

## DIN EN 13698-1



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Supersedes DIN 15146-2,  
November 1986 edition.**Pallet production specification**

Part 1: Construction specification for 800 mm × 1200 mm flat wooden pallets  
English version of DIN EN 13698-1

Produktspezifikation für Paletten – Teil 1: Herstellung von 800 mm × 1200 mm Flachpaletten aus Holz

**European Standard EN 13698-1 : 2003 has the status of a DIN Standard.**

*A comma is used as the decimal marker.*

**National foreword**

This standard has been prepared by CEN/TC 261 'Packaging' (Secretariat: France).

The responsible German body involved in its preparation was the *Normenausschuss Verpackungswesen* (Packaging Standards Committee), Technical Committee *Paletten*.

**Amendments**

DIN 15146-2, November 1986 edition, has been superseded by the specifications of EN 13698-1.

**Previous editions**

DIN 15146-2: 1959-12, 1969-06, 1970-09, 1983-04, 1986-11.

Document comprises 25 pages.



**English version**

**Pallet production specification**

Part 1: Construction specification for 800 mm × 1200 mm flat wooden pallets

Spécification de produit pour les palettes – Partie 1: Spécification de fabrication des palettes en bois, de dimensions 800 mm × 1200 mm

Produktspezifikation für Paletten – Teil 1: Herstellung von 800 mm × 1200 mm Flachpaletten aus Holz

This European Standard was approved by CEN on 2003-04-10.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

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European Committee for Standardization  
Comité Européen de Normalisation  
Europäisches Komitee für Normung

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## Foreword

This document (EN 13698-1:2003) 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of an identical text or by endorsement, at the latest by January 2004, and conflicting national standards shall be withdrawn at the latest by January 2004.

Annexes A, D and F are normative. Annexes B, C, E and G are informative.

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

All general purpose re-usable pallets, irrespective of the material from which they are made, are required to conform to the dimensional requirements and performance criteria specified in the following standards:

EN 13382:2002	<i>Flat pallets for materials handling — Principal dimensions</i>
prEN ISO 8611-1	<i>Pallets for materials handling — Part 1: Test methods for flat pallets (ISO/DIS 8611-1:2000)</i>
prEN ISO/DIS 8611-2	<i>Pallets for materials handling - Flat pallets - Part 2: Performance requirements and selection of tests</i>
prEN ISO/DIS 8611-3	<i>Pallets for materials handling – Flat pallets - Part 3: Maximum working load</i>

Tests performed by various European railway companies, and over 30 years of experience in through transport of goods, have demonstrated that the design of pallet 'Europallet' conforms to the relevant dimensional requirements and appropriate tests specified in the above standards. This certifies that the quality of the pallet is suitable for normal purposes as regards the physical stresses involved in distribution and handling. Pallets in full conformity to this specification are therefore exempt from the load testing programs described in the standards relating to performance listed above.

This European Standard is largely based upon, but not identical to, UIC-Code 435-2:1994 *Standard of quality for a European flat pallet made of wood with four openings and measuring 800 mm × 1200 mm.*

## 1 Scope

This European Standard specifies the manufacturing characteristics of a flat re-usable wooden 800 mm × 1200 mm, double deck, non-reversible, 4-way entry, 9 block pallet suitable for transport, storage, handling or exchange use. It also gives some requirements for manufacture and marking and addresses the issue of safety.

## 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).

ENV 717-1, *Wood-based panels – Determination of formaldehyde release – Part 1: Formaldehyde emission by the chamber method*

EN 1087-1, *Particleboards – Determination of moisture resistance – Part 1: Boil test*

EN 1310:1997, *Round and sawn timber – Method of measurement of features*

EN 12246:1999, *Quality classification of timber used in pallets and packaging.*

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 ISO 445:1998, *Pallets for materials handling – Vocabulary (ISO 445:1996)*

prEN ISO 8611-1:2000, *Pallets for materials handling - Part 1: Test methods for flat pallets (ISO/DIS 8611-1:2000)*

EN ISO 12777-3, *Methods of test for pallet joints – Part 3: Determination of strength of pallet joints (ISO 12777-3:2002).*

ISO 3133, *Wood – Determination of ultimate strength in static bending.*

## 3 Terms and definitions

For the purposes of this European Standard, the definitions given in EN ISO 445:1998 and the following apply.

### 3.1

#### **stacking**

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

### 3.2

#### **nominal load**

reference load capacity, in kilograms, assuming a uniformly distributed load

### 3.3

#### **safe working load**

maximum load capacity, in kilograms, in a defined loading situation

### 3.4

#### **concentrated load**

load concentrated over an area between 30 % and 85 % of the pallet deck

### **3.5** **uniformly distributed load**

load spread evenly across the full surface of the pallet deck

### **3.6** **solid load**

single, compact, rigid, homogeneous load, covering approximately the complete surface of the pallet

## **4 Nominal and safe working loads**

The nominal load of pallets conforming to this standard is to be established by tests conducted under the review of ISO 8611:1991. Annex G gives general information on safe working loads under different loading conditions. The safe working load of the pallet is 1 500 kg for a uniformly distributed load.

## **5 Construction**

### **5.1 Materials**

#### **5.1.1 Timber**

##### **5.1.1.1 Timber species**

Timber species are given in annex A.

##### **5.1.1.2 Timber quality grade**

The timber quality grade shall conform to A.2.

##### **5.1.1.3 Moisture content**

Moisture content shall be determined in accordance with EN 13183-1 or EN 13183-2.

