminum	Thickness not applicable
Fully grouted concrete block masonry	Thickness not applicable
Solid or hollow masonry constructed of clay or shale masonry units	Thickness not applicable

2015 IECC Essentials with Maryland Amendments 94

Infiltration Rates

- Fenestration components are listed in Table C402.5.2 of the IECC and grouped by the applicable test procedure.

2015 IECC Essentials with Maryland Amendments 95

Key Learning

- IBC Chapter 7 is titled “Fire and Smoke Protection Features,” and Section 716 is “Opening Protectives.”
- Underwriters Laboratory (UL) 1784 is a standard for “Air Leakage Tests for Door Assemblies.”
- An important distinction is made here in that the UL 1784 requirements apply to doors (fenestration) in the continuous air barrier that are required to be fire and smoke protected based upon the building code. The doors required to maintain fire and smoke control must be identified on the plans and schedule to comply with UL 1784. **[Ref. C402.5.4 exception]**

2015 IECC Essentials with Maryland Amendments 96

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Outdoor Air Openings, Loading Docks and Vestibules

- Motorized dampers are required to control air leakage through the air barrier.
- Exteriors of loading dock door perimeters must have a weatherseal installed to minimize the air flow.
- Vestibule provisions include self-closing doors and designs that allow closing one door behind you before opening the next.

Chapter 8

Mechanical Systems for Commercial Buildings

Mandatory Requirements

- HVAC load calculation
- Equipment sizing
- Equipment efficiency
- Equipment system control
- Snow and ice melt system controls

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HVAC load calculation

- Accurate load calculations are essential and the first step in mechanical system design.
- Load calculations must be submitted with the mechanical drawings and specifications.

Equipment sizing

- The design load calculation provides the information required to determine the right size of HVAC equipment for the building.
- Code specifies the design temperatures so equipment can be properly sized. Design temperatures are based on climate data in the larger climate zones referenced in the IECC.

Table C403.2.3(2) Minimum efficiency requirements: electrically operated unitary and applied heat pumps

Equipment type	Size category	Heating section type	Subcategory or rating condition	Minimum efficiency	Test procedure
Air cooled (cooling mode)	< 65,000 Btu/h	All	Split system	14.0 SEER	AHRI 210/240
			Single packaged	14.0 SEER	
Through-the-wall, air cooled	< 30,000 Btu/h	All	Split system	12.0 SEER	
			Single packaged	12.0 SEER	
Single-duct high-velocity air cooled	< 65,000 Btu/h	All	Split system	11.0 SEER	
Air cooled (cooling mode)	≥65,000 Btu/h and < 135,000 Btu/h	Electric resistance (or None)	Split system and single package	11.0 EER 12.0 IEER	AHRI 340/360
		All other	Split system and single package	10.8 EER 11.8 IEER	
	≥ 135,000 Btu/h and < 240,000 Btu/h	Electric resistance (or None)	Split system and single package	10.6 EER 11.6 IEER	
		All other	Split system and single package	10.4 EER 11.4 IEER	
	≥240,000 Btu/h	Electric resistance (or None)	Split system and single package	9.5 EER 10.6 IEER	
		All other	Split system and single package	9.3 EER 9.4 IEER	

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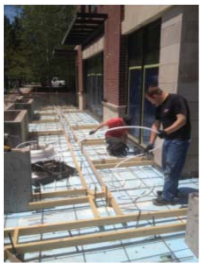
Equipment system control

- Each heating and cooling zone must be independently controlled by a programmable thermostat.

A *zone* is defined as:
"A space or group of spaces within a building with heating or cooling requirements that are sufficiently similar so that desired conditions can be maintained throughout using a single control device."

Snow and ice melt system controls



- Snow and ice melt systems linked to the building's energy system, either hydronic or electric, must have automatic controls.

Heat-Traced Piping

- Pipe-heating elements must have automatic controls to turn off the system when the outdoor air temperature is above 40° F or when it is determined the pipe fluid will not freeze.

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Ventilation

- Natural or mechanical ventilation is acceptable as long the minimum outdoor air supply complies with the IMC.
- Purpose of building ventilation is to protect the health of building occupants by controlling indoor air quality.
- Properly designed and functioning ventilation systems create a healthy and comfortable environment.

Demand-controlled ventilation

- Demand-controlled ventilation (DCV) varies the minimum outdoor air supply to larger assembly areas in the building.

Energy-recovery ventilation

- Energy recovery ventilation (ERV) is an exchange process that transfers the warm or cool temperature in exhaust air and exchanges the energy to temper the supply air coming into the building.

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Ducts and Plenums

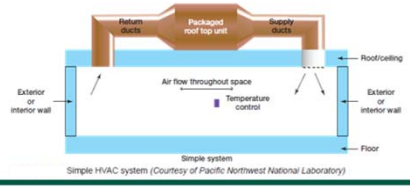
- All air ducts and plenums must be insulated to minimize heat loss and sealed to minimize air leakage.

Ducts and Plenums

- When fuel-burning appliances are supplied by open combustion air ducts, the rooms containing the appliances and ducts supplying them must be separated from conditioned spaces.
- Pipes carrying fluids serving HVAC systems must be insulated.
- Buildings with very large systems must meet specific additional requirements.
- Radiant heat systems with occupancy sensors are required when outdoor spaces are heated.

Simple HVAC Systems

- Simple HVAC system is designed so that only unitary or packaged equipment supplies the heating and cooling needs for only one zone.
- Zone is controlled by a single thermostat.



Simple HVAC system *(Courtesy of Pacific Northwest National Laboratory)*

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Complex HVAC Systems

- Any HVAC system that is not unitary or packaged equipment supplying the heating and cooling needs for one zone and that is not controlled by a single thermostat is a complex system.

Fan Motors

- Fan motors move large volumes of air through ducts and plenums in the building ventilation system.
- Larger fans must have capability and controls that automatically change the fan speed to control fluid and condensing temperatures.

Refrigeration Systems

- Regulation of refrigeration equipment energy use is new in the 2015 IECC.

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Discussion Question

- What are the biggest concerns of the building department with regard to the inspection of mechanical systems?

Chapter 9

Efficient Water Heating for Commercial Buildings

TABLE 9-2 Minimum performance of water-heating equipment

Equipment type	Size category (input)	Subcategory or rating condition	Performance required[a,b]	Test procedure
Water heaters, electric	≤ 12 kW	Resistance	0.97 2 0.00132 V, EF	DOE 10 CFR Part 430
	> 12 kW	Resistance	$(0.3 + 27/V_{m})$, %/h	ANSI Z21.10.3
	≤ 24 amps and ≤ 250 volts	Heat pump	0.93 2 0.00132 V, EF	DOE 10 CFR Part 430
Storage water heaters, gas	≤ 75,000 Btu/h	≥ 20 gal	0.67 2 0.0019V, EF	DOE 10 CFR Part 430
	> 75,000 Btu/h and ≤ 155,000 Btu/h	< 4,000 Btu/h/gal	80% E_t (Q/800 1 110 $\sqrt{V}$) SL, Btu/h	ANSI Z21.10.3
	> 155,000 Btu/h	< 4,000 Btu/h/gal	80% E_t (Q/800 1 110 $\sqrt{V}$) SL, Btu/h	
Instantaneous water heaters, gas	50,000 Btu/h and < 200,000 Btu/h[c]	≥ 4,000 (Btu/h)/gal and < 2 gal	0.62 2 0.0019 V, EF	DOE 10 CFR Part 430
	≥ 200,000 Btu/h	≥ 4,000 (Btu/h)/gal and . 10 gal	80% E_t	ANSI Z21.10.3
	≥ 200,000 Btu/h	≥ 4,000 Btu/h/gal and ≥ 10 gal	80% E_t (Q/800 1 110 $\sqrt{V}$) SL, Btu/h	
Storage water heaters, oil	≤ 105,000 Btu/h	≥ 20 gal	0.59 2 0.0019 V, EF	DOE 10 CFR Part 430
	≥ 105,000 Btu/h	< 4,000 Btu/h/gal	80% E_t (Q/800 1 110. $\sqrt{V}$) SL, Btu/h	ANSI Z21.10.3

For SI: °C 5 [(°F) - 32J/1.8, 1 British thermal unit per hour 5 0.2931 W, 1 gallon 5 3.785 L, 1 British thermal unit per hour per gallon 5 0.078 W7L.

