
**Packaging — Complete, filled transport
packages and unit loads —
Horizontal impact tests**

*Emballages — Emballages d'expédition complets et pleins et charges
unitaires — Essais de choc horizontal*



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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 3.

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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 2244 was prepared by Technical Committee ISO/TC 122, *Packaging*, Subcommittee SC 3, *Performance requirements and tests for means of packaging, packages and unit loads (as required by ISO/TC 122)*.

This third edition cancels and replaces the second edition (ISO 2244:1985) which has been technically revised.

Introduction

It is the responsibility of the user of this International Standard to establish appropriate health and safety practice in accordance with relevant legislation.

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Packaging — Complete, filled transport packages and unit loads — Horizontal impact tests

1 Scope

This International Standard specifies methods of horizontal impact testing (horizontal or inclined plane test and pendulum test) on a complete, filled transport package or a unit load. The test may be performed either as a single test to investigate the effects of horizontal impact or as part of a sequence of tests designed to measure the ability of a package or a unit load to withstand a distribution system that includes a horizontal impact hazard.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 2206, *Packaging — Complete, filled transport packages — Identification of parts when testing*.

ISO 2233, *Packaging — Complete, filled transport packages and unit loads — Conditioning for testing*.

3 Term and definition

For the purposes of this International Standard, the following term and definition applies.

3.1

test specimen

a complete, filled transport package or unit load

4 Principle

Applying a horizontal velocity to the test specimen and bringing it to a halt by impact with a vertical impact surface. The atmospheric conditions, the impact velocity and the attitude of the test specimen are predetermined. Particular conditions of impact may be simulated by placing appropriately profiled inserts between the impact surface and the impacting face or edge of the test specimen.

5 Apparatus

5.1 Impact surface, which should be either:

- a) a plane inclined to the vertical at $10^\circ \pm 1^\circ$ (for the inclined plane test), or
- b) a plane vertical to within 1° (for the horizontal or pendulum test).

The dimensions of the impact surface shall be greater than those of the impacting face, or selected part, of the test specimen.

The impact surface shall be sufficiently rigid not to deflect more than 0,25 mm when a load of 160 kg/cm² is applied anywhere on the surface.

In addition, the apparatus shall meet the requirements and tolerances specified in clause 7.

5.2 Optional interposed hazards, which are to be used when it is required to concentrate the impact in a particular area of the test specimen. The dimensions, material and location of the interposed hazard shall be carefully specified.

EXAMPLE A steel beam with a length of 200 mm and a cross-section of $(100 \pm 1) \text{ mm} \times (100 \pm 1) \text{ mm}$ with rounded edges of radius $(5 \pm 0,5) \text{ mm}$, placed centrally to the impact surface (5.1).

5.3 Impact apparatus, types which may be used are described in 5.3.1, 5.3.2 and 5.3.3.

5.3.1 Inclined plane tester, (see Figure 1) consisting of the following items:

5.3.1.1 Two-rail steel track, inclined at 10° to the horizontal.

The distance along the incline shall be graduated at intervals of 50 mm.

5.3.1.2 Rolling carriage, of which the surface friction between the rolling carriage/dolly and the test specimen shall be such that during movement from rest to impact the test specimen will not move in relation to the carriage, but such that upon impact the test specimen will move freely.

5.3.1.3 Impact surface (or bumper), meeting the specifications of 5.1, placed at the bottom of the track with its face perpendicular to the direction of movement of the carriage down the track.

5.3.2 Horizontal plane tester, consisting of the following items:

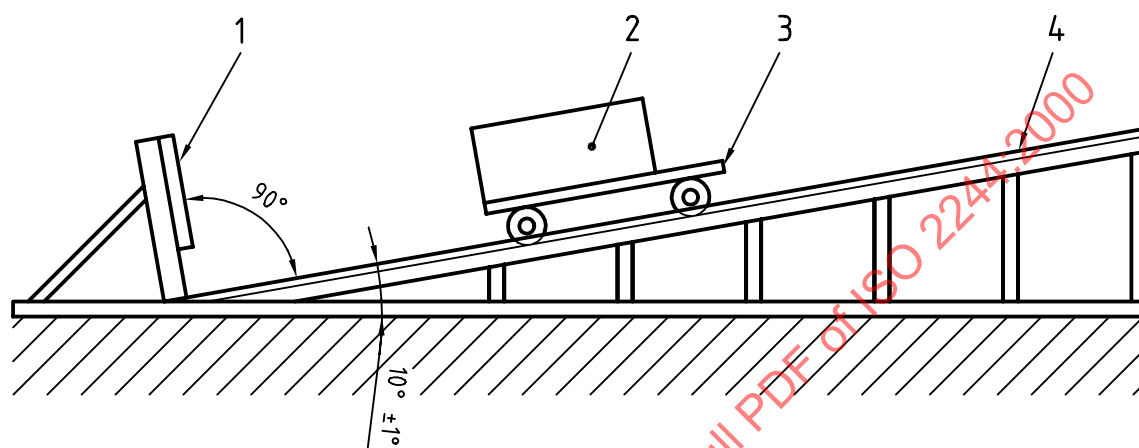
5.3.2.1 Two-rail steel track, fixed in the horizontal plane.

