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## Repair of flat wooden pallets

*Réparation des palettes plates en bois*

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## Foreword

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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 18613 was prepared by the European Committee for Standardization (CEN) in collaboration with Technical Committee ISO/TC 51, *Pallets for unit load method of materials handling*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this document, read “...this European Standard...” to mean “...this International Standard...”.

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## Foreword

This document (EN ISO 18613:2003) has been prepared by Technical Committee CEN/TC 261 "Packaging", the secretariat of which is held by AFNOR, in collaboration with Technical Committee ISO/TC 51 "Pallets for unit load method of materials handling".

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of an identical text or by endorsement, at the latest by November 2003, and conflicting national standards shall be withdrawn at the latest by November 2003.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.

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## Introduction

Mandatory requirements for recycling of packaging materials have led to an expansion of reuse, repair and recycling of wooden pallets. This European Standard is intended to assist this process, in that, through its implementation, the safety and longevity of repaired pallets will be maximised. The standard also refers particularly to new pallet standards and prescriptive pallet specifications in wide use.

There is no requirement in this standard for pallet repairers to undertake tests, since, if guidance given in this standard is followed and systematic repair and inspection systems are used, then a successful repair is recognised to follow.

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## 1 Scope

This European Standard specifies the maximum defects and damage allowed before a flat wooden pallet shall be repaired, and defines the minimum repair criteria that shall be used.

This European Standard is applicable to wooden flat pallets repaired with wood based components.

**NOTE** The maximum allowed defects and damage for pallets are described in this standard and the annexes A to D show examples of defects and damage which make the widely used pallets unacceptable for use. For other pallet types similar criteria should be set up. The repair criteria for pool and rental pallets are controlled by their respective controlling operators/owners, and may be subject to a licence.

## 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 1087-1:1994, *Particleboards – Determination of moisture resistance – Boil test.*

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

ISO/DIS 15629:2000, *Pallets for material handling – Quality of fasteners for assembly of new and repair of wooden flat pallets.*

## 3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN ISO 445:1998 (some of which are repeated below for convenience) apply, together with the following:

### 3.1

#### **board**

top deck board, bottom deck board, or stringer board

### 3.2

#### **deckboard**

individual member of a top or bottom deck

### 3.3

#### **bottom deck board**

individual member of bottom deck

### 3.4

#### **stringerboard**

horizontal member linking the blocks and deckboards

### 3.5

#### **stringer or bearer**

continuous longitudinal member underneath the top deck or between the top and bottom decks, which provides space for the entry of fork-lift forks and pallet-truck fingers.

## 4 Defects and damage criteria

### 4.1 Overriding criterion

The overriding criterion for an unacceptable pallet is if its condition is such that it cannot be regarded as safe and that handling the pallet might be dangerous for persons or goods (as illustrated in annexes A to D).

### 4.2 Nail joint strength

Nail joint strength is particularly important for the performance of pallets.

### 4.3 Inspection

Inspection of a pallet shall take place before any handling, whether loaded or empty.

### 4.4 General conditions identifying an unacceptable pallet for use

The general conditions, which make a pallet unacceptable for use, are as follows:

- a) one deckboard missing or broken, either obliquely or across;
- b) either one block, stringer (bearer) or stringerboard missing or broken;
- c) missing wood on deckboards to such an extent that on one deckboard, two or more nail shanks are visible, or on more than two deckboards, one or more nail shanks are visible, or missing wood of more than  $\frac{1}{4}$  of the width of the board for  $\frac{1}{4}$  length. Missing wood on a deckboard between the blocks of more than  $\frac{1}{4}$  of the width of the deckboard;
- d) splits on deckboards of more than  $\frac{1}{2}$  of the width or the length of the deckboard, which cannot be securely nailed;
- e) wings on pallets may only have missing wood from inner deckboard ends for a maximum of  $\frac{1}{3}$  of projecting wing length;
- f) missing wood on blocks, stringers (bearers) or stringerboards, if more than one nail shank is visible at any one joint;
- g) depending on use, dirty or contaminated pallet. If any doubt exists as to the nature of the contamination, care shall be taken in its identification and subsequent disposal;
- h) older pallets with a combination of minor damage or loose joints and with a poor appearance may have a combination of issues and be unacceptable when viewed as a whole;
- i) pallets with bad workmanship. Pallets with materials or components that have been previously incorrectly applied;
- j) components affected by decay which could affect their mechanical properties;
- k) Full width splits of any length in stringer (bearer) notches.

