BRITISH STANDARD

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13626:2003

Packaging — Box pallets — General requirements and test methods

The European Standard EN 13626:2003 has the status of a British Standard

ICS 55.180.20

BSI
British Standards

National foreword

This British Standard is the official English language version of EN 13626:2003.

The UK participation in its preparation was entrusted by Technical Committee PKW/5, Primary and transport packaging, to Subcommittee PKW/5/34, Pallets, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

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Packaging - Box pallets - General requirements and test methods

Emballage - Caisses palettes - Exigences générales et méthodes d'essai

Verpackung - Boxpaletten - Allgemeine Anforderungen und Prüfverfahren

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This document (EN 13626:2003) has been prepared by Technical Committee CEN /TC 261, "Packaging", the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2003, and conflicting national standards shall be withdrawn at the latest by October 2003.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

Box pallets are intended for repeated use while maintaining their service ability and their safe handling.

They may be used for:

- Mechanical handling by fork-lift and hand-pallet trucks.
- Bulk storage in stacks storage where, for safety reasons, it is not advisable to stack box pallets to a height exceeding seven times the smaller horizontal dimension of the box pallet.
- Transport:

This standard is performance-based, i.e. no minimum values are fixed. It reflects ISO 8611-1 in this respect. Box pallets should be tested in accordance with the claimed performances. The standard evaluates performances in relation to the load capacity of a box pallet carrying a uniformly distributed load used as test load and called the nominal load. However, it is recognised that the actual safe working load for a box pallet could vary with the type of load carried and that, for a specific type of load, the maximum working load may be smaller or larger than the nominal load of a box pallet. Therefore, the allowable maximum load for a given design of box pallet vary according to the characteristics of the type of load carried.

1 Scope

This European Standard sets out definitions and specifies general requirements and test methods regarding the use of reusable box pallets.

This draft European Standard applies to box pallets, post pallets and cage pallets, but excludes tank or silo pallets, as defined in EN ISO 445. They can be fixed, collapsible or demountable. This European Standard only applies to the above mentioned products which are handled with fork lift trucks or pallet trucks and no other lifting devices.

Tests for storage in racks and specific transportation conditions are not addressed by this European Standard.

NOTE For the purposes of this standard, the term box pallet covers box pallets, post pallets and cage pallets, as defined in 3.1.1.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 13183-1. *Moisture content of a piece of sawn timber - Part 1: Determination by oven dry method*

EN 13183-2 *Moisture content of a piece of sawn timber - Part 2: Estimation by electrical resistance method*

EN 13382, *Flat pallets for materials handling — Principal dimension.*

EN 22206*, Packaging - Complete, filled transport packages - Identification of parts when testing (ISO 2206:1987).*

EN 22248, *Packaging - Complete, filled transport packages - Vertical impact test by dropping (ISO 2248:1985).*

EN ISO 445, *Pallets for materials handling – Vocabulary (ISO 445:1996).*

EN ISO 2233*, Packaging - Complete, filled transport packages and unit loads - Conditioning for testing (ISO 2233:2000)*

EN ISO 2234, *Packaging - Complete, filled transport packages and unit loads - Stacking tests using a static load (ISO 2234:2000)*

EN ISO 2244, *Packaging - Complete, filled transport packages and unit loads - Horizontal impact tests (ISO 2244:2000)*

EN ISO 2247, *Packaging - Complete, filled transport packages and unit loads - Vibration tests at fixed low frequency (ISO 2247:2000)*

3 Terms, definitions, symbols and abbreviations

3.1 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply:

3.1.1
box pallet
box pallet, post pallet or cage pallet, as defined in EN ISO 445, whether fixed, collapsible or demountable. (see Figures 1 to 5)

