

Safety of earth-moving machinery —

Part 17: Specification for laboratory evaluation of operator seat vibration

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by Technical Committee B/513, Construction equipment and plant, and site safety, to Subcommittee B/513/1, Earth-moving machinery, upon which the following bodies were represented:

- British Coal Corporation
- Construction Plant-Hire Association
- Federation of Civil Engineering Contractors
- Federation of Manufacturers of Construction Equipment and Cranes
- Health and Safety Executive
- Institution of Civil Engineers
- Silsoe Research Institute

This British Standard, having been prepared under the direction of the Sector Board for Building and Civil Engineering, was published under the authority of the Standards Board and comes into effect on 15 August 1995

© BSI 04-1999

The following BSI references relate to the work on this standard:
Committee reference B/513/1
Draft for comment 93/105240 DC

ISBN 0 580 24290 0

Amendments issued since publication

Amd. No.	Date	Comments

Contents

	Page
Committees responsible	Inside front cover
National foreword	ii
1 Scope	1
2 Normative references	1
3 Symbols and indices	1
4 Criteria for evaluation of seats	1
5 Vibration testing of operator seats	1
6 Conditions for acceptance of seat	3
7 Test report	3
Figure 1 — Posture of test person	6
Figure 2 — Normalized power spectral density for classes I and II	7
Figure 3 — Illustration of tolerances for normalized power spectral density of input vibration	8
Table 1 — Definition of spectral classes of input vibrations	4
Table 2 — Characteristics of simulated input vibration on z-axis for different types of machines	4
Table 3 — Report form for simulated input vibration testing of seats	5
Table 4 — Report form for damping test	5
List of references	Inside back cover

National foreword

This Part of BS 6912 has been prepared by Subcommittee B/513/1, and is identical with ISO 7096:1994, *Earth-moving machinery — Laboratory evaluation of operator seat vibration*, published by the International Organization for Standardization (ISO). This Part supersedes BS 6294:1982 *Method for measurement of body vibration transmitted to the operator of earth-moving machinery*, which is withdrawn.

The second edition of ISO 7096 represents a technical revision of ISO 7096:1982 and was prepared by Subcommittee 2, Safety requirements and human factors, of ISO Technical Committee 127, Earth-moving machinery, with the active participation and approval of the UK.

Cross-reference

International standard	Corresponding British Standard
	BS 6914 <i>Terminology (including definitions of dimensions and symbols) for earth-moving machinery</i>
ISO 6165:1987	Part 1:1988 <i>Glossary of terms for basic types of earth-moving machinery</i> (Identical)

The Technical Committee has reviewed the provisions of ISO 8041 and of ISO 10326-1, to which reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This International Standard specifies a laboratory method for vibration testing of operator seats for earth-moving machinery at frequencies between 1 Hz and 20 Hz.

It is based on ISO 10326-1 which is a general method applicable to seats for different types of vehicles: this International Standard lays down the specifications which relate particularly to earth-moving machinery.

It applies to operator seats of the following earth-moving machines as defined in ISO 6165:

- wheel-loaders and crawler-loaders;
- tractor-scrappers;
- wheel-tractors and crawler-tractors.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards. ISO 6165:1987, *Earth-moving machinery — Basic types — Vocabulary*.

ISO 8041:1990, *Human response to vibration — Measuring instrumentation*.

ISO 10326-1:1992, *Mechanical vibration — Laboratory method for evaluating vehicle seat vibration — Part 1: Basic requirements*.

3 Symbols and indices

For the purposes of this International Standard, the following symbols and indices apply.

3.1 Symbols

a	Instantaneous acceleration, in metres per second squared.
a_w	Frequency-weighted acceleration signal, in metres per second squared.
f	Frequency, in hertz.
f_c	Filter cut-off frequency.
f_r	Resonance frequency.
$G_P^*(f)/G_o$	Power spectral density.
G_o	Standard spectral power, in square metres per second cubed $[(m/s^2)^2/Hz]$.
j	Assumed unit ($j^2 = -1$).
$T(f_r)$	Resonance transmission factor.

3.2 Indices

P Platform

S Seat

4 Criteria for evaluation of seats

Two criteria are used for the evaluation of seats:

- the vibration magnitude measured between the seat pan and the test person (see ISO 10326-1:1992, subclause 9.1);
- transmissibility at resonance (see ISO 10326-1:1992, subclause 9.2).

Users of this International Standard are reminded that the quantities referred to shall be calculated from the acceleration values measured simultaneously on the vibration table and between the seat pan and the test person or the inert mass.

The specifications for instrumentation shall be as given in ISO 8041. Measurements during testing shall be made with type 1 instruments according to ISO 8041. The frequency filter shall have a 12 dB/octave slope at the relevant cut-off frequencies.

5 Vibration testing of operator seats

5.1 Seat mounting

A platform, the dimensions of which correspond approximately to those of the operator's position on an earth-moving machine, shall be mounted on a vibrator which is capable of generating vibrations along the (vertical) z-axis (see Figure 1).

The vibrator shall, when loaded, be capable of simulating sinusoidal vibrations having a displacement amplitude equivalent to at least 7,5 cm, at a frequency of 2 Hz.

5.2 Seat adjustment

The seat shall be adjusted to the mass of the test person in accordance with the manufacturer's instructions.

With seats where the stroke available is unaffected by the adjustment for seat height or test person mass, testing shall be performed with the seat adjusted to the centre of the stroke.

With seats where the stroke available is affected by the adjustment of the seat height or by test person mass, testing shall be performed in the position which gives the minimum available stroke.

The manufacturer shall specify what influence different combinations of mass and seat height adjustments will have on the stroke available during testing.