5.3.2.2 Rolling carriage, which can be mechanically driven in such a manner that its velocity is known at the moment of the impact. The surface friction between the rolling carriage/dolly and the test specimen shall be such that during movement from rest to impact the test specimen will not move in relation to the carriage, but such that upon impact the test specimen will move freely.

5.3.2.3 Impact surface or bumper, at one end of the track. The impact surface shall have its face perpendicular to within 1° to the direction of movement of the carriage along the track.

5.3.3 Pendulum apparatus, consisting of a rectangular platform suspended at each corner by steel rods or ropes so that in its rest position the front edge just touches the impact surface that meets the specifications of 5.1. The suspension system shall be such that it moves freely and its path is not obstructed when the test specimen is mounted on the platform (see Figure 2).

5.4 Impact measuring apparatus, when required, this shall be fitted on the carriage, allowing measuring and recording of the peak deceleration and impact velocity.

**Key**

- 1 Impact of surface (or bumper)
- 2 Test specimen
- 3 Rolling carriage
- 4 Two-rail steel track

NOTE 1 The track and the wheels should be kept clean.

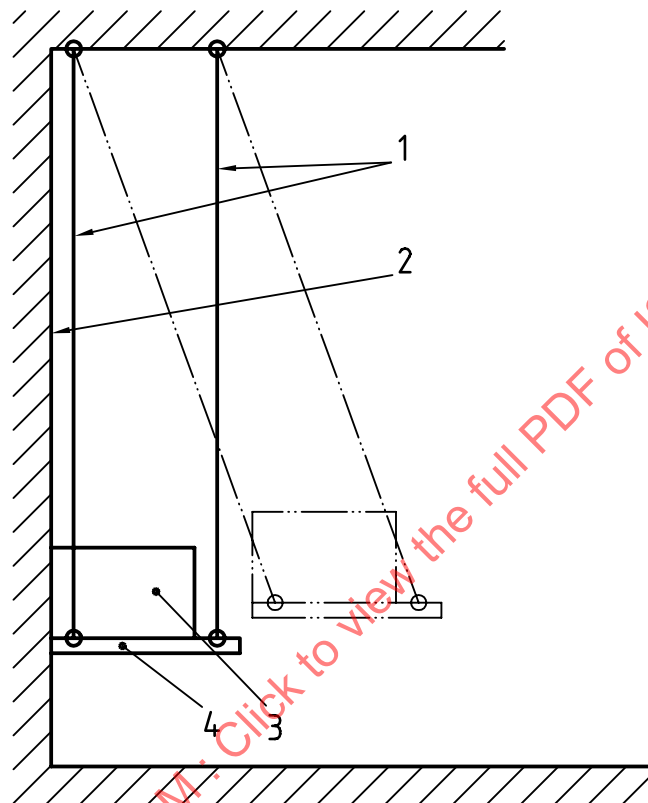
NOTE 2 The wheel bearings should be regularly lubricated. Roller bearings are recommended.

NOTE 3 A suitable impact surface comprises a number of heavy timbers mounted horizontally across the face of the structure such as the optional interposed hazard (5.2) can be fitted easily when required.

NOTE 4 It is recommended that the impact surface (or bumper) be made in such a way that the carriage can travel underneath it for about 100 mm so that the test specimen impacts the bumper before the carriage stops.

NOTE 5 The apparatus should preferably be equipped with a device to prevent the carriage from rebounding after the impact. Either a spring damper or an oil damper may be incorporated into such a device.

Figure 1 — Incline plane tester



Key

- 1 Steel rods or ropes
- 2 Impact surface
- 3 Test specimen
- 4 Rectangular platform

NOTE For certain types of test specimen, such as carboys, it may be sufficient to suspend the test specimen from a single rod or rope. In both instances the suspension system shall not impart a rotary movement to the test specimen.

