Public Review Draft

Proposed Addendum m to Standard 189.1-2023

Standard for the Design of High-Performance Green Buildings

Except Low-Rise Residential Buildings

First Public Review (February, 2025)
(Draft Shows Proposed Changes to Current Standard)

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(This foreword 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 objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)

Foreword

This addendum revises the mandatory and credit provisions for demand response and load management measures.

The mandatory language for HVAC, lighting and demand response requirements has been revised to provide updated standards and further clarity on use case application. Examples include that heating only systems that are non-electric or are provided by on-site solar thermal heating are exempted. A new measure for mandatory electrical vehicle service equipment has been added.

The technical language for additional “credits” for load management largely mirror those found in ASHRAE 90.1 but have been separated for compliance from the energy efficiency credits. Similar to what is in ASHRAE 90.1, the additional efficiency credits section reiterates that on-site renewable energy is limited to 60% of the additional efficiency credits.

To prevent load management credits from being traded against additional energy requirements, a new section sets minimum requirements for load management credits based on electric load capacity of the building and whether a demand responsive program is available where the building project is located. Load management credits are not required for locations with a demand response program. Additional clarifying language replaces the ambiguity of the term “common areas” which are not included in the lighting available for the Reduce Interior Lighting Power credit. This term is replaced with “areas other than dwelling units, dormitory living quarters and guest rooms.” This revision clarifies that dormitory living quarters are included in the list of residential spaces.

[Note to Reviewers: This addendum makes proposed changes to the current standard. These changes are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) except where the reviewer instructions specifically describe some other means of showing the changes. Only these changes to the current standard are open for review and comment at this time. Additional material is provided for context only and is not open for comment except as it relates to the proposed changes.]

Addendum m to 189.1-2023

Modify Section 3.2 as follows

demand response signal: A signal that provides actionable information or a direct ~~indicates a price or a~~ request to modify electricity consumption for a limited time period.

demand response control: A control capable of receiving and automatically responding to a *demand response signal*. (*Note, this definition is provided for reference only*)

***gross lighted floor area**:* see ANSI/ASHRAE/IES Standard 90.1

Modify Section 7.3.4 as follows

7.3.4 Automated Demand Response. The building controls shall be designed with *demand response controls* capable of implementing load adjustments to the HVAC, lighting, ~~and~~ water heating systems, and to electric vehicle supply equipment.

Exceptions to 7.3.4:

1. Buildings with a *gross conditioned floor area* less than 5000 ft2 (500 m2).
2. Buildings that employ a thermal or electrical energy storage system with a total storage capacity that complies with one of the following:
   a. For thermal energy storage, the system shall be capable of displacing the building total HVAC design cooling coil capacity for not less than the equivalent of three hours or the building heating system total heating capacity for not less than the equivalent of three hours.
   b. For electrical energy storage, the capacity shall be not less than the requirements of the following formula:

Minimum kWh capacity = *Gross conditioned floor area* (ft^2) × 5.0 W/ft^2 × 1.0 h × (1 kW/1000 W) (I-P)

Minimum kWh capacity = *Gross conditioned floor area* (m^2) × 50 W/m^2 × 1.0 h × (1 kW/1000 W) (SI)

7.3.4.1 HVAC Systems ~~Zone Set Points.~~ Demand Response Controls. ~~The building project's HVAC systems shall be programmed to allow centralized demand reduction in response to a signal from a centralized contact or software point in accordance with the following:~~

~~a. The controls shall be programmed to automatically adjust upward the zone operating cooling set points by a minimum of 3°F (1.7°C).~~
~~b. The controls shall programmed to automatically adjust downward the zone operating heating set points by a minimum of 3°F (1.7°C).~~
~~c. The controls shall be programmed to automatically adjust downward the zone operating cooling set points by a minimum of 2°F (1.1°C).~~

Each HVAC system with a rated heating or cooling capacity of not greater than 240,000 Btu/h (70 kW), shall be provided with *demand response controls* that comply with Sections 7.3.4.1.1 and 7.3.4.1.2.

