

PPP-P-1660A  
April 12, 1973  
SUPERSEDING  
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October 29, 1971

FEDERAL SPECIFICATION

PALLET, EXPENDABLE

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers expendable pallets. See 6. I for intended use.

1.2 Classification

1.2.1 Types, styles, class, trades, and sizes. Pallets covered by this specification shall be of the following types, styles, classes, grades, and sizes:

Type I- 1/2 Ton\* (508 kg.) load capacity.

Styles 1-7 (see table I).

Classes:

- A-2-way entry (stringer type construction).
- B-4-way entry (block post type construction).
- C-4-way entry (stringer type construction).

Grades:

- 1- (Single-trip).
- 2- (Multi-trip).

Sizes - (see table II).

Type II- 1 Ton\* (1016 kg.) load capacity.

Styles 1-7 (see table I).

classes:

- A-2-way entry (stringer type construction).
- B-4-way entry (block post type construction).
- C-4-way entry (stringer type construction).

Grades:

- 1- (Single-trip).
- 2- (Multi-trip).

Sizes - (see table II).

Type III - 1.5 Ton\* (1524 kg.) load capacity.

Styles 1-7 (see table I):

Classes:

- A-2-way entry (stringer type construction).
- B-4-way entry (block post type construction).
- C-4-way entry (stringer type construction).

Grades:

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Type IV - 2 Tons\* (2032 kg.) load capacity.

Styles 1-7 (see table I).

Classes:

- A-2-way entry (stringer type construction).
- B-4-way entry (block post type construction).
- C-4-way entry (stringer type construction).

Grades:

- 1 - (Single-trip).
- 2 - (Multi-trip).

Size - (see table II).

Type V - 2.5 Ton\* (2540 kg.) load capacity.

Styles 1-7 (see table I).

Classes:

- A-2-way entry (stringer type construction).
- B-4-way entry (block post type construction).
- C-4-way entry (stringer type construction).

Grades:

- 1 - (Single-trip).
- 2 - (Multi-trip).

Size - (see table II).

TABLE I.

Style	Description
1	Single deck (face), flush, non-reversible pallet (see figs. 3, 10 and 14).
2	Double deck (face), flush, non-reversible pallet (see figs. 2, 4 and 16).
3	Double deck (face), flush, reversible pallet (see figs. 6 and 7).
4	Double deck (face), single-wing, non-reversible pallet (see figs. 5 and 11).
5	Double deck (face), double-wing, non-reversible pallet (see figs. 5 and 11).
6	Double deck (face), double-wing, reversible pallet (see figs. 5 and 6).
7	Double deck (face), with openings for hand fork lift (see figs. 12, 16, and 17).

TABLE II. Size

Size	Inches		Millimeter	
	+0	+0	+16	+16
a	40 - 5/8 x 40 - 5/8	+0	1000 - 0 x 1000 - 0	+16
b	40 - 5/8 x 48 - 5/8	+0	1100 - 0 x 1200 - 0	+19
c	42 - 5/8 x 36 - 5/8	+0	1050 - 0 x 900 - 0	+14
d	42 - 5/8 x 42 - 5/8	+0	1050 - 0 x 1050 - 0	+16
j**	45 - 5/8 x 34 - 5/8	+0	1125 - 0 x 830 - 0	+14
e**	45 - 5/8 x 36 - 5/8	+0	1125 - 0 x 900 - 0	+16
f**	45 - 5/8 x 45 - 5/8	+0	1125 - 0 x 1125 - 0	+19
g	48 - 5/8 x 32 - 5/8	+0	1200 - 0 x 800 - 0	+16
k**	49 - 5/8 x 41 - 5/8	+0	1225 - 0 x 1025 - 0	+21
h**	54 - 3/4 x 45 - 5/8	+0	1350 - 0 x 1125 - 0	+19

\*2240 lbs. = 1 long ton = Avoirdupois (1.016 metric tons).

\*\*Pallet sizes used in ANSI MH10.1 - Unit - load sizes for dimensioning transport-package sizes.

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## 2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on the date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

### Federal Standard:

Fed. Std. No. 123 - Marking for Domestic Shipment (Civil Agencies).

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U. S. Government Printing office, Washington, DC 20402.

