



STANDARD

ANSI/ASHRAE Standard 20-2019
(Supersedes ANSI/ASHRAE Standard 20-1997)

Methods of Laboratory Testing Remote Mechanical-Draft Air-Cooled Refrigerant Condensers

Approved by ASHRAE and the American National Standards Institute on January 4, 2019.

ASHRAE® Standards are scheduled to be updated on a five-year cycle; the date following the Standard number is the year of ASHRAE approval. The latest edition of an ASHRAE Standard may be purchased on the ASHRAE website (www.ashrae.org) or from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: orders@ashrae.org. Fax: 678-539-2129. Telephone: 404-636-8400 (worldwide) or toll free 1-800-527-4723 (for orders in US and Canada). For reprint permission, go to www.ashrae.org/permissions.

© 2019 ASHRAE

ISSN 1041-2336



ASHRAE Standard Project Committee 20
Cognizant TC: 8.4, Air-to-Refrigerant Heat Transfer Equipment
SPLS Liaison: Russell C. Tharp

Raymond W. Rite*, *Chair*
Ronald E. Wood*, *Secretary*
Konrad G. Chmielewski*

Zan Liu*
Richie Mohan
Gary W. Price

Gordon B. Struder*
Ted Wayne*

* Denotes members of voting status when the document was approved for publication

ASHRAE STANDARDS COMMITTEE 2018–2019

Donald M. Brundage, *Chair*
Wayne H. Stoppelmoor, Jr., *Vice-Chair*
Els Baert
Charles S. Barnaby
Niels Bidstrup
Robert B. Burkhead
Michael D. Corbat
Drury B. Crawley
Julie M. Ferguson
Michael W. Gallagher

Walter T. Grondzik
Vinod P. Gupta
Susanna S. Hanson
Roger L. Hedrick
Rick M. Heiden
Jonathan Humble
Kwang Woo Kim
Larry Kouma
R. Lee Millies, Jr.
Karl L. Peterman

Erick A. Phelps
David Robin
Lawrence J. Schoen
Dennis A. Stanke
Richard T. Swierczyna
Russell C. Tharp
Adrienne G. Thomle
Craig P. Wray
Lawrence C. Markel, *BOD ExO*
Michael CA Schwedler, *CO*

Steven C. Ferguson, *Senior Manager of Standards*

SPECIAL NOTE

This American National Standard (ANS) is a national voluntary consensus Standard developed under the auspices of ASHRAE. *Consensus* is defined by the American National Standards Institute (ANSI), of which ASHRAE is a member and which has approved this Standard as an ANS, as "substantial agreement reached by directly and materially affected interest categories. This signifies the concurrence of more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that an effort be made toward their resolution." Compliance with this Standard is voluntary until and unless a legal jurisdiction makes compliance mandatory through legislation.

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

- a. interpretation of the contents of this Standard,
- b. participation in the next review of the Standard,
- c. offering constructive criticism for improving the Standard, or
- d. permission to reprint portions of the Standard.

DISCLAIMER

ASHRAE uses its best efforts to promulgate Standards and Guidelines for the benefit of the public in light of available information and accepted industry practices. However, ASHRAE does not guarantee, certify, or assure the safety or performance of any products, components, or systems tested, installed, or operated in accordance with ASHRAE's Standards or Guidelines or that any tests conducted under its Standards or Guidelines will be nonhazardous or free from risk.

ASHRAE INDUSTRIAL ADVERTISING POLICY ON STANDARDS

ASHRAE Standards and Guidelines are established to assist industry and the public by offering a uniform method of testing for rating purposes, by suggesting safe practices in designing and installing equipment, by providing proper definitions of this equipment, and by providing other information that may serve to guide the industry. The creation of ASHRAE Standards and Guidelines is determined by the need for them, and conformance to them is completely voluntary.

In referring to this Standard or Guideline and in marking of equipment and in advertising, no claim shall be made, either stated or implied, that the product has been approved by ASHRAE.

CONTENTS
ANSI/ASHRAE Standard 20-2019
Methods of Laboratory Testing
Remote Mechanical-Draft Air-Cooled Refrigerant Condensers

SECTION	PAGE
Foreword	2
1 Purpose	2
2 Scope	2
3 Definitions	2
4 Requirements	2
5 Instruments	2
6 Method of Testing	3
7 Data to be Recorded	4
8 Nomenclature and Computations.....	5
9 Normative References	6
10 Informative References	6
Informative Appendix A: Test Apparatus.....	7
Informative Appendix B: Method for Removing Noncondensables in Remote Mechanical-Draft Refrigerant Condensers.....	10

NOTE

Approved addenda, errata, or interpretations for this standard can be downloaded free of charge from the ASHRAE website at www.ashrae.org/technology.

