
**Pallets for materials handling — Flat
pallets —**

**Part 1:
Test methods**

Palettes pour la manutention — Palettes plates —

Partie 1: Méthodes d'essai

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ISO 8611-1:2004

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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 2.

The main task of technical committees is to prepare International Standards. 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 document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 8611-1 was prepared by Technical Committee ISO/TC 51, *Pallets for unit load method of materials handling*.

This first edition, together with ISO 8611-2 and ISO 8611-3, cancels and replaces ISO 8611:1991.

ISO 8611 consists of the following parts, under the general title *Pallets for materials handling — Flat pallets*:

- *Part 1: Test methods* [ISO 8611-1:2004](https://standards.iteh.ai/catalog/standards/sist/47e2b368-90fd-4dca-bdd3-68529270157d/iso-8611-1-2004)
- *Part 2: Performance requirements and selection of tests* (Technical Specification)
- *Part 3: Maximum working load* (Technical Specification)

Introduction

The 1991 edition of ISO 8611 described a system of sequential testing that relied upon a pallet passing every test in a series. This meant that one pallet could be near to failure in one particular test where another pallet might be substantially over-designed. Using the (earlier) deflection criteria, both pallets were presented as equals in terms of safety factor. The notched stringer pallet was a good example of this where it was typically very stiff, but frequently near fracture point in the (old) bending test. The new, three-part version of ISO 8611 redresses this in failing every specimen in order to establish a definite safety factor. Stiffness is dealt with as a separate series of measurements conducted during testing.

Conducting the tests requires experience in testing (including the load) and also some expertise of the materials under test. This part of ISO 8611, in conjunction with ISO/TS 8611-2 and ISO/TS 8611-3, has been expressly designed to cover all pallet materials either when used alone or used as composites. A further change over ISO 8611:1991 is that all pallets for materials handling are now covered and not just high quality through-transit, exchange or pool pallets.

This part of ISO 8611 cannot be used to evaluate a pallet to normative ISO requirements without the additional application of ISO/TS 8611-2 and ISO/TS 8611-3.

This part of ISO 8611 was designed to be coupled with ISO/TR 10232:1989 *General-purpose flat pallets for through transit of goods — Design rating and maximum working load* and ISO/TR 10233:1989 *General-purpose flat pallets for through transit of goods — Performance requirements*.

The changing of the title and the scope of ISO 6780 from *General purpose flat pallets for through transit of goods — Principal dimensions and tolerances*, to a wider scope of *Flat pallets for intercontinental materials handling — Principal dimensions and tolerances*, makes it necessary to amend ISO 8611:1991 and the Technical Reports ISO/TR 10232 and ISO/TR 10233. The test methods, performance requirements and design rating and maximum working load should now include not only “general purpose pallets” but also all other pallets for materials handling.

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Pallets for materials handling — Flat pallets —

Part 1: Test methods

1 Scope

This part of ISO 8611 specifies test methods of existing and prototype flat pallets for materials handling (for all types of use).

NOTE Specific tests for determining load capacity do not replace the value of conducting field tests on specific pallet designs.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 445, *Pallets for materials handling — Vocabulary*:2004

ISO 2244, *Packaging — Complete, filled transport packages and unit loads — Horizontal impact tests*

ISO/TS 8611-2:—¹⁾, *Pallets for materials handling — Flat pallets — Part 2: Performance requirements and selection of tests*

ISO 12777-1, *Methods of test for pallet joints — Part 1: Determination of bending resistance of pallet nails, other dowel-type fasteners and staples*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 445 (some of which are repeated below for convenience) and the following apply.

3.1

test load

load applicators, the load board or load box and the applied load itself

1) To be published.

**3.2
ultimate load**

load at which compression, displacement or deflection is no longer contained, resulting in the destruction of the specimen or breaking of one component, or when displacement, deformation or deflection becomes excessive

NOTE See Table 1 of ISO/TS 8611-2:—.

**3.3
stiffness**

relative deformation of a pallet or component under load

NOTE High stiffness means small displacement, deflection or deformation, for a given load.

**3.4
racking**

storage of loaded pallets in drive-in or beam racks

**3.5
stacking**

placing of pallets with unit loads one upon the other without recourse to intermediate shelves or racking

**3.6
payload**

load carried by the pallet in use

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4 Measurements

4.1 Pallets selected for testing shall be checked to ensure that materials, construction and dimensions conform to any associated written specification. [ISO 8611-1:2004](https://standards.iteh.ai/catalog/standards/sist/47e2b368-90fd-4dca-bdd3-68529270157d/iso-8611-1-2004)

4.2 The mass and the material of each pallet shall be determined and recorded at the time of testing.

4.3 The moisture content of wooden pallets shall be measured and recorded in accordance with EN 13183-2 at the time of testing.

