Commercial Webinar of the 2009 IECC and 90.1-2007
Introductions

Stephen Rivera

Project email:

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Overview

• Project funded by the Missouri Department of Natural Resources (MDNR) with American Recovery and Reinvestment Act of 2009 (ARRA) funding.

3 Locations:

1. St. Louis (December 1, 2011)
2. Springfield (December 5, 2011)

• Objective of the Workshop: Work with municipalities and counties across the state to identify opportunities to adopt or enhance compliance with the 2009 International Energy Conservation Code (IECC) at a local level.
Overview

- BCAP (Building Codes Assistants Program)
- BECP (Building Energy Codes Program)
What are the topics for today?

1. Overview of Best Practices and Lessons Learned in Missouri.
2. Commercial Compliance Approaches and Their Corresponding Tools.
3. Overview of the Requirements of Commercial Provisions of 2009 IECC
<table>
<thead>
<tr>
<th>Topic</th>
<th>Approx. Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction, Project Background, Workshop Overview</td>
<td>5 minutes</td>
</tr>
<tr>
<td>Overview of Best Practices and Lessons Learned in Missouri.</td>
<td>20 minutes</td>
</tr>
<tr>
<td>Commercial Compliance Approaches and their Corresponding Tools</td>
<td>25 minutes</td>
</tr>
<tr>
<td>Overview of the Requirements of Commercial Provisions of 2009 IECC</td>
<td>35 minutes</td>
</tr>
<tr>
<td>Commercial Resources - Building Data Collection Checklist and COMcheck.</td>
<td>25 minutes</td>
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<tr>
<td>Summary/Questions</td>
<td>10 minutes</td>
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<tr>
<td><strong>Total Time</strong></td>
<td><strong>2 Hrs</strong></td>
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</tbody>
</table>
Some Important Points

Overall

- Focused on commercial
- Discussion-based
- Forum for ideas and practices

What can you expect?

- Code citations in [ ]
- Webinar is Recorded and will be Available for 60 Days
Building Energy Codes

ASHRAE Standard 90.1

International Energy Conservation Code

State and Locally Adopted Codes
Comparison of 2009 IECC and ASHRAE 90.1-2007

2009 IECC
- 2009 IECC developed by the International Code Council (ICC)
- New version every three years with more stringent requirements

ASHRAE
- ASHRAE 90.1-2007 developed by American Society for Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
- ASHRAE 90.1 is the referenced standard in IECC
- Compliance with ASHRAE 90.1-2007 results in 4% more energy savings than ASHRAE 90.1-2004
## Model Codes & Standards

<table>
<thead>
<tr>
<th>Title</th>
<th>Type</th>
<th>Applicability</th>
<th>Common Versions</th>
</tr>
</thead>
</table>
2009 IECC Compliance

- Must the Project Comply with the IECC?
  - Comply with the Envelope Requirements
    - Section 502
    - 90.1 Section 5
  - Comply with the Mechanical/SWH Requirements
    - Sections 503 and 504
  - Comply with the Power & Lighting Requirements
    - 90.1 Section 6
    - Section 505
    - 90.1 Section 9

Document Compliance with the IECC
- Plan Review
- Inspection
Commercial Provisions Contained in Chapter 5

• Chapter 5 is dedicated to Commercial buildings in IECC
• ASHRAE 90.1-2007

Section 501.2 “Application” requires 90.1 to be used in its entirety (Envelope, Lighting, Mechanical).

**The Code does not allow for mixing and matching of IECC and ASHRAE**
IECC or ASHRAE 90.1

Both IECC & ASHRAE 90.1 apply, either used to comply

Both IECC & ASHRAE 90.1 apply, ASHRAE 90.1 likely used
Climate Zones – 2009 IECC
Climate Zones – 2009 IECC

Climate Zone 5

Climate Zone 4
Missouri: A Patchwork of Codes

Due to its history of strong local government, Missouri does not have a mandatory statewide energy code, however all local jurisdictions except class III counties have the right to adopt an energy code. As expected, this system creates a sometimes confusing patchwork of different codes throughout the state.

Regardless of the system in place, the bottom line is that many jurisdictions in Missouri still don’t have an energy code—meaning that many residents do not receive the benefits of energy-efficient construction.
## Missouri Facts

<table>
<thead>
<tr>
<th>Energy Costs</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>$20 billion</td>
<td>Amount spent annually on energy in Missouri.</td>
</tr>
<tr>
<td>95%</td>
<td>Percentage of primary energy imported from other states.</td>
</tr>
<tr>
<td>22%</td>
<td>The rise in the cost of residential electricity, 2004 to 2009.¹</td>
</tr>
</tbody>
</table>

Missouri residents spend billions every year importing energy from other states and abroad. Energy codes can help the state retain some of these dollars and improve Missouri’s economy.
### Missouri Facts

<table>
<thead>
<tr>
<th>Statewide Savings</th>
<th>Annual energy savings by 2030.</th>
</tr>
</thead>
<tbody>
<tr>
<td>$318 million</td>
<td>26 trillion Btu of energy avoided annually by 2030.</td>
</tr>
<tr>
<td>1.4 million</td>
<td>Metric tons of CO₂ prevented annually by 2030.</td>
</tr>
</tbody>
</table>

By adopting and enforcing the 2009 IECC starting in 2011, Missouri municipalities and counties would **significantly improve the state's economy and environment** now and into the future.
Topic 1

Overview of Best Practices and Lessons Learned in Missouri
Commercial State Energy Code Status (*)

(*) as of November 1, 2011, DOE – Building Energy Codes Program
Commercial Energy Code - Midwest
Best Practices Missouri

- Jackson County, Lake St. Louis, Marshall, O’Fallon, and the City of St. Louis (St. Louis County Public Works) have adopted the 2009 IECC.

- Creve Coeur and Independence are currently in the adoption process.

- St. Charles County and St. Louis County have adopted the 2009 IRC with amendments.
Best Practices Missouri

Kansas City incorporates energy codes into its broader sustainability effort:
• Created the Environmental Management Commission which advises the city on energy/environmental issues.

Columbia created commissions to advise the city council on energy code issues:
• The Building Construction Codes Commission (BCCC) reviews codes and provides a construction industry perspective.

University City
• The University City Green Practices Committee provides input into energy code adoption efforts.
Local Jurisdiction – Adoption Status

- **Adopted the IBC and/or IRC**
- **Adopted the IECC**
- **Population > 100,000**
- **50,000 - 100,000**
- **< 50,000**

- Arnold
- Ballwin
- Belton
- Bethany
- Boonville
- Branson
- Camden
- Cape Girardeau
- Carthage
- Chillicothe
- Clay
- Columbia
- Eldon
- El Dorado Springs
- Farmington
- Florissant
- Fulton
- Gladstone
- Hannibal
- Harrisonville
- Hazelwood

- Higginsville
- Highlandville
- Joplin
- Kansas City
- Kirksville
- Kirkwood
- Knob Noster
- Lake St. Louis
- Loch Lloyd
- Lebanon
- Lee's Summit
- Macon
- Marshall
- Maryville
- Mexico
- Mountain Grove
- Neosho
- Nixa
- O'Fallon
- Osage Beach
- Ozark

- Pacific
- Park Hills
- Pineville
- Platte City
- Raytown
- Republic
- Riverside
- Rolla
- Sedalia
- Sikeston
- Sni Valley
- Springfield
- St. Charles
- St. Joseph
- St. Louis
- St. Peters
- Sugar Creek
- Troy
- Warrensburg
- Wentzville
- West Plains
Topic 2

Commercial Compliance Approaches and their Corresponding Tools
Different compliance paths

- Prescriptive compliance
- Trade-off*
- Total building performance

*The 2009 International Energy Conservation Code (IECC) contains a U-factor alternative (Section 502.1.2).
Total Building Performance Approach

Samples of performance software available are listed in the


and on the


eQuest is a software that can do an energy analysis.

- http://doe2.com/equest/
More Resources

• http://www.ashrae.org/technology/page/121

• http://www.iccsafe.org/cs/Pages/opinions.aspx

• http://www.energycodes.gov/help/
Compliance for additions or alterations

• One of the keys to showing compliance for additions and alterations is to remember you are only considering the new space, or the new walls, etc.

• You have the option of showing compliance for the entire space, but this is not necessary or typical.
Compliance for additions or alterations

Using COMcheck™, you will indicate "addition" or "alteration" on the project information tab, and need to enter the following information, as it applies to your project:

• Ceiling – gross area (ft²) and insulation R-value of new ceiling
• Exterior walls – gross area (ft²) of new exterior walls and insulation R-value (any existing exterior wall(s) that will become interior wall(s) once the addition is built are not be entered as part of the addition wall area)
• Windows/Doors – gross area (ft²) of windows and/or doors with U-factor from NFRC label or default table in the help section of COMcheck™
• Floor – gross area (ft²) of addition and insulation R-value. If the floor is a slab, the length of the exterior slab edge should be entered in linear feet
Compliance for Remodels and Alterations

• **COMcheck** will calculate compliance for your project as you define it. For example, if your project is a tenant improvement with new interior lighting, new exterior lighting and mechanical, you would not need to fill in the envelope tab.