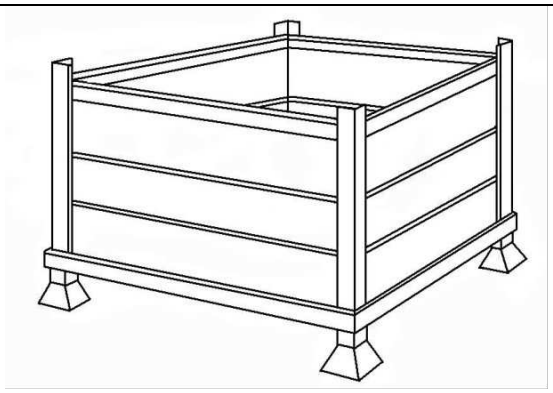


Figure 1 - Box pallet

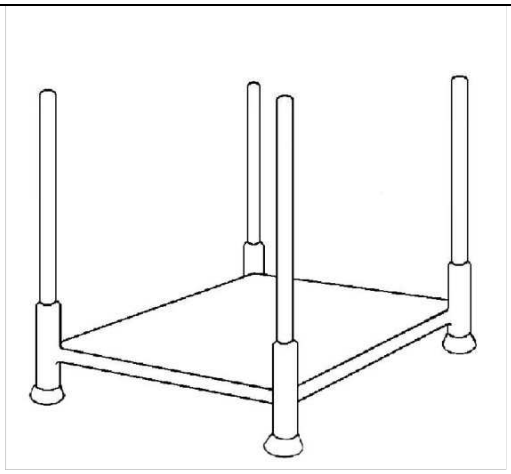


Figure 2 - Post pallet

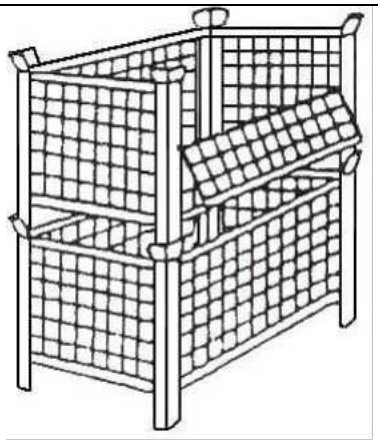


Figure 3 - Cage pallet

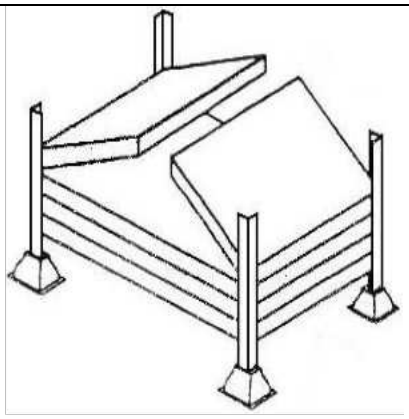


Figure 4 - Collapsible box pallet

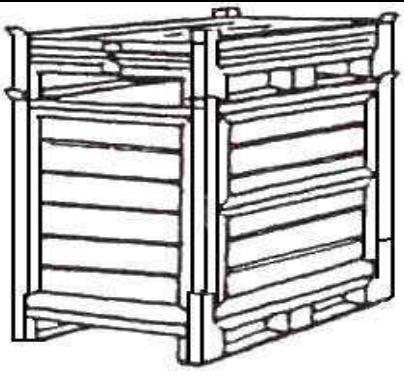


Figure 5 - Demountable box pallet

3.1.2
nominal load
maximum permitted load which may be placed in the box pallet. It is expressed in kilograms and assumes a uniformly distributed load (when the box pallet is not tested with the actual product or family of products but with the dummy ballast set in 5.2)

3.1.3
nominal stacking load
maximum permitted load which may be placed on the box pallet resting on the ground (of a storage area for instance). It is expressed in kilograms and, if appropriate, in the number of box pallets which may be stacked on the one resting on the ground. In the latter case, the following abbreviation is used: 1/1 (stack of two box pallets), 2/1 (stack of three box pallets), etc. It assumes a uniformly distributed load (when the box pallet is not tested with the actual product or family of products but with the dummy ballast set in 5.2)

3.1.4
dynamic load
test load used in the vibration test in order to simulate an average transportation situation

3.1.5
test load
load applied during test in or on the box pallet in order to simulate storage and transport conditions

3.2 Symbols and abbreviations

F_l	Force applied parallel to the length of the box pallet in the lift truck stacking test, in newtons
F_w	Force applied parallel to the width of the box pallet in the lift truck stacking test, in newtons
g	9,81 ms^{-2}
H	Height of the box pallet in metres
l	Length of the box pallet in metres
n	Number of box pallets to be stacked on top of a box pallet submitted to tests
w	Width of the box pallets in metres
μ	Coefficient of static friction

4 Requirements

4.1 Stacking devices

Box pallets shall be designed or equipped in order to allow stacking.

4.2 Dimensions

The structure shall allow handling from the bottom using fork lift trucks and/or pallet trucks with entries conforming to EN 13382. In addition, the height of the box pallet shall not exceed twice the smallest base dimension to ensure stability of the product.

4.3 Nominal Load - Nominal Stacking Load - Dynamic Load

4.3.1 Nominal Load - Nominal Stacking Load

The values of nominal load and nominal stacking load shall be those given in the manufacturer's specifications or those marked on the product. The manufacturer may also stipulate a value before the test.