(Single copies of this specification and other Federal Specifications required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Services Administration Regional Offices in Boston, New York, Washington, DO, Atlanta, Chicago, Kansas City, MO, Fort Worth, Denver, San Francisco, Los Angeles, and Seattle, WA.

(Federal Government activities may obtain copies of Federal Specifications, Standards and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

### Military Standards:

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.  
MIL-STD-731 - Quality of Wood Members for Containers and Pallets.

(Copies of Military Specifications and Standards required by contractors in connection with specifications procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

## 3. REQUIREMENTS

### 3.1 Rating and preproduction Sample.

3.1.1 Rating. The load rating of a pallet shall be of one of the nominal ratings shown in 1.2.1 under types and also of one of the size shown in the same paragraph, as specified in the contract or purchase order (see 6.2). All optional requirements given in 6.2 not taken by the purchaser shall become the option of the supplier.

3.1.2 Preproduction sample. When specified a preproduction sample shall be furnished.

### 3.2 Materials.

3.2.1 General. The material from which a pallet is constructed shall be as specified by the purchaser or when not specified shall be at the option of the manufacturer and shall be suitable for the rating of the pallet, the nature of the load, load capacity, grade and intended service. The quality and thickness of the material shall be such that the pallet is able to comply with the appropriate requirements of 3.5 (see 6.2).

3.2.2 Materials. Materials shall meet the following additional requirements.

- (a) Metal components shall be corrosion resistant or acceptably protected against corrosion to the extent considered good commercial practice.
- (b) If so required by purchaser (see 6.2), the outer surface of the deck(s) shall be treated with anti-slip compound or roughened to the degree specified by the purchaser.
- (c) Material shall be entirely suitable for the load requirements and design of pallet when tested as specified in section 4.

### 3.3 Dimensions.

3.3.1 Length and width. The size (l x w) of pallets shall be as specified by the purchaser, and the length and width of the plan shall conform to the appropriate values given in paragraph 1.2. When specified in the contract or purchaser order, the pallet size (l x w) shall be the option of the supplier (see 6.2).

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3.3.2 Height for pallet and entry. The height from the ground to (u) the underside of the top deck shall not exceed 6 inches (150 mm); and (b) the distance from the bottom of the stringers or blocks (when present) to the bottom of the upper deck shall be at least 3-1/2 inches.

3.3.3 Double-deck pallets. The combined area of the bearing surface of the lower deck shall be at least 40 percent of the overall plan area of the top deck. Double-deck pallets that are intended for use with pallet trucks shall have openings (see fig. 17) in the lower position of the size that conforms to the appropriate dimension shown in figure 17. The thickness of the members of the lower deck shall not exceed 1-1/8 inches (29 mm.) and if their thickness exceeds 12 inch (13 mm.) the bottom members shall be so chamfered (see fig. 12) on each side of the top face (at the point of entry) that the angle between the chamfered surface and horizontal is  $40 \pm$  degrees, and the height of the vertical part of each edge is  $1/2 \pm 1/8$  inch ( $14 \pm 2$  mm.)

3.3.4 Deck members. When a deck is not of one-piece construction, the space between adjacent members shall not exceed 1-1/2 inches (38 mm), unless otherwise specified by the purchaser (see 6.2).

#### 3.4 Construction.

3.4.1 Style. The style of pallet shall conform to the appropriate style shown in Table I as specified by the purchaser (see 6.2) or when not specified the style shall be the option of the supplier.

3.4.2 Stability. When standing on 8 horizontal flat surface, the pallet shall rest evenly and the decks shall be flat and horizontal.

3.4.3 Entries. Pallet shall be class A-2-way or class B and C-4-way entry. If for 2-way entry, the length of the adjacent sides of a pallet are not the same, the entries shall, unless otherwise specified (see 6.2), be in the longer side.

3.4.4 Assembly. The decks of the pallets shall be parallel to one another. Joining of components shall be such that the assembled pallet shall meet the performance requirements of 3.5. The ends and sides shall form right angles ( $90 \pm 1^\circ$ ) to one another.

3.5 Performance. Each pallet shall be capable of passing the tests referred to in table III appropriate to the grade 1 (single-trip) or 2 (multi-trip) pallet specified, see 6.2.