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Efficient Heated Water Supply Piping

- New section in 2015 IECC limits the volume of piping between sources of heated water and the termination of fixture supply piping.

Heat Traps, Pipe Insulation

- Most commercial water heating equipment have factory-installed heat traps.
- Heat traps are not required on circulating service water heating systems.
- Piping from water heaters to the termination of the heated water fixture supply pipes must be insulated.

Pool and Spa Heaters & Covers

- Specific energy-saving provisions apply to pool and spa heaters, time switches, and covers.

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Discussion Question

- What aspects of this section pose the biggest inspection and commissioning challenges?

Chapter 10

Electric Power and Light for Commercial Buildings

Applicability

- Provisions apply to lighting systems in new buildings, additions, tenant finishes, alterations to existing lighting systems and any change in occupancy.

- Controls and minimum lamp efficiencies are required for interior and exterior lighting systems.

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Lighting Controls

- Interior lighting systems must be designed so that lights are on only when they need to be and only as many lights are on as needed for safety and functionality.

Interior

- Interior controls are required in every space enclosed by floor-to-ceiling partitions.
- A control in a remote location is allowable provided a panel shows whether the lights are on or off in the space.

Reduction controls

- Space required to have manual controls must also have a strategy to reduce the lighting load by 50%.
- Specific areas and designs are exempt from manual lighting reduction control provisions.

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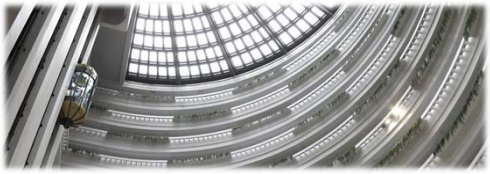
Additional controls

- Regulated areas are also required to have one or more types of additional controls.
- Automatic time-switch controls
- Occupancy sensors

Daylight zones

- Daylighting design strategy best uses available sunlight by optimal window and skylight placement.



Specific application lighting controls

- Display and accent lighting
- Hotel and motel main entry door switch
- Supplemental desk and work task lighting
- Plant-growth and food-warming lights are considered nonvisual lighting applications

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Specific application lighting controls

- Lighting for sale or used for education or demonstration should be controlled separately
- Exterior lighting must be connected to photocell or 24-hour time switch

Interior lighting power

- Building-area method limits lighting power density (LPD) by first describing the building area and associating the allowable watts per square foot.
- Space-by-space method refers to the building areas as best described by uses in Table C405.4.2(2)
- Space-by-space method permits increase in power for specific lighting in retail sales area.

Exterior Lighting

- Section covers lighting in parking lots, outside building entrances, connecting walkways and highlighting building facades.

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Electric Motors and Transformers

- Two new mandatory sections state that electrical transformers and electric motors must meet minimum efficiency requirements.

2015 IECC Essentials with Maryland Amendments 133

Elevators, Escalators and Moving Walks

- Escalators and moving walks are required to be equipped with automatic controls configured to reduce speed to a minimum when not conveying passengers.

2015 IECC Essentials with Maryland Amendments 134

Discussion Question

- What aspects of this section pose the biggest inspection and commissioning challenges?

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Chapter 11

Required Efficiency Options

136

Additional Efficiency Features

- Six options complement the minimum mandatory provisions for building envelope performance, mechanical systems, service water heating and lighting efficiency.

2015 IECC Essentials with Maryland Amendments 137

HVAC system performance

- The first option results in more efficient HVAC performance than required by Section C403.
- If this option is chosen, the provisions for mechanical systems still apply, and the HVAC equipment efficiency must exceed certain criteria.

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Lighting density

- Second option reduces the lighting power density (LPD) to 90 percent of that allowed by either the Building Area Method or the Space-by-Space Method

Lighting controls

- Third option is enhanced lighting controls.
- Luminaires required to be capable of continuous dimming and being addressed individually.
- Fixtures required to be controlled through a digital control system.

On-site renewables

- Fourth option is a photovoltaic (PV) system (Figure 11-1) providing at least 0.50 watts or a solar thermal (hot water) system providing at least 1.75 Btu per square foot of the building conditioned floor area.

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On-site renewables

- Alternative for fourth option requires that at least 3 percent of the energy used by the mechanical, service hot water and lighting systems in the building be provided by onsite renewables.

Outdoor air system

- Fifth option is a dedicated outdoor air system that is available to buildings with hydronic and multiple-zone HVAC systems.

Service water heating

- Sixth and final option is reduced energy use in service water heating.

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Building use types

TABLE 11-1 Specific building use types allowed to use the additional compliance option in C406.7

1	Group R-1	Boarding houses, hotels or motels
2	Group I-2	Hospitals, psychiatric hospitals and nursing homes
3	Group A-2	Restaurants and banquet halls or buildings containing food preparation areas
4	Group F	Laundries
5	Group R-2	Buildings with residential occupancies
6	Group A-3	Health clubs and spas

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Discussion Question

- What aspects of this section pose the biggest inspection and commissioning challenges?

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General Residential Energy Provisions
Chapter 12

General Provisions

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Scope

- The residential provisions apply only to residential buildings as defined in the IECC.
- Classifications and descriptions of residential occupancies are found in IBC Section 310.

Intent, Applicability

- "This code shall regulate the design and construction of buildings for the effective use and conservation energy over the useful life of each building."
- Design requirements of the energy code are intended to promote the effective use of energy in new buildings and building systems as well as in repairs and other work.

Low-Energy Buildings

- Low-energy residential buildings are exempt from the thermal envelope code requirements.
- Low-energy buildings are not exempt from the mandatory lighting, heating and service hot water provisions of the code.

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Tropical Zones

- Special exemption to the provisions of the IECC exists for residential buildings located in the tropical climate zone.
- Zone is defined as Hawaii, Puerto Rico, Guam, American Samoa, US Virgin Islands, the Commonwealth of Northern Mariana Islands and additional islands.

2015 IECC Essentials with Maryland Amendments 151

Compliance, Alternate Materials

- Compliance path for residential buildings is same as that for commercial buildings.

- Simplest compliance path for single-family and noncomplex residential structures is use of pre-scriptive worksheets offered by some juris-dictions that establish applicable requirements.

2015 IECC Essentials with Maryland Amendments 152

Existing Buildings and Historical Buildings

- Code provisions for existing and historical residential buildings are the same as those for existing and historical commercial buildings.

2015 IECC Essentials with Maryland Amendments 153

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Permits, Change in Occupancy or Use

- Changes in residential tenant occupancy seldom trigger energy code compliance.
- Any change in use from another occupancy to residential must fully comply with the code.

Discussion Question

- What aspects of this section pose the biggest plan review and inspection challenges?

General Residential Energy Provisions
Chapter 13

Administration

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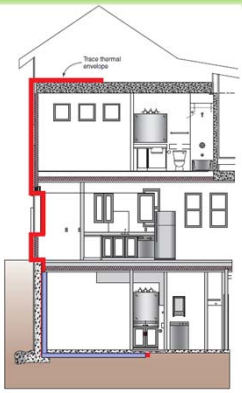
Preparing the Plans

- A more complete understanding of the specific provisions and requirements of the code by the design professionals and contractors will help the plans examiner to review the project for compliance and issue the permit.

Construction Drawings and Documents

- The construction documents must clearly indicate the nature and extent of the proposed work.
- The details include insulation materials, window and door schedules, mechanical system design, lighting fixture schedule, location of daylight zones and air-sealing details.

Thermal envelope and air sealing drawings



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Building systems

- Mechanical system design must be included in construction documents.
- Some residential building HVAC and plumbing systems must be prepared by registered design professionals, but others in single-family homes may be prepared by someone other than a registered design professional.

Plan Review

- Code official is charged with reviewing the construction documents for code compliance.
- Officials will visit the work site for field inspections, and the construction must agree with the approved plans.

Inspections, Fees

- Building construction work that requires a permit also requires inspection.
- Mechanical, plumbing and electrical inspections are required to verify compliance with the approved plans.
- Every jurisdiction that adopts building codes establishes a fee schedule.

