

ANSI/ASHRAE Standard 151-2002



ASHRAE[®] STANDARD

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

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REFRIGERATING AND
AIR-CONDITIONING ENGINEERS, INC.**

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FOREWORD

Technical Committee 9.7 recommended a standard be written for testing and balancing of shipboard HVAC&R systems to unify procedures for the marine industry and to aid ship operators and design engineers in writing a testing and balancing specification that would encompass the ramifications of system test and adjustments.

Field test results are essential to operators and to design engineers, manufacturers, and installers to better enable them to evaluate the results of the system performance and installation techniques under actual operating conditions.

This standard describes the quality of field testing, instruments, reporting, and testing techniques. The standard covers causes that affect a system's performance. HVAC system testing and balancing will determine if design conditions are met.

Testing and balancing results are the means used to verify and monitor system performance. Testing and balancing reports are a written record of information that is useful for the following reasons:

- (a) *To assist operating personnel responsible for the efficient plant operation*
- (b) *To show existing conditions*
- (c) *To compare a periodic test to original conditions for determination of pending failures or deterioration of components*
- (d) *As a basis for future modifications*
- (e) *As a record for spare parts designations*
- (f) *As a record for operational readiness*

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 on board ships.

2. SCOPE

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

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

2.3 This standard 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 This standard does not include system design, application, or equipment design criteria.

3. DEFINITIONS AND SYMBOLS

3.1 Definitions

accessible: time, access, and space required for balancing.

adjustable: devices required for balancing that can be changed to alter capacity of the equipment to be balanced.

authorized shipping company representative: captain, chief engineer, port engineer, and designated officers of ships (vessels).

available: time, access, and space required for balancing.

barometric pressure: measurement of ambient environmental pressure.

watertight integrity: containment bulkheads to control flooding onboard ship.

onboard: any area on the ship.

shipboard: any area on the ship.

holds: cargo storage areas onboard the ship.

platform: a stabilizing device that maintains instruments level when the ship is rolling.

balancing valves: metering-type valves with locking positions to control water flow and steam flow.

balancing dampers: opposed blade devices to control airflow.

flow meters: devices used to measure airflow and fluid flow for balancing.

monitoring systems: equipment to measure and record the parameters of the HVAC&R systems, i.e., temperature, humidity, pressure, electric current, kW, and volts.

equivalent diameters: length in diameter for a rectangular duct is the equivalent in round-duct diameter.

power: energy source used to drive the HVAC&R system, and parameters for measurement are current, kW, and volts.