ANSI/ASHRAE/USGBC/IES Addenda a, c, d, e, f, h, j, k, l, n, q, s, t, x, y, aa, ab, and ac to ANSI/ASHRAE/USGBC/IES Standard 189.1-2011

2013 Supplement

Standard for the Design of High-Performance Green Buildings

Except Low-Rise Residential Buildings

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ANSI/ASHRAE/USGBC/IES Addenda to ANSI/ASHRAE/USGBC/IES Standard 189.1-2011, Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings

NOTE

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FOREWORD

This addendum updates references to the newly approved ANSI/BIFMA M7.1-2011, ANSI/BIFMA X7.1-2011 and ANSI/BIFMA e3-2011 in Sections 8 and Section 11. It deletes all of Appendix E, making reference to the relevant material in Section 8. However, all of the requirements remain the same as those in the current version of Appendix E except the acetaldehyde and xylene requirements are updated for consistency with ANSI/BIFMA e3-2011, CA OEHHA guidance and the 2010 requirements of the CDPH Standard Method v1.1.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum a to Standard 189.1-2011

Modify Section 8.4.2.5 as follows.

8.4.2.5 Office Furniture Systems and Seating. ~~All e~~Office furniture systems and seating installed prior to occupancy shall ~~be tested according to~~ comply with the requirements of both Section 8.4.2.5.1 and Section 8.4.2.5.2 based on testing according to ANSI/BIFMA ~~Standard~~ M7.1 ~~and shall not exceed the limit requirements listed in Normative Appendix E of this standard~~.

8.4.2.5.1 At least 95% of the total number of installed office furniture system workstations and at least 95% of the total number of seating units installed shall comply with ANSI/BIFMA X7.1.

8.4.2.5.2 At least 50% of the total number of installed office furniture system workstations and at least 50% of the total number of seating units installed shall comply with Section 7.6.2 of ANSI/BIFMA e3.

Modify Section 11 as follows.

ANSI/BIFMA M7.1-201107	Standard Test Method For Determining VOC Emissions From Office Furniture Systems, Components ~~A~~and Seating	8.4.2.5 and 8.5.2 ~~and Appendix E~~
ANSI/BIFMA X7.1-201107	Standard for Formaldehyde and TVOC Emissions of Low-Emitting Office Furniture Systems and Seating	8.4.2.5 ~~Appendix E~~
ANSI/BIFMA e3-200811	Furniture Sustainability Standard	8.4.2.5 ~~Appendix E~~

Delete Normative Appendix E in its entirety.

~~**NORMATIVE APPENDIX E—**~~
~~**IAQ LIMIT REQUIREMENTS FOR OFFICE FURNITURE SYTSEMS AND SEATING**~~

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FOREWORD

This addendum narrows the scope of the reference to ANSI/ASHRAE/IES Standard 90.1 to cover only those sections involved with exterior lighting.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum c to Standard 189.1-2011

Modify Section 5.3.3.1 as follows.

5.3.3.1 General. Exterior lighting systems shall comply with ~~Section 9~~ Sections 9.1, 9.4.1.7, 9.4.3, 9.4.4, and 9.7 of ANSI/ASHRAE/IES Standard 90.1-2010 and with Sections 5.3.3.2 and 5.3.3.3 of this standard.

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FOREWORD

This addendum clarifies the intent of the exception to relax the limitations of 150 ft (50 m) and 100 ft (35 m) for the case of low-impact trails. The current text fails to establish any limit as to how close the trail can be to the sensitive areas. If the trail is "allowed" to be within 15 ft (4.5 m), the trail can be located at any distance between 0 and 15 ft. The intent is to clarify the language and relax the stringency of items b and c by reducing the restrictions from 150 ft (50 m) and 100 ft (35 m) to only 15 ft (4.5 m). The low-impact trail must be no closer than 15 ft (4.5 m) to the sensitive areas.

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Addendum d to Standard 189.1-2011

Modify the exceptions in Section 5.3.1.2 as follows.

5.3.1.2 Prohibited Development Activity. There shall be no *site* disturbance or development of the following:

a. previously undeveloped land having an elevation lower than 5 ft (1.5 m) above the elevation of the 100 year flood as defined by USFEMA.

Exception~~s to 5.3.1.2a~~:

1. Development of *low-impact trails* shall be allowed anywhere within a flood zone.
2. Development of building structures shall be allowed i~~I~~n alluvial "AO" designated flood zones~~, development is allowed when~~ provided that such structures include engineered floodproofing ~~for building structures~~ up to an elevation that is at least as high as the minimum lowest floor elevation determined by the *AHJ*. and provided that the site includes d~~D~~rainage paths ~~shall be~~ constructed to guide floodwaters around and away from the structures.

b. land within 150 ft (50 m) of any *fish and wildlife habitat conservation area* ~~unless the~~.

Exceptions:

1. Development of *low-impact trails* shall be allowed provided that such trails are located at least 15 ft (4.5 m) from the area.
2. ~~s~~*Site* disturbance or development shall be allowed provided that it involves plantings or habitat enhancement of the functions and values of the area.

c. land within 100 ft (35 m) of any *wetland* ~~*unless the*~~.

Exception~~s to 5.3.1.2~~:

1. Development of ~~a~~ *low-impact trail*~~s~~ shall be~~is~~ allowed ~~within~~provided that such trails are located at least 15 ft (4.5 m) from the~~of a *fish and wildlife habitat conservation area* or~~ *wetland*.
2. ~~s~~*S*ite disturbance or development shall be allowed provided that it involves plantings or habitat enhancement of the functions and values of the *wetland*.

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FOREWORD

ENERGY STAR® is in the process of replacing two lighting-related specifications with a new specification (ENERGY STAR® Program Requirements for Luminaires) that will cover the same set of products (residential light fixtures) and more. This addendum modifies Standard 189.1 to include the new specification and to update reference information for other ENERGY STAR documents. It includes text from Addendum g, which has already been approved for publication.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum e to Standard 189.1-2011

Modify section 7.4.7.3(f) as follows.

7.4.7.3 ENERGY STAR Equipment. The following equipment within the scope of the applicable ENERGY STAR program shall comply with the equivalent criteria required to achieve the ENERGY STAR label if installed prior to the issuance of the certificate of occupancy:

....

f. Lighting

1. Compact fluorescent light bulbs (CFLs): ENERGY STAR Program Requirements for Compact Fluorescent Lamps (CFLs) ~~CFLs~~
2. ~~Residential light fixtures: ENERGY STAR Program Requirements for Residential Light Fixtures~~ Directional and non-directional residential-grade luminaires and directional commercial-grade luminaires: ENERGY STAR Program Requirements for Luminaires
3. Integral LED Lamps: ENERGY STAR ~~p~~Program Requirements for Integral LED Lamps

Modify Section 11 as follows.

Version 4.2~~0~~, December 2, 2008	ENERGY STAR Program Requirements for Compact Fluorescent Lamps (CFLs) ~~CFLs~~	7.4.7.3(f)
~~Version 4.1, August 1, 2008~~	~~ENERGY STAR Program Requirements for Residential Light Fixtures~~	~~7.4.7~~
Version 1.1, July 5, 2011 (Effective Date: April 1, 2012)	ENERGY STAR Program Requirements for Luminaires	7.4.7.3(f)
Version 1.4~~2~~, ~~August 31, 2010~~ May 13, 2011 (Effective Date: August 31, 2010)	ENERGY STAR Program Requirements for Integral LED Lamps	7.4.7.3(f)

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FOREWORD

This addendum updates the modeling requirements for on-site renewable energy systems in Normative Appendix D. The addendum changes the requirements for modeling both the baseline and proposed buildings.

The modeling requirements for the baseline building clarify that the baseline annual renewable energy production is based on the requirements in Section 7.4.1.1. Additionally, the energy cost reduction associated with this energy production is calculated based on the average energy rate for the baseline building. Similarly, the CO_2e reduction is based on the average CO_2e rate for the baseline building. Building projects that qualify for all items in the exception to Section 7.4.1.1 are not required to model a renewable energy system in the baseline building model.

The modeling requirements for the proposed building have been updated with detailed requirements for the calculation of the reduction in annual energy cost and CO_2e. Calculation of annual energy cost reduction due to renewable energy production is required to be done on an hourly basis. Renewable energy systems that produce thermal energy offset hourly thermal loads accordingly, but not to less than zero. If the appropriate thermal energy storage system losses are calculated, any excess thermal energy generated in a given hour is allowed to be stored for later use. Renewable energy systems that produce electrical energy offset hourly electrical loads accordingly. Any excess electricity generated in a given hour may reduce the building's annual energy cost in accordance with local utility agreements for net metering, feed-in tariff, or other mechanism that credits excess generated electricity. Buildings with no net metering, feed-in tariff, or other agreement that have excess generated electricity on a monthly basis qualify for the exception. Such buildings are allowed to reduce annual energy cost by the monthly net generation, credited at the regional monthly average wholesale electrical rate. Calculation of annual CO_2e reduction due to on-site renewable generation is done on an annual basis. Any exported electricity is subtracted from the annual CO_2e at the electrical CO_2e rate.

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Addendum f to Standard 189.1-2011

Modify Normative Appendix D as follows.

~~**D1.1.4** Energy Rates (Section G2.4 of ANSI/ ASHRAE/ IES Standard 90.1). In addition to the requirements in Section G2.4 of ANSI/ASHRAE/IES Standard 90.1, when the total modeled annual on-site renewable energy generated by the proposed design exceeds that generated by the baseline building design, the difference in the annual on-site generated renewable energy between the baseline building performance and the proposed building performance shall be based on the energy source used as the backup energy source in the proposed design or on the use of electricity if no backup energy source has been specified.~~

Subsequent sections (D.1.1.5 through D.1.1.11) require renumbering.

Table D1.1 Modifications and Additions to Table G3.1 of Appendix G in ANSI/ASHRAE/IES Standard 90.1

No.	Proposed Building Performance	Baseline Building Performance
15.	***On-site Renewable Energy* Systems** ~~1. Purchase of off-site renewable energy shall not be modeled in the *proposed design*.~~ ~~2. The annual energy production of any *on-site renewable energy systems* in the *proposed design* shall be subtracted from the *proposed building performance*.~~ The reduction in the *proposed building performance* and annual CO_2e of the *proposed design* due to energy generated by *on-site renewable energy systems* shall be calculated as follows: 1. **Annual Energy Cost.** The annual energy cost of the *proposed design* with an *on-site renewable energy system* shall be calculated on an hourly basis and adjusted as follows.	~~The *baseline building design* shall have an *on-site renewable energy system* that complies with the annual energy production specified in Section 7. This annual energy production shall be subtracted from the *baseline building performance*. No exceptions shall apply.~~ The *baseline building design* shall include an *on-site renewable energy system* that generates an annual amount of energy equal to that required in Section 7.4.1.1. The *on-site renewable energy system* shall reduce the annual energy cost and the annual CO_2e. 1. **Annual Energy Cost.** The reduction in annual energy cost of the *baseline building performance* due to on-site renewable production shall be equal to the amount of on-site renewable energy production required in Section 7.4.1.1 multiplied by the average energy rate for the *baseline building design*. The average energy rate shall be equal to the calculated total annual cost of energy to serve the baseline building divided by the total annual site energy consumption of the building not including reductions in consumption from on-site renewable energy production.

