

**ANSI/ASHRAE/ICC/USGBC/IES Addendum g to
ANSI/ASHRAE/ICC/USGBC/IES Standard 189.1-2020**

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 Board of Directors on May 9, 2022; by the ASHRAE Standards Committee on April 11, 2022; by the International Code Council and U.S. Green Building Council on March 10, 2022; by the Illuminating Engineering Society on April 5, 2022; and by the American National Standards Institute on May 31, 2022.

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

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FOREWORD

Addendum g updates Table B-7, which covers efficiency requirements for heat rejection equipment for the following five changes:

- Adds a category and efficiency requirement for propeller or axial fan dry coolers (air-cooled fluid coolers) corresponding to those added in ASHRAE Standard 90.1-2019. As a higher-efficiency standard, Standard 189.1 adds a 5% higher efficiency requirement. A related new reference is also added to Section 11.*
- Standard ASHRAE 90.1-2019 replaces refrigerant R-507A with R-448A, as R-507A has been eliminated from regulations due to its high GWP.*
- Some equipment efficiencies in Standard 189.1 are currently the same as in Standard 90.1. Addendum g increases these by approximately 5% to reflect Standard 189.1's intended purpose as a higher-efficiency standard.*
- Several editorial changes correct improper use of italics and update significant figures in SI conversions to be consistent.*
- The rating temperature descriptor for air-cooled condensers was corrected to 95°F db from the 95°F wb that was listed in ASHRAE 189.1-2020, with a similar change in the SI table.*

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

Addendum g to Standard 189.1-2020

Add a new reference to Section 11 as shown.

Reference	Title	Section
[...]		
Cooling Technology Institute (CTI) PO Box 681807 Houston, TX 77268 1-281-583-4087; www.cti.org		
CTI ATC-105 (19)	Acceptance Test Code for Water Cooling Towers	Appendix B
<u>CTI ATC-105DS (19)</u>	<u>Acceptance Test Code for Dry Coolers</u>	<u>Appendix B</u>
CTI ATC-105S (11)	Acceptance Test Code for Closed-Circuit Cooling Towers	Appendix B
CTI ATC-106 (11)	Acceptance Test Code for Mechanical Draft Evaporative Vapor Condensers	Appendix B
CTI STD-201RS (19)	Standard for the Certification of Water-Cooling Tower Thermal Performance	Appendix B
[...]		

Modify Table B-7 as shown (I-P).

Table B-7 Performance Requirements for Heat Rejection Equipment—Minimum Efficiency Requirements (I-P)
(Supersedes Table 6.8.1-7 in ANSI/ASHRAE/IES Standard 90.1)

Equipment Type	Total System Heat Rejection Capacity at Rated Conditions	Subcategory or Rating Condition ^g	Performance Required ^{a,b,c,d,e,f,i}	Test Procedure ^h
Propeller or axial fan open-circuit cooling towers	All	95°F entering water 85°F leaving water 75°F entering wb	≥42.1 gpm/hp	CTI ATC-105 and CTI STD-201RS
Centrifugal fan open-circuit cooling towers	All	95°F entering water 85°F leaving water 75°F entering wb	≥22.0 gpm/hp	CTI ATC-105 and CTI STD-201RS
Propeller or axial fan closed-circuit cooling towers	All	102°F entering water 90°F leaving water 75°F entering wb	≥ 16.4 16.9 gpm/hp	CTI ATC-105 and CTI STD-201RS
Centrifugal fan closed-circuit cooling towers	All	102°F entering water 90°F leaving water 75°F entering wb	≥8.0 gpm/hp	CTI ATC-106
<u>Propeller or axial fan dry coolers (air-cooled fluid coolers)</u>	<u>All</u>	<u>115°F entering water</u> <u>105°F leaving water</u> <u>95°F entering db</u>	<u>≥4.8 gpm/hp</u>	<u>CTI ATC-105DS</u>
Propeller or axial fan evaporative condensers	All	Ammonia test fluid 140°F entering gas temperature 96.3°F condensing temperature 75°F entering wb	≥ 134,000 141,000 Btu/(h·hp)	CTI ATC-106
Centrifugal fan evaporative condensers	All	Ammonia test fluid 140°F entering gas temperature 96.3°F condensing temperature 75°F entering wb	≥ 110,000 116,000 Btu/(h·hp)	CTI ATC-106
Propeller or axial fan evaporative condensers	All	R-507A-R-448A test fluid 165°F entering gas temperature 105°F condensing temperature 75°F entering wb	≥ 157,000 164,000 Btu/(h·hp)	CTI ATC-106
Centrifugal fan evaporative condensers	All	R-507A-R-448A test fluid 165°F entering gas temperature 105°F condensing temperature 75°F entering wb	≥ 135,000 141,000 Btu/(h·hp)	CTI ATC-106
Air-cooled condensers	All	190°F entering gas temperature 125°F condensing temperature 15°F subcooling 95°F entering wb db	≥ 176,000 185,000 Btu/(h·hp)	AHRI 460

