
TS Mapes
DR Conover

May 2012
DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor Battelle Memorial Institute, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or Battelle Memorial Institute. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

PACIFIC NORTHWEST NATIONAL LABORATORY

operated by

BATTTELL

for the

UNITED STATES DEPARTMENT OF ENERGY

under Contract DE-AC05-76RL01830

Printed in the United States of America

Available to DOE and DOE contractors from the Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37831-0062; ph: (865) 576-5401; fax: (865) 576-5728; email: reports@adonis.osti.gov

Available to the public from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Rd., Springfield, VA 22161; ph: (800) 553-6447; fax: (703) 605-6906; email: orders@ntis.fedworld.gov; online ordering: http://www.ntis.gov/ordering.htm

This document was printed on recycled paper.

(9/2005)

TS Mapes
DR Conover

May 2012

Prepared for
the U.S. Department of Energy
under Contract DE-AC05-76RL01830

Pacific Northwest National Laboratory
Richland, Washington  99352
Acronyms

AAMA  American Architectural Manufacturers Association
ACCA  Air Conditioning Contractors of America
ACH   air changes per hour
AHAM  Association of Home Appliance Manufacturers
AHRI  Air-Conditioning, Heating, and Refrigeration Institute
AMCA  Air Movement and Control Association
ANSI  American National Standards Institute
ARI   Air-Conditioning and Refrigeration Institute
ASHRAE American Society of Heating, Refrigerating and Air-Conditioning Engineers
BECP  Building Energy Codes Program
COP   coefficient of performance
CSA   Canadian Standards Association
CTI   Cooling Technology Institute
DASMA Door and Access Systems Manufacturers Association
DOE   U.S. Department of Energy
EER   energy efficiency ratio
HVAC  Heating, ventilation, and air conditioning
IBC   International Building Code
ICC   International Code Council
IECC  International Energy Conservation Code
IEER  integrated energy efficiency ratio
IESNA Illuminating Engineering Society
IMC   International Mechanical Code
IPLV  integrated part load value
IRC   International Residential Code
ISO   International Organization for Standardization
NFRC  National Fenestration Rating Council
NPLV  non-standard part load value
NR    no requirement
PF    performance factor
SEER  seasonal energy efficiency ratio
SHGC  solar heat gain coefficients
VAV   Variable air volume
VT    Visible transmittance
WDMA  Window & Door Manufacturers Association
Executive Summary

The International Code Council (ICC) published the 2012 International Energy Conservation Code® (IECC) in early 2012. The 2012 IECC is based on revisions, additions, and deletions to the 2009 IECC that were considered during the ICC code development process conducted in 2011. Solid vertical lines, arrows, or asterisks printed in the 2012 IECC indicate where revisions, deletions, or relocations of text respectively were made to 2009 IECC. Although these marginal markings indicate where changes have been made to the code, they do not provide any further guidance, leaving the reader to consult and compare the 2009 and 2012 IECC for more detail.

The U.S. Department of Energy (DOE) Building Energy Codes Program (BECP) created this guide to help those interested in energy codes compare where and how the 2009 and 2012 IECC documents differ. Key changes to the code are summarized on the following page(s). Additional changes are summarized in the table that follows.

This document is intended only as a cursory overview of the differences between the 2009 and the 2012 IECC. It does not provide the text of the codes, and should not be considered a stand-alone reference to code requirements. Readers are encouraged to refer to the 2009 and 2012 IECC texts for greater detail as needed. Revisions, additions and deletions between codes are noted in this document as R, A, or D, in the revision type column.

Please note that BECP made every effort to avoid language that inferred opinions or judgments of these provisions. Any interpretation of such judgment is purely coincidental and not the intent of the authors.
1.0 Key Changes

Key changes between the 2009 and 2012 IECC are provided below. A change may be considered key if it raises the level of stringency of the code, or if it has a positive impact on the implementation of, or compliance with, the code. The distinction between “key” and “not key” was made by the authors and is not intended to diminish the significance of any changes not noted.

1.1 All Building Types

- The IECC has been reformatted so that the provisions for residential and commercial buildings completely stand alone with their own separate administrative provisions, definitions, general provisions, climate zones, and reference standards.
- The provisions for both residential and commercial opaque thermal envelope components have been increased in stringency in most cases.

1.2 Commercial Buildings

- The table covering fenestration in commercial buildings has been simplified to define all fenestration as being fixed, operable, or an entrance door. The distinction between framing materials, thermal breaks, and curtain walls/storefronts with respect to thermal requirements has been removed. In some cases only residential criteria were modified. For example, solar heat gain coefficients (SHGC) were raised moderately for residential buildings but were not raised for commercial buildings. In addition, many of the U-factors applicable to skylights have been reduced.
- The allowable percentage of skylight area as a function of roof area has been increased from 3% to 5% of total roof area. Additionally, in certain building types (e.g., offices, convention centers over 10,000 ft² with ceilings more than 15 ft high), at least half of the floor area must be in a daylighting zone under skylights (with several exceptions allowed).
- Vertical fenestration area is now limited to 30% of above-grade wall area. The previous maximum of 40% is still allowed in Climate Zones 1-6, provided half of the conditioned floor is in a daylight zone, controls are installed, and the VT/SHGC ratio is at least 1.1.
- Visible transmittance is now used in several provisions for both vertical fenestration and skylights. In particular, a VT/SHGC ratio is one of three conditions used to increase the fenestration area maximum from 30% to 40%.
- Air barrier requirements have been added such that a continuous barrier is now needed throughout the building envelope in other than Climate Zones 1-3. The barrier must be sealed at all seams and joints, and lighting fixtures and other recesses must be treated to maintain that barrier.
- HVAC system piping insulation requirements have become more stringent. These requirements now also rely on pipe diameter and fluid temperature.
- Air system economizers are required in more climate zones and at a lower threshold (33K Btu/h instead of 54K Btu/h).
- A space-by-space method for determining allowable lighting power limits based on ASHRAE 90.1-10 was added.
A new section on building commissioning has been added. It is now necessary for a *registered design professional* (or agency) to develop a mechanical system commissioning plan, and provide evidence of commissioning prior to the final mechanical inspection. HVAC air and water flow rates now must be balanced, and equipment, controls, and lighting must be performance tested.