Figure 2 — Pendulum apparatus

6 Test specimen preparation and conditioning

6.1 Preparation

Fill the test specimen with its intended contents and ensure that it is closed normally, as if ready for distribution.

NOTE Simulated or substituted contents may be used, on condition that the dimensions and physical properties of such contents should be as close as possible to those of the intended contents. The closure should still be as for distribution.

6.2 Conditioning

The test specimen shall be conditioned in accordance with one of the conditions described in ISO 2233.

7 Procedure

7.1 General

7.1.1 Wherever possible the test shall be carried out in atmospheric conditions identical to those used for conditioning, and particularly where this is critical to the materials or application of the test specimen. In other circumstances, the test shall be carried out in atmospheric conditions which approximate those used for conditioning as closely as is practicable.

7.1.2 The velocity at impact shall be within $\pm 5\%$ of the predetermined impact velocity.

7.1.3 When the impact is on a face, the test specimen shall strike the impact surface so that the angle between the face and the plane of the impact surface is less than 2° .

7.1.4 When the impact is on an edge, the attitude of the test specimen at impact shall be such that the angle α between the edge and the plane of the impact surface is less than 2° and such that the angle β between one adjacent face and the impact surface is within $\pm 5^\circ$ or 10% of the predetermined angle, whichever is the greater (see Figure 3).

7.1.5 When the impact is on a corner, the test specimen shall strike the impact surface so that the angle β between any face adjoining the tested corner and the impact surface is within $\pm 5^\circ$ or 10% of the predetermined angle, whichever is the greater (see Figure 4).

7.2 Inclined plane test

7.2.1 Place the test specimen on the carriage in an attitude that will ensure that it strikes the impact surface (5.3.1.3) in the desired position.

7.2.2 Whenever possible the test specimen shall not project beyond the edges of the carriage. Raise the carriage to that height, up the incline (5.3.1.1), which corresponds with the desired impact velocity, then release it.

7.3 Horizontal plane test

7.3.1 Place the test specimen on the carriage (5.3.2.2) as described in 7.1.

7.3.2 Set the carriage in motion along the steel track at a velocity predetermined to give the desired impact velocity on the impact surface (5.3.2.3).

7.4 Pendulum test

7.4.1 Place the test specimen on the rectangular platform (see 5.3.3 and Figure 2) so that the impacting face or edge just touches the impact surface.

7.4.2 Raise the pendulum by pulling out the platform to the distance from the impact surface appropriate to the velocity required, then release it.

