Public Review Draft

Proposed Addendum g to Standard 189.1-2020

Standard for the Design of High-Performance Green Buildings

Except Low-Rise Residential Buildings

First Public Review Draft (July 2021)
(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 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 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.

The appearance of any technical data or editorial material in this public review document does not constitute endorsement, warranty, or guaranty by ASHRAE of any product, service, process, procedure, or design, and ASHRAE expressly disclaims such.

ASHRAE, 180 Technology Parkway, Peachtree Corners GA 30092

(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 objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)

Foreword

This addendum is intended to update table B-7 which covers efficiency requirements for heat rejection equipment for the following 5 changes:

1. Add a category and efficiency requirement for Propeller or axial fan dry coolers (air-cooled fluid coolers) that was added to the ASHRAE 90.1-2019 standard. As the ASHRAE 189.1 standard is a higher efficiency standard, a 5% higher efficiency requirement is proposed for ASHRAE 189.1. This also requires the addition of a new reference in chapter 11.
2. In ASHRAE 90.1-2019, refrigerant R-507A has been replaces by R-448A because R-507A has been eliminated from regulations due to its high GWP.
3. ASHRAE 189.1 is a higher efficiency standard but some of the equipment efficiencies in Table B-7 are currently the same as in ASHRAE 90.1, while others are specified with higher efficiency requirements. To support the overall strategy that ASHRAE 189.1 is a higher efficiency standard the efficiencies that are the same as in ASHRAE 90.1-2019 have been increased by about 5%.
4. There are several editorial changes to correct some incorrect use of italics and to use consistent significant figures for SI conversions.
5. 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.
   The proposed efficiency and refrigerant changes have been reviewed with TC8.6 and their Regulatory Committee supports the proposed changes to the ASHRAE 189.1 requirements. The Committee also believes that with these new proposed values, adequate equipment models will still be available to the market.

The following is a summary of the supporting justification for this addendum change proposal.

Benefits of the Change

The following is a summary of the benefits of this change;

- The table will be expanded the scope of ASHRAE 189.1 heat rejection equipment requirements to cover the air-cooled fluid coolers similar to the change made to ASHRAE 90.1.
- The 5% higher efficiency requirements will result in additional energy savings and align with the optional 5% energy savings increase defined in the IECC 2018 and 2021 codes, so the level is harmonized with

previous industry regulations. This also supports the requirements of ASHRAE 189.1 to allow for reduced renewable energy to be used as defined in the alternate renewable energy approach defined in 7.4.1.1.

- The change in test refrigerants from R-507A to R-448A is being done to support the reductions in GWP values where R-507A has a GWP of 3985 and R-448A as a GWP of 1,387. This will likely have to change again to meet the final phasedown requirements of the Kigali agreement, but lower GWP options will likely require A2L refrigerants which are not currently allowed by model building codes.

Cost Impact of the Change

The following is a summary of the cost impact of the change:

- The efficiency increase for the product classifications that have been increased will increase the cost of the heat rejection, but this will allow systems with these products to use the alternate renewable energy approach so the overall cost impact will be small to even positive.
- The refrigerant change is likely minimal on cost as phased out refrigerants typically increase in cost as regulations like California CARB and the new US AIM Act are implemented.

Enforcement

The enforcement of this addendum change should be easy to administer as there are existing certification programs for CTI and defined ratings and testing standards.

The refrigerant change has already been implemented in ASHRAE 90.1-2019. The change for the efficiencies has been reviewed with TC 8.6, which has a regulatory review committee staffed by industry manufacturers, and the committee believes that with these new proposed values, adequate models will still be available to the market. Note that Table B-7 is used as part of an optional compliance path and users have the option to use ASHRAE 90.1 requirements with the standard renewable energy requirements defined in section 7.1.

[Note to Reviewers: This addendum makes proposed changes to the language published in 189.1-2020. These changes are indicated in the text by underlining (for additions) and ~~strikethrough~~ (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 g to 189.1-2020

Add the following reference Section 11, Normative References, under Cooling Technology Institute (CTI)

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
CTI ATC-105DS (19)	Acceptance Test Code for Dry Coolers	Appendix B
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

Make the following modifications Table B-7 (I-P) in Appendix B

Table B-7 Performance Requirements for Heat Rejection Equipment – Minimum Efficiency Requirements (I-P)
(Supersedes Table 6.8.1-7 in ASNI/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	~~≥16.1~~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
Propeller or axial fan dry coolers (air-cooled fluid coolers)	All	115°F entering water 105°F leaving water 95°F entering db	~~≥4.8 gpm/hp~~	CTI ATC-105DS
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

a. 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.

b. 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.
c. 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.
d. 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.
e. 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.
f. 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.
g. 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.
h. Informative Appendix G contains information on the referenced test procedures.
i. 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.

Make the following modifications to table B-7 (SI) in Appendix B

Table B-7 Performance Requirements for Heat Rejection Equipment – Minimum Efficiency Requirements (SI)
(Supersedes Table 6.8.1-7 in ASNI/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~~1.43 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~~0.71 L/s kW	CTI ATC-106
Propeller or axial fan dry coolers (air-cooled fluid coolers)	All	46.1°C entering water 40.6°C leaving water 35.0°C entering db	≥0.41 L/s kW	CTI ATC-105DS
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~~55.4 COP	CTI ATC-106
Centrifugal fan evaporative condensers	All	Ammonia test fluid 60.0°C entering gas temperature 35.7°C condensing temperature	~~≥43.2~~45.6 COP	CTI ATC-106

		23.9°C entering wb		
Propeller or axial fan evaporative condensers	All	~~R-507A~~R-448A test fluid 73.9°C entering gas temperature 40.6°C condensing temperature 23.9°C entering wb	≥~~61.7~~64.5 COP	CTI ATC-106
Centrifugal fan evaporative condensers	All	~~R-507A~~R-448A test fluid 73.9°C entering gas temperature 40.6°C condensing temperature 23.9°C entering wb	≥~~53.1~~55.4 COP	CTI ATC-106
Air-cooled condensers	All	~~88~~87.7°C entering gas temperature ~~52~~51.7°C condensing temperature ~~8~~8.3°C subcooling ~~35~~35.0°C entering ~~wb~~db	≥~~69~~72.7 COP	AHRI 460

a. 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.

b. 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.

c. 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.

d. 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.

e. 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.

f. 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.

g. 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.

h. Informative Appendix G contains information on the referenced test procedures.

i. 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.