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Enforcement, Board of Appeals

- Code official has the authority to stop work on any part of a project if the work regulated by the code is dangerous, unsafe or not code compliant.
- Board of appeals exists to allow a means to appeal decisions made by the building official.

Defined Terms

- Specific words and terms listed in Section 2 of the IECC define what code users agree to understand as the meaning of such terms when written and appearing in the code provisions.
- Terms not defined in IECC but defined in IBC, IFC, IFGC, IMC, IPC, or IRC shall have meanings as defined in those codes.

Discussion Question

- What aspects of this section pose the biggest plan review and inspection challenges?

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Specific Requirements for Residential Buildings
Chapter 14

Specific Requirements

166

General

- An Energy Efficiency Certificate listing installed insulation, glass and door ratings, and heating and cooling equipment efficiency and test results must be posted on a wall in the space where the furnace is located, a utility room or an approved location inside the building.
- The builder or registered design professional is responsible for completing the information required on the certificate.

2015 IECC Essentials with Maryland Amendments 167

Energy Efficiency Certificate template

2015 IECC Energy Efficiency Certificate

Insulation rating	R-Value	
Ceiling/Roof	59.00	
Wall	30.00	
Floor/Foundation	15.00	
Ductwork (unconditioned spaces):	____	
Glass & door rating	**U-Factor**	**SHGC**
Window	0.28	0.40
Door	0.35	NA
Heating & cooling equipment	**Efficiency**	
Heating system: _____	_____	
Cooling system: _____	_____	
Water heater: _____	_____	
Building air leakage and duct test results		
Building air leakage test results	_____	
Name of air leakage tester	_____	
Duct tightness test results	_____	
Name of duct tester	_____	

Name: _____ Date: _____
Comments:

2015 IECC Essentials with Maryland Amendments 168

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Specific Requirements for Residential Buildings
Chapter 15

Building Thermal Envelope

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About the Thermal Envelope

- Building thermal envelope separates the interior from the exterior and encloses conditioned space. It includes basement and exterior walls, roofs, windows, doors, skylights and floors.

2015 IECC Essentials with Maryland Amendments 170

Code Compliance Paths

- Code offers five choices for prescriptive compliance with the building thermal envelope requirements.

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Ceilings and Attics

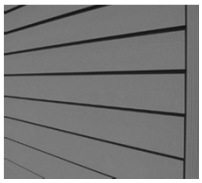
- When framing or truss design allows the ceiling insulation to extend over the top of the exterior wall plate, the insulation R-value can be decreased from R-38 to R-30 or from R-49 to R-38.
- Exception is also offered for cathedral ceilings or ceilings without attic spaces.

Attic ventilation

- Attic ventilation is required by the IBC and the IRC.
- The insulation must be held back and not block the vent area.

Walls

- Energy code recognizes a number of different types of walls because each material in the assembly behaves differently in the thermal envelope and because some walls are above grade, below grade or both.



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Mass walls

- Mass walls are built of dense materials such as concrete block, reinforced concrete, brick, and insulated concrete forms (ICFs).
- Traditional building materials and methods such as adobe, solid logs and rammed earth are also mass wall materials.

Steel-frame walls

- Steel framing is sometimes specified and is common in multi-family buildings; it must comply with the requirements of the residential energy code provisions.

Basement walls

- In conditioned basements, walls must be insulated from the top of the basement wall to at least 10 feet below grade or to the basement floor, whichever is less.

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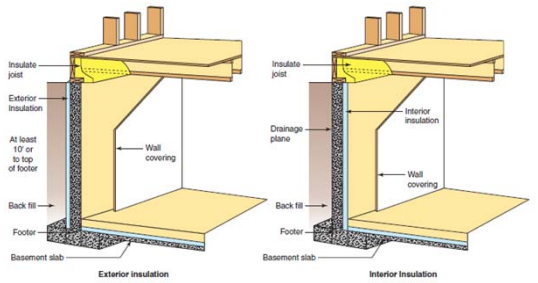
Basement wall insulation



Crawlspace walls

- The code allows for the thermal envelope with respect to the crawlspace to be horizontal in the floor above or vertical down the walls to create a conditioned crawlspace.

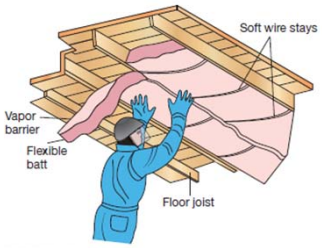


FIGURE 15-10 Basement ceiling insulation

Crawlspace walls

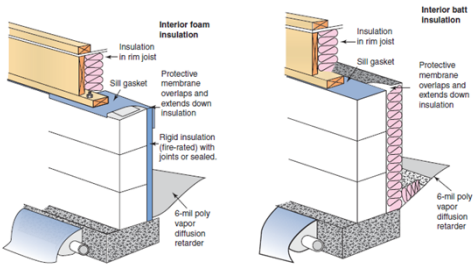


FIGURE 15-11 Interior insulated crawlspace *(Courtesy of EnergySavers.gov)*

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Crawlspace walls

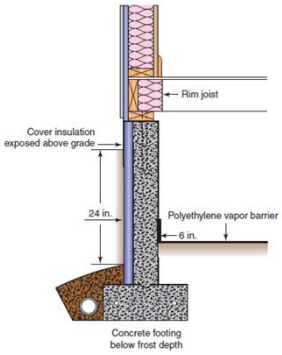

FIGURE 15-12 Exterior insulated crawlspace

Floors

- Insulation requirements for wood-frame floor joist construction can be found in the now familiar R-value and U-value tables.
- The R-value, U-value and installation requirements apply to all floors that are part of the thermal envelope and do not apply to floors with conditioned space both above and below the floor.

Slab-on-grade floors

- Any portion of the conditioned space that incorporates a slab 12 inches or less below grade requires insulation.

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Sunrooms

- Code requires all conditioned sunrooms to meet the insulation requirements of the code.

Fenestration

- The term "fenestration" refers to light-transmitting areas in a building's thermal envelope and includes windows, skylights and opaque and glazed doors.

Windows

- Code illustrates the relationship between window and skylight energy-saving performance characteristics and climate zones
- *U*-factor requirements range from "not required" (NR) in semi-tropical climates to 0.32 in semi-arctic climates.

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Doors

- Two exemptions to all fenestration requirements allow some design flexibility for designers and contractors to include decorative windows, skylights and glazed doors.

Fenestration replacement

- In work that requires removing a window sash, a skylight window frame or glazed door, the new fenestration components are required to comply with the U-factors and SHGC values for new construction.

Infiltration

- New IECC recognizes that air leakage control is absolutely critical in the “construction of buildings for the effective use and conservation of energy over the useful life of each building.”

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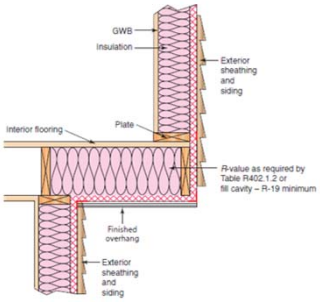
The Air Barrier and Building Thermal Envelope

- Specific requirement for the continuous air barrier is that it must be installed in the building thermal envelope.



Blower Door Test

- Blower door test is mandatory to verify that the requirements for maximum air leakage are met.

Discussion Question

- What aspects of this section pose the biggest plan review and inspection challenges?

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Specific Requirements for Residential Buildings
Chapter 16

Building Systems

193

Programmable Thermostat

- All forced-air furnace heating and cooling systems must have at least one programmable thermostat. It must be capable of daily time and temperature settings.

2015 IECC Essentials with Maryland Amendments 194

Ducts

- Effectiveness of the ductwork is critical to efficient energy use in the building and providing comfort for the people living in the building.

2015 IECC Essentials with Maryland Amendments 195

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Duct testing (Mandatory)

- Ducts shall be pressure tested to determine air leakage by one of the following methods:
  1. Rough-in test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the system
  2. Post construction test: Total leakage shall be measured with a pressure differential of 0.1 inch w.g. (25 Pa) across the entire system

Exception: A duct air leakage test shall not be required where the ducts and air handlers are located entirely within the building thermal envelope.