• Conversely, if your project is new construction of an unoccupied commercial shell and there is no interior lighting or mechanical system, you would not fill out those tabs.
Common Questions

• Please explain how to use different wattage luminaire and comply with code?

• How do I create an energy code compliance report to get my building permit?

• Where can I get a copy of the energy code?
Common Questions

What are the minimum insulation and window requirements for my building?

My project has both business and homes, is it residential or commercial?

Do the last IECC versions reference the ASHRAE Standards in such a way as to require the commissioning work described in them?
State-Level Technical Assistance

Over the years, DOE's Building Energy Codes Program has provided the following types of assistance to state energy organizations:

**Technical analysis of residential and commercial codes**, including:

- Analysis of energy savings associated with adoption of new codes
- Analysis of first cost impacts and cost-effectiveness associated with adoption of new codes
- Comparative analysis of future code options
- Suggested language for modification of national model codes for state-specific issues
State-Level Technical Assistance

- **Training on residential and commercial codes**
  Development of customized training materials for state codes
  Web-based or in-person training on the national model codes and state codes

- **Software in support of residential and commercial codes**
  State-specific energy codes in [REScheck](#)
  State-specific energy codes in [COMcheck](#)

- In addition, DOE's BECP has acquired databases of residential and commercial construction volume by state and county. BECP can prepare a number of summary products from these databases for state use related to energy codes.
State-Level Technical Assistance

Funding to provide no-cost technical assistance is limited. In assessing each request, the following issues will be taken into consideration:

- Impact, current codes, population, construction start
- States vs Localities
- Nationwide 70% adoption
- State Wide 90% Compliance
State-Level Technical Assistance

Status of State-Level Technical Assistance Requests
http://www.energycodes.gov/states/open_requests.stm

Missouri
(City of Kansas City) 08/10 Analyze savings between the 2006 IECC and 2009 IECC and the 2006 IECC and 2012 IECC. - In Progress
| Building Energy Codes Assistance for States | Status of State Energy Codes | Check on the current code status of any U.S. state or territory using BECP’s interactive map tool. Also find links to state specific portions of BECP’s recent nationwide analysis reports, state-level energy official contact information, and many other details. | www.energycodes.gov/states |
| Technical Assistance to States | BECP provides specialized technical assistance to the states in the form of economic analysis, code comparisons, webcast training, and compliance material development requested by states to help them adopt, upgrade, implement, and enforce their building energy codes. | http://www.energycodes.gov/states/techAssist.stm |
| State Compliance Assistance | BECP has developed an approach states can use for measuring compliance with building energy codes. | http://www.energycodes.gov/arra/compliance_evaluation.stm |
| No-cost Compliance Tools | Residential Code Compliance Software | REScheck™ and REScheck-Web™ | http://www.energycodes.gov/software.stm |
| | Commercial Code Compliance Software | COMcheck™ and COMcheck-Web™ | |
| Training | Building Energy Codes University (BECU) | To help stakeholders broaden and deepen their knowledge of building energy codes, BECP is collecting its diverse training resources in an extensive Building Energy Codes University (BECU) that features webcasts, training videos, self-paced online courses, presentations, and other BECP materials and tools. | www.energycodes.gov/training |
| Resource Center | Building Energy Codes Knowledge Base | This knowledge base provides a variety of different media types, including articles, graphics, online tools, presentations, and videos that anyone can use to create their own training and presentations. | http://resourcecenter.pnl.gov/ |
| Advocacy | The Building Codes Assistance Project (BCAP) | BCAP is an initiative of the Alliance to Save Energy, the American Council for an Energy-Efficient Economy, and the Natural Resource Defense Council that provides states with code advocacy assistance on behalf of DOE. | www.bcap-energy.org |
Topic 3

Overview of the Requirements of Commercial Envelope, Lighting and Mechanical Provisions of the 2009 IECC
Envelope

Must the Project Comply with the IECC?
- Comply with the Envelope Requirements
  - Section 502
  - 90.1 Section 5
- Comply with the Mechanical/SWH Requirements
  - Sections 503 and 504
- Comply with the Power & Lighting Requirements
  - 90.1 Section 6
  - Section 505
  - 90.1 Section 9

Document Compliance with the IECC
Plan Review
Inspection
What is the Building Thermal Envelope?

- Roof/Ceiling Assembly
- Wall Assembly
- Vertical Fenestration and Skylights
- Floor Assembly
- Slab Edge
- Below Grade Wall Assembly

**BUILDING THERMAL ENVELOPE.** The basement walls, exterior walls, floor, roof, and any other building element that enclose *conditioned space*. This boundary also includes the boundary between *conditioned space* and any exempt or unconditioned space.
What are My Options for Complying with the IECC?

• Chapter 5 of the IECC General Prescriptive Approach
• Use for \( \leq 40\% \) of gross wall area in vertical fenestration
• Use for \( \leq 3\% \) of gross roof area in skylights
• Section 506 Total Building Performance Approach
• ASHRAE/IESNA Standard 90.1-2007

Section 501.2 “Application” requires 90.1 to be used in its entirety (Envelope, Lighting, Mechanical) if used as an alternate compliance path
Compliance with CH 5 Prescriptive Approach

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<th>CLIMATE ZONE</th>
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<th>4</th>
<th>5 AND MARINE 4</th>
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<td>Cavity doors</td>
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<td>Roll-up or sliding</td>
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</table>

For SI: 1 inch = 25.4 mm.
- = Continues insulation; NR = No requirement.
a. When using R-value compliance method, a thermal spacer block is required, otherwise use the U-value compliance method (see Tables 502.1.2 and 502.2.2).
b. Assembly descriptions can be found in Table 502.2.2.
<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>4</th>
<th>5 AND MARINE 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Envelope Requirements - Opaque Assemblies</td>
<td></td>
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<tr>
<td>Insulation entirely above deck</td>
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<td>U-0.048</td>
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<td>Metal buildings</td>
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<td>Slab-on-Grade Floors</td>
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<td>Unheated slabs</td>
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Changes to Tables 502.1.2 and 502.2(1)

- Table now separated by occupancy type
- Group R occupancies use “Group R” column
- Non-Group R occupancies use “All other” column
Compliance with Chapter 5 Prescriptive Approach

**TABLE 502.2(2)
BUILDING ENVELOPE REQUIREMENTS—OPAQUE ASSEMBLIES**

<table>
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<tr>
<th>ROOF</th>
<th>DESCRIPTION</th>
<th>REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-19</td>
<td>Standing seam roof with single fiberglass insulation layer. This construction is R-19 faced fiberglass insulation batts draped perpendicular over the purlins. A minimum R-3.5 thermal spacer block is placed above the purlin/butt, and the roof deck is secured to the purlins.</td>
<td>ASHRAE/IESNA 90.1 Table A2.3 including Addendum “G”</td>
</tr>
<tr>
<td>R-13 + R-13 R-13 + R-19</td>
<td>Standing seam roof with two fiberglass insulation layers. The first R-value is for faced fiberglass insulation batts draped over purlins. The second R-value is for unfaced fiberglass insulation batts installed parallel to the purlins. A minimum R-3.5 thermal spacer block is placed above the purlin/butt, and the roof deck is secured to the purlins.</td>
<td>ASHRAE/IESNA 90.1 Table A2.3 including Addendum “G”</td>
</tr>
<tr>
<td>R-11 + R-19 FC</td>
<td>Filled cavity fiberglass insulation. A continuous vapor barrier is installed below the purlins and uninterrupted by framing members. Both layers of uncompressed, unfaced fiberglass insulation rest on top of the vapor barrier and are installed parallel, between the purlins. A minimum R-3.5 thermal spacer block is placed above the purlin/butt, and the roof deck is secured to the purlins.</td>
<td>ASHRAE/IESNA 90.1 Table A2.3 including Addendum “G”</td>
</tr>
</tbody>
</table>

**WALLS**

<table>
<thead>
<tr>
<th>WALLS</th>
<th>DESCRIPTION</th>
<th>REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-16, R-19</td>
<td>Single fiberglass insulation layer. The construction is faced fiberglass insulation batts installed vertically and compressed between the metal wall panels and the steel framing.</td>
<td>ASHRAE/IESNA 90.1 Table A3.2 including Addendum “G”</td>
</tr>
<tr>
<td>R-13 + R-5.6 ci R-19 + R-5.6 ci</td>
<td>The first R-value is for faced fiberglass insulation batts installed perpendicular and compressed between the metal wall panels and the steel framing. The second rated R-value is for continuous rigid insulation installed between the metal wall panel and steel framing, or on the interior of the steel framing.</td>
<td>ASHRAE/IESNA 90.1 Table A3.2 including Addendum “G”</td>
</tr>
</tbody>
</table>
Roof R-Value (502.2.1) / U-Factor (502.1.2)

