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AMERICAN NATIONAL STANDARD
**GUIDELINES FOR
THE MEASUREMENT AND EVALUATION
OF VIBRATION OF SHIP PROPULSION
MACHINERY**

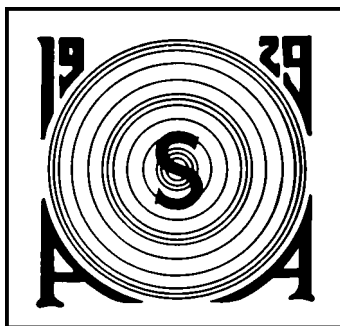
ANSI S2.27-2002

Accredited Standards Committee S2, Mechanical Vibration and Shock

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ANSI S2.27-2002

AMERICAN NATIONAL STANDARD

**Guidelines for
the Measurement and Evaluation
of Vibration of Ship Propulsion
Machinery**

Secretariat
Acoustical Society of America

Approved 20 September 2002
American National Standards Institute, Inc.

Abstract

This standard contains guidelines for the measurement and evaluation of vibration of ship propulsion systems including limits for acceptability. It is applicable to all ocean-going ships and inland vessels. Test conditions, instrumentation, data analysis and evaluation, and reporting requirements are described.

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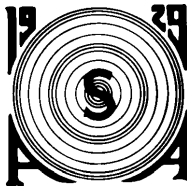
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Foreword

[This Foreword is for information only, and is not a part of the American National Standard ANSI S2.27 - 2002– Guidelines for the Measurement and Evaluation of Vibration of Ship Propulsion Machinery].

This standard comprises a part of a group of definitions, standards, and specifications for use in mechanical vibration and shock. It has been developed using the American National Standards Institute (ANSI) Accredited Standards Committee Procedure. The Acoustical Society of America provides the Secretariat for Accredited Standards Committee S2, Mechanical Vibration and Shock.

American National Standards Committee S2, Mechanical Vibration and Shock, under whose jurisdiction this standard was developed, has the following scope:

Standards, specifications, methods of measurement and test terminology in the fields of mechanical vibration and shock and condition monitoring and diagnostics of machines, but excluding those aspects which pertain to biological safety, tolerance, and comfort.

This standard is comparable to parts of ISO 4867:1984, Code for the measurement and reporting of shipboard vibration data.

At the time this Standard was submitted to Accredited Standards Committee S2, Mechanical Vibration and Shock for approval, the membership was as follows:

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D. J. Vendittis (*Alt.*)

Individual Experts of Accredited Standards Committee S2, Mechanical Vibration and Shock were:

P.K. Baade L.A. Herstein D.L. Johnson

Working Group S2/WG11, Measurement and Evaluation of Mechanical Vibration of Vehicles, which assisted Accredited Standards Committee S2, Mechanical Vibration and Shock, in the development of this standard, had the following membership:

A. F. Kilcullen, *Chair*

G. Antonides	L. Herstein	A. Parkes
W. Blake	G. Hill	S. Schechter
R. Brown	A. Kukk	P. Shang
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Suggestions for the improvement of this standard are welcomed. They should be made in writing to Accredited Standards Committee S2, Mechanical Vibration and Shock, in care of the Standards Secretariat, Acoustical Society of America, 35 Pinelawn Road, Suite 114E, Melville, New York 11747. Telephone: +1 631 390 0215; FAX: +1 631 390 0217; e-mail: asastds@aip.org.

American National Standard

Guidelines for the Measurement and Evaluation of Vibration of Ship Propulsion Machinery

0 Introduction

This national standard provides guidelines for acceptable vibration of new marine propulsion machinery during normal operation of the ship. This standard also defines requisite calculations and the measurement and data processing procedures to obtain reliable data to compare with the guidelines.

In addition to addressing the more common types of propulsion systems, such as geared-turbine and diesel drive, this standard includes thrusters, cycloidal propellers and waterjets.

The design of a ship propulsion system is a continuing process of analysis and testing, during which components are analytically evaluated with increasing complexity as the details of the design evolve. This process culminates with ship testing. Eventual proof of performance is demonstrated in full-scale ship trials with the installed propulsion system. This national standard provides guidance for evaluating the vibration of a propulsion system during the design cycle and a detailed description of the vibration tests to be conducted during ship trials.

These guidelines treat longitudinal, lateral and torsional vibration of conventional systems and, as applicable, non-conventional systems. While vibration tests are the basis of acceptability, calculations are usually required in addition to measurements to indicate probable compliance with acceptance criteria. The requirements for calculations are given in paragraph 4; test procedures, instrumentation and data analysis are described in paragraph 5; and the acceptance criteria are contained in paragraph 6.

Evaluation of a ship's vibration environment for habitability is dealt with in ANSI S2.25 [2].

1 Scope, purpose and applications

This standard establishes uniform procedures for determining the acceptance of new marine propulsion machinery with respect to vibration of sea-going and inland ships of all lengths, excluding ice-breakers.

NOTE – This standard covers vibrations of ships in steady underway conditions but does not include the vibrations resulting from special operations such as the crushing of ice by an icebreaker.

This standard covers propulsion systems with turbine (both gas and steam), electric and diesel drives with single or multiple shafts, thrusters, and cycloidal propeller and waterjet systems. Propulsion systems have higher vibration magnitudes than most other shipboard machinery because of propeller excitation. There are some special requirements, such as avoiding thrust reversals in the thrust bearing and torque reversals in the gear trains. Table 1 presents a summary of acceptance criteria.

Although this standard is intended for new ships, it can also be used during the life of the ship to check for mechanical damage, performance monitoring and evaluating a repair, provided, however, that some allowances are made for wear, erosion of parts, etc.

2 References

2.1 Normative references

[1] ISO 2041:1990, Mechanical vibration and shock—Vocabulary.

2.2 Informative references

[2] ANSI S2.25:2001, American National Standard Guide for the Measurement, Reporting, and Evaluation of Hull and Superstructure Vibration in Ships.

[3] General Radio, *Handbook of Noise Measurement*, General Radio, Seventh Edition, General Radio Company, Concord, MA, USA, 1974 (out of print).

[4] ISO 10816-6:1995, Mechanical vibration—Evaluation of machine vibration by measurements on non-rotating parts—Part 6: Reciprocating machines with power ratings above 100 kw.

[5] ANSI/AGMA 6000-B96:1996, Specification for Measurement of Linear Vibration on Gear Units.