Duct leakage (Prescriptive)

- The total leakage of the ducts, where measured in accordance with Section R403.3.3, shall be as follows:
  1. Rough-in test: The total leakage shall be less than or equal to 4 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m^2) of conditioned floor area.
     Air handler is not installed at the time of the test, the total leakage shall be less than or equal to 3 cubic feet per minute (85 L/min) per 100 square feet (9.29 m^2) of conditioned floor area.
  2. Post construction test: Total leakage shall be less than or equal to 4 cubic feet per minute (113.3 L/min) per 100 square feet (9.29 m^2) of conditioned floor area.

Hot Water Systems

- Most mechanical system pipes designed to carry hot water are required to be insulated with a minimum of R-3 pipe insulation.

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Mechanical Ventilation

- Mechanical ventilation systems are covered by requirements in the updated IECC.
- Designs are either exhaust-only, supply-only, or balanced air-exchange systems.

Mechanical Ventilation

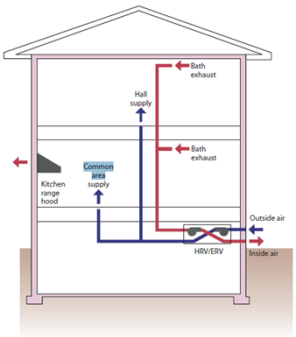

FIGURE 16-5 Simple ERV/HRV schematic layout *(Courtesy of Building Science Corporation)*

Snow Melt

- Operational controls for snow and ice systems are mandatory.

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Pools and Spas

- Energy-saving provisions for residential pool and spa pumps and heaters are addressed in the IECC.
- Vapor-retardant covers are required to limit evaporation, but not covers specifically installed to maintain the heated water temperature.

Specific Requirements for Residential Buildings
Chapter 17

Electrical Power and Lighting

Lighting

- Mandatory provision requires that at least 75 percent of installed light fixtures in a dwelling have high-efficacy lamps.

- Lamps that produce 60 lumens/W for lamps over 40 W, 50 lumens/W for lamps over 15 W to 40 W and 40 lumens/W for lamps 15 W or less meet the provision.

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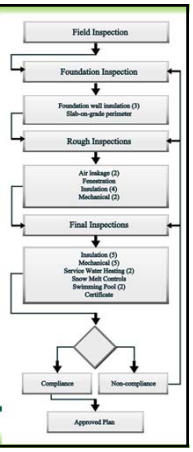
Inspection Process

Inspection Process



The Inspection Process

- The purpose of a residential energy inspection is to determine that the building components, as built:
  - Use appropriate materials and methods specified in the IECC with Maryland Amendments and the approved plans.
  - Comply with applicable standards of construction.
  - Are safe for people and property.
  - Comply with code requirements of the IECC with Maryland Amendments.

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Field Inspections

- Inspections of the building are based on the plan review and submitted documents.
  - If the builder submits plans that follow the prescriptive path, and the plan review is approved, then the inspector needs to verify the mandatory provisions for air leakage and building systems are satisfied as well as the thermal envelope and electrical systems comply with the IECC with Maryland Amendments. This includes the R-value, the U-factor and the Total UA alternative.

Field Inspections

- Inspections of the building are based on the plan review and submitted documents.
  - If the builder submits plans that follow the performance path, and the plan review is approved, then the inspector needs to verify the mandatory provisions for air leakage and building systems are satisfied as well as the appropriate simulated performance tests are performed and comply with the IECC. This includes the blower door test and the duct blast leakage test.

Field Inspections

If the installation is not in compliance:

- The inspector must issue a field correction notice to the responsible party on the construction site.

If the installation is in compliance, then the inspector approves the inspection by:

- Signing the inspection approval on the job site inspection card or,
- Issuing a field correction notice that indicates the inspection has been approved.

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How the inspections fit with construction

Construction phase	Inspection

Foundation is excavated; footings and foundation walls are poured.	• Foundation wall insulation (5 inspections)
	  • Insulation on exterior of wall
	  • Insulated concrete forming system
	  • Structural insulated panels
	  • Precast insulated concrete panel system
	  • Crawl space wall
	• Slab-on-grade perimeter

How the inspections fit with construction

Construction phase	Inspection

Rough construction of the building frame along with installation of sill plate, rim joist, floor joists, vent and duct work, windows, exterior air barrier. At this point the building is under roof and the plumbing, mechanical and electrical rough in work is completed.	• Air leakage (2 inspections)
	  • Table R402.4.1.1
	  • Testing R404.4.1.2
	• Fenestration
	• Insulation (4 inspections)
	  • Rim joist
	  • Floor
	  • Wall
	  • Attic
	• Mechanical
	• Concealed portions of the service water heating system
	• Fireplace (2 inspections)
	  • Exterior air
	  • Gasket

How the inspections fit with construction

Construction phase	Inspection
Final installation of mechanical heating, water heating system and lighting systems.	I. Insulation (4 inspections) II. Mechanical (6 inspections) III. Service Water Heating (2 inspections) IV. Lighting (2 inspections) V. Fireplace (2 inspections)

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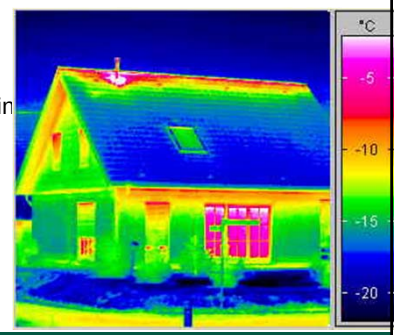
Why do we enforce this code?

- To reduce energy consumption in this country.



Importance of Inspections

- As with other inspections, the energy inspections are of upmost importance to the jurisdiction, the homeowner and the builder. Compliance with the IECC is in the ARRA, American Reinvestment and Recovery Act. The jurisdiction is mandated to show 90% compliance.

REScheck and COMcheck

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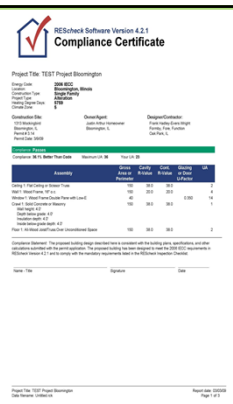
2015 IECC Essentials with Maryland Amendments

REScheck



2015 IECC Essentials with Maryland Amendments 217

RES*check* Software Version 4.2.1

Compliance Certificate

Project Title: TEST Project Bloomington

Energy Code: **2006 IECC**
Location: **Bloomington, Illinois**
Construction Type: **Single Family**
Project Type: **Alteration**
Heating Degree Days: **5759**
Climate Zone: **5**

Construction Site:
1313 Mockingbird
Bloomington, IL
Permit # 3.14
Permit Date: 3/9/09

Owner/Agent:
Justin Arthur Homeowner
Bloomington, IL

Designer/Contractor:
Frank Hadley-Evers Wright
Formby, Fore, Function
Oak Park, IL

Compliance: **Passes**

Compliance: **36.1% Better Than Code** Maximum UA: **36** Your UA: **23**

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Glazing or Door U-Factor	UA
Ceiling 1: Flat Ceiling or Scissor Truss	150	38.0	38.0		2
Wall 1: Wood Frame, 16" o.c.	150	20.0	20.0		4
Window 1: Wood Frame:Double Pane with Low-E	40			0.350	14
Crawl 1: Solid Concrete or Masonry Wall height: 4.0' Depth below grade: 4.0' Insulation depth: 4.0' Inside below-grade depth: 4.0'	150	38.0	38.0		1
Floor 1: All-Wood Joist/Truss:Over Unconditioned Space	150	38.0	38.0		2

Compliance Statement: The proposed building design described here is consistent with the building plans, specifications, and other calculations submitted with the permit application. The proposed building has been designed to meet the 2006 IECC requirements in RES*check* Version 4.2.1 and to comply with the mandatory requirements listed in the RES*check* Inspection Checklist.

