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ANSI/ASHRAE Standard 111-2024
Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems

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NOTE

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

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FOREWORD

ANSI/ASHRAE Standard 111 was first published 1988 with the title Practices for Measurements, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air Conditioning, and Refrigeration Systems. *At the time of publication, the cognizant Technical Committee was TC 9.7, Testing and Balancing, which is now designated TC7.7. In 2013, the TC recommended the standard be updated.*

Testing and balancing provides the means to determine and monitor system performance and may be utilized repeatedly long after a project is completed. Testing and balancing reports provide many benefits that can be used to

- *Assist personnel responsible for the efficient operation of HVAC systems*
- *Provide a record of existing conditions*
- *Compare periodic tests to original conditions as a way to determine possible system deterioration or reduced efficiency*
- *Establish operating conditions whenever modifications or changes are made to the HVAC system*
- *Determine existing conditions for base energy-level calculations in energy conservation programs*
- *Create procedures and reports that can be used to verify energy conservation results*
- *Provide a comparison of design to actual field condition performance*

The 2024 edition of Standard 111 updates the testing procedures for air, hydronics, and control verification; identifies new instrumentation; and incorporates the findings of research that provides new ideas and methods for testing.

1. PURPOSE

1.1 To provide uniform procedures for measurement, testing, adjusting, balancing, evaluating, and reporting the performance of building heating, ventilating, and air-conditioning systems in the field.

2. SCOPE

2.1 This standard applies to building heating, ventilating, and air-conditioning (HVAC) systems of the air-moving and hydronic types and their associated heat transfer, distribution, refrigeration, electrical power, and control subsystems.

2.2 This standard includes

a. Methods for determining thermodynamic, hydraulic, hydronic, mechanical, and electrical conditions
b. Methods for determining room air change rates, room pressurization, and cross contamination of spaces
c. Procedures for measuring and adjusting outdoor ventilation rates to meet specified requirements
d. Methods for validating collected data while considering system effects

2.3 This standard establishes

a. Minimum system configuration requirements to ensure that the system can be field-tested and balanced
b. Minimum instrumentation required for field measurements
c. Procedures for field measurements in HVAC testing and balancing and equipment testing
d. Formats for recording and reporting results
e. The field data collected and reported under this standard is intended for use by building designers, operators and users, and by manufacturers and installers of HVAC systems

3. DEFINITIONS AND SYMBOLS

Terminology is as defined below. All other definitions shall be as listed in the *ASHRAE Terminology of Heating, Ventilation, Air Conditioning, & Refrigeration*.

airflow measuring stations: specialized devices that are permanently mounted in an airstream to provide a continuous output of the average velocities at the plane of measurement for HVAC control or system monitoring. Averaging errors can be reduced with the use of multiple independent sensors across the plane of measurement.

The most popular technologies used by airflow measuring stations are thermal dispersion and velocity pressure. Thermal dispersion may be either digital or analog electronic in design, while velocity pressure