4.3.2 Dynamic Load

Dynamic load shall be specified by the manufacturer in accordance with any transportation limits on vehicles. For example, a value of 2000 kg/m² is commonly observed and thus limits the dynamic capacity of box pallets.

5 Tests

5.1 Sampling for the tests

The number of box pallets required for the tests is at least one for each test, except in 5.4 where two are needed.

NOTE 1 It is recommended for repeatability and quality of the tests to use more than one sample.

NOTE 2 The full range of tests can be done on the same sample if the effects of the tests are clearly identified.

It is necessary to ensure that the box pallet subjected to the tests is complete and, when appropriate, fitted with the accessories expected to be used (covers, toggle-fasteners etc. ...) as if it were ready for use.

5.2 Ballast

The ballast is made up of:

— either the actual product to be transported or a product having the same physical characteristics.

In this case, the test certificate is only valid for such product;

— or one of the following dummy ballasts:

  — ballast n°1: sand,

  — ballast n°2: plastic granules,

Unless otherwise specified, the test load, consisting of receptacles filled with ballast n°1 or 2, shall be uniformly spread and shall occupy more than 80 % of the capacity of the box pallet.

5.3 Climatic conditioning

No climatic conditioning is required as a general rule for all-metal box pallets. For box pallets consisting completely or partially of other materials, it is necessary to apply the conditioning specifications mentioned in Table 1 (in accordance with EN ISO 2233) before testing. Unless otherwise specified, the tests shall be carried out at the temperature given in Table 1.

Table 1 — Conditioning before testing

Material	Temperature °C	Humidity (RH) %	Moisture content %	Minimum duration h
Plastic [b]	+23 ± 2	--	--	48
Wood	+23 ± 2	--	20 ± 2 [a]	24
Wood based panels	+20 ± 2	50 ± 5[c]	--	48

[a] In the event that end use is not known then the moisture content should be 20 ± 2 %. If the moisture content is outside this value, the tests may proceed provided that the moisture content of critical components is recorded at the beginning and end by non-destructive means (by portable electrical resistance-type moisture meter which enables corrections to be made when reporting according with EN 13183-2) prior to the use of EN 13183-1 (oven drying method) which shall be used shortly after the test programme.

[b] For plastics, if the variation of the raw material performances at the temperature of use are greater than 20 % from the ones at temperature determined in Table 1, the test shall be conducted at that temperature (for instance drop test at (- 20 ± 2) °C or stacking test at (40 ± 2) °C). In this event, conditioning for the test shall last at least 24 hours in order to have homogeneous temperature through the material.

[c] For wood based panels, it is acknowledged that humidity may change widely the performances of the pallet. High relative humidity conditions of use imply tests with relevant parameters (higher temperature and/or higher relative humidity).

5.4 Stacking test using a static load

5.4.1 General

The test shall be performed in accordance with EN ISO 2234, using an unguided load (see Figure 6).

5.4.2 Standard calculation — Equation 1

The test load shall be calculated in accordance with equation 1:

$$\text{Test Load} = 1{,}5 \times n \times (\text{Tare weight} + \text{Nominal load}) \quad (1)$$

where:

n : number of box pallets to be stacked on top of a box pallet submitted to tests

5.4.3 Folded box pallets — Equation 2

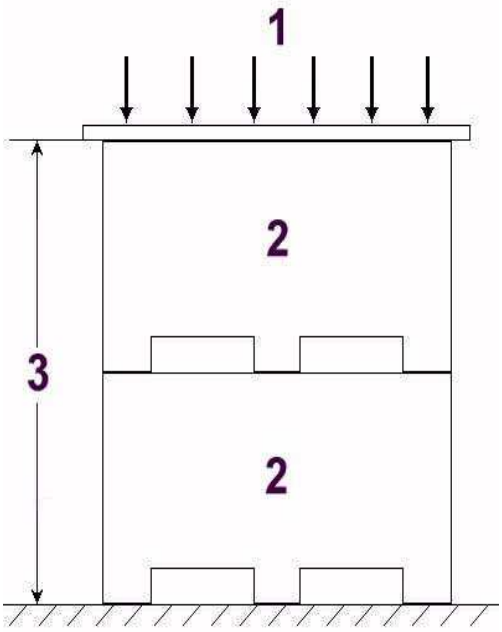
The test load for foldable box pallets shall be calculated in accordance with equation 2 :

NOTE Empty foldable box pallets are usually stored in a folded position in high stacks. This situation may lead to damage of the foldable parts which make the product unable to fulfil its original use.

$$\text{Test Load} = 1{,}5 \times n \times \text{Tare weight} \quad (2)$$

where:

n : number of box pallets to be stacked on top of a box pallet submitted to tests



Key
1 Test load
2 Empty box pallet
3 Height of the stack

Figure 6 — Stacking test using a static unguided load

5.4.4 Test procedure

The test parameters to be used are given in Table 2.