© 2019 ASHRAE

1791 Tullie Circle NE · Atlanta, GA 30329 · www.ashrae.org · All rights reserved.

ASHRAE is a registered trademark of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
ANSI is a registered trademark of the American National Standards Institute.

(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

This 2019 revision to ASHRAE Standard 20 incorporates a number of technical revisions, and additional changes have been made to bring the standard into compliance with ASHRAE's mandatory language requirements. References have also been updated.

1. PURPOSE

This standard prescribes methods of laboratory testing remote mechanical-draft air-cooled refrigerant condensers.

2. SCOPE

2.1 This standard provides

- a. methods of laboratory testing for obtaining performance data,
- b. definitions of terms,
- c. specification of data to be recorded,
- d. calculation formulas,
- e. test limits and tolerances, and
- f. apparatus and instrumentation with associated accuracies.

2.2 This standard does not cover

- a. methods of test for production or field use;
- b. heat exchangers that do not fully condense refrigerant vapor, as in heat reclaim applications;
- c. methods for rating condensers; or
- d. external air resistance devices not provided by the manufacturer.

3. DEFINITIONS

The following key terms are defined. For all other terms, refer to *ASHRAE Terminology of Heating, Ventilation, Air Conditioning and Refrigeration*¹.

bubble point: a liquid-vapor equilibrium point for a volatile pure liquid or for a multicomponent mixture of miscible, volatile, pure component liquids, in the absence of noncondensables, where the temperature of the mixture at a defined pressure is the minimum temperature required for a vapor bubble to form in the liquid.

condenser subcooling: the difference between the bubble point corresponding to the measured refrigerant outlet pressure and the measured liquid outlet temperature.

condenser superheat: the difference between the dew-point temperature and the measured refrigerant vapor temperature at the inlet.

condensing temperature: for single-component and azeotropic refrigerants, the saturation temperature corresponding

to the measured refrigerant pressure at the condenser inlet. For zeotropic refrigerants, the arithmetic average of the dew point and bubble point corresponding to the measured refrigerant pressure at the condenser inlet.

dew point: a liquid-vapor equilibrium point for a volatile pure vapor or for a multicomponent mixture of miscible, volatile, pure component vapors, in the absence of noncondensables, where the temperature of the mixture at a defined pressure is the maximum temperature required for a liquid droplet to form in the vapor.

remote mechanical-draft air-cooled refrigerant condenser (air-cooled condenser): a factory-made encased unit intended for connection in the field to a heat transfer system by means of refrigerant piping. It consists of a heat exchanger for desuperheating, condensing, and subcooling refrigerant, and a means for forced-air circulation where heat is transferred from refrigerant to air.

steady state: required test measurements remain within specified tolerances during a test condition.

temperature difference: the difference in degrees between the condensing temperature and the entering air dry-bulb temperature.

test measurement: the reading of a specific test instrument at a specific point in time.

test run: a collection of successive test sets at the same specified condition.

test series: a collection of test runs performed on the same test unit.

test set: a complete collection of test measurements, taken as simultaneously as practicable, that includes all data to be recorded.

4. REQUIREMENTS

4.1 Test Setup. Informative Appendix A describes known workable systems. This standard does not specify an exclusive list of required components.

4.2 Duration of Test. After establishment of steady-state test conditions, all required readings, a test set, as detailed in Section 7.3, shall be recorded at a maximum of 30-second intervals. The test period, a test run, shall be defined as a minimum of twenty (20) minutes of consecutive readings that are within the specified limits.

4.3 Safety Requirements. All components in the test apparatus and the condenser shall meet the design requirements for safety as outlined in ANSI/ASHRAE Standard 15, *Safety Standard for Refrigeration Systems*².

5. INSTRUMENTS

5.1 Instruments (or instrument systems) shall be selected to meet the minimum accuracies shown in Table 1.

5.2 Measurements from the instruments shall be traceable to primary or secondary standards calibrated by National Institute of Standards and Technology (NIST) or to the Bureau International des Poids et Mesures (BIPM) if a National Metrology Institute (NMI) other than NIST is used. The indicated correc-