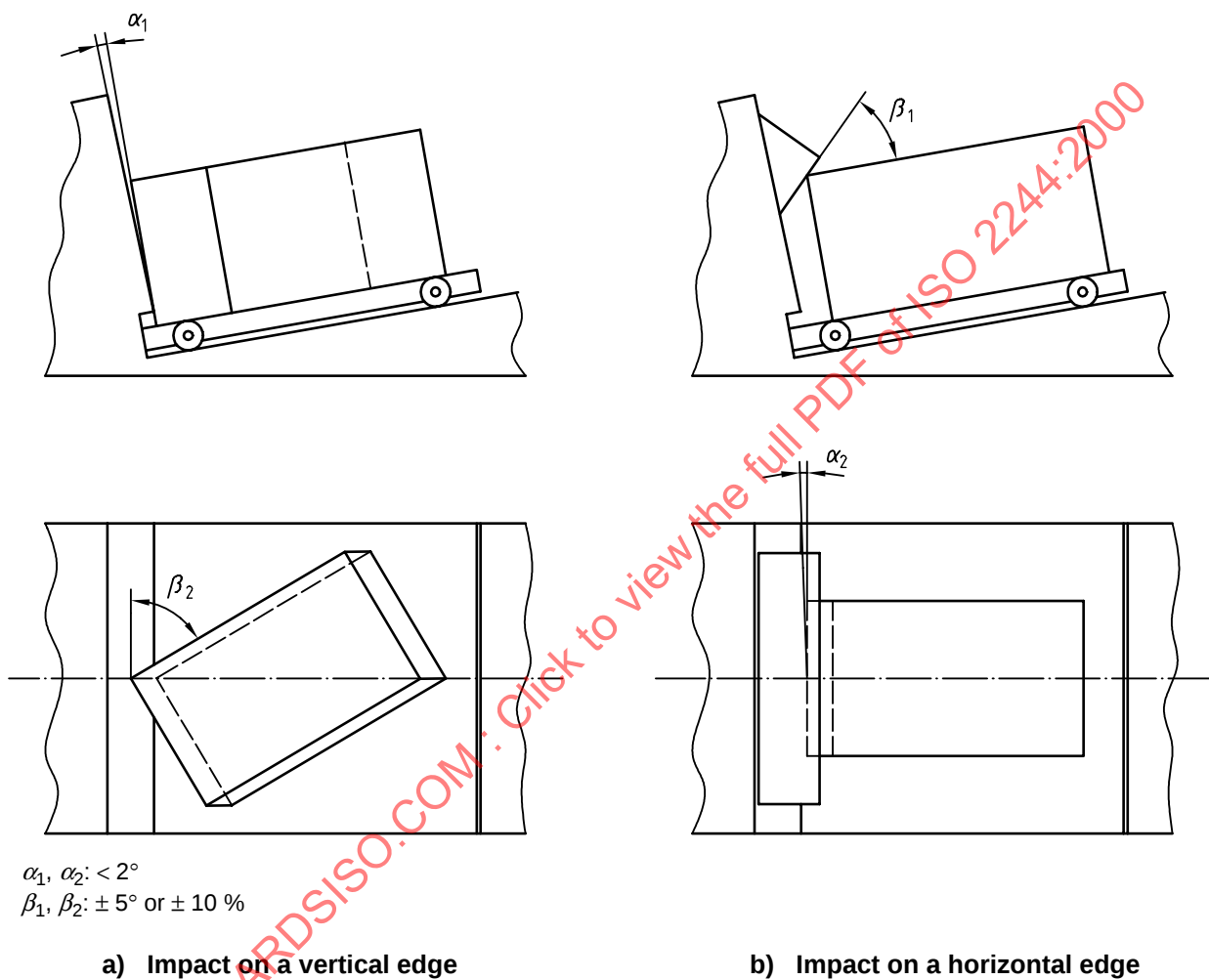
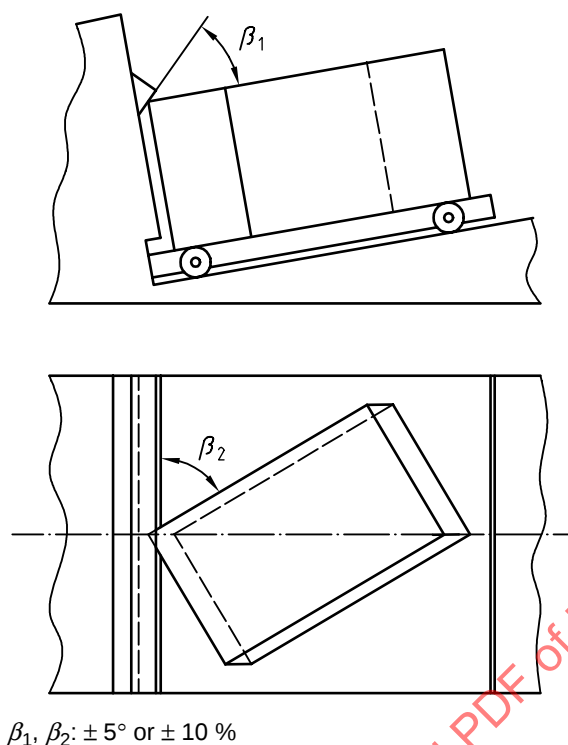


Figure 3 — Tolerances on the test specimen attitude for an impact on an edge



NOTE Shown for the inclined plane test. The same tolerances apply to the horizontal plane and pendulum tests.

Figure 4 — Tolerances on the test specimen attitude for an impact on a corner

8 Test report

The test report shall include:

- a) a reference to this International Standard;
- b) the name and address of testing laboratory and the name and address of customer;
- c) the unique identification of the report;
- d) the date of receipt of the test specimens and the date(s) of performance of the test;
- e) the name, title and signature of persons accepting test responsibility for the test report;
- f) a statement to the effect that the results relate only to the specimens tested;
- g) a statement that the report shall not be reproduced except in full without the written approval of the testing laboratory;
- h) the number of replicate test specimens tested;
- i) a full description, including dimensions, structural and material specifications of the test specimen and its fittings, cushioning, blocking, closure and reinforcing arrangements, gross mass of the test specimen and mass of the contents in kilograms;
- j) a description of the contents and if simulated or substituted contents were used, full details shall be given;