



BSR/ASHRAE/IES Addendum cs  
to ANSI/ASHRAE/IES Standard 90.1-2016

**Advisory** Public Review Draft

# Proposed Addendum cs to Standard 90.1-2016, Energy Standard for Buildings Except Low-Rise Residential Buildings

**Advisory Public Review (May 2019)  
(Draft Shows Proposed Changes to Current Standard)**

This draft has been recommended for public review by the responsible project committee. To submit a comment on this proposed standard, go to the ASHRAE website at [www.ashrae.org/standards-research--technology/public-review-drafts](http://www.ashrae.org/standards-research--technology/public-review-drafts) and access the online comment database. The draft is subject to modification until it is approved for publication by the Board of Directors and ANSI. Until this time, the current edition of the standard (as modified by any published addenda on the ASHRAE website) remains in effect. The current edition of any standard may be purchased from the ASHRAE Online Store at [www.ashrae.org/bookstore](http://www.ashrae.org/bookstore) or by calling 404-636-8400 or 1-800-727-4723 (for orders in the U.S. or Canada).

This standard is under continuous maintenance. To propose a change to the current standard, use the change submittal form available on the ASHRAE website, [www.ashrae.org](http://www.ashrae.org).

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ASHRAE, 1791 Tullie Circle, NE, Atlanta GA 30329-2305

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(This foreword is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objections on informative material are not offered the right to appeal at ASHRAE or ANSI.)

## FOREWORD

SSPC 90.1 periodically reviews the Informative references for applicability to this standard. Some new references have been added

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

Addendum cs to 90.1-2016

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Modify the standard as follows (IP and SI Units)

### 1. MODIFY Informative Appendix E AS FOLLOWS:

## Informative Appendix E

### Informative References

This appendix contains informative references for the convenience of users of Standard 90.1 and to acknowledge source documents when appropriate. Some documents are also included in Section [12](#), "Normative References," because there are other citations of those documents within the standard that are normative.

#### Address/Contact Information

##### AABC

Associated Air Balance Council  
~~1518 K Street Northwest, Suite 503~~  
~~Washington, DC 20005~~  
220 19th St NW, Suite 410  
Washington, DC 20036  
aabchg@aol.com

##### AMCA

30 West University Drive  
Arlington Heights, IL 60004

##### ASHRAE

1791 Tullie Circle  
Atlanta, GA 30329-2305

After 10/30/2020:

180 Technology Parkway  
Peachtree Corners, GA 30092

## [BLAST](#)

Building Systems Laboratory University of Illinois  
1206 West Green Street Urbana, IL 61801  
[www.bso.uiuc.edu/BLAST/index.html](http://www.bso.uiuc.edu/BLAST/index.html)

...

## [CWEC Climate Data](#)

Environment Canada [Engineering Climate Datasets](#)  
[http://climate.weather.gc.ca/prods\\_servs/engineering\\_e.html](http://climate.weather.gc.ca/prods_servs/engineering_e.html)

## [DOE-2](#)

Building Energy Simulation news  
<http://simulationresearch.lbl.gov/un.html>

## [Hydraulic Institute \(HI\)](#)

6 Campus Drive, First Floor North,  
Parsippany, NJ 07054-4405 (T) 973-267-9700  
<http://pumps.org>

## [EERE](#)

US Department of Energy  
Office of Energy Efficiency and Renewable Energy  
Better buildings  
Forrestal Building  
1000 Independence Avenue, SW Washington, DC 20585  
[eere.energy.gov/betterbuildingsalliance/emis](http://eere.energy.gov/betterbuildingsalliance/emis)

## [LBLN Characterization and Survey of Automated Fault Detection and Diagnostics Tools](#)

Lawrence Berkeley National Laboratory Building Technology & Urban Systems Division Energy Technologies Area  
MS 90R3111  
1 Cyclotron Road Berkeley, CA 94720 USA [eis.lbl.gov](http://eis.lbl.gov)  
<http://eis.lbl.gov/pubs/lbnl-2001075.pdf>

...