1) place the first empty box pallet on a flat rigid surface; stack the second empty box pallet on the top of the first one;

2) apply 10 % of the test load on the second box pallet. Measure the height of the two box pallets stack at all four corners (1st measurement);

3) apply 100 % of the test load for time specified in Table 2. Then measure the height of the two box pallets stack at all four corners (2nd measurement);

4) remove the test load from the box pallets;

5) allow relaxation of the test sample according Table 2;

6) apply 10 % of the test load on the stack. Measure the height of the two box pallets stack at all four corners (3rd measurement).

Table 2 — Test parameters for stacking test and base deflection test

Material	Full Load duration (h)	Maximum relaxation duration (h)
Plastics	96	24
Unprocessed (saw) timber with metal fastenings	2	24
Wood based panels	24	24
All metal	0,25	--

NOTE The relaxation process can be stopped when two readings or two successive measurements are identical or less than 0,1 %.

5.4.5 Assessment criteria

5.4.5.1 Where the contents of the box pallet consist of equipment, note whether this equipment operates normally before and after the test.

5.4.5.2 Breakage resulting in the box pallet being able to withstand no further handling or affecting its stability during stacking shall not happen,

5.4.5.3 Compression under load (average value of the four 2nd measurements minus the 1st measurements) shall not exceed 2 % of the height of the stack,

5.4.5.4 Residual compression (average value of the four 3rd measurements minus the 1st measurements) shall not exceed 1 % of the height of the stack.

5.4.5.5 Other assessment criteria may be taken into consideration in each individual test, by agreement between the manufacturer and the user.

5.5 Vertical impact by dropping

5.5.1 Applicability

This test is not compulsory for all metal box pallets.

5.5.2 Vertical impact by dropping

The test shall be performed in accordance with EN 22248. The box pallet shall be loaded with its nominal load.

5.5.3 Test Procedure

1) load the box pallet;

2) lift it to a height of 0,10 m and place it in the appropriate alignment. According EN 22206, one impact test is done on edges 2-3 and 3-5 and on corner 3-2-5 as defined in EN 22206 (see Figure 7);

3) after the vertical impact test, do the other impact tests with the same product.

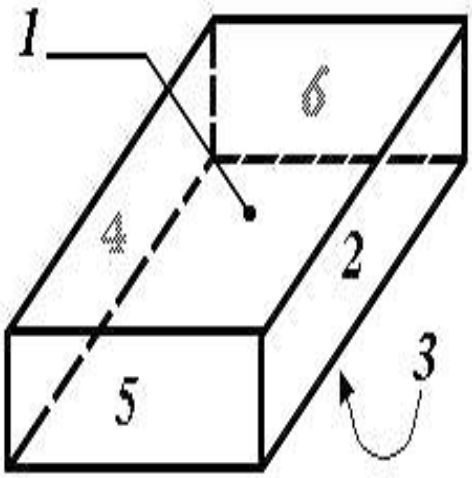


Figure 7 — Identification of the parts

5.5.4 Assessment criteria

5.5.4.1 Where the contents of the box pallet consist of equipment, note whether this equipment operates normally before and after the test.

5.5.4.2 Breakage resulting in the box pallet being able to withstand no further handling or affecting its stability during stacking shall not happen,

5.5.4.3 Other assessment criteria may be taken into consideration in each individual test, by agreement between the manufacturer and the user.

5.6 Localised impact test

5.6.1 Purpose

The purpose of this test is to find the weakest point of the box pallet and to test it, whatever the design and construction.

5.6.2 Principle

Application of a horizontal force to the box pallet, followed by its impact against a post with a specified shape.

5.6.3 Apparatus

5.6.3.1 Inclined plane in accordance with EN ISO 2244,

5.6.3.2 Impact stop (see Figure 8) to concentrate the impact onto one part of the box pallet. The impact stop is mounted on the fixture forming an angle of (7 ± 1)° in relation to the contact plane of the dolly (see Figure 9). The box pallet shall be loaded with its nominal load.

5.6.4 Test Procedure

1) place the box pallet onto the dolly with the impact stop in contact with the part of the box pallet to be tested;

2) load the box pallet with the appropriate ballast;

3) set the testing apparatus (travel of the dolly) to reach the predetermined impact speed of 1,3 ms^{-1} ± 5 %;

4) carry out the impact test, 3 times per impact point;

5) points of impact: (see Figure 10)

   — 1 on the long side of the deck (a);

   — 1 on the short side of the deck (b);

   — 1 on a block (c);

   — 1 on the junction of the corner block and the deck (d).