Roof R-values and U-factor requirements are based on assembly type / insulation placement

- Construction Roofs
- Metal buildings
- Attic and other
Roof R-Value – Insulation Completely Above Deck

- Insulation considered continuous ($CI$)
- Insulation thickness can vary ≤ 1” and area weighted U-factor meets the requirements of Table 502.2(1)
Roof R-Value – Metal Buildings

- R-5 thermal blocks required on all metal buildings or must use U-factor Compliance Method
- Climate Zones 2-8 require two layers of insulation
- CZ 2-5 and marine R:  R-13+R-13
- Example (R-13+R-19):
- R-13 draped perpendicularly to the purlins
- R-19 running parallel to the purlins supported by the R-13
Roof R-Value – Ceilings with Attic Spaces

- Install insulation between framing
- R-37 in most CZ 4 and 5
Wall R-Value – Mass Walls

- Walls weighing at least 35 lbs/ft$^2$ of wall surface area, or
- 25 lbs/ft$^2$ of wall surface area if material weight is $\leq 120$ lb/ft$^3$
Wall R-Value – Wood, Metal Frame, and Other

- Cavity insulation or cavity plus continuous (CI)
- Continuous insulation not broken up by framing members e.g. rigid board insulation
Metal Building Walls [Table 502.2(2)]

<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>R-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>R-16</td>
</tr>
<tr>
<td>3-4 except Marine</td>
<td>R-19</td>
</tr>
<tr>
<td>Marine 4 – 6</td>
<td>R-13+R-5.6ci</td>
</tr>
<tr>
<td>7-8</td>
<td>R-19+R-5.6ci</td>
</tr>
</tbody>
</table>

Picture from NAIMA
Below Grade Walls (502.2.4)

• What is a below grade wall?
• Basement or first-story walls ≥ 85% below grade
• Insulation must extend down 10 ft from the outside finished grade level or to the level of the floor, whichever is less
Floors Over Outdoor Air or Unconditioned Space (502.2.5)

- Joist/Framing (Steel/Wood)
- Insulation installed between framing
- Mass Floors
- Materials weighing 35 lbs/ft\(^2\), or
- 25 lbs/ft\(^2\) if material weight is \(\leq 120\) lbs/ft\(^3\)
Slab-on-Grade Floors (502.2.6)

- Unheated slab – insulation required in Climate Zones 4-8
- Heated slabs – insulation required in all Climate Zones
## Compliance with Chapter 5 Prescriptive Approach

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical fenestration (40% maximum of above-grade wall)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>U-factor</strong></td>
<td>1.20</td>
<td>0.75</td>
<td>0.65</td>
<td>0.40</td>
<td>0.35</td>
<td>0.35</td>
<td>0.35</td>
<td>0.35</td>
</tr>
<tr>
<td>Framing materials other than metal with or without metal reinforcement or cladding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>U-factor</strong></td>
<td>1.20</td>
<td>1.10</td>
<td>0.90</td>
<td>0.65</td>
<td>0.55</td>
<td>0.55</td>
<td>0.55</td>
<td>0.55</td>
</tr>
<tr>
<td>Metal framing with or without thermal break</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curtain wall/storefront <strong>U-factor</strong></td>
<td>1.0</td>
<td>0.70</td>
<td>0.60</td>
<td>0.50</td>
<td>0.45</td>
<td>0.45</td>
<td>0.40</td>
<td>0.40</td>
</tr>
<tr>
<td>Entrance door <strong>U-factor</strong></td>
<td>1.20</td>
<td>1.10</td>
<td>0.90</td>
<td>0.65</td>
<td>0.55</td>
<td>0.55</td>
<td>0.55</td>
<td>0.55</td>
</tr>
<tr>
<td>All other <strong>U-factor</strong></td>
<td>1.20</td>
<td>0.75</td>
<td>0.65</td>
<td>0.55</td>
<td>0.55</td>
<td>0.55</td>
<td>0.55</td>
<td>0.55</td>
</tr>
<tr>
<td>SHGC-all frame types</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHGC: PF &lt; 0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.40</td>
<td>0.40</td>
<td>0.40</td>
<td>0.40</td>
<td>0.40</td>
</tr>
<tr>
<td>SHGC: 0.25 ≤ PF &lt; 0.5</td>
<td>0.33</td>
<td>0.33</td>
<td>0.33</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>SHGC: PF ≥ 0.5</td>
<td>0.40</td>
<td>0.40</td>
<td>0.40</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td>Skylights (3% maximum)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>U-factor</strong></td>
<td>0.75</td>
<td>0.75</td>
<td>0.65</td>
<td>0.60</td>
<td>0.60</td>
<td>0.60</td>
<td>0.60</td>
<td>0.60</td>
</tr>
<tr>
<td>SHGC</td>
<td>0.35</td>
<td>0.35</td>
<td>0.35</td>
<td>0.40</td>
<td>0.40</td>
<td>0.40</td>
<td>NR</td>
<td>NR</td>
</tr>
</tbody>
</table>

NR = No requirement.
PF = Projection factor (see Section 502.3).
a. All others includes operable windows, fixed windows and nonentrance doors.

### Vertical fenestration (40% maximum of above-grade wall)

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>U-factor</strong></td>
<td>0.4</td>
<td>0.35</td>
</tr>
</tbody>
</table>

### Metal framing with or without thermal break

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>U-factor</strong></td>
<td>0.5</td>
<td>0.45</td>
</tr>
</tbody>
</table>

### Entrance door **U-factor**

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>U-factor</strong></td>
<td>0.85</td>
<td>0.8</td>
</tr>
</tbody>
</table>

### All other **U-factor**

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>U-factor</strong></td>
<td>0.55</td>
<td>0.55</td>
</tr>
</tbody>
</table>

### SHGC-all frame types

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SHGC</strong></td>
<td>0.4</td>
<td>0.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SHGC</strong></td>
<td>NR</td>
<td>NR</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SHGC</strong></td>
<td>NR</td>
<td>NR</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Skylights (3% maximum)</strong></td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td><strong>SHGC</strong></td>
<td>0.4</td>
<td>0.4</td>
</tr>
</tbody>
</table>
Vertical Fenestration Requirement (502.3.1)

- Based on above-grade wall area (gross)
- Includes walls between conditioned space and unconditioned space or the great outdoors
- Total fenestration area (includes frame and glazing)
Fenestration U-Factor (502.3.2)

Framing Materials Other Than Metal w/ or w/o metal reinforcement or cladding
- Includes vinyl and wood frame products or other non-metal frames
- Typically manufactured fenestration products
Fenestration U-Factor (303.1.3)

How Do You Meet the Requirement?
• Fenestration product rating in accordance to NFRC 100
• Labeled and certified by the manufacturer
• Non-NFRC 100 rated fenestration
• Default Glazed Fenestration U-factor Table 102.1.3(1)
Default U-Factors from Tables 303.1.3(1) and (2)

### TABLE 102.1.3(1)
**DEFAULT GLAZED FENESTRATION U-FACTOR**

<table>
<thead>
<tr>
<th>FRAME TYPE</th>
<th>SINGLE PANE</th>
<th>DOUBLE PANE</th>
<th>SKYLIGHT</th>
<th>Single</th>
<th>Double</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal</td>
<td>1.20</td>
<td>0.80</td>
<td>2.00</td>
<td>1.30</td>
<td></td>
</tr>
<tr>
<td>Metal with Thermal Break</td>
<td>1.10</td>
<td>0.65</td>
<td>1.90</td>
<td>1.10</td>
<td></td>
</tr>
<tr>
<td>Nonmetal or Metal Clad</td>
<td>0.95</td>
<td>0.55</td>
<td>1.75</td>
<td>1.05</td>
<td></td>
</tr>
<tr>
<td>Glazed Block</td>
<td></td>
<td>0.60</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### TABLE 102.1.3(2)
**DEFAULT DOOR U-FACTORS**

<table>
<thead>
<tr>
<th>DOOR TYPE</th>
<th>U-FACTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uninsulated Metal</td>
<td>1.20</td>
</tr>
<tr>
<td>Insulated Metal</td>
<td>0.60</td>
</tr>
<tr>
<td>Wood</td>
<td>0.50</td>
</tr>
<tr>
<td>Insulated, nonmetal edge, max 45% glazing, any glazing double pane</td>
<td>0.35</td>
</tr>
</tbody>
</table>
Glazed Fenestration SHGC (502.3.2)

What is Solar Heat Gain Coefficient?