## [The Green Grid Administration](#)

3855 SW 153rd Drive  
Beaverton, Oregon 97006 USA  
(T) 503-619-0653  
(F) 503-644-6708

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NIBS

National Institute of Building Sciences

1090 Vermont Avenue NW, Suite 700

Washington, DC 20005-4950

(T) 202-289-7800

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Subsection No.	Reference	Title/Source
<del>3.2</del> Computer Room Energy	Recommendations for Measuring and Reporting Overall Data Center Efficiency v2 17 May 2014	The Green Grid
<del>3.2</del> IT Equipment Energy	Recommendations for Measuring and Reporting Overall Data Center Efficiency v2 17 May 2014	The Green Grid
<del>3.2</del> Power Usage Effectiveness	Recommendations for Measuring and Reporting Overall Data Center Efficiency v2 17 May 2014	The Green Grid
<del>5.7.3.2</del>	<u>NIBS Guideline 3-2012</u>	<u>Building Enclosure Commissioning Process BECx, Annex O</u>
<del>5.7.3.2</del>	<u>ASTM E2947-16a</u>	<u>Standard Guide for Building Enclosure Commissioning, Section 9.4</u>
<del>5.9.1</del>	<u>ASTM E2947-16a44</u>	<u>Standard Guide for Building Enclosure Commissioning</u>
<del>5.9.1</del>	<u>ASTM E2813-1842e1</u>	<u>Standard Practice for Building Enclosure Commissioning</u>
<del>6.4.1</del>	<del>CTI STD-201 OM (4317) Operations Manual for Thermal Performance Certification of Evaporative Heat Rejection Equipment</del>	<u>Operations Manual for Thermal Performance Certification of Evaporative Heat Rejection Equipment</u> Cooling Technology Institute
<del>6.4.2</del>	<del>2013-2017</del> ASHRAE Handbook—Fundamentals	ASHRAE
<del>6.4.3.1.11</del>	ASHRAE Guideline 22-2012	Instrumentation for Monitoring Central Chilled-Water Plant Efficiency
<del>6.4.4.1.1</del>	MICA Insulation Standards—7th Edition	National Commercial and Industrial Insulation Standards
<del>6.4.4.2.1</del>	SMACNA Duct Construction Standards—2005	HVAC Duct Construction Standards, Metal and Flexible
<del>6.4.4.2.2</del>	SMACNA Duct Leakage Test Procedures—2012	HVAC Air Duct Leakage Test Manual Sections 3,5, and 6
<del>6.7.23.2</del>	ASHRAE Guideline 4-2008 (RA2013)	Preparation of Operating and Maintenance Documentation for Building Systems
<del>6.7.23.3.1</del>	AABC 2002	Associated Air Balance Council, National Standards for Total System Balance
<del>6.7.23.3.1</del>	ASHRAE Standard 111-2008	Measurement, Testing, Adjusting and Balancing of Building HVAC Systems
<del>6.9.2</del>	<u>ASHRAE Standard 202-20132018</u>	Commissioning Process for Buildings and Systems
<del>6.9.2</del>	<u>ASHRAE Guideline 0-2013</u>	The Commissioning Process
<del>6.7.2.49.2</del>	ASHRAE Guideline 1.1-2007	HVAC&R Technical Requirements for the Commissioning Process
<del>6.7.2.46.9.2</del>	NEBB Procedural Standards—2013	Procedural Standards for Building Systems Commissioning
<del>7.4.1 and 7.5</del>	2011 ASHRAE Handbook—HVAC Applications	Chapter 49, Service Water Heating/ASHRAE
<del>8.4.2.2</del>	<u>Lawrence Berkeley National Laboratory LBNL-2001075</u>	<u>Characterization and Survey of Automated Fault Detection and Diagnostic Tools</u>
<del>8.4.2.2</del>	<u>Institute for Building Efficiency</u>	<u>Fault Detection and Diagnostics – Enabling techno-commissioning to ease building operation and improve performance</u>