5.6.5 Assessment criteria

5.6.5.1 Where the contents of the box pallet consist of equipment, note whether this equipment operates normally before and after the test.

5.6.5.2 Breakage resulting in the box pallet being able to withstand no further handling or affecting its stability during stacking shall not happen,

5.6.5.3 Others refusal criteria may be taken into consideration in each individual test, by agreement between the manufacturer and the user.

Dimensions in millimetres

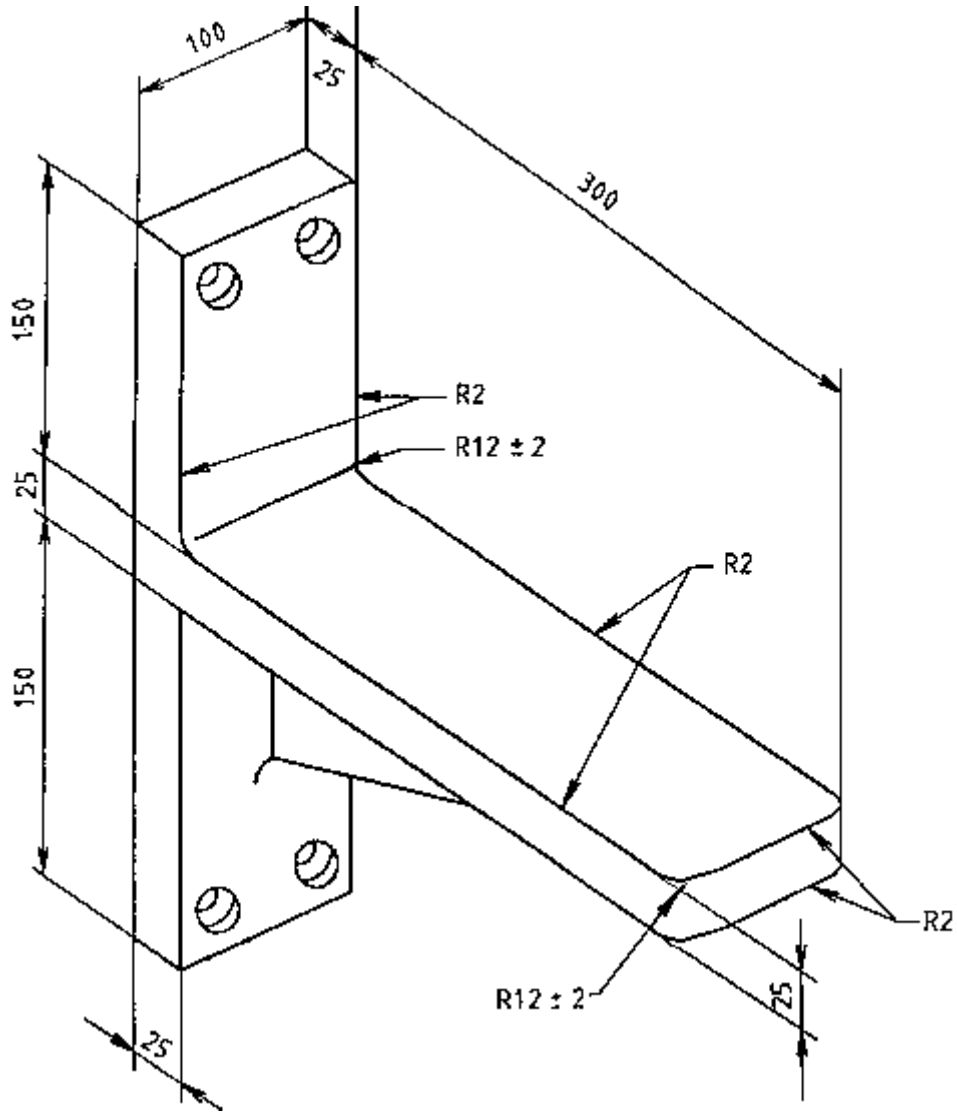
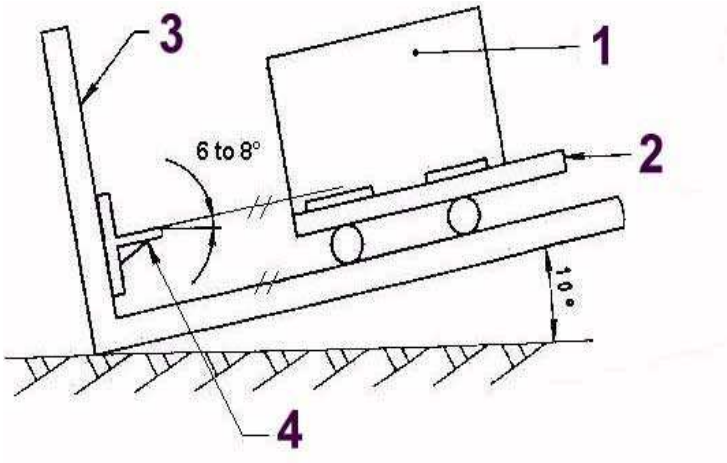
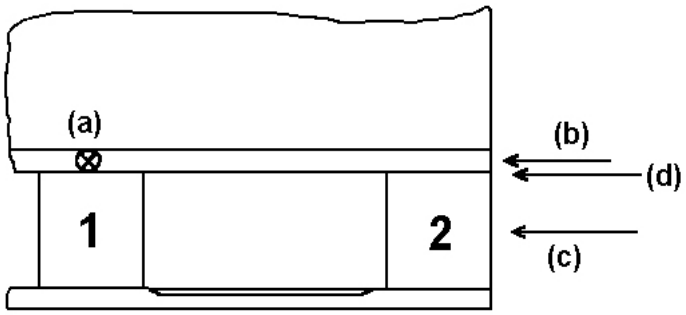


