
Draft for Development

Methods of test and performance requirements for general-purpose flat pallets for through transit of goods

Projet à développer

Palettes plates d'usage général pour le transport de marchandises
— Méthodes d'essai et exigences de performances

Entwurf zur weiteren Ausarbeitung

Allzweckflachpaletten für den durchgehenden Güterverkehr;
Anforderungen und Prüfung

Contents

National foreword	Page 2	Annex	
Committees responsible	Back cover	A Recommended performance requirements	19
Draft for Development		Tables	
Section one. General-purpose flat pallets for through transit of goods – Test methods		1 Conditioning environments	4
0 Introduction	3	2 Test load duration for static tests	6
1 Scope and field of application	3	3 Impact stop spacing	10
2 References	3	4 Drop heights for corner drop test	15
3 Definitions	3	Figures	
4 Measurement and checking of test pallets	3	1 Stacking test	5
5 Number of replicates and sequence of testing	4	2 Bending test using square supports and load applicators	6
6 Conditioning	4	3 Alternative pallet supports/load applicators	7
7 Accuracy of test apparatus	4	4 Bottom deck test with pallet inverted	8
8 Static tests	5	5 Load box for inclined plane tests	9
9 Impact tests	9	6 Shear test – Points of measurement	10
10 Test report	15	7 Inclined plane shear test	11
Section two. General-purpose flat pallets for through transit of goods – Performance requirements		8 Top deck impact test – Points of measurement	12
1 Scope	17	9 Impact stop for top deck edge and corner impact test rigs	12
2 Normative references	17	10 Top deck edge impact test rig	13
3 Definitions	17	11 Displacements x , y and z , and angles α and β	14
4 Number of pallets tested	17	12 Impact points in block impact test	14
5 Performance requirements	17	13 Corner drop test	15
6 Normal grade pallets (grade N)	17		
7 Special grade pallets (grade S)	18		

This publication is not to be regarded as a British Standard.

It is being issued in the Draft for Development series of publications and is of a provisional nature because the performance requirements given are subject to review by the International Standards Committee (ISO/TC51 Pallets for unit load method of materials handling). It should be applied on this provisional basis, so that information and experience of its practical application may be obtained.

A review of this Draft for Development will be carried out not later than two years after its publication. Notification of the start of the review period, with a request for the

submission of comments from users of this Draft for Development will be made in an announcement in the appropriate issue of *BSI News*. According to the replies received, the responsible BSI Committee will judge whether the Draft for Development can be converted into a British Standard or what other action should be taken.

Observations which it is felt should receive attention before the official call for comments will be welcomed. These should be sent to the Secretary of BSI Technical Committee PKM/554 at the BSI Manchester office, 3 York Street, Manchester M2 2AT.

National foreword

This Draft for Development has been prepared under the direction of the Packaging and Freight Containers Standards Policy Committee.

The objectives of this Draft for Development are:

- (a) to enable users to gain experience in the application of the test methods specified in section one;
- (b) to allow the performance levels proposed in section two to be checked in practical use, on a wide basis.

Section one of DD 188 is identical with ISO 8611 : 1988 'General-purpose flat pallets for through transit of goods — Test methods' and section two with ISO/TR 10233 : 1989, 'General-purpose flat pallets for through transit of goods — Performance requirements', published by the International Organization for Standardization (ISO). For ease of reproduction the ISO texts have been reproduced unchanged.

The UK has actively participated in the preparation of the ISO documents, providing the Conveners of the two ISO Working Groups involved, in addition to normal participation through BSI Technical Committee PKM/554. The Technical Committee will review any agreed amendment or addendum to the ISO texts and will update the text of the Draft for Development as appropriate. When ISO/TR 10233 is approved for publication as an international standard this Draft for Development will be converted to a British Standard or standards to replace BS 2629 : Part 3 : 1978, subject to Technical Committee approval.

Cross-references

International standard	Corresponding British Standard
ISO 445 : 1984	BS 6637 : 1985 Glossary of terminology for pallets for materials handling (Identical)
ISO 2244 : 1985	BS 4826 Complete, filled transport packages Part 5 : 1986 Method for determination of resistance to horizontal impact (Identical)

The Technical Committee has reviewed the provisions of ISO 6780, to which reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard. A related British Standard to ISO 6780 : 1988 is BS 2629 'Specification for pallets for materials handling through transit' Part 1 : 1989 'Principal dimensions and tolerances'.

Section one

General-purpose flat pallets for through transit of goods — Test methods

0 Introduction

The tests specified in this International Standard are particularly appropriate for testing pallet prototypes. They may also be valuable in point-of-manufacture, quality-assurance and field testing of pallets, but it is not intended that these tests be used for research purposes. Tests to establish data for pallet research will normally be considerably more comprehensive than those contained in this International Standard.