TABLE III. Performance requirements 1/

Property	Test method subsection	
	Single-trip	Multi-trip
Deflection of deck(s) under static load $\neq$	4.4.1.1	4.4.1.2
Resistance to full-deck load	4.4.2.1	4.4.2.2
Rigidity	4.4.3.1	4.4.3.2
Resistance to impacts	4.4.4.1	4.4.4.2

1/ When a manufacturer's pallet has met these performance requirements and certified test records have been maintained for a particular material, type, style, class, grade and size pallet, the manufacturer will not be required to retest unless he changes materials, material thickness, type, style, class, grade, size, method of fastening or method of manufacture provided he a government contract using this specification within the last six months.

2/ Not applicable to pallets to be loaded with items of base area such that each item will cover at least two-thirds of the area of the deck.

3.6 Workmanship. All components shall be made with smooth surfaces without sharp edges or protruding fasteners, which, when handled will be a safety hazard to personnel. Also, pallets shall meet the requirements of all subsidiary specifications as related to workmanship.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the Specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Sampling for inspection and acceptance. Sampling for inspection and acceptance shall be performed in accordance with the provisions set forth in MIL-STD-105, except otherwise indicated.

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4.2.1 Inspection of components and materials. In accordance with 4.1, the supplier is responsible for insuring that components and materials used are manufactured, tested, and inspected in accordance with requirement of reference subsidiary specifications and standards to the extent specified, or, if none, in accordance with this specification.

4.2.2 Inspection of assembled pallet. One pallet of each type, class, style, grade, size and material to be offered under a given contract shall meet or exceed the requirements of 3.5 except as otherwise specified.

#### 4.3 End item inspection.

4.3.1 Lot size and sample unit. The lot size shall be all pallets of each type, class, and size submitted for inspection at one time. The sample unit shall be one assembled pallet, or the components necessary for the assembly on one unassembled pallet, as applicable.

4.3.2 Visual examination. The end item shall be examined in accordance with the classification or defects set forth in table IV. The inspection level shall be level S1 with AQL of 4.0 for major defects and 6.5 for total defects, expressed in term of defects per hundred units.

4.3.3 Conditioning. If the pallet is to be used under abnormal conditions each test sample shall be exposed to the appropriate condition immediately before it is tested. The length of exposure shall depend upon the nature of the material from which the pallet is made and shall be long enough to ensure adequate conditioning of the material for the conditions of use expected (see 3.2.1).

TABLE IV. Classification of defects

Examine	Defects	Classification	
		Major	Minor
Materials	Not as specified.	X	
Pallets	Length, width not as specified.	X	
Pallet	Style not as specified.	X	
Assembly (assembled pallets)	Assembled unit does not form a rectangle with 90 degrees corners.	X	
Marking	Not as specified.		X

#### 4.4 Tests.

4.4.1 Static load deflection of deck (see fig. 15). The load capacity for best purposes shall be shown as follows: R = load capacity for the type (I, II or III etc.) pallet specified (see 1.2).

##### 4.4.1.1 Grade 1 (single-trip) pallets.

(1) Support the bottom of the top deck of the pallet with two rigid arms of length greater than the width of the deck and of width 2 inches (50 mm.) and having no sharp edges. Position the supports parallel to and just inside the outer stringer (runners) or blocks. In the case of wing pallets position the supporting arms parallel to and just outside the outer stringers (runners) or blocks. Measure the distance from the bottom of the pallet to a fixed point on the smooth level floor when the pallet is horizontal and at some height from a smooth level floor. Designate this height A1. Place two load bearing members as shown in figure 15 on top of the deck parallel to the support arms and so positioned that they divide the deck into three equal areas. Slowly apply a load, evenly distributed on the load bearing member and increase it until the load plus the weight of the load bearing members is equal to R. Remeasure the clearance below the center of the pallet and designate this height A2. Raise the load from the pallet and then reapply it slowly on the load bearing members. Remeasure the clearance below the pallet and designate this height A3.

(2) If the pallet is 4-way style, repeat the test with the support and load bearers at right angles to the directions used in the first test.

(3) The pallet shall have failed if any value of (A1-A2) or (A1-A3) is greater than 1.8 percent of the distance between the centers of the supporting arms.

4.4.1.2 Grade 2 (multi-trip) pallets. Use the procedure described in 4.4.1.1 with the following modifications:

(1) Apply a load of 1-1/2 R instead of R, and apply and remove the load four times instead of only twice.

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(2) Consider the pallet to have failed if any of the deflections (A1-A2) Or (A1-A3) is greater than 1.8 percent of the distance between the centers of the supporting arms.

