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**Governor Scott Walker      Secretary Dave Ross**

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**COMMERCIAL BUILDING CODE COUNCIL MEETING**  
**Room 121A, 1400 East Washington Avenue, Madison**  
**Contact: Sandra Cleveland (608) 266-0797**  
**May 3, 2016**

*The following agenda describes the issues that the Council plans to consider at the meeting. At the time of the meeting, items may be removed from the agenda. Please consult the resulting meeting minutes for a description of the recommendations of the Council.*

**AGENDA**

**9:00 A.M.**

**CALL TO ORDER – ROLL CALL**

- A. Adoption of Agenda (1)**
- B. Approval of Minutes of April 5, 2016 (2)**
- C. Department Update**
- D. Council Review and Discussion of Significant Changes to the IECC Chapters 1-6 and Appendices (3-44)**
  - 1) Code Revisions
  - 2) Wisconsin Considerations
- E. Council Review and Discussion of Significant Changes to ASHRAE 90.1 2007-2013 (45-63)**
- F. Council Review and Discussion of Exhaust System Requirements in Boat Storage Facilities (64-67)**
- G. Council Review and Discussion of Common Path of Egress Travel in Townhouses (SPS 362.1014)**
- H. Public Comments**
- I. Administrative Matters**
- J. Adjournment**

**NEXT MEETING DATE JUNE 7, 2016**

**COMMERCIAL BUILDING CODE COUNCIL  
MEETING MINUTES  
April 5, 2016**

**PRESENT:** Kevin Bierce, Hunter Bohne, David Enigl, Steven Howard, Steven Klessig (*arrived at 9:04 a.m.*), Michael Mamayek, Irina Ragozin, Corey Rockweiler, Peter Scheuerman

**EXCUSED:** Samuel Lawrence

**STAFF:** Sandy Cleveland, Rules Coordinator; Randy Dahmen, Building Plan Reviewer; Jeff Grothman, Legislative Liaison; Jason Hansen, Building Plan Reviewer; Robin Zentner, Section Chief-Field Operations; and Nifty Lynn Dio, Bureau Assistant

**CALL TO ORDER**

Michael Mamayek, Chair, called the meeting to order at 9:00 a.m. A quorum of eight (8) members was confirmed.

**ADOPTION OF AGENDA**

**Amendments to the Agenda**

- *Added: Additional material to Item F*
- *Additional handout received relating to Item D*

**MOTION:** Hunter Bohne moved, seconded by Irina Ragozin, to adopt the agenda as amended. Motion carried unanimously.

**APPROVAL OF MINUTES**

**Amendments to the Minutes**

- *Correction: Gas piping installation from insulation on page 1 of the minutes*

**MOTION:** Corey Rockweiler moved, seconded by Peter Sheuerman, to approve the minutes of March 1, 2016 as amended. Motion carried unanimously.

*(Steven Klessig arrived at 9:04 a.m.)*

*(Steven Klessig left the meeting at 2:00 p.m.)*

*(Steven Klessig rejoined the meeting via phone at 2:10 p.m.)*

**ADJOURNMENT**

**MOTION:** Hunter Bohne moved, seconded by Corey Rockweiler, to adjourn the meeting. Motion carried unanimously.

The meeting adjourned at 2:54 p.m.

**Summary of 2012 and 2015 IECC Changes<sup>a</sup> Significant<sup>b</sup> in Wisconsin<sup>c</sup>  
and Comparison With Wisconsin's Requirements<sup>d</sup>**

IECC / ASHRAE 90.1 Code Sections	Description		Comments	
	SPS 363	2012 IECC		2015 IECC
		DIS Recommendations / Editorial Clarifications		
<b>P A R T 1 - IECC</b>				
<b>CHAPTER 1 - SCOPE AND ADMINISTRATION</b>				
2012 IECC Table of Contents	SPS 363 numbering is based on the older page numbering of the IECC; <i>the new chapter designations with the C or R prefix will need to be incorporated into SPS 363 to maintain a connection to the appropriate provisions in the IECC</i>	The 2012 IECC was completely reorganized and renumbered for an easier and more user friendly format; the code has been broken into two separate parts for Commercial Energy Efficiency and Residential Commercial Efficiency	Residential chapters apply to multi-family dwellings	
	Renumber: <b>SPS 363.001</b>	SPS 363.0010		
	Renumber: <b>SPS 363.002</b>	SPS 363.0020		
	Amend: <b>SPS 363.002</b>	<b>Application. (1) MIXED OCCUPANCY.</b> Where a building includes both residential and commercial occupancies, each occupancy shall be separately considered and meet the applicable provisions of IECC <del>chapter 4</del> <u>Residential Provisions</u> for residential or IECC <del>chapter 5</del> <u>Commercial Provisions</u> for commercial.		
C101.2 R101.2	SPS 363.0101 states "Except for IECC 101.5.2, the requirements in IECC sections 101 and 103 to 109 are not included as part of this chapter"; additional administrative requirements regarding commissioning occur elsewhere in the 2015 edition of the IECC; <i>the SPS 363.0101 statement</i>	Modifies the scope of the code to include the building site and associated systems and equipment; clarifies that the IECC is not limited to a structure shell and its contents	Should the expanded scope of IECC be included in SPS 363.001?	

	<i>may need to address these changes</i>			
	<b>Amend: SPS 363.0100 Note:</b>	<b>Note:</b> The sections in this chapter are generally numbered to correspond to the numbering used in the IECC, <u>with a 0 to the right of the decimal point referring to the Commercial Provisions and a 5 to the right of the decimal point referring to the Residential Provisions of the IECC</u> , i.e., s. SPS 363.0101 refers to section IECC <del>404</del> <u>C101</u> and s. SPS 363.5101 refers to section <u>IECC R101</u> .		
	<b>Amend: SPS 363.0101</b>	<del>Except for IECC 101.5.2, the</del> The requirements in IECC sections <del>401 and 403 to 409</del> <u>C101, and C103 to C109</u> are not included as part of this chapter.		The low-energy building exemption has been moved to C402.1.1 and R402.1, Exception
	<b>Create SPS 363.5101</b>	The requirements in IECC sections R101, and R103 to R109 are not included as part of this chapter.		
C101.3 R101.3		Modifies the intent statement from “effective use of energy” to “effective use and conservation over the useful life of each building”	Removes the word “effective” from the intent statement	
C103.2.1 R103.2.1			Code now requires the building thermal envelope to be explicitly shown on the construction drawings.	
C104.1 R104.4			Code provides for enhanced details governing inspections and provisions are more specific and written to relate to the Energy Code.	

**CHAPTER 2 - DEFINITIONS**

Section 202 New		Definitions which are new to the 2012 IECC and their applicable sections are: C Building Commissioning C Building Entrance C,R Building Site C Coefficient of Performance (COP) – Cooling C Coefficient of Performance (COP) – Heating C,R Continuous Air Barrier C,R Demand Recirculation Water System C,R [B] Dwelling Unit C Dynamic Glazing C Enclosed Space		
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		<p>C Equipment Room  C Fenestration Product, Field Fabricated  C,R Fenestration Product, Site Built  C Furnace Electricity Ratio  C General Lighting  C Integrated Part Load Value (IPLV)  C Nonstandard Part Load Value (NPLV)  C On-site Renewable Energy  C,R [B] Sleeping Unit  C,R Visible Transmittance (VT)  R Whole House Mechanical Ventilation System</p>		
Section 202 Modified		<p>Definitions which are modified in the 2012 IECC and their applicable sections are:  C,R Residential Building  C,R Skylight</p>		
	Amend: <b>SPS 363.0202 (2)</b>	<p><b>SUBSTITUTIONS.</b> Substitute the following definition for the corresponding definition listed in IECC section <del>202 C202</del>: “Approved” has the meaning given in s. SPS 362.0202 (2).</p>		
	Create: <b>SPS 363.5202</b>	<p><b>SUBSTITUTIONS.</b> Substitute the following definition for the corresponding definition listed in IECC section R202: “Approved” has the meaning given in s. SPS 362.0202 (2).</p>		
202	Application of "daylight zone"	<p>Add former amendment from 2006 IECC Comm 63.0505(1)(b) Alternative. The daylit (daylight) area (zone) shall be as calculated using a method acceptable to the department”. This allows single fixtures whose placement is odd for control situations to be placed with lighting controls more appropriate to its location.  Location of single fixtures that may visually not seem appropriate for daylight zone controls, can be more appropriately grouped for control purposes, without the need for petition for variance</p>	Amend 363.0202 Daylight zone adjacent to vertical fenestration, "method acceptable to the department"	3
Section 202 C402.2.2.1		<p>Clarifies that the provisions include multiple definitions of “Above-Grade Wall” for the commercial requirements, the alternate definition in C402.2.2.1 pertains only to walls covered by section C402.2.3</p>	ASHRAE 90.1 uses a third definition for “above grade wall”	
<b>CHAPTER 3 - GENERAL REQUIREMENTS</b>				
302	SPS 364.0403(5)(d)2.d.	<p>IECC 302 references 75°F as the indoor design temperature, while SPS 364.0403(5)(d)2.d. references 78°F.  Modify WI amendment to compliment wording of the IMC</p>	SPS 364.0403 minimum 75° F cooling	13
	Amend: <b>SPS 363.0302</b>	<p><b>Exterior design conditions.</b> These are department rules in addition to the requirements in IECC section <del>302 C302</del>: The exterior design temperatures used for heating and cooling load</p>		

		calculations shall be as specified under Table 363.0302.		
	Create: <b>SPS 363.5302</b>	<b>Exterior design conditions.</b> These are department rules in addition to the requirements in IECC section R302: The exterior design temperatures used for heating and cooling load calculations shall be as specified under Table 363.0302.		
	Amend: <b>SPS 363.0303</b>	<b>Materials, systems and equipment.</b> These are department rules in addition to the requirements in IECC section <del>303</del> <u>C303</u> .		
	Create: <b>SPS 363.5303</b> Copy (1) and (2) from 363.0303	<b>Materials, systems and equipment.</b> These are department rules in addition to the requirements in IECC section R303.		
Tables C303.1.3(3), R303.1.3(3)		Adds Visual Transmittance (VT) values to Table 102.1.3(3); VT is the ratio of visible light entering the space through the fenestration product assembly to the incident visible light, it includes the effects of glazing material and frame, and is expressed as a number between 0 and 1; a “0” is opaque, a “1” is totally transparent”	Allows ANSI/DASMA 105 to be used as a standard for determination of U-factors for garage doors.	VT is one of the factors used when calculating the performance of “dynamic glazing” in a commercial building for compliance with C402.3.3
C303.1.4.1 R303.1.4			Requires R-value of insulated siding to be determined in accordance with ASTM C1363 and installation shall be in accordance with manufacturer’s instructions.	

**PART 2 - IECC - COMMERCIAL ENERGY**

**CHAPTER C4 - COMMERCIAL ENERGY EFFICIENCY**

C401.1		Modifies the format to more clearly show the three options for compliance, [1] following ANSI/ASHRAE/IESNA 90.1, [2], a prescriptive path, and [3] a performance path; <b>the prescriptive path</b> follows requirements for building envelope in C402, mechanical systems in C403, service water heating in C404, and electrical and lighting in C405, with a requirement for meeting efficiency requirements for either HVAC in C406.2, lighting in C406.3, or on-site renewable energy in C406.4; <b>the performance path</b>		Numbering of SPS 363 will have to change to adapt to the new format in the IECC  For example: Use SPS 363.0405 to modify C405 Use SPS 363.5405 to modify R405
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		follows the requirements of C407, along with C402.4, C403.2, C404, C405.2, C405.3, C405.4, C405.6, and C405.7, and must have an energy cost equal to or less than 85 percent of the standard reference building		
	Renumber and amend <b>SPS 363.0501</b>	<b>SPS 363.0401 General application.</b> This is a department rule in addition to the requirements in IECC section <del>501.2</del> <u>R401.2</u> : All of the following rules shall apply regardless of whether the IECC chapter <del>5</del> 4 [CE] or ASHRAE 90.1 standard is used to determine compliance: <b>(1)</b> Section <del>SPS 363.0503</del> <u>SPS 363.0403</u> (1) relating to design loads. <b>(2)</b> Sections <del>SPS 363.0503</del> <u>SPS 363.0403</u> <del>(3)</del> and (4) relating to economizers. <b>(3)</b> Section <del>SPS 363.0505</del> <u>SPS 363.0405</u> relating to lighting systems. <b>(4)</b> IECC section <del>505.2.2.1</del> <u>C405.2.2.2</u> relating to dual switching.		
C401.2.1		Adds a new section with requirements for additions, alterations, and repairs of existing buildings to either follow ANSI/ASHRAE/IESNA 90.1 or the prescriptive requirements of the IECC without the added efficiency requirements of C406		
Section C402		Focuses more on building envelope where the previous commercial section focused more on mechanical, lighting, and service water heating systems; <b>new sections include:</b> <ul style="list-style-type: none"> <li>▪ roof solar reflectance and thermal emittance</li> <li>▪ insulation of radiant heating systems</li> <li>▪ increased vertical fenestration with daylighting controls</li> <li>▪ increased skylighting with daylighting controls</li> <li>▪ minimum skylight daylight fenestration area</li> <li>▪ haze factor</li> <li>▪ dynamic glazing</li> <li>▪ air barrier construction</li> <li>▪ air barrier compliance options</li> <li>▪ materials</li> <li>▪ assemblies</li> </ul>		

		<ul style="list-style-type: none"> <li>▪ building test, air barrier penetrations</li> <li>▪ building test, air leakage of fenestration</li> </ul> <p><b>revised sections include:</b></p> <ul style="list-style-type: none"> <li>▪ specific insulation requirements</li> <li>▪ opaque thermal envelope requirements</li> <li>▪ building envelope requirements, fenestration</li> <li>▪ maximum fenestration area</li> <li>▪ vestibules</li> <li>▪ outdoor air intakes and exhausts</li> <li>▪ recessed lighting</li> </ul>		
C402.1.1	SPS 363.002 exempts glazed structures from the requirements of the energy code; similar language is now found in IECC C402.1.1, where greenhouses have been added to the list of building types exempt from the thermal envelope provisions of the IECC; <i>the SPS 363.002 statement should be reviewed</i>			
C402.1.2			Exempts the following from envelope provisions: <ul style="list-style-type: none"> <li>• Separate buildings not more than 500 ft<sup>2</sup></li> <li>• Intended to house certain electronic equipment</li> <li>• Buildings that have a heating system capacity <math>\leq 17,000</math> BTU/hr</li> <li>• Thermostat set point restricted to <math>\leq 50^{\circ}</math></li> <li>• Have a maximum average wall and roof U-factor (0.2 or .12)</li> </ul>	
C402.1.3 R402.1.2 Table C402.1.4			Minimum thermal performance increased for roof insulation entirely above deck in Climate Zones 1-5. Increased to be compatible with	

			ASHRAE 90.1.	
Table C402.1.4.1			Method to determine effective R-values for steel stud wall assemblies.	
C402.1.5			Establishes an alternative component performance path for commercial buildings to allow trade-offs in the building envelope.	
C402.2		Modifies thermal performance values and adds provisions for the installation of continuous insulation		(prescriptive)
C402.2.1.1		Adds a new section that addresses the amount of solar heat reflected and radiated from low sloped roofs in Climate Zones 1, 2, and 3		NA
C402.2.6		Modifies requirements for slabs on grade by adding a new minimum prescriptive protection requirement for insulation extending away from the building, and by adding a new exception for perimeter insulation with slab on grade floors greater than 24 inches below the finished exterior grade		
C402.2.8		Adds a requirement for insulation of all radiant heated floor slabs and radiant panels designed for sensible heating of internal space		
C402.3		Modifies the building envelope requirements: fenestration table C402.3 with a major overhaul and supplements it with a table for SHGC adjustment multipliers, C405.2.2.3.2		(prescriptive)
C402.3.1		Modifies the baseline maximum for vertical fenestration from 40 percent to 30 percent, but up to 10 percent can be added with the use of automatic daylighting controls; the baseline maximum of 3 percent for skylights can be increased to 5 percent with daylighting controls; and skylights are now required over large spaces exceeding 10,000 square feet with certain uses, but Climate Zones 6-8 are exempt from this requirement		Skylights are now required over certain large spaces for specific uses, but Climate Zones 6-8 are exempt
C402.3.3		Modifies the method of determining the		

		maximum U-factor and solar heat gain coefficient (SHGC) by no longer allowing for an area-weighted projection factor; each area with a different projection factor will be required to be evaluated separately		
C402.3.3.1-4		Modifies provisions by providing additional variables to allow increased design flexibility for adjusting the SHGC		
C402.4.1		Adds requirements for air-barriers with new prescriptive and/or measurable mandatory requirements		
C402.4.7		Modifies vestibule requirements by requiring vestibules for doors adjacent to revolving doors, and by exempting doors used only by employees from needing a vestibule		
C402.5.3 R402.4.4			Rooms containing fuel-burning appliances and their open-combustion air openings: <ul style="list-style-type: none"> <li>• In Climate Zones 3-8</li> <li>• To be isolated from remainder of building in accordance with envelope provisions.</li> </ul>	
	Renumber and amend: <b>SPS 363.0503</b>	<b>SPS 363.0403 Building mechanical systems.</b> <b>(1) CALCULATION OF HEATING AND COOLING LOADS.</b> The following wording is a department requirement in addition to the requirements in IECC section <del>503.2.1</del> <u>C403.2.1</u> : Design heating and cooling loads shall be determined in accordance with s. SPS 363.0302 and Table 363.0302. <b>(2) EQUIPMENT AND SYSTEM SIZING.</b> Substitute the following wording for the requirements and the exceptions in IECC section <del>503.2.2</del> <u>C403.2.2</u> : Heating and cooling equipment and systems shall be sized to provide the minimum space and system loads calculated in accordance with s. SPS 363.0302. <b>(3) HVAC SYSTEM COMPLETION.</b> The requirements in IECC sections <del>503.2.9</del> <u>C403.2.11</u> is not included as part of this chapter. <b>(4) ECONOMIZERS-SIMPLE HVAC SYSTEMS.</b> Substitute the following wording for the requirements in IECC section <del>503.3.1</del> <u>the first paragraph C403.3</u> and Table <del>503.3.1</del> <u>(1) C403.3.3(1)</u> : Supply air economizers shall be provided on the following cooling systems: (a) Package roof top units > 33,000 Btu/h. (b) All other cooling systems > 54,000 Btu/h. <b>(5) ECONOMIZERS-COMPLEX HVAC SYSTEMS.</b> Substitute the following wording for the requirements, but not the exceptions, in IECC section <del>503.4.1</del> : Supply air economizers shall be		