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Table D1.1 Modifications and Additions to Table G3.1 of Appendix G in ANSI/ASHRAE/IES Standard 90.1 *(Continued)*

a. **Thermal Energy Performance Calculation.** The hourly thermal loads of the *proposed design* shall be reduced by the hourly thermal energy production of the *on-site renewable energy system* (but thermal loads shall not be reduced to less than zero). When the on-site renewable thermal energy production exceeds the applicable thermal demands of the building for any hour, the excess generated energy may be used to displace thermal loads at other times, provided the system has the storage capability and storage losses are included in the calculation. The approved energy rate structure shall be applied to the reduced energy consumption.

b. **Electric Energy Performance Calculation.** The total electrical energy production of the *on-site renewable energy system* shall be calculated on an hourly basis and the energy cost of the proposed building performance shall be calculated by applying the approved electrical rate structure to each hour's electrical usage, including any reduction from hourly electrical energy production of the *on-site renewable energy system.*

Exception: For *building projects* with no net metering agreement, feed-in tariff, or other electrical rate structure for net generated electricity, the cost of imported electricity from the grid is calculated by applying the approved electrical rate structure to each hour's electrical loads minus the hourly electrical energy production of the *on-site renewable energy system*, but the cost of imported electricity shall not be less than zero on a monthly basis. Electricity production of the *on-site renewable energy system* which has a retail value in excess of the retail cost of electricity consumption on a monthly basis shall be credited as a reduction in energy costs to the *building performance* at the wholesale rate as follows.

$$\text{Credit} = \frac{(\text{ExRR} - \text{ImRR})}{\text{ExRR}} \times \text{ExkWh} \times \text{WR}$$

where

Credit = cost reduction credit for month where retail value of exported electricity is greater than retail value of imported electricity

ExRR = month's value of exported electricity at retail rate

ImRR = month's value of imported electricity at retail rate

ExkWh = total kilowatt-hours exported in month

WR = average monthly wholesale rate for the region where the building located

2. **Annual CO_2e.** The annual CO_2e of the proposed building that includes an *on-site renewable energy system* shall be equal to the annual CO_2e of the imported energy to serve the proposed building (with reduced loads due to the *on-site renewable energy system*) minus the annual exported electricity produced by the *on-site renewable energy system* multiplied by the electrical CO_2e emission factor.

Documentation: The documentation required in paragraphs (a), (b), and (e) of Section G2.5 in ANSI/ASHRAE/IES Standard 90.1 shall be made available to the *AHJ* upon request for all *on-site renewable energy systems* in the *proposed design*.

2. **Annual CO_2e.** The reduction in annual CO_2e of the baseline building due to on-site renewable production shall be equal to the amount of on-site renewable energy production required in Section 7.4.1.1 multiplied by the average CO_2e rate for the *baseline building design.* The average CO_2e rate shall be equal to the calculated total annual CO_2e for all types of imported energy used by the baseline building divided by the total annual site energy consumption of the building not including reductions in consumption from on-site renewable energy production.

Exception: When the *proposed design* qualifies for the exception to Section 7.4.1.1, an *on-site renewable energy system* shall not be included in the *baseline building design*.

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FOREWORD

This addendum clarifies the requirements for a continuous air barrier in Section 7 of the standard as well as the requirements for airtightness commissioning in Section 10. As part of these changes, the addendum replaces the definition for a continuous air barrier with the definition from Standard 90.1, which is clearer than the existing definition. The requirement for a continuous air barrier currently contained in Section 7.4.2.9 is deleted since it is already included in the reference to Standard 90.1 (Section 5.4) under the mandatory requirements in Section 7.3. However, a new section is added under 7.3.1 to modify the continuous air barrier requirement in Standard 90.1 by not allowing exceptions to the requirement. These exceptions are not allowed in order to make the requirement more demanding, consistent with the higher performance objectives of Standard 189.1 relative to Standard 90.1. Appendix B is removed since that material is already required by reference to Standard 90.1 and to reflect the addition of a new commissioning requirement in Section 10. That commissioning can be done in two ways, either a whole building pressurization test to demonstrate a level of airtightness consistent with the value in the Army Corps of Engineers requirement, or a comprehensive air barrier commissioning program.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum h to Standard 189.1-2011

Modify Section 3.2 as follows.

continuous air barrier: ~~the combination of interconnected materials, assemblies, and flexible sealed joints and components of the *building envelope* that provide airtightness to a specified permeability. (See *building envelope*.)~~ see ANSI/ASHRAE/IES Standard 90.1.

Insert the following new Section 7.3.1.1 as follows.

7.3.1.1 Continuous Air Barrier. The exceptions to the requirement for a continuous air barrier in Section 5.4.3.1 of ANSI/ASHRAE/IES Standard 90.1 for specific climate zones and constructions shall not apply.

Delete Section 7.4.2.9.

~~**7.4.2.9 Continuous Air Barrier.** The *building envelope* shall be designed and constructed with a *continuous air barrier* that complies with Normative Appendix B to control air leakage into, or out of, the *conditioned space*. All air barrier components of each envelope assembly shall be clearly identified on construction documents and the joints, interconnections, and penetrations of the air barrier components shall be detailed.~~

~~**Exception:** *Building envelopes* of *semiheated spaces* provided that the *building envelope* complies with Section 5.4.3.1 of ANSI/ASHRAE/IES Standard 90.1.~~

Modify Section 10.3.1.2 as follows, adding a new Section 10.3.1.2.5 and renumbering the current Section 10.3.1.2.5 as 10.3.1.2.6.

10.3.1.2.4 Systems. The following systems, if included in the building project, shall be commissioned:

a. Heating, ventilating, air-conditioning, ~~IAQ,~~ and refrigeration systems (mechanical and/or passive) and associated controls. Control sequences to be verified for compliance with construction documentation as part of *verification*.
b. *Building envelope* systems, components, and assemblies to verify the airtightness, thermal and moisture integrity. *Building envelope* airtightness commissioning shall also comply with Section 10.3.1.2.5.
~~c. *Building envelope* pressurization to confirm air-tightness if included in *BOD* requirements.~~
~~d~~c. Lighting systems.
~~e~~d. Fenestration control systems: Automatic controls for shading devices and *dynamic glazing.*
~~f~~e. Irrigation.
~~g~~f. Plumbing.
~~h~~g. Domestic and process water pumping and mixing systems.
~~i~~h. *Service water heating* systems.
~~j~~i. Renewable energy systems.
~~k~~j. Water measurement devices, as required in Section 6.3.3.
~~l~~k. Energy measurement devices, as required in Section 7.3.3.

10.3.1.2.5 Building Envelope Airtightness. Building envelope airtightness shall comply with one of the following:

1. Whole building pressurization testing shall be conducted in accordance with ASTM E779, CAN/CGSB-149.10-M86, CAN/CGSB-149.15-96 or equivalent. The measured air leakage rate of the *building envelope* shall not exceed 0.25 cfm/ft^2 (1.25 L/s·m^2) under a pressure differential of 0.3 in. wc (75 Pa), with this air leakage rate normalized by the sum of the above- and below-grade *building envelope* areas of the *conditioned* and *semiheated space*
2. An air barrier commissioning program consistent with generally accepted engineering standards that consists of the following elements shall be implemented:
   a. A third-party design review shall be conducted and documented to assess the design documentation describing the air barrier systems and materials, the manner in which continuity will be maintained across joints between air barrier components and at

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all envelope penetrations, and the constructability of the air barrier systems.

b. Incremental field inspection and testing of air barrier components shall be conducted and documented during construction to ensure proper construction of key components while they are still accessible for inspection and repair.

10.3.1.2.~~5~~6 Documentation. *Owner* shall retain the System Manual and Final Commissioning Report.

Modify Section 11 by inserting the following new text.

Canadian General Standards Board
Place du Portage III, 6B1
11 Laurier Street
Gatineau, Quebec K1A 1G6
Canada
819-956-0425
www.tpsgc-pwgsc.gc.ca/ongc-cgsb/index-eng.html

CAN/CGSB 149.10-M86	Determination of the Airtightness of Building Envelopes by the Fan Depressurization Method
CAN/CGSB 149.15-96	Determination of the Overall Envelope Airtightness of Buildings by the Fan Pressurization Method Using the Building's Air Handling Systems

Delete Appendix B as follows.

~~**NORMATIVE APPENDIX B**~~
~~**PRESCRIPTIVE CONTINUOUS AIR BARRIER**~~

~~**B1. CHARACTERISTICS**~~

~~The *continuous air barrier* shall have the following characteristics:~~

~~a. It shall be continuous throughout the envelope (at the lowest *floor*, exterior *walls*, and ceiling or *roof*), with all joints and seams sealed and with sealed connections between all transitions in planes and changes in materials and at all penetrations.~~

~~b. The air barrier component of each assembly shall be joined and sealed in a flexible manner to the air barrier component of adjacent assemblies, allowing for the relative movement of these assemblies and components.~~

~~c. It shall be capable of withstanding positive and negative combined design wind, fan, and stack pressures on the air barrier without damage or displacement, and shall transfer the load to the structure. It shall not displace adjacent materials under full load.~~

~~d. It shall be installed in accordance with the *manufacturer's* instructions and in such a manner as to achieve the performance requirements.~~

~~e. Where lighting *fixtures* with ventilation holes or other similar objects are to be installed in such a way as to penetrate the *continuous air barrier*, provisions shall be made to maintain the integrity of the *continuous air barrier*.~~

~~**Exception:** Buildings that comply with (c) below are not required to comply with either (a) or (e) above.~~

~~**B1. COMPLIANCE**~~

~~Compliance of the *continuous air barrier* for the *opaque building envelope* shall be demonstrated by one of the following:~~

~~a. **Materials.** Using individual materials that have an air permeability not to exceed 0.004 cfm/ft2 under a pressure differential of 0.3 in. water (1.57 lb/ft2) (0.02 L/s·m2 under a pressure differential of 75 Pa) when tested in accordance with ASTM E2178. These materials comply with this requirement when all joints are sealed and the above section on characteristics are met:~~

~~1. Plywood—minimum 3/8 in. (10 mm)~~
~~2. Oriented strand board—minimum 3/8 in. (10 mm)~~
~~3. Extruded polystyrene insulation board—minimum 3/4 in. (19 mm)~~
~~4. Foil-back urethane insulation board—minimum 3/4 in. (19 mm)~~
~~5. Exterior or interior gypsum board—minimum 1/2 in. (12 mm)~~
~~6. Cement board—minimum 1/2 in. (12 mm)~~
~~7. Built up roofing membrane~~
~~8. Modified bituminous *roof* membrane~~
~~9. Fully adhered single-ply *roof* membrane~~
~~10. A Portland cement/sand parge, or gypsum plaster minimum 5/8 in. (16 mm) thick~~
~~11. Cast-in-place and precast concrete~~
~~12. Fully grouted concrete block masonry~~
~~13. Sheet steel~~

~~b. **Assemblies.** Using assemblies of materials and components that have an average air leakage not to exceed~~

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~~0.04 cfm/ft2 under a pressure differential of 0.3 in. water (1.57 lb/ft2) (0.2 L/s·m2 under a pressure differential of 75 Pa) when tested in accordance with ASTM E2357 or ASTM E1677. These assemblies comply with this requirement when all joints are sealed and the above section on characteristics are met:~~

~~1. Concrete masonry *walls* coated with:~~

~~a. one application of block filler and two applications of a paint or sealer coating, or~~

~~b. a Portland cement/sand parge, stucco or plaster minimum 1/2 in. (12 mm) thick.~~

~~c. **Building.** Testing the completed building and demonstrating that the air leakage rate of the *building envelope* does not exceed 0.4 cfm/ft2 under a pressure differential of 0.3 in. water (1.57 lb/ft2) (2.0 L/s·m2 under a pressure differential of 75 Pa) in accordance with ASTM E779 or an equivalent approved method.~~

Modify Table D1.1 as follows.