“The ratio of the solar heat gain entering the space through the fenestration assembly to the incident solar radiation.”
Fenestration SHGC Requirements – Table 303.1.3(3)

Two Options for Meeting the SHGC Requirements

- Fenestration product rated and labeled to NFRC 200, or
- Select default from Table 303.1.3(3)

<table>
<thead>
<tr>
<th>TABLE 102.1.3(3)</th>
<th>DEFAULT GLAZED FENESTRATION SHGC</th>
</tr>
</thead>
<tbody>
<tr>
<td>SINGLE GLAZED</td>
<td>DOUBLE GLAZED</td>
</tr>
<tr>
<td>Clear 0.8</td>
<td>Clear 0.7</td>
</tr>
<tr>
<td>Tinted 0.7</td>
<td>Tinted 0.6</td>
</tr>
<tr>
<td>GLAZED BLOCK</td>
<td>0.6</td>
</tr>
</tbody>
</table>
The Effect of Overhangs on Fenestration SHGC

- Overhangs allow a higher SHGC product to be installed
- Projection factor must be calculated
Skylight U-Factor / SHGC

- Limited to ≤ 3% of Roof Area
- U-factor and SHGC Based
- NFRC 100 Rating for U-factor or Default Table
NFRC 100 Rating for U-factor or Default Table

**TABLE 303.1.3(1)**  
DEFAULT GLAZED FENESTRATION  
U-FACTOR

<table>
<thead>
<tr>
<th>FRAME TYPE</th>
<th>SINGLE PANE</th>
<th>DOUBLE PANE</th>
<th>SKYLIGHT</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Single</td>
<td>Double</td>
<td></td>
</tr>
<tr>
<td>Metal</td>
<td>1.20</td>
<td>0.80</td>
<td>2.00</td>
<td>1.30</td>
<td></td>
</tr>
<tr>
<td>Metal with Thermal Break</td>
<td>1.10</td>
<td>0.65</td>
<td>1.90</td>
<td>1.10</td>
<td></td>
</tr>
<tr>
<td>Nonmetal or Metal Clad</td>
<td>0.95</td>
<td>0.55</td>
<td>1.75</td>
<td>1.05</td>
<td></td>
</tr>
<tr>
<td>Glazed Block</td>
<td></td>
<td>0.60</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Mandatory Requirements – Sealing of the Building Envelope (502.4.3)

• All penetrations, openings, joints and seams in the building envelope must be sealed. Materials that can be used include:
• Moisture vapor-permeable wrapping material
• Sealing materials spanning joints between dissimilar materials must allow for expansion and contraction
Not Included But Mandatory Requirements

- Opaque Doors (502.2.7)
- Curtain Wall, Storefront Glazing, and Commercial Entrance Doors (502.4.2)
- Hot Gas Bypass (502.4.4)
- Outdoor Intakes and Exhaust Openings (502.4.5)
- Loading Dock Weather Sealing (502.4.6)
- Vestibules (502.4.7)
- Recessed Lighting (502.4.8)
Mechanical

- Must the Project Comply with the IECC?
  - Comply with the Envelope Requirements
    - Section 502
    - 90.1 Section 5
  - Comply with the Mechanical/SWH Requirements
    - Sections 503 and 504
    - 90.1 Section 6
  - Comply with the Lighting Requirements
    - Section 505
    - 90.1 Section 9

- Document Compliance with the IECC
- Plan Review
- Inspection
Section 503 Building Mechanical Systems

Simplified to Include Only Four Sections:

- General (503.1)
- Mandatory Provisions (503.2)
- Simple HVAC Systems and Equipment (503.3)
- Complex HVAC Systems and Equipment (503.4)
What Provision of the Code Apply? (503.1)

Mandatory Provisions – Section 503.2 PLUS

- Section 503.3 (Simple Systems) or
- Section 503.4 (Complex Systems)
Simple Versus Complex Systems

- **Simple systems**
- Unitary or packaged HVAC equipment
- Serves one zone and controlled by a single thermostat

**Section 503.3** Simple Systems
Buildings served by unitary or packaged HVAC each serving 1 zone controlled by 1 thermostat. Two-pipe heating systems serving multiple zones are included if no cooling system is installed [Tables 503.2.3(1) through 503.2.3(5)]
Simple Versus Complex Systems

• Complex systems
• All equipment not covered under Section 503.3 Simple Systems

Section 503.4 Complex Systems
All buildings served by HVAC systems not covered under 503.3
Mandatory Provisions Applicable to ALL Mech. Systems (503.2)

- HVAC Load Calculations
- Equipment and System Sizing
- HVAC Equipment Performance Requirements
- HVAC System Controls
- Ventilation
Equipment and System Sizing (503.2.2)

- Output capacity SHALL NOT exceed sizing –
- Select the system which serves the greater load, heating or cooling
### HVAC Performance (Minimum Efficiency) Requirements (503.2.3)

#### Table 503.2.3(2)

<table>
<thead>
<tr>
<th>EQUIPMENT TYPE</th>
<th>SIZE CATEGORY</th>
<th>SUBCATEGORY OR RATING CONDITION</th>
<th>MINIMUM EFFICIENCY&lt;sup&gt;ab&lt;/sup&gt;</th>
<th>TEST PROCEDURE&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Air cooled, (Cooling mode)</strong></td>
<td>&lt; 65,000 Btu/h</td>
<td>Split system</td>
<td>13.0 SEER</td>
<td>AHRI 210/240</td>
</tr>
<tr>
<td></td>
<td>≥ 65,000 Btu/h and &lt; 135,000 Btu/h</td>
<td>Single package</td>
<td>13.0 SEER</td>
<td>AHRI 210/240</td>
</tr>
<tr>
<td></td>
<td>≥ 135,000 Btu/h and &lt; 240,000 Btu/h</td>
<td>Split system and single package</td>
<td>10.1 EER&lt;sup&gt;c&lt;/sup&gt; (before Jan 1, 2010) 11.0 EER&lt;sup&gt;c&lt;/sup&gt; (as of Jan 1, 2010)</td>
<td>AHRI 340/360</td>
</tr>
<tr>
<td></td>
<td>≥ 240,000 Btu/h</td>
<td>Split system and single package</td>
<td>9.3 EER&lt;sup&gt;c&lt;/sup&gt; (before Jan 1, 2010) 10.6 EER&lt;sup&gt;c&lt;/sup&gt; (as of Jan 1, 2010)</td>
<td>AHRI 340/360</td>
</tr>
<tr>
<td><strong>Through-the-Wall (Air cooled, cooling mode)</strong></td>
<td>&lt; 30,000 Btu/h</td>
<td>Split system</td>
<td>10.9 SEER (before Jan 23, 2010) 12.0 SEER (as of Jan 23, 2010)</td>
<td>AHRI 210/240</td>
</tr>
<tr>
<td></td>
<td>Single package</td>
<td>10.6 SEER (before Jan 23, 2010) 12.0 SEER (as of Jan 23, 2010)</td>
<td>AHRI 210/240</td>
<td></td>
</tr>
<tr>
<td><strong>Water Source (Cooling mode)</strong></td>
<td>&lt; 17,000 Btu/h</td>
<td>86°F entering water</td>
<td>11.2 EER</td>
<td>AHRI/ASHRAE 13256-1</td>
</tr>
<tr>
<td></td>
<td>≥ 17,000 Btu/h and &lt; 135,000 Btu/h</td>
<td>86°F entering water</td>
<td>12.0 EER</td>
<td>AHRI/ASHRAE 13256-1</td>
</tr>
<tr>
<td><strong>Groundwater Source (Cooling mode)</strong></td>
<td>&lt; 135,000 Btu/h</td>
<td>59°F entering water</td>
<td>16.2 EER</td>
<td>AHRI/ASHRAE 13256-1</td>
</tr>
<tr>
<td><strong>Ground source (Cooling mode)</strong></td>
<td>&lt; 135,000 Btu/h</td>
<td>77°F entering water</td>
<td>13.4 EER</td>
<td>AHRI/ASHRAE 13256-1</td>
</tr>
<tr>
<td></td>
<td>&lt; 65,000 Btu/h (Cooling capacity)</td>
<td>Split system</td>
<td>7.7 HSPF</td>
<td>AHRI 210/240</td>
</tr>
<tr>
<td></td>
<td>Single package</td>
<td>7.7 HSPF</td>
<td>AHRI 210/240</td>
<td></td>
</tr>
<tr>
<td></td>
<td>≥ 65,000 Btu/h and &lt; 135,000 Btu/h (Cooling capacity)</td>
<td>47°F db/43°F wb Outdoor air</td>
<td>3.2 COP (before Jan 1, 2010) 3.3 COP (as of Jan 1, 2010)</td>
<td>AHRI 340/360</td>
</tr>
<tr>
<td></td>
<td>≥ 135,000 Btu/h (Cooling capacity)</td>
<td>47°F db/43°F wb Outdoor air</td>
<td>3.1 COP (before Jan 1, 2010) 3.2 COP (as of Jan 1, 2010)</td>
<td>AHRI 340/360</td>
</tr>
</tbody>
</table>