		<p><del>provided on cooling systems as described under sub. (4). Economizers shall be capable of operating at 100 percent outside air, even if additional mechanical cooling is required to meet the cooling load of the building.</del></p> <p><del>(6) (5) CLIMATE ZONES 3 AND 4 5 THROUGH 8. Substitute the following wording for the requirements in IECC section 503.4.3.3.2.2 C403.4.2.3.2.2: For climate Zones 5 through 8 as indicated in Figure 301.1 C301.1 and Table 301.1 C301.1, if an open-circuit cooling tower is used, then a separate heat exchanger shall be required to isolate the cooling tower from the heat pump loop, and heat loss shall be controlled by shutting down the circulation pump on the cooling tower loop and providing an automatic valve to stop the flow of fluid.</del></p>	
C403.2.2		<p>Limits sizing of equipment</p> <p>Request committee to review since past advice &amp; practice via previous committees was to allow oversizing to address pick-up loads in factories, warehouses, offices, etc.</p> <p>Review language and acceptable options</p>	97
C403.2.3 C403.2.3.2 Tables C403.2.3 (1-9)		<p>Modifies the equipment performance requirements; adds a new column "Heating Section Type" which differentiates electric resistance equipment from other types; additional equipment types (through-the-wall, air-cooled) have been added; new tables have been added for heat rejection and heat transfer equipment; SEER requirements have been improved; and some equipment efficiencies have improved</p>	
C403.2.4.3.3		<p>Adds a requirement for all HVAC systems to be capable of automatically adjusting the daily start time in order to bring the space that is controlled up to temperature immediately prior to scheduled occupancy</p>	
C403.2.4.4			<p>Requires zones served by HVAC systems over 25,000 square feet or more than one floor to be subdivided into isolation areas to control the HVAC system in each isolation area.</p>
C403.2.5.1		<p>Modifies the threshold for Demand Control Ventilation (DCV) from average occupant load of 40 people/1,000 square feet to 25 people/1,000 square feet; adds an exception for process loads</p>	
C403.2.6		<p>Modifies energy recovery ventilation system requirements by adding a new table which</p>	

		replaces a single fixed trigger point of 5,000 cfm and 70 percent outdoor air, and provides a comprehensive and scalable energy recovery requirement based on the climate zone and percentage of outdoor air at full design flow rate		
C403.2.6.2			Requires enclosed parking garages used for storing or handling automobiles operating under their own power to use ventilation optimization controls to modulate airflow.	
C403.2.8 Kitchen Exhaust Systems (2015)			Regulates efficiency of kitchen exhaust systems including replacement air and maximum exhaust rates.	
C403.2.8 Piping Insulation (Renumbered C403.2.10 in 2015)		Modifies piping insulation by expanding and clarifying exceptions for smaller strainers, control valves and balancing valves, as well as direct buried piping that conveys fluids at or below 60 degrees Fahrenheit; provides a scalable table which bases insulation thickness on fluid operating temperature range and insulation conductivity		
C403.2.8.1		Adds a requirement for protecting insulation exposed to the elements, but prohibits the utilization of adhesive tape as the protective measure		
C403.2.11	SPS 363.0503 removes IECC 503.2.9 (2009) and its subsections from the code; the IECC commissioning and completion requirements are much stricter now; in the 2015 edition of the IECC, this is now section C403.2.11 and references section C408, which deals with commissioning; <i>the SPS</i>			

	<i>361 regulations regarding completion may need to be revised in order to address the commissioning aspects of the current code</i>			
C403.2.14 Refrigeration equipment performance			Tables C403.2.14 (1) and (2): <ul style="list-style-type: none"> <li>List the maximum energy use in kWh/day</li> <li>Organize by equipment type, the operating mode and rating temperature.</li> </ul>	
C403.2.15 C403.2.16			Establishes requirements for walk-in coolers, freezers, refrigerated warehouse coolers and refrigerated warehouse freezers including requirements that: <ul style="list-style-type: none"> <li>Door self-closes</li> <li>Minimum floor, wall and ceiling insulation</li> <li>Anti-sweat heaters and controls</li> <li>Lighting efficiency</li> </ul>	
C403.3.1, Table C403.3.1 (1)	The IECC 2009 requirements for economizers were made more strict by SPS 363.0503; they were made stricter yet in IECC 2012 and in 2015 the IECC continued this trend; <i>SPS 363.0503 (4) and (5) should be revisited in light of these modifications</i>	Modifies the provisions regarding economizers, making requirements more comprehensive than previous editions of the IECC		
C403.3.1 (2015) C503.3.1 (2009)	SPS 363.0503 (4)	Challenges by designers have pointed out that a zone (see Definition in IMC 202) within an enclosed area could be treated differently when attempting to apply this section Add language that defines a zone as an enclosed room or space, or that the application of this section is specific to the enclosed area via walls, ceilings, windows, doors, skylights, etc. served by the cooling system(s).		Clarify definition of Zone as related to economizer requirements

C403.4.1.3, C403.4.1.4		Adds a requirement for economizers to be integrated with the associated mechanical cooling system, operate even when additional cooling is required, and provide no-to-minimal impact on the heating system		
C403.4.2		Modifies variable air volume (VAV) controls by reducing minimum motor sizes and allowing vane axial fans with variable pitch blades; and specifies the location(s) for static pressure sensors		
C403.4.2.5			Establishes turndown ratio for boilers with design input over 1,000,000 Btu/hr.	
C403.4.3.2.2	SPS 363.0503 (6) removes closed-circuit cooling towers from this requirement; this paragraph is now found at C403.4.2.3.2.2			
C404	SPS 363.0504 removes sections of the IECC 2009 related to service water heating dealing with temperature controls, heat traps, and pool covers; the latter two may still be appropriate, but the referenced section on temperature controls is not in the 2015 IECC			
	Renumber and amend <b>SPS 363.0504</b>	<del>SPS 363.0504</del> <b>SPS 363.0404 Service water heating. (1) TEMPERATURE CONTROLS.</b> The requirements in IECC section 504.3 are not included as part of this chapter. <del>(2) (1) HEAT TRAPS.</del> The requirements in IECC section <del>504.4</del> <b>C404.3</b> are not included as part of this chapter. <del>(3) (2) POOL COVERS.</del> The requirements in IECC section <del>504.7.3</del> <b>C404.9.3</b> are not included as part of this chapter.		
	Create <b>363.0504 (3)</b>	<b>SPS 363.0504 (3) COMMISSIONING.</b> The requirements in IECC section C404.11 are not included as part of this chapter.		?
C404.5		Modifies pipe insulation requirements for		

Pipe Insulation (2012)		automatic circulating hot water and heat traced systems by addressing heat traced systems as an individual item and clarifying insulation requirements for non-circulating systems; modifies the control section to clarify that manually controlled circulating systems are required to stop pumping when there is limited hot water demand		
C404.5 R404.5 Efficient heated water supply piping.			Table C404.5.1 establishes the maximum allowable pipe length method from the nearest source of heated water to termination of the fixture supply pipe, public lavatory faucets and all other fixtures. It also establishes the maximum allowable pipe volume method from the nearest source of heated water to the termination of the fixture pipe, public lavatory faucet and other fixtures.	
C404.7		Modifies requirements for pools by excluding temporary and above ground spas from the scope of the regulations, raising the benchmark percentage for site recovered energy, and setting the criteria for energy use calculations; revises the section title to include in-ground permanently installed spas		
C404.8 R403.5.4			Requires drain water heat recovery units to comply with CSA B55.2 and that potable waterside pressure loss to be less than 10 psi.	
C404.9 (2015) 504.7.2 (2009)		This section requires that time switches be installed in pools. Rules issued by DHS mandate that pump operation occur continuously, 24 hrs/day, 365 days per year.		Amend this section such that the requirements is eliminated 85
C405.1		Modifies from 50 percent to 75 percent the amount of line voltage fixtures required to have high efficacy bulbs		(mandatory)
C405.2.1.2		Modifies lighting reduction controls by limiting the size of exempted single luminaires and by exempting electrical and mechanical rooms		
C405.2.2		Deletes the section on automatic lighting shutoff and adds this section on additional		

		lighting controls which includes automatic daylighting controls; and provides exceptions for sleeping rooms, spaces for patient care, spaces where automatic shutoff would endanger safety or security, and lighting intended for continuous operation		
C405.2.2.1		Modifies requirements for automatic controls by eliminating the 5,000 square feet threshold, and making reductions in the allowable maximum override control area; exempts emergency egress lighting and lighting controlled by occupancy sensors from this requirement		
C405.2.2.2		Adds requirements for occupancy sensors in classrooms, conference rooms, restrooms, private offices, and all areas 300 square feet or less enclosed by floor to ceiling height partitions		
C405.2.2.2.1	SPS 363.0505 (1) (a) 2. References IECC 505.2.2.1, which now pertains to C405.2.2.2.1, <i>this chapter has changed enough that SPS 0505 should be reviewed; additionally, the definitions and provisions regarding daylight zones and daylighting have change and been expanded considerably since 2009</i>			
C405	SPS 363.0505 (2) references IECC section 505.5.1.4 (2009), which has no equivalent section in the 2015 IECC			
	Renumber and amend	<b>SPS 363.0405 Lighting systems. (1) CONTROLS.</b> These are department rules in addition to the		Only reference to track

	<p><b>SPS 363.0505</b></p>	<p>requirements in IECC section <del>505</del> C405:  (a) <i>General</i>. Except as provided in par. (b), daylight zones in any interior enclosed space greater than 250 square feet and a lighting density more than 0.6 W/ft<sup>2</sup> shall have at least one control that meets all of the following requirements:  1. Controls only luminaires in the daylight zones.  2. Controls at least 50% of the lamps or luminaires in the daylight zone, in a manner described in IECC section <del>505.2.2.4</del> C405.2.2.2.  (b) <i>Exceptions</i>. The requirements of this subsection do not apply to any of the following:  1. Daylight zones where the effective aperture of glazing is equal or less than 0.1 for vertical glazing and 0.01 for horizontal glazing.  2. Daylight zones where existing adjacent structures or natural objects obstruct daylight to the extent that effective use of daylighting is not feasible.  <del>(2) LINE-VOLTAGE LIGHTING TRACK AND PLUG-IN BUSWAY BUSWAY. Substitute the following for the requirements in IECC section 505.5.1.4 C405: The wattage of line-voltage lighting track and plug-in busway which allows the addition or relocation of luminaires without altering the wiring of the system shall be the volt-ampere rating of the branch circuit feeding the luminaires or an integral current limiter controlling the luminaires, or the higher of the maximum relamping rated wattage of all of the luminaires included in the system, listed on a permanent factory installed label, or 30 W/linear foot.</del></p>	<p>lighting in C405.4.1</p> <p>Renumber section accordingly if (2) is eliminated</p>
C405.2.2.3		<p>Modifies provisions related to daylight zones, which are areas likely to have sufficient sunlight for compliance with IBC minimum lighting requirements during the day</p>	
C405.2.2.3.2		<p>Adds requirements for automatic daylighting controls to give the user a choice between continuous dimming or stepped dimming</p>	
C405.2.3		<p>Adds additional specific application controls in addition to those for hotel sleeping rooms, and lighting equipment for sale or for lighting demonstrations by including:</p> <ul style="list-style-type: none"> <li>▪ display and accent lighting</li> <li>▪ lighting in cases used for display</li> <li>▪ supplemental task lighting</li> <li>▪ lighting for non-visual applications</li> </ul>	
C405.5.2		<p>Modifies the provisions by providing two methods of demonstrating compliance with the total interior lighting power allowance; the Building Area Method, and the Space by Space Method</p>	

Table C405.5.2.1		Modifies the Interior Lighting Power Allowances: Building Area Method by removing the additional power allowance for specific merchandizing categories and moves them to the Space by Space Method (Table C405.5.2(2))		
Table C405.5.2 (2)		Adds the Space by Space Method of compliance with Interior Lighting Power Allowance determination and includes the additional power allowance for specific merchandizing categories, which were formally only applicable to the Building Area Method of compliance		
C406		This section requires that one (1) efficiency option be met. The Dept. does not require the submittal of lighting plans, thus review is in question. Additionally, water service is addressed by the plumbing group, and not the building code group. Add language that requires that the specific efficiency project option chosen is clearly addressed on the building/HVAC plans, with appropriate justification of code compliance included. IECC 2015 has requirements that are not spelled out on submitted plans. Not able to track. No lighting submittal makes it difficult to track option selected.		50
C406.1		Adds a new section with additional efficiency package options; where the prescriptive compliance path is followed; at least one of these options is required in addition to all other code requirements; they are described in C406.2, C406.3, and C406.4		
C406.1		Direct COMcheck for use under prescriptive requirements instead of Total Building Performance so that the program may be used prescriptively with C406.1 -the additional efficiency requirements Failure to do so will require that bldg design will be required to meet the prescriptive requirement only. This allows for greater flexibility.		Creates code flexibility for design 102
	Renumber and amend SPS 363.0506	<del>SPS 363.0506</del> <b>SPS 363.0407. Total building performance.</b> This is a department informational note to be used under IECC section <del>506</del> C407: <b>Note:</b> COMCheck is a computer program that may be used only for determining building envelope or lighting compliance. The COMCheck computer program may be downloaded at: <a href="http://www.energycodes.gov/">http://www.energycodes.gov/</a> .		
C406.2		Adds an efficiency option to continue to use off site generated energy and to increase the		

		HVAC efficiency		
C406.3		Adds an efficiency option to use an efficient lighting system for the entire building as the additional energy efficiency package		
C406.4		Adds an efficiency option to provide on-site renewable energy that is equivalent to or greater than: 75 Btu or 0.50 watts per square foot of conditioned floor area, or three percent of the energy used in the building for non-process loads		
C407.3		Modifies performance based compliance methodology by keeping the requirements the same, but requiring buildings to achieve 15 percent greater energy efficiency, since C401.2 states that “ <i>The building energy cost shall be equal to or less than 85 percent of the standard reference design building</i> ”		
C408.1		Adds a section for building system commissioning which allows performance and efficiencies to be verified, giving a reasonable idea of how a well maintained building will perform		
C408.2		Adds requirements for the <b>registered design professional</b> to: <ul style="list-style-type: none"> <li>▪ provide evidence of commissioning and compliance</li> <li>▪ indicate provisions for commissioning and completion in construction documents</li> <li>▪ provide copies of documents to owner, and if requested, to code official</li> <li>▪ provide written commissioning plan</li> </ul>		
C408.2.2		Modifies requirements for balancing both air and hydronic systems in a manner intended to minimize throttling losses		
C408.2.3		Adds requirements for testing of mechanical equipment, controls, and economizers prior to a final inspection		
C408.2.4		Adds requirements for the registered design professional or approved agency to complete		

		and certify a preliminary report of the commissioning test procedures itemizing: <ul style="list-style-type: none"> <li>▪ uncorrected deficiencies</li> <li>▪ deferred tests</li> <li>▪ conditions for performing deferred tests</li> </ul>		
C408.2.5		Modifies documentation requirements by removing the mechanical contractor as the responsible party; and spelling out that documentation include: <ul style="list-style-type: none"> <li>▪ drawings</li> <li>▪ manuals</li> <li>▪ system balancing report</li> <li>▪ final commissioning report</li> </ul>		
C408.3		Adds functional lighting control testing as part of the commissioning process with the design professional responsible for identifying the party who will do the testing, the plan reviewer is responsible to see that the party is named, and the inspector has a contact to assure compliance prior to approving occupancy		
C403.2.4.2 (2015) 503.2.4.3 (2009)		ASHRAE 90.1 exempts radiant floor and ceiling heating systems from requiring setback controls because the mass/heat capacity of these building systems. This exception should be incorporated into the IECC because requiring the use of such setback controls is inappropriate for such systems. Add language exempting the need for setback controls for radiant floor & ceiling heating systems. Provides recognition of system limitations, and limited energy savings		32
C503.1 exc.7 C503.6		Two referenced sections list different percentages of luminaire replacement (ie. 50% vs 10%) Dept. to define which is to be applicable for code use		104
C600	SPS 363.0900 adds 1 NCMA standard and 4 ASTM standards, one of which is now also cited in the IECC			
	Renumber and amend: <b>SPS 363.0900</b>	<b>SPS 363.0900 SPS 363.0600 Referenced standards.</b> This is a department rule in addition to the requirements in IECC chapter 6 [CE]: The following standards are hereby incorporated by reference into this code: <b>(1) ASTM C177-04 C177-13, Test method for steady-state heat flux measurements and</b>		

