STANDARD 189.1-2014 USER'S MANUAL

ANSI/ASHRAE/USGBC/IES

STANDARD 189.1-2014

STANDARD FOR THE DESIGN OF HIGH-PERFORMANCE GREEN BUILDINGS

EXCEPT LOW-RISE RESIDENTIAL BUILDINGS



Includes online access to compliance forms and calculators

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Standard 189.1-2014 User's Manual

ANSI/ASHRAE/USGBC/IES Standard 189.1-2014

Standard for the Design of High-Performance Green Buildings

Except Low-Rise Residential Buildings



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ASHRAE Research contributed significantly to the material in this book.

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https://www.ashrae.org/189-1-2014-UM

Preface

General

ANSI/ASHRAE/USGBC/IES Standard 189.1-2014, (referred to in this User's Manual as "Standard 189.1" or simply "the Standard"), is a standard for *high-performance green buildings*. Standard 189.1 is meant to be used in conjunction with ANSI/ASHRAE/IESNA Standard 90.1-2013, ANSI/ASHRAE Standard 62.1-2013, and ANSI/ASHRAE Standard 55-2013. Where a requirement is contained in Standard 189.1, this requirement supersedes the requirements in those standards. Standard 189.1 is not a rating system, though it could be incorporated as the baseline in a green building rating system. It addresses sustainable *sites*, water use efficiency, energy efficiency, the building's impact on the atmosphere, materials and resources, and indoor environmental quality (IEQ). These five key subject areas, as well as construction and operation, are each addressed in separate sections.

This User's Manual can assist users in understanding the principles on which Standard 189.1 is based, the requirements of the Standard and how those requirements may be met. This User's Manual will serve to improve the ability of these users to understand Standard 189.1 by providing explanations of the Standard's requirements and examples of its application. It contains sample calculations, forms to demonstrate compliance, and references to helpful resources and websites. This User's Manual can also be suitable for use in educational programs.

Audience

This User's Manual is intended to aid many types of building professionals, including architects, engineers, and other *design professionals* applying Standard 189.1 to the design of their buildings; general and specialty contractors constructing buildings in compliance with Standard 189.1; plan examiners, field inspectors, and other code officials enforcing Standard 189.1 in areas where it is adopted as code; and product manufacturers, state and local energy offices, policy groups, and others.

It is important to note the effectiveness of integrated design in compliance with Standard 189.1 and in general good design practice. It is critical to emphasize the need to work with all design elements and trades and involve the appropriate professionals as early as possible in the process.

Addenda

This edition of the User's Manual is consistent with ANSI/ASHRAE/USGBC/IES Standard 189.1-2014. Standard 189.1 is continuously maintained. Any suggestions for changes and improvements to the Standard can be submitted using the form located at the back of Standard 189.1, titled, "Form for Submittal of Proposed Change to an ASHRAE Standard under Continuous Maintenance." The project committee will review suggestions and propose addenda, which will be available for public review. All users are encouraged to check the ASHRAE website (http://www.ashrae.org) for notices on approved addenda. Users also can sign up for the free ASHRAE Internet Listserv for Standard 189.1 in order to receive notices for all public reviews and approved and published addenda and errata. It is important to ensure that recommendations of this User's Manual are applied appropriately.

Official Interpretations of the Standard

Standing Standard Project Committee (SSPC) 189.1 provides official interpretations of the Standard upon written request. Formal interpretation request forms are available on the ASHRAE website. Address requests for interpretations to the Senior Manager of Standards:

Senior Manager of Standards
ASHRAE
1791 Tullie Circle, NE,
Atlanta, GA
30329-2305
E-mail: standards.section@ashrae.org
Fax: 404-321-5478

Be aware that requests for interpretations are forwarded to SSPC 189.1. That committee usually assigns the request to a subcommittee, which then reviews it and develops an interpretation. This interpretation is then voted on by the full committee. A common timeframe for a response is six to twelve months.

Standard 189.1 Organization

Standard 189.1 contains 11 sections. Sections 1 through 4 are mainly administrative:

a. **Section 1, "Purpose,"** describes the Standard's purpose.
b. **Section 2, "Scope,"** discusses situations when the Standard is or is not applicable.
c. **Section 3, "Definitions, Abbreviations, and Acronyms,"** lists the Standard's defined terms and each definition, as well as a list of abbreviations and acronyms used throughout the Standard.
d. **Section 4, "Administration and Enforcement,"** states that compliance is required with Sections 4 through 11. Discusses compliance with mandatory provisions in addition to a prescriptive option or a performance option (if those options are offered).