TABLE D1.1 Modifications and Additions to Table G3.1 of Appendix G in ANSI/ASHRAE/IES Standard 90.1

Proposed Building Performance	Baseline Building Performance
5. Building Envelope	
Exception (c) of Table G3.1 (5) shall be replaced with the following: The exterior roof surface shall be modeled using the solar reflectance and thermal emittance determined in accordance with Sections 5.3.2.3 and 5.3.2.4. Where test data are unavailable, the roof surface shall be modeled with a reflectance of 0.30 and a thermal emittance of 0.90.	1. In addition to the requirements in Table G3.1 (5), the baseline building design shall comply with Section 7.4.2. 2. If the proposed design does not comply with Section ~~7.4.2.9~~7.4.2.8, then the fenestration area in the baseline building design shall be uniformly reduced until it complies. This adjustment is not required to be made when rotating the building as required in Table G3.1 (5.a). 3. In addition to the requirements in Table G3.1 (5.d) and (5.e), roof surfaces shall comply with Section 5.3.2.3.

Modify Informative Appendix G by adding the following standard under ASTM.

ASTM E2813 Standard Practice for Building Enclosure Commissioning

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FOREWORD

This addendum clarifies shading provided by vegetation for the site hardscape and walls for heat island mitigation (Sections 5.3.2.1 and 5.3.2.2). The modification requires the planting of vegetation either prior to the issuance of the certificate of occupancy or the establishment of a contract that requires planting no later than 12 months after the final approval by the authority having jurisdiction, so that required shade is provided within ten years.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum j to Standard 189.1-2011

Modify Sections 5.3.2.1 and 5.3.2.2 as follows.

5.3.2 Mitigation of Heat Island Effect

5.3.2.1 Site Hardscape. ~~For the purposes of this section, the *site hardscape* includes roads, sidewalks, courtyards, and parking lots but does not include the constructed building surfaces and not nor any portion of the *site hardscape* covered by photovoltaic panels generating electricity or other *solar energy systems* used for space heating or water heating.~~ At least 50% of the *site hardscape* that is not covered by *solar energy systems* shall be provided with one or any combination of the following:

a. existing trees and vegetation or new *bio-diverse plantings* of *native plants* and *adapted plants* ~~located~~, which shall be planted either prior to the final approval by the *AHJ* or in accorance with a contract established to require planting no later than 12 months after the final approval by the *AHJ* so as to provide the required shade no later than ~~within~~ ten years after ~~of~~ the final approval ~~certificate of occupancy~~. The effective shade coverage on the *hardscape* shall be the arithmetic mean of the shade coverage calculated at 10 a.m., noon, and 3 p.m. on the summer solstice.

b. paving materials with a minimum initial *SRI* of 29. A default *SRI* value of 35 for new concrete without added color pigment is allowed to be used instead of measurements.

c. *open-graded (uniform-sized) aggregate*, *permeable pavement*, *permeable pavers*, and *porous pavers (open-grid pavers)*. *Permeable pavement* and *permeable pavers* shall have a percolation rate of not less than 2 gal/min·ft^2 (100 L/min·m^2).

d. shading through the use of structures, provided that the top surface of the shading structure complies with the provisions of Section 5.3.2.3.

e. parking under a building, provided that the *roof* of the building complies with the provisions of Section 5.3.2.3.

f. buildings or structures that provide shade to the *site hardscape*. The effective shade coverage on the *hardscape* shall be the arithmetic mean of the shade coverage calculated at 10 a.m., noon, and 3 p.m. on the summer solstice.

Exception: Section 5.3.2.1 shall not apply to *building projects* in *climate zones* 6, 7, and 8.

5.3.2.2 Walls. Above-grade building *walls* and retaining *walls* shall be shaded in accordance with this section. The building is allowed to be rotated up to 45 degrees to the nearest cardinal orientation for purposes of calculations and showing compliance. Compliance with this section shall be achieved through the use of shade-providing *plants*, man-made structures, existing buildings, hillsides, permanent building projections, *on-site renewable energy systems* or a combination of these, using the following criteria:

a. shade shall be provided on at least 30% of the east and west above-grade *walls* and retaining *walls* from grade level to a height of 20 ft (6 m) above grade or the top of the exterior *wall*, whichever is less~~, within five years of issuance of the final certificate of occupancy~~. Shade coverage shall be calculated at 10 a.m. for the east *walls* and 3 p.m. for the west *walls* on the summer solstice.

b. where shading is provided by vegetation, such vegetation ~~(including trees)~~ shall be existing trees and vegetation or new *bio-diverse plantings* of *native plants* and *adapted plants*. Such planting shall occur prior to the final approval by the *AHJ* or in accordance with a contract established to require planting no later than 12 months after the final approval by the *AHJ* so as to provide the required shade no later than ten years after the final approval. Vegetation shall be ~~and~~ appropriately sized, selected, planted, and maintained so that they do not interfere with overhead or underground utilities. ~~Such t~~Trees shall be placed a minimum of 5 ft (1.5 m) from and within 50 ft (15 m) of the building or retaining *wall*.

Exceptions:

1. The requirements of this section are satisfied if 75% or more of the opaque *wall* surfaces on the east and west have a minimum *SRI* of 29. Each *wall* is allowed to be considered separately for this exception.

2. East *wall* shading is not required for buildings located in *climate zones* 5, 6, 7, and 8. West *wall* shading is not required for buildings located in *climate zones* 7 and 8.

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FOREWORD

This addendum updates the Section 7.4.3.7, which was written to reference the language in ASHRAE/ANSI/IES Standard 90.1-2007. The air barrier Section 7.4.3.7 references ASHRAE/ANSI/IES Standard 90.1-2010 and supersedes Sections 6.5.7.1.3 and 6.5.7.1.4 of Standard 90.1-2010 as follows.

Added Sections 7.4.3.7.1 and 7.4.3.7.2 reduce the threshold in Sections 6.5.7.1.3 and 6.5.7.1.4 of ASHRAE/ANSI/IES Standard 90.1-2010 from 5000 to 2000 cfm to cover small kitchen/dining facilities.

Added note (a) under Table 7.4.3.7 limits the single-island hood to be no more than 5000 cfm in a kitchen/dining facility, since this hood type is less efficient than other types. ASHRAE Research Project RP-1480 confirmed that single-island canopy hoods need significantly higher exhaust airflow rates than their wall-mounted counterparts to effectively ventilate cooking equipment for any given duty class.

Added Section 7.4.3.7.2b modifies option (b) in Section 6.5.7.1.4 of ASHRAE/ANSI/IES Standard 90.1-2010 to provide kitchen occupants minimum ventilation and maintain a safe environment in the event of a hood control failure.

Added Section 7.4.3.7.2d adds an additional option to meet Section 6.5.7.1.4 of ASHRAE/ANSI/IES Standard 90.1-2010.

Modified Section D1.1.5 updates Normative Appendix D to reflect the change in prescriptive requirements.

The text in Sections 6.5.7.1.3 and 6.5.7.1.4 of Standard 90.1-2010 is moved to Section 7.4.3.7 for the convenience of the readers, and editorial changes are made for clarification.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum k to Standard 189.1-2011

Modify Section 3 definitions as follows.

mechanical cooling: see ANSI/ASHRAE/IES Standard 90.1

Modify Chapter 11, Normative References, as follows.

ANSI/ASHRAE Standard 154-2003 Ventilation for Commercial Cooking Operations.

Modify Section 7.4.3.7 as follows.

7.4.3.7 ~~Variable-Speed Fan Control for Commercial Kitchen Hoods~~. Kitchen Exhaust Systems. ~~In addition to the requirements in Section 6.5.7.1 of ANSI/ASHRAE/IES Standard 90.1, commercial kitchen Type I and Type II hood systems shall have variable-speed control for exhaust and makeup air fans to reduce hood airflow rates at least 50% during those times when cooking is not occurring and the cooking appliances are up to temperature in a standby, ready-to-cook mode. All exceptions in Section 6.5.7.1 of ANSI/ASHRAE/IES Standard 90.1 shall apply.~~ The requirements in Sections 6.5.7.1, 6.5.7.2, and 6.5.7.5 of ASHRAE/ANSI/IES Standard 90.1 shall apply, except as follows: Sections 7.4.3.7.1 and 7.4.3.7.2 supersede the requirements in Sections 6.5.7.1.3 and 6.5.7.1.4 of ANSI/ASHRAE/IES Standard 90.1.

7.4.3.7.1 For kitchen/dining facilities with total kitchen hood exhaust airflow rate greater than 2000 cfm, the maximum exhaust flow rate for each hood shall be determined in accordance with Table 7.4.3.7. For single hoods, or hood sections installed over appliances with different duty ratings, the maximum allowable exhaust flow rate for the hood or hood section shall be determined in accordance with Table 7.4.3.7 for the highest appliance duty rating under the hood or hood section. Refer to ASHRAE Standard 154 for definitions of hood type, appliance duty, and net exhaust flow rate.

Exception to 7.4.3.7.1: When at least 75% of all the replacement air is transfer air that would otherwise be exhausted.

7.4.3.7.2 Kitchen/dining facilities with total kitchen hood exhaust airflow rate greater than 2000 cfm shall comply with at least one of the following:

a. At least 50% of all replacement air must be transfer air that would otherwise be exhausted.

TABLE 7.4.3.7 Maximum Net Exhaust Flow Rate in cfm per Linear Foot of Hood Length

Type of Hood	Light Duty Equipment	Medium Duty Equipment	Heavy Duty Equipment	Extra Heavy Duty Equipment
Wall-mounted canopy	140	210	280	385
Single island[a]	280	350	420	490
Double island (per side)	175	210	280	385
Eyebrow	175	175	Not allowed	Not allowed
Backshelf/Pass-over	210	210	280	Not allowed

a. The total exhaust flow rate for all single-island hoods in a kitchen/dining facility shall be no more than 5000 cfm.

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b. At least 75% of kitchen hood exhaust air shall be controlled by a demand ventilation system(s), which shall
   1. be capable of reducing exhaust and replacement air system airflow rates by no more than the larger of
      (a) 50% of total design exhaust and replacement air system airflow rate, or
      (b) the outdoor airflow and exhaust rates required to meet the ventilation and exhaust requirements of Sections 6.2 and 6.5 of ANSI/ASHRAE Standard 62.1 for the zone;
   2. include controls to modulate airflow in response to appliance operation and to maintain full capture and containment of smoke, effluent, and combustion products during cooking and idle;
   3. include controls that result in full flow when the demand ventilation system(s) fail to modulate airflow in response to appliance operation; and
   4. allow occupants to temporarily override the system(s) to full flow.

c. Listed energy recovery devices with a sensible heat recovery effectiveness of not less than 40% shall be applied on at least 50% of the total exhaust airflow.

d. In Climate Zones 1B, 2B, 3B, 4B, 5B, 6B, 7B, and 8B, when makeup air is uncooled or cooled without the use of *mechanical cooling*, the capacity of any nonmechanical cooling system(s) (for example, natural cooling or evaporative cooling) shall be demonstrated to be no less than the system capacity of a *mechanical cooling* system(s) necessary to meet the same loads under design conditions.