The majority of pallets are of conventional timber design. The tests specified in this International Standard are, to a large degree, applicable to such pallets. As new designs and materials, particularly plastics, are introduced, a pallet which meets the requirements for conventional timber designs may, however, be unfit for use in normal transit by virtue of undesirable properties. In such instances, the inclusion of special tests and special climatic conditioning prior to testing may have to be considered. Extension of the duration of the loading tests may also be desirable.

Suggested levels of performance in relation to the tests specified in this International Standard are not included but will be incorporated in a future Technical Report.

1 Scope and field of application

This International Standard specifies test methods for general-purpose flat pallets. The tests are principally intended for the evaluation of existing pallets or of new designs of pallet in relation to their designed load capacity.

Specific tests for wing pallets are not included. It is anticipated that such additional tests can be developed for inclusion in a future edition of this International Standard.

NOTE — The tests may also be of value in

- a) testing individual pallet components;
- b) development of prototype pallets;
- c) research into basic pallet performance (though these tests are not as comprehensive as most research requires: see note in clause 10);
- d) evaluation of pallets from in-use failure situations;
- e) testing at point of manufacture (unconditioned).

2 References

ISO 445, *Pallets for materials handling — Vocabulary*.

ISO 2244, *Packaging — Complete, filled transport packages — Horizontal impact tests (horizontal or inclined plane test; pendulum test)*.

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 445 apply.

4 Measurement and checking of test pallets

4.1 Pallets selected for testing shall be checked to ensure that materials, construction and dimensions conform with any stated specification (see clause 10).

4.2 The mass of each pallet shall also be determined and recorded, together with the moisture content of individual components at the time of weighing (where appropriate).

5 Number of replicates and sequence of testing

When evaluating a pallet in relation to its designed load capacity, a minimum of three replicates shall be tested. The complete sequence of seven tests shall be carried out consecutively in the exact order laid down in this International Standard.

For each complete sequence of tests, the same pallet shall be used, including those tests where it is necessary to test the pallet across both of its horizontal axes.

6 Conditioning

6.1 Temperature and moisture are known to affect pallets of a number of materials both under test and in the field. Conditioning prior to testing takes account of the reaction of the pallet material to the test environment and ensures valid and repeatable test results.

A further purpose of conditioning is to predict the behaviour of identical pallets in the extreme conditions that may be encountered in transit while loaded with goods.

6.2 Table 1 includes details of conditioning environments relevant to pallet usage. They shall be applied as follows:

- a) the moisture content of timber pallets should not be less than 18 %. If the moisture content is below this value, the test may proceed provided that the moisture content of critical components is recorded every 24 h until completion of the test programme;
- b) at least one specimen of a plastics pallet shall be conditioned to environment A and a further pallet to environment B;
- c) at least one specimen of paper-based and wood-based pallets shall be conditioned to environment C or D.

NOTE — Composite pallets consisting of two or more materials, for example hollow plastics blocks supporting plywood decks, may have to undergo more extensive conditioning.

6.3 Where conditioning is relevant and the whole test laboratory cannot be maintained at the required level, then tests shall commence within 1 h after the pallet has been removed from the conditioning chamber. When environments A and B apply, the tests shall commence immediately after the pallet has been removed from the conditioning chamber. Immediately after each individual test, specimens subjected to environments A or B shall be returned to the conditioning chamber for a minimum of 1 h.

6.4 For wood or wood-based materials, a record shall be made of the moisture content in selected components at the beginning of the full test programme.

7 Accuracy of test apparatus

7.1 Test apparatus described in clauses 8 and 9 shall satisfy the following requirements:

- a) in the design of the test equipment, the tolerances on all dimensions shall be ± 2 %;
- b) the resolution/accuracy of measuring equipment for tests shall be better than $\pm 0,5$ mm;
- c) the accuracy of positioning of every component, excluding the test load, shall be ± 2 mm;
- d) the accuracy of positioning of the centre of gravity of the test loads referred to in clause 8 shall be ± 20 mm;
- e) the total mass of the test loads used shall be within ± 3 % of the predetermined value.

7.2 No part of any test rig shall deflect an amount greater than 2 mm when under maximum test load.

7.3 The inclined plane apparatus shall be constructed as specified in ISO 2244.

Table 1 — Conditioning environments

Conditioning environment	Atmosphere	Temperature °C	Relative humidity %	Time h	Pallet material
No conditioning required [see 6.2a)]					Unprocessed (sawn) timber with metal fastenings
A	Air	40 $\pm$ 2	—	24	Plastics
B	Air	– 25 $\pm$ 3	—		
C	Air	25 $\pm$ 5	90 $\pm$ 5	48	Paper-based and processed wood (for example plywood, particle board) ¹⁾
D	Water	20 $\pm$ 5	—	24	
No conditioning required					All metal

1) Includes any pallet containing or assembled with adhesive.

8 Static tests

For all static tests described in 8.1 to 8.3, the test load applied shall include in all cases the mass of any load board and load applicators.