## 5 Repair

### 5.1 General

Components with unacceptable defects or damage shall be removed and replaced by new or reusable components of one piece.

#### 5.1.1 Blocks of particleboard

If blocks of particleboard are used they shall conform to EN 1087-1. The density of the particle board shall be more than 580 kg per cubic metre.

#### 5.1.2 Bottom deckboards

Bottom deckboards and the corners of the pallet shall be chamfered, if required.

#### 5.1.3 Nail heads

Nail heads shall be countersunk so that the top of the head of the nail cannot be snagged above the surface.

### 5.2 Repair of pallets of known specification

Replacement components shall be from new or re-used materials. They shall be in accordance with the relevant specifications of the pallet and its repair requirements in the relevant standards. Re-used components shall conform to all the requirements of the new pallet component specifications. No missing wood or splits are allowed in these re-used components. The nails used and the final assembled pallet shall meet the requirements of the specifications for that pallet.

NOTE Repair requirements may differ from the new pallet specification. Details as agreed by contract.

Pallets which are unacceptable for use, shall be repaired or disposed of, and marking requirements met as defined in 5.4.

### 5.3 Repair of pallets of unknown specification

If the specification is not known or no specification exists, the replacement components shall have the same dimensions and quality as the removed components. Replacement components may be from new or re-used materials. Components shall meet the conditions given in 5.3.3. Too many nail holes may weaken the component.

#### 5.3.1 Dimensional tolerances

The general maximum permitted tolerances from basic dimensions for pallets of unknown specifications shall be as in Table 1.

**Table 1 — General maximum permitted tolerances from basic dimensions for pallets of unknown specifications**

	<b>Tolerance</b>
Length	+ 8 / - 8 mm
Width	+ 8 / - 8 mm
Overall height	+ 10 / - 10 mm
Diagonal difference	+ 10 / - 10 mm
Flatness	Within 10 mm
Block twist	No overhang
Top gaps	Max 65 mm
Lead board position from edge	+ 0 / - 5 mm
Inner deckboard position from centre line	+ 2,5 / - 2,5 mm
Stringerboard position from centre line	+ 2,5 / - 2,5 mm
Stringer (bearer) position from centre line	+ 5 / - 5 mm
Butted joints	Max 5 mm
Nail counter-sinking from the surface	- 1 / - 5 mm
<p>NOTE The pallets should be flat on their top and bottom surfaces to within 6 mm maximum deviation from the corner-to-corner straight line. Other accuracy requirements may be specified. Annex G shows one example of high accuracy requirements.</p>	

**5.3.2 Assembly**

**5.3.2.1 General**

For assembly, the following fasteners having the physical characteristics described in ISO/DIS 15629:2000, annex A, shall be used. The specification of the nails shall meet the requirements of the pallets concerned.

**5.3.2.2 Boards - blocks or stringers (bearers)**

Twisted square wire, helically threaded, annular threaded nail (the length of the nail depends on the depth of the assembly), the nail penetration shall be at least 35 mm into the block or stringer (bearer).

**5.3.2.3 Deckboards - stringerboards:**

Twisted square wire, helically threaded, annular threaded nail (the length of the nail depends on the combined thickness of the stringerboards and deckboards). If the nail is not clinched, the nail shall not penetrate the underside of the stringer board. If the nail is clinched the clinch shall be 10 mm. Plain nails may also be used if the nail is clinched.

**5.3.2.4 Positioning and number of nails used in assembly**

The number of nails per joint and the correct positioning shall repeat the pattern of the original pallet. Nails shall be positioned no closer than 15 mm from either the end or the edge of a board.

### 5.3.2.5 Repair of notched stringers (bearers)

Full width splits in notched stringers (bearers) of partial four-way pallets shall be repaired using metal plates according to annex E.

### 5.3.3 Components

Components shall have maximum tolerances as shown on Table 2.

**Table 2 — Maximum tolerances for components**

Component	Maximum tolerance
Thickness of stringerboards and deckboards	+ 2 / - 2 mm
width of deckboards	+ 10 / - 10 mm
Length of stringerboards and deckboards	+ 5 / - 10 mm
Height of blocks or stringers (bearers)	+ 2 / - 2 mm
length or width of blocks or stringers (bearers)	+ 5 / - 5 mm

### 5.4 Marking

The marking of repaired pallets shall be as defined by the competent authority and may be identified for example, by a pool mark or identification nail (or fastener).