Name - Title Signature Date

Project Title: TEST Project Bloomington
Data Filename: 1mtbbw.cfk

Report date: 03/03/09
Page 1 of 3

RES*check* Software Version 4.2.1

Compliance Certificate

Project Title: TEST Project Bloomington

Energy Code: **2006 IECC**
Location: **Bloomington, Illinois**
Construction Type: **Single Family**
Project Type: **Alteration**
Heating Degree Days: **5759**
Climate Zone: **5**

Construction Site:
1313 Mockingbird
Bloomington, IL
Permit # 3.14
Permit Date: 3/9/09

Owner/Agent:
Justin Arthur Homeowner
Bloomington, IL

Designer/Contractor:
Frank Hadley-Evers Wright
Formby, Fore, Function
Oak Park, IL

Compliance: **Passes**

Compliance: **36.1% Better Than Code** Maximum UA: **36** Your UA: **23**

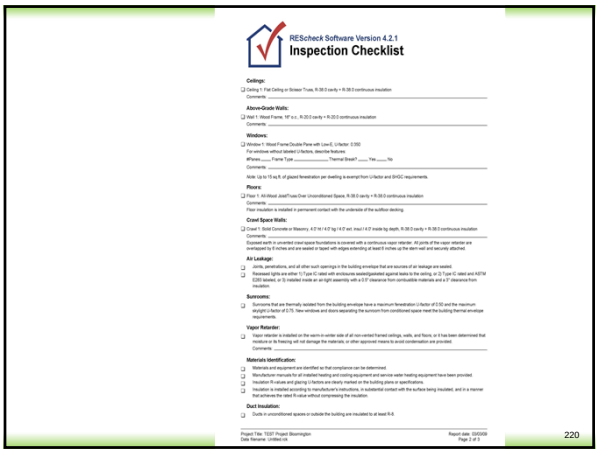
Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Glazing or Door U-Factor	UA
Ceiling 1: Flat Ceiling or Scissor Truss	150	38.0	38.0		2
Wall 1: Wood Frame, 16" o.c.	150	20.0	20.0		4
Window 1: Wood Frame:Double Pane with Low-E	40			0.350	14
Crawl 1: Solid Concrete or Masonry	150	38.0	38.0		1
Floor 1: All-Wood Joist/Truss:Over Unconditioned Space	150	38.0	38.0		2

Compliance Statement: The proposed building design described here is consistent with the building plans, specifications, and other calculations submitted with the permit application. The proposed building has been designed to meet the 2006 IECC requirements in RES*check* Version 4.2.1 and to comply with the mandatory requirements listed in the RES*check* Inspection Checklist.

Name - Title Signature Date

2015 IECC Essentials with Maryland Amendments 219

2015 IECC Essentials with Maryland Amendments



RES*check* Software Version 4.2.1

Inspection Checklist

Ceilings:

☐ Ceiling 1: Flat Ceiling or Scissor Truss, R-38.0 cavity + R-38.0 continuous insulation
Comments: _____

Above-Grade Walls:

☐ Wall 1: Wood Frame, 16" o.c., R-20.0 cavity + R-20.0 continuous insulation
Comments: _____

Windows:

☐ Window 1: Wood Frame:Double Pane with Low-E, U-factor: 0.350
For windows without labeled U-factors, describe features:
#Panes _____ Frame Type _____ Thermal Break? _____ Yes _____ No
Comments: _____

Note: Up to 15 sq.ft. of glazed fenestration per dwelling is exempt from U-factor and SHGC requirements.

Floors:

☐ Floor 1: All-Wood Joist/Truss:Over Unconditioned Space, R-38.0 cavity + R-38.0 continuous insulation
Comments: _____
Floor insulation is installed in permanent contact with the underside of the subfloor decking.

Crawl Space Walls:

☐ Crawl 1: Solid Concrete or Masonry, 4.0' ht / 4.0' bg / 4.0' ext. insul / 4.0' inside bg depth, R-38.0 cavity + R-38.0 continuous insulation
Comments: _____
Exposed earth in unvented crawl space foundations is covered with a continuous vapor retarder. All joints of the vapor retarder are overlapped by 6 inches and are sealed or taped with edges extending at least 6 inches up the stem wall and securely attached.

Air Leakage:

☐ Joints, penetrations, and all other such openings in the building envelope that are sources of air leakage are sealed.
☐ Recessed lights are either 1) Type IC rated with enclosures sealed/gasketed against leaks to the ceiling, or 2) Type IC rated and ASTM E283 labeled, or 3) installed inside an air-tight assembly with a 0.5" clearance from combustible materials and a 3" clearance from insulation.

Sunrooms:

☐ Sunrooms that are thermally isolated from the building envelope have a maximum fenestration U-factor of 0.50 and the maximum skylight U-factor of 0.75. New windows and doors separating the sunroom from conditioned space meet the building thermal envelope requirements.

Vapor Retarder:

☐ Vapor retarder is installed on the warm-in-winter side of all non-vented framed ceilings, walls, and floors; or it has been determined that moisture or its freezing will not damage the materials; or other approved means to avoid condensation are provided.
Comments: _____

Materials Identification:

☐ Materials and equipment are identified so that compliance can be determined.
☐ Manufacturer manuals for all installed heating and cooling equipment and service water heating equipment have been provided.
☐ Insulation R-values and glazing U-factors are clearly marked on the building plans or specifications.
☐ Insulation is installed according to manufacturer's instructions, in substantial contact with the surface being insulated, and in a manner that achieves the rated R-value without compressing the insulation.

Duct Insulation:

☐ Ducts in unconditioned spaces or outside the building are insulated to at least R-8.

Project Title: TEST Project Bloomington
Data filename: Untitled.rck
Report date: 03/03/09
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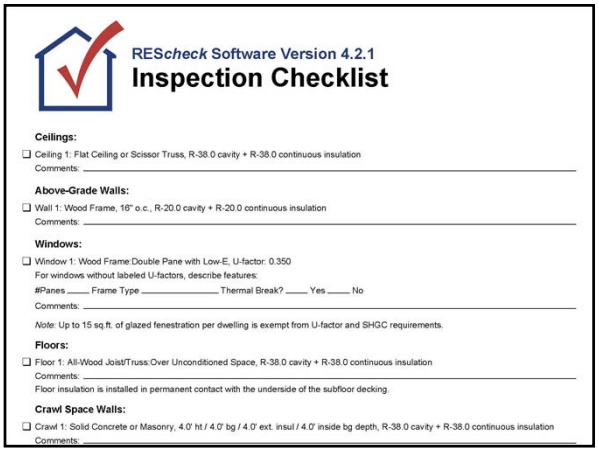


RES*check* Software Version 4.2.1

Inspection Checklist

Ceilings:

☐ Ceiling 1: Flat Ceiling or Scissor Truss, R-38.0 cavity + R-38.0 continuous insulation
Comments: _____

Above-Grade Walls:

☐ Wall 1: Wood Frame, 16" o.c., R-20.0 cavity + R-20.0 continuous insulation
Comments: _____

Windows:

☐ Window 1: Wood Frame:Double Pane with Low-E, U-factor: 0.350
For windows without labeled U-factors, describe features:
#Panes _____ Frame Type _____ Thermal Break? _____ Yes _____ No
Comments: _____

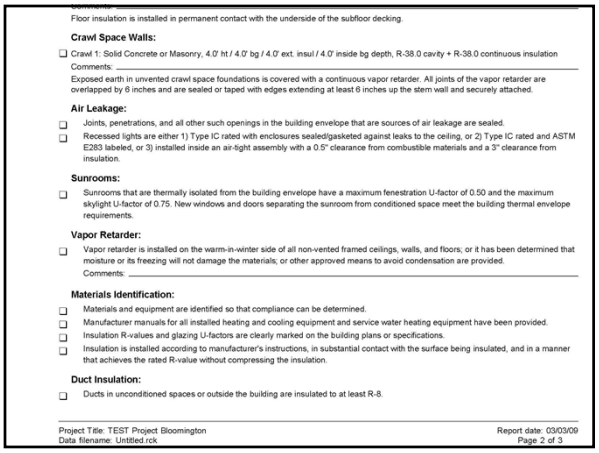
Note: Up to 15 sq.ft. of glazed fenestration per dwelling is exempt from U-factor and SHGC requirements.

Floors:

☐ Floor 1: All-Wood Joist/Truss:Over Unconditioned Space, R-38.0 cavity + R-38.0 continuous insulation
Comments: _____
Floor insulation is installed in permanent contact with the underside of the subfloor decking.

Crawl Space Walls:

☐ Crawl 1: Solid Concrete or Masonry, 4.0' ht / 4.0' bg / 4.0' ext. insul / 4.0' inside bg depth, R-38.0 cavity + R-38.0 continuous insulation
Comments: _____



Floor insulation is installed in permanent contact with the underside of the subfloor decking.