Exceptions to 7.3.4.1:

1. Group I-2 occupancies
2. Group B Ambulatory care facilities
3. Group H occupancies
4. Occupancies or applications requiring precision in indoor temperature control as approved by the *AHJ.*
5. *Systems* with a cooling and a heating capacity not greater than 7000 Btu/h (2 kW)
6. Heating only systems where all heating is provided by non-electric heating systems or *solar thermal energy systems*

7.3.4.1.1 Cooling Set Point Controls. The controls shall be capable of and configured to automatically adjust the zone operating cooling set points by a minimum of 3°F (1.5°C) from the normal setpoint in response to a *demand response signal* calling for cooling load modification. Where thermostatic control is provided by a central *direct digital control* including, but not limited to, an energy management system, the system shall be capable of *demand response control* and capable of adjusting all active *set points* to comply. Heating setpoint controls shall be independently controlled and shall not increase in response to a *demand response signal* calling for cooling load reduction.

Exception to 7.3.4.1.1: Buildings with a thermal energy storage system capable of displacing not less than 50% of the HVAC equipment design cooling capacity for not less than three hours in response to a *demand response signal*.

7.3.4.1.2 Heating Set Point Controls. The controls shall be capable of and configured to automatically adjust the zone operating heating set points by a minimum of 3°F (1.5°C) from the normal setpoint in response to a *demand response signal* calling for heating load modification. Where thermostatic control is provided by a central *direct digital control* including, but not limited to, an energy management system, the system shall be capable of *demand response control* and capable of adjusting all active *set points* to comply. Cooling setpoint controls shall be independently controlled and shall not decrease in response to a *demand response signal* calling for heating load reduction.

Exception to 7.3.4.1.2:

1. Buildings with a thermal energy storage system capable of displacing not less than 50% of the HVAC equipment design heating capacity for not less than three hours in response to a *demand response signal*.
2. HVAC systems where all heating is provided by non-electric heating systems or *solar thermal energy systems*.

7.3.4.2 Variable-Speed Equipment. For HVAC equipment with variable-speed control, ~~the controls shall be programmed to allow *automatic* adjustment of the~~ demand response controls shall be capable of and configured to *automatically* adjust the maximum speed of the equipment to 90% of design speed in response to a *demand response signal*. ~~during automated DR events.~~ Adjustments shall not decrease the supply airflow rate below the level that would result in outdoor airflow delivery below the *minimum outdoor airflow* rates specified in Section 8.3.1, or that would cause adverse building pressurization ~~problems~~.

7.3.4.3 Lighting. ~~For~~ *Building projects* with interior lighting control systems controlled at a central point~~, such systems shall be programmed to allow automated DR. The programming shall reduce the total connected lighting power demand during a DR event by not less than 15% but no more than 50% of the baseline power level. The baseline lighting power shall be determined in accordance with Section 7.4.6.1. For *building projects* without central lighting controls, DR capabilities for lighting systems shall not be required. For *spaces* not in the *daylight area* and not connected to automated daylighting control, the lighting levels shall be uniformly reduced throughout the *space*.~~ shall provide *demand response control* for the *general lighting* in not less than 75% of the total interior floor area. The *demand response control* shall be capable of and configured to reduce the controlled lighting power by not less than 15% in response to a *demand response signal.*

Exceptions to 7.3.4.3:

~~1. *Luminaires* or signage on emergency circuits.~~

~~2. *Luminaires* located within a *daylight area* that are dimmable and connected to automated daylighting control systems.~~

1. *Building projects* with a *gross lighted floor area* not greater than 5000 ft^2 (500 m^2).
2. Parking garages.

7.3.4.4 Demand Responsive Water Heating. Electric storage water heaters with a rated water storage volume of 40 gallons (150L) to 120 gallons (450L) and a nameplate input rating equal to or less than 12 kW shall be provided with demand response controls in accordance with ~~that meet the requirements in Table 7.3.4 or an equivalent *approved* standard~~ AHRI Standard 1430.

Exceptions to 7.3.4.4:

1. Water heaters that provide a hot water delivery temperature of 180°F (82°C) or greater.
2. Water heaters that comply with Section IV, Part HLW or Section X of the *ASME Boiler and Pressure Vessel Code*.
3. Water heaters that are connected to ~~use~~ 3-phase electric power.