Sections 5 through 10 contain the five key subject areas of the Standard, and Section 10 addresses construction and plans for operations:

a. **Section 5, "Site Sustainability,"** addresses *site* selection, *site* development, *heat island effect* mitigation, and light pollution reduction.
b. **Section 6, "Water Use Efficiency,"** addresses potable and *nonpotable water* use efficiency for both the *site* and for the building, as well as water monitoring.
c. **Section 7, "Energy Efficiency,"** addresses energy efficiency for buildings and appliances and also addresses *on-site renewable energy systems* and energy measuring.
d. **Section 8, "Indoor Environmental Quality (IEQ),"** addresses indoor air quality (IAQ), environmental tobacco smoke (ETS) control, outdoor air delivery monitoring, thermal comfort, *building entrances*, acoustic control, daylighting, and low-emitting materials.
e. **Section 9, "The Building's Impact on the Atmosphere, Materials, and Resources,"** addresses construction waste management, refrigerants, storage and collection of recyclables, and reduced impact materials.
f. **Section 10, "Construction and Plans for Operation,"** addresses the commissioning (Cx) process, building acceptance testing, measurement and *verification* (M&V), energy use reporting, durability, transportation management, erosion and sediment control, construction, and IAQ during construction.

Sections 5 through 10 contain subsections, with subsection numbering using the following format:

a. **General** provides a general overview of the section, including the scope.
b. **Compliance Paths** provides a description of the options available for complying with the section of the Standard.
c. **Mandatory Provisions** provides the minimum requirements for all projects to meet.
d. **Prescriptive Option** provides a compliance path option that may be offered for a section, usually not requiring substantial calculations.
e. **Performance Option** provides a compliance path option that may be offered for a section, usually requiring substantial calculations.

Section 11 contains Normative References and is followed by the Normative Appendices A through D and the Informative Appendices E through H:

a. **Normative References** lists references that are a part of the Standard and contain requirements necessary for conformance with the Standard.
b. **Normative Appendix A—Climate Zones and Prescriptive Building Envelope and Duct Insulation Tables** contains the *climate zone* map of the United States and tables for *building envelope* requirements for *Climate Zones* 1 through 8 and ductwork insulation requirements.
c. **Normative Appendix B—Prescriptive Equipment Efficiency Tables for the Alternate Reduced Renewables and Increased Equipment Efficiency Approach in Section 7.4.1.1.2** provides minimum equipment efficiency for projects using the alternative on-site renewable approach (reduced on-site renewable energy).
d. **Normative Appendix C—Performance Option for Energy Efficiency** provides the methodology for Standard 189.1, Section 7.5, Performance Option B, which quantifies performance.
e. **Normative Appendix D—Building Concentrations** provides methodology for calculating indoor air concentrations.
f. **Informative Appendix E—Building Envelope Tables** provides envelope insulation tables that may be used for projects using the alternative on-site renewable approach (reduced on-site renewable energy).
g. **Informative Appendix F—Integrated Design** discusses the importance of integrated design, in compliance with the Standard and in general good design practice, working with all design elements and trades.
h. **Informative Appendix G—Informative References** contains resources for users that are not part of the Standard.
i. **Informative Appendix H—Addenda Description Information** lists all addenda to Standard 189.1-2011 that have been incorporated into Standard 189.1-2014.

User's Manual Organization

The User's Manual organization follows Standard 189.1's organization, with a corresponding chapter for each major section of the Standard. The Standard's section numbers are referenced in the major headings of the User's Manual's chapters. The symbol "§" is used interchangeably with the word "Section" to reference a section of the Standard. As an example, a heading in the User's Manual titled, "Building Water Use Reduction (§ 6.3.2)," indicates to the user that Standard 189.1, Section 6.3.2, is being addressed.

Many of the chapters contain compliance forms that clearly illustrate the requirements for each section, including requirements under prescriptive or performance options if they are offered for that section. The forms are available online at the following address:

https://www.ashrae.org/189-1-2014-UM

Table i-A Standard 189.1 and User's Manual Numbering

Item	Standard 189.1	User's Manual	Notes
Major division numbers	[Section number] [Section title]	[Section number] [Section title]	Section numbers correspond to one another. (Section 5 in the Standard and Section 5 in the User's Manual are both "Site Sustainability.")
Equation, table, and figure numbers	[Section number] [Alphabetic if more than one] (Table 6.3.2.1 is the only table in Section 6.3.2.1; Table 6.3.3B is the second table in Section 6.3.3.)	[Section Number]-[Alphabetic] (Figure 6-C is the third figure in Section 6 of the User's Manual.)	User's Manual equation, table, and figure numbers do not correspond to those of Standard 189.1. (Figure 6-A would not be the same as Figure 6-1.)

