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Mechanical vibration and shock — Resilient mounting systems —

Part 1: Technical information to be exchanged for the application of isolation systems

Vibrations et chocs mécaniques — Systèmes de montage résilients — Partie 1: Informations techniques à échanger pour l'application des systèmes d'isolation

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 2017-1 was prepared by Technical Committee ISO/TC 108, *Mechanical vibration and shock*.

This first edition of ISO 2017-1, together with ISO 2017-2, cancels and replaces ISO 2017:1982, which has been technically revised.

ISO 2017 consists of the following parts, under the general title *Mechanical vibration and shock — Resilient mounting systems*:

— *Part 1: Technical information to be exchanged for the application of isolation systems*

— *Part 2: Technical information to be exchanged for the application of vibration isolation associated with railway systems*

Introduction

This International Standard is limited to the consideration of resilient devices.

Some suppliers of shock and vibration isolators (resilient mounts) have experience covering a wide variety of applications. In most instances, they are willing to use this background information for solving the user's problems with isolators. However, it is frequently difficult for the supplier to provide this service, because the customer, the user or the producer of the vibration source or receiver has not furnished sufficient information regarding the application.

On the other hand, the user is sometimes handicapped in applying isolators properly because the supplier does not furnish sufficient technical information. Consequently, the users must conduct their own experimental evaluation of the isolator and may unknowingly duplicate work already carried out by the supplier.

With some vibration sources or receivers, the producer provides the isolating system. To do that, the producer needs all the information from the customer relating to the future application, site and environment.

This International Standard is intended to serve as guide for the exchange of technical information between the customer, the supplier of resilient devices, and the producer of vibration sources or receivers, as required for their proper application.

Mechanical vibration and shock — Resilient mounting systems —

Part 1:
Technical information to be exchanged for the application of isolation systems

1 Scope

This part of ISO 2017 establishes requirements to ensure the appropriate exchange of information between users, manufacturers and suppliers of vibration sources and receivers regarding the application of isolation systems. The sources and the receivers can be machines, structures, people or sensitive equipment subjected to vibrations and shocks generated by machines, railways, road traffic and other external and internal sources where the vibrations are usually transmitted through the ground to a building.

This part of ISO 2017 is applicable to the use of new products (source or receiver), and can also be applied to previously installed products when the user wishes to solve a newly arisen vibration problem.

It is not to be considered as a manual for the design or installation of an isolation system. Examples of elements of vibration isolation are shown in Annex A, for information only.

This part of ISO 2017 is intended to provide appropriate responses to questions highlighted by the producer and users (e.g. why, what, when and how to isolate mechanical systems).

2 Normative references

The following normative documents are indispensable for the application 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 2041:1990, *Vibration and shock — Vocabulary*

ISO 9688:1990, *Mechanical vibration and shock — Analytical methods of assessing shock resistance of mechanical systems — Information exchange between suppliers and users of analyses*

ISO 10846-4:2003, *Acoustics and vibration — Laboratory measurement of vibro-acoustic transfer properties of resilient elements — Part 4: Dynamic stiffness of elements other than resilient supports for translatory motion*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 2041, ISO 9688 and ISO 10846-4 and the following apply.

3.1
resilient device
flexible element or system used between an equipment item and its supporting structure to attenuate the transmission of shock or vibration from the equipment to the structure or from the structure to the equipment

3.2
vibration source
simple or multiple solid, liquid or gaseous body causing vibration in its environment

NOTE This covers sources such as machinery, traffic, explosions, wave loading and wind loading.

3.3
vibration receiver
all structures or elements of structures responding to vibration energy emitted by an internal or external source

3.4
customer
user or purchaser of a product (building, machine, etc.)

3.5
producer
party constructing or manufacturing a product that needs to be isolated from internal or external vibration

3.6
isolation supplier
party responsible for providing and installing an isolation system which will meet the requirements to reduce vibration as agreed upon with the customer

NOTE 1 In certain cases, the producer and the supplier may be the same party.

NOTE 2 The customer, the producer or the supplier may each mandate subcontractors to execute the work or to purchase elements. From a legal point of view, all three remain responsible in the case of failure of the project.

4 Purpose of vibration isolation (why isolate mechanical systems)

The purpose of vibration isolation is to protect people and mechanical systems from vibrations and shocks by taking action on the source or the receiver of the vibration. The purpose may include assurance of the following:

a) the safety of the industrial building containing the vibrating equipment itself;

b) the safety and comfort of the operators of the vibrating machine;

c) the safety and comfort of bystanders near the vibrating machine;

d) the security of a building located close to a source of vibration, such as an industrial plant or railway;

e) the comfort of people in temporary or permanent habitations that may be subject to vibration excitation;

f) the security of sensitive equipment in buildings;

g) the correct operation of the isolated equipment;

h) meeting regulatory requirements.

5 What is to be isolated

5.1 Source isolation

The purpose in this case is the protection of the environment in the vicinity of a vibrating source by modifying the input at the source level. This may include

a) isolation of the machine emitting vibrations,

b) isolation of the rail track and surrounding subsystems, such as the soil systems for new and existing railways, and

c) isolation of the road embankment and viaducts for highways and removal (suppression) of irregularities.