~~**Table 7.3.4 Electric Storage Water Heater Controls**~~

	~~**Control**~~

~~Equipment Type~~	~~s~~	
	~~Manufactured before 7/1/2025~~	~~Manufactured on or after 7/1/2025~~
~~Electric storage water heaters~~	~~ANSI/CTA-2045-B Level 1 and also capable of initiating water heating to meet the temperature set point in response to a *demand response signal*~~	~~ANSI/CTA-2045-B Level 2, except all related requirements for "Price Stream Communication" functionality~~

~~d. The automated demand response (DR) strategy shall include both ramp-up and ramp-down logic to pre- vent the building peak demand from exceeding that expected without the DR implementation.~~

~~**Exception to 7.3.4.1:** Systems serving areas deemed by the *owner* to be critical in nature.~~

7.3.4.5 Demand Response Electric Vehicle Supply Equipment (EVSE). *Electric vehicle supply equipment* shall be "ENERGY STAR certified", as identified connected capable.

Modify Section 7.5 as follows

7.5 Modified Additional Efficiency Requirements *Building projects* shall be designed to comply with ANSI/ASHRAE/IES Standard 90.1, Section 11, with the modifications ~~contained in~~ required by this section.

7.5.1 Energy Credits Required. Projects shall achieve energy credits from Section 7.5.2 not less than 105% of the total of credits required by ANSI/ASHRAE/IES Standard 90.1, Section 11.5.1.

7.5.1.1 [JO] Higher Energy Credits Required. Projects shall achieve energy credits from Section 7.5.2 not less than 110% of the total of credits required by ~~of~~ ANSI/ASHRAE/IES Standard 90.1, Section 11.5.1.

7.5.2 Energy Credits Achieved. Energy credits ~~achieved for the project~~ shall be ~~calculated~~ achieved in accordance with ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2, except where superseded by the requirements of this section. The (R01) *on-site renewable energy* credits achieved shall be limited to meeting 60% of the total required *energy* credits. The energy credits associated with load management in ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2.8, shall not be used for compliance with this section.

7.5.2.1 E01: Improved Envelope Performance. To achieve this credit, *building* envelope measures shall be installed to improve the *energy* performance of the project. ~~Measure energy~~ Energy credits for ~~improvement~~ improved ~~of the~~ *building envelope energy* performance shall be determined ~~based on the following~~ as follows:

$$EC_{ENV} = 1000 \times \frac{EPF_B - EPF_P}{EPF_B}$$

where

EC_{ENV} = ~~measure~~ energy credits for improved *building envelope energy* performance.

EPF_B = base *envelope performance factor* calculated in accordance with ANSI/ASHRAE/IES Standard 90.1, Appendix C but with opaque envelope and *fenestration* U-factors reduced by 5%,
fenestration SHGC reduced by 5%, and air leakage rate of the *building envelope* (I_{75Pa}) at a fixed building pressure differential of 75 Pa (0.30 in. of water) shall be 0.25 cfm/ft^2 (1.25 L/s·m^2).

EPF_P = proposed *envelope performance factor* calculated in accordance with ANSI/ASHRAE/IES Standard 90.1, Normative Appendix C

7.5.2.2 Improved HVAC Performance. ~~Same as ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2.2, for all measures H01 through H06.~~ Measures H01 through H07 shall be in accordance with ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2.2.

7.5.2.3 Reduced Energy Use in Service Water Heating. ~~Same as ANSI/ASHRAE/IES Standard 90.1 Section 11.5.2.3 for all measures W01 through W09~~. Measures W01 through W09 shall be in accordance with ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2.3.

7.5.2.4 P01: Energy Monitoring. The ~~energy~~ credits for energy monitoring in ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2.4~~, used for compliance with Section 7.5~~ shall be limited to buildings with an electrical service no greater than 200 kVA.

7.5.2.5 Lighting Efficiency Measures

7.5.2.5.1 L01: Lighting System Performance Improvement (Reserved)

7.5.2.5.2 L02: Continuous Dimming and High-End Trim Tuning. ~~Same as ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2.5.2.~~ Measure L02 shall be in accordance with ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2.5.2.

7.5.2.5.3 L03: Occupancy Sensor Control Areas. ~~Same as ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2.5.3.~~ Measure L03 shall be in accordance with ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2.5.3.

7.5.2.5.4 L04: Increased Daylighting Control Area. For office buildings and education buildings, ~~the energy credits in~~ ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2.5.4, shall not apply ~~be used for compliance with Section 7.5~~. For all other building use types, ~~the energy credit is same as in ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2.5.4.~~ measure L04 shall be in accordance with ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2.5.4.

7.5.2.5.5 L05: Lighting Control for Multifamily Buildings. ~~The energy credits associated with lighting control for multifamily buildings in~~ ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2.5.5, shall not apply ~~be used for compliance with Section 7.5~~.