Modify Normative Appendix D as follows.

D1.1.5 Baseline HVAC System Type and Description (Section G3.1.1 of ANSI/ASHRAE/IES Standard 90.1). ~~The hood or hood section modeled according to Exception (d) to Section G3.1.1 of ANSI/ASHRAE/IES Standard 90.1 shall also meet the requirements of Section 7.4.3.9.~~ Exception (d) to Section G3.1.1 of ANSI/ASHRAE/IES Standard 90.1 shall be replaced as follows:

Kitchens with a total exhaust hood airflow rate greater than 2000 cfm shall use system type 5 or 7 with a demand ventilation system on 75% of the exhaust air. The system shall reduce exhaust and replacement airflow rates by 50% for one-half of the kitchen occupied hours in the baseline design. If the *proposed design* uses demand ventilation, the same airflow rate schedule shall be used. The maximum exhaust flow rate allowed for the hood or hood section shall meet the requirements of Section 7.4.3.7.1 for the numbers and types of hoods and appliances provided for in the *proposed design*. For all-electric buildings, the heating shall be electric resistance.

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FOREWORD

This addendum adds a new Table C-17, which contains minimum nominal efficiencies for transformers used in buildings.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum l to Standard 189.1-2011

Modify Section 3.2 as follows.

3.2 Definitions

low-voltage dry-type distribution transformers: transformers that are not oil- or fluid-cooled, with an input voltage less than or equal to 600V, and that range in size from 15-333 kVA for single-phase and 15–1000 kVA for three-phase equipment and are used for general-purpose applications as described in 42 USC§ 6291.

Modify Normative Appendix C.

NORMATIVE APPENDIX C— PRESCRIPTIVE EQUIPMENT EFFICIENCY TABLES

TABLE C-17 Low-Voltage Dry-Type Distribution Transformers Minimum Nominal Efficiencies by Transformer Rating in Kilovolt-Amperes (kVA)

Single-Phase		Three-Phase	
kVA	Efficiency	kVA	Efficiency
15	98.39%	15	97.90%
25	98.60%	30	98.25%
37.5	98.74%	45	98.39%
50	98.81%	75	98.60%
75	98.95%	112.5	98.74%
100	99.02%	150	98.81%
167	99.09%	225	98.95%
250	99.16%	300	99.02%
333	99.23%	500	99.09%
—	—	750	99.16%
—	—	1000	99.23%

Note: Efficiencies are based on procedures in the Code of Federal Regulations 10 CFR 431, Subpart K, Appendix A, "Uniform Test Method for Measuring the Energy Consumption of Distribution Transformers."

Add the following reference to Chapter 11.

Reference	Title	Section
National Archives and Records Administration Office of the Federal Register 800 North Capital, N.W. Suite 700 Washington DC, 20408 http://www.gpo.gov/about/		
42 USC§ 6291	Title 42—THE PUBLIC HEALTH AND WELFARE CHAPTER 77—ENERGY CONSERVATION SUBCHAPTER III—IMPROVING ENERGY EFFICIENCY Part A—Energy Conservation Program for Consumer Products Other Than Automobiles Sec. 6291—Definitions	Appendix C, Table C-17

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FOREWORD

This addendum clarifies the heat island reduction provisions in Sections 5.3.2.3 and 5.3.2.4 to include aged values for Solar Reflectance Index (SRI) and to include a reference to the Cool Roof Rating Council standard. It also deletes the requirement for a minimum initial SRI value. The ENERGY STAR option is removed because the values are less stringent and focused solely on building heat gain.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum n to Standard 189.1-2011

Modify Section 5.3.2.3 as follows.

5.3.2.3 Roofs. This section applies to the building and covered parking *roof* surfaces for *building projects* in *climate zones* 1, 2, and 3. A minimum of 75% of the entire *roof* surface not used for *roof* penetrations and associated equipment, *on-site renewable energy systems* such as photovoltaics or solar thermal energy collectors including necessary space between rows of panels or collectors, portions of the roof used to capture heat for building energy technologies, rooftop decks or walkways, or vegetated (green) roofing systems shall be covered with products that~~comply with one or more of the following~~:

a. H~~h~~ave a minimum ~~initial *SRI* of 78~~ three-year-aged *SRI* of 64 for a low-sloped *roof*. (~~a~~A low-sloped *roof* has a slope of less than or equal to 2:12.)~~and~~
b. Have a minimum ~~initial *SRI* of 29~~ three-year-aged *SRI* of 15 for a steep-sloped *roof*. (~~A~~ steep sloped *roof* has a slope of more than 2:12~~)~~.
~~b. comply with the criteria for the USEPA's ENERGY STAR® Program Requirements for Roof Products—Eligibility Criteria.~~

Modify Section 5.3.2.4 as follows.

5.3.2.4 Solar Reflectance Index. The *SRI* shall be calculated in accordance with ASTM E1980 for medium-speed wind conditions~~.~~ using a convection coefficient of 2.1 Btu/h·ft²·°F (11.9 W/m²·°C) for the following conditions.

a. For materials other than roofs, ~~T~~the *SRI* shall be based upon solar reflectance as measured in accordance with ASTM E1918 or ASTM C1549, and the thermal emittance as measured in accordance with ASTM E408 or ASTM C1371. The values for solar reflectance and thermal emittance shall be determined and certified by an independent third party.
b. For roofing products, the *SRI* values shall be based on a minimum three-year-aged solar reflectance and thermal emittance as measured in accordance with the CRRC-1 Standard ~~for solar reflectance and thermal emittance shall be determined by a laboratory accredited by a nationally recognized accreditation organization,~~ and shall be certified by the manufacturer. ~~For building materials other than roofing products, the values for solar reflectance and thermal emittance shall be determined by an independent third party.~~

Add a reference to Section 11 as follows.

Cooling Roof Rating Council (CRRC)
1600 Harrison Street
Oakland, CA 94612
United States
1-866-465-2523; www.coolroofs.org

ANSI/CRRC Standard-1-2010	ANSI/CRRC-1 Standard	5.3.2.4

Modify Normative Appendix D as follows.

Table D1.1 Modifications and Additions to Table G3.1 of Appendix G in ANSI/ASHRAE/IES Standard 90.1

5. Building Envelope	
Exception (c) of Table G3.1 (5) shall be replaced with the following: The exterior roof surface shall be modeled using the solar reflectance and thermal emittance determined in accordance with Sections 5.3.2.3 and 5.3.2.4. Where test data are unavailable, the roof surface shall be modeled with a solar reflectance of 0.30 and a thermal emittance of 0.90.	1. In addition to the requirements in Table G3.1 (5), the *baseline building design* shall comply with Section 7.4.2. 2. If the *proposed design* does not comply with Section 7.4.2.9, then the fenestration area in the *baseline building design* shall be uniformly reduced until it complies. This adjustment is not required to be made when rotating the building as required in Table G3.1 (5.a). 3. In addition to the requirements in Table G3.1 (5.d and 5.e), roof surfaces shall comply with Section 5.3.2.3.

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FOREWORD

This addendum ensures that systems that require commissioning also require commissioning of the associated control systems.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum q to Standard 189.1-2011

Modify Section 10.3.1.2.4 as follows.

10.3.1.2.4 Systems. The following systems and associated controls, if included in the *building project*, shall be commissioned:

a. Heating, ventilating, air-conditioning, IAQ, and refrigeration systems (mechanical and/or passive) ~~and associated controls~~. Control sequences to be verified for compliance with construction documentation as part of *verification*.
b. *Building envelope* systems, components, and assemblies to verify the thermal and moisture integrity.
c. *Building envelope* pressurization to confirm air-tightness if included in *BOD* requirements.
d. Lighting systems.
e. Fenestration control systems: Automatic controls for shading devices and *dynamic glazing*.
f. Irrigation.
g. Plumbing.
h. Domestic and process water pumping and mixing systems.
i. *Service water heating* systems.
j. Renewable energy systems.
k. Water measurement devices, as required in Section 6.3.3.
l. Energy measurement devices, as required in Section 7.3.3.

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FOREWORD

This addendum clarifies the requirements for outdoor airflow monitoring in Section 8, along with operational requirements for such monitoring in Section 10. The intent is not to add a new set of requirements but rather to clarify what is currently in the standard. A new definition is included for outdoor air fault condition that indicates when the measured outdoor airflow is significantly different from the expected value under a given set of operating conditions. This newly defined term allows reference to it, when needed, without having to redefine each time. In addition, the definition for minimum outdoor airflow is clarified.

The revision of Section 8 still requires an outdoor monitoring device but clarifies that it is intended to monitor the minimum outdoor airflow over the range of occupancy and system operation. It also clarifies the exception intended for smaller and simpler ventilation systems. The revision of Section 10 clarifies what is to be done with such monitoring devices during operation as well as the associated maintenance requirements.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum s to Standard 189.1-2011

Modify Section 3 as follows.

airflow ~~rate~~, minimum outdoor: the ~~rate of~~ outdoor airflow provided by a ventilation system ~~when running when all~~ *~~densely occupied spaces~~* ~~with~~ *~~demand control ventilation~~* ~~are unoccupied~~ to meet requirements for indoor air quality, excluding any additional outdoor air intake to reduce or eliminate the need for mechanical cooling.

outdoor air fault condition: a situation in which the measured *minimum outdoor airflow* of a ventilation system is 10% or more below the setpoint value that corresponds to the occupancy and operation conditions at the time of the measurement.

Modify Sections 8.3.1.2 as follows.

8.3.1.2 Outdoor Air Delivery Monitoring

8.3.1.2.1 ~~Spaces Ventilated by Mechanical Systems~~ Design for Outdoor Air Intake Measurement. Each mechanical ventilation system shall be configured to allow for the measurement of the outdoor air intake for use in testing and balancing, recommissioning, and outdoor air monitoring as required in Section 8.3.1.2.2.

8.3.1.2.2 Monitoring Requirements. Each mechanical ventilation system shall have a ~~A~~ permanently ~~mounted~~ installed~~, direct total outdoor airflow measurement~~ device ~~shall be provided that is capable of measuring~~ to measure the ~~system~~ *minimum outdoor airflow ~~rate~~* that meets the following requirements:

1. The device shall ~~be capable of measuring flow within~~ employ methods described in ASHRAE Standard 111.
2. The device shall have an accuracy of ~~±15%~~ ±10% of the *minimum outdoor airflow ~~rate~~*. Where the *minimum outdoor airflow* varies, as in *demand control ventilation* systems, the device shall maintain this accuracy over the entire range of occupancy and system operation.
3. The device shall ~~also~~ be capable of ~~being used to alarm~~ notifying the building operator, either by activating a local indicator or ~~for~~by sending a signal to a building ~~central~~ monitoring system, ~~when flow rates are not in compliance~~ whenever an *outdoor air fault condition* exists. This notification shall require manual reset.