		<p>thermal transmission properties by means of the guarded-hot-plate apparatus.</p> <p>(2) ASTM <del>C335-05</del> <u>C335/C335M-10e1</u>, Test method for steady state heat transfer properties of horizontal pipe insulation.</p> <p>(3) ASTM <del>C518-04</del> <u>C518-15</u>, Test Method for steady-state thermal transmission properties by means of the heat flow meter apparatus.</p> <p>(4) <del>ASTM C1363-05, Test method for thermal performance of materials and envelope assemblies by means of a hot box apparatus.</del></p> <p>(5) (4) National Concrete Masonry Association (NCMA) Evaluation Procedures of Integrally Insulated Concrete Masonry Walls, January 1, 1999.</p>	
<b>PART 3 - IECC - RESIDENTIAL ENERGY</b>			
CHAPTER R4 - RESIDENTIAL ENERGY EFFICIENCY			
	Renumber and amend: <b>SPS 363.0401</b>	<b>SPS 363.5401 Certificate.</b> The requirements in IECC section <del>401.3</del> <u>R401.3</u> are not included as part of this code.	
R402.1.1		<p>Section references both the IRC and IBC for vapor retarder requirements</p> <p>Reference to the IRC for vapor retarder requirements should be stricken since this code is applicable to commercial buildings only</p> <p>Clarifies that IBC 1405.3 is to be used.</p>	103
Table R402.1.1		Modifies the prescriptive insulation and fenestration requirements by component including requirements for continuous insulation at wood framed walls in Climate Zones 6 and 7	Renamed Table R402.1.2  !
Table R402.1.1		<p>Modifies the footnotes for the table including:</p> <ul style="list-style-type: none"> <li>▪ footnote <i>a</i> notes the reduction in R-value when batt insulation is compressed</li> <li>▪ footnote <i>b</i> allows the exclusion of certain skylights from some SGHC requirements</li> <li>▪ footnote <i>h</i> allows for consistent sheathing thickness while maintaining wall bracing</li> <li>▪ footnote <i>j</i> regarding impact rated fenestration has been eliminated</li> </ul>	Renamed Table R402.1.2
Table R402.1.3		Modifies the prescriptive Equivalent U-factor table, an alternative to the R-value table, R402.1.1	Renamed Table R402.1.4
R402.2.3		Adds requirements for eave baffles to maintain openings between soffit and eave vents and a vented attic space	
R402.2.6		Modifies the R-values significantly for steel	

		framed walls to account for the conduction properties of the steel		
R402.2.12, R402.3.5		Modifies requirements for sunrooms by clarifying the wall separation provision and making it clear that these provisions do not apply to spaces that are not thermally isolated; requires the wall separating the conditioned space and the thermally isolated sunroom to meet exterior wall criteria of IECC 2012		
R402.4.1		Modifies building thermal envelope provisions by requiring testing and visual inspection; the code official is authorized to require an approved third party to inspect and verify compliance		Administration issues
R402.4.1.2		Modifies air leakage provisions by requiring inspection and testing while increasing tightness requirements; in most cases mechanical ventilation will be required in houses to meet the air tightness requirements		
R402.4.2		Modifies the requirement for gasketed doors at fireplaces by moving it from the text of the code to table R402.4.1.1; and adds a requirement for tight fitting flue dampers		
	Renumber and amend: <b>SPS 363.0403</b>	<b>SPS 363.5403 Systems.</b> (1) ELECTRICAL POWER AND LIGHTING. This is a department rule in addition to the requirements in IECC section <del>403</del> R403: In residential buildings having individual dwelling units, provisions shall be made to determine the electrical energy consumed by each tenant by separately metering individual dwelling units. (2) DUCTS. Substitute the following wording for the requirements in IECC section <del>403.2.2</del> RR403.3.2: All ducts, air handlers, and filter boxes shall be sealed. Joints and seams shall comply with IMC section 603.9.		
R403.2	SPS 363 0403 (2) reads in part “all ducts, air handlers, and filter boxes shall be sealed, joints and seams shall comply with IMC section 603.9	Modifies requirements for duct construction and sealing by requiring joints and seams to comply with either the <i>International Mechanical Code (IMC)</i> or the <i>International Residential Code (IRC)</i> , which includes: <ul style="list-style-type: none"> <li>▪ SMACNA HVAC duct construction standards</li> <li>▪ NAIMA fibrous glass duct construction standards</li> </ul>		

		<ul style="list-style-type: none"> <li>▪ UL-181 listing for duct board construction</li> <li>▪ UL-181b listing for flexible construction</li> <li>▪ unlisted duct tape is prohibited</li> <li>▪ exception for certain longitudinal seams</li> </ul>		
R403.2		Modifies requirements for duct tightness and verification by compliance with provisions related to a post construction test and a rough-in test		
R403.3.1		Adds a requirement for protecting insulation exposed to the elements, but prohibits the utilization of adhesive tape as the protective measure		
R403.4		Modifies insulation requirements for service hot water systems by increasing the minimum R-value to R-3 and including a list of specific situations where insulation is required, detailed in table R403.4.2		
R403.5		Adds requirements for mechanical ventilation in any building that has less than five air changes per hour at 50 Pascals (5ACH/50)		(mandatory)
R403.5.1		Adds a simple efficiency requirement for various mechanical ventilation system fans in table R403.5.1		
R403.6		Modifies requirements for equipment sizing from a reference through the IRC to a direct reference requiring sizing of equipment per Air Conditioning Contractors of America (ACCA) Manual S based on loads calculated in accordance with ACCA Manual J or other approved method		(mandatory)
R403.9		Modifies requirements for pools by excluding temporary and above ground spas from the scope of the regulations, insulated pool covers are no longer required		(mandatory)
R403.10 (2015) 403.9.2 (2009)		<a href="#">This section requires that time switches be installed in pools. Rules issued by DHS mandate that pump operation occur continuously, 24 hrs/day, 365 days per year.</a>		<a href="#">Amend this section such that the requirements is eliminated</a> 85

R403.10.4 (2015) 403.9.3 (2009)	SPS 363.0504 (3)	<p>This section req's a pool cover be installed for pools located within low rise residential bldgs &lt; 3 stories above grade. SPS 363.0504(3) was created due to health issues from the field that chloramines would overwhelm people when the pool cover was removed, and cause them to go unconscious.</p> <p>Amend this section such that the req't for a pool cover is eliminated just as has been previously done to IECC 504.7.3</p>		86
R404.1		Modifies lighting equipment provisions by requiring that 75 percent of the lamps in permanently installed light fixtures contain only high efficacy lamps		(mandatory)
R405.3		Clarifies that the Commercial provisions require computer modeled performance 15 percent better than the standard reference design, the Residential provisions do not		
Table R405.5.2 (1)		Modifies the language of the table to clarify acceptable compliance methodology with the inclusion of technical details		
	Renumber and amend: <b>SPS 363.0405</b>	<b>SPS 363.5405 Calculation software tools.</b> This is a department informational note to be used under IECC section <del>405-6</del> <u>R405.6</u> :		
	Renumber and amend: <b>SPS 363.0405 Note:</b>	<p><b>SPS 363.5405 Note:</b> The federal Department of Energy has developed <b>REScheck™</b> <del>REScheck™</del>, a computer program that may be used in demonstrating compliance for a residential building which has no more than 3 stories above grade and has 3 or more dwelling units. The REScheck program may be downloaded at <a href="http://www.energycodes.gov/">http://www.energycodes.gov/</a>. <del>When using the program, the applicable code must be defined as the “2009 IECC.” The use of the “Wisconsin” option will apply requirements associated with a 1 or 2 family dwelling, which are more restrictive than those associated with low-rise multifamily buildings.</del> (new text)</p>		
405.6	363.0405	<p>RESCheck has multiple versions in use, for uniformity the dept recommends using the most recent version.</p> <p>363.0405 Calculation software tools. Add: The most recent version of REScheck shall be used when demonstrating code compliance.</p> <p>This will provide uniformity for reviewers, submitters and users of energy standard to all be consistent and current with energy requirements.</p> <p>As this is utilized in the design stage, there should be minimal impact to construction cost. Software is free download.</p>		Add to the Note: The most recent version of REScheck shall be used when demonstrating code compliance.

## Summary of Significant Changes to ANSI/ASHRAE STANDARD 90.10 Since 2007

Sections Affected	Description of Changes to ASHRAE 90.1 since 2007	Comments
<b>Chapter 4-Administration and Enforcement</b>		
4.2.4	Adds continuous air barriers to the list of required inspection items	
<b>Chapter 5-Building Envelope</b>		
5.1.2	Adds language clarifying that the new requirement for the addition of skylights to certain spaces also applies to unconditioned spaces	
5.1.3	Clarifies that storm window retrofits may be added either inside or outside existing windows and requires that storm windows have low-emissivity coating if the existing glazing is not low-E.	
5.4.3.1	Modifies provisions for sealing the building envelope by adding requirements for <b>design, installation, and materials</b> for the construction of a continuous air barrier for the entire building envelope	
5.4.3.2	Modifies air leakage criteria at fenestration and doors to more closely reflect current practice	
5.5.3.1	Modifies and expands the types of roofs shown by research to reduce the conduction loads through roofs into the conditioned space, allowing designers to select from a number of alternatives and reduce space loads, reducing energy use and cost	
5.5.3.4	Modifies the vestibule requirements for Climate Zone 4	NA
5.5.4.2.2	Adds skylight requirements in larger spaces with specific uses to promote daylighting energy savings, but Climate Zones 6-8 are exempt	NA
5.5.4.4.1	Adds a requirement that the minimum values for dynamic glazing be used to show compliance; in the envelope trade off rules found in Appendix C, the dynamic glazing must use the Standard values from C3.5 to show compliance; when dynamic glazing is used in the Appendix G models, the average values are to be used	
5.5.4.5	Adds a requirement that the area of south facing glass be equal to or larger than the area of east or west facing glass	
Tables 5.5.1 through 5.5.8	Modifies the building envelope requirements for opaque assemblies and fenestration in tables 5.5.1 through 5.5.8 and the associated text in section 5.5.4.5. It also updates NFRC 301 and modifies two metal building roof assemblies in Table A2.3. It increases insulation values for most opaque buildings.	

Sections Affected	Description of Changes to ASHRAE 90.1 since 2007	Comments
5.8.1.10	Adds a requirement for offsetting joints by staggering boards when multiple layers of insulation are used	
5.8.2	Adds Visible Transmittance (VT) to the list of rating and labeling requirements for fenestration products	
<b>Chapter 6-HVAC</b>		
6.4.1.1	Modifies the minimum equipment efficiencies tables by adding new equipment types and requiring compliance with the Standard for equipment used in buildings as defined by the new scope of the Standard	
6.4.1.2	Modifies provisions by introducing a new equation to adjust the performance of centrifugal chillers operating at non-standard conditions to show compliance with the Standard	
6.4.1.2.2	Modifies provisions related to positive displacement chillers that use glycol and other additives by requiring them to be tested with water at standard rating conditions	
6.4.2	Modifies heating and cooling load calculations by reference to ANSI/ASHRAE/ACCA Standard 183, <i>Peak Heating and Cooling Load Calculations in Buildings Except Low-Rise Residential Buildings</i> ; and requires pump head calculation for the critical circuit	
6.4.3.4.3	Modifies provisions to separate the requirements for exhaust/relief dampers from ventilation intake dampers	
6.4.3.4.5	Adds an allowance for a reduction in ventilation in unconditioned garages and requires an automatic control that is capable of staging fans or modulating fan volume as required to maintain carbon monoxide contaminant levels	
6.4.3.9	Adds control requirements for vestibules.	
6.4.3.10	2010 version added a requirement for variable air volume fan speed controls to be included in single zone units. 6.4.3.10 of the 2013 version of ASHRAE mandates Direct Digital Control for many systems.	
6.4.4.1.4	Adds a requirement for minimum insulation to be applied to the back of radiant heating panels	
6.4.4.1.5	Adds a requirement for minimum insulation to be applied to the bottom of radiant heated floors	
6.4.4.2.1	Modifies provisions regarding duct sealing to require ducts and plenums with pressure class ratings to be constructed to seal Class A, and provides a definition for the seal class	

Sections Affected	Description of Changes to ASHRAE 90.1 since 2007	Comments
6.4.5	Adds requirements for commercial refrigeration equipment, including a requirement for automatic closing doors minimum R-values of R-25 for coolers and R-32 for freezers, light source efficiencies, among other requirements.	
6.5.1	Modifies provisions so as to provide minimum fan cooling unit sizes for required economizers on computer rooms	
6.5.1	Modifies the economizer table, requiring economizers to be installed in all units with 54,000 Btu/h or more of cooling in all but Climate Zone 1	
6.5.1.2	Adds requirements for water economizers in computer rooms	
6.5.1.3	Modifies provisions by removing all exceptions from the requirement for integrated economizer control	
6.5.2.1	Adds a control strategy for VAV reheat boxes and eliminates some exceptions from the section	
6.5.2.1.1	Adds a provision limiting the heating air temperature of reheat boxes when the supply and return grilles are both six feet above the floor	
6.5.3.3	Adds a requirement to use ASHRAE 62.1, Appendix A, to optimize the ventilation efficiency and reduce the outside air amount used with room loads below design	
6.5.3.4	Adds a requirement for supply air temperature automatic reset controls for multiple zone HVAC systems	
6.5.3.5	Requires fan motors that are 1/12 hp or greater and less than 1 hp be electronically-commutated motors or have a minimum motor efficiency of 70% when rated in accordance with DOE 10 CFR 431.	
6.5.4.1	Modifies the pumping power requirements for HVAC systems	
6.5.4.4.2	Modifies provisions to include water cooled unitary air conditioners with hydronic heat pumps and require both to provide automatic valves that shut off when the compressor does, and provide variable speed pumps	
6.5.4.5	Adds requirements to use a standard table for sizing HVAC piping in order to control pump energy	
6.5.5.3	Adds requirements limiting the power used in open cooling towers with centrifugal fans	
6.5.6.1	Modifies provisions by increasing the requirement for air energy recovery in most climate zones	

Sections Affected	Description of Changes to ASHRAE 90.1 since 2007	Comments
6.5.7.1	Modifies provisions for kitchen exhaust systems by modifying make-up air requirements to prevent short circuiting, by establishing maximum net exhaust flow rates for exhaust hoods, and by requiring exhaust system performance testing	
6.5.7.2	Modifies the equation for designing laboratory exhaust systems by integrating the alternative paths of compliance to allow each system to contribute to the energy savings	
<b>Chapter 9-Lighting</b>		
9.1.2	Modifies the provisions to clarify that alterations to the lighting system must comply with all of the section 9 requirements	
9.1.3	Modifies details of the calculations needed to determine the installed exterior lighting power density requirements	
9.2.2.3	Adds two additional exceptions to the lighting types which are not to be included in the installed lighting power calculation	
9.4.1	<p>Modifies provisions by requiring bi-level lighting control and automatic shutdown in all buildings regardless of size, with exceptions:</p> <ul style="list-style-type: none"> <li>▪ public corridors and stairwells</li> <li>▪ restrooms</li> <li>▪ primary building entrance areas and lobbies</li> </ul> <p>areas where manual-on operation would endanger the safety or security of the room or building occupants</p>	
9.4.1.3	Modifies provisions for lighting control in garages by requiring bi-level lighting control and daylighting controls	
9.4.1.4	Adds a requirement for multilevel daylighting controls for areas adjacent to sidelights	
9.4.1.5	Adds a requirement for multilevel daylighting controls for areas lit by skylights	
9.4.1.6	Modifies provisions to exclude bathroom lighting from being controlled by the master switch required in hotel/motel guest rooms and adds new control requirements for the bathroom lighting	
9.4.1.6	Adds requirements for occupancy lighting controls in building stairwells to dim lighting after occupants leave	

Sections Affected	Description of Changes to ASHRAE 90.1 since 2007	Comments
9.4.1.7	Modifies provisions to require controls for exterior lights to turn off the lights under daylight conditions; older versions of the code merely required that the controls were provided	
9.4.2	Deletes requirements for tandem wiring of light fixtures because of improvements in ballast design	
9.4.3	Modifies provisions to apply a five zone lighting power density approach, each with its own base site allowance, and provide allowances for varying site use classifications in different exterior lighting zones	
9.4.4	Deletes the requirement for minimum efficacy of exterior lamps over 100 watts	
9.4.4	Adds a requirement for functional testing of lighting control devices and control systems	
9.5.1	Modifies the lighting power densities used with the building area method of lighting power allowance calculation	
9.6.1	Modifies the Standard to set the lighting power density by space function whether the function is separated by full height wall or not	
9.6.2	Modifies additional retail lighting provisions to reflect the use of modern lamp technology and adds a power allowance requirement to encourage the use of advanced lighting controls	
9.6.3	Adds an allowance for 20 percent more lighting power to be used in small rooms with high ceilings	
9.7	Adds provisions for submittals to the lighting section requiring the submittal of compliance documentation and supplemental information	Administrati on issues
<b>Other Changes</b>		
1 Purpose and Scope	Modifies the purpose and scope of the Standard by adding building operation and maintenance, on-site renewable energy systems, and commercial systems to those for which the Standard may develop requirements	

Sections Affected	Description of Changes to ASHRAE 90.1 since 2007	Comments
3.2	Modifies provisions by adding multiple definitions, mostly related to daylighting, including: <ul style="list-style-type: none"> <li>▪ Daylight area               <ul style="list-style-type: none"> <li>▪ Under skylights</li> <li>▪ Under rooftop monitors</li> </ul> </li> <li>▪ Daylighted area</li> <li>▪ Dynamic glazing</li> <li>▪ Fenestration, field fabricated</li> <li>▪ Multi-level occupancy sensor</li> <li>▪ Multi-scene control</li> <li>▪ Primary sidelighted area</li> <li>▪ Secondary sidelighted area</li> <li>▪ Sidelighting effective aperture</li> <li>▪ Toplighting</li> <li>▪ Vegetative roof system</li> </ul> Visible transmittance (VT)	
8.4.2	Adds a requirement for the installation of controls to turn off 50 percent of receptacles when the space is unoccupied	
10.4.2	Adds requirements addressing energy waste in service water pressure booster systems	
10.4.3	Modifies energy consumption in elevators by requiring more efficient lighting and fans and by requiring controls that turn the lighting and ventilation off when the elevators are not in use for an extended period of time	
Tables 10.8	Adds efficiency requirements for small electric motors.	

a. Published sources:

- 2009 *International Energy Conservation Code*<sup>®</sup> – International Code Council<sup>®</sup> (ICC)
- 2012 *International Energy Conservation Code* – International Code Council
- 2015 *International Energy Conservation Code* – International Code Council
- Significant Changes to the International Energy Conservation Code and ANSI/ASHRAE/IES Standard 90.1, IECC 2012 Edition, ANSI/ASHRAE/IES 2010 Edition* – International Code Council
- ANSI/ASHRAE Standard 90.1-2007* – American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
- ANSI/ASHRAE/IES Standard 90.1-2010* – American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
- ANSI/ASHRAE/IES Standard 90.1-2013* – American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
- ANSI/ASHRAE/IES 2010 TO 2013 Supplements Addenda to ANSI/ASHRAE/IES STANDARD 90.1-2010* – American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

b. Various ICC code section number references in SPS 363 will be updated where code section numbering has changed, but these modifications are not referenced here.

c. Changes that are not addressed because they do not apply in Wisconsin include the changes for most of chapter 1 Administration

d. Chapters SPS 361 and 363 of the *Wisconsin Administrative Code* (Register, December 2011)

Prepared by Dan Smith and Sandra Cleveland

*File Reference: SPS 363/Summary 2012 & 2015 IECC changes*



# 2015 IECC Update

The International Energy Conservation Code® (IECC®) is recognized as the national model energy code of choice for U.S. cities, counties and states that adopt codes. The IECC and its predecessor, the Model Energy Code (MEC), are cited throughout Federal law for national private and public housing initiatives.

