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

**Part 2:  
Performance requirements and selection  
of tests**

**iTeh STANDARD PREVIEW**  
*Palettes pour la manutention — Palettes plates —  
Partie 2: Exigences de performance et sélection des essais*  
(standards.iteh.ai)

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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 8611-2 was prepared by Technical Committee ISO/TC 51, *Pallets for unit load method of materials handling*.

This first edition of ISO 8611-2 cancels and replaces ISO/TS 8611-2:2005, which has been technically revised.

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

- *Part 1: Test methods* <https://standards.iteh.ai/catalog/standards/sist/fb699ceb-13bb-40f8-9732-d96b2bb7c4ac/iso-8611-2-2011>
- *Part 2: Performance requirements and selection of tests*
- *Part 3: Maximum working loads*

## Introduction

The forces to which pallets are exposed during use vary significantly. The test procedures described in ISO 8611-1 are approximate simulations of pallet use. These tests help the pallet designer to establish an initial acceptable balance between the cost and the performance of a pallet design. It is intended that all results of tests performed using this protocol be confirmed and verified using field trials before publication of performance or the commercial implementation of a new pallet design.

The nominal load, determined according to this test protocol, does not represent a payload and cannot be verified using field trials. The nominal load is a minimum payload level for use in determining maximum working load according to the procedures in ISO 8611-3. The maximum working load can be verified for a specified payload and intended use, using field trials. It is intended that the publication of the maximum working load include a description of the payload and the intended modes of use of the pallet.

It is essential to exercise care when comparing the results of tests with historic experience using existing pallet designs. User expectations of pallet performance vary. Some require greater and some accept lower levels of performance. Users are accepting different levels of risk when using pallets. Because of the varied performance expectations of pallet users, the results of tests might not always reflect the user's perception of pallet performance in use.

The nominal load might not reflect users' perception of pallet performance because the nominal load does not represent a payload. It is intended that maximum working loads be used to compare with the historic performance of existing pallet designs.

Regarding the use of the ISO 8611 series,

- ISO 8611-1 describes the test methods,
- this part of ISO 8611 describes the performance requirements and selection of tests, and
- ISO 8611-3 describes tests for determining maximum working loads for known payloads.

ISO 8611-1 and this part of ISO 8611 are required for determining nominal load. The nominal load is the lowest safe load value for the specified support conditions, independent of the type of load (excluding concentrated loads).

ISO 8611-1, this part of ISO 8611 and ISO 8611-3 are required for determining maximum working loads for known payloads.

The nominal load for the intended use is established by the selection of tests in ISO 8611-1 and the performance requirement is established from criteria in this part of ISO 8611.

The following three types of intended use with specified support conditions are defined:

- handling of loaded pallets with racking and stacking;
- handling of loaded pallets without racking;
- handling of loaded pallets without racking or stacking.

To determine the maximum working load through testing given in ISO 8611-3, the deflection under the known payload cannot exceed the limiting deflection (see 4.2, 4.3 and 4.4 of ISO 8611-3:2011) established in ISO 8611-1 and this part of ISO 8611. The maximum working load is the greatest payload that a pallet can be permitted to carry in a specific loading and support condition.

## ISO 8611-2:2011(E)

Guidance is given in Annex A of ISO 8611-3:2011 as to the general effect on performance of different load types and stabilization methods. These can only give guidance as to the likely result from tests with the known payload.

Other tests for durability evaluation are specified in ISO 8611-1.

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# Pallets for materials handling — Flat pallets —

## Part 2: Performance requirements and selection of tests

### 1 Scope

This part of ISO 8611 specifies the performance requirements to establish nominal loads for new flat pallets.

It also specifies the tests required for new flat pallets in various handling environments and the performance requirements for tests with payloads. It is not intended to apply to pallets with a fixed superstructure or a rigid, self-supporting container that can be mechanically attached to the pallet and which contributes to the strength of the pallet.

### 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*  
<http://standards.iteh.ai/catalog/standards/sist/fb699ceb-13bb-40f8-9732-d96b2bb7c4ac/iso-8611-2-2011>

ISO 8611-1, *Pallets for materials handling — Flat pallets — Part 1: Test methods*

ISO 8611-3, *Pallets for materials handling — Flat pallets — Part 3: Maximum working loads*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 445 and the following apply.