Exception: Constant volume air supply systems that do not employ *demand control ventilation* and that use an indicator to confirm that the intake ~~a~~ damper is open to the position ~~feedback~~, determined during system~~ are not required to have a direct total outdoor airflow measurement device~~ startup and balancing, needed to maintain ~~this~~ the design ~~flow~~ *minimum outdoor airflow*.

Modify Sections 10.3.2.1 as follows.

10.3.2.1 High Performance Building Operation Plan

...

10.3.2.1.4 Indoor Environmental Quality The Plan for Operation shall include the requirements of Section 8 of ANSI/ASHRAE Standard 62.1, and shall describe ~~the~~ additional procedures, as outlined in Sections 10.3.2.1.4.1 through 10.3.2.1.4.7, for implementing a regular indoor environmental quality measurement and *verification* program after building occupancy ~~as outlined below~~.

10.3.2.1.4.1 Outdoor Airflow Measurement. The Plan for Operation shall document procedures for implementing a regular outdoor airflow monitoring program after building occupancy and shall meet the following requirements. ~~The Plan shall include minimum verification frequencies of airflows supplied by mechanical ventilation systems at the system level. Verification shall be performed using hand-held airflow measuring instruments appropriate for such measurements or permanently installed airflow measuring stations Hand-held airflow measuring instruments or airflow measuring stations used for airflow verifications must be calibrated no more than 6 months prior to such verifications. Naturally ventilated systems shall be exempted from this requirement provided that the design parameters, including but not limited to permanent openings or window opening frequency are not modified.~~

~~**10.3.2.1.4.2 Outdoor Airflow Verification Procedures**. The plan procedures shall contain the following requirements:~~

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a. For each mechanical ventilation system where direct *outdoor airflow* measurement is required according to Section 8.3.1.2, a procedure shall be in place to ~~react~~ respond when there is notification that the *minimum outdoor airflow* is in an *outdoor air fault condition*. ~~15% or more lower than *minimum outdoor airflow rate*.~~ For systems that use a damper indicator instead of a direct measurement, per the exception to Section 8.3.1.2, a procedure shall be in place to respond when there is notification that the indicator identifies that the damper is out of position. ~~It shall be verified that the device that measures *outdoor air flow* rate is actually measuring the flow rate within ±15% of the sensor output reading at the *minimum outdoor airflow rate*. If the sensor is within ±15%, it shall be recalibrated. *Verification* of outdoor airflow shall be done on a quarterly basis and records maintained onsite. Direct outdoor airflow measurement devices shall be calibrated at the manufacturer's recommended interval or at least annually.~~

b. For each mechanical ventilation system where direct *minimum outdoor airflow* measurement is ~~not~~ required according to Section 8.3.1.2, ~~a procedure shall be in place to verify outdoor airflow and records maintained onsite and shall be made available upon request~~ the *minimum outdoor airflow* shall be recorded every three months in either electronic or written form.

c. For systems that use a damper indicator, per the exception to 8.3.1.2, the *minimum outdoor airflow* shall be measured and recorded in either electronic or written form every two years for air handling systems with a design supply airflow rate of more than 2000 cfm (1000 L/s). The *minimum outdoor airflow* shall be measured using methods as described in ASHRAE Standard 111 and with an accuracy of ±10% or better.

Renumber the remainder of Section 10.3.2.1.4 as follows.

10.3.2.1.4.3~~2~~2
10.3.2.1.4.4~~3~~3
10.3.2.1.4.5~~4~~4
Exception to 10.3.2.1.4.5~~4~~4(a):
Exception to 10.3.2.1.4.5~~4~~4(b):
10.3.2.1.4.6~~5~~5
10.3.2.1.4.7~~6~~6

Modify Section 10.3.2.2 as follows.

10.3.2.2 Maintenance Plan. A *Maintenance Plan* shall be developed for mechanical, electrical, plumbing, and fire protection systems, which includes the following:

a. The Plan shall be in accordance with ANSI/ASHRAE/ACCA Standard 180 for HVAC systems in buildings that meet the definition of commercial buildings in ANSI/ASHRAE/ACCA Standard 180.

b. The Plan shall address all elements of Section 4 of ANSI/ASHRAE/ACCA Standard 180 and shall develop required inspection and maintenance tasks similar to Section 5 of ANSI/ASHRAE/ACCA Standard 180 for electrical and plumbing systems in buildings that meet the definition of commercial buildings in ANSI/ASHRAE/ACCA Standard 180.

c. Outdoor air delivery monitors required by Section 8.3.1.2 shall be visually inspected at least once each quarter and cleaned or repaired as necessary and calibrated at the manufacturer's recommended interval or not less than once per year, whichever is more frequent.

d. For systems with a damper indicator and with less than 2000 cfm (1000 L/s) of supply air, the system components that control the *minimum outdoor airflow* shall be visually inspected every two years. Records of this inspection shall be maintained on-site either in electronic or written form.

e. Documentation of the Plan and of completed maintenance procedures shall be maintained on the building site at all times in:
   1. Electronic format for storage on the building Energy Management System (EMS), Building Management System (BMS), computerized maintenance management system (CMMS) or other computer storage means, or
   2. Maintenance manuals specifically developed and maintained for documenting completed maintenance activities.

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Add to and modify Section 11 Normative References as follows.

11. NORMATIVE REFERENCES

Reference	Title	Section
American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), **1791 Tullie Circle NE** **Atlanta, GA 30329** **United States** **1-404-636-8400** **www.ashrae.org**		
ANSI/ASHRAE Standard 111-2008	Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems	8.3.1.2.2, 10.3.2.2
Green Seal **1001 Connecticut Avenue, NW, Suite 827** **Washington, DC 20036-5525** **United States** **1-202-872-6400** **www.greenseal.org**		
GS-42, September 1, 2006	Environmental Standard for Cleaning Services	10.3.2.1.4.~~6~~5

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FOREWORD

This addendum clarifies the role of standards referenced by Standard 189.1 and addresses situations in which the requirements of two or more referenced standards, both of which are required for compliance with Standard 189.1, are in conflict. This situation is not expected to arise frequently, but it recently was noted that such a conflict may arise when Standard 189.1 updates its references to the 2010 editions of Standards 62.1 and 90.1. Standard 90.1-2010 requires demand-controlled ventilation in parking garages in some situations, while Standard 62.1-2010 currently does not allow it. A conflict would arise if Standard 189.1 required compliance with the 2010 editions of both of those standards. Rather than deal with such issues individually as they arise, the general approach taken in this addendum has the advantage of dealing with the issue only once.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum t to Standard 189.1-2011

Modify Section 4.1 as follows.

4.1 General. *Building projects* shall comply with Sections 4 through 11. Within each of those sections, *building projects* shall comply with all Mandatory Provisions (x.3); and, where offered, either

a. Prescriptive Option (x.4) or
b. Performance Option (x.5).

4.1.1 Referenced Standards. The standards referenced in this standard and listed in Section 11 shall be considered part of the requirements of this standard to the prescribed extent of such reference. Where differences exist between provisions of this standard and a referenced standard, the provisions of this standard shall apply. Informative references in Informative Appendix G are cited to acknowledge sources and are not part of this standard.

4.1.2 Normative Appendices. The normative appendices to this standard are considered to be integral parts of the mandatory requirements of this standard, which for reasons of convenience, are placed apart from all other normative elements.

4.1.3 Informative Appendices. The informative appendices to this standard and informative notes located within this standard contain additional information and are not mandatory or part of this standard.

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FOREWORD

This addendum modifies the Backlight, Uplight and Glare (BUG) threshold values to match those found in the latest draft of the IES/IDA Model Lighting Ordinance. Clarification has been added on the aiming of backlights. Stringency has been increased for building-mounted luminaires that are closer than one mounting height from a property line.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum x to Standard 189.1-2011

Modify Tables 5.3.3.2A and 5.3.3.2B as follows.

TABLE 5.3.3.2A Maximum Allowable Backlight, Uplight and Glare (BUG) Ratings[1,2,3,4]

	LZ0	LZ1	LZ2	LZ3	LZ4
Allowed Backlight Rating					
> 2 mounting heights from property line	~~B0~~B1	~~B1~~B3	~~B2~~B4	~~B3~~B5	~~B4~~B5
1 to 2 mounting heights from property line	~~B0~~B1	~~B1~~B2	~~B2~~B3	~~B3~~B4	~~B3~~B4
0.5 to 1 mounting height to property line	B0	~~B0~~B1	B1B2	~~B2~~B3	~~B2~~B3
< 0.5 mounting height to property line	B0	B0	B0	B1	B2
Allowed Uplight Rating	U0	U1	U2	U3	U4
Allowed Glare Rating	G0	G1	G2	G3	G4

Notes to Table 5.3.3.2A:

1. Except where installed on a building surface, luminaires ~~Fixtures~~ ~~mounted~~ that are located at a distance of two times the mounting heights of the luminaire or less from a property line shall have the backlight of the luminaire aimed towards and perpendicular to the nearest property line, ~~except when mounted on buildings.~~ Backlight is that part of the luminaire's lumen output that was used to determine the backlight rating in its final angular position.
2. For property lines that abut public walkways, bikeways, plazas, and parking lots, the property line may be considered to be 5 feet (1.5 m) beyond the actual property line for purpose of determining compliance with this section. For property lines that abut public roadways and public transit corridors, the property line may be considered to be the centerline of the public roadway or public transit corridor for the purpose of determining compliance with this section.
3. If the luminaire is installed in other than the intended manner, or is an adjustable luminaire for which the aiming is specified, the rating shall be determined by the actual photometric geometry in the aimed orientation.
4. Backlight, Uplight, and Glare ratings are defined based on specific lumen limits per IES TM-15 Addendum A.

TABLE 5.3.3.2B Maximum Allowable Glare Ratings for Building Mounted Luminaires Within Two Mounting Heights of Any Property Line

Distance in Mounting Heights to Nearest Property Line	LZ0	LZ1	LZ2	LZ3	LZ4
~~Glare~~ ≥ 1 and < 2	G0	G0	G1	G1	G2
≥ 0.5 and < 1	G0	G0	G0	G1	G1
< 0.5	G0	G0	G0	G0	G1

Notes to Table 5.3.3.2B:

1. For property lines that abut public walkways, bikeways, plazas, and parking lots, the property line may be considered to be 5 feet (1.5 m) beyond the actual property line for purpose of determining compliance with this section. For property lines that abut public roadways and public transit corridors, the property line may be considered to be the centerline of the public roadway or public transit corridor for the purpose of determining compliance with this section
1. Backlight, Uplight, and Glare ratings are defined based on specific lumen limits per IES TM-15 Addendum A.

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Modify Section 11 as follows.

Illuminating Engineering Society of North America, 120 Wall Street, Floor 17 New York, NY 1005-4001 1-212-248-5017, www.ies.org		
TM-15-~~2007~~2011 including addendum "a"	Backlight, Uplight, and Glare (BUG) Ratings	5.3.3.2~~A~~

Add a reference to Informative Appendix G as follows.

Illuminating Engineering Society of North America, 120 Wall Street, Floor 17 New York, NY 10005-4001 *1-212-248-5017, www.ies.org*		
IDA – IES Model Lighting Ordinance	Model Lighting Ordinance (MLO)	5.3.3.2

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FOREWORD

The purpose of this addendum is to clarify the requirements for heating, ventilating, air conditioning, and service water heating equipment for building projects.