The 2015 edition of the IECC is intended to provide flexibility to permit the use of innovative approaches and techniques. This is achieved by allowing the choice of a prescriptive or performance-based compliance path for both commercial and residential buildings.

## Goal

Participants will be able to use this document to identify changes from the 2012 IECC to the 2015 IECC, allowing them to apply these code requirements to the design, plan review, inspection and commissioning of both residential and commercial buildings.

## Objectives

Upon completion, participants will be better able to:

- Identify the most significant differences between the 2012 IECC and the 2015 IECC
- Explain the differences between the commercial and residential provisions
- Understand the choice of compliance paths
- Identify newly-regulated systems and components
- Identify the applicability of design, plan review, inspection and commissioning requirements

The 2015 edition has numerous changes that provide users of the Code considerably more compliance choices without trading energy efficiency. While there will be regional variability in the technology advances, a preliminary estimate from U.S. Department of Energy (DOE) suggests the 2015 IECC will at least as energy efficient as the 2012 edition [reference: PNNL-23438], which yielded a 32 percent energy savings over the 2006 IECC. Homes built to the IECC consume less energy, and families who live in those homes save energy costs.

The 2015 IECC contains two separate sets of provisions—one for commercial buildings and one for residential buildings. Each set is applied separately to buildings within its scope.

- The IECC—Residential Provisions are referenced as R before the section number. They apply to detached one- and two-family dwellings and multiple single-family dwellings, as well as Group R-2, R-3 and R-4 buildings, three stories or less in height.
- IECC—Commercial Provisions are referenced as C before the section number and apply to all others.

The Commercial and Residential Provisions are independent; and each contains the following chapters:

1. Scope and Administration
2. Definitions
3. Climate Zones and General Materials Requirements
4. Energy Efficiency Requirements (*applicable to buildings within its scope*)
5. Existing Buildings
6. Referenced Standards

**2015 IECC Table of Contents for both Residential and Commercial Provisions**

**TABLE OF CONTENTS**

<i>IECC—COMMERCIAL PROVISIONS. . . . C-1</i>	<i>IECC—RESIDENTIAL PROVISIONS. . . . R-1</i>
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CHAPTER 2 DEFINITIONS . . . . . C-7	CHAPTER 2 DEFINITIONS . . . . . R-7
CHAPTER 3 GENERAL REQUIREMENTS . . . . C-13	CHAPTER 3 GENERAL REQUIREMENTS . . . . R-11
CHAPTER 4 COMMERCIAL ENERGY EFFICIENCY . . . . . C-31	CHAPTER 4 RESIDENTIAL ENERGY EFFICIENCY . . . . . R-29
CHAPTER 5 EXISTING BUILDINGS . . . . . C-95	CHAPTER 5 EXISTING BUILDINGS . . . . . R-43
CHAPTER 6 REFERENCED STANDARDS . . . . C-99	CHAPTER 6 REFERENCED STANDARDS . . . . R-45

Chapters 1, 2 and 3 are nearly identical for the Commercial and Residential Provisions and have been marked as Section C and R accordingly. For the purpose of this document, they will be explained together, and the differences will be highlighted.

Chapter 4 of the Commercial and Residential Provisions contains the technical requirements for energy efficiency.

Chapter 5 of the Commercial and Residential Provisions contains requirements for existing building.

Chapter 6 of the Commercial and Residential Provisions contains the Referenced Standards.

The 2015 edition of the IECC remains fully compatible with all the International Codes® (I-Codes®) published by the International Code Council® (Code Council®).

Chapter 1: Scope and Administration			
Code Section		Section Title	Description of Change
2015	2012		
C103.2.1 R103.2.1	<b>NEW</b>	Building Thermal Envelope Depiction	Code now requires the building thermal envelope to be explicitly shown on the construction drawings.
C104.1 R104.4	<b>NEW</b>	Inspections - General	Improved and enhanced details governing inspection of construction. The provisions are more specific and written to relate to the Energy Code.
C104.2 R104.2	<b>NEW</b>	Required Inspections	
C104.3 R104.3	<b>NEW</b>	Reinspection	
C104.4 R104.4	<b>NEW</b>	Approved Inspection Agencies	

Chapter 3: General Requirements			
Code Section		Section Title	Description of Change
2015	2012		
C301.4 R301.4	<b>NEW</b>	Tropical Climate Zone	<p>New additional defined Climate Zone 1:</p> <ul style="list-style-type: none"> <li>• Area between the Tropic of Cancer &amp; Tropic of Capricorn</li> <li>• Recognizes the unusually constant and unique climate of this region</li> </ul>
<p>The map displays seven climate zones across the United States. Zone 1 (red) covers the southern United States, including Florida, Texas, and parts of the Gulf Coast. Zone 2 (orange) covers the Southeast and parts of the South. Zone 3 (yellow) covers the South and parts of the Midwest. Zone 4 (green) covers the West and parts of the Midwest. Zone 5 (light blue) covers the Midwest and parts of the Northeast. Zone 6 (dark blue) covers the Northeast and parts of the West. Zone 7 (purple) covers the northern United States. Two callout boxes provide specific details: one for Alaska (listing various boroughs) and one for Zone 1 (listing Hawaii, Guam, Puerto Rico, and the Virgin Islands).</p>			
R401.2.1	<b>NEW</b>	Tropical Zone Compliance	Unique compliance path for <i>residential occupancies</i> .

Chapter 3: General Requirements			
Code Section		Section Title	Description of Change
2015	2012		
C303.1.3 R303.1.3	<b>C303.1.3</b> <b>R303.1.3</b>	Fenestration Product Rating	<p>U-factors of fenestration products (windows, doors and skylights) shall be determined in accordance with NFRC 100.</p> <p>Allows ANSI/DASMA 105 to be used as a standard for determination of U-factors for garage doors</p> 
C303.1.4.1 R303.1.4.1	<b>NEW</b>	Insulated Siding	Requires R-value of insulated siding to be determined in accordance with ASTM C1363. Installation for testing shall be in accordance with the manufacturer's instructions.

Chapter 4: Energy Efficiency			
Code Section		Section Title	Description of Change
2015	2012		
Table C402.1.3	Table C402.2	Opaque thermal envelope insulation component minimum requirements, <i>R</i> -value methods	Minimum thermal performance increased for roof insulation entirely above deck in Climate Zones 1 – 5  Increased to be compatible with ASHRAE 90.1
R402.1.2	R402.1.1	Insulation and fenestration criteria	
Table C402.1.4	Table C402.1.2	Opaque thermal envelope insulation component minimum requirements, <i>U</i> -factor methods	
R402.1.4	R402.1.3	<i>U</i> -factor alternative	
C402.1.2	<b>New</b>	Equipment buildings	Exempt from envelope provisions: <ul style="list-style-type: none"> <li>• Separate buildings not more than 500 ft<sup>2</sup></li> <li>• Intended to house electronic equipment</li> <li>• Heating system capacity ≤ 17,000 Btu/hr</li> <li>• Thermostat set point restricted to ≤ 50°F</li> <li>• Have a maximum average wall and roof <i>U</i>-factor (0.2 or 0.12)</li> <li>• Roof provisions of Climate Zone 1</li> </ul>

Chapter 4: Energy Efficiency																																																		
Code Section		Section Title	Description of Change																																															
2015	2012																																																	
Table C402.1.4.1	<b>New</b>	Effective <i>R</i> -values for steel stud wall assemblies	Method to determine effective <i>R</i> -values for steel stud wall assemblies																																															
<p><b>TABLE C402.1.4.1</b>  <b>EFFECTIVE <i>R</i>-VALUES FOR STEEL STUD WALL ASSEMBLIES</b></p> <table border="1"> <thead> <tr> <th>NOMINAL STUD DEPTH (inches)</th> <th>SPACING OF FRAMING (inches)</th> <th>CAVITY <i>R</i>-VALUE (insulation)</th> <th>CORRECTION FACTOR (<math>F_c</math>)</th> <th>EFFECTIVE <i>R</i>-VALUE (ER) (Cavity <i>R</i>-Value <math>\times F_c</math>)</th> </tr> </thead> <tbody> <tr> <td rowspan="2">3½</td> <td rowspan="2">16</td> <td>13</td> <td>0.46</td> <td>5.98</td> </tr> <tr> <td>15</td> <td>0.43</td> <td>6.45</td> </tr> <tr> <td rowspan="2">3½</td> <td rowspan="2">24</td> <td>13</td> <td>0.55</td> <td>7.15</td> </tr> <tr> <td>15</td> <td>0.52</td> <td>7.80</td> </tr> <tr> <td rowspan="2">6</td> <td rowspan="2">16</td> <td>19</td> <td>0.37</td> <td>7.03</td> </tr> <tr> <td>21</td> <td>0.35</td> <td>7.35</td> </tr> <tr> <td rowspan="2">6</td> <td rowspan="2">24</td> <td>19</td> <td>0.45</td> <td>8.55</td> </tr> <tr> <td>21</td> <td>0.43</td> <td>9.03</td> </tr> <tr> <td rowspan="2">8</td> <td>16</td> <td>25</td> <td>0.31</td> <td>7.75</td> </tr> <tr> <td>24</td> <td>25</td> <td>0.38</td> <td>9.50</td> </tr> </tbody> </table>					NOMINAL STUD DEPTH (inches)	SPACING OF FRAMING (inches)	CAVITY <i>R</i> -VALUE (insulation)	CORRECTION FACTOR ( $F_c$ )	EFFECTIVE <i>R</i> -VALUE (ER) (Cavity <i>R</i> -Value $\times F_c$ )	3½	16	13	0.46	5.98	15	0.43	6.45	3½	24	13	0.55	7.15	15	0.52	7.80	6	16	19	0.37	7.03	21	0.35	7.35	6	24	19	0.45	8.55	21	0.43	9.03	8	16	25	0.31	7.75	24	25	0.38	9.50
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C402.1.5	<b>New</b>	Component performance alternative.	Alternative component performance path for commercial buildings allows trade-offs in building envelope																																															

<b>Chapter 4: Energy Efficiency</b>			
<b>Code Section</b>		<b>Section Title</b>	<b>Description of Change</b>
<b>2015</b>	<b>2012</b>		
R406	<b>New</b>	Energy rating index compliance alternative	ERI analysis requires that the rated design ERI be $\leq$ the appropriate value listed in Table R406.4

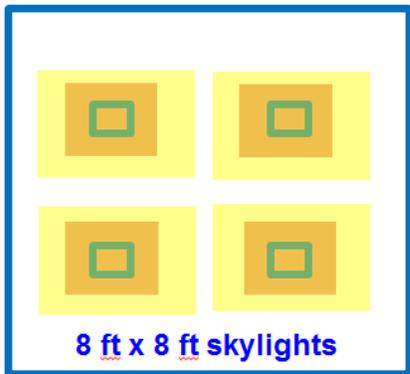
**TABLE R406.4  
MAXIMUM ENERGY RATING INDEX**

<b>CLIMATE ZONE</b>	<b>ENERGY RATING INDEX</b>
1	52
2	52
3	51
4	54
5	55
6	54
7	53
8	53

**Chapter 4: Energy Efficiency**

Code Section		Section Title	Description of Change
2015	2012		
C402.4	C402.3 & C402.3.3.1	Fenestration (Prescriptive)	Building Envelope Fenestration Maximum U-Factor and SHGC Requirements <ul style="list-style-type: none"> <li>Maximum SHGCs based on Projection Factors are folded back into the fenestration table (like 2009 IECC)</li> <li>North-facing fenestrations are allowed higher SHGCs</li> </ul>
C402.4.2	C402.3.2	Minimum skylight fenestration area.	Lowers the threshold for requiring a daylight zone in an enclosed space from 10,000 ft <sup>2</sup> to 2,500 ft <sup>2</sup>

100 ft x 100 ft space  
20 ft ceilings



2012 IECC

28 ft x 28 ft Daylight Zone

Daylight Zone:  
3,136 / 10,000 = 31%

2015 IECC

36 ft x 36 ft Daylight Zone

Daylight Zone:  
5,184 / 10,000 = 51%

**Chapter 4: Energy Efficiency**

Code Section		Section Title	Description of Change
2015	2012		
C402.4.1.1	C402.3.1.1	Increased vertical fenestration area with daylight responsive controls.	In Climate Zones 1-6, up to 40% permitted to be vertical fenestration area, provided: <ul style="list-style-type: none"> <li>• In buildings ≤ 2 stories above grade, ≥ 50 % floor area is within a daylight zone.</li> <li>• In buildings ≥ 3 stories above grade, ≥ 25% floor area is within a daylight zone.</li> <li>• Equipped with daylight responsive controls</li> <li>• VT ≥ 1.1 x SHGC</li> </ul>
<b>Deleted</b>	C402.3.3.2	Increased vertical fenestration SHGC	Removes an exception that allowed an increase in SHGC values in Climate Zones 1, 2, and 3
C402.4.3.3 R402.4.3.2	C402.4.3.3.5 <b>New</b>	Dynamic glazing	Requires a minimum ratio of 2.4 for the higher to lower SHGC rating of dynamic glazing UNLESS both the lower and higher labeled SHGCs comply
C402.5.3 R402.4.4	<b>New New</b>	Rooms containing fuel-burning appliances	Rooms containing fuel-burning appliances and their open-combustion air openings: <ul style="list-style-type: none"> <li>• In Climate Zones 3 - 8</li> <li>• To be isolated from remainder of building in accordance with envelope provisions</li> </ul>
C402.5.7	C402.4.7	Vestibules	New exception allows an air curtain tested in accordance with ANSI/AMCA 220 to be used instead of a vestibule
C403.2.4.4	<b>New</b>	Zone isolation	Requires zones served by HVAC systems over 25,000 square feet or more than one floor to be subdivided into isolation areas to control the HVAC system in each isolation area
C403.2.6.2	<b>New</b>	Enclosed parking garage ventilation controls	Ventilation optimization controls to modulate airflow

**Chapter 4: Energy Efficiency**

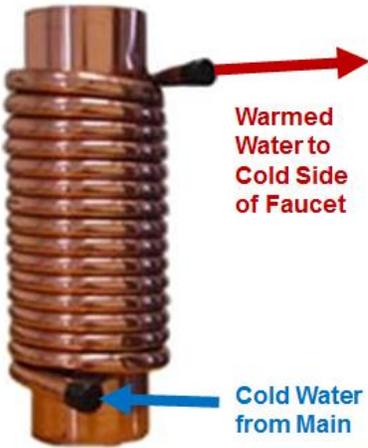
<b>Code Section</b>		<b>Section Title</b>	<b>Description of Change</b>
<b>2015</b>	<b>2012</b>		
C403.2.8	<b>New</b>	Kitchen exhaust systems	Regulates efficiency of kitchen exhaust systems: <ul style="list-style-type: none"> <li>• Replacement air</li> <li>• Maximum exhaust rates</li> </ul>
C403.2.14	<b>New</b>	Refrigeration equipment performance	Tables C403.2.14 (1) & (2): <ul style="list-style-type: none"> <li>• List the maximum energy use in kWh/day</li> <li>• Organized by equipment type, operating mode &amp; rating temperature</li> </ul>
C403.2.15 C403.2.16	<b>New</b>	Walk-in coolers, walk-in freezers, refrigerated warehouse coolers and refrigerated warehouse freezers	Requirements include: <ul style="list-style-type: none"> <li>• Door self-closures</li> <li>• Min. floor, wall &amp; ceiling insulation</li> <li>• Anti-sweat heaters and controls</li> <li>• Lighting efficiency</li> </ul>
C403.4.2.5	<b>New</b>	Boiler turndown	Turndown ratio for boilers with design input over 1,000,000 Btu/h.

**TABLE C403.4.2.5  
BOILER TURNDOWN**

<b>BOILER SYSTEM DESIGN INPUT (Btu/h)</b>	<b>MINIMUM TURNDOWN RATIO</b>
$\geq 1,000,000$ and less than or equal to 5,000,000	3 to 1
$> 5,000,000$ and less than or equal to 10,000,000	4 to 1
$> 10,000,000$	5 to 1

For SI: 1 British thermal unit per hour = 0.2931 W.

**Chapter 4: Energy Efficiency**

Code Section		Section Title	Description of Change
2015	2012		
C404.5 R404.5	<b>New</b>	Efficient heated water supply piping	<p>Maximum allowable pipe length method (Table C404.5.1):</p> <ul style="list-style-type: none"> <li>From the nearest source of heated water to termination of the fixture supply pipe</li> <li>2 columns: public lavatory faucets and all other fixtures</li> </ul> <p>Maximum allowable pipe volume method:</p> <ul style="list-style-type: none"> <li>Volume from the nearest source of heated water to the termination of the fixture supply pipe</li> <li>2 oz. public lavatory faucet, ½ gallon for other fixtures</li> </ul>
C404.8 R403.5.4	<b>New</b>	Drain water heat recovery units	<p>CSA B55.2 (commercial) Max 10 psi pressure loss (C404.8)</p> <p>CSA B55.1 (residential) Max 3 psi pressure loss (R403.5.4)</p> 
C405.9	<b>New</b>	Vertical and horizontal transportation systems and equipment	<ul style="list-style-type: none"> <li>Luminaires</li> <li>Ventilation fans</li> <li>Speed reduction</li> <li>Variable frequency regenerative drive</li> </ul>
C406	C406	Additional Efficiency Package Option	<ul style="list-style-type: none"> <li>More efficient HVAC performance</li> <li>Reduced lighting power density system</li> <li>Enhanced lighting controls</li> <li>On-site supply of renewable energy</li> <li>Provision of a dedicated outdoor air system for certain HVAC equipment</li> <li>High-efficiency service water heating</li> </ul>

**Chapter 4: Energy Efficiency**

Code Section		Section Title	Description of Change
2015	2012		
C408	C408	System Commissioning	<ul style="list-style-type: none"> <li>• Mechanical and service water report in separate sections to allow for independent review</li> <li>• Functional testing of lighting – requirements were broken up and expanded                             <ul style="list-style-type: none"> <li>▪ Construction documents specify performance criteria</li> <li>▪ O&amp;M manuals</li> <li>▪ Schedule for inspection &amp; recalibrating</li> </ul> </li> </ul>

**Summary**

- The format of the IECC slightly changed
- New regulated systems and components were added
- Additional compliance paths are allowed
- Requirements for some systems have been tightened
- Daylight zone dimensions have changed
- Thermal envelope provisions remain mostly unchanged

(This appendix is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objections on informative material are not offered the right to appeal at ASHRAE or ANSI.)