### 1.3 Residential Buildings

- Added clarification that sunrooms enclosing conditioned spaces must meet the thermal envelope provisions of the 2012 IECC unless they are thermally isolated from the rest of the building.
- All residential buildings must be subjected to a blower door test to determine the air leakage rate and must not exceed the number of air changes per hour (ACH), either 5 or 3, prescribed as a function of climate zone.
- Hot water piping must now be insulated to at least R-3 with some exceptions.
- The minimum number of high-efficacy electrical lighting sources was changed from 50% of lamps in permanent fixtures to 75% of lamps in permanent fixtures or 75% of the permanent fixtures.
The following identifies changes between the 2009 and 2012 IECC by location. The first column shows section numbers of the 2009 IECC that contain changes. The second column lists the corresponding section number in the 2012 IECC. Note that the structure or format of the 2009 and 2012 IECC differ. The 2012 IECC has section numbers that are preceded by a “C” and an “R,” indicating either commercial or residential provisions. Provisions for residential buildings are located in Chapter 4, and provisions for commercial buildings are located in Chapter 5 of the 2009 IECC.

Columns 3, 4, and 5 provide a description of new text in the 2012 IECC that was not in the 2009 IECC (addition), text that was in the 2009 IECC and is not in the 2012 IECC (deletion), and provisions that have been revised (revision) in the 2012 IECC. Section numbers in the 2009 IECC that are not included in the first column or described elsewhere in the table remain unchanged other than being renumbered to be consistent with the new “C” and “R” designation.

<table>
<thead>
<tr>
<th>2009 IECC</th>
<th>2012 IECC</th>
<th>CHANGES</th>
<th>REVISION TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>101.2 Scope</td>
<td>C101.2 Scope</td>
<td>The 2012 IECC separated the residential and commercial portions into two distinct, separate, stand-alone “codes.” Both residential and commercial scopes were revised to include building sites in addition to systems and equipment associated with buildings and building sites.</td>
<td>R</td>
</tr>
<tr>
<td>R101.2 Scope</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>101.3 Intent</td>
<td>C101.3 Intent</td>
<td>The intent of the 2009 IECC is “effective use of energy.” The 2012 IECC adds “conservation of energy” and “over the useful life of the building” to that intent.</td>
<td>R</td>
</tr>
<tr>
<td>202 Definitions</td>
<td>C202 Definitions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building</td>
<td>Building</td>
<td>The 2012 IECC expanded the definition beyond the building to include mechanical, service water heating, electrical, and lighting systems that are on the building site and support the building.</td>
<td>R</td>
</tr>
<tr>
<td>Building commissioning</td>
<td>New defined term - Verifying and documenting that a building operates according to the owner’s requirements and to minimum code requirements.</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Building entrance</td>
<td>New defined term - Any portal with access to the building from the outside.</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Building site</td>
<td>New defined term - A continuous area of land owned by a single entity.</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Building thermal envelope</td>
<td>Building thermal envelope</td>
<td>Editorial clarification regarding boundaries between conditioned space and any exempt of unconditioned space.</td>
<td>A</td>
</tr>
<tr>
<td>Building thermal envelope</td>
<td>New defined term - The ratio of heat removed to energy input for a complete refrigeration system or specific part of that system.</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Building thermal envelope</td>
<td>New defined term - The ratio of heat delivered to energy input for a complete heating system or specific part of that system, including the compressor and auxiliary heat.</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Continuous air barrier</td>
<td>New defined term - Building materials or assemblies that restrict air passage through the building envelope.</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Demand recirculation water system</td>
<td>New defined term - A system that prunes hot water piping with hot water upon demand.</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Dwelling unit</td>
<td>(B) Dwelling unit</td>
<td>Added (B) in front of the definition to indicate that changes to the definition are under the IBC code change agenda and not the purview of the IECC Commercial Committee.</td>
<td>R</td>
</tr>
<tr>
<td>—</td>
<td>Dynamic glazing</td>
<td>New defined term - A fenestration product capable of changing its performance properties, such as U-factor, SHGC, or VT.</td>
<td>A</td>
</tr>
<tr>
<td>—</td>
<td>Enclosed space</td>
<td>New defined term - A three-dimensional area surrounded by solid surfaces or operable devices (e.g., doors, windows).</td>
<td>A</td>
</tr>
<tr>
<td>Energy recovery ventilation</td>
<td>[M] Energy recovery ventilation</td>
<td>Added (M) in front of the definition to indicate that changes to the definition are under the IMC code change agenda and not the purview of the IECC Commercial Committee.</td>
<td>R</td>
</tr>
<tr>
<td>Equipment room</td>
<td>New defined term - Any room whose equipment, machinery, or pumps support the building.</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>—</td>
<td>Fenestration product, field-fabricated</td>
<td>New defined term - Frames, jambs, and other fenestration parts created from materials near the site that were not originally intended for that purpose (e.g., the use of excess lumber to create window frames). This does not, however, include site-built parts that were created in factories for the fenestration purpose and then assembled on site.</td>
<td>A</td>
</tr>
<tr>
<td>—</td>
<td>Fenestration product, site-built</td>
<td>New defined term - A fenestration product made from parts created in factories for the purpose of fenestration and assembled on site.</td>
<td>A</td>
</tr>
<tr>
<td>—</td>
<td>Furnace electricity ratio</td>
<td>New defined term - The ratio of furnace electricity use to total furnaces energy use. EIR = 3.412E/(1000E&lt;sub&gt;c&lt;/sub&gt; + 3.412E&lt;sub&gt;c&lt;/sub&gt;).</td>
<td>A</td>
</tr>
<tr>
<td>—</td>
<td>General lighting</td>
<td>New defined term - Lighting that remains at a uniform level over a given area. This does not include decorative lighting and task-specific lighting.</td>
<td>A</td>
</tr>
<tr>
<td>—</td>
<td>Integrated part load value (IPLV)</td>
<td>New defined term - Unlike EER or COP, which describe efficiency at full load conditions, IPLV describes efficiency at various capacities.</td>
<td>A</td>
</tr>
<tr>
<td>—</td>
<td>Non-standard part load value (NPLV)</td>
<td>New defined term - Calculated part-load value that does not use the standard ARI rating conditions.</td>
<td>A</td>
</tr>
<tr>
<td>Residential building</td>
<td>Residential building</td>
<td>New defined term - Any system located on site that provides energy from a renewable source (e.g., solar, wind, geothermal, tidal, biomass).</td>
<td>A</td>
</tr>
<tr>
<td>—</td>
<td>Skylight</td>
<td>Changed defining angle of skylights from at least 15 degrees from vertical to less than 60 degrees from horizontal.</td>
<td>A</td>
</tr>
<tr>
<td>—</td>
<td>Sleeping unit</td>
<td>Added (B) in front of the definition to indicate that changes to the definition are under the IBC code change agenda and not the purview of the IECC Commercial Committee.</td>
<td>R</td>
</tr>
<tr>
<td>—</td>
<td>Storefront</td>
<td>Added “with or without mulled windows and doors” to the end of the definition.</td>
<td>R</td>
</tr>
<tr>
<td>—</td>
<td>Ventilation</td>
<td>Added (M) in front of the definition to indicate that changes to the definition are under the IMC code change agenda and not the purview of the IECC Commercial Committee.</td>
<td>R</td>
</tr>
<tr>
<td>—</td>
<td>Ventilation air</td>
<td>Added (M) in front of the definition to indicate that changes to the definition are under the IMC code change agenda and not the purview of the IECC Commercial Committee.</td>
<td>R</td>
</tr>
<tr>
<td>303.1.3 Fenestration product rating</td>
<td>C303.1.3 Fenestration product rating</td>
<td>Expanded ratings to include VT for fenestration products whose SHGC ratings are determined by the NFRC 200.</td>
<td>R</td>
</tr>
<tr>
<td>Table 303.1.3(3) Default glazed fenestration SHGC</td>
<td>Table C303.1.3(3) Default glazed fenestration SHGC and VT</td>
<td>Added VT requirements to the table.</td>
<td>R</td>
</tr>
</tbody>
</table>
### Changes to the 2012 IECC