4.4.2 Resistance to full-deck loading.

4.4.2.1 Grade 1 (single-trip) pallets.

(1) The pallet shall be placed on a flat horizontal surface and the top deck shall be covered with a steel plate 1/8 inch (3 mm.) thick and of such size (length and width) to cover the deck completely with a maximum length or width tolerance of +2 percent. When a compression tester is used with a \*tea of such size (length + width) to cover the deck +2 percent, the steel plate will not be required. Slowly apply a load, evenly distributed over the surface of the plate, until the sum of the load and the weight of the plate is equal to 5R. After 5 minutes measure any defamation that has occurred. Remove the load and measure any permanent definition. Repeat this procedure on the same pallet.

(2) When the pallet is made from paper products, consider the pallet to have failed if at any tins during the test the deformation exceeds 10 percent of the original dimension.

(3) When the pallet is made from materials other than paper products, consider the pallet to have failed if at any time during the test the defamation exceeded 5 percent of the original dimension.

4.4.2.2 Grade 2 (multi-trip) pallets. Use the procedure in 4.4.2.1 but apply and remove the load 10 times, and consider the pallet to have failed if at any time during the test the deformation exceeded 2 percent of the original dimension.

4.4.2 Rigidity drop test.

4.4.3.1 Grade 1 (single-trip) pallets. Pallets shall be tested for rigidity as follows:

(1) Suspend the pallet so that one of the diagonals of the top deck is vertical and the lowest petit of the pallet is 10 inches (25 cm.) above a solid flat horizontal surface. Drop the pallet so that it falls freely on the lowest corner. The drop should be made in such a manner as to reduce secondary impacts.

(2) Suspend the pallet, as in (1) above, by a corner of the top deck adjacent to the first corner used, and repeat the drop.

(3) Suspend the pallet by the corner opposite fo the first corner used and replace the drop.

(4) Suspend the pallet by the fourth corner and repeat the drop. the pallet shall be considered to have passed the test if:

- (a) No member has broken and no joint or fastener has failed, ignore local deformation and splits at the corners that occur within 2 inches (50 mm.) of a corner, and
- (b) The difference between the original and final lengths of a diagonal does not exceed 3.5 percent of the original length of the diagonal.

4.4.3.2 Grade 2 (multi-trip) pallets. Use the procedure described in 4.4.3.1 except that the clearance between the pallet and the solid surface shall be 40 inches (1 meter).

4.4.4 Resistance to impacts - drop test.

4.4.4.1 Grade 1 (single-trip) pallets.

(1) Place the pallet on a solid flat horizontal surface. Cover the top deck of the pallet with a steel plate as described in 4.4.2.1. Slowly apply a load, evenly distributed over the surface of the plate, until the sum of the load and the weight of the pallet is equal to 1.25R. Keeping one end of the pallet in contact with the solid surface, lift by means of a bar sling and a quick-release book, the outer end so that it remains horizontal and the vertical distance between the solid surface and the outer most edge of the bottom deck board or runners at the end is 6 inches (150 mm.). Release the hook and allow the pallet to fall freely on to the solid surface. Readjust the load if necessary so that the load is again evenly distributed on the deck. Rotate the pallet through an angle of 90° and repeat the test, lifting an edge that in adjacent to the end first lifted.

2. Consider the pallet to have failed if any deformation that has occurred exceeds 5 percent of the original dimsnion or if any member has broken or if any joint or fastener has failed.

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4.4.4.2 Grade 2 (multi-trip) pallets. Use the procedure described in 4.4.4.1 but subject the pallet to two cycles of drops, each cycle consisting of one drop on each of the four edges in rotation.

## 5. PREPARATION FOR DELIVERY

5.1 Packing: Level C. Assembled pallets shall be packed in a manner to insure commercial carrier acceptance and safe delivery at destination for lowest transportation rate for such supplies. Shipments shall be made in accordance with rules or regulations of commercial carrier for applicable mode of transportation.

### 5.2 Marking.

5.2.1 Civil agencies. In addition to any special marking required by the contract or order (see 6.2), shipment shall be marked in accordance with Fed. Std. No. 123.

5.2.2 Military activities. In addition to any special marking required by the contract or order (see 6.2), shipment shall be marked in accordance with MIL-STD-129.