**INFORMATIVE APPENDIX F  
ADDENDA DESCRIPTION INFORMATION**

ASHRAE/IES Standard 90.1-2010 incorporates ANSI/ASHRAE/IESNA Standard 90.1-2007 all addenda to ANSI/ASHRAE/IESNA Standard 90.1-2007. The following table lists each addendum and describes the way in which the standard is affected by the change. It also lists the ASHRAE, IES, and ANSI approval dates for each addendum.

**TABLE F-1 Addenda to ANSI/ASHRAE/IES Standard 90.1-2010, Changes Identified**

Addendum	Section(s) Affected	Description of Changes*	ASHRAE Standards Committee Approval	ASHRAE BOD Approval	ASHRAE Approval	IES BOD Approval	ANSI Approval
a	6.8.1G	This addendum seeks to clarify that the current cooling tower requirements in the Standard apply to open-circuit cooling towers only.	6/23/2007	6/27/2007	6/27/2007	6/12/2007	7/25/2007
b	6.5.2.3	This addendum updates the references for outdoor ventilation rates.	6/23/2007	6/27/2007	6/27/2007	6/12/2007	7/25/2007
c	6.5.2.3	This addendum adds vivariums to the list of spaces that require specific humidity levels to satisfy process needs.	6/23/2007	6/27/2007	6/27/2007	6/12/2007	7/25/2007
d	5.5.4.4, 9.7	This addendum modifies the daylighting requirements to allow the use of photocontrols combined with skylighting to reduce the electricity used for lighting.	6/20/2009	6/24/2009	6/24/2009	6/15/2009	7/22/2009
e	6.5.6	This addendum modifies the requirements for Energy Recovery by expanding them to cover the use of energy recovery by weather zone	1/23/2010	1/27/2010	1/27/2010	1/20/2010	1/28/2010
f	5.5.3.1	This addendum sets requirements for high-albedo roofs	6/26/2010	6/30/2010	6/30/2010	6/23/2010	7/1/2010
g	Section 5, Normative Appendix A2.3	This addendum updates the building envelope criteria for metal buildings.	6/21/2008	6/25/2008	6/25/2008	6/30/2008	7/26/2008
h	6.5.2.1	This addendum adds a new exception that is geared toward zones with direct digital controls (DDC).	6/21/2008	6/25/2008	6/25/2008	6/30/2008	7/26/2008
i	9.4.5	This addendum applies a four-zone lighting power density approach to exterior lighting requirements.	6/21/2008	6/25/2008	6/25/2008	6/30/2008	7/26/2008
j	Section 12, Informative Appendix E	This addendum updates references in the Standard.	1/19/2008	1/23/2008	1/23/2008	1/28/2008	1/26/2008
k	Table 6.8.1E, Table 7.8	This addendum specifies specific sections of reference standards in Tables 6.8.1E and 7.8.	1/19/2008	1/23/2008	1/23/2008	1/28/2008	7/24/2008
l	Table 6.8.1G, Section 12	This Addendum adds minimum efficiency and certification requirements for both axial and centrifugal fan closed-circuit cooling towers (also known as fluid coolers) to Table 6.8.1G. In addition, a reference to ATC-105S, the Cooling Technology Institute test standard for closed-circuit cooling towers, has been added to Section 12, Normative References.	1/19/2008	1/23/2008	1/23/2008	1/28/2008	7/24/2008

TABLE F-1 Addenda to ANSI/ASHRAE/IES Standard 90.1-2010, Changes Identified

m	Section 6.4.1.2, Table 6.8.1C	This addendum establishes effective January 1, 2010, an additional path of compliance for water-cooled chillers and also combines all water-cooled positive displacement chillers into one category and adds a new size category for centrifugal chillers at or above 2110 kW.	10/12/2008	10/24/2008	10/10/2008	10/27/2008
n	6.4.3.10	This addendum extends variable air volume fan control requirements to large single-zone units.	6/21/2008	6/25/2008	6/30/2008	7/26/2008
o	8.1	This provides the necessary pressure credits for laboratory exhaust systems that allow prescriptive compliance of systems serving fume hoods.	6/20/2009	6/24/2009	6/15/2009	7/22/2009
p	6.5.3.1.1	This addendum addresses fan power limitations to all fan systems with exception to those serving fume hoods.	6/21/2008	6/25/2008	6/30/2008	7/26/2008
q	5.4.3.4	This addendum modifies the vestibule requirements for climate zone 4.	1/19/2008	1/23/2008	1/28/2008	7/24/2008
r	Appendix G	This changes Appendix G from an informative appendix to a normative appendix.	6/6/2009	6/24/2009	6/15/2009	6/23/2009
s	Table 6.8.1A, Table 6.8.1B	This addendum updates the COP at -8.3°C efficiency levels for commercial heat pumps and introduces a new part load energy efficiency descriptor for all commercial unitary products above 19 kW of cooling capacity.	10/12/2008	10/24/2008	10/10/2008	10/27/2008
t	6.4.1.5.2, Table 6.8.1D	This addendum removes the terms "replacement" and "new construction" from the product classes listed in Table 6.8.1D and replaces them with the terms "non-standard size" and "standard size," respectively, to clarify that one product class is intended for applications with non-standard size exterior wall openings while the other is intended for applications with standard size exterior wall openings. The addendum also amends Section 6.4.1.5.2 and footnote b to Table 6.8.1D to clarify that non-standard size packaged terminal equipment have sleeves with an external wall opening less than 46 cm high or less than 107 cm wide to reflect existing applications where the wall opening is not necessarily less than 46 cm high and less than 107 cm wide.	10/12/2008	10/24/2008	10/10/2008	10/27/2008
u	6.5.5.3	This addendum adds requirements for axial fan open-circuit cooling towers.	10/12/2008	10/24/2008	10/10/2008	10/27/2008
v	6.4.2	This modifies the requirements for axial fan open circuit cooling towers	1/24/2009	1/28/2009	1/26/2009	1/29/2009
w	Table G3.1.1A, Section G3.1.2.10	This addendum modifies requirements on exhaust air energy recovery for multifamily buildings in Appendix G.	10/12/2008	10/24/2008	10/10/2008	10/27/2008
x	9.4.1.1	This revision updates the requirements for automatic lighting shutoffs, adds specific occupancy sensor applications, and provides additional clarification.	6/20/2009	6/24/2009	6/15/2009	7/22/2009
y	Table 7.8, Section 12	This addendum establishes AHRI 1160 as the test procedure for heat pump pool heaters and that the minimum COP be met at the low outdoor temperature of 10°C.	6/21/2008	6/25/2008	6/30/2008	7/26/2008
aa	9.4.1	This change mandates that lighting controls have a "manual on" capability	6/20/2009	6/24/2009	6/15/2009	7/22/2009
ab	9.4.1	This change modifies skylighting and daylighting requirements from addendum "c" to 90.1-2007.	6/20/2009	6/24/2009	6/15/2009	7/22/2009
ac	9.1.4, 9.6.2	This addendum modifies requirements for controls in the following applications: personal and manual dimming, multi-scene, manual and automatic bi-level switching, day-lighting.	6/21/2008	6/25/2008	6/30/2008	7/24/2008

TABLE F-1 Addenda to ANSI/ASHRAE/IES Standard 90.1-2010, Changes Identified

ad	Table 6.8.1K, Section 6.4.1.4, Section 12	This addendum adds requirements for liquid to liquid heat exchangers and adds a reference to AARI 400-2008.	6/21/2008	6/25/2008	6/30/2008	7/24/2008
ae	6.4.4.1.4	This change adds requirements for radiant heating panels.	6/20/2009	6/24/2009	6/15/2009	7/22/2009
af	6.5.4.5	This change modifies the pipe sizing requirements.	1/24/2009	1/28/2009	1/26/2009	1/29/2009
ag	5.8.1.10	This adds a requirement for joint insulation overlap.	6/6/2009	6/24/2009	6/15/2009	6/25/2009
ai	G3.1.1.3	This clarifies how distribution pump energy is to be addressed when using purchased heat or purchased chilled water.	6/6/2009	6/24/2009	6/15/2009	6/25/2009
aj	10.4.1	This update the test and table of Chapter 10 to comply with the new federal law. Since the new law and the new version of ASHRAE 90.1 will both occur in 2010, this change will ensure that there is no confusion about the new energy efficiency standards for motors that are manufactured in 2010 and beyond.	6/6/2009	6/24/2009	6/15/2009	6/25/2009
ak	6.5.4	This modifies requirements for Heat Pump and Water-Cooled Unitary Air-Conditioners, Differential Pressure Reset, fan power limitations, chilled water cooling, and deletion of 10 HP from Section 6.5.4	6/6/2009	6/24/2009	6/15/2009	6/25/2009
al	5.5.4.2.3,	This adds <i>skylight</i> requirements in certain <i>space</i> types to promote daylighting energy savings.	6/26/2010	6/30/2010	6/23/2010	7/1/2010
am	5.4.3.2	The intent of this addendum is to revise air leakage criteria so they more closely reflect current practice.	6/26/2010	6/30/2010	6/23/2010	7/1/2010
an	Appendix A2.4	This expand the table of default <i>U-Factors</i> for single digit rafter roofs.	1/24/2009	1/28/2009	1/26/2009	1/29/2009
ao	Table 6.8.1E	This corrects errors in Table 6.8.1E, re-orders footnotes, and changes one <i>efficiency</i> .	1/24/2009	1/28/2009	1/26/2009	1/29/2009
ap	6.3.2	This modifies the requirements for <i>Demand Control Ventilation</i> (DCV).	1/24/2009	1/28/2009	1/26/2009	1/29/2009
aq	1. Purpose, 2. Scope	This addendum modifies the Purpose and expands the scope so the standard may regulate <i>process loads</i>	6/26/2010	6/30/2010	6/23/2010	7/1/2010
ar	9.1.3, 9.4.5	This addendum adds exterior lighting power requirements.	1/23/2010	1/27/2010	1/20/2010	1/24/2010
as	6.5.2.1	This addendum adds lab exhaust requirements.	1/23/2010	1/27/2010	1/20/2010	1/28/2010
at	6.4.3.4	This change modifies the exhaust air damper requirements in 90.1	6/20/2009	6/24/2009	6/15/2009	7/22/2009
au	6.3.2	This change modifies the economizer requirements in Standard 90.1.	6/20/2009	6/24/2009	6/15/2009	7/22/2009
av	9.1.2.1	This modifies the requirements of section 9.1.2 Lighting Alterations and replaces the previous public review draft of addendum "av" in its entirety.	1/23/2010	1/27/2010	1/20/2010	1/24/2010
aw	9.4.1.4	This change recognizes the practical design application of excluding bathroom lighting from "master" switch control in hotel/motel guest rooms and adds a requirement to eliminate wasted light in guest room bathrooms.	1/19/2008	1/23/2008	1/28/2008	7/26/2008
ax	6.5.7.1	This modifies requirements for kitchen exhaust.	6/26/2010	6/30/2010	6/23/2010	7/1/2010

TABLE F-1 Addenda to ANSI/ASHRAE/IES Standard 90.1-2010, Changes Identified

ay	9.6.1	This change more correctly requires users to identify <i>spaces</i> by function and is consistent with a previous interpretation. It is expected that the net <i>energy</i> result will be positive.	6/6/2009	6/24/2009	6/15/2009	6/25/2009
az	9.4.6	Lighting <i>controls</i> must be functionally tested to ensure their proper use and appropriate <i>energy</i> savings. This addendum provides requirements for those tests.	1/23/2010	1/27/2010	1/20/2010	1/28/2010
ba	6.8.3	This is a <i>system</i> performance option that allows compensating for the insulating value of the piping while maintaining the same net thermal requirements.	6/20/2009	6/24/2009	6/15/2009	7/22/2009
bc	5.1.2.2	This clarifies that the requirements in Section 5.4.2.3 are also specified for <i>unconditioned spaces</i> .	6/6/2009	6/24/2009	6/15/2009	6/25/2009
bd	8.4.1	This addendum removes emergency circuits not used for normal building operation from the requirements which will lead to increased compliance.	6/6/2009	6/24/2009	6/15/2009	6/25/2009
bf	5.4.3.1	This provides performance requirements for air leakage of the <i>opaque</i> envelope.	6/26/2010	6/30/2010	6/23/2010	7/1/2010
bg	Table 6.8.1B	This provides requirements for water-to-water heat pumps	1/23/2010	1/27/2010	1/20/2010	1/28/2010
bh	6.5.3.3	This provides requirements for multiple zone <i>HVAC</i> systems (that include simultaneous heating and cooling) to include <i>controls</i> that automatically raise the supply-air temperature when the <i>spaces</i> served are not at peak load conditions.	1/23/2010	1/27/2010	1/20/2010	1/28/2010
bi	6.4.4.1.3	This provides updated requirements for pipe insulation.	6/26/2010	6/30/2010	6/23/2010	7/1/2010
bj	G3.1.2.5	This adds an exception within Appendix G that allows users to claim <i>energy</i> cost savings credit for the increased <i>ventilation</i> effectiveness of certain <i>HVAC</i> system designs.	1/23/2010	1/27/2010	1/20/2010	1/28/2010
bk	10.4.1	This language distinguishes Subtype I and Subtype II motors. Addendum "aj" to ASHRAE Standard 90.1-2007 first incorporated these changes into Standard 90.1. This proposed language has different minimum <i>efficiency</i> requirements as called out in EISA 2007, Section 313 and clarified in the Federal Register.	1/23/2010	1/27/2010	1/20/2010	1/28/2010
bl	6.4.1.2.1	This adds requirements for chillers with secondary coolants (glycol or brine). In additions, there are changes to footnote a to Table 6.8.1C in recognition of lower practical scope limits for positive displacement (both air- and water-cooled) and corrects for the lower limit introduced in Addendum M for centrifugal chillers.	1/23/2010	1/27/2010	1/20/2010	1/28/2010
bmi	3.3	The intent of this addendum is to coordinate terminology for <i>visible transmittance</i> with NFRC 200	1/23/2010	1/27/2010	1/20/2010	1/28/2010
bn	5.5.4.5	This limits poorly oriented <i>fenestration</i> . Compliance can be shown by having more south facing <i>fenestration</i> than west facing <i>fenestration</i> . For those buildings affected by this requirement, this reduces envelope loads, <i>energy</i> usage and thereby costs	6/26/2010	6/30/2010	6/23/2010	7/1/2010
bo	11.3.2, G3.1.2.1	This is part of an ongoing effort to keep the requirements of Section 11 and Appendix G consistent with other addenda to the Standard. This addendum makes changes to Section 11 and G related to Addenda e, s, and u.	1/23/2010	1/27/2010	1/20/2010	1/28/2010
bp	9.4.1	This allows the use of <i>control</i> that provides <i>automatic</i> 50% auto on with the capability to manually activate the remaining 50% and has full auto-off.	1/23/2010	1/27/2010	1/20/2010	1/24/2010

TABLE F-1 Addenda to ANSI/ASHRAE/IES Standard 90.1-2010, Changes Identified

bq	9.6.2	This changes the requirements for retail <i>space</i> lighting which will make use of more recent <i>lamp</i> technology that is readily available.	1/23/2010	1/27/2010	1/20/2010	1/28/2010
br	9.4.5	This adds an exterior zone 0 to cover very low light requirement areas	1/23/2010	1/27/2010	1/20/2010	1/28/2010
bs	8.4.2	This new requirement will provide the means for non-critical receptacle loads to be automatically controlled (turned off) based on occupancy or scheduling without additional individual desk top or similar controllers.	6/26/2010	6/30/2010	6/23/2010	7/1/2010
bt	6.4.1.2	This addendum modifies centrifugal chiller adjustment factor for nonstandard conditions.	6/26/2010	6/30/2010	6/23/2010	7/1/2010
bu	6.4.1.1, 6.5.1, Table 6.8.1H	This addendum adds <i>efficiency</i> requirements to <i>HVAC</i> systems dedicated to computer rooms and data centers.	7/20/2010	7/23/2010	7/24/2010	7/26/2010
bv	G3.1.2.9	The addendum makes Appendix G of Standard 90.1 consistent with addenda ej, bk, and ax.	1/23/2010	1/27/2010	1/20/2010	1/28/2010
bw	Table 6.8.1D	The addendum modifies <i>efficiency</i> requirements for <i>packaged terminal air conditioner</i> (PTAC).	1/23/2010	1/27/2010	1/20/2010	1/28/2010
bx	6.5.2.1	This addendum modifies VAV reheat requirements.	6/26/2010	6/30/2010	6/23/2010	7/1/2010
by	9.6.2, Table 9.5.1	This proposes new Lighting Power Densities for both the whole building and space-by-space compliance methods. In addition, the <i>Lighting Power Density</i> may be recalculated based on room geometry.	6/26/2010	6/30/2010	6/23/2010	7/1/2010
ca	6.5.3.1.1	This change closes a loophole in the fan power allowances for <i>Variable Air Volume</i> (VAV) systems. Standard VAV systems are multi-zone systems with terminal units containing <i>control</i> dampers to vary airflow to individual zone	6/26/2010	6/30/2010	6/23/2010	7/1/2010
cb	6.3.2, 6.4.3.4.2	This addendum includes a number of changes to require simple systems to meet prescriptive <i>outdoor air</i> damper requirements, allow backdraft dampers only for exhaust and relief dampers in buildings less than three stories in height, require backdraft dampers on <i>outdoor air</i> intakes to be protected from wind limiting wind blown infiltration through the damper.	6/26/2010	6/30/2010	6/23/2010	7/1/2010
cc	Table 6.5.4.5	This addendum fixes a mistake in the way 200 mm pipe was analyzed. RS Means data for threaded pipe was used for 8" when welded pipe data should have been used. It also includes a minor editorial change since it is not possible to operate more than 8760 hrs/yr	6/26/2010	6/30/2010	6/23/2010	7/1/2010
cd	9.4	These additions 1) strengthen the language to actually require exterior <i>control</i> rather than just require the <i>control</i> capability; 2) add bi-level <i>control</i> for general all-night applications such as parking lots to reduce lighting when not needed; 3) add <i>control</i> for façade and landscaping lighting not needed after midnight	7/20/2010	7/23/2010	7/24/2010	7/26/2010
ce	9.4.1.2	This additional <i>control</i> requires that all <i>spaces</i> (unless exempted) have multilevel <i>control</i> capability (also commonly known as bi-level switching).	6/26/2010	6/30/2010	6/23/2010	7/1/2010