<table>
<thead>
<tr>
<th>Code</th>
<th>New Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C401.2</td>
<td></td>
<td>Added new subsection to provide that additions, alterations, and repairs to existing buildings meet either ASHRAE 90.1-10, or the envelope, HVAC, service water heating, and lighting provisions of the IECC.</td>
</tr>
</tbody>
</table>

#### 502.1 Scope

- **502.1.1 Application to existing buildings**: Changed the criteria relating to compliance. ANSI/ASHRAE/IES Standard 90.1-2010 remains a “deemed-to-comply” option. Alternatively, all commercial provisions of the IECC must be satisfied. However, the 2012 IECC has added three new provisions (Section C406), one of which must also be chosen. The total building performance compliance path remains, although instead of the proposed design having an annual energy cost less than the standard reference design building, that criterion has been reduced to 85% of the standard reference design building (although the provisions in 506.3 of the 2009 IECC have not been similarly changed in Section C407.3 of the 2012 IECC). |

#### 502.2 General

- **502.2.1 Roof assembly**: Added provisions covering insulation of a skylight curb: the lesser of R-0.5 or the R-value of the roof insulation that is entirely above the roof deck unless the skylight curb is included as a component of the skylight assembly. |

#### 502.3 Above-grade walls

- **502.3.3 Maximum SHGC**: Added provisions addressing minimum solar reflectance and thermal emittance of roofs in Climate Zones 1-3 that have a slope less than 2 in 12 and a number of exceptions from those provisions for certain types of roof surfaces or those that are not exposed to solar radiation at certain times. |

#### 502.4 Below-grade walls

- **502.4.2 Thermal resistance of below-grade walls**: Added reference to new provision that daylighting controls specified in Section C405.2.1 must satisfy the lighting section of the 2012 IECC (Section C405). |

#### 502.5 Floors over outdoor air or unconditioned space

- **502.5.2 Slabs on grade**: Added provisions that limit scope to slabs in contact with the ground and an exception to limit that coverage to those 24 in. or less below finished grade. Also added additional requirements that insulation extending away from the building must be protected by pavement or at least 10 in. of soil. |

### Table 502.1.2 Building envelope requirements opaque element, maximum U-factors

<table>
<thead>
<tr>
<th>Building envelope requirement</th>
<th>Table 502.2</th>
<th>Table 502.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opaque thermal envelope assembly requirements</td>
<td>No row or column headings changed. Some requirements increased, some stayed the same, and none decreased in stringency. Added a footnote to allow values from ASHRAE 90.1-10 Appendix A to be used where the construction in question matches that covered in Appendix A.</td>
<td></td>
</tr>
</tbody>
</table>