(continued)
Table 503.2.3(3)

<table>
<thead>
<tr>
<th>EQUIPMENT TYPE</th>
<th>SIZE CATEGORY (INPUT)</th>
<th>SUBCATEGORY OR RATING CONDITION</th>
<th>MINIMUM EFFICIENCY&lt;sup&gt;a&lt;/sup&gt;</th>
<th>TEST PROCEDURE&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTAC (Cooling mode) New construction</td>
<td>All capacities</td>
<td>95°F dry-bulb outdoor air</td>
<td>12.5 - (0.213 · Cap/1000) EER</td>
<td>ARI 310/3180</td>
</tr>
<tr>
<td>PTAC (Cooling mode) Replacements&lt;sup&gt;c&lt;/sup&gt;</td>
<td>All capacities</td>
<td>95°F dry-bulb outdoor air</td>
<td>10.9 - (0.213 · Cap/1000) EER</td>
<td>ARI 310/3180</td>
</tr>
<tr>
<td>PTHP (Cooling mode) New construction</td>
<td>All capacities</td>
<td>95°F dry-bulb outdoor air</td>
<td>12.3 - (0.213 · Cap/1000) EER</td>
<td>ARI 310/3180</td>
</tr>
<tr>
<td>PTHP (Cooling mode) Replacements&lt;sup&gt;c&lt;/sup&gt;</td>
<td>All capacities</td>
<td>95°F dry-bulb outdoor air</td>
<td>10.8 - (0.213 · Cap/1000) EER</td>
<td>ARI 310/3180</td>
</tr>
<tr>
<td>PTHP (Heating mode) New construction</td>
<td>All capacities</td>
<td>—</td>
<td>3.2 - (0.026 · Cap/1000) COP</td>
<td>ARI 310/3180</td>
</tr>
<tr>
<td>PTHP (Heating mode) Replacements&lt;sup&gt;c&lt;/sup&gt;</td>
<td>All capacities</td>
<td>—</td>
<td>2.9 - (0.026 · Cap/1000) COP</td>
<td>ARI 310/3180</td>
</tr>
</tbody>
</table>

For SI: °C = ([°F] - 32) / 1.8, 1 British thermal unit per hour = 0.2931 W, 
db = dry-bulb temperature, °F
wb = wet-bulb temperature, °F
<sup>a</sup> Chapter 6 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.
<sup>b</sup> Cap means the rated cooling capacity of the product in Btu/h. If the unit’s capacity is less than 7,000 Btu/h, use 7,000 Btu/h in the calculation. If the unit’s capacity is greater than 15,000 Btu/h, use 15,000 Btu/h in the calculation.
<sup>c</sup> Replacement units must be factory labeled as follows: “MANUFACTURED FOR REPLACEMENT APPLICATIONS ONLY. NOT TO BE INSTALLED IN NEW CONSTRUCTION PROJECTS.” Replacement efficiencies apply only to units with existing sleeves less than 16 inches (406 mm) high and less than 42 inches (1067 mm) wide.
System Controls (503.2.4)

One temperature and humidity (when applicable) controller per zone
Demand Controlled Ventilation (503.2.5.1)

*DCV* must be provided for each zone with spaces > 500 ft² and the average occupant load > 40 people/1000 ft² of floor area where the HVAC system has:

- An air-side economizer,
- Automatic modulating control of the outdoor air damper,
- A design outdoor airflow > 3,000 cfm
Energy Recovery Ventilation Systems (503.2.6)

- Applies to individual fan systems with Design Supply Air capacity ≥ 5,000 CFM
- Minimum outside air supply of ≥ 70% of design supply air quantity
- Exhaust air recovery efficiency must be ≥ 50%

How a Heat Recovery Ventilator Works

1. Warm, stale air is drawn from the kitchen and bathrooms
2. Fresh, cold air from outside is drawn in
3. Fresh, heated air is sent to bedrooms and living areas
4. Stale, cool air from inside is exhausted outside
Piping Insulation (503.2.8)

All piping serving heating or cooling system must be insulated in accordance with Table 503.2.8

<table>
<thead>
<tr>
<th>FLUID</th>
<th>NOMINAL PIPE DIAMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(thickness in inches)</td>
</tr>
<tr>
<td></td>
<td>≤ 1.5”</td>
</tr>
<tr>
<td>Steam</td>
<td>1 ½</td>
</tr>
<tr>
<td>Hot water</td>
<td>1 ½</td>
</tr>
<tr>
<td>Chilled water, brine or</td>
<td>1 ½</td>
</tr>
<tr>
<td>refrigerant</td>
<td></td>
</tr>
</tbody>
</table>

Minimum Pipe Insulation
HVAC System

Completion (503.2.9)
- Air System Balancing
- Hydronic System Balancing
- Equipment Capacity and Required Maintenance

Design and Control (503.2.10)
- HVAC systems with total fan system power > 5 hp to meet 503.2.10.1 and 503.2.10.2
- Allowable Fan Floor Horsepower
- Motor Nameplate Horsepower
Motor Nameplate Horsepower (503.2.10.2)

- Selected fan motor to be no larger than first available motor size greater than bhp
- Fan bhp on design documents
Simple HVAC Systems and Equipment (503.3)

Unitary or packaged, single zone controlled by a single thermostat in the zone served. Includes:

**Simple Systems**
- Unitary packaged cooling system
- Split system cooling
- Packaged terminal A/C
- Heat pump cooling
- Unitary packaged heating
- Split system heating
- Packaged terminal heat pump

- Fuel-fired furnace
- Electrical resistance heating
- Two-pipe heating systems w/o cooling
- Economizers
Economizers (503.3.1)

### Table 503.3.1(1)

<table>
<thead>
<tr>
<th>CLIMATE ZONES</th>
<th>ECONOMIZER REQUIREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A, 1B, 2A, 7, 8</td>
<td>No requirement</td>
</tr>
<tr>
<td>2B, 3A, 3B, 3C, 4A, 4B, 4C, 5A, 5B, 5C, 6A, 6B</td>
<td>Economizers on cooling systems ≥ 54,000 Btu/h&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> The total capacity of all systems without economizers shall not exceed 480,000 Btu/h per building, or 20 percent of its air economizer capacity, whichever is greater.
Economizers (503.3.1)

Trade-off high cooling efficiency for economizer

<table>
<thead>
<tr>
<th>CLIMATE ZONES</th>
<th>COOLING EQUIPMENT PERFORMANCE IMPROVEMENT (EER OR IPLV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2B</td>
<td>10% Efficiency Improvement</td>
</tr>
<tr>
<td>3B</td>
<td>15% Efficiency Improvement</td>
</tr>
<tr>
<td>4B</td>
<td>20% Efficiency Improvement</td>
</tr>
</tbody>
</table>
Complex HVAC Systems and Equipment (503.4)

**Complex Systems**
- Packaged VAV reheat
- Built-up VAV reheat
- Built-up single-fan, dual-duct VAV
- Built-up or packaged dual-fan, dual-duct VAV
- Four-pipe fan coil system with central plant

- Hydronic heat pump with central plant
- Any other multiple-zone system
- Hydronic space heating system
- Economizers

This section applies to all HVAC equipment and systems not included in Section 503.3

This section applies to all HVAC equipment and systems not included in Section 503.3
Economizers (503.4.1)

- Air side economizer requirements and equipment performance exceptions in Tables 503.3.1(1) and 503.3.1(2)
- Water side economizer requirements
- Capable of providing 100% of the cooling system load at 50°F dry bulb/ 45°F wet bulb
Variable Air Volume Fan Control (503.4.2)

Individual fans with motors ≥ 10hp
• Driven by a mechanical or electrical variable speed drive

OR
• Have controls or devices to result in fan motor demand ≤ 30% of their design wattage at 50% of design airflow when static pressure set point = 1/3 of the total design static pressure
Hydronic System Controls (503.4.3)

Limit Reheat/Recool of Fluids

• Multiple-packaged boiler systems designed to deliver conditioned water/steam into common distribution system

• Automatic controls capable of sequencing operation of the boilers
Hydronic System Controls (503.4.3)

Limit reheat/recool of fluids

- Single boilers > 500,000 Btu/h input design capacity
- Multi-staged or modulating burner required
Part Load Control (503.4.3.4)

- System ≥ 300,000 Btu/h
- Automatic Resets for Supply Water Temperature by 25% of Design Supply-to-Return Temperature Differences or
- Reduce System Pump Flow by 50% of Design Flow Using
- Multiple Staged Pumps
- Adjustable Speed Drives
- Control Valves with Modulate or Step Down Capabilities
Heat Rejection Equipment Fan Speed Control (503.4.4)