## 6. NOTES

6.1 Intended use. Pallets covered by this specification are intended for use with forklift and hand-lift trucks for general materials handling operations in storage and distribution systems. They are used to palletize such commodities as bags, bales, barrels, boxes, cartons, cases, drums, kegs, sheeting tags and wire, or other commodities packaged or packed in these containers.

6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents:

- (a) Title, number, and date of this specification.
- (b) Types, styles, classes, grades, and sizes (see 1.2.1 and 3.4.1).
- (c) When a preproduction sample is required (see 3.1).
- (d) Material required for pallet (see 3.2).
- (e) Surface treated with anti-slip compound (see 3.2.3(b)).
- (f) When entry shall be in other than long side (see 3.4.3).
- (g) Size of spaces between deckboards other than those specified in 3.3.4.
- (h) Size (L x W) is the option of the supplier (see 3.3.1).
- (i) When abnormal temperature and humidity conditions are required for intended service (see 3.2.1 and 4.3.3).

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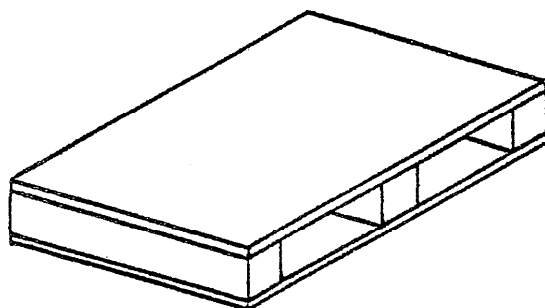


FIGURE 1 - Two-way pallet.

A pallet whose stringers (runners) or posts permit the entry of forks or tines from two opposite directions only. (Two-way pallets may be of the stringer and post pallet type (as illustrated).)

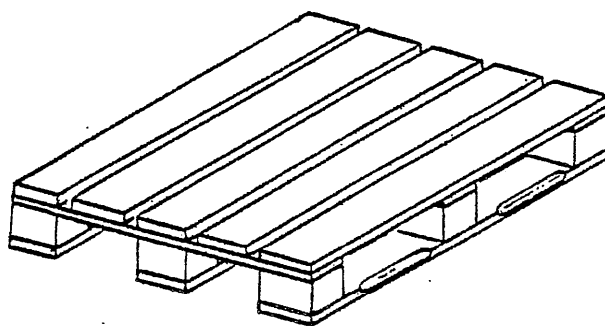


FIGURE 2 - Four-way pallet.

A pallet whose stringers (runners) or posts permit the entry of forks or tines from all four directions. (Four-way pallets may be of the stringer and post pallet type (as illustrated).)



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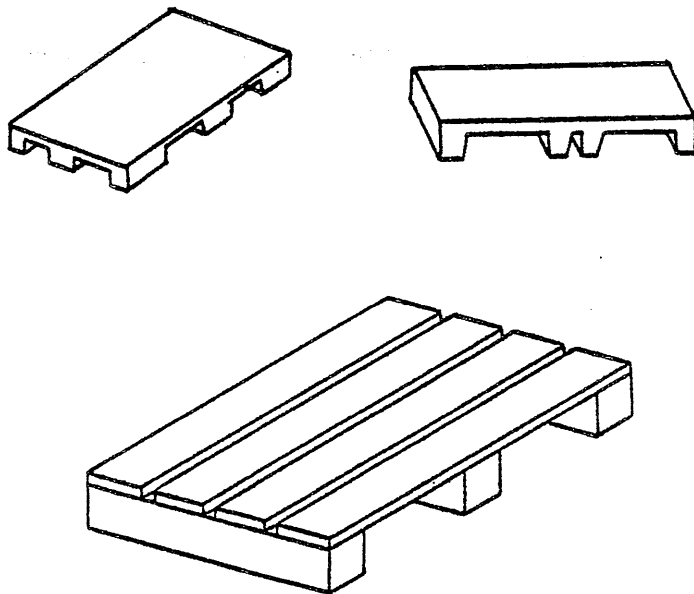


FIGURE 3 - Single-deck pallet.

A pallet with only one deck to take the load. (Single-deck pallets may be of the stringer and post pallet type (as illustrated).)