### Table 502.2.1 Building envelope requirements - opaque assemblies

<table>
<thead>
<tr>
<th>Building envelope requirement</th>
<th>Table 502.2</th>
<th>Table 502.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opaque thermal envelope requirements</td>
<td>No row or column headings changed. Some requirements increased in stringency, some remain unchanged, and none decreased in stringency. Changed the note referring to metal building assembly thermal properties from a table in the IECC to ASHRAE 90.1-10 Appendix A.</td>
<td></td>
</tr>
</tbody>
</table>

### Table 502.3.1 Maximum area

<table>
<thead>
<tr>
<th>Building envelope requirement</th>
<th>Table 502.3</th>
<th>Table 502.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opaque vertical fenestration area with daylighting controls</td>
<td>Added provisions that allow up to 40% fenestration area to above-grade wall area in Climate Zones 1-6 when at least 50% of the conditioned floor area is within a daylighting zone that also has daylighting controls and the VT of the fenestration, within the scope of NFRC 200, is at least 10% greater than the SHGC.</td>
<td></td>
</tr>
</tbody>
</table>

### Table 502.3.2 Minimum U-factor and SHGC

<table>
<thead>
<tr>
<th>Building envelope requirement</th>
<th>Table 502.3</th>
<th>Table 502.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skylights in certain areas (e.g., office, storage, automotive service) must have a glazing material or diffuser that creates a haze factor greater than 90% according to ASTM D 1003. An exception is made for skylights using baffles or skylight geometry to exclude direct sunlight from entering the area.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 502.3.3 Maximum U-factor and SHGC

<table>
<thead>
<tr>
<th>Building envelope requirement</th>
<th>Table 502.3</th>
<th>Table 502.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>For windows and doors having different PF values, the option of using an area-weighted PF value has been removed. Each must be evaluated separately.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 502.3.4 Increased skylight SHGC

<table>
<thead>
<tr>
<th>Building envelope requirement</th>
<th>Table 502.3</th>
<th>Table 502.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skylights above daylighting zones that have automated control systems will have a maximum SHGC of 0.60 in Climate Zones 1-6.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 502.3.5 Increased skylight U-factor

<table>
<thead>
<tr>
<th>Building envelope requirement</th>
<th>Table 502.3</th>
<th>Table 502.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skylights above daylighting zones that have automated control systems will have a maximum U-factor of 0.90 in Climate Zones 1-3 and 0.75 in Climate Zones 4-8.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
C402.3.3.5 Dynamic glazing

For dynamic glazing, the SHGC used to comply with Section 402.3.3 will be the lowest rated by the manufacturer, and the VT/SHGC ratio will use the highest rating for each metric. Area-weighted U-factors of dynamic glazing together with non-dynamic windows will not be permitted.

502.4 Air leakage

502.4.1 Air barriers

The thermal building envelope must be a continuous air barrier either inside, outside, or within the envelope assemblies or any combination thereof. Specifics are given in the next several sections. Exception: Climate Zones 1-3.

502.4.1.1 Air barrier construction

The continuous air barrier is expected to be: (1) across all joints and assemblies; (2) sealed at joints and changes of position or materials; and (3) compliant with Section C404.2.8 where the barrier is penetrated (recessed light fixtures, etc.). However, buildings complying with Section C402.4.1.2.3 are exempt from (1) and (3).

502.4.1.2 Air barrier compliance options

Opaque building envelopes must meet the conditions of Sections C402.4.1.1-2 and C402.4.1.2.3.

502.4.1.2.1 Materials

A list of 15 materials (e.g., plywood, gypsum board) must be tested in accordance with ASTM E 2178 if they have an air leakage greater than 0.004 cfm/ft² under a pressure differential of 75 Pa.

502.4.1.2.2 Assemblies

Material assemblies must be tested to ASTM E 2357, ASTM E 1677, and ASTM E 283 and display an average air leakage no greater than 0.04 cfm/ft² at a pressure differential of 75 Pa. Two particular assemblies—coated concrete masonry walls and a Portland cement/sand parge—need only comply to Section C402.4.1.1.1.

502.4.1.2.3 Building test

The completed building envelope air leakage should not exceed 0.40 cfm/ft² for a pressure differential of 75 Pa in accordance with ASTM E 779 or an equivalent method approved by a code official.

502.4.2 Air barrier penetrations

Deleted the provisions from the 2009 IECC and replaced them with a table that lists the maximum allowable air infiltration rates for fenestration. All maximum air leakage rates are reduced except certain fenestration tested to AAMA/WDMA/CSA 101/1.5.2A/440 at 300 Pa can continue to have an air leakage rate of 0.30 cfm/ft². Also added air leakage limits for garage doors and rolling doors and added NFRC 400 as an acceptable test standard. Provisions allowing site-constructed windows and doors to be weather stripped and sealed in lieu of meeting the air infiltration rates were deleted.

502.4.3 Sealing of the building envelope

Deleted the provisions from the 2009 IECC and replaced them with new provisions addressing sealing all paths of air leakage in the air barrier at both penetrations of and joints and seams in the air barrier.

502.4.4 Hot gas bypass limitation

Provisions moved from Section 502 to Section C403 and remain unchanged.

502.4.5 Outdoor air intakes and exhaust openings

C402.4.5.1 Stairway and shaft vents

Must have Class I motorized dampers with a maximum leakage rate of 4 cfm/ft² at 249 Pa when tested to AMCA 500D. Controls must be installed that open the dampers when activated by a fire alarm system or when power to the dampers is interrupted.