This addendum modifies Appendix D of ANSI/ASHRAE/IES Standard 189.1 to require a consistent set of baseline building equipment efficiencies for all building projects using the performance option described in Section 7. The language updates Table D-3.1 item 10 (HVAC Systems) in Appendix D by clarifying the modeling rules for baseline building HVAC equipment efficiency.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum y to Standard 189.1-2011

Modify section as follows.

7.4.1.1 On-Site Renewable Energy Systems. *Building projects* shall contain *on-site renewable energy systems* that provide the annual energy production equivalent of not less than 6.0 KBtu/ft^2 (20 kWh/m^2) multiplied by the total roof area in ft^2 (m^2) for single story buildings and not less than 10.0 kBtu/ft2 (32 kWh/m2) multiplied by the total roof area in ft^2 (m^2) for all other buildings. The annual energy production shall be the combined sum of all *on-site renewable energy systems.*

Exceptions:

1. Projects that comply with Section 7.4.3.1(b) and 7.4.4.1(b) and contain on-site renewable energy systems that provide an annual energy production of not less than 4.0 kBtu/ft^2 (13 kWh/m^2) multiplied by the total roof area in ft^2 (m^2) for single-story buildings and not less than 7.0 kBtu/ft^2 (22 kWh/m^2) multiplied by the total roof area in ft^2 (m^2) for all other buildings.

~~**Exception:**~~ 2. Buildings that demonstrate compliance with both of the following are not required to contain *on-site renewable energy systems*:

a. ~~1.~~An annual daily average incident solar radiation available to a flat plate collector oriented due south at an angle from horizontal equal to the latitude of the collector location less than 4.0 kWh/m^2·day, accounting for existing buildings, permanent infrastructure that is not part of the *building project*, topography, and trees

b. ~~2.~~A commitment to purchase renewable electricity products complying with the Green-e Energy National Standard for Renewable Electricity Products of at least 7 kWh/ft^2 (75 kWh/m^2) of conditioned space each year until the cumulative purchase totals 70 kWh/ft^2 (750 kWh/m^2) of conditioned space.

7.4.3.1 Minimum Equipment Efficiencies. Projects shall comply with one of the following:

a. ~~**EPAct baseline**~~ **Minimum Efficiency.** All ~~P~~products shall comply with the minimum efficiencies addressed in the National Appliance Energy Conservation Act (NAECA), Energy Policy Act (EPAct), ~~and~~ the Energy Independence and Security Act (EISA), and ANSI/ASHRAE/IES Standard 90.1. All the minimum efficiency requirements are listed in Tables 6.8.1A through 6.8.1K of ANSI/ASHRAE/IES Standard 90.1.

b. **Higher Efficiency.** Products shall comply with the ~~greater of the ENERGY STAR~~ requirements in Section 7.4.7.3 and the values in Normative Appendix C. These requirements supersede the requirements in Tables 6.8.1A to 6.8.1~~G~~K of ANSI/ASHRAE/IES Standard 90.1. Projects that comply with Section 7.4.3.1(b) and 7.4.4.1(b) qualify for Exception 1 of Section 7.4.1.1 and the exception to Section 7.4.5.1. ~~The building project shall comply with Sections 7.4.1.1 and 7.4.5.1 with the following modifications:~~

~~1. The on-site renewable energy systems required in Section 7.4.1.1 shall provide an annual energy production of not less than 4.0 kBtu/ft2 (13 kWh/m2) multiplied by the total *roof* area in ft2 (m2) for single story buildings and not less than 7.0 kBtu/ft2 (22 kWh/m2) multiplied by the total *roof* area in ft2 (m2) for all other buildings.~~

~~2. The peak load reduction systems required in Section 7.4.5.1 shall be capable of reducing electric peak demand by not less than 5% of the projected peak demand.~~

7.4.4 Service Water Heating. The *service water heating* shall comply with Section 7 of ANSI/ASHRAE/IES~~NA~~ Standard 90.1 with the following modifications and additions.

7.4.4.1 Equipment Efficiency. Projects shall comply with one of the following: ~~Equipment shall comply with the minimum efficiencies in Table C-12 in Normative Appendix C. These requirements supersede the requirements in Table 7.8 of ANSI/ASHRAE/IESNA Standard 90.1.~~

a. **Minimum Efficiency** The efficiency of the water heating equipment shall comply with the minimum efficiencies addressed in the National Appliance Energy Conservation Act (NAECA), Energy Policy Act (EPAct), the Energy Independence and Security Act (EISA), and ANSI/ASHRAE/IES Standard 90.1. All the minimum efficiency requirements are listed in Table 7.8 of ANSI/ASHRAE/IES Standard 90.1.

b. **Higher Efficiency.** The efficiency of the water heating equipment shall comply with the requirements in Section 7.4.7.3 and the values in Normative Appendix C. These requirements supersede the requirements in Table 7.8 of

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ANSI/ASHRAE/IES Standard 90.1. Projects that comply with Section 7.4.3.1(b) and 7.4.4.1(b) qualify for Exception 1 of Section 7.4.1.1 and the exception to Section 7.4.5.1.

7.4.5.1 Peak Load Reduction. *Building projects* shall contain automatic systems, such as demand limiting or load shifting, that are capable of reducing electric peak demand of the building by not less than 10% of the projected peak demand. Standby power generation shall not be used to achieve the reduction in peak demand.

Exception: Projects that comply with Sections 7.4.3.1(b) and 7.4.4.1(b) that are capable of reducing electric peak demand by not less than 5% of the projected peak demand.

Modify Table D-3.1 HVAC Systems as follows.

TABLE D-1.1 Modifications and Additions to table G3.1 of Appendix G in ANSI/ASHRAE/IES Standard 90.1

No.	Proposed Building Performance	Baseline Building Performance
10.	**HVAC Systems**	
	No modifications	In addition to the requirements in Table G3.1 (10), the baseline building design shall comply with all requirements in Section 7.4.3.1a.
11.	**Service Hot Water Systems**	
	In addition to the requirements in Table G3.1 (11), service hot-water usage is allowed to be lower in the proposed design than in the baseline building design if service hotwater use can be demonstrated to be less than that resulting from compliance with Sections 6.3.2, 6.4.2, and 6.4.3.	a. In addition to the requirements in Table G3.1 (11.b) and (11.c), service hot-water systems shall meet the requirements of Sections 7.4.4.1(a), 7.4.7.2, and 7.4.7.3. b. 2. In addition to the requirements in Table G3.1 (11.f), the baseline building design shall meet the requirements of Section 7.4.7.2. If a condenser heat recovery system meeting the requirements described in Section 7.4.7.2 cannot be modeled, the requirement for including such a system in the actual building shall be met as a prescriptive requirement and no heatrecovery system shall be included in the proposed design or baseline building design. c. In addition to the requirements in Table G3.1 (11.i), the baseline building design shall meet the requirements of Sections 6.3.2 and 6.4.3.

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FOREWORD

This addendum addresses the following issues.

- *The mandatory daylighting section has been moved to the prescriptive section to allow for the alternative of using the performance path to show equivalent daylighting benefits.*
- *When relatively large spaces with high ceilings are directly under a roof, it is cost-effective to daylight them with skylights and it is reasonable to daylight at least half of the area of the space. This addendum provides more flexibility in achieving minimum daylight requirements.*
- *The addendum adds occupancy exceptions to the requirement for diffusing glazing.*
- *The rationale of Section 8.4.1.2(c) is to ensure that surfaces in the daylight are highly reflective. Surface reflectances impact the perception of the brightness of a space.*
- *The performance option (Section 8.5.1) has been modified to more clearly align with the proposed prescriptive path.*
- *References have been added and updated.*
- *Clarification has been added that requirements for visible transmittance (VT) of skylights and roof monitors apply only to those products when they are used to comply with the minimum daylighted area requirements. If extra skylights or roof monitors, are added these requirements don't apply.*
- *This addendum allows as an exception smaller skylight areas if the transmittances of the skylights are high enough that the skylight effective aperture is above 1%. This essentially matches the option for skylights to have either 40% VT and 3% skylight area or 1% skylight effective aperture as described in Section 5.5.4.2.3 of ASHRAE/IES Standard 90.1-2010. The smaller skylight areas with an effective aperture over 1% are allowed as an exception to make clear that for the energy performance option (Section 7.5), the smallest possible skylight area in the baseline building has 3% skylight area with a 40% VT.*
- *This addendum allows as an exception skylights with lower transmittances if there is enough skylight area so that the skylight effective aperture is above 1%. This essentially matches the option for skylights to have either 40% VT and 3% skylight area or 1% skylight effective aperture as described in Section 5.5.4.2.3 of ASHRAE/IES Standard 90.1-2010. The lower skylight VTs with an effective aperture over 1% are allowed as an exception to make clear that for the energy performance option (Section 7.5) the baseline building has 40% VT and skylight area no less than 3% of daylighted area and no more than 5% of roof area.*

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum aa to Standard 189.1-2011

Add the following definitions to Section 3.2.

enclosed space: See the ANSI/ASHRAE/IES Standard 90.1 definition.

skylight effective aperture: See the ANSI/ASHRAE/IES Standard 90.1 definition.

Modify Section 7 as follows.

7.4.2.1 Building Envelope Requirements. The *building envelope* shall comply with the requirements in Tables A-1 to A-8 in Normative Appendix A. These requirements supersede the requirements in Tables 5.5-1 to 5.5-8 of ANSI/ASHRAE/IES Standard 90.1.

Exception: Buildings that comply with Section ~~8.3.4~~ 8.4.1 regardless of building area are exempt from the SHGC criteria for skylights.

7.5.2 Annual Energy Cost. The *building project* shall have an annual energy cost less than or equal to that achieved by compliance with Sections 7.3 and 7.4, and Sections 5.3.2.2, 5.3.2.3, 6.3.2, 6.4.2, 8.3.1, ~~8.3.4,~~ and 8.4.1. Comparisons shall be made using Normative Appendix D.

7.5.3 Annual Carbon Dioxide Equivalent (CO2e). The *building project* shall have an annual CO2e less than or equal to that achieved by compliance with Sections 7.3 and 7.4, and Sections 5.3.2.2, 5.3.2.3, 6.3.2, 6.4.2, 8.3.1, ~~8.3.4,~~ and 8.4.1. Comparisons shall be made using Normative Appendix D provided that the baseline building design is calculated in accordance with Section 7.5.2. To determine the CO_2e value for each energy source supplied to the *building project*, multiply the energy consumption by the emissions factor. CO_2e emission factors shall be taken from Table 7.5.3.

7.5.4 Annual Load Factor/Peak Electric Demand. The *building project* shall have the same or less peak electric demand than achieved by compliance with Sections 7.3 and 7.4, and Sections 5.3.2.2, 5.3.2.3, 6.3.2, 6.4.2, 8.3.1, ~~8.3.4,~~ and 8.4.1. Comparisons shall be made using Normative Appendix D provided that the baseline building design is calculated in accordance with Section 7.5.2. In addition, the *building project* shall have a minimum electrical *annual load factor* of 0.25.

Modify Sections 8.3 and 8.4 as follows.