Figure 8 — Impact Stop



Key
1 Box pallet
2 Dolly
3 Fixture
4 Impact stop

Figure 9 — Impact Test



Key
1 Centre block
2 Corner block

For (a), (b), (c), (d) see 5) of 5.6.4

Figure 10 — Points of impact

5.7 Base deflection test

5.7.1 Applicability

This test is not compulsory for all metal box pallets.

5.7.2 Principle

Positioning of the box pallet with ballast on hard surface (concrete or harder material). The test enables the rigidity and the bending resistance of the base of the box pallet to be tested, both longitudinally and transversally. After the test, the box pallet shall be able to be handled by usual handling means.

NOTE This test ensures that the bottom of the box pallet is strong enough to allow handling. It is not a bending test, as described in ISO/DIS 8611-1.

5.7.3 Apparatus

Flat, horizontal, hard and rigid supporting surface. The test shall be performed in accordance with Figure 11.

5.7.4 Base deflection test

The test load shall be 1,5 times the nominal load.

5.7.5 Test procedure

1) Place the box pallets in position (see Figure 11),

2) First apply an unguided load uniformly distributed over the base of the box pallet equal to 10 % of the test load, then implement the load up to 100 % of the test load,

3) Measure the distance d at the lowest point of the box pallet bottom, after a the time specified in Table 2 of subjection to 100 % of the test load.

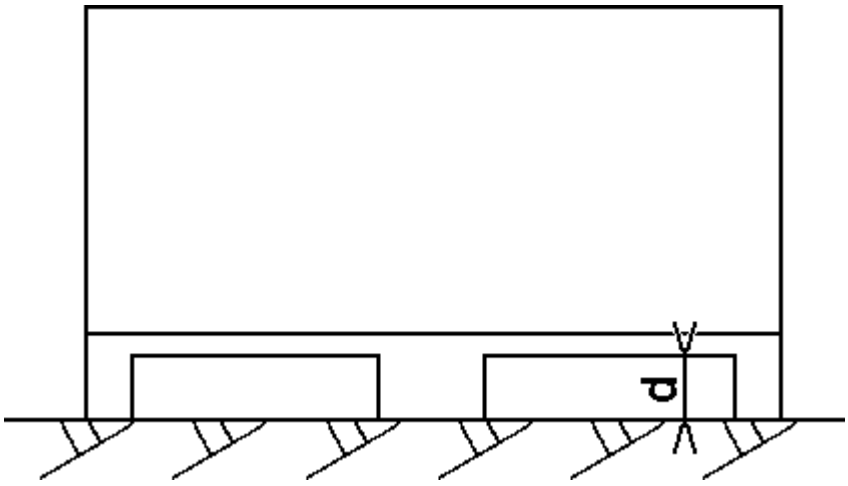


Figure 11 — Base deflection Test

Key
d Entry height

5.7.6 Assessment criteria

5.7.6.1 Where the contents of the box pallet consist of equipment, note whether this equipment operates normally before and after the test.

