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ANSI/ASHRAE Standard 84-2020
Method of Testing Air-to-Air Heat/Energy Exchangers

NOTE

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

(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

ASHRAE Standard 84 provides rules for the measurement and expression of values characterizing the energy-related performance of air-to-air heat/energy exchangers. The following changes are new in the 2020 edition:

a. Rules are provided for measurement of fixed-bed regenerator performance.
b. The metric "energy recovery ratio," first introduced in ASHRAE Standard 90.1-2016, is defined. This metric differs from the fundamental effectiveness equations in that it characterizes only an exchanger's ability to reduce the load associated with the supply air at a specified condition.
c. The standard was revised to comply with ASHRAE's mandatory language policy.

Versions of the standard prior to the 2008 edition were heavily prescriptive in measurement processes and yielded testing uncertainty within generally acceptable limits. This new edition, in keeping with the 2008 and 2013 editions, instead stipulates a maximum desired uncertainty while allowing laboratories the flexibility of selecting various testing apparatus as long as the uncertainty limits are satisfied. It should be noted that laboratories must evaluate their testing apparatus to ensure that their instrumentation achieves the required test uncertainty. Laboratories also may specify more rigorous uncertainty limits.

Application of the standard is determined by reviewing introductory Sections 1 through 3, which provide the scope and purpose of the standard and defines terms. Section 4 presents the metrics that express performance of a heat/energy exchanger, the measurements that must be taken, and the equations used to calculate the metrics. This section also identifies the essential required instrumentation and requires pretest uncertainty analysis and appropriate instrument calibrations. Section 5 outlines the basic test procedures. The quality of test data is discussed in Section 6, which outlines the use of measurement inequalities to detect and reject invalid tests. Section 7 sets out the uncertainty levels that a performance test must satisfy to be acceptable. (Informative Appendix D shows how test conditions can be selected to meet specified uncertainty limits.) Section 8 describes acceptable instruments and measurement methods and the ASHRAE standards prescribing relevant measurement methods. The specialized measurement methods required for testing of fixed-bed regenerators, in which steady-state outlet conditions are not achieved, are introduced here for the first time. (Informative Appendix B provides examples from peer-reviewed literature of these measurement methods and testing of fixed-bed regenerators.) Performance calculations and test result reporting are presented in Sections 9 and 10, respectively. In an effort to both provide more flexibility in the design of test labs and to provide additional guidance, all discussion of test system layout has been moved from the normative body of the standard to Informative Appendix A. The special challenges in field testing of air-to-air heat/energy exchangers are discussed in Informative Appendix E. The extrapolation of test performance data is discussed in Informative Appendix F.

1. PURPOSE

The purpose of this standard is to

a. establish a uniform method of test for obtaining the effectiveness of air-to-air heat/energy exchangers;
b. specify the test conditions, data required, uncertainty analysis to be performed, calculations to be used, and reporting procedures for testing the performance of an air-to-air heat/energy exchanger; and
c. specify the types of test equipment for performing such tests.

2. SCOPE

2.1 This standard prescribes the laboratory methods for testing the performance of air-to-air heat and energy exchangers. In this standard, an air-to-air heat/energy exchanger is a device to