

**Comparison of the Electrical, Power and Lighting Requirements of IECC-2006 Section 505  
Versus the Requirements of ASHRAE / IESNA / ANSI Standard 90.1- 2004 Sections 8, 9, &10 ©**

Topic	IECC – 2006	ASHRAE – 2004 *	Comments
	Choose <b>either</b> these requirements↓:	Or choose these requirements↓:	Comply with <b>all</b> the requirements of <b>either</b> standard. Mixing of the requirements (or selecting requirements from either or both standards) is <b>not</b> permitted.
<b>Electrical Requirements</b> Voltage Drop Limits	No Requirement	<b>2%</b> Maximum Voltage Drop in <b>Feeders</b> ; <b>3%</b> Max. Volt Drop in <b>Branch Circuits</b> (Both "at Design Load")	Mandatory requirement in Section 8 of ASHRAE This trumps the NEC 2005 (where it is <b>not</b> mandatory, because the NEC Voltage Drop requirements are found in a "Fine Print Note", which is <b>not</b> enforceable).
Complete Electrical System Documentation	No Requirement	Electrical Single-Line Drawings plus an Operation and Maintenance Manual	30-Day requirement for System "As-Built" Drawings No time limit on O&M Manual, which shall include an operational narrative, ratings, and a service provider
Electric Motor Efficiency	No Requirement	All general-purpose, Design A & B, Open and Enclosed motors, from <b>1 to 200 HP</b> shall meet the EPACT 1992 requirements for minimum efficiency – Table 10.8	Mandatory requirement in Section 10 of ASHRAE Applies to single-speed, <b>three-phase induction motors</b> , operated at nominal voltages of <b>230-240 or 460-480 Volts</b> ; [multi-speed, single phase, 120 or 208 Volt, and <1HP or >200 HP motors are exempt] ASHRAE is more comprehensive.
Electrical Energy Consumption	In buildings with individual dwelling units, provisions shall be made to determine the energy consumed by each tenant, by metering	No Requirement	Mandatory requirement in Section 505 of IECC (page 52, paragraph 505.7) IECC is more comprehensive.
<b>Lighting Requirements</b> General Scope / Applicability	<b>Residential and all Commercial Buildings</b> Residential – Chapter 4 Commercial – Chapter 5 In IECC Section 501, the <b>Alternative: Std. 90.1-2004</b>	<b>All Buildings, Except</b> Low-Rise Residential (< or = to three stories above grade), Manufactured houses, or Industrial or Manufacturing processes (primary use)	ASHRAE Section 9 covers Lighting for Interior Spaces, Exterior Building Façades and Lighted Roofs, Architectural Features, and Grounds Lighting that is powered by the building's electrical system. ASHRAE also covers High-Rise Residential buildings. <b>Note:</b> Commercial processes are <b>not</b> exempt in IECC
Exceptions to above Lighting Scope	Lighting within Dwelling units (Section 505.1)	Lighting within Living units, Emergency and Statutorily-required lighting, and Decorative gas lighting	ASHRAE's four exceptions are listed in paragraph 9.1.1.
Interior Lighting Space Controls	At least one manual control per space, located within the space. Exceptions for designated security or emergency areas, and in stairways or corridors that are part of a path of egress	At least one control device per space. One per 2500 sq. ft., for < 10,000 sq. ft., or one per 10,000 sq. ft. for > 10,000 sq. ft. Auto-off required in Lunch, Conference & Break rooms, and in certain Classrooms	Applies to spaces enclosed by ceiling-height partitions, [or walls (for IECC only)]. Both Standards require that the control be accessible & located so that the occupant can see the controlled lighting operate, or if remotely controlled, it must be labeled and annunciated (with a pilot light). ASHRAE also permits Auto-off control (< 30 min.) by occupant sensing, and has an exception in areas with multi-scene control.
Light Reduction Controls	Where a manual control is required, the occupant shall be able to, "reduce the connected load in a reasonably uniform pattern by <b>at least 50%</b> ", by controlling groups of lamps or luminaires	No Requirement	IECC requires independently controlled, bi-level switching, localized analog dimming, or digital ballast addressability plus dimming. IECC has four alternative methods to achieve this reduction <b>plus</b> that approved by the Authority Having Jurisdiction (AHJ). Check IECC's five methods and five exceptions to this requirement carefully. IECC is more comprehensive.
Automatic Interior Lighting Shut-Off in buildings larger than 5000 square feet The automatic control device shall function as follows:	a) Scheduled time of day, with an independent program schedule for up to 25,000 sq.ft., and not more than one floor or b) Occupant sensor (off within 30 minutes) or c) Control system signal	a) Scheduled time of day, independent schedule for no more than 25,000 sq.ft., but not more than one floor or b) Occupant sensor (off within 30 minutes) or c) Signal from another control system	Both Standards permit the signal from another system to be from almost any control or alarm system that indicates when the area is unoccupied.
Exceptions to Auto Shut-off Control Override Duration	Sleeping units, patient care No more than <b>2</b> hours	24-hour ops, patient care No more than <b>4</b> hours	Both allow exceptions for safety or security Note IECC's override provisions and exceptions
Automatic Holiday Scheduling	If an automatic time control device is installed, a holiday schedule feature is required to turn off all loads for at least 24 hrs; then resume.	No Requirement	When a time clock is used to satisfy the automatic shut-off requirement, IECC appears to necessitate an electronic programmable time switch control device. Check IECC's exception applications carefully. IECC is more comprehensive.
Additional Lighting Controls	Sleeping unit rooms: at least one master switch at each entry door(s), controlling all permanently wired luminaires and switched receptacles	Guest rooms: one master control at main room entry Individual controls for: <b>all</b> display/accent, case, or task lighting, non-visual lighting, and demo lighting	In ASHRAE, the control for the task lighting can be integral to the luminaire or it can be wall-mounted, and it must be readily accessible and located so that the occupant can see the controlled lighting. IECC has an exception for bathroom lighting (505.2.3) ASHRAE is more comprehensive and specific.
Tandem Wiring of Fluorescent luminaires with one or three lamps; [or an odd # of lamps (IECC only)]	Recessed luminaires <b>within</b> 10' (ctr. to ctr.) plus Surface and Pendant luminaires within 1'; with exceptions	Same, for lamps greater than 30 Watts Exceptions for electronic ballasts, no pair, or emergency circuits	Tandem Wiring has become an obsolete requirement for <b>many</b> fluorescent lighting applications. Magnetic ballasts for <b>new commercial</b> applications ceased to be manufactured after July 2005.