Each fan powered by a motor ≥ 7.5 hp to have capability to operate that fan at 2/3 of full speed or less

• Have controls to automatically change the fan speed to control the leaving fluid temperature or condensing temperature/pressure of the heat rejection device

Exception

• Factory-installed heat rejection devices within HVAC equipment tested and rated in accordance with Tables 503.2.3(6) and 503.2.3(7)
Multiple Zone System Requirements (503.4.5)

• VAV Systems must be designed and capable of being controlled to reduce the primary air supply to each zone before reheat, recool, or mixing take place
• Options
  – 30% of the maximum supply air to each zone
  – <300 cfm where the maximum flow rate is <10% of total fan system supply airflow rate
  – Minimum ventilation requirements from Chapter 4 of the IMC
Variable Air Volume System or Zone Exceptions

- Zones with special pressurization or cross-contamination requirements
- Where 75% of reheat energy comes from site-recovered or site-solar energy source
- Zones with special humidity requirements
- Zones with $\leq 300$ cfm peak supply and flow rate is $< 10\%$ of total fan system supply airflow rate
Supply-Air Temperature Reset Controls (503.4.5.4)

- Multiple zone HVAC systems to have controls to automatically reset supply-air temperature in response to building loads or outdoor air temperature
- Controls to be capable of resetting supply air temperature at least 25% of difference between design supply-air temperature and design room air temperature
Heat Recovery for Service Hot Water Heating (503.4.6)

Most effective where water heater loads are large and well distributed throughout the day

- Typical applications: hotels, dorms, prisons, hospitals
- Condenser heat recovery required for heating/reheating of SWH provided:
  - Facility operates 24 hours/day
Section 504 Service Water Heating

- Service water-heating equipment performance efficiency (504.2)
- Table 504.2 Minimum Performance of Water-Heating Equipment
- Water Heater Types Covered
  - Electric Storage
  - Gas and Oil Storage
  - Instantaneous Water Heaters – Gas and Oil
Hot Water System Controls (504.6)

- Ability to turn off circulating hot water pumps and heat trace tape when the system is not in operation
- Automatically or manually
Not Included But Mandatory Requirements

- HVAC Load Calculations (503.2.1)
- Duct and Plenum Insulation and Sealing (503.2.7)
- Heating Outside a Building (503.2.11)
- Hydronic Water Loop Heat Pump Systems (503.4.3.3)
- Pump Isolation (503.4.3.5)
- Single Duct VAV Systems, Terminal Devices (503.4.5.1)
- Pipe Insulation (504.5)
- Pool (504.7)
High-Efficacy Lamps

Defined in the 2009 IECC as:
Compact fluorescent lamps, T-8 or smaller diameter linear fluorescent lamps, or lamps with a minimum efficacy based on lamp wattage

<table>
<thead>
<tr>
<th>Lamp Wattage</th>
<th>Efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 40 watts</td>
<td>60 lumens/watt</td>
</tr>
<tr>
<td>15-40 watts</td>
<td>50 lumens/watt</td>
</tr>
<tr>
<td>&lt; 15 watts</td>
<td>40 lumens/watt</td>
</tr>
</tbody>
</table>
What’s Covered Under Electrical Power and Lighting Systems Requirements?

• Mandatory Interior Lighting requirements
• Required Controls
• Wattage/Efficiency Limits
• Interior Lighting Power Allowances (watts/ft²)
Interior Lighting Control (505.2): Basic Control

Independent Lighting Control required for each space surrounded by floor-to-ceiling partitions

• Must be located in the space served, or

• Switched from a remote location

• Must have indicator that identifies the lights served and their status (off or on)

Intent: Allow occupants to control unneeded lighting!
Interior Lighting Control: Light Reduction

• Light Reduction Controls must allow the occupant to reduce connected lighting
• By at least 50%
• In a reasonably uniform illumination pattern
• Note: Alternate Standard ASHRAE/IESNA 90.1-2007 does not require Light Reduction Control

Intent: Allow occupants to moderate light levels to save energy!
Light Reduction Control Options

- Controlling all lamps or luminaires
- Dual switching of alternate rows of luminaires, alternate luminaires or lamps
- Switching middle lamp luminaires independently from the outer lamps
- Each luminaire or each lamp
Interior Lighting Control: Automatic Shutoff

Automatic lighting shutoff control device required in all buildings larger than 5,000 ft\(^2\)

Building Defined:
- “Any structure used or intended for supporting or sheltering any use or occupancy”
- Building area surrounded by exterior walls and fire walls

Exempted spaces
- Sleeping units
- Lighting for patient care
- When an automatic shutoff would endanger occupant safety or security

Intent: Eliminate after hours lighting waste!
Interior Lighting Control: Automatic Shutoff Options

1. Control lights on a scheduled basis (automatic time switch)
   • Time-of-day controller
   • Controls ≤ 25,000 ft$^2$ and not more than one floor, or
2. Occupant sensor
   • Turn lights off within 30 minutes of occupant leaving the space
3. Signal from another control or alarm that indicates the area is unoccupied
Daylight Zone Definition – Under Skylights

- The area under skylights whose horizontal dimension, in each direction, is equal to the skylight dimension plus the smaller of:
  - The floor-to-ceiling height, or
  - The distance to a ceiling height opaque partition, or
  - One-half the distance to adjacent skylights or windows
Daylight Zone Definition – Adjacent to Vertical Fenestration

• The daylight zone depth is assumed to be 15 feet into the space or to the nearest ceiling height opaque partition, whichever is less.

• The daylight zone width is assumed to be:
  – the width of the window plus 2 feet on each side, or
  – the window width plus distance to opaque partitions, or
  – the window width plus one-half the distance to adjacent skylight or vertical fenestration, whichever is least.
Daylight Zone Control

Daylight zones

• Must have individual control of the lights independent of general area lighting
• Contiguous daylight zones adjacent to vertical fenestration
• Can be controlled by a single controlling device if the zone doesn’t include areas facing more than two adjacent cardinal orientations (i.e., north, east, south, west)
• Daylight zones under skylights > 15 ft from the perimeter must be controlled separately from daylight zones adjacent to vertical fenestration
Tandem Wiring (505.3)

- Tandem Wiring for all Odd Numbered Lamp Configurations

Intent: Eliminate the use of magnetic ballasts driving single lamps!
Interior Lighting Power Limits (505.5)

Connected Interior Lighting Power must not exceed Interior Lighting Power Allowance

1. Calculate Interior Lighting Power Allowance
   Building Area type allowance
   Additional allowances

2. Calculate proposed connected lighting power
   Wattage calculation “rules”
   Exempted lighting

3. Compare values: proposed wattage must be less than or equal to allowed wattage

Intent: Eliminate waste from sloppy lighting design and application!
## Interior Lighting Power Allowances

### Table 505.5.2

<table>
<thead>
<tr>
<th>Building Area Type*</th>
<th>(W/SF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automotive Facility</td>
<td>0.5</td>
</tr>
<tr>
<td>Convention Center</td>
<td>1.2</td>
</tr>
<tr>
<td>Court House</td>
<td>1.0</td>
</tr>
<tr>
<td>Dining: Bar</td>
<td>1.3</td>
</tr>
<tr>
<td>Dining: Lounge/Laundry</td>
<td>1.3</td>
</tr>
<tr>
<td>Dining: Cafeteria/Fast Food</td>
<td>1.4</td>
</tr>
<tr>
<td>Dining: Family</td>
<td>1.6</td>
</tr>
<tr>
<td>Dormitory</td>
<td>1.0</td>
</tr>
<tr>
<td>Exercise Center</td>
<td>1.0</td>
</tr>
<tr>
<td>Gymnasium</td>
<td>1.1</td>
</tr>
<tr>
<td>Healthcare - clinic</td>
<td>1.0</td>
</tr>
<tr>
<td>Hospital</td>
<td>1.2</td>
</tr>
<tr>
<td>Hotel</td>
<td>1.0</td>
</tr>
<tr>
<td>Library</td>
<td>1.2</td>
</tr>
<tr>
<td>Manufacturing Facility</td>
<td>1.3</td>
</tr>
<tr>
<td>Model</td>
<td>1.0</td>
</tr>
<tr>
<td>Motion Picture Theater</td>
<td>1.2</td>
</tr>
<tr>
<td>Multi-family</td>
<td>0.7</td>
</tr>
<tr>
<td>Museum</td>
<td>1.1</td>
</tr>
<tr>
<td>Office</td>
<td>1.0</td>
</tr>
<tr>
<td>Parking Garage</td>
<td>0.3</td>
</tr>
<tr>
<td>Perforated Theater</td>
<td>1.0</td>
</tr>
<tr>
<td>Performing Arts Theater</td>
<td>1.6</td>
</tr>
<tr>
<td>Police/Fire Station</td>
<td>1.0</td>
</tr>
<tr>
<td>Post Office</td>
<td>1.1</td>
</tr>
<tr>
<td>Religious Building</td>
<td>1.2</td>
</tr>
<tr>
<td>Retail</td>
<td>1.5</td>
</tr>
<tr>
<td>School/University</td>
<td>1.2</td>
</tr>
<tr>
<td>Sports Arena</td>
<td>1.4</td>
</tr>
<tr>
<td>Town Hall</td>
<td>1.1</td>
</tr>
<tr>
<td>Transportation</td>
<td>1.0</td>
</tr>
<tr>
<td>Warehouse</td>
<td>0.8</td>
</tr>
<tr>
<td>Workshop</td>
<td>1.4</td>
</tr>
</tbody>
</table>

Building Area Type

Note: Alternate Standard ASHRAE/IESNA 90.1-2007 provides whole building and space-by-space options.
Interior Lighting Power Allowance for Multiple Occupancy Building

How is an allowance determined if the building has more than one Building Area Type?