At the time of delivery the moisture content of the component parts of the pallets shall not exceed 22 %.

NOTE Dimensions at other moisture levels may be calculated using the correction factors given in annex B.

The reference moisture content shall be 20 %.

#### **5.1.2 Particle board**

High density, moisture resistant particle board conforming to A.3 is permitted for skid blocks.

#### **5.1.3 Fasteners**

Pallets shall be assembled with fasteners conforming to A.4.

### **5.2 Design and manufacture**

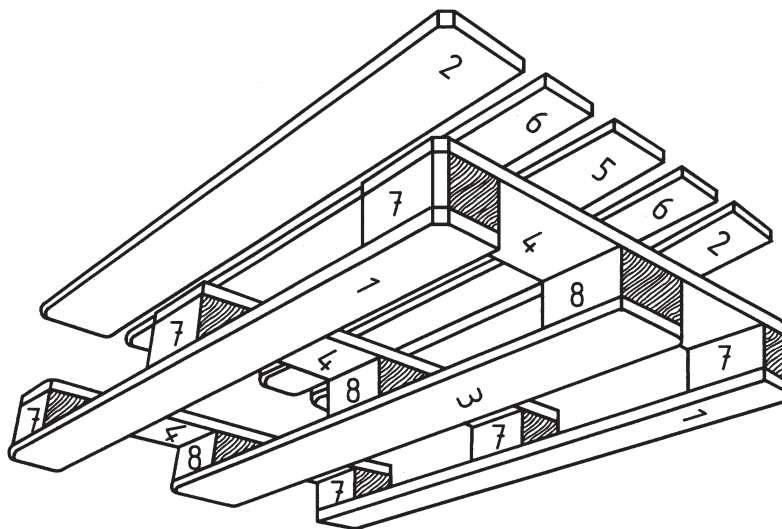
#### **5.2.1 Component parts**

Component parts of pallets shall conform to Table 1 and Figure 1.

Table 1 - Dimensions and tolerances of pallet components

Part	Component <sup>1)</sup>	Number of components	Dimensions at 22 % moisture content		
			mm		
			Length	Width <sup>2)</sup>	Thickness <sup>2)</sup>
1	Bottom deck lead board	2	1200 ± 3	100 ± 3	22 <sup>+2</sup> <sub>0</sub>
2	Top deck lead board	2	1200 ± 3	145 <sup>+5</sup> <sub>-3</sub>	22 <sup>+2</sup> <sub>0</sub>
3	Central bottom deck board	1	1200 ± 3	145 <sup>+5</sup> <sub>-3</sub>	22 <sup>+2</sup> <sub>0</sub>
4	Stringer board	3	800 ± 3	145 <sup>+5</sup> <sub>-3</sub>	22 <sup>+2</sup> <sub>0</sub>
5	Central top deck board	1	1200 ± 3	145 <sup>+5</sup> <sub>-3</sub>	22 <sup>+2</sup> <sub>0</sub>
6	Intermediate top deck board	2	1200 ± 3	100 ± 3	22 <sup>+2</sup> <sub>0</sub>
7	Outer skid block	6	145 <sup>+5</sup> <sub>-3</sub>	100 ± 3	78 <sup>+1</sup> <sub>0</sub>
8	Centre skid block	3	145 <sup>+5</sup> <sub>-3</sub>	145 <sup>+5</sup> <sub>-3</sub>	78 <sup>+1</sup> <sub>0</sub>
9	Fasteners <sup>3)</sup>				
10	Fasteners <sup>3)</sup>				
11	Fasteners <sup>3)</sup>				

<sup>1)</sup> See Figures 1, 2 and C.1  
<sup>2)</sup> See Annex B  
<sup>3)</sup> See A.4



**Key**

See Table 1

Figure 1 — 800 mm × 1200 mm pallet component parts



## 5.2.2 Boards and blocks

Boards and blocks shall meet the following requirements:

- a) All boards and natural timber blocks shall be of one piece.
- b) The outer surfaces of the top and bottom decks shall be unplanned.
- c) The wood fibres of the outer skid blocks shall be parallel to the longitudinal axis of the pallet.
- d) Skid blocks shall be of natural timber or particle board (see 5.1.2).

## 5.2.3 Pallet assembly and fastener positions

### 5.2.3.1 General

All fasteners shall be driven in vertically, at a minimum of 20 mm from the edges of the boards, and, for particle board blocks, a minimum of 20 mm from the centre hole if present. Fasteners shall not be inserted parallel with the wood grain (which may split the board), and shall be spaced as far apart as possible. Nail heads shall not protrude above the surface of the board (this also applies after drying the pallet), or be sunk below the board surface by more than 3 mm. Fasteners shall not pierce the sides of blocks.

No splits resulting from nailing shall be visible on the blocks or boards after assembly.

NOTE A recommended nail pattern for pallets is given in annex C.

### 5.2.3.2 Assembly top board block

For each block, a minimum of three fasteners shall be used on both the top and bottom surfaces.

### 5.2.3.3 Assembly top deck board /stringer board

A minimum of three fasteners shall be used for fixing each intermediate top deck board to a stringer board. The top deck leadboard, and if necessary the central deck board, shall be fixed to each stringer board by one fastener. Any fastener protruding below the stringer board shall be bent back.

NOTE A staple is considered to be a single fastener.