TABLE F-1 Addenda to ANSI/ASHRAE/IES Standard 90.1-2010, Changes Identified

cf	9.4.1.4	Stairwell lighting represents the "Emergence Egress Light Level" with stairwell occupancy. However the occupancy percentage of a stairwell is only 10%, thus offering savings. Various case studies and demonstrations have shown significant energy savings for this strategy.	7/20/2010	7/23/2010	7/24/2010	7/26/2010
ch	11.3.2, G3.1.1	This addendum makes Appendix G and Section 11 consistent with requirements approved in Addenda h (dual minimum controls) and as (lab exhaust)	6/26/2010	6/30/2010	6/23/2010	7/1/2010
ck	6.5.3	This addendum expands zone level demand controlled ventilation to include various forms of system level strategies.	7/20/2010	7/23/2010	7/24/2010	7/26/2010
cl	5.5.4.4.2, Appendix C	The proposed text would clarify how to interpret the use of dynamic glazing products that are designed to be able to vary a performance property such as SHGC, rather than having just a single value.	6/26/2010	6/30/2010	6/23/2010	7/1/2010
cn	Table 9.6.2	This change adds two versions of a combined advanced control to the control incentives table. These control system combinations involve personal workstation control and workstation-specific occupancy sensors for open office applications. The control incentive will apply only to the particular controls when they are applied in open office areas.	7/20/2010	7/23/2010	7/24/2010	7/26/2010
co	Table 6.8.1A	This proposal makes three major amendments to Table 6.8.1A. First, it updates EER and IEER values for all condensing units and water and evaporatively cooled air conditioners with cooling capacities greater than 19 kW. Second, the proposal establishes a separate product class for evaporatively cooled air conditioners with different energy efficiency standards. Third, the proposal replaces the IPLV descriptor for condensing units with the new IEER metric and amends the EERs with more stringent values.	7/20/2010	7/23/2010	7/24/2010	7/26/2010
cp	6.4.1.1, Table 6.8.1I	This proposal establishes, for the first time in ASHRAE 90.1, efficiency requirements for VRF air conditioners and heat pumps, including heat pumps that use a water source for heat rejection.	6/26/2010	6/30/2010	6/23/2010	7/1/2010
cq	6.4.4.2	This addendum modifies the duct sealing requirements in ANSI/ASHRAE/IESNA Standard 90.1-2007.	7/20/2010	7/23/2010	7/24/2010	7/26/2010
cr	Table 11.3.1, Appendix G	The definition for an unmet load hour is currently lacking a throttling range or limit to the setpoint. It was decided that the baseline and proposed shall have the same thermostat throttling range. This required additional language in the unmet load hour definition as to how throttling range effects determination of an unmet hour along with additional language in Table 11.3.1 and Table G3.1, Design Model sections.	6/26/2010	6/30/2010	6/23/2010	7/1/2010
cs	8.4.2	This change originated with a continuous maintenance proposal to address information received on addendum bs on receptacles after the public review period closed and which the committee found to have merit.	6/26/2010	6/30/2010	6/23/2010	7/1/2010
ct	9.4.1.3	This addendum sets controls for the "night lights" that are part of the emergency system when there are no occupants in the space. This has definite energy savings and is not prohibited by the electrical codes.	7/20/2010	7/23/2010	7/24/2010	7/26/2010
cv	10.4.2	This addendum adds energy efficiency requirements for service water pressure booster systems.	7/20/2010	7/23/2010	7/24/2010	7/26/2010

TABLE F-1 Addenda to ANSI/ASHRAE/IES Standard 90.1-2010, Changes Identified

cw	11.3.1	These changes address corrections and clarifications necessary to Section 11, Table 11.3.1 and Section 11 <i>Service Hot Water Systems</i> .	6/26/2010	6/30/2010	6/23/2010	7/1/2010	
cy	6.5.1	This addendum makes several revisions to the economizer requirements in Section 6.5.1 and in Section 6.3.2. With increased envelope insulation levels and higher internal plug loads we are seeing commercial buildings operating in cooling at lower ambient temperatures. This allows for greater air and <i>water economizers</i> to be used instead of <i>mechanical cooling</i> .	7/20/2010	7/23/2010	7/24/2010	7/26/2010	
cz	9.4.1.3	This change incorporates bi-level <i>control</i> for parking garages to reduce the wasted <i>energy</i> associated with unoccupied periods for many garages AND allows an exception for lighting in the transition (entrance/exit) areas to accommodate IES recommendations.	6/26/2010	6/30/2010	6/23/2010	7/1/2010	
da	G3.1.2.5	The intent of this addendum is to establish that an Appendix G baseline shall be based on the minimum <i>ventilation</i> requirements required by local codes or a rating authority and not the <i>proposed design ventilation</i> rates.	6/26/2010	6/30/2010	6/23/2010	7/1/2010	
db	G3.1.2	This addendum modifies the fan power requirements in the <i>energy cost budget</i> section.	7/20/2010	7/23/2010	7/24/2010	7/26/2010	
dc	9.4.2	The conditions and common practice that existed to create the need for this requirement on tandem wiring are no longer practiced primarily with the new <i>Federal efficacy</i> requirements and products available on the market	6/26/2010	6/30/2010	6/23/2010	7/1/2010	
dd	5.5.4.2.3	This addendum modifies the VAV fan power limitation requirements.	7/20/2010	7/23/2010	7/24/2010	7/26/2010	
de	Table 9.6.1	This addendum lowers the Lighting Power Densities in 90.1 to reflect advances in lighting technology.	7/20/2010	7/23/2010	7/24/2010	7/26/2010	
df	10.4.3	This addendum sets requirements elevator <i>ventilation</i> and lighting, which have been unregulated, regardless of occupancy.	7/20/2010	7/23/2010	7/24/2010	7/26/2010	
dg	Table G3.1	This addendum adds a definition for the term field fabricated used in Section 5.4.3.2, which is similar to the definition in CA Title 24	7/20/2010	7/23/2010	7/24/2010	7/26/2010	
di	6.4.3.4.6	This addendum allows for a reduction in <i>ventilation</i> in uncontaminated garages	7/20/2010	7/23/2010	7/24/2010	7/26/2010	
dj	Table 6.5.3.1.1B	This addendum provides limits on the pressure drop of <i>energy</i> recovery devices.	7/20/2010	7/23/2010	7/24/2010	7/26/2010	
dk	Appendix C	This addendum makes 90.1-2010 consistent with changes made in addenda a, bc, and bd.	7/20/2010	7/23/2010	7/24/2010	7/26/2010	
dl	Appendix C	This addendum gives instruction to the users of Appendix C on how to model the base envelope design and the proposed envelope design in complying with the cool roof provisions in Section 5.	7/20/2010	7/23/2010	7/24/2010	7/26/2010	
du	G3.1.1	This addendum modifies the efficiencies for <i>variable refrigerant flow</i> equipment	7/20/2010	7/23/2010	7/24/2010	7/26/2010	
do	9.7	This addendum attempts to clearly establish the goals and requirements of the <i>lighting system</i> including <i>controls</i> and to ensure that the owner is provided all information necessary to best use and maintain the <i>lighting systems</i>	7/20/2010	7/23/2010	7/24/2010	7/26/2010	

TABLE F-1 Addenda to ANSI/ASHRAE/IES Standard 90.1-2010, Changes Identified

dp	Section 12	This addendum updates the references in Standard 90.1. While these changes reflect the current edition of the cited standard it should be noted that substantive changes in the referenced documents did not affect the requirements in 90.1 or change the stringency of the requirements of 90.1.	7/20/2010	7/23/2010	7/24/2010	7/26/2010
dq	Appendix C	This addendum modifies the calculations found in Appendix C in order to reflect modifications to the modeling assumptions in the equations.	7/20/2010	7/23/2010	7/24/2010	7/26/2010
dr	9.4.4	The original purpose for this provision was to limit the use of inefficient lighting sources for high wattage applications when there was not a comprehensive table of exterior LPD limits. With the table of requirements now in the 2007 and beyond versions of the standard, the need for this limit is superseded.	7/20/2010	7/23/2010	7/24/2010	7/26/2010

(This appendix is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objections on informative material are not offered the right to appeal at ASHRAE or ANSI.)

## INFORMATIVE APPENDIX F ADDENDA DESCRIPTION INFORMATION

ANSI/ASHRAE/IES Standard 90.1-2013 incorporates all addenda to ANSI/ASHRAE/IES Standard 90.1-2010. The following table lists each addendum and describes the way in which the standard is affected by the change. It also lists the ASHRAE, IES, and ANSI approval dates for each addendum.

TABLE F-1 Addenda to ANSI/ASHRAE/IES Standard 90.1-2010

Addendum	Section(s) Affected	Description of Changes*	ASHRAE Standards Committee Approval	ASHRAE BOD Approval	IES BOD Approval	ANSI Approval
bb (formerly Addendum bb to 90.1-2007)	5. Building Envelope; Appendix A	This addendum modifies the building envelope requirements for opaque assemblies and fenestration in tables 5.5.1 through 5.5.8 and the associated text in section 5.5.4.5. It also updates the NFRC 301 reference and modifies two metal building roof assemblies in Table A2.3.	3/23/2012	4/4/2012	3/23/2012	5/11/2012
bz (formerly Addendum bz to 90.1-2007)	6. Heating, Ventilating, and Air Conditioning	This addendum adds a Section 8.4.2 which specifies requirements for installation of basic electrical metering of major end uses (total electrical energy, HVAC Systems, interior lighting, exterior lighting and receptacle circuits) to provide basic reporting of energy consumption data to building occupant.	1/21/2012	1/23/2012	1/18/2012	1/26/2012
eg (formerly Addendum eg to 90.1-2007)	11. Energy Cost Budget; Appendix G	This addendum modifies the simulation requirements for modeling mandatory automatic daylighting controls as well as automatic lighting controls. It also modifies the simulation requirements for automatic lighting controls in the proposed design, beyond the minimum mandatory requirements. Table G3.2 which provided power adjustment percentages for automatic lighting controls has been deleted and savings through automatic control devices are now required to be modeled in building simulation through schedule adjustments for the proposed design.	1/21/2012	1/23/2012	1/18/2012	1/26/2012
ci (formerly Addendum ci to 90.1-2007)	3. Definitions; 11. Energy Cost Budget; Appendix G	This addendum modifies requirements for the cooling tower in Chapter 11, from two-speed to variable speed. A formula has been specified to calculate the condenser water design supply temperature. Similar revisions have been made to Appendix G for the cooling tower requirements. Definitions for cooling design wet-bulb temperature and heating design wet-bulb temperature have been added to Chapter 3.	1/21/2012	1/23/2012	1/18/2012	1/26/2012
cj (formerly Addendum cj to 90.1-2007)	Appendix G	Creates modeling rules for computer rooms in Appendix G	6/26/2012	6/26/2013	6/28/2013	7/24/2013

\*These descriptions may not be complete and are provided for information only.

TABLE F-1 Addenda to ANSI/ASHRAE/IES Standard 90.1-2010 (Continued)

Addendum	Section(s) Affected	Description of Changes*	ASHRAE Standards Committee Approval	ASHRAE BOD Approval	IES BOD Approval	ANSI Approval
cm (formerly Addendum cm to 90.1-2007)	5. Building Envelope	The proposed text clarifies how to interpret the use of dynamic glazing products given the requirements in Addendum bb (envelope requirements).	7/20/2010	7/23/2010	7/24/2010	7/26/2010
dm (previously from 2007)	5. Building Envelope	This addenda modifies section 5.4.3.4. for vestibules. It adds a size limit for large buildings, exemptions for semi heated spaces and elevator lobbies in parking garages	1/26/2013	1/29/2013	2/1/2013	2/12/2013
ds (formerly Addendum ds to 90.1-2007)	5. Building Envelope	This addendum corrects the definitions of primary sidelighted area, secondary sidelighted area, and sidelighting effective area to use the term "vertical fenestration" instead of "window" to clarify that glazed doors and other fenestration products are included as well as windows. Additionally, the definition of daylight area under rooftop monitors is corrected to include the spread of light beyond the width of the rooftop monitor glazing.	1/21/2012	1/23/2012	1/18/2012	1/26/2012
a	10. Other Equipment; 12. Normative References	This addendum specifies that nominal efficiencies for motors are required to be established in accordance with DOE 10 CFR 431 instead of NEMA Standards. It modifies the footnotes to Tables 10.8A, 10.8B, 10.8 C. The corresponding reference for 10 CFR 431 has also been added.	1/21/2012	1/23/2012	1/18/2012	1/26/2012
b	10. Other Equipment 12. Normative References	This addendum requires escalators and moving walks to automatically slow when not conveying passengers. The corresponding reference to ASME A17.1/CSA B44 has also been added to the Normative References.	6/25/2011	6/29/2011	6/30/2011	6/30/2011
c	Appendix G	This addendum adds requirements for laboratory exhaust fans to section G3.1.1.1, Baseline HVAC System Type and Definition. Lab exhaust fans are required to be modeled as constant horsepower, reflecting constant volume stack discharge with outside air bypass.	6/25/2011	6/29/2011	6/30/2011	6/30/2011
e	Appendix G	This addendum updates language in Section G3.1, part 5 'Building Envelope', to require that existing buildings use the same envelope baseline as new buildings with the exception of fenestration area.	6/27/2012	6/27/2012	6/18/2012	7/26/2012
f	Appendix G	This addendum modifies Section G.3.1, Building Envelope. It specifies the vertical fenestration area for calculating baseline building performance for new buildings and additions.	6/26/2013	6/26/2013	6/28/2013	7/24/2013
g	6. Heating, Ventilating, and Air Conditioning; 12. Normative References	This addendum adds efficiency requirements for commercial refrigerators, freezers and refrigeration equipment. Table 6.8.1L and Table 6.8.1M have been added which specify the energy use limits for refrigerators and freezers. The corresponding references have also been added in Chapter 12.	6/25/2011	6/29/2011	6/30/2011	6/30/2011

\*These descriptions may not be complete and are provided for information only.

TABLE F-1 Addenda to ANSI/ASHRAE/IES Standard 90.1-2010 (Continued)

Addendum	Section(s) Affected	Description of Changes*	ASHRAE Standards Committee Approval	ASHRAE BOD Approval	IES BOD Approval	ANSI Approval
h	6. Heating, Ventilating, and Air Conditioning	This addendum modifies the minimum efficiency standards for water to air heat pumps (water loop, ground water and ground loop). The proposed cooling EERs and heating COPs are more stringent than the present values. This addendum also removes the small duct high velocity product class from Table 6.8.1B.	6/25/2011	6/29/2011	6/30/2011	6/30/2011
i	6. Heating, Ventilating, and Air Conditioning	This addendum increases the minimum efficiency standards for SPVAC and SPVHP. It also creates a new product class for SPVAC and SPVHP used in space constrained applications. This new product class only applies to non-weatherized products with cooling capacities <36,000 Btu/h and intended to replace an existing AC.	1/26/2013	1/29/2013	2/11/2013	2/12/2013
j	6. Heating, Ventilating, and Air Conditioning	This addendum modifies notes to Table 8.1 and specifies that nominal efficiencies would be established in accordance with the 10 CFR 431 test procedure for low voltage dry-type transformers. The corresponding references have also been added in Chapter 12.	6/25/2011	6/29/2011	6/30/2011	6/30/2011
k	8. Power; 12. Normative References	This addendum modifies notes to Table 8.1 and specifies that nominal efficiencies would be established in accordance with the 10 CFR 431 test procedure for low voltage dry-type transformers. The corresponding references have also been added in Chapter 12.	6/25/2011	6/29/2011	6/30/2011	6/30/2011
l	6. Heating, Ventilating, and Air Conditioning	This addendum fixes the mistake with 90.1-2010 fan power limitations which required the user to perform calculations for fan bhp even if the simplified nameplate hp option was being used.	6/27/2012	6/27/2012	6/18/2012	6/28/2012
m	9. Lighting	This addendum adds some control requirements for lighting alterations, for interior and exterior applications. It adds a section for submittals and includes loading docks as a tradable surface. It modifies the provisions for additional interior lighting power, which would now be calculated on the basis of controlled wattage.	6/27/2012	6/27/2012	6/18/2012	6/28/2012
n	10. Other Equipment	This addendum clarifies that the total lumens/watt for the entire elevator cab is required to meet the efficiency requirement and it is not required for each individual light source.	6/27/2012	6/27/2012	6/18/2012	6/28/2012
o	5. Building Envelope; 3. Definitions	This addendum adds the definition for sectional garage doors. It also modifies Section 5.4.3.2 (d), fenestration air leakage provisions for doors, to include requirements for glazed sectional garage doors.	1/21/2012	1/23/2012	1/18/2012	1/26/2012
p	5. Building Envelope; 12. Normative References	This addendum modifies Section 5.5.3.1 and requires roof solar reflectance and thermal emittance testing to be in accordance with CRRC-1 Standard. It also modifies Section 12 by adding the reference for CRRC.	1/21/2012	1/23/2012	1/18/2012	1/26/2012
q	5. Building Envelope; 3. Definitions; 12. Normative References	This addendum modifies Section 5.8.2.2, by clarifying the requirements for labeling of fenestration and door products. The corresponding references to NFRC in Chapter 12 have also been updated.	6/27/2012	6/27/2012	6/18/2012	6/28/2012

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TABLE F-1 Addenda to ANSI/ASHRAE/IES Standard 90.1-2010 (Continued)

