



Issue: #TB156
Date: July 24, 2003
Topic: ASHRAE/IESNA Standard 90.1-1999

ASHRAE 90.1-1999: Lighting Provisions

The ASHRAE/IESNA Standard 90.1 states minimum energy efficiency requirements for commercial building design. In 2002, the Department of Energy (DOE) selected ANSI/ASHRAE/IESNA Standard 90.1-1999 as the commercial building reference standard for state building energy codes by its authority under the Energy Conservation and Production Act. This means that by July 15, 2004, states must certify that they have energy codes in force that are at least as stringent as 90.1-1999, or provide justification for their noncompliance. In turn, this standard requires new construction be built to comply with these standards.

When publishing the ruling in July 2002, the DOE indicated its analysis showed that adoption of this standard would increase new building efficiency by approximately six percent. The standard was developed by the members of ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.) and IESNA (Illuminating Engineering

Figure 2. Status of State Energy Code Adoptions

| ASHRAE/IESNA Standard or Equivalent State Code | States Adopted or Adopting |
|--|--|
| ASHRAE/IESNA 90.1-2001, Statewide adoption or equivalent state code | 5 States (GA, KS, ME, NV ⁴ , PA,) |
| 2000 IECC | 5 States (KY ³ , NC, NE, VA, WV) |
| ASHRAE/IESNA 90.1-1999, Statewide or equivalent state code adoption or in adoption process | 18 States (AL, CA, FL, ID, MA, ME, MI, NJ, NY, OH, OR, RI, TN, TX, UT, WA) |
| ASHRAE/IESNA 90.1-1989, Mandatory statewide adoption/equivalence | 16 States and DC (AR, CT, DE, IA, LA, MD, MN, MT, NH, OK, SC, WI, HI ¹ , IN, NE, VT ²) |
| No commercial code or commercial code is not EPAAct compliant ⁶ | 12 States (AK, AZ ⁴ , CO ^{1,4} , IL ¹ , MO, MS, ND, NM ⁴ , SD, TN, WY) |

Building Code Assistance Project July 2003

- Code implementation depends upon the voluntary adoption of the code by local jurisdictions.
- Vermont's commercial code for state-owned buildings exceeds ASHRAE 90.1-1989. The state is developing a private commercial energy code that will exceed ASHRAE 90.1-1989.
- KY adopted only 2000 IECC external envelope requirements.
- Code applies only to state-owned and -funded buildings.

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Society of North America). Figure 1 shows the current status of state energy code adoptions.

Lighting Provisions:

While ASHRAE 90.1-1999 was designed to be easier to use than 90.1-1989, it also imposes tougher standards for energy-efficient lighting. The points/credits approach of the earlier standard has been abandoned in favor of clearer, mandatory language. The new standard includes broad mandatory provisions for lighting control, with few exceptions. The only lighting exempted from these control provisions is lighting that is intended for 24 hours/day operation for safety.

Automatic Lighting Shut off:

- Buildings larger than 5000 sq ft must use an automatic control device to turn off lighting in all spaces. The automatic control device shall be either:
 - A programmable time scheduling device, where an independent program schedule shall be provided for areas less than or equal to 25,000 sq ft, but not more than one program schedule per floor, or
 - An occupancy sensor that turns lighting off within 30 minutes after the space is vacated, or
 - An unoccupied control signal from another control or alarm system

Space Control:

- Each space that's enclosed by ceiling-height partitions must have at least one control device that