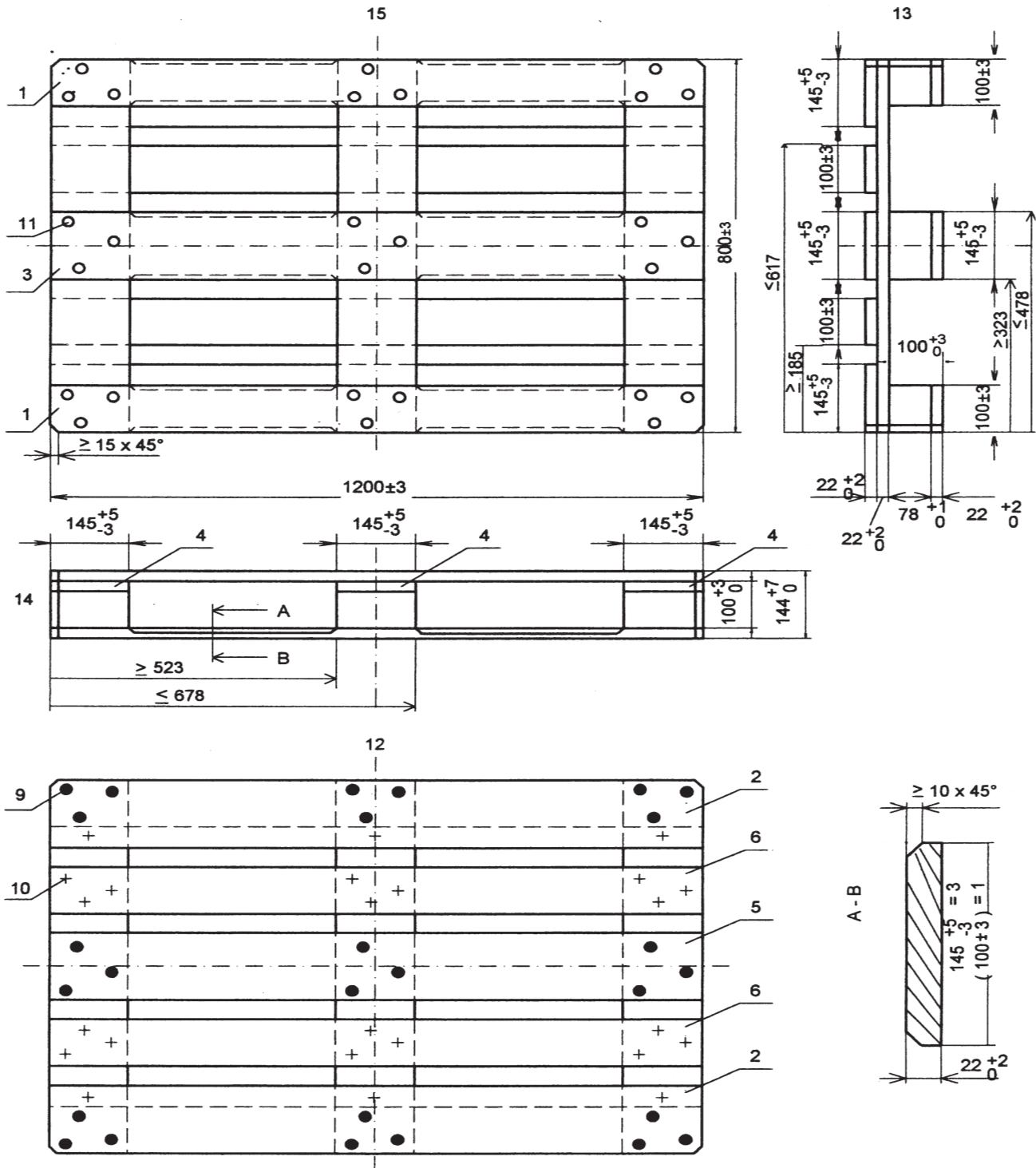
## 5.3 General assembly details

General assembly details of the pallet, including dimensions and tolerances, shall conform to Figure 2 and to Table 2. The chamfering section A–B shall be on all three bottom boards.

**Table 2 – General assembly details — Overall tolerances in millimetres**

Length	1200 ± 3
Width	800 ± 3
Height	144 <sup>+7</sup> <sub>0</sub>

Dimensions in millimetres



- Key**
- 1-11 See Table 1 and Table C.2
  - 12 Top view
  - 13 Side view
  - 14 Front view
  - 15 Bottom view

Figure 2 — General assembly details, dimensions and tolerances

## 5.4 Assembly strength

### 5.4.1 Diagonal rigidity

Test for diagonal rigidity in accordance with prEN ISO 8611-1:2000 (Test No 10) on three pallets with six corner drops on each pallet (same corner throughout). The drop height shall be 1 metre.

After the test, the pallets shall not be distorted by more than 3 % of the initial value (measured as the mean distortion for all three pallets).

### 5.4.2 Separation force

The joints of the pallet shall be tested using the joint separation test in accordance with annex D. The arithmetic mean of the recorded separation force, and at least 75 % of all recordings, shall be equal to or higher than the following:

- a) block/stringer board/top deck board: 5,5 kN;
- b) block/bottom deck board: 5,5 kN;
- c) stringer board/intermediate top deck board: 3,0 kN.

## 6 Inspections and marking

Before delivery, pallets shall be inspected for quality. For guidance on inspection (Quality control) see Annex E.

Pallets in conformity with this standard shall be marked on the outer side of the centre block with the number of this European Standard, the mark of the country and of the manufacturer.

NOTE 1 Pallets used in pooling or exchange systems may be marked in accordance with the guidelines defined at the pooling or exchange system.