Addendum	Section(s) Affected	Description of Changes*	ASHRAE Standards Committee Approval	ASHRAE BOD Approval	IES BOD Approval	ANSI Approval
T	12. Normative References; Appendix G	This addendum clarifies the requirements related to temperature and humidity control in Appendix G and relocates all related wording to the Schedules section of Table 3.1. Additionally, clarity is provided for modeling systems that provide occupant thermal comfort via means other than directly controlling the air dry bulb and wet-bulb temperature (i.e., radiant cooling/heating, elevated air speed, etc.). It permits the use of ASHRAE Standard 55 for calculation of PMV-PPD. This addendum also updates the Normative References by including a reference to ASHRAE Standard 55-2010.	7/26/2013	7/30/2013	7/29/2013	7/31/2013
S	6. Heating, Ventilating, and Air Conditioning	This addendum modifies the requirement for the static pressure sensor location and the control requirements for set point reset for systems with DDC of individual zones. Insures that savings from previously required static pressure reset will be realized.	1/21/2012	1/23/2012	1/18/2012	1/26/2012
U	6. Heating, Ventilating, and Air Conditioning	This addendum adds new definition as Fan Efficiency Grade (FEG) and requires each fan has a FEG of 67 or higher as defined by AMCA205-10 (Energy Efficiency Classification for Fans)	1/26/2013	1/29/2013	2/11/2013	2/12/2013
Y	8. Power	This addendum clarifies the requirement for controlled receptacles in open offices. It also requires the automatically controlled receptacles to be appropriately identified for the users benefit.	1/26/2013	1/29/2013	2/11/2013	2/28/2013
W	3. Definitions; 11. Energy Cost Budget Method; Appendix G	This addendum adds definitions for on-site renewable energy and purchased energy. It clarifies the process for accounting for on-site renewable energy and purchased energy as well as calculating the annual energy costs in the ECB approach and Appendix G.	6/26/2013	6/26/2013	6/28/2013	7/24/2013
Y	3. Definitions; 10. Other Equipment	This addendum revises the definitions of general purpose electric motors (subtype I & II) based on information from NEMA. It also updates the standard to include the new federal energy efficiency standards used in HVAC equipment to be in effect from 2015. It adds Table 10.8D which specifies minimum average full-load efficiency for Polyphase Small Electric Motors; and Table 10.8E which specifies minimum average full-load efficiency for Capacitor-Start Capacitor-Run and Capacitor-Start Induction-Run Small Electric Motors.	1/21/2012	1/23/2012	1/18/2012	1/26/2012
Z	6. Heating, Ventilating, and Air Conditioning	This addendum relocates the requirements for water economizers into the main economizer section, Section 6.5.1.5.	1/21/2012	1/23/2012	1/18/2012	1/26/2012

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TABLE F-1 Addenda to ANSI/ASHRAE/IES Standard 90.1-2010 (Continued)

Addendum	Section(s) Affected	Description of Changes*	ASHRAE Standards Committee Approval	ASHRAE BOD Approval	IES BOD Approval	ANSI Approval
aa	6. Heating, Ventilating, and Air Conditioning	Prior to this addendum certain controls requirements were only required when the controls were provided by a DDC system. This addendum eliminates that contingency for set point overlap restrictions, humidification and dehumidification controls, VAV fan control set point reset, multiple-zone VAV system ventilation optimization control, hydronic system design and control, and instead specifies how the system must perform. This will in effect require DDC for systems where these controls are needed.	7/26/2013	7/30/2013	7/29/2013	7/31/2013
ad	12. Normative References	Adds reference to specific addenda to AHRJ standards 340/360 and 130 being referenced	6/27/2012	6/27/2012	6/18/2012	6/28/2012
ae	12. Normative References	Adds reference to specific addenda to AHRJ standards 210/240 and 550/590 being referenced	7/26/2013	7/30/2013	7/29/2013	8/28/2013
af	6. Heating, Ventilating, and Air Conditioning	Modifies heat rejection equipment (cooling tower) requirements to require VSDs on fans, operate all fans at the same speed instead of sequencing them, and require that systems with multiple condenser water pumps operate those pumps in parallel at reduced flow.	6/26/2013	6/26/2013	6/28/2013	7/1/2013
ag	Appendix G	Establishes a method for gaining credit in Appendix G for buildings that undergo whole building air leakage testing to demonstrate that they have an air-tight building.	7/26/2013	7/30/2013	7/29/2013	8/28/2013
ah	Appendix G	Sets system sizing requirements in appendix G for humid climates based on humidity ratio instead of SA delta T. Sets baseline system dehumidification requirements.	6/27/2012	6/27/2012	6/18/2012	6/28/2012
ai	Appendix G	Modifies Appendix G to account for 3 prescriptive addenda that were incorporated in to standard 90.1-2010, but did not make it into Appendix G in time for publication. Updates economizer requirements to match addendum cy, establishes baseline transformer efficiency requirements to match addendum o, and establishes path A for centrifugal chiller baselines from addendum n.	6/27/2012	6/27/2012	6/18/2012	6/28/2012
aj	6. Heating, Ventilating, and Air Conditioning	Requires fractional horsepower motors $\geq 1/22$ hp to EC motors or minimum 70% efficient in accordance with DOE 10 CFR 431. Also requires adjustable speed or other method to balance airflow.	6/26/2013	6/26/2013	6/28/2013	7/1/2013
al	Appendix G	Establishes a consistent fuel source for space heating for baseline systems based on climate zone. Establishes a consistent fuel source for service water heating based on building type.	6/26/2013	6/26/2013	6/28/2013	7/24/2013
am	6. Heating, Ventilating, and Air Conditioning	Establishes minimum turndown for boilers and boiler plants with of at least 1,000,000 Btu/h.	6/26/2013	6/26/2013	6/28/2013	7/1/2013
an	Appendix C	Rewrites entire Appendix C to use a simulation based approach for envelope trade-offs.	7/26/2013	7/30/2013	7/29/2013	8/28/2013

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TABLE F-1 Addenda to ANSI/ASHRAE/IES Standard 90.1-2010 (Continued)

Addendum	Section(s) Affected	Description of Changes*	ASHRAE Standards Committee Approval	ASHRAE BOD Approval	IES BOD Approval	ANSI Approval
ap	6. Heating, Ventilating, and Air Conditioning	Adds Power Utilization Effectiveness (PUE) as an alternative compliance methodology for data centers.	1/26/2013	1/29/2013	2/11/2013	5/3/2013
aq	6. Heating, Ventilating, and Air Conditioning; 11. Energy Cost Budget	This addendum makes changes to the requirements for fan control for both constant volume and VAV units including extending the fan part load power requirements down to ¼ HP. In addition it defines the requirements for integrated economizer control and defines DX unit capacity staging requirements.	6/26/2013	6/26/2013	6/28/2013	7/1/2013
ar	6. Heating, Ventilating, and Air Conditioning	Adds mandatory and prescriptive requirements for walk-in coolers and freezers and refrigerated display cases.	6/26/2013	6/26/2013	6/28/2013	7/1/2013
as	6. Heating, Ventilating, and Air Conditioning	Avoidance of simultaneous heating and cooling at AHU. Requires humidifiers mounted in the airstream to have an automatic control valve shutting off preheat when humidification is not required, and insulation on the humidification system dispersion tube surface.	6/27/2012	6/27/2012	6/18/2012	6/28/2012
at	3. Definitions; 5. Building Envelope; 9. Lighting	Deletes the term clerestory and instead adds roof monitor and clarifies the definition. Changes the references in Chapters 5 and 9 from clerestory to roof monitor.	6/27/2012	6/27/2012	6/18/2012	6/28/2012
au	6. Heating, Ventilating, and Air Conditioning	This addendum modifies Table 6.5.3.1.1B which addresses fan power limitation pressure drop adjustment credits. Deductions are added for systems without any central heating or cooling as well as systems with electric resistance heating. Sound attenuation credit is modified to be available only when there are background noise criteria requirements.	1/26/2013	1/29/2013	2/11/2013	2/12/2013
av	6. Heating, Ventilating, and Air Conditioning	This addendum modifies Section 6.5.1, exception k, applicable to Tier IV data centers, in an attempt to make economizer exceptions more strict and in agreement with ASHRAE TC 9.9	6/26/2013	6/26/2013	6/28/2013	7/24/2013
aw	11. Energy Cost Budget; Appendix G	This addendum updates the reference year for ASHRAE Standard 140 and exempts software used for ECF and Appendix G compliance from having to meet certain sections of ASHRAE Standard 140	1/26/2013	1/29/2013	2/11/2013	2/12/2013
ax	Appendix G	Table G3.1 Part 14 of Appendix G is modified to exclude the condition which permits a building surface, shaded by an adjacent structure, to be simulated as north facing if the simulation program is incapable of simulating shading by adjacent structures.	6/26/2013	6/26/2013	6/28/2013	7/1/2013

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TABLE F-1 Addenda to ANSI/ASHRAE/IES Standard 90.1-2010 (Continued)

Addendum	Section(s) Affected	Description of Changes*	ASHRAE Standards Committee Approval	ASHRAE BOD Approval	IES BOD Approval	ANSI Approval
ay	3. Definitions; 9. Lighting	This addenda modifies daylighting requirements. It modifies definitions for daylight area under skylights, daylight area under roof monitors, primary sidelight area, secondary sidelight area. It modifies the thresholds for applying automatic daylighting control for sidelighting and toplighting, to a wattage basis and provides characteristics for the required photo controls. It modifies Table 9.6.2 to include continuous dimming in secondary sidelighted areas, which is now based on a W level rather than area of the space. It eliminates the need for effective aperture calculation.	6/26/2013	6/26/2013	6/28/2013	7/1/2013
az	6. Heating, Ventilating, and Air Conditioning	This addendum increases the minimum efficiency of open circuit axial fan cooling towers. An additional requirement has been added which states that the minimum efficiency requirements for all types of cooling towers also applies to accessories which affect the thermal performance of the unit. An additional footnote clarifies that the certification requirements do not apply to field erected cooling towers.	1/26/2013	1/29/2013	2/11/2013	2/12/2013
ba	6. Heating, Ventilating, and Air Conditioning	Adds requirements for door switches to disable or reset mechanical heating or cooling when doors are left open.	7/26/2013	7/30/2013	7/29/2013	8/28/2013
bc	9. Lighting	Modifies requirements for automatic lighting control for guestroom type spaces. Exception to this requirement are lighting and switched receptacles controlled by captive key systems.	6/26/2013	6/26/2013	6/28/2013	7/24/2013
bd	9. Lighting	This addenda adds more specific requirements for the functional testing of lighting controls, specifically, occupancy sensors, automatic time switches and daylight controls.	6/26/2013	6/26/2013	6/28/2013	7/1/2013
be	9. Lighting	Minor revisions to Section 9.7.2.2, which addresses the scope of the operating and maintenance manuals required for lighting equipment and controls.	1/26/2013	1/29/2013	2/11/2013	2/12/2013
bf	8. Power	This addenda addresses Section 8.4.2 on automatic receptacle control and increases the spaces where plug shutoff control is required. It also clarifies the application of this requirement for furniture systems, states a labeling requirement to distinguish controlled and uncontrolled receptacles and restricts the use of plug-in devices to comply with this requirement.	7/26/2013	7/30/2013	7/29/2013	8/28/2013
bg	5. Building Envelope	Requirements for low E storm window retrofits.	6/26/2013	6/26/2013	6/28/2013	7/1/2013
bh	9. Lighting	Modifies Table 9.6.1 Space-By-Space Lighting Power Density allowance	7/26/2013	7/30/2013	8/12/2013	9/4/2013
bi	6. Heating, Ventilating, and Air Conditioning	Increase SEER and HSPF for air-cooled commercial air conditioners and heat pumps below 65,000 Btu/h. Effective 1/1/2015	6/26/2013	6/26/2013	6/28/2013	7/1/2013
bj	6. Heating, Ventilating, and Air Conditioning	Re-establishes the product class for Small Duct High Velocity (SDHV) air conditioners and heat pumps. Adds efficiency requirements for systems at <65,000 Btu/h	6/26/2013	6/26/2013	6/28/2013	7/1/2013

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TABLE F-1 Addenda to ANSI/ASHRAE/IES Standard 90.1-2010 (Continued)

Addendum	Section(s) Affected	Description of Changes*	ASHRAE Standards Committee Approval	ASHRAE BOD Approval	IES BOD Approval	ANSI Approval
bk	6. Heating, Ventilating, and Air Conditioning	Increases cooling efficiency for PTACs	1/26/2013	1/29/2013	2/11/2013	2/12/2013
bl	11. Energy Cost Budget, Appendix G	Provide rules for removing fan energy from efficiency metrics when modeling in ECB or Appendix G.	7/26/2013	7/30/2013	7/29/2013	7/31/2013
bn	8. Power; 10. Other Equipment	Establishes electric and fuel metering requirements	7/26/2013	7/30/2013	7/29/2013	9/4/2013
bo	6. Heating, Ventilating, and Air Conditioning	Requires buildings with SW capacity >= 1million but/h to have average efficiency of at least 90%. Updates Table 7.8 to reflect federal requirements for electric water heaters. Updates the reference standard for swimming pool water heaters to ASHRAE Standard 146.	7/26/2013	7/30/2013	7/29/2013	9/4/2013
bp	6. Heating, Ventilating, and Air Conditioning	Adds efficiency requirements (Btu/h-hp) to Table 6.8.1G for evaporative condensers with ammonia refrigerants	7/26/2013	7/30/2013	7/29/2013	7/31/2013
bq	6. Heating, Ventilating, and Air Conditioning	Improve efficiency of commercial refrigeration systems	1/26/2013	1/29/2013	2/11/2013	2/12/2013
br	10. Other Equipment	Updates motor efficiency tables	6/26/2013	6/26/2013	6/28/2013	7/1/2013
bs	6. Heating, Ventilating, and Air Conditioning	Reduce occupancy threshold for demand controlled ventilation from greater than 40 people per 1000 ft2 to equal to or greater than 25 people per 1000 ft2 with exemptions for certain occupancies.	7/26/2013	7/30/2013	7/29/2013	7/31/2013
bt	6. Heating, Ventilating, and Air Conditioning	Reduces the threshold at which energy recovery is required. Relaxed in some climate zones.	6/26/2013	6/26/2013	6/28/2013	7/24/2013
bv	9. Lighting	Reduces the threshold at which skylights and daylighting controls are required for high bay spaces.	6/26/2013	6/26/2013	6/28/2013	7/1/2013
bw	5. Building Envelope	Modifies orientation requirements and adds SHGC tradeoff	7/26/2013	7/30/2013	7/29/2013	8/28/2013
bx	9. Lighting	Clarification of exceptions to occupancy sensor requirements	1/26/2013	1/29/2013	2/11/2013	2/12/2013
by	9. Lighting	Improves and enhances lighting controls requirements. Establishes table of lighting controls applicable to each space type. Corrects daylighting threshold.	7/26/2013	7/30/2013	7/29/2013	8/28/2013
ca	5. Building Envelope	Adds control requirements for heating systems in vestibules	6/26/2013	6/26/2013	6/28/2013	7/1/2013
cb	6. Heating, Ventilating, and Air Conditioning	This addendum requires night setback 10F heating & 5F cooling and removes exception for systems less than 10,000 cfm min for optimum start	7/26/2013	7/30/2013	7/29/2013	8/28/2013

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TABLE F-1 Addenda to ANSI/ASHRAE/IES Standard 90.1-2010 (Continued)

Addendum	Section(s) Affected	Description of Changes*	ASHRAE Standards Committee Approval	ASHRAE BOD Approval	IES BOD Approval	ANSI Approval
cc	6. Heating, Ventilating, and Air Conditioning	Adds efficiency requirements (Btu/h-tp) to Table 6.8.1.G for evaporative condensers with R-507A	6/26/2013	6/26/2013	6/28/2013	7/1/2013
cd	6. Heating, Ventilating, and Air Conditioning	Provides definition for piping to include all accessories in series with pipe such as pumps, valves, strainers, air separators, etc. This is meant to clarify that these accessories need to be insulated.	7/26/2013	7/30/2013	7/29/2013	8/28/2013
ce	Appendix G	Establishes a baseline system type for retail occupancies less than 3 stories in Appendix G	6/26/2013	6/26/2013	6/28/2013	7/1/2013
cf	Appendix G	Establishes baseline WWR in Appendix G for strip malls.	7/26/2013	7/30/2013	7/29/2013	8/28/2013
ch	6. Heating, Ventilating, and Air Conditioning	Improved air and water cooled chiller efficiencies in Table 6.8.1.C. Exempt's water cooled positive displacement chillers with leaving condenser temperature $\geq 115$ deg.F. (typically heat reclaim chillers).	6/26/2013	2/26/2013	6/28/2013	7/1/2013
ck	6. Heating, Ventilating, and Air Conditioning	Requires VAV dual maximum damper position when DDC system is present	6/26/2013	6/26/2013	6/28/2013	7/1/2013
cl	6. Heating, Ventilating, and Air Conditioning	Table 6.8.1A and B. Improves IEER requirements for air-cooled air conditioners and heat pumps and EER requirements for water and evaporatively-cooled air-conditioners and heat pumps.	7/26/2013	7/30/2013	7/29/2013	7/31/2013
cn	Appendix G	Establishes modeling rules for laboratories with 100% OA in Appendix G	6/26/2013	6/26/2013	6/28/2013	7/1/2013
co	9. Lighting	Comprehensive update of LPDs in Table 9.5.1 - Building Area Method	7/26/2013	7/30/2013	7/29/2013	7/31/2013
cp	5. Building Envelope	Corrects non-residential U-factor and R-value requirements for steel joist floors in CZ3	6/26/2013	6/26/2013	6/28/2013	7/1/2013
cr	9. Lighting	Makes a number of adjustments to Table 9.6.1 Space-by-space LPD	7/26/2013	7/30/2013	7/29/2013	7/31/2013
ct	Appendix G	Identifies heated only storage systems 9 and 10 in Appendix G as being assigned one system per thermal zone.	7/26/2013	7/30/2013	7/29/2013	7/31/2013
cy	Appendix G	Establishes baseline system types in Appendix G for Assembly occupancies.	7/26/2013	7/30/2013	7/29/2013	7/31/2013
cy	6. Heating, Ventilating, and Air Conditioning	More stringent energy recovery for 24/7 occupancies	7/26/2013	7/30/2013	7/29/2013	7/31/2013
cz	6. Heating, Ventilating, and Air Conditioning	Increases boiler efficiency for residential sized (NAECA covered) equipment, $< 3,000$ Btu/h	7/26/2013	7/30/2013	7/29/2013	7/31/2013