### 5.5 Final inspection of repaired pallets

The overall size accuracy of the pallet and the minimum dimensions of the openings shall be met and all joints shall be fixed with the relevant number of nails. The repaired pallets are required to conform to the physical requirements of the intended use. The inspection of pallets of known specification is controlled by the competent authority.

## 6 Recycling - disposal

Pallets which cannot be repaired for reuse in line with these specifications shall be discarded.

NOTE 1 After removing the markings, some pallets may be used as limited use pallets.

NOTE 2 Components of good condition can be used as replacement components.

NOTE 3 Other methods for disposal include grinding, composting and burning.

## Annex A (informative)

### Defects and damage which make a 4-way block pallet unacceptable for use

#### A.1 Criteria for which a 4-way block pallet cannot be reused (see Figure A.1)

- 1) A top deck board or a bottom deck board or a stringerboard is missing or broken;
- 2) missing wood on lead top deck boards or lead bottom deck boards to such an extent that on one deckboard, two or more nail shanks are visible, or on more than two deckboards and stringerboards, one or more nail shanks are visible;
- 3) a block is missing, broken or split to such an extent that more than one nail shank is visible.

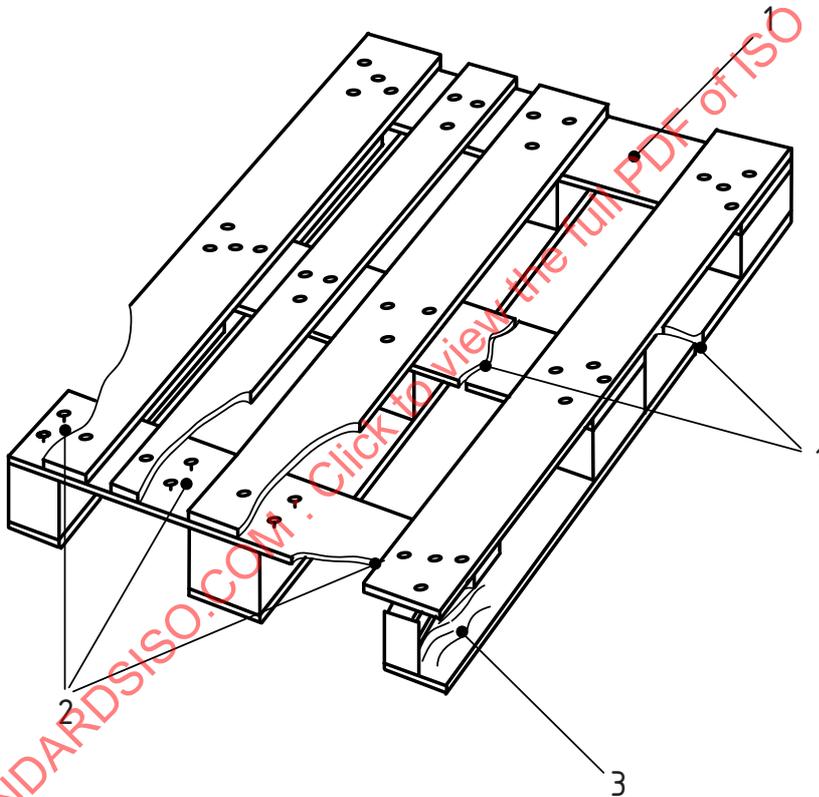


Figure A.1 — Example of a 4-way block pallet unacceptable for use

#### A.2 Other defects and damage which make a 4-way block pallet unacceptable for use

- i) Essential markings stipulated in a specification are missing or illegible,
- ii) inadequate components have been used (boards or blocks too thin, too narrow, too short),
- iii) the general condition is so poor that the load-bearing capacity cannot be ensured (rotten boards or several splits in boards or blocks), the merchandise risks being damaged.