NOTE 2: Pallets manufactured in conformity with this standard may be required to comply with National Authority marking requirements.

NOTE 3: Plant health recommendations are constantly under review and pallets may need to be marked accordingly.

## Annex A (normative)

### Materials

#### A.1 Timber

##### A.1.1 General

Pallets shall be constructed from the timber species listed in Table A.1 and in A.1.2.

Table A.1 — European grown wood

Softwood (conifer)	Hardwood (deciduous)
Douglas	acacia
Pine	alder
Fir	ash
Larch	beech
Spruce	birch
	chestnut
	elm
	maple
	oak
	plane
	poplar

##### A.1.2 Other timber species

If other timber species are taken into consideration for manufacturing pallets in conformity with this standard, this species shall have an ultimate strength in static bending of at least 42 N/mm<sup>2</sup>, tested on small clear samples with a moisture content of 20 %, in accordance with ISO 3133, and the pallets manufactured from these species shall be tested according to prEN ISO 8611-1:2000 (bending test) before starting the production.

#### A.2 Timber quality grade

##### A.2.1 Pallet components

The quality of sawn timber for pallet components (except stringer boards) shall conform to Table A.2.

##### A.2.2 Stringer boards

The quality of sawn timber for stringer boards shall conform to Tables A.2 and A.3.

##### A.2.3 Bark

Timber containing bark shall not be used.

**Table A.2 — Quality of sawn timber in pallets**

<b>Criterion</b>	<b>Requirement (EN 12246:1999, Class P1)</b>
Knots:	On both faces, knots shall be measured in accordance with 4.1.2 of EN 1310:1997. Knots shall be disregarded on the edges. Knots less than 10 mm shall be disregarded. Knot clusters shall be considered as individual knots.
– intergrown, partially intergrown, dead	Shall be $\leq 33$ % of the width of the piece.
– loose	Shall be $\leq 20$ mm.
– unsound	Shall be $\leq 20$ mm.
– branched	Permitted.
Exposed pith	Permitted on one face.
Boxed heart	Permitted.
Shakes:	Shakes shall be taken into account on the ends, faces and edges. Shakes shall be measured in accordance with EN 1310.
– surface shake	Permitted except at points of nailing.
– split (in boards)	One split permitted $\leq$ width of the board.
– split (in blocks)	Not permitted.
Resin pocket	Permitted on one face only.
Bark pocket	Not permitted.
Blue stain <sup>1)</sup>	
Biodeterioration except blue stain	Not permitted.
Active timber infestation	Not permitted.
Black holes (non active)	Up to 5 holes of diameter $\leq 3$ mm permitted.
Wane (without bark)	Wane shall be measured in accordance with 4.8 of EN 1310:1997. Permitted up to 25 % of the piece length, up to 33 % of the thickness and allowed both sides of one face if $\leq 10$ mm from each side.
<sup>1)</sup> See Annex F	

**Table A.3 — Quality of sawn timber for stringer boards**

<b>Criterion</b>	<b>Requirement</b>
Knots– intergrown, partially intergrown, dead	$\leq 25$ % of piece width.
Wane	Not permitted.
Slope of grain	$\leq 5$ %.

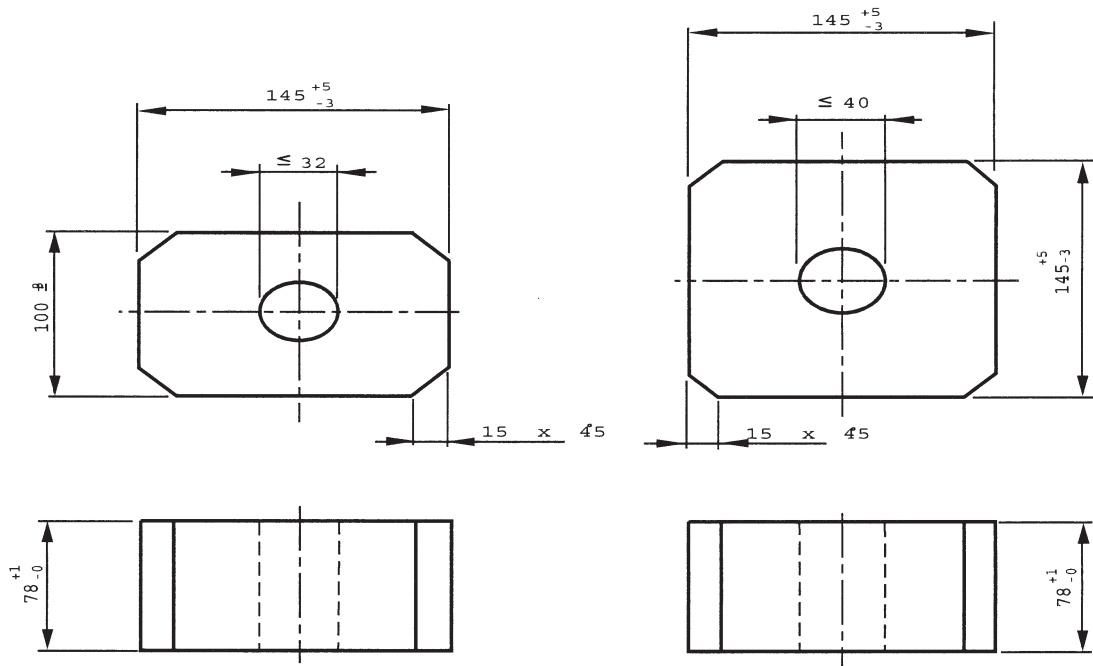
### A.3 Particle board

#### A.3.1 Particle board composition and dimensions

Particle board shall only be used for blocks. The material shall conform to the following:

- a) depending on the manufacturing process, blocks shall be rectangular or provided with chamfered edges of  $15 \text{ mm} \times 45^\circ$  and with or without a central hole. The diameter of any hole shall not exceed 32 mm for blocks  $145 \text{ mm} \times 100 \text{ mm}$  or 40 mm for blocks  $145 \text{ mm} \times 145 \text{ mm}$ .
- b) the mean weight per unit volume shall be  $\geq 580 \text{ kg/m}^3$ .
- c) the moisture content shall be between 7 % and 13 %.
- d) the material shall give a formaldehyde emission of  $< 0,1 \text{ ml}$  per cubic metre of air, when determined in accordance with ENV 717-1.
- e) the efficiency of the bonding process shall be determined by the following tests:
  - 1) size variation test, after 24 h immersion in water at  $20^\circ \text{C}$ , measured on 10 test pieces:
    - the length and width shall not increase by more than 2 %;
    - the height shall not vary by more than 4,5 %, except that one of the ten blocks may vary between 4,5 % and 5,5 %.
  - 2) tests for retention of material strength, absence of splits, loss of cohesion after test cycle, and determination of bond quality, in accordance with EN 1087-1 involving:
    - a 2-h immersion in water at  $100^\circ \text{C}$  under ambient pressure,
    - 2 h in the oven at  $(65 \pm 3)^\circ \text{C}$ .

Dimensions in millimetres



NOTE The examples in this diagram are shown with both hole and chamfer. Blocks are not required to have either.

Figure A.1 — Particle board blocks

## A.4 Fasteners

### A.4.1 Nails for block/stringer board/top deck board assemblies (part No 9)

Nails for block/stringer board/top deck board assemblies shall conform to Table A.4.

**Table A.4 — Nails for block/stringer board/top deck board assemblies**

Property	Specification
Minimum length	88 mm <sup>1)</sup>
Dimension of nail head	min 8,4 mm (diameter) or min 55 mm <sup>2</sup>
Ratio of head diameter to shank diameter	≥ 2
Nail shank type	spiral rolled, annular ring rolled, square twisted, indented shank
Minimum tensile strength	700 N/mm <sup>2</sup>
Nail point type	diamond or chisel point
<sup>1)</sup> This value is valid for a standard nominal dimension of (90 ± 2) mm.	

#### A.4.2 Nails for block/bottom deck board assemblies (part No 11)

For block/bottom deck board assemblies shall conform to Table A.5.

**Table A.5 — Nails for block/bottom deck board assemblies**

Property	Specification
Minimum length	68 mm <sup>1)</sup>
Dimension of nail head	min 8,4 mm (diameter) or min 55 mm <sup>2</sup>
Ratio of nail head diameter to shank diameter	≥ 2
Nail shank type	spiral rolled, annular ring rolled, square twisted, indented shank
Minimum tensile strength	650 N/mm <sup>2</sup>
Nail point type	diamond or chisel point
<sup>1)</sup> This value is valid for a standard nominal dimension of (70 ± 2) mm.	

#### A.4.3 Fasteners for stringer board/top deck board assemblies (part No 10)

Fasteners for stringer board/top deck board assemblies shall conform to Tables A.6, A.7, or A.8 as appropriate.



**Table A.6 — Nails bent back on the lower surface of the stringer board**

Property	Specification
Minimum length	50 mm <sup>1)</sup>
Dimension of nail head	min 5,5 mm (diameter) or min 24 mm <sup>2</sup>
Ratio of nail head diameter to shank diameter	≥ 2
Nail shank type	plain, spiral rolled, annular ring rolled, square twisted, indented shank
Minimum tensile strength	800 N/mm <sup>2</sup>
Nail point type	diamond or diamond offset
<sup>1)</sup> This value is valid for standard nominal dimensions of (55 $\begin{smallmatrix} +2 \\ -5 \end{smallmatrix}$ ) mm and (60 ± 2) mm.	

**Table A.7 — Nails that do not pierce the stringer board**

Property	Specification
Length	min 36 mm , max 41 mm <sup>1)</sup>
Dimension of nail head	min 5,5 mm (diameter) or min 24 mm <sup>2</sup>
Ratio of nail head diameter to shank diameter	≥ 2
Nail shank type	spiral rolled, annular ring rolled, square twisted, indented shank
Minimum tensile strength	600 N/mm <sup>2</sup>
Nail point type	diamond or chisel point
<sup>1)</sup> This value is valid for a standard nominal dimension of (38 $\begin{smallmatrix} +3 \\ -2 \end{smallmatrix}$ ) mm.	

**Table A.8 - Staples bent back on the lower surface of the stringer board**

Property	Specification
Length	Min 53 mm
Width (inside)	Min 14 mm
Thickness of wire	Min 2,2 mm
Shank type	Plain
Tensile strength	760 N/mm <sup>2</sup>
Point type	Diamond offset

## Annex B (informative)

### Wood shrinkage

#### Comparative wood shrinkage/expansion rates

At the saw milling stage, it is necessary to consider the machining allowances taking into account the moisture content, consequent shrinkage of the wood, and dressing, smoothing or planing operations.

Table B.1 gives comparative wood shrinkage/expansion rates, valid for all species, for determination of dimensions at alternative moisture contents to 22 %.