NOTE Clause 11 gives further details on what should be recorded during testing and in the written report.

5 Accuracy of tests and apparatus

5.1 Test apparatus shall satisfy the following requirements:

- a) in the design of the test equipment, the tolerances on all dimensions shall be ± 2 %;
- b) the accuracy of measuring equipment for tests shall be $\pm 0,5$ mm;
- c) the accuracy of positioning of every component, excluding the test load, shall be ± 2 mm, measurement gauges shall be positioned to ± 4 mm;
- d) the accuracy of positioning of the centre of application of test load (where used) shall be ± 10 mm;
- e) the total mass of the test load applied shall be within ± 3 % of the prescribed value.

5.2 No part of any test rig shall distort an amount greater than 3 mm when under maximum test load. Distortion of the test rig shall be taken into account in measuring deflections of the pallet.

NOTE Using heavy duty steel box sections in the construction of fixtures in tests 1 and 2 (see Table 1) will normally result in central distortions approaching the 3 mm given limit.

5.3 The inclined plane apparatus shall be constructed as specified in ISO 2244 and shall permit inclined travel distance to change by 250 mm increments from 250 mm to 1 250 mm, each increment to within ± 5 mm.

6 Test load

A general value for the test load is not fixed. The test load for each test is defined in ISO/TS 8611-2.

The test load shall be applied with hydraulic or air pressure or with dead load and shall increase continuously or in steps to the failure (for determination of ultimate load) or up to the fixed value (for qualification tests).

7 List of tests

The matrix of tests applicable to this document are as shown in Table 1.

For tests numbered 1, 2, 3, 4, 5 and 8, two tests (a and b) are necessary, which can be carried out in one test sample (first b and then a) or in two separate test samples. For tests numbered 1, 2, 3, 4, 5 and 8, testing shall always be conducted with new untested pallets.

Table 1 — List of tests

Test No.	Test Measurement	Characteristic	Handling activity or purpose of the test	Ref. No.
Static tests				8
1	Bending tests	Pallet length, width	Racking	8.1
1a	Bending strength			8.1.3.1
1b	Bending stiffness			8.1.3.2
2	Wing pallet bending tests	Pallet length, width	Lifting with slings	8.2
2a	Bending strength			8.2.3.1
2b	Bending stiffness			8.2.3.2
3	Air bag bending tests	Pallet length, width	Racking	8.3
3a	Bending strength			8.3.3.1
3b	Bending stiffness			8.3.3.2
4	Fork lifting tests	Top deck	Lifting with forklift and pallet trucks	8.4
4a	Bending strength			8.4.3.1
4b	Bending stiffness			8.4.3.2
5	Compression tests for blocks or stringers	Height of blocks, stringers	Any activity that compress blocks or stringers	8.5
5a	Blocks or stringers strength			8.5.3.1
5b	Blocks or stringers stiffness			8.5.3.2
6	Stacking test	Top and bottom deck	Stacking	8.6
7	Dead-weight bending test	Pallet length, width	Racking	8.7
8	Bottom deck bending tests	Bottom deck	Racking/stacking/conveyors	8.8
8a	Bending strength			8.8.3.1
8b	Bending stiffness			8.8.3.2
9	Static shear test	Decks, blocks, stringer	Distortion resistance	8.9
Dynamic strength tests				9
10	Corner drop test	Diagonal rigidity	Resistance to impacts	9.1
11	Shear impact test	Decks, blocks, stringer	Distortion resistance	9.2.2
12	Top deck edge impact test	Top leading deckboard	Resistance to fork arms	9.2.3
13	Block impact test	Corner block, stringer	Resistance to fork tip	9.2.4
Friction tests				10
14	Static coefficient of friction test	Under deck/fork arms	Slip resistance on fork arms	10.1
15	Slip angle test	Top deck/payload	Slip resistance of loads	10.2

8 Static tests

8.1 Test No. 1 — Bending tests

8.1.1 Purpose

The purpose of these tests is to determine the bending strength (Test 1a) and bending stiffness (Test 1b) of the pallet in racking situations.

8.1.2 Procedure

8.1.2.1 In order to establish the weakest pallet support dimension, test one pallet across the length of the pallet and then a second pallet across the width of the pallet. There is no requirement for further tests on the stronger dimension unless the result was within 15 % of the weaker.

8.1.2.2 This having been established, place a fresh pallet across its weakest side, top deck uppermost, on pallet supports positioned with their centrelines 75 mm from the outer edges of the pallet. The load applicators shall be positioned at $0,25 L_1$ or $0,25 L_2$, when measured as shown, where L_1 or L_2 is the distance between the centre lines of the pallet supports (see Figure 1).