## Annex B (informative)

### Defects and damage which make a perimeter base pallet unacceptable for use

#### B.1 Criteria for which a 4-way perimeter base pallet cannot be reused (see Figure B.1)

- 1) A top deck board or a bottom deck board or a stringerboard is missing,
- 2) a top deck board or a bottom deck board or a stringerboard is broken,
- 3) missing wood on a top deck board or a bottom deck board or a stringerboard of more than  $\frac{1}{4}$  of the width of the board,
- 4) missing wood on a top deck board or a bottom deck board or a stringerboard between 2 blocks of more than  $\frac{1}{4}$  of the width of the board or if nails are visible,
- 5) splits on top deck boards or bottom deck boards of more than  $\frac{1}{2}$  of the width or the length of the board,
- 6) a block is missing,
- 7) missing wood or splits on a block of more than  $\frac{1}{2}$  of the width or height of the block,
- 8) a block is turned about more than  $30^\circ$ ,
- 9) nail heads or nail points are protruding through the boards.

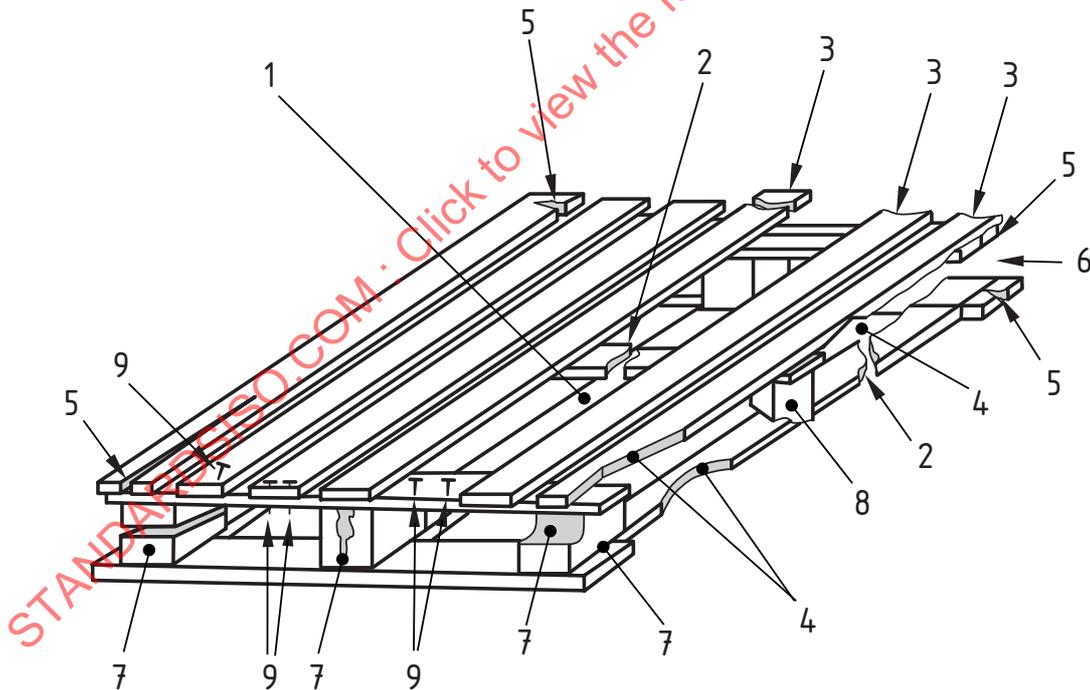


Figure B.1 — 4-way perimeter base pallet, criteria for unacceptable use

#### B.2 Other defects and damage which make a 4-way perimeter base pallet unacceptable for use

- 1) Inadequate components have been used (boards or blocks too thin, too narrow, too short),
- 2) the general condition is so poor that the load-bearing capacity cannot be ensured (rotten boards or several splits in boards or blocks), the merchandise risks being damaged.

## Annex C (informative)

### Defects and damage which make a 2-way stringer (bearer) pallet unacceptable for use

#### C.1 Criteria for which a 2-way stringer (bearer) pallet cannot be reused (see Figure C.1)

- 1) A top deck board or a bottom deck board is missing or broken,
- 2) missing wood on lead top deck boards to such an extent that on one board two or more nail shanks are visible, or on more than two top deck boards, one or more nail shanks are visible. Or there is missing wood on a top or bottom deck board of more than  $\frac{1}{4}$  of the width of the board, for  $\frac{1}{4}$  length,
- 3) splits on top or bottom deck boards of more than  $\frac{1}{2}$  of the width of the board,
- 4) a stringer (bearer) is missing, broken or split to such an extent that more than one nail shank is visible,
- 5) missing wood or splits on a stringer (bearer) of more than  $\frac{1}{2}$  of the height of the stringer (bearer).