Crawl Space Walls:

☐ Crawl 1: Solid Concrete or Masonry, 4.0' ht / 4.0' bg / 4.0' ext. insul / 4.0' inside bg depth, R-38.0 cavity + R-38.0 continuous insulation
Comments: _____
Exposed earth in unvented crawl space foundations is covered with a continuous vapor retarder. All joints of the vapor retarder are overlapped by 6 inches and are sealed or taped with edges extending at least 6 inches up the stem wall and securely attached.

Air Leakage:

☐ Joints, penetrations, and all other such openings in the building envelope that are sources of air leakage are sealed.
☐ Recessed lights are either 1) Type IC rated with enclosures sealed/gasketed against leaks to the ceiling, or 2) Type IC rated and ASTM E283 labeled, or 3) installed inside an air-tight assembly with a 0.5" clearance from combustible materials and a 3" clearance from insulation.

Sunrooms:

☐ Sunrooms that are thermally isolated from the building envelope have a maximum fenestration U-factor of 0.50 and the maximum skylight U-factor of 0.75. New windows and doors separating the sunroom from conditioned space meet the building thermal envelope requirements.

Vapor Retarder:

☐ Vapor retarder is installed on the warm-in-winter side of all non-vented framed ceilings, walls, and floors; or it has been determined that moisture or its freezing will not damage the materials; or other approved means to avoid condensation are provided.
Comments: _____

Materials Identification:

☐ Materials and equipment are identified so that compliance can be determined.
☐ Manufacturer manuals for all installed heating and cooling equipment and service water heating equipment have been provided.
☐ Insulation R-values and glazing U-factors are clearly marked on the building plans or specifications.
☐ Insulation is installed according to manufacturer's instructions, in substantial contact with the surface being insulated, and in a manner that achieves the rated R-value without compressing the insulation.

Duct Insulation:

☐ Ducts in unconditioned spaces or outside the building are insulated to at least R-8.

Project Title: TEST Project Bloomington
Data filename: Untitled.rck
Report date: 03/03/09
Page 2 of 3

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2015 IECC Essentials with Maryland Amendments

- ☐ Ducts in floor trusses above unconditioned spaces or above the outdoors are insulated to at least R-6.

Duct Construction:

- ☐ Air handlers, filter boxes, and duct connections to flanges of air distribution system equipment or sheet metal fittings are sealed and mechanically fastened.
- ☐ All joints, seams, and connections are made substantially airtight with tapes, gasketing, mastics (adhesives) or other approved closure systems. Tapes and mastics are rated UL 181A or UL 181B.
- ☐ Building framing cavities are not used as supply ducts.
- ☐ Automatic or gravity dampers are installed on all outdoor air intakes and exhausts.
- ☐ Additional requirements for tape sealing and metal duct crimping are included by an inspection for compliance with the International Mechanical Code.

Temperature Controls:

- ☐ Thermostats exist for each separate HVAC system. A manual or automatic means to partially restrict or shut off the heating and/or cooling input to each zone or floor is provided.

Certificate:

- ☐ A permanent certificate is provided on or in the electrical distribution panel listing the predominant insulation R-values; window U-factors; type and efficiency of space-conditioning and water heating equipment.

NOTES TO FIELD: (Building Department Use Only)

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2006 IECC Energy Efficiency Certificate

Insulation Rating	R-Value
Ceiling / Roof	76.00
Wall	40.00
Floor / Foundation	76.00
Ductwork (unconditioned spaces):	_____

Glass & Door Rating	U-Factor	SHGC
Window	0.35	
Door		

Heating & Cooling Equipment	Efficiency
Water Heater:_____	_____

Name: _____ **Date:** _____

Comments:

224

COMCheck

COMcheck Software Version 4.0.0

Envelope Compliance Certificate

Project Information

Energy Code:	2012 IECC
Project Title:	Office Building
Location:	Annapolis, Maryland
Climate Zone:	4a
Project Type:	New Construction
Vertical Glazing / Wall Area:	20%
Permit No.	12345678

Construction Site:	Owner/Agent:	Designer/Contractor:
3 Main Street Annapolis, MD	State of Maryland	ABC ARCHITECTS

Building Area	Floor Area
1-Office : Nonresidential	7500

Additional Efficiency Package

High efficiency HVAC. Systems that do not meet the performance requirement will be identified in the mechanical requirements checklist report.

Envelope Assemblies

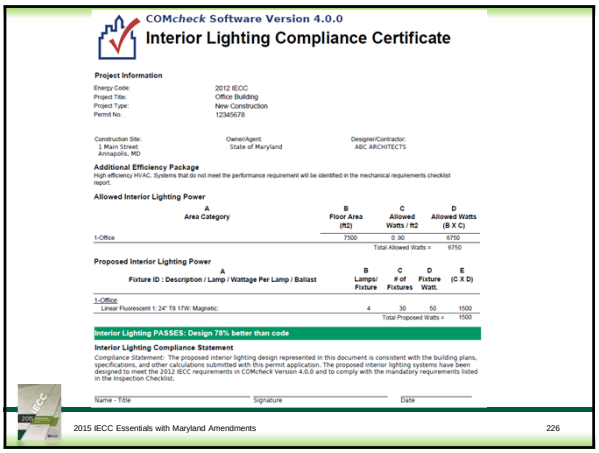
Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Proposed U-Factor	Budget U-Factor$_{(a)}$
Roof 1: Insulation Entirely Above Deck, [Bldg. Use 1 - Office]	7500	—	40.0	0.020	0.039
Exterior Wall 1: Steel-Framed, 24" o.c., [Bldg. Use 1 - Office]	1450	20.0	5.0	0.083	0.084
Window 1: Metal Frame with Thermal Break,Fixed, Perf. Specs.: Product ID:vfro-1234, SHGC:0.50, [Bldg. Use 1 - Office] (b)	290	—	—	0.300	0.360
Door 1: Glass (> 50% glazing),Metal Frame, Entrance Door, Perf Specs.: Product ID:vfr2-1234, SHGC:0.50, [Bldg. Use 1 - Office] (b)	105	—	—	0.900	0.770
Floor 1: Slab-On-Grade:Unheated, Vertical 2 ft., [Bldg. Use 1 - Office] (c)	7500	—	0.0	0.730	0.550

(a) Budget U-factors are used for software baseline calculations ONLY, and are not code requirements.
(b) Fenestration product performance must be certified in accordance with NFRC and requires supporting documentation.
(c) Slab-On-Grade proposed and budget U-factors shown in table are F-factors.

Envelope FAILS: Design 15% worse than code

2015 IECC Essentials with Maryland Amendments 225

2015 IECC Essentials with Maryland Amendments



COMcheck Software Version 4.0.0

Interior Lighting Compliance Certificate

Project Information

Energy Code: 2012 IECC
Project Title: Office Building
Project Type: New Construction
Permit No. 12345678

Construction Site: 1 Main Street Annapolis, MD
Owner/Agent: State of Maryland
Designer/Contractor: ABC ARCHITECTS

Additional Efficiency Package

High efficiency HVAC. Systems that do not meet the performance requirement will be identified in the mechanical requirements checklist report.

Allowed Interior Lighting Power

A Area Category	B Floor Area (ft2)	C Allowed Watts / ft2	D Allowed Watts (B X C)
1-Office	7500	0.90	6750
		Total Allowed Watts =	6750

Proposed Interior Lighting Power

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixtures	D Fixture Watt.	E (C X D)
1-Office				
Linear Fluorescent 1: 24" T8 17W: Magnetic:	4	30	50	1500
			Total Proposed Watts =	1500

Interior Lighting PASSES: Design 78% better than code

Interior Lighting Compliance Statement

Compliance Statement: The proposed interior lighting design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed interior lighting systems have been designed to meet the 2012 IECC requirements in COMcheck Version 4.0.0 and to comply with the mandatory requirements listed in the Inspection Checklist.