**Table B.1 - Minimum dimensions in relation to moisture content**

Moisture content	Minimum actual dimension of nominal width and thickness <sup>1)</sup>				
	(22 <sup>+2</sup> <sub>0</sub> ) mm (nominal)	(78 <sup>+1</sup> <sub>0</sub> ) mm (nominal)	(100 <sup>+3</sup> <sub>-3</sub> ) mm (nominal)	(100 <sup>+3</sup> <sub>0</sub> ) mm (nominal)	(145 <sup>+5</sup> <sub>-3</sub> ) mm (nominal)
%	mm	mm	mm	mm	mm
30	22,5	79,5	99,0	102,0	145,0
29	22,5	79,5	98,5	102,0	144,5
28	22,5	79,0	98,5	101,5	144,0
27	22,5	79,0	98,0	101,5	144,0
26	22,0	79,0	98,0	101,0	143,5
25	22,0	78,5	97,5	100,5	143,0
24	22,0	78,5	97,5	100,5	142,5
23	22,0	78,0	97,0	100,0	142,5
<b>22</b>	<b>22,0</b>	<b>78,0</b>	<b>97,0</b>	<b>100,0</b>	<b>142,0</b>
21	22,0	78,0	97,0	99,5	141,5
20	22,0	77,5	96,5	99,5	141,5
19	22,0	77,5	96,5	99,0	141,0
18	22,0	77,0	96,0	99,0	140,5
17	21,5	77,0	96,0	98,5	140,0
16	21,5	77,0	95,5	98,5	140,0
15	21,5	76,5	95,5	98,0	139,5
14	21,5	76,5	95,0	98,0	139,0
13	21,5	76,0	95,0	97,5	139,0
12	21,5	76,0	94,5	97,5	138,5

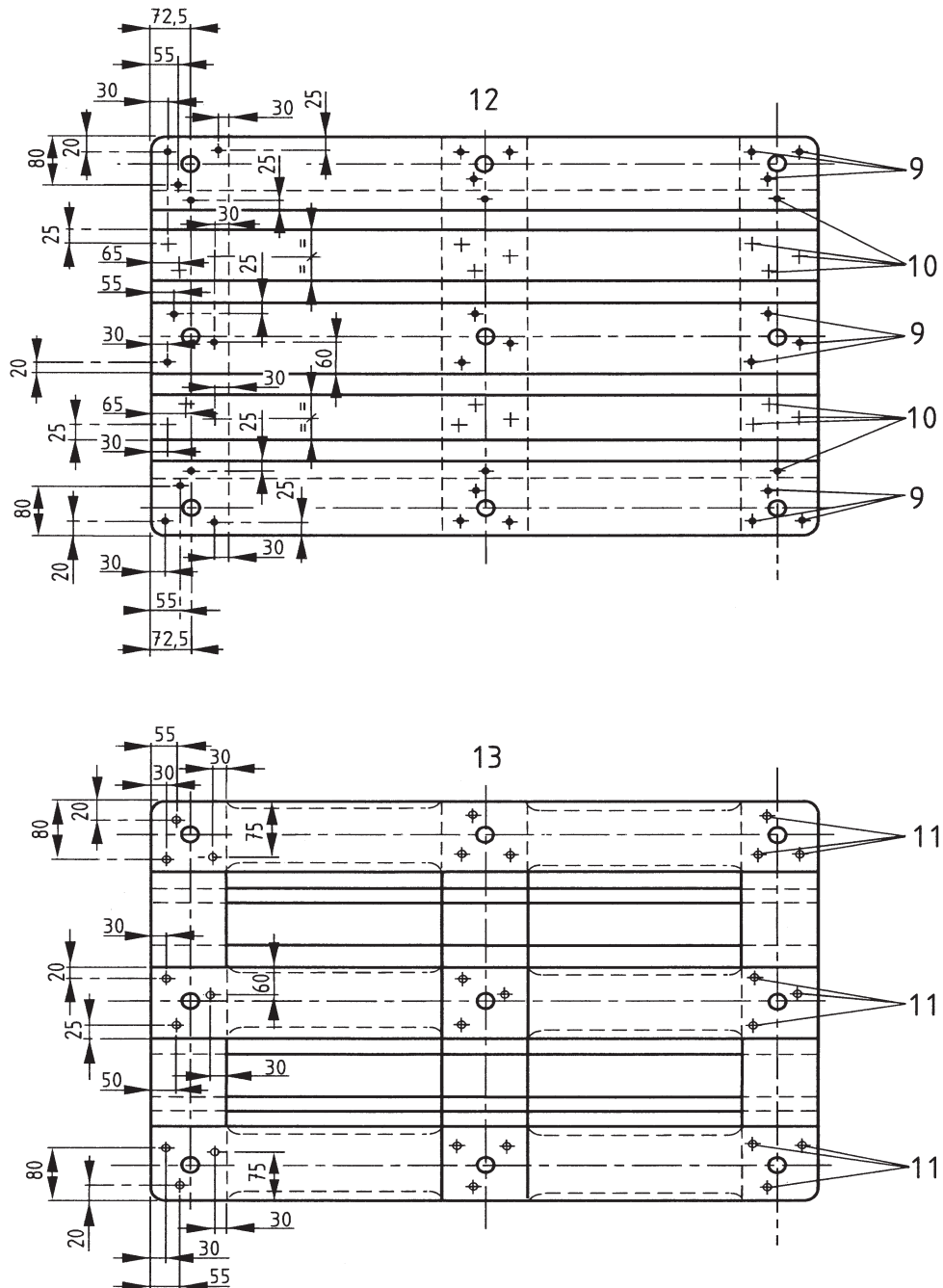
<sup>1)</sup> The thickness and the width of a piece of timber increase by 0,25 % for every 1 % of moisture content from 20 % up to 30 %, and decrease by 0,25 % for every 1 % of moisture content. below 20 %. The above values are typical, regardless of the species (see EN 1313-1 and EN 1313-2).