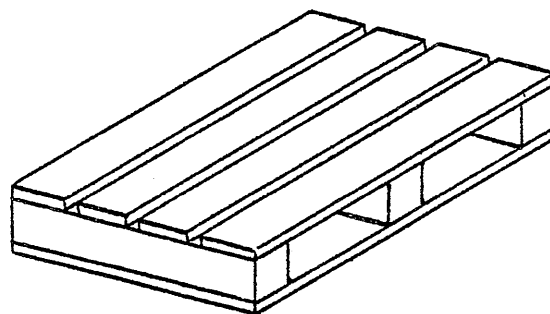


FIGURE 4 - Double-deck pallet.

A pallet with a top deck to take the load and a bottom deck that acts as a base. (Double-deck pallets may be of the stringer and post type (as illustrated).)

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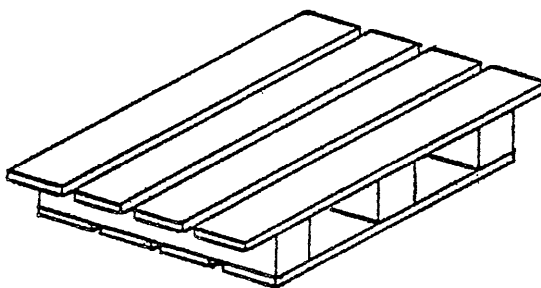


FIGURE 5 - Wing pallet.

A pallet whose deck(s) project beyond the stringers (runners) or the feet, at each end. (Wing pallets may be stringers and post pallet type (as illustrated).)

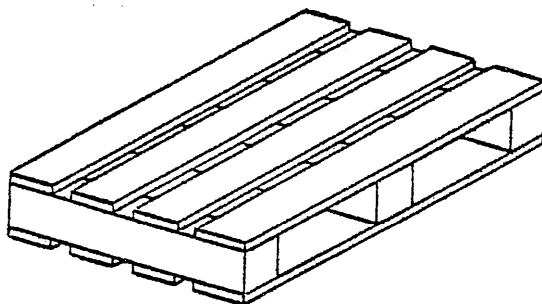
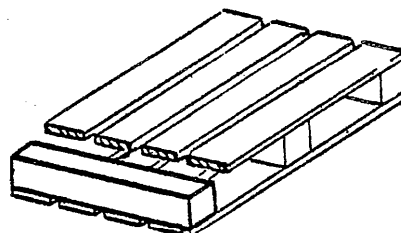
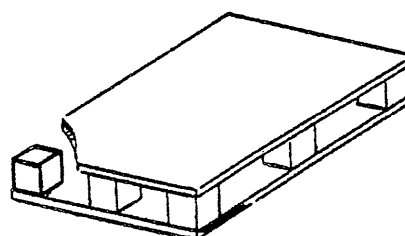


FIGURE 6 - Reversible pallet.

A double-deck flat pallet with top and bottom decks of similar construction, each of which can take the same load.



Stringers (runners)



Blocks

FIGURE 7 - Stringers (runners) and blocks.

Members that separate the top and bottom decks, tie the decks members together and provide space for the entry of forks or tines.

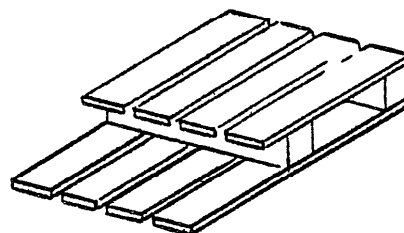
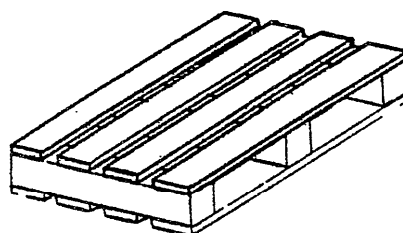
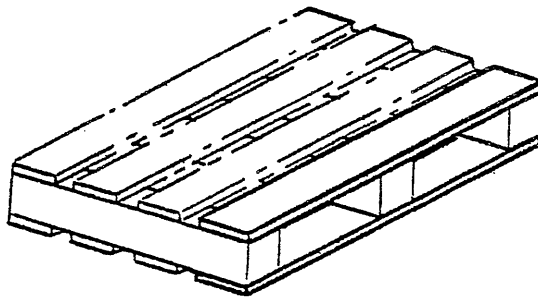


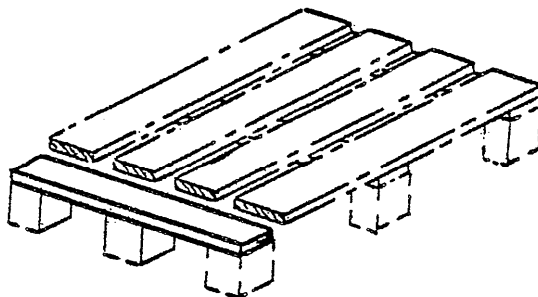
FIGURE 8 - Deck.