C402.4.5.2 Outdoor air intakes and exhausts

Must have Class I motorized dampers with a maximum leakage rate described in Section C402.4.5.1. Exceptions: Gravity dampers with a maximum leakage of 20 cfm/ft² at 249 Pa when tested to AMCA 500D are permitted when used for exhaust or relief dampers, in buildings less than three stories above grade, buildings in Climate Zones 1-3, or where design air intake/exhaust may have a leakage up to 40 cfm/ft².

502.4.7 Vestaillbes

C402.4.7 Vestaillbes

Added a provision that the installation of a revolving door in an entrance does not eliminate the requirement for installation of a vestibule. Changed the scope of the requirement to provide a vestibule from doors separating conditioned space from the exterior to buildings. Changed the exception for doors not intended to be used by the public or intended solely for employee use to doors not intended to be used as a building entrance. Added a new definition for building entrance.

502.4.8 Recessed lighting

Editorial change to state the limitation of 2.0 cfm first and then the ASTM test standard instead of the reverse. No change in the “end state” technical requirements in the 2012 IECC.

503.2.1 Calculation of heating and cooling loads

C403.2.1 Calculation of heating and cooling loads

Added a sentence that the required design loads must account for building envelope, lighting, ventilation, and occupancy-related loads of the project.

503.2.2 Equipment and system sizing

C402.4.1 Equipment and system sizing

For clarification, heating and cooling equipment and systems capacity is defined as output capacity.

503.2.3 HVAC equipment performance requirements

C402.3.3 HVAC equipment performance requirements

Addition of plate-type liquid-to-liquid heat exchangers, which must meet the requirements of Table C403.2.3(9).

503.2.3 Exception

C403.2.3.1 Water-cooled centrifugal chilling packages

Two equations (Equations 4-3 and 4-4) are given for equipment not designed for operation at AHRI Standard 550/590 test conditions. These equations refer to Table 6.8.1C of the AHRI Standard and replace the earlier equations used in the 2009 IECC. These equations only apply to centrifugal chillers having (1) exit evaporative fluid temperature ≥36°F; (2) exit condenser fluid temperature ≤115°F; and (3) delta temperature for these two fluids ≥20°F and ≤80°F. Chillers designed to operate outside of these ranges need not comply.

Tables 503.2.3(1)-(7)

Table C403.2.3(1)-(9)

An additional column has been added titled “Heating Section Type,” which differentiates electric resistance equipment from other types in some areas of the table. Some additional equipment types (e.g., through-the-wall, air-cooled) have been added, numerous quantitative changes have been made to the SEER requirements, and some test procedures have changed, but otherwise these tables have the same format as in the 2009 version. Two additional tables have been added for heat rejection and heat transfer equipment.
Table 503.3.1(1) (Mandatory) Emisnizer requirements

<table>
<thead>
<tr>
<th>2009 IECC</th>
<th>2012 IECC</th>
<th>CHANGES</th>
<th>REVISION TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table C403.3.1(1) Emisnizer requirements</td>
<td>Climate Zones 2A, 7, and 8 have been moved to the category that requires an emisnizer, and the minimum requirement has been raised to 54K Btu/h. The total capacity for all systems without emisnizers has been lowered to 300K Btu/h.</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>C403.3.1.1 Air emisnizers</td>
<td>Air emisnizers must comply with Sections C403.1.1.1-C403.1.1.4.</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>C403.3.1.1.1 Design capacity</td>
<td>Must be able to modulate up to 100% of the design supply air as outdoor air for cooling.</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>C403.3.1.1.2 Control signal</td>
<td>Dampers must be able to be sequenced with cooling equipment and not only by mixed air temperature. An exception exists for systems controlled from space temperature (e.g., single-zone systems).</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>C403.3.1.1.3 High-limit shutoff</td>
<td>Must automatically reduce outdoor air intake to design minimum when it will no longer reduce energy usage. Table C403.3.1.1.3(1) shows the allowed and prohibited control types by climate zones, and Table C403.3.1.1.3(2) shows the settings required by device type and climate zone.</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Table C403.3.1.1.3(1) High-limit shutoff control options for air emisnizers</td>
<td>Added provisions that vary by climate zone for control type acceptability in meeting the provisions requiring high-limit controls.</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Table C403.3.1.1.3(2) High-limit shutoff control setting for air emisnizers</td>
<td>Added provisions that vary by device type and climate zone that address the high-limit settings at which the emisnizer must shut off.</td>
<td>A</td>
<td></td>
</tr>
</tbody>
</table>

503.4.1 Emisnizers

C403.4.1 Emisnizers

Sections C403.4.1.1-C403.4.1.4 have been created for these requirements.

---

C403.4.1.1 Design capacity

Water emisnizers must be able to cool by indirect evaporation and provide up to 100% of the cooling load at outdoor temperatures of ≤50 °F dry bulb and ≤45 °F wet bulb. An exception exists for systems that cannot meet dehumidification requirements at these temperatures. For such systems, the requirements are ≤50 °F dry bulb and ≤45 °F wet bulb.

---

C403.4.1.2 Maximum pressure drop

Precooling coils and water-to-water heat exchangers in these systems need to have a water-side pressure drop of <15 ft or a secondary loop so that pressure drop is not seen by the circulating pumps in non-emisnizer mode.

---

C403.4.1.3 Integrated emisnizer control

Must be integrated with the mechanical system and able to provide partial cooling even when the mechanical system is needed. Exceptions exist for direct expansion systems that reduce outdoor air to prevent coil frosting if it is no greater than 25% of system capacity, and for direct expansion units rated less than 54K Btu/h that use nonintegrated controls, which preclude simultaneous use of the emisnizer and mechanical system.

---

C403.4.1.4 Emisnizer heating system impact

HVC system design and controls must not increase heating energy use. An exception exists for VAV systems that cause zone-level heating to increase due to reduced supply air temperature.

