ANSI/ASHRAE/IES Addenda cr, cs, cw, cz, da, and dc to ANSI/ASHRAE/IESNA Standard 90.1-2007

ASHRAE ADDENDA

Energy Standard for Buildings Except Low-Rise Residential Buildings

Approved by the ASHRAE Standards Committee on June 26, 2010; by the ASHRAE Board of Directors on June 30, 2010; by the IES Board of Directors on June 23, 2010; and by the American National Standards Institute on July 1, 2010.

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ASHRAE obtains consensus through participation of its national and international members, associated societies, and public review.

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FOREWORD

Justification for modifying unmet load hour definition, section 11.3.2i, Table 11.3.1, section G3.1.2.2, Table G3.1, and adding new section G3.1.2.3:

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.

It was also discussed to remove the requirement that the proposed unmet hours be no more than 50 greater than baseline unmet hours. Several LEED reviewers commented to the EA TAG that they had required an analysis to be modified to meet the 50 hour limit, which proved very difficult to do, and resulted in no appreciable differences in the results, as long as the 300 hour total limit on loads not met was not violated. It appears to be a burdensome requirement that does not result in a better or more accurate accounting of savings. Section 11.3.2i was revised to require both the proposed and baseline unmet hours be no greater than 300 in both the baseline and proposed. This is the same language used for unmet hours in Appendix G.

Lastly it was decided to remove the language allowing modification of the system coil capacities to reduce unmet hours as needed. The consensus of the ECB subcommittee and of other modelers was that loads not being met were almost never a result of undersized equipment, but rather some other fundamental flaw in the model.

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Addendum cr to 90.1-2007

Modify Section 3.2 as follows (I-P and SI Units):

temperature control throttling range: The number of degrees that room temperature must change in order to go from full heating to no heating or from full cooling to no cooling.

unmet load hour: an hour in which one or more zones is outside of the thermostat setpoint plus or minus one half of the *temperature control throttling range*. Any hour with one or more zones with an unmet cooling load or unmet heating load is defined as an unmet load hour.

Modify Section 11 as follows:

11.3.2 HVAC Systems

i. The equipment capacities for the *budget building design* shall be sized proportionally to the capacities in the *proposed building design* based on sizing runs, i.e., the ratio between the capacities used in the annual simulations and the capacities determined by the sizing runs shall be the same for both the *proposed building design* and *budget building design*. ~~Unmet load hours for the *proposed building design* shall not differ from unmet load hours for the *budget baseline building by more than 50 hours.*~~ *Unmet load hours* for the *proposed design* or *baseline building designs* shall not exceed 300. The *unmet load hours* for the proposed design shall not exceed the *unmet load hours* for the budget building. Alternatively, *unmet load hours* exceeding these limits may be accepted at the discretion of the *rating authority* provided that sufficient justification is given indicating that the accuracy of the simulation is not significantly compromised by these unmet loads.

Modify Table 11.3.1 as follows

Proposed Building Design (Column A)

Design Energy Cost (DEC)

1. DESIGN MODEL

a. The simulation model of the *proposed building design* shall be consistent with the design documents, including proper accounting of fenestration and opaque envelope types and area; interior lighting power and controls; HVAC system types, sizes, and controls; and service water heating systems and controls.
b. All conditioned spaces in the *proposed building design* shall be simulated as being both heated and cooled even if no cooling or heating system is being installed. Temperature and humidity control setpoints and schedules, as well as *temperature control throttling range* shall be the same for *proposed* and *baseline building designs*.
c. When the *energy cost budget* method is applied to buildings in which energy related features have not yet been designed (e.g., a lighting system), those yet-to-be-designed features shall be described in the *proposed building design* so that they minimally comply with applicable mandatory and prescriptive requirements from Sections 5 through 10. Where the space classification for a building is not known, the building shall be categorized as an office building.

Modify Appendix G as follows:

G3.1.2.2 Equipment Capacities. The equipment capacities (i.e. system coil capacities) for the *baseline building design* shall be based on sizing runs for each orientation (per Table G3.1, No. 5a) and shall be oversized by 15% for cooling and 25% for heating, i.e., the ratio between the capacities used in the annual simulations and the capacities determined by the sizing runs shall be 1.15 for cooling and 1.25 for heating. ~~Unmet load hours for the *proposed design* or *baseline build-*~~

~~*ing designs* shall not exceed 300 (of the 8760 hours simulated), and unmet load hours for the *proposed design* shall not exceed the number of unmet load hours for the *baseline building design* by more than 50. If unmet load hours in the *proposed design* exceed the unmet load hours in the *baseline building* by more than 50, simulated capacities in the *baseline building* shall be decreased incrementally and the building resimulated until the unmet load hours are within 50 of the unmet load hours of the *proposed design*. If unmet load hours for the *proposed design* or *baseline building design* exceed 300, simulated capacities shall be increased incrementally, and the building with unmet loads resimulated until unmet load hours are reduced to 300 or less. Alternatively, unmet load hours exceeding these limits may be accepted at the discretion of the *rating authority* provided that sufficient justification is given indicating that the accuracy of the simulation is not significantly compromised by these unmet loads.~~

