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AMERICAN NATIONAL STANDARD

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

Secretariat:

Acoustical Society of America

Approved on 20 Sept 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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AMERICAN NATIONAL STANDARD
**GUIDELINES FOR
THE MEASUREMENT AND EVALUATION
OF VIBRATION OF SHIP PROPULSION
MACHINERY**

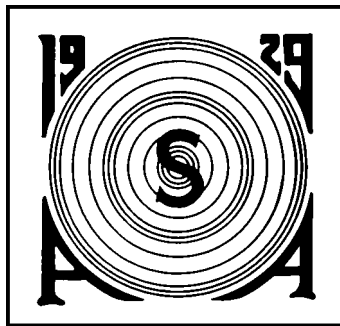
ANSI S2.27-2002

Accredited Standards Committee S2, Mechanical Vibration and Shock

Standards Secretariat
Acoustical Society of America
35 Pinelawn Road, Suite 114E
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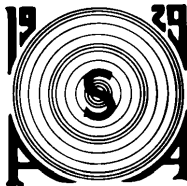
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Contents

	Page
Foreword	iii
0 Introduction	1
1 Scope, purpose and applications	1
2 References	1
2.1 Normative references	1
2.2 Informative references	1
3 Definitions	2
4 Calculations	2
4.1 Torsional vibration calculations	2
4.2 Lateral vibration calculations	3
4.3 Longitudinal vibration calculations	3
4.4 Calculations for diesel engines	4
4.5 Calculations for thrusters, cycloidal propellers and waterjets	4
4.6 Calculations for gearboxes	4
5 Vibration tests	4
5.1 Instrumentation	4
5.2 Test conditions	5
5.3 Test procedure	5
5.4 Data processing	6
5.5 Measurements	6
6 Acceptance criteria	8
6.1 Torsional vibration	8
6.2 Lateral vibration	8
6.3 Longitudinal vibration (conventional systems)	9
6.4 Vibration of diesel engines	9
6.5 Vibration of thrusters	9
6.6 Vibrations of cycloidal propellers and waterjets	9
6.7 Gearboxes	9
7 Report	10
 Annexes	
A Optional test procedures and calculation requirements	13
A1 General	13
A2 Test procedure	13
A3 Calculations	13
A4 Criteria	13
B Torsional shaft stress criteria	14
B1 General	14
C Example calculations of vibration properties of ship propulsion systems	16
C1 Torsional calculations	16
C2 Longitudinal calculations	17
C3 Lateral vibration	21
D Bibliography	23

Tables

1	Summary of acceptance criteria	11
2	Particulars of test ship	12
C1	Description of elements	18

Figures

B1	Stress concentration factor at keyway	15
B2	Stress concentration factor for shaft flange fillet in torsion	15
C1	Equivalent systems for calculating torsional natural frequencies of a geared turbine-driven propulsion system	16
C2	Calculated mode shapes for geared-turbine drive	17
C3	Propulsion shafting details	18
C4	Propulsion system longitudinal vibration model	19
C5	Calculated propulsion system longitudinal natural frequencies vs. machinery foundation stiffness for a 4-bladed propeller	19
C6	Calculated propulsion system longitudinal blade rate vibration response for a 4-bladed propeller (machinery fdn stiffness = 5×10^6 lb/in; total thrust brg stiffness = 3×10^6 lb/in) ..	20
C7	Propulsion shafting first mode whirling frequency vs. propeller bearing and aft stern tube bearing stiffnesses	21
C8	Simplified (Jasper) model of propulsion shafting lateral vibration	22

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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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:

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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.