8.1.2.3 Load applicators and supports shall be flush with or project beyond the edges of the pallet. Edges shall be relieved with $2 \text{ mm} \pm 1 \text{ mm}$ radii. Where load applicators coincide with gaps between deckboards, in-fill pieces of equal thickness to deckboards with 3 mm to 6 mm overall clearance on each shall be used. Place on the pallet deck the load applicators and the load board, then apply the rest of the test load.

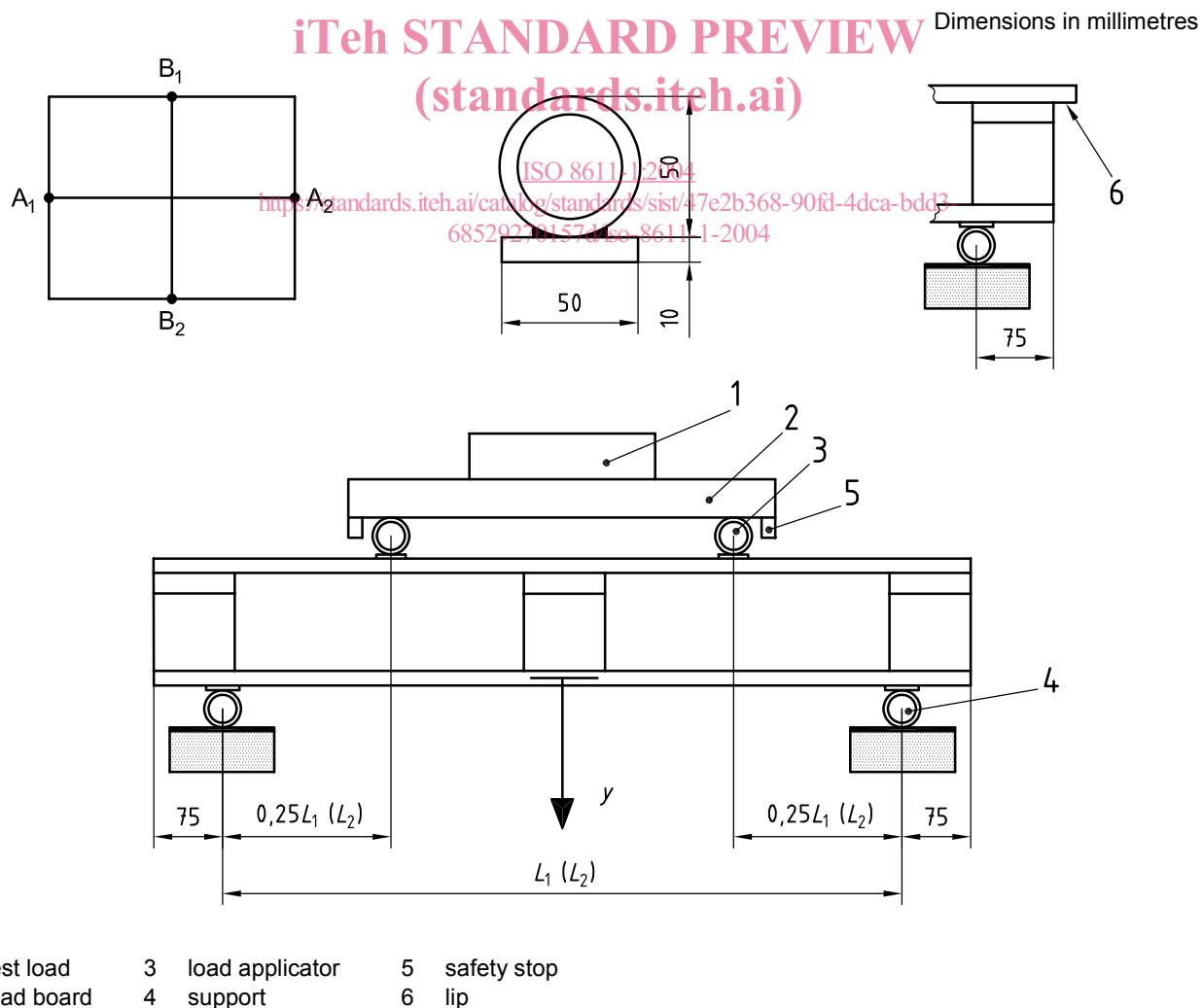


Figure 1 — Bending test

8.1.3 Measurements

8.1.3.1 Test No. 1a — Determination of bending strength

Place a load on the load board until breakage of one of the components of the pallet or until reaching an excessive deflection or deformation. Record the ultimate load.

8.1.3.2 Test No. 1b — Determination of bending stiffness

Depending on the support location, the deflection, y , shall be measured at points A [maximum of y at A_1 (B_1) and A_2 (B_2)]:

- a) on the unloaded pallet;
- b) after positioning of the load applicators and the load board;
- c) immediately after full test load is applied;
- d) at end of the full test load period;
- e) after the relaxation period.