8/18/2007 For questions, comments, or additional information contact: Carl M. Watson, PE, LC (610)-642-7911.

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<b>Exterior Lighting Controls</b>	Photo sensor or Astronomical Time Switch; Clock shall have at least a 10-hour Power back-up (Outage ride-through) capability. Same exceptions as ASHRAE	Photo sensor or Astronomical Time Switch with 10-hour min. back-up Exceptions for covered vehicle entrances or exits from buildings or parking structures where required for safety, security, or eye adaptation	
<b>Exterior Building Grounds Lighting Efficacy</b>	When supplied through the building, all <b>luminaires [lamp and ballast]</b> that operate at <b>greater than 100 Watts</b> shall contain lamps with a <u>minimum</u> efficacy of <b>60 Lumens / Watt, unless</b> controlled by a motion sensor, with nine exceptions in 505.6.2.	All exterior building grounds <b>luminaires</b> [powered by the building] that operate at <b>greater than 100 Watts</b> shall contain lamps with a <u>minimum</u> efficacy of <b>60 Lumens / Watt, unless</b> controlled by a motion sensor, with four exclusions (9.1.1) <b>plus</b> same nine exceptions in 9.4.5.	The exception for lighting controlled by a motion sensor, allows use of "instant-on" lighting for security applications, <u>without</u> the minimum efficacy restriction. IECC has an exclusion for low-voltage landscape lighting (505.6). IECC also has an exception for <u>approved</u> historical, signage, safety or emergency applications (Section 505.6).
<b>Power Density Limits for Building Exterior Lighting</b>	Uncovered Parking Areas: <b>0.15 Watts / Square foot</b> (Tradable) Walkways <10' wide: <b>1.0 Watts/ Linear foot</b> (Tradable) Walkways >10' wide: <b>0.2 Watts / Square foot</b> (Tradable) Stairways: - <b>1.0 Watts / Square foot</b> (Tradable) Building Entrance (without Canopy): <b>30 Watts / Linear foot of Door width</b> Building Exit: <b>20 Watts / Linear foot of Door width</b> (Tradable) Building Entrance <u>with</u> a Canopy <u>or</u> a Free Standing Canopy: <b>1.25 Watts / Square foot of horizontal surface</b> (Tradable) Building Façade Lighting: <b>0.2 Watts / Sq. Ft.</b> of lighted area, <u>or</u> <b>5.0 Watts / Linear foot of lighted surface length</b> ( <b>Non-Tradable</b> ) Drive-up windows at fast food restaurants: <b>400 Watts per drive-thru</b> (NT)		The Exterior Building Lighting Power Allowance is the <b>sum</b> of all the lighting applications present at that building, <b>plus</b> an additional unrestricted <b>5%</b> . The <b>Non-Tradable</b> (NT) Surfaces are <u>in addition</u> to allowances permitted in the Tradable Surfaces. These are "Use it or Lose it" allowances; meaning they can be claimed <u>only</u> if actually present, <b>and</b> they <u>cannot</u> be combined (traded) with any other exterior allowance. See IECC Table 505.6.2 or ASHRAE Table 9.4.5, which have the <b>identical</b> surface categories and limit values.
<b>Exit Signs</b>	Internally Illuminated signs shall not exceed <b>5 Watts per side</b>	Internally Illuminated signs shall not exceed <b>5 Watts per face</b>	Essentially the same
<b>Luminaire Wattage Determination</b>	a) Screw lamp holders – the maximum labeled wattage of the luminaire b) Low-voltage lighting – the specified wattage of transformer supplying the system c) Line-voltage track and plug-in busway – the <b>greater of 30 Watts / Linear foot of track</b> <u>or</u> the sum of wattages of the specified equipment d) Other luminaires – per data furnished by the manufacturer or other approved sources	a) Medium screw base sockets w/ ballasts -- maximum labeled wattage of the luminaire b) Luminaires with permanently installed or remote ballasts or transformers – maximum wattage of lamp / ballast (lamp / auxiliary) combination c) Low-voltage track, cable or rail lighting – wattage of transformer d) Line-voltage track and plug-in busway – <b>greater of 30 Watts / linear foot</b> <u>or</u> the sum of the specified wattages of luminaires included in system e) All other lighting – as specified	Compare the <u>actual text</u> in each of the two Standards, IECC Section 505.5.1-4 and ASHRAE paragraph 9.1.4.  In ASHRAE paragraph 3.2; page 9, the Installed Interior Lighting Power (IILP) is defined as, "the power in Watts of <b>all permanently installed</b> general, task, and furniture lighting systems and luminaires." The only exception to ASHRAE paragraph 9.1.3 [on IILP] (below) says, "If two or more independently operating lighting systems in a space are capable of being controlled to prevent simultaneous user operation, the installed interior lighting power shall be based solely on the lighting system with the <b>highest wattage.</b> "
