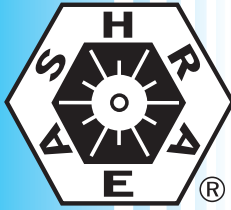


ANSI/ASHRAE Standard 84-2008
(Supersedes ANSI/ASHRAE Standard 84-1991)



ASHRAE STANDARD

Method of Testing Air-to-Air Heat/Energy Exchangers

Approved by the ASHRAE Standards Committee on January 19, 2008; by the ASHRAE Board of Directors on January 23, 2008; and by the American National Standards Institute on January 24, 2008.

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NOTE

When addenda, interpretations, or errata to this standard have been approved, they can be downloaded free of charge from the ASHRAE Web site at www.ashrae.org.

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FOREWORD

This standard provides rules for the testing of air-to-air heat/energy exchangers in both the laboratory and in the field. Application of the standard should be determined by reviewing introductory Sections 1 through 3. Section 4 details the necessary steps to be taken in the performance evaluation of a heat/energy exchanger, including a pre-test uncertainty analysis. (Appendix A presents a comprehensive discussion of effectiveness as a dimensionless ratio to characterize air-to-air heat/energy exchangers.) Discussion of laboratory testing begins in Section 5 and continues in Sections 6 through 8. (Appendix B shows how test conditions can be selected to meet specified uncertainty limits.) The quality of test data is covered in Section 6, which outlines the use of balance checks based on measurement uncertainty. Section 7 sets out the uncertainty levels that a performance test must satisfy in order to be acceptable. A discussion of the allowable instruments and measurement methods is contained in Section 8. Various other standards are mentioned as being acceptable for use with instrument measurements. Performance calculations and test result reporting are presented in Sections 9 and 10, respectively. Field testing conditions are discussed and specified in Appendix C. The extrapolation of test performance data is discussed in Appendix D.

This edition of the standard has been substantially revised to reflect state-of-the-art technology in the measurement of various moist air properties and to reflect information regarding physical performance characterizations derived from ASHRAE research. Previous versions of the standard were very prescriptive in measurement processes and yielded testing uncertainty within acceptable limits. This new edition of the standard stipulates the desired uncertainty while allowing laboratories the flexibility of selecting various testing apparatus as long as the uncertainty limit is satisfied.

1. PURPOSE

The purpose of this standard is as follows:

- a. Establish a uniform method of test for obtaining performance data for 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 methods for testing the performance of air-to-air heat/energy exchangers.

2.2 In this standard, an air-to-air heat/energy exchanger is a device to transfer heat and/or water vapor from one airstream to another. The types of air-to-air heat/energy exchangers covered by this standard are:

- a. regenerative energy exchangers (including heat wheels and total energy wheels),
- b. heat pipe exchangers,
- c. thermosiphon exchangers,
- d. recovery loop exchangers (also called run-around exchangers), and
- e. fixed-plate exchangers.

2.3 The scope of this standard also includes both laboratory and field tests, provided that appropriate levels of uncertainty can be achieved when testing.

2.4 A test is deemed to be within the scope of this standard if both a pre-test uncertainty analysis and a post-test uncertainty analysis yield satisfactory uncertainty limits.

3. DEFINITIONS

air leakage: air transferred from the exhaust to the supply airstream due to pressure differentials.

bias: the difference between the mean indicated value of repeated measurements for one physical property (or the calculation of a parameter using several properties) and the true value of the same physical quantity. Bias is sometimes referred to as accuracy.

coil recovery loop exchanger (run-around exchanger): an exchanger that has finned-tube coils with interconnecting piping placed in supply and exhaust airstreams and is filled with heat transfer fluid that is pumped between coils.

carryover: in regenerators, the amount of exhaust air that is transferred to the supply by the mechanical operation (the rotation) of the exchanger, i.e., the air trapped within the matrix pore space of energy wheel as it rotates from the exhaust to the supply airstream.

effectiveness: the actual energy transfer (sensible, latent, or total) divided by the product of the minimum energy capacity rate and the maximum difference in temperature, humidity ratio, or enthalpy.

exhaust air transfer: the air quantity transferred from the exhaust to the supply. Exhaust air transfer is typically a measure of both carryover and leakage.

exhaust air transfer ratio (EATR): the ratio of the exhaust air transfer to the supply flow rate.

fixed plate exchanger: an exchanger with multiple alternate airflow channels, separated by a heat transfer plate(s) and connected to supply and exhaust airstreams.