- For purposes of this table, ~~open-circuit cooling tower performance~~ “open-circuit cooling tower performance” is defined as the water flow rating of the tower at the thermal rating condition listed in Table B-7 divided by the fan motor nameplate power.
- For purposes of this table, ~~closed-circuit cooling tower performance~~ “closed-circuit cooling tower performance” is defined as the process water flow rating of the tower at the thermal rating condition listed in Table B-7 divided by the sum of the fan motor nameplate power and the integral spray pump motor nameplate power.
- For purposes of this table, ~~evaporative condenser performance~~ “evaporative condenser performance” is defined as the heat rejected at the specified rating condition in the table divided by the sum of the fan motor nameplate power and the integral spray pump nameplate power.
- ~~For purposes of this table, “dry cooler performance” is defined as the process water flow rating of the unit at the thermal rating condition listed in Table B-7 divided by the total fan motor nameplate power of the unit, and For purposes of this table, air-cooled condenser performance~~ “air-cooled condenser performance” is defined as the heat rejected from the refrigerant divided by the total fan motor nameplate power.
- The efficiencies and test procedures for both ~~open~~—open-circuit and ~~closed-circuit cooling towers~~ closed-circuit cooling towers are not applicable to hybrid cooling towers that contain a combination of separate wet and dry heat exchange sections. The certification requirements do not apply to field erected cooling towers.
- All cooling towers, closed-circuit coolers, evaporative condensers, and air-cooled condensers shall comply with the minimum efficiency listed in the table for that specific type of equipment with the capacity effect of any project specific accessories and/or options included with the equipment.
- Requirements for evaporative condensers are listed with ammonia (R-717) and R-507A-R-448A as test fluids in the table. Evaporative condensers intended for use with ~~halocarbon~~ refrigerants other than R-507A-R-448A must meet the minimum efficiency requirements listed for R-507A-R-448A as the test fluid.
- Informative Appendix G contains information on the referenced test procedures.
- Not applicable for air-cooled condensers applied to condenserless chillers. The air-cooled condenser and condenserless chiller shall comply with the requirements for air-cooled chillers as defined in ANSI/ASHRAE/IES Standard 90.1, Table 6.8.1-3.

Modify Table B-7 as shown (SI).

Table B-7 Performance Requirements for Heat Rejection Equipment—Minimum Efficiency Requirements (SI)
(Supersedes Table 6.8.1-7 in ANSI/ASHRAE/IES Standard 90.1)