The differences in the numbering systems between Standard 189.1 and this User's Manual are summarized in Table i-A.

Unless directly footnoted or contained within the text, full citations for documents referred to in this User's Manual are found in Standard 189.1, Section 11, "Normative References." This User's Manual uses a distinct terminology and numbering scheme to avoid confusion between references to items within the Standard and this document.

Data and Analysis Tools

The following is a list of tools that are necessary to apply the Standard. Some of these items, as noted, are only applicable to specific sections of the Standard:

- A current copy of Standard 189.1-2014 with errata and interpretations.
- Copies of any published addenda to Standard 189.1-2014.
- A personal computer and spreadsheet software to run the materials calculators provided online for Chapters 9 (**https://www.ashrae.org/189-1-2014-UM**).
- ANSI/ASHRAE Standard 55-2013, *Thermal Environmental Conditions for Human Occupancy*, which is referenced in Section 8.
- ANSI/ASHRAE Standard 62.1-2013, *Ventilation for Acceptable Indoor Air Quality*, which is referenced in Section 8.
- ANSI/ASHRAE Standard 90.1-2013, *Energy Standard for Buildings Except Low-Rise Residential Buildings*, which is referenced in Section 7.
- In addition to the project plans and specifications, manufacturer's data may be required for lighting, motors, opaque envelope, *fenestration*, HVAC, control, and water heating systems and equipment.
- A complete set of plans and specifications for the project being reviewed.

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The 2014 User's Manual builds on the work of those who have been acknowledged in previous versions.

Sean Beilman, PE, of BCER Engineering was the project manager and technical editor for the 2014 User's Manual. BCER Engineering, Inc., provided administrative and resource support for the document production. Martha VanGeem provided technical support for Sections 5, 7, 8, and 9. Molly McGuire provided technical support for Sections 7 and 8.

The 2014 Project Monitoring Subcommittee for this User's Manual, initially chaired by Lee Burgett and subsequently by Charles Eley, guided the User's Manual project and helped reach resolution on issues and problems as they arose. Special thanks are due to Lee Burgett, who passed during the production of this User's Manual, for years of service and dedication to the Society and to SSPC 189.1. The Project Monitoring Subcommittee also included SSPC 189.1 members David Williams, John Koeller, Merle McBride, Jeff Bolt, Josh Jacobs, Jeff Ross-Bain, and Wesley Sullens. Steven Ferguson and Stephanie Reiniche were the ASHRAE staff liaisons.

Existing and past members of SSPC 189.1 deserve thanks for the wealth of knowledge, experience, and insight they bring to the Standard. This User's Manual is built on the firm foundation laid by the committee. Over the years, many SSPC 189.1 members have contributed to the Standard, and thousands of persons provided useful comments during the public review process. It is not possible to acknowledge all who have contributed, but special recognition is due to the SSPC Chair, Andrew Persily, who worked diligently to establish and maintain Standard 189.1 as an international standard for high-performance green buildings.

1 Purpose

Standard 189.1 provides minimum requirements for *high-performance green buildings* and building systems, addressing siting, design, construction and plans for operation. It applies to all buildings except low-rise *residential* buildings (low-rise means three habitable floors or less). The *Standard* is written in building code language and is intended for adoption by international, national, state/province, and local code jurisdictions. The *Standard* specifies reasonable design, construction and operational practices and technologies that minimize water, energy and materials consumption without sacrificing either the comfort or productivity of the occupants.

The *Standard* strives to balance these issues along with environmental, resource and community concerns, and the need for current and future developments. The *Standard* is broad in scope and the requirements are appropriate for a wide range of building types, *climate zones*, and for a variety of *site* conditions. When designing a specific building on a specific site for a specific climate, design issues will undoubtedly have to be addressed that go beyond those considered in developing the Standard.

2 Scope

Building Projects Covered (§ 2.1)[1]

Standard 189.1 provides minimum sustainability requirements for new buildings and their systems, additions to (new portions of) existing buildings and their systems, and new systems and equipment in existing buildings.

The requirements of Standard 189.1 address the *building project*'s *site* sustainability, water use efficiency, energy efficiency, indoor environmental quality (IEQ), and the building's impact on the atmosphere, materials, and resources.