---

503.4.2 Variable air volume (VAV) fan control

C403.4.2 Variable air volume (VAV) fan control

Requirements now apply to fans with motors ≥7.5 hp. The second requirement from 2009 may be replaced with a vane-axial fan with variable-pitch blades.

---

C403.4.2.1 Static pressure sensor location

Must be positioned so that the set point is no more than one-third of design static pressure, except for those with zone reset controls. Those downstream of duct splits must have a sensor in each branch.

---

C403.4.2.2 Set points for direct digital control

The static pressure set point must be reset based on the zone needing the most pressure.

---

504.2.4 Hot gas bypass limitation

C404.4.7 Hot gas bypass limitations

Moved (but did not change) the hot gas bypass requirements from the envelope section of the code to the HVAC section of the code.

---

504.5 Pipe insulation

C404.5 Pipe insulation

Heat-traced systems are now included in this section and must meet the manufacturer’s installation instructions.

---

504.6 Hot water system controls

C404.6 Hot water system controls

Additional wording requiring ready access to operating controls.

---

504.7 Pools

C404.7 Pools and inground permanently installed spas (Mandatory)

This section, including the three Subsections C404.7.1-C404.7.3, remains unchanged except inground permanent spas have been added to the pool category, heaters pumps and motors with built-in timers are in compliance with these codes, the R-12 requirement for covers has been eliminated, and the exception for covers now applies to those receiving at least 70% of their energy from on-site.

---

C404.7.1 Heaters

Change in title only from pool heaters to heaters, which according to Section C404.7 would apply to pool heaters and inground permanently installed spas.

---

504.7.3 Pool covers

C404.7.3 Covers

Change in title from pool covers to covers, which according to Section C404.7 would apply to pools and inground permanently installed spas. The R-12 cover requirement has been eliminated. Changed the exception from 60% to 70% of site-recovered energy, added examples (heat pump or solar energy source) and added that the percentage contribution be assessed over an operating season.

---

505.1 General (Mandatory)

C405.1 General (Mandatory)

Exception to compliance now exists only for units with 75% of permanent light fixtures having high efficacy lighting.

---

C405.2.1 Manual lighting controls

Added a new section to refer to subsequent subsections that cover manual lighting controls.

---

505.2.2 Additional controls

Section has been moved and renamed to refer to relocation of provisions previously covered in subsections under this section (light reduction controls and automatic lighting shutoff) in new subsections in the 2012 IECC. See Section C405.2.2.

---

505.2.2.1 Light reduction controls

C405.2.2.1.1 Light reduction controls

Exception to compliance has undergone several changes: areas with one luminaire must have at least 100W, equipment, electrical, and mechanical rooms have been added, and daylight spaces that comply with Section C405.2.2.2.2 have been added.

---

505.2.2.2 Additional lighting controls

Section reads the same as 505.2.2 in the 2009 IECC but now refers to code provisions associated with automatic time control devices, occupancy sensors, and daylight zone control. Exceptions to section on additional lighting controls have been added and include sleeping units, spaces where patient care is directly provided, spaces where automatic shutoff would impact safety or security of occupants, and where lighting must be operated continuously.

---

C405.2.2.2.1 Automatic time switch control devices

Added new section on automatic time switch control devices and in part included the intent of 502.2.2.2.1 from the 2009 IECC. The new section indicates that all automatic control devices must be installed in all buildings other than for emergency egress lighting and lighting in spaces with occupancy sensors (new text in Section C405.2.2.2).

---

502.2.2.2 Holiday scheduling

---

C405.2.2.2.2 Occupancy sensors

Occupancy sensors are required in several specifically named types of spaces (e.g., classrooms, lunch rooms). Controls must turn off lights in rooms that are unoccupied for 30 minutes and must be manually or automatically turning light to no more than 50% power. An exception exists for spaces that are used for safety and security (e.g., corridors, stairways).

---
### 505.2.3 Daylight zone control

<table>
<thead>
<tr>
<th>C405.2.2.3</th>
<th>Daylight zone control</th>
<th>Lighting in daylight zones must be controlled separately from other areas and must be documented in Section C405.2.2.3.1 or C405.2.2.3.2. Daylight control zones must not be greater than 2,500 ft². Contiguous zones and zones under skylights shall follow the 2009 IECC.</th>
<th>R</th>
</tr>
</thead>
</table>

### 505.2.3.2 Automatic daylighting controls

| C405.2.3.2.2 | Automatic daylighting controls | Calibrating controls (set point) must be readily accessible. Daylighting controls must either: (1) reduce lighting to less than 35% of rated maximum power; or (2) incorporate stepped dimming such that at least one step 50-70% of design power and another step is no greater than 35% of maximum power. | A |

### 505.2.3.3 Multi-level lighting controls

| C405.2.3.3.3 | Multi-level lighting controls | Added provisions for multi-level lighting control in daylight zones to ensure that, where such controls are provided to meet the daylight zone control provisions, the general lighting in the zone is separately controlled by one multi-level control that reduces space lighting power in response to daylighting. The control must also control the power draw of the general lighting to no more than 35% of rated power when the day-lit illuminance in the space is greater than the rated illuminance of the general lighting in the zone. The control must be located so that levels and set points are readily accessible and separate from the light sensor. | A |

### 505.2.3 Specific application controls

| C405.2.3.4 | Specific application controls | Added a new section to outline situations where additional lighting controls are required. The provisions for hotel and motel sleeping units in 505.2.3 is retained in principle as item 3 in Section C405.2.3. New situations include display and accent lighting, cases used for display case purposes, supplemental task lighting, lighting for non-visual applications, and lighting equipment that is for sale or demonstration. | R |