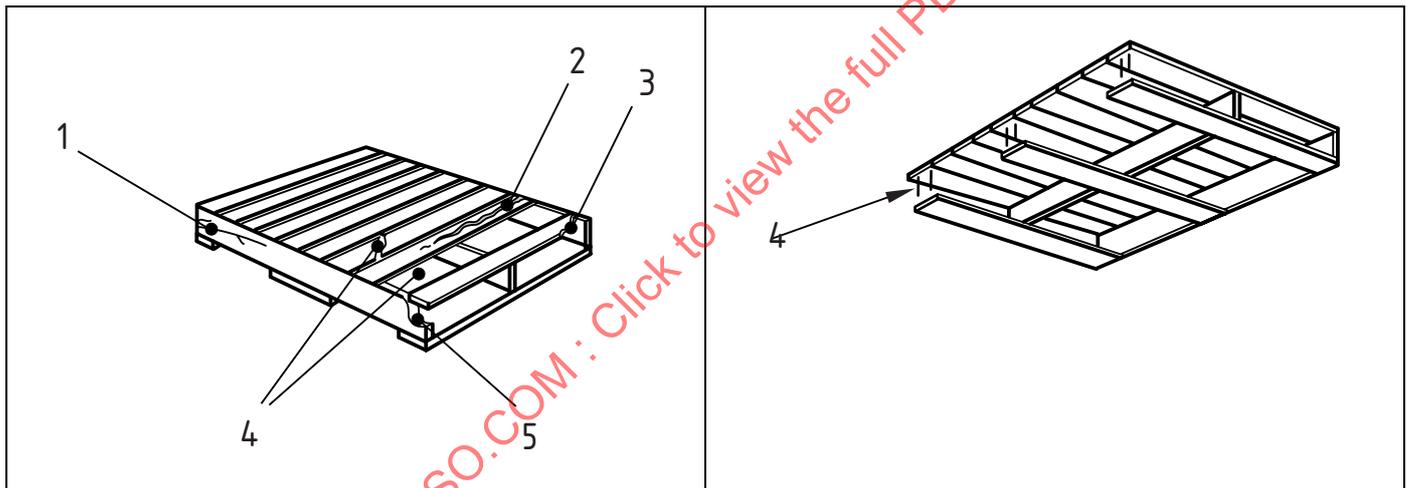


Figure C.1 — Criteria for which a 2-way stringer (bearer) pallet cannot be reused

#### C.2 Other defects and damage which make a 2-way stringer (bearer) pallet unacceptable for use

- i) A stringer (bearer) has splits across its full width,
- ii) nail heads or nail points are protruding through the boards or stringers (bearers),
- iii) essential markings stipulated in a specification are missing or illegible,
- iv) inadequate components have been used (boards or stringers (bearers) too thin, too narrow, too short),
- v) the general condition is so poor that the load-bearing capacity cannot be ensured (rotten boards or several splits in boards or stringers (bearers), the merchandise risks being damaged).

## Annex D (informative)

### Defects or damage which make a partial 4-way pallet unacceptable for use

#### D.1 Criteria for which a partial 4-way pallet cannot be reused (see Figure D.1)

- 1) A top deck board or a bottom deck board is missing or broken,
- 2) missing wood on lead top or bottom deck boards to such an extent that on one board two or more nail shanks are visible, or on more than 2 top or bottom deck boards, one or more nail shanks are visible. Or there is missing wood on a top or bottom deck board of more than  $\frac{1}{4}$  of the width of the board, for  $\frac{1}{4}$  length,
- 3) splits on top or bottom deck boards of more than  $\frac{1}{2}$  of the width or length of the board,
- 4) a stringer (bearer) is missing, broken or split to such an extent that more than one nail shank is visible,
- 5) missing wood or splits on a stringer (bearer) of more than  $\frac{1}{2}$  of the width or height of the stringer (bearer) ,
- 6) a notched stringer (bearer) has splits across full width at the inner end of the notch,
- 7) nail heads or nail points are protruding through the boards or stringers (bearers).

