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**Pallets for materials handling —  
Quality of new wooden components  
for flat pallets**

*Palettes pour la manutention et le transport de marchandises —  
Qualité des composants neufs en bois pour palettes plates*





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# Contents

	Page
<b>Foreword</b> .....	<b>iv</b>
<b>Introduction</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
<b>4 Species</b> .....	<b>3</b>
<b>5 Quality characteristics</b> .....	<b>3</b>
<b>6 Moisture content of components</b> .....	<b>3</b>
<b>7 Preparation of pallet components</b> .....	<b>3</b>
7.1 Manufacturing tolerances.....	3
7.2 Deckboard chamfer.....	5
7.3 Stringer notches.....	5
<b>Bibliography</b> .....	<b>7</b>

## 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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 51, *Pallets for unit load method of materials handling*.

This second edition cancels and replaces the first edition (ISO 18333:2002), which has been technically revised.

## Introduction

Efficient international transportation of products depends on both pallet strength and functionality, or fit, to the material handling systems. Existing International Standards address issues of strength and some issues regarding functionality of pallets. However, major issues related to the minimum material quality and manufacturing and repair workmanship are not addressed in current International Standards. These factors can significantly impact the efficiency of international unit load material handling practices.

The purpose of this International Standard is to establish internationally recognized minimum acceptable quality levels for wooden parts commonly used for the assembly of timber pallets. These parts are stringers, stringerboards, blocks, and deckboards. The properties of these components affect pallet performance.

There are four related International Standards:

- ISO 15629;
- ISO 18333;
- ISO 18334;
- ISO 18613.

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# Pallets for materials handling — Quality of new wooden components for flat pallets

## 1 Scope

This International Standard gives guidance on minimum recommended timber quality characteristics. It is applicable to new stringers, stringerboards, blocks, and deckboards used for flat wooden pallet assembly.

This International Standard does not address the phytosanitation and safety problems, if any, associated with the use of these components.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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*

EN 844-3, *Round and sawn timber — Terminology — Part 3: General terms relating to sawn timber*

EN 844-9, *Round and sawn timber — Terminology — Part 9: Terms relating to features of sawn timber*

EN 844-10, *Round and sawn timber — Terminology — Part 10: Terms relating to stain and fungal attack*

EN 844-12, *Round and sawn timber — Terminology — Part 12: Additional terms and general index*

International Standards for Phytosanitary Measures Publication No. 15 (ISPM 15), *Regulation for wood packaging material in international trade*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 445, EN 844-3, EN 844-9, EN 844-10 and EN 844-12 and the following apply.

### 3.1

#### **bark pocket**

bark that is partly or wholly enclosed in the wood

### 3.2

#### **boxed heart**

pith that is present and not visible in any face or edge

### 3.3

#### **decay**

disintegration of the wood substance due to actions of wood-destroying fungi

### 3.4

#### **exposed pith**

pith that is visible on a part or the full length of a face or on an edge

### 3.5

#### **face shake**

fissure showing on a face and possibly at the end

**3.6**

**fungal decay**

biodeterioration caused by fungi

**3.7**

**heart shake**

radial end shake originating at the pith

**3.8**

**intergrown knot**

knot that, on the surface considered, is intergrown with the surrounding wood for more than three quarters of its cross-sectional perimeter

**3.9**

**oblique shake**

fissure at an angle to the arris, showing on a face and/or an edge

**3.10**

**resin pocket**

lens-shaped cavity in timber containing, or that has contained, resin

**3.11**

**ring shake**

fissure following the line of the growth ring

**3.12**

**sound knot**

knot showing no indication of rot

**3.13**

**split**

fissure that extends from one surface to another

**3.14**

**straight shake**

fissure approximately parallel with the arris

**3.15**

**unsound knot**

knot affected by rot

**3.16**

**wane**

original rounded surface of a log, with or without bark, on any face or edge of sawn timber

**3.17**

**notch area**

area above the notch and within 50 mm of either end of the notch, to include half the notch depth

Note 1 to entry: See [Figure 2](#).

**3.18**

**blue stain**

stain caused by fungi, where discoloration ranges from pale blue to black

Note 1 to entry: This usually affects the sapwood of certain species.



**3.19****dote**

early stage of rot, characterized by discoloured streaks or patches in the wood, where the general texture and strength properties remain more or less unchanged

Note 1 to entry: It occurs prior to felling or during storage.