7.5.2.5.6 L06: Reduce Interior Lighting Power. To achieve this credit, the *installed interior lighting power*, less ~~any~~ the installed additional lighting ~~allowance~~ power shall be 95% or less than the *interior lighting power allowance,* less any additional lighting allowed. In multifamily, dormitory, hotel, and motel buildings, the credit is calculated for ~~common~~ areas other than *dwelling units*, dormitory living quarters and guest rooms. Energy credits shall not be greater than three times the L06 base credit from ANSI/ASHRAE/IES Standard 90.1, Section 11.5.3 where calculated as follows:

$$EC_{LPA} = EC_5 \times 20 \times \frac{LPA_n - LP_n}{LPA_n}$$

where,

EC_{LPA} = additional energy credit for lighting power reduction

LP_n = net *installed interior lighting power* calculated in accordance with ANSI/ASHRAE/IES Standard 90.1, Sections 9.1.3 and 9.1.4, in watts, less any additional lighting in ANSI/ ASHRAE/IES Standard 90.1, Section 9.5.2.2

LPA_n = net *interior lighting power allowance* calculated in accordance with the method used to meet the requirements of Section 7.4.6.1, in watts, less any additional interior lighting allowance in Section 7.4.6.1.1 or Section 7.4.6.1.2.

EC_5 = L06 base credit from ANSI/ASHRAE/IES Standard 90.1, Section 11.5.3

7.5.2.6 R01: On-Site Renewable Energy. To achieve this credit, the total minimum ratings of *on-site renewable energy* systems in *addition* to the requirements of ~~ASHRAE/IES Standard 90.1, Section 10.5.1.1~~ Section 7.3.2 shall be not less than 0.1 W/ft^2 (1.1 W/m^2) of *gross floor area*. Additional energy credits shall be determined as follows:

$$\text{AEC}_{RRa} = AEC_{0.1} \times \frac{RR_t - RR_r}{0.1 \times BGFA}$$

where,

AEC_{RRa} = achieved energy credits for this project

RR_t = actual total minimum rating of *on-site renewable energy* systems, W

RR_r = minimum rating of *on-site renewable energy* systems required by Section 7.3.2, in watts, without exception

BGFA = project *gross floor area*

$AEC_{0.1}$ = ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2.6, base credits from ANSI/ASHRAE/IES

Standard 90.1, Section 11.5.3

Informative Note: Onsite renewable energy may include thermal *service water heating* or *pool* water heating, in which case ratings in Btu/h can be converted to W, where W = Btu/h/~~3.413~~3.412.

7.5.2.7 Equipment Efficiency Measures

7.5.2.7.1 Q01: Efficient Elevator Equipment. Measure Q01 for efficient elevator equipment shall be in accordance with ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2.7.1. Energy credits shall only be achieved for buildings where the vertical rise of each elevator is less than 75 ft (23 m). ~~The energy credits for efficient elevator equipment available for compliance with Section 7.5 shall be limited to buildings where all elevators have a rise of less than 75 ft (23 m). Equipment qualifications and energy credits shall be the same as in ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2.7.1.~~

7.5.2.7.2 Q02: Efficient Kitchen Equipment. ~~The energy credits for energy monitoring in~~ ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2.7.2, shall not apply ~~be used for compliance with Section 7.5~~.

7.5.2.7.3 Q03: Fault Detection and Diagnostics System. The energy credits for fault detection and diagnostics in ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2.7.3~~, used for compliance with Section 7.5~~ shall be limited to buildings with a gross floor area less than 25,000 ft^2 (2500 m^2) or *residential* buildings with less than 10,000 ft^2 (1000 m^2) of common area.

7.5.3 Load Management Credits Required. Where a demand response program is available to the *building project* from the project's electricity provider or a third party associated with that provider, projects with electrical service greater than 200 kVA shall achieve load management credits from Section 7.5.4 in a quantity not less than 10% of the total energy credits required by ANSI/ASHRAE/IES Standard 90.1, Section 11.5.1. Where a demand response program is available to the building project from the project's electricity provider or a third party associated with that provider, projects with electrical service not greater than 200kVA shall achieve load management credits from Section 7.5.4 in a quantity not less than 5 % of the total energy credits required by ANSI/ASHRAE/IES Standard 90.1, Section 11.5.1.