G3.1.2.3 Unmet Loads. ~~Unmet load hours~~ *Unmet load hours* for the *proposed design* or *baseline building designs* shall not exceed 300 (of the 8760 hours simulated). Alternatively, ~~unmet load hours~~ *unmet load hours* exceeding these limits may be accepted at the discretion of the *rating authority* provided that sufficient justification is given indicating that the accuracy of the simulation is not significantly compromised by these unmet loads.

Modify Table G3.1 as follows

Proposed Building Performance

1. DESIGN MODEL

a. The simulation model of the *proposed design* shall be consistent with the design documents, including proper accounting of fenestration and opaque envelope types and areas; interior lighting power and controls; HVAC system types, sizes, and controls; and service water heating systems and controls. All end-use load components within and associated with the building shall be modeled, including, but not limited to, exhaust fans, parking garage ventilation fans, snow-melt and freeze-protection equipment, facade lighting, swimming pool heaters and pumps, elevators and escalators, refrigeration, and cooking. Where the simulation program does not specifically model the functionality of the installed system, spreadsheets or other documentation of the assumptions shall be used to generate the power demand and operating schedule of the systems.

b. All conditioned spaces in the *proposed design* shall be simulated as being both heated and cooled even if no heating or cooling system is to be installed~~., and temperature and humidity control setpoints and schedules as well as *temperature control throttling range* shall be the same for *proposed* and *baseline building designs*~~. Temperature and humidity control setpoints and schedules as well as *temperature control throttling range* shall be the same for *proposed* and *baseline building designs*.

c. When the *performance rating method* is applied to buildings in which energy related features have not yet been designed (e.g., a lighting system), those yet-to be-designed features shall be described in the *proposed design* exactly as they are defined in the *baseline building design*. Where the space classification for a space is not known, the space shall be categorized as an office space.

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FOREWORD

This proposed change originated with a continuous maintenance proposal to address information received on addendum bs after the public review period closed and which the subcommittee found to have merit. The change from a list of exemptions that may not be incomplete to a set of spaces where the control is required eliminates many potential practical application issues (that tends to reduce compliance) while still retaining the requirement in those spaces expected to provide the vast majority of savings.

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Addendum cs to 90.1-2007

Modify Section 8.4.2 as follows (SI and I-P units):

8.4.2 Automatic Receptacle Control

At least 50% of all 125~~0~~ volt 15- and 20-Ampere receptacles, including those installed in modular partitions, installed in ~~an enclosed space~~ the following space types:

a. Private offices
b. Open offices
c. Computer Classrooms

shall be controlled by an *automatic control device* that shall function on:

a. a scheduled basis using a time-of-day operated control device that turns receptacles off at specific programmed times - an independent program schedule shall be provided for areas of no more than 25,000 ft^2 but not more than one floor, or
b. an *occupant sensor* **that shall turn receptacles off within** 30 minutes of all occupants leaving a space, or
c. a signal from another control or alarm system that indicates the area is unoccupied.

Exceptions: Receptacles for the following shall not require an *automatic control device:*

a. Receptacles specifically designated for equipment requiring 24 hour operation.
~~b. Spaces where patient care is rendered.~~
c. Spaces where an automatic shutoff would endanger the safety or security of the room or building occupant(s).
~~d. Corridors~~
~~e. Hotel and motel guest rooms~~
~~f. Restrooms~~

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FOREWORD

These changes address corrections and clarification necessary to Section 11, Table 11.3.1 section 11 Service Hot Water Systems. Currently the budget building design (Column B) for the Energy Cost Budget (ECB) instructs the user to apply identical system type and efficiency for the service hot water systems in the budget building design and in the proposed building design. This contradicts section 11.32 (b) which clearly states that the minimum efficiency of the service hot water system of the budget building design shall be per section 7.4 (or 7.4.2) which refers to table 7.8. The current approach also doesn't allow any credit for better than the minimum efficiency requirements as listed in table 7.8. By correcting this contradiction and changing the current description, there is a possibility that the proposed building design Service Hot water system will not be listed in table 7.8. This will not allow the user to select the system type and specify the minimum efficiency of the budget building design service hot water system. Under these circumstances the user is instructed to use identical service hot water system (and efficiency) in both the budget Building design and the proposed building design. This approach is also consistent with section 11.3.2 (a) which refers only to HVAC systems.