## Annex C (informative)

### Nail pattern

#### Recommended nail pattern

The recommended nail pattern for pallets are as shown in Figure C.1 and the recommended fasteners in Table C.1.



<b>Key</b>	
9-11	See Table C.1
12	View from above
13	View from below

Figure C.1 — Recommended nail pattern for pallets

Table C.1 — Recommended fasteners for pallets

Minimum quantity <sup>1)</sup>	Part no. <sup>2)</sup>	Type of nail	Nominal dimensions mm	Minimum tensile strength <sup>3)</sup> N/mm <sup>2</sup>	use for
27	9	Annular ring rolled nail	4,2 × 90	700	blocks of softwood (conifer), chipboard and poplar
27	9	Spiral rolled nail with chisel point	5,2 × 90	700	blocks of hardwood (deciduous)
24	10	Annular ring rolled nail	4,2 × 38	600	stringer board of hardwood (deciduous)
24	10	Annular ring rolled nail with diamond point offset	2,8 × 55	800	fixed nailing bar
24	10	a) Plain shank nail	2,5 × 60	800	movable nailing bar
24	10	Staple	14 × 2,2 × 53	760	fixed nailing bar
27	11	Annular ring rolled nail	4,2 × 70	650	blocks of softwood (conifer), particle board and poplar
27	11	Spiral rolled nail with chisel point	5,2 × 70	650	blocks of hardwood (deciduous)
<p>1) See 5.2.3 and Figure C.1</p> <p>2) See Figure 2 and Figure C.1</p> <p>3) See EN 10002-1</p>					

## Annex D (normative)

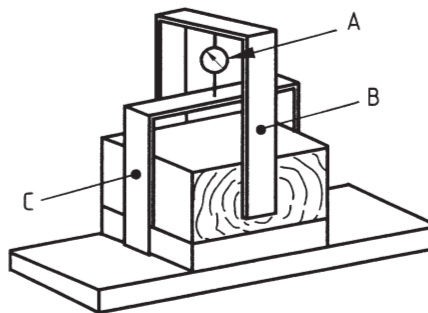
### Joint separation test

#### D.1 Test apparatus

The test apparatus shall conform to Figure D.1 in accordance with prEN ISO 12777-3. Two stirrups shall be prepared, with stirrup B attached to a pallet block (or stringer board), and stirrup C pressing on to an adjoining board.

A gauge shall be positioned to measure the force (at A) required to separate the block and board.

The accuracy of the measuring gauge shall be at least 4 % of the nominal separation force.



#### Key

- A Force indicator
- B Stirrup
- C Stirrup

Figure D.1 — Joint separation test apparatus

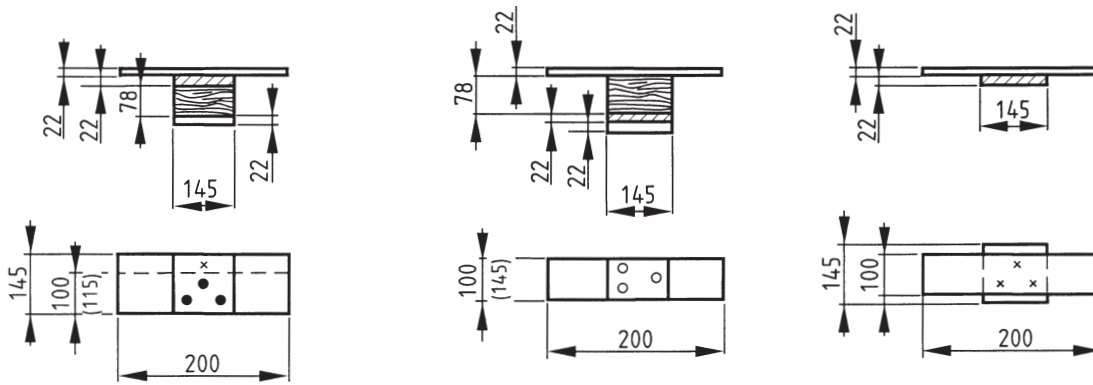
#### D.2 Test pieces

Cut test pieces conforming to figure D.2 from workable pallets.

NOTE The moisture content of the wood should be  $(20 \pm 2)$  %.

For each type of assembly, wood and fastener, perform the following tests:

- a new assembly test (20 test pieces);
- production control tests (10 test pieces; at the start of production, if changing the type of wood or fasteners, or changing production methods).



A	B	C
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Key (Dimensions in mm)

- A. Block/stringerboard/top deckboard
- B. Block/bottom deckboard
- C. Intermediate top deckboard/stringerboard

Figure D.2 — Test pieces

### D.3 Procedure

Apply a separating force across the block and board slowly and smoothly, and measure the resulting separation force.

### D.4 Test results

The test pieces shall conform to 5.4.2.

### D.5 Report

The test report shall contain:

- a) the type, dimensions material and tensile strength of the fasteners, with tolerances and drawings;
- b) the wood species used for the blocks and boards;
- c) the moisture content of each test piece;
- d) the separation force of each test piece;
- e) the arithmetic mean separation force for each type of assembly.