~~8.3.4 Daylighting by Toplighting.~~ ~~There shall be a minimum *fenestration area* providing daylighting by *toplighting* for large enclosed spaces. In buildings three stories and less~~

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~~above grade, conditioned or unconditioned enclosed spaces that are greater than 20,000 ft2 (2000 m2) directly under a *roof* with finished ceiling heights greater than 15 ft (4 m) and that have a *lighting power allowance* for general lighting equal to or greater than 0.5 W/ft2 (5.5 W/m2) shall comply with the following.~~

~~**Exceptions:**~~

~~**1.** Buildings in *climate zones* 7 or 8.~~

~~**2.** Auditoria, theaters, museums, places of worship, and refrigerated warehouses.~~

~~**8.3.4.1 Minimum Daylight Area by Toplighting.** A minimum of 50% of the floor area directly under a *roof* in spaces with a lighting power density or *lighting power allowance* greater than 0.5 W/ft2 (5 W/m2) shall be in the *daylight area*. Areas that are daylit shall have a minimum *toplighting* area to *daylight area* ratio as shown in Table 8.3.4.1. For purposes of compliance with Table 8.3.4.1, the greater of the space lighting power density and the space *lighting power allowance* shall be used.~~

~~**8.3.4.2 Skylight Characteristics.** *Skylights* used to comply with Section 8.3.4.1 shall have a glazing material or diffuser that has a measured haze value greater than 90%, tested according to ASTM D1003 (notwithstanding its scope) or other test method approved by the *AHJ*.~~

~~**TABLE 8.3.4.1 Minimum Toplighting Area**~~

~~**Lighting Power Density or *Lighting Power Allowances* in Daylight Zone, W/ft2 (W/m2)**~~	~~**Minimum Toplighting Area to Daylight Zone Area Ratio**~~
~~1.4 W/ft2 (14 W/m2) < LPD~~	~~3.6%~~
~~1.0 W/ft2 (10 W/m2) < LPD < 1.4 W/ft2 (14 W/m2)~~	~~3.3%~~
~~0.5 W/ft2 (5 W/m2) < LPD < 1.0 W/ft2 (10 W/m2)~~	~~3.0%~~

~~**Exceptions:**~~

~~1. *Skylights* with a measured haze value less than or equal to 90% whose combined area does not exceed 5% of the total *skylight* area.~~

~~2. *Tubular daylighting devices* having a diffuser.~~

~~3. *Skylights* that are capable of preventing direct sunlight from entering the occupied space below the well during occupied hours. This shall be accomplished using one or more of the following:~~

~~a. orientation~~

~~b. automated shading or diffusing devices~~

~~c. diffusers~~

~~d. fixed internal or external baffles~~

~~4. Airline terminals, convention centers, and shopping malls.~~

8.3.5~~4~~ Isolation of the Building from Pollutants in Soil. Building projects that include construction or expansion of a ground-level foundation and which are located on *brownfield sites* or in "Zone 1" counties identified to have a significant probability of radon concentrations higher than 4 picocuries/liter on the USEPA map of radon zones, shall have a *soil gas retarding system* installed between the newly constructed space and the soil.

8.4 Prescriptive Option

8.4.1 Daylighting ~~by Sidelighting~~

8.4.1.1 Daylighting in Large Spaces Directly under a Roof and Having High Ceilings. Enclosed spaces, including conditioned and unconditioned spaces, shall comply with Sections 8.4.1.1.1, 8.4.1.1.2 and 8.4.1.1.3, provided these spaces meet all of the following criteria:

1. The space is in a building with three stories or fewer above grade,
2. The space area is greater than 5000 ft^2 (465 m^2).
3. The space is located directly under a *roof* and average ceiling heights are greater than 15 ft (4.6 m).
4. The space *lighting power allowance* for general lighting is equal to or greater than 0.5 W/ft^2 (5.4 W/m^2).

Exceptions to Section 8.4.1.1:

1. Spaces in buildings located in *climate zones* 7 or 8.
2. Auditoria, motion picture theaters, performing arts theaters, museums, places of worship, and refrigerated warehouses.
3. Enclosed spaces where documentation shows that existing structures or natural objects block direct sunlight on at least 50% of the *roof* over the enclosed space at all three of the following times on the date of the spring equinox: three hours before solar noon (peak solar altitude), at solar noon, and three hours after solar noon.

8.4.1.1.1 Minimum Daylight Area. A minimum of 50% of the floor area shall be in the *daylight area* as defined in Section 3. *Daylight areas* shall be under skylights, under roof monitors, or in the primary or secondary sidelighted areas and shall meet at least one of the following requirements:

1. The combined area of the skylights within the space shall be no less than 3% of the calculated *daylight area* under skylights.

   Exception: *Enclosed spaces* that have a *skylight effective aperture* of at least 1%.
2. The combined area, within the space, of any vertical fenestration in roof monitors shall be no less than 20% of the calculated *daylight area* under roof monitors.
3. Primary sidelighted areas shall have a *sidelighting effective aperture* of no less than 0.15.
4. Secondary sidelighted areas shall have a *sidelighting effective aperture* of no less than 0.30.

8.4.1.1.2 Visible Transmittance (VT) of Skylights and Roof Monitors. The visible transmittance of *skylights*

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and *roof monitors* for *daylight areas* used to comply with Section 8.4.1.1.1 shall be no less than 0.40.

Exception: *Enclosed spaces* that have a *skylight effective aperture* of at least 1%.

8.4.1.1.3 Skylight Optical Diffusion Characteristics. *Skylights* used to comply with Section 8.4.1.1.1 shall have a glazing material or diffuser that has a measured haze value greater than 90%, tested according to ASTM D1003 or other test method approved by the *AHJ*.

Exceptions to Section 8.4.1.1.3:

1. *Skylights* with a measured haze value less than or equal to 90% whose combined area does not exceed 5% of the total *skylight* area.
2. *Tubular daylighting devices* having a diffuser.
3. *Skylights* designed to prevent direct sunlight from entering the occupied space below during occupied hours.
4. *Skylights* in transportation terminals and concourses, sports arenas, convention centers, and shopping malls.

8.4.1.~~1~~2 Minimum Sidelighting Effective Aperture for Office Spaces and Classrooms. Office spaces and *classrooms* shall comply with the following criteria:

a. All north-, south-, and east-facing facades ~~for those spaces~~ shall have a minimum *sidelighting effective aperture* as prescribed in Table 8.4.1.~~1~~2.
b. For all facades, ~~T~~the combined width of the *primary sidelighted* areas shall be at least 75% of the length of the façade wall.
c. All ~~O~~opaque interior surfaces in *daylight areas* shall have average visible light reflectances greater than or equal to 80% for ceilings~~,70%~~ 40% for partitions higher than 60 in. (~~1.8~~1.5 m), and 60% for walls ~~in *daylight areas*~~.

TABLE 8.4.1.~~1~~2 Minimum Sidelighting Effective Aperture

Climate Zone	Minimum Sidelighting Effective Aperture
1, 2, 3A, 3B	0.10
3C, 4, 5, 6, 7, 8	0.15

Exceptions to Section 8.4.1.2:

1. Spaces with ~~programming~~ tasks that require~~s~~ dark conditions (e.g., photographic processing).
2. Spaces ~~with *toplighting*~~ covered by and in compliance with Section ~~8.3.4~~ 8.4.1.1 without use of any exception.
3. *Daylight areas* where the height of existing adjacent structures above the window is at least twice the distance between the window and the adjacent structures, measured from the top of the glazing.

8.4.1.~~2~~3 Office Space Shading

Modify Section 8.5.1 as follows.

8.5.1 Daylighting Simulation

8.5.1.1 Usable Daylight Illuminance in Large Spaces ~~Office Spaces and Classrooms.~~ ~~The design for the *building project* shall demonstrate an illuminance of at least 30 fc (300 lux) on a plane 2.5 ft (0.8 m) above the floor, within 75% of the area of the *daylight areas*. The simulation shall be made at noon on the equinox using an accurate physical model or computer daylighting model.~~ In buildings three stories and fewer above grade, enclosed spaces, including conditioned and unconditioned spaces, with floor area greater than 5000 ft^2 (465 m^2) directly under a roof with average ceiling heights greater than 15 ft (4.6 m) and with a lighting power allowance for general lighting equal to or greater than 0.5 W/ft^2 (5.4 W/m^2), a physical or computer model for the building project shall be used to demonstrate a calculated illuminance from daylight of no less than 25 fc (270 lux) at 9:00 a.m. and 3:00 p.m. on the date of the spring equinox for at least half of the space. Daylight illuminances resulting from a physical model or computer daylighting model are to be calculated for a plane 2.5 ft (0.8 m) above the floor and need not include storage racks or internal obstructions other than walls and permanent partitions. The simulation shall include daylight illuminance calculations with no more than 5 ft (1.5 m) between calculation points.

a. Computer models shall be built using daylight simulation software based on the ray-tracing or radiosity methodology.
b. Simulation and normalized physical model results shall be based on external daylight illuminance ~~done~~ using either the CIE Overcast Sky Model or the CIE Clear Sky Model for the location of the project.
c. For office spaces, the same model (including shading) used to show compliance with Section 8.5.1.3, shall be used in the calculation of illuminances.

~~**Exception:** Where the simulation demonstrates that existing adjacent structures preclude meeting the illuminance requirements.~~

Exceptions:

1. Buildings in climate zones 7 or 8.
2. Auditoria, motion picture theaters, performing arts theaters, museums, places of worship, and refrigerated warehouses.
3. Enclosed spaces where it is documented that existing structures or natural objects block direct beam sunlight on at least 50% of the roof over the enclosed space at all three of the following times on the date of the spring equinox: three hours before solar noon (peak solar altitude), at solar noon, and three hours after solar noon.

8.5.1.2 Usable Daylight Illuminance in Office Spaces and Classrooms. The physical or computer model for the *building project* shall demonstrate that at least 75% of the area within one ceiling height of the perimeter walls has a calculated daylight illuminance of at least 25 fc (250 lux) at

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9:00 a.m. and 3:00 p.m. on the date of the spring equinox. The physical or computer daylighting model shall calculate daylight illuminance on a plane 2.5 ft (0.8 m) above the floor with no more than 5 ft (1.5 m) between calculation points. The simulation need not include storage racks or internal obstructions other than walls and permanent partitions.

a. Computer models shall use daylight simulation software based on the ray-tracing or radiosity methodology.
b. Simulation and normalized physical model results shall be based on external daylight illuminance using either the CIE Overcast Sky Model or the CIE Clear Sky Model for the location of the project.
c. For office spaces, the same model (including shading) used to show compliance with Section 8.5.1.3, shall be used in the calculation of illuminances.

Exceptions to Section 8.5.1.2:

1. Spaces with tasks that require dark conditions (e.g. photographic processing).
2. Spaces that are covered by and compliant with the requirements of Section 8.5.1.1 without using exceptions.
3. Daylight areas where the height of existing adjacent structures above the window is at least twice the distance between the window and the adjacent structures, measured from the top of the glazing.

8.5.1.~~2~~3 Direct Sun Limitation on Worksurfaces in Offices. It shall be demonstrated that direct sun does not strike anywhere on a worksurface in any ~~daylit~~ daylighted space for more than 20% of the occupied hours during an equinox day in regularly occupied office spaces. If the worksurface height is not defined, a height of 2.5 ft (0.75 m) above the floor shall be used.

Modify Section 11 as follows.