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Addendum cw to 90.1-2007

Modify the Table 11.3.1 as follows (I-P and SI Units):

Part 11 - Design Energy Cost *(budget building design column)*

The service hot-water system type ~~and related performance~~ in the budget building design shall be identical to the proposed building design. The service hot-water system performance of the budget building design shall meet the requirements of Table 7.8.

Exceptions:

a. If the service hot water system type is not listed in Table 7.8 it shall be identical to the proposed building design.

Reletter exception a and b, as b and c respectively.

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FOREWORD

This change incorporates bi-level control for parking garages to reduce the wasted energy associated with unoccupied periods for many garages AND allows an exception for lighting in the transition (entrance/exit) areas to accommodate IES recomendations.

The IES Recommended Practice for Parking Facilities, RP-20 includes a recommendation for a Daylight Transition Zone to allow for eye adaptation going to/from daylight conditions and the interior of a parking facility. Since some parking facilities will have much more daylight available than others, it is very difficult to determine an appropriate LPD (watts per square foot allowance). An exception for this specific small area in a parking garage is the most straightforward way to allow for this recommended practice.

A number of case studies have been conducted by the California Lighting Technology Center (CLTC) of motion sensing bi-level lighting controls for outdoor lighting. The CLTC measured lighting control savings of 42% in parking garages (http://cltc.ucdavis.edu/content/view/354/287/). The CLTC had also conducted a life cycle savings analysis and showed that this type of control was cost effective with simple paybacks less than 5 years. The University of California has a sample specification for these types of controls and is implementing this control across their campuses. Campus police have indicated that they like this type of control as they can readily identify occupancy in spaces at night. Bi-level controls are compatible with a variety of small (< 175 W) wattage sources used in parking garages including ceramic metal halide, fluorescent, LED and induction lighting.

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Addendum cz to 90.1-2007

Modify the Standard as follows (I-P Units)

Add exception "r" to 9.2.2.3

r. Parking garage transition lighting: Lighting for covered vehicle entrances and exits from buildings and parking structures, that comply with section 9.4.1.3 a and c. Each transition zone shall not exceed a depth of 66 feet inside the structure and a width of 50 feet.

Add new Section 9.4.1.3 as follows and renumber current Section 9.4.1.3 as 9.4.1.4

8.4.2.3 Parking Garage Lighting Control. Lighting for parking garages shall comply with the following requirements:

a. Comply with Section 9.4.1.1.

b. Lighting shall be controlled by one or more devices that automatically reduce lighting power of each luminaire by a minimum of 30% when there is no activity detected within a lighting zone for no more than 30 minutes. Lighting zones for this requirement shall be no larger than 3,600 ft^2.

c. Daylight transition zone lighting, as described in Section 9.2.2.3 exception r, shall be separately controlled by a device that automatically turns lighting on during daylight hours and off at sunset.

d. For luminaires within 20 feet of any perimeter wall structure that has a net opening to wall ratio of at least 40% and no exterior obstructions within 20 feet, the power shall be automatically reduced in response to daylight.

Exceptions:

a. Daylight transitions zones and ramps without parking are exempt from sections b and d above.

b. Applications using HID of 150 watts or less or Induction lamps are exempt from section b above.

Modify the Standard as follows (SI Units)

Add exception "r" to 9.2.2.3

r. Parking garage transition lighting: Lighting for covered vehicle entrances and exits from buildings and parking structures, that comply with section 9.4.1.3 a and c. Each transition zone shall not exceed a depth of 20 m inside the structure and a width of 15 m.

Add new Section 9.4.1.3 as follows and renumber current Section 9.4.1.3 as 9.4.1.4

8.4.2.3 Parking Garage Lighting Control. Lighting for parking garages shall comply with the following requirements:

a. Comply with Section 9.4.1.1.

b. Lighting shall be controlled by one or more devices that automatically reduce lighting power of each luminaire by a minimum of 30% when there is no activity detected within a lighting zone for no more than 30 minutes. Lighting zones for this requirement shall be no larger than 334 m^2.

c. Daylight transition zone lighting, as described in Section 9.2.2.3 exception r, shall be separately controlled by a device that automatically turns lighting on during daylight hours and off at sunset.

d. For luminaires within 6 m of any perimeter wall structure that has a net opening to wall ratio of at least 40% and no exterior obstructions within 6 m, the power shall be automatically reduced in response to daylight.

Exceptions:

a. Daylight transitions zones and ramps without parking are exempt from sections b and d above.

b. Applications using HID of 150 watts or less or Induction lamps are exempt from section b above.

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FOREWORD

The benefits of ventilation to the health and well being of building occupants is well documented and widely accepted. Minimum ventilation rates for buildings are generally established by local code and or a rating authority (ie: USGBC - LEED certification). In cases where building owners make conscious decisions to provide ventilation in excess of the minimum required for the health of building occupants they need to understand the energy implication of this decision. Building owners and designers must make balanced decisions regarding indoor air quality and energy efficiency. The intent of this addendum is to establish that an Appendix G baseline shall be based on the minimum ventilation requirements required by local codes or a rating authority and not the proposed design ventilation rates.

