

Packaging code —

Section 12: Methods of protection against shock (excluding cushioning devices)

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Packaging and Freight Containers Standards Committee (PKM/-) to Technical Committee PKM/573 upon which the following bodies were represented:

- British Paper and Board Industry Federation (PIF)
- British Rubber Manufacturers Association
- Institute of Packaging
- Ministry of Defence
- PIRA (The Research Association for the Paper and Board, Printing and Packaging Industries)
- Pressed Felt Manufacturers Association
- Telecommunication Engineering and Manufacturing Association (TEMA)

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Foreword

This Section of BS 1133 has been prepared under the direction of the Packaging and Freight Containers Standards Committee. It is a revision of BS 1133:Section 12:1967, which is withdrawn.

BS 1133 was originally issued in December 1943, primarily to give guidance on the packaging of Service and other Government supplies. In practice, however, the code was used not only by Government departments and contractors but also by civilian packers and, accordingly, it was amended to suit peace-time requirements. The Parts were later issued separately and new Sections were added as new materials and methods were developed.

Various Sections of the code have been revised and the most recent revision of Section 12 was in 1967.

This revision of Section 12 incorporates some cushion theory and design examples using the popular peak deceleration/static stress method and gives information on new cushioning materials. Guidance on the use of cushion factor dynamic stress data or the Mustin presentation¹⁾ is not included. The revision also takes account of the decision of the Packaging and Freight Containers Standards Committee that BS 1133 should include only guidance material with references to separately published British Standard specifications and methods of test where appropriate, rather than incorporating such material.

A new British Standard dealing with methods of test for cushioning materials for packaging use is in preparation.

The Packaging code now consists of the following Sections.

- *Sections 1 to 3: Introduction to packaging;*
- *Section 4: Mechanical aids in package handling;*
- *Section 5: Protection against spoilage of packages and their contents by micro-organisms, insects, mites and rodents;*
- *Section 6: Temporary protection of metal surfaces against corrosion (during transport and storage);*
- *Section 7: Paper and board wrappers, bags and containers;*
- *Section 7: Subsection 7.1: Wrapping papers;*
- *Section 7: Chapter 7.5: Fibreboard cases;*
- *Section 8: Wooden containers;*
- *Section 9: Textile bags, sacks and wrappings;*
- *Section 10: Metal containers;*
- *Section 12: Methods of protection against shock (excluding cushioning devices);*
- *Section 13: Twines and cords for packaging;*
- *Section 14: Adhesive closing and sealing tapes;*
- *Section 15: Tensional strapping;*
- *Section 16: Adhesives for packaging;*
- *Section 17: Wicker and veneer baskets;*
- *Section 18: Glass containers and closures;*
- *Section 18: Subsection 1: Terminology;*
- *Section 19: Use of desiccants in packaging;*
- *Section 21: Regenerated cellulose film, plastics film, aluminium foil and flexible laminates;*
- *Section 22: Packaging in plastics containers.*

¹⁾ The Mustin presentation is a shorthand system of presenting data on specific materials. Further information may be obtained from the Enquiry Section, BSI, Linford Wood, Milton Keynes MK14 6LE.

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 to iv, pages 1 to 14, 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 Section of BS 1133 deals with protection against shock. The ways in which protection against shock can be provided are defined and the more commonly used materials are classified.

Considerations affecting design are included, together with information on basic cushioning theory and cushion design but cushioning devices are not covered.

The particular cushion design requirements of the Ministry of Defence are not specifically covered but reference to Ministry of Defence practice is made at certain points.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 General

2.1 Introduction

Shocks occur when a package is dropped and hits the ground or as a result of side impacts arising during mechanical handling, e.g. when the package is swung against the side of a ship or dock during loading. For packaging purposes shocks may be defined as rapid changes in velocity, i.e. acceleration or deceleration. On impact with a hard surface, the outside of a container is quickly brought to rest by a high deceleration and is subject to a force which is proportional both to its own mass and to the rate of change of velocity. These impact forces may be very high, e.g. if an item is dropped from a few inches without cushioning onto a hard surface, the deceleration can be several hundred times that due to the earth's gravitational field and the force between item and ground up to several hundred times the mass of the item. Low intensity repeated shocks also occur due to vehicle vibration in transit. However, it is impacts, in particular those arising from drops, which almost always determine the design of the cushioning and vibration effects are not considered further in this Section.

A packaged article can be protected against impacts in the following three ways:

- a) by spreading the forces on impact over a large area so that the force per unit area is reduced and no part is subjected to concentrated forces (see 2.4.1);
- b) by locating supports in contact with the stronger parts of the article so that, on impact, forces are directed to those parts (see 2.4.2);
- c) by cushioning the article (see clauses 3, 4 and 5).

The kind of protection outlined in a) (known as load spreading) and in b) can be provided by materials which do not deform on impact. Thus blocking and bracing into position could provide protection as described in b).

The method of protection outlined in c) depends on the cushioning material deflecting on impact. Cushioning materials reduce the level of shocks by allowing controlled movement of the packaged article within the container at the instant of impact and so reducing the deceleration and the resulting force transmitted to the article.

In practice, combinations of methods a), b) and c) may occur, although for a particular material one method will normally predominate.

Cushioning materials vary in the way in which they deform and also in their ability to recover from such deformation. Most of the data on dynamic performance are applicable to those materials which give a considerable amount of shock reduction with a large percentage deformation under impact.

2.2 Design considerations

The amount, type and arrangement of material needed for a specific application depends on a number of factors of which the following are the most important:

- a) the mass, dimensions and fragility of the item;
- b) the type of journey, in particular the transport hazards;
- c) the expected life of the packaging and the associated storage hazards;
- d) the design of the container.

It is generally uneconomic to provide protection against extreme and infrequent hazards. The most cost effective package is one in which an increase in cost ceases to be offset by a comparable decrease in the damage cost. This damage cost may include a factor allowing for inconvenience and loss of customer's "goodwill" resulting from receipt of damaged goods.

Where the item to be packed is an assembly, it is sometimes more economic to pack any fragile components separately as components of the item packed individually may be more robust than the assembly. Other procedures include regularizing the shape to rectangular or cylindrical form, thus permitting the use of standard shape materials, e.g. sheet stock.