<b>Interior Lighting Power (ILP)</b>	Section 505.5.1 lists <b>five</b> specific exemptions to the total connected interior lighting power (ILP) load.	Section 9.2.2.3 lists <b>fifteen different</b> exemptions to ILP. <b>Each</b> must <u>not</u> be general lighting, <u>and</u> <b>each</b> must have an independent control device.	The Installed Interior Lighting Power (IILP) includes all power used by the luminaires <b>and</b> their control equipment, per ASHRAE paragraph 9.1.3.; also see the <b>one</b> exception, noted above.
<b>ILPD – Interior Lighting Power Density Limits</b>	Table 505.5.2 -- Interior Lighting Power Density – on an entire or whole building basis -- (page 50) The ILPD Limits are listed as the Maximum <u>Watts per Square Foot</u> permitted for a particular use.	Table 9.5.1 -- Lighting Power Density using the <b>Building Area Method</b> (page 64) The ILPD Limit values are listed as the Maximum <u>Watts per Square Foot</u> permitted for a particular use.	Note that IECC pertains only to the "conditioned space" (floor area) portion of the building. Both IECC and AHSRAE use the <b>same</b> table categories <u>and</u> limit values for the whole building (building area) prescriptive method.
<b>ILPD – Interior Lighting Power Density Limits</b>	Table 505.5.2 -- Interior Lighting Power Density – (page 50)  <b>NOTE:</b> IECC allows the <u>same</u> ILPD limits to be used for portions of the building, but these values are no greater than the ILPD limits for the whole building  The ILPD Limits are listed as the Maximum <u>Watts per Square Foot</u> permitted for a particular use.	Table 9.6.1 -- Lighting Power Density using the <b>Space by Space Method</b> (pages 65-66) ASHRAE provides an additional table with <u>slightly</u> higher ILPD limit values for its space-by-space method, <u>and</u> it has a much more comprehensive variety of application choices.  The ILPD Limit values are listed as the Maximum <u>Watts per Square Foot</u> permitted for a particular use.	ASHRAE offers a Space-by-Space method that provides applicability flexibility due to its large matrix of space types and uses. Both Standards permit <u>differently limited</u> extra power density allowances for retail display lighting. ASHRAE has <u>additional</u> ILPD allowances for decorative lighting and lighting for visual display terminals (VDTs). ASHRAE's VDT allowance is only applicable to lighting systems that do <u>not</u> exceed the luminance [brightness] limits listed in the Standard (maximum average luminance values at specific viewing angles).
<b>Existing Bldg. Lighting System Alterations</b>	<b>Additions, alterations, renovations or repairs</b> to a lighting system, or portion thereof, shall conform to <u>all</u> provisions of IECC.	<b>Replacement</b> of lighting systems in any space, <u>and</u> all <b>new</b> lighting systems, shall comply with the applicable LPD requirements of Section 9.	Examine IECC Chapter 1, Section 101.4.3. See International Existing Building Code (IEBC-2006): Chapter 4, Alterations; <u>where adopted</u> . ASHRAE <u>also</u> requires compliance with the Space Control provisions of Section 9.4.1.2 (b).
<b>Exceptions to Lighting System Alterations</b>	The <u>unaltered</u> portion(s) of the existing lighting system is (are) <u>not</u> required to comply with IECC. Alterations involving <b>&gt; 50%</b> of the <b>building area</b> trigger compliance.	Alterations that replace <b>&lt; 50%</b> of the <b>luminaires in a space</b> ; <u>provided that</u> such alterations do <u>not</u> increase the installed interior lighting power [new lighting load <b>must be</b> <b>&lt; or =</b> old load]	Both ASHRAE and IECC have reduced requirements, or exemptions, for authentic historic buildings. Consult the local Authority Having Jurisdiction (AHJ) for more information.

\*ASHRAE Standard 90.1 is the **only** standard for compliance with LEED-NC® (Leadership in Energy and Environmental Design).

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