<u>8.4.2.2</u>	<u>ASHRAE</u>	<u>Methods for Fault Detection, Diagnostics, and Prognostics for Building Systems – A Review, Part I</u> <u>HVAC&amp;R RESEARCH</u> <u>January 2005</u> <u>VOLUME 11, NUMBER 1</u>
<u>8.4.2.2</u>	<u>ASHRAE</u>	<u>Methods for Fault Detection, Diagnostics, and Prognostics for Building Systems – A Review, Part I</u> <u>HVAC&amp;R RESEARCH</u> <u>April 2005</u> <u>VOLUME 11, NUMBER 2</u>
<u>8.4.2.2</u>	<u>US Department of Energy EERE; Better Buildings</u>	<u>Energy Management Information Systems (EMIS) Specification and Procurement Support Materials</u>
<u>9.6.1</u>	<u>IES RP-6 (2015)-15</u>	<u>Recommended Practice for Sports and Recreational Area Lighting</u>
<u>9.9.2</u>	<u>IES Design Guide 29 – 2011</u>	<u>The Commissioning Process Applied to Lighting and Control Systems</u>
<u>10.4.3.4</u>	<u>ISO 25745-2:2015</u>	<u>Energy performance of lifts, escalators and moving walks— Part 2: Energy calculation and classification for lifts (elevators), ISO</u>
<u>10.4.5</u>	<u>ISO 27327-1:209 (R2014) — Air curtain units — Part 1: Laboratory Methods of Testing for Aerodynamic Performance Rating</u>	<u>AMCA</u>
<u>10.4.5</u>	<u>ANSI/AMCA Standard 220-05 (R2012) Laboratory Methods of Testing Air Curtain Units for Aerodynamic Performance Rating</u>	<u>ISO</u>
<u>10.4.7</u>	<u>ANSI/HI 1.1-1.2-2014</u>	<u>Rotodynamic Centrifugal Pumps for Nomenclature and Definitions</u>
<u>10.4.7</u>	<u>ANSI/HI 2.1-2.2-2014</u>	<u>Rotodynamic Vertical Pumps or Radial, Mixed, and Axial Flow Types for Nomenclature and Definitions</u>
<u>11.4.1</u>	<u>DOE-2</u>	<u>Support provided by Lawrence Berkeley National Laboratory at the referenced Web site</u>
<u>11.4.1</u>	<u>BLAST</u>	<u>University of Illinois</u>
<u>11.4.2</u>	<u>CWEC</u>	<u>Canadian Weather for Energy Calculations</u>
<u>11.4.2</u>	<u>IWEC2</u>	<u>International Weather for Energy Calculations, Generation 2</u>
<u>11.4.2</u>	<u>TMY3</u>	<u>Typical Meteorological Year, Generation 3</u>
<u>A9.4.6 Metal Building U-Factor Equations</u>	<u>Choudhary, M.K., C. Kasprzak, R.H. Larson, and R. Venuturumilli. 2010. ASHRAE Standard 90.1 metal building U-factors—Part 1: Mathematical modeling and validation by calibrated hot box measurements</u>	<u>ASHRAE Transactions 116(1):10-017</u>
<u>A9.4.6 Metal Building U-Factor Equations</u>	<u>Choudhary, M.K., and C.P. Kasprzak. 2010. ASHRAE Standard 90.1 Metal building U-factors—Part 2: A system based approach for predicting the thermal performance of single layer fiberglass batt insulation assemblies</u>	<u>ASHRAE Transactions 116(1):10-018</u>
<u>A9.4.6 Metal Building U-Factor Equations</u>	<u>McBride, M.F., and P.M. Gavin. 2010. ASHRAE Standard 90.1 metal building U-factors—Part 3: Equations for double layers of fiberglass batt insulation in roof and wall assemblies</u>	<u>ASHRAE Transactions 116(1):10-019</u>
<u>A9.4.6 Metal Building U-Factor Equations</u>	<u>Christianson, L. 2010. ASHRAE Standard 90.1 metal building U-factors—Part 4: Metal building U-factors for walls and roof based on experimental measurements.</u>	<u>ASHRAE Transactions 116(1):10-020</u>
<u>A9.4.6 Metal Building U-Factor Equations</u>	<u>Choudhary, M.K., C.P. Kasprzak, D.E. Musick, M.J. Henry, and N.D. Fast. 2012. ASHRAE Standard 90.1 metal building U-factors—Part 5:</u>	<u>ASHRAE Transactions 118(1):12-006</u>

Mathematical modeling of wall assemblies and validation by calibrated hot box measurements

A9.4.6 Metal Building U-Factor Equations

Choudhary, M.K 2016. A general approach for predicting the thermal performance of metal building fiberglass insulation assemblies

ASHRAE Transactions 122(1):16–014

~~G3.1 Building Performance Calculations~~

~~ISO 25745-2:2015~~

~~Energy performance of lifts, escalators and moving walks—  
Part 2: Energy calculation and classification for lifts (elevators), ISO~~