8.1 Stacking test

The purpose of this test is to determine the compression strength of the pallet or pallet corner block to localized vertical loads.

8.1.1 Deformation measurements

When tested in accordance with the method specified in 8.1.2, the change in the height, y , of the top deck at point A, as shown in figure 1, relative to the ground (or test frame) shall be recorded

- at the datum load (see 8.1.2);
- at the beginning and end of the full load period;
- upon unloading, at the datum load (see 8.1.2), every 5 min until successive readings are identical (limited to a maximum period of 1 h).

The deflection at A is established by taking the mean value of measurements at points A₁ and A₂ (see figure 1).

Similar measurements shall be made relating to point B when the test is repeated on the diagonally opposite corner (see 8.1.2).

8.1.2 Procedure

Place the pallet in a normal position on a flat, hard, rigid, horizontal surface. Place a rigid load applicator of dimensions 200 mm × 200 mm × 25 mm, over an outer block [as shown in figure 1a)] or, in the case of a stringer pallet, over one end of a stringer [as shown in figure 1b)].

Gradually apply the test load at a uniform rate from 0 to 0,25 R where R is the designed load capacity of the pallet, assuming an evenly and uniformly distributed load. This shall be the datum for subsequent deflection measurements. Apply the full test load of 1,1 R , per loaded block, in not less than 1 min and not more than 5 min. If deadweight is used for the test load, it shall be symmetrically built up during loading. Keep the full test load in place for a period of 2 h or 24 h, depending on the pallet material (see table 2).

Reduce the test load to the datum load for the necessary period [see 8.1.1 c)].

Take deflection measurements relating to point A (see 8.1.1).

Repeat the test at point B (see figure 1) so that the test shall have been carried out on two diagonally opposed corners of the pallet. Take a further set of deflection measurements relating to point B (see 8.1.1).

NOTE — Alternatively the test may be carried out on several corners simultaneously with an appropriate increase in full test load (i.e. 2,2 R on two corners or 4,4 R on four corners).

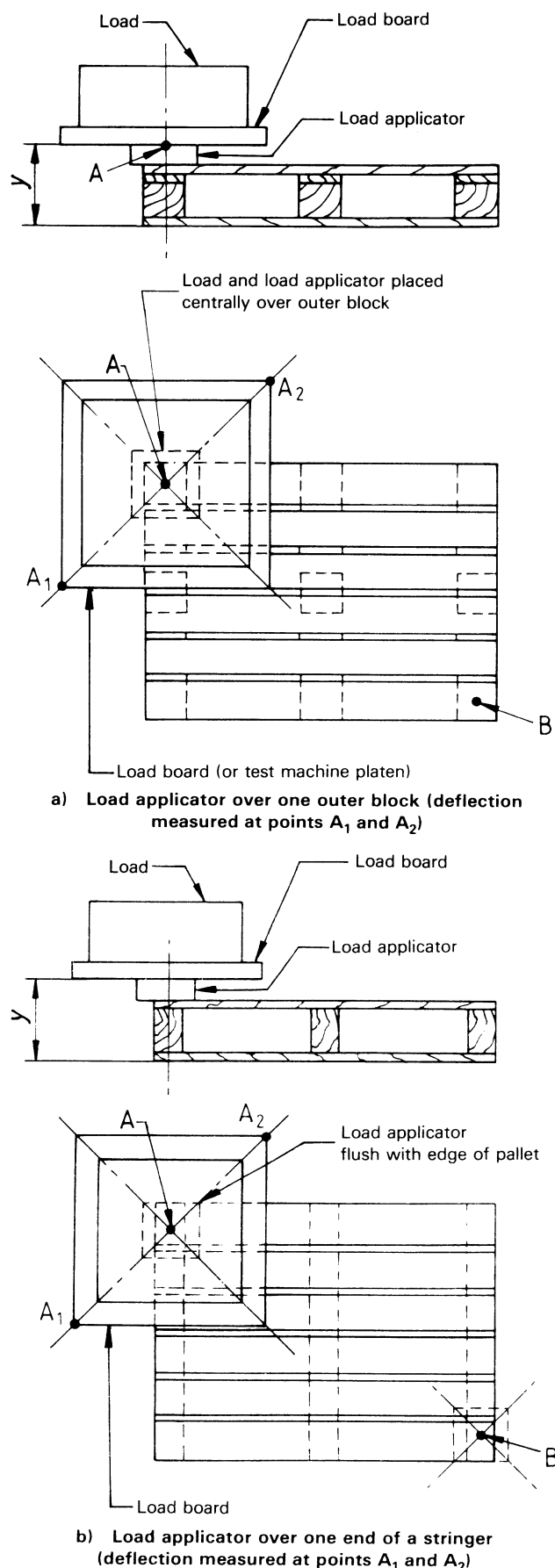


Figure 1 — Stacking test