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Ships and marine technology — Guidelines on vibration isolation design methods for shipboard auxiliary machinery

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 8, *Ship design*.

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Introduction

This document has been developed in response to the demand, noted by the International Maritime Organization (IMO) and its Marine Environment Protection Committee (MEPC), for an International Standard on reduction of vibration and noise from machinery onboard ships, considering the negative effects of ship vibration and noise on the health of seafarers and the negative effects of underwater noise radiated from ships on marine life.

The reduction of ship vibration and noise may necessitate machinery vibration isolation measures. Although marine machinery vibration isolation design can be done by professional groups, such as consultant companies, with the development of modern shipbuilding technology, the integration of various technical fields for ship design is becoming a necessity.

The ship designers themselves should also understand the procedures, requirements and basic methodology of vibration isolation for shipboard machinery. The purpose of developing a basic methodology in this document is not limited to better vibration isolation measures, but to help ship designers take into account the need of machinery vibration isolation, planning for the space and weight for machinery vibration isolation in advance at the design stage and to consequently promote the application of vibration isolation design technology onboard.

Vibration isolation concerns the use of comparatively resilient elements called vibration isolators. Practical vibration isolators usually consist of springs, of elastomeric elements with damping or of a combination of these. The primary purpose of isolators is to attenuate the transmission of vibrations, whereas the main purpose of dampers is the dissipation of mechanical energy. Simple models based on systems with a single degree of freedom are useful for establishing some fundamental relations, such as single-stage isolation. Extensions of these models can account for the non-rigidity of supports and isolated items, as well as for reaction effects on vibration sources. More complex models apply to two-stage isolation that can provide greater attenuation than single-stage isolation systems. As common measures onboard a ship, single-stage and double-stage vibration isolation design methods are suggested in this document.

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Ships and marine technology — Guidelines on vibration isolation design methods for shipboard auxiliary machinery

1 Scope

The purpose of this document is to provide general guidelines on the design of ship vibration isolation based on the basic methodology of vibration isolation for shipboard machinery, for example, auxiliary engine, compressor, fan, pump, etc. A well-designed vibration isolation system can significantly reduce the vibration transmission from shipboard machinery to ship structures lowering the noise level onboard the ship or the underwater noise radiated from the ship.

2 Normative reference

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 20283-3, *Mechanical vibration — Measurement of vibration on ships — Part 3: Pre-installation vibration measurement of shipboard equipment*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
single-stage vibration isolation
vibration isolation where a single machinery or assembly is mounted on the ship foundation through a stage of elastic connection by a group of isolators

3.2
double-stage vibration isolation
vibration isolation where a single machinery or assembly is flexibly installed on an intermediate frame through a first stage isolator group, and an intermediate frame is mounted on the ship foundation through a second stage isolator group

3.3
displacement limiter
rigid element which is used in combination with the vibration isolator to avoid excessive displacement and consequent damages of the vibration isolation system

3.4
coast down test
test to determine the resonant frequencies of the machine isolation system for the machinery from a certain speed while it is shut down, simultaneously recording the vibration level until the machine stops

Note 1 to entry: Annex A gives information on the determination of the resonant frequencies of machine isolation system.

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