Equipment Type	Total System Heat Rejection Capacity at Rated Conditions	Subcategory or Rating Condition ^g	Performance Required ^{a,b,c,d,e,f,i}	Test Procedure ^h
Propeller or axial fan open-circuit cooling towers	All	35.0°C entering water 29.4°C leaving water 23.9°C entering wb	≥3.56 L/(s·kW)	CTI ATC-105 and CTI STD-201RS
Centrifugal fan open-circuit cooling towers	All	35.0°C entering water 29.4°C leaving water 23.9°C entering wb	≥1.86 L/(s·kW)	CTI ATC-105 and CTI STD-201RS
Propeller or axial fan closed-circuit cooling towers	All	38.9°C entering water 32.2°C leaving water 23.9°C entering wb	≥ 1.36 <u>1.43</u> L/(s·kW)	CTI ATC-105 and CTI STD-201RS
Centrifugal fan closed-circuit cooling towers	All	38.9°C entering water 32.2°C leaving water 23.9°C entering wb	≥ 0.68 <u>0.71</u> L/(s·kW)	CTI ATC-106
<u>Propeller or axial fan dry coolers (air-cooled fluid coolers)</u>	<u>All</u>	<u>46.1°C entering water</u> <u>40.6°C leaving water</u> <u>35.0°C entering db</u>	<u>≥0.41 L/(s·kW)</u>	<u>CTI ATC-105DS</u>
Propeller or axial fan evaporative condensers	All	Ammonia test fluid 60.0°C entering gas temperature 35.7°C condensing temperature 23.9°C entering wb	≥ 52.6 <u>55.4</u> COP	CTI ATC-106
Centrifugal fan evaporative condensers	All	Ammonia test fluid 60.0°C entering gas temperature 35.7°C condensing temperature 23.9°C entering wb	≥ 43.2 <u>45.6</u> COP	CTI ATC-106
Propeller or axial fan evaporative condensers	All	R-507A <u>R-448A</u> test fluid 73.9°C entering gas temperature 40.6°C condensing temperature 23.9°C entering wb	≥ 61.7 <u>64.5</u> COP	CTI ATC-106
Centrifugal fan evaporative condensers	All	R-507A <u>R-448A</u> test fluid 73.9°C entering gas temperature 40.6°C condensing temperature 23.9°C entering wb	≥ 53.4 <u>55.4</u> COP	CTI ATC-106
Air-cooled condensers	All	88.7°C entering gas temperature 52.1°C condensing temperature 88.3°C subcooling 35.0°C entering wbdb	≥ 69.7 <u>72.7</u> COP	AHRI 460

- For purposes of this table, open-circuit cooling tower performance open-circuit cooling tower performance is defined as the water flow rating of the tower at the thermal rating condition listed in Table B-7 divided by the fan motor nameplate power.
- For purposes of this table, ~~closed-circuit cooling tower performance~~ "closed-circuit cooling tower performance" is defined as the process water flow rating of the tower at the thermal rating condition listed in Table B-7 divided by the sum of the fan motor nameplate power and the integral spray pump motor nameplate power.
- For purposes of this table, ~~evaporative condenser performance~~ "evaporative condenser performance" is defined as the heat rejected at the specified rating condition in the table divided by the sum of the fan motor nameplate power and the integral spray pump nameplate power.
- For purposes of this table, "dry-cooler performance" is defined as the process water flow rating of the unit at the thermal rating condition listed in Table B-7 divided by the total fan motor nameplate power of the unit, and ~~For purposes of this table, air-cooled condenser performance~~ "air-cooled condenser performance" is defined as the heat rejected from the refrigerant divided by the total fan motor nameplate power.
- The efficiencies and test procedures for both ~~open-open-circuit~~ and ~~closed-circuit cooling towers~~ closed-circuit cooling towers are not applicable to hybrid cooling towers that contain a combination of separate wet and dry heat exchange sections. The certification requirements do not apply to field erected cooling towers.
- All cooling towers, closed-circuit coolers, evaporative condensers, and air-cooled condensers shall comply with the minimum efficiency listed in the table for that specific type of equipment with the capacity effect of any project specific accessories and/or options included with the equipment.
- Requirements for evaporative condensers are listed with ammonia (R-717) and ~~R-507A~~R-448A as test fluids in the table. Evaporative condensers intended for use with ~~halo-carbon~~ refrigerants other than ~~R-507A~~R-448A must meet the minimum efficiency requirements listed for ~~R-507A~~R-448A as the test fluid.
- Informative Appendix G contains information on the referenced test procedures.
- Not applicable for air-cooled condensers applied to condenserless chillers. The air-cooled condenser and condenserless chiller shall comply with the requirements for air-cooled chillers as defined in ANSI/ASHRAE/IES Standard 90.1, Table 6.8.1-3.

**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.

Standard 189.1 and the International Green Construction Code

Standard 189.1 serves as the complete technical content of the International Green Construction Code® (IgCC). The IgCC creates a regulatory framework for new and existing buildings, establishing minimum green requirements for buildings and complementing voluntary rating systems. For more information, visit www.iccsafe.org.

About ASHRAE

Founded in 1894, ASHRAE is a global professional society committed to serve humanity by advancing the arts and sciences of heating, ventilation, air conditioning, refrigeration, and their allied fields.

As an industry leader in research, standards writing, publishing, certification, and continuing education, ASHRAE and its members are dedicated to promoting a healthy and sustainable built environment for all, through strategic partnerships with organizations in the HVAC&R community and across related industries.

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