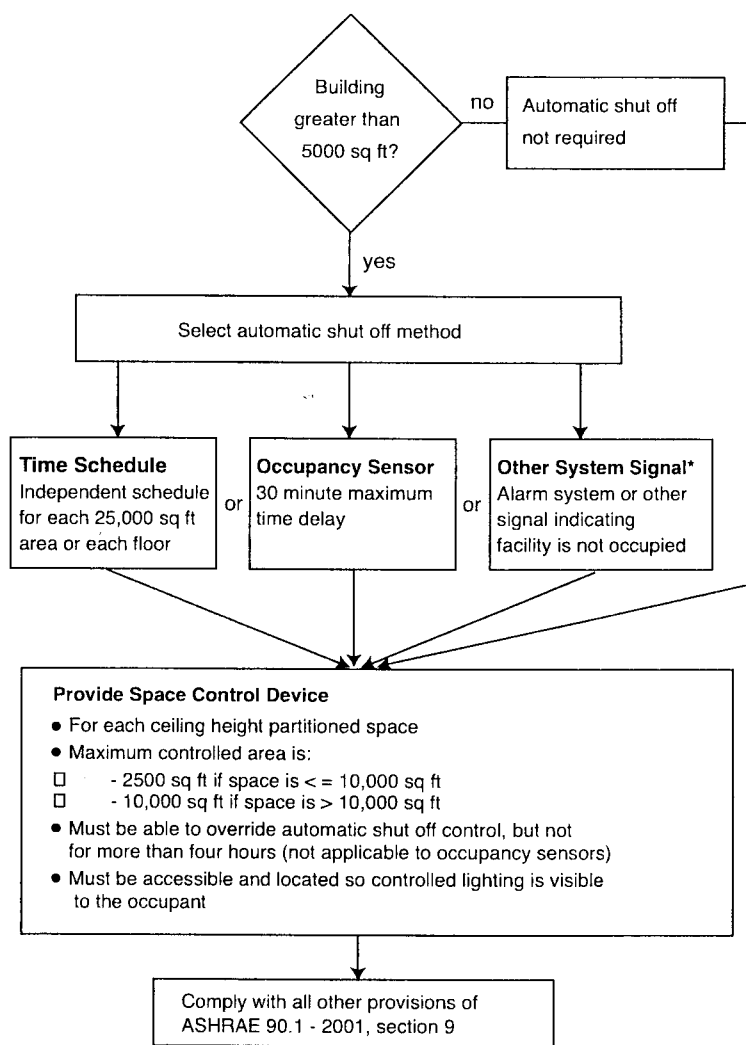


Figure 2. Lighting Control Compliance Guidelines for ASHRAE 90.1-1999

independently controls the general lighting in the space. Each control device shall be activated either by an automatic motion sensor, or manually by an occupant.

- For spaces equal to or less than 10,000 sq ft, each control device shall control a maximum of 2500 sq ft
- For spaces greater than 10,000 sq ft, each control device shall control zones no larger than 10,000 sq ft
- Each control device shall be capable of overriding the automatic lighting shut off for no more than four hours
- Each control device shall be readily accessible and located so that the occupant can see lights from the controlling switch

Exterior Lighting Control:

- Lighting for all exterior applications shall be controlled by a photocell or astronomical time clock capable of automatically turning off the exterior lighting when adequate daylight is available.

Additional Control Requirements

- Display/Accent Lighting: separate control device required
- Case Lighting: lighting in cases used for display purposes requires a separate control device.
- Hotel Guest Room Lighting: a master control device at the main room entry that controls all permanently installed luminaires and switched receptacles is required.
- Task Lighting: supplemental task lighting, including permanently installed undershelf or undercabinet lighting, requires either a control device that is integral to the luminaires or that is controlled by a readily accessible, wall-mounted control device located so the occupant can see the controlled lighting.
- Nonvisual Lighting: lighting for nonvisual applications (i.e., plant growth or food warming) must have a separate control device.
- Demonstration Lighting: lighting equipment that is for sale or for demonstrations in lighting education shall have a separate control device.

Examples:

A commercial office building has exterior lighting throughout its parking lot, along the walkways, and around the building. In addition, it has a large illuminated sign located near the parking lot entrance. In compliance with ASHRAE 90.1-1999, the parking lot, walkway, and exterior building lighting is automatically turned off during the day by a photocell or astronomical time clock, as is the sign.