Name - Title Signature Date

2015 IECC Essentials with Maryland Amendments 226

COMcheck Software Version 4.0.0

Exterior Lighting Compliance Certificate

Project Information

Energy Code: 2012 IECC
Project Title: Office Building
Project Type: New Construction
Permit No. 12345678
Exterior Lighting Zone 2 (Neighborhood business district)

Construction Site: 1 Main Street Annapolis, MD
Owner/Agent: State of Maryland
Designer/Contractor: ABC ARCHITECTS

Allowed Exterior Lighting Power

A Area/Surface Category	B Quantity	C Allowed Watts / Unit	D Tradable Wattage	E Allowed Watts (B X C)
Parking area	1500 ft2	0.06	Yes	90
			Total Tradable Watts (a) =	90
			Total Allowed Watts =	90
			Total Allowed Supplemental Watts (b) =	600

(a) Wattage tradeoffs are only allowed between tradable areas/surfaces.
(b) A supplemental allowance equal to 600 watts may be applied toward compliance of both non-tradable and tradable areas/surfaces.

Proposed Exterior Lighting Power

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixtures	D Fixture Watt.	E (C X D)
Parking area (1500 ft2): Tradable Wattage				
Halogen 1: Halogen 55W:	1	5	90	450
			Total Tradable Proposed Watts =	450

Exterior Lighting PASSES: Design 38% better than code

Exterior Lighting Compliance Statement

Compliance Statement: The proposed exterior lighting design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed exterior lighting systems have been designed to meet the 2012 IECC requirements in COMcheck Version 4.0.0 and to comply with the mandatory requirements listed in the Inspection Checklist.

Name - Title Signature Date

2015 IECC Essentials with Maryland Amendments 227

COMcheck Software Version 4.0.0

Mechanical Compliance Certificate

Project Information

Energy Code: 2012 IECC
Project Title: Office Building
Location: Annapolis, Maryland
Climate Zone: 4a
Project Type: New Construction
Permit No. 12345678

Construction Site: 1 Main Street Annapolis, MD
Owner/Agent: State of Maryland
Designer/Contractor: ABC ARCHITECTS

Additional Efficiency Package

High efficiency HVAC. Systems that do not meet the performance requirement will be identified in the mechanical requirements checklist report.

Mechanical Systems List

Quantity System Type & Description

1 HVAC System 1 (Single Zone w/ PerimeterSystem):
Single Package Heat Pump
Heating Mode: Capacity = 40000 kBtu/h,
Proposed Efficiency = 13.00 COP; Required Efficiency = 3.20 COP
Cooling Mode: Capacity = 35000 kBtu/h, , Air Economizer
Proposed Efficiency = 13.00 EER; Required Efficiency = 12.00 EER
Fan System: None

1 Water Heater 1:
Gas Storage Water Heater, Capacity: 80 gallons, Input Rating: 40000 Btu/h
Proposed Efficiency: 90.00 % Et; Required Efficiency: 80.00 % Et

Mechanical Compliance Statement

Compliance Statement: The proposed mechanical design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 2012 IECC requirements in COMcheck Version 4.0.0 and to comply with the mandatory requirements listed in the Inspection Checklist.

Name - Title Signature Date

2015 IECC Essentials with Maryland Amendments 228

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2015 IECC Essentials with Maryland Amendments

COMcheck Software Version 4.0.0

Inspection Checklist

Energy Code: 2012 IECC

Requirements: 0.0% were addressed directly in the COMcheck software

Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

2012 IECC	Plan Review	Complies?	Comments/Assumptions
C103.2 [PR1]*	Plans and/or specifications provide all information with which compliance can be determined for the building envelope and document where exceptions to the standard are claimed.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C103.2 [PR2]*	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the mechanical systems and equipment and document where exceptions to the standard are claimed. Load calculations per acceptable engineering standards and handbooks.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C103.2 [PR3]*	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the service water heating systems and equipment and document where exceptions to the standard are claimed. Hot water demand per manufacturer's rating guide.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C103.2 [PR4]*	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the electrical lighting and electrical systems and equipment and document where exceptions to the standard are claimed. Information provided should include interior lighting power calculations, wattage of lamps and ballasts, transformers and control devices.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C103.2 [PR5]*	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the exterior lighting and electrical systems and equipment and document where exceptions to the standard are claimed. Information provided should include exterior lighting power calculations, wattage of lamps and ballasts, transformers and control devices.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C406 [PR9]*	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the additional energy efficiency package options.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

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2012 IECC	Plan Review	Complies?	Comments/Assumptions
C402.3.1 [PR10]*	Vertical fenestration area <= 30 percent of the gross above-grade wall area.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C402.3.1 [PR11]*	Skylight area <= 3 percent of the gross roof area.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C402.3.2 [PR14]*	In enclosed spaces > 10,000 ft2 directly under a roof with ceiling heights >15 ft. and used as an office, lobby, atrium, concourse, corridor, storage, gymnasium/exercise center, convention center, automotive service, manufacturing, non-refrigerated warehouse, retail store, distribution/sorting area, transportation, or workshop, the following requirements apply: (a) the daylight zone under skylights is >= half the floor area; (b) the skylight area to daylight zone is >= 3 percent with a skylight VT >= 0.40; or a minimum skylight effective aperture >= 1 percent.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C402.3.2.2 [PR15]*	Areas with obstructions that block direct beam sunlight on >= 1/2 of the roof over the enclosed area for more than 1,500 daytime hours per year between 8 am and 4 pm.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

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Section # & Req.ID	Footing / Foundation Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
C402.2.6 [FO3]*	Slab edge insulation R-value.	R-____ ☐ Unheated ☐ Heated	R-____ ☐ Unheated ☐ Heated	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
C303.2 [FO4]*	Slab edge insulation installed per manufacturer's instructions.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C402.2.6 [FO5]*	Slab edge insulation depth/length. Slab insulation extending away from building is covered by pavement or >= 10 inches of soil.	____ ft	____ ft	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
C403.2.7, C408.2.8, C404.5 [FO6]*	Exterior insulation protected against damage, sunlight, moisture, wind, landscaping and equipment maintenance activities.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.4.5 [FO9]*	Freeze protection and snow/ice melting system sensors for future connection to controls.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C402.2.8 [FO12]*	Bottom surface of floor structures incorporating radiant heating insulated to >=R-3.5.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*

Additional Comments/Assumptions:

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Section # & Req.ID	Framing / Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
C402.4.1, C402.4.2 [FR16]¹	The building envelope contains a continuous air barrier that is sealed in an approved manner and either constructed or tested in an approved manner. Air barrier penetrations are sealed in an approved manner.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C402.4.3, C402.4.4 [FR18]¹	Factory-built fenestration and doors are labeled as meeting air leakage requirements.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C402.4.7 [FR17]¹	Vestibules are installed on all building entrances. Doors have self-closing devices.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C402.3.3, C402.3.4 [FR8]¹	Vertical fenestration U-Factor.	U-____	U-____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
C402.3.3 [FR10]¹	Vertical fenestration SHGC value.	SHGC____	SHGC____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
C303.1.3 [FR12]¹	Fenestration products rated in accordance with NFRC.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C303.1.3 [FR13]¹	Fenestration products are certified as to performance labels or certificates provided.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C402.2.7 [FR14]¹	U-factor of opaque doors associated with the building thermal envelope meets requirements.	U-____ ☐ Swinging ☐ Nonswinging	U-____ ☐ Swinging ☐ Nonswinging	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*

Additional Comments/Assumptions:

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2012 IECC	Plumbing Rough-In Inspection	Complies?	Comments/Assumptions
C404.3 [PL5]³	Temperature controls installed on service water heating systems (110 ºF for dwelling units and lavatories in public restrooms and 90 ºF for other occupancies.)	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.2 [PL4]³	Heat traps installed on non-circulating storage water tanks.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

