**ANSI/ASHRAE/ICC/USGBC/IES Addendum i to**
**ANSI/ASHRAE/ICC/USGBC/IES Standard 189.1-2017**

# Standard for the Design of High-Performance Green Buildings

## Except Low-Rise Residential Buildings

*The Complete Technical Content of the International Green Construction Code* ®

Approved by the ASHRAE Standards Committee on June 22, 2019; by the ASHRAE Technology Council on June 26, 2019; by the International Code Council on May 31, 2019; by the USGBC Board of Directors on July 9, 2019; by the IES Board of Directors on June 10, 2019; and by the American National Standards Institute on July 24, 2019.

These addenda were approved by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the standard. Instructions for how to submit a change can be found on the ASHRAE® website (https://www.ashrae.org/continuous-maintenance).

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

ASHRAE Standards are prepared by a Project Committee appointed specifically for the purpose of writing the Standard. The Project Committee Chair and Vice-Chair must be members of ASHRAE; while other committee members may or may not be ASHRAE members, all must be technically qualified in the subject area of the Standard. Every effort is made to balance the concerned interests on all Project Committees.

The Senior Manager of Standards of ASHRAE should be contacted for

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## FOREWORD

*Addendum i updates the cooling tower requirements by specifying different maximum concentrations of contaminants for different cooling tower materials and simplifying the calculations for meeting the requirements.*

*This addendum also replaces the prescriptive cooling tower requirements in Section 6.4.2.1 with a set of revised mandatory requirements in Section 6.3. A previous addendum (designated as s), moved these requirements from Section 6.4 to Section 6.3 but did not revise them. The intent is to replace the current cooling tower requirements with those shown in addendum.*

***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 i to Standard 189.1-2017

***Modify Section 3 as shown.***

### 3.2 Definitions

***Langelier Saturation Index (LSI):*** a measure of a solution's ability to dissolve or deposit calcium carbonate that is often used as an indicator of the corrosivity of water, calculated using the following formula:

$$LSI = pH - pH_s$$

where

pH = measured water pH

$pH_s$ = pH at saturation in calcium carbonate

[ . . . ]

### 3.3 Abbreviations and Acronyms

*LSI* = Langelier Saturation Index

***Modify Section 6.3.2.3 as shown.***

#### 6.3.2.3 HVAC Systems and Equipment

a. *Once-through cooling* with *potable water* is prohibited.

~~b. The water being discharged from cooling towers for air conditioning systems such as chilled water systems shall be limited in accordance with method (1) or (2):~~

~~1. For makeup waters having less than 200 ppm (200 mg/L) of total hardness expressed as calcium carbonate, by achieving a minimum of 5 *cycles of concentration*.~~

~~2. For makeup waters with more than 200 ppm (200 mg/L) of total hardness expressed as calcium carbonate, by achieving a minimum of 3.5 *cycles of concentration*.~~

~~**Exception to 6.3.2.3(b):** Where the total dissolved solids concentration of the discharge water exceeds 1500 mg (1500 ppm/L) or the silica exceeds 150 ppm (150 mg/L) measured as silicon dioxide before the above *cycles of concentration* are reached.~~

b. The design of open-circuit cooling towers for air-conditioning systems, including the materials used to construct them and their water treatment systems, shall not allow water exchange (blowdown) until one or more of the parameters in Table 6.3.2.3 reaches 90% or more of the maximum value specified in Table 6.3.2.3. The system shall be tolerant of pH levels between 7.0 and 9.2.

c. The materials of construction for the water cooling system that comes in contact with cooling tower water shall be of the type that can operate and be maintained within the limits set in Table 6.3.2.3.

~~c.~~d. Open-circuit ~~C~~cooling towers, closed-circuit cooling towers, and evaporative condensers ~~coolers~~ shall be equipped with makeup ~~and blowdown~~ water meters, conductivity controllers, and overflow alarms in accordance with the thresholds listed in Table 6.3.4.1B. Cooling towers shall be equipped with ~~efficient~~ drift eliminators that ~~achieve~~ reduce drift to ~~a maximum of~~ 0.002% or less of the recirculated water ~~volume~~ flow for counterflow towers and 0.005% or less of the recirculated water flow for cross-flow towers.

~~d.~~e. *Building projects* located in regions where the ambient mean coincident wet-bulb temperature at 1% design cooling conditions is greater than or equal to 72°F (22°C) shall have a system for collecting condensate from air-conditioning units with a capacity greater than 65,000 Btu/h (19 kW), and the condensate shall be recovered for reuse.

**Table 6.3.2.3 Recirculating Water Properties for Open-Circuit Cooling-Tower Construction**

| Recirculating Water Parameters | Maximum Value |
|---|---|
| Conductivity (micro-ohms) | 3300 |
| Total dissolved solids (ppm) | 2050 |
| Total alkalinity as $CaCO_3$ (ppm) excluding galvanized steel | 600 |
| Total alkalinity as $CaCO_3$ (ppm) galvanized steel (passivated) | 500 |
| Calcium hardness as $CaCO_3$ (ppm) | 600 |
| Chlorides as Cl (ppm) | 300 |
| Sulfates (ppm) | 250 |
| Silica (ppm) | 150 |
| Langelier Saturation Index (LSI) | +2.8 |

## 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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