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TABLE F-1 Addenda to ANSI/ASHRAE/IES Standard 90.1-2010 (Continued)

Addendum	Section(s) Affected	Description of Changes*	ASHRAE Standards Committee Approval	ASHRAE BOD Approval	IES BOD Approval	ANSI Approval
da	5. Building Envelope	Relaxes air leakage requirements for high-speed doors for vehicle access and material transport	7/26/2013	7/30/2013	7/29/2013	8/28/2013
db	5. Building Envelope	Corrects residential U-factor and R-value requirements for steel joist floors in CZ3	7/26/2013	7/30/2013	7/29/2013	7/31/2013
dc	9. Lighting	Clarifies automatic lighting and switched receptacle control in guest rooms as applied to individual spaces.	7/26/2013	7/30/2013	7/29/2013	7/31/2013
dd	5. Building Envelope	Clarifies roof insulation requirements, differentiating between roof recovering (on top of existing roof covering) and replacement of roof covering.	7/26/2013	7/30/2013	7/29/2013	7/31/2013
de	6. Heating, Ventilating, and Air Conditioning	Relaxes design requirements for waterside economizers for computer rooms	7/26/2013	7/30/2013	7/29/2013	7/31/2013
dg	5. Building Envelope	Updates reference to ANSI/CRRC-1 Standard 2012 (cool roof ratings)	7/26/2013	7/30/2013	7/29/2013	7/31/2013
di	6. Heating, Ventilating, and Air Conditioning	Establishes limits on using electric or fossil fuel to humidify or dehumidify between 30% & 60% RH except certain applications. Requires deadband on humidity controls.	7/26/2013	7/30/2013	7/29/2013	7/31/2013
dj	9. Lighting	Additional lighting power allowance for electrical/mechanical rooms provided there is separate control for additional lighting.	7/26/2013	7/30/2013	7/29/2013	7/31/2013
dk	9. Lighting	Eliminates the exemption for wattage used in spaces where lighting is specifically designed for those with age-related eye conditions or other medical conditions related to the eye, where special lighting or light levels might be needed.	7/26/2013	7/30/2013	7/29/2013	8/28/2013
dl	9. Lighting	Modifies hotel and motel guest room lighting power density	7/26/2013	7/30/2013	7/29/2013	8/28/2013
dn	6. Heating, Ventilating, and Air Conditioning	Reduces the limits on hot gas bypass as a means of cooling capacity control.	7/26/2013	7/30/2013	7/29/2013	7/31/2013
do	6. Heating, Ventilating, and Air Conditioning	Updates references to AHRI 550, AMCA 500, ANSI Z21.10.3 & Z21.47, ASHRAE 90.1 & 62.1, NEMA MG 1, & NEPA 70 & 96	7/26/2013	7/30/2013	7/29/2013	7/31/2013
dp	6. Heating, Ventilating, and Air Conditioning	Corrects the definition of walk-in-cooler to be consistent with federal requirements.	7/26/2013	7/30/2013	7/29/2013	7/31/2013
dq	6. Heating, Ventilating, and Air Conditioning	Deletes sizing requirements for pipes >24 in.	7/26/2013	7/30/2013	7/29/2013	7/31/2013
dr	5. Building Envelope	Clarifies definition of building entrances to exclude electrical room, mechanical rooms, and other utility service entrances.	7/26/2013	7/30/2013	7/29/2013	7/31/2013

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TABLE F-1 Addenda to ANSI/ASHRAE/IES Standard 90.1-2010 (Continued)

Addendum	Section(s) Affected	Description of Changes*	ASHRAE Standards Committee Approval	ASHRAE BOD Approval	IES BOD Approval	ANSI Approval
dt	9. Lighting	Added exceptions for control of exterior lighting integral to signage. Requires certain types of exterior lighting exempt from LPD requirements to be separately controlled.	7/26/2013	7/30/2013	7/29/2013	7/31/2013
dv	6. Heating, Ventilating, and Air Conditioning	Establishes chiller and boiler fluid flow isolation requirements so there is no flow through the equipment when not in use.	7/26/2013	7/30/2013	7/29/2013	7/31/2013
dww	6. Heating, Ventilating, and Air Conditioning	Revises high limit shutoff for air economizers. Add sensor accuracy requirements.	7/26/2013	7/30/2013	7/29/2013	7/31/2013

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NOTE

Approved addenda, errata, or interpretations for this standard can be downloaded free of charge from the ASHRAE Web site at [www.ashrae.org/technology](http://www.ashrae.org/technology).

(5) **VENTILATION RATE.** Substitute the following wording for the requirements and exception in IMC section 403.3:

(a) *Ventilation rate determination.* 1. Except as provided in sub. (1) (a) and s. SPS 364.0300, a mechanical ventilation system shall be designed to have the capacity to supply a minimum outdoor airflow rate of 7.5 cfm per person as determined in accordance with Table 364.0403 based on the occupancy of the space and the occupant load or other parameters stated therein. A mechanical ventilation system shall be designed to have the capacity to exhaust air as specified in Table 364.0403 except as provided in par. (c).

2. a. Except as provided in subd. 2. b. to d., the occupant load utilized for design of the ventilation system shall not be less than the number determined from the estimated maximum occupant load rate indicated in Table 364.0403.

b. The estimated maximum occupant load rate may be determined using other means with justification acceptable to the department to show that a different number of occupants is reasonable.

c. Where there is no value indicated for the net square feet per person in Table 364.0403, the actual number of occupants shall be used to determine the required amount of outside air.

d. Ventilation rates for occupancies not represented in Table 364.0403 shall be determined by an approved engineering analysis, or by using the most similar occupancy in the table.

(b) *Adjacent spaces with differing ventilation requirements.*

1. Except as provided in subd. 2., spaces with different ventilation requirements shall be provided with a complete solid separation, or the most stringent ventilation requirement shall apply to all unseparated areas.

2. The separation as specified in subd. 1. is not required where an engineered ventilation design system will prevent the concentration of contaminants from exceeding that obtainable by providing a physical separation.

(c) *Exceptions for certain occupancies.* 1. 'Toilet rooms.' A toilet room that has only one water closet or urinal and no bathtub or shower may be provided with either natural ventilation via a window or louvered opening with at least 2 square feet of area openable directly to the outside or mechanical exhaust ventilation as specified in Table 364.0403.

2. 'Janitor closets.' A janitor closet that has only one service sink may be provided with either natural ventilation via a window or louvered opening with at least 2 square feet of area openable

directly to the outside or mechanical exhaust ventilation as specified in Table 364.0403.

3. 'Locker and shower rooms.' An adjoining locker room, shower room and toilet room shall be exhausted at the rate specified in Table 364.0403 based on the largest amount of exhaust required for any of the three rooms. A negative pressure relationship shall be maintained in the shower and toilet rooms with respect to the locker room.

5. 'Pool ventilation.' In a natatorium, the volume of supply air and exhaust air may be reduced to a minimum of 1 cfm per square foot of pool surface provided automatic humidity controls perform so as not to create accelerated building material deterioration from moisture condensation.

(d) *Common ventilation system airflow.* 1. Substitute the following wording for the requirements in IMC sections 403.3.1 through 403.3.2.3.4: Where multiple spaces having different ventilation rate requirements are served by a common ventilation system, the minimum amount of outdoor airflow supplied by the ventilation system shall equal the total outdoor airflow required for each space if each space is provided with minimum air changes in accordance with this paragraph.

2. a. Except as provided in subd. 2. d., an air change rate of 6 air changes per hour shall be provided in each space.

b. The air change air rate under this subsection shall be determined upon either the actual height of the space or 10 feet from the floor level of the space which ever is less.

c. The air movement providing the required minimum air change shall be that amount that is transferred through the air handling equipment where the return air is diluted or replaced with outside air and supplied back to the space.

d. Air change rate of less than 6 air changes per hour is permitted where mechanical cooling is provided to maintain an interior design temperature of 78°F or lower. The air change rate may not be less than the alternative minimum air change rate per hour specified in Table 364.0403. Air changes are not required to be provided for spaces required to be mechanically exhausted.

(6) **SYSTEM OPERATION.** Substitute the following wording for the requirements in IMC section 403.5: The minimum flow rate of outdoor air that the ventilation system must be capable of supplying during its operation may be based on the rate per person indicated in Table 364.0403 and the actual number of occupants present.

Table 364.0403  
Ventilation Requirements

Occupancy Classification	Estimated Maximum Occupant Load (persons per 1,000 sq. ft.) <sup>a</sup>	Exhaust <sup>c</sup> (cfm/net sq. ft. floor area)	Common Ventilation System Alternative – Minimum AC Rate per hour with A/C
<u>Correctional facilities</u>			
Sleeping rooms <sup>d</sup>	20	NR	2.0
Dining halls	100	NR	2.0
Guard stations	40	NR	1.5
<u>Dry cleaners, laundries</u>			
Coin-operated dry cleaners	8	NR	1.0
Coin-operated laundries	8	NR	1.0
Commercial dry cleaners	NA	2.0	NR
Commercial laundries	NA	2.0	NR
Storage, pick up	8	NR	1.0
Apartment laundry rooms	NA	0.5	NR
<u>Education</u>			
Auditoriums	150	NR	2.0
Classrooms	50	NR	2.0
Day care facilities	30	NR	2.0
Laboratories (science)	30	NR	2.0
Music rooms	50	NR	2.0
Special education	35	NR	2.0
Training shops	30	NR	2.0
<u>Food and beverage service</u>			
Bars and cocktail lounges	100	NR	2.0
Cafeterias, fast food	100	NR	2.0
Dining rooms	70	NR	2.0
Kitchens (cooking) <sup>d, e</sup>	20	NR	1.0
<u>Health care facilities</u>			
Hospitals	See s. SPS 364.0300	See s. SPS 364.0300	See s. SPS 364.0300
Nursing homes			
Outpatient surgical facilities			
<u>Hotels, motels, resorts and dorms</u>			
Assembly rooms	120	NR	2.0
Bathrooms <sup>c, d</sup>	NA	35 cfm/room	NR
Bedrooms	footnote f	NR	1.0
Conference rooms	50	NR	2.0
Dormitory sleeping areas	20	NR	1.0
Casinos	NA	2.0	NR
Living rooms	footnote f	NR	1.0
Lobbies	30	NR	2.0
<u>Industrial/Factory</u>			
Factories and machine shops	13	NR	NR
Foundries	13	NR	NR
Sawmills	NA	NR	NR
<u>Offices</u>			
Conference rooms	50	NR	1.5
Office spaces	7	NR	1.5
Reception areas	60	NR	1.5
Telecommunication centers and data entry	60	NR	1.5

Table 364.0403 – Continued  
Ventilation Requirements

Occupancy Classification	Estimated Maximum Occupant Load (persons per 1,000 sq. ft.) <sup>a</sup>	Exhaust <sup>c</sup> (cfm/net sq. ft. floor area)	Common Ventilation System Alternative – Minimum AC Rate per hour with A/C
<u>Private dwellings, single and multiple</u>			
Living areas	2 people for first bedroom plus one person for each additional bedroom	NR	1.0
Kitchens <sup>d</sup>	NA	100 cfm intermittent or 20 cfm continuous	NR
Toilet rooms and bathrooms <sup>d</sup>	NA	Mechanical exhaust capacity 50 cfm intermittent or 20 cfm continuous per room <sup>j</sup>	NR
Garages, separated by a solid wall for each dwelling	NA	100 cfm/vehicle	NR
Garages, common for multiple units <sup>e</sup>	NA	0.5	NR
<u>Retail stores, sales floors and showroom floors</u>	8	NR	1.0
<u>Seasonal occupancies, camps and lodges</u>			
Dining and recreational areas	15	NR	1.0
Living and sleeping areas	NA	NR	1.0
Club houses	15	NR	1.0
Drive-ins	15	NR	1.0
<u>Specialty shops</u>			
Automotive service and repair garages	NA	0.5	NR
Barber shops	25	NR	1.0
Beauty salons <sup>h</sup>	NA	0.5	NR
Car washes	NA	NR	NR
Clothier, furniture specialty shops	8	NR	1.0
Florist shops	8	NR	1.0
Hardware, drugs, fabrics stores	8	NR	1.0
Supermarkets	8	NR	1.0
<u>Sports and amusement</u>			
Ballrooms and discos	100	NR	2.0
Bleacher areas	363 or 18 in./person	NR	2.0
Bowling centers (seating areas)	70	NR	2.0
Game rooms	70	NR	2.0
Ice skating rinks (indoor)	5	NR	NR
Natatoriums	NA	2.0 cfm/sq. ft. pool area	NR
Playing floor (gymnasiums)	30	NR	2.0
Roller skating rinks (indoor)	30	NR	2.0
Spectator areas (non-bleacher)	150	NR	2.0
<u>Storage</u>			
Chlorine storage and handling rooms	NA	2.0	NR
Enclosed parking garages <sup>i</sup>	NA	0.5	NR
Warehouses	NA	NR	NR

Table 364.0403 – Continued  
Ventilation Requirements

Occupancy Classification	Estimated Maximum Occupant Load (persons per 1,000 sq. ft.) <sup>a</sup>	Exhaust <sup>c</sup> (cfm/net sq. ft. floor area)	Common Ventilation System Alternative – Minimum AC Rate per hour with A/C
<b>Theaters</b>			
Auditoriums	150	NR	2.0
Lobbies	150	NR	2.0
Stages, studios	70	NR	2.0
Ticket booths	60	NR	2.0
<b>Transportation</b>			
Platforms	100	NR	2.0
Waiting rooms	100	NR	2.0
<b>Utility and public spaces</b>			
Elevator cars <sup>m</sup>	NA	NR	NR
Janitor closets	NA	2.0 or 75 cfm/sink <sup>g</sup>	NR
Locker and dressing rooms <sup>c</sup>	NA	0.5	NR
Shower rooms	NA	2.0	NR
Toilet rooms <sup>c, d</sup>	NA	75 cfm/TF <sup>g</sup>	NR
<b>Workrooms</b>			
Bank vault	5	NR	NR
Meat processing	10	NR	NR
Pharmacy	20	NR	1.5
Photo studio	10	NR	1.0
Printing	13	footnote j	NR

NA = not applicable; NR = none required; cfm = cubic feet per minute; TF = toilet fixtures (water closets and urinals); A/C = air conditioning

a Based upon net floor area.

b The ventilation rate is based upon cubic feet per minute per square foot of the floor area being ventilated.

c Mechanical exhaust is required and the recirculation of air from these spaces that would otherwise be allowed by IMC section 403.2.1 is prohibited.

d Outdoor air shall be provided at the rate of 1.0 cfm/net sq. ft. floor area. Transfer air is permitted in accordance with IMC section 403.2.2.

e The sum of the outdoor and transfer air from adjacent spaces shall be sufficient to provide an exhaust rate of not less than 1.5 cfm/sf.

f The minimum mechanical ventilation rate is 15 cfm/room of outside air.

g Natural ventilation may be allowed under this section.

h The classification of a 'beauty' salon depends on the types of services provided. Only beauty salons routinely provide chemical processing of hair to produce texture or color changes, or manicures or other services with a similar need for air-borne contaminant and odor control.

i Enclosed parking garages are parking garages with less than 30% open areas in the total wall area enclosing the garage. Ventilation systems in enclosed parking garages shall comply with IMC section 404. A mechanical ventilation system shall not be required in garages having a floor area of 850 square feet or less and used for the storage of 5 or fewer motorized vehicles.

j Refer to IMC chapter 5 for exhaust requirements based upon the chemicals used.

History: CR 00-179: cr. Register December 2001 No. 552, eff. 7-1-02; CR 01-135: renum. (3) to be (3) (b), cr. (3) (a), (4) (a) 6. and (5) (d), am. (5) (a), (b) 1. a., (c) 1. and (6) Table; CR 01-139: renum. (3) to (6) to be (4), (6), (8) and (9), cr. (3), (5) and (7), am. (6) Table, r. and recr. (6) Register June 2002 No. 558, eff. 7-1-02; CR 04-016: am. Table 64.0403 Register December 2004 No. 588, eff. 1-1-05; CR 06-120: r. (1), (4) (a), (6) (a) 3., 6. and (d), am. (2) (a) and (3), renum. (4) (b) to be (4), r. and recr. (6) (intro.), (a) 1., (8) and Table 64.0403 Register February 2008 No. 626, eff. 3-1-08; CR 10-103: r. (6) (c) 4., (9), r. and recr. Table 64.0403, renum. (2) to (7), (8) to (1) to (6), (5) (d) and am. Register August 2011 No. 668, eff. 9-1-11; correction in (2), (4), (5) (a) 1., 2. a., c., d., (c) 1., 2., 3., (d) 2. d., (6), Table 364.0403 made under s. 13.92 (4) (b) 7., Stats., Register December 2011 No. 672.

**SPS 364.0404 Minimum enclosed garage ventilation.** (1) Substitute the following wording for the requirements in IMC section 404.2: Automatic operation of the system shall not reduce the ventilation rate below 0.05 cfm per square foot of the floor area and the system shall be capable of producing a ventilation rate of 0.75 cfm per square foot of floor area.

(2) This is a department alternative to the requirements in IMC sections 404.1 and 404.2: Mechanical ventilation systems for enclosed parking garages are not required to operate continuously where the system conforms to all of the following:

(a) The system is arranged to operate automatically upon detection of carbon monoxide at a level of 35 parts per million (ppm) by automatic detection devices.

(b) If diesel-fueled vehicles are stored, the system is arranged to operate automatically upon detection of nitrogen dioxide at a level of one part per million (ppm) by automatic detection devices.

(c) The system includes automatic controls for providing exhaust ventilation at a rate of 0.75 cfm per square foot for at least 5 hours in each 24-hour period.

(d) The system maintains the garage at negative or neutral pressure relative to other spaces.

History: CR 00-179: cr. Register December 2001 No. 552, eff. 7-1-02; CR 01-139: r. and recr. (1) Register June 2002 No. 558, eff. 7-1-02; CR 06-120: r. and recr. Register February 2008 No. 626, eff. 3-1-08; CR 10-103: am. (1) and (2) (c) Register August 2011 No. 668, eff. 9-1-11.