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Section # & Req.ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
C403.2.3 [ME35]¹	HVAC equipment efficiency verified.	Efficiency____	Efficiency____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Mechanical Systems list for values.*
C402.4.5 [ME10]¹	Stair and elevator shaft vents have motorized dampers that automatically close.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C402.4.5.2 [ME38]¹	Outdoor air and exhaust systems are equipped with dampers that automatically shut when not in use and meet maximum leakage rates. Check gravity dampers where allowed			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.5.1 [ME59]¹	Demand control ventilation provided for spaces >500 ft2 and >25 people per 1000 ft2 floor density and served by systems with air side economizer, auto modulating outside air damper control, or design airflow >3,000 cfm.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.7 [ME60]¹	HVAC ducts and plenums located in unheated spaces. If plenums are installed in or under a slab, verification may need to occur during Foundation inspection.	R-____	R-____	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.8 [ME41]¹	Thermally ineffective panel surfaces of sensible heating panels have insulation >= R-3.5.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.7 [ME10]¹	Ducts and plenums sealed based on static pressure and location.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.7.1.3 [ME11]¹	Ductwork operating >3 in. water column requires air leakage testing.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.3.1.1, C403.3.1.1 [ME62]¹	Air economizers provided where required, meet the requirements for design capacity, control signal, ventilation controls, high-limit shut off control, direct economizer control, and provide a means to relieve excess outside air during operation.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.2.1 [ME53]¹	Air outlets and zone terminal devices have means for air balancing.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.4.2 [ME62]¹	VAV fan motors >=7.5 hp to be driven by variable speed drive, have a vane-axial fan with airfoil or pitch blades, or have controls to limit fan motor demand.	☐ VSD ☐ Vane axial fan ☐ Other	☐ VSD ☐ Vane axial fan ☐ Other	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

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Section # & Req.ID	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
C403.4.2 [ME66]*	VAV fan motors >=7.5 hp to be driven by variable speed drive, have a vane-axial fan with variable pitch blades, or have controls to limit fan motor demand.	☐ VSD ☐ Vane axial fan ☐ Other	☐ VSD ☐ Vane axial fan ☐ Other	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.6 [ME57]*	Exhaust air energy recovery on systems meeting Table C403.2.6			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.11 [ME71]*	Unenclosed spaces that are heated use only radiant heat.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

2012 IECC	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
C405.2.2.1 [EL22]*	Automatic controls to shut off all building lighting installed in all buildings.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.1.1 [EL23]*	Independent lighting controls installed per approved lighting plans and all lighting controls are easily accessible and visible to occupants.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.1.1 [EL15]*	Lighting controls installed to uniformly reduce the lighting load by at least 50%.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.2.3 [EL14]*	Daylight zones provided with individual controls that control the lights independent of general area lighting.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.3 [EL17]*	Sleeping units have at least one master switch at the main entry door that controls wired luminaires and switched receptacles.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.2.2 [EL18]*	Occupancy sensors installed in required spaces.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.2.1 [EL20]*	Primary sidelighted areas are equipped with required lighting controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.2.3 [EL21]*	Enclosed spaces with daylight area under skylights and rooftop monitors are equipped with required lighting controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.4 [EL25]*	Automatic lighting controls for exterior lighting installed.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.3 [EL4]*	Separate lighting control devices for specific uses installed per approved lighting plans.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.3 [EL19]*	Fluorescent luminaires with odd numbered lamp configurations that are with 10 feet center to center (if recess mounted) or are within 1 foot edge to edge (if pendant or surface mounted) shall be tandem wired.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.4 [EL6]*	Exit signs do not exceed 5 watts per face.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

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2012 IECC	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
C405.6 [EL24]*	Exterior grounds lighting over 100 W provides >60 lm/W unless on motion sensor or fixture is exempt from scope of code or from external LPD.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.3 [EL8]*	Additional interior lighting power allowed for special functions per the approved lighting plans and is automatically controlled and separated from general lighting.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

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Section # & Req.ID	Insulation Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments/Assumptions
C402.4.1.1 [IN1]-	All sources of air leakage in the building thermal envelope are sealed, caulked, gasketed, weather stripped or wrapped with moisture vapor-permeable wrapping material to minimize air leakage.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C402.4.2.1 [IN2]-	Roof R-value. For some ceiling systems, verification may need to occur during Framing Inspection.	R-____ ☐ Above deck ☐ Metal ☐ Attic	R-____ ☐ Above deck ☐ Metal ☐ Attic	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
C303.2 [IN3]-	Roof insulation installed per manufacturer's instructions. Blown or poured loose-fill insulation is installed only where the roof slope is <=3 in 12.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C303.2 [IN7]-	Above-grade wall insulation installed per manufacturer's instructions.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C402.2.5 [IN8]-	Floor insulation R-value.	R-____ ☐ Mass ☐ Steel ☐ Wood	R-____ ☐ Mass ☐ Steel ☐ Wood	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Envelope Assemblies table for values.*
C303.1 [IN10]-	Building envelope insulation is labeled with R-value or insulation certificate providing R-value and other relevant data.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C303.2.1 [IN14]-	Exterior insulation is protected from damage with a protective material. Verification for exposed foundation insulation may need to occur during Foundation Inspection.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C402.2.1 [IN17]-	Insulation intended to meet the roof insulation requirements cannot be installed on top of a suspended ceiling. Mark this requirement compliant if insulation is installed accordingly.			☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

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2012 IECC	Final Inspection	Complies?	Comments/Assumptions
C402.4.6 [FI37]-	Weatherseals installed on all loading dock cargo doors.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.4.2 [FI47]-	Heating and cooling to each zone is controlled by a thermostat control. Minimum one humidity control device (installed humidification/dehumidification system).	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.4.2 [FI38]-	Thermostatic controls have a 5 °F deadband.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.4.2 [FI20]-	Temperature controls have setpoint overlap restrictions.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.4.3 [FI39]-	Each zone equipped with setback controls using automatic time clock or programmable control system.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.4.3 [FI40]-	Automatic Controls: Setback to 55°F (heat) and 85°F (cool): 7-day clock. 2-hour occupant override, 10-hour backup	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.4.1.1 [FI42]-	Heat pump controls prevent supplemental electric resistance heat from coming on when not needed.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.5.1 [FI7]-	Furnished HVAC as-built drawings submitted within 90 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C303.3.C408.2.5.2 [FI8]-	Furnished O&M manuals for HVAC systems within 90 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.5.3 [FI43]-	An air and/or hydronic system balancing report is provided for HVAC systems.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.3.2 [FI10]-	HVAC control systems have been tested to ensure proper operation, calibration and adjustment of controls.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C404.3 [FI11]-	Public lavatory faucet water temperature <=110°F.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

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2012 IECC	Final Inspection	Complies?	Comments/Assumptions
C404.5 [FI45]-	First 8 ft of outlet piping is insulated	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C402.4.8 [FI26]-	Recessed luminaires in thermal envelope to limit infiltration and be IC rated and labeled. Seal between interior finish and luminaire housing.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C403.2.2 [FI27]-	HVAC systems and equipment capacity does not exceed calculated loads.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.5.1 [FI16]-	Furnished as-built drawings for electric power systems within 30 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C303.3.C408.2.5.2 [FI17]-	Furnished O&M instructions for systems and equipment to the building owner or designated representative.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.5.2 [FI18]-	Interior installed lamp and fixture watts are consistent with what is shown on the approved lighting plans, demonstrating proposed watts are less than or equal to allowed watts.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Interior Lighting fixture schedule for values.*
C405.6.2 [FI19]-	Exterior lighting power is consistent with what is shown on the approved lighting plans, demonstrating proposed watts are less than or equal to allowed watts.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	*See the Exterior Lighting fixture schedule for values.*
C408.2.1 [FI28]-	Commissioning plan developed by registered design professional or approved agency.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.4 [FI29]-	Preliminary commissioning report completed and certified by registered design professional or approved agency.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.5.4 [FI30]-	Final commissioning report due to building owner within 90 days of receipt of certificate of occupancy.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.3 [FI31]-	HVAC equipment has been tested to ensure proper operation.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.3. [FI32]-	Economizers have been tested to ensure proper operation.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

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2012 IECC	Final Inspection	Complies?	Comments/Assumptions
C408.3 [FI33]>	Lighting systems have been tested to ensure proper calibration, adjustment, programming, and operation.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.3 [FI48]>	Lighting systems have been tested to ensure proper calibration, adjustment, programming, and operation.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C406 [FI34]>	Efficient HVAC performance, efficient lighting system, or on-site supply of renewable energy consistent with what is shown the approved plans.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

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Conclusion

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Final Reflection

This slide will help the learner to reflect on the day and what they will take back to the job and apply.

- **What?** What happened and what was observed in the training?
- **So what?** What did you learn? What difference did this training make?
- **Now what?** How will you do things differently back on the job as a result of this training?

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