A solid or slatted surface designed to carry the load (top deck), or to act as a base (bottom deck).

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**FIGURE 9 - Entry members.**  
Members that form the outside edges of decks on the sides on which the forks or the tines enter.



**FIGURE 10 - Stringer boards.**  
A horizontal member that supports the top deck and connects the blocks to it.

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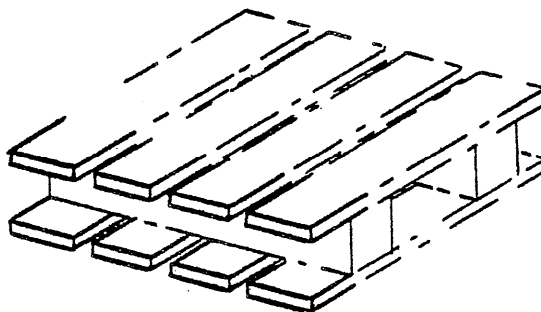


FIGURE 11 - Wings.

Parts of deck(s) which project beyond the stringers (runners) or blocks to permit handling other than by forks, e.g. by means of cranes.

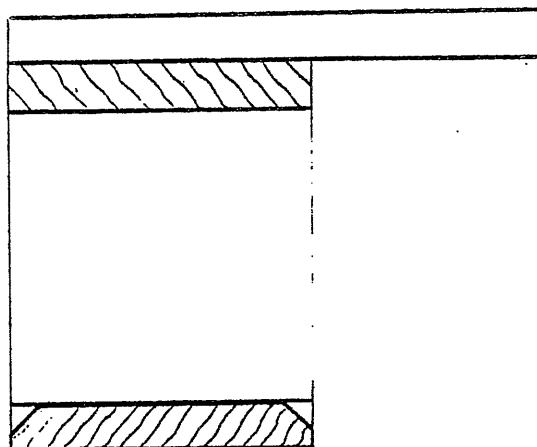


FIGURE 12 - Section at chamfer.

A bevelled area on the upper edges of the bottom deck at a point of entry.

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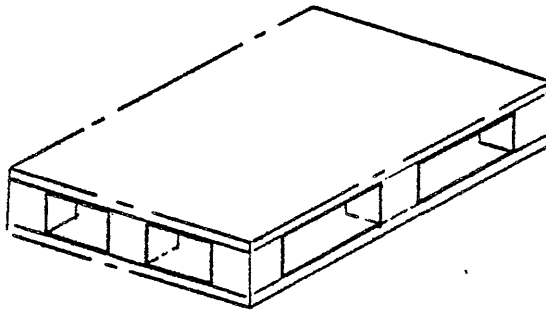


FIGURE 13 - Entry.

Space that permits the entry of forks or tines in a particular direction.

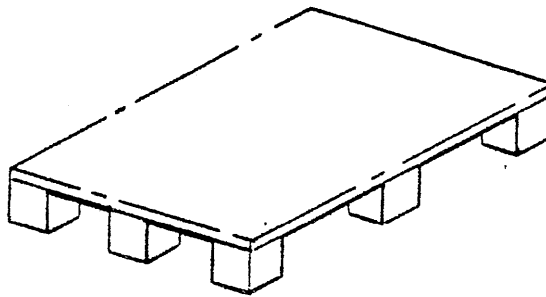


FIGURE 14 - Free entry.

Entry through which the wheels of a hand pallet truck can pass without leaving the ground.