#### 3.1

##### **breaking of one component**

fracture of a structural element which significantly affects the strength, stiffness or functionality of a pallet

#### 3.2

##### **concentrated load**

load concentrated over an area of less than 50 % of the pallet top deck

[ISO 445:2008, definition 2.3]

#### 3.3

##### **maximum working load**

greatest payload that a pallet is permitted to carry in a specific loading and support condition

NOTE 1 This varies according to the type, distribution, arrangement and means of stabilization of the load and the system of support, and can be lower or higher than the nominal load (see, for example, Clauses 4 and 6 and see also ISO 8611-3).

NOTE 2 Adapted from ISO 445:2008, definition 2.7.

**3.4 nominal load**  
*R*  
lowest safe load value for the specified support conditions, independent of the type of load (excluding concentrated loads)

NOTE 1 “Specified support conditions” refers to the range of conditions of use in 7.1 of this part of ISO 8611.

NOTE 2 Nominal load does not represent an actual payload on a pallet in use. The nominal load is used for comparing the performance of different pallets.

NOTE 3 Adapted from ISO 445:2008, definition 2.2.

**3.5 payload**  
*Q*  
load carried by the pallet in use

[ISO 445:2008, definition 2.8]

NOTE This can be above, identical to or below the nominal load.

**3.6 platen**  
solid, rigid surface on a test machine used for applying a load to test a sample pallet

**3.7 racking**  
storage of unit loads in drive-in or beam racks with free, unsupported spans

[ISO 445:2008, definition A.3.1]

**3.8 safety factor**  
ratio of the ultimate load to the nominal load

NOTE In ISO 8611 (all parts), this ratio is at least 2,0.

**3.9 solid load**  
single, compact, rigid, homogeneous load, supported by all the blocks and/or stringers (bearers) of the pallet

NOTE Adapted from ISO 445:2008, definition 2.6.

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

NOTE Adapted from ISO 445:2008, definition A.2.1.

**3.11 stiffness**  
relative deformation of a pallet or component under load

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



**3.12****test load***P*

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

**3.13****ultimate load***U*

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.

**3.14****uniformly distributed bonded load**

load spread evenly across the full surface of the pallet top deck, where the pattern of each single layer changes, so that the packages are interlocked

**3.15****uniformly distributed unbonded load**

load spread evenly across the full surface of the pallet top deck where the packages are not interlocked, bound or connected

## 4 Test conditions **STANDARD PREVIEW** (standards.iteh.ai)

**4.1 General**

Test conditions shall be determined based on the pallet material in accordance with 4.2 to 4.6 and shall be maintained throughout the test. If the pallet comprises several different types of material, the moisture and temperature conditions shall be in accordance with the material that is most sensitive to changes in conditions.

**4.2 Wooden pallets**

The reference moisture content is  $(20 \pm 2)$  %. If the pallets are used at a higher moisture content, they shall be tested at this higher moisture content and the moisture content shall be recorded in the test results.

NOTE The measurement can be carried out in accordance with EN 13183-2<sup>[2]</sup>.

**4.3 Metal pallets**

Conditioning shall not be used for metal pallets.

**4.4 Plastic pallets**

The test conditions for nominal load, maximum working load and durability tests for plastic pallets shall be the following:

- tests 1a, 1b, 2a, 2b, 3a, 3b, 4a, 4b, 5a, 5b, 6a, 6b, 8, 9, 10, 11, 12 and 13:  $(23 \pm 2)$  °C
- maximum working load tests supporting the payload:  $(40 \pm 2)$  °C
- test 9:  $(23 \pm 2)$  °C and  $(-10 \pm 2)$  °C

For maximum working loads and test 9, wherever plastic pallets are used in controlled or more extreme conditions, the test conditions shall be agreed between the supplier and purchaser.

#### 4.5 Paper pallets

The test conditions for nominal load, maximum working load and durability tests for paper pallets shall be the following:

- tests 1a, 1b, 2a, 2b, 3a, 3b, 4a, 4b, 5a, 5b, 6a, 6b, 8, 9, 10, 11, 12 and 13:  $(23 \pm 2) ^\circ\text{C}$  and  $(50 \pm 5) \% \text{RH}$
- maximum working load tests supporting payload:  $(23 \pm 2) ^\circ\text{C}$  and  $(90 \pm 5) \% \text{RH}$

For maximum working loads and test 9, wherever paper pallets are used in controlled or more extreme conditions, the test conditions shall be agreed between supplier and purchaser.