## Annex E (informative)

### Inspection (Quality control)

#### E.1 General policy

Quality control of each batch of pallets should be executed at least in accordance with the random survey schedule given in E.1.1 to E.1.6.

**E.1.1** Quality control of a submitted batch of pallets involves inspection of a statistically selected sample on the basis of quality characteristics described in the survey schedule.

**NOTE** The inspection carried out in accordance with the survey schedule should only be used provided a constant manufacturing standard is guaranteed.

**E.1.2** The number  $n$  of pallets in the quality control sample should vary with the number  $N$  of pallets in the batch as shown in Table E.1.

If  $N$  exceeds 10000, the pallets should be divided into smaller batches.

**Table E.1 Sample sizes**

Size of batch $N$	Sample size $n$
$< 150$	8
$151 < 280$	13
$281 < 500$	20
$501 < 1200$	32
$1201 < 3200$	50
$3201 < 10000$	80

**E.1.3** Prior to inspection, a random sample of  $n$  pallets should be selected.

**E.1.4** A visual inspection should be carried out on the sample, and the main dimensions of the pallet and its component parts measured. An inspection report conforming to the example in Table E.2 should be completed, with all defects (critical, major or minor) recorded.

**NOTE** A critical defect is one that, from experience, is likely to reduce the level of safety or increase the risk of accidents to users or persons depending on the unit. A major defect is one that could result in failure of the unit or considerably reduce its performance. A minor defect is one that does not affect the performance or efficient operation of the unit.

**Table E.2 — Example of a typical inspection report**

Defect	Number in sample
Critical defects:	
– pallet length exceeding $1200_{-5}^8$ mm	
– pallet width exceeding $800_{-5}^8$ mm	
– stringer board thickness exceeding $22_0^3$ mm	
– unacceptable timber species, knots and waness in stringer boards (see annex A)	
– unacceptable fasteners	
Total critical defects	
Major defects:	
– pallet length exceeding $1200 \pm 3$ mm	
– pallet width exceeding $800 \pm 3$ mm	
– height of entry exceeding $100_0^3$ mm	
– width of stringer board exceeding $145_{-3}^5$ mm	
– board thickness exceeding $22_0^2$ mm	
– insect damage, decay, bark pocket	
– moisture content > 26 %	
– unacceptable knots (see annex A)	
– assembly splits	
– chamfers	
– missing or twisted fasteners	
– unacceptable distance between fasteners	
– marking incomplete	
Total major defects	
Minor defects:	
– deck/lead board length exceeding $1200 \pm 3$ mm	
– stringer board length exceeding $800 \pm 3$ mm	
– board width exceeding $145_{-3}^5$ mm (except stringer boards)	
– board width exceeding $100_{-3}^3$ mm	
– block length exceeding $145_{-3}^5$ mm	
– centre skid block width exceeding $145_{-3}^5$ mm	
– outer skid block width exceeding $100_{-3}^3$ mm	
– block height exceeding $78_0^1$ mm	
– moisture content 22 % to 26 %	
– waness > 15 mm	
– unacceptable knots (see annex A)	
– Biodeterioration	
– resin pockets > 50 mm	
– slope of grain exceeding 5 %	
– black holes	
– protruding fasteners	
Total minor defects	

**E.1.5** If the sample does not exceed the maximum permitted number of defects given in Table E.3, the batch should be accepted.



If any of the maximum number of critical, major or minor defects is exceeded, the batch should be rejected. Markings should be removed from all pallets that do not conform to this standard.

**Table E.3 — Maximum number of defects**

Sample size n	Maximum permitted number of defects		
	Critical defects	Major defects	Minor defects
8	0	5	10
13	0	7	14
20	0	10	21
32	0	14	30
50	0	21	44
80	0	30	70

**E.1.6** With approval of the inspector, an initially rejected batch should be resubmitted, after elimination of the defective pallets and replenishing of the batch. The eliminated pallets should be re-tested separately after repair if possible.

Procedures E.1.3 to E.1.5 should be repeated on the new batch.

## Annex F (normative)

### Preservatives

#### General policy

Blue stain does affect only the appearance of the wood, but not the mechanical properties. Blue stain can be avoided by kiln drying or other means.

If some species have to be protected in view to avoid blue stain, products used have to be in respect of the requirements of the directive BIOCIDES (98-8-CE). The directive has taken into account (clause 3) human and animal health and environmental risks. This directive is therefore in line with one of the first considerations fixed in the Directive 94/62 CE concerning packaging and packaging waste.

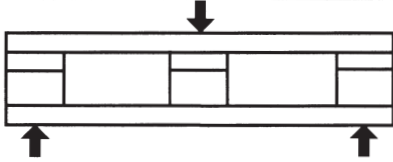
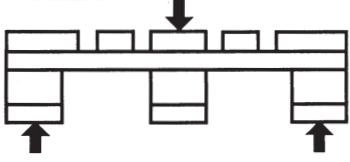
## Annex G (informative)

### Safe working loads under different loading situations

#### General policy

Pallets conforming to this standard should have a safe working load as described in the Table G.1.

**Table G.1 - Safe working load in racking conditions**

		
Concentrated load	*)	*)
uniformly distributed load	*)	*)
uniformly distributed bonded load	*)	*)
solid load	*)	*)

\*) Values will be checked after the completion of studies for prEN ISO/DIS 8611-3.

### Bibliography

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