Example – A building contains the following area types
Museum: 40,000 ft$^2$
Retail: 5,000 ft$^2$
Cafeteria: 10,000 ft$^2$

Use the more specific building area type where more than one area type exists in the building

Sum the individual (lighting power density X area square footage) values for Total Power Allowance
Multiple Occupancy Building - Example

Museum: 40,000 ft²
at 1.1 W/ft² = 44,000 W

Cafeteria: 10,000 ft²
at 1.4 W/ft² = 14,000 W

Retail: 5,000 ft²
at 1.5 W/ft² = 7,500 W

Total watts allowed = 65,500 W
Proposed Lighting Power Calculation

Sum the wattage of all proposed connected lighting power
This must include all lighting that is part of the design for the space including:

• Overhead lighting
• Task lighting
• Decorative lighting

Note: Wattage must be calculated based on actual power draw...not just nominal lamp rating
Proposed Lighting Calculation: Rules

Lighting wattage must be documented in accordance with Section 505.5.1
Screw lamp holders: maximum labeled wattage of the luminary
Low voltage lighting: transformer wattage
Line voltage track:

1. specified wattage with minimum of 30 W/linear ft OR
2. wattage limit of system’s circuit breaker OR
3. wattage limit of other permanent current limiting devices
Other: manufacturer’s rated wattage of lamp and associated ballast
Exemptions to Proposed Lighting Power Calculation

- Connected power for following not included in calculations:
  - Professional sports arena playing field
  - Sleeping unit lighting
  - Emergency lighting automatically off during normal building operation
  - Lighting in spaces specifically designed for use by occupants with special lighting needs including visual impairment and other medical and age related issues
  - Lighting in interior spaces specifically designated as a registered interior historic landmark
  - Casino gaming areas

- Lighting equipment used for the following exempt if in addition to general lighting and controlled by an independent control device
  - Task lighting for medical and dental procedures
  - Display lighting for exhibits in galleries, museums and monuments
Exterior Lighting Control Requirements (505.2.4)

- For dusk-to-dawn lighting: astronomical time switch or photocell
- For all other: astronomical time switch OR photocell + time switch
- All time switches must have 10 hour battery backup
Exterior Efficiency Requirement (505.6.1)

Building grounds lighting luminaires over 100 watts must have source efficacy of at least 60 lumens per watt

<table>
<thead>
<tr>
<th>Light Source</th>
<th>Typical System Efficacy Range in LPW (varies depending on wattage and lamp type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incandescent</td>
<td>10-18</td>
</tr>
<tr>
<td>Halogen incandescent</td>
<td>15-20</td>
</tr>
<tr>
<td>Compact fluorescent (CFL)</td>
<td>35-60</td>
</tr>
<tr>
<td>Linear fluorescent</td>
<td>50-100</td>
</tr>
<tr>
<td>Metal halide</td>
<td>50-90</td>
</tr>
</tbody>
</table>
Exterior Lighting Power Limits (505.6.2)

Connected Exterior Lighting Power must not exceed Exterior Lighting Power Allowance

- Calculate exterior Lighting Power Allowance
  - Lighting power densities by exterior function and by applicable lighting zone
- Calculate proposed connected lighting power
  - Wattage calculation “rules”
  - Exempted lighting
- Compare values: proposed wattage must be less than or equal to allowed wattage
Exterior Lighting Power Limits (505.6.2)

What areas are covered under exterior lighting allowances?

- ** Tradable surfaces**
  Common exterior lighted needs that can be traded for other needs. For example, wattage allowed for parking lot lighting can be “traded” and used for canopy lighting.

- ** Nontradable surfaces**
  Less common exterior lighted needs that **cannot** be traded for other needs. These applications have more specific security or task illuminance needs.
## Exterior Lighting Zones [Table 505.6.2(1)]

<table>
<thead>
<tr>
<th>Lighting Zone</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Developed areas of national parks, state parks, forest land, and rural areas</td>
</tr>
<tr>
<td>2</td>
<td>Areas predominantly consisting of residential zoning, neighborhood business districts, light industrial with limited nighttime use and residential mixed use areas</td>
</tr>
<tr>
<td>3</td>
<td>All other areas</td>
</tr>
<tr>
<td>4</td>
<td>High-activity commercial districts in major metropolitan areas as designated by the local land use planning authority</td>
</tr>
</tbody>
</table>
Exemptions from Exterior Calculation (505.6.2)

• The following lighting does not need to be included in the proposed lighting calculation:
• Specialized signal, directional, and marker lighting associated with transportation
• Advertising signage or directional signage
• Lighting integral to equipment or instrumentation and installed by its manufacturer
• Lighting for theatrical purposes, including performance, stage, film production, and video production
Not Included But Mandatory Requirements

• Interior Lighting Control Sleeping Unit Lighting Control (505.2.3)
• Exit Signs (505.4)
• Additional Retail Lighting Power Allowance (Table 505.5.2)
• Tradable Surfaces (505.6.2)
• NonTradable Surface (505.6.2)
• Electrical Energy Consumption Mandatory Requirements (505.7)
Topic 4

Commercial Resources, Building Data Collection Checklist and COMcheck
Building Data Collection Checklists

• To “check on” compliance, the first step is to have a proper checklist. BECP offers evaluation checklists for both residential and commercial buildings, complete with instructions to help evaluators.

• The checklists offer weighted scoring in order to focus on the most important code requirements and help states produce accurate metrics.

BECP Tool:
Download inspection checklists and corresponding instructions at:  
www.energycodes.gov/arra/compliance_evaluation.stm
Building data collection checklists

1. Commercial Building Data Collection Checklist
ANSI/ASHRAE/IESNA Standard 90.1-2007

Software

No-cost, easy-to-use software that will demonstrate compliance. www.energycodes.gov/software.stm

Desktop Software Tools

- COMcheck™
  - Windows version or Mac version

Web-Based Tools

- COMcheck Web™
- Package Generator
Commercial Compliance

**Building System**
- Envelope
- Lighting
- Mechanical
  - HVAC
  - SWH

**Compliance Options**
- Prescriptive Option
- Trade Off Option
- Total Building Performance

**Mandatory Provisions**
(required for most compliance options)

**Energy Code Compliance**
Info You’ll Need

• Basic information about the builder and project
• Area take-offs for exterior walls, fenestration, roof/ceiling, basement walls, floors, etc.
• Insulation R-values, fenestration U-factors, etc.
• Lighting fixture details
• Heating and cooling system details
• Service water heating details
Appropriate Code

- Energy code applicable to your state/jurisdiction (Code Menu)
- Status of State Codes
- Default
- Preferences
Navigation Bar

• Edit Menu
• General
• File Options
• Beyond Code Advisor
• Version Update Check
• Project
• Code/location
• Envelope
• Applicant
  – Project Details

• Reports
  – Signatures
  – Email Reports
Project Information

- Project location
- Project type
- Project details for report (optional)
- Title/Site/Permit
- Owner/Agent
- Designer/Contractor
- Notes
Project Screen
Building Components

- Only components that separate conditioned space from unconditioned space/outside air
- Only use applicable buttons
- Can group “like” components
- Use of “other” assembly type
- Gross area
Foundations

• Basement button – use if
  – basement is conditioned
  – basement walls are insulated

• Floor button – use if
  – separates conditioned from unconditioned space (includes slab-on-grade floor)
Envelope Screen

- Entries can change based on code and/or location selected
- Assembly types
- *Int. Wall* button
- Projection Factor
- Orientation

![Diagram of Envelope Screen with notation: \( PF = \frac{A}{B} \)]
Envelope Results

Section 3: Requirements Checklist

Envelope PASSES: Design 0.2% better than code.