8.2 Test No. 2 — Wing pallet bending tests

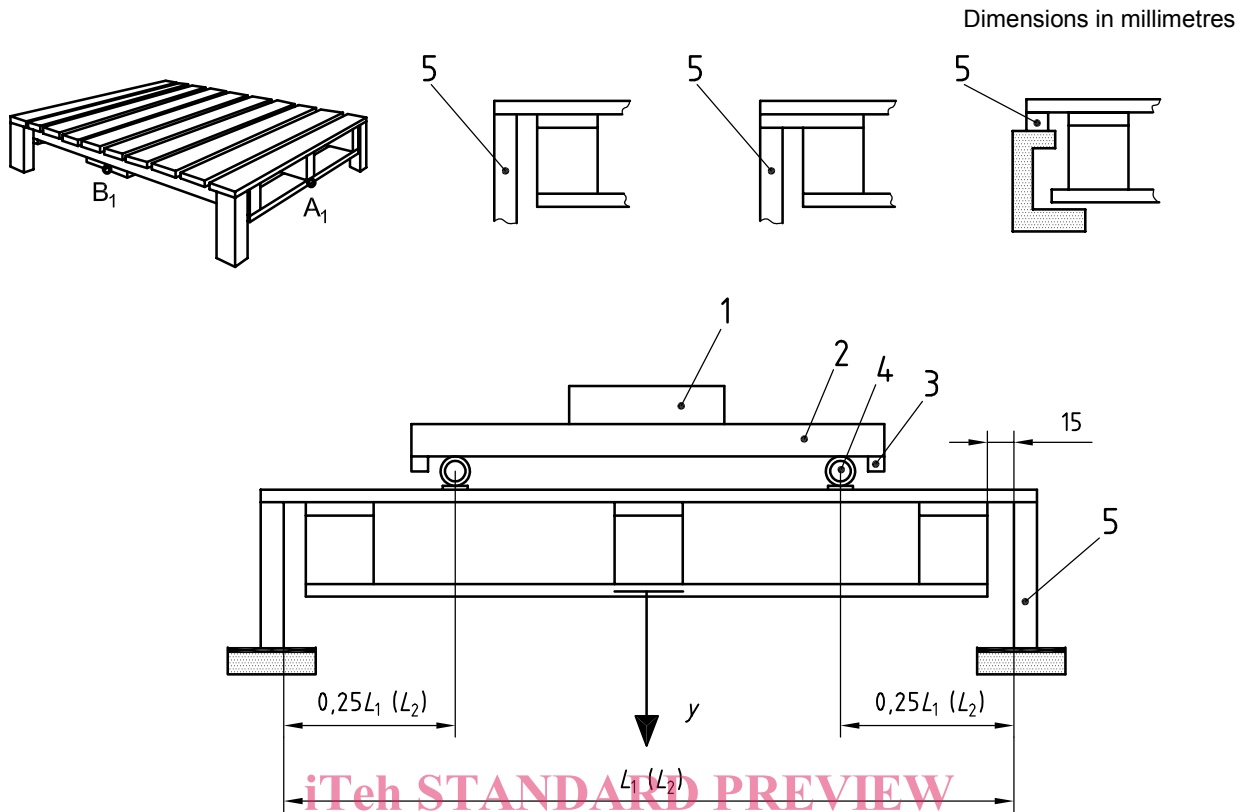
8.2.1 Purpose

The purpose of these tests is to determine the bending strength (Test 2a) and the bending stiffness (Test 2b) of winged pallet during lifting with slings

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8.2.2 Procedure

Place the wing pallet, top deck uppermost, on four posts 50 mm × 50 mm positioned beneath the wings of the top deck flush with the ends of the pallet and 15 mm from the side of the block or the stringer. The supports shall be fixed at such a height that a space of at least 50 mm is between the underside of the bottom deck and the ground or test frame. Each load applicator shall be positioned such that the dimension from the inside edge of the support to the centre line of the load applicators shall be 0,25 L_1 as shown in Figure 2. Place the load board on the load applicators and then apply the rest of the test load.



Key

- 1 test load
- 2 load board
- 3 safety stop
- 4 load applicator
- 5 support

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 ISO 8611-1:2004

Figure 2 — Wing pallet bending test

8.2.3 Measurements

8.2.3.1 Test No. 2a — Determination of bending strength

Place a load on the load board until breakage of one of the components of the pallet or until reaching an excessive deflection or deformation. Record the ultimate load.

8.2.3.2 Test No. 2b — Determination of bending stiffness

Depending on the support location, the deflection, y , shall be measured at points A [average of y at A_1 (B_1) and A_2 (B_2)]:

- a) on the unloaded pallet;
- b) after positioning of the load applicators and the load board;
- c) immediately after the full test load is applied;
- d) at end of the full test load period;
- e) after the relaxation period.