### 505.5.2 Interior lighting power

| C405.5.2 | Interior lighting power | In addition to Table C405.5.2(1), used for the building area method, a second table has been created, Table C405.5.2(2) for a space-by-space method. The approach is similar, choosing the appropriate category, multiplying the given number by the floor area, and then taking the sum of all numbers. However, the second table allows for specific spaces within a building type (e.g., dining areas, lounges within a hotel). Documented justification for the need for higher power in some areas is allowed according to the guidelines found in Section C408.2.2.3. The original Table C405.2(1) is retained. | R |

### Table 505.5.2.1 Interior lighting power allowances: Building area method

| C405.5.2.1 | Interior lighting power allowances: Building area method | Footnote a to the table covering building area types and more specific building areas has been deleted and the current footnote b covering additional lighting power for retail areas has been moved so it does not apply to the building area method but instead to the space-by-space method. |

### Table 505.5.2.2 Interior lighting power allowances: Space-by-space method

| C405.5.2.2 | Interior lighting power allowances: Space-by-space method | Added a new table based on ASHRAE 90.1-10 for the new space-by-space compliance method added to the code. Retained footnote ‘b’ covering additional lighting power for retail areas from the building area method table and moved it to footnote ‘a’ of the space-by-space method table. Revised the footnote so the retail allowance starts at 500 watts instead of 1000 watts. | A |

### 505.5.2.3 Reduced lighting power density

| Added a new section to outline specific spaces within a building type (e.g., dining areas, lobbies within a hotel). Documented justification for the need for higher power in some areas is allowed according to the guidelines found in Section C408.2.2.3. The original Table C405.2(2) is retained. |

### 505.2.2.3 Daylight system functional testing

| C408.2.3 | Daylight system functional testing | Before completion of the final inspection, documentation must be provided with evidence of mechanical systems commissioning. This entire section has been added to the previous code and applies to the commissioning of systems in service hot water heating, and lighting. |

### 505.2.2.3.1 Equipment

| C408.2.3.1 | Equipment | HVAC controls must be tested and documented to be calibrated, adjusted, and operate according to specifications. |

### 505.2.2.3.2 Controls

| C408.2.3.2 | Controls | HVAC controls must be tested and documented to be calibrated, adjusted, and operate according to specifications. |

### 505.2.2.3.3 Ecosystems

| C408.2.3.3 | Ecosystems | Must be tested to show operation in accordance with specifications. |

### 505.2.2.3.4 Preliminary commissioning report

| C408.2.3.4 | Preliminary commissioning report | Documented evidence of test procedures and results must be given to the building owner and must identify: (1) deficiencies that have not been corrected; (2) tests deferred due to climatic conditions; and (3) climatic conditions required for deferred tests. |

### 505.2.2.4 Acceptance of report

| C408.2.4.1 | Acceptance of report | Before final mechanical inspection, a letter of receipt of the report must be given to the code official from the owner. |

### 505.2.2.4.2 Copy of report

| C408.2.4.2 | Copy of report | The code official may require a copy of the code report. |

### 505.2.2.4.5 Documentation requirements

| C408.2.4.5 | Documentation requirements | Construction documents must specify that the documents in this section are provided to the building owner within 90 days of the receipt of certificate of occupancy. |

### 505.2.2.5 Drawings

| C408.2.5.1 | Drawings | Must include the location and performance data for all equipment. |

### 505.2.3.3 Manuals

| C408.2.5.2 | Manuals | The provisions for HVAC system manuals were deleted from the 2009 ICEC and are now included in Section C408.2.5.3 of the 2012 IECC, which applies to HVAC and electrical lighting systems. |

### 505.2.5.3 System balancing report

| C408.2.5.3 | System balancing report | A written report based on the findings from Section C408.2.2. |

### 505.2.5.4 Final commissioning report

| C408.2.5.4 | Final commissioning report | Must include: (1) results of performance tests; (2) deficiencies found during testing and corrective measures proposed; and (3) performance test procedures used. An exception exists for test deferred due to climatic conditions. |

### 505.3 Lighting systems functional testing

| C408.3 | Lighting systems functional testing | Controls for lighting systems must comply with Section C408.3. |
Table 402.4.1 Air barrier and insulation requirements by component

- **R402.2.12 Sunroom insulation**
  - Sunrooms enclosing conditioned spaces must comply with this code: For sunrooms with thermal isolation, the ceiling R-values need only be R-19 in Climate Zones 1-4 and R-24 in Climate Zones 5-8; wall R-values need only be R-13 in all climate zones.

- **R402.4 Air leakage (Mandatory)**
  - Sunrooms enclosing conditioned space must comply with this code: The 2009 IECC had no text in this section. Text has been added to indicate that the provisions of all subsections to Section R402.4 must be satisfied.

- **R402.4.1 Building thermal envelope**
  - This section has been removed.

- **R402.4.2 Air barrier and insulation inspection component criteria**
  - One category (common wall) has been added and several changes have been made to the criteria, including a footnote. All other formatting remains the same.

- **R402.4.2.2 Visual inspection option**
  - This section is now mandatory. Air changes per hour must not exceed five in Climate Zones 1 and 2, and must not exceed three in all others. The conditions of testing have undergone slight modification but are essentially the same except that the condition that HVAC ducts not be sealed has been removed.

- **R402.4.3 Fireplaces**
  - New wood-burning fireplaces now require tight-fitting flue dampers rather than gasketed doors.

- **R402.4.4 Recessed lighting**
  - The wording has been edited to provide the air leakage rate limit first, followed by the test standard instead of the test standard first, followed by the air leakage rate limit.