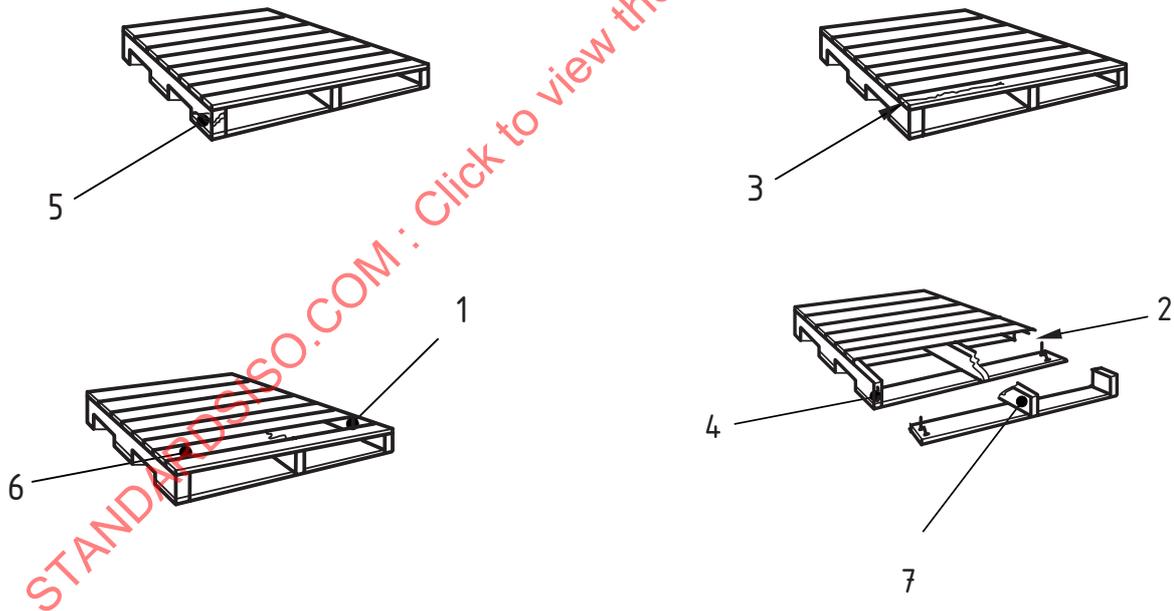


Figure D.1 — Criteria for which a partial 4-way pallet cannot be reused

#### D.2 Other defects and damage which make a partial 4-way pallet unacceptable for use

- i) Essential markings stipulated in a specification are missing or illegible,
- ii) inadequate components have been used (deckboards or stringers (bearers) too thin, too narrow, too short),
- iii) the general condition is so poor that the load-bearing capacity cannot be ensured (rotten boards or several splits in boards or stringers (bearers) , the merchandise risks being damaged.

## Annex E (normative)

### Metal plates for repairing of notched stringers (bearers)

#### E.1 General

##### E.1.1 Minimum plate specifications

Repairs using metal plates shall conform to the criteria given below for size, material, coating, teeth and application (see Figure E.1).

##### E.1.2 Size

The plates shall be a minimum of 70 mm in length or width and a minimum of 7 100 mm<sup>2</sup> in area as determined by external plate dimensions.

##### E.1.3 Material

The material shall be of a 0,90 mm minimum target thickness with a tolerance of  $\pm 0,15$  mm, of un-coated, sheet steel.

##### E.1.4 Coating

The coating should be of Hot-Dip galvanized designation.

##### E.1.5 Teeth

There shall be at least 4 teeth per 645 mm<sup>2</sup> of plate area as determined by external dimensions. The length of teeth shall be at least 8,0 mm excluding plate thickness.