7.5.4 Load Management Credits Achieved. Load management credits achieved for the project shall be calculated in accordance with ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2, with the modifications required by this section. Only the energy credits associated with load management in ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2.8, as modified by this section shall be used for compliance.

~~**7.5.2.8 Load Management Systems**~~

~~**7.5.8.2.1**~~ **7.5.4.1 G01: Lighting Load Management.** *Building projects* with a *gross floor area* not greater than 5000 ft^2 (500 m^2) shall comply with Section 7.3.4.3 without use of exceptions to achieve the ~~The~~ energy credits associated with lighting load management in ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2.8.1~~, used for compliance with Section 7.5 shall be limited to buildings with a *gross conditioned floor area* less than 5000 ft^2 (500 m^2)~~.

~~**7.5.8.2.2**~~ **7.5.4.2 G02: HVAC Load Management.** The energy credits associated with HVAC load management in ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2.8.2, shall be prorated by the fraction of HVAC cooling capacity out of total building project cooling capacity used for compliance with ~~Section 7.5~~ this section and shall be limited to HVAC systems with a capacity greater than 240,000 Btu/hr (70 kW). ~~buildings with *a gross conditioned floor area* less than 5000 ft2 (500 m2).~~

~~**7.5.8.2.3**~~ **7.5.4.3 G03: Automated Shading Load Management.** ~~Same as~~ Measure G03 shall be in accordance with ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2.8.3.

~~**7.5.8.2.4**~~ **7.5.4.4 G04: Electric Energy Storage.** ~~Same as~~ Measure G04 shall be in accordance with ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2.8.4.

~~**7.5.8.2.5**~~ **7.5.4.5 G05: HVAC Cooling Energy Storage.** ~~Same as~~ Measure G05 shall be in accordance with ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2.8.5.

~~**7.5.8.2.6**~~ **7.5.4.6 G06 Service Hot-Water Thermal Storage.** ~~Same as~~ Measure G06 shall be in accordance with as ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2.8.6.

~~**7.5.8.2.7**~~ **7.5.4.7 G07: Building Thermal Mass.** ~~Same as~~ Measure G07 shall be in accordance with ANSI/ASHRAE/IES Standard 90.1, Section 11.5.2.8.

Add the following normative references to Section 11.

Reference	Title	Section
ANSI/ASHRAE/IES Standard 90.1-2022	Energy Standard for Buildings Except Low-Rise Residential Buildings	3.1, 3.2, 5.3.5.2, 5.3.6.1, 7.3, 7.3.1.1, 7.3.1.2, 7.3.7, 7.3.8.1, 7.3.8.1.1, 7.4, 7.4.2, 7.4.2.1–7.4.2.5, 7.4.2.7–7.4.2.9, 7.4.3, 7.4.3.1–7.4.3.4 7.4.3.5.1–7.4.3.5.3, 7.4.3.6, 7.4.3.7, 7.4.3.8.3, 7.4.3.9, 7.4.4, 7.4.4.1, 7.4.5, 7.4.6, 7.4.6.1, 7.4.6.1.1, 7.4.6.1.2, 7.4.6.2–7.4.6.4, 7.4.7, 7.4.7.6, 7.4.8, 7.5, 7.5.1, 7.5.1.1, 7.5.2, 7.5.2.1–7.5.2.4, 7.5.2.5.2–7.5.2.5.6, 7.5.2.6, 7.5.2.7.1–7.5.2.7.3, 7.5.2.8.1–7.5.2.8.7, 7.5.4.1-7.5.4.7 7.6, 7.6.1, 7.6.1.1, 7.6.3, 8.6.1.4, 10.6, Tables A-1 and A-2, B1.1, B1.2, B1.4.1, B1.4.2, Tables B1.1 and B1.2, G3.2.1, G3.3.3, G3.3.12, G3.6.7.7
Air Conditioning, Heating and Refrigeration Institute (AHRI) 2311 Wilson Blvd., Arlington, VA 22201		
AHRI 1430-2022	Demand Flexible Electric Storage Water Heaters	7.3.4.4
United States Environmental Protection Agency (USEPA) 1200 Pennsylvania Avenue, NW Washington, DC 20460, United States www.epa.gov ENERGY STAR® (www.energystar.gov) WaterSense (www.epa.gov/watersense)		
Version 1.2 June 20, 2023	Version 1.2 ENERGY STAR product specification for Electric Vehicle Supply Equipment	7.3.4.5