**3.20****rot**

decomposition of wood by fungi or other microorganisms, resulting in softening, progressive loss of mass and strength, and often a change of texture and colour

**4 Species**

The species of woods used in pallet manufacture are numerous and are not limited in this International Standard. However, the species selected significantly influences pallet performance. Therefore, when specifying wooden pallets, the permissible timber species should be indicated.

NOTE Properties of timber species can be determined from ISO 3131, ISO 3133, and ISO 3349.

**5 Quality characteristics**

Pallet components should meet or exceed the minimum quality levels of Q1 or Q2 as indicated by the characteristic limitations contained in [Table 1](#), and according to a previously specified minimum percentage of quality levels per component.

**6 Moisture content of components**

The moisture content of pallet components is not limited to any value.

NOTE However, the moisture content of wood in pallets can affect strength and functionality. Below 20 % moisture content, there is a minimal risk of biological infestation.

**7 Preparation of pallet components****7.1 Manufacturing tolerances****7.1.1 Target dimensions**

Wooden components should have a target thickness and width, and be uniform in dimension; and 50 % of components should meet or exceed the target dimension at the time of manufacture.

The target dimension should be adequate to meet the pallet specification requirements including the tolerances.

EXAMPLE If the pallet specification for component thickness is 22 (+2/-0) mm and the manufacturing tolerance is  $\pm 1,5$  mm, then the target manufacturing thickness should be 23,5 mm, plus an allowance for shrinkage.

**Table 1 — Minimum acceptable component quality characteristics prior to pallet assembly**

Characteristics <sup>a</sup>	Quality levels	
	Q1 <sup>b</sup>	Q2
Sound, intergrown, partially intergrown knots <sup>c,d</sup>	1/3 of the width of the piece	1/2 of the width of the piece
Loose knot or unsound knot	≤20 mm	≤30 mm
Exposed pith <sup>d</sup>	Permitted on one face	Permitted on one face
Boxed heart	Permitted	Permitted
Face shake <sup>e</sup>	Permitted	Permitted
Splits (in boards)	1 split on the board ≤ 1 width of the board	1 split on the board ≤ 2 width of board
Splits (in stringers and blocks)	Not permitted	≤ 1/4 of the length
Resin pocket	Permitted on one face only	Permitted on one face only
Bark pocket	Not permitted	Not permitted
Blue stain	Refer to <sup>f,g</sup>	Permitted — refer to <sup>f,g</sup>
Biological degradations except blue stain <sup>g</sup>	Not permitted	Not permitted
Active insect infestation <sup>g</sup>	Not permitted	Not permitted
Insect holes (non-active) <sup>h</sup>	Up to five holes of diameter 2 mm to 4 mm permitted	Up to five holes of diameter >4 mm and ≤8 mm permitted
Wane (without bark) <sup>d</sup>	Permitted up to 33 % of the thickness if ≤25 % of the piece length allowed both sides of one face and ≤10 mm from each side	Permitted up to 50 % of the thickness if ≤ 30 % of the piece length allowed both sides of one face and ≤20 mm from each side

<sup>a</sup> EN 1310 contains procedures for measuring timber characteristics or features.  
<sup>b</sup> It is recommended that stringerboards be of the Q1 quality level.  
<sup>c</sup> Knots less than 10 mm can be ignored, but clusters are considered as individual knots.  
<sup>d</sup> For additional restrictions for stringers, see [7.3](#).  
<sup>e</sup> Face shake appears in only one face of the parts and is acceptable except in the notch area (see [Figure 2](#)).  
<sup>f</sup> Mechanical properties are not affected by blue stain. Stain can be avoided by kiln drying or other means.  
<sup>g</sup> Refer to ISPM 15 and respective national phytosanitation regulations for restrictions.  
<sup>h</sup> Non-active insect holes in less than 2 mm can be ignored, provided their frequency does not significantly affect the strength of the piece, but clusters should be considered as individual holes.

### 7.1.2 Deckboards and stringerboards

The recommended manufacturing tolerances permitted on established target dimensions at a specified moisture content for deckboards and stringer boards are as follows.

- a) Thickness: ±1,5 mm maximum deviation.
- b) Width: ±3 mm maximum deviation.
- c) Length: ±3 mm maximum deviation.

### 7.1.3 Stringers and blocks

The recommended manufacturing tolerances permitted on established target dimensions at a specified moisture content for stringers and blocks are as follows.

- a) Width: ±1,5 mm maximum deviation.
- b) Height: ±1,5 mm maximum deviation.