The interior of the building has private offices on the building perimeter, and open office space

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of 7500 square feet in the building center. To comply with the ASHRAE Standard, the private offices have occupancy sensors that turn lighting on upon detection of occupancy, and off no later than 30 minutes after an occupant has left the space. The open office area has three manually operated switches, each controlling a 2500 square foot area. These switches work in conjunction with a time-scheduled lighting control panel that is scheduled to automatically shut lighting off when the open office is unoccupied. Occupants can use the switches to override the shut-off control during scheduled unoccupied times for no more than four hours.

Conclusion:

The use of lighting controls such as lighting control panels or occupancy sensors is a simple and convenient way to comply with the lighting controls sections of the ASHRAE 90.1-1999 Standard. The Watt Stopper provides reliable lighting control products to comply with today's energy code standards. Through its Technical Support team, The Watt Stopper also provides technical expertise on code compliance issues, such as product selection and design and application guidance. Call Technical Support at 800.879-8585 for assistance with code compliance.

Sources:

Building Codes Assistance Project (BCAP) web site: <http://www.bcap-energy.org/index.html>.

Department of Energy website: www.energycodes.gov/news/broadcasts/cast_01.stm.

ASHRAE/IESNA 90.1-1999, ASHRAE/IESNA Standard: Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings and ASHRAE/IESNA Standard 90.1-1999 User's Manual. The ASHRAE 90.1-1999 Standard includes sections on Lighting, Heating, Ventilating and Air-Conditioning (HVAC) Systems and Equipment, Auxiliary Systems and Equipment, Building Envelope, Service Water Heating (SWS) Systems and Equipment, Energy Management, and Building Energy Cost Budget Methods. For more complete information on these sections, or to purchase a copy of the Standard, please contact ASHRAE at 1/800-5 ASHRAE (1/800-527-4723) or visit <http://resourcecenter.ashrae.org/store/ashrae/>. or visit the Illuminating Engineering Society of North America and American Society of Heating, Refrigerating and Air-Conditioning Engineers (IESNA) website at www.iesna.org.

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| | |
|---------------------|------------|
| Project Name: | |
| Project Address: | Date: |
| Designer of Record: | Telephone: |
| Contact Person: | Telephone: |
| City: | |

Mandatory Provisions Checklist

- | | | |
|--|--|--|
| <input type="checkbox"/> Automatic lighting shutoff controls are provided based on either a scheduling device or an occupant sensor. <ul style="list-style-type: none"> <input type="checkbox"/> Exception: Space is intended for 24-hour operation. <input type="checkbox"/> Exception: Space is smaller than 5,000 ft². | <input type="checkbox"/> For spaces less than or equal to 10,000 ft ² , a separate space control is provided for each 2,500 ft ² of area. <input type="checkbox"/> For spaces more than 10,000 ft ² , a separate space control is provided for each 10,000 ft ² of area. <input type="checkbox"/> Either a photosensor or an astronomical time switch controls exterior lighting applications. <ul style="list-style-type: none"> <input type="checkbox"/> Exception: Lights must remain on for safety, security or eye adaptation reasons. | <input type="checkbox"/> Case lighting has a separate control. <input type="checkbox"/> Hotel/motel guest rooms have a master switch at the main entry. <input type="checkbox"/> Task lighting has a separate control. <input type="checkbox"/> Nonvisual lighting has a separate control. <input type="checkbox"/> Demonstration lighting has a separate control. <input type="checkbox"/> Exit signs larger than 20 W have an efficacy greater than or equal to 35 lumens/W. <input type="checkbox"/> Exterior luminaires greater than 100 W have lamps with minimum efficacy of 60 lumens/W. <ul style="list-style-type: none"> <input type="checkbox"/> Exception: Luminaire is activated with a motion sensor. |
| <input type="checkbox"/> Each space enclosed by ceiling-height partitions has an independent, accessible control that operates general lighting in the space. <ul style="list-style-type: none"> <input type="checkbox"/> Exception: The control is located in a remote location for safety or security reasons. | <input type="checkbox"/> Two-lamp tandem-wired ballasts. <input type="checkbox"/> Display lighting has a separate control. | |