5.2 Receiver isolation

Where source isolation is impossible or impractical (i.e. environmental sources), as for railways or road traffic, or where source isolation has proved unsatisfactory, receiver isolation is applied. Sometimes it is an economical compromise. It may include applying isolation to

a) a machine operator's workstation,

b) a new building or elements of the building in the neighbourhood of a railway, tunnel, or heavy traffic roadway,

c) a sensitive building (concert halls, laboratories, or sensitive installations),

d) the support of sensitive equipment (laser tables, computer discs, electronic microscopes, etc.), and

e) isolation from environmental sources.

6 Applicability of vibration isolation (when to isolate structures or mechanical systems)

A vibration isolation system may be used additionally to design measures for reducing vibration. It shall not be substituted for such measures, but it may be applied as follows:

a) when vibrating machines are designed or installed;

b) when constructions, installations or buildings containing vibrating machines are designed or modified;

c) when vibrating sources are displaced or modified;

d) when structure-borne noises occur;

e) when designing and constructing buildings, especially sensitive ones in the neighbourhood of railways or high-traffic roads;

f) when designing or ordering sensitive equipment;

g) when receiving complaints from people working or living in the area of vibration sources;

h) when the limiting values specified in legislation for vibration are exceeded.

7 Measurement and evaluation of vibration conditions

In order to choose the correct isolation mounting system, it is necessary to make prior measurement and evaluation of vibration in the site.

Measurements shall be made under the environmental conditions relevant for the location of the source or receiver. The measurements and analysis should help to provide an understanding of the origin of the problem and possibly give an indication of the solutions. Measurements shall be made in accordance with an appropriate standard and this standard shall be identified.

The measuring position shall be defined in a contract, and the mounting points of transducers and the directions of measurements shall be reported.

These measurements shall include time history monitoring over a sufficiently long period to cover the working cycle of the source of vibration.

For source measurements, analysis of frequency responses for the structures that transmit and receive vibration will help to avoid coincidence between dominant frequencies of the source and the natural frequencies of these structures.

For receiver measurements, determination of the background vibration shall be carried out in order to know the inherent level below which no solution is normally necessary.

8 Information for the choice of an isolation mounting system

In order to select appropriate isolators and to correctly fit the isolation, an exchange of information is needed between the producer, the supplier of the isolator and the customer. Clause 9 lists the information required for optimized isolation. If the source or receiver producer is also the supplier of the isolation system, some of the information requested may seem to be not relevant. Nevertheless, this information may be useful when replacement parts have to be provided and should be part of the instruction handbook.

The choice of the isolation system shall take into consideration not only the static characteristics of the isolated structure, but also its dynamic characteristics and the dynamic characteristics of its surrounding structure (and other sources).

It will often be necessary for the supplier of a vibration isolation system to ask for more detailed information from the user in order to provide the best possible solution.

The information is different in the case of source or receiver isolation.

In every case, the people concerned are

— the producer (of the source or receiver),

— the supplier of the isolation, and

— the customer of the source or receiver.

9 Information to be supplied by the producer of the source or receiver

9.1 General

The manufacturer shall supply to the user as much of the information listed in 9.2 and 9.3 as is needed to ensure proper installation. If necessary, the manufacturer should obtain information from the supplier of the vibration isolation system.

The main vibration sources to be considered in this part of ISO 2017 are machines.

9.2 Information to be supplied by the source producer

9.2.1 Machine drawing

A drawing shall be furnished giving the following:

a) the outline and installation of the machine, if appropriate, including an intermediate foundation specified by the machine manufacturer;

b) the overall dimensions;

c) the total mass and the location of the centre of gravity (rotational inertia shall also be included);

d) specifications of bolt sizes and special connectors for securing the machine; the locations of attachments, tapped holes, tolerances, and any special material considerations shall be indicated on the drawing;

e) identification and direction of the three mutually orthogonal axes of origin in the centre of gravity of the unit to be isolated under conditions of preferred orientation;

f) the normal machine orientation with respect to the vertical axis; the direction of the major shock or vibration shall be indicated;

g) feasible structural attachment points (these points frequently determine the isolation system in relation to orientation, centre of gravity, etc.);

h) the structure and dimensions of the supporting surface of the mechanism, with indication of the connection of this surface to the mechanism body.

9.2.2 Vibration excitation

The vibration excitation by a machine as characterized by its exciting forces and couples as a function of frequency, or in the form of a time history, shall be described in the detail necessary to ensure the safe installation and use of the machinery.

Examples include the following:

a) rotational frequency forces and couples;

b) forces and couples caused by reciprocating masses;

c) torque reaction couples;

d) amplitudes and/or frequencies of fluid pulsation phenomena;

e) frequencies of aerodynamic phenomena (e.g. for fans);

f) electromagnetic forces and frequencies associated with electrical rotating machines or transformers;

g) dynamic characteristics of the isolation system on which the mechanism has been tested;

h) distribution of vibration (in three directions) over the surface of the mechanism mounting and where electric cables and pipes may be mounted;

i) factors ensuring that the isolation system does not introduce specific vibration levels that are detrimental to the machine.