Climate-Specific Requirements:

<table>
<thead>
<tr>
<th>Component Name/Description</th>
<th>Gross Area or Perimeter</th>
<th>Cavity R Value</th>
<th>Cont. R Value</th>
<th>Proposed U-Factor</th>
<th>Budget U-Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail 1: Metal Frame, Double Pane, Tinted, SHGC 0.50</td>
<td>8112</td>
<td>0.3</td>
<td>20.1</td>
<td>0.007</td>
<td>0.006</td>
</tr>
<tr>
<td>Exter. Wall 1, Solid Concrete or Masonry &lt;= 8&quot;, Framing: Metal</td>
<td>6056</td>
<td>2.5</td>
<td>6.6</td>
<td>0.114</td>
<td>0.072</td>
</tr>
<tr>
<td>Door 1: Glass, Clear, SHGC 0.58</td>
<td>42</td>
<td>2</td>
<td>0.0</td>
<td>0.700</td>
<td>0.636</td>
</tr>
<tr>
<td>Window 1: Metal Frame, Double Pane, Low-E, Tinted, SHGC 0.45</td>
<td>1518</td>
<td>0.0</td>
<td>0.0</td>
<td>0.600</td>
<td>0.520</td>
</tr>
<tr>
<td>Window 2: Metal Frame, Double Pane, Low-E, SHGC 0.72</td>
<td>58</td>
<td>2</td>
<td>0.700</td>
<td>0.620</td>
<td>0.520</td>
</tr>
<tr>
<td>Door 3: Glass, Clear</td>
<td>288</td>
<td>0.0</td>
<td>0.140</td>
<td>0.118</td>
<td>0.118</td>
</tr>
<tr>
<td>Door 4: Glass</td>
<td>288</td>
<td>0.0</td>
<td>0.140</td>
<td>0.118</td>
<td>0.118</td>
</tr>
<tr>
<td>Interior Wall 1: Solid Concrete or Masonry &lt;= 8&quot;, Framing: Wood 3 1/2, Depth 6&quot;, C: 7.0</td>
<td>912</td>
<td>22.0</td>
<td>0.0</td>
<td>0.100</td>
<td>0.110</td>
</tr>
<tr>
<td>Basement Wall 1: Solid Concrete or Masonry &lt;= 8&quot;, Framing: None, Wood 3 1/2, Depth 6&quot;, C: 7.0</td>
<td>5069</td>
<td>10.8</td>
<td>0.062</td>
<td>0.066</td>
<td>0.066</td>
</tr>
<tr>
<td>Floor 1: Glass, Clear, Unframed, Vertical 18</td>
<td>193</td>
<td>0.0</td>
<td>0.0</td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Section 3: Requirements Checklist

Envelope PASSES: Design 0.2% better than code.

Climate-Specific Requirements:
Interior Lighting

- Mandatory requirements
- Interior lighting power requirements
- Complies if total connected power is less than interior lighting power allowance (entire building or partial building)

Proposed Wattage \(\leq\) Allowed Wattage
# Interior Lighting

- LPDs based on Building Use on *Project* screen
- Add fixtures
- Identify exemptions and allowances (if applicable)

<table>
<thead>
<tr>
<th>Component</th>
<th>Fixture ID</th>
<th>Fixture Description</th>
<th>Lamp Description/ Wattage Per Lamp</th>
<th>Ballast</th>
<th>Lamps Per Fixture</th>
<th>Number of Fixtures</th>
<th>Fixture Wattage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building</td>
<td></td>
<td>Allowed wattage = 17320 Proposed wattage = 12478</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Office (4520 sq.ft.)</td>
<td></td>
<td>Allowed wattage = 6780 Proposed wattage = 1976</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Incandescent 1</td>
<td>G</td>
<td>Recessed wall washer</td>
<td>Incandescent 150W</td>
<td></td>
<td>1</td>
<td>2</td>
<td>150</td>
</tr>
<tr>
<td>3 Incandescent 2</td>
<td>H</td>
<td>Accent track lighting</td>
<td>Incandescent 50W</td>
<td></td>
<td>1</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>4 Compact Fluorescent 1</td>
<td>F</td>
<td>Down light, twin tube</td>
<td>Twin Tube 18W</td>
<td>Magnetic</td>
<td>2</td>
<td>31</td>
<td>46</td>
</tr>
<tr>
<td>5 Convention, Conference or M</td>
<td></td>
<td>Allowed wattage = 630 Proposed wattage = 3900</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 T8 / T12 Fluorescent 5</td>
<td>E</td>
<td>8 ft. Industrial, pendant</td>
<td>96” T8 75W</td>
<td>Electronic</td>
<td>2</td>
<td>30</td>
<td>130</td>
</tr>
</tbody>
</table>
Exemptions and Allowances
Interior Lighting Results

Section 1: Project Information
Project Title: New Construction

Section 2: General Information

Section 3: Requirements Checklist
Interior Lighting:
1. Task specifications must be less than or equal to 5% above code.

Section 4: Compliance Statement

Interior Lighting PASSES: Design 8% better than code.
Exterior Lighting

• Based on code selected
• Mandatory requirements
• Exemptions

<table>
<thead>
<tr>
<th>Total Connected Power</th>
<th>Ext. Ltg. Power Allowance</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;</td>
<td></td>
</tr>
</tbody>
</table>
Exterior Lighting

- Pay attention to Quantity and Units

**Tradable**
- Common applications where unused power can be traded where needed

**Non-Tradable**
- Less common applications that cannot be traded

<table>
<thead>
<tr>
<th>Exterior Lighting Area</th>
<th>Quantity</th>
<th>Units</th>
<th>W/Unit</th>
<th>Tradable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive-up window</td>
<td>2</td>
<td>window(s)</td>
<td>400</td>
<td>No</td>
</tr>
<tr>
<td>Main entry/exit</td>
<td>4</td>
<td>ft of door</td>
<td>30</td>
<td>Yes</td>
</tr>
<tr>
<td>Parking area(s)</td>
<td>15000</td>
<td>ft²</td>
<td>0.15</td>
<td>Yes</td>
</tr>
<tr>
<td>Walkway &lt; 10 feet wide</td>
<td>100</td>
<td>ft of walk</td>
<td>1.0</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Exterior Lighting Results

COMcheck Software Version 3.5.3
Exterior Lighting Compliance Certificate

2006 IECC
Project Date: 03/12/08
City: Kansas City
Project Name: [Project Name]
Project Number: [Project Number]

Section 1: Project Information
Project Type: New Construction
Project Title: [Project Title]
Construction Site: [Construction Site]
Owner/Agent: [Owner/Agent]
Designer/Contractor: [Designer/Contractor]

Exterior Lighting PASSES: Design 3% better than code.

Section 3: Exterior Lighting Fixture Schedule

Exterior Lighting Fixtures

- Light Fixtures
- Fixture: [Fixture]
- Location: [Location]
- Model: [Model]
- Wattage: [Wattage]
- Color Temp: [Color Temp]
- Kelvin: [Kelvin]
- Lumens: [Lumens]
- Price: [Price]

- Landscape Fixtures
- Fixture: [Fixture]
- Location: [Location]
- Model: [Model]
- Wattage: [Wattage]
- Color Temp: [Color Temp]
- Kelvin: [Kelvin]
- Lumens: [Lumens]
- Price: [Price]

Section 4: Requirements Checklist

Lighting Wattage:

1. All lights meet maximum requirements. Total proposed watts must be less than or equal to total allowed watts. Across all task and illumination zones, total proposed watts must be less than or equal to total allowed watts.

Compliance Pass: [Compliance Pass]

Controls, Switching, and Wiring:

- [Control]
- [Switching]
- [Wiring]
Mechanical Equipment

Works differently than Envelope and Lighting
Enter characteristics of:
• HVAC system
• Plant
• Water heating
Generates a customized list of requirements
Section 5: 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 2009 IECC requirements in COMcheck Version 3.9.0 and to comply with the mandatory requirements in the Requirements Checklist.

Name - Title

Signature

Date

Section 6: Post Construction Compliance Statement

☐ HVAC record drawings of the actual installation, system capacities, calibration information, and performance data for each equipment provided to the owner.

☐ HVAC O&M documents for all mechanical equipment and system provided to the owner by the mechanical contractor.

☐ Written HVAC balancing and operations report provided to the owner.

The above post construction requirements have been completed.

Principal Mechanical Designer-Name

Signature

Date

☐ 1. Newly purchased heating equipment meets the heating efficiency requirements

Generic Requirements: Must be met by all systems to which the requirement is applicable:
Mandatory Requirements

• Must be met by all buildings
• Included in compliance report(s)
• Viewable in software Help
Screen Operations

Compliance Bar

Status Bar
Screen Operations

Compliance Bar
Status Bar
Colors - Red
Screen Operations

Compliance Bar

Status Bar

Colors - Green

Colors - Blue
Screen Operations

Compliance Bar
Status Bar
Colors
Right Mouse Button
“Context” Menu
Additional COMcheck Training Opportunities

• COMcheck 101
• COMcheck 201
• Case studies

www.energycodes.gov
Thank You!