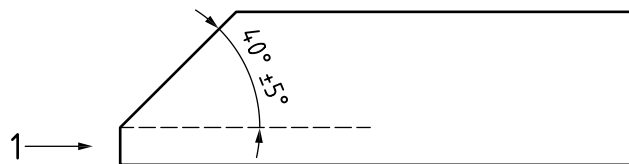
c) Length:  $\pm 3$  mm maximum deviation.

#### 7.1.4 Changes in wood moisture content

When changes in wood moisture content influence the measurement of component dimensions, it can be assumed that the dimensions will increase by 0,25 % for every 1 % of moisture content from 20 % up to 30 %, and decrease by 0,25 %, for every 1 % of moisture content below 20 %. The above values are typical, regardless of species; see [Clause 6](#).

### 7.2 Deckboard chamfer

The deckboard chamfers, if specified, should be located on both outside faces of the bottom end boards and all interior edges of bottom boards adjoining wheel openings for pallet trucks. The chamfers should be 65 mm from the stringers or blocks and at an angle of  $40^\circ \pm 5^\circ$ . The vertical face below the chamfer should not exceed 16 mm (see [Figure 1](#)). Chamfers should not extend into connections.



#### Key

1 vertical face maximum of 16 mm

Figure 1 — Deckboard chamfer

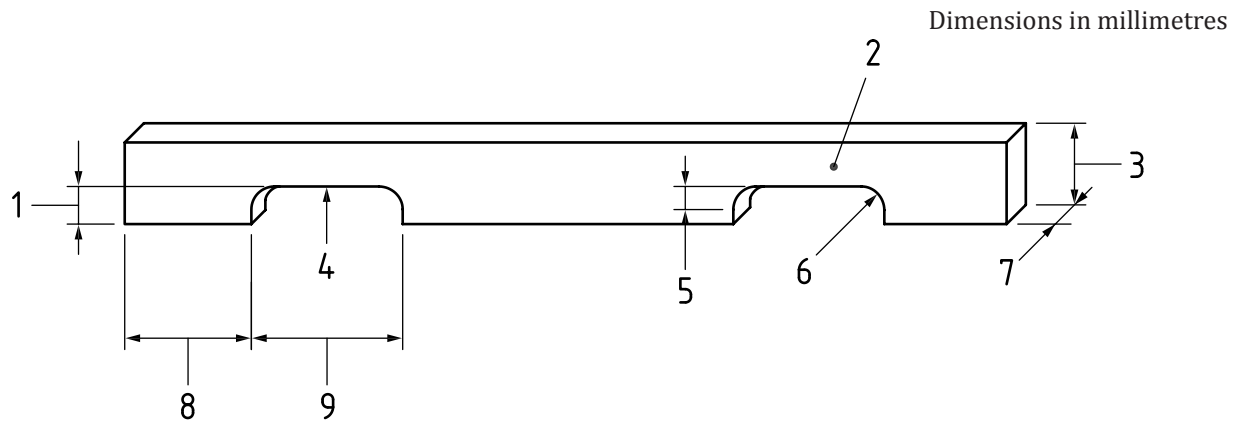
### 7.3 Stringer notches

**7.3.1** Notches in stringers, if required, should be specified by location (distance from stringer end), depth and length (see [Figure 2](#)). The recommended notch length should conform to the openings for notches in partial four-way pallets in ISO 6780 and the depth of the notch plus the thickness of the bottom deck should be equal to or exceed 50 mm.

**7.3.2** A minimum flat surface of 180 mm is recommended for the notch top. Notches should have rounded or filleted corners with a radius not less than 13 mm, nor greater than 37 mm.

**7.3.3** Square notches are not recommended. Manufacturing tolerances should be  $\pm 3$  mm of actual specified dimensions, except for the notch location which should be within  $\pm 6$  mm of target.

**7.3.4** Sound knots should be limited in any portion of the notch area (see [Figure 2](#)) to one-third of the net cross section above the notch. Unsound knots or holes should be limited to one-quarter of the net cross section above the notch. In the notch area (see [Figure 2](#)), wane should be limited to one-third of the stringer width and one-third of the height above the notch. No wane should be permitted in or below the notch fillets within the notch area (see [Figure 2](#)).



**Key**

- 1 depth
- 2 notch area
- 3 stringer height
- 4 notch top
- 5 half depth not less than 20 mm
- 6 fillet radius
- 7 stringer width
- 8 distance of notch from the stringer end
- 9 notch length

**Figure 2 — Schematic diagram of a pallet stringer with notch features indicated**

## Bibliography

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