American Society for Testing and Materials International
100 Barr Harbor Dr.
West Conshohocken, PA 19428-2959
United States
1-610-832-9585; www.astm.org

ASTM D1003-07e1	Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics	~~8.3.4.2,~~ ~~8.4.1.2~~ 8.4.1.1.3, 8.4.1.3
ASTM E1331 - 09	Standard Test Method for Reflectance Factor and Color by Spectrophotometry Using Hemispherical Geometry	
ASTM E1477 - 98a(2008)	Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers	
British Standards Institute Light reflectance value (LRV) of a surface	Method of test Series/ doc. No BS 8493:2008	

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FOREWORD

This addendum allows salvaged material content to be added to the recycled content requirement of Reduced Impact Materials.

The annual average industry values for the recycled content of steel products manufactured in basic oxygen furnaces and electric arc furnaces are allowed to be used as the recycled content of the steel. For the purpose of calculating the recycled content contribution of concrete, the constituent materials in concrete (e.g., the cementitious materials, aggregates, and water) are allowed to be treated as separate components and calculated separately.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum ab to Standard 189.1-2011

Modify Section 9 as follows.

9.4.1.1 Recycled Content and Salvaged Material Content. The sum of ~~*post-consumer recycled content* plus one-half of the *pre-consumer recycled content*~~ the *recycled content* and the salvaged material content shall constitute a minimum of 10%, based on cost, of the total materials in the *building project.*

9.4.1.1.1 Recycled Content. The *recycled content* of a material shall be the *post-consumer recycled content* plus one-half of the *pre-consumer recycled content*, determined by weight. The recycled fraction of the material in ~~a~~an product or an assembly shall then be multiplied by the cost of the product or assembly to determine its contribution to the 10% requirement.

The annual average industry values for the *recycled content* of steel products manufactured in basic oxygen furnaces and electric arc furnaces are allowed to be used as the *recycled content* of the steel. For the purpose of calculating the *recycled content* contribution of concrete, the constituent materials in concrete (e.g. the cementitious materials, aggregates, and water) are allowed to be treated as separate components and calculated separately.

9.4.1.1.2 Salvaged Material Content. For purposes of this standard, a salvaged material is a material that has been removed in a whole form from a structure and reused in the *building project*. The salvaged material content shall be determined based on the cost of a comparable alternative component material.

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FOREWORD

ENERGY STAR withdrew its program for programmable thermostats. In its absence, NEMA developed a standard for programmable thermostats. This addendum deletes the ENERGY STAR requirements and requires compliance with the NEMA standard in residential spaces.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum ac to Standard 189.1-2011

Modify Section 7 as follows.

7.4.7.3 ENERGY STAR Equipment. The following equipment within the scope of the applicable ENERGY STAR® program shall comply with the equivalent criteria required to achieve the ENERGY STAR label if installed prior to the issuance of the certificate of occupancy:

b. Heating and Cooling

~~6. Programmable thermostats: ENERGY STAR Program Requirements for Programmable Thermostats~~

~~7.~~ 6. Ventilating fans: ENERGY STAR Program Requirements for Residential Ventilating Fans

~~8.~~ 7. Residential Warm Air Furnaces: ENERGY STAR Requirements for Warm Air Furnaces

7.4.7.4 Programmable Thermostats. *Residential* programmable thermostats shall meet the requirements of NEMA Standards Publication DC 3, Annex A, "Energy-Efficiency Requirements for Programmable Thermostats."

7.4.7.4 ~~5~~ Commercial Refrigerators, Freezers, and Clothes Washers

Modify Section 11 as follows.

11. NORMATIVE REFERENCES

National Electrical Manufacturers Association (NEMA)
1300 North 17th Street, Suite 1752
Rosslyn, VA 22209
1-703-841-3200; www.nema.org

ANSI/NEMA MG-1-2006	Motors and Generators	Appendix C
NEMA DC 3, Annex A-2010	Energy-Efficiency Requirements for Programmable Thermostats	7.4.7.4

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INFORMATIVE APPENDIX—
12-MONTH SUPPLEMENT: ADDENDA TO ANSI/ASHRAE STANDARD 189.1-2011

This supplement includes Addenda a, c, d, e, f, h, j, k, l, n, q, s, t, x, y, aa, ab, and ac to ANSI/ASHRAE/USGBC/IES Standard 189.1-2011. The following table lists each addendum and describes the way in which the standard is affected by the change. It also lists the ASHRAE, ANSI, USGBC, and IES approval dates for each addendum.

Addendum	Section(s) Affected	Description of Change(s)*	ASHRAE Standards Committee Approval	ASHRAE BOD Approval	ANSI Approval	USGBC Approval	IES Approval
a	8.4.2 Materials, Section 11 Normative References, Appendix E, IAQ Limit Requirements for Office Furniture Systems and Seating	This addendum updates references to the newly approved ANSI/BIFMA M7.1-2011, ANSI/BIFMA X7.1-2011 and ANSI/BIFMA e3-2011 in Sections 8 and Section 11. It deletes all of Appendix E, making reference to the relevant material in Section 8.	June 23, 2012	June 27, 2012	June 28, 2012	June 15, 2012	June 18, 2012
c	5.3.3 Reduction of Light Pollution	This addendum narrows the scope of the reference to ANSI/ASHRAE/IES/Standard 90.1 to just those sections involved with exterior lighting.	June 23, 2012	June 27, 2012	June 28, 2012	June 15, 2012	June 18, 2012
d	5.3.1 Allowable Sites	This addendum d clarifies the intent of this exception to relax the limitations of 150 feet and 100 feet for the case of low-impact trails.	June 23, 2012	June 27, 2012	June 28, 2012	June 15, 2012	June 18, 2012
e	7.4.7 Other Equipment, Section 11 Normative References	This addendum updates Standard 189.1-2011 references to ENERGY STAR.	June 23, 2012	June 27, 2012	June 28, 2012	June 15, 2012	June 18, 2012
f	Appendix D Performance Option for Energy Efficiency	This addendum updates the modeling requirements for on-site renewable energy systems in Normative Appendix D. The addendum changes the requirements for modeling both the baseline and proposed buildings.	June 23, 2012	June 27, 2012	June 28, 2012	June 15, 2012	June 18, 2012
h	3.2 Definitions, 7.3 Mandatory Provisions, 7.4 Prescriptive Option, 10.3.1 Building Acceptance Testing	This addendum clarifies the requirements for a continuous air barrier in Section 7 of the standard as well as the requirements for airtightness commissioning in Section 10.	January 26, 2013	January 29, 2013	January 30, 2013	January 24, 2013	January 21, 2013
j	5.3.2 Mitigation of Heat Island Effect	This addendum clarifies shading provided by vegetation for the site hardscape and walls for heat island mitigation (Sections 5.3.2.1 and 5.3.2.2).	January 26, 2013	January 29, 2013	January 30, 2013	January 24, 2013	January 21, 2013

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Addendum	Section(s) Affected	Description of Change(s)*	ASHRAE Standards Committee Approval	ASHRAE BOD Approval	ANSI Approval	USGBC Approval	IES Approval
k	3.2 Definitions, 7.4.3.7 Variable Speed Fan Control for Commercial Kitchen Hoods, Appendix D Performance Option for Energy Efficiency	This addendum updates Section 7.4.3.7, which was written to reference the language in ASHRAE/ANSI/IES Standard 90.1-2007.	January 26, 2013	January 29, 2013	January 30, 2013	January 24, 2013	January 21, 2013
l	3.2 Definitions, 7.4.3.1 Minimum Equipment Efficiencies, Appendix C Prescriptive Equipment Efficiency Tables	This addendum adds a new Table C-17 that contains the minimum efficiencies of transformers for buildings that are following path B of Section 7.4.3.1 (b), i.e., those buildings that have a lower amount of on-site renewable generation and have required minimum efficiencies greater than the minimum federal efficiencies.	January 26, 2013	January 29, 2013	January 30, 2013	January 24, 2013	January 21, 2013
n	5.3.2 Mitigation of Heat Island Effect, Appendix D Performance Option for Energy Efficiency	This addendum clarifies the heat island reduction provisions in Sections 5.3.2.3 and 5.3.2.4 to include aged values for solar reflective index and to include a reference to the Cool Roof Rating Council ANSI Standard. It also modifies the solar reflectance and emittance values in Normative Appendix D.	June 23, 2012	June 27, 2012	June 28, 2012	June 15, 2012	June 18, 2012
q	10.3.1.2. Activities Prior to Building Occupancy	This addendum clarifies that systems that require commissioning also include commissioning of the associated control systems.	January 26, 2013	January 29, 2013	January 30, 2013	January 24, 2013	January 21, 2013
s	8.3.1.2 Outdoor Air Delivery Monitoring, 10.3.2 Plans for Operation	This addendum clarifies the requirements for outdoor airflow monitoring in Section 8, along with operational requirements for such monitoring in Section 10.	January 26, 2013	January 29, 2013	January 30, 2013	January 24, 2013	January 21, 2013
t	4 Administration and Enforcement	This addendum clarifies the role of standards referenced by Standard 189.1 and addresses situations in which the requirements of two or more referenced standards, both of which are required for compliance with Standard 189.1, may have inconsistent requirements.	June 23, 2012	June 27, 2012	June 28, 2012	June 15, 2012	June 18, 2012
x	5.3.3 Reduction of Light Pollution	This addendum modifies the Backlight, Uplight and Glare (BUG) threshold values to match those found in the latest draft of the IDA/IES Model Lighting Ordinance.	June 23, 2012	June 27, 2012	June 28, 2012	June 15, 2012	June 18, 2012

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Addendum	Section(s) Affected	Description of Change(s)*	ASHRAE Standards Committee Approval	ASHRAE BOD Approval	ANSI Approval	USGBC Approval	IES Approval
y	7.4.1 General Comprehensive Prescriptive Requirements, 7.4.3 Heating Ventilating, and Air Conditioning, 7.4.4 Service Water Heating, 7.4.5 Power, Appendix D Performance Option for Energy Efficiency	This addendum clarifies the requirements for heating, ventilating, air conditioning, and service water heating equipment when compliance path is chosen for the building project where federal minimum preemptive efficiency requirements are applicable.	January 26, 2013	January 29, 2013	January 30, 2013	January 24, 2013	January 21, 2013
aa	8.3.4 Daylighting and Toplighting, 8.4.1 Daylighting and Sidelighting, 8.5.1 Daylighting Simulation, Appendix D Performance Option for Energy Efficiency	This addendum provides more flexibility in achieving minimum daylight requirements, allows for the alternative of using the performance path to show equivalent daylighting benefits, and adds occupancy exceptions to the requirement for diffusing glazing.	June 23, 2012	June 27, 2012	June 28, 2012	June 15, 2012	June 18, 2012
ab	9.4.1.1 Recycled Content	This addendum allows salvaged material content to be added to the recycled content requirement of Section 9.4.1	January 21, 2012	January 25, 2012	January 26, 2012	December 19, 2011	January 17, 2012
ac	7.4.7 Other Equipment	This addendum deletes the ENERGY STAR requirements and requires compliance with the NEMA standard in residential spaces.	January 21, 2012	January 25, 2012	January 26, 2012	December 19, 2011	January 17, 2012

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

NOTE

When addenda, interpretations, or errata to this standard have been approved, they can be downloaded free of charge from the ASHRAE Web site at http://www.ashrae.org.

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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.

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10/13
Errata noted in the list dated 9/5/2013 have been corrected.