5.7.6.2 Breakage resulting in the box pallet being able to withstand no further handling or affecting its stability during stacking shall not happen,

5.7.6.3 Entry height under load shall be greater or equal to 95 mm,

5.7.6.4 Other assessment criteria may be taken into consideration in each individual test, by agreement between the manufacturer and the user.

5.8 Vibration Test

5.8.1 Applicability

This test is compulsory for foldable or demountable box pallets.

NOTE 1 Fixed box pallets and non collapsible or non demountable box pallets are usually not affected by such a test

NOTE 2 The box pallet should be marked with the dynamic load assessed by this test.

5.8.2 Principle

The testing is carried out in accordance with EN ISO 2247. The box pallet is positioned in a predetermined attitude on a vibrating table with a stacked load of specified value and subjected to vibration.

5.8.3 Apparatus

Vibrating table of rigid construction with appropriate dimensions and capacity, mounted on a mechanism capable of holding it in the horizontal plane during vibration. The difference in level between the two ends of the surface of the table shall not exceed 10 mm.

The table may be equipped with :

- a low enclosure designed to restrict lateral and longitudinal movement of the load during testing ;
- a high enclosure or any other device enabling the stacked load on the box pallet to undergo the test ;
- devices to simulate the stowage method of the box pallet during transport.

The movement of the table is elliptical within a vertical plane with a main vertical axis of 15 mm (peak to peak) and with a secondary horizontal axis of 6 mm (peak to peak).

5.8.4 Test procedure

a) place the box pallet with ballast (see below) onto the vibrating table in the predetermined position;

b) place the load onto the box pallet. This load may consist of another identical box pallet with appropriate ballast;

c) operate the vibration with the following parameters :

- frequency : (3,5 ± 0,5) Hz (avoid resonance);
- duration of the first phase (horizontal movement parallel to the length of the box pallet) : 2 hours;
- duration of the second phase (horizontal movement parallel to the width of the box pallet) : 2 hours;
- applied test load calculated in accordance with equation (3).

$$\text{test load} = n \times (\text{tare weight} + \text{nominal load}) \quad (3)$$

with a maximum test load of (2000 kg/m2 × w × l) – tare weight

and n : number of box pallets to be stacked on top of a box pallet during transport

NOTE The value of 2000 used above corresponds to the maximum permitted load in trucks (2000 kg/m²).

5.8.5 Assessment criteria

5.8.5.1 Where the contents of the box pallet consist of equipment, note whether this equipment operates normally before and after the test.

5.8.5.2 Breakage resulting in the box pallet being able to withstand no further handling or affecting its stability during stacking shall not happen,

5.8.5.3 Other assessment criteria may be taken into consideration in each individual test, by agreement between the manufacturer and the user.

5.9 Lift truck stacking test

5.9.1 Principle

This test shall only be carried out on metal box pallets. The box pallet shall be fixed in order to keep the legs in contact with the floor during the test. The forces F_l and F_w are applied to one structure top corner at the level of the stacking device. This forces F_l and F_w are respectively parallel to the length *l* and the width *w*. They are pointed towards the outside of the box pallets (see Figure 12). The corner submitted to the test is at least resistant to deflection. If the box pallet is not designed to be lifted by forks introduced perpendicularly to the width, the test with the force F_l shall not be carried out. The purpose of this test is to simulate the loads induced by the deflection of the structure when a box pallet is stacked on the top of a stack. The test is carried out on one corner since the stacking is generally non symmetric.

5.9.2 Apparatus

Device to apply a static force equal to F_l and F_w.

Testing equipment to record the permanent deformation

5.9.3 Test Procedure

- apply the force F_w for 10 s;
- remove the static force and record the initial position of the top of the structure;
- apply the force *F*w for 10 s;
- remove the static force and record the position of the top of the structure. Calculate the permanent deformation;
- same procedure for F_l when the test is carried out (see principle).

F_w and F_l shall be calculated according equations (4) and (5) :

$$F_w = ((\text{Tare weight} + \text{Nominal Load}) \times g \times w) / (2 \times H) \quad (4)$$