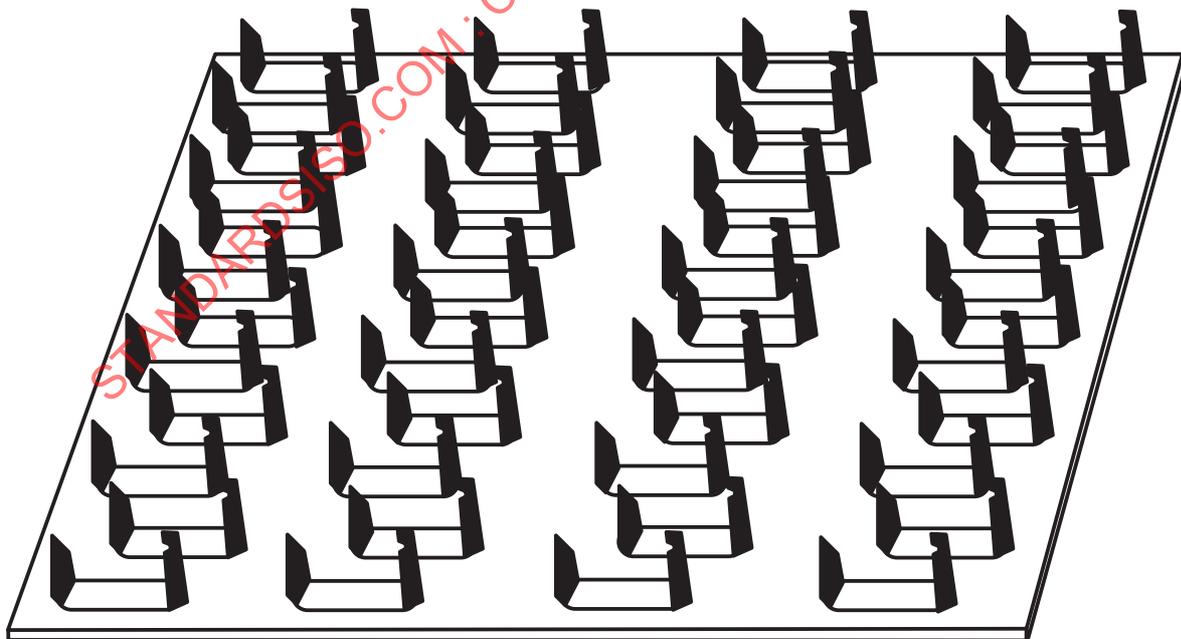


Figure E.1 — Metal plate

## E.2 Metal plate application

### E.2.1 General

Repairs to vertical splits of any kind and repair of damage (splits at large knots) above the stringer notches are not acceptable (see Figure E 2).

### E.2.2 Applying plates to a pallet

Apply plates with mechanical, hydraulic, or pneumatic power, using machinery designed and manufactured for this purpose.

### E.2.3 Minimum number of plates to be applied

A minimum of two plates shall be used per repair. The plates shall be applied opposite one another on each stringer side, flush with the wood surface. Plates shall then be aligned in such a way that they do not overhang the stringer (bearer) ends or edges and the plate's edges will be approximately parallel to the ends or edges of the stringer (bearer). All teeth of each plate are to be pressed into the wood. Splits longer than 200 mm shall be repaired with four plates.

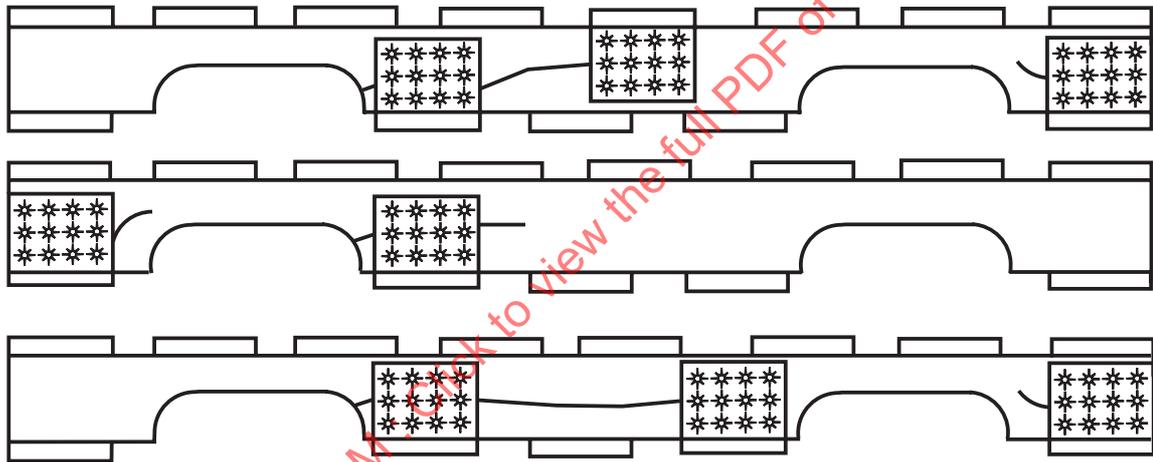


Figure E.2 — Metal plate application