Interior Lighting Power Allowance (Building Area Method)

| Building Type | Lighting Power Density (W/ft ²) | Building Area (ft ²) | Lighting Power Allowance (W) |
|---------------|---|----------------------------------|------------------------------|
| | | | |
| | | | |
| | | | |
| Total | | | |

Interior Lighting Power Allowance (Space-by-Space Method)

| Building Type | Common/Specific Space Type | Lighting Power Density (W/ft ²) | Space Area (ft ²) | Lighting Power Allowance (W) |
|---------------|----------------------------|---|-------------------------------|------------------------------|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| Total | | | | |



| | |
|-----------------|------------|
| Project Name: | |
| Contact Person: | Telephone: |

Interior Connected Lighting Power

| ID | Luminaire Description (including number of lamps per fixture, watts per lamp, type of ballast, type of fixture) | Type | | | | | | Number of Luminaires | Watts/ Luminaire | Total Watts |
|-------|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|-------------------------|---------------------|----------------|
| | | Incandescent | Fluorescent | HID | Line-Voltage Track | Low-Voltage Track | Other | | | |
| | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Total | | | | | | | | | | |

Additional Interior Lighting Power Allowance

| Space ID | Space Name | Type | | | Area (ft ²) | Unit Allowance (W/ft ²) | Allowance (W) | Luminaire ID's | Installed Power (W) |
|----------|------------|--------------------------|--------------------------|--------------------------|-------------------------|--|------------------|-------------------|------------------------|
| | | Decorative | VDT's | Display Lighting | | | | | |
| | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | | |
| | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | | |
| | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | | |
| | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | | |
| | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | | |
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| | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | | |
| | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | | | |



| | |
|-----------------|------------|
| Project Name: | |
| Contact Person: | Telephone: |

Additional Interior Connected Lighting Power

| ID | Luminaire Description (including number of lamps per fixture, watts per lamp, type of ballast, type of fixture) | Type | | | | | | Number of Luminaires | Watts/ Luminaire | Total Watts |
|-------|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|-------------------------|---------------------|----------------|
| | | Incandescent | Fluorescent | HID | Line-Voltage Track | Low-Voltage Track | Other | | | |
| | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | |
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| | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| | | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | | | |
| Total | | | | | | | | | | |

Exterior Building Lighting Power Allowance (except façades)

| Application | Allowance | Area or Length (ft ² or ft) | Total Watts |
|--|--------------------------------------|--|-------------|
| Building entrance with canopy or free standing | 3 W/ft ² of canopied area | | |
| Building entrance without canopy | 33 W/lin ft of door width | | |
| Building exit | 20 W/lin ft of door width | | |
| Total | | | |

Exterior Connected Lighting Power (except façades)

| ID | Luminaire Description (including number of lamps per fixture, watts per lamp, type of ballast, type of fixture) | Number of Luminaires | Watts/ Luminaire | Total Watts |
|-------|---|-------------------------|---------------------|----------------|
| | | | | |
| | | | | |
| | | | | |
| Total | | | | |

Building Façades Lighting Power Allowance

| Application | Allowance | Area or Length (ft ² or ft) | Total Watts |
|------------------|---|--|-------------|
| Building façades | 0.25 W/ft ² of illuminated façade area | | |

Building Façades Connected Lighting Power

| ID | Luminaire Description (including number of lamps per fixture, watts per lamp, type of ballast, type of fixture) | Number of Luminaires | Watts/ Luminaire | Total Watts |
|-------|---|-------------------------|---------------------|----------------|
| | | | | |
| | | | | |
| | | | | |
| Total | | | | |