#### 4.6 Wood-based composite pallets

The test conditions for nominal load, maximum working load and durability tests for wood-based composite pallets shall be the following:

- tests 1a, 1b, 2a, 2b, 3a, 3b, 4a, 4b, 5a, 5b, 6a, 6b, 8, 9, 10, 11, 12 and 13:  $(23 \pm 2) ^\circ\text{C}$  and  $(50 \pm 5) \% \text{RH}$
- maximum working load tests:  $(23 \pm 2) ^\circ\text{C}$  and  $(90 \pm 5) \% \text{RH}$

If it is intended that the pallet be exposed to water in the distribution environment, the pallet shall be immersed in water just below the surface for 24 h at a temperature of  $(20 \pm 5) ^\circ\text{C}$ .

Blocks of wood-particle board, which can be shown to have been tested according to nationally recognized standards (for example, see EN 1087-1), are exempt from conditioning.

For maximum working loads and test 9, when wood-based composite pallets are used in controlled or more extreme conditions, the test conditions shall be agreed between the supplier and purchaser.

#### 5 Number of replicates

For each test, at least three untested pallets shall be used.

#### 6 Performance requirements

Performance requirements for tests 1, 2, 3, 4, 5, 6 and 9 in ISO 8611-1 are given in Table 1. The maximum observation from the tests shall be compared with the performance requirements in Table 1.

Performance requirements for tests 8, 10, 11, 12, 13 and 14 in ISO 8611-1 are not included in Table 1, pending more experience with these tests.

Table 1 — List of tests

Test no.	Test measurement	Handling activity or purpose of the test	Test load level	Performance limits	ISO 8611-1:2011 subclause ref.
<b>Nominal load tests</b>					
<b>1</b>	<b>Bending tests</b>	Racking			8.1
1a	Bending strength <sup>ad</sup>		Ultimate load ( $U_1$ ) or a load causing 6 % of $L_1$ ( $L_2$ ) deflection		8.1.3.1
1b	Bending stiffness <sup>bd</sup>		$\leq 50$ % of $U_1$	2 % of $L_1$ ( $L_2$ ) under load 0,7 % of $L_1$ ( $L_2$ ) after relaxation period	8.1.3.2
<b>2</b>	<b>Forklifting tests</b>	Lifting with forklift and pallet trucks			8.2
2a	Bending strength <sup>a</sup>		Ultimate load, $U_2$		8.2.3.1
2b	Bending stiffness <sup>b</sup>		$\leq 50$ % of $U_2$	20 mm or bend angle of less than 4,5 <sup>g</sup> , whichever is the lesser deflection, under load 7 mm after relaxation period	8.2.3.2
<b>3</b>	<b>Compression tests for blocks or stringers</b>	Any activity that compresses blocks or stringers, including stacking			8.3
3a	Blocks or stringers strength		Ultimate load, $U_3$ , per block or load causing 10 % of $y$ deflection		8.3.3.1
3b	Blocks or stringers stiffness <sup>c</sup>		$\leq 50$ % of $U_3$ per block	4 mm under load 1,5 mm after relaxation period	8.3.3.2
<b>4</b>	<b>Stacking tests<sup>f</sup></b>	Stacking	Payload		8.4
4a	Decks strength test		Ultimate $U_4$ top deck and ultimate $U_4$ bottom deck or a load causing 6 % of deflection $L_1$ ( $L_2$ )		8.4.3.1
4b	Deck stiffness test <sup>b</sup>		$\leq 50$ % of $U_4$	2 % of $L_1$ ( $L_2$ ) under load 0,7 % of $L_1$ ( $L_2$ ) after relaxation period	8.4.3.2
<b>5</b>	<b>Bottom deck bending tests</b>	Twin track conveyors			8.5
5a	Bending strength <sup>ae</sup>		Ultimate load ( $U_5$ ) or a load causing 6 % of $L_1$ ( $L_2$ ) deflection		8.5.3.1
5b	Bending stiffness <sup>be</sup>		$\leq 50$ % of $U_5$	15 mm under load, 7 mm after relaxation time	8.5.3.2