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Addendum da to 90.1-2007

Modify the Standard as follows (SI and I-P Units)

G3.1.2.5 Ventilation. Minimum ventilation system *outdoor air* intake flow, shall be the same for the *proposed* and *baseline building designs.*

Exceptions:

a. When modeling demand-control ventilation in the *proposed design* when its use is not required by Section 6.3.2(p) or Section 6.4.3.9.

b. When designing systems in accordance with Standard 62.1 Section 6.2 Ventilation Rate Procedure, reduced ventilation airflow rates may be calculated for each HVAC zone in the *proposed design* with a zone air distribution effectiveness (Ez) > 1.0 as defined by Table 6-2 in Standard 62.1.

   Baseline ventilation airflow rates in those zones shall be calculated using the *proposed design* Ventilation Rate Procedure calculation with the following change only. Zone air distribution effectiveness shall be changed to (Ez)=1.0 in each zone having a zone air distribution effectiveness (Ez)>1.0.

   Proposed design and *baseline design* Ventilation Rate Procedure calculations, as described in Standard 62.1, shall be submitted to the rating authority to claim credit for this exception.

c. If the minimum outdoor air intake flow in the *proposed design* is provided in excess of the amount required by the *rating authority* or *building official* then the *baseline building design* shall be modeled to reflect the greater of that required by the *rating authority* or *building official* and will be less than the *proposed design.*

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FOREWORD

The conditions and common practice that existed to create the need for this requirement are no longer practiced primarily with the new Federal efficacy requirements and products available on the market.

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Addendum dc to 90.1-2007

Delete Section 9.4.2 (I-P Units)

~~9.4.2~~ ~~Tandem Wiring.~~ ~~Luminaires designed for use with one or three linear fluorescent lamps greater than 30 W each shall use two-lamp tandem-wired ballasts in place of single-lamp ballasts when two or more luminaires are in the same space and on the same control device.~~

~~Exceptions:~~

~~a. Recessed luminaires more than 10 ft apart measured center to center.~~

~~b. Surface mounted or pendant luminaires that are not continuous.~~

~~c. Luminaires using single-lamp high frequency electronic ballasts.~~

~~d. Luminaires using three-lamp high frequency electronic or three-lamp electromagnetic ballasts.~~

~~e. Luminaires on emergency circuits.~~

~~f. Luminaires with no available pair.~~

Delete Section 9.4.2 (S-I Units)

~~9.4.2~~ ~~Tandem Wiring.~~ ~~Luminaires designed for use with one or three linear fluorescent lamps greater than 30 W each shall use two-lamp tandem-wired ballasts in place of single-lamp ballasts when two or more luminaires are in the same space and on the same control device.~~

~~Exceptions:~~

~~a. Recessed luminaires more than 3 m apart measured center to center.~~

~~b. Surface mounted or pendant luminaires that are not continuous.~~

~~c. Luminaires using single-lamp high frequency electronic ballasts.~~

~~d. Luminaires using three-lamp high frequency electronic or three-lamp electromagnetic ballasts.~~

~~e. Luminaires on emergency circuits.~~

~~f. Luminaires with no available pair.~~

POLICY STATEMENT DEFINING ASHRAE'S CONCERN FOR THE ENVIRONMENTAL IMPACT OF ITS ACTIVITIES

ASHRAE is concerned with the impact of its members' activities on both the indoor and outdoor environment. ASHRAE's members will strive to minimize any possible deleterious effect on the indoor and outdoor environment of the systems and components in their responsibility while maximizing the beneficial effects these systems provide, consistent with accepted standards and the practical state of the art.

ASHRAE's short-range goal is to ensure that the systems and components within its scope do not impact the indoor and outdoor environment to a greater extent than specified by the standards and guidelines as established by itself and other responsible bodies.

As an ongoing goal, ASHRAE will, through its Standards Committee and extensive technical committee structure, continue to generate up-to-date standards and guidelines where appropriate and adopt, recommend, and promote those new and revised standards developed by other responsible organizations.

Through its *Handbook*, appropriate chapters will contain up-to-date standards and design considerations as the material is systematically revised.

ASHRAE will take the lead with respect to dissemination of environmental information of its primary interest and will seek out and disseminate information from other responsible organizations that is pertinent, as guides to updating standards and guidelines.

The effects of the design and selection of equipment and systems will be considered within the scope of the system's intended use and expected misuse. The disposal of hazardous materials, if any, will also be considered.

ASHRAE's primary concern for environmental impact will be at the site where equipment within ASHRAE's scope operates. However, energy source selection and the possible environmental impact due to the energy source and energy transportation will be considered where possible. Recommendations concerning energy source selection should be made by its members.