ANSI/ASHRAE Standard 151-2010
(Supersedes ANSI/ASHRAE Standard 151-2002)

ASHRAE STANDARD

Practices for Measuring, Testing, Adjusting, and Balancing Shipboard HVAC&R Systems

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SPECIAL NOTE

This American National Standard (ANS) is a national voluntary consensus standard developed under the auspices of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (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 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.

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NOTE

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

First published in 2002, ASHRAE Standard 151 describes best practices for measuring, testing, adjusting, and balancing shipboard HVAC&R systems. As recommended by the cognizant technical committee for this standard, TC 7.7, it has been revised in this edition in order to update procedures for the maritime industry, to aid ship operators, and to assist design engineers in writing a testing and balancing specification that would encompass the design ramifications of present-day shipboard HVAC&R systems. It updates the testing procedures for air, hydronic, refrigeration, and control systems; it updates instrumentation to be used in testing shipboard systems; and it outlines reporting methods to be used for shipboard systems.

The intent of this standard is to convey the message that testing and balancing may be used repeatedly to determine and monitor shipboard systems performance but will not necessarily provide the accuracy of factory testing. However, when employing good engineering practices and craftsmanship installation, and utilizing realistic ratings, adequate results can be obtained to:

- Assist personnel responsible for the efficient operation of shipboard HVAC&R systems;
- Provide a record of existing conditions, which can also be used to determine operational readiness;
- Compare periodic test results to determine possible system deterioration or reduced efficiency, which can also be used to determine spare parts designations;
- Establish operating conditions whenever modifications are made to the shipboard HVAC&R systems;
- Determine base-level conditions for energy calculations used in energy conservation programs; and
- Compare periodic test results that can be used to verify energy conservation programs.

Field test results are considered essential to operators, designers, manufacturers and installers because they provide a better understanding of the design results, installation techniques and equipment operation of shipboard HVAC&R systems under actual operating conditions.

1. PURPOSE

This standard provides uniform and systematic practices for making measurements in testing, analyzing, balancing, and reporting the performance of the heating, ventilation, air-conditioning, and refrigeration (HVAC&R) systems onboard ships.

2. SCOPE

2.1 This standard describes methods for evaluating shipboard HVAC&R systems.

2.2 It applies to all air-moving equipment, hydronic equipment, and HVAC heat-transfer equipment, refrigeration equipment, HVAC electrical power and control equipment.

2.3 It describes methods for measuring temperature, humidity, enthalpy, current, wattage, voltage, rotation, fluid flow, heat flow, pressures, sound, and vibration levels in HVAC&R systems.

2.4 This standard includes the following:

a. Minimum system configuration requirements to ensure the system can be tested and balanced.
b. Minimum instruments and permanently installed measuring equipment for underway measurements.
c. Procedures for measurements used in testing and balancing and system analysis.
d. Reporting format and forms.
e. Classification of ships and spaces to assist in defining the different procedures required for different ships and spaces.
f. Procedures for testing and adjusting refrigeration systems, including direct-expansion type, chilled-water type, and absorption-type, air-cooled condensers, and seawater-cooled condensers.

2.5 It does not include system-design, application, or equipment-design criteria.

3. DEFINITIONS

For the purposes of this standard, the following terms and definitions apply. Terms that are not defined shall have their ordinary accepted meanings within the context in which they are used.

accessible: a term used in this standard to describe equipment for which the access and space are sufficient to permit balancing.

adjustable: a term used to describe balancing devices that can be changed to alter capacity of the equipment being balanced.

available: a term applied to equipment for which the operating schedule is such that balancing can be accomplished.

barometric pressure: a measurement of the ambient environmental pressure.

watertight integrity: a term applied to ships with containment bulkheads for controlling any flooding that might occur onboard ship.

onboard: as used in this standard, anything occurring on or carried within a ship.

shipboard: anything pertaining to the operation, procedures, or equipment of a ship.

holds: cargo storage areas onboard a ship.