- **R402.5 Sealing**
  - Exceptions have now been made such that (1) air-impermeable spray foam products are permitted without joint seals; (2) for inaccessible duct connections, three rivets will be spaced on the exposed joint; and (3) continuously welded and locking longitudinal seams in ducts operating at 50 Pa do not require additional closure systems. Also, leakage must be ≤2 cfm/100 ft² of conditioned floor area for both the preconstruction and rough-in test and for the rough-in test the leakage is ≤3 cfm/100 ft² of conditioned floor area if the air handler is not installed. This test is not required if air handlers and ducts are entirely within conditioned space.

- **R402.3.2 Sealing (Mandatory)**
  - Air handlers must have a manufacturer’s air leakage of ≤2% of design air flow rate when tested to ASHRAE 193.

- **R402.3.3 Protection of piping insulation**
  - Exposed insulation must be protected from damage (e.g., from sunlight, moisture, maintenance). Adhesive tape is not permitted.

- **R402.4 Service hot water systems**
  - New provisions have been added to distinguish provisions for pipe insulation and circulating systems as applying to service hot water systems (see Sections R403.4.1 and R403.4.2).

- **R403.4 Circulating hot water systems (Mandatory)**
  - The provision concerning R-2 insulation has been deleted (see Section R403.4.2). The code now only addresses controls as covered in the previous code requirements.

- **R403.4.1 Circulating hot water systems (Mandatory)**
  - R-3 insulation is required with hot water piping for the following piping: (1) ¾ in. diameter; (2) serving more than one dwelling unit; (3) from water heater to kitchen outlets; (4) outside conditioned space; (5) from water heater to distribution manifold; (6) under floor slab; (7) buried piping; (8) supply and return recirculation other than demand recirculation; and (9) having greater run lengths than the distance specified in Table R403.4.2.

- **Table R403.4.2 Maximum run length**
  - A new table has been added providing pipe lengths as a function of pipe diameter over which R-3 pipe insulation is required unless the pipe’s location or function is specifically listed in Section R403.4.2.
<table>
<thead>
<tr>
<th>2009 IECC</th>
<th>2012 IECC</th>
<th>CHANGES</th>
<th>REVISION TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>403.5 Mechanical ventilation (Mandatory)</td>
<td>R403.5 Mechanical ventilation (Mandatory)</td>
<td>Must now meet the requirements of IRC or IMC or with other approved means of ventilation.</td>
<td>R</td>
</tr>
<tr>
<td>---</td>
<td>R403.5.1 Whole-house mechanical ventilation system fan efficiency</td>
<td>Must meet the requirements of Table 403.5.1. An exception exists for fans integral to tested and listed HVAC systems, which must have an electrically commutated motor.</td>
<td>A</td>
</tr>
<tr>
<td>---</td>
<td>Table R403.5.1 Mechanical ventilation system fan efficiency</td>
<td>Added new provisions (see Section R403.5.1) for minimum fan efficiency in cfm/watt by fan location (e.g., range, in-line, bathroom, utility room) as a function of minimum and maximum fan air flow rate.</td>
<td>A</td>
</tr>
<tr>
<td>403.6 Equipment sizing (Mandatory)</td>
<td>R403.6 Equipment sizing (Mandatory)</td>
<td>Must be done in accordance with ACCA Manual S based on loads calculated in Manual J or other approved methods.</td>
<td>R</td>
</tr>
<tr>
<td>403.9.3 Pool covers</td>
<td>R403.9.3 Pool covers</td>
<td>Minimum R-12 values are not required. An exception exists for pools receiving &gt;70% of their energy from site-recovered sources.</td>
<td>R</td>
</tr>
<tr>
<td>404.1 Lighting (Prescriptive)</td>
<td>R404.1 Lighting (Mandatory)</td>
<td>This section is now mandatory. At least 75% of all fixtures must be high efficacy. An exception exists for low-voltage fixtures.</td>
<td>R</td>
</tr>
<tr>
<td>---</td>
<td>R404.1.1 Lighting equipment (Mandatory)</td>
<td>Fuel gas lighting may not have continuous pilot lights.</td>
<td>A</td>
</tr>
<tr>
<td>405.4 Documentation</td>
<td>R405.4 Documentation</td>
<td>Text has been included in the 2012 IECC to specifically refer to and require compliance with subsections to this section of the code.</td>
<td>R</td>
</tr>
<tr>
<td>405.5 Calculation procedure</td>
<td>R405.5 Calculation procedure</td>
<td>Text has been included in the 2012 IECC to specifically refer to and require compliance with subsections to this section of the code.</td>
<td>R</td>
</tr>
<tr>
<td>405.6 Calculation software tools</td>
<td>R405.6 Calculation software tools</td>
<td>Text has been included in the 2012 IECC to specifically refer to and require compliance with subsections to this section of the code.</td>
<td>R</td>
</tr>
<tr>
<td>405.6.1 Minimum capabilities</td>
<td>R405.6.1 Minimum capabilities</td>
<td>Calculation of whole-building sizing for heating and cooling equipment is now in accordance with the standard reference design in Section R403.6.</td>
<td>R</td>
</tr>
<tr>
<td>Table 405.5.2(1) Specifications for the standard reference and proposed designs</td>
<td>Table 405.5.2(1) Specifications for the standard reference and proposed designs</td>
<td>Revisions have been made to the table for interior shade fraction, the air-exchange rate, heating systems, cooling systems, and thermal distribution systems. Footnotes to the table have also been revised to reflect changes to the table.</td>
<td>R</td>
</tr>
<tr>
<td>Chapter 5 Referenced standards</td>
<td>Chapter 6 Referenced standards</td>
<td>Updates to editions of reference standards were made in AAMA, ASHRAE, CSA, ICC, NFRC, and WDMA standards. New standards were listed for ACCA and ASHRAE. Standards were deleted from ASHRAE and ASTM.</td>
<td>R</td>
</tr>
</tbody>
</table>