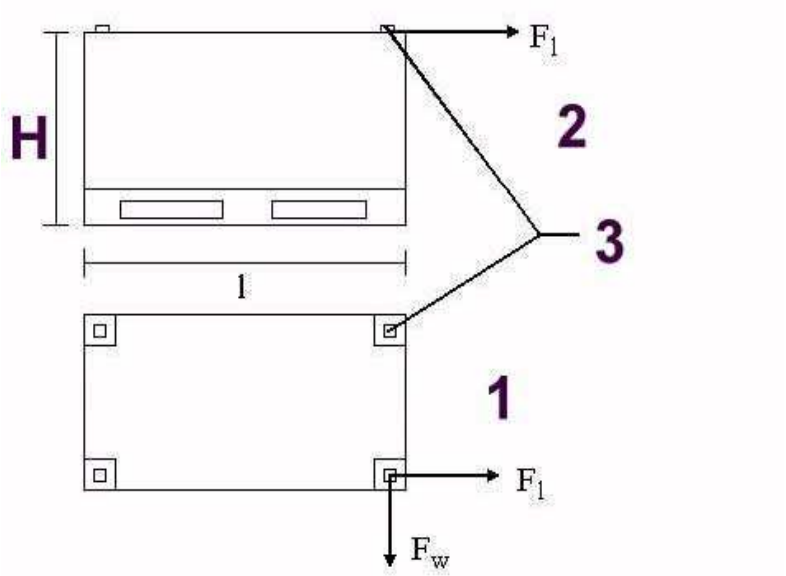
$$F_l = ((\text{Tare weight} + \text{Nominal Load}) \times g \times l) / (2 \times H) \quad (5)$$

5.9.4 Assessment criteria

5.9.4.1 Where the content of the box pallet consist of equipment, note whether this equipment operates normally before and after the test.

5.9.4.2 Breakage resulting in the box pallet being able to withstand no further handling or affecting its stability during stacking shall not happen.

5.9.4.3 Others refusal criteria may be taken into consideration in each individual test by agreement between the manufacturer and the user.



Key
1 Top view
2 Side view
3 Stacking device
H Height of box pallet

For F_1 and F_W, see equations (4) and (5)

Figure 12 — Lift Truck Stacking Test

5.10 Determination of static friction coefficient

5.10.1 Principle

This test shall ensure that the coefficient of static friction μ value of the box pallet deck underside is, when in contact with steel forks, above a certain minimum. This reduces the risk of dangerous sliding of an empty or loaded pallet in motion.

5.10.2 Test Procedure

— weight the box pallet ; record tare weight;

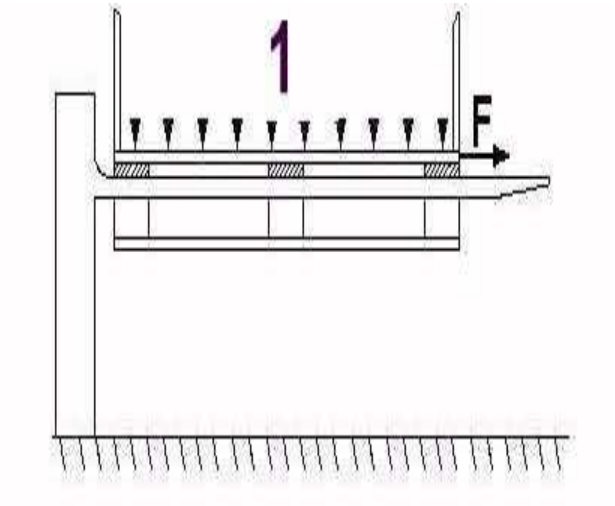
— place the box pallet on horizontally positioned grease free, dry, steel forks set level to ±1° (see Figure 13);

— gradually increase force *F* until motion commences and record this value;

— repeat this test 3 times and take an average value;

— determine the coefficient of friction μ according equation (6) :

$$\mu = F / \text{tare weight} \quad (6)$$



Key
1 Tare weight

Figure 13 — Determination of static friction coefficient

5.10.3 Assessment criteria

The value of μ shall be a minimum of 0,20.

6 Marking

Each box pallet shall be marked in a visible and durable manner with at least the following information:

a) reference to this standard;

b) manufacturer identification;

c) nominal load;

d) nominal stacking load;

e) tare weight;

f) production date (month and year).

7 Test report

The test report shall include the following information:

a) reference to this standard;

b) number of box pallets subjected to testing;

c) identification and description of the box pallet subjected to testing according to the information given by the box pallet supplier (type, model, materials and constituent components, assembly, method of closure, details, outside dimensions in millimetres);

d) precise identification of the contents and their position inside the box pallet;

e) tare-weight of the complete box pallet and the net weight of its contents, in kilograms;

f) prior conditioning of the box pallet and its contents before testing, as well as the climatic conditions during testing;

g) identification of the faces of the box pallet determined in accordance with EN 22206;

h) test conditions and the apparatus used;

i) description of the box pallet and its contents after testing, accompanied if appropriate by a sketch or photographs;

j) report of results and all the details observed during testing which might help correct interpretation of the results or improvement of the design of the box pallet;

k) any deviation from this standard;

l) date;

m) signature of the operator.

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