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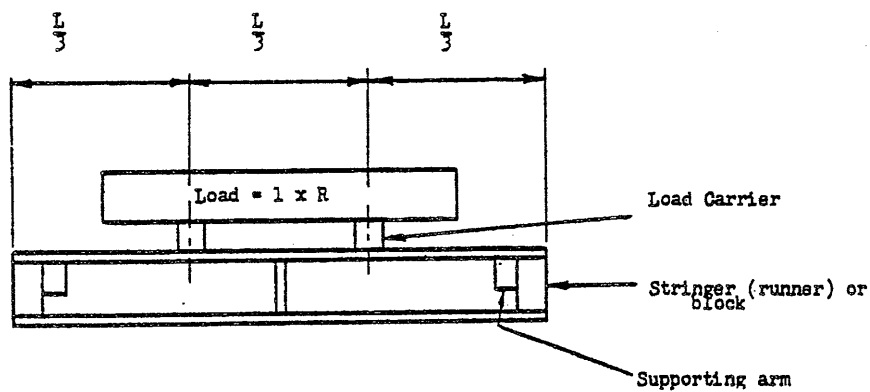


FIGURE 15 - Deflection test of pallet.

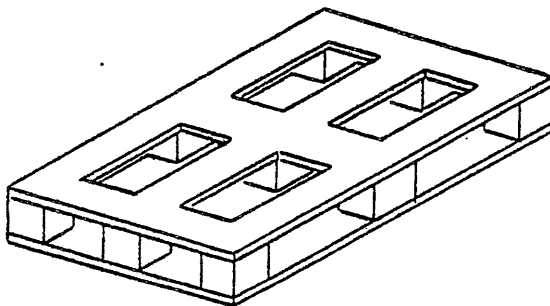


FIGURE 16 - Openings.

Gaps provided in the bottom deck of a double-deck pallet to allow the wheels of a hand pallet truck to bear on the ground ( see fig. 17).

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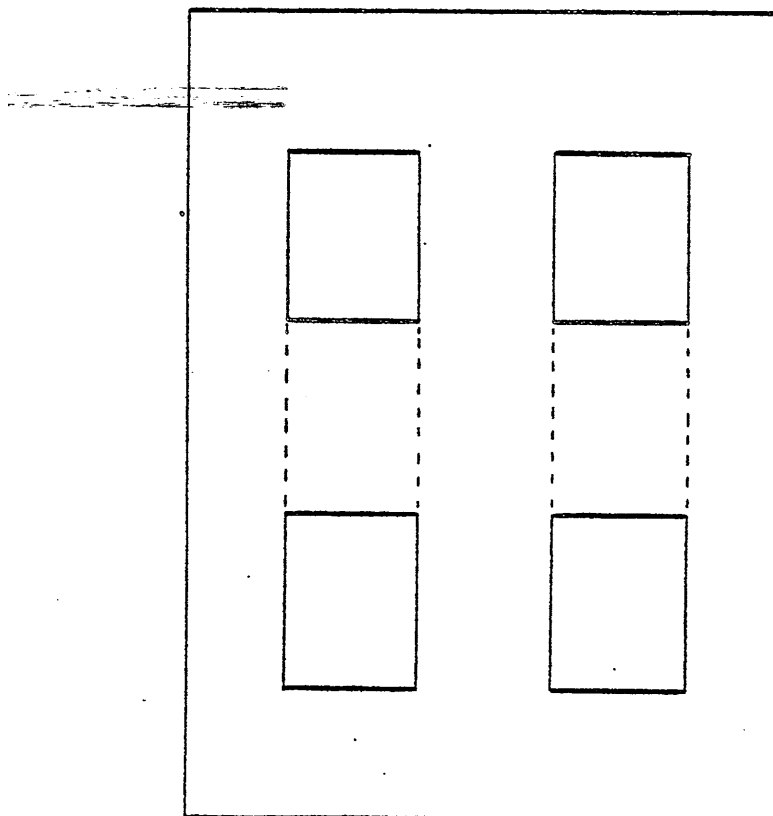


FIGURE 17 - Openings for hand pallet truck wheels in the bottom deck of a double-deck pallet.

Pallet size designation	a, Min.		b, Min.		c, Min.		d, Min.*	
	In.	Mm.	In.	mm	In.	Mm.	In.	Mm.
a	11	280	6-1/4	150	11	280	6-1/4	150
b	11	280	6-1/4	150	12	305	6-1/4	150
c	11	280	6-1/4	150	12	305	6-1/4	150
d, e, f, g, and h	12	305	6-1/4	150	12-1/4	312	6-1/4	175

\*If the design of the pallet permits, the openings may be extended to form 2 rectangular openings, as indicated by the dotted lines, instead of 4.