Building Projects not Covered (§ 2.2)

Standard 189.1 excludes low-rise *residential* buildings, defined as

a. single-family houses,
b. multifamily structures of three stories or fewer above grade, or
c. manufactured houses (mobile homes and modular).

Residential occupancies in a mixed-use facility or a multifamily structure four stories or more above grade are not excluded unless so stated in a particular requirement of Standard 189.1.

Standard 189.1 also does not apply to buildings that do not use electricity, fossil fuel, and water. To illustrate this exclusion, if a building does not use water but does use electricity, the building is included in the scope of Standard 189.1.

Building Project Site Boundary Identification

The *building project site* boundary is identified as the *site* that is contained in a single submittal for a construction permit or the boundary of a contiguous property under single ownership or effective control.

For *building projects* that are submitted with multiple permit applications, are broken down into multiple phases, or are a smaller part of a larger contiguous property, the limit of work[2] can be used to identify a single *site* boundary for the *building project*.

In other words, if a *building project* has multiple permits but is under a single *building project*, then the *site* limit of work can be used to identify the *building project site* boundary.

Note that a *building project* with a plumbing permit, for example, must comply with the water-related requirements of Standard 189.1.

Public roads, bridges, utilities, and other public works infrastructure projects are excluded from Standard 189.1. Such public infrastructure should also be excluded from the *building project site* boundary. However, elements such as private roads or private on-site wastewater treatment facilities that are included in a *building project* are included in the *building project site* boundary.

Below are three situations that may arise in determining the *building project site* boundary:

a. New *building projects* with a *site*
b. Additions to existing *building projects* with a *site*
c. Existing buildings or additions to existing *building projects* with no *site*

---

1. Definitions that can be found in Standard 189.1 are italicized throughout the User's Manual.
2. The limit of work is the boundary used to identify the limit of site disturbance for construction activities and also delineates the boundary within which the stormwater pollution prevention control measures are implemented for a building project.

In the first two situations, the *building project site* boundary is the *building project site* or the *site* limit of work. In existing buildings or additions to existing buildings with no *site*, *site* requirements do not apply. For example, an interior fit-out is under construction but the *building project* does not include any landscaping or other *site* improvements. In this case, *site* requirements of Standard 189.1 do not apply to the *building project.*

Safety, Health, or Environmental Requirements (§ 2.3)

Standard 189.1 shall not be used to circumvent any safety, health, or environmental requirements of local building codes. If a *building project*'s local jurisdiction has more stringent requirements than Standard 189.1, the more stringent requirements apply, which do not prevent the application of the requirements of Standard 189.1.

If there is a conflict between the requirements of Standard 189.1 and safety, health, or environmental codes, the local code requirements should apply. Alternatively, the project team can ask for interpretations from the local *authority having jurisdiction* (*AHJ*).

Example 2-A Addition to Existing Project, with Shared Existing Systems between Old and New Portions of Project

Q

A new administrative wing will be added to an existing school building and will be served by the existing HVAC and water systems. Does Standard 189.1 apply to the existing building as well as to the new addition? Does Standard 189.1 apply to all or only some of the new or existing portions of the facility?

A

Standard 189.1 applies to new additions to existing *building projects* and their systems. In this case, all portions of the new administrative wing will need to comply with the requirements of Standard 189.1. It would not apply to the rest of the existing building. However, new systems or new components of systems installed as part of the addition (e.g., a new water heater or chiller added to serve the addition, or any changes in the *building envelope*) will need to comply with the requirements of Standard 189.1 even if they do not fall in the physical *building project*.

Example 2-B Net Zero Energy Building with Grid Connections

Q

A nonprofit organization is building its new headquarters, which will include an on-site photovoltaic (PV) array on the *roof*. The building will produce enough electricity to eliminate the need to purchase any electricity from the local utility during the day. It will feed off the grid during evening hours and feed into the grid during the *daylight hours*. While the net sum of the electricity used in this building is zero, does the building fall under the scope of Standard 189.1?

A

Yes. Although the building generates enough electricity to compensate for the electricity it uses from the grid, it is still using electricity. Standard 189.1 applies to buildings that use any electricity, fossil fuels, or water.

Example 2-C Existing Major Renovation to Building that Did not Comply with Certain Mandatory *Site* Requirements when Built

Q

An industrial manufacturing company is planning a major renovation of its existing warehouse facilities. The original existing building was constructed 10 years ago. The existing facilities are located within 100 ft (30.48 m) of a wildlife habitat conservation area. The renovation does not include any additional *site* disturbance or development outside of the current building footprint of the facilities. Is this renovation within the scope of Standard 189.1?

A

The major renovations of the existing warehouse facilities do fall under the scope of Standard 189.1 even though the original existing building has a conflict with a mandatory provision of Standard 189.1, Section 5.3.1.2(b), which states that there shall be no *site* disturbance or development within 150 ft (50 m) of any *fish and wildlife habitat conservation area* unless the *site* disturbance or development involves plantings or habitat enhancement of the functions and value of the area. However, as this is an existing building and there is no new *site* disturbance or development outside of the current footprint, the *site* requirements of Standard 189.1 do not apply to the major renovations of the facilities.

Example 2-D New Buildings or Existing Building on Campuses, Complexes, or Other Contiguous Properties

Q

A campus is constructing a new building and an addition to an existing building on its existing campus. The new building is located at opposite ends of the campus from the existing building that will have the new addition. The campus comprises multiple buildings. Would any of these buildings fall under the scope of Standard 189.1? How is the project *site* boundary defined?

A

Standard 189.1 applies to all new *building projects*, additions to existing *building projects*, and new systems and equipment in existing *building projects*, regardless of whether or not they are located on a campus, complex, or contiguous property setting. Only the new building and the new addition to the existing building in the campus fall under the scope of Standard 189.1, even if the new building and the new addition to the existing building are located at opposite ends of the campus. The *site* boundary shall be defined as the *site* limit of work for the *building project*, which might not be contiguous.

Example 2-E Security Building with Safety Requirements for *Site* Lighting

Q

A building being constructed has special safety requirements for *site* lighting, requiring more lighting power for outside exit passages than is allowed by Standard 189.1, Section 7.4.6.4, which references Standard 90.1-2013, Section 9. In other words, the local requirement does not comply with the requirements of Standard 189.1. Which requirement should the project follow, the local requirement or the requirement in Standard 189.1?

A

Standard 189.1 shall not be used to circumvent any safety, health, or environmental requirements. If there is a conflict between the requirements of Standard 189.1 and safety, health, or environmental codes, local building code shall take precedence. In the case of uncertainty, interpretation should be requested from the local *AHJ*.

Example 2-F Distribution Centers, Warehouses, and other *Spaces* with Largely Unoccupied Areas

Q

A manufacturing company will build a large warehouse that will be largely unoccupied. Does this fall under the scope of Standard 189.1?

A

Standard 189.1 applies to all new *building projects*, additions to existing *building projects*, and new systems and equipment in existing *building projects*, regardless of whether or not they are occupied. For specific requirements of Standard 189.1 that may refer to other standards that involve occupancy levels, follow the occupancy guidelines for that particular referenced standard.

Example 2-G Health and Safety Requirements for Filtration and Redundant Systems

Q

A pharmaceutical company is building a new manufacturing facility. Its industrial use of water is primarily involved in the manufacturing of drugs, as well as in cleaning and sanitizing. Therefore, the water must meet stringent quality requirements mandated by the Food and Drug Administration (FDA). The *building project* will have a higher energy and water use to meet these requirements. Does this building fall under the scope of Standard 189.1? How do the energy and water efficiency requirements of Standard 189.1 apply to this project?

A

Yes. Standard 189.1 would apply to this new manufacturing facility. Standard 189.1 does not circumvent any safety, health, or environmental requirements. Standard 189.1 does not prevent the application of the FDA's more stringent water filtration requirements. If these requirements do not allow the project to follow prescriptive options, the *building project* should use performance options that use a base comparison case equal to the minimum mandated by such safety, health, or environmental requirements.

Note that this is also applicable to *building projects* such as hospitals, which have requirements for redundant or backup systems not included in Standard 189.1. For example, stand-alone hospitals whose design includes tenant equipment must, along with the equipment, comply with Standard 189.1. As another example, for commercial food service, a *building project*'s kitchen must comply with Standard 189.1 if the design includes the kitchen; otherwise, the kitchen would not have to comply with Standard 189.1.

Note also that Standard 189.1 does not apply to process water used in the manufacturing of goods which is submetered separately. Process water in manufacturing would be excluded in baseline calculations but should be submetered. In addition, other types of water use that are not addressed in Standard 189.1 are also excluded from baseline calculations but should also be submetered.

3 Definitions, Abbreviations, and Acronyms

Definitions

Standard 189.1 includes definitions for the terms listed below. These definitions are not repeated in the User's Manual but defined terms are italicized throughout. Definitions, resources, terms, and calculation methods are presented in the context in which they are used in this User's Manual.

acceptance representative
adapted plants
adequate transit service
agricultural land
alternative daily cover (ADC)
attic and other roofs
authority having jurisdiction (AHJ)
automatic
baseline building design
baseline building performance
basis of design (BoD)
bilevel lighting control
biobased product
biodiverse plantings
breathing zone
brownfield site
building entrance
building envelope
building project
carbon dioxide equivalent (CO_2e)
classroom
clerestory
climate zone
commissioning authority (CxA)
commissioning (Cx) plan
commissioning (Cx) process
conditioned space
construction checklist
construction documents
contaminant
continuous air barrier
cycles of concentration (COC)
daylight area:
    under roof monitor
    under skylights
daylight hours
demand control ventilation (DCV)
densely occupied space
design professional
designated park land
dwelling unit
dynamic glazing
electronics
emergency ride home
enclosed space
evapotranspiration (ET)
ET_c
ET_o
expressway
fenestration
fenestration area
fish and wildlife habitat conservation area
forest land
generally accepted engineering standard
geothermal energy
greenfield site
greyfield site
hardscape
heat island effect
high-performance green building
high-speed door
hydrozoning
improved landscape
integrated design process
integrated project delivery
irrigation adequacy
irrigation excess
isolation devices
landscape establishment period
life-cycle assessment (LCA)
light rail

lighting power allowance
lighting quality
lighting zone (LZ):
  LZ0
  LZ1
  LZ2
  LZ3
  LZ4
low-impact trail
low-voltage dry-type distribution transformers
maintenance plan
makeup air
mechanical cooling
minimum outdoor airflow
multilevel lighting control
native plants
networked guest-room control system
nonresidential
north-oriented
occupant load
occupiable space
office furniture system
on-site renewable energy system
once-through cooling
open-graded (uniform-sized) aggregate
outdoor air
outdoor air fault condition
owner
owner's project requirements (OPR)
permanently installed
permeable pavement
permeable pavers
plants:
  adapted plants
  invasive plants
  native plants
porous pavers (open-grid pavers)
postconsumer recycled content
preconsumer recycled content
primary sidelighted area
projection factor (PF)
projection factor, interior
proposed building performance
proposed design
public way
recovered material
recycled content
recycled material
regulated energy use
residential
roof
roof area, gross
roof monitor
salvaged material
seating
secondary sidelighted area
semiheated space
service water heating
sidelighting
sidelighting effective aperture
single-rafter roof
site
skylight
smart controller (weather-based irrigation controller)
soil gas retarding system
solar energy system
solar heat gain coefficient (SHGC)
solar reflectance index (SRI)
space
task lighting
transfer air
tubular daylighting device
turfgrass
variable-air-volume (VAV) system
vendor
verification
vertical fenestration
wall
wall area, gross
water, alternate on-site sources of
water, nonpotable
water, potable
water, reclaimed
water factor (WF)
clothes washer (residential and commercial)
residential dishwasher
weatherproofing system
wetlands
yearly average day-night average sound levels

Abbreviations and Acronyms

Abbreviations and acronyms used in Standard 189.1 and this User's Manual are listed below.

AC	alternating current
AHJ	*authority having jurisdiction*
AHRI	Air-Conditioning, Heating, and Refrigeration Institute
AHU	air-handling unit
ADC	alternative daily cover
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials International
BAS	building automation system
BIFMA	The Business and Institutional Furniture Manufacturer's Association
BMP	best management practice
BMS	building management system
BoD	*basis of design*
Btu	British thermal unit
Btu/h	British thermal unit per hour
CDPH	California Department of Public Health
CFC	chlorofluorocarbon
cfm	cubic feet per minute (ft^3/min)
CH_4	methane
c.i.	continuous insulation
CIE	Commission Internationale de L'Eclairage (International Commission on Illumination)
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CO_2	carbon dioxide
CO_2e	*carbon dioxide equivalent*
CREL	chronic reference exposure levels
CSA	Canadian Standards Association
Cx	commissioning
CxA	*commissioning authority*
dB	decibel
db	dry bulb
DC	direct current
DCV	*demand control ventilation*
EISA	Energy Independence and Security Act
EMS	Energy Management System
EPAct	U.S. Energy Policy Act
EPD	environmental product declaration
ESC	erosion and sedimentation control
ET_c	*evapotranspiration*
ET_o	*maximum evapotranspiration*
ETS	environmental tobacco smoke
fc	footcandle
ft	foot
gal	gallon
gpm	gallons per minute
gpf	gallons per flush
GWP	global warming potential
h	hour
ha	hectare
HCFC	hydrochlorofluorocarbon
HID	high-intensity discharge
HVAC	heating, ventilation, and air conditioning
HVAC&R	heating, ventilation, air conditioning, and refrigeration
IAPMO	International Association of Plumbing and Mechanical Officials
I-P	inch-pound
IA	Irrigation Association
IAQ	indoor air quality
IEQ	indoor environmental quality
IES	Illuminating Engineering Society of North America
in.	inch
kg	kilogram

km	kilometre
kVA	kilovolt-ampere
kW	kilowatt
kWh	kilowatt-hour
L	litre
lb	pound
LCA	*life-cycle assessment*
LCI	life-cycle inventory
LPD	lighting power density
LZ	*lighting zone*
m	metre
M&V	measurement and verification
µg	microgram
µm	micrometre
mg	milligram
MDF	medium density fiberboard
MERV	minimum efficiency reporting value
mi	mile
min	minute
mm	millimetre
mph	miles per hour
N_2O	nitrous oxide
NA	not applicable
NAECA	National Appliance Energy Conservation Act
NR	not required
O&M	operation and maintenance
OITC	outdoor-indoor transmission class
OPR	*owner's project requirements*
Pa	Pascal
PCR	product category rules
PF	phenol-formaldehyde
PF	*projection factor*
PM	particulate matter
ppm	parts per million
PV	photovoltaic
s	second
SCAQMD	South Coast Air Quality Management District
SHGC	*solar heat gain coefficient*
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SRI	*solar reflectance index*
STC	sound transmission class
TAC	total air changes
UF	urea-formaldehyde
UL	Underwriters Laboratory
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFEMA	United States Federal Emergency Management Agency
USGBC	United States Green Building Council
VAV	*variable air volume*
VOC	volatile organic compound
VRP	Ventilation Rate Procedure
wb	wet bulb
wf	water factor
yr	year

4 Administration and Enforcement

General (§ 4.1)

This chapter addresses how to administer Standard 189.1 from an enforcement and compliance perspective. Due to the broad scope of Standard 189.1, specific enforcement programs are best defined at the time of adoption by a jurisdiction. When Standard 189.1 is adopted as a code, the adopting jurisdiction may choose to use and/or supplement the compliance forms provided for reference online[3]. As a result, users should always check with the adopting jurisdiction to determine specific requirements for demonstrating compliance with Standard 189.1.

To demonstrate compliance with Standard 189.1, projects must comply with the requirements of Sections 4 through 11. Section 4 simply describes how to determine which requirements are mandatory in all cases and which are optional compliance paths. In Sections 5 through 9, all projects must demonstrate compliance with the mandatory provisions (x.3) as well as either the prescriptive option (x.4) or the performance option (x.5). Section 10 does not offer a prescriptive or performance option; therefore, all of the requirements listed are part of the mandatory provisions. Section 11 contains the normative references, which is a compiled list of the reference standards that are employed throughout Standard 189.1.

See Figure 4-A for graphical representation of the compliance requirements.

Referenced Standards (§ 4.1.1)

Other standards are referenced throughout Standard 189.1 and are listed in Section 11. When another standard is referenced in part or in whole within Standard 189.1, the referenced portion of that standard is considered a requirement to comply with Standard 189.1. When Standard 189.1 references a section or provision of another standard, only that part of the standard becomes a requirement of Standard 189.1. If another standard is referenced with provisions that have discrepancies from this standard, this standard shall apply. Informative references in informative Appendix G are referenced within this standard, but are not part of Standard 189.1 and are cited to acknowledge sources.

Normative Appendices (§ 4.1.2)

Normative appendices, which occur as Appendices A through D, are a part of Standard 189.1 and contain detailed reference tables and reference material for use in determining compliance.

Informative Appendices (§ 4.1.3)

Informative appendices are not a part of Standard 189.1 and are purely informative in nature.

3. https://www.ashrae.org/189-1-2014-UM

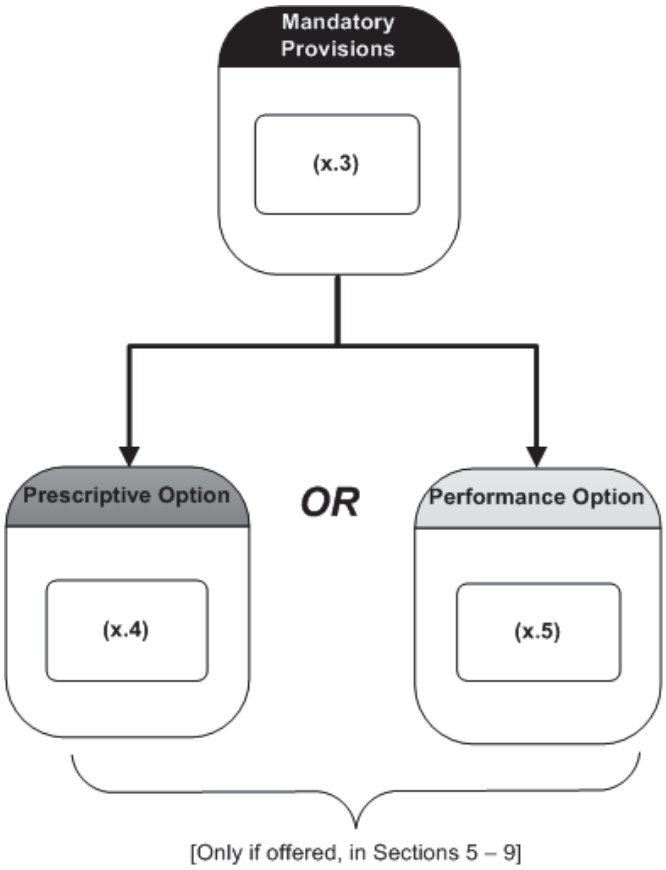


Figure 4-A Compliance paths for Sections 5 through 10.

5 Site Sustainability

Changes to Site Sustainability

- ❑ **5.2 Compliance.** All sections are now mandatory; there are no prescriptive or performance criteria.
- ❑ **5.3.1 Site Selection.** The requirements were modified for 2014 for clarification.
- ❑ **5.3.2 Predesign Site Inventory and Assessment.** Requirements were added for 2014 for observing and documenting the predevelopment environment of the project *site*.
- ❑ **5.3.3 Plants.** Requirements were added for 2011 for the removal and destruction of *invasive plants* found on the project *site*.
- ❑ **5.3.4 Stormwater Management.** Specific requirements for stormwater management were added for 2014.
- ❑ **5.3.5.1 Site Hardscape.** For 2011, requirements for systems such as *permeable pavements* are based on percolation rates and are no longer be based on *solar reflectance index* (*SRI*).
- ❑ **5.3.5.3 Roofs.** *SRI* is now an appropriately lower value to take into account aging. Requirements are a three-year-aged *SRI* of at least 64 for a low-sloped *roof* (defined as having a slope less than or equal to 2:12) and a three-year-aged *SRI* of at least 15 for a steep-sloped *roof* (slope of more than 2:12). *SRI* shall be determined in accordance with the CRRC-1 standard.
- ❑ **5.3.6 Reduction of Light Pollution.** As a result of adding exterior *lighting zones* (*LZs*) to Standard 90.1-2010, the language and requirements in this section were adjusted for 2011.
- ❑ **5.3.7 Mitigation of Transportation Impacts.** This section was added for 2011 and amended for 2014 to provide requirements for reducing energy consumption associated with transportation. It includes requirements for pedestrian walkways, bicycle parking, low-emission vehicle parking, and electric vehicle charging infrastructure.
- ❑ **5.4 Prescriptive Option.** Removed for 2014.
- ❑ **5.5 Performance Option.** Removed for 2014.

These changes are designated with a ❖ in the margin of this section. For the specific addenda that define the differences between the 2009 and 2011 editions of Standard 189.1, refer to Standard 189.1-2011, Appendix I. For the specific addenda that define the differences between the 2011 and 2014 editions of Standard 189.1, refer to Standard 189.1-2014, Appendix H.

Scope (§ 5.1)

The *site* sustainability measures in Standard 189.1 are meant to address the environmental impacts associated with the selection, development, and use of a building *site*. For example, building on a *greenfield* or previously undeveloped *site* often disrupts natural ecosystems and increases the negative effects of erosion. Similarly, *hardscape* on a building *site* affects stormwater runoff and can increase the *heat island effect*, depending on the color, reflectivity, and emissivity of paved surfaces.

The selection of a building *site* also affects air pollutant emissions, including carbon dioxide. Building occupants frequently rely on vehicular transportation to travel to and from the building. If a *site* is located adjacent to a *residential* community or public transportation lines, individuals are more able to use alternative forms of transportation such as walking or bicycling, thereby